• The FDA has not cleared the drug and/or medical device for the use described in this presentation

ANKLE/FOOT/CALF

E-poster #100: Arthroscopic Management for Osteochondral Lesions of the Talar Dome
Masato Takao, JAPAN

E-poster #101: Autologous Chondrocyte Implantation for Osteochondral Lesions of the Talus: A 12 Month Clinical, Arthroscopic & Biopsy Evaluation
Ian Henderson, AUSTRALIA

E-poster #102: Ankle Arthroscopy in Local Anesthesia
Luciano Lucania, ITALY

E-poster #103: Intra-articular fractures of the distal tibial epiphysis in young sportsmen.
Vitaliy Kuksov, RUSSIA

E-poster #104: Arthroscopic-Assisted Tibiototalocalcaneal Arthrodesis Using Intramedullary Nail
Hitoshi Sekiya, JAPAN

E-poster #105: Combined Anterior and Posterior Impingement Syndrome of the Ankle
Ian Henderson, AUSTRALIA

E-poster #106: Endoscopy in Percutaneous Repair of Achilles Tendon Rupture. Is it a Waste of Time?
Athanasios Fortis, GREECE

E-poster #107: Plantar Fascitis Treated with Radiofrequency. Preliminary Results.
Ramon Barredo, USA

E-poster #108: Arthroscopy Assisted Reduction and Internal Fixation for Triplane Fracture of the Ankle: A Case Report
Halefik Nishi, JAPAN

E-poster #110: MRI Evaluation for Consecutive Change of the Intensity of Anterior Talofibular Ligament Autografts Comparison with Articular Portion and Bone Tunnel Portion
Masatoshi Tokita, JAPAN

E-poster #111: Osteochondral Lesions of the Ankle: A Retrospective Clinical Study
Alvaro Ojeda, CHILE

E-poster #112: Confidence of the conservative treatment for the acute ankle lateral ligament injury.
Kozo Ohtera, JAPAN

E-poster #113: Extracorporeal Shock Wave Therapy in Tibial Stress Fractures
Juan Herrera, COLOMBIA

E-poster #115: Arthroscopy and Endoscopy of Hindfoot Pathology
Gonzalo Mora, SPAIN

E-poster #117: Pseudarthrosis of the Medial Tubercle of the Posterior Process of the Talus: A Misdiagnosed Cause of Chronic Ankle Pain in Athletes
Elias Dagher, FRANCE

E-poster #121: Physiotherapy Programme Following Halux Valgus Corrective Surgery and Plaster Cast Free Healing Process
Izabela Maziarcz, POLAND

E-poster w/ Standard #122: Results of Endoscopic Plantar Facia Release
Rajesh Bazaz, USA

E-poster w/ Standard #123: Results of Functional Postoperative Treatment of Professional and Amateur Athletes After Achilles Tendon Ruptures
Witek Ewa, POLAND

E-poster w/ Standard #124: Anatomical Reduction of Anterior Tibio- Fibular Avulsion Fracture: An Accurate and Secure Fixation Technique
Yousef Salameh, ISRAEL

E-poster w/ Standard #125: Efficacy of Mesotherapy on Achilles Tendinopathy. A Placebo-Controlled Study
Gianluca Camilli, ITALY
**E-poster w/ Standard #126**: A New Anatomical Reconstruction of the Lateral Ankle Ligaments. Hideji Kura, JAPAN

**E-poster w/ Standard #127**: Pathoanatomy and Treatment of the Unstable Os Subfibulare or Old Avulsion Fractures of the Lateral Malleolus. Kensuke Yasumura, JAPAN

**E-poster w/ Standard #128**: Risk Factors for Stress Fractures, Orthopaedic Acute and Overuse Injuries in Female Infantry Recruits. Gideon Mann, ISRAEL

**E-poster w/ Standard #129**: Diagnostic Value of Stress X-P, Ultrasound, and MR imaging for Disruption of the Anterior Talofibular Ligament. Kazunori Oae, JAPAN

**BASIC SCIENCE**

**E-poster #150**: Injury Pattern of the Degenerative Adolescent Porcine Spine Exposed to Traumatic In-Vitro Loading. Leif Swärd, SWEDEN

**E-poster #151**: The Meniscofemoral Ligaments of the Knee in Japanese. Shinya Nagasaka, JAPAN

**E-poster #153**: Long Term Sport Involvement Does Not Lead To Significantly Greater Incidence Of Sporting Injuries In Elite Young Athletes. Nicola Maffulli, UNITED KINGDOM

**E-poster #154**: Reconstruction of a Bone Defect with Injectable Biodegradable Bone Substitute: A Histological and Biomechanical Studies in Rabbits. Chih-Hwa Chen, TAIWAN

**E-poster #155**: The Effect Of Bipolar Radiofrequency Energy On The Structure Of The Meniscus Of The Knee Joint- An Invitro Study. Vijay Bhalaik, UNITED KINGDOM

**E-poster #156**: Clinical and Anatomical Study About Double Bundles in the Anterior Cruciate Ligament. Masaaki Ito, JAPAN

**E-poster #157**: The Relationship of the Glenoid Notch Angle and the Attachment of the Antero-superior Labrum. Pol Huysmans, NETHERLANDS

**E-poster #159**: Biomechanical Comparison of the Bioabsorbable Retroscrew System, Delta Screw, and Bioscrew Xtralok for Tibialis Anterior Graft-Tibial Tunnel Fixation. Haw Chong Chang, SINGAPORE

**E-poster #160**: Biomechanical Evaluation of Bioknotless and Bio-cork screw Suture Anchors in the Repair of Rotator Cuff Tears. Jennifer Ammon, USA

**E-poster #161**: Retroscrew System Biomechanical Fixation Characteristics Differ During Submaximal Cyclic and Load To Failure Testing in Porcine Tibiae. John Nyland, USA

**E-poster #164**: Classification of PCL and Associated Lesions Using Stress-Radiography Techniques. Guido Garavaglia, SWITZERLAND

**E-poster #165**: Bone Growth Factors and Staminal Cells: From Experimentation In Vitro to Clinical Medicine. Jolanda Taglioretti, Italy

**E-poster #166**: Cell Viability of Menisci Frozen at Three Different Temperatures: Experimental Study in Rabbits. Moises Cohen, BRAZIL

**E-poster #167**: A Surgical Technique for Autologous Medial Femoral Condyle Transplantation in Rabbits. Moises Cohen, BRAZIL

**E-poster #168**: Medial Meniscus Transplantation Using Synthetic Glue for Fixation In Rabbits. Moises Cohen, BRAZIL

**E-poster #169**: Microsurgical Evaluation of the Posterolateral Corner. Anastasios Tokis, GREECE
E-poster #170: The Effect of Shock Wave Treatment At The Tendon-Bone Interface - A Histomorphological and Biomechanical Study in Rabbits  
Ching-Jen Wang, TAIWAN

E-poster #171: Immunohistochemical Analysis of Mechanoreceptors in the Human Posterior Cruciate Ligament  
Moises Cohen, BRAZIL

E-poster w/ Standard #175: Mechanical Properties of the Anterior Cruciate Ligament Treated with Radiofrequency Shrinkage Deteriorate In Vivo Over Time, Even When Sufficient Volume of Ligament Tissue Remains Intact Around the Treated Portion  
Eiji Kondo, JAPAN

E-poster w/ Standard #176: The Integration Process at the Bone-Tendon Interface in Anterior Cruciate Ligament Reconstruction: an Immunohistological Study in a Rabbit Model  
Tomonoshin Kanazawa, JAPAN

E-poster w/ Standard #177: Myofibroblast Expression in Injured Medial Collateral and Anterior Cruciate Ligaments  
Guido Garavaglia, SWITZERLAND

E-poster w/ Standard #178: Effects of Parecoxib on Bone Healing  
Sigbjorn Dimmen, NORWAY

E-poster w/ Standard #179: The Role of Radiofrequency Microdebridement in Meniscus Surgery. A Study in a Sheep Model  
Wolf Petersen, GERMANY

E-poster w/ Standard #180: Reducing the Killer turn in single bundle PCL Reconstruction: Anatomical and Extracortical Fixation Under Cyclic Loading  
Thore Zantop, USA

ELBOW/WRIST/HAND
E-poster #200: Risks Evaluation in Posterior Transolecranon Surgical Approach: A Traffic Lights Model  
Andrea Salvi, ITALY

E-poster #201: Malpositioning of the Ulnar and Humeral Component of Total Elbow Prosthesis and Revision Rate  
Margarita van der Hoeven, NETHERLANDS

E-poster #202: Viscosupplementation Not Effective for the Treatment of Posttraumatic Osteoarthritis of the Elbow  
Richard van Brakel, NETHERLANDS

E-poster #203: Results of the Kudo Total Elbow Arthroplasty in Patients with Sever Destruction of the Elbow Joint due to Rheumatoid Arthritis  
Rinze Reinhard, NETHERLANDS

E-poster #204: Epicondylitis. Arthroscopic Treatment  
Alberto Pienovi, ARGENTINA

E-poster #205: Four Years Preliminary Experience with Personal Technique for All Inside Arthroscopic Repair of Triangular Fibrocartilage  
Marco Conca, ITALY

E-poster #206: Microsurgical Dissection of the Carpal Tunnel in Respect to Neurovascular Structures At Risk During Endoscopic Carpal Tunnel Release  
Harilaos Vasiliadis, GREECE

E-poster #207: Arthroscopy for Snapping Elbow Due to Congenital Radial Head Dislocation: A Case Report  
Yoshiaki Kurihara, JAPAN

E-poster #208: Shockwave Therapy in Tennis Elbow - Our first two years  
Carlos Leal, COLOMBIA

E-poster #210: Endoscopic Olecranon Bursa Resection  
Gonzalo Mora, SPAIN

E-poster #212: Arthroscopic Treatment of Stiff Elbow  
Jin Soo Park, KOREA

E-poster #213: Arthroscopic Repair Of Combined TFCC Tears, A New Clinical Entity  
Michael Redler, USA
E-poster #215: Physiotherapeutic Approach in Epicondylopathy of the Humerus
Izabela Maziarz, POLAND

E-poster #216: Open Treatment of Stage III Kienbock's Disease With Lunate Revascularization Compared With Arthroscopic Treatment Without Revascularization Gursel Leblebicioglu, TURKEY

E-poster w/ Standard #217: A New Technique for Reconstruction of the MCL of the Elbow Using Triceps Tendon Denise Eygendaal, NETHERLANDS

E-poster w/ Standard #218: Distal Biceps Tendon Anatomy and Endoscopy Gregory Bain, AUSTRALIA

E-poster #219: Midcarpal Anatomy as a Guide to Understanding Carpal Mechanics Gregory Bain, AUSTRALIA

E-poster w/ Standard #220: Complex, Comminuted Distal Radius Fractures: Treatment by Modified Ligamentotaxis employing Wrist Arthroscopy. Sushrut Babhulkar, INDIA

E-poster w/ Standard #221: Wrist Arthroscopy in the Diagnosis of Pediatric Wrist Conditions Paramasivam Sathyamoorthy, UNITED KINGDOM

KNEE-ACL

E-poster #300: Arthroscopic Fixation of ACL Avulsion Fracture of Tibia in Children Kyung Taek Kim, KOREA

E-poster #301: Do Race, Gender and Age Influence the Size of HS Autografts? Ronald Bavaro, USA

E-poster #302: Complications during ACL Reconstruction Using BPTB our Experience of First 100 Cases Deepak Chaudhary, INDIA

E-poster #303: Hour-glass (Bargash) Technique in Arthroscopic ACL Reconstruction Using Semi-T and Gracilis Quadruple Graft Nael Bargash, UNITED ARAB EMIRATES

E-poster #304: Anatomical Angle of the Anterior Cruciate Ligament in the Coronal Plane Masaaki Takahashi, JAPAN

E-poster #305: The Effect of the Oral Contraceptive Pill on Ligamentous Laxity Mark Burman, CANADA

E-poster #306: PLLA Ligament as a Ligament Augmentation Device Masao Ishimura, JAPAN

E-poster #307: Stress Fractures of the Femur After Cross-pin ACL Reconstruction Rafael Lariola, SPAIN

E-poster #308: Active and Passive Mechanisms of Anterior Cruciate Ligament Rupture: Correlation with MRI and Operative Findings of Injury Severity David Parker, AUSTRALIA

E-poster #309: Consequences of a Mid-third BPTB-autograft Excision on Patellofemoral Biomechanics and Knee Kinematics Michael Bohnsack, GERMANY

E-poster #310: Correlation the Anterior Tibial Subluxation with Valgus Instability in Chronic ACL Deficient Knees Kazutoshi Kurokouchi, JAPAN

E-poster #311: Osteochondral Lesions of the Posterolateral Tibia in ACL Disrupted Knees Hayden Morris, AUSTRALIA

E-poster #313: Comparison of EndoButton® Versus Bioabsorbable Interference Screw plus EndoPearl® Femoral Fixation in Hamstring Anterior Cruciate Ligament Reconstruction: A Randomized Clinical Trial Monika Volesky, CANADA

E-poster #316: Clinical Short Term Outcome of Anterior Cruciate Ligament Reconstruction with Quadrupled hamstring tendon graft and Bioabsorbable Tibial Cross Pin Fixation Matthias Klepsch, GERMANY

E-poster #317: Return to Sports After Anterior Cruciate Ligament Reconstruction for Handball and Basketball Yoshinobu Maruhashi, JAPAN
E-poster #318: Configuration of the Tibial Lateral Condyle in a Non-contact Type Knee Injury of the Anterior Cruciate Ligament
Katsuhiro Kitaoka, JAPAN

E-poster #320: Reconstruction of the Anterior Cruciate Ligament Using Mid-Third Patellar Tendon - Evaluation of Quality of Life Measures After 1-15 Year Follow-Up
Moises Cohen, BRAZIL

E-poster #321: Self-Efficacy Beliefs in Patients with an ACL Injury
Pia Thome, SWEDEN

E-poster #322: Development of a New Instrument to Measure Self-Efficacy Beliefs in Patients with an ACL Injury
Pia Thome, SWEDEN

E-poster #323: A Strenght Test Battery for Evaluation of Side-to-Side Difference in Power Development in Patients with ACL Injury
Roland Thomee, SWEDEN

E-poster #324: A Hop Test Battery for Evaluation of Side-to-Side Difference in Hop Performance in Patients with ACL Injury
Roland Thomee, SWEDEN

E-poster #326: Comparative Study the Morphologies, Histochemicals and Immunohistochemicals Characteristics of the Semitendinosus and Gracilis Muscles Tendons between Genders
Edgard Pereira, BRAZIL

E-poster #327: Low Plantar Arch as a Risk Factor for Anterior Cruciate Ligament Injury
Takashi Tsukahara, JAPAN

E-poster #328: Arthroscopic Pull-out Repair for the Acute Anterior Cruciate Ligament Rupture
Chong-Hyuk Choi, KOREA

E-poster #329: The Role of Immobilization on Tunnel Enlargement After Anterior Cruciate Ligament Reconstruction
Ozgur Atay, TURKEY

Anna-Stina Moisala, FINLAND

E-poster #331: Computer-Assisted Comparison of Two Double-bundle Techniques for ACL Reconstruction
Stefano Zaffagnini, ITALY

E-poster #332: Clinical Outcome and Second-look Findings of Amateur Athlete with Bi-socket ACL Reconstruction using Multiple Hamstring Tendons
Atsushi Inoue, JAPAN

E-poster #333: 2 To 5 Years Follow-Up Of Full Thickness Quadriceps Tendon Graft For ACL Reconstruction With Aggressive Rehabilitation.
Daniel Slullitel, ARGENTINA

E-poster #335: Simplified MRI Sequences for Postoperative Control of Hamstring ACL-reconstruction
Jens Agneskircher, GERMANY

E-poster #336: The Use of Allograft Bone Screws and Aperture Fixation in Allograft Bone Patellar Bone ACL Reconstructions
Stephen Houseworth, USA

E-poster #337: Improved Technique of Anatomic Reconstruction of Anteromedial and Posterolateral Bundles of ACL - A Split Double-Bundle Technique-
Chul-Won Ha, SOUTH KOREA

E-poster #338: Results of the Posterolateral Corner Sling for Posterolateral Rotatory Instability Combined Anterior Cruciate Ligament reconstruction
Young Jung, KOREA

E-poster #339: Comparison of Quadriceps and Hamstring Muscle Strength following ACL reconstruction
Caleb Wong, CHINA
E-poster #340: Perturbation Training Induces Dynamic Stability in the ACL Injured Knee
Wendy Hurd, USA

E-poster #341: Posterolateral Instability Associated to ACL Injuries in Contact Sports Athletes
Mario Larrain, ARGENTINA

E-poster #342: Loss of Extension Following ACL Reconstruction: Analysis of Incidence and Etiology Using New IKDC Criteria
Craig Mauro, USA

E-poster #343: Morphological Changes of the Intercondylar Notch after Notchplasty: Longitudinal Changes in Anterior Cruciate Ligament Reconstruction
Atsushi Kobayashi, JAPAN

E-poster #344: Stress Inside Grafts Used for 2-bundle Anterior Cruciate Ligament Reconstruction
Keisuke Kita, JAPAN

E-poster #345: Temporal Change in the Tibiofemoral Relationship in the Extended Knee before and after Anterior Cruciate Ligament Reconstruction
Takashi Soejima, JAPAN

E-poster #346: Isokinetic Study of Extension and Flexion Muscles Strength after Removal of the Medium Third of Patellar Tendon and of the Semitendinosus and Gracilis Muscles for the Reconstruction of Anterior Cruciate Ligament
Marcelo Filardi, BRAZIL

E-poster #347: Transtendinous Cross Pin Fixation for Soft Tissue Grafts: Mode of Fixation and Effects on the Tendon
Geoffrey Baer, USA

Manuel Leyes, SPAIN

E-poster #349: Anterior Cruciate Ligament Reconstruction: A Study of the Effect of Radiological Image Guidance on Tunnel Placement
Gareth Stables, UNITED KINGDOM

E-poster #351: Spur-like lesion on the Lateral Tibial Condyle: A Sign of Chronic Anterior Cruciate Ligament Tear
Sung Choi, KOREA

E-poster #352: Tibial Interference Screw Position in Soft Tissue ACL Graft Fixation: Biomechanical Considerations
David Hayes, AUSTRALIA

E-poster #353: Evaluation of the Femoral Tunnel O’clock Position in Anterior Cruciate Ligament Reconstruction
Eisaku Fujimoto, JAPAN

E-poster #354: Anterior Cruciate Ligament Reconstruction Using the Gracilis Tendon
Sung-Gon Kim, JAPAN

E-poster #355: Dynamic Function After Anterior Cruciate Ligament Reconstruction is Related to Graft Type
Julian Feller, AUSTRALIA

E-poster #356: Relationship Between Eccentric Contraction Strength of Knee Extensor and Joint Stability Before and After Anterior Cruciate Ligament Reconstruction
Hiroshi Ikeda, JAPAN

E-poster #358: Revision Anterior Cruciate Ligament Surgery in Sports Contact Athletes. Mario Larrain, ARGENTINA

E-poster #359: Arthroscopic ACL Reconstruction using Fresh-Frozen Achilles Allograft(-Clinical results, Recovery of sports activity-)
Churl Hong Chun, KOREA

E-poster #360: A New Double Bundle Anterior Cruciate Ligament Reconstruction with Hamstrings Using the Posteromedial Portal Technique
Arai Yuji, JAPAN

E-poster #361: Elucidation of a Potentially Destabilizing Control Strategy in ACL Deficient Non-Copers
Terese Chmielewski, USA
E-poster #363: Computer Assisted ACL Reconstruction: Results at One Year of the First 30 Cases
Guy Messerli, SWITZERLAND

E-poster #364: Bone Tunnel Enlargement after Anterior Cruciate Ligament Reconstruction Using Femoral Cross Pin Fixation.
Takashi Ogiuchi, JAPAN

E-poster #365: Biomechanical Evaluation of Healing Tissue of Patellar Tendon After Harvesting of Its Central Third
Carlo Fabbriani, ITALY

E-poster #366: Tensioning in ACL Surgery
Luigi Pederzini, ITALY

E-poster #368: Difference in Deep Knee Flexion After ACL Reconstruction Using ST and STG Autografts
Alberto Gobbi, ITALY

E-poster #370: Septic Arthritis Following Arthroscopic Anterior Cruciate Ligament Reconstruction: A Retrospective Review and Evaluation of Long-term Outcomes
Rajshri Maheshwari, USA

E-poster #371: Revision ACL due to Posterolateral Insufficiency
Bent Jakobsen, DENMARK

E-poster #372: Education and Sports Activity Level Influences Self-Reported Patient Outcomes more than age at 5 Years Post-ACL Reconstruction Using Allograft Tissue
Kevin Harrel, USA

E-poster #373: The Osseous Incorporation of Free Cancellous Bone Cylinders in the Femoral Canal: A CT Based Study According to ACL-Reconstruction with Hamstring Autografts and Transfix Fixation.
Uwe Pietzner, GERMANY

E-poster #374: Donor Site Morbidity in the First Year after ACL Reconstruction Using Autografts: A Comparison between Hamstrings and Patellar Tendon
Michael Hantes, GREECE

E-poster #375: Functional Outcome of ACL Revision Surgery
Misha Hindriks, NETHERLANDS

E-poster #376: The Potential Benefit of Thermal Shrinkage for Lax Anterior Cruciate Ligaments
Richard Roach, UNITED KINGDOM

E-poster #377: Analysis of Anatomical and Functional Changes of Hamstrings Muscles after ACL Reconstruction
Toru Fukubayashi, JAPAN

E-poster #378: Anterior Cruciate Ligament Injury among Brazilian Indian Population
Eduardo Stewien, BRAZIL

E-poster #379: Endoscopic Anterior Cruciate Ligament Reconstruction using Fluoroscopic Navigation System
Hisatada Hiraoka, JAPAN

E-poster #380: ACL Instability Associated with Pigmented Vilonodular Synovitis- Case Report
Carlos Ferreira, BRAZIL

E-poster #381: Gait Analysis in Well and Poor Functioning Patients with an Anterior Cruciate Ligament Deficiency
Joanna Kvist, SWEDEN

E-poster #382: An Evaluation of Rotatory Instability after ACL Reconstruction: Comparison Between the Three-dimensional analyzer and the Manual Testing
Hiroshi Takagi, JAPAN

E-poster #383: Evaluation of Antero-posterior and Rotatory Instability after Anterior Cruciate Ligament Reconstruction
Hiroki Yamashita, JAPAN

E-poster #384: Effect of Vision on Postural Sway in Anterior Cruciate Ligament Injured Knees
Kazuhiro Okuda, JAPAN

E-poster #385: Endoscopic 3D Insertion Geometry of the Two Functional Bundles of the ACL
Joan Luites, NETHERLANDS
E-poster #386: Motion Analysis of One Legged Vertical Jump in Anterior Cruciate Ligament Injured Knee
Takayuki Kuroda, JAPAN

Takehiko Suginoshita, JAPAN

E-poster #388: Allograft Reconstruction of the Anterior Cruciate Ligament: Comparison with Patellar Tendon
Metin Baydar, TURKEY

E-poster #395: All-inside Anterior Cruciate Ligament Reconstruction Using Patellar Tendon
Arturo Makino, ARGENTINA

E-poster #396: Simultaneous High Tibial Osteotomy and ACL Reconstruction in Active Patients
Matias Costa-Paz, ARGENTINA

E-poster #397: ACL Reconstruction with Hamstring Graft: Comparison of Two Tibial Fixation Techniques in a Prospective Randomized Study
Eric Milon, FRANCE

E-poster #398: Specific Questionnaire for Knee Symptoms: Lysholm Knee Scoring Scale - Translation and Validation for Portuguese Language
Moises Cohen, BRAZIL

E-poster #399: Quadriceps Femoris Musculature Isokinetics Evaluation in Patients with Anterior Cruciate Ligament Injury
Fabiano Kupczik, BRAZIL

E-poster #400: Anterior Cruciate Ligament Injury: Two to Seven Year Follow-Up After Surgical Reconstruction
Fabiano Kupczik, BRAZIL

E-poster #401: Anterior Cruciate Ligament Injury in Women
Fabiano Kupczik, BRAZIL

E-poster #402: Muscle Recruitments Evaluation with Open and Closed Kinetic Chain Exercises in Anterior Cruciate Ligament Deficient Knees
Nobuhiro Abe, JAPAN

E-poster #403: Systematic Review or Meta-analysis: What to do and How to Identify Quality of Orthopaedics?
Moises Cohen, BRAZIL

E-poster #404: A Meta-analysis of Anterior Cruciate Ligament Reconstruction Stability Rates as a Function of Hamstring Versus Bone-Patellar Tendon-Bone Graft Selection and Fixation Type
Chadwick Prodromos, USA

E-poster #405: Arthroscopic and Mini Invasive ACL Reconstruction Using Iliotibial Band: Anatomic Study of a New Concept
Elias Dagher, FRANCE

E-poster #406: Risk Factors Correlated with Results After Anterior Cruciate Ligament Reconstruction in 948 Patients, with a Normal ContraLateral Knee
Gauti Laxdal, SWEDEN

E-poster #407: Anatomic Double-bundle ACL Reconstruction with a Simple Femoral Fixation: Anatomic Study
Elias Dagher, FRANCE

E-poster #408: ACL Hamstring Reconstruction. Comparison of Three Types of Tibial Fixation Devices
Fernando Barclay, ARGENTINA

E-poster #409: Anatomical Description of the Anterior Cruciate Ligament Attachment with Respect to the Anteromedial and Posterolateral Bundles. Part 2: Femoral Footprint
Andrew Edwards, UNITED KINGDOM

E-poster #410: Topographical Anatomy in Anterior Cruciate Ligament Replacement Surgery in Children
Romain Seil, LUXEMBOURG
E-poster #411: Proprioception Differences in Elite Female Athletes - Implication for ACL Injury Protection
Henry Goitz, USA

E-poster #412: Anterior Cruciate Ligament Replacement with Semitendinosus and Gracilis Quadruple Tendon. Femoral Fixation with New Metallic Anchor Device
Raul Gutierrez, BOLIVIA

E-poster w/ Standard #414: Ten Year Follow-up of PBTB ACL-reconstruction with Emphasis of Occurrence of Osteoarthritis
Thomas Patt, NETHERLANDS

E-poster w/ Standard #415: Reduction of Post Operative Pain Following ACL Reconstruction Using Low Temperature Irrigation Fluid
Hayden Morris, AUSTRALIA

E-poster w/ Standard #416: Articular Cartilage Changes Associated with Bony Contusions in Anterior Cruciate Ligament injury
Monika Volesky, CANADA

E-poster w/ Standard #417: Hamstring ACL Reconstruction: Why Sacrifice the Gracilis?
Alberto Gobbi, ITALY

E-poster w/ Standard #418: Analysis of the Relationship Between Knee Hyperextension and the Slope of the Intercondylar Notch Roof
Ryuichi Nakamura, JAPAN

E-poster w/ Standard #419: Initial Tension of Reconstructed ACL on Clinical Outcome Including MRI Findings
Masaki Sonoda, JAPAN

E-poster w/ Standard #420: Preemptive Analgesic Effect of Valdecoxib in Arthroscopic Anterior Cruciate Ligament Reconstruction: A Randomized Controlled Trial
Felicia Tan, SINGAPORE

E-poster w/ Standard #421: Revision Anterior Cruciate Ligament Reconstruction: The US Military Academy Experience
Darryl Thomas, USA

E-poster w/ Standard #422: Quantitative Evaluation of Rotational Instability During Pivot Shift Test in the ACL Deficient Knee - Discrepancy between Anterior and Rotational Instability
Masayoshi Yagi, JAPAN

E-poster w/ Standard #423: A Thirteen-Year Review of Anterior Cruciate Ligament Injuries in Collegiate Basketball and Soccer
Julie Agel, USA

E-poster w/ Standard #424: How Does the ACL Deficient Knee Behave in Different Walking Speeds?
Tina Moraiti, GREECE

E-poster w/ Standard #425: Comparison of XtraLok® vs Intrafix® Tibial Fixation in Hamstring Anterior Cruciate Ligament Reconstruction: A Randomized Clinical Trial
Monika Volesky, CANADA

E-poster w/ Standard #426: Anterior Displacement in the Knee During Electrical Stimulation of a Reconstructed Anterior Cruciate Ligament
Junji Iwasa, JAPAN

E-poster w/ Standard #427: The Variability in Accuracy of the Rolimeter in Assessing Anterior Cruciate Ligament Laxity as Tested by Users of Different Experience.
Gareth Stables, UNITED KINGDOM

•E-poster w/ Standard #428: Femoral Fixation of Patellar Tendon Graft in ACL Reconstruction: A Mechanical Analysis
Giuseppe Milano, ITALY

E-poster w/ Standard #429: Knee Proprioception Gender Differences in Collegiate Soccer
Henry Goitz, USA

E-poster w/ Standard #430: Effects of Physiotherapy versus Home Based Rehabilitation on Outcomes after Anterior Cruciate Ligament Reconstruction
Erik Hofmann, AUSTRALIA
E-poster w/ Standard #431: Prospective Randomized Comparison of Three ACL Techniques at 5 Years Follow-up
Stefano Zaffagnini, ITALY

E-poster w/ Standard #432: A Prospective Evaluation of Femoral Tunnel Widening in Hamstring ACL Reconstructions.
Guillermo Arce, ARGENTINA

E-poster w/ Standard #433: Factors Affecting Athletes Ability to Return to Sports After Successful ACL Reconstruction
Alberto Gobbi, ITALY

E-poster w/ Standard #434: Cadaveric Validation of the 65° Howell Guide for Anterior Cruciate Ligament Reconstruction
Pierluigi Cuomo, ITALY

E-poster w/ Standard #435: The Short-Term Results of Lateralized Single-Route Reconstruction With a Patellar Tendon Graft and Anatomical Two-Route Reconstruction With a Hamstrings Tendon Graft to Treat Anterior Cruciate Ligament-Deficiency
Eiichi Tsuda, JAPAN

E-poster w/ Standard #436: ACL Reconstruction: Comparison of Bone-Patellar Tendon-Bone Graft with Central Quadriceps Tendon. A Retrospective Study
Sahnghoon Lee, SOUTH KOREA

E-poster w/ Standard #437: Anatomical Description of the Anterior Cruciate Ligament Attachment with Respect to the Anteromedial and Posterolateral Bundles. Part I: Tibial Footprint
Andrew Edwards, UNITED KINGDOM

E-poster #438: Press Fit ACL Reconstruction: Is It Reliable? A Prospective Randomized Study.
Mohammad Razi, IRAN

E-poster #439: A New Objective Description of the Femoral Tunnel Placement as a CLOCK Following Anterior Cruciate Ligament Reconstruction
Junya Yamazaki, JAPAN

E-poster #440: Deteriorated Proprioception in the Patients with the Anterior Cruciate Ligament Deficiency Affects Performance
Hiroshi Higuchi, JAPAN

E-poster #441: Second Look Arthroscopic Findings of ACL Reconstruction Using 2-bundle Hamstring Tendons: The Effect of Initial Graft Tension
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SHOULDER INSTABILITY

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Michał Drwiega, POLAND

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Young-Kyu Kim, SOUTH KOREA

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Hiroyuki Nose, JAPAN
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Yves Lefebvre, FRANCE

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Kazuhiko Kikugawa, JAPAN

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Max Kaab, GERMANY

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C. Benjamin Ma, USA

E-poster #950: Slap Lesion in Athletes: An Epidemiologic Study.
Gustavo Monteiro, BRAZIL

E-poster #951: Arthroscopic Trans-tuberosity Cuff Repair: Technique and Preliminary Results
Kazuhiro Yamaguchi, JAPAN

E-poster #952: Evaluation of Partial Rotator Cuff Injuries in Athletes
Benno Ejnisman, BRAZIL

E-poster w/ Standard #954: Complications in Shoulder Arthroscopy in Athletes
Carlos Andreoli, BRAZIL

E-poster #955: Biceps Long Head to Conjoint Tendon Transfer
Ronald Selby, USA

SPINE/HIP/THIGH
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Tarik Aitsiselmi, FRANCE

E-poster #1001: A Case of OS Odontoideum Incidentally Detected by Sports Medical Check
Hiroomi Kamikura, JAPAN

E-poster #1002: Associated Changes in Glenohumeral Joint in Rotator Cuff Tear
Chang-Hyuk Choi, KOREA

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Robert Smigielski, POLAND

E-poster w/ Standard #1006: Relation between Radiological Findings of the Cervical Spine and Neck Muscle Strength in American Football Players and Rugby Football Players
Yasunori Tsukimura, JAPAN

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Masaki Nagashima, JAPAN

SPORTS MEDICINE
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Dennis Liem, GERMANY

E-poster #1101: Injury Profile in Competitive Karate. Prospective Analysis of Three Consecutive World Karate Championships
Rafael Loureda, SPAIN

E-poster #1102: Bilateral Stress Fracture of the Tibia in a Professional Soccer Player: A Case Report and Review the Literature
Moises Cohen, BRAZIL

E-poster #1103: Injury Rates in Taekwondo Players
Metin Baydar, TURKEY

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Minoru Shiraishi, JAPAN

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Toshiro Otani, JAPAN

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Kyle Flik, USA

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Erik Hofmann, AUSTRALIA
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Sven Jonhagen, SWEDEN

E-poster w/ Standard #1111: Differential Sensitivity of Symptoms and Neuropsychological testing following Sport-Related concussion.
Derk van Kampen, NETHERLANDS

E-poster w/ Standard #1112: Effect of Multiple Concussions
Derk van Kampen, NETHERLANDS
E-poster #100
Arthroscopic Management for Osteochondral Lesions of the Talar Dome
Masato Takao, Izumo, Shimane, JAPAN, Presenter
Yuji Uchio, Izumo, Shimane, JAPAN
Kohei Naito, Ohdashi, Shimane, JAPAN
Kazunori Oae, Izumo, Shimane, JAPAN
Mitsuo Ochi, Hiroshima, Hiroshima, JAPAN
Shimane University School of Medicine, Izumo, JAPAN

Purpose: We investigated the efficacy of drilling as a treatment for osteochondral lesions of the talar dome (OLT), and clarified the available surgery in each stages of OLT.

Materials and Methods: There were 39 cases of grade 0 or I OLT (early stage), and 79 cases of grade II, III or IV OLT (late stage) according to modified Pritsch’s classification. In early stage, 19 patients underwent transmalleolar drilling (group TMD; 9 males and 10 females; mean age 29.3±8.6) and 20 patients underwent retrograde drilling (group RD; 12 males and 8 females; mean age 28.0±9.5). In late stage, 39 patients underwent arthroscopic drilling (AD) in which the remaining cartilage was kept at the lesion (group KC; 22 males and 17 females; mean age 30.5±7.6) and 40 patients underwent AD in which the remaining cartilage at the lesion was removed using cup and ring curettes (group RC; 25 males and 15 females; mean age 35.4±12.3). At 1 year after surgery, we performed ankle arthroscopy to grade the chondral lesion. In addition, at preoperation and at 2 years after the operation, we evaluated the clinical results in conjunction with the AOFAS score.

Results: In early stage, the arthroscopic findings revealed that in group TMD, 11 cases (52.6%) were unchanged, and 8 cases (47.4%) had deteriorated, in group RD, 6 cases (30.0%) were improved and 14 cases (70.0%) were unchanged. There were significant differences between group TMD and group RD in the rate of cases showing an improved cartilage condition under arthroscopic examination (p<0.0001). The mean AOFAS score was 91.5±3.5 points in group KC and 95.8±4.9 points in group RC at 2 years after the operation (P=0.0002).

Discussion: Arthroscopic examination has shown that the regenerative cartilage that appears after drilling for the treatment of OLT does not always cover the cartilage defect sufficiently. Our study showed that retrograde drilling in early stage and arthroscopic drilling with removing the remaining cartilage at the lesion in late stage may be of some benefit in the treatment of these lesions.

E-poster #101
Autologous Chondrocyte Implantation for Osteochondral Lesions of the Talus: A 12 Month Clinical, Arthroscopic & Biopsy Evaluation
Ian J Henderson, East Melbourne, VIC AUSTRALIA, Presenter
Ramces Francisco, Manila, PHILIPPINES
Barry Oakes, Clayton, AUSTRALIA
St Vincents & Mercy Private Hospital, Melbourne, Victoria, AUSTRALIA

Talar dome lesions are a common accompaniment of ankle injury often resulting in ongoing symptomatic and functional disability. Conventional treatment results in fibrocartilaginous repair. Among the recent techniques used, only mosaicplasty and autologous chondrocyte implantation (ACI) have found extensive clinical application. In this study, the short-term outcome of ACI for talar dome lesions was evaluated over a 12 month period. Eight patients with talar dome lesions amenable for ACI were included in the study. The procedure involved initial diagnostic ankle arthroscopy and if suitable healthy chondrocytes were harvested for in vitro proliferation. After three to four weeks, cells were re-implanted with a medial or lateral malleolar osteotomy. Standard post-operative rehabilitation followed. Clinical assessment was performed prior to surgery and at three, six, nine, and twelve months post-ACI. Second look arthroscopy and core biopsy for histological examination was carried out at removal of internal fixation.

Clinical evaluation was performed using the American Orthopaedic Foot and Ankle Society Hindfoot Score. Clinical scores obtained showed
progressive improvement from pre-operative [57 (range 26-84)] period to 12 months [86.5 (range 79-98)] post-ACI. Twelve month MRI in four patients showed excellent fill in one and good fill in three. Signal was good and effusion absent in all four MRI’s reviewed. Minimal marrow edema previously seen in two patients showed resolution. Second-look arthroscopy at a mean of six months (range 2.5-9) post-ACI demonstrated nearly normal repair in all. Biopsy performed in four patients showed three to have hyaline-like cartilage while one demonstrated fibrohyaline-like tissue. Minimal marrow edema previously seen in two patients showed resolution. Second-look arthroscopy at a mean of six months (range 2.5-9) post-ACI demonstrated nearly normal repair in all. Biopsy performed in four patients showed three to have hyaline-like cartilage while one demonstrated fibrohyaline-like tissue. Minimal marrow edema previously seen in two patients showed resolution.

This study although with a limited sample, demonstrates the viability of ACI for treatment of osteochondral defects of the talus. Short-term results demonstrated clinical improvement up to 12 months post-ACI compatible with findings at second look arthroscopy and biopsy examination.

E-poster #102
Ankle Arthroscopy in Local Anesthesia
Luciano Lucania, Messina, ITALY, Presenter
Roberto Simonetta, Messina, Sicily, ITALY
Antonio Fede, Messina, ITALY
Carla Fedeli, Perugia, ITALY
Osvaldo Azzaro, Messina, Sicily, ITALY
Sergio Cecconi, Perugia, PG, ITALY
Sergio Cecconi, Perugia PG, ITALY
Michele Attilio Rosa, Messina, Sicily, ITALY
University of Messina - Centro Ortopedico Umbro, Perugia, ITALY

PURPOSE: evaluate the safety and effectiveness of local anesthesia in performing operative ankle arthroscopy.

MATERIALS and METHOD: between January 2001 and September 2003, 15 operative ankle arthroscopies were performed without tourniquet and external distractor. All patients had local anesthesia. The anesthetic procedure consisted of intra-articular injection of mepivacaine 2% (100 mg). Antero-medial and antero-lateral portals were used in all cases. Indications for surgery were partial synovectomies for antero-lateral fibrous impingement in 8 patients, removals of osteophytes for anterior bony impingement in 4 patients, debridements and microfracture of osteochondral lesion in 2 patients and removal of loose bodies in one patient. During arthroscopy, the patients reported pain and discomfort using visual analog scales. The criterion used to assess safety of the local anesthesia was the ratio between patients who showed anesthesia-related neurological, vascular and/or general complications and those who did not (safety ratio, RS). The effectiveness of the anesthetic procedure was evaluated on an objective basis, namely on the ratio between the patients who did not require intra-operative conversion to general anesthesia and those who did (effectiveness ratio, RE). A further differentiation between patients who received intra-operative parenteral analgesia and those who did not was carried out (ratio intra-operative analgesia/no intra-operative analgesia).

RESULTS: Neither neurological nor vascular nor general anesthesia-related complications were observed intra- or post-operatively (ratio complications/no complications: 0). Conversion to general anesthesia was required in 0 out of the 15 patients (ratio no conversion/conversion: 0). Intra-operative analgesia was required in 3 out of the 15 patients (ratio intra-operative analgesia/no intra-operative analgesia = 0,13). The mean visual analog score during arthroscopy was 1.72.

CONCLUSION: Ankle arthroscopy may be performed under local with a low complication rate. We feel that local anesthesia can be a reliable procedure for ankle arthroscopy.

E-poster #103
Intra-articular Fractures of the Distal Tibial Epiphysis in Young Sportsmen.
Pirogov City Hospital, Samara, RUSSIA

The intra-articular fractures of the distal tibial epiphysis with fragment displacement concern to a category of high-gravity injuries for the young sportsmen. Thus the teenage zones are permanently involved in pathological process. There comes acute instability of an ankle joint. For its removal the adequate methods of treatment are required.

We consider that the surgical treatment should be adequate only. We were treated 47 patients with intra-articular fractures of the distal tibial epiphysis with fragment displacement - types 3 and 4 by Salter and Harris. The boys - 28, girls - 19. Age of the patients from 10 till 14 years, dominated 13-14 years -32. A sporting specialization of the children: ski-20, football-15; basketball-8, handball and sporting gymnastics - on 2. At X-ray research: alienation of an internal part distal tibial epiphysis - for 42, outside - for 5. Detected combined injuries: distal fractures epiphysis both
tibial - for 14, stop subluxation-for 9 patients. Preferred early (per the maiden 3 day after a trauma) surgical treatment - deleting of a hematoma, precise confrontation of fragments and fixing them by 2-3 Kirshner’s wires. The bend ends of wires left under a skin. At subluxations stops restored full congruence intra-articular surfaces of an ankle joint. Gypsum longine up to a mean third of anticnemion. The junctures removed on 9-10 day. Plaster bandage for 2 months. The wires extracted after 2, 5-3 months. Conducted in a full volume a medical and sporting aftertreatment.

Long term results are studied for 40 patients in terms from 2 till 7 years after operation. For all inspected - true adnation of fragments, full congruence intra-articular surfaces and accelerated synostosis. A full volume of motions in an ankle joint. Prolong successfully to be engaged in a selected kind of sports. Adequate treatment for the young sportsmen with avulsion distal fractures tibial epiphysis is early operating. The testimony to that - excellent anatomic-functional parameters and favourable sporting forecast.

**E-poster #104**  
**Arthroscopic-Assisted Tibiototalocalcaneal Arthrodesis Using Intramedullary Nail**  
Tomoko Horii, Tochigi, JAPAN  
Yusei Kariya, Tochigi, JAPAN  
Jichi Medical School, Tochigi, JAPAN  

Due to poor long-term results and a high rate of complications, indications for total ankle arthroplasty have remained limited. Arthrodesis of the tibiotalar, talocalcaneal joint and tibiotalocalcaneal joint are widely accepted for the treatment of osteoarthritis or rheumatoid arthritis of the foot and ankle. Aggravation at the talocalcaneal joint after tibiotalar arthrodesis had been reported in cases of both osteoarthritis and rheumatoid arthritis. Fixation of both the tibiotalar and talocalcaneal joints simultaneously seems reasonable in ankles displaying polyarthritic disease, such as rheumatoid ankle. We performed arthroscopic-assisted arthrodesis of the tibiotalocalcaneal joint using intramedullary nails with fins for four cases. Intramedullary nails with fins allow stable fixation even in osteoporotic bone without distal transfixation. In addition, even in cases with poor skin condition, this arthroscopic combined technique is readily indicated.

**E-poster #105**  
**Combined Anterior and Posterior Impingement Syndrome of the Ankle**  
Ian J Henderson, East Melbourne, VIC AUSTRALIA, Presenter  
David P La Valette, Leeds, Yorkshire, UNITED KINGDOM  
St Vincents & Mercy Private Hospital, Melbourne, Victoria, AUSTRALIA  

Aim:  
To identify patients with symptoms of both anterior and posterior ankle impingement, and to document their findings and response to treatment  

Methods:  
Between January 1990 and December 2003 we identified 62 consecutive patients with symptoms and signs of both anterior and posterior impingement of the ankle. 58 of these patients recorded a single injury or multiple ankle sprains. The most common mechanism of injury was inversion or plantar flexion. All patients failed initial conservative treatment and underwent anterior arthroscopy and open posterior clearance.  

Results:  
62 patients were identified. All patients showed synovitis at arthroscopy and 48 also had other arthroscopically detected lesions such as anterior tibial plafond lesions, ossicles or soft tissue impingement. The posterior arthrotomy revealed a bony cause for impingement in all but four cases. This was usually an os-trigonum or a long posterior process of the talus. Three patients had anterolateral tenderness following arthroscopy and three had tenderness of the posterior arthrotomy scar. There were no persistent neurological complications in this series.  

58 patients were available for follow-up. 81% of patients had excellent or good outcomes, and 15.5% had fair outcomes and 3.5% were graded as poor.  

Discussion:  
We have identified a group of patients who have symptoms and signs of both anterior and posterior ankle impingement, which has not been published previously. We postulate that a single inversion injury mechanism is responsible for this syndrome. We have treated these with a combined arthroscopic and open procedure, and we feel this gives good predictable results with minimal complications.
**E-poster #106**

**Endoscopy in Percutaneous Repair of Achilles Tendon Rupture. Is it a Waste of Time?**

Athanasios Fortis, Tripolis, GREECE, Presenter
Anastasios Dimas, Tripolis, GREECE
Georgios Tsitsanis, Tripolis, GREECE
B’ Orthopaedic Dept., Panarkadian General Hospital, Tripolis, GREECE

The aim of the present study is to evaluate if the endoscope is useful in treating percutaneously repaired Achilles tendon ruptures.

**MATERIAL AND METHOD** Twelve patients 28 to 46 years old suffering from Achilles tendon rupture were divided in two groups of six patients each. Two of them had the rupture for over three weeks time. All the tendons were repaired using the percutaneous suturing technique. In the first group the arthroscope was used from the beginning and the repair was performed under direct vision, whereas in the second the scope was used after the end of the suturing. The operating time, the remaining gap and the number of additional sutures were evaluated along with the functional results.

In the first group the average operating time was 45 min and 32 for the second. There was a small gap in all tendons, but in the second (non arthroscopy) group this was larger and additional sutures were used in order to close it. This resulted to a subsequent elongation of the operating time.

Postoperatively all the patients were mobilized with partial to full weight bearing in a below knee plaster in equinus position. Active and passive ankle mobilization started 10 to 15 days post operatively. The patient wore an insole wedge pad for two months time. The evaluation was performed using the modified Merkel’s for Load (Weight) Bearing Capacity and Pain scale.

**RESULTS** There was no infection or skin healing problems, but one of the patients in the second group had a sural neuralgia subsided without any further treatment. All the patients have had excellent outcome (700 points).

**DISCUSSION** Endoscopy in percutaneous Achilles tendon repair is important in order to achieve the best results, although a large number of patient is necessary to fully establish it.

**E-poster #107**

**Plantar Fascitis Treated with Radiofrequency. Preliminary Results.**

Alicar Hospital, Guayaquil, ECUADOR

**Purpose.** To determine if the use of radiofrequency in chronic plantar fascitis in patients previously treated with other techniques, is an effective method of treatment.

**Type of Study.** Prospective, case series.

**Methods.** Between June 2003 and December 2003 (mean 4.1 month follow up), 26 Plantar Fascitis in 22 patients (mean age 38 years old, range 19 to 58; 13 male and 9 female; 17 patients in sports activities) has been treated with the use of radiofrequency (Topaz, Arthrocare Corp.). Under local anesthesia, 1 cm long longitudinal incision was made in the plantar area, then the radiofrequency is applied through an electrode; non weight bearing for 2 week and rehabilitation program was start immediately. Patients were analyzed using Patients’ subjective assessment of the procedure, modified Mayo Scoring System (100-point scale) and Patients activity level.

**Results.** At last follow up 20 Patients reported no paint, 1 mild and 1 same as before surgery. Mayo Scoring average was 96.7 points (68 - 100); 10 Patients returned to previous sport, 3 were still in rehabilitation and 1 had the same symptoms as before.

**Discussion.** If we compare with other techniques as fasciotomy, we can avoid complication as lateral column pain, arch cramping or tingling of the ball of the foot, previously report by others; in relation with extracorporeal shock wave results are still unknown because of previous reports.

**Conclusion.** In spite of the fact that our results do not have sufficient follow up, we think that it is not an aggressively technique, and they are encouraging.

**E-poster #108**

**Arthroscopy Assisted Reduction and Internal Fixation for Triplane Fracture of the Ankle: A Case Report**

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Nobuo Yamagami, Izumo, Shimane, JAPAN
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**Purpose.** To report and investigated the results of arthroscopy assisted reduction and internal fixation for triplane fracture of the ankle

**Patients.** A fourteen-year-old boy was injured when he fell down during running with his left foot into inverted position. Physical examination
showed severe swelling without an open wound of his left ankle, and tenderness of the distal tibia of his left leg. He had no sensory or motor disturbance. Plain radiographs and computerized tomography with three-dimensional reconstructions showed a four-part triplane fracture of his left distal tibia. We attempted a closed manipulative reduction but were unsuccessful. Therefore, an arthroscopy assisted reduction and internal fixation was performed.

[Surgical technique] Initially, we reduced the tibial shaft fracture site manipulatively and fixed with percutaneous canulated screw system under fluoroscopic view. Next, we inserted an ankle arthroscopy via an anteromedial portal, and reduced the articular surface of the intra-articular fracture site and fixed with percutaneous canulled screw system under fluoroscopic view. The patient was allowed to begin active ROM exercise a day after surgery, and partial weight-bearing three weeks after surgery.

[Results] At two months after surgery, he was able to walk without discomfort. At three months after surgery, he felt no pain when running, and was able to fully participate in athletic activities. At one year after surgery, the midfoot had a full range of motion, and the AOFAS score was 100 points. Radiographs showed no recurrence of dislocation, and ankle arthroscopy showed well healed articular surface of the tibial plafond.

[Discussion] Whipple reported the efficacy of arthroscopy assisted internal fixation for triplane fractures of the ankle to reduce the articular surface. To reduce the displacement of the articular surface is important to gain an excellent clinical results and to avoid a following degenerative changes.

[Conclusion] We concluded that ankle arthroscopy should be applied in the treatment of triplane fracture of the ankle.

E-poster #110
MRI Evaluation for Consecutive Change of the Intensity of Anterior Talofibular Ligament Autografts Comparison with Articular Portion and Bone Tunnel Portion
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Kohei Naito, Ohdashi, Shimane, JAPAN
Masato Takao, Izumo, Shimane, JAPAN
Kenichi Kajitani, Matsue-shi, Shimane, JAPAN
Hidetoshi Yamaguchi, Izumo, Shimane, JAPAN
Nobuyuki Kumahashi, Izumo, Shimane, JAPAN
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Ohda Municipal Hospital, Ohda, Shimane, JAPAN

[Purpose] We investigated the consecutive change of the intensity of anterior talofibular ligament (ATFL) autografts using MRI.

[Patients and methods] Nine patients with chronic ATFL tear were performed anatomical ATFL reconstruction with grachilis tendon. There were 6 male and 3 female patients, with the mean age of operation being 28 years (range, 16 to 49 years). Postoperatively, patients had their ankles immobilized with a short-leg cast 4 weeks, after which passive range-of-motion exercises of the ankle were performed with soft ankle orthoses. Partial weight bearing was allowed after 2 weeks with cast immobilization, and full weight bearing resumed after 6 weeks. Each patient underwent MRI at postoperative 1, 3, 6, 9 and 12 months. T2-weighted axial images were obtained to assess the intensity of the autografts in articular portion, and T2-weighted oblique axial images were obtained to assess those in bone tunnel.

[Results] In articular portion, all patients showed high intensity at 1 month postoperatively. Four cases of 9 patients showed low intensity at 6 months postoperatively, and the intensity turned into low until 9 months postoperatively in all patients. In bone tunnel, all patients showed high intensity at 1 month postoperatively. Four cases of 9 patients showed low intensity at 6 months postoperatively, and the intensity turned into low until 9 months postoperatively in all patients. In bone tunnel, all patients showed high intensity at 1 month postoperatively. However no patient showed low intensity by the time of 9 months postoperatively. Seven cases of 9 patients showed low intensity at 12 months postoperatively.

[Discussion and conclusion] It is said that the change to low intensity of autografts represents the maturation of the graft in MRI. In this study, ATFL autografts in articular portion maturated earlier than those in bone tunnel.

E-poster #111
Osteochondral Lesions of the Ankle: A Retrospective Clinical Study
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Esteban Diaz, Concepcion, CHILE
Edgardo Sanzana, Concepcion, CHILE
Victor Contreras, Concepcion, CHILE
Fredy Cristian Montoya, Concepcion, CHILE
U. of Concepcion Worker’s Hospital, Concepcion, CHILE

OBJECTIVE:
The purpose of this study was to evaluate the clinical results of the microfracture technique used for the osteochondral lesions of the talus.

MATERIAL AND METHODS:
From October 1998 to December 2002 were treated 24 patients who had osteochondral lesions of the talar dome with the technique of microfracture of whom we could evaluate 16 cases retrospectively. The mean age of men and women was of 28 and 29.3 years respectively. The mean time of follow up was of 43 months. The mean time between the onset of the symptoms and surgery was of 14 months (1-32 months). The lesions were preoperatively evaluate using plain radiographs, computed tomography (CT), magnetic resonance imaging (MRI) and arthroscopy. Surgery consisted on partial sinovectomy, debridement and cleaning of the expose bone and cartilage of the lesion, the microfracture was made using an ice pick every 2 to 4 mm and 4 mm of deep into the subchondral bone. The patients were preoperatively and postoperatively evaluated using the Martin Ankle Score

RESULTS
The preoperative Martin Ankle Score was poor in all the patients, and the postoperative Score was excelent and good in 75% of the patients, with 25% fair and poor. There was a superficial infeccion and a superficial peroneus nerve lesion.

CONCLUSIONS
The poor and fair results were correlactionated with the size of the lesion, been worse in lesions larger than 2 cm². Now we are doing mosaicoplasty as an alternative for lesions larger than 2 cm².

E-poster #112
Confidence of the Conservative Treatment for the Acute Ankle Lateral Ligament Injury.
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Hideji Kura, Sapporo, Hokkaido, JAPAN
Eiichi Uchiyama, Sapporo, Hokkaido, JAPAN
Kota Watanabe, Sapporo, Hokkaido, JAPAN
Toshihiko Yamashita, Sapporo, Hokkaido JAPAN
Daisuke Suzuki, Hamamatsu, Shizuoka JAPAN
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PURPOSE:
The purpose of this study was to evaluate the ankle stability with the brace and the cast associated with the lateral ligament injury of the ankle.

MATERIALS & METHODS:
Five cadaveric feet were used for the biomechanical test. The anterior talofibular ligament and calcaneofibular ligament were cut to create the ankle instability. The ankle were immobilized by the brace and cast in three different flexed position. The load were applied to the tibia to create the ankle motion, 2kg for inversion and 1Nm for internal rotation. Metatarsal bones and calcaneus were fixed to the special devise for testing by the Kirshner wire. The magnetic tracking system was used to measure the ankle motion.

RESULTS: The brace allowed the ankle motion 40 degrees in dorsi flexion and 40 degrees in plantar flexion. The cast allowed the ankle 15 degrees in dorsi and plantar flexion. The rotation instability were created after cutting ATFL and CFL. The degree of the rotation were 8.3 degrees in normal, 12 degrees after cutting ATFL, and 17.6 degrees after cutting ATFL and CFL in dorsi flexed position of the ankle. The brace and cast prevented against the rotation in dorsi flexed position and neutral position.

DISCUSSION: The brace did not work to protect the mobility of the plantar flexion and inversion much enough to heal the ligament original length, except for the external rotation. The cast protected the mobility of the plantar flexion and inversion. But the external rotation increased as the fixation position of the cast flexed plantar. The brace and inadequate position casting can heal ligament elongated and remain the ankle instability.

E-poster #113
Extracorporeal Shock Wave Therapy in Tibial Stress Fractures
Juan Manuel Herrera, Bogota, D.C. COLOMBIA, Presenter
Carlos Leal, Bogota, DC COLOMBIA
Juan Carlos Lopez, Bogota, DC COLOMBIA
Oscar Eduardo Reyes, Bogota, DC COLOMBIA
Magda Murillo, Cartagena, DT COLOMBIA
Ricardo Duran, Cartagena, DT COLOMBIA
Bosque University, Bogota, COLOMBIA

Stress fractures have been described in numerous areas of the skeletal system and in multiple sports. The first descriptions are related to metatarsal stress fractures. With time, lifestyle changes and modern footwear, led to a different incidence of stress fractures over the skeletal
system. Actually, tibial stress fractures are the more common, with an incidence of 49-73% between series. The current treatment includes a progressive retraining that will place the athlete out of competence for at least four months, and if there are persistent symptoms, it could be over a year. This same challenging situation has been seen in military recruits. Limitation of the activity causing the symptoms is the keystone to any treatment regimen. However, the treatment os often too long and costly in terms of absense leaves from military or sports activities. We studied the behavior of tibial stress fractures treated with shockwave therapy in order to enhance their healing and therefore reduce their recovery time and pain. Five COLOMBIAN Navy cadets were first included in our pilot study. There were four women and one men. All of them were 18 years old, first year cadets, with identical bilateral stress fractures located at the union of the middle and distal thirds of the tibia. The onset of the symptoms were of at least 8 weeks before they were included in the study. The diagnosis was made over clinical history, Tc-99 Bone scans, ultrasound tests and X-Ray were positive for stress fractures. The treatment consisted of 2000 shockwaves of 0.7 Mili-Jules applied to the more symptomatic Tibia and eight days later the shock wave dose was repeated in a second session. All patients went into a progressive retraining program. Nutritional facts and activity were strictly controlled, and the progressive retraining standard program for the management of stress fractures was established. The rate of success was measured by the presence of pain before, through, or after the training practice on third, fourth, sixth and twelve months. All patients but one were free of pain at 3, 6 and 12 months of the follow up. One of the subtalar ganglions was not totally pain free but the patiente was satisfied enough as to keep on playing soccer. There was no loss of movement except one patient with secuelae of calcaneus fracture, 1 OCD of the talus, 1 os trigonum removal, 2 Flexor Hallucis longus releases and 1 Posterior tibial tendon). Three different portal approaches were used in teh different cases (subtalal standard, posterior endoscopy according to Van Dijk and Tendoscopy).

Results: Due to the different types of pathology the absence or presence of symptoms was the scale used for evaluation of results. Every patient but one were free of pain at 3, 6 and 12 months of the follow up. One of the subtalar ganglions was not totally pain free but the patiente was satisfied enough as to keep on playing soccer. There was no loss of movement except one patient with secuelae of calcaneus fracture who had a subtalar arthrodesis.

E-poster #115
Arthroscopy and Endoscopy of Hindfoot Pathology
Gonzalo Mora, Pamplona, SPAIN, Presenter
Juan Ramon Valenti, Pamplona, SPAIN
Clanica Universitaria de Navarra, Pamplona, SPAIN

Introduction: We describe our experience in treating hindfoot pathology with endoscopic/artrhoscopic approaches since we started in 2000 in order to try to avoid the morbidity associated to open surgery for the surgical treatment of this anatomical area. Material and Methods: We treated 14 patients with hindfoot pathology refractary to conservative treatment with 15 different lesions (3 peroneal tenosinovitis, 2 subtalar ganglions, 1 retro-peroneal ganglion, 4 sinus tarsi sindroms, 1 subtalar free body, 1 subtalar sinovitis, 1 posterior ankle impingement and 2 secuelae of calcaneus fracture, 1 OCD of the talus, 1 os trigonum removal, 2 Flexor Hallucis longus releases and 1 Posterior tibial tendon). Three different portal approaches were used in teh different cases (subtalal standard, posterior endoscopy according to Van Dijk and Tendoscopy). Results: Due to the different types of pathology the absence or presence of symptoms was the scale used for evaluation of results. Every patient but one were free of pain at 3, 6 and 12 months of the follow up. One of the subtalar ganglions was not totally pain free but the patiente was satisfied enough as to keep on playing soccer. There was no loss of movement except one patient with secuelae of calcaneus fracture who had a subtalar arthrodesis.
Conclusions: Although not a big enough group for an optimal statistical study or a comparative one, our impression is that these endoscopic and/or arthroscopic procedures, in selected cases, offer less morbidity, faster recovery and avoidance of major complications if a careful technique is achieved.

E-poster #117
Pseudarthrosis of the Medial Tubercle of the Posterior Process of the Talus: A Misdiagnosed Cause of Chronic Ankle Pain in Athletes
Elias Dagher, Paris, FRANCE, Presenter
Bertrand Sonnery-cottet, Lyon, FRANCE
Michel P Bonnin, Lyon, FRANCE
Clinique Sainte Anne Lumiaire, Lyon, FRANCE

Introduction: Avulsion fracture of the medial tubercle of the posterior process of the talus occurs in forced dorsiflexion and pronation of the foot. This fracture may mimic common ankle sprains and is frequently misdiagnosed. We report 8 cases of pseudarthrosis of the medial tubercle of the posterior process of the talus.

Material and methods: Between 1999 and 2003, 8 patients (all male, sportsmen) underwent operative excision of the medial tubercle of the posterior process of the talus for pseudarthrosis. They were retrospectively reviewed with an average follow-up of 24 months (range 6-42). The average age at the time of surgery was 24 years (range 17-32). All patients were initially misdiagnosed as having sustained ankle sprains during sports activity. Persistent posteromedial ankle pain at return to sports leads them to our consultation with an average delay of 14 months after injury. Clinical examination revealed posteromedial ankle pain in all cases associated to a firm mass at the posteromedial aspect of the ankle in 5 cases. X-rays confirmed the diagnosis in 5 cases. CT-scan was performed in all cases for diagnosis confirmation or preoperative assessment. We performed operative excision of the fragment and the pseudarthrosis in all cases.

Results: All patients reported significant relief of posteromedial ankle pain. Return to sports was achieved at an average of 3 months (range 2-6) after surgery. All patients reported full resumption of sports after excision. No laxity or loss in range of motion were reported.

Conclusion: Chronic posteromedial ankle pain in athletes who had a history of ankle sprains should alert the physician to the possibility of pseudarthrosis of the medial tubercle of the posterior process of the talus. Operative excision provides significant improvement and allows early return to sports.

E-poster #121
Physiotherapy Programme Following Halux Valgus Corrective Surgery and Plaster Cast Free Healing Process
Izabela Maziarz, POLAND, Presenter
Carolina Medical Center, Warsaw, POLAND

Physiotherapy programme following halux valgus corrective surgery using first metatarsal osteotomy Scarf and DSTP procedures. Twenty patients were enrolled into the study which was carried out in the period between 2002 and 2004. Rehabilitation was carried out in several phases which covered range between preoperative to phase IV, that is full return to normal live. According to the postoperative period the range of techniques were introduced.

First phase focuses on killing the pain and oedema with the use of cryotherapy, pressure/corrective casts (special bandage technique) and limb elevation.

After four weeks passive and active motion patterns (muscle pump) and massage techniques were introduced.

Following that the strengthening programme of the short flexors was carried out.

Next step focuses on short flexors strengthening (transverse arch) and mobilization of the MTP joints as well as scar mobilization.

After that exercises with resistance, stretching and proprioception was introduced.

In the end intensification of exercises a regaining of normal walking pattern is carried out.

All patients could walk directly after the operation providing that special shoes were used.

After sixth week 80% of patients could go back to their regular shoes.

Rest of the patients had to wait another week.

Twelve weeks after surgery 90% of patients required no longer professional attention of a physiotherapist. Ten per cent had a discomfort with the persisting oedema.

Plaster cast free process of healing and as early as 24 hours post operatively rehabilitation allows for very good final results that is free functional mobility of patients.
E-poster w/ Standard #122
Results of Endoscopic Plantar Fascia Release
Rajesh Bazaz, Van Nuys, CA, USA, Presenter
Richard D Ferkel, Van Nuys, CA USA
Southern California Orthopedic Institute, Van Nuys, CA, USA

Introduction:
Heel pain secondary to plantar fascitis is one of the most common conditions seen by orthopedic surgeons. A minority of patients require surgical treatment. In the past an open procedure had been performed, but more recently endoscopic plantar fascia release (EPFR) has been advocated. This study reviews our results with EPFR and compares the outcome in workers compensation (WC) and non-WC populations.

Methods:
Between 1995 and 2003, 20 patients (23 feet) underwent partial medial EPFR. All patients failed a conservative treatment program for at least 6 months. Preoperative evaluations including radiographs, EMG, and an inflammatory lab panel were negative. The patients were subdivided based on WC status. Group I (non-WC) was composed of 11 patients (13 feet). There were 9 females and 2 males. The average age was 47.9 years old (range 29-70). Group II (WC) was composed of 9 patients (10 feet). There were 2 females and 7 males. The average age was 38.1 years old (range 28-48). Patients were evaluated pre and post procedure using the AOFAS hindfoot score and the Maryland foot score. Follow up at an average of 44 months (range 12 to 107) was available on 9 feet in Group I and 8 feet in Group II.

Results:
Overall the AOFAS hindfoot score increased from 65.1 pre-operatively to 86.1 post-operatively. The Maryland foot score increased from 61.1 pre-operatively to 80.7 post-operatively. The results were also analyzed based on WC status. Group I (non-WC) preoperative AOFAS hindfoot score was 66.8 and Maryland foot score was 53.8. Postoperatively the scores were 91.7 and 89.9 (7 excellent, 1 good, 1 poor) respectively. Group II preoperative AOFAS hindfoot score was 63.1 and Maryland foot score was 55.1. Postoperatively the scores were 79.9 and 70.4 (1 excellent, 2 good, 4 fair, 1 poor) respectively. There were no postoperative infections or neurovascular injuries. No patients noted lateral column pain and there was no arch collapse.

Discussion:
Our results with EPFR at medium term follow-up revealed a 21-point improvement in the AOFAS hindfoot score and a 19.6-point improvement in the Maryland foot score. On further analysis there was a discrepancy in the results in the WC and non-WC populations. Workers compensation status has been shown to affect the outcome of many surgical procedures. This is the first study that evaluates the effect of WC status on the outcome of EPFR. Group I and II were similar in the severity of their plantar fascitis pre-procedure based on the AOFAS hindfoot score and Maryland foot score. Non-WC patients had greater improvement in their AOFAS hindfoot score (24.9 points) compared to WC patients (16.8 points). Non-WC patients also had a greater improvement in their Maryland foot score (36.1 points) compared to WC patients (15.3 points). Eight of the nine non-WC were able to achieve good or excellent results. Only 3 of 8 WC patients experienced good or excellent results. Our data suggests that the results of EPFR may be effected by patient WC status.

E-poster w/ Standard #123
Results of Functional Postoperative Treatment of Professional and Amateur Athletes After Achilles Tendon Ruptures
Ewa Witek, Warszawa, POLAND, Presenter
Renata Jopek, Warszawa, POLAND
Aneta Jarzabek, Warszawa, POLAND
Carolina Medical Center, Warszawa, POLAND

PURPOSE:
To present postoperative rehabilitation programme following Achilles tendon repair with early weight bearing but without postoperative full cast immobilisation and results of this treatment

METHOD:
Sixty three one patients who were operated between July 1998 and December 2003 in our clinic: 25 patients were professional athletes (basketball players, handball players,football players, runners, boxers, gymnasts), 17 were amateur. 21 participated only occasionally in athletics activity. This group included 42 patient with complete and 21 with partial ruptures. Patient with total ruptures, were immobilised in anterior splint in mild equinus position for 2 weeks after surgery. Following that period they were allowed to begin partial weightbearing. Patients could do full weightbearing after 6 weeks. After 10-12 weeks they started running in
Orthoepadic shoes on soft surface. Patients finished rehabilitation after 18-20 weeks reaching activity level as before the injury. Athletes with partial ruptures were able to walk after 4 and to run after 8-10 weeks.

Rehabilitation program was divided into 3 phases: I early postoperative (acute, 0-14 day), II- function restoring (2-8 weeks), III-return to sport activity (8 weeks plus).

Main goal of our program was returning to pre-injury activity. We put particular attention to: restoration of tendon elasticity and muscle’s flexibility, proprioception and muscle control. In our programme we used: manual technics, PNF, eccentric exercises, stretching, exercises according to spiral dynamics, dynamic exercises on different surfaces, element’s of sport specific rehabilitation in 2nd and 3rd rehabilitation phases.

RESULTS:

Patients were assessed using the Ankle-Hindfoot Scale and Foot and Ankle Functional Testing (hop test and strength test).

Treatment resulted in very good therapeutic outcomes. All our patients acknowledged that they returned to their sport activity and they were functioning well after completing rehabilitation. There were no reruptures and recurrent pain in this group of patients. All patients were satisfied. Final results: 55 patients received excellent note and the rest good note.

CONCLUSIONS:

Compilation of operative technics, physioterapy and training adapted individually to each patient and patient’s cooperation guarantees quick come-back to sports and good long-term results. The general guidelines and specific programs with great emphasis on sport specific rehabilitation outlined are used to minimize the chance of re-injury and to facilitate the return of function and confidence in the athlete. The program and its progression should be modified to meet the specific needs of each individual athlete.

E-poster w/ Standard #124

Anatomical Reduction of Anterior Tibio- Fibular Avulsion Fracture: An Accurate and Secure Fixation Technique

Yousef Raga Salameh, Turan Village, ISRAEL, Presenter
Noam Bor, Afula, ISRAEL
Basil Kaufman, Tevon, ISRAEL
Haemek Medical Center, Afula, ISRAEL

Background - The Anterior Tibio-Fibular Ligament constitutes the anterior portion of the syndesmosis. According to Lauge-Hansen, injury to this ligament always precedes fracture of the fibula at the external rotation or abduction component of the injury mechanism. Avulsion fracture of the insertion at the anterior fibular tubercle has been described and announced as the Wagstaffe’s fracture, having an incidence rate of 25% of Weber type B ankle fractures. It was also described as part of higher-grade supination external rotation ankle fractures. Accurate reduction and fixation is important for the restoration of the distal tibio-fibular joint and to prevent chronic ankle pain caused by impingement of the avulsed fragment. The fixation technique has been described by the AO /ASIF group using a small fragment cancellous screw when a large bony fragment was avulsed, or using a trans-osseous metal wiring when it is a small bony fragment.

Purpose: To describe an innovative, elegant and secure technique of fixation, ensuring better anatomical reduction.

Materials- Eight patients operated for unilateral ankle fractures, 6 females and 2 males, with average age of 41 years old. 6 injured during hobby-athlete accidents. They have underwent an internal fixation of Anterior Tibio- Fibular Ligament avulsion fracture of the fibula using a small fragment 4 mm thread cortical screw. The reduction was maintained using bone forceps, and lag screw drilling technique was achieved from anterior to posterior direction. The compression effect obtained by this technique ensured accurate anatomical reduction and stiff fixation. Results- Six patients were available for follow up. Median period was 8 months (range 3-14).

Radiological examination revealed anatomical reduction. Also, clinical examination demonstrated an excellent range of motion with the absence of anterior ankle pain in stressing examination.

Discussion - We would like to note that the complication of malreduction of Anterior Tibio-Fibular Ligament avulsion fractures will lead to chronic laxity or insufficiency of the ligament, and, in turn, it leads to talar pathological motion and impingement. These complications are described in literature also after operative treatment of Anterior Tibio- Fibular Ligament avulsion fractures. Our fixation technique restores anatomical reduction with an excellent
radiological, and clinical results within short time follow up.

**E-poster w/ Standard #125**  
**Efficacy of Mesotherapy on Achilles Tendinopathy. A Placebo-Controlled Study**  
Gianluca Camillieri, Rome, ITALY, Presenter  
Edoardo Monaco, Rome, ITALY  
Luca Labianca, Rome, ITALY  
S. Andrea Hospital University of Rome “La Sapienza”, Rome, ITALY

Objective:  
To assess effects of mesotherapeutic cocktails based on type of lesion (deep, size, site, vascularisation and sonographic features).

Methods:  
Twenty-four sportive subjects with Achilles tendinopathy were involved in a randomised double blind placebo-controlled study. Each group was homogeneous for age, gender and sport level. Clinical evaluation before and after treatment included Speck-Kalaue scoring system, toe rise test, VAS, isokinetic test, functional jump tests, and ultrasonographic evaluation. The treatment protocol consisted of four mesoterapic sessions distributed in three weeks. The post-treatment evaluation was performed after four weeks. Saline physiologic solution was used as placebo. Any physical therapy or orthesis were utilised during the mesoterapic treatment. T-test, MANOVA and regression analysis were used for statistical analysis. Differences were checked for significance (P<0.05) using Tukey’s post hoc comparison test

Results:  
Pre-treatment and post-treatment clinical evaluation showed a difference statistically significant in the control group. The same difference was recorded at the follow-up between placebo and control group with favourable outcomes for this last group. The ultrasonographic analysis showed a significant improvement in terms of tendon diameters, homogeneity of sonographic signal, and decrease of degenerative lesions for the control group. One patient of control group and four of the placebo, underwent to surgery after a long unsuccessful period of physical therapy. For the control group, two patients with chronic findings of peritendinitis showed any improvement with mesotherapy

Conclusions:  
The aim of the mesotherapeutic treatment is to remove degenerative tissue, improve tendon vascularisation, decrease the inflammatory process, and rebuild normal collagen stock. The mesotherapeutic protocol adopted this study showed significant better outcomes than placebo treatment. The ultrasonographic evaluation documented consistent healing findings of the Achilles tendon. This study suggested us to keep on the research on biochemical less-invasive treatment of Achilles tendinopathy.

**E-poster w/ Standard #126**  
**A New Anatomical Reconstruction of the Lateral Ankle Ligaments.**  
Hideji Kura, Sapporo, Hokkaido, JAPAN, Presenter  
Kozo Ohtera, Sapporo, Hokkaido, JAPAN  
Toshihiko Yamashita, Sapporo, Hokkaido JAPAN  
Sapporo Medical University, Sapporo. Hokkaido, JAPAN

INTRODUCTION: We developed a new operative procedure for chronic lateral ankle ligament insufficiency and investigated the long-term clinical results of this procedure.

METHODS: Twenty-eight feet of twenty-eight patients with chronic lateral instability of the ankle were treated. There were 10 men and 18 female. Their age at surgery varied between 12 and 42 years, with a mean of 25 years. Either one half or a whole peroneus brevis tendon was used as free tendon graft for the reconstruction. Both the ATFL and the CFL were reconstructed at the anatomical sites. The follow-up period ranged from 108 to 142 months (mean, 10 years 6 months).

RESULTS: Subjective evaluation according to Good’s criteria was Grade 4 in all the patients before the operation. It improved to Grade 1 in 20 (71%) patients and Grade 2 in 8 (29%) patients after the operation. Using TELOS stress equipment with a load of 150 N, talar tilt (TT) improved from 15.3 ± 7.0 before the operation to 5.2 ± 3.7 after the operation and anterior talar translation (ATT) improved from 10.3 mm ± 5.1 mm to 5.6 mm ± 1.0 mm. There was no statistic significance between pre and postoperative range of motion in the ankle joints. No patient has complained the restriction of the subtalar joint motion. No significant degenerative change of the ankle or subtalar joint was identified by plain rentogenographic examination. DISCUSSION AND CONCLUSION: The results suggested that anatomical reconstruction of the ATFL and the CFL could restore good stability with minimal
restriction of the ankle and subtalar joints for long
time.

E-poster w/ Standard #127
Pathoanatomy and Treatment of the unstable
Os Subfibulare or Old Avulsion Fractures of the
Lateral Malleolus
Kensuke Yasumura, Koshigaya, Saitama JAPAN,
Presenter
Satoru Ozeki, Koshigaya, JAPAN
Takaoki Negishi, Nerima-ku, Tokyo JAPAN
Tomohiro Takemoto, Koshigaya, Saitama JAPAN
Yutaka Nohara, Koshigaya, Saitama JAPAN
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Saitama, JAPAN

The Os subfibulare, or round ossicles at the tip of
the lateral malleolus, are often regarded as
accessory bone. Some patients with such
fragments, however, complain of ankle pain and
repeated sprain. This study addresses whether
these fragments are unnecessary and ignorable?
Materials and method: From 1990 to 2003, we
treated 79 ankles in 80 patients surgically. The
average age at surgery was 19 years; the mean
follow up period was 6.4 years. The whole the
fragment was fixed to the lateral malleolus using a
tension band.
Results: Each fragment was attached to at least
one ligament. We classified these attachments as
follows:
Type I a: only ATFL was attached to one fragment
Type I b: ATFL and CF were attached to one
fragment
Type I c: ATFL, CF, and PTFL were attached to one
fragment
Type II a: ATFL and CF were attached to two
individual fragments
Type II b: ATFL was attached to one fragment, CF
and PTFL were attached to the other
Type III: ATFL, CF, and PTFL were attached to
three individual fragments
77 ankles (96%) developed bony union and three
united fibrously. The talar tilt was restored from
9.7 to 5.5 degrees after surgery. The result of
anterior drawer test in which evaluated by
concentric circular method was reconstructed
from 8 to 5 mm. The AOFAS clinical rating system
for the ankle-hindfoot improved from 77 to 97 and
ankle pain decreased dramatically.
Conclusion: The fragments at the tip of the lateral
malleolus are the origin site and keystones of the
lateral ankle ligament complex. These fragments
can be united with the lateral malleolus, and the
ankle stability successfully reestablished. We
strongly recommend that not to take out, but
reuse them.

E-poster w/ Standard #128
Risk Factors for Stress Fractures, Orthopaedic
Acute and Overuse Injuries in Female Infantry
Recruits
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Introduction:
5-30% of infantry recruits suffer stress fractures.
20% suffer ankle sprains and approximately 30%
suffer anterior knee pain. In this study we
followed up a group of female infantry recruits in
order to define the risk factors for acute and
overuse injuries.
Material and Methods:
83 female infantry recruits were prospectively
followed up during a 4-month course of basic
training. On commencing the course, a
questionnaire was filled concerning previous
skeletal pain or injury, previous physical activity
and menstrual history. A detailed orthopaedic
examination was performed. Footprints were
taken using the Harris Mat. During the course,
follow up of injuries was done by interview twice a
month and all clinic visits were documented.
Results:
60 of 83 recruits completed the course. Of the
total 83 recruits, 15 suffered LBP, 21 suffered AKP,
27 had an ankle sprain and 16 suffered stress
fracture with a total of 33 fractures and 31 ankle
sprains. 11 complained of foot pain and 22 of
shin pain.
The recruits suffering stress fractures had no more
LBP than those not suffering a stress fracture.
However, they had nearly a double number of
ankle sprains, three times the number of AKP and
over three times the number of complaints of foot
pain.
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ankle sprains, three times the number of AKP and
over three times the number of complaints of foot
pain.
Of the stress fractures, ten were grade 2 and six
were grade 3. Twenty were considered dangerous
according to location. 39% were located in the
tibia and 15% in the femur.
Ankle sprains occurred in 27 recruits with a total of
31 sprains. 10 had recurrent sprains.
Stress fractures were not affected by height, weight, BMI or the arch of the foot. Irregular menstruation (p=0.17, and for dangerous SF, p=0.05) and an older age of menarche (p=0.14) showed a tendency for a higher occurrence of stress fractures. A mild tendency for less dangerous stress fracture was shown in higher use of milk products (p=0.25) and birth control pills showed a mild tendency for stress fracture reduction (p=0.24).

Scoliosis seemed to cause dangerous stress fracture (p=0.06) and a valgus heel showed a possible mild tendency for the same (p=0.09-0.22) as more so did ankle instability (p=0.03-0.15).

Conclusions:
Amenorrhea, late menarche and possibly irregular menstruation, unstable ankles and heel valgus seem to be related to stress fractures in female infantry recruits, especially the dangerous fractures, occurring in the shaft of the long bones. The footprint, hip rotation, height, weight and BMI were not shown to effect stress fracture occurrence.

In our study of female Infantry recruits 20% to 30% suffered LBP, AKP and acute ankle sprains. Further research should probably be directed to reduction of this unacceptable high rate.

**E-poster w/ Standard #129**

**Diagnostic Value of Stress X-P, Ultrasound, and MR imaging for Disruption of the Anterior Talofibular Ligament.**

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Purpose: To evaluate the diagnostic value of Stress X-P, Ultrasound (US), and magnetic resonance (MR) imaging in comparison with that of arthroscopic findings for injuries of the anterior talofibular ligament (ATFL).

Materials and Methods: This study involved twenty-nine patients with ankle sprain. There were 16 acute ankle injuries and 13 chronic ankle injuries. Preoperative stress X-P, US, and MR imaging to diagnose the ATFL disruption and identify its location were compared with the arthroscopic findings. Bilateral ankle stress X-P was performed. If there was 5 degree or greater difference in inversion stress compared with contralateral side, we regarded the case as showing lateral instability of the ankle. After that, US and MR imaging was performed in all patients. The diagnostic criteria by US were 1) discontinuity, 2) hyper-echoic lesion. The diagnostic criteria by MR imaging were 1) discontinuity, 2) a wavy or curved contour, and 3) increased signal intensity within the ligament. The arthroscopic results were considered to be the gold standard, and the stress X-P, US, and MR imaging results were compared to the arthroscopic results.

Results: Arthroscopic findings showed ATFL disruption in 25 out of 29 cases. Their disruption located at the attachment of the fibula (n=10), the mid-substance (n=6), and the attachment of the talus (n=9) under arthroscopy. The diagnosis of ATFL disruption with stress X-P was made with an accuracy of 59% (acute: 44%, chronic: 77%). The diagnosis of ATFL disruption with US was made with an accuracy of 90%. The diagnosis of ATFL disruption with MR imaging was made with an accuracy of 97%.

US demonstrated the same location of the disruption as arthroscopy in 16 cases out of 25. MR imaging demonstrated the same location of the disruption as arthroscopy in 23 cases out of 25.

Conclusion: The stress X-P can demonstrate the degree of laxity in the ankle joint. However, the stress X-P is difficult to perform for acute ankle sprains because of patient pain, edema and muscle spasms. Therefore, it is not suitable for the acute ankle injuries. US is a simple method of exploring ligament injury. We obtained a satisfactory result for the diagnosis of the ligament injury. We obtained a satisfactory result for the diagnosis of the ligament injury. However, it can not detect the location of the ligament disruption. Relatively, the MR imaging is able to detect the location of the ligament disruption. It is a useful tool for clarifying the location of the ligament tear preoperatively.
**BASIC SCIENCE**

**E-poster #150**

**Injury Pattern of the Degenerative Adolescent Porcine Spine Exposed to Traumatic In-Vitro Loading**

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Introduction. High frequencies of abnormalities affecting the intervertebral discs, the vertebral endplates and the vertebral ring apophyses have been found in athletes. The aetiology of these abnormalities is still a controversy issue. Previous studies have shown that the healthy adolescent spine is vulnerable in the vertebral growth zones. The aim of this study was to identify the injury pattern of the degenerative adolescent porcine lumbar functional spinal unit’s (FSU) by exposing them to different loading conditions.

Material and Methods. Twenty-four male porcine were used in the experiment. A degenerative FSU was created by drilling a hole in the vertebral body and through the cranial endplate into the disk on the L3-L4 level. After a 2 month recovery period, the animals were sacrificed and the degenerative FSU’s harvested. Eight FSU’s were exposed to axial-compression, 8 to flexion-compression and another 8 to were exposed to extension-compression forces to failure. Magnetic resonance imaging (MRI) and plain radiographs were taken before and after loading to failure.

Results. Only great separations and fractures could be seen on plain radiographs and on MRI. Traumatic avulsion fractures/separations were seen in the growth zone anteriorly and more frequently posteriorly in 7 (n=8) of the FSU’s exposed to flexion-compression. In 6 (n=8) of the extension-compression units were the separations more frequently anteriorly. In 5 (n=8) of the FSU’s exposed to axial-compression were a fracture line found in the dorsal part of the endplate, through the epiphyseal plate, and the growth zone dorsally. No injuries were found in the degenerated discs or the vertebral bodies or to the healed drill holes.

The median angle at failure for FSUs (n=16) in both extension- and flexion-compression was 11.5 (range 7-17). The median ultimate compression load at failure for the axial-compression group was 16724 N (range 11299-17848 N) for the flexion group 7654 N (range 4383-8446 N) and for the extension group 2915 N (range 2505-8967 N).

Conclusion. Several experimental studies show that the growing spine is vulnerable for compression loads. The present study shows that the weakest part in the degenerative adolescent porcine lumbar spine, when compressed in axial-, flexion- or extension-compression is the growth zone and the apophysis(endplate).

**E-poster #151**

**The Meniscofemoral Ligaments of the Knee in JAPANese**

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The meniscofemoral ligaments (MFLs) are identified as a Humphry ligament (aMFL) or a Wrisberg ligament (pMFL). The PCL Complex, so-called PCL, includes MFLs and the PCL proper. The incidence, differences between races and functions of MFLs have yet to be elucidated. The purpose of this study was to clarify the incidence, morphology and cross-sectional area of MFLs in JAPANese.

Materials and Methods: (1) Arthroscopic study; Observation of MFLs was performed on 38 patients (16 males and 22 females; mean age, 23.7 years) during endoscopic ACL reconstruction. The continuity between the PCL and the posterior horn of the lateral meniscus was confirmed by observation and probing. (2) Study using specimens obtained during total knee arthroplasty (TKA); The PCLs with lateral meniscus were obtained as a specimen from 30 patients (3 males and 27 females; mean age, 71.9 years) during TKA. The PCL proper and MFLs were identified, and the cross-sectional area was measured using an area micrometer. The morphology, mainly regarding the origin of pMFL from LM, was investigated.

Results: (1) Arthroscopic study; Thirty-eight cases were examined. The aMFL was present in 12 (36.8%), pMFL in 20 (71.1%) and both in 8 (26.7%).
Twenty-four cases (84.2%) had at least one MFL. The aMFL was present in 5 (16.7%), and the pMFL was present in all cases (100%). The cross-sectional area was 50.1±16.9 mm² for the PCL proper, 2.3±1.2 mm² for the aMFL and 7.5±2.5 mm² for the pMFL. The average ratio of the cross-sectional area of the MFLs to the PCL proper was 17.2% (4.0~38.9%). The origin of the pMFL from the posterior horn of the lateral meniscus was able to be classified into 5 types.

Discussion: This study confirmed that a majority of JAPANese have at least one MFL. The origin of the pMFL from the posterior horn of the lateral meniscus was able to be classified into 5 types. The maximum ratio of the cross-sectional area of the aMFL and pMFL to the PCL proper was 38.9%. The MFLs thus contribute significantly to the cross-sectional area of the PCL Complex.

E-poster #153
Long Term Sport Involvement Does Not Lead To Significantly Greater Incidence Of Sporting Injuries In Elite Young Athletes
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Background: The long-term effects of high level sports participation during childhood and adolescence are unclear. Hypothesis: There are no significant adverse long-term effects of high level sports participation (gymnastics, swimming, tennis and football) during childhood and adolescence. Study Design: Retrospective cohort study to establish the long-term effects of sport, performance success, gender and age of maturity on rate and site of injury. Methods: All 453 subjects originally enrolled in the Training of Young Athletes (TOYA) study, performed in the period 1987-1992, were invited to participate in a 10 year follow up study. A self-administered questionnaire was designed to obtain growth and injury data. The results were analysed using chi square analysis. Results: 203 questionnaires were returned. The rates and location of injuries varied significantly among the four sports. Athletes competing and succeeding at international level have the greatest injury rates. There was a significant association between injury rates of female athletes and age at menarche. Conclusions: Athletes competing at international level have the greatest injury rates. Even after 10 years, injury rates among elite young athletes were low, and similar to those in the original study. Long-term sport involvement does not lead to significantly greater incidence of sporting injuries.

E-poster #154
Reconstruction of a Bone Defect with Injectable Biodegradable Bone Substitute: A Histological and Biomechanical Studies in Rabbits
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INTRODUCTION
Bone graft materials are vital for bone defects caused by trauma, infection, tumor and joint reconstruction. Various synthetic materials for bone substitute have been tested with unreliable clinical application. Calcium sulfate has been used as a bone-graft substitute. A solid form calcium sulfate product could not fill the defect completely to provide immediate structural support. And it’s resorption time of less than 6 weeks that is obviously insufficient in clinical use. Calcium phosphate is regarded to have longer resorption period for further scaffold support. The purpose of this study is to evaluate the mechanical and histological properties of an injectable form calcium sulfate-calcium phosphate composite as a bone substitute. MATERIALS AND METHODS A hemihydrate of calcium sulfate and calcium phosphate can absorb water to become liquid form. The composite was shaped into a cylindrical blocks for compression test and strip form for bending test. The microstructure, particle size and particle distribution were examined and measured by Zeta particle sizing software. Twelve adult NEW ZEALAND rabbits were used for in-vivo study. The rabbits were randomly divided into four groups for sacrifice at 2, 4, 8, or 12 weeks respectively. A 10 mm depth and 5 mm diameter cylindrical bone defect was created at both medial femoral condyle of hind limbs were prepared for surgery. 5 gm medical-grade calcium sulfate and 1.25 gm calcium phosphate were mixed with 1.25ml saline solution to become a liquid form, which was injected to the bone defect. After sacrifice, femoral
The condyle was harvested for the histological examination.

RESULTS

The mean compression strength is 22.17±1.37 Mpa. The mean bending strength is 11.19±0.72 Mpa. The average setting time was 12.5±0.5 min after one minute of stirring works. At 2 weeks, there was extensive apposition of bone, which was composed of mostly woven bone and unmineralized osteoid. Osteoclasts also could be identified on the surface of the material indicating active resorption. At 4 weeks, osteoblasts appeared adjacent to the osteoclasts indicating initiation of bone ingrowth. At 8 weeks, the filling material showed evidence new-bone formation. At 12 weeks, the calcium sulfate in the bone defect replaced with ingrowing trabecular bone.

DISCUSSION

Composite of calcium sulfate and calcium phosphate can achieve both injectable and longer resorption period. The injectable property made it possible to fill gaps easily and efficiently and could avoid fibrous tissue ingrowth during the bone healing process. It provides instant mechanical support of the recipient site, which avoid early mechanical failure. Calcium sulfate-calcium phosphate composite is an acceptable bone substitute for bone defects. In addition, injectable form made it possible for more surgical indication.

E-poster #155

The Effect Of Bipolar Radiofrequency Energy On The Structure Of The Meniscus Of The Knee Joint- An Invitro Study

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Purpose: To evaluate the effect of bipolar radiofrequency energy on the human meniscus.
Method: In vitro study. Bipolar radiofrequency energy has been used to treat various musculoskeletal pathology recently, although its effect on meniscal tissue has not been critically evaluated.

Menisci were harvested from patients undergoing total knee replacement. The menisci were then treated with various settings (V2-10 to V2-120) of radiofrequency energy using the Mitek VAPR system. Specimens were then processed for analysis with both light and electron microscopy. Results: Histological changes consisted of homogenization of collagen fibres, pyknosis of fibrochondrocyte nuclei, and loss of lacunae surrounding fibrochondrocyte. Electron microscopic changes in the treated tissue consisted of tissue homogenization with loss of cross-striations and fusion of collagen fibers. There was a clear demarcation between treated and untreated areas.

Conclusions: The effects of bipolar radiofrequency energy on meniscus in this study are consistent with thermal tissue damage limited to the treatment area. Bipolar radiofrequency may therefore be used to treat meniscal pathology without causing propagation of its thermal effects.

E-poster #156

Clinical and Anatomical Study About Double Bundles in the Anterior Cruciate Ligament

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ACL reconstruction techniques have been developed for the past decade. Many papers about the isometric point in the ACL have been published, and methods for isometric reconstruction have been standardized.

The anatomy of the ACL has been recently re-noticed, and some surgeons suggest that the ACL should be reconstructed with two bundles.

In the ACL reconstruction and TKA, however, we cannot find two bundles in all ACLs. We examined cadavers in Kanazawa University to determine whether double bundles could be detected in the ACL in all cadaver knees. 47 knees of 25 cadavers were examined in this study.

1. Investigation of the midsubstance of ACL

First we examined the middle of the ACL for macroscopic study. If we detected double bundles in the ACL, these ligaments were classified to the macroscopic double bundle group (group A). Second the other cases were additionally investigated by microscopy. If a septum was
microscopically found, we classified the ligaments into the microscopic double bundle group (group B). Finally, the ligaments in which we could not detect double bundles were classified as the single bundle group (group C).

2. Investigation of the femoral and tibial insertion of ACL

Morphological investigation was performed at the points of insertion of the ACL into the femur and tibia. We classified them into three morphological types, including two separate insertion type. One of these had two insertions of double bundles, which were adjoined each other. This was named the adjoining separate insertion type (type 1). The second type was the completely separate insertion type (type 2), in which we clearly detected the separation between two insertions. The third was the common insertion type (type 3). This type showed common insertion of the anteromedial and posterolateral bundles.

1. Investigation of the midsubstance of ACL

Group A contained 26 knees (55.3%). Groups B and C had a combined 21 knees (46.7%). There were 9 knees (19.9%) in group B and 12 knees in group C. Three cadavers which had group A knees on one side had group C knees on the other side.

2. Investigation of the femoral and tibial insertion of ACL

Twenty-two knees (46.8%) on the femoral side and 26 (55.3%) on the tibial side were type 1. There were four type 3 knees in group A on the femoral side, and 25 knees on the femoral side and 21 on the tibia were type 3. We did not find any type 2 knees.

ACL has long been a topic of interest among orthopedic surgeons and numerous studies have been reported on the anatomy and function of the ACL. Girgis (1975) and Arnoczky (1983) divided the ACL into two parts: a small anteromedial and a large posterolateral band. Muneta (1997) described the double bundle procedure for the ACL reconstruction and Yasuda (2003) showed the anatomical, biomechanical, clinical studies about the anteromedial and posterolateral band of the ACL.

Many orthopedic surgeons recognize that all ACLs are two strands and all insertions of the ACL on the femur and tibia are completely separated. In this study, however, we clarified only 75% in all knees were double bundles and no completely separated insertions of the ACL were detected in both femur and tibia.

Double bundles ACL reconstruction with hamstrings placed on the completely separate insertion dose not mean a true anatomical reconstruction.

E-poster #157
The Relationship of the Glenoid Notch Angle and the Attachment of the Antero-superior Labrum

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INTRODUCTION:
The shape of the glenoid can vary between a pear-shape and an oval-shape depending on the presence of a glenoid notch.
We measured the angle between the superior and inferior part of the anterior glenoid rim (Glenoid Notch Angle) and investigated its relationship with the labral attachment to the glenoid at that location.

METHODS:
53 embalmed cadaver shoulders were used in this study.
The attachment of the anterosuperior labrum at the site of the glenoid notch was observed and assessed as 1) tight, 2) loosely attached or 3) sublabral foramen.
Then the anterior labrum was removed and digital images perpendicular to the glenoid notch were taken.
With a digital image analysis program the angle of the glenoid notch was measured.

RESULTS:
The attachment of the labrum at the site of the glenoid notch was assessed as tight in 37 (70%), loose in 8 (15%) and in 8 (15%) shoulders a sublabral foramen was found.
Then the anterior labrum was removed and digital images perpendicular to the glenoid notch were taken.
With a digital image analysis program the angle of the glenoid notch was measured.

CONCLUSION:
The glenoid notch angle is related with the attachment of the labrum.
With the presence of a glenoid notch there is more likely to be a loosely attached labrum or sublabral foramen.
This loose attachment of the antero superior labrum is maybe a predisposition for traumatic anterior instability.

E-poster #159
Biomechanical Comparison of the Bioabsorbable Retroscrew System, Delta Screw, and Bioscrew Xtralok for Tibialis Anterior Graft-Tibial Tunnel Fixation
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Purpose: This laboratory biomechanical study evaluated the cyclic test and load to failure characteristics of doubled human tibialis anterior graft-tibial tunnel fixation using either a 20-mm retrograde bioabsorbable interference screw with a 17-mm antegrade bioabsorbable interference screw back-up (RetroLoc System, Arthrex, Naples, FL), a 35-mm Delta Tapered Bio-interference Screw (Arthrex, Naples, FL) or a 35-mm BioScrew XtraLok (Linvatec, Largo, FL) in conjunction with instrumented graft tensioner use (Stress Equalization Tensioner, Linvatec, Largo, FL). Our hypothesis was that no group differences would exist for construct stiffness and displacement during cyclic testing and no differences would exist for maximum load, displacement, and stiffness during load to failure testing.

Methods: Eighteen porcine tibiae were divided into 3 equivalent groups of 6 specimens based on dual energy x-ray absorptiometry evaluation of apparent bone mineral density (1.16 ± 0.16 g/cm²). Doubled human tibialis anterior grafts were divided into 3 equivalent groups of 6 specimens based on graft diameter. Cyclic testing (50-250 N, 500 cycles, 1 Hz) followed by load to failure testing (20 mm/min) was performed on a servo hydraulic device with the loading axis aligned directly with the tibial tunnel. One-way ANOVA and Tukey HSD post hoc tests were used to assess group differences (P < 0.05).

Results: Cyclic stiffness and cyclic displacement of the BioScrew XtraLok (210.9 N/mm, 0.99 mm) and Delta Tapered Bio-interference Screw (224.3 N/mm, 0.92 mm) fixations were superior to RetroScrew System fixation (114.1 N/mm, 1.8 mm) (P = 0.001, P < 0.001, respectively). All constructs survived cyclic testing. Maximum load at failure for the RetroScrew System was 778.7 ± 177.5 N, with a displacement of 5.3 ± 2 mm and a stiffness modulus of 204.3 ± 52.9 N/mm.

Maximum load at failure for the 35-mm Delta Tapered Bio-interference Screw was 1042.2 ± 214.4 N, with a displacement of 7 ± 2.3 mm and a stiffness modulus of 257.2 ± 22.2 N/mm. Maximum load at failure for the BioScrew XtraLok was 1436.3 ± 331.3 N, with a displacement of 5.9 ± 2.6 mm and a stiffness modulus of 323.6 ± 56.8 N/mm. BioScrew XtraLok fixation displayed greater maximum load at failure compared to both RetroScrew System fixation and Delta Tapered Bio-interference Screw fixation (P = 0.001). During maximum load at failure testing BioScrew XtraLok fixation displayed greater stiffness than RetroScrew System fixation (P = 0.002) however it did not display a statistically significant difference from the stiffness attained with Delta Tapered Bio-interference Screw fixation (P = 0.16). Significant differences were not evident for displacement at failure load between the 3 groups (P = 0.49). All constructs failed by graft pullout.

Conclusions: BioScrew XtraLok fixation with instrumented graft tensioning and Delta Tapered Bio-interference Screw fixation were superior to the RetroScrew System during cyclic testing. BioScrew XtraLok fixation with instrumented graft tensioning was superior to both Delta Tapered Bio-interference Screw and RetroScrew System fixation during load to failure testing.

E-poster #160
Biomechanical Evaluation of Bioknotless and Bio-corkscrew Suture Anchors in the Repair of Rotator Cuff Tears
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Purpose: Attaining secure fixation during the arthroscopic repair of large rotator cuff tears is paramount to successful patient outcomes. This biomechanical study used cadaveric specimens to evaluate the rotator cuff tear fixation integrity of...
the Bioknotless suture anchor (Mitek, Westwood, MA) and the Bio-corkscrew suture anchor (Arthrex, Naples, FL).

Methods: A standardized template was used to create 3-cm wide by 1-cm long full-thickness supraspinatus defects in 7 paired fresh frozen cadaveric shoulders. Defects were repaired using either two 6.5 mm Bio-corkscrew anchors (n = 7) or three Bioknotless suture anchors (n = 7). All defects and repairs were performed by the primary investigator. Following placement in a servo hydraulic device with the loading vector applied at a 60º abduction angle, constructs underwent incremental cyclic testing (5-100 N for 1000 cycles and 5-180 N for 2000 cycles) and load to failure testing at a rate of 31 mm/sec. Nonparametric statistical analysis was performed to evaluate group differences (P < 0.05).

Results: All specimens repaired with the Bio-corkscrew suture anchors (7 of 7) completed cyclic testing compared to only 3 of 7 specimens repaired with the Bioknotless suture anchors (P < 0.03, Fisher Exact Test). The Bio-corkscrew suture anchors displayed superior failure load results (533.7 ± 237 N vs. 339.7 ± 228 N, P = 0.018, Wilcoxon Signed Ranks Test). Stiffness and displacement did not display significant group differences (P > 0.50).

Conclusions: To our knowledge this is the first investigation to evaluate the biomechanical properties of the Bioknotless suture anchor when used to repair human rotator cuff defects. The superior performance of the Bio-corkscrew suture anchor suggests safer patient performance of routine activities of daily living and functional rehabilitation exercises during the early post-operative period with less risk of fixation site failure.

E-poster #161
Retroscrew System Biomechanical Fixation Characteristics Differ During Submaximal Cyclic and Load to Failure Testing in Porcine Tibiae

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Introduction: The RetroScrew System (20-mm long bioabsorbable retrograde screw with 17-mm long bioabsorbable antegrade “back-up” screw) was designed to facilitate optimum tibial fixation of soft tissue grafts for ACL reconstruction at the level of the intercondylar floor conceivably maximizing both construct biomechanical characteristics and anatomical placement. The efficacy of this relatively short screw to provide secure fixation of soft tissue grafts has been observed clinically, however basic biomechanical information is lacking. Methods: This biomechanical study evaluated double bundle human tibialis anterior tendon graft fixation in porcine tibiae during cyclic and load to failure testing (n = 7). Tibial tunnel and interference screw diameter matched graft diameter. Detailed screening of apparent tibial bone mineral density (BMD) was performed using dual energy x-ray absorptiometry at the proximal third, middle third, and distal third regions of interest for tibial tunnel placement. Following fixation and placement in a servo hydraulic device with the loading axis aligned directly with the tibial tunnel, the constructs were cycled from 10-50N at 0.1 Hz for 10 cycles before undergoing 500 cycles between 50-250 N at 1 Hz and a single-cycle load to failure test at 20 mm/min. Coefficient of determination (R²) analysis was performed to establish relationships between apparent BMD and fixation characteristics (P < 0.05).

Results: Insertion torques were 16.6 ± 5 in-lbs and 9.3 ± 4 in-lbs for the retrograde and antegrade screws, respectively. All specimens survived cyclic testing with displacement of 2.1 ± 0.9 mm and stiffness of 105.3 ± 32 N/mm. Load at failure was 728.1 ± 210 N with a stiffness modulus of 214 ± 55 N/mm and a displacement of 4.9 ± 2 mm. Upper third tunnel region BMD was 1.07 ± 0.23 g/cm². Middle third region BMD was 1.32 ± 0.24 g/cm², and distal third region BMD was 1.06 ± 0.18 g/cm². All constructs failed by graft pullout. During cyclic testing, middle third tunnel region BMD displayed a strong direct relationship with construct stiffness (R² = 0.94) while displacement displayed a strong inverse relationship (R² = -0.92). Similar, but less robust relationships were observed at the other BMD regions of interest. However, during load to failure testing, an inverse relationship was observed between stiffness and middle third tunnel region BMD (R² = -0.80) and less robust relationships were observed at the other BMD regions of interest. Retrograde screw insertion torque displayed a weak relationship with maximal load at failure (R² = 0.44), however stiffness and displacement relationships were not significant. Antegrade screw insertion torque failed to display significant relationships with...
maximal load at failure, stiffness, or displacement. Conclusions: Although the retroscrew system was effective for withstanding the cyclic loads of early rehabilitation, these findings suggest that the back-up antegrade screw may not provide sufficient support during intense loading conditions. Further study with modified back-up screw design and/or instrumented graft tensioning is warranted.

**E-poster #164**

**Classification of PCL and Associated Lesions Using Stress-Radiography Techniques**

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INTRODUCTION: Although posterior cruciate ligament injuries are less frequent than ACL injuries, precise diagnosis is essential for proper treatment. Stress radiography techniques have been shown to be superior to the arthrometer and clinical examination in evaluating the PCL deficient knee, but no precise relationship has been established between the extent of the lesion and the laxity measured by stress radiography.

OBJECTIVE: To determine the correlation between posterior laxity and the anatomical lesions of the PCL and posterior structures using different stress radiography techniques.

METHODS: Measurements were performed on 8 fresh frozen cadaveric knee specimens. The intra-articular status was evaluated by arthroscopy. A partial PCL lesion was created by sectioning the antero-lateral bundle, followed by a complete section of the PCL. Then the LCL and the PLC were transected, and finally the MCL and the PMC were sectioned. Stress radiography were performed on the intact knee and after each lesion was created using the following 4 techniques: Gravity sag view; PCL-Press with 180N load; Telos at 80° of flexion with 180N load; and Telos at 30° with 180N load.

RESULTS: The mean differential posterior displacement (mm ± standard error) after a partial PCL lesion was: 3.5 ± 4.6 mm (Gravity), 0.5 ± 2 (PCL-Press), 3.2 ± 2.5 (Telos 80°), and 0.8 ± 0.8 (Telos 30°). After a complete PCL lesion: 9.1 ± 3.3 mm (Gravity), 5.1 ± 4.6 (PCL-Press), 10.9 ± 3.7 (Telos 80°), and 4.2 ± 1.5 (Telos 30°). With the association of LCL and PLC lesions: 10.7 ± 4.2 mm (Gravity), 8.9 ± 4.0 (PCL-Press), 15.7 ± 6.3 (Telos 80°), and 9.3 ± 4.2 (Telos 30°). Finally, after the addition of MCL and PMC lesions: 13.5 ± 4.5 mm (Gravity), 15.6 ± 6.8 (PCL-Press), 20.5 ± 8.8 (Telos 80°), and 13.1 ± 3.1 (Telos 30°).

CONCLUSIONS: There is high variability between the specific techniques of stress radiography and pathologic specimens. Measurements performed with the Telos device at 80° and 30° of flexion are comparable with results obtained from previous sectioning studies and are the most reliable. Based upon our findings, a partial PCL injury results in a posterior displacement of less than 5mm, and a complete PCL injury from 5 to 12mm. The association of peripheral lesions (LCL, PLC, MCL, PMC) results in posterior displacement greater than 12mm at 80° of flexion and 5mm at 30° of flexion.

**E-poster #165**

**Bone Growth Factors and Stimal Cells: From Experimentation In Vitro to Clinical Medicine.**

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From Urist’s studies (1965) to the following observations by Sampath and Reddi (1981) on the role of BPM morphogenetic proteins, and more particularly, BPMs/OPs in the complex mechanism on bone regeneration to the recent (Solheim, 1998) on the properties of the single elements belonging to the superfamily of AGF of Platen derivation to activate the specific receptors of stimal cells, progress in research and clinical application has been considerable.

In orthopedy, these new techniques are suggested in all cases of bone loss, ranging from tumor or similar tumor lysis to mobilisations due to prosthesis, to pseudoarthrosis. The outcome of the patients treated so far is estimated through clinical analogical cards, standard radiographs or RSA, or DEXA or, in rarer cases, through microTAC. The non specificity of these methods, on the other hand, prevents us from singling out which element has activated the osteogenetic process when and which one has affected the course favourably.

In order to answer all these questions, from March 2002 to January 2004, we have
carried out a perspective study, parallel between autologous AGF and staminal cells application in orthopedy and the ex-vivo valuation in vitro of platen activation on the patient’s osteoblast in 12 cases (5 hip prosthesis mobilisation, 5 knee prosthesis mobilisation, 2 knee prosthesis). The outcome of all cases has been good. The study has proved that the PDGF-AA, isoform of pDGF, an important mitogenous among AGF, increases more remarkably after adding platen gel to the osteoblasts than in check cultures which are lacking in platenet gel. Such increase might mean the platen activation on the ostoblast and might play a causal role in the process.

E-poster #166
Cell Viability of Menisci Frozen at Three Different Temperatures: Experimental Study in Rabbits
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Jose Luiz Pozo Raymundo, Pelotas, BRAZIL
Marcia Bento Moreira, Sao Paulo, BRAZIL
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Background and Objectives: The successful of meniscus transplantation was in dependence of different procedures of storage and the cell viability. Menisci to be transplanted may be stored in different ways: frozen, fresh, freeze-dried and cryopreserved. The purpose was evaluating menisci morphology, by recording cell death time and collagen organization, after freezing at three different temperatures.

Methods: Menisci medial(n=90) and lateral(n=90) of NEW ZEALAND rabbits(n=45) was aseptic removed and frozen at 7.3oC, 24oC and 73oC. Four menisci were thawed every two days for histological analysis until completing 30 freezing days. Menisci hematoxilin-eosin stained was examined by fluorescent microscopic method. A qualitative score of collagen fibrin disruption was compared with the standard normal meniscus. The cell viability was evaluated by morphometric count of pyknosis index.

Results: The start of appearance of disruption collagen lawyers was at the 2th (-7.3oC), 4th (-30 oC) and 4th day (-73 oC). The progressive disorganization was worst at 20th to 30th day with appearance of a white and amorph substance in 80% of samples. The pyknosis started at same time of collagen disorganization and at 28th day there was cell death in virtually all meniscus extension. Menisci cellularity has changed according to freezing time.

Conclusion: Our findings have shown that meniscus freezing leads to cell death in different days according to temperature. This is vital for determining meniscus storage time for future transplantation.

E-poster #167
A Surgical Technique for Autologous Medial Femoral Condyle Transplantation in Rabbits
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Background and Objectives: The focal articular cartilage injury with loss of substance is still a surgical challenge. Current treatment is a simple resection of fragments with future arthritis and functional restriction. The purpose was to evaluated a surgical procedure of transplantation and fixation of the medial femoral condyle in an experimental animal model.

Methods: NEW ZEALAND rabbits (n=12) was submitted to surgical procedure in three stages: 1- medial condyle fragment (10x5x3mm) was resected in the posterior direction - posterior cruciate ligament, which coincides with anterior osteotomy border, was used as reference; 2- bone fragment was removed and placed in saline solution for five minutes; 3 bone fragment was reimplanted in the same animal using 1.0mm Kirschner’s thread. Euthanasia occurs in 4th week; the knee was dissected and observed the fixation of the bone fragment. Samples of bone fragment and distal femur was prepared for usual histological procedures and hematoxilin-eosin stained.

Results: Medial femoral condyle was firmly attached to the distal femur in 83% of cases (10 knees). Two bone fragments were poorly attached with movements at manipulation of surgical site. Intense periosteal reaction was one of histological aspects of osteo regeneration. Trabecular bone was present in healing line between bone fragment and distal femur. Normal mature bone tissue was observed with hematogenic narrow. Conclusion: Kirschner’s thread technique was feasibility for medial femoral condyle fixation in rabbits. So, we are starting a pilot-study with homologous medial femoral condyle
transplantation in rabbits, trying to create a actual situation which in the future may be found in humans beings.

E-poster #168
Medial Meniscus Transplantation Using Synthetic Glue for Fixation In Rabbits
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Background and Objectives: Meniscus transplantation is an evolving process with its most different fixation methods. Surgical adhesives may represent a option for these procedures. This study aimed at macroscopically and histologically evaluating the fixation of the meniscus transplantation with cianoacrylate.

Methods: NEW ZEALAND rabbits (n=20): autologous meniscus transplantation (n=10) and homologous meniscus transplantation (n=10). Homologous transplantation was done in two stages: 1-Right meniscus removal and stored at -73oC for 30 days; 2- reimplant of meniscus in a different rabbit with cianoacrylate acid-derived. For autologous transplantation, meniscus has been removed and then reimplanted (without stored) to the same animal with synthetic glue. The animals of both groups were expected to be observed until 60th PO(post-operative day). The follow-up showed some intercurrence that led to premature euthanasia.

Results: Animals of homologous transplantation were gone to unexpected sacrifice in 11th PO due to dehiscence and fibrinogenous exudations. The same occurs in 19th PO with the animals of autologous transplantation. There was no fixation of the meniscus in both groups. Gross and white exudations coming from the articular cavity with aspect of caseous necrosis appear trough the surgical scar. Microscopic aspect of tibial cartilage showed massive necrosis and the transplanted meniscus had focus necrosis and inflammatory eosinophilic infiltrate.

Conclusion: Surgical adhesive of cianoacrylate acid-derived promotes necrosis from cortical to bone narrow both in autologous and homologous transplantations meniscus, although more severe and premature in the homologous transplantation.

E-poster #169
Microsurgical Evaluation of the Posterolateral Corner
Andreas Panagiotis Diamantopoulos
Anastasios V Tokis, Anatoli- Ioannina, GREECE, Presenter
Matheos Tzurbakis, Athens, GREECE
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Anastasios Georgoulis, Ioannina, GREECE
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Introduction: Aim of the study was to evaluate under microsurgical dissection the anatomy and the relationships of the posterolateral corner of the knee and measure the mean dimensions of these components after microsurgical dissection.

Methods: Ten fresh-frozen human adult cadaveric knees were used for the study. Dissection of the knees was performed using magnifying loupes, an operative microscope and microsurgical instruments. Dissecting the area, care was taken to identify the structures attaching to the fibular head, the femoral condyle and the lateral meniscus. All anatomic components were photographed and dimensions were recorded using a micrometer. Anatomical variations, ligaments shape, separated bundles of the ligaments and topography of ligament attachments were also described and recorded.

Results: The presence rates of the popliteofibular ligament (PFL), the fabellofibular ligament (FFL) and the arcuate ligament (AL) were 100%, 40% and 70% respectively. Our dissections showed that the shape and the fibula attachment of the PFL can vary. Using the surgical microscope we were able to dissect and identify two different fiber groups of the PT at its attachment to the lateral femoral condyle. Also, we were able to confirm in 20% of our knees an anatomical variation of the LCL. In these specimens, the LCL was found to consist of two different fiber groups.

Conclusions: Our anatomical study could increase the comprehension of the normal anatomy of the posterolateral corner of the knee and provide significant help in repair and reconstruction. The PFL is well established, always recognizable and significant in size ligament.
E-poster #170
The Effect of Shock Wave Treatment At The Tendon-Bone Interface - A Histomorphological and Biomechanical Study in Rabbits
Ching-Jen Wang, Taiwan, Presenter
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Purpose: This study was performed to investigate the effect of shock wave treatment on the healing at tendon-bone interface in rabbits.

Materials and Methods: Thirty-six NEW ZEALAND White rabbits were used in this study. The anterior cruciate ligament was excised and replaced with the long digital extensor. The right knees (study group) were treated with 500 impulses of shock waves at 14 kV, while the left knees (control group) received no shock waves.

Histomorphological studies were performed in 24 rabbits at 1, 2, 4, 8, 12 and 24 weeks. Biomechanical studies were performed in 12 rabbits at 12 and 24 weeks.

Results: There were significantly more trabecular bones around the tendon noted in the study group than the control group at different time intervals after 4 weeks (P < 0.05). The binding between bone and tendon was significantly better in the study group than the control group after 8 weeks (P < 0.05). The tensile strength of the tendon-bone interface was significantly higher in the study group than the control group at 24 weeks (P = 0.018), and the modes of graft failure differed between the two groups.

Conclusion: Shock wave treatment significantly improves the healing of the tendon-bone interface in a bone tunnel in rabbits. The effect of shock waves appears to be time-dependent.

E-poster #171
Immunohistochemical Analysis of Mechanoreceptors in the Human Posterior Cruciate Ligament
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Purpose: The aim of this study was to classify and evaluate the frequency and localization of the posterior cruciate ligament mechanoreceptors by S-100 ant protein immunohistochemical method.

Type of Study: experimental in human cadavers.

Methods: Nineteen normal right knees harvested from human male cadavers were evaluated. Age ranged from 17 to 24 years old with a mean of 35 years. Posterior cruciate ligament was separated for sampling in femoral and tibial portions. Topographic distribution and frequency within the ligament texture were determined employing the Pro-Image digital analysis system.

Mechanoreceptors were counted and classified according to the criteria proposed by Freeman & Wyke (1967). Results: A total of 1820 mechanoreceptors were found, being type II the most frequent. Analysis of the femoral portion of the ligament showed an equivalent predominance of type II and IV receptors. Tibial portion had a predominance of type II mechanoreceptors, followed by type IV. At this portion receptors types I and III were less commonly identified.

Conclusions: There was no significant statistically difference in relationship of femoral and tibial portions mechanoreceptors. The type II receptor was the most frequent. The present data suggest that the PCL has not only biomechanical function but also an important neural function.

E-poster w/ Standard #175
Mechanical Properties of the Anterior Cruciate Ligament Treated with Radiofrequency Shrinkage Deteriorate In Vivo Over Time, Even When Sufficient Volume of Ligament Tissue Remains Intact Around the Treated Portion
Eiji Kondo, Sapporo, JAPAN, Presenter
Harukazu Tohyama, Sapporo, JAPAN
Kazunori Yasuda, Sapporo, JAPAN
Neishin Chu, Sapporo, JAPAN
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INTRODUCTION: Effects of radiofrequency (RF) energy on the anterior cruciate ligament (ACL) have not been sufficiently clarified. Our previous in vitro study (Arthroscopy 2004) demonstrated that the RF energy drastically reduced biomechanical properties of the ACL immediately after surgery, while the RF energy significantly reduces the length of the ACL. Recently, a few studies have shown that RF energy significantly deteriorates structural properties of the whole ACL under in vivo conditions. However, these studies have ignored the existence of the untreated intact portion in a cross-section of the RF-treated lesion. In addition, these studies have not determined the mechanical properties of the RF-treated ligament, distinguishing it from those of the intact ligament tissue. On the other hand, in the clinical field, many orthopaedic surgeons
have the expectation that the ACL properties which are reduced by the RF shrinkage may be gradually restored over time, when some of the ligament tissues remain intact around the RF-treated portion. No studies have been conducted thus far to clarify the in vivo effect of RF energy, quantitatively distinguishing the RF-treated portion from the untreated portion. The purpose of this in vivo experimental study is to clarify whether the mechanical properties of the ACL reduced by the RF shrinkage are then restored over time, when a sufficient volume of ligament tissues remains intact around the treated portion.

MATERIALS AND METHODS: Thirty skeletally mature rabbits weighing 3.5+/-.2 kg were used in this study. In each animal, the right ACL was treated using the following quantitative technique. After the antero-medial (AM) and postero-lateral (PL) bundles of the ACL were identified, separation was then performed by a blunt probe between the two bundles. In each knee, RF energy set at a non-ablative level was applied to the whole PL bundle of the ACL with a bipolar RF generator (ArthroCare, Sunnyvale, CA). The RF treatment was applied using 28-Watts for 5 seconds. The reason why the PL bundle was chosen to be treated was that, when the AM bundle was treated in the same manner, the whole ACL was completely torn at 6 weeks in our pilot study. The RF treatment was performed in physiological saline solution at 90 degrees of knee flexion. No immobilization was applied after surgery. The animals were allowed unrestricted activities in their cages. Then, all the animals were randomly divided into 3 groups, Groups S0, S6, and S12, with 10 rabbits in each group. In these groups, all animals were sacrificed at 0, 6, and 12 weeks after surgery, respectively. In each group, 7 out of the 10 rabbits were used for biomechanical evaluation, and the remaining 3 were used for histological observation with light and polarized light microscopy. Nine knees (Control group) randomly harvested from all left knees were used to obtain normal control data. As to the biomechanical evaluation, the anterior-posterior (A-P) translation of the knee was measured using a tensile tester with a 5-DOF fixture under 10N forces at 30, 60, and 90 degrees of knee flexion. The cross-sectional area (CSA) of the whole ACL was measured with a non-contact optical method using a video dimension analyzer. Then, after the AM bundle was resected, the CSA of the treated PL bundle was measured, and the mechanical properties of the PL bundle were determined in tensile testing at a cross-head speed of 20 mm/min. Statistical analyses were made using the ANOVA with the Fisher’s PSLD test for post-hoc multiple comparisons.

RESULTS: Concerning the A-P translation of the knee, the ANOVA showed a significant difference among all the groups at each angle of knee flexion (p<.0265). The posthoc test demonstrated that, at 60 degrees of knee flexion, there was a significant difference between Group S0 and the other groups. In tensile testing, the ANOVA demonstrated a significant difference in the tangent modulus among the groups (p<.0001). Groups S0, S6, and S12 were significantly lower than the control group, respectively (p<.0003). In addition, Group S12 was significantly lower than Group S0 (p=.0413). Concerning the tensile strength, the ANOVA demonstrated a significant difference among the groups (p<.0005). Groups S0, S6 and S12 were significantly lower than the control group, respectively (p<.0129). Histological examination performed immediately after the treatment showed diffuse collagenous denaturation and pyknotic nuclear changes in fibroblasts in the RF treated portion. The crimp patterns were not present in the treated area. In Group S12, granulation-like tissues with numerous plump fibroblasts and inflammatory cells were predominantly found in the mid-substance of the PL bundle, where collagen fibers were loosely woven without the crimp pattern.

DISCUSSION: This study clearly demonstrated that, even when a sufficient volume of ligament tissues remains intact around the treated portion, the mechanical properties of the ACL reduced by the RF shrinkage are not restored in vivo, but the properties significantly deteriorate over time. This result indicated that the intact ligament tissue around the treated portion does not protect the RF-treated ACL tissue from the material deterioration. This study also showed that the application of RF energy to the PL bundle significantly reduced the A-P translation of the knee immediately after surgery, but that this shrinkage effect disappeared at 6 weeks. This result suggested that the ACL tissue shortened with the RF shrinkage treatment is elongated gradually over time. Therefore, this study cautioned against being too optimistic over a clinical application of RF energy to the ACL shrinkage.
E-poster w/ Standard #176
The Integration Process at the Bone-Tendon Interface in Anterior Cruciate Ligament Reconstruction: An Immunohistological Study in a Rabbit Model
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Purpose
Fixation and integration of a tendon implanted within the bone concerns for the surgeon who treats instability problems of the knee. It is well known that in ACL reconstruction the grafted tendon inside the bone tunnel finally adheres to the bone via fibers called Sharpey-like fibers to then mature into a structure different from a normal bone-ligament complex. This region is considered to constitute a clinical problem because it is a mechanically weak point early after surgery and because there are some cases in which the bone tunnel is enlarged. Future studies to investigate how to accelerate the integration process are needed. The integration process, however, has many still-to-be-elucidated points. In this study, we verified immunohistologically the integration process between the bone and grafted tendon in the tibial tunnel.

Material and Method
Study design:
Twenty matured JAPANEse white rabbits were used. Each animal underwent ACL reconstruction using autogenous semitendinosus tendon in the left knee. Free semitendinosus tendon was folded into half, and then passed through a bone tunnel of 2.0mm diameter made in the tibia and femur, and attached by buttons. At each of 1, 2, 4, and 8 weeks after surgery, 5 rabbits were sacrificed, and a sagittal section of the tibial side was prepared for histological examination.

Histological preparation:
Each graft-tibia complexes was fixed in a 10% buffered formalin solution immediately after harvesting. After the specimen was decalcified, it was cast in paraffin blocks. The specimens were sectioned parallel to the longitudinal axis of the bone tunnel.

Immunohistological evaluation:
The visualization reaction was performed by using an Envision and EPOS system. To visualize the antigens, we used a monoclonal antibody against CD31 (marker for endothelial cell), RAM-11 (marker for rabbit macrophage), VEGF, b-FGF, S-100 protein, collagen type I, 2, and type 3. Purified normal mouse IgG was used as a negative control antibody. For all specimens, the tendon-bone interface and the intraosseous tendon substance were evaluated with light microscopy.

Results
Early after the operation, the bone-grafted tendon interface was pervaded with collagen type III-rich vascular fibrous granulation tissue expressing VEGF/b-FGF, and the vascular endothelium / macrophage wandered. This is a change seen in the ordinary process of wound healing, not a change specific to this region.

Using this matrix as a springboard, S-100 protein-positive round cells appeared from the wall of the bone tunnel, eroding the matrix in the interface while producing collagen type II. The erosion of the matrix diminished without eroding the grafted tendon, and the number of S-100 protein-positive round cells decreased gradually maturing into the bone lamellae. The changes that occurred from the wall of the bone tunnel seemed to be almost the same as those observed in enchondral ossification.

As the changes similar to enchondral ossification diminished, Sharpey-like fibers began to be detected. The results of this study confirmed that Sharpey-like fibers consisted of type III collagen. And the directions of Sharpey-like fibers were running against that of shear stress.

On the other hand, the grafted tendon became hypocellular. Following the expression of b-FGF, however, spindle-shaped cells were detected from 4 weeks onward. That is to say, changes similar to the remodeling in the intraarticular graft were thought to have occurred in the intraosseous graft. Remodeling in the intraosseous tendon, however, seemed to begin much later than the ossification in the wall of the bone tunnel.

Discussion
From these results, to enhance ossification from the wall of the bone tunnel seems to be most useful to accelerate the integration process between the bone and grafted tendon. Our results support the experiment of improving the integration between the bone and grafted tendon using BMP-2, 7 and/or low-powered ultrasonic stimuli.
However, the enhancement of just changes in the wall of the bone tunnel leaves on problem, unsolved; that is to say, remodeling in the tendon begins belatedly. Tomita reported that the grafted tendon pulled out inside the tendon except the surface layer in contact with the bone (anchoring surface). Therefore, we think that remodeling in the grafted tendon substance also needs to be enhanced simultaneously in order to improve biomechanical strength.

E-poster w/ Standard #177
Myofibroblast Expression in Injured Medial Collateral and Anterior Cruciate Ligaments
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BACKGROUND It has been shown that α-smooth muscle actin (SMA) positive cells are myofibroblasts and contribute substantially to the contractile period of the healing and might allow recovery of original ligament length and in situ strain. OBJECTIVE To describe the spatial-temporal expression of the myofibroblast in the entire injured MCL and ACL. METHODS A tear model was created in the left MCL of 21 adult NEW ZEALAND white rabbits. The right ACL was transected in mid-substance creating a partial ACL tear. Non-injured contralateral ligaments were used as controls. Three animals each were sacrificed at 3, 7, 14, and 21 days, and 4, 6 and 12 weeks post-injury. Ligament healing was assessed histologically and expression of SMA positive cells was revealed by immunohistochemistry. The spatial-temporal expression of SMA was quantified by image analysis.

RESULTS Histological analysis of healing of the MCL revealed an inflammatory phase (D3-7), a proliferation phase (D7-3 w.), and a maturation phase (5 12 w.). Analysis of the ACL showed an inflammatory phase (D3-2 w.) and a limited proliferation phase (2 - 6 w.). The SMA positive cells were seen as early as the third day post-injury in the MCL. Their numbers increased up to the third week before decreasing progressively toward the 12th week. A few SMA positive cells were found in the ACL from day 7 to 2 weeks.

CONCLUSIONS This study shows that myofibroblasts appear in the lesion as early as the third day post-trauma in a centripetal migration. They form a network and a contractile framework to facilitate ligament healing. This process occurs rapidly after the injury. This has important clinical implications where joint laxity is often evaluated several days post-trauma. The density of myofibroblasts was higher in the MCL. This may partially explain the difference in the healing between both ligaments.

E-poster w/ Standard #178
Effects of Parecoxib on Bone Healing
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Aims: Non-steroidal anti-inflammatory drugs (NSAIDs) are commonly used in musculoskeletal trauma to reduce the inflammatory response and pain. These drugs have been reported in general to affect bone metabolism, and especially indometacin is claimed to affect bone healing through the effect on prostaglandin synthesis. Parecoxib is a new and selective NSAID targeting cyclooxygenase-2 (COX-2). Through their selective action these drugs are supposed to lack many of the main side effects of other NSAIDs and are expected to be drugs of choice in near future for several patient groups. The effects on bone metabolism and healing have, however, not been elucidated. Furthermore, recently Zhang et al demonstrated that COX-2 is required for both intramembranous and endochondral bone formation. Thus there are reasons for concern regarding the potential negative effects of these drugs on bone metabolism and bone repair. The present study is designed to investigate the effects of short-term administration of parecoxib on bone mineral and bone healing. METHODS 20 female Wistar rats were given parecoxib intraperitoneally for 7 days after a closed tibial fracture was performed, the control group of 20 animals were given saline. All fractures were stabilised with an intramedullary nail. 2, 3 and 6 weeks after surgery the bone density at the fracture site was measured using
Dual Energy X-ray Absorptiometry (DXA) with a bone densitometer specially designed for measurements on small animals (PIXIMUS). At 6 weeks after the operation 15 rats from each group were killed and the healing fractures were mechanically tested in three-point cantilever bending.

Results: The bone mineral density (BMD) at the fracture site were significantly lower in the parecoxib group compared to the control group after both 2, 3 and 6 weeks, the difference was decreasing with time. There was no significant differences in mechanical properties 6 weeks after fracture.

Conclusions: Parecoxib decreased BMD at the fracture site for 6 weeks after fracture. Mechanical strength after 6 weeks were not affected.

E-poster w/ Standard #179
The Role of Radiofrequency Microdebridement in Meniscus Surgery: A Study in a Sheep Model
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Thore Zantop, Pittsburgh, PA USA
Andre Weimann, Kiel, GERMANY
Thomas Fuchs, Muenster, GERMANY
Richard Stange, Muenster, GERMANY
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Purpose: Synovial abrasion and trephination have been used successfully as neovascularisation techniques to stimulate meniscus healing. Recently, a beneficial influence of radiofrequency microdebridement on tendinopathies has been described. Aim of the current study was to evaluate the influence of bipolar radiofrequency microdebridement on the healing of medial meniscus tears in a sheep model.

Type of study: Experimental animal study.
Methods: Merino sheep underwent unilateral medial meniscus repair using three different techniques: trephination and suturing (group 1), and application of radiofrequency microdebridement and suturing (group 2). Six weeks postoperatively the angiogenic response was evaluated by factor VIII immunostaining and VEGF expression was analysed using an ELISA and RT PCR.

Results: Quantitative assessment of factor VIII immunostaining showed a significant higher amount of blood vessels in both groups of repaired menisci in comparison to uninjured menisci. There was no significant difference between the two treatment groups. The ELISA measurements showed that the intrameniscal VEGF concentration was significantly elevated in both treatment groups in comparison to uninjured control menisci without any statistical significant differences between both treatment groups. From all specimen, two PCR products were obtained: One with 526 bp corresponding to VEGF121 and one with 658 bp corresponding to VEGF165. In both treatment groups the bands were much stronger than in specimen of uninjured menisci.

Conclusion: The results of the current study suggest that no beneficial effect can be gained by the addition of bipolar radiofrequency to the trephination of a torn meniscus. Additional basic research is needed to investigate different time duration for the energy application and the effect of different energy settings.

E-poster w/ Standard #180
Reducing the Killer turn in Single Bundle PCL Reconstruction: Anatomical and Extracortical Fixation Under Cyclic Loading
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Several authors hypothesized that the abnormal posterior tibial laxity after PCL reconstruction could be related to thinning and permanent elongation of the graft as it turns around the sharp edge of the posterior tibial tunnel and being cyclically loaded in vivo. Aim of this study is to evaluate the influence of the so-called killer turn on the structural properties of a soft tissue graft using an extra-cortical and an anatomical fixation under cyclic loading.

Grafts were fixed in a porcine tibia model using interference screw fixation close to the joint line and extracortical fixation with staples. Ten reconstructions each were cyclically loaded (2000 times) between 50 and 150 N and ten were subjected to 2000 cycles between 50 and 300 N force. The surviving PCL reconstructions were loaded to failure using a material testing machine. Load and elongation were recorded continuously using a strip chart recorder. Elongation, stiffness, maximal load, yield load, as well as failure mode...
were recorded. In part two of the study, we investigated the benefit of reducing the sharp edge at the tibial tunnel exit using the same fixation techniques and the same two cyclic loading protocols.

Being subjected to the sharp edge of the posterior tibia, 5 of 10 extra-cortical and 8 of 10 anatomical fixed grafts survived cyclic loading between 50 and 150 N. All extra-cortical fixed and 8 of 10 anatomical fixed grafts failed prior to 2000 cycles between 50 and 300 N. Structural properties of grafts fixed with interference screw were statistically significant higher when compared to extra-cortical fixation. After rounding the sharp edge of the tunnel, all grafts survived cycles between 50 and 150 N and 6 out of 10 extra-cortical and 8 of 10 anatomical fixed grafts survived 2000 cycles between 50 and 300 N. The results of this study suggest that a rounded posterior aspect of the tunnel exit at the tibial tunnel leads to significant less graft damage when compared to the typical sharp edge of the tunnel (killer turn). Additionally, the results show that anatomical fixation of soft tissue grafts in PCL reconstruction is superior when compared to an extra-cortical fixation site.

ELBOW/WRIST/HAND

E-poster #200
Risks Evaluation in Posterior Transolecranon Surgical Approach: A Traffic Lights Model
Andrea Emilio Salvi, Brescia, ITALY, Presenter
Orthopaedic and Traumatologic Clinic of Brescia, BRESCIA, ITALY

The posterior transolecranon surgical approach of the elbow is often used for the treatment of the distal humerus fracture. It consists of an olecranon osteotomy in order to visualize the articular face including a part of the diaphysis. Notwithstanding the advantages of the wide area exposed, there are two hazards always to take into consideration: the presence of the ulnar nerve and the olecranon osteotomy-osteosynthesis performing. Because of the possibility in making mistakes during this approach, we have applied a decreasing degree of risk passing from medial to lateral that we have compared to a traffic lights transverses the elbow. The maximum risk (red light) is located in the medial side of the elbow where it passes the ulnar nerve that can be damaged. The intermediate risk (yellow light) is located in the olecranon: an incorrect osteotomy or an unsuitable osteosynthesis can fail the operation. The complete lack of risk (green light) is located in the lateral side of the elbow.

According to this point of view, the surgical approach is performed starting from the maximum risk identified by the red light, isolating the ulnar nerve, coming along the olecranon with its osteotomy-osteosynthesis and terminating the surgical process on the lateral side. The advantages of this "traffic lights view" lie in the progressive risks decreasing from medial to lateral since the surgeon can evaluate step by step all the performed gestures during the operation.

E-poster #201
Malpositioning of the Ulnar and Humeral Component of Total Elbow Prosthesis and Revision Rate
Margarita van der Hoeven, Nijmegen, NETHERLANDS, Presenter
Rinze Reinhard, Nijmegen, NETHERLANDS
Maarten de Vos, Nijmegen, NETHERLANDS
Denise Eygendaal, Nijmegen, NETHERLANDS
Sint Maartenskliniek, Nijmegen, NETHERLANDS

There is a lack of knowledge about malpositioning of total elbow prosthesis components and revision rate. In this study we tried to identify the relation between malpositioning in varus-valgus and flexion/extension direction and radiographic loosening of the prosthesis, subsidence and revision rate. In the period from 1990 to 1997 fifty-nine unconstrained total elbow prosthesis Kudo type-4 were inserted in 47 patients with rheumatoid arthritis. The group available for follow up consisted of 36 patients, resulting in 45 elbows available for radiological assessment. Anteroposterior (AP) and lateral radiographs of the elbow, performed in a standardized way, taken before the operation, six weeks after the operation, and at evaluation were used for radiological assessment. Malpositioning in other directions was not related to radiographic loosening of the prosthesis.
subsidence and revision rate. Malpositioning of components can result in abnormal soft tissue balancing, asymmetrical stress rising and maltracking. Malposition of the ulnar component in varus direction and positioning of the humeral component in extension resulted in more radiographic loosening and a higher revision rate. In order to reduce revision rate and improve results of TEP a better alignment of the components during insertion of the prosthesis must be achieved. Maybe computer assisted surgery can solve this problem in the future.

E-poster #202
Viscosupplementation Not Effective for the Treatment of Posttraumatic Osteoarthritis of the Elbow
Richard van Brakel, Nijmegen, NETHERLANDS, Presenter
Denise Eygendaal, Nijmegen, NETHERLANDS
Sint Maartenskliniek, Nijmegen, NETHERLANDS

The treatment of posttraumatic osteoarthritis of the elbow in young patients remains a challenge. The current conservative options of treatment are analgetics and intra-articular injection of corticosteroids. No studies are available in which the results after viscosupplementation in the elbow are evaluated. In this prospective cohort study, we have evaluated the effect of hyaluronic acid on pain and function of the posttraumatic osteoarthritic elbow-joint. In this prospective cohort study, we evaluated the effect and safety of viscosupplementation in 20 elbows with posttraumatic osteoarthritis of 19 patients (9 male, 10 female, average age 47,1 years, SD: 15,8 years). Three injections with sodium hyaluronate were given within four weeks with regular intervals. Evaluation took place just before the first injection as well as after three and six months and consisted of the Elbow Function Assessment Score, the Functional Rating Index by Broberg and Morrey and the Modified Andrews Elbow Scoring System. Pain was also assessed by means of Visual Analogue Scales. Only pain showed a slight (but not significant) decrease 3 months after starting viscosupplementation. Other parameters were not influenced by treatment with viscosupplementation at any time. Systemic or local adverse effects did not occur. Because the use of viscosupplementation for the treatment of posttraumatic osteoarthritis of the elbow provides only slight (but not significant) short-term pain relief while other parameters were not modified, we believe that viscosupplementation is not suitable for this indication. Different rheological properties of the synovial fluid in posttraumatic osteoarthritic joints in comparison to that in degenerative osteoarthritis may explain the ineffectiveness of intra-articular injections with sodium hyaluronate.

E-poster #203
Results of the Kudo Total Elbow Arthroplasty in Patients with Sever Destruction of the Elbow Joint due to Rheumatoid Arthritis
Rinze Reinhard, Nijmegen, NETHERLANDS, Presenter
Margarita van der Hoeven, Nijmegen, NETHERLANDS
Maarten de Vos, Nijmegen, NETHERLANDS
Denise Eygendaal, Nijmegen, NETHERLANDS
Sint Maartenskliniek, Nijmegen, NETHERLANDS

Despite increased experience with total elbow arthroplasty there is no consensus whether to use an unconstrained or semi-constrained prosthesis in severely destructed elbow joints. In this study we evaluated the results of the Kudo type-4 unconstrained total elbow prosthesis in severely destructed elbows. From 1990 to 1997 fifty-seven elbows in forty-five patients with rheumatoid arthritis (RA) underwent a primary, non-cemented total elbow arthroplasty with use of the Kudo type-4 prosthesis. All elbows were graded as Larsen III, IV or V. After an average of 7 years (4.4-11.2) thirty-four patients (44 elbows) were available for clinical follow-up. The Mayo Clinic Performance Index for the elbow (MCPI) was used to classify the results. Anteroposterior and lateral radiographs of the operated elbow were obtained in a standardised way at follow-up examination. According to the MCPI twenty-nine elbows were excellent or good and four were fair or poor. Four elbows had a limited range of motion and one patient had a superficial infection. Ulnar neuropathy occurred in 9 patients; 4 were operated additionally. Thirteen elbows (30%) needed a revision procedure for ulnar loosening (7), fractured humeral components (5) and for a fractured ulnar component (1). No (sub)luxations were seen. Kudo unconstrained type-4 total elbow arthroplasty generally results in acceptable scores and function, without dislocation or instability. However, our study confirms high rates of ulnar neuropathy and revision procedures. Fatigue breakage of the humeral stem seems to be overcome by the development of the Kudo type-5
E-poster #204
Epicondylitis. Arthroscopic Treatment
Alberto Pienovi, San Isidro, ARGENTINA, Presenter
Luciano Quevedo, San Isidro, Buenos Aires ARGENTINA
Daniel Varela, San Isidro, ARGENTINA
CTO San Isidro, Buenos Aires, ARGENTINA

Introduction: Epicondylitis or tennis elbow is a frequent pathology among the sports population. Its medical-physical treatment not always solves the problem and this pathology becomes chronic and recurrent.

In this study, a series of 29 cases treated arthroscopically and their results is presented.

Method: Eleven cases were evaluated, 9 women and 20 men, who were treated arthroscopically for chronic or recurrent epicondylitis. Previously, all cases underwent a treatment consisting of anti-inflammatory drugs, physical therapy and in 16 cases a minimum of 3 infiltrations with corticoids.

Patients were classified in four grades for the application of different arthroscopic techniques, according to their clinical evaluation, the MRI and the arthroscopic findings.

The methodology consisted on the bursectomy, fasciotomy and release of the epicondyle muscles in each case.

In 14 cases an intra-articular semiology of the elbow was performed, not finding a related pathology attributable to this lesion.

Results: An average follow-up of 26.8 months (6 to 40) was carried out. Owens classification in three arthroscopic types was used, performing in type I (12 cases) bursectomy and decompressive fasciotomy, in type II (13 cases) epicondyle muscles release, type III cases with exostosis (4 cases). Results were 75.8% of the cases (22 patients) had excellent or very good results, 20.7% (6 patients) regular results and 3.4% (1 patient) poor results.

Discussion: The arthroscopic treatment is considered a good election for patients with chronic or recurrent epicondylitis, and where non-surgical treatments are not effective.

Decompression of the fascia, together with the partial release of the epicondyle muscles is an effective method for the treatment of this pathology and has foreseeable results.

E-poster #205
Four Years Preliminary Experience with Personal Technique for All Inside Arthroscopic Repair of Triangular Fibrocartilage
Marco Conca, Milan, ITALY, Presenter
Riccardo Conca, Milan, ITALY
Pierangelo Catalano, Milan, ITALY
Orthopedic & Arthroscopic Dep. - Clinica San Carlo, Milan, ITALY

It’s common habit to repair Triangular fibrocartilage complex lesions by arthroscopy, the most common techniques are the in-out or the out-in, both of which have the disadvantage of an extra incision in order to tie the suture.

We have developed a personal technique that allows an all-inside repair for T.F.C.C. lesions with a technique similar to the one used for cuff-repair in the shoulder.

From May 2001 we have repaired 26 T.F.C.C. lesions, 21 Palmer 1B, 1 patient with 1B & 1D Palmer lesion contemporary, and 3 1D lesions using anchor-screws of 2.0mm.

The middle average was 28, the younger 17 and the older 45, 18 male and 8 female, 17 right hands and 9 left. Every patient had clinical signs of T.F.C.C. lesion and a pre-op. M.R.I. has been performed to confirm that.

We usually perform 3 portals 3-4, 4-5 and 6R or 6U with the scope in 3-4. A shaver is used to remove the synovitis and to refresh the edges of the lesion to obtain bleeding. We use a suture hook inserted percutaneously into the wrist perpendicular to the lesion or inserted in the 6R or 6U portal, and we catch both the sides of the lesion, as performed in side to side cuff tears repair, assisted with a small holder from 4-5 portal. Than a grasper or a crochet through the 6R or 6U portal retrieves both the side of the suture wire and a sliding knot is performed to tie the suture. The patient is immobilized in a long-arm plaster in complete supination for 4 weeks. After removal of the cast, the patient performs an average of 4-6 weeks of physical therapy. All patients report an improvement in the strength of the wrist and absence of pain or stiffness. To date, there has been only 1 case of lesion of the sensitive branch of ulnar nerve, and no other complication at all. We consider that the method we suggest has the advantages of not requiring an additional skin incision, lower risk of neuro-vascular damage, reduced post-op pain,
faster rehabilitation, so we think it’s an interesting alternative to the techniques actually in use.

E-poster #206
Microsurgical Dissection of the Carpal Tunnel in Respect to Neurovascular Structures At Risk During Endoscopic Carpal Tunnel Release
Harilaos S. Vasiliadis, Ioannina, GREECE, Presenter
Anastasios V Tokis, Anatoli- Ioannina, GREECE
Nikolaos V. Kordalis, Ioannina, GREECE
Alexandros E. Beris, Ioannina, GREECE
Anastasios Georgoulis, Ioannina, GREECE
Department of Orthopaedics, University of Ioannina, Ioannina, GREECE

Introduction: The aim of the study was to investigate the anatomy of the carpal tunnel in respect to the related neurovascular structures and to better understand the procedure of Endoscopic Carpal Tunnel Release.

Material and methods: 10 fresh frozen cadaveric hands were used for the study. Dissection of the palmar aspect of the hand was performed using magnifying loopes, an operative microscope and microsurgical instruments. All anatomic components were photographed and dimensions were recorded using a micrometer. The distance from the radial aspect of os pisiformis to other very important structures, the distance between the entry and exit portals and the main structures usually injured was measured. Topography of the transverse ligament and possible adhesions to the tendons and median nerve were described.

Results: The mean distance from radial aspect of os pisiformis to radial border of the Guyon’s canal was 10,7mm (9-12mm) and to ulnar edge of the palmaris longus tendon was 16,2mm (12-22mm). The mean distance from the exit portal to the superficial palmar arch and ulnar artery were 8,8mm (5-15) and 6,2mm (4,6-9) respectively. The mean distance from the distal edge of the transverse ligament to the thenar branch of the median nerve was 2,7mm (0-4,1). The mean length of the transverse ligament was 31,6mm (25-34,5). In 9 hands we identified the palmaris longus tendon. In 7 hands we found adhesions between the transverse ligament and the sheath.

Discussion: The area beneath the palmaris longus tendon is the safest place for the entry portal and the only guarantee for not introducing the obdurator in the Guyon’s canal (distance from os pisiformis more than 12mm). Identification of the distal border and not working more than 5mm further from it is very essential. Synovial adhesions can usually cover the transverse ligament and they need to be removed for clear endoscopic identification of the transverse fibres before cutting the ligament.

E-poster #207
Arthroscopy for Snapping Elbow Due to Congenital Radial Head Dislocation: A Case Report
Yoshiaki Kurihara, Soka City, Saitama JAPAN, Presenter
Takeshi Muneta, Tokyo, JAPAN
Soka City Hospital, Soka City, Saitama, JAPAN

There have been few reports on elbow arthroscopy for congenital radial head dislocation, though some reports have been available in regard to snapping elbows due to synovial plicae. We report a case of adult bilateral snapping elbows with bilateral congenital radial head dislocation, which required a surgical procedure.

The patient was a 37-year-old woman who had been aware of the popping of her elbows since her childhood but ignored the symptom with no signs of disability in evidence. A few years ago, after contusion of her left elbow, she had pains in both elbows while popping in motion at work and visited our hospital. Physical examination revealed anterior dislocation of the bilateral radial heads in extension and their lateral shift in flexion. Snapping with pains occurred at about 90 degrees of flexion in both elbows. X-ray and 3D-CT of her left elbow showed a dome-shaped radial head and mild displasia of humeral capitulum. MRI showed a relaxed and displaced annular ligament. Conservative treatments like motion control or joint injection were not effective and surgical treatment for the left elbow was required.

With elbow arthroscopy, it was observed that there was no intercalation and that snapping occurred between the humeral capitulum and the radial head, accompanied by articular cartilaginous damage. The snapping and pains disappeared after excision of the radial head by means of additional small incision. Arthroscopic excision was considered to be possible if important structures, such as the nerves and the vessels, were guarded.
Shockwave Therapy in Tennis Elbow - Our first Two years
Carlos Leal, COLOMBIA, Presenter
Bosque University, Bogota, COLOMBIA

Tennis Elbow is a relatively common pathology in sports medicine, and its prevalence is of approximately 4% in most European and American statistics. Its pathophysiologic relation is related to mechanical overuse at the insertion of the extensor/supinator muscles of the forearm, wrist and hand, in a biomechanically vulnerable point: the lateral epicondyle of the elbow. The insertion of the powerful medial epicondylic muscles, the pronator/flexor group, has an osseous prominence that provides a better biomechanical advantage. The lateral epicondyle is more a soft tissue prominence made of tendon and fibrocartilage without a bone trochanter. The causation of lateral epicondylitis of the elbow is multifactorial. Histologic evidence of vascular proliferation and focal hyaline degeneration in surgical specimens suggests that chronic refractory lateral epicondylitis is a degenerative process rather than an inflammatory process. The use of shockwave therapy in tennis elbow has been widely used in Europe since 1990, and in the US since 1999. The basic principle of Extracorporeal Shockwave Therapy (ESWT) is the revascularization of chronically inflamed areas, associated with a powerful analgesic effect due to the mechanical and cavitation properties of shockwaves. The literature is young in GCP criteria and Evidence Based Medicine Recommendations, and until 2001 we saw the first papers in peer-reviewed journals. Most of the data available comes still from the specialized meetings and groups of interest all over the world, showing promising results and phase one studies. The mode of action of shock wave therapy is uncertain. It has been suggested that shock waves relieve pain by hyperstimulation analgesia. Shock wave therapy has been shown to have an 80% success rate in the treatment of pseudarthrosis, and a 56% to 90% success rate in the treatment of soft tissue disease including calcifying tendinitis of the shoulder, tendinopathy of the elbow, and painful heels. Although the early results have been encouraging, a longer follow up is needed for final conclusions. No device-related problems and no systemic or local complications have been observed. Our own early clinical results are comparable with the results of others and the success rates reported in the literature. We observed that patients who did not respond well enough to the first treatment were likely to have improvement after a second treatment. It seemed that repeated shock wave treatments resulted in a cumulative positive effect on elbows with lateral epicondylitis. Our own two year experience at the ESWT center of the Bosque University Orthopaedics Department in Bogota, shows good and excellent results in most of our tennis elbow patients. We have performed ESWT for tennis elbow in 109 patients and completed a close twelve month follow-up in 96. Our treatment protocol is based in the application of 2000 shockwaves with a flux intensity of 0.2 - 0.4 mJ/mm2 in two sessions at weekly intervals. Our follow up includes a visual analogue scale, a functional scale measurement, and the ability to return to sports evaluating the athletic level as compared to the one previous to the onset of the symptoms. After twelve months, our patients reduced their pain in an average 73% of the visual analogue scale. 79% of our patients returned to sports in a similar athletic level, and 18% in a lower level. 3% of the patients did not return to sports because of persistent pain. No patients required surgery during this period. In the functional scale we had 78% of good or excellent results. The use of ESWT in tennis elbow is a clear alternative in our patients with chronic pathologies or tendinosis. Low energy shock wave treatment seems to be effective for lateral epicondylitis of the elbow in selected patients. It is safe and complications are rare. This method seems to offer substantial advantages for the treatment of patients with lateral epicondylitis of the elbow. It does not replace the conventional treatment, but results in less number of surgical procedures. We tend to use it before the tendinitis becomes an irreversible tendinosis with mixoid changes, in order to prevent chronic tendinous diseases that might end in surgery anyway. Even though this is a new alternative, the FDA approval and widespread use in the world will result in more clinical and basic research and data in the future years.

Endoscopic Olecranon Bursa Resection
Gonzalo Mora, Pamplona, SPAIN, Presenter
Juan Ramon Valenti, Pamplona, SPAIN
Clinica Universitaria de Navarra, PAMPLONA, SPAIN
Introduction: Based on the associated morbidity with the open surgical excision of the olecranon bursal sac when conservative treatment has failed, since 2001 we have treated this pathology with endoscopic bursal resection.

Material and Methods: We treated 8 patients with olecranon bursitis refractory to conservative treatment (aspiration and corticoids injection). Through a two portal approach almost all the inflamed areas of the bursa could be resected with an angled 4.5 shaver. Technique is explained in the presentation.

Results: After a minimum 1 year follow up we found no recurrence, with 7 of the six patients with no pain at all and one patient with pain for 3 months since a fall on the floor two weeks after the surgery, but pain free after that. No complications were observed.

Conclusions: Although not a big enough group for an optimal statistical study or a comparative one, our impression is that this endoscopic procedure offers less morbidity, faster recovery and avoidance of major complications if a careful technique is achieved.

E-poster #212
Arthroscopic Treatment of Stiff Elbow
Jung Han Yoo, Seoul, KOREA,
Yung Khee Chung, Seoul, KOREA
Jin Soo Park, KOREA, Presenter
Kangnam Sacred Heart Hospital, Seoul, KOREA

The purpose of this study was to evaluate range of motion and patient-related outcome after complete arthroscopic release of elbow contracture. sixteen consecutive patients who underwent elbow arthroscopy and capsular release were reviewed retrospectively at a minimum follow-up of 1 year. Pain and range of motion were measured. Patient outcome was assessed with the American Shoulder and Elbow Surgeons Elbow Assessment Form. Mean self-reported satisfaction on a visual analog scale was 8.4 out of 10. Flexion increased from a mean of 79 deg. to 113 deg., and extension improved from a mean of 35.4 deg. to 9.3 deg. All patients had improved function after the procedure, with a mean self-reported functional ability score of 28.3 out of 30. There were two ulnar nerve palsies. The improvement in range of motion and functional outcome compares favorably with open-release procedures. Combined with the potential benefits of improved joint visualization and low surgical morbidity, arthroscopic release of elbow contracture appears to be a reasonable alternative to open techniques.

E-poster #213
Arthroscopic Repair Of Combined TFCC Tears; A New Clinical Entity
Michael R. Redler, Trumbull, CT, USA, Presenter
Steven P. Fries, Trumbull, CT USA
Beth A. Roros, Trumbull, CT USA
The OSM Center, Trumbull, CT, USA

In recent years, appreciation for the role of triangular fibrocartilage complex tears in ulnar sided wrist pain has significantly increased (TFCC - triangular fibrocartilage complex). The TFCC functions as the major stabilizer of the distal radioulnar joint. It is the focal point that allows the carpus to rotate with the radius around the ulna. As a stabilizer of the ulnar carpus, the TFCC transmits 20% of an axially applied load from the ulnar carpus to the distal ulna. Severe twisting and loading injuries of the wrist are commonly responsible for tears of the TFCC. These patients will not only present with ulnar sided wrist pain, but pain with the extremes of supination and pronation as well as repetitive activity. Injuries to the TFCC have presented a challenge in regards to treatment. We have previously reported on a successful technique for arthroscopic repair of peripheral TFCC tears. The technique involves the use of spinal needles placed percutaneously through the safe zone and the use of a Shuttle relay (Linvatec) and Panacryl suture to create a mattress type repair. Follow up for a minimum of 24 months has produced excellent results when evaluated using the Mayo Modified wrist score. As our series of patients has grown, we have noted an interesting subset of patients that have had not only peripheral TFCC tears, but central tears as well. Past studies have demonstrated successful outcomes with debridement of central lesions and repair of peripheral lesions. Both arthroscopic as well as open techniques have been described. However, when we first encountered a TFCC tear with both a central and a peripheral component, what we have termed a Combined TFCC lesion, we were perplexed as to how to approach the problem. We ultimately did a thorough debridement of the central component
and a secure arthroscopic repair of the peripheral component and then treated the patient postoperatively as we would any other peripheral repair. This first patient postoperatively had an excellent outcome with a Modified Mayo wrist score of 100. Since that first patient, review of our series of TFCC repairs has yielded fifteen additional patients with combined lesions of the TFCC for a total of sixteen patients. This report is an evaluation of these sixteen patients with combined TFCC lesions. There were fourteen males and two female patients. Their average age was thirty-three years old. There were eleven right wrist injuries and five left wrist injuries. The dominant wrist was injured 12/16 times. The mechanism of injuries included thirteen sports related injuries (baseball, hockey and tennis), two MVA’s and one assault. Associated pathology involved one scapholunate ligament rupture and one ECU sling rupture. Follow up ranged from 24 to 110 months and averaged 52 months. Average Mayo Modified wrist score was 90. This compared favorable with our previous series of peripheral TFCC repairs where the average score was 92.5.

We believe that debridement of the central portion of a Combined TFCC lesion in conjunction with repair of the peripheral portion can lead to good and excellent results. Without repair of the peripheral portion of the combined lesion, the laxity caused by the tear of the central portion would lead to biomechanical instability. Despite the lack of continuity of the central portion of the TFCC, repair of the peripheral portion leads to increased stability by creating a suspension bridge type configuration. Burkhart popularized this concept in regards to partial repair of massive rotator cuff tears and we believe this biomechanical theory is applicable for Combined lesions of the TFCC as well. Debridement of the central portion in conjunction with repair of the peripheral portion of a combined TFCC lesion gives the surgeon a viable surgical option when faced with this difficult variant of TFCC pathology.

E-poster #215
Physiotherapeutic Approach in Epicondylopathy of the Humerus
Izabela Maziarz, POLAND, Presenter Carolina Medical Center, Warsaw, POLAND

Purpose: presentation of the physiotherapeutic methods of treatment of patients with epicondylopathy in Carolina Medical Center Material: we analyzed 20 patients divided into two groups. First group (10 patients) presented with early symptoms of epicondylopathy (painful elbow). Patients in the second group (10 patients) presented with long lasting complaints. Patients were treated for 4-8 weeks.


Results: Patients with early symptoms of painful elbow recovered faster than patients with long lasting complaints.

Conclusion: early physiotherapeutic assessment results in shorter therapy period and better long term effects.

E-poster #216
Open Treatment of Stage III Kienbock's Disease With Lunate Revascularization Compared With Arthroscopic Treatment Without Revascularization
Mahmut NedimDoral, Ankara, TURKEY
Ozgur Ahmet Atay, Ankara, TURKEY
Onur Tetik, Ankara, TURKEY
Terry L. Whipple, Richmond, VA USA
Akin Uzumcugil, Ankara, TURKEY
Gursel Leblebicioglu, TURKEY, Presenter University of Hacettepe Medical School Department, Ankara, TURKEY

Purpose: The goal of this study was to compare the results of open scaphocapitate fusion and revascularization with the results of arthroscopic scaphocapitate fusion and capitate pole excision.

Type of Study: Prospective randomized study.

Methods: Between April 1997 and January 2000, 16 consecutive patients (5 men and 11 women with a mean age of 31 years [range, 18 to 61]) Presenter with Kienböck’s disease stage IIIA and stage IIIB were randomized to either open scaphocapitate fusion and lunate revascularization (group I) or fully arthroscopic scaphocapitate fusion and capitate pole excision (group II) groups. Cannulated 3.5-mm ASIF screws were used for the purpose of scaphocapitate fixation in both groups. Operation time, hospital stay, time to fusion, range of wrist motion at final follow-up, grip strength, and return to unrestricted activities of daily living were evaluated at 33 months follow-
up. Results: The mean operating time (153 v 99 minutes), hospital stay (3.6 v 2.3 days), and return to unrestricted daily activities (15 v 5.8 weeks) were shorter in group II. Average time to radiographically evident fusion was shorter in group I (7.25 weeks v 9 weeks). There was a significant increase in grip strength and in range of motion at final follow-up in both groups, and the final grip strength and range of motion was not different between the groups. There were no major complications in either group. Conclusions: Although the number of patients was small and the follow-up period was short, arthroscopic scaphocapitate fusion and capitare pole excision in stage IIIA and IIIB Kienbo¨ck’s disease resulted in shorter operating time, shorter hospital stay, earlier return to unrestricted daily activities, and equal range of motion and grip strength as compared with open scaphocapitate fusion and lunate revascularization. Determination of specific surgical indications for the benefits of arthroscopic treatment of Kienbo¨ck’s disease must be analyzed in larger studies.

**E-poster w/ Standard #217**

**A New Technique for Reconstruction of the MCL of the Elbow Using Triceps Tendon**
Denise Eygendaal, Nijmegen, NETHERLANDS, 
Presenter
Jens-Ole Sobjerg, Arhus, DENMARK 
Sint Maartenskliniek, Nijmegen, NETHERLANDS 

Presentation of short term results after reconstruction of the Medial Collateral Ligament of the elbow using the ipsi-lateral triceps tendon. In this study ten patients are described with a medial instability of the elbow joint due to insufficiency of the medial collateral ligament. History and findings at physical and radiological examination are presented. All underwent reconstruction of the anterior part of MCL using one third of the ipsi-lateral triceps-tendon. Follow-up took place 4 months-1.5 year after surgery including the EFA and Morrey scoring system. Reconstruction of the MCL using ipsi-lateral triceps tendon or refixation of the MCL of the elbow joint gives satisfactory results in throwing athletes. Eight patients regained full range of motion, two had an extension deficit of 10°. Two patients had a transient sensory ulnar nerve symptoms. All patients but one were able to return to their previous level of athletics. Reconstruction of the MCL using ipsilateral triceps tendon or refixation of the MCL of the elbow joint gives satisfactory results in throwing athletes.

**E-poster w/ Standard #218**

**Distal Biceps Tendon Anatomy and Endoscopy**
Gregory Ian Bain, North Adelaide, SA AUSTRALIA, 
Presenter
Michael Eames, Adelaide, AUSTRALIA 
Quentin Fogg, Adelaide, AUSTRALIA 

**INTRODUCTION**
The detailed anatomy of the distal biceps tendon as yet to be defined. The clinical assessment of partial tears of the biceps tendon is difficult to visualise intra-operatively.

**MATERIAL AND METHOD**
Using cadaveric and clinical models we have reviewed the anatomy of the distal biceps tendon and its bursa. We have developed an anterior cubital fossa portal to allow assessment of the distal biceps tendon.

**RESULTS**
The distal biceps tendon can be shown to be two distinct tendons. Each is a continuation of the short and long head muscle bellies. The tendon may also be visualised and debrided through the anterior cubital portal. 

**CONCLUSION**
The distal biceps tendon has two portions, one acting as a supinator and the other a flexor of the forearm. These two tendons represent the muscle bellies of the long and short heads of the biceps. The cubital portal allows endoscopic assessment of the tendon and debridement of partial tears. The new portal can also be as an anterior elbow portal.

**E-poster #219**

**Midcarpal Anatomy as a Guide to Understanding Carpal Mechanics**
Gregory Bain, North Adelaide, SA AUSTRALIA, 
Presenter
Quentin Fogg, Adelaide, AUSTRALIA 
Michael Eames, Adelaide, AUSTRALIA 
Ray Tedman, Adelaide, SA AUSTRALIA

**Aim**
Kinematic and morphologic evidence suggests that the scaphoid may be moved differently between individuals. This study therefore aims to determine to what extent the morphology and ligamentous support of the scaphoid supports the
suggestion of variable scaphoid motion. The influence of scaphoid motion on the remainder of the carpus will also be considered.

Methods
Embodied Specimens were either dissected (n=50) using 3x loupes, sectioned histologically (n=30) or sectioned macroscopically (n=20) and dynamic 3D computed tomography.

Results
Two distinct morphological patterns were observed. Some scaphoids had a shallow capitate facet and were supported by a series of ligaments that may prevent flexion/extension but allow/facilitate rotation about the longitudinal axis of the scaphoid. Others had deeply concave capitate facets and were supported by ligaments that may prevent rotation but allow flexion/extension. These patterns may be continuous throughout the proximal row of the carpus. Boney morphology of the midcarpal joint varies with scaphoid types.

Conclusions
Two distinct morphological patterns may dictate the mechanical pattern of the carpus. A flexing and extending scaphoid is restricted by the capitate to its radial position, whilst a rotating scaphoid may be allowed to translate along the proximo-ulnar aspect of the capitate. The rotating scaphoid may then push the lunate ulnarily to facilitate radial deviation. This may not be necessary with a flexing/extend scaphoid, allowing the lunate to flex/extend to contribute to similar global movements of the wrist.

E-poster w/ Standard #220
Complex, Comminuted Distal Radius Fractures: Treatment by Modified Ligamentotaxis employing Wrist Arthroscopy.
Sushrut Babhulkar, Nagpur, INDIA, Presenter
Ashish H Thakur, Nagpur, MS INDIA
Sushrut Hospital, Res Ctr & Post-Graduate Instt of, Nagpur, INDIA

Complex, comminuted distal radius fractures continue to pose dilemma in the minds of Orthopedic surgeons worldwide. At our Institute we prospectively studied 124 such injuries (Frykman’s Type III VIII) being treated by a single methodology by a single surgeon. There were 84 males and 40 females. All victims of road-traffic accidents. 76 patients had dominant hand involved. Compound injuries were not included. All of them underwent surgical procedure within 7 days of the injury. Criteria on deciding timing of surgery was diminution of the swelling and edema around wrist.

A standard surgical technique was used in all the patients which included regional anaesthesia, application of manual reduction techniques for comminuted fragments followed by application of a multiplanar external fixation apparatus. This then was followed by wrist arthroscopy using a 2.5 mm scope (Arthrex Inc). The findings included TFCC peripheral tear (repairable, irrepairable), TFCC Central tear, Scapholunate dissociation, Lunatotriquetral dissociation, DRUJ dissociation, Ulnar styloid fracture, Chondral surface lesion on carpal side.

All the above mentioned lesions were taken care of employing various reconstructive techniques (TFCC repair, Scapholunate k wire fixation, Debridement etc).

Arthroscopic technique employing these techniques alongwith the joystick maneuver helped in reduction of articular fragments and holding them under vision during precutaneous fixation. This particular method ensured precise articular reconstruction.

All the patients were followed for a period of 3 to 5 years but minimum for 3 years. All the findings were evaluated using Objective, Subjective, Clinico-radiological criteria and results then calculated after employing Demerit Point System. Excellent to good results were obtained in 92 % cases. Fair in 5 % and Poor in 3% cases. Complications encountered were mainly related to External Fixation, early radiological collapse and wrist stiffness.

Employing Wrist Arthroscopy techniques results of conventional Ligamentotaxis can be improved in terms of intra-articular soft-tissue stability thus avoiding early collapse. This also will avoid early arthritic changes occurring eventually. This thus seems to be an effective and reproducible modality of treatment for such complex injury of distal radius though it has a steep learning curve.

E-poster w/ Standard #221
Wrist Arthroscopy in the Diagnosis of Pediatric Wrist Conditions
Paramasivam Sathyamoorthy, Warrington, UNITED KINGDOM, Presenter
Lore Feldberg, Merseyside, UNITED KINGDOM
Pidikiti Prasad, Merseyside, UNITED KINGDOM
Stilwell John, Merseyside, UNITED KINGDOM
Alderhey Children’s Hospital, Liverpool, UNITED KINGDOM
Background:
The role of arthroscopy in the treatment of paediatric wrist problems has not been widely reported. The incidence of hand and wrist injuries in children has been reported to be from 3 to 65 percent. We report a group of paediatric patients who had arthroscopy of wrist for diagnosis which led to treatment and their outcome.

Methods and patients:
This was a retrospective study done at a tertiary children's teaching hospital. There were 32 patients involving 33 wrists who had undergone wrist arthroscopy. Of these 3 were male and 29 female. Average age was 12.96 years [range: 8 - 17].

23 wrists had injury of which 6 were sports related (1 was a national shot putter) and 3 gymnastics related. The rest were injuries mainly related to fall. Of the 10 wrists which were not injured 2 were from patients who were regular gymnasts. 3 had congenital problems [Type 1 Ulnar dysplasia, Arthrogryposis with post dislocation of radial head and Blauth Hypoplastic thumb]. The remaining 5 had symptoms which had begun spontaneously. All of them had pain. 9 had complained a feeling of instability. 2 had experienced clicking.

Results:
All patients except one had a preoperative working diagnosis. All had Xrays, 24 wrists had MRI done and 12 had videofluoroscopy done.

Arthroscopy revealed 11 scapholunate ligament disruption. 12 had TFCC tears of which 9 had history of injury. Patient with thumb hypoplasia was found to have a tear similar to Palmer A although she had no history of injury. Patient with arthrogryposis had an absent TFCC. 2 of them had lesions similar to Palmer D although without history of injury. 8 patients had lunotriquetral ligament tear. Other than scapholunate ligament disruption, lunotriquetral ligament tear and TFCC tears 8 other diagnoses were made.

In 16 out of 33 wrists arthroscopy confirmed preoperative diagnosis. In 5 out of these 23, an additional pathology was observed on arthroscopy. In the rest of the patients [17/33] [51%] preoperative diagnosis did not correlate with arthroscopic diagnosis. Arthroscopy led to further open procedures in 14 patients.

Conclusion:
Wrist injuries are well recognised as a problem in children especially those involved in sports. Our study reports a considerable number of patients in the paediatric age group undergoing arthroscopy of the wrist for diagnosis. This has shown that arthroscopy is a useful tool to diagnose wrist conditions in children.

KNEE - ACL

E-poster #300
Arthroscopic Fixation of ACL Avulsion Fracture of Tibia in Children

Kyung-taek Kim, Busan, KOREA, Presenter
Myung-Jin Lee, Busan, SOUTH KOREA
Hyung-Seo Jang, Busan, SOUTH KOREA
Sung-Hoo Kim, Busan, SOUTH KOREA
Sung-Won Lee, Busan, SOUTH KOREA
Dong-A University Medical Center, Busan, KOREA

Introduction:
ACL avulsion fracture of tibia in children is not common. But there are many different treatment modalities for the ACL avulsion fracture of tibia. In general, Meyers-Mckeever type I and II can take good result with conservative treatment, but type III is difficult to take good result with operative treatment. We have treated three cases of ACL avulsion fracture in children with type II and III by arthroscopic reduction and fixation with cannulated screws which brought good results.

Case 1:
A 7-year-old girl had complaints about pain and instability of left knee for 10 months since she fell down. She was then diagnosed of avulsion fracture of left tibial spine. At the time of initial physical examination, ROM was full, but anterior drawer test was positive (Gr III). Lysholm score was 65. Plain radiograph showed an avulsion fracture of tibial spine (Meyers-Mckeever type III). Arthroscopic debridement of hypertrophied soft tissue have been done. Under arthroscopy, microfracture procedure was performed on the attached site of tibial spine. After arthroscopic reduction, tibial spine was fixed with 5.0 mm cannulated screw. Eight weeks after internal fixation, bone union began to appear. Four months later, the screw was removed. Physical examination at post-operative 4 months revealed no evidence of instability and growth disturbance.

Case 2:
A 11-year-old boy have sustained traumatic injury due to traffic accident. At the time of initial examination, intraarticular hematoma was noted.
Case 3:
A 7-year-old girl sustained traumatic injury due to bicycle accident. At the time of initial examination, she was complaining about pain on the right knee. Lachman test and anterior drawer test were positive. Plain radiographs showed Meyers-Mckeevers type III avulsion fracture of tibial spine. After arthroscopic reduction, tibial spine was fixed with cannulated screw. Three months later, bone union began to appear. Physical examination at post-operative 3 months revealed positive finding of anterior drawer test (<5mm) without restriction in the range of knee joint motion. Lysholm score was 96. Physical examination at post-operative 15 months revealed no evidence of instability and growth disturbance.

Conclusion:
The results of these studies showed that there's no evidence of non-union, no growth disturbance, but achieved full ROM with acceptable stability which could give one with normal gait and life style. In cases of ACL avulsion fracture of tibia in children, early arthroscopic fixation, regardless of radiologic type, permits good results. Arthroscopic reduction and fixation with cannulated screw may be one of treatment methods for children’s ACL avulsion fracture of tibia with large fragment.

**E-poster #301**
**Do Race, Gender and Age Influence the Size of HS Autografts?**
Ronald A. Navarro, Harbor City, CA, USA
Presenter
Liz W. Paxton, El Cajon, CA USA
South Bay Kaiser Permanente Medical Center, Harbor City, CA, USA

Objective: It’s been observed that hamstring (HS) autograft diameters may differ depending on race, gender and age. We performed an analysis on our graft data to delineate the influence these parameters may have on graft size.

Methods: Over a 6-year period, we recorded the quadrupled HS diameters for anterior cruciate ligament reconstruction (ACLR) in 258 patients. We compared HS sizes in males vs. females, and with respect to age. We also assessed the effect race may play on the resultant size, based on the patients stated race in medical records. Statistical analysis was performed on the results.

Results: The overall average graft size was 7.87 mm. The average HS size in males (n=176) was 8.04 mm vs. 7.47 mm in females (n=78). An independent t-test showed a significant difference in male vs female graft size (Spearman rho = .01, p = .93). However, when data was stratified by gender, there was a significant, negative correlation between HS diameter and age for males (Spearman rho = -.24, p = .003). For females, there was a positive correlation between age and graft that did not reach significance (Spearman rho = .173, p = .16).

The following represents average graft size by race. (Race: N, Mean graft size (mm), Std dev) African American: 51, 8.03, .75, Asian: 16, 7.63, .67, Caucasian: 92, 7.81, .68, Hispanic: 76, 7.88, .68, Filipino: 10, 7.60, .66. Although the race comparisons were limited by sample size, there were some emerging trends with African Americans having larger graft sizes than Asians (p = .05), Caucasians (p = .077), and Filipinos (p = .098).

Conclusions: This study represents the first attempt to assess the relationship race may have on HS graft girth. Interesting trends including different sizes depending on race seem to be emerging but correlation with body mass may be important to determine clinical significance. Males have predictably thicker HS and their HS diameter seems to decrease with age. If the diameters are getting smaller with senescence, it may imply that the ultra-structural properties of the graft are changing. If this girth loss is validated, it may argue for cessation in older patients. A larger sample size will be necessary to obtain more meaningful data, and to dictate future use of the HS autograft in ACLR.
Complications during ACL reconstruction using BPTB: our experience of first 100 cases

Chaudhary Deepak, New Delhi, INDIA, Presenter
Bhatia Naval, New Delhi, INDIA
Singh Awdesh, New Delhi, INDIA
Central Institute of Orthopaedics, New Delhi, INDIA

Introduction
Arthroscopic ACL Reconstruction using BPTB technique is extremely popular and is still considered Gold standard for restoring knee stability. However, the technique requires high level of psychomotor skills and has a steep learning curve. During this learning period, a number of complications can occur which are unavoidable. Once a high level of psychomotor skills are achieved, the rate of complications should be very low and the procedure can then be performed in a reproducible and systemic manner every time.

Methods
One hundred ACL Reconstructions were performed between January 2000 and April 2002 at our institute.

Results
The complications encountered during the ACL reconstruction in our series are as under:

<table>
<thead>
<tr>
<th>Complications</th>
<th>Number</th>
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<tbody>
<tr>
<td>1. Blow out of the Posterior Femur cortex</td>
<td>4</td>
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<tr>
<td>2. Anterior Placement of Femur Tunnel</td>
<td>5</td>
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<tr>
<td>3. Mismatch of Graft and Tunnel length</td>
<td>7</td>
</tr>
<tr>
<td>4. Divergent Femur Screw</td>
<td>9</td>
</tr>
<tr>
<td>5. Anterior placement of Tibial Tunnel</td>
<td>3</td>
</tr>
<tr>
<td>6. Fracture of Bone Plugs</td>
<td>3</td>
</tr>
<tr>
<td>7. Loose Hardware in the joint</td>
<td>2</td>
</tr>
<tr>
<td>8. Patellar fracture</td>
<td>1</td>
</tr>
</tbody>
</table>

Conclusions
Arthroscopic ACL reconstruction is a demanding technique that requires precision instrumentation, a high level of psychomotor skills and a knowledgeable surgical team. With close attention to the details of the procedure, complications should be rare. When problems do occur, they should be promptly recognized and addressed.

Hour-glass (Bargash) Technique in Arthroscopic ACL Reconstruction Using Semi-T and Gracilis Quadruple Graft

Nael Bargash, UNITED ARAB EMIRATES, Presenter
Damanhour Medical National Institute, Damanhour, EGYPT

Semi-T and gracilis quadruple graft nowadays is a well recognized and accepted technique for arthroscopic ACL reconstruction. Several techniques for fixing of the graft have been described but each has its own limitations and hazards.

Our aim is to describe a new technique for fixation of the femoral component without interference screw or any other hardware by rubbing the tendons on themselves after creating an Hour-Glass femoral tunnel.

Thirty seven patients with clinically and radiologically proven ACL tears were operated by arthroscopic ACL reconstruction using an autogenous Semi-T and gracilis quadruple graft. All patients are active male athletes with mean age of 27 years.

All patients were assessed preoperatively and at 12 and 24 months postoperatively by the author using the International Knee Documentation Committee (IKDC) and the Lysholm knee scoring system. 93% of the patients were normal or nearly normal.

The preliminary results of this technique are very encouraging. Of greatest advantage is being more physiological allowing a direct tendon to bone healing without intervening hardware, normal bone stock in case of revision surgery and the avoidance of any intra-articular hardware related complication.

Anatomical Angle of the Anterior Cruciate Ligament in the Coronal Plane

Masaaki Takahashi, Hamamatsu, Shizuoka JAPAN, Presenter
Mitsuhito Doi, Hamamatsu, Shizuoka JAPAN
Masashi Abe, Hamamatsu, Shizuoka JAPAN
Daisuke Suzuki, Hamamatsu, Shizuoka JAPAN
Yu Yamato, Hamamatsu, Shizuoka JAPAN
Akira Nagano, Hamamatsu, Shizuoka JAPAN
Hamamatsu University School of Medicine, Hamamatsu, Shizuoka, JAPAN
Introduction: Several studies recently demonstrated that in ACL reconstruction the less perpendicular the angle of the graft in the coronal plane to the joint line resulted in reduced loss of flexion and anterior laxity. It was also reported that when a tibial tunnel was drilled at the angle of 60 degrees, 70 degrees, and 80 degrees in the coronal plane and the femoral tunnel was drilled using the transtibial technique in cadaveric knees, placing the femoral tunnel at 60 degrees in the coronal plane lowered graft tension in flexion. Therefore, the importance of graft positioning in the coronal plane is emphasized. However, the angle of normal human ACL in the coronal plane is unknown.

Purpose: The aim of this study is to measure the angle of human ACL in the coronal plane in cadaveric knees.

Method: 50 cadavers from the anatomical course for medical students at the medical school were inspected. The cadavers were perfusion-fixed in embalming fluid containing formaldehyde. The measurements of height and weight of the donors were recorded at the anatomy department. We dissected 100 knees of 50 cadavers in order to select the bilateral knee in best condition from each, and then dissected that knee joint. Knees that displayed macroscopically degenerative changes or evidence of trauma, such as osteoarthritis, meniscal tears or ligament injury, were excluded. Finally, 36 knee specimens were examined, 20 male and 16 female, with a mean age of 82 years. Frontal views of the knee joints were photographed. The angle of the medial edge and lateral edge of ACL in the coronal plane were measured as the angle subtended by the medial and lateral edge of ACL and a line drawn parallel to the articular surface of the proximal tibiae in the photographed frontal view of the dissected knee joints. The width of the articular surface of the proximal tibia between the medial to lateral was also measured.

Results: The angle of the medial edge of ACL was 60°±7.6° (mean±SD), the lateral edge of ACL was 68°±8.4°, and the medial to lateral width of the articular surface of the proximal tibia was 88±7.2 mm. The angle of the medial edge of ACL significantly correlated with that of the lateral edge, but the angle of either edge did not correlate with the width of the proximal tibia. The angle of either edge of ACL had no correlation with height or weight. The width of the proximal tibia significantly correlated with height and weight. The angle of the lateral edge of ACL was smaller in males than females. The width of the tibia was shorter in females than males.

Conclusion: A clinical study of ACL reconstruction using the transtibial technique recommended drilling the tibial tunnel at an angle of 65 degrees to 70 degrees in the coronal plane. Our results suggest drilling the tibial tunnel at an angle of 60 to 68 degrees in the coronal plane to reconstruct anatomically. Furthermore, more care should be taken when drilling at these angles in male patients than in female.

E-poster #305
The Effect of the Oral Contraceptive Pill on Ligamentous Laxity
Paul A. Martineau, Montreal, Quebec, CANADA
Fawzi Al-Jassir, Montreal, Quebec, CANADA
Eric Lenczner, Montreal, Quebec, CANADA
Mark L Burman, Montreal, Quebec, CANADA
Presenter
McGill University, Montreal, Quebec, CANADA

Purpose: Our goal was to explore the relationship between oral contraceptive pill (OCP) use and ligamentous laxity in female athletes.

Conclusion: The use of the OCP by female athletes yielded statistically significant decreases in knee laxity when compared to female athlete nonusers especially when comparing laxity of athletes under the influence of the exogenous OCP hormones at the time of laxity testing.

Significance: Women participating in sports are 4-8 times more likely to sustain a serious knee injury than men. Sex steroids are known to affect ligamentous tissue composition.

Summary of Results: Non-dominant knee KT-1000 measurements at 67N and 89N for the 42 OCP users and the 36 nonusers were: mean translation at 67N, 3.00 mm vs. 3.86 mm (p 0.011); at 89N, 3.98mm vs. 4.83mm respectively (p 0.018). Results of the 29 OCP users not menstruating at the time of the measurements vs. nonusers were: at 67N, 2.95 mm vs. 3.86 mm (p 0.008); at 89N, 3.88mm vs. 4.83mm respectively (p 0.011).

Methods: 127 female athletes underwent KT-1000 measurements of anterior translation of the tibia. A screening questionnaire was administered to exclude athletes with history suggestive of previous knee injuries or hormonal imbalance.

Discussion: OCP use yielded statistically significant decreases in anterior translation of the tibia as compared to nonusers. The OCP may have
a role to play in the prevention of ACL injuries by prophylactically targeting one of the variables responsible for the increased ACL injury rates in women.

**E-poster #306**

**PLLA Ligament as a Ligament Augmentation Device**

Masao Ishimura, Ikoma, Nara, JAPAN, Presenter
Naohide Tomita, Kyoto, Kyoto, JAPAN
Takashi Habata, Kashihara, Nara, JAPAN
Yoshinori Takakura, Kashihara, Nara, JAPAN
Nara Mimuro Hospital, Ikoma, Nara, JAPAN

Since 1995, we have reconstructed the cruciate ligament of knee joint using biodegradable Poly-L-lactic acid (PLLA). The fibers of the PLLA ligament we used are manufactured by melt-spinning out of high molecular weight, exactly 233,000 daltons, poly-L-lactide polymer. The shape of the ligament is plain braid and is the same as that of the Kennedy Ligament Augmentation Device (Kennedy-LAD), the material of which is polypropylene. Three types of width, 5, 7 and 9 mm, were clinically applied in this series. The initial tensile strength of the 5 mm width ligament was 800 N, that of the 7 mm ligament was 1300 N, and that of the 9 mm was 1700 N. The degradation of PLLA occurs with hydrolytic de-esterification into lactic acid and then lactic acid is metabolized to pyruvate in living organisms. The rate of degradation depends on the molecular weight, size, and shape of the implant.

In vitro hydrolytic degradation test in 37? C Saline was performed for the polyglycolic acid (PGA) braids and PLLA braids as a comparative study. Time dependent decrease rate of tensile strength in PLLA braid was lower than that in PGA. The maximum tensile strength of PLLA braid immersed for 24 weeks was 46 % and for 52 weeks was 46% of the initial strength, respectively. Animal studies with 40 goats were performed. In half of the 40 goats, each anterior cruciate ligament was replaced with the composite graft of an autogenous bone-patellar tendon-bone and a 5mm width PLLA ligament. The PLLA ligament was used as the core of the tendinous portion of the autogenous graft. Biomechanical and histological examination showed excellent results. Histological examination showed the complete disappearance of the PLLA ligament from the knee joint 2 years after operation.

Twenty-nine patients with the anterior and/or posterior cruciate ligament insufficiency consented to undergo operation with the PLLA ligaments. Sixteen patients were male and 13 were female. Their age at operation was 26.4 years on average ( 15 to 53 years).

Seven patients had combined anterior and posterior cruciate ligament injury and underwent combined anterior and posterior cruciate ligaments reconstruction. In the ACL reconstruction, a PLLA ligament of 5mm width was used as the core of the bone-patellar tendon-bone. In the PCL reconstruction, a PLLA ligament of 5mm width was used as the core of the 2 or 3 times folded semitendinosus and gracilis tendons. Furthermore, a PLLA ligament of 9mm width was passed between the folded tendons at each end.

Eighteen patients had isolated ACL injury and underwent reconstruction with the 2 or 3 times folded semitendinosus and gracilis tendons combined with a PLLA ligament of 7mm width at each end.

Four patients had isolated PCL injury and underwent reconstruction by the same way as the PCL reconstruction in the combined ACL and PCL insufficient cases. Within the follow-up periods, ranged from 1 to 9 years (average 54.6 months), one patient with isolated PCL reconstruction suffered temporary hydrarthrosis of the operated knee. All of the other patients had no local inflammatory sign and had no abnormal data on the blood test. Eighteen patients with isolated ACL reconstruction were evaluated using JAPAN Orthopaedic Association (JOA) scoring system and International Knee Documentation Committee (IKDC) evaluation form, KT-1000 arthrometer, and repeat arthroscopy. The results of JOA score were improved from 52.5 (36 to 81) to 86.6 (68 to 100) on average. The FINAL EVALUATION of IKDC Form was C in 5 cases and D in 13 cases preoperatively and B in 3 cases, C in 13 cases and D in 2 cases postoperatively. The results of Manual Maximum Displacement test by KT1000 was 6.23mm on average (0.5 to 13.0mm) preoperatively and 1.86mm (-2.0 to 8.5mm) postoperatively. Repeat arthroscopy showed no inflammatory sign in every cases and all reconstructed ACLs were covered with synovial tissue and the volume and tension of the ACLs were excellent.
E-poster #307
Stress Fractures of the Femur After Cross-pin ACL Reconstruction
Rafael Arriaza Loureda, La Coruna, SPAIN, Presenter
Jose Rodriguez, La Coruna, SPAIN
Carlos Sampedro Curbera, La Coruna, SPAIN
Jesus Aizpura Prada, La Coruna, SPAIN
Gonzalo Couceiro Sanchez, La Coruna, SPAIN
Hospital USP Santa Teresa, La Coruna, SPAIN

Two cases of femoral stress fractures after ACL reconstruction using hamstring tendons and cross-pin fixation are presented. During the functional rehabilitation phase after successful ACL reconstruction with Bio-Tranfix femoral fixation, two professional athletes presented with pain in the medial side of the knee that worsened with running and weight-bearing exercises. No instability or joint effusion were present, and a typical stress fracture pattern of pain was readily evident. MRI studies showed an area of increased signal compatible with bone oedema arising in the medial supracondilar area of the femur, around the exit orifice of the fixation device guide-pin. The diagnosis of stress fracture of the femur was made in both cases and treatment with rest and progressive activity resumption allowed them to heal and recover to full activity.

The possible causes of the stress fractures in these cases seem to be related to the position of the exit hole of the guide-pin in the supracondilar medial area of the femur and to the increased diameter of the pin as compared to other cross-pin devices.

We consider it important to report this unusual complication to the surgeons using cross-pin fixation and accelerated rehabilitation programs, so that it might be promptly recognized to avoid further complications.

E-poster #308
Active and Passive Mechanisms of Anterior Cruciate Ligament Rupture: Correlation with MRI and Operative Findings of Injury Severity
Naven Duggal, Sydney, AUSTRALIA, Presenter
Bruno M Giuffra, Sydney, AUSTRALIA
Myles Coolican, Sydney, AUSTRALIA
David Parker, Sydney, AUSTRALIA, Presenter
Sydney Orthopaedic, Arthritis & Sports Medicine, Sydney, NSW, AUSTRALIA

- INTRODUCTION - Anterior cruciate ligament (ACL) injuries have historically been classified as non-contact or contact based on the mechanism of injury. The purpose of this study was to establish a detailed correlation between mechanism and the associated

E-poster #309
Consequences of a Mid-third BPTB-autograft Excision on Patellofemoral Biomechanics and Knee Kinematics
Michael Bohnsack, Hannover, GERMANY, Presenter
Arne Wilharm, Hannover, GERMANY
Chris Hurschler, Hannover, GERMANY
Oliver Rahmann, Hannover, GERMANY
Carl Joachim Wirth, Hannover, GERMANY
Department of Orthopaedic Surgery, Hannover, GERMANY

Introduction:
This biomechanical study evaluates the consequences of a mid-third BPTB-autograft excision on patellofemoral biomechanics and knee kinematics. Of particular interest was the potential role of a BPTB-autograft excision on postoperative anterior knee pain in ACL replacement surgery.

Methods:
Isokinetic knee extension from 120° of flexion to full extension was simulated on 9 human knee cadaver specimens (5 male, 4 female, average age at death 43 years). Joint kinematics was evaluated by ultrasound sensors (CMS 100TM, Zebris, Isny, GERMANY), and retro-patellar contact pressure was measured using a thin-film resistive ink pressure system (K-ScanTM 4000, Tekscan, Boston). All data were taken before and after excision of a mid-third BPTB-autograft.

Results: Following excision of a mid-third patella tendon autograft we found a significant (p<0.05) proximalization of the patella (average: 0.5 mm) and a significant decrease of patella flexion in the sagittal plane (average: 1°). Patella tilt, -rotation (frontal plane), -translation (medial / lateral) and tibiarotation (external- /internal-) , -axis (varus- / valgus position) remained unchanged. Patellofemoral contact pressure and -area decreased significantly near knee extension (p<0.05).

Conclusions: We conclude that an excision of a mid-third patella tendon autograft results in a lengthening of the tendon with a proximalization of the patella. As the patellofemoral pressure
decreases and the patella remains centralized, postoperative anterior knee pain following ACL replacement using a BPTB autograft can not be explained by the results of our study.

E-poster #310
Correlation the Anterior Tibial Subluxation with Valgus Instability in Chronic ACL Deficient Knees
Shigeo Takahashi, Nagoya, Aichi, JAPAN, Tomofumi Yamada, Nagoya, Aichi, JAPAN, Kazutoshi Kurokouchi, JAPAN, Presenter Mitsubishi Nagoya Hospital, Nagoya, Aichi, JAPAN

The purpose of the present study is to elucidate the relationship between the anterior tibial subluxation in full extension and valgus instability in chronic ACL unilateral deficient knees. Anterior tibial subluxation in full extension was quantified using sagittal MR images. Valgus instability was determined on the abduction stress test in 20 degrees of flexion. ACL reconstruction was performed arthroscopically with autogenous hamstring tendons. Clinical results of ACL reconstruction, including side-to-side difference with KT-1000 and IKDC final evaluation, were examined for more than 12 M (mean 19.9 M) after ACL reconstruction. In 95 knees, 24 knees had the anterior tibial subluxation of more than 3 mm (L group) and 71 knees had of less than 3 mm (S group). Thirteen knees had instability to valgus and 11 knees had stability to valgus in L group. In S group, 18 knees had instability to valgus and 53 knees had stability to valgus. There was a significant difference between the two groups (p=0.012). Side-to-side difference of 3.0±2.9 mm in L group was significantly greater than that of 1.66±2.0 mm in S group (p=0.015). IKDC showed seven knees abnormal (C) and 17 knees normal or nearly normal (A or B) in L group, four knees abnormal (C) and 67 knees normal or nearly normal (A or B) in S group. There was a significant difference between the two groups (p=0.049). Chronic ACL deficient knee with an anterior tibial subluxation, suggesting the disruption of secondary restraining structures, inclines to combine valgus instability and may lead clinical failure as well.

E-poster #311
Osteochondral Lesions of the Posterolateral Tibia in ACL Disrupted Knees

Hayden Morris, Melbourne, AUSTRALIA, Presenter
Adam Dalgleish, Auckland, NEW ZEALAND
University of Melbourne, Melbourne, AUSTRALIA

Bone bruising of the lateral femoral condyle and posterolateral tibial plateau have been well documented in association with Anterior Cruciate Ligament (ACL) disruption. Subluxation of the lateral femoral condyle onto the posterolateral tibial plateau has been postulated as the cause. Chondral lesions are common, most often affecting the lateral and medial femoral condyles. Arthroscopic examination of forty-three consecutive patients with ACL rupture was performed by a single experienced knee surgeon. Nine patients (21%) had a chondral lesion of the posterolateral tibia beneath the posterior horn of the lateral meniscus, not seen unless the meniscus was elevated with the arthroscopic probe. On four occasions a chondral loose body was identified and removed. Seven of the nine (78%) had an associated lateral meniscal tear. Magnetic Resonance Imaging (M.R.I.) was not accurate in predicting the presence of a posterolateral chondral lesion but did accurately identify bone bruising in the posterolateral tibial region. Chondral lesions of the posterolateral tibial plateau in association with ACL tears has not been previously described. As yet the clinical implications are unknown and subject to further study. Chondral loose bodies of unknown origin may arise from the relatively hidden position beneath the posterior lateral meniscus. When a lateral meniscal tear is noted, care should betaken to examine the lateral tibial plateau and lateral femoral condyle for chondral defects.

E-poster #313
Comparison of EndoButton® Versus Bioabsorbable Interference Screw plus EndoPearl® Femoral Fixation in Hamstring Anterior Cruciate Ligament Reconstruction: A Randomized Clinical Trial
Ari E Pressman, Ottawa, Ontario, CANADA, Monika Volesky, Outremont, Quebec, CANADA Presenter
Andrew R Pickle, Ottawa, Ontario, CANADA
Donald H Johnson, Ottawa, Ontario, CANADA
Carleton Sports Medicine Clinic, Ottawa, Ontario, CANADA
INTRODUCTION: In 4-bundle hamstring anterior cruciate ligament reconstruction, femoral fixation can be performed with either EndoButton® or interference screw fixation, which can further be augmented with EndoPearl®.

PURPOSE: The purpose of the present study was to perform a prospective, randomized clinical comparison of two methods of femoral fixation in hamstring ACL reconstruction. The hypothesis of this study is that there is no difference in mechanical results (laxity) between the bioabsorbable interference screw plus EndoPearl® (Linvatec, Largo, FL) and EndoButton® (Smith & Nephew, Andover, MA).

METHODS: After Research and Ethics Board approval, 51 sequential patients from the Ottawa Hospital undergoing arthroscopy-assisted ACL reconstruction by a single surgeon were recruited. Inclusion criteria included: normal contra-lateral knee, isolated ACL injury, closed tibial physis, no previous knee surgery and ability to complete 2-year follow-up. After drilling tunnels, a computer-generated randomization table was used to allocate patients to a study arm. The patients were assessed with IKDC scores and had KT-1000 arthrometer measurements taken at 6 weeks, and 3, 6, 9, 12, and 24 months post-operatively by independent clinical observers.

RESULTS: 49 patients (26 EB, 23 BS/EP) completed follow-up of 2 years. Average side-to-side differences on KT-1000 manual maximum scores at 2 years were 1.8 +/- 2.4mm for EndoButton® and 2.2 +/- 4.9mm for the bioscrew plus EndoPearl® (p=0.58). Thsee differences in mechanical laxity at all times to 2 years are not statistically significant. Average IKDC scores were 85.9 +/- 9.8 for the tibial interference screw fixation group and 84.0 +/- 10.2 for the bioscrew-EndoPearl®, respectively (p=0.51).

DISCUSSION: The EndoButton® has been shown to have excellent laboratory (Kousa P et al, AJSM 2003) and clinical (Ma CB et al, Arthroscopy 2004) results. Bioscrew interference fit and pull-out strength is bone-quality dependant. The addition of EndoPearl® to the aperture bioscrew femoral fixation decreases clinical laxity (Macdonald, AJSM 2004).

CONCLUSION: The 2-year IKDC scores support the null hypothesis. EndoButton® and bioscrew plus EndoPearl® provide equal femoral fixation in 4-bundle hamstring ACL reconstruction. Both methods of femoral fixation have evidence of excellent clinical results.

E-poster #316
Clinical Short Term Outcome of Anterior Cruciate Ligament Reconstruction with Quadrupled Hamstring Tendon Graft and Bioabsorbable Tibial Cross Pin Fixation
Matthias Klepsch, Munich, GERMANY, Presenter
Tomas Buchhorn, Munich, GERMANY
Center of Sports Medicine, Orthozentrum, Munich, GERMANY

Purpose: To report the one year results of quadrupled hamstring tendon autograft anterior cruciate ligament reconstruction with bioabsorbable tibial cross pin fixation.

Material and Method: In a prospective study we compared the clinical outcome of 30 acl-reconstructions with tibial interference screw graft fixation with 30 tibial cross pin fixation (rigid fix, Mitek®). Femoral graft fixation in both groups was with the rigid fix femoral cross pin system by Mitek®. We report the one year results.

Results: The mean Lysholm score was 90 (range, 44 to 97), the mean Tegner activity score was 5.6 (range, 3 to 7) for the tibial interference screw graft fixation group. For the tibial cross pin group the Lysholm score was 84 (range, 38 to 92) and the Tegner activity score was 4.5 (range, 2 to 5). The KT-1000 arthrometer mean side-to-side difference for manual maximum displacement was 2.6 mm (range, 0 to 8) for the tibial interference screw fixation group and 4.2 mm (range, 2 to 10) for the tibial cross pin group. The mean IKDC knee score was 85 (range, 48 to 99) for the tibial interference screw fixation group and 79 (range, 42 to 85) for the tibial cross pin group. In 7 patients (23%) of the tibial cross pin group, we observed loosening of the distal pin of the two tibial fixation pins. The earliest loosening with skin prolabation was reported 6 weeks post-op. The latest 9 weeks post-op. In all cases we had to remove the distal pin with a local incision, because of pain while kneeling or threatening skin penetration. All knees with cross pin loosening showed increased knee laxity in the KT-1000 after six month.

Conclusions: Quadrupled hamstring tendon autograft acl-reconstruction with tibial bioabsorbable interference screw fixation and femoral cross pin fixation is comparable with other methods of acl-reconstruction in terms of patient satisfaction, knee stability, and function. Tibial fixation with the rigid fix cross pin system is not recommendable due to increased laxity and distal pin loosening. Further studies have to be
performed about the stability of tibial cross pin fixation techniques.

**E-poster #317**

**Return to Sports After Anterior Cruciate Ligament Reconstruction for Handball and Basketball**

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Katsuhiko Kitaoka, Ishikawa, JAPAN
Ryuichi Nakamura, Ishikawa, JAPAN
Akira Okano, Ishikawa, JAPAN
Kenichi Nakamura, Ishikawa, JAPAN
Takeshi Tsuyama, Ishikawa, JAPAN
Yosuke Shima, Ishikawa, JAPAN
Kasturo Tomita, Ishikawa, JAPAN
Kanazawa, Ishikawa, JAPAN

< Introduction > Anterior cruciate ligament (ACL) injuries are common in the high risk pivoting sports of handball and basketball, and for athletes engaged in these sports, a return to competitive play at the earliest possible opportunity is of great importance.

< Purpose > The purpose of this study was to examine the return to their sport after ACL reconstruction for handball and basketball players.

< Patients and Methods > This study examined 50 patients who underwent Howell's ACL reconstruction method using hamstring tendons. Six of the injuries were incurred by males and 44 by females. All patients were athletes engaged in handball and basketball at a high level of competition. Full return to sports was allowed at 4 months, depending on muscular strength and progress of rehabilitation. We evaluated the mechanisms of the injuries, muscular strength, KT-values, return to competition, IKDC, Lysholm score, and knee injury after reconstruction.

< Results > Nearly all the injuries occurred in non-contact situations (88.7%) and during games (77.4%). Four months after ACL reconstruction, nearly all patients recovered 90% of the muscle strength of noninvolved side. The average KT value one year after ACL reconstruction was 1.2 mm. Sport at the same level as before could be resumed by 20.8% of the patients 4 months after ACL reconstruction, by 75.5% after 6 months and by 86.8% after one year. The IKDC score showed 94.3% of the condition of the knees had returned to normal or nearly normal, and the average Lysholm score was 98 points one year after ACL reconstruction. Re-ACL rupture, ACL rupture on the contralateral side, and meniscus injury after ACL reconstruction were recognized in 5.7% each of the patients.

< Discussion > We selected the reconstruction material, operative method and rehabilitation which endure for early return to competition. Training of balance, planting and landing are important. Rate of return to the competition is not so good. In addition, re-traumatism occurs at a reported incidence of 8%. The postoperative results of our series were good, but we recognized re-laceration after ACL reconstruction, ACL rupture on the contralateral side, and meniscus injury in about 5.7% each of the patients. We plan to investigate the cause of these re-traumatisms in order to prevent them in future.

**E-poster #318**

**Configuration of the Tibial Lateral Condyle in a Non-contact Type Knee Injury of the Anterior Cruciate Ligament**

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Yoshinobu Maruhashi, Ishikawa, JAPAN
Ryuichi Nakamura, Ishikawa, JAPAN
Akira Okano, Ishikawa, JAPAN
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Kasturo Tomita, Ishikawa, JAPAN
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Takara-Machi, Kanazawa, Ishikawa, JAPAN

< Introduction > Most anterior cruciate ligament (following ACL) knee injuries are of the non-contact type, but the mechanism of these injuries is not yet fully understood. In this study we therefore focused on the configuration of the tibial lateral condyle as an anatomical intrinsic risk factor for ACL injury of the non-contact type.

< Purpose > We hypothesized that high convexity of the lateral tibial condyle can cause ACL injury of the non-contact type. The purpose of this study was to examine by means of MRI the relationship between non-contact ACL injury and the configuration of the tibial lateral condyle.

< Patients and Methods >

For this study we examined 65 patients who had undergone a checkup because of a chief complaint of a disorder of the knee in our hospital’s Department of Sports Medicine. Three groups were compared: Group I, bilateral ACL ruptures (6 females, 12 knees); Group II, unilateral ACL ruptures (10 males, 17 females); Group III, normal knees (18 males, 14 females). All MRI scans were performed at the same institution at
the time of the checkup. The index of convexity (IC) of the tibial lateral condyle is equal to the height from the joint line of the mid-sagittal section to the top of the condyle divided by the length of the joint line.

< Results > In the control group, there was no statistically significant difference in IC between males and females. The mean IC for females was 0.187 for the bilateral group, 0.175 for the unilateral group, and 0.143 for the control group (P < 0.05). The mean IC for males was 0.161 for the unilateral group, and 0.126 for the control group (P < 0.05).

< Discussion > IC was higher for the ACL rupture group, than for the control group. The tibial and femoral articular surfaces can be divided into anterior and posterior segments. The femoral articular surfaces contact to the posterior segment of tibial articular surface from 20 ±10 degree to 120 degree of flexion. The femur can easily move to the back when the knee is bent. We hypothesize that the lateral femoral condyle then slides down to the posterior when the knee is bent. We hypothesize that the lateral femoral condyle then slides down to the posterior of the tibial lateral condyle resulting in ACL rupture, particularly if the IC is high. The degree of convexity of the lateral tibial condyle appears to be an intrinsic risk factor of non-contact ACL injury.

E-poster #320
Reconstruction of the Anterior Cruciate Ligament Using Mid-Third Patellar Tendon - Evaluation of Quality of Life Measures After 1-15 Year Follow-Up
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Cristiano Frota de Souza Laurino, Sao Paulo, BRAZIL
Rogerio Carvalho, Sao Paulo, BRAZIL
Kleber Nakano, Sao Paulo, BRAZIL
Maria Stella Peccin, Sao Paulo, BRAZIL
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Moises Cohen, Sao Paulo, BRAZIL, Presenter
University of Sao Paulo, Sao Paulo, BRAZIL

Background: there are many publications on ACL reconstruction but few studies with a 10-15-year follow-up.

Purpose: to evaluate return to sports level associated with subjective generic quality of life (SF-36 and Lysholm) and objective (IKDC) indicators for the knee after a 10-15-year follow-up.

Study design: retrospective study.

Methods: 62 patients were evaluated on LCA reconstruction after 10-15-year follow-up by means of physical test, functional test, KT1000 arthrometer. XR and SF-36, Lysholm score and IKDC.

Results: mean of Lysholm score was 89.3, Lachman test negative in 27.4%, (1+) in 40.3%. Pivot shift test was negative in 33.9% and 56.5% slight (+). In the KT1000, 32.3% of the patients had a level above 3mm. Subjective satisfaction level was 91.9%. By the objective IKDC, 50% of the patients were almost normal (B), 37.1% abnormal and 12.9% very abnormal. Return to the same sports occurred in 66.1% of the patients, change of sports in 16.1 and no return in 17.7%.

Conclusions: generic and specific indicators of quality of life for the knee are less strict than the objective indicators. The best levels of return to sports corresponded to the best degrees of protocols of subjective and objective evaluations.

E-poster #321
Self-Efficacy Beliefs in Patients with an ACL Injury
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Bengt Eriksson, Goteborg, SWEDEN
Jon Karlsson, Goteborg, SWEDEN
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The emotional reaction to an anterior cruciate ligament (ACL) injury seem to have important implications not only for the injured athlete’s subjective well-being, but also for their rehabilitation behavior and clinical outcome (Brewer 1994, Wiese-Bjornstal et al 1998). Athletes have cited the fear of reinjury as a salient emotion associated with resuming sports participation (Bianco et al 1999, Johnston and Carroll 1998). The patients perceived self-efficacy and outcome expectations are according to Crossman (2001) the most predictive factor for patient behavior after an injury. Self-efficacy is a belief in one’s potential ability to carry out a task, rather than a measure of whether or not one actually can or does perform the task. The purpose of this study was to describe self-efficacy beliefs, as measured with the new instrument Knee Self-Efficacy Scale (K-SES), in patients with an ACL injury both before and after surgery. The study is part of a larger prospective project on patients with ACL injury aiming for establishing criteria to return to
sports, for evaluating rehabilitation protocols and to aid in the decision making process on surgery or not. Method: One-hundred and forty-eight patients with ACL injury completed the K-SES at some of the following occasions: 1, 4, 6 and 12 months after ACL trauma, preoperatively, and 3, 6 and 12 months after ACL reconstruction. The K-SES, being a self-administered questionnaire with 22 items, is grouped in four categories: 1) daily activities 2) sports activities 3) knee function activities and 4) knee function in the future. The items are evaluated with an 11 grade Lickert scale. The results from the K-SES were correlated with the Knee Injury and Osteoarthritis Outcome Score (KOOS) and the Tegner Physical Activity Scale.

Results: The average K-SES at the various test occasions ranged from 3 to 9. The correlation between K-SES and the dimension of sports performance on KOOS was $r = 0.69$ at 12 months after ACL trauma and $r = 0.40$ at 12 months after ACL surgery. At these occasions the correlation with physical activity was $r = 0.42$ and $r = 0.34$ respectively. Conclusion: It is concluded that self-efficacy beliefs in patients with ACL injury change during the rehabilitation process and that K-SES correlates with sports and physical activity before as well as after surgery. Clinical perspective: Ongoing studies will reveal if self-efficacy beliefs has any predictive value for rehabilitation success.

E-poster #322
Development of a New Instrument to Measure Self-Efficacy Beliefs in Patients with an ACL Injury
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Self-efficacy is a belief in one’s potential ability to carry out a task, rather than a measure of whether or not one actually can or does perform the task. Instruments that measure self-efficacy beliefs have been shown to aid in the evaluation and rehabilitation of patients with arthritis and chronic pain. The objective of this study was to design an instrument to measure self-efficacy beliefs in patients with an ACL injury. The study is part of a larger prospective project on patients with ACL injury aiming for establishing criteria to return to sports, for evaluating rehabilitation protocols and to aid in the decision making process on surgery or not.

Method: Eighty-eight patients with ACL injury completed a first version of the Knee Self-Efficacy Scale (K-SES). It consisted of 44 self-administered items generated by twelve physical therapists and two orthopaedic surgeons experienced in dealing with ACL injuries, and two medical doctors experienced with patients having a pain syndrome. After item analysis a final 22 item version of the K-SES was evaluated for test-retest reliability, internal consistency and validity in 120 patients. The K-SES was correlated with the instruments Multidimensional Health Locus of Control (MHLC), Coping Strategies Questionnaire (CSQ), SF-36 and Knee Injury and Osteoarthritis Outcome Score (KOOS). A factor analysis was also performed on the K-SES.

Results: Good reliability ($r=0.73$) was established for K-SES with an internal consistency of Cronbachs alpha = 0.7-0.9. There was none or very weak correlations between K-SES, MHLC and CSQ. A very strong correlation was found between K-SES and physical functioning as measured by SF-36. All the dimensions on KOOS correlated moderately weak to moderately strong with K-SES. The factor analysis produced two factors of importance.

Summary & Conclusion: It is concluded that the K-SES is a reliable and valid instrument and therefore can be recommended for measuring self-efficacy beliefs in patients with ACL injury. In the future, we are planning to evaluate the K-SES in terms of predictive ability for final outcome.

E-poster #323
A Strength Test Battery for Evaluation of Side-to-Side Difference in Power Development in Patients with ACL Injury
Roland Thomee, Goteborg, SWEDEN, Presenter
Camille Neeter, Goteborg, SWEDEN
Alexander Gustavsson, Goteborg, SWEDEN
Pia Thomee, Goteborg, SWEDEN
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The literature clearly states that muscle function, e.g. muscle strength, is not restored within the first year for a vast majority of patients after anterior cruciate ligament (ACL) injury or after ACL surgery. The literature also clearly states that insufficiently rehabilitated ACL patients do worse in terms of returning to pre-injury sports level, risk for further knee pathology or re-injury. The
The purpose of this study was to develop a strength test battery with high reliability and high ability to detect difference in power development between the injured and the uninjured side in patients with ACL injury. The study is part of a larger prospective project on patients with ACL injury aiming for establishing criteria to return to sports, for evaluating rehabilitation protocols and to aid in the decision making process on surgery or not.

Methods: Thirteen healthy subjects performed three strength tests for maximal power on each leg in a test-retest design (n = 26). Thirty-four patients with a uni-lateral ACL injury were tested six months after ACL reconstruction. The three strength tests were: leg extension, leg curl and leg press. Results: ICC values ranged from 0.83-0.99 for the three strength tests, indicating that all three tests had high reliability. When comparing side-to-side difference in the healthy subjects 92%, 92% and 75% were considered to have normal symmetry (<10% side-to-side difference) in the leg extension, leg curl and leg press tests respectively. The percentage of the patients six months after ACL reconstruction who showed abnormal symmetry were 88%, 39% and 64% respectively. The test battery, i.e. all three strength tests analyzed as one test, showed a sensitivity of 94% for patients six months after ACL reconstruction, when at least one of the three tests was classified as abnormal (>10% side-to-side difference). Conclusion: It is concluded that the test battery, with the three strength tests, has a high ability to detect difference in power development between the injured and the uninjured side in patients six months after ACL reconstruction. The test battery is therefore used in ongoing studies on patients with ACL injury and after ACL surgery.

E-poster #324
A Hop Test Battery for Evaluation of Side-to-Side Difference in Hop Performance in Patients with ACL Injury
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Camille Neeter, Goteborg, SWEDEN
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The literature clearly states that muscle function, e.g. maximal single-leg hop performance, is not restored within the first year for a vast majority of patients after anterior cruciate ligament (ACL) injury or after ACL surgery. The literature also clearly states that insufficiently rehabilitated ACL patients do worse in terms of: returning to pre-injury sports level, risk for further knee pathology or re-injury. The purpose of this study was to develop a test battery of hop tests with high ability to discriminate hop performance between the injured and the uninjured side in patients with anterior cruciate ligament ACL injury and in patients after ACL reconstruction. The study is part of a larger prospective project on patients with ACL injury aiming for establishing criteria to return to sports, for evaluating rehabilitation protocols and to aid in the decision making process on surgery or not. Methods: Fifteen healthy subjects performed five hop tests in a test-retest design. Twenty-five patients with ACL injury and 32 patients after ACL reconstruction were tested. The five hop tests were: vertical jump, hop for distance, drop jump followed by a double hop for distance, square hop and side hop. Results: ICC values ranged from 0.85 to 0.97 for the five hop tests, indicating that all tests had high reliability. When comparing side-to-side difference in the healthy subjects 67% to 100% were considered to have normal symmetry (<10% side-to-side difference) in the five hop tests. The percentage of the patients with ACL injury, who showed abnormal symmetry ranged from 48% to 84% and from 50% to 87% in the patients after ACL reconstruction in the five hop tests. The three tests with the highest sensitivity were chosen for the test battery: the vertical jump, the hop for distance and the side hop. The test battery showed a high sensitivity and accuracy in patients with ACL injury (96% and 90%) and in patients after ACL reconstruction (94% and 93%), when at least one of the three tests was classified as abnormal (>10 % side-to-side difference). Conclusion: It is concluded that the test battery, with the three hop tests, is suitable to discriminate hop performance between the injured and the uninjured side in patients with ACL injury and in patients after ACL reconstruction. The test battery is therefore used in ongoing studies on patients with ACL injury and after ACL surgery.
**E-poster #326**  
Comparative Study the Morphologics, Histochemicals and Immunohistochemicals Characteristics of the Semitendinosus and Gracilis Muscles Tendons between Genders  
Edgard Pereira, Jr., Sao Paulo, BRAZIL, Presenter  
Ricardo Navarro, Sao Paulo, BRAZIL  
Mario Carneiro Fo., Sao Paulo, BRAZIL  
Unifesp, Sao Paulo, BRAZIL  

**SUMMARY**  
PEREIRA Jr., E. S. Comparative study the morphologics, histochemicals and immunohistochemicals characteristics of the semitendinosus and gracilis muscles tendons used in reconstruction of the anterior cruciate ligament between genders. São Paulo, 2003. Tese de Mestrado Universidade Federal de Sao Paulo - Escola Paulista de Medicina.  
The aim of this study was to compare the morphologics, histochemicals and immunohistochemicals characteristics of the semitendinosus and gracilis muscles tendons used in reconstruction of the anterior cruciate ligament between genders. It was evaluated samples of tendons of the semitendinosus and gracilis in 36 patients (36 knees). The ages ranged between 15 and 46, with average of 29.3 years old. In relation to race, 33 were white and 3 not white, and, to side, 23 knees were right and 13 left. The patients were divided in two groups male (n=20) and female (n=16). The samples of tendons were submitted to histologics, histochemicals and immunohistochemicals analysis. No significants differences were observed between groups related to age, gender, race, side, inflammation, vascularity and alcianophilia. It was observed increase in cellularity in semitendinosus muscles tendons when compared gracilis muscles tendons in both genders (male p=0.03* and female p=0.22). It was observed a tendency in female increase in calcifications in semitendinosus and gracilis muscles tendons (p=0.06 and p=0.09), and to increase in degeneration in collagens fibrils semitendinosus muscles tendons (p=0.06). In relation to estrogen receptors in semitendinosus and gracilis muscles tendons it was observed increase of number receptors in male patients. The author concluded that are morphologics, histochemicals and immunohistochemicals differences in semitendinosus muscles tendons between genders and between tendons itselfs in male.  

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**E-poster #327**  
Low Plantar Arch as a Risk Factor for Anterior Cruciate Ligament Injury  
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Takehiko Suginoshita, Gifu, JAPAN  
Hiroto Komiyama, Gifu, JAPAN  
Katsuyuki Ohtomo, Gifu, JAPAN  
Yoshiaki Kusaka, Gifu, JAPAN  
Hiroshi Yamaga, Gifu, JAPAN  
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The purpose of this study is to investigate the possible relationship between a low plantar arch and anterior cruciate ligament (ACL) injury.  
[Subjects and methods] We obtained 100 foot prints from 50 men with a history of ACL injury and measured foot length, breadth and arch height. The height per length, height per breadth, and breadth per length were calculated and compared between the injured side and the uninjured side. In addition, the results were compared between those with a non-contact type of injury (n=30) and those with a contact type of injury (n=20). As the control group, 124 foot prints from 62 healthy volunteers with normal ACL were examined. Mann-Whitney test was used for the statistical analysis of data.  
[Results] In the injured side the average plantar arch height per foot length was 0.076, the height per breadth was 0.22, and the breadth per length was 0.34. In the uninjured those values were 0.079, 0.23 and 0.35, respectively with no significant differences between the two sides. In the group with non-contact type of injury (both sides), the results were 0.081, 0.23 and 0.35, respectively while in the contact type of injury group, they were 0.074, 0.21 and 0.34, respectively with no significant differences between them. On the other hand, in ACL injured cases (both sides), the values of the investigated results were 0.077, 0.22 and 0.35, and in the control subjects, they were 0.090, 0.22 and 0.35, respectively there were significant differences between the ACL injured group and the control, in the plantar arch height per foot length (p<0.01), and the plantar arch height per foot breadth (p<0.01). In contrast, there was no significant difference in the foot breadth per foot length between them.  
[Discussion] A knee-in and toe-out posture is common risk factor for ACL injury. When the arch
height decreases, the low leg alignment adopts knee-in and toe-out position.
Our results show that a low plantar arch is a risk factor for ACL injury because the plantar arch of the ACL injured cases was significantly lower than that of subjects without ACL injury. However, there were no significant differences between contact and non-contact injured cases. When the athlete’s plantar arch decreased, the alignment of the lower leg would adopt the knee-in and toe-out position, thus he/she becomes highly prone suffer on ACL either during a contact and non-contact moment. Conversely the athlete who has a normal plantar arch is not prone to ACL injury in any situation. An arch support can prevent ACL injury in athletes with a low plantar arch.

[Conclusion] In ACL injured cases, the plantar arch was significantly lower than in controls. A low plantar arch is a risk factor for ACL injury.

E-poster #328
Arthroscopic Pull-out Repair for the Acute Anterior Cruciate Ligament Rupture
Chong Hyuk Choi, Seoul, KOREA, Presenter Jaee Bong Chung, Seoul, KOREA Youngdong Severance Hospital, Seoul, KOREA

Purpose: Direct repair of the anterior cruciate ligament (ACL) has been criticized as an invaluable surgery. This criticism was arose from the complication regarding with classical large open incision and from the mechanical failure of torn ACL. Although the ACL reconstruction is a gold standard for the chronic ACL deficient knee, it has many difficulties in the whole processing of recovery including graft selection, surgical technique, rehabilitation and proprioception. If the original tissue of ACL would be preserved adequately, the knee joint function will be recovered in the more reasonable fashion. This study was attempted to evaluate the results of arthroscopic pull out repair of acute ACL tear with minimal incision and to investigate the prognostic factors.

Materials and Methods: Thirty-seven ACLs were repaired within 3 weeks after trauma. We investigated the MRI findings of ACL, location of tear, status of synovium and associated injuries. Twenty-nine ACLs were torn at the proximal one third. Operation was done in the manner of pull out repair with 5 stitches through two tunnels that were created at the anatomical attachment area of lateral femoral condyle for the proximal tear, two tunnels through the proximal tibia for the distal tear and each of two tunnels through both bone for mid substance tear. In the case of partial rupture, only ruptured segment was repaired preserving intact segment. After two weeks of immobilization, rehabilitation was started as same protocol as ACL reconstruction. The average follow up period was 23 months (14 months to 36 months).

Results: Lysholm knee score was used to evaluate the clinical results. Twenty-seven of 37 patients (73%) were classified as excellent or good. The KT-1000 arthrometer revealed 3.1 mm side to side difference in anterior displacement with 20 pounds of force. In seven patients who developed recurrent pivot phenomena, ACL reconstruction was performed. Six patients who had limited motion improved with arthroscopic arthrolysis and bricement. The clinical results were good for the patients with proximal tear and intact synovium with the diffuse edematous change of ACL in MRI examination.

Conclusion: Arthroscopic repair for the acute ACL tear was an effective surgery for the preservation of the original ACL without disadvantages from reconstructive surgery or classical large open surgery in the selective patient. Preoperatively, MRI evaluation was necessary for the examination of tear pattern. The location of rupture and the status of synovial coverage were considered as an important prognostic factor.

E-poster #329
The Role of Immobilization on Tunnel Enlargement After Anterior Cruciate Ligament Reconstruction

Aim: The etiology of tunnel enlargement after anterior cruciate ligament (ACL) reconstruction is unknown. The many postulated factors, however, can be divided into two broad categories: mechanical and biological. In this study, we eliminated mechanical factor by immobilizing the knee after ACL reconstruction and tried to reveal the biological factor on tunnel enlargement.
Material and Methods: Seven mature mongrel dogs (average age 1.9 years, 4 males and 3 females) were included. After cutting the ACL, an open reconstruction was performed by using a soft tissue autograft (fascia latae). Femoral and tibial tunnels were made by using a 6-mm drill and the graft was fixed onto both ends of tunnels with non-absorbable sutures and knee motion was eliminated with an above-knee cast. The tunnels were evaluated at the post-operative 1st day, 3rd and 6th weeks with computed tomography (CT). Reformatted CT images on appropriate planes were obtained and the cross-sectional area of tibial and femoral tunnels were measured from reformatted transverse sections.

Results: All tunnels were found enlarged over time in the comparison of the 1st day with 3rd week, and 1st day with 6th week (F; 37.237, P<0.005). However, there was no statistically difference between 3rd and 6th weeks (P>0.005). Although both tunnels seemed to have more prominently enlarged close to the knee joint, this could not be statistically proven, probably due to the limited number of subjects.

Conclusion: The fact that even when the knee motion is eliminated both tunnels (tibial and femoral) enlarge very early after ACL surgery suggests that mechanical factor is probably not the only factor responsible in tunnel enlargement.

E-poster #330
The Effect of Hand-Dominance of the Surgeon vs. Side of the Injury in Arthroscopic ACL Reconstruction: Evaluation of Graft Placement and Duration of Surgery
Anna-Stina Moisala, Tampere, FINLAND, Presenter
Timo Jarvela, Tampere, FINLAND
Seppo Honkonen, Tampere, FINLAND
Markku Jarvinen, University of Tampere, FINLAND
Teppo Jarvinen, Tampere, FINLAND
Tampere University Hospital, Tampere, FINLAND

Introduction: The position of the graft plays an important role in the clinical outcome of the ACL reconstruction. The choice of hand (dominant or non-dominant) used in instrumenting may effect the success of the graft placement in arthroscopic ACL reconstruction. Our objective was to investigate the effect of hand-dominance in arthroscopic ACL reconstruction by evaluating the graft placement and duration of surgery.

Materials and methods: Lateral radiographs of 208 knees operated by two senior orthopaedic surgeons were evaluated using the method of ‘the sum score of the graft placement’. The method takes into account both the femoral and the tibial positions of the graft simultaneously. Also the time spent for the operation was measured. The right-handed surgeon operated 140 knees (71 right knees and 69 left knees), the both-handed surgeon (uses both hands equally) operated 34 left knees and 34 right knees, a total of 68 knees.

Results: The average sum score of the graft placement in all 208 reconstructed knees was 67 (SD 11, range 39 to 103). In the 140 reconstructed knees operated by the right-handed surgeon, the mean sum score was 66 (SD 11, range 44 to 95). The mean sum score in right knee radiographs was 64 (range 44 to 95) and 68 (range 47 to 95) in left knee radiographs, respectively. In all 68 operated knees by the both-handed surgeon, the average sum score of the graft placement was 66 (SD 11, range 39 to 92). The average sum score in the right knee radiographs was 66 (range 39 to 88) and 66 (range 41 to 92) in the left knee radiographs, respectively. There was no significant correlation between using the dominant hand in instrumenting and the success of the graft placement measured by ‘the sum score of the graft placement’. The right-handed surgeon’s femur positions in the right and left knees had a significant difference (P = 0.007).

Discussion and conclusion: To our knowledge the effect of hand-dominance in arthroscopic ACL reconstruction has not been studied before. We prefer one hand to the other (the dominant hand). With this hand we perform better on activities, especially in tasks containing elements of accuracy and speed. Thus using the dominant hand in instrumenting in endoscopic surgery might have some benefits compared to using the non-dominant hand. Results might be seen as a more accurate placement of the graft to it’s ideal position and a shorter duration of operation. In our study there was no statistical difference
between using the dominant or the non-dominant hand in instrumenting when measured by evaluating the graft placement using the method of “the sum score of the graft placement” and duration of surgery. However, there was a significant difference in the femur positions of the knees operated by the right-handed surgeon (P = 0.007).

E-poster #331
Computer-Assisted Comparison of Two Double-bundle Techniques for ACL Reconstruction
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Sandra Martelli, Bologna, ITALY
Marco Bontempi, Bologna, ITALY
Simone Bignozzi, Bologna, ITALY
Laboratorio di Biomeccanica, Bologna, ITALY

Introduction:
In this study we present a new method to analyse the double-bundle ACL reconstruction, based on the use of a navigation system to track passive motion and to digitize anatomical data and successive computer elaboration of the kinematics. The accuracy of the system allows a reliable analysis also of secondary kinematic constraints and, on cadaveric specimen, also a reliable study of the relationship with anatomical features [1, 2].

This study describes the acquisition and elaboration protocol of the methodology and reports a case study to investigate the effect of tunnel orientation in double-bundle ACL reconstruction on the kinematics of the reconstructed knee.

Materials and Methods:
We performed the comparison of two double-bundle techniques for ACL reconstruction in two cadaver knee, using an optical navigation system (FlashPoint, Image Guided, Boulder, Colorado) to record relative motion of the tibia and the femur and to digitize anatomical data. The acquisition protocol of our study was the following:

1.1 Limb preparation.
Femur was fixed horizontally with tibia, at 90deg of flexion, perpendicular to floor in order to minimize external forces, like varus rotation, and have a physiological passive range of motion.

Two rigid bodies with infra-red emitters were fixed respectively to femur and tibia in order to record the relative position during passive motion.

1.2 Tests
The passive range of motion during flexion, the internal/external rotation at 90deg of flexion, at maximum force, and the drawer test, at maximum force, were recorded twice by the same operator in the ACL intact knee.

Then the ACL was dissected, and the ACL-deficient knee kinematics was examined performing again the passive range of motion, the internal-external rotation at 90? and the drawer test with the patella in situ, like in the previous case.

The gracilis and semitendinous tendons were harvested and sutured together with the tibial insertion left intact. A tibial tunnel was performed in a way to reach the natural tibial insertion area of ACL, in particular its postero-medial part. The tunnel started in the medial part of cresta tibialis and had an orientation of 9deg respect to the anatomical axis in the frontal plane and 30deg respect to the sagittal plane.

From the femoral insertion two femoral tunnel with different orientation were performed, one at 40deg with respect to the tibial plateau in flexion, that we call horizontal, and one at 65deg that we call vertical. The tendons were passed through the tibial tunnel, over the top, in the horizontal tunnel and in the tibial tunnel again. The tendons were then clamped and cinematic tests were repeated. Same protocol was followed for the vertical tunnel.

The final bundle of ACL goes from tibial tunnel to over the top in order to reproduce the postero-medial bundle of the reconstructed ACL. The other bundle of the reconstructed knee went from the tibial tunnel to the femoral tunnel in both cases, and was identified as the antero-medial bundle.

In order to have a complete description of the joint the knee was then dissected and bone surfaces, tunnel and ligaments insertions were digitized.

1.3 Computer analysis
The computer analysis of the knee joint and the kinematic data was performed with a custom software that allows the reconstruction of relative motion of the joint and the computation of laxities, as well as instantaneous rotations and translations [1].

During anatomical acquisitions transepicondylar line and mechanical axis on femur and medial lateral direction and anatomical axis on tibia were acquired and used as local reference coordinate systems for the two bones.

Results
The passive range of flexion was the same in all cases, although small differences were found in the initial attitude of the joint in full extension. The elongation and orientation of the reconstructed ACL bundles were similar both in the horizontal and vertical case and differed in their position and orientation from the central fibre of the natural ACL, especially in extension. The anterior bundles of the reconstructed ACL resulted isometric during PROM, like the normal ACL central fibre, while the posterior bundle decreased its length in flexion by almost 20%. Also the orientation of the anterior bundle of the reconstructed ligament with respect to the tibial plateau was similar to the normal one and decreased in flexion. The orientation of the posterior bundle of the reconstructed ACL with respect to the tibial plateau varied much more during PROM.

The orientation of both anterior and posterior bundles of the reconstructed ACL with respect to the femoral notch were quite similar, and increased less than normal ACL during PROM. It is interesting to remark that the attitude of the knee at 90° was slightly different for normal and reconstructed knees and therefore the elongation during IE and drawer test showed a different trend.

This is confirmed by the results of the kinematic stress tests. In fact AP and IE laxities varied according to the ACL state, as the mean among all repeated tests in the same conditions.

Discussion and Conclusions:
The experimental setup was successful in providing a comparison among normal knee, ACL-deficient knee and reconstructed knee from the kinematic point of view, avoiding the problem of individual variability and lack of data on 3D kinematics.

In our experiment the ACL elongation and general orientation of the ligament was restored by both techniques [2,3]. However only the vertical tunnel was able to restore the natural AP and IE stability of the knee. It performed better than the horizontal one, which appeared unable to fully control AP laxity and constrained IE rotation more than the normal ACL.

Therefore a first analysis of the experimental data showed that the femoral tunnel orientation had a significant effect on the final knee behaviour, probably because it produced a different global length of the used tendon or, although small, different positions of the antero-medial or postero-medial bundle of ACL reconstructions. In fact all the other features of the reconstructions were the same in the two examined technique (i.e. the graft, the tibial tunnel, the position of the anterior and posterior bundle of the reconstructed ACL).

It can be noticed that this result appears surprisingly different from the classic single bundle technique, were the control of AP laxities increases when the orientation of the femoral part becomes more horizontal [4]. This result may be due to the physical behaviour of the tendon wrapping around the femoral condyle with different length and therefore forces in the two double-bundle techniques and absent in the single-bundle one.

We plan to perform a more extensive experimental study of this issue in the near future.

References

E-poster #332
Clinical Outcome and Second-look Findings of Amateur Athlete with Bi-socket ACL Reconstruction using Multiple Hamstring Tendons
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Toshiaki Yamamura, Sapporo, JAPAN
Nishioka Daiichi Hospital, Sapporo, JAPAN

Purpose
The purpose of this study is to verify whether sport activity level of amateur athlete after ACL reconstruction influences the clinical outcome at post-operative one year and the graft in second-look arthroscopy.

Materials and Methods
From 2000 to 2002, 67 patients with an isolated complete ACL injury, who were amateur athletes between 15 and 30 years old, were operated by bi-socket ACL reconstruction using multiplied hamstring tendons. The average age at surgery was 18.5 years old. The average follow up period were 27 months (13~51). These patients were separated into the following two groups. One is high activity group (Hi-group) which is to return to competitive sports after ACL reconstruction almost 8 months. Another is low activity group (Lo-group) which is not to return to competitive sports until second-look arthroscopy. There was no significant difference between two groups about age and sex. The evaluation was performed as follows: Tegner activity score, Lysholm knee scoring scale, KT-1000 arthrometer side-to-side difference, IKDC, graft in second-look arthroscopy. We classified grafts into the following three grades; Grade I: completely covered by synovium, Grade II: incompletely covered by synovium and no graft fibers ruptured, Grade III: graft fibers ruptured partially.

Results
Clinical results at post-operative one year were revealed in Table 1. Two patients in Hi-group sustained revised ACL injury before second-look arthroscopy.

<table>
<thead>
<tr>
<th>Tegner</th>
<th>Lysholm</th>
<th>KT-1000(mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hi-group (N=35)</td>
<td>7.5</td>
<td>98.1</td>
</tr>
<tr>
<td>B:10 C:4 D:0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lo-group (N=30)</td>
<td>5.2</td>
<td>97.1</td>
</tr>
<tr>
<td>B:7 C:3 D:0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Grade of the graft in second-look arthroscopy were revealed in Table 2.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Grade II</th>
<th>Grade III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hi-group (N=35)</td>
<td>10</td>
<td>17</td>
</tr>
<tr>
<td>Lo-group (N=30)</td>
<td>24</td>
<td>4</td>
</tr>
</tbody>
</table>

Conclusions
These results suggested that sports activity level influences the graft, though does not the clinical outcome. Careful observations are necessary for amateur athlete after ACL reconstruction, especially high activity group, to avoid early graft degeneration.

**E-poster #333**
2 To 5 Years Follow-Up Of Full Thickness Quadriceps Tendon Graft For ACL Reconstruction With Aggressive Rehabilitation.
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Introduction
ACL reconstruction has been used since 1998 with a full thickness quadriceps tendon graft, opening everytime the suprapatellar pouch to fasten dissection and to improve fixation. We present our medium term results.

Material and Methods
We dissect the full thickness of a tendon of 10 mm width 8 cm long, including 2,5 cm bone block opening deliberately the suprapatellar pouch. Using #2 Ethibond sutures through the tendinous side, we passed through the femoral ACL hole retrieving and tying them on the opened pouch also improving fixation with a bioabsorbable screw on the femoral hole.

On the tibial side, bone block fixation is done with standard interference screw. No splints are used and full weight bearing with aggressive full ROM movements are started on the first post-op day. Normally patients progress to run at 45 days and start practising contact sports as full muscle balance is regained usually at 5 months. Between december 1998 and June 2001, 150 patients were operated and 92 of them came back to evaluation.

Results
In Tegner Sports Scale mean scored 7.9 (our biggest sport population being Rugby players). Using IKDC Score, 85 patients (92.4 %) were rate normal or nearly normal. KT1000 arthrometric evaluation scored on 79 patients (85.86%) between 1 to 3 mm on manual max. 10 patients (10.87 %) between 3 and 5 mm, 3 patients (3.27%) more than 5 mm.

On Lyshom Scale mean 90 points. Anterior knee pain slight to moderate in 8 patients (8.7%) and crepitus 20 patients (21.7% patients).

No difficulties due to lack of visualisation were noted on surgery. We have 3 patellar linear fractures, that required no treatment 1 septic arthritis with full recovery, 1 case of retrieved Ethibon sutures due to pain and effusion.

Conclusion
With this technique we achieved medium terms results in line with best patellar tendon ones with less anterior knee pain, so it is a suitable alternative on ACL reconstruction, also with this aggressive rehabilitation protocol.
Simplified MRI Sequences for Postoperative Control of Hamstring ACL-reconstruction

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Background: Usually standard radiographs are used for postoperative quality control after ACL-reconstruction. However, with the use of hamstring grafts and bioabsorbable implants, accurate assessment of the tunnel- and implant-position is impossible. The graft and its relation to anatomical landmarks cannot be evaluated directly. MRI is an alternative to radiography permitting direct graft visualization and 3-dimensional assessment of tunnel position. However, for routine use it is expensive and time-consuming. The aim of this study was to develop a simplified MRI protocol with less time consumption and to evaluate it for routine postoperative quality control after ACL reconstruction.

Materials and Methods: Various scanning protocols were tested in a series of 105 patients and evaluated for image sharpness, clarity of the structures, susceptibility to artefacts, applicability regarding precise analysis of graft and tunnel position and time consumption. One simplified specific scan protocol was then defined and applied in a series of 60 consecutive patients after hamstring ACL-replacement. The position of the femoral and tibial tunnels was measured in the sagittal, coronal and axial sections and classified according to Harner (femoral) and Staeubli (tibial). Impingement of the graft in the intercondylar roof was analysed according to Howell. The position of the bioabsorbable interference screws was assessed.

Results: Scan protocol: T2 weighted gradient echo sequences (GRE) with TR=246ms, TE 11ms, flip angle 25°, 2mm sections and a 256*256 matrix yielded the best image quality of tendon grafts and bone tunnels with tolerable time consumption (average scanning time per patient 1 min 40 sec). Altogether 8-16 sections were obtained in every patient. Tunnel placement: 46/60 (77%) of the femoral tunnels were in zone 4, 13/60 (21%) at the border zone 3 to zone 4, 1/60 (2%) in zone 3 in the sagittal plane (Harner). The femoral tunnels in the axial plane were at 10:30 o’clock in 32/60 (53%), at 11:00 o’clock at 24/60 (40%) and at 10:00 o’clock in 4/60 (4%) patients. The mean distance of the anterior border of the tibial tunnel from the anterior cortex was 39% (+/- 4.9%) related to the total sagittal diameter of the tibia. There was no graft impingement. The position of the interference screws was anterior to the grafts in all cases.

Conclusion: Simplified MRI sequences can be used for postoperative quality control after ACL-replacement and are an alternative to standard radiographs giving more specific and precise information regarding tunnel position and screw placement. Analyzing the bone tunnels in a series of 60 patients demonstrated that correct assessment of tunnel placement after arthroscopic ACL-reconstruction is feasible using this simplified MRI technique.

The Use of Allograft Bone Screws and Aperture Fixation in Allograft Bone Patellar Bone ACL Reconstructions

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Hypothesis: Is the use of allograft bone screws combined with aperture fixation an effective means of fixation of allograft bone tendon bone grafts for ACL reconstruction surgery and does this method prevent tunnel widening?

Methods: This is a retrospective review of 30 consecutive patients undergoing intra-articular allograft patellar bone tendon bone ACL reconstructions. Each patient had sustained and ACL tear between 6 weeks and 14 years prior to the procedure and had symptomatic ACL insufficiency. All patients had undergone a pre-operative MRI which documented the torn or absent ACL. Each patient had been counselled extensively about options of ACL reconstruction graft choices and had agreed to the use of allograft tissue. All patients were informed about the need for their need to follow a carefully supervised post-operative physical therapy program. X-rays were obtained during the post-operative course to follow for possible tunnel widening.

Results: A total of 30 patients (16 male, 14 female, average age 43 years) underwent this procedure. An allograft bone screw was used for ‘interference fit’ fixation at the anterior aspect of
the femoral tunnel in routine fashion allowing for aperture fixation at the entrance of the femoral tunnel. All femoral tunnels were created by placing an acorn drill bit through the medial arthroscopy portal to the most posterior aspect of the lateral wall of the posterior intercondylar notch and flexing the knee to 120 degrees (in the method described by Dr. Jack Andrish and others.) Tibial fixation was performed by placing a 9mm by 30 mm allograft bone screw to the level of the tibial articular surface under direct arthroscopic visualization. Sutures in the tibial bone block were tied over a post screw for supplemental fixation.

There were no surgical failure in this group. All patients improved at least on Grade on pre and post-operative IKDC ratings and improved between 1 and 3 levels on Tegner values. There was one complication that occurred in the post-operative time when the tip on one allograft screw broke off and temporarily acted as a “tehered loose body”. There has been no significant tunnel widening (less than 1-2 mm) on follow up X-rays. In each case, the bone screws have incorporated well into the surrounding bone as noted by X-ray.

Conclusions: The use of allograft bone screws and aperture fixation of allograft patellar tendon bone tendon bone arthroscopic assisted ACL reconstructions is an effective method of achieving ACL fixation and prevents significant tunnel widening.

E-poster #337
Improved Technique of Anatomic Reconstruction of Anteromedial and Posterolateral Bundles of ACL - A Split Double-Bundle Technique-
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PURPOSE: This paper is to report an improved technique of anatomic reconstruction of anteromedial (AM) and posterolateral (PL) bundles of anterior cruciate ligament (ACL). The two bundles are separately tensioned and secured in flexion and extension respectively to reproduce more physiological tension. The broad tibial attachment of ACL is reproduced by this technique.

TECHNIQUE: Tibial and femoral tunnels are made as usual. Tibial tunnel is then enlarged by reaming 5-7mm more anteriorly and posteriorly to make the tibial tunnel elliptical in cross section. Most kind of graft can be used for this technique. When preparing tendon graft, the proximal portion is prepared as in the conventional technique. The distal portion is prepared as two separate bundles by longitudinally separating the graft, creating a Y-shaped graft.

The graft inserted into the femoral tunnel is fixed with cross pins or an interference screw. The two distal bundles are then oriented and positioned by 90 degree rotation to each other as the normal ACL. Then, the PL bundle is secured by post-tie method around the distal orifice of tibial tunnel under maximum manual tension, with the knee in full extension. The AM bundle is then tightened and secured with the knee in 70 degree flexion with the same method. Then, an absorbable interference screw was inserted between the two bundles up to the upper end of the tibial tunnel with the knee in 45 degree flexion. The interference screw provide more tightening and more anatomical position of the two bundles.

CONCLUSION: The split double-bundle technique has the advantage of separate tensioning of the AM and PL bundles of ACL and free choice of graft. The two bundles of ACL can be more anatomically located with minimal increase in surgical difficulty. We believe it will result in more physiologically functioning ACL. The technique is also valuable in revision of failed ACL reconstructions with enlarged tibial tunnel.

E-poster #338
Results of the Posterolateral Corner Sling for Posterolateral Rotatory Instability Combined Anterior Cruciate Ligament reconstruction
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Yong Seuk Lee, Seoul, KOREA
Sang Hak Lee, Seoul, KOREA
Young Uk Park, Seoul, KOREA
Yong San Hospital Chung-ang University, Seoul, KOREA

INTRODUCTION: The common cause of ACL (anterior cruciate ligament) reconstruction failures was unrecognized and untreated concomitant PLRI (posterolateral rotatory instability). We report the results of combined PLRI and ACL treatment.

MATERIALS AND METHODS: From January 1998 to December 2002, twenty-nine consecutive patients were included in this study, 24 patients were followed-up for at least 12 months, a mean of 25 months (range 12 to 58) postoperatively. The
PLRI was treated using a biceps tenodesis or posterolateral corner sling through proximal tibia or fibular head obliquely from anteroinferior to posterosuperiorty. The clinical results were evaluated with OAK (Orthopadishe Arbeitsgruppe Knie) and IKDC (International Knee Documentation Committee) knee scoring system. The integrities of physical findings were assessed with pull, varus stress radiograph using Telos stress device and the manual maximum displacement test using a KT-2000TM arthrometer with 30 degrees flexion of the knee.

RESULTS: At the last follow up, the average 64.1 OAK score, 7.9 mm (pull) displacement by stress radiographs, 1.9 mm (varus) and 6.5 mm displacement by KT-1000TM arthrometer were improved to an average 84.4, 2.1 mm, 0.4 mm, 2.3 mm, respectively. By the IKDC and OAK scoring systems, 22 (92%) cases and 21 (88%), respectively, showed satisfactory clinical outcome.

CONCLUSION: The modified posterolateral corner sling method may improve the quality of outcome of arthroscopic ACL reconstruction combined with PLRI. In a patient with varus instability, combined LCL implication yielded successful result.

E-poster #339
Comparison of Quadriceps and Hamstring Muscle Strength following ACL reconstruction
Paul Yun-Tin Tse, Kowloon, Hong Kong CHINA, Rebecca Ching Man Leung, Kowloon, HONG KONG
Caleb Tsz Kau Wong, Shatin, NT, Hong Kong CHINA, Presenter
Tsz-kau Wong, Hong Kong, CHINA
Kwong Wah Hospital, Kowloon, CHINA

A retrospective cross-sectional study was carried out to investigate the knee strengths of subjects who received anterior cruciate ligament (ACL) reconstruction using either bone-patella tendon-bone (BPTB) or hamstring (H) graft. 37 subjects aged from 18-45 who had undergone unilateral ACL reconstruction from January 2001 to February 2002 participated in the study on a voluntary basis. There were 18 patients in the BPTB and 19 patients in the H group. At an average follow up of 24 months, all subjects were examined for their knee extension and flexion strength with an isokinetic dynamometer on the operated and non-operated knee at 60 /sec, 120 /sec and 180 /sec angular speed respectively. The knee laxity was examined by a KT-1000 arthrometer, and subjective functional outcomes were assessed via the Tegner activity and Lysholm knee score. There were no statistically significant differences on both knee extension and flexion strength between the two groups. Significant difference was observed in the knee extensor strength of the operated knee compared with the good side (F=29.88, p=0.0001) across the 3 angular speeds for both groups. The overall residual weakness of knee extensor strength in BPTB and H group was 11.9% and 13.5% respectively. Although, there was significant deficit of knee flexor strength between sides within two groups of subjects (4.3% to 6.1% of knee flexors deficit with F=9.086 & p=0.005), differences smaller than 10% of deficit between sides can be considered as clinically not significant. No significant difference was shown on knee laxity, the Tegner activity score and the Lysholm knee score.

E-poster #340
Perturbation Training Induces Dynamic Stability in the ACL Injured Knee
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Wendy I. Hurd, Newark, DE, USA, Presenter
Michael Axe, Newark, DE USA
Lynn Snyder-Mackler, Newark, DE USA
University of Delaware, Newark, DE, USA

INTRODUCTION: Motor control strategies for those who successfully compensate for the absence of the ACL (copers) are different from those who do not compensate well for the injury (non-copers). Rehabilitation that includes perturbation training, a specialized training that involves support surface translations, has helped improve dynamic knee stability in certain individuals with ACL rupture soon after injury (potential copers) (Fitzgerald et al., 2000). The purpose of this study was to elucidate the mechanism underlying the development of dynamic stability of the knee as a result of perturbation training in potential copers with an ACL injury. Variables of interest included peak knee flexion angle and co-contraction indices of the vastus lateralis-lateral hamstring and vastus lateralis-medial gastrocnemius.

METHODS: Sixteen individuals with acute, unilateral ACL rupture, categorized as potential copers, and 16 active, uninjured subjects were recruited for this study. All subjects participated in five trials of free speed walking (undisturbed), and trials during which a platformtranslated
horizontally (anteriorly or laterally) at heel contact, before and after completing ten sessions of perturbation augmented rehabilitation. Motion analysis data were collected at 120 Hz with a six camera passive, three-dimensional analysis system. Electromyographic (EMG) data from the vastus lateralis, lateral hamstring, and medial gastrocnemius were collected. Electromyographic data were collected at 960 Hz and band pass filtered from 20-350 Hz. Muscle co-contraction, the simultaneous activation of antagonistic muscles [vastus lateralis -lateral hamstring and vastus lateralis-medial gastrocnemius], was calculated using the method of Rudolph et al (2001) for the following gait intervals: preparatory phase (100 ms prior to heel contact to heel contact) and weight acceptance (heel contact to peak knee flexion).

RESULTS: Before training, potential copers had significantly higher vastus lateralis-lateral hamstring and vastus lateralis-medial gastrocnemius co-contraction compared to uninjured subjects (p<0.10) and reduced peak knee flexion angles (p<0.05). After training potential copers demonstrated movement patterns that more closely simulated uninjured subjects, including reduced co-contraction indices and increased peak knee flexion angles.

DISCUSSION: When performing the challenging task of disturbed walking, potential copers used a stiffening strategy consisting of high co-contraction and decreased peak knee flexion to dynamically stabilize the injured knee prior to training. Although this strategy may prevent tibial subluxation, it is unlikely to be successful long-term, as higher than normal co-contraction has been found during gait in patients with ACL rupture who experience continued knee instability (non-copers, Rudolph et al 2001). Perturbation training induced reduced quadriceps-hamstrings and quadriceps-gastrocnemius co-contraction and improved knee kinematics in individuals with ACL rupture classified as potential copers. Findings from this study provide evidence for a mechanism by which perturbation enhanced rehabilitation acts as an effective intervention for promoting coordinated muscle activity in a select population of those with ACL rupture.

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David M. Mauas, Buenos Aires ARGENTINA
Cristian Collazo, Buenos Aires ARGENTINA
Horacio Carlos Galante, Chivilcoy, Buenos Aires ARGENTINA
Mansilla, Buenos Aires, ARGENTINA

PURPOSE: The incidence of posteroexternal ligament lesions associated to ACL injury has not been frequently described in the literature. The lack of diagnosis and proper repair of the associated posteroexternal structures lead to failure in ACL reconstruction. The purpose of this study is to analyse the incidence of this association, the mechanisms of injury, their relation to sports practice and the evaluation of the results achieved.

METHODS: A retrospective analysis was performed between 1990 and 2002. Of 1871 ACL arthroscopic reconstructions performed, 43 cases (2.29 %) had lesions associated to the posteroexternal angle, which required surgical repair. The distribution according to sex was: 39 males and 4 females. Mean age was 30 years (range 17-41 y). 29 patients were Rugby players (67%). The posterolarateral instability was classified into three types depending on the injured anatomic structures. The most frequent mechanism of injury was coupled loading of varus and rotation. In physical examination the varus laxity was more evident than external rotation test. All cases were treated by an arthroscopic ACL autograft techniques + open posterolateral reconstruction using direct repair with augmentation in acute and reconstruction with autograft in chronic cases.

RESULTS: The mean follow-up was 7.9 years, ranging from 26 months to14.2 years. Results were assessed using objective (KT1000) and subjective (Lisholm, physical exam) methods.

CONCLUSIONS: It is essential to perform a careful physical examination and testing of the posteroexternal structures’ integrity in anterior cruciate ligament injuries. Although this is not a frequent association, it more common in collision...
athletes. The proper treatment of these structures in combination with the ACL’s can have excellent and good results, similar to those of isolated ACL reconstructions.

E-poster #342
Loss of Extension Following ACL Reconstruction: Analysis of Incidence and Etiology Using New IKDC Criteria
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Mauricio F. Herrera, Pittsburgh, PA USA
James J. Irrgang, Pittsburgh, PA USA
Kimberly Francis, Pittsburgh, PA USA
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University of Pittsburgh, Pittsburgh, PA, USA

Objective: In 1992, we reported our incidence of loss of extension (LOE) (>=10) to be 11.1% at 2 months postoperatively. By avoiding acute surgery, we decreased our incidence to 1.7% in 1995. In 2000, the International Knee Documentation Committee (IKDC) redefined a nearly normal passive motion deficit postoperatively to be a side-to-side difference <=5. The purpose of this study was to determine our incidence of and factors associated with LOE at 4 weeks postoperatively using the redefined criteria. The secondary aim was to describe the intraoperative findings in those patients who underwent repeat arthroscopy to treat LOE.

Methods: The records of 229 patients who had undergone ACL reconstruction between 1995 and 2000 were included in this series. We excluded subjects with revision ACL reconstruction, concomitant ligament surgery, or meniscal reconstruction. LOE was defined as > 5 side-to-side difference in passive knee extension or the need for repeat arthroscopy or a drop out cast to alleviate LOE.

Results: The overall incidence of LOE was 25.3% (58 of 229). Thirteen point three percent (28 of 233) of patients required arthroscopy to recover full extension. LOE was significantly associated with preoperative extension (p<0.05) and time from injury to surgery (p<0.05). Preoperative knee extension was 3.67 for those with postoperative LOE versus 1.19 for those without postoperative LOE. Median time from injury to surgery was 60 days for those with LOE and 93.5 days for those without LOE. LOE was not associated with age, sex, graft type, concomitant meniscal procedures, or presence of nerve block. Twenty-five of 28 patients undergoing repeat arthroscopy demonstrated intercondylar notch scarring, which was the most frequent pathoanatomic feature. At final examination, 4 patients had abnormal knee extension of > 5 side-to-side difference in passive knee extension.

Conclusions: The incidence of LOE increased when the new IKDC criteria were applied. However, postoperative motion was examined earlier in this series and a new reference point of side-to-side difference was used, which contributed to the increased incidence of LOE. Our findings that preoperative LOE and acute surgery were associated with postoperative LOE are consistent with previous studies. Unlike previous studies, this study considered nerve blocks as a potential risk factor for LOE, but did not find any association. Early recognition of even modest LOE may be promoted by the new IKDC criteria, and ultimately may lead to improved outcomes.

E-poster #343
Morphological Changes of the Intercondylar Notch after Notchplasty: Longitudinal Changes in Anterior Cruciate Ligament Reconstruction
Atsushi Kobayashi, Maebashi-shi, Gunma-ken JAPAN, Presenter
Hiroshi Higuchi, Maebashi-shi, Gunma-ken JAPAN
Masashi Kimura, Gumma, JAPAN
Kenji Takagishi, Maebashi, Gunma JAPAN
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Purpose: The morphological changes of the intercondylar notch after notchplasty in anterior cruciate ligament (ACL) reconstruction and bone hyperplasia were measured using computed tomographic (CT) images.

Method: Among the cases which underwent ACL reconstruction, 10 knees of 10 subjects (2 men, 8 women) for which CT images were made preoperatively, one month postoperatively, and one year postoperatively were enrolled in the study. The mean age at surgery was 28.7 years (range, 14-49 years). CT images were taken one-fourth the distance from the anterior opening of intercondylar notch vertically to Blumensaat’s line, captured on a computer, and measured using Sion Image software (Sion, Inc.). The maximal lateral diameter, height, and area of the images were measured.

Results:
The maximal lateral diameter of intercondylar notch was 15.7±1.3 mm preoperatively, 19.0±1.8 mm one month postoperatively, and 18.5±1.8 mm one year postoperatively. Its height was 14.1±1.1 mm preoperatively, 15.7±1.3 mm one month postoperatively and 15.2±1.5 mm one year postoperatively. The area measured 200.7±33.5 mm² preoperatively, 251.7±41.2 mm² one month postoperatively and 248.8±42.3 mm² one year postoperatively. We next analyzed the relationship between the amount of notchplasty and regrowth. The amount of notchplasty of the lateral diameter was 3.1±1.4 mm (range, 1.4-5.7 mm) and the amount of regrowth was 0.4±0.5 mm (range, 0.05-1.2 mm), thus, the mean increase calculated as the proportion of the amount of regrowth to the amount of notchplasty was 22.6% (range, 0.1-53.2%). In relationship to height, the amount of notchplasty was 1.4±0.5 mm (range, 0.5-2.1 mm) and the amount of regrowth was 0.5±0.2 mm (range, 0.1-0.8 mm resulting in a mean increase of 42.7% (range, 3.9-66.1%). No correlation was observed between the amount of notchplasty and the amount of regrowth in the lateral diameter or the height.

Conclusion:
Bone regrowth in the intercondylar notch was moderate one year after notchplasty. No correlation was observed between the amount of notchplasty and amount of regrowth.

E-poster #344
Stress Inside Grafts Used for 2-bundle Anterior Cruciate Ligament Reconstruction
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INTRODUCTION: Initial tension applied to the anterior cruciate ligament (ACL) graft is thought to influence graft remodeling, and has been discussed. Although the initial tension can be controlled in clinical situation, it is unknown how much stress exists inside transplanted grafts. Especially in case of 2-bundle ACL reconstruction, difference in stress between the two bundles may compromise the clinical results. In this study, the stress within the grafts was calculated by measuring their cross sectional areas (CSAs).

METHODS: 109 patients underwent arthroscopic two-bundle ACL reconstruction using multiplied hamstring tendons with Endobutton CL for femoral fixation and with DSP (double spike plate) for tibial fixation. The CSA of the midportion of each bundle (anteromedial bundle (AMB) and posterolateral bundle (PLB)) was measured using a custom-made area micrometer. Each portion of the graft was fixed under the same tension at 40N at 20 degrees of knee flexion. Intra-graft stress was estimated by dividing the applied tension by CSA.

RESULTS: The mean CSAs of AMB and PLB were 21.8±5.8 and 19.5±5.0 mm², respectively. The mean estimated stress inside AMB was 2.0 MPa with a range from 1.0 to 3.2, while that for PLB was 2.5 MPa ranging from 1.1 to 5.6.

DISCUSSION & CONCLUSION: This study has shown that intra-graft stress is different between the two bundles, even if the same tension is applied to each one. Considering uneven stress distribution inside the grafts which should influence the graft maturation and knee kinematics, intra-graft stress should be more strictly controlled in 2-bundle ACL reconstruction.
23 cases. Presenter an isolated ACL injury in the unilateral knee were prospectively examined. All 23 underwent ACLR using hamstrings at 80 N force for graft fixation, and underwent the metal removal at a mean of 13 months after ACLR. There were 12 males and 11 females, with a mean age at ACLR of 27 years. Lateral radiographs of the knee in passive terminal extension under anesthesia were obtained at just before ACLR, at just after ACLR, and at the time of metal removal. We investigated the temporal changes in the tibial position against the femur on the lateral radiographs using computer analysis.

Results:
The mean side-to-side difference on KT-2000 in 20 degree flexion was 5.9 (SD: 2.2) mm at before ACLR, and was 1.8 (SD: 1.0) mm at metal removal. On lateral radiographs in passive terminal extension, the mean side-to-side difference in tibial position against the femur at just before ACLR, at just after ACLR, and at metal removal, was 1.8 (SD: 2.5) mm, -1.5 (SD: 2.5) mm, and 1.6 (SD: 2.9) mm, respectively. Statistical significance was not found between at just before ACLR and at metal removal. However, the side-to-side difference in tibial position at the metal removal was correlated to that at just after ACLR (r=0.57, p<0.01).

Discussion:
The findings suggested that ACLR on average over all cases did not recover a normal tibiofemoral relationship in passive terminal extension when the applied force to the graft was fixed. However, in individual cases when the tibial position at just after ACLR was sufficiently controlled, then the tibiofemoral relationship could be recovered.

E-poster #346
Isokinetic Study of Extension and Flexion Muscles Strength after Removal of the Medium Third of Patellar Tendon and of the Semitendinosus and Gracilis Muscles for the Reconstruction of Anterior Cruciate Ligament
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In order to perform a prospective study, thirty patients were randomly selected and were submitted to ACL reconstruction, so that, in twenty of them the medium third of the patellar tendon (GTP) was used and in ten, the tendons of Semitendinosus and Gracilis muscles (GSP).

In relation to the patients’ sex, in group GTP, 18 (90%) were males and 2 (10%) were female. In group GST/GR, 8 (80%) were male and 2 (20%) were female. The age ranged from 16 to 45 years old, with an average of 24 years in group GTP, and 19 to 33 years old, with an average of 27.5 years old in GST/GR. In GTP, everyone was white and in GST/GR, 9 (90%) were white and 1 (10%) weren’t white.

All tests were carried out from the sixth month on counting from the day of surgery, so that in GTP the average was 14 months and in GST/GR, 12.2 months.

Isokinetics evaluation tests with angled predetermined speed in a protocol were performed, aiming to evaluate the muscle’s strength of the operated knees compared to the normal side.

We concluded that, in both groups (GTP and GST/GR) the extension strength is more compromised and that the removal of the flexion’s muscle does not weaken the flexion strength, the reason why it happens still lacks analysis.

E-poster #347
Transtendinous Cross Pin Fixation for Soft Tissue Grafts: Mode of Fixation and Effects on the Tendon
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Introduction: Hamstring grafts have become increasingly popular for ACL reconstruction because of diminished patient morbidity associated with graft harvest but concerns remain with the mode of graft fixation. Suspensory fixation with a suture post or cortical anchoring device has potential problems of graft stretch and tunnel widening. Aperture fixation with cross pins lessens the potential for graft stretch and tunnel widening but raises concerns of direct graft damage from pins transfixing the graft. The goal of this study was to assess whether transtendinous cross pin fixation causes significant disruption of the collagen fibers of the
graft that could potentially compromise the mechanical integrity of the reconstruction. Methods: The first arm of the study utilized two cadaveric ACL reconstructions with the Rigidfix system (DePuy Mitek, Norwood, MA) to evaluate the direct effect of cross pin fixation on the gross structure of a standard four bundle semitendinosus and gracilis hamstring graft. The second arm of the study involved cross pin fixation of double-looped tibialis anterior or four-bundle hamstring grafts ex vivo. The specimens were sectioned for histological evaluation and the collagen fibers were inspected to assess whether cross pin passage had caused compression or disruption of the fibers. The effect exerted upon the collagen fibers by the cross pins was compared to that of suture that had been passed through the grafts during preparation. Results: The cadaveric knees demonstrated compression of the graft against the femoral tunnel walls during pin transfixion and no tearing, fraying, or damage to the tendons following cross pin fixation was detected. Histologic analysis demonstrated that cross pin passage resulted in near total collagen fiber compression in 2/4 hamstring grafts, compression with minor collagen tearing in 1/4 hamstring grafts and 4/4 tibialis anterior grafts, and possible predominant tearing in 1/4 hamstring grafts. Suture placement resulted in minor collagen fiber tearing in 1/3 hamstring grafts and 5/8 tibialis anterior grafts and predominant collagen tearing in 2/3 hamstring grafts and 3/8 tibialis anterior grafts. Conclusion: Transfixion of a soft tissue graft with cross pins results in graft compression within the femoral tunnel and results in minimal collagen fiber disruption that is proportionately less than that seen with suture passage. These results provide reassurance to the surgeon that cross pin fixation allows for secure graft fixation without jeopardizing the structural integrity of the graft.

E-poster #348
Manuel Leyes, Madrid, SPAIN, Presenter
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INTRODUCTION
In recent clinical, morphologic and MRI studies a regeneration potential of the semitendinosus and gracilis tendons has been observed. The aim of this study was to report two cases of successful ACL reconstruction with regenerated ST and gracilis tendons. To our knowledge there are no studies in the literature where these tendons have been harvested a second time and used for a new ACL reconstruction.

MATERIAL AND METHODS
This study included two males, ages 38 and 30, who had undergone a previous ACL reconstruction (9 and 6 years earlier) with a ST and gracilis tendon graft. Full length and thickness harvesting of the tendon grafts had been performed using a tendon stripper. Both patients ruptured their ACL graft in a sport injury. Prior to their second reconstructive procedure, they were examined by MRI and found to have regenerated ST and gracilis tendons. Both tendons were reharvested and the findings were documented macroscopically and morphologically through tendon biopsies. The reharvested tendons were used to reconstruct the ACL preserving their distal tibial insertion and fixing them proximally with staples.

RESULTS
Macroscopically the regenerated tendons had a nearly normal appearance. Both tendons had regenerated to their full thickness and length (the diameter of the tunnels was the same in the first and second ACL reconstructions). The histological evaluation showed normal tendon with some areas of irregularly arranged collagen bundles, increased fibroblastic proliferation and capillary formation. After a follow-up of 14 and 17 months, both patients have returned to their previous level of activity and their knees are stable (side to side difference less than 3 mm).

CONCLUSION
Harvesting of the ST and gracilis tendon results in full length tendon regeneration. Although the mechanical properties of this regenerated tissue are still unknown, clinically it seems appropriate for a second time ACL reconstruction.

E-poster #349
Anterior Cruciate Ligament Reconstruction: A Study of the Effect of Radiological Image Guidance on Tunnel Placement
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Yiannis Pengas
Michael J McNicholas, Cheshire, UNITED KINGDOM
Introduction
Arthroscopically assisted anterior cruciate ligament (ACL) reconstruction has become the technique of choice for the majority of surgeons. There are different operative techniques to implant the graft especially concerning the method of femoral tunnel placement. Tunnel misplacement is the most common technical error which leads to graft failure. Tunnel placement is probably the single most important variable that the surgeon can influence in achieving a successful outcome.

The purpose of this study was to compare two techniques of determining the site of the femoral tunnel. The first utilising fluoroscopic intra-operative image guidance (IG) to aid in positioning of the tunnel, the second without any IG. Acceptable position for tunnel placement was decided on review of the literature and the post-operative radiographs of both groups were assessed using the method described by Amis et al (ESSKA Scientific Workshop).

Patients and Methods
From June 2001 two consecutive series of 12 patients with chronic ACL injuries had reconstruction operations by the same surgeon (the senior author). We included only patients with unilateral ACL rupture who had no previous intra-articular graft surgery. In the first group, the femoral tunnel placement was image guided, in the second no guidance was used. The post-operative radiographs were evaluated and the position of the femoral tunnel noted on the lateral radiograph.

The results were recorded onto a database (microsoft excel) and analysed.

Results and discussion
No significant difference in the position of the femoral tunnel was noted between the two groups. There was no significant difference in their clinical outcome scores. The use of IG does not significantly improve the positioning of the femoral tunnel and therefore the outcome of the surgery. The authors do not recommend its use for this purpose.

E-poster #351
Spur-like lesion on the Lateral Tibial Condyle: A Sign of Chronic Anterior Cruciate Ligament Tear
Sung Do Cho, Ulsan, KOREA, Presenter

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Introduction: Authors have found that some patients with chronic anterior cruciate ligament (ACL) tear had spur-like lesion on the lateral tibial condyle which was different from lateral capsular sign or degenerative spur. The purpose of this study is to evaluate the spur-like lesion and its significance in relation with chronic ACL tear.

Material and Method: Six patients had spur-like lesion on the lateral tibial condyle in simple roentgenogram. The location, shape, and size of the lesions were studied using anteroposterior roentgenogram and magnetic resonance imaging. The cause of primary injury, chronicity of the ACL tear and associated injury were also analyzed. All 6 patients were male and mean age was 33.8 (17 - 46) years.

Results: The spur-like lesions were located from the level of 3.8 mm in average below the articular surface of the lateral tibial condyle to the apex of the fibular head and were protruded laterally or inferolaterally from just posterior to the Gerdy’s tubercle. Their shapes were triangular with either round or sharp ends. Average length of the lesion was 6.0 mm and average width of the base, 9.2 mm. The causes of primary injury were sports trauma in 5 cases and traffic accident in one. The chronicity of the ACL tear was from 8 months to 23 years. Medial meniscus tear was associated in all cases and lateral meniscus tear, in three.

Conclusion: We suggest that a patient who has a history of trauma with the spur-like lesion on the lateral tibial condyle of the knee is expected to have chronic ACL tear and the spur-like lesion is thought to be a healed Segond’s fracture (lateral capsular sign).

E-poster #352
Tibial Interference Screw Position in Soft Tissue ACL Graft Fixation: Biomechanical Considerations
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Concentric interference screw placement has been proposed as having potentially better biological graft integration than eccentric interference screw placement during soft tissue ACL reconstruction. The purpose of this study was to determine whether a wedge shaped concentric screw was at least equivalent to an eccentric screw in stiffness, yield load, ultimate load and mode of failure. Seven matched pairs of human cadaveric tendon in porcine tibia with titanium wedge shaped screws were randomly allocated to either the eccentric or concentric groups. Bone tunnels were drilled 45 degrees to the long axis of the tibia, akin to standard ACL reconstruction. Tendon diameter was matched to tunnel diameter and a screw 1mm larger than tunnel diameter was inserted. An Instrom machine was used to pull in the line of the tendon. Tendons were inspected after construct disassembly. The concentric screw configuration showed significantly higher stiffness ($p<0.0085$), yield load ($p<0.0135$) and ultimate load ($p<0.0075$). The mode of failure in the eccentric screw position was slippage at the screw tendon interface in all cases. In the concentric group 87.5% of cases had a breakage in the tendon and 12.5% of cases had slippage at the tendon bone interface. However, it was observed during construct disassembly that there was more macroscopic damage to the tendon substance in the concentric group. Failure was mostly by tendon breakage, which reflects the strongest fixation possible with the tendon being the weakest link in the system. Concentric interference screw fixation of soft tissue graft offers superior fixation in single pullout mode when compared to eccentric interference screw fixation.

E-poster #353
Evaluation of the Femoral Tunnel O’clock Position in Anterior Cruciate Ligament Reconstruction
Eisaku Fujimoto, Kure, Hiroshima, JAPAN, Presenter
Yoshiaki Sasashige, Kure, Hiroshima, JAPAN
Yasuji Masuda, Kure, Hiroshima, JAPAN
Takanari Hamaki, Kure, Hiroshima, JAPAN
Kurando Nakasaki, Kure, Hiroshima, JAPAN
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Recently, the femoral tunnel position of anterior cruciate ligament (ACL) reconstruction is recommended to be located at the site of attachment of the normal ACL to the femur and 2 o’clock position in the left knee is clinically and biomechanically warranted. However, there has been no reliable method to assess o’clock position of the femoral tunnel. The purposes of this study are, first to measure o’clock position of femoral tunnel precisely using 3 dimensional reconstruction from computed radiography (CT) data, and second to find the most reliable index of o’clock position using plain radiograph.

Material and Methods
Twenty two one-incision endobutton technique ACL reconstructed knees at 3 weeks after the operation are available in this study. Both CT examination and plain radiographies of a lateral and a notch view were carried out. First, the precise opening angles of femoral tunnel were measured using 3 dimensional reconstruction from CT data and its workstation, and second, the correlation with several indexes of the femoral tunnel on plain radiograph were evaluated.

Results
The average opening angle of the femoral tunnel using CT was $51.6 \pm 9.4$ degree. The average opening angle of the femoral tunnel on a notch view was $54.6 \pm 13.5$ degree, which was similar with the opening angle of the femoral tunnel using CT, although it was not so strongly correlated with the opening angle of the femoral tunnel using CT ($R= 0.462, P=0.0304$). The axis of the femoral tunnel on a notch view was the most significantly correlated with the opening angle of the femoral tunnel using CT ($R= 0.739, P<0.0001$). The position of the endobutton on a lateral view was more correlated ($42.6 \pm 25.6\%$, $R= 0.677, P=0.0005$) than the opening angle of the femoral tunnel on a notch view.

Discussion
To our knowledge, this is the first report about the measurement of the exact femoral tunnel o’clock position in ACL reconstruction using 3-dimensional software from CT data. The axis of the femoral tunnel on a notch view was the most significantly correlated with the opening angle of the femoral tunnel using CT ($55.1+9.7$ degree, $R= 0.739, P<0.0001$). The position of the endobutton on a lateral view was more correlated ($42.6+25.6\%$, $R= 0.677, P=0.0005$) than the opening angle of the femoral tunnel on a notch view.

Conclusion
A notch view provides useful information about the femoral tunnel o'clock position. The axis of the femoral tunnel on a notch view could be the most reliable index on one-incision technique ACL reconstruction.

**E-poster #354**

**Anterior Cruciate Ligament Reconstruction Using the Gracilis Tendon**

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In anterior cruciate ligament (ACL) injury, especially subacute injury, the torn ACL often remains on the tibial side. This study presents the method and early results of ACL reconstruction using a gracilis tendon alone. This method indicated when the considerable volume of the remnant of the injured ACL remains.

The gracilis tendon is folded 5 times, and is connected with extension polyester tapes at the distal and proximal ends of the tendon loop. The graft is passed through the ACL remnant, and is secured with a small metal button introduced through a small incision on the lateral thigh at the femur side. Thereafter the graft is pulled distally through the tibial tunnel and is fixed with two staples.

This method was performed in 18 cases, and we studied seven cases who had been followed for 12 months or longer. The average diameter and length of the graft were 7.6 mm and 43.4 mm, respectively. The postoperative side-to-side anterior laxity difference measured by KT2000 arthrometer at 30 lbs averaged 0.6 mm.

Good clinical results of the reconstruction with a gracilis tendon were shown in this study, so the donor site morbidity can be minimized if smaller tendon is chosen as a graft.

**E-poster #355**

**Dynamic Function After Anterior Cruciate Ligament Reconstruction is Related to Graft Type**

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Background. Anterior cruciate ligament (ACL) reconstruction is a common procedure. However, considerable debate continues as to whether the patellar tendon (PT) or the hamstring tendon (HS) graft is preferable. It is therefore important that functional differences associated with these two graft types are understood. The purpose of this study was to examine lower limb biomechanics after HS and PT ACL reconstruction.

Methods. Two experiments were conducted. In experiment 1, the gait patterns of 18 PT ACL reconstruction patients, 18 HS ACL reconstruction patients and 18 matched controls were compared. In experiment 2, single-limb landing patterns were compared between 17 PT ACL reconstruction patients, 17 HS ACL reconstruction patients, and 12 controls. For both experiments a 3-dimensional motion analysis and force plate system was used to determine sagittal plane kinematics and kinetics of the lower limb.

Results: In experiment 1 there were significant differences in the moments about the knee that related to graft type. The PT patients had a reduced external knee flexion moment at mid stance whilst the HS patients had a reduced external extension moment at terminal stance.

Experiment 2 results also showed a reduction in the external flexion moment about the operated knee for the PT group compared to both the HS and control groups.

Conclusion: These combined results suggest that there are graft specific differences in knee biomechanics following ACL reconstruction that appear to relate to the donor site.

**E-poster #356**

**Relationship Between Eccentric Contraction Strength of Knee Extensor and Joint Stability Before and After Anterior Cruciate Ligament Reconstruction**

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Hisashi Kurosawa, Tokyo, JAPAN
Shunji Takazawa, Tokyo, JAPAN
Sung-Gon Kim, Tokyo, JAPAN
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Hiroaki Seto, Tokyo, JAPAN
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Twelve men and 18 women with mean age of 22 (15-32) years who underwent anterior cruciate
ligament (ACL) reconstruction using semitendinosus muscle tendon were studied. The quadriceps strength was isokinetically measured during concentric and eccentric contractions before and after ACL reconstruction. Before surgery, the injured : un injured ratio was 72.9% for eccentric contraction, which was significantly lower than the 81.4% for concentric contraction. For postoperative muscle, the injured : un injured ratio was 98.6% for eccentric contraction and 80.6% for concentric contraction, showing better recovery of muscle strength for eccentric contraction. The reason why observation of lower muscle strength for eccentric contraction is more important than for concentric contraction in knees before ACL reconstruction may be explained by the fact that movements such as stop and turn become difficult due to ACL dysfunction. Thus, ACL deficient patients avoid exerting eccentric knee extension and contraction forces even in daily living activities. On the other hand, once the joint instability is improved by ACL reconstruction, patients do not need to avoid movements such as stop and climbing down stairs that require eccentric contraction strength. This may account for good recovery of the muscle strength for eccentric contraction.

E-poster #358
Revision Anterior Cruciate Ligament Surgery in Sports Contact Athletes.
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PURPOSE: The purpose of this study is to evaluate the results of ACL revision surgeries, analysing their indications, causes of re-rupture, preoperative studies, therapeutic plan, technical difficulties found during these surgeries and their possible solutions.

METHODS: We performed a retrospective study of the ACL revisions, operated between 1992 and 2002. Seventy-seven patients with rupture of the ACL graft underwent surgery. Seventy-four patients were male and only three females (mean age was 27 years, 16-43 y), 86% of these were contact athletes. All the patients consulted for residual instability, with or without pain and effusion, confirmed by Lachman and Pivot Shift tests. The causes of failure were studied following the Pittsburgh University (USA) criteria taking into account the following factors: technical errors, traumatic and failure in graft incorporation. The average time between the primary surgery and re-rupture was 42 months (range 3 to 10 years). In 60% of the cases (46), the graft used for the revision was hamstring autograft, and in 27% (21c) was B-PT-B autograft due to failure of the primary surgery performed with B-PT-B autograft and hamstring autograft, respectively.

RESULTS: We mainly found mixed failures, combing a 63% of traumatic factors with 59% of technical errors. The most frequent technical failure was in the positioning of the femoral bone tunnel. With an average follow-up of 6.4 years (2.2-12.2 years), we had a 92.3% of excellent and good results using Lisholm score. Stability was assessed with comparative KT-1000 max; in 96% of cases joint stability was restored. 53.2% of the series was found to be normal (0-2mm) and 42.8% was subnormal (3-5mm). A minimal difference of less than 3 degrees was observed in the extension with respect to the healthy side in 86.5% of the cases, that does not involve the revision’s final result. 87% (67c) of the patients did not present any limitation in their sports practice.

CONCLUSIONS: The success of the revision surgery begins with a thorough understanding of the causes of failure, taking into account that in most cases these are combined. Although we can obtain satisfactory stability rates with a technically appropriate procedure, the final results in revision surgery also depends on other variables such as articular cartilage and meniscal status.

E-poster #359
Arthroscopic ACL Reconstruction using Fresh-Frozen Achilles Allograft(-Clinical results, Recovery of sports activity-)
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Jin Young Park, Iksan, Chunbuk SOUTH KOREA
Churl Hong Chun, SOUTH KOREA, Presenter
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Purpose : ACL (anterior cruciate ligament) reconstruction using Achilles allograft was done for whom ACL injured person in recreational sports activity. The purpose of this study was to
evaluate the clinical results and return to their sports activity in these patients.

Materials and Methods: ACL injured 56 amateur athletes who had experienced sports 3 times a week more than 5 years, reconstructed with Achilles allograft, and it was analyzed subjective and objective parameter, Tegner scoring, Telos stress arthrometer, Lysholm Knee Scoring System and modified Feagin scoring system. The average age was 25 years old (range: 18–49), the average follow up period was 15 months (range 12–19). Morbid sports were football (29 cases), basketball (14 cases), badminton (5 cases), tennis (3 cases), squash (2 cases) and otherwise (3 cases).

Result: The mean Lysholm Knee Scoring System was improved to 88.2 from 60. Telos arthrometer in anterior stress test revealed 2.3 mm improved from 7.1 mm. The modified Feagin scoring system showed 50 cases (89%) with excellent and good results. We had obtained 12 cases (21%) of Tegner score VI, 32 cases (57%) of score V, 20 cases (35%) of score IV, 3 cases (5.3%) of score III.

Conclusion: Reconstruction of anterior cruciated ligaments can restore stability sufficient to allow sports activity in ACL injured patients, but it’s difficult to achieve normal sports activity. So we will have to solve the reasons of this dissatisfaction at furthermore.

Key Words: ACL reconstruction, Achilles allograft, Sports activity recovery

E-poster #360
A New Double Bundle Anterior Cruciate Ligament Reconstruction with Hamstrings Using the Postero medial Portal Technique
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We established a new double bundle reconstruction method for ruptured anterior cruciate ligament using the posteromedial portal technique. Reconstruction substitutes are semitendinosus (ST), and gracilis (G) tendons. ST is fixed for anteromedial bundle (AMB) in the tunnels produced on the tibia and the femur. G is fixed for posterolateral bundle (PLB) in the same tibial tunnel and the femoral tunnel created using the posteromedial portal. These procedures are performed using the inside-out technique. The posteromedial portal provides an accurate access to the PLB femoral attachment. This surgical technique can avoid the overlap of the both femoral tunnels and the destruction of the posterior cortex of the femoral lateral condyle during preparation of PLB. Both femoral tunnels can be created utilizing only one tibial bone tunnel for preparation of AMB.

E-poster #361
Elucidation of a Potentially Destabilizing Control Strategy in ACL Deficient Non-Copers
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Introduction: Most active individuals with a ruptured anterior cruciate ligament (ACL) experience knee instability and difficulty participating in physical activity (non-copers). Non-copers implement a compensatory stabilization strategy that involves reducing the range of motion and increasing co-contraction across the knee to stiffen and quasi-statically stabilize the knee. Complex neuromuscular control strategies appear to be responsible for the ability of some individuals to dynamically stabilize their knees and return to high-level activities without surgery (copers). Copers have knee kinematics and kinetics that are similar to uninjured subjects, and use phasic, targeted muscle activity to avoid functional instability. Potential copers, those individuals identified early after injury as having good potential to dynamically stabilize the injured knee, display characteristics that are intermediate between copers and non-copers. The purpose was to differentiate the dynamic knee stabilization strategies of potential copers and non-copers. Methods: Twenty subjects with ACL rupture were assigned to potential coper (n = 10) and non-coper (n = 10) groups via a screening examination. Ten active people without lower extremity injury were also tested. Knee angle, tibial position and muscle activity data were collected while subjects stood in unilateral stance on a platform that moved horizontally in an anterior direction. Analysis included the preparation for platform movement, and short-loop, intermediate reflex
and voluntary response intervals after platform movement.

Results: Non-copers showed greater knee flexion than uninjured subjects, and had a posterior tibial position and altered hamstring recruitment compared to the other groups. Potential copers demonstrated greater medial quadriceps activity while maintaining knee kinematics similar to uninjured subjects. Both potential copers and non-copers had greater co-contraction between medial hamstrings and quadriceps than uninjured subjects. All excitatory muscle activation occurred in the intermediate reflex interval.

Discussion and Conclusions: Non-copers displayed aberrant muscle recruitment that may contribute to knee instability. Potential copers maintained normal tibial position using a strategy that permits quadriceps activation without excessive anterior tibial translation. Muscle recruitment in the intermediate reflex interval suggests neuromuscular training may influence the strategies.

E-poster #363
Computer Assisted ACL Reconstruction: Results at One Year of the First 30 Cases
Guy Messerli, Geneva, SWITZERLAND, Presenter
Domizio Suva, Geneva, SWITZERLAND
Christophe Barea, Geneva, SWITZERLAND
Pierre Hoffmeyer, Geneva, SWITZERLAND
Daniel Fritschy, Geneva, SWITZERLAND
Jacques Menetrey, Geneva, SWITZERLAND
University Hospital of Geneva, Geneva, SWITZERLAND

BACKGROUND  The success of ACL reconstruction depends mainly upon the correct positioning of tibial and femoral tunnels. These tunnels are actually placed under arthroscopic view with the help of guides which may generate high variability and errors. The use of a CAOS system should improve the precision and the reproducibility in tunnel positioning. OBJECTIVE To evaluate the outcome of the first patients operated upon with the CAOS system. MATERIAL AND METHODS 30 consecutive patients (30 knees) underwent an ACL reconstruction with an autologous BPTB graft using the CAOS system. There were 27 males and 3 females, mean age 25 (15-42) years. All patients were assessed clinically and with radiographs at 6 weeks, 3, 6, and 12 months post-operatively. The clinical evaluation was performed with the IKDC 2000 score, the anterior laxity evaluated by arthrometric measurement, and the placement of tunnels assessed on radiographs using the method described by Aglietti et al. RESULTS 29 patients were graded A with the subjective and objective IKDC 2000. One patient could not be graded due to the traumatic tear of his graft sustained before the 12th post-operative month. The mean manual side to side difference measured with the KT-1000 was 1.1mm (0-3). According to Aglietti’s criteria, all tibial (mean ratio 37,2%) and femoral (mean ratio 63 5%) tunnels were correctly placed. No major complication was noted. CONCLUSIONS This study validates the use of a navigation system for ACL reconstruction. This technology is precise, reliable, applicable in operative theater, yields excellent results, and allows the correct placement of the tibial and femoral tunnels in all knees.

NB: 50 knees will be reported at the meeting, control in process

E-poster #364
Bone Tunnel Enlargement after Anterior Cruciate Ligament Reconstruction Using Femoral Cross Pin Fixation.
Takashi Ogiuchi, Saitama, JAPAN, Presenter
Ichiro Torigoe, Ageo, Saitama JAPAN
Daisuke Iwasawa, Ageo, Saitama JAPAN
Toshiro Ishibashi, Ageo, Saitama JAPAN
Takeshi Muneta, Tokyo, JAPAN
Saitama Prefectural Rehabilitation Center, Ageo, Saitama, JAPAN

Purpose: The purpose of this study was to evaluate the amount of bone tunnel enlargement that occurred after anterior cruciate ligament (ACL) reconstruction using autogenous hamstring tendons fixed with the femoral cross pin (TransFix system) and to determine the factors related with the bone tunnel enlargement and clinical results. Methods: We examined 38 knees of 37 patients who had undergone ACL reconstruction with a minimum follow-up of 1 year. ACL was reconstructed with multiplied hamstring tendons, which were fixed to femoral side with the TransFix pin and to tibial side with the soft interference screw and the suture screw. We evaluated the bone tunnel diameter of femoral and tibial side at the level of inside orifice on the radiographs. Bone tunnel enlargement over 2mm was classified in the enlarged group and we examined the correlation between bone tunnel enlargement and age, gender, distance between fixation site, pre-
and postoperative knee laxity measured by KT-1000 arthrometer and Lysholm score.

Results: Bone tunnel enlargement over 2mm was observed in 12 cases (32%) of femoral AP view and 5 cases (13%) of femoral lateral view and 3 cases (8%) of tibial AP view and 5 cases (13%) of tibial lateral view on radiographs. Four different tunnel morphologies were seen, and there were relatively many mushroom types in femoral AP view and relatively many cone types in femoral lateral view and liner type was main in tibial AP and lateral view. Average side-to-side differences measured by KT-1000 at manual maximum pull was 1.8mm and average Lysholm score was 95.0 points. We can find statistical difference in patient age between two groups, but there was no significant difference in other factors.

Conclusions: We considered that the amount and rate of bone tunnel enlargement after using the TransFix system were less as compared with that after using the Endobutton technique on past literatures. This system will be one of useful methods to decrease bone tunnel enlargement and to get better clinical outcomes.

E-poster #365
Biomechanical Evaluation of Healing Tissue of Patellar Tendon After Harvesting of Its Central Third
Carlo Fabbriciani, Rome, ITALY, Presenter
Fabio Ziranu, Sassari, ITALY
Angelino Sanna, Sassari, ITALY
Laura Deriu, Sassari, ITALY
Donatella Zarelli, Sassari, ITALY
Stefano Paris, Sassari, ITALY
Pier Damiano Mulas, Sassari, ITALY
Giuseppe Milano, Sassari, ITALY
Department of Orthopaedics - University of Sassari, Sassari, ITALY

Purpose of the study: To evaluate the mechanical properties of healing tissue of the patellar tendon (PT) after removal of its central third. Type of the study: Experimental study on animal model. Materials and Methods: Central third of the PT of the right knee was removed in 20 sheep. Animals were divided in two groups: in Group 1 the tendon defect was left open and in Group 2 it was closed. The peritenon was closed in all cases. Animals were sacrificed at 3 and 6 months. In each sample, the lateral and medial third of the operated PT were removed and a load-to-failure test (strain rate: 200 mm/min) was performed on the harvest site tissue. Central third of the contralateral PT was used as control. Mean (+SD) maximum load, yield load, stiffness and elongation at yield point were documented. Statistical analysis of results was performed to compare the results of the same group at different time intervals, the results of the two groups at each time interval, and the results of each group with the controls. We used Mann-Whitney U-test for single paired comparisons, Kruskal-Wallis test for analysis of variance, and Bonferroni test for multiple paired comparisons. Significance was assumed for p< .05. Results: Mechanical analysis showed that at 3 months, there was not significant difference between the two groups and controls for maximum load and stiffness. At 6 months, there was not significant difference between Group 1 and control group, while maximum load of Group 2 was significantly greater than Group 1 and control group. For mean stiffness, there was not significant difference between the two groups and controls.

Conclusions: Healing tissue of PT after removal of the central third was as strong and stiff as the normal tendon, six months after surgery. Closure of the defect significantly increased the strength of the healing tissue. Clinical relevance: Harvest site of PT after ACL reconstruction can be potentially reharvested for ACL revision.

• E-poster #366
Tensioning in ACL Surgery
Luigi A Pederzini, Modena, ITALY, Presenter
Massimo Tosi, Campogalliano, ITALY
Mauro Prandini, Sassuolo, ITALY
Carolina Botticella, Sassuolo, ITALY
Filippo Martini, Parma, ITALY
Casa di Cura Villa Fiorita, Sassuolo, ITALY

Purpose: to evaluate high and low tension in acl reconstructionin sheep.

Materials: 12 sheep underwent acl reconstruction (central third of patellar tendon, interference screws) using different tension before fixing the distal end of the ligament. The normal tension was calculated by Prefixing Evaluation Device (PED) and consisted in 8-10 N. 6 reconstruction were performed using 4N of tension while 6 had 24 N of tension. 2 low tension and 2 high tension were sacrificed at 1 month follow up, at 3 months and 6 months follow up. All the knees were evaluated by mri, instrum machine and istologically

Results: MRI, Instrom and histology depicted at 1 month follow up a less vacularization, more strenght and less mature picture for the high
tension reconstructions, while at 3 and 6 months follow up a better strength and a more mature histological picture was seen in the low tensioned acl.

Conclusions: results show how important is tensioning in acl surgery. Probably lower tension guarantee a better maturation of the new acl in sheep.

E-poster #368
Difference in Deep Knee Flexion After ACL Reconstruction Using ST and STG Autografts
Ramces A. Francisco, Milan, ITALY
Alberto W. Gobbi, Milan, ITALY, Presenter
OASI, Milan, ITALY

Purpose of the Study
The purpose of this prospective investigation was to document at designated intervals the changes in hamstring muscle strength in patients who have undergone ACL reconstruction using hamstring autografts. The hypothesis was that knee flexor weakness at deeper flexion angles could reveal differences in patients operated utilizing semitendinosus and gracilis compared to semitendinosus tendon only.

Materials and Methods
From October 2000 to November 2002, 51 consecutive patients diagnosed to have ACL deficient knees underwent knee reconstruction using either only the semitendinosus (ST) tendon or the semitendinosus in combination with the gracilis tendon (STG). Surgery was carried out by a single surgeon on a mean of 5 months post injury. All patients underwent a group specific rehabilitation program following the surgery. Pre-operative and post-operative evaluation included clinical and radiographic assessment. Standard knee scores were determined and computed analysis, isokinetic and functional strength tests of quadriceps and hamstring muscle strength were conducted. Statistical analysis of data was achieved using parametric/non parametric tests.

Results
Clinical data obtained demonstrated no significant difference between the two groups (p<0.05). Isokinetic tests revealed comparable quadriceps and hamstring strengths at flexion angles < 90m. Flexion angles > 90m demonstrated a significant decrease in hamstring muscle strength in both groups. Moreover, STG group demonstrated weaker hamstring strength when compared to ST group at deeper flexion angles (>90 m). STG group also displayed lesser range of active movement.

Conclusions
This investigation suggests that hamstring muscle strength and range of movement following harvest of both semitendinosus and gracilis for ACL reconstruction may have a more profound effect than what has been previously reported. This observation becomes more apparent at deeper flexion angles and therefore routine use of both tendons for reconstruction is not recommended especially in athletes engaged in activities requiring deep knee bends and hamstring strength.

E-poster #370
Septic Arthritis Following Arthroscopic Anterior Cruciate Ligament Reconstruction: A Retrospective Review and Evaluation of Long-term Outcomes
Rajshri Maheshwari, Seattle, WA, USA, Presenter
Taylor Brown, MD, Houston, TX USA
Walter Lowe, Houston, TX USA
David M Lintner, Houston, TX USA
Baylor Sports Medicine Institute, Houston, TX, USA

INTRODUCTION: Infections after ACL reconstruction are rare, and there is little data regarding long term outcome. The purpose of this study was to evaluate the long term outcome of post-operative infections after ACL reconstruction.

METHODS: 1,803 consecutive ACLR from 1994 to 1999 were reviewed. Inclusion criteria was a culture-positive intra-articular infection within 6 months of the arthroscopic ACLR. Presentation, labs, and treatment were reviewed. Patients were contacted at an average of 6.6 years (range 4.8-9.3 years) post-operatively to evaluate long-term outcomes using the modified Lysholm knee scoring scale, Activities of Daily Living Questionnaire, and Subjective IKDC Assessment. Objective testing was performed using KT-1000 arthrometry and knee radiographs.

RESULTS: There were 21 cases (1.16%) of septic arthritis. The most common organisms were coagulase negative Staphylococcus (N=12) and Staphylococcus aureus (N=5). The cases required an average of 2.0 arthroscopic debridements along with intravenous antibiotics for an average of 6.3 weeks. 8 grafts were removed and 4 underwent hardware removal. For long-term assessment, 14 (67%) patients were successfully contacted and
Lysholm, ADL, and IKDC all showed average scores poorer than those of historical controls. There was no statistically significant difference between graft type, organism (S. Aureus versus S. Epidermis), or graft retention versus removal. Of the 5 patients on whom radiographs were obtained, all showed signs of degenerative changes.

**DISCUSSION:** Patients with septic arthritis following ACL reconstruction have lower functional scores after 6 years than do those with uncomplicated ACL reconstruction.

**E-poster #371**

**Revision ACL due to Posterolateral Insufficiency**

Bent Wulff Jakobsen, Aarhus, DK DENMARK, Presenter
Svend Erik Christiansen, Aarhus C, DENMARK
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Lesion of the popliteus fibular ligament and the popliteus tendon with or without rupture of the lateral collateral ligament is often referred to as lesion of the postero-lateral corner of the knee. The postero-lateral corner is involved in 4% of all knee-ligament injuries giving an incidence of less than 0.1 per 1,000 per year. Lesion of the postero-lateral corner is often related to either rupture of the anterior or posterior cruciate ligament. Untreated lesion of the postero-lateral corner will lead to rotatory instability. Undiagnosed lesion can lead to failure of primary anterior cruciate ligament reconstruction. Of 136 revision ACL reconstructions 29 were due to postero-lateral instability. In 6 cases ligamentous insufficiency after ACL reconstruction were caused by postero-lateral instability alone, and could be treated with concomitant PLC/LCL reconstruction.

In 10 cases one or more revision ACL reconstruction had been performed prior to diagnosis of postero-lateral instability.

In revision cases ACL revision with either patella tendon-, hamstrings tendons autografts or allografts was combined with reconstruction of the postero-lateral corner. Through a lateral hockey stick approach the proximal tibia and fibula were exposed as well as the anatomical insertion points of the lateral collateral ligament and the popliteus tendon at the femoral epicondyle. Drill-holes through head of fibula, proximal tibia and femur were done and a reconstruction of the lateral collateral and the popliteus tendon with semitendinosus and gracilis graft was performed.

Patients were evaluated with IKDC evaluation after minimum 10 months and KOOS questionnaire after 24 months. The stability according to KT1000 evaluation gained from the combined reconstruction of the postero-lateral corner and revision ACL.

**E-poster #372**

**Education and Sports Activity Level Influences Self-Reported Patient Outcomes more than age at 5 Years Post-ACL Reconstruction Using Allograft Tissue**

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John Nyland, Louisville, Kentucky USA
David N.M. Caborn, Louisville, KY USA
University of Louisville, Louisville, KY, USA

Introduction: Self-reported patient outcomes following primary ACL reconstruction using allograft tissues were compared to patient education level, sports activity level and age group classification. Methods: The Demographic, Subjective Knee Evaluation, and Current Health Assessment components of the IKDC 2000 Knee Forms, the Knee Outcome Survey Activities of Daily Living Scale and the Knee Outcome Survey Sports Activity Scale were mailed to 335 subjects at > 2 years following ACL reconstruction. Multiple regression analysis was used to analyze the influence of patient self-reported education level (1 = < high school, 2 = high school graduate, 3 = some college, 4 = college graduate, 5 = postgraduate school), sports activity level (1 = non-sporting, 2 = sporting sometimes, 3 = well-trained and frequently sporting, and 4 = highly competitive), and age group classification (1 = < 18 yrs, 2 = 19-25 yrs, 3 = 26-38 yrs, 4 = > 38 yrs). Results: Surveys were completed by 188 subjects (95 male, 93 female, 56% return). Patients were 5 ± 2.8 years post-surgery (range = 2-12 years). Time post-surgery was slightly greater for age group 1 than for group 4 (P = 0.001) but did not differ between sports activity level groups (P = 0.70) or education level (P = 0.79). Groups had similar numbers of female and male subjects based on age group (P = 0.68), education level (P = 0.39) and sports activity level (P = 0.08). Multiple regression analysis revealed that education level (beta = 0.40) and sports activity level (beta = 0.35) predicted 31.4% of Knee Outcome Survey Activities of Daily Living Scale scores. Education level (beta = 0.35) and sports activity level (beta = 0.36) predicted 27.7% of Knee Outcome Survey...
Sports Activity Scale scores. Education level (beta = 0.34) and sports activity level (beta = 0.45) predicted 32.9% of IKDC Subjective Knee Evaluation Scores (P < 0.0001). Education level (beta = 0.40), sports activity level (beta = 0.21), and age group (beta = -0.27) predicted 22.2% of IKDC Current Health Assessment Role Physical subscores (P < 0.0001). Education level (beta = 0.40), sports activity level (beta = 0.21), and age group (beta = -0.27) predicted 22.2% of IKDC Current Health Assessment Role Physical subscores (P < 0.0001). Education level (beta = 0.16) and sports activity level (beta = 0.17) predicted 5% of Role Emotional subscores (P = 0.019). Education level (beta = 0.20) and sports activity level (beta = 0.25) predicted 10% of Social Function subscores (P < 0.0001). Education level (beta = 0.28) and sports activity level (beta = 0.25) predicted 16% of Bodily Pain subscores (P < 0.0001). Education level (beta = 0.23) and sports activity level (beta = 0.30) predicted 14% of Vitality subscores. Education level (beta = 0.25) and sports activity level (beta = 0.27) predicted 13.2% of General Health subscores (P < 0.0001). Education level (beta = 0.21) predicted 4% of Mental Health subscores (P = 0.01). Conclusions: With the exception of the Role Physical subscore of the IKDC Current Health Assessment, age group classification did not influence these self-reported patient outcome measures. Education level in combination with continued participation in frequent training and competitive sporting activities had a more significant influence on self-reported patient outcomes than age.

E-poster #373
The Osseous Incorporation of Free Cancellous Bone Cylinders in the Femoral Canal: A CT Based Study According to ACL-Reconstruction with Hamstring Autografts and Transfix Fixation.
Uwe Pietzner, Mesekenhagen, MV GERMANY, Presenter
Katrin Giese, Greifswald, MV GERMANY
Lutz Valker, Guetzgow, MV GERMANY
Niels Follak, Greifswald, GERMANY
Streckenbach Holger, Greifswald, MV GERMANY
Dirk Ganzer, Neubrandenburg, GERMANY
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Purpose: A bungee- or windshield wiper effect in the femoral canal in ACL reconstruction with semitendinosus and gracilis tendon under usage of various techniques has been described by several authors. Additional impaction of free cancellous bone cylinders in the femoral canal was used in order to stop this effect.

Type of Study: A retrospective non randomized study.

Methods: Twenty five male patients with an isolated ACL deficiency were examined. All patients were treated with a quadruple semitendinosus and gracilis graft using femoral Transfix fixation and additional impaction of a free cancellous bone cylinder. The postoperative reexamination was performed 8 (6-9) months after the operation. At that point in time, radiographs of the respective knee joint as well as a Computerized Tomography (CT) were conducted.

Results: Eighteen (72%) patients showed a complete resorption of the cancellous bone cylinder. The average tunnel width in this group was 12.3 (11-15) mm. Seven (28%) patients showed partially integrated cylinders. The average tunnel width in this group was 10.5 (10-12) mm. This difference was significant (p=0.003).

Noticeable was a missing correlation between radiographs and CT-findings.

Conclusions: Additive cancellous bone cylinders in the femoral canal did not fulfill the anticipated function of preventing the bungee- or windshield wiper effect respectively a stiffness increase.

Key words: Femoral Fixation - Transfix ACL Windshield Wiper Effect

E-poster #374
Donor Site Morbidity in the First Year after ACL Reconstruction Using Autografts: A Comparison between Hamstrings and Patellar Tendon.
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University Hospital of Larisa, Larisa, GREECE

Purpose: The aim of this study was to document donor site problems one year after anterior cruciate ligament (ACL) reconstruction and to compare the differences between hamstring and patellar tendon autografts.

Materials and Methods: Sixty-four patients undergoing primary arthroscopically ACL reconstruction were randomized to have a central third bone patellar tendon bone (PT) autograft (30 patients) or a doubled semitendinosus/doubled
gracilis (HS) autograft (34 patients). The postoperative rehabilitation regimen was identical for both groups. All patients were examined one year postoperatively. Objective parameters evaluated included pre and postoperative IKDC and Lysholm score, side-to-side KT-1000 maximum-manual arthrometer differences. The Shelbourne score was used to evaluate anterior knee symptoms. Loss of sensitivity in the anterior knee region postoperatively as well as scar sensitivity were also recorded.

Results: Three patients (10%) in the PT group had anterior knee symptoms while only one (3%) in the HS group. The mean Shelbourne score was 98 for the HS group and 93 for the PT group but this was not statistically significant. However, 8 patients (23%) had disturbed sensitivity in the anterior knee region in the HS group, but none in the PT group and this was statistically significant (p<0.005). Scar sensitivity was present in 3 patients (10%) in the PT group and in one (3%) in the HS group. No differences were found postoperatively between the groups regarding IKDC, Lysholm score and side-to-side KT-1000 measurements.

Conclusions: Although, not statistically significant patients in the PT group had more anterior knee symptoms and scar sensitivity, one year postoperatively. In contrast, harvesting of hamstring tendons produces significantly more sensory nerve complications in the anterior knee region than harvesting the middle third of patellar tendon. Both grafts seem to improve equally patients’ performance.

E-poster #375
Functional Outcome of ACL Revision Surgery
Misha M Hindriks, Haarlem, NETHERLANDS, Presenter
Thomas W Patt, Huizen, NETHERLANDS
Cor P van der Hart, Amsterdam, NETHERLANDS
W Jaap Willems, Bergen, NETHERLANDS
Onze Lieve Vrouwe Gasthuis, Amsterdam, NETHERLANDS

Introduction: ACL revision surgery is a demanding challenge for the experienced surgeon. The purpose of this study was to evaluate the reasons and results of revision ACL surgery with a mean 4 years follow-up (range 2 to 9).

Material and Methods: Between 1994 and 2003, 38 patients underwent ACL revision in our department. Twenty four patients returned for follow-up and underwent clinical examination, including Tegner-score, Lysholm-score, IKDC, VAS patient satisfaction, KT-1000 and pre operative X-rays. Twelve patients were lost to follow-up due to missing address (n=7) or refusal (n=5). One patient got a total knee arthroplasty and one patient died of unrelated causes. From all these patients we gathered information about reasons for ACL revision and evaluated pre operative X-rays for tunnel placement.

Results: Of the 38 patients 63% (n=24) were male and 47% (n=18) were left knees. In 55% a surgical error (n=21) was the cause for failure of reconstruction, in 50% a traumatic rupture (n=19) and in 18% (n=7) a graft failure. Almost all surgical errors were tunnel misplacements. Revision surgery was performed utilizing ipsilateral hamstrings graft in 47% (n=18), ipsilateral bptb in 11% (n=4), allograft bptb in 39% (n=15) and one allograft achillestendon.

The reviewed patients showed a Tegner-score of 7 (range 4 to 10) before trauma and at follow-up 5 (range 1 to 9). The mean Lysholm-score was 73 (range 13 to 100). The IKDC showed 4% grade A (n=1), 42% grade B (n=10), 42% grade C (n=10) and 12% grade D (n=3). The mean VAS patient satisfaction was 8 (range 4 to 10).

Conclusions: The subjective results and the return to a higher functional level are key aspects concerning ACL revision surgery. The patient satisfaction is higher than the clinical outcome. Patients undergoing revision surgery for failed primary ACL repair should nevertheless be informed about the less favourable outcome after a revision procedure.

E-poster #376
The Potential Benefit of Thermal Shrinkage for Lax Anterior Cruciate Ligaments
Richard Roach, Telford, UNITED KINGDOM, Presenter
Simon Roberts, Clutton, Cheshire, UNITED KINGDOM
Dai Rees, Oswestry, Shrops, UNITED KINGDOM
Robert Jones and Agnes Hunt Hospital, Oswestry, UNITED KINGDOM

Radiofrequency thermal shrinkage of partial anterior cruciate ligament (ACL) tears is a relatively recent treatment modality. 32 patients were reviewed with a minimum follow-up of 12 months. Cases were acute(1) or...
chronic(31), involving either native or reconstructed ligaments. Failures overall occurred in 28% (9/32) but in particular 56% of reconstructed ligaments (5/9). There was no correlation to the treatment of co-existent pathology and clinical scores remained high in successful cases, although sporting function did reduce. We conclude that despite these results the technique may avoid the necessity to proceed to reconstruction in appropriately selected, counselled and rehabilitated individuals.

E-poster #377
Analysis of Anatomical and Functional Changes of Hamstrings Muscles after ACL Reconstruction
Toru Fukubayashi, Kashiwa, Chiba JAPAN, Presenter
Yukiko Makihara, Tokyo, JAPAN
Akie Nishino, Tokyo, JAPAN
Akihiro Kanamori, Tsukuba, Ibaragi, JAPAN
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INTRODUCTION: We have previously reported that the architectural differences of the semitendinosus (ST) and gracilis (G) have an influence in the loss of deep knee flexion torque after anterior cruciate ligament (ACL) reconstruction. In this study, a detailed analysis of the anatomical and functional changes of the hamstring muscles and tendons after ACL reconstruction was performed.

METHODS: Thirteen athletes who underwent ACL reconstruction by ipsilateral ST or ST/G tendons participated in this study. Isometric knee flexion torque of both limbs at 30, 45, 60, 90 and 105 degrees were recorded with the subjects in a prone position. At the same time, the electromyography (EMG) data normalized to 50% of the maximum voluntary contraction (MVC) for the ST, semimembranosus (SM) and biceps femoris (BF) were measured. Transaxial MRI data was used to calculate the volume of the hamstring muscles as well as the proximal migration of the ST.

RESULTS: A significant decrease in torque of the reconstructed side was shown only at 90 and 105 degrees (p<0.01). Upon analysis of the MRI data, the volume of the tendon-harvested ST was significantly smaller than that of the normal (p<0.01), and the position of the muscle-regenerated tendon transition shifted 35 mm proximally on average. Moreover, there was a significant correlation between the knee flexion torque and the proximal migration rate of the regenerated ST.

DISCUSSION: Atrophy and proximal migration of the ST after tendon harvest could lead to the decrease in deep knee flexion torque. Furthermore, since the G might compensate for the function of the ST based on its anatomical features, it should be preserved at the time of ACL reconstruction.

E-poster #378
Anterior Cruciate Ligament Injury among Brazilian Indiana Population
Eduardo Telles de Menezes Stewien, Manaus, BRAZIL, Presenter
Elson Santos Melo, Manaus, BRAZIL
Mauricio Pereira, Manaus, BRAZIL
Amazonas Federal University, Manaus, BRAZIL

PURPOSE
The purpose of this study was to investigate anterior cruciate (ACL) injury among BRAZILian ticuna INDIan population in the Amazonas State.

METHODS
In August 2003 a ticuna village called Umariaçu was visited. It is located near Tabatinga city that can only be reached by boat or airplane. The village had a total population of 1443 natives. INDIans 10 to 65 years old were included in the study. The examination form of the International Knee Documentation Committee 2000 was used to determine general and ligament physical status.

RESULTS
A total of 151 ticuna INDIans fulfilled the criteria, divided into 88 (58,3%) men and 63 (41,7%) women. INDIans 10 to 65 years old were included in the study. The examination form of the International Knee Documentation Committee 2000 was used to determine general and ligament physical status.

CONCLUSIONS
The authors believed that the higher level of ACL lesion in male BRAZILian INDIans was determined by cultural issues and the isolation of this population was critical for the lack of diagnosis and treatment of these lesions.

E-poster #379
Endoscopic Anterior Cruciate Ligament Reconstruction using Fluoroscopic Navigation System

Hisatada Hiraoka, Saitama, JAPAN, Presenter
So Kuribayashi, Tokyo, JAPAN
Yoshinari Miyamoto, Tokyo, JAPAN
Takumi Nakagawa, Tokyo, JAPAN
Takehiro Matsubara, Tokyo, JAPAN
Akira Fukuda, Tokyo, JAPAN
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We employed a newly developed fluoroscopy based navigation system for endoscopic ACL reconstruction surgery to realize ideal graft placement. With the aid of computer technology, the system navigates surgical instruments in a real time manner during surgery. Antero-posterior and lateral fluoroscopic images of the knee at full joint extension are obtained at the beginning of the surgery, and the system displays the predicted positions of the tibial bone tunnel and the graft rout on these images before placement of a guide pin for the tunnel. Because the virtual images for the tunnel and the graft are displayed on the true antero-posterior and lateral knee images of full joint extension irrespective of the actual knee position, the surgeon can easily place the tunnel at the optimal location without roof impingement. Since the obtained knee images were loaded onto the system prior to the reconstruction procedure, use of fluoroscopy was not necessary during the surgery. Using this system, thirty-two ACL reconstructions were performed so far. Of these patients, eight knees of eight patients whose follow-up time was more than twelve months were evaluated about the locations of tibial tunnels and grafts by X-p and MRI at one year after surgery. Results: Lateral X-p and MRI obtained at the maximally extended knee position revealed that the grafts were located at the predicted positions and roof impingement was completely avoided in all the knees. The optimal location of the tibial tunnel was confirmed by radiographic measurement: the ratio of the distance between Blumensaat’s line and the anterior edge of the tibial tunnel at the level of the tibial plateau against antero-posterior width was 0.8 ± 1.2 %, and the angle between the Blumensaat’s line and the axis of the tibial tunnel was 3.4 ± 2.2 degrees. T2 weighted MR images have shown that the graft was placed close to and in parallel with the intercondyler roof and they were depicted as low signal bands in all the patients at 1 year after the surgery. Corresponding to these results, the outcome of the surgery at one year was satisfactory: all the patients had resumed full range of motion, and the average anterior laxity measured by KT-2000 was 1.2 mm. Conclusions: The application of fluoroscopic navigation system in endoscopic ACL reconstruction enables precise control of the tibial tunnel location and the graft rout. Better and more consistent results can be expected with the use of the system.

E-poster #380
ACL Instability Associated with Pigmented Villonodular Synovitis- Case Report

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Pigmented Villonodular Synovitis is a relatively infrequent diagnosis (1.8 cases/million inhabitants/year), not being commonly associated with cruciate ligament instability. This is a case report of a 31 year old female athlete who has sustained an injury to the knee. ACL rupture was diagnosed Non-operative treatment was indicated and the patient developed instability and persistent effusion. Arthroscopic ACL reconstruction was performed and a synovial biopsy confirmed PVNS. This paper aims at describing the pathology, treatment options and the results achieved. In conclusion, PVNS is an infrequent diagnosis that should be considered in cases of persistent effusion while treating knee ligament injuries.
**E-poster #381**
**Gait Analysis in Well and Poor Functioning Patients with an Anterior Cruciate Ligament Deficiency**
Joanna Kvist, SWEDEN, Presenter
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Introduction: Some patients with ACL-deficiency can function well and participate in high-level sports, while others have functional limitations even during activities of daily living. We have previously found that patients, who function well after an ACL-injury, have similar static translation in the injured leg compared to poor functioning patients. However, they utilize a greater anterior translation during gait. The aim of the present study was to investigate if the anterior positioning of the tibiae in the well-functioning patients was assisted dynamically by the neuromuscular system.

Material and Method: Twenty-one patients with a unilateral ACL injury participated in the study. Twelve patients functioned well (Lysholm score >=84) and 9 patients had poor knee function (Lysholm score <84). There were no differences between the groups regarding sex, age, injured leg, concomitant injuries, time from injury to test or activity level before or after the injury recorded by the Tegner score. The patients were examined for joint moment and joint rotation during gait with the CODA motion analysis system. In addition, EMG activity of mm tibialis anterior, soleus, lateral head of gastrocnemius, v medialis, v lateralis and hamstrings was registered.

Results: At the first half of the stance phase, the well functioning patients had a greater knee extensor moment compared to the poor functioning group (p=0.048). In addition, the well-functioning group had a greater activation of m vastus medialis compared to the poor-functioning group during the whole stance phase (p=0.007). No differences were found on hip or ankle joint moment, joint rotation or EMG activity of mm tibialis anterior, soleus, lateral head of gastrocnemius, v lateralis or hamstrings.

Conclusion: Patients who functioned well had an increased knee extension moment and increased activation of muscle vastus medialis that cause anterior tibial translation, compared to patients with poor knee function. These results indicate that patients who function well after an ACL injury, use the neuromuscular system in order to stabilize the tibia in the anterior position during gait. This position may encourage functional stability. Rehabilitation that emphasizes training to stabilize the tibia in an anterior position may improve functional stability of the ACL deficient knee.

**E-poster #382**
**An Evaluation of Rotatory Instability after ACL Reconstruction: Comparison Between the Three-dimensional analyzer and the Manual Testing**
Hiroshi Takagi, Kanagawa JAPAN, Presenter
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Toshiro Yonezawa, Kanagawa, JAPAN
Hiroki Yamashita, Kanagawa, JAPAN
Akihiko Fujimoto, Kanagawa, JAPAN
Showa Univ. Fujigaoka Hosp., Yokohama, JAPAN

The purpose of this study is to evaluate antero-posterior and rotatory instability after ACL reconstruction using the patella tendon (in-side out method) and to compare the evaluation of rotatory instability by the three-dimensional analyzer (CA4000) with the evaluation by manual testing. The study assessed 20 ACL reconstructed knees: 10 males and 10 females. All patients had unilateral ACL injury. Mean age at surgery was 25.5 years and mean follow-up period was 17.6 months. We divided manual evaluation of the pivot shift test into 3 levels: (-)negative, (+/-)trace and (+)positive. Antero-posterior and rotatory instability were measured by the CA4000.

Evaluation of the pivot shift test by CA4000 (PS) was classified into 3 groups. Group1 was PS negative. Group 2 was PS positive with uneasy feeling during the pivot shift test. Group 3 was PS positive without uneasy feeling. This study showed that there were 4 knees that were PS positive in spite of no uneasy feeling during the pivot shift test. The mean PS was very small (2.3mm) in these knees, with 3 knees showing (+/-) and one knee showing (+) by manual evaluation of the pivot shift test. Besides, the mean Lysholm scores were high (93.5) in these knees. These results suggest that these patients feel very little disability for daily living and sports activity and that computerized registration of the pivot shift phenomenon was more sensitive than ordinary manual testing.

**E-poster #383**
Evaluation of Antero-posterior and Rotatory Instability after Anterior Cruciate Ligament Reconstruction

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Yujiro Mori, Kanagawa JAPAN
Hiroshi Takagi, Kanagawa JAPAN
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The purpose of this study was to dynamic evaluate the remaining knee instability after anterior cruciate ligament (ACL) reconstruction. Knee Motion Analyzer (CA4000) was used to evaluate postoperative ACL stability. Seventy-one patients who underwent ACL reconstruction by the modified over-the-top method using a Kennedy LAD reinforced patellar tendon. Twenty-five patients who had remaining knee instability after ACL reconstruction. There were 13 males and 12 females with a mean of 28 years. The results of knee instability were classified into the following three types. Type A: eight patients had both antero-posterior(A-P) instability and rotatory instability. Type B: eleven patients had only rotatory instability. Type C: six patients remained only A-P instability. The results of our study showed that remaining three types of instability after ACL reconstruction. We concluded that it was necessary to evaluate both antero-posterior stability and rotatory stability when doing the evaluation of knee stability after ACL reconstruction.

E-poster #384
Effect of Vision on Postural Sway in Anterior Cruciate Ligament Injured Knees
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Nobuhiro Abe, Okayama, JAPAN
Masuo Senda, Okayama, JAPAN
Yoshimi Katayama, Okayama, JAPAN
Hiroyuki Hashizume, Okayama, JAPAN
Hajime Inoue, Okayama, JAPAN
Okayama University graduate school, Okayama, JAPAN

Introduction: It is well known that proprioception is reduced in the ACL deficient knee. After ACL injury, the knee in some patients may suddenly give way during walking. All of the factors and their roles are not clarified. We measured and compared postural sway during one-leg standing with eyes open and closed to assess the difference between injured and non-injured leg.

E-poster #385
Endoscopic 3D Insertion Geometry of the Two Functional Bundles of the ACL.
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Jan Kooloos, Nijmegen, NETHERLANDS
Joan Luites, NETHERLANDS, Presenter
Sint Maartenskliniek, Nijmegen, NETHERLANDS

Introduction. The anterior cruciate ligament (ACL) consists of an anteromedial bundle (AMB), thight in flexion and a posterolateral bundle (PLB), tensed near extension. Restoring this functional twobundled nature through a double bundle anatomic reconstruction asks for a surgeon-oriented description of the insertion geometry from an endoscopic view.
Methods. 35 Cadaveric knees were dissected, the AMB and PLB insertion sites were marked and measured with a 3D system, as were the cartilage border on the medial wall of the lateral femoral condyle and the tibial spines and plateaus.

Positions of the mean centres on femur and tibia were calculated, relative to landmarks detectable during arthroscopy.

Results. FEMUR: The mean ACL, AMB and PLB centers are at 75%±6% of the notch depth (ND). The ACL is at 72%±9% of the notch height (NH). The AMB and PLB at 90%±12% NH and 53%±13% NH.

TIBIA: The mean ACL, AMB and PLB centers are at 36%±9% of the anterior-posterior length of the anterior intercondylar area. Relative to the distance between the tibial spines, the ACL is at 37%±13% lateral of the medial spine, the AMB and PLB at 23%±12% and 55%±13% lateral.

Conclusions. The insertion geometry of the ACL is well defined from an arthroscopic perspective in 35 cadaveric knees with respect to the AMB and PLB. With simple guidelines for the surgeon the centers of the insertions can be found within 1-3 mm.

With these results a femoral aiming device for anatomic tunnel positioning will be developed. Supported by the AO Foundation, SWITZERLAND; Grant 99-W14.

E-poster #386
Motion Analysis of One Legged Vertical Jump in Anterior Cruciate Ligament Injured Knee
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Nobuhiro Abe, Okayama JAPAN
Kazuhiro Okuda, Okayama JAPAN
Hiroyuki Hashizume, Okayama JAPAN
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INTRODUCTION
The one leg hop test is regarded as a simple and useful evaluation method for the functional performance in anterior cruciate ligament (ACL) injuries of the knee. We analyzed the results of the one leg hop test in patients to assess the functional performance using a three-dimensional motion analysis system (Elite plus, BTS, ITALY).

MATERIALS AND METHODS
We studied 4 knees in 4 patients (2 men and 2 women). Their ACL was found to be deficient by MRI, manual examination and KT2000 in 2002. Their mean age was 23 3 years old (18 to 29 years), and the mean period from the injury to the test was 7 months (4 to 11 months).

One legged vertical jump was performed on a force platform. We measured and compared the duration and height of the jump, the angle of the knee joint at takeoff and landing phases, the vertical force at landing, and the maximum flexion angle of the knee joint after landing for contralateral and ipsilateral legs. Data was analyzed using a three-dimensional motion analysis system.

RESULTS AND DISCUSSION
The duration and height of the jump in the injured side were less than in the uninjured side. The angle of the knee joint in the injured side was smaller than that in the uninjured side at takeoff and landing phases. The maximum flexion angle of the knee joint after landing in the injured side was smaller than that in the uninjured side. There was no difference in the vertical force at the landing phase between the ipsilateral and contralateral sides.

The motion analysis system allowed us to analyze additional factors during the hop test, which might expand the assessment of functional performance in ACL injuries.

E-poster #387
Supracondylar Femoral Fracture after Double-bundle Anterior Cruciate Ligament Reconstruction using Hamstring Tendons: Report of a Case
Takehiko Suginoshita, Gifu, JAPAN, Presenter
Takashi Tsukahara, Gifu, JAPAN
Yoshiaki Kusaka, Gifu, JAPAN
Hiroto Komiyama, Gifu, JAPAN
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Case report:
The patient was a 26-years-old man with a deficient left anterior cruciate ligament. We performed double-bundle anterior cruciate ligament reconstruction using hamstring tendons according to the inside-out technique in January 2003. Femoral ends of the reconstructed ligaments were fixed with end-button CLs, and tibial ends were fixed with three staples. His postoperative course was favorable. However, he collided with a tree while snowboarding on February 10, 2004, and injured his left femur. Radiographs of the left femur revealed two fractures. The proximal fracture affected 1/3 of the
The distal one was a supracondylar fracture, which was classified as AO 33-A1. The distal fracture line passed through the two bone tunnels made at the time of anterior cruciate ligament reconstruction. On February 16, we fixed the supracondylar femoral fracture with an AO plate. Subsequently, we fixed the femoral shaft using an AO antegrade intramedullary nail.

Discussion:
Femoral fracture is a rare complication after anterior cruciate ligament reconstruction. Noah reported the first case of femoral fracture related to anterior cruciate ligament reconstruction in 1992, and only three cases have been reported in the literature. But this is the first report of femoral supracondylar fracture after double-bundle anterior cruciate ligament reconstruction using end-button CLs.

After anterior cruciate ligament reconstruction using end-button CL the bone tunnel will never undergo bony resturation, because of the presence of the artificial ligament. We believe the distal femur was mechanically weak because of the two bone tunnels and thus the patient was prove to suffer a supracondylar fracture.

E-poster #388
Allograft Reconstruction of the Anterior Cruciate Ligament: Comparison with Patellar Tendon
Metin Lutfi Baydar, Isparta, TURKEY, Presenter
Hijseyin Yorgancigil, Isparta, TURKEY
Ozgur Ozer, Isparta, TURKEY
Suleyman Demirel University, Isparta, TURKEY

PURPOSE: The study goal was to determine the results of allograft anterior cruciate ligament (ACL) reconstruction and to compare them with the cases in whom autogenous bone-patellar tendon was used. TYPE OF STUDY: Retrospective review. METHOD: In our clinic arthroscopic ACL reconstructions were started with using autogenous bone-patellar tendon. Then, with advent of allografts as an effective source of ACL graft material, we used freeze-dried anterior tibialis tendon (ATT) allografts in this procedure. The records of a total of 68 patients with arthroscopic anterior cruciate ligament reconstruction and who were followed up for two years after the reconstruction were reviewed retrospectively. Forty-four of these patients were professional athletes and the remaining 24 were mildly trained. Follow-up period was at least 24 months (mean, 48.6 months; range, 24 to 80 months). In the latest 38 patients (mean age at surgery, 25.2 years; range, 18.1 to 32.8 years) anterior tibialis tendon allograft was used (mean follow-up, 30 months; range, 24 to 48 months). In the remaining 30 patients with longer follow-up (mean, 62 months; range, 24 to 80 months), autogenous bone-patellar tendon-bone was used as graft source. Thirty six of all patients (21 ATT group, 15 BTB group) were available for final clinical evaluation including physical examination, radiographs, and functional knee rating systems. We compared pre- and postoperative results of the two distinct techniques arthroscopic ACL reconstruction.

RESULTS: Assessment using IKDC knee scoring revealed higher percentage of patients in the ATT group, with a normal or nearly normal knee joint (81% in ATT group and 71% in BTB group). Most of the athletes in the ATT group returned to the preinjury sport and level. Postoperative instability was minimal and in the same ratios in the both groups. There was only one case of re-rupture of the ATT graft, necessitating revision with allograft again. There were more patients in the BTB group with postoperative complications including anterior knee pain (8/0 patients), quadriceps muscle atrophy (8/2 patients), arthrofibrosis (5/1 patients), patella infera (1/0 patient).

CONCLUSIONS: We believe that arthroscopic ATT allograft reconstruction is a safe and effective method to treat functional instability in the ACL deficient patient. With single-incision technique, it is less traumatic and allows sufficient graft fixation. Postoperative pain and muscle atrophy were relatively a minor problem compared to BTB autograft technique.

E-poster #395
All-inside Anterior Cruciate Ligament Reconstruction Using Patellar Tendon
Arturo Makino, Buenos Aires, ARGENTINA, Presenter
Matias Costa-Paz, Buenos Aires, ARGENTINA
Miguel Puigdevall, Buenos Aires, ARGENTINA
Miguel Angel Ayerza, Buenos Aires, ARGENTINA
D. Luis Muscolo, Buenos Aires, ARGENTINA
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Introduction: The purpose of this study was to evaluate the results of 9 patients with an arthroscopic all-inside ACL reconstruction.
Methods: Nine patients who underwent ACL reconstruction with autogenous bone-patellar tendon-bone grafts using an all-inside technique were followed-up after a mean of 29 months (range 24-65). The mean age at the time of evaluation was 28 years (range 13-45). Clinical results were evaluated using the international knee documentation committee (IKDC) and Lysholm score. A postoperative MRI was performed in all patients to evaluate the graft.

Results: Using the IKDC evaluation system, 67% of patients were classified as nearly normal knees and 33% as abnormal knees. The pivot shift was positive in 33% of patients. Fifty-five percent of patients had a KT-1000 side-to-side difference of more than 3 mm. The mean Lysholm score was 93 points. In the postoperative MRI the graft was continuous and with a homogeneous signal in 22% of patients.

Conclusion: All-inside technique offers several distinct advantages such as fixation at the original ACL insertion, tibial tunnel with no damage to the anterior cortical of the tibia and the tibial physis might not be violated in immature patients. In spite of the advantages described of this technique we consider that this procedure was technically demanding therefore limiting its use. Initial results are not encouraging enough to justify its practice in a habitual way. To our knowledge this is the first report of a series of patients evaluated with this technique. It is indicated only for strictly selected cases and must performed by surgeons with experience.

E-poster #396
Simultaneous High Tibial Osteotomy and ACL Reconstruction in Active Patients.
Matias Costa-Paz, Buenos Aires, ARGENTINA, Presenter
Arturo Makino, Buenos Aires, ARGENTINA
Miguel Angel Ayerza, Buenos Aires, ARGENTINA
Miguel Puigdevall, Buenos Aires, ARGENTINA
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Purpose: The purpose of this study was to evaluate a group of active patients, with symptomatic knee instability and varus malalignment with medial unicompartmental arthrosis, who underwent a simultaneous high tibial osteotomy and ACL reconstruction.

Methods: Twenty patients with an average age of 40 years (range 29-51) underwent arthroscopic ACL reconstruction and high tibial osteotomy in one surgical step. In all patients a lateral closing wedge and internally fixed with plate and screws was performed. Eighteen patients with a minimum two year follow-up were radiographic and clinically reviewed. Clinical evaluation was performed according to Lysholm score, Hospital for special surgery (HSS) and IKDC.

Results: Mean anatomic tibiofemoral axis was corrected from 8º of varus preoperatively to 4º of valgus at final control. Complete range of motion was obtained in all patients, however one patient required mobilization under anesthesia. Mean Lysholm score was 94 points, mean HSS 91 and IKDC evaluation showed 5 A result, 10 B results and 3 C results. Mean manual maximum KT-1000 difference to the opposite site was less than 3 mm in 12 patients, 4mm in 5 and the remaining was not evaluated due to bilateral pathology.

Discussion: Indication for high tibial osteotomy and an ACL reconstruction in young active patients with varus malalignment and symptomatic instability is controversial. A simultaneous technique is very demanding and requires precise preoperative planning and surgical timing. These results showed that most patients could expect symptomatic improvement and return to recreational activities.

E-poster #397
ACL Reconstruction with Hamstring Graft: Comparison of Two Tibial Fixation Techniques in a Prospective Randomized Study.
Philippe Lacroix, Lyon, FRANCE
Jean-Claude Imbert, Saint Etienne, FRANCE
Eric Milon, Lyon, FRANCE, Presenter
Clinique du parc, Lyon, FRANCE

E-poster #398
Specific Questionnaire for Knee Symptoms: Lysholm Knee Scoring Scale - Translation and Validation for Portuguese Language
Rozana Ciconelli, Sao Paulo, BRAZIL
Moises Cohen, Sao Paulo, BRAZIL, Presenter
Federal University OF Sao Paulo/UNIFESP, Sao Paulo, BRAZIL

Purpose: Knee disorders have various consequences for the individuals’s quality of life and functional capacity. To translate, validate and verify the measurement properties of the Lysholm Knee Scoring Scale for the Portuguese language, fifty patients with knee lesions (meniscal, anterior...
cruciate ligament, chondromalacia and arthrosis) were selected. Type of study: Transversal study. Methods: The methodology employed followed the one advocated by Guillemot et al., to the processes of translation and cultural adaptation. Specific for knee symptoms, the Lysholm Knee Scoring Scale questionnaire was translated.

Results: Patients characteristics included 29 male, 21 female, average age = 38.7 years, graduated at high school (16 patients) and at university (34 patients). Ordinal concordance and inter and intra-interviewer reproducibility were excellent (r = 0.9). Inter-interviewer nominal concordance was good (Kappa = 0.7) and intra-interviewer was excellent (Kappa=0.8). In the validation process Lysholm’s questionnaire was correlated to the numerical scale for pain (r = -0.6; p=0.001) and to Lequesne’s index (r = -0.8, p=0.001). The correlation between Lysholm’s and the overall health evaluation by the patient and therapist was poor and non-significant. The correlation between Lysholm questionnaire and the SF-36 was significant in relation to physical aspects (r = 0.4, p = 0.04), pain aspects (r= 0.5, p = 0.001) and functional capacity (r = 0.7; p= 0.001).

Conclusions: We concluded that the Lysholm knee scoring scale version for the BRAZILian culture showed reproducibility and validity for patients with meniscal, anterior cruciate ligament lesions, chondromalacia and arthrosis of the knee.

Key words: questionnaires, translation, reliability, knee injuries

E-poster #399
Quadricipital Musculature Isokinetics Evaluation in Patients with Anterior Cruciate Ligament Injury
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Alcy Vilas Boas Jr, Curitiba, Parana, BRAZIL
Marcio Hiroaki Kume, Curitiba, Parana, BRAZIL
Cassio Preiss, Curitiba, Parana, BRAZIL
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Introduction: The anterior cruciate ligament (ACL) is frequently torn in sports, propitianting instability, proprioceptive alterations and muscle hypotrophy. The instability may only be improved by surgical intervention. The second and third aspects may be previously managed, with an isokinetic evaluation of the accomitted musculature. Objective: Evaluate by isokinetics the existence of strenght loss and resistance of the quadricipital musculature in patients with chronic injury of the ACL. Material and Method: Ten patients of the masculine sex with unilateral injury of ACL, minimum evolution of 6 months and without associated injuries had been submitted to the study in a dynamometer type CYBEX 6000, evaluating both knees in relation to the maximum and average force, power, resistance and muscular deficiency index (MDI). The healthy side was considered as control group

Results: In knee flexion, the average MDI was of 18,23 (4.0 to 52.7). In extension of the knee, the average MDI was of 23.60 (5.7 to 62.1). The average value of the flexion and extension relation of the maximum torque in speed of 60º/seg in the injured side was of 62.22% (50.0 to 77.3) and in the other knee was of 56.68% (39.6 to 78.6). In the speed of 240º/seg in the injured side was of 69.16% (37 to 104.8) and in the healthy side was of 53.92% (28.5 to 77.2). Conclusions: The values of the flexion and extension balance had been more similar in the lesser speed. Concomitantly to the speed increase, an increase of the flexion and extension relation of the knee occurred, denoting a trend of the flexor grouping to come close itself to the extensor.

E-poster #400
Anterior Cruciate Ligament Injury: Two to Seven Year Follow-Up After Surgical Reconstruction
Lucio Sergio Rocha Ernlund, Curitiba, BRAZIL, Fabiano Kupczik, Curitiba, Parana, BRAZIL, Presenter
Luiz Fernando Ballao, Parana, BRAZIL
Daniel Pundek Tenius, Parana, BRAZIL
Marcio Hiroaki Kume, Parana, BRAZIL
Cleverson Sidoli, Curitiba Parana, BRAZIL
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Introduction: The anterior cruciate ligament (ACL) is crucial for the knee stability. Its injury is one of the main causes of sports related injuries. In women, the number of ACL tears had been increased in the last years. Objective: review the epidemiologic presentation and results of the ACL reconstruction surgery in a seven-year review. Material and Method: All data in our institution related to ACL reconstruction was studied. Later, it was boarded only data related to the injury of ACL in women. The IKDC protocol was used.

Results: The authors had found 987 patients 39 were selected for the study analysis. 26 patients
had been included in the inclusion criteria. Conclusions: the average of age was 27.8 years. 15 lesions were on the right side. 23 patients had ACL injury were sports related. Only 4 patients did not perform any sports daily. 18 patients had associated injuries. 9 were medial meniscus tears. The patellar tendon graft was used in 22 patients and 6 ACL injuries received hamstrings grafts. 22 patients concluded their treatment without any major complications. 3 developed patellar tendinitis and 1 patellar fracture was reported. With the IKDC evaluation protocol, 18 patients had B grade and only 2 achieved C grade.

E-poster #401
Anterior Cruciate Ligament Injury in Women
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Presenter
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Introduction: The anterior cruciate ligament (ACL) is crucial for the knee stability. Its injury is one of the main causes of sports related injuries, propitiating instability and increased risk of meniscal and condral injury. However, its evidence in the feminine sex seems not to present only an unique etiology. Objective: To focus the etiopathogenic aspects of ACL injury in women. Material and Method: An electronic research in the virtual library of our institution was carried through, through specific solicitors. They had been boarded articles related to the injury of LCA in women. Results: The authors had found 45 articles pertinent. 37 articles in english language had been selected. Conclusions: The more prevalent risk factors can be divided in hormone related, anatomical and ambient or extrinsic factors. The estrogen, the progesterone and the relaxina have influence in the ligamental looseness. Wide pelvis, a lesser muscular development of the thigh, increased flexibility and the hiper-extension, the geno valgus, the femoral anteversion, the narrower intercondilar notch and the external rotation of the tibia had been the anatomical aspects more frequently related to the etiology of the LCA injury. The sport more frequently related to the injury of LCA in women was basketball. The quality of the sports equipment, as well as the type and the conditions of the field are important extrinsic aspects to be considered. The prevention must be prioritized to minimize the genesis of ACL in women.

E-poster #402
Muscle Recruitments Evaluation with Open and Closed Kinetic Chain Exercises in Anterior Cruciate Ligament Deficient Knees
Nobuhiro Abe, Okayama-shi, Okayama JAPAN, Presenter
Takayuki Matsuo, Takahashi-shi, Okayama JAPAN
Ikuko Okada, Takahashi-shi, Okayama JAPAN
Ikuhi Dan-ura, Fukuyama-shi, Hiroshima JAPAN
Kenji Kawamura, Takahashi-shi, Okayama JAPAN
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INTRODUCTION:
Closed kinetic chain exercise is reported to be quite safe for anterior cruciate ligament (ACL) deficient knee due not to be presumably less anterior translation of tibia than isokinetic open kinetic chain (OKC) exercise because co-contractions of extensor and flexor muscles around the knee joint to be stabilized. The objective of this study was to make a new device for isokinetic CKC exercise and to evaluate the usefulness of CKC muscle exercise in comparison with that of isokinetic OKC exercise to be established the safe rehabilitation in ACL deficient knees.

PATIENTS AND METHODS:
We evaluated the 8 ACL deficient patients (2 men and 6 women, mean age 22 ±11.6 year) about the muscle strength around the knee with two isokinetic exercises. One was isokinetic OKC with CYBEX NORM (Lumex, USA) to assess the muscle strength of knee flexor and extensor in both injured and non-injured knees. The other was isokinetic CKC which was newly produced (OG Giken, JAPAN) to assess the knee torque and knee flexion angle at the maximum peak torque during pressing down on the foot plate. We also evaluated 13 healthy women (26 knees, mean age 22 year) with same methods as the control group and statistically assessed the correlation between OKC and CKC measurement of torque strength around the knee joint.

RESULTS AND DISCUSSION:
There was statistically correlation between knee extension and flexion torque in OKC and CKC exercises. In ACL deficient knees, torque strength of knee flexion and extension was significantly
reduced with OKC method in comparison with non-injured knees. In ACL deficient knees with CKC method, knee torque was also reduced because hip and ankle joint torque was increase in compensation for the decreasing knee torque and the direction angle of force on the foot plate was reduced against the axis of lower leg. It was meant that hip extensor and hamstring muscle was dominantly activated and thus to prevent the anterior translation of the tibia. This study showed that isokinetic CKC exercise was quite safe for the ACL deficient and reconstructed knees.

**E-poster #403**

**Systematic Review or Metanalysis: What to do and How to Identify Quality of Orthopaedics?**

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The systematic review is a type of study aimed at making the elaboration of guidelines and planning of clinical research easier. A great amount of results of clinical researches are adequately assembled and organized in a systematic review. Finally, meta-analysis is a rigorous statistical method but when performed in the absence of a systematic review lacks quality. It assembles under strict statistical methods, the results of two or more primary studies (Clarke, 2003).

**Objective:** To evaluate quality of on the anterior cruciate ligament

**Method:** Methodologic quality of meta-analysis was evaluated according to the Cochrane Collaboration criteria.

**Results:** Both studies ignored data bases (note that the mentioned Journals have an impact factor, for instance: Arthroscopy and American Journal of Sports Medicine) of important clinical trials, such as: LILACS, EMBASE, COCHRANE LIBRARY, etc and also included articles published only in the English language generating very important bias of selection. That is, although these journals where these reviews were published are indexed to the ISI and have a reasonable impact factor, the two systematic reviews have several methodological problems, as mentioned before.

**Conclusion:** The best systematic review, the one with the greatest validity, must include clearly all criteria and with a minimum of omission. As the systematic review is a scientific process, the methodology must be described with sufficient details to make reproducibility of the studies possible and to generate similar results. At the Cochrane Collaboration, the Systematic Reviews are published in the Cochrane Library after a rigorous process of editorial review of the protocol and complete review which are at least annually updated.

**E-poster #404**

**A Meta-Analysis of Anterior Cruciate Ligament Reconstruction Stability Rates as a Function of Hamstring Versus Bone-Patellar Tendon-Bone Graft Selection and Fixation Type**

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**Type of Study:** Meta-analysis

**Introduction:** Hamstring (HS) anterior cruciate ligament reconstruction (ACLR) has been felt to result in less morbidity but also less stability than bone-patellar tendon-bone (BTB) ACLR. However, since a quadruple HS (OHS) graft is far stronger than a 10mm BTB graft, and since modern HS fixation and tunnel healing have been shown to be as strong as for BTB, we hypothesized that OHS ACLR should produce equal or greater stability than BTB. We hypothesized that lower reported stability with HS grafts was from older, double HS (DHS) grafts with older fixation. We also hypothesized that since the fixation areas of HS grafts are viscoelastic soft tissue, unlike the bony fixation areas of BTB grafts, that friction/compressive “aperture” fixation such as interference screws would produce inferior results for HS grafts when compared to cortical and screw-post type fixation.

**Methods:** An extensive computerized medical literature search was performed for all articles dealing with anterior cruciate ligaments in humans since 1990. All clinical series using hamstring and/or bone-patellar tendon-bone autograft were selected and analyzed. Inclusion criteria included minimum twenty-four month follow-up, stratified presentation of arthrometric stability data (not just averages), and use of at least 30lb arthrometric testing (including maximum manual). The 11 DHS, 15 OHS, and 37 BTB series that met these criteria were then each
subdivided into groups according to fixation type. Arthrometric side-to-side difference data were then calculated for each group to determine <=2mm (International Knee Documentation Committee IKDC “normal”) and >5mm (IKDC “abnormal” or failed graft) rates. Meta-analytic statistical methods were then used to assess group level differences.

RESULTS: QHS ACLR using EndoButton and screw-post fixation (EBSP) had the highest average <=2mm rate, 89%, versus 74% for interference screw (IS) fixated BTB (p<0.001). This OHS group also had the lowest average failure rate, 1.75%, versus 6% for IS BTB (p=0.157). The two QHS series using interference screws had the lowest average <=2mm rate, 58%, and the highest average failure rate, 13%, of all QHS groups. DHS grafts had an average <=2mm rate of 55% and an average failure rate of 14%. This was far worse than the EBSP OHS graft rates (p<0.001 and p=0.007 respectively).

CONCLUSIONS: The recent literature suggests that QHS ACLR with EndoButton and screw-post type fixation produces the highest stability rates after ACLR, higher than BTB with interference screw fixation. For HS grafts, interference screws produced the lowest stability rates. “Aperture” fixation had no advantage versus non-aperture fixation for QHS grafts; the non-aperture EndoButton/screw-post fixation produced the highest stability. The incorrect hypothesis that HS grafts produce lower stability rates than BTB appears to derive from examination of lower stability rates from older double HS grafts often with obsolete fixation, rather than quadruple HS grafts with modern fixation.

E-poster #405
Arthroscopic and Mini Invasive ACL Reconstruction Using Iliotibial Band: Anatomic Study of a New Concept
Elias Daghe, Paris, FRANCE, Presenter
Ecole de chirurgie, Paris, FRANCE

Introduction: Iliotibial band presents many advantages in ACL reconstruction. It is largely abandoned for arthroscopic techniques using patellar or hamstrings tendons. We report a new arthroscopic and mini invasive technique for ACL reconstruction using the iliotibial band and an anatomic study which analyzes the different parameters and the feasibility of this new concept. Material and methods: This study concerned thirty cadaveric knees. After harvesting the iliotibial band graft by a minimal lateral incision, an outside-in Femoral tunnel going from the extra articular isometric point on the lateral facet of the lateral condyle to the intra articular isometric point on the medial facet of the lateral condyle was performed with a special guide. An inside-out tibial tunnel was performed by the anterolateral arthroscopic approach from the ACL tibial insertion site with a postero-medial direction. The graft was then passed intra articularly through the femoral tunnel where it was fixed with an interference screw. The last step was to pass the graft through the tibial tunnel by using a special device which allows graft tensioning and fixation. Clinical examination concerned frontal and rotatory laxity. Open exploration was then performed in order to study tunnels placements, tunnels directions and graft stability.

Results: This procedure was feasible in 29 cases. Femoral tunnel was easily performed since we had an open control on the lateral side of the condyle and an arthroscopic control for femoral tunnel performance and graft passage. Open exploration was then performed in order to study tunnels placements, tunnels directions and graft stability. Results: This procedure was feasible in 29 cases.
E-poster #406
Risk Factors Correlated with Results After Anterior Cruciate Ligament Reconstruction in 948 Patients, with a Normal Contralateral Knee
Department of Orthopaedics, Goteborg, SWEDEN

Introduction: The aim of the study was to assess the outcome after anterior cruciate ligament (ACL) reconstruction in a large group of patients.

Patients and Methods: 948 patients (323 female, 625 male) with a symptomatic unilateral ACL rupture, who underwent arthroscopic reconstruction using patellar tendon autograft and interference screw fixation at 3 Swedish hospitals were included in the study. The age of the patients at the time of the index operation was 26 (14-53) years. The patients were operated 12 (0.5-360) months after the index injury. Independent physiotherapists performed the follow-up examinations after 32 (21-117) months.

Results: 550/948 (58%) patients underwent meniscal surgery before, during or after the ACL reconstruction. The Tegner activity level was 8 (2-10) pre-injury, 3 (0-9) pre-operatively and 6 (1-10) at follow-up (p<0.0001 pre-op vs follow-up). At follow-up, the Lysholm score was 90 (14-100) points, the KT-1000 anterior side-to-side laxity difference was 1.5 (minus 6 to +13) mm and the one-leg-hop test was 95 (0-167)% compared to the contralateral normal side. At follow-up, 69.3% of the patients were classified as normal or nearly normal according to the IKDC evaluation system. However, 36% of the patients were unable or had severe problems to walk on their knees. Furthermore, inferior results correlated with increased time period between the index injury and associated injuries found at the index operation.

Discussion: Over all the results were good after ACL reconstruction using patellar tendon autograft and interference screw fixation. Concomitant joint damage and a long time period between the ACL injury and reconstruction are major risk factors for inferior outcome after ACL reconstruction.

Key words: ACL reconstruction, patellar tendon, risk factors

E-poster #407
Anatomic Double-bundle ACL Reconstruction with a Simple Femoral Fixation: Anatomic Study
Elias Dagher, Paris, FRANCE, Presenter
Bertrand Sonnery-cottet, LYON, FRANCE, Pierre Chambat, Lyon, FRANCE
Clinique Sainte Anne Lumiere, Lyon, FRANCE

Introduction: The main problem with hamstring tendons in ACL reconstruction is the low primary stability of the graft fixation. However gracilis and semitendinous tendons can present the advantage of an anatomic double-bundle reconstruction. We report a new technique which allows an anatomic double-bundle reconstruction with an easy and safe fixation and an anatomic study which analyzes the different parameters and the feasibility of this new concept.

Material and methods: This study concerned thirty cadaveric knees. The tendons were harvested and sutured together. At the femur, we performed two tunnels (at 9 and 11 o’clock directions in the frontal plane for a right knee) according to the outside-in technique and through a canula at the lateral side of the knee. At the intra-articular side the 11 o’clock tunnel arrives at the insertion site of anteromedial ACL fibers, the 9 o’clock tunnel is then performed in order to ovalise it postero-inferiorly to the insertion site of posterolateral fibres. At the tibia two convergent tunnels were performed from the harvest site incision to the ACL tibial insertion. The graft is then passed through the lateral tibial tunnel, the 9 o’clock posterior femoral tunnel, then inside the articulation through the 11 o’clock tunnel and finally the medial tibial tunnel. The two bundles were fixed by a biodegradable interference screw in each tibial tunnel and secured by suturing them together. Clinical examination concerned frontal and rotatory laxity. Open exploration was then performed in order to study tunnels placements, tunnels directions and graft stability.

Results: This procedure was feasible in 28 cases. Femoral tunnels were easily performed through the lateral canula in 23 cases. In 7 cases femoral tunnels achievement required a minimal approach of 2 cm at the lateral side of the knee. Femoral tunnels directions were judged optimal in 26 cases permitting a solid U fixation of the graft over a sufficient bone block. In 2 knees the bone block

Key words: ACL reconstruction, patellar tendon, risk factors
was not sufficient and in 2 other knees the bone block was broken. Femoral insertion of the graft was judged anatomic in 23 cases and acceptable in 4 cases. Tibial tunnels were easy to perform and provided satisfactory placements and directions in all cases. Clinical examination was satisfactory in 27 achieved procedures.

Conclusions: The four tunnels with U femoral fixation technique permits a safe and solid U fixation on the femoral side, an anatomic double-bundle reconstruction of the ACL and an independent tensioning of the anteromedial and posterolateral bundle. This procedure provides an economical and easy way to achieve an anatomic double-bundle ACL reconstruction with a satisfactory primary stability. It must be evaluated by a biomechanical study.

E-poster #408
ACL Hamstring Reconstruction. Comparison of Three Types of Tibial Fixation Devices
Fernando E Barclay, Pilar, Buenos Aires
ARGENTINA, Presenter
Santiago Butler, Buenos Aires, ARGENTINA
Jorge Cavallo, Buenos Aires ARGENTINA
Pablo Lacroze, Buenos Aires, ARGENTINA
IADT, Buenos Aires, ARGENTINA

Background:
Surgical reconstruction of the ACL is frequently performed with a quadrupled hamstring graft. Tibial fixation of this graft has been identified as the weak link of the construct.

Objective:
The purpose of this study is to retrospectively evaluate three different tibial fixation devices, and its influence in the clinical outcome.

Method:
Sixty patients underwent ACL reconstruction with quadrupled hamstring graft. Femoral fixation with a titanium crosspin device (Transfix-Arthrex) was performed in all knees. Three different types of tibial fixation were used.

Group A (20 patients, 7 female and 13 male, mean age 28.2 years +/- 8.4) were fixed with a 10mm x 35mm bioabsorbable interference screw (Delta Screw- Arthrex).

In group B (19 patients, 11 female and 8 male, mean age 29.6 +/- 10.2) a 9mm x 28mm bioabsorbable interference screw (Arthrex) plus a staple as backup fixation was used.

In Group C (21 patients, 6 female and 15 male, mean age 28.5 +/- 8.7) tibial fixation was performed with a 25mm x 9mm round threaded titanium interference screw plus a staple.

All patients were operated by the same surgical team (a compaction drilling technique was used for the tibial tunnel) and followed the same rehabilitation program. They were evaluated using Lysholm score, lachman test, anterior drawer test, pivot shift test, KT1000 arthrometric testing.

Results:
All sixty patients were available for evaluation at a mean follow up of 24 months. The results revealed no statistically significant differences with respect to clinical or instrumented laxity testing between the three groups.

Conclusions:
The different fixation systems of this study do not influence the late results of ACL reconstructions.

E-poster #409
Anatomical Description of the Anterior Cruciate Ligament Attachment with Respect to the Anteromedial and Posterolateral Bundles. Part 2: Femoral Footprint
Andrew Edwards, London, UNITED KINGDOM, Presenter
Andrew A Amis, London, UNITED KINGDOM
Anthony MJ Bull, London, UNITED KINGDOM
Imperial College, London, UNITED KINGDOM

The aim of this study was to describe the anatomical locations of the femoral attachment of the anterior cruciate ligament with respect to its anteromedial and posterolateral bundles. 22 human cadaver knees with intact anterior cruciate ligaments were included in the study. The femoral insertions of the two bundles were identified and marked. Digital photographs were then taken and these images were transferred onto computer documents. Measurements of the attachments were taken with respect to their o’clock positions parallel to the femoral long axis and parallel to the femoral intercondylar roof. The centres of the bundles were measured in a high-low and a superficial-deep manner referencing from the centre of the posterior femoral condyle, and with respect to their positions within a quadrant described for this study. The results showed the bulk of the anteromedial bundle occurred between the 11.30 and 9.30 o’clock positions and the posterolateral bundle between the 10 and 8.30 o’clock positions. Also the anteromedial bundle was found in zones 1 and 2 (20 out of 22) of the
quadrant and the posterolateral bundle in zone 7 (18 out of 22). Using the posterior condyle reference method, the centre of the anteromedial bundle was at 68.0% (SD 6.5%, range 57 - 78%) in a shallow-deep direction and 54.6% (SD 5.2%, range 44 - 62%) in a high-low direction. The posterolateral bundle was found at a distance of 56.3% (SD 8.4%, range 40 - 73%) in a shallow-deep direction, and 62.4% (SD 7.0%, range 40 - 70%) in a high-low direction.

E-poster #410
Topographical Anatomy in Anterior Cruciate Ligament Replacement Surgery in Children
Romain Seil, Luxembourg, LUXEMBOURG, Presenter
Stefan Milz, Munich, GERMANY
Alexander Gohm, Feldkirch, AUSTRIA
Dept. of Orthop. Surgery, Univ. of Saarland, Homburg / Saar, GERMANY

Introduction:
Anterior cruciate ligament replacement surgery in children is controversial. Many treatment options, including a high number of operative techniques, have been described. Among pediatric orthopaedic surgeons, the periphery of the growth plate is a structure at risk for secondary growth changes. The purpose of the present anatomical cadaver study was to analyze the relation between routinely used tibial and femoral tunnels of an intraarticular, transphyseal ACL replacement technique, the tibial and femoral growth plate and relevant soft-tissue structures around the knee.

Material and Methods:
2 cadaveric knee specimens of a 10-year old child were used. After removal of the skin and the subcutaneous tissue a 6 mm tibial and femoral tunnel was drilled. Tunnel placement was comparable to routine ACL reconstruction techniques in adults (40-50° angulation to the longitudinal axis of the tibia and femur; use of tibial and femoral drill guides). After drilling of the tunnels, the distance between both tunnel entrances on the tibia and the femur and relevant anatomical structures (growth plates, ossification groove of Ranvier, fibrous ring of LaCroix, tendon insertion areas) was measured. Finally a sagittal section was performed through the tunnels and the relation between the tunnel and the growth plate was analyzed.

Results:
Tibia: The tunnel entrance on the anteromedial side of the tibia was located in small area of 2 x 2 cm delimited by the tibial tuberosity apophysis on the lateral side, the superior border of the pes anserinus on the infero-medial side and the periphery of the proximal tibial growth plate cranially. The lesion created by the tibial tunnel was located within the centre of the growth plate. The angle between the growth plate and the tunnel axis was 85° (+/- 5°), creating a round drill injury.

Femur: The distance between the femoral tunnel entrance (corresponding to the femoral origin of the ACL) and the periphery of the posterolateral growth plate was 3.5 mm in average. The lesion of the growth plate created by the femoral tunnel was excentrically located. At the height of the growth plate the distance of the posterior tunnel wall and the periphery of the growth plate (ossification groove and fibrous ring) was 2.5 (+/- 0.5) mm. Due to the inclination of the drill guide the angle between the growth plate and the longitudinal axis of the femoral tunnel was 30° (+/- 5°). This increased the surface of the drill hole from 28.2 to 56.5 mm² (100%)

Conclusion:
A too cranial tibial tunnel entrance (injury of the periphery of the tibial growth plate) or a too lateral placement (tibial tuberosity apophysis) might have a potential of secondary growth changes after ACL replacement on the tibial side. On the femoral side a too posterior tunnel placement might cause an injury of the periphery of the growth plate. The femoral drill injury is larger than the tibial drill injury. Since drilling of the femoral tunnel is more difficult to control during surgery, the femur might be at a higher risk for secondary growth changes after ACL replacement procedures in children. Surgeons performing ACL replacements in children should be aware of the specific pediatric anatomy.

E-poster #411
Proprioception Differences in Elite Female Athletes - Implication for ACL Injury Protection
Henry Thomas Goitz, Toledo, OH, USA, Presenter
Rebecca LynnMocniak, Toledo, Ohio USA
Jennifer Metz, Cincinnati, Ohio USA
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Pam Place, Toledo, Ohio USA
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INTRODUCTION: Professional ballet dancers utilize the extremes of flexibility, coordination, postural control, and balance, giving them a proposed greater proprioception ability than their
elite athlete, non-dancer, counter parts. While women today are more likely to injure their ACL in various sports than their male counterparts, the literature supports a near absence of such injury in ballet. While a multitude of factors have been suggested, isolated proprioception differences have not been specifically studied. We evaluated a group of elite female ballet dancers and compared them to a group of female collegiate soccer players and elite gymnasts in a functional manner not previously described.

METHODS: Knee proprioception data was gathered from thirty-three collegiate soccer players, twenty-two elite gymnasts (level 8 and greater) and eight semi-professional ballet dancers, using an electrogoniometer with digital readout accuracy within one degree (Biometrics Electrogoniometer, Model ADU 301). The electrogoniometer was secured to the subjects’ dominant leg. The subject was then verbally instructed to squat/flex to a specific angle for a designated period of time and subsequently replicated the angle previously positioned. Deviations between the set angles and the reproduced angles were recorded and used to evaluate the athlete’s proprioception skills in a standing closed chain position. The protocol was carried out for a flexion range between 10° and 75° at 5° intervals, where set angles were randomly chosen.

RESULTS: The average deviation between set and reproduced angles were calculated for both male and female soccer players between 10° and 75° of flexion. Using average deviation values, a one-tailed t-test performed at each interval determined that there was no statistical difference at any angle of knee flexion between the soccer players and gymnasts, yet, when comparing the ballet dancers to both the soccer players and gymnasts, that was a statistically significant difference between the populations at multiple angles with the greatest statistical significance noted between 10 and 30 degrees of knee flexion the position where most ACL injuries are believed to occur.

CONCLUSION: Female ballet dancers when compared to collegiate soccer players and elite gymnasts exhibit statistically different proprioception abilities when measured in a closed chain, i.e., a functionally relevant position. This is particularly evident at those knee flexion angles that generally correlate with the risk of non-contact ACL injury, namely less than 30 degrees of knee flexion. It has been suggested that a reduction of proprioception ability is linked to an increased vulnerability to ACL injury. This data suggests that ballet dancers may exhibit protective mechanisms for knee ligament injury.

E-poster #412
Anterior Cruciate Ligament Replacement with Semitendinosus and Gracilis Quadruple Tendon. Femoral Fixation with New Metallic Anchor Device
Raul Gutierrez, Cochabamba, BOLIVIA, Presenter
Victor N Henriquez, Santiago, CHILE
Matias Villalba, Cordoba, ARGENTINA
Gendarmeria, Santiago, CHILE

The research was developed in the Penitentiary Hospital of Gendarmeria of CHILE, since April 2002 until April 2004. The study follow two steps: 1 - Preliminary Laboratory study: Comparative of maximum resistance at the axis traction of metallic anchor device, with technique semitendinosus and gracilis tendon fixation on wood flat preparation surface and femoral condyle of fresh frozen knee versus other fixation systems used in ACL replacement. 2 - Evaluation of 20 patients with ACL anterior instability, all males, average age 32 years (Range 26-40). Anterior laxity average translation 10.5 mm (Range 9-16). In all, consent information before, replacement of the ACL was made by using quadruple semitendinosus and gracilis tendon graft, double incision technique, fixation femoral condyle with new anchor device and tibial fixation with staple and screw. Rehabilitation protocol followed short criteria of Shelbourne and clinical evaluation was made, at one week, one month and three month intervals. Outcome: The maximum resistance at the traction axis of metallic device, measuring with knee tester digital, gave outcome over 1000 N. The clinic outcome at six months, showed reduction of the laxity in average at 5 mm (range 3-6), Articular mobility (range 120-140 degrees), effusion 0%, infection 0%. Conclusion: The preliminary outcome in a short time follow up period, gave all good results, however, at longer time follow up is need to be examined in future.
The double incision technique is easy, has low morbidity, reproduce and allow early rehabilitation.

**E-poster w/ Standard #414**

**Ten Year Follow-up of PBTB ACL-reconstruction with Emphasis of Occurrence of Osteoarthritis**

Thomas Patt, Huizen, NETHERLANDS, Presenter
Maikel Bruin, Amsterdam, NETHERLANDS
Miguel E Sewnath, Amsterdam, NETHERLANDS
Cor P van der Hart, Amsterdam, NETHERLANDS
OLVG, Amsterdam, NETHERLANDS

The Hypothesis - What is the question?
The purpose of this study was to evaluate the incidence of osteoarthritis ten years after acl-reconstruction. Does acl reconstruction have an influence on osteoarthritis of the knee?

Method - How was the question investigated?
Between March 1993 and January 1994 53 patients with acl instability were operated arthroscopically using the central third bone-patellar-tendon-bone. At minimum 10 year follow up 58% (n=31) of the patients (11 female / 20 male, 41 (26-53) years of age at follow-up, matched the including criteria (no knee ligament surgery at the contralateral side, no ipsilateral revision) and could be reached for follow-up. All patients were operated upon by one surgeon (CPvdH). Follow-up was 10 years (118-128 months) after the initial reconstruction and was done by one independent examiner. Evaluation included a patient satisfaction evaluation using a Visual Analog Scale (VAS), clinical examination (IKDC score, Tegner score, Lysholm score, KT-1000 stabilometry) and a radiological evaluation (knee AP standing, lateral and patella in 30° of flexion). X-ray evaluation, according to the classifications of Kellgren and Fairbanks, was performed by two independent examiners.

Results - What are the results?
The overall IKDC score at the 10 year follow-up demonstrated 32% IKDC A, 52% B and 16% C results. The KT 1000 arthrometer revealed 55% A (-1-2mm), 29% B (3-5mm) and 16% C (6-10 mm) stability. The Lysholm score showed satisfactory results with a mean of 91 points (range 56-100), which was also seen in the VAS (1-10) with a mean of 8.5 (range 4-10). According to the Tegner score (mean pre-op 6.8 / post-op 6.0) 52% of the patients were able to perform at the same activity level as pre-operatively, 6% could improve one level. 16% decreased one level, 13% two levels and another 13% three levels (the last group due to non-knee-related reasons).

Looking at the osteoarthritis rate 55 % decreased one grade according to the Kellgren classification, 32% two or more grades. In 13 % there was no change, compared to the contralateral side. The Fairbank classification showed increase in osteoarthritis in 52% grade 1, 35% grade 2 and 3% grade 3. 10 % had no changes 10 years after follow-up.

Conclusions
10 years after acl-reconstruction more than 60% of the patients showed only a slight increase concerning osteoarthritis. 52% could keep up the level of activity and 6% could even improve it. There was no correlation between the level of activity and occurrence of OA. The long term clinical results of acl-reconstruction are satisfactory, the occurrence of arthritis only minor to moderate based on radiographic criteria and minor based on Visual Analog Scale

**E-poster w/ Standard #415**

**Reduction of Post Operative Pain Following ACL Reconstruction Using Low Temperature Irrigation Fluid**

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Jon Borrill, Manchester, UNITED KINGDOM
Andrew Porteus, Bristol, UNITED KINGDOM
Jon Seddon-porteus, Bristol, UNITED KINGDOM
University of Melbourne, Melbourne, Victoria, AUSTRALIA

Introduction
Cold therapy is known to reduce pain and swelling after surgical procedures on the knee. We hypothesised that if cold therapy is started earlier, then there would be a reduction in pain and swelling in patients undergoing arthroscopic anterior cruciate ligament (ACL) reconstruction

Methods
We prospectively randomised 40 patients undergoing arthroscopic ACL reconstruction with hamstring autograft, to receive either room temperature (19°C) or cold (4°C) arthroscopy irrigation fluid.

Patients were then assessed over the following 7 days, with regard to pain (measured on a visual analogue scale), and swelling (measured with limb girth at 4 points
Results
Pain scores were consistently reduced in the cold fluid group compared to the room temperature group throughout the postoperative period, and this was significant (p<=0.05) at 6 hours, and from day 2 to day 7. There was no statistical difference in swelling between the two groups.

Conclusion
The use of cold irrigation fluid is a simple and safe measure by which pain can be reduced in the early post-operative period for arthroscopic ACL reconstruction.

E-poster w/ Standard #416
Articular Cartilage Changes Associated with Bony Contusions in Anterior Cruciate Ligament injury
Monika Volesky, Outremont, Quebec, CANADA, Presenter
Fawzi Al-Jassir, Montreal, Quebec, CANADA
Eric Lenczner, Montreal, Quebec, CANADA
Mark L Burman, Montreal, Quebec, CANADA
McGill University Hospital Centre, Montreal, Quebec, CANADA

Summary:
The purpose of the present study is to determine a correlation between articular cartilage changes and underlying bone contusions in ACL-deficient knees. Analysis of surgical and MRI findings in 37 knees shows that medial femoral condyle and medial tibial plateau bone contusions, present in 30% of ACL injuries, correlate strongly with articular cartilage damage, irrespective of meniscal status. Although lateral compartment bone contusions are more commonly seen following injury, we have not found this to be associated with the status of the overlying cartilage. Degenerative changes in the ACL-deficient knee are multifactorial, but medial compartment bone contusions may be an important contributor that warrants further investigation.

Full Abstract:
Purpose: Despite successful reconstruction of the anterior cruciate ligament, many patients eventually develop osteoarthritis, suggesting that something in addition to mechanical instability may contribute. The purpose of the present study is to determine a correlation between articular cartilage changes and underlying bone contusions in ACL-deficient knees.

Methods: Between January 2002 and March 2003, 68 knees consecutively underwent ACL reconstruction at our institution. Presence and location of bone contusions on MRI were noted, and correlated to presence of articular cartilage changes and meniscal pathology witnessed during surgery.

Results: Of the 68 knees operated, 31 were excluded because of either pre-existing arthritis, previous surgery, presence of multiple ligament injury, or absence of bone contusions on MRI. In the analysis of the 37 remaining knees, bone contusions were present on the medial tibial plateau and medial femoral condyle in 30%, on the lateral tibial plateau in 84%, and on the lateral femoral condyle in 73%. Articular cartilage damage is most commonly seen on the medial femoral condyle, irrespective of meniscal status. Analysis using Fisher’s Exact test shows that medial femoral condyle (p=0.026) and medial tibial plateau articular cartilage damage (p=0.011) is strongly correlated with presence of underlying bone contusions. No association was found between lateral compartment articular cartilage status and presence of bone contusions.

Conclusion: Although lateral compartment bone contusions are common following ACL injuries, we have not found an association with cartilage damage. Medial compartment bone contusions are correlated with cartilage damage and may contribute to degenerative changes in the ACL-deficient knee.

E-poster w/ Standard #417
Hamstring ACL Reconstructn: Why Sacrifice the Gracilis?
Alberto W. Gobbi, Milan, ITALY, Presenter
Ranacs A. Francisco, Milan, ITALY
Orthopaedic Arthroscopic Surgery Int., Milan, ITALY

OBJECTIVE: The purpose of this prospective randomized study was to determine if there was a difference in the clinical results of ACL reconstruction when using a semitendinosus tendon (ST) alone versus the semitendinosus and gracilis (STG) construct.

METHODS: We prospectively followed a group of 97 patients operated with either an ST graft (50) or STG graft (47). The patients were evaluated according to standard knee scales (IKDC, Noyes, Lysholm,Tegner), subjective scores, clinical
findings, a computerized knee laxity analysis and functional tests. Isokinetic flexion, extension and internal rotation-external rotation testing were also performed. Furthermore we analysed deep flexion strength. The results were subjected to statistical analysis. 

RESULTS: We did not find any significant difference between the two groups in terms of the standard knee scores, subjective assessment, clinical findings, computerized knee laxity analysis, flexion-extension and external rotation strengths as well as functional tests. We noted however that the internal rotation torque deficit was significantly higher in the STG group (p=0.039). Likewise, the external to internal rotation ratio was significantly greater (p=0.006) as well as deep flexion deficit (p = 0. 042) in the STG group.

CONCLUSION: Although there is not much clinical difference when using the ST alone versus the STG construct, internal rotation and deep flexion weakness following harvest of two tendons may need to be evaluated further. We suggest that whenever possible, only one tendon should be used in when performing ACL reconstruction with hamstring tendons.

E-poster w/ Standard #418
Analysis of the Relationship Between Knee Hyperextension and the Slope of the Intercondylar Notch Roof

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Introduction
Impingement of the ACL graft to the intercondylar notch roof has been suggested to be a cause of graft failure after ACL reconstruction. Whether the graft impinges to the roof is mainly dependent on the following three factors: 1) the position of the tibial bone tunnel, 2) the slope of the intercondylar notch roof, and 3) the degree of hyperextension. The purpose of this study was to examine the relationship between knee hyperextension and the slope of the intercondylar notch roof to determine the theoretical impingement-free tibial bone tunnel position by means of analysis of the lateral view of the uninjured knee.

Materials and Methods
A total of sixty subjects with an average age of 18.7 years (10 men and 50 women) with unilateral anterior cruciate ligament rupture were examined by fluoroscopy. Under general anesthesia after ACL reconstruction, the heel of the uninjured side was elevated 20 cm from the operation table to allow maximum hyperextension of the knee. The precise lateral view of the uninjured knee was then taken with an image intensifier with superimposition of the medial and lateral condyles. Hyperextension angle (HEA), roof-femoral angle (RFA), and roof-plateau intersection ratio (RPIR) were measured from each film. HEA was defined as the angle between the line of the anterior cortex of the femur and that of the posterior cortex of the tibia. RFA and RPIR were defined as follows according to the method reported by Buzzi et al. RFA was determined by the angle formed by the line of the roof of the notch (Blumensaat’s line) and the anterior cortex of the femur. RPIR was calculated as the following ratio: distance from the anterior margin of the tibia to the intersection between Blumensaat’s line and tibial plateau/ the sagittal width of the tibia. Simple regression analysis was used to determine the relationships between HEA and RFA, and HEA and RPIR.

Results
Mean HEA was 13.8 (range, 7 to 27), that of RFA was 40.3 (range, 30 to 54), and that of RPIR was 25.6% (range, 11% to 53%). There was a direct positive relationship between HEA and RFA (RFA=0.67*HEA+31, R=0.63, P<0.001), while no relationship was observed between HEA and RPIR (R=0.23, P=0.080). The values of RPIR of all but one knee were less than 40%, and the one knee for which RPIR was 53% had a large HEA of 24. Although the expected RFA of this knee calculated from the above formula was 47, the actual RFA was 37, which was considerably steeper than expected.

Discussion and Conclusions
The positive correlation between HEA and RFA means that a larger hyperextension angle is associated with a more horizontal intercondylar notch roof, while conversely a smaller hyperextension angle is associated with a more vertical intercondylar notch roof. As a result of this positive correlation, very few knees have a far posterior theoretical impingement-free tibial bone
tunnel position even if they have excessive hyperextension. Thus, it is appropriate to determine the tibial bone tunnel position from the intersection between the tibial plateau and Blumensaat’s line in an accurate lateral view of the uninjured knee in the majority of cases. However, in the case of knees with excessive hyperextension and a vertical intercondylar notch roof, i.e., so-called unforgiving knees, it remains to be determined how best to make the tibial bone tunnel.

E-poster w/ Standard #419
Initial Tension of Reconstructed ACL on Clinical Outcome Including MRI Findings
Masaki Sonoda, Chiba, JAPAN, Presenter
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Kan Tsuchiya, Chiba, JAPAN
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Introduction: Initial tension applied to the graft is an important factor for successful anterior cruciate ligament (ACL) reconstruction. Optimal ranges for graft tension are advised and recommended by several studies. The purpose of this study was to analyze clinical outcome including magnetic resonance image (MRI) findings with two different set forces of initial graft tension.

Materials and Methods: ACL reconstruction through use of hamstring tendons and endobutton technique were performed on 96 knees (42 male, 54 female, average age 26.9). Distal part of the graft was connected to a polyester tape and fixed to the proximal tibia using double staples with two different set forces (80N or 120N). Group I (80N) included 60 knees and Group II (120N) 36 knees. Assessment was performed at one year post surgery, including Lysholm score, IKDC score, side-to-side difference of KT-2000 (133N), and MRI findings. MRI findings of reconstructed ACL were divided into three grades; Grade I: low signal, Grade II: high signal within 50%, and Grade III: high signal over 50%.

Results: No significant differences were observed between two groups in Lysholm score. IKDC score (Grade-number) was Group I (I-54, II-6, III-0) and Group II (I-33, II-3, III-0) with no significant difference. MRI finding (Grade-number) was Group I (I-54, II-6, III-0) and Group II (I-33, II-3, III-0) with no significant difference.

Discussion and Conclusions: A previous study of hamstring grafts reported that the patients with initial tension of 80N have less laxity than those with 20N and 40N. This study indicated no significant difference in clinical outcome including MRI findings between two groups (80N and 120N) of initial tension. A relatively high initial tension may subside to an adequate tension through rehabilitation and possible clinical outcomes have demonstrated no significant difference.

E-poster w/ Standard #420
Preemptive Analgesic Effect of Valdecoxib in Arthroscopic Anterior Cruciate Ligament Reconstruction: A Randomized Controlled Trial
Felicia Li-Sher Tan, Singapore, SINGAPORE, Presenter
Pankaj Bajaj, Singapore, SINGAPORE
Amit Kanta Mitra, Singapore, SINGAPORE
Boon Keng Tay, Singapore, SINGAPORE
Cheng Shi Tham, Singapore, SINGAPORE
Paul Chang, SINGAPORE
Singapore General Hospital, Singapore, SINGAPORE

Introduction: Postoperative pain control has gained importance in the orthopaedic arena as more procedures are being performed on an outpatient basis. This study aims to assess the effect of pre-operative versus post-operative administration of a selective cyclo-oxygenase 2 (COX-2) inhibitor on pain scores and analgesia consumption after arthroscopic anterior cruciate ligament (ACL) reconstruction.

Method: Randomized, placebo-controlled, double-blind trial conducted between January 2003 through January 2004, enrolling 40 patients undergoing arthroscopic ACL reconstruction with/without partial meniscectomy at a tertiary hospital in Singapore. Patients were randomly assigned to 2 groups. The first group received Valdecoxib 40mg 2h before surgery and a placebo 15min after surgery (Preoperative group). The second group received a placebo 2h before surgery and Valdecoxib 40 mg 15min after surgery (Postoperative group).

Main Outcome Measure: Post-operative pain scores at rest and on movement using a visual analogue scale (VAS) and analgesia requirements. Results: There was significant difference in VAS at rest between the two groups at 3 hours (p=0.02).
However, there was no significant difference in VAS at rest after 3 hours. On movement, VAS was lower in the Preoperative group at 3 hours (p=0.018) and 6 hours (p=0.047) compared to the Post-operative group. Again, there was no significant difference in pain scores at 12 and 24 hours on movement. The analgesia requirement in the Post-operative group was much higher than that seen in the Pre-operative group. There were no adverse effects reported.

Conclusion: This study validates the efficacy of preemptive Valdecoxib to reduce post-operative pain and analgesia consumption after arthroscopic anterior cruciate ligament reconstruction.

E-poster w/ Standard #421
Revision Anterior Cruciate Ligament Reconstruction: The US Military Academy Experience
Darryl B. Thomas, Ft. Sam Houston, TX, USA, Presenter
Dean C. Taylor, West Point, NY USA
Keller Army Community Hospital, West Point, NY, USA

OBJECTIVES
Failure of primary anterior cruciate ligament (ACL) reconstruction, resulting in symptomatic recurrent instability, occurs in 3-10% of patients. Results of revision ACL reconstruction are generally inferior to primary reconstruction. This study was performed to determine the results of revision ACL reconstruction at our institution, and to better identify and address those factors that lead to primary ACL failure.

METHODS
Thirty-four patients who underwent revision arthroscopic ACL reconstruction were retrospectively reviewed. Grafts used for ACL revision included BTB autografts (76%), HS autografts (19%), and Achilles allografts (5%). Pre and post-operative exams included comprehensive subjective evaluation using the SANE, Tegner, Lysholm, KOOS, and IKDC scoring systems. Objective evaluation included manual laxity testing, instrumented laxity testing, isokinetic muscle testing, and functional activity testing. The average age at revision was 26 years and the average time from primary to revision surgery was 48 months. Average length of follow-up was 60 months. The results of these 34 patients were then compared to a cohort of 42 patients who underwent primary ACL reconstruction at the same institution.

RESULTS
Anterior laxity was improved in all patients. Eighty-two percent of patients had less than 5-mm side-to-side difference on arthrometric testing, and 78% had either a Grade 0 or grade 1 pivot shift. The mean Tegner score following revision ACL reconstruction was 5.4, which was significantly lower than the mean score for those following primary reconstruction, 8.5 (p<0.05). The mean SANE, Lysholm and KOOS scores following revision were 82.6, 80.2, and 81.1 points, respectively. These results were also significantly lower than those following primary surgery, 93.4, 92.6, and 93.1 points, respectively (p<0.05).

CONCLUSION
The results of revision ACL reconstruction surgery at our institution were routinely lower than the results of primary ACL reconstruction. Although patients demonstrated improved function following revision surgery, they returned to a lower activity level than patients who had a primary ACL reconstruction.

E-poster w/ Standard #422
Quantitative Evaluation of Rotational Instability During Pivot Shift Test in the ACL Deficient Knee - Discrepancy between Anterior and Rotational Instability
Masayoshi Yagi, Kobe, Hyogo, JAPAN, Presenter
Yasunobu Sunny Iwasaki, Kobe, Hyogo, JAPAN
Shinichi Yoshiya, Kobe, Hyogo, JAPAN
Seiji Kubo, Pittsburg, PA, USA
Kouichi Tanaka, Kobe, Hyogo, JAPAN
Ryosuke Kuroda, Kobe, Hyogo, JAPAN
Hirotugu Muratsu Kobe Hyogo, JAPAN
Masahiro Kurosaka Kobe Hyogo, JAPAN
Shin-Suma Hospital, Kobe, Hyogo, JAPAN

Introduction:
Previous clinical studies have reported that certain percentage of patients remain symptomatic after ACL reconstruction. One of explanations for those unsatisfactory results could be that the complex roles of the intact ACL cannot be restored by the current ACL reconstructive procedures. KT-1000 measurement is currently one of the standard methods to evaluate the
function of the ACL. However, in the evaluation of the stability, attention has not been fully paid to rotational instability, as grading of the pivot shift test greatly depends on the clinician’s subjective feel. In order to quantitatively evaluate the pivot shift test, we have developed and reported a non-invasive measurement system for knee kinematics during the pivot shift phenomenon. The purpose of our study was to examine the relationship between the results of the quantitative assessment of the pivot shift test and those of the KT-1000 evaluation in the ACL-deficient knee.

Methods:
Twelve patients with ACL deficiencies were included for the study. One experienced examiner performed the pivot shift test with the maneuver recommended by the IKDC under general anesthesia. In the kinematics analysis of the pivot shift phenomenon, three-dimensional electromagnetic sensors were attached at the distal femur, proximal and distal tibia. When the pivot shift was clinically positive, a sudden posterolateral translation of the tibia was observed. As a parameter for evaluation, the total amount of posterolateral translation of the tibia in relation to the femur was calculated. Additionally, anterior stability was also measured using KT-1000 for the same subjects, and these results were compared. Statistical analysis was performed using paired t-test.

Results:
The pivot shift phenomenon was revealed in all subjects and the total amount of posterolateral translation of the tibia ranged from 3.9 to 39.3mm (mean: 18.6±14.0mm). In the KT-1000 evaluation, the manual maximum side-to-side difference ranged from 3 to 10 mm (mean: 6.8±1.9mm), while the maximum anterior translation for injured knee by KT-1000 ranged from 15 to 24mm (mean: 17.8±2.5mm). There was no significant correlation between the side-to-side difference in the KT-1000 evaluation and the result of the quantitative assessment of the pivot shift test. By contrast, a significant correlation was demonstrated between the maximum translation value for the injured knee in the KT-1000 evaluation and the amount of abnormal tibial motion during the pivot shift test.

Conclusions:
Although the side-to-side difference in the KT-1000 evaluation has been adopted as one of the most widely used parameters for evaluation of ACL function, these results did not correlate with the extent of the rotational instability during the pivot shift test. The results of our study suggest that attention should be paid to the rotational instability as well as anterior instability in evaluation of the ACL function.

E-poster w/ Standard #423
A Thirteen-Year Review of Anterior Cruciate Ligament Injuries in Collegiate Basketball and Soccer
Julie Agel, Minneapolis, MN, USA, Presenter
Elizabeth A. Arendt, Minneapolis, MN USA
Boris Bershadsky, Minneapolis, MN USA
University of Minnesota, Minneapolis, MN, USA

Objectives: In 1995 Arendt & Dick found that the rate of anterior cruciate ligament (ACL) injury was significantly higher in female collegiate basketball and soccer players compared to males. This report was undertaken to determine if the trends reported by Arendt & Dick have continued. We reviewed the NCAA Injury Surveillance System from the 1989/1990-2001/2002 academic years to establish the trend of ACL injury and the mechanism of injury in male and female athletes.

Materials and Methods: The NCAA ISS database was reviewed for all data relating to Men and Women’s basketball and soccer anterior cruciate ligament injuries for 1990-2002. Non-contact injuries were classified as those reported to be no apparent contact, contact with the ball, or contact with the floor. Those injuries reported as occurring due to contact with another person or equipment were considered contact injuries. An injury is defined as an event requiring medical attention and resulting in restriction of the student-athletes’ participation for one or more days. Injury rates are reported per 1000 athlete-exposures. An athlete-exposure is one player participating in a game or practice where there is a possibility of an injury being sustained.

Results: We obtained a representative (15.6%) sample of NCAA schools. No significant difference was seen in basketball comparing frequency of contact versus non-contact injuries between males (70.1%) and females (75.7%). Male basketball players sustained 37 contact injuries and 78 non-contact injuries. Female basketball players sustained 100 contact injuries compared to 305 non-contact injuries. In soccer, there was a significant difference in frequency of injury for male (49.6%) and female (58.3%) athletes when comparing contact to non-contact injuries (chi-sq = 4.1, p < .05). Male soccer players sustained 72 contact injuries and 66 non-contact injuries.
Female soccer players sustained 115 contact injuries compared to 161 non-contact injuries. The magnitude of the difference in injury rates between male and female basketball players (.32-.21, p=.93) remained constant while the magnitude of the difference in the rate of injuries between male and female soccer players (.16-.21, p=.08) widened. Comparing injury within gender by sport, soccer players consistently sustained more ACL injuries than basketball players. The rate of ACL injury for male soccer players was .11 compared to .08 for male basketball players (p=.002). The rate of ACL for female soccer players was .33 and for female basketball players was .29 (p=.04). The rates for all ACL injuries for females were statistically significantly higher (p < .01) than the rates for all ACL injuries for male regardless of the sport. In soccer, the rate of all ACL injuries across the thirteen years for male soccer players significantly decreased (p = .02) while remaining constant for female.

Conclusions: In this sample of NCAA schools, the rate of ACL injury regardless of mechanism of injury, continues to be significantly higher for female collegiate athletes than for male collegiate athletes in both soccer and basketball. Despite vast attention to the discrepancy between ACL injury rates between men and women, collegiate basketball and soccer players continue to exist. Additionally, although the rate of injury for women is higher than for men, the actual rate of injury remains low and should not be a deterrent to participation in sports.

E-poster w/ Standard #424
How Does the ACL Deficient Knee Behave in Different Walking Speeds?
Tina Moraitii, Ioannina, GREECE, Presenter
Nick Stergiou, Omaha, USA
Giannis Giakas, Trikala, GREECE
Argyris Mitsou, Athens, GREECE
Anastasios Georgoulis, Ioannina, GREECE
Orthopeadic Sports Medicine Center, Medical School, Ioannina, GREECE

Introduction
Modern mathematics can estimate whether a system is periodic, random, or chaotic. Chaotic systems are complex but flexible and therefore, they can cope with an unpredictable and ever-changing environment. It has been demonstrated that variability in human gait exhibits such chaotic properties, which seem to diminish with pathology. The purpose of this study was to investigate the effect of ACL deficiency on locomotion variability under different walking speeds using chaotic dynamics.

Methods
Ten subjects with unilateral ACL deficiency, walked on a treadmill at self-selected speed, 20% faster, and 20% slower. Two minutes (120 footfalls) of continuous data were recorded in each speed with 6-camera video (50Hz). Chaotic dynamics analysis consisted of using the Surrogation method and the calculation of the Lyapunov Exponent (LyE) of the knee flexion-extension time series. Surrogation is a phase-randomization technique that determines if the fluctuations in a system’s (i.e. knee during locomotion) behavior are deterministic and it was performed on all time series. LyE measures the amount of fluctuations present in the trajectories of the time series under investigation. Small LyE means that the amount and the rate of the fluctuations within the system are also small and thus, the system is more stable. The LyE for the original time series and their surrogated counterparts were compared using Student T-tests. Two-way (Side X Speed) fully-repeated ANOVAs were also performed on group means for the LyE.

Results
We found significant differences for LyE values between the original time series and their surrogate counterparts for all subject-conditions. We also found that the ACL deficient knee exhibits significantly larger LyE than the contralateral intact knee, regardless of the walking speed. No significant differences were found for the LyE values among the three speeds. No significant interaction was present.

Discussion
Our surrogation results showed that the deterministic nature of human walking is maintained despite the absence of the ACL. Thus, the deterministic nature of locomotion is controlled not at the periphery but by the central nervous system (i.e. spinal cord). However, according to our LyE results, the loss of ACL resulted in a less stable knee when compared with the contralateral intact knee, regardless of the walking speed. These results indicated that ACL rupture may reduce the ability of the knee to resist perturbations and therefore render it less able to adjust to the unpredictable and changing environmental demands. This could probably explain the increased amount of future pathology (osteoarthritis and meniscal damage) found in
ACL deficient knees. Chaotic tools such as the LyE offer the ability to examine knee stability during dynamic activities (i.e. walking) something that is not possible with current technologies such as the KT-1000. The orthopaedic community should consider adapting them as standards to be used for the examination of dynamic functional knee stability when gait analysis is conducted.

**E-poster w/ Standard #425**

**Comparison of XtraLok® vs Intrafix® Tibial Fixation in Hamstring Anterior Cruciate Ligament Reconstruction: A Randomized Clinical Trial**

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Andrew R Pickle, Ottawa, Ontario, CANADA
Ben I Bessette, Ottawa, Ontario, CANADA
Ross Wilkinson, Ottawa, Ontario, CANADA
Geoffrey F. Dervin, Ottawa, Ontario, CANADA
Donald H Johnson, Ottawa, Ontario, CANADA
Carleton Sports Medicine Clinic, Ottawa, Ontario, CANADA

**Introduction:** Tibial fixation is currently the "weak link" in hamstring anterior cruciate ligament reconstruction.

**Purpose:** The purpose of the present study was to perform a prospective, randomized clinical comparison of two methods of tibial fixation in hamstring ACL reconstruction. The hypothesis of this study is that there is no difference in mechanical results (laxity) between the BioScrew XtraLok® (Linvatec, Largo, FL) and Intrafix® (Mitek Products, Norwood, MA) in tibial graft fixation.

**Method:** 105 sequential patients from the Ottawa Hospital undergoing arthroscopy-assisted ACL reconstruction were recruited. 3 surgeons, using identical surgical technique, were involved in the study. Inclusion criteria included: normal contralateral knee, isolated ACL injury, closed tibial physis, no previous knee surgery and ability to complete 2-year follow-up. EndoButton® (Smith & Nephew, Andover, MA) was used for femoral fixation in both groups. After drilling tunnels, a computer-generated randomization table was used to allocate patients to a study arm. The patients were assessed with IKDC scores and had KT-1000 arthrometer measurements taken at 6 weeks, and 3, 6, 9, and 12 months post-operatively by independent clinical observers.

**Results:** KT-1000 arthrometer side-to-side differences between groups at 6 weeks, and 3, 6, 9, and 12 months are not statistically significant (ANOVA).

**Discussion:** The Intrafix® device has been shown to have excellent laboratory pullout strength (Kousa P et al, AJSM 2003). The BioScrew XtraLok® compares favourably to Intrafix® in preliminary 12 month study data.

**Conclusion:** Early clinical results support the null hypothesis: Intrafix® and BioScrew XtraLok® have equal mechanical results up to one year.

**E-poster w/ Standard #426**

**Anterior Displacement in the Knee During Electrical Stimulation of a Reconstructed Anterior Cruciate Ligament**

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Yuji Uchio, Izumo, Shimane, JAPAN
Nobuyuki Kumahashi, Izumo, Shimane, JAPAN
Kenzo Kawasaki, Izumo, Shimane, JAPAN
Tadahiko Yotsumoto, Izumo, Shimane, JAPAN
Mitsuo Ochi, Hiroshima, Hiroshima, JAPAN
Shimane University School of Medicine, Izumo, Shimane, JAPAN

**Purpose:** The anterior cruciate ligament (ACL)-hamstring reflex arc has not recently been demonstrated in the normal knee but also in the ACL-reconstructed knee. We investigated anterior displacement in the knee during direct electrical stimulation of the reconstructed ACL using a KT-2000 knee arthrometer, and compared the findings to those of the normal ACL.

**Methods:** Thirty-seven patients with ACL-reconstructed knees (mean age: 30 years, average time from ACL reconstruction: 27 months) and 8 with normal ACL (mean age: 28 years) participated in this study with informed consent. The ACL was electrically stimulated using a bipolar electrode probe during arthroscopy under general anesthesia (200 stimuli, intensity: 10 mA, rate 3/s). Anterior knee laxity was examined with the knee flexed at 20° under a force of 133N applied anteriorly to the tibia using the KT-2000 knee arthrometer before electrical stimulation, during electrical stimulation, and after electrical stimulation.

**Results:** We found detectable somatosensory evoked potentials in all ligaments during direct electrical stimulation of the ligaments. The anterior displacement in normal knees during stimulation was significantly smaller than that before stimulation. The anterior displacement in
ACL-reconstructed knees during stimulation tended to be less than that before stimulation, although the difference was not statistically significant. Conclusion: These data suggest that the ACL-hamstring reflex arc in ACL-reconstructed knees may be not fully restored.

E-poster w/ Standard #427
The Variability in Accuracy of the Rolimeter in Assessing Anterior Cruciate Ligament Laxity as Tested by Users of Different Experience.
Gareth Stables, Lymm, UNITED KINGDOM, Presenter
James Arbuthnot, Warrington, Cheshire UNITED KINGDOM
Julian Hatcher, Salford, Manchester UNITED KINGDOM
Michael J McNicholas, Warrington, Cheshire UNITED KINGDOM
North Cheshire NHS Trust, Warrington, UNITED KINGDOM

Instrumented arthrometry is a widely used technique for the quantification of cruciate ligament laxity. It is used both before and after surgery. The Rolimeter knee tester (Aircast, Europe) is a tool that is used in such scenarios. It has several advantages over its cousins; it is more compact, lighter, less expensive and amenable to sterilization techniques, allowing it to be used intra-operatively. The other leading arthrometers have however had over 15 years of clinical use and their reliability has been thoroughly assessed. Balsach et al 2 and Ganko et al have already demonstrated that the Rolimeter knee tester has no significant difference in sensitivity for the diagnosis of an ACL deficient knee when compared to the KT-1000 arthrometer (MEDMetric, San Diego, CA). Muellner et al found no significant difference in the intra-tester and inter-tester results obtained on Rolimeter assessment of the knees of un-injured healthy subjects.

Our study assesses the inter-tester and intra-tester variability when the Rolimeter is applied to patients with unilateral ACL-deficient knees. It also examines whether the level of experience of the examiner influences the results in this group of patients.

Materials and Methods:
Six examiners each examined thirty-three subjects on two occasions. One examiner was medically qualified but had never performed a Lachman or anterior drawer test. Two examiners were qualified physiotherapists who routinely examined knees, but had never used a Rolimeter. One medically qualified examiner was considered to be of intermediate experience, having used the Rolimeter regularly for six months. Two examiners were regarded as expert Rolimeter users, having used the device regularly for several years (one was medically qualified and the other was a qualified physiotherapist).

For each examination a Rolimeter reading was taken three times with the knee at 30 degrees of flexion and three times at 90 degrees of flexion for both knees. The interval between examinations was at least thirty minutes. All the readings were acquired on the same day. The examiners were blinded to whether the subject was known to be ACL deficient or not.

The results of the examinations were entered onto a database (SPSS Chicago, Illinois). Repeated measures analysis of variance was used to test for the effects of the following factors; difference between examiners, reproduction of results between examinations for each examiner.

Results:
Repeated measures analysis of variance, intra class coefficients (ICC), pearson correlation coefficient (PCC) and a single tailed t-test were used to test for the following effects, reproducibility of readings (intra-tester reliability) ,differences in the readings taken by the different examiners (inter-tester reliability) and whether the rolimeter could diagnose ACL laxity > 3mm (diagnostic reliability) regardless of users experience level. There was statistically significant good inter-tester reliability with ICC > 0.9 for all measurements. PCC with r2 values > 0.6 showed good intra-tester reliability. Measurements were significantly higher in the ACL-deficient group compared to the normal knees (p<0.001) . Each user was able to detect a difference of >3mm in the ACLD group (p<0.001) . There was no significant difference between right and left knees in the control group.

Conclusion:
We have shown that the rolimeter is a reliable tool in the assessment of ACL laxity regardless of experience of the examiner.
Femoral Fixation of Patellar Tendon Graft in ACL Reconstruction. A Mechanical Analysis

Giuseppe Milano, Sassari, ITALY, Presenter
Pier Damiano Mulas, Sassari, ITALY
Donatella Zarelli, Sassari, ITALY
Stefano Piras, Sassari, ITALY
Laura Deriu, Sassari, ITALY
Angelino Sanna, Sassari, ITALY
Fabio Ziranu Sassari, ITALY
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Purpose of the study: To evaluate the mechanical properties of femur-PT graft complex in ACL reconstruction using different femoral fixation devices. Type of the study: Mechanical ex-vivo study. Material and Methods: An ACL reconstruction was performed on 40 cadaver porcine knees, using PT graft. Femoral fixation was achieved using four different fixation mechanisms: interference fixation (absorbable screw), lateral compression (Setscrew), suspension (Rigidfix), and a combination of compression and suspension (CrossPress). Other 10 knees were used as controls. On each sample, after femoral graft fixation, tibia was removed and the femur-PT graft complex underwent a mechanical evaluation consisting of a cyclic loading test (loading range: 10-150 N, strain rate: 200 mm/min), then a load-to-failure test (strain rate: 200 mm/min). Elongation after 1000 loading cycles, maximum load, yield load, stiffness, deformation at the yield point, and mode of failure were recorded. Kruskal-Wallis test was used to compare the differences between groups for each variable. A post hoc analysis with Tukey test was also carried out for all possible pairwise comparisons. Alpha level was assumed .05. Results: Cyclic loading test series showed lowest mean elongation for Setscrew (1.7 mm) and CrossPress (1.2 mm). Load-to-failure test series showed no significant differences in maximum load between CrossPress (1021.8 N) and normal ACL (1091.2 N). All other groups showed significantly lower mean maximum load, without differences between them. For mean stiffness, only absorbable screw (104.3 N/mm) was significantly lower than normal ACL (162.5 N/mm). Mode of failure was graft pullout for absorbable screw and Setscrew fixation, distal pin breakage for Rigidfix fixation, and midsubstance graft rupture for most of CrossPress fixation samples. Conclusions: Compression screw fixation (Setscrew and CrossPress) minimized PT graft elongation under cyclic loading. CrossPress fixation only showed maximum load not significantly different respect to normal ACL. Furthermore, it reduced the risk of graft pullout or hardware breakdown in comparison with other fixation devices. Significance: Combination of compression and suspension fixation mechanisms of PT graft gives structural properties of femur-graft complex similar to those of normal ACL.

Knee Proprioception Gender Differences in Collegiate Soccer

Henry Thomas Goitz, Toledo, OH, USA, Presenter
Lynsey Ebel, Toledo, Ohio USA
Rebecca Lynn Mocniak, Toledo, Ohio USA
Jeffrey B Noftz, Bowling Green, OH USA

INTRODUCTION: Women are more likely to injure their ACL than men. While a multitude of factors have been suggested, isolated proprioception differences have not been specifically studied, particularly in a functional or standing position. We evaluated collegiate female soccer players and compared them to their male counterparts in a functional manner not previously described in athletes.

METHODS: Thirty-three male and thirty-three female collegiate soccer players were included in this study. Data regarding each athlete’s proprioception skills via reproducible knee flexion angles from a standing position were collected. These angle deviations were measured with an electronic goniometer with digital readout and accuracy to within one degree (Biometrics Electrogoniometer, Model ADU301). The goniometer was secured to the subjects' dominant leg. The subject was then verbally instructed to squat/flex to a specific angle for a designated period of time and subsequently replicated the angle previously positioned. Deviations between the set angles and the reproduced angles were recorded and used to evaluate the athlete’s proprioceptive skills via reproducible knee flexion angles from a standing position were collected. These angle deviations were measured with an electronic goniometer with digital readout and accuracy to within one degree (Biometrics Electrogoniometer, Model ADU301). The goniometer was secured to the subjects’ dominant leg. The subject was then verbally instructed to squat/flex to a specific angle for a designated period of time and subsequently replicated the angle previously positioned. Deviations between the set angles and the reproduced angles were recorded and used to evaluate the athlete’s proprioceptive skills in a standing closed chain position. The protocol was carried out for a flexion range between 10 and 75 at 5 intervals, where set angles were randomly chosen.

RESULTS: The average deviation between set and reproduced angles were calculated for both male
and female soccer players between 10 and 75 of flexion. Using average deviation values, a one-tailed t-test performed at each interval determined that there was a statistically significant difference between the two populations at multiple angles with the greatest statistical significance (95% confidence level) noted between 10 and 30 degrees of knee flexion—the position where most ACL injuries are believed to occur. Moreover, there was no statistical difference between 40 and 60 degrees of knee flexion, the proportioned safe zone from ACL injury.

CONCLUSION: Women and men at the collegiate level exhibit statistically different proprioception abilities when measured in a closed chain, i.e., a functionally relevant position. This is particularly evident at those knee flexion angles that generally correlate with the risk of ACL injury, namely less than 30 degrees of knee flexion. Moreover, no statistical differences were noted between flexion angles of 40 and 60 degrees, angles associated with the least risk of ACL injury.

E-poster w/ Standard #430
Effects of Physiotherapy versus Home Based Rehabilitation on Outcomes after Anterior Cruciate Ligament Reconstruction
Erik Hohmann, Rockhampton, QLD AUSTRALIA, Presenter
Kevin Tetsworth, Brisbane, Queensland AUSTRALIA
Adam Bryant, Rockhampton, Queensland AUSTRALIA
Musculoskeletal Research Unit, CQU, Rockhampton, QLD, AUSTRALIA

Long-term outcome of anterior cruciate ligament reconstruction is dependent on surgical technique and post-operative rehabilitation. Whilst surgical techniques are well established rehabilitation protocols are largely dependent on the surgeon’s preference. Studies also suggested that non-compliant patients progressed more rapidly with fewer motion problems without compromise of knee stability and outcome. This raises the question as to the necessity of supervised rehabilitation in non-professional athletes. The purpose of this study was to establish whether there was a difference between a group of patients who underwent rehabilitation supervised by a physical therapist after anterior cruciate ligament reconstruction with a group who performed unsupervised, home based rehabilitation. Fifty ACL deficient patients underwent anterior cruciate ligament reconstruction with bone-patella tendon graft performed by the same surgeon were randomly allocated to the physical therapy or home based group. Pre and post surgery all patients were assessed up by an independent examiner. IKDC, Lysholm and Tegner scores were assessed pre-surgery, three, six, nine and twelve months post surgery. Bilateral concentric and eccentric isokinetic strength testing for the quadriceps and hamstring muscles and single leg hop tests were performed. Repeated measures of ANOVA revealed no significant differences (p<0.05) between the two groups. These results indicate that formal physical therapy with its associated expense and inconvenience does not afford any measurable advantage over unsupervised home-based rehabilitation.

E-poster w/ Standard #431
Prospective Randomized Comparison of Three ACL Techniques at 5 Years Follow-up
Maurilio Marcacci, Bologna, ITALY, Mirco MD Lo Presti, Bologna, Emilia Romagna, ITALY
Iacono MD Francesco, Bologna, ITALY
Giordano Giovanni, Bologna, ITALY
Steffano Zaffagnini, ITALY, Presenter
Istituti Ortopedici Rizzoli, Bologna, ITALY

Introduction
The purpose of this study is to compare three different techniques of ACL reconstruction and compare clinical results, radiographic findings, and advantages and disadvantages of these three different methods, analyzing which factors have much influence on the final clinical outcome.

Material and methods:
In 1998 a prospective randomized study was designed to compare three different methods of ACL reconstruction. 75 patients were included in the study because they meet the inclusion criteria. The three groups of 25 patients each were generated by alternatively select the technique to be utilized, under a previous consent of the patient.

Group 1 consisted of patients treated with bone patellar tendon bone graft fixed with interference screws. Group 2 patients had ACL reconstruction with 4 strands hamstring tendon fixed with endobutton and absorbable interference screw. Group 3 included acl reconstruction with 2 strands hamstring and an extraarticular plasty. All patients of the three groups received the same postoperative protocol with running allowed at 2
months, and sports activities after 4 months. IKDC score, Lysholm Test and Tegner score were recorded as well as the time to resume sport. KT-2000 arthrometer was also used. The mean age of the 75 patients was 29.5 years (min 15- max 50). 53 patients were male and 22 were female. The right knee was involved in 47 patients and the left in 28. Associated meniscal lesions found during the intervention were treated with partial meniscectomy and were registered.

Results:
In the first group (P.T) IKDC was in 23 cases satisfactory, as well in II group (Ham) while in III group (Ham+ lat.) 24 patients was satisfactory. Complete range of motion was obtained in the III and II group while flexion deficit was observed in the group I. Tegner score was superposable in the three group, with 90% of patients that resume sport at the same level before surgery. Tunnel enlargement was observed major in the second group. Subjective evaluation was statistically better in the third group with less time to return to sport. I group (PT) had an anterior knee pain: in 12 of 25 patients respect to only 5 and 3 respectively of the other two groups.

Conclusion:
The three techniques at 5 years has shown comparable clinical outcome. However range of motion, subjective evaluation, return to the sport activity and tunnel enlargement were better in the group with intra extraarticular plasty. Patellar tendon guarantees stability but have higher incidence of rom deficit and anterior knee pain. Extraarticular plasty as well as construction with preservation of tibial insertion allows better control of associated rotational laxities and of post-op neoligamentization process permitting good stability avoiding the morbidity of patellar tendon.

**E-poster w/ Standard #432**
**A Prospective Evaluation of Femoral Tunnel Widening in Hamstring ACL Reconstructions.**

Guillermo R. Arce, Buenos Aires, ARGENTINA, Presenter
Pablo Lacroze, Buenos Aires, ARGENTINA
Juan Pablo Previgliano, Buenos Aires, ARGENTINA
Eduardo Humberto Costanza, Buenos Aires, ARGENTINA
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**Background:** Isometric position of the femoral tunnel is the key of success in ACL reconstruction procedures. Tunnel enlargement may jeopardize long term results and revision surgery.

**Objective:** The purpose of this study was to prospectively evaluate the incidence of femoral tunnel enlargement (FTE) in two different femoral fixation devices and its influence in the clinical outcome.

**Method:** Eighty patients were prospectively selected for quadrupled hamstring ACL reconstructions. Group A was fixed with a titanium cross pin (Arthrex, Transfix) with 30 mm distance between fixation device and the Blumensaat’s line. In Group B, the hamstring graft was fixed with two bioabsorbable cross pins (Mitek, Rigid Fix) and the distance to anatomical fixation was 13 mm. Mean age, sex, DJD changes and tibial fixation devices were the same in both groups. The operated knee was radiographed the day after surgery, and at 6, 12 and 24 months post-reconstruction. The average femoral tunnel diameter was measured on AP and lateral images. The tunnel diameter was calculated and compared to the initial diameter recorded from the operative drill size. The clinical outcome was evaluated using IKDC score and KT1000 Arthrometer measurements.

**Results:** Sixty six patients were available for a 2 year follow up period (Group A: 34, Group B: 32). No significant tunnel enlargement was found in the immediate postoperative X-rays in either groups. After 6 months, the X rays demonstrated a 62% larger average diameter in group A and 49% in group B. At the one year measurements the femoral aperture diameter decreased 24% in group A and 21% in group B. No differences were recorded at the 24 months evaluation. Tunnel widening did not influence clinical outcome over a 2 year period.

**Discussion & Conclusions:** FTE does not influence the late results of ACL reconstructions. No significant differences were found between the herein femoral fixation devices but fixations nearer the anatomic ACL femoral footprint seems to have less radiographic femoral tunnel enlargement.
E-poster w/ Standard #433
Factors Affecting Athletes Ability to Return to Sports After Successful ACL Reconstruction
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Matteo G. Vitali, Milan, ITALY
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Objective
The purpose of this prospective investigation was to determine the factors affecting the patients ability to return to their previous levels of activity following ACL reconstruction.

Materials and Methods
We investigated 100 athletes who underwent ACL reconstruction with either patellar-tendon bone graft (PT) (n=50) or quadrupled semitendinosus graft (ST) (n=50). Evaluation was carried out pre-operatively and post-operatively [3, 6, 12 months and at final evaluation, average of 4 years (3-6)] using standard knee rating scales (IKDC, Lysholm, Noyes and Tegner). Pre-operative activity level was determined and compared with activity at final evaluation. Subjective evaluation was obtained with Subjective Assessment Numeric Evaluation (SANE) while activity level was scored using the Marx scale. We also developed a specific questionnaire to establish patients’ psychological profile. Muscle strength was analyzed with isokinetic tests while anterior tibial translation was evaluated using a computerized knee motion analyser (OSI CA 4000). Numeric data gathered were then subjected to statistical analysis using the U-Mann Whitney non-parametric test.

Results
Sixty-five percent of our patients were able to return to previous level of sports activity, 24% changed sports and 11% completely ceased sporting activities for different reasons. Knee scores obtained revealed: IKDC (A-63%; B-34%; C-2% and D-1%), Lysholm (90/100), Noyes (88/100), Tegner (6/10) and SANE (85/100). No significant difference was found between the 2 groups (p>0.05). Initial Isokinetic tests in flexion-extension and internal-external rotation demonstrated decreased quadriceps strength in the patellar tendon group and slight decrease in flexor strength in semitendinosus group. At 1 year no correlation was observed between Isokinetic data and among patients who returned to sports. Computerized laxity test revealed 90% to have less than 3 mm side-to-side difference. Mean scores obtained from Marx scale demonstrated statistically better scores in patients who returned to their pre-injury activity level (p<0.001). Furthermore these patients also obtained significantly better scores in the psychological evaluation (p<0.001).

Conclusions
Re-establishing normal knee kinematics after ACL reconstruction does not guarantee optimal recovery as good scores obtained from standard knee rating scales do not correlate with actual ability of patients to resume pre-injury activities. The Marx activity rating scale combined with psychological evaluation can be useful in predicting a successful return to pre-injury level of sports participation.

E-poster w/ Standard #434
Cadaveric Validation of the 65° Howell Guide for Anterior Cruciate Ligament Reconstruction
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Andrew Edwards, London, UNITED KINGDOM
Francesco Giron, Florence, ITALY
Anthony MJ Bull, London, UNITED KINGDOM
Andrew A Amis, London, UNITED KINGDOM
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Aim: to study in cadaver knees the position of the tibial tunnel in ACL reconstruction using the 65° Howell guide. This has only been inferred previously by imaging, and the guide design has changed.

Material and method: 21 fresh-frozen cadaver knees were employed. The two ACL bundles were identified and resected. The tibial attachments were marked. A Howell 65 degrees tibial guide was used. This locates in the intercondylar roof in extension to avoid impingement. After drilling a transtibial K-wire its position was photographed and defined relative to a transverse axis passing through the transverse interspinous ridge (over the top) and a sagittal axis passing through the lateral aspect of the medial spine. The percentage position of the wire within the ACL attachment was calculated, taking the posterior and medial limits as the 0% positions.

Results: all the wires were within the ACL attachment: 17 were in the ACL posterolateral bundle attachment and the other 4 in the anteromedial. The average distance of the wire from the transverse and sagittal axes was 12 mm (±SD 3 mm) anterior and 1±1 mm lateral,
respectively. The wire was positioned at 38±16% of the length of the ACL attachment and at 40±17% of the width. Eighty percent of the wires were positioned at between 35% and 48% of the attachment length.

Conclusion: the 65 Howell guide ensures anatomical positioning of the graft on the tibial side and reproducibility can be expected. It avoids roof impingement even when placed in the anteromedial bundle.

E-poster w/ Standard #435
The Short-Term Results of Lateralized Single-Route Reconstruction With a Patellar Tendon Graft and Anatomical Two-Route Reconstruction With a Hamstrings Tendon Graft to Treat Anterior Cruciate Ligament-Deficiency
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Yasuyuki Ishibashi, Hirosaki, Aomori, JAPAN
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PURPOSE: Based on recent biomechanical studies, graft placements that better restore the rotatory stability in lower flexion angle have been recommended in anterior cruciate ligament (ACL) reconstruction. One is a single-route reconstruction with a laterally placed femoral tunnel close to the insertion of the posterolateral bundle. The other is a two-route reconstruction replacing both the anteromedial and posterolateral bundles anatomically. The purpose of this study was to investigate the short-term results of lateralized single-route reconstruction (LSRR) with a patellar tendon graft and anatomical two-route reconstruction (ATRR) with a hamstrings tendon graft.

MATERIALS AND METHODS: Fifty-four ACL-reconstructed knees followed-up for more than 12 months were involved in this study. Twenty-nine patients (11 females and 18 males, average age of 22.0 years) underwent LSRR with a patellar tendon graft. The tibial tunnel was placed in the center of the ACL insertion and the femoral socket drilled at the 10 o’clock position in right knees or 2 o’clock in left knees through the tibial tunnel. A bone-patellar tendon-bone graft was fixed using interference screws in knee extension. Twenty-eight ACL-deficient knees (17 females and 11 males, average age of 22.0 years) underwent ATRR with semitendinosus and gracilis tendons. Two femoral sockets and two tibial tunnels were placed on the insertions of the anteromedial and posterolateral bundles. The tendons were fixed to the femur using endobuttons and to the tibia using a post screw in 20 degree of knee flexion. Postoperative knee stability was assessed by pivot-shift test and KT-1000 arthrometer. The IKDC evaluation form was employed for evaluation of the overall function of ACL-reconstructed knees. Statistical analysis was performed using the Mann-Whitney’s U test and the Chi-square test.

RESULTS: No patient required a revision surgery due to a recurrent anterior instability. The averages of postoperative side-to-side difference in KT-1000 were 0.5±1.4mm for LSRR and 0.5±1.6mm for ATRR. Four knees (14%) in LSRR and 4 knees (14%) in ATRR were revealed as positive in pivot-shift test. Twenty-three knees (79%) in LSRR and 22 knees (79%) in ATRR were classified as Normal of IKDC evaluation. None of the 56 knees was classified as Abnormal or Severely Abnormal. No significant difference in the parameters examined clinically was detected between LSRR and ATRR.

CONCLUSIONS: While only the short-term results are shown in this study, it was suggested that LSRR with the patellar tendon graft could restore anterior and rotatory stability in lower flexion angle comparable to ATRR with the hamstrings tendon graft. The patellar tendon graft is inferior for reproduction of the anatomy of the normal ACL compared to the hamstrings tendon graft. This disadvantage of the patellar tendon graft, however, is compensated with laterally placing the femoral socket close to the insertion of the posterolateral bundle.

E-poster w/ Standard #436
ACL Reconstruction: Comparison of Bone-Patellar Tendon-Bone Graft with Central Quadriceps Tendon. A Retrospective Study
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Introduction: The purpose of this study is to compare the outcome of ACL reconstruction using patellar tendon (BPTB) to that using central quadriceps tendon autograft. Methods: One
hundred and seventy patients who received ACL reconstruction from 1994 to 2001 were reviewed in a retrospective manner. 72 underwent reconstructions with BPTB autograft, and 98 were treated with quadriceps tendon. Patients were followed for an average 45 months (range, 25-73 months). Each group was evaluated in terms of anterior laxity test, Lysholm score, IKDC score, KT-2000 arthrometer and isokinetic quadriceps strength using Cybex II dynamometer. Results: A mean age at operation, interval between injury and operation, and concomitant injury pattern was not different between the two groups. The two treatment methods produced similar outcomes in terms of patient satisfaction, activity level, range of motion and knee function (Lysholm score improved from 71 to 93 in BPTB group and from 70 to 92 in quadriceps tendon group). Sixty-nine and Ninety-three patients were found to be grade 0 or 1 in Lachman test and pivot shift, respectively. At follow-up, no statistical difference was found between groups in side to side difference evaluated by KT 2000 arthrometer. Quadriceps muscle strengths measured by Cybex II recovered to 82 % of contralateral side at 1 year and 89% at 2 years in quadriceps tendon group, and 76%, 80% in BPTB group. Conclusion: ACL reconstruction using quadriceps tendon showed similar satisfactory results when compared with that using BPTB. Quadriceps tendon could be a good alternative graft choice.

E-poster w/ Standard #437
Anatomical Description of the Anterior Cruciate Ligament Attachment with Respect to the Anteromedial and Posterolateral Bundles. Part 1: Tibial Footprint
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We present the anatomical attachments of the anterior cruciate ligament anteromedial and posterolateral bundles with the aim of relating the findings to consistent bony landmarks. 55 specimens were used and the anterior cruciate ligament attachments were measured in relation to the various bony landmarks described. Wide variation in measured values was found when using the posterior tibial surface, the anterior tibial surface and the medial tibial spine as reference points. We found that the least variation in measured values occurred between the over-the-back position of the tibial plateau and the posterior limit of the anterior cruciate ligament footprint (distance 5.8mm, SD +/- 0.53mm, range 4.8 - 6.9 mm). The over-the-back landmark also revealed the least variation in values with respect to the centre of the bundles. We describe the measured distances between the bony landmarks and the centre of two 6mm circles placed in the posterior and medial limits of the bundles to represent the position of the drill holes in a double tunnel tibial technique for anterior cruciate reconstruction. The anteroposterior depth and the mediolateral width of the tibial plateau did not correlate well with the measurements taken from any of the bony landmarks with the exception of the posterior tibial surface distance to the posterior limit of the ACL. However this measurement showed a larger standard deviation and range than measurements taken from the over-the-back position.

E-poster #438
Press Fit ACL Reconstruction: Is It Reliable? A Prospective Randomized Study.
Mohammad Razi, Tehran, IRAN, Presenter
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Introduction: Sporadic reports indicate that Press Fit fixation of the BPTB graft in the femoral tunnel is reliable and has advantages of no need to use any hardware for fixation and preserving of the femoral bone stock in the case of revision, but there is no report to document the position and stability of the graft in the femoral tunnel. In this prospective randomized study, by incorporating a metal marker in the bony part of the patellar tendon graft, we documented its position and stability by control X-rays.

Methods: Press Fit fixation of the graft in the femoral tunnel, was attempted in 35 males with the average age of 25 years, a metal marker was inserted in the bony part of the patellar tendon graft, Press Fitted in the femoral tunnel and its stability was tested by 200N traction in almost knee extension. In seven cases stability was not enough to withstand, therefore fixation was completed by interference screws. Also 3 patients lost from final evaluation. So 25 cases were followed for the average of 41 months (24 to 66 mos). Patients were evaluated by serial X-rays, Functional tests, KT - 1000 arthrometer, Lysholm score, Tegner activity level, and IKDC.
Results: in control X-rays there was no displacement of the metal marker in relation to Blumensaat’s line and average position of the graft was at 76% of the anteroposterior lengths of the Blumensaat’s line. Average Lysholm score was 93 and in 60% of patients Tegner activity level was in group seven. In IKDC evaluation 84% of patients were in group A and B and no one in group D.

Conclusion: Press Fit ACL reconstruction is a reality and by incorporating a metal marker in the graft to facilitate control X-rays and intraoperative testing of the graft by 200N traction we documented that graft would not be displaced and early aggressive rehabilitation is safe like other standard techniques.

E-poster #439
A New Objective Description of the Femoral Tunnel Placement as a CLOCK Following Anterior Cruciate Ligament Reconstruction
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INTRODUCTION
Though all surgeons who perform anterior cruciate ligament (ACL) reconstruction know that the placements of the femoral and tibial tunnels are the important factor for achievement of ACL reconstructions, the clock description of the femoral tunnel placement in the coronal plane had not been well defined in the past literature. In this study, we proposed a new objective description of the femoral tunnel placement in knees with ACL reconstruction.

MATERIALS AND METHODS
54 knees in 54 patients who underwent primary ACL reconstructions (2 root 2 bundles) from 1995 to 2002 in Tokyo Medical and Dental University Hospital were included in this study. The subjects included 28 males and 26 females, and the average age of the patients were 25.8 years. From the Rosenberg view, the clock description of the femoral tunnel placement was defined. The clock was drawn to be placed between the top of the notch and line, which connected the distal edge of the medial and lateral femoral condyles. The tibial tunnel angle was measured as the angle, which the tibial tunnel formed with the medial joint line from the anteroposterior radiograph at standing position. All the knees were assumed as a left knee.

RESULTS AND DISCUSSION
The femoral tunnel placements as a clock were resulted in 0 hour and 37±14 minutes in the AM bundle and 1 hour and 35±19 minutes in the PL bundle on average. The tibial tunnel angles were 78.9±5.4 degrees in the AM bundle, and 62.9±7.6 degrees in the PL bundle on average. From the time-dependent reproducibility assessment in this study, we concluded these radiographic assessments were reproducible and reliable.

CONCLUSION
We proposed a new objective description of the femoral tunnel placement as a clock in knees with ACL reconstruction using the Rosenberg view.

E-poster #440
Deteriorated Proprioception in the Patients with the Anterior Cruciate Ligament Deficiency Affects Performance
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Atsushi Kobayashi, Maebashi-shi, Gunma-ken JAPAN
Masanori Terauchi, Gunma-Ken, JAPAN
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Purpose: It has been unclear how deteriorated proprioception in ACL-deficient knees affects the patient’s sports performance. Aim of this study was to investigate the characteristics of proprioception in the patients with ACL-deficient knee, and also to determine whether the correlation between the proprioceptive function and the performance.

Materials and Methods: This prospective and randomized study was composed of 32 patients (14 male, 18 female, average age, 25.6 years) with unilateral isolated ACL-deficient knee. According to Skinner’s method, the position sense of the knee was applied as proprioceptive examination. The functional ability test with visual control consists of two tests: the one-leg hop (OLH) and one-leg vertical jump (OLV). An average value of the five trials of both proprioceptive and functional ability test was used for the statistical analysis.

Results: The mean inaccuracy (degree) of the joint position sense was 3.8±1.8 in the healthy side and
5.3±2.1 in the ACL-injured side, being significant. Proprioceptive examination clearly showed poor joint position sense in the ACL-deficient knees than normal knees. On the other hand, the healthy side had a significant better ability for both OLH and OLV. The performance of ACL-deficient knee was also worse than healthy side. In addition, a minus correlation with a significant difference was found between proprioceptive test and functional ability, and this correlation was emphasized at visual deprivation.

Conclusions: Deteriorated proprioception in the patients with the ACL-deficiency reduced the patient’s functional ability.

E-poster #441
Second Look Arthroscopic Findings of ACL Reconstruction Using 2-bundle Hamstring Tendons: The Effect of Initial Graft Tension
Hiroto Asagumo, JAPAN, Presenter
Gunma Sports Medicine Research Center, Zenshukai H, Maebashi-shi, JAPAN

In ACL reconstruction using 2-bundle hamstring tendons, initial graft tension is controversial. The purpose of this study was to examine second look arthroscopic findings after ACL reconstructions done with different initial graft tensions (60N or 100N).

Fifty patients (24 males, 26 females) underwent arthroscopically assisted ACL reconstruction. The patients were divided into 2 groups (group A: initial graft tension of 100N, and Group B: tension of 60 N. Group A (100N) contained 6 males and 14 females. Group B (60N) contained 18 males and 12 females. With regard to arthroscopic findings, synovium coverage of the reconstructed ACL was categorized into 3 grades (Good, Fair and Poor), differentiation of AM/PL bundle was categorized into 2 grades (Separation and Union), tension of the reconstructed ACL was categorized into 3 grades (Good, Fair and Poor). With regard to anterior tibial translation, there was no statistically significant difference between the two groups, but there was a greater tendency towards good synovium coverage of reconstructed ACL in the 60N group than in the 100N group, as well as good tension and union of the AM/PL bundle.

E-poster #442
Intra-articular Triple Bundle Technique for Anterior Cruciate Ligament Reconstruction
Byoung Hyun Min, Suwon, KOREA, Jeong ho Roh, Suwon, Kyung-gi do KOREA
Presenter
Cheng zhe jin, suwon, kyung gi, KOREA
Kyunghun Song, suwon, kyung gi, KOREA
Ajou university hospital, Dept of Ortho surgery, Suwon, KOREA

Introduction: Anterior cruciate ligament (ACL) is collection of fibers which are divided into anteromedial and posterolateral bundles. Recently ACL reconstruction using double bundle of graft or two tunnels at femur were introduced in order to recruit as many fibers in ACL insertion area as possible so that rotational instability can be overcome. We introduce novel technique using Achilles tendon allograft with which triple bundle can be placed in the knee.

Methods: 58 patients who were undertaken triple bundle technique were followed up at least one year, were included in the present study. The results were assessed by physical examination, functional score (Lysholm’s score, international knee documentation committee knee subjective examination) and objective joint displacement evaluation (KT-2000 knee ligament arthrometer).

Results: The results of the Lachman, anterior drawer and pivot shift tests were at least grade I instability. Average of Lysholm’s score was increased from 63.7±8.3 to 87.7±7.1 and 41 cases (70.6%) were normal and 17 cases (29.4%) were nearly normal according to the IKDC examination. Using KT-2000 knee ligament arthrometer, average of preoperative and last follow up joint displacement was decreased from 15.8±2.12mm to 8.2±1.90mm in 30 degree flexion of the knee. All patients returned to the normal activities of daily living.

Conclusion: The intra-articular triple bundles technique is considered to be useful ACL reconstruction.

E-poster #443
The Effectiveness of Reconstruction of the Anterior Cruciate Ligament Using the Novel Knot/Pressfit Technique: A Cadaveric Study
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Scott Hanford, Pittsburgh, PA USA
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Purpose: For ACL reconstruction using hamstring grafts, a variety of fixation devices have been successfully used. However, many of these devices are expensive and can present artifacts in MRI as well as complications in revision surgery. Therefore, a novel Knot/pressfit technique that eliminates the need for any fixation device has been developed. The objective of this study was to evaluate the biomechanical function of the Knot/pressfit technique by comparing the kinematics of the reconstructed knee with the more commonly used EndoButton® CL fixation. In addition, it is important whether stiffness and strength of the Knot/pressfit fixation, under uniaxial tension are equivalent to existing methods.

Methods: Eight fresh-frozen human cadaver knees (age: 52 ± 7 y.) were tested using a robotic/universal force-moment sensor (UFS) testing system. Two external loading conditions were tested: (1) a 134N anterior tibial load (ATL) at 0, 15, 30, and 90° of knee flexion and (2) a combined rotatory load of 10 N-m of valgus torque and 5 N-m of internal tibial torque at 15 and 30° of knee flexion. The resulting five degrees of freedom (DOF) knee kinematics of the intact, ACL-deficient, EndoButton® CL and Knot/pressfit reconstructed knee were determined, and their differences were compared with a two-factor repeated measures analysis of variance (p=0.05). Subsequently, all Femur-Graft-Tibia Complexes (FGTC) with the Knot/pressfit fixation were tested in uniaxial tension until failure, and the stiffness and strength of each specimen were obtained from the resulting load-elongation curve.

Results: In response to the ATL, the anterior tibial translation (ATT) for the Knot/pressfit reconstruction was found to be not significantly different for all four flexion angles tested to those of the intact ACL as well as to those for the Endobutton® CL reconstruction (p>0.05). In response to a combined rotatory load, neither reconstruction could effectively reduce the coupled ATT to the level of the intact knee. The coupled ATT of the Knot/pressfit fixation was found to be 4.1 ± 2.8 mm at 15° of knee flexion and 7.2 ± 2.7 mm at 30° of knee flexion, which was not significantly different from the Endobutton CL fixation. Further, the stiffness of the FGTC was found to be 37.8 ± 9.6 N/mm, while the load to failure was 540 ± 97.7 N. These values are comparable to those for the BPTB pressfit technique and femoral fixation using Interference screws.

Discussion: The Knot/pressfit technique for ACL reconstruction was found to be able to restore the knee kinematics. The ATT in response to the two external loading conditions were similar to those for the popular Endobutton CL technique. The limitation was the lack of alternating order for ACL reconstruction because the femoral tunnel of the Endobutton technique could be used for the Knot technique but not vice versa. Based on this human cadaveric study, the Knot/pressfit fixation is a reliable alternative for the femoral fixation of hamstring grafts. In the future, in vivo studies of the Knot/PressFit fixation including examination of the tendon to bone healing are suggested.

KNEE - ARTHRITIS

E-poster #501
Gains of Visco-supplementation Following Arthroscopic Assisted Surgery in Limited Gonarthrosis of the Femoro-Tibial Joint
Inderpreet Oberoi, INDIA, Presenter
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Introduction: Osteoarthritis is a combination of both mechanical and biochemical derangements. Biochemically, there is reduction in concentration and size of Hyaluronic acid in synovial fluid resulting in its decreased viscosity and elasticity and thus cartilage wear. The condral flaps and particulate debris thus produced cause mechanical derangement by repeatedly damaging the joint and disease progression. It is thus imperative to correct both biochemical and mechanical derangements at an early stage so as to ensure healthy pain free joint.

Material and Methods: 75 patients aged 48 - 72 years (Average 56.4 years) with limited Gonarthrosis of femoro-tibial joint, who had not responded to conservative treatment were subjected to arthroscopic joint debridment. The results of the treatment were compared with those of 60 patients aged 51 - 71 years (Average 52.4 years) with similar problems treated with arthroscopic joint debridment and 5 weekly intraarticular visco supplementation with 25 mg sodium Hyaluronate (Hyruan) given thereon. In selecting the patients, important considerations were near normal mechanical axis (deviation<5%), limited extent of joint degradation (Kellegran
grade 1-3) and near normal joint motion. The average pre-operative duration of symptom was 16.6 and 18.4 months both the clinical groups respectively. Patients were followed up at six monthly intervals for 3-4 years (Average 38.4 months) and results evaluated with 100mm visual analogue score and Lyshkom’s Knee score. The average preoperative score in both groups was 48.4 and 46.5 respectively.

Results:
At first year of study, patients in both clinical groups had similar functional improvements, average knee score being 84.6 and 88.4 respectively, however, VAS were less in supplementary visco supplementation group. In subsequent years, the knee score in arthroscopic debridement group fell from 78.4 at second year and 67.8 at third year to 62.5 at fourth year. In Post surgery visco supplementation group, the scores initially at two year was 82.5 which plateaued to 78.4 at three years and subsequently fell to 72.2 in fourth year. Recurrence of mechanical symptoms such as locking and giving way in both clinical groups at two years was 13.7% and 7.1% respectively, at three years 19.5% and 9.3% respectively and at fourth year was 38% and 20.8% respectively. All 24 patients with mild osteoarthritis treated with surgery and visco supplementation were symptom free at four years follow up, while 12 out of 14 patients with milder disease treated with surgery alone had started having problems at similar follow up.

Conclusions: Patients who benefit most of arthroscopic joint debridement have history of mechanical symptoms such as Knee locking of short duration, near normal axis deviation and mild to moderate radiographic evidence of osteoarthritis. Post arthroscopic visco supplementation improves the joint biology thus improving the extent and duration of pain relief. In early stage of disease such a combination treatment is often curative. Even in advanced stages it helps delay the progression of disease and postpones any further surgical intervention by 2 - 3 years. The rationale of combination therapy of biologic and mechanical intervention seems to be an acceptable modality in changing the progression of disease.

**E-poster #502**
Non-manufacturer Linked Navigation for Tibial Osteotomies: An Easy Way to Increase Intraoperative Limb Angle Measurement Accuracy

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Caesar Fernandez Rodriguez, La Coruna, SPAIN
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One of the main difficulties that most authors find in tibial osteotomy surgery is precise angle correction. To overcome this difficulty, the authors have been using a navigation system originally designed for total knee arthroplasty (Orthopilot, Aesculap) with the aid of arthroscopic intraarticular probe positioning during both opening and closing wedge tibial osteotomy. The method has proved to be simple, reliable and, very important, can be used with any fixation method and both with opening and closing osteotomies, without the obligation to link it to any manufacturer. The technique is presented along with the results of the first 15 cases. Using any navigation system available in knee surgery units to increase precision in osteotomy surgery could be a viable option for any surgeon interested in this field, without the necessity to change the actual surgical technique, and with a minor increase in surgical time.

**E-poster #503**
The Role of the Two Bundles of PCL Should be Considered During TKA
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Background: Some authors recently focused on the relationship between the posterior cruciate ligament (PCL) and equality of flexion-extension joint gaps and varus-valgus ligament balance during total knee arthroplasty (TKA). It was clarified that the functions of the two bundles of PCL were different.

Purpose: To examine the influence of the resection of the postero medial (PM) and anterolateral (AL) bundles on equality of flexion-extension joint gaps and varus-valgus ligament balance.
Methods: A total of 14 consecutive TKAs for varus osteoarthritis were examined. PM bundle was first resected and then AL bundle was resected. Flexion-extension joint gaps and varus-valgus ligament balance were measured using Natural Balance (Centerpulse Orthopedic Inc) at 40 lb distraction force. The changes of flexion-extension gaps and varus-valgus ligament balance before and after the resection of PM and AL bundle were recorded.

Results: The increase in extension gap after the resection of PM bundle (average, 1.18mm) was statistically significant. The increase in flexion gap after the resection of AL bundle (average, 3.86mm) was statistically significant. The decrease in varus alignment was significant after the resection of PM bundle. The increase in varus alignment was significant after the resection of AL bundle.

Conclusions: The resection of PM bundle was effective on increasing extension gap and decreasing varus alignment. However, the resection of AL bundle was not recommended because it excessively increased flexion gap and aggravated varus alignment.

E-poster #504
The Efficacy of Magnets in the Management of Osteoarthritis of the Knee: A Randomized Clinical Trial
Steve MacDonald MD, London, Ontario, CANADA,
Alexandra Kirkley, London, Western Ontario, CANADA,
Sharon Griffin, London, Ontario, CANADA, Presenter
Jason Ashley, London, Ontario, CANADA
Craig Griffin, London, Ontario, CANADA
Fowler Kennedy Sport Medicine Clinic and LHSC, London, Ontario, CANADA

Purpose: To compare the effectiveness of neoprene knee braces containing high-power static magnets to sham magnets in the management of osteoarthritis of the knee.

Method and Discussion: All study patients were recruited from a knee arthroplasty waiting list. At baseline and at 2, 6, 12 and 24 weeks each patient completed a WOMAC, MACTAR, KOOS quality-of-life questionnaire, SF-36 global health measure, and 6 minute walk and 30 second stair climb after which they were asked to determine their general fatigue, pain and shortness of breath on a 100mm VAS scale. Patients were instructed to wear their brace at least 6 hours per day and when active (walking, shopping, golfing).

Results: A prospective double-blinded randomized clinical trial was conducted. 96 patients with moderate to severe osteoarthritis of the knee were randomized to receive a Magnet (M) or Sham (S) knee brace. Both groups were equal with regards to age (M = 71.1 yrs, S = 66.8yrs), severity of disease, gender and all baseline measures. No statistically significant difference in patient-related quality-of-life and objective functional evaluation was found between groups at any time interval. Both groups however showed significant improvement over time.

Conclusion: No statistically significant difference in patient-related quality-of-life and objective functional evaluation was found between groups.

Significance: This study provides patients and doctors with evidence as to the efficacy of this type of therapy. It will allow those individuals on fixed incomes to utilize their resources to the best advantage to minimize their symptoms related to osteoarthritis of the knee.
Outerbridge classification. 34 patients were bilateral. The minimum follow-up was 12 months, and the maximum was 14, 4 years (173 months), which means an average of 35.89 months or 2.99 years. The abrasion arthroplasty was performed with an abrader, combined with multiple micro picks. The osteotomy was a closing-wedge osteotomy, with proximal fibular joint lysis and internal fixation.

Results: The mean knee score for patients treated by abrasion arthroplasty plus micro picking and osteotomy was 38.10 ± 8.04. Overall 83% of the patients reported no or mild pain, with 14.2% moderate and only 2.7% with significant pain. 60.8% were able to walk more than 1 hour, 29.7% between 16 and 60 minutes, 5% short distances and only 4.4% reported real difficulty walking. 84.8% of the patients had no difficulties climbing or descending stairs, 10.5% had moderate and only 4.7% had found this activity really difficult. Only 2.5% of the patients went on to have their knee replaced by either TKR or UKR.

Conclusions: We feel that it is time to have a new and unprejudiced look at abrasion arthroplasty and osteotomy as an alternative to knee replacement surgery. The vast majority of patients treated that way are very satisfied over a period of up to 15 years and only 2.5% of the patients received a total knee replacement. When compared to results for TKR and UKR, our results are better, with fewer and less severe complications. This treatment modality is particularly interesting for young patients and for patients who refuse joint replacement surgery. In addition, with this technique one is “not burning any bridges” and, if necessary, the knee can still be replaced.

Key Words: Abrasion Arthroplasty; Micro fractures; Osteotomy; Osteoarthritis; Knee replacement; Oxford Knee Score.

E-poster #506
A Comparative Study of the Surgical Incision Scar Following Primary Total Knee Arthroplasty Using Midline and Medial Parapatellar Incisions
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Aim: To determine the patient satisfaction of their surgical incision scar following primary total knee arthroplasty (TKA) using the validated Manchester Scar Proforma (MSP) and Visual Analogue Scales (VAS)

Methods: 2 Groups of patients who underwent primary TKA were consecutively reviewed. Group 1 consisted of patients who underwent their primary TKA through a medial parapatellar incision. Group 2 consisted of patients who underwent their primary TKA using a midline incision. The surgical incision scar was assessed using the validated MSP and VAS to determine patient satisfaction, functional affect of the scar, pain and resulting sensory loss.

Results: The mean follow-up period for patient assessment was 2.67 years. Group 1: There were 91 patients with a mean age of 71.8 years. The mean scar length was 19.8 cm, the mean MSP score was 11.73. The mean VAS scores for; functional affect of the scar was 9.96, scar pain was 9.97 and sensory loss was 9.56. 5 patients had superficial wound infections, and 56 patients noticed significant sensory loss around the knee.

Group 2: There were 76 patients with a mean age of 69.9 years. The mean scar length was 19.57 cm, the mean MSP score was 11.92. The mean VAS scores for; functional affect of the scar was 9.99, scar pain was 9.81 and sensory loss was 9.82. 3 patients had superficial wound infections, and 44 patients noticed significant sensory loss around the knee.

Conclusion: There was no statistical significance in any of the parameters measured between midline and medial parapatellar incisions for primary TKA (p>0.08). Mean incision scars of 19.8 cm and 19.57 cm for medial parapatellar and midline incision produced excellent cosmetic results and the resulting sensory loss is not significantly distressing. It remains to be seen whether smaller incisions for TKA will result in significantly improved cosmetic outcomes in this age group of patients.

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E-poster #508
ACL Reconstruction and Oxford UKA: A Viable Treatment Option for ACL Deficient Arthritic Knees
Hemant Pandit, Oxford, UNITED KINGDOM, Presenter
David Beard, Oxford, UNITED KINGDOM
Cathy Jenkins, Oxford, UNITED KINGDOM
Neil Thomas, Hants, UNITED KINGDOM
David Murray, Oxford, UNITED KINGDOM
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OOEC, Nuffield Orthopaedic Centre, Oxford, UNITED KINGDOM

Introduction: Unicompartmental knee arthroplasty (UKA) is an increasingly popular procedure for young osteoarthritic patients whose age and activity levels preclude the use of a total knee arthroplasty. However, successful reconstruction using an unconstrained mobile bearing implant requires an intact and functioning ACL. Patients with isolated medial compartment OA and an absent ACL therefore provide a management dilemma for the treating surgeon. One option is to perform a combined ACL reconstruction and mobile bearing UKA. This paper presents early results of this new procedure using an Oxford UKA and ACL reconstruction using an autograft.

Materials and Methods: Eleven patients who underwent one or two-staged ACL reconstruction and Oxford UKA for treatment of symptomatic medial compartment OA were reviewed at two years after surgery. The combined procedure required specific precautions and considerations; care had to be taken to place the tibial tunnel as far laterally as possible to avoid impingement of the graft by the tibial implant. In 8 cases, hamstring graft was used and the procedure was staged. In three cases, bone-patella-tendon-bone graft was used for ACL reconstruction and both the procedures were performed under the same anaesthetic.

Results: All patients were male with an average age of 49 years (range: 36 - 52) and mean follow up of 31 (2-4.1) years. One patient needed revision to TKA due to infection. The objective and functional knee society scores improved pre to post operatively from 55 to 98, and 85 to 100, respectively.

Conclusions: ACL reconstruction and simultaneous or staged UKA is a viable treatment option for patients with symptomatic medial compartment arthritis in whom the ACL is absent. Early results of this technically demanding procedure are encouraging but longer follow-up is required.

E-poster #509
Predictors of Decreased Function and Activity Level in Patients Seeking Treatment for Osteoarthritis of the Knee
Karen K Briggs, Vail, CO, USA, Presenter
J. Richard Steadman, Vail, CO, USA
Steadman Hawkins Sports Medicine Foundation, Vail, CO, USA

Introduction: One of three adults in the United States is affected by arthritis or chronic joint symptoms and arthritis is currently the leading cause of disability in the United States. As the population ages, these numbers will increase. Increased prevalence of arthritis is also associated with decreased activity. Identifying factors associated with decreased function and decreased activity may help develop early treatment programs which can decrease the impact of arthritis. The purpose of this study was to identify determinants of decreased function, as determined by Lysholm score, and patient activity level, as determined by Tegner Activity Level, in patients seeking evaluation for osteoarthritis of the knee.

Methods: A cohort of patients (n=242, average age = 56 (range 29 to 82); 101 females, 141 males), who were diagnosed with OA of the knee on initial exam, was studied prospectively. All patients had complete demographic, subjective and objective data from the initial exam. Patient symptoms were graded on a 4-point scale (none, mild, moderate, severe). The dependent variables were Lysholm score (0-100) and Tegner Activity level(1-10). Univariate and multivariable analysis were performed to identify determinants.

Results: Prior surgeries were reported in 58% of the knees, and 80% had joint space narrowing on radiographic examination. For demographic variables, there were no significant differences (p>0.05) in Lysholm for age, gender, or prior surgery. Tegner was significantly associated (P<0.05) with age and gender. Tegner was also associated with number of prior surgeries, with knees operated on 2 or more times having significantly lower scores(P<0.05). For objective variables, there was a significant difference (p<0.05) in Lysholm for the presence of joint space narrowing, extension deficits and flexion deficits. Tegner level was not associated with joint space narrowing, however, it was associated
with extension and flexion deficits. For subjective symptoms at initial visit, patients with knee stiffness had significantly lower Lysholm scores. (p<0.05) Patients reporting severe stiffness had an average Lysholm score of 24 points less than those with no stiffness. Multivariate analysis identified joint space narrowing and patient reported stiffness as independent predictors of Lysholm (r²=0.24; p<0.05). Independent predictors of Tegner activity level were age, gender, patient reported stiffness, flexion deficit, and Lysholm score (r²=0.27; p<0.05).

Conclusion: Determinants of decreased function and decreased activity level in patients seeking treatment for osteoarthritis of the knee were established. Patient reported stiffness and range of motion deficit were found to be associated with both decreased activity level and decreased Lysholm score. These factors may be important in developing early treatment programs aimed at improving function and maintaining activity level in patients with osteoarthritis.

**E-poster #510**

*Posterior Slope Following Medial Opening Wedge Proximal Tibial Osteotomy for Varus Arthrosis of the Knee*

William I. Sterett, Vail, CO, USA, Presenter
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Bruce S. Miller, Ann Arbor, MI USA
Valerie J. Rich, Vail, CO USA
Elizabeth M. Barry, Vail, CO USA
Steadman-Hawkins Sports Medicine Foundation, Vail, CO, USA

Introduction: Medial opening wedge osteotomy has gained popularity as a means of decreasing pain and correcting malalignment in physiologically young and active patients. Because of the triangular cross-sectional anatomy of the tibia, this procedure may produce a biconal correction. The purpose of this study was to determine if medial opening wedge osteotomies change the posterior slope of the tibia and whether or not this change affects range of motion and Lysholm scores.

Methods: Lateral radiographs of 85 patients with varus arthrosis were reviewed before and after medial opening wedge tibial osteotomy to measure posterior tibial slope (PS). Patients consisted of 57 men and 28 women with an average age of 51 years (range 25-70). Patients were divided into 3 groups based on the technique and type of fixation utilized. Twenty-two osteotomies were performed using distraction osteogenesis and a medial external fixator (EX FIX), 28 using acute distraction and fixation with a Puddu plate (PUDDU) (Anthrex), and 35 using acute distraction and fixation with a VS plate (VS) (EBI). Pre- and post-operative Lysholm scores and range of motion were reported.

Results: Overall, the PS increased from 12.52 to 16.51 (3.99 degrees) (p=0.00). In the EX FIX group, PS increased from 14.00 to 16.32 (2.32 degrees) (p=0.01), in the PUDDU group from 11.79 to 17.00 (5.21 degrees) (p=0.00), and in the VS group PS increased 12.17 to 16.23 (4.06 degrees) (p=0.00).

Conclusion: This study suggests that medial opening wedge osteotomy may alter sagittal alignment by increasing posterior tibial slope. Changes in PS did not correlate with changes in range of motion or post-op Lysholm scores. PS was increased the greatest amount in PUDDU plate group and the least amount in the EX FIX group.

**E-poster #511**

*Kneeling Ability in Patients Following Primary, Unicondylar and Revision Knee Arthroplasty*

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Aims: To determine the kneeling ability in 3 groups of patients who have undergone either Unicondylar, Primary, or Revision knee arthroplasty.

Methods: A questionnaire was designed to determine the kneeling ability of patients who have undergone knee arthroplasty surgery. The Kneeling questionnaire along with a Western Ontario and MacMaster Osteoarthritis Index (WOMAC) questionnaire was sent to 191 patients of whom, 27 had Unicondylar, 105 had Primary and 59 Revision knee arthroplasty.
Results: The mean follow-up time for assessment for each of the 3 groups of patients were; Unicondylar = 3.32 years, Primary = 5.30 years and Revision = 5.06 years. The mean total WOMAC scores for the 3 groups were; Unicondylar = 13.96, Primary = 22.10, and Revision = 38.67. The percentage of patients who underwent knee arthroplasty that found it impossible to kneel were; Unicondylar = 18%, Primary = 36% and Revision = 66%. The commonest reasons why patients found kneeling difficult were; pain and stiffness around the knee prosthesis, fear of harming the prosthesis and sensory deficit around the knee. Visual Analogue Pain scores for kneeling in the 3 patient groups were, Unicondylar = 5.6, Primary = 7.12, Revision = 9.18. A minimum of 30% of patients in each of the 3 groups reported their daily lives were moderately-severely affected due to their difficulty in kneeling following knee arthroplasty. At least 60% of the patients in each group reported they would like to have better kneeling ability.

Conclusion: Unicondylar knee arthroplasty patients have better WOMAC scores and find kneeling easier than patients who have undergone Primary knee arthroplasty (p<0.01). The Primary group have better WOMAC scores and find kneeling easier than the Revision group (p<0.001). Kneeling is considered important in patients who have undergone knee arthroplasty. Poor kneeling ability in patients may restrict their daily activities.

E-poster #512
Rotational High Tibial Osteotomy for Patella Instability.

John Cameron, CANADA, Presenter
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External tibial torsion associated with an increased ‘Q’ angle is an important factor in recurrent patella instability. It is surgically correctable with a rotational osteotomy of the proximal tibia above the patella tendon insertion. This technique “normalizes” the extensor mechanics and produces better results than patella tendon transfer.

Ninety percent of the patients were female with an average of 30 (range 14-45). Prior unsuccessful surgical procedures included lateral release (16), Maquet procedure (10), Hauser procedure (16), medialization of patella tendon (1), semitendinosis tenodesis and patellectomy (2).

Post-operative follow-up average 5 - 8.2 years. Pre-op external tibial torsion averaged 45 degrees (range 40 deg - 65 deg) with an average rotational correction of 25 deg. The average pre-op ‘Q’ angle was 27 deg and post-op 14 deg. Average pre-op functional score has 40 and post-op 70 deg. Outcome assessment of the 55 knees showed 26 excellent, 16 good and 13 poor. Overall 76% of the knee were good - excellent. Of the 16 patients with associated anterior knee pain, 13 obtained good - excellent results. Patients with less painful symptoms pre-op had significantly better outcomes. Knees that had undergone multiple unsuccessful surgical procedures had significantly poorer outcomes. Uniplanar patella tendon transfer in these cases generally resulted in continued anterior knee pain.

E-poster #513
Results After Anteromedial Tibial Tuberosity Transfer (Fulkerson Osteotomy) in Patients with Arthritis of the Patellofemoral Joint

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Dieter Kohn, Homburg / Saar, GERMANY
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Introduction: Anteromedialization of the tibial tuberosity predictably leads to pain reduction and better functional results in patients with an initial and moderate patellofemoral arthritis. The aim of the study was to assess the clinical outcome of the Fulkerson procedure in patients with an isolated arthritis of the patellofemoral joint by using the IKDC-score and the visual analog scale (VAS).

Material and Methods: We followed 15 consecutive patients (10 women, 5 men) with an isolated arthritis of the patellofemoral joint after an anteromedial transfer of the tibial tuberosity. The average age at the time of surgery was 42 (±13.3) years. The average followup was 2.3 (±1.4) years. The operated knee joint was assessed pre- and postoperatively by using the IKDC-score and the VAS. The statistical evaluation was performed by using the t-test and the Matched-Pairs-Signed-Rank-Test.

Results: A significant improvement of the subjective symptoms was found (subjective IKDC evaluation form: from 47.6 ± 22.4 points preoperatively to 73.9 ± 22.2 points postoperatively, p<0.01). The VAS improved from
7.4±1.9 to 3±2.5 points (p<0.01). The IKDC-activity-level improved from 7.6±3.1 to 5.2±2.6 points (p<0.01).

Conclusions: The anteromedial transfer of the tibial tuberosity lead to a significant improvement of the subjective symptoms and the activity-level in patients with an isolated arthritis of the patellofemoral joint.

E-poster #514
TKA in the Elderly: Is the Age the Problem?
Philippe Piriou, Garches, FRANCE, Presenter
Thierry Judet, Paris, FRANCE
David Biau, Garches, FRANCE
Hopital Raymond Poincara, Garches, FRANCE

Introduction
Surgery in the old age is often associated with high rates of preoperative co-morbidity and early post-operative morbidity, and with uncertain post-operative mortality.

We planed a matched pair case-control study, matching on known pre-operative influencing factors, patient having TKA after the age of 85 years old, to a younger control group.

Material and Methods:
The group A (patients over 85 years old) included 22 knees in 20 patients.
The group B (patients between 65 and 75 years old) included 22 knees in 22 patients.

Matching was proceeded as follows: all patients in our computer database aging 65 to 75 years old at the time of surgery were retrospectively assessed according to the gender, the ASA classification and the pathologies reported. General medical headings were constituted and a control group was matched as closely as possible to the reference group.

All tests were performed as paired observations and two-sided at the 0.05 significant level (McNemar). Analysis of survival time and survival curve were performed using Kaplan-Meier method. Statistical analysis was perfomed using S-Plus 2000 (MathSoft Inc., Seattle, WA).

Results and conclusions:
In conclusion, the age should not be a limitation to total knee replacement in the elderly, although they are associated with high co-morbidity factors and hence, should be dealt with special care.

When proposing a knee replacement, the surgeon should be aware that the surrounding medical co-morbidity will be a limitation to the late functional results, and therefore, should not focus on the prosthesis itself, but on the possible gain in quality of life for the elderly.

E-poster #515
A Study of Lateral View of Radiograph in Osteoarthritis of the Knee
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Hirotaka Haro, Chino, Nagano, JAPAN
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Suwa Central Hospital, Chino, Nagano, JAPAN

Introduction
It was suggested that bony factor and soft tissue were associated with knee joint contracture of osteoarthritis. The purpose of this study was to evaluate knee joint contracture with lateral views of radiograph in osteoarthritis of the knee.

Methods: We study 45 knee joints of 41 patients with osteoarthritis of the knee and 43 knees of 22 healthy volunteers. Lateral views of radiograph were taken in maximum extension, in maximum flexion, and in 90 of flexion. Maximum extension angle and maximum flexion angle were measured using the lateral views of radiograph. We examine the existence of posterior femoral condylar osteophyte and anterior tibial osteophyte. Correlations these osteophytes and maximum flexion/extension were analyzed. Contact point was defined as the lowest point of medial femoral condyle with a lateral view of radiograph in 90 of flexion. Contact point was measured as b/a—100 (%) (a: the distance from the anterior point to the posterior point of tibia, b: the distance from the anterior point of tibia to the lowest point of medial femoral condyle). Correlations of contact points between flex<120 group, flex>120 group and normal group were analyzed.

Results: The average maximum flexion and extension were 118.8 and 3.6. The average contact point of osteoarthritic knees and normal knees were 67.9% and 64.1%. The posterior femoral condylar osteophyte reduced maximum flexion significantly(p=0.0003). The posterior femoral condylar osteophyte did not increase loss of maximum extension significantly. The anterior tibial osteophyte increased loss of maximum extension significantly(p=0.0064). The anterior tibial osteophyte did not reduce maximum flexion significantly. In maximum flex<120 group, the contact point was located significantly more posterior than that in the normal knee group(p<0.0001). Conclusions: The posterior femoral condylar osteophyte and the anterior tibial osteophyte reduced range of motion.
significantly. In maximum flex <120 group, the contact point was located significantly more posterior than that in the normal knee group.

E-poster #516
Candida Infection After Total Knee Arthroplasty: A Case Report with Successful Staged Reimplantation
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Tahir Ogt, Istanbul, TURKEY
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Muharrem Babacan, Istanbul, TURKEY
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Abstract. Prosthetic joint infection with Candida is uncommon. We present the case of a 69-year-old man with Candida albicans infection of a prosthetic knee joint. Knee joint swelling was noted 24 weeks after surgery, and repeated cultures of aspirated fluid established the diagnosis of Candida albicans infection 30 weeks after surgery. Removal of the prosthesis, thorough debridement, and antifungal therapy treated the infection successfully. Antifungal therapy included 400 mg/d for 10 weeks and 800 mg/d for 4 weeks of parenteral administration of fluconazole. The involved knee joint was reimplanted 24 weeks after removal of the prosthesis. Prophylactic parenteral antibiotics included 1 g of cefazolin every 8 hours for 10 days and 400 mg fluconazole once a day IV for 6 weeks. The prosthetic joint was pain free and functioned satisfactorily during the ensuing year. No recurrence of infection was noted. The principle in treating Candida prosthetic infection generally has been the same as that of bacterial prosthetic infection. In chronic cases, removal of implants, thorough debridement, and effective antifungal therapy are mandatory for the eradication of infection. Reimplantation of the prosthesis can be performed successfully in a staged surgical procedure with the interval between the 2 stages shortened to 14 weeks. Key Indexing Term: Candida, prosthetic joint infection, reimplantation.

E-poster #517
Articular Cartilage Injuries: A Combination Between Surgical and Conservative Treatment. An Early Report
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Mehmet Can Unlu, Istanbul, TURKEY
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The aim of this early report is to present our results of a combination between arthroscopic debridment and drilling of knee cartilage defects, and postoperative use of intrarticular injection of hyaluronan and glucosamine sulfate per os. During the period January 2003 to July 2003, we performed 47 knee arthroscopies (44 patients, 25 men and 19 women, mean age 36.8 years), in which we found cartilage injuries only or with meniscal or/and anterior cruciate ligament injuries. We classified the defects according to Outerbridge classification (grades I through IV) and the defects were shaved and drilled. We classified our patients in two groups randomly, taking care to consist the same cartilage injuries' quality and quantity. Group A (20 patients) were not treated in any additionally way. Group B (22 patients) were treated postoperatively by intrarticular injection of hyaluronan (Synvisc, Hyalan G-F 20) in 3-time course (after the 1st p.o. month, one per week), and took from the early p.o. period glucosamine sulfate per os, at least for 6 months.

We followed up all our patients using Lysholm Scoring System the 1st p.o. month, the 3rd, and the 6th and after 1 year (mean 8.1 months). There was a prevalence of group B scores when there was I to III grade of cartilage defect (for example mean 91.2 to 85.6 the 3rd p.o. month, for group B and A respectively). It seemed to not exist any significant deference between the two groups when there was a grade IV defect. Our study is going on, and until now is too early to secure conclusions. But, we believe that the combination of arthroscopic debridment and postoperative use of intrarticular injection of hyaluronan and glucosamine sulfate per os, offers a better result in cartilage repair procedure.
E-poster #518
Thrombotic Thrombocytopenic Purpura (TTP): A Severe Complication Following Valgus Osteotomy of Knee
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Leonidas Malioufas, Naoussa, GREECE
John Giannoulis, Naoussa, GREECE
Peter Sarriggiannidis, Naoussa, GREECE
Stavros Traios, Naoussa, GREECE
Antonios Ioannou, Naoussa, GREECE
George Giantsis, Naoussa, GREECE
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Thrombotic thrombocytopenic purpura (TTP) or Moschowitz’s syndrome, is a life threatening illness thus should be treated immediately. Long term patient follow up is required. Some patients have only a single episode of TTP but in most cases the disease is chronic with frequent relapses. It is a very rare condition after orthopaedic elective operations, but it causes serious problems.
We report a case of TTP following valgus osteotomy of knee in a 57 year old female. There was no record for systemic disease and the preoperative check was without anything pathological.
During the 4th p.o. day the patient had high fever and a strong feeling or tiredness. The blood check showed renal dysfunction, very low Ht and number of platelets. At the 7th p.o. the patient was gone to haematology department, where she had treatment with cortisone and plasmapheresis. TTP is an acute, recurrent disease of the circulation consisting of thrombocytopenia, microangiopathic haemolytic anemia, neurological signs, fever and renal dysfunction. The etiology is still unknown, although different factors such as large von Willebrand factor multimers (ULvWF) released by endothelial injuries, and the presence in plasma, of a factor that forms platelet aggregates in vitro, have been implicated. Surgical stress has been associated with TTP, probably by releasing massive amounts of ULvWF.
This syndrome is very rare in the international literature, especially after orthopaedic operations. We should be aware of it because of its possible fatal result.

E-poster #519
Total Knee Arthroplasty for Old Tuberculosis of the Knee
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John Giannoulis, Naoussa, GREECE
Peter Sarriggiannidis, Naoussa, GREECE
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Despite the improvement of protection and condition of living during the last 40 years, there is a remarkable recurrence of tuberculosis in the last decade. When it appears in bones and joints, it is always secondary. Knee tuberculosis (or white tumor) affects almost always one joint and there is installation of the vacilous in articular membrane or in the bones metaphysis.
We present a case of a patient (60 years old woman), who came to our department complaining for knee pain and swelling. The clinical examination showed severe knee arthritis without any sign of systemic disease and from the history there was not infectious disease. The blood test showed slightly increased Erythrocyte Sentimentation Rate (ESR) and C reactive protein (CRP), and the x-rays apart from the osteoarthritic damages showed big subchondral cysts both in femur and tibia. We decided to operate her and during the operation there was evidence of knee tuberculosis. We did wide bursectomy and cleaning of the cysts, and we send this material for cultivation and biopsy. We put unconstrained total knee arthroplasty using orthopaedic cement both in femur and tibia.
The laboratory check showed knee tuberculosis and the patient took antituberculotic treatment for 12 p.o. months. Four years after the operation there are no clinical or laboratory evidences for tuberculosis.
The international literature is proposed TKR for knee tuberculosis with good results, when patient takes antituberculotic treatment before and after the operation. There is also increasing danger of disease’s recurrence when this treatment is given only the p.o. period. But in our patient, 4 years p.o., the final result is completely satisfactory.
**E-poster #520**  
**Arthroscopic Evaluation and Management of Unicompartmental Degenerative Disease of the Knee**  
Rodica Marinescu, Voluntari, ROMANIA, Presenter  
Dan Laptoiu, Bucharest, ROMANIA  
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Arthroscopy plays an important role in the evaluation and management of degenerative disease of the knee. The decision for reconstructive surgery is taken during the arthroscopy in numerous cases. The study group we reviewed consists of 60 cases - active, younger than 50 years old, with symptomatic unicompartmental degenerative disease who underwent arthroscopy - initial procedures included lavage, meniscectomy, chondrectomy of cartilage flaps, removal of free bodies and removal of limited osteophytes. Average follow-up is 36 months - the outcome being related to improvement of pain, function and need of further surgery; all patients followed similar post-operative protocol with rehabilitation, bracing and wedge insoles, chondroprotective oral drugs. 16 cases (26.6%) required subsequent surgery - 10 osteotomies and 6 unicompartmentals - at an average of 8 to 10 months.

**Discussion**  
- due to discordant aspects found between clinic and X-rays, arthroscopy may be the best guide for therapeutic decision;  
- history of mechanical symptoms, relatively acute onset of symptoms may be related to a faster clinical improvement and better outcome;  
- osteotomy should be prepared at the time of first arthroscopy ; it may be a valuable ‘gaining time’ intervention in well-selected cases;  
- unicompartmental arthroplasty was a special, age-limited indication; in our group, we used only mobile bearing Oxford implants.

**E-poster #521**  
**Total Knee Replacement in the Young Patient: A Prospective Study**  
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James Edward Arbuthnot, Warrington, Cheshire UNITED KINGDOM  
Michael J McNicholas, Warrington, Cheshire UNITED KINGDOM  
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We report our experience of younger patients with a primary diagnosis of osteoarthritis undergoing Total Knee Arthroplasty (TKA). Patients were recruited prospectively and included if they were 65 years of age or younger at the time of operation and had a primary diagnosis of osteoarthritis. In the first part of this study we present the results for 75 knees in patients 65 years of age or younger with minimum 3 years follow-up. The mean American Knee Society Scores improved from 34.5 to 84.0 for the knee score and from 48.6 to 75.8 for the function score. Break-down of the scoring system shows that predominantly, the knee score increases as a result of pain relief and the function score increases as a result of improved walking ability. Analysis of one-year results of TKA in a cohort of 1202 patients under 65 years of age divided into 5-year age bands shows that there is a small but significant difference in the results achieved by surgery in this younger age group. Patients under 56 years of age had poorer knee scores at one year in comparison to the older groups. Our study shows that TKA remains a good, reliable management strategy in the treatment of younger patients with osteoarthritis affecting the knee.

**E-poster #522**  
**Comparison of Anteroposterior Laxity in Mobile Bearing Prostheses in vivo Using Two Different Arthrometers**  
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A number of factors affect sagittal laxity in total knee arthroplasty (TKA), including applied force, soft tissue structures, and implant design. This study compared the anteroposterior (AP) displacement in a mobile bearing TKA system using two different arthrometers between posterior cruciate ligament (PCL) retaining (PCLR) and PCL sacrificing (PCLS) prostheses and to assess the role of the PCL in mobile bearing TKA prostheses. Sixty LCS prostheses were analyzed. Thirty knees had PCLR and 30 had PCLS prostheses. The selected patients had successful arthroplasty at 2 years postoperatively. The greater AP laxity in PCLR versus PCLS showed the influence of implant design, because only PCLR allows AP excursion. The less effect of AP laxity on
the applied force in PCLR suggests that the soft tissue structures of the PCL absorb the load to some extent. The laxity in PCLS, which retains soft tissue structures other than the PCL, depends on the applied force. These results suggest that soft tissue structures, especially the PCL, have a much greater effect on sagittal laxity than design and absorb the applied force to some extent.

E-poster #523
Changes in Bone Mineral Density of the Calcaneus Following
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Hideo Noguchi, Gyoda, Saitama, JAPAN
Ryo Ishii, Gyoda, Saitama, JAPAN
Hiroshi Kiga, Gyoda, JAPAN
Yoshikazu Matsuda, JAPAN, Presenter
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This study prospectively measured forty consecutive patients undergoing total knee arthroplasty (TKA) to evaluate the relationship between TKA and bone mineral density (BMD) of the calcaneus. The mean age at latest follow-up was 72 years, and all patients had the preoperative diagnosis of osteoarthritis. Broadband ultrasound attenuation through the calcaneus was measured to assess the BMD of patients. The BMD was measured preoperatively and 1 month (M), 3M, 6M, 1 year, and 2 years after TKA. Despite a predicted age-related loss of 4% during 2 years, 65% of the calcaneus on the operative side had BMD higher than preoperative levels and 85% had BMD that was within the expected 4% age-related loss. TKA might contribute to decrease the age-related bone loss. The increase with TKA in patient mobility and the increased heel loading may be a mechanism whereby the calcaneus BMD increases. It is important for surgeons to recognize the objection beneficial effects of TKA in addition to pain relief.

E-poster #524
Influencing Factors on the Postoperative Flexion after Total Knee Arthroplasty
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Hirotu Kobayashi, Niigata City, Niigata, JAPAN
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<Introduction> Influencing factors on the improvement of flexion after TKA were investigated.

<Materials and Methods> Thirty-two TKAs for osteoarthritis in 23 patients with minimum follow-up of 6 months were included in this study. The mean age at arthroplasty was 76.5 and mean follow-up period was 15.6 months. Eighteen cruciate retaining (CR) TKAs and 14 posterior substituting (PS) TKAs were performed by a single surgeon. Preoperative knee extension was -16.1 degrees and knee flexion was 117.8 degrees. Intraoperative extension and flexion gaps were measured by Tensor/Balancer device. Joint line and posterior condylar offset of femur were measured by the pre- and the postoperative roentgenographs.

<Results> Postoperative knee extension was -0.6 degrees and postoperative knee flexion was 117.8 degrees. Improvement of flexion with PS knee (113.7%) was significantly better than that with CR knee (92.7%). Difference of the gaps (flexion gap minus extension gap) and change joint line up to 6mm did not influenced on improvement of flexion. Four of eight cases with 3mm decrease in posterior condylar offset showed improvement of flexion less than 85%.

<Discussion> Improvement of flexion after CR TKAs was influenced by the tension of PCL. Change of joint line should be restored with in 6mm and postoperative posterior condylar offset should be restored within 3mm.

E-poster #525
Use of Femoral Head Strut Allograft for Severe Bone Defect in Primary Total Knee Arthroplasty and Revision Total Knee Arthroplasty
Tae Kyun Kim, Iksan, KOREA
Young Jin Kim, Iksan, Chunbuk, KOREA
Hwan Duk Yang, Iksan, Chunbuk, KOREA
Churl Hong Chun, KOREA, Presenter
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Purpose : To investigate the clinical and radiological results after primary or revision total knee arthroplasty using fresh frozen femoral head strut allograft for bone defect.

Subjects and Methods : Seventeen patients(18 cases) with severe bone defect were taken primary or revision TKA from 1997 to 2001 using fresh frozen femoral head allograft. 12 cases of revision TKA and 6 of primary TKA were conducted. The
average age was 66 years old (55–74) and the follow-up period was 29 months (12–63 months). Bone defects were found at proximal tibia in 10 cases, distal femur in 2 cases and both sites in 6 cases. PCL substituting TKA with extension rod were 15 cases, and PCL retaining TKA were 3 cases. The clinical result was assessed with the knee score of Hospital for Special Surgery (HSS) and for assessment of allograft, simple X-ray film was employed.

Results: Average range of motion was increased from 71 to 103 and HSS score was increased from 46 (18–68) to 83 (68–91). With 17 of 18 femoral head strut allograft, union was seen and no clinical collapse was present. In one, partial allograft absorption was occurred. The preoperative alignment was an average of 7° varus (range 5–15°) and postoperative alignment was averaged 6.1° valgus (range 3–7°). No radiolucent lines were 2 mm or more in width, and there was no case of infection or fracture of allograft.

Conclusions: Femoral head strut allograft was satisfactory method of managing severe bone defect in primary or revision TKA.

Key Words: Knee, Bone defect, Primary TKA, Revision TKA, Femoral head allograft

E-poster #526
Functional Orthosis System Reduces the Peak Impact Force Loading Rate or Patients with Osteoarthritis During Partial Weightbearing Gait
John Nyland, Louisville, KY, USA, Presenter
University of Louisville, Louisville, KY, USA

Introduction: Osteoarthritis represents the late clinical expression of mechanical fatigue failure due to deleterious impacts over a prolonged period of time. Repetitious, uncontrolled compression causes subchondral bone failure, articular cartilage detachment, and reduced proteoglycan synthesis particularly following articular cartilage repair procedures. The purpose of this study was to compare the peak plantar force-time integral and center of peak plantar force location during the loading response of partial weight bearing gait on flat surfaces using either axillary crutches or a functional orthosis system (Easy Strutter, Orthotic Mobility Systems, Kensington, MD). Our hypothesis was that the Easy Strutter device would display a reduced peak plantar force-time integral and more medial and anterior peak plantar force locations.

Methods: Forty subjects with history of knee or hip osteoarthritis were evaluated at > 1 year following unilateral total knee or hip arthroplasty. The operative lower extremity was instrumented with a plantar force sensor (Pedar, Munich, GERMANY). Subjects were instructed in 50% weight bearing at the surgical lower extremity during assistive device use. Subjects ambulated 15.2 m at a self-selected pace as plantar force data were collected (50 Hz). Subjects completed the course with each assistive device with alternating device use order. Mean peak plantar force-time integral and center of peak plantar force locations were determined from the initial 3 steps taken with each device. One-way ANOVA were used to evaluate condition differences (P < 0.05).

Results: Peak plantar forces were comparable between devices (Easy Strutter = 380 ± 209 N, axillary crutches = 388 ± 211 N, P = 0.76). The Easy Strutter device displayed reduced peak plantar force-time integral (855.4 ± 480 N/sec vs. 992.3 ± 525 N/sec) compared to axillary crutches (mean difference = 136.9 N/sec, P = 0.024). Medial-lateral peak plantar force locations at initial foot-ground contact (Easy Strutter = 53 ± 13 mm, axillary crutches = 52.2 ± 12 mm, P = 0.60) and at the instant of peak plantar force production (Easy Strutter = 49 ± 7 mm, axillary crutches = 50.9 ± 7 mm, P = 0.06) did not differ. Anterior-posterior peak plantar force locations displayed significant differences at initial foot-ground contact (Easy Strutter = 82.6 ± 68 mm, axillary crutches = 67.1 ± 62 mm, P = 0.04), however significant differences were not evident at the instant of peak plantar force production (Easy Strutter = 107.9 ± 45 mm, axillary crutches = 100.8 ± 44 mm, P = 0.12).

Conclusions: The Easy Strutter Functional Orthosis System displayed a substantially reduced peak plantar force-time integral during partial weight bearing gait on flat surfaces with a concurrent anterior shift in peak plantar force location at initial foot-ground contact. Reduced and better controlled lower extremity joint impact forces during gait may enable safer, early progressive weight bearing following arthroscopic assisted surgical interventions for osteoarthritis.

E-poster #527
The Effect of Cruciate Integrity on Joint Motion Following UniSpacer Arthroplasty
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Matthew T Thompson, Houston, Texas, USA
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Introduction: An articulating discoid spacer (UniSpacer) has been popularized to reduce pain and restore bony alignment in the patient with early OA of the medial compartment of the knee. While early clinical results are promising, success seems to be sensitive to appropriate patient selection, particularly with regard to the integrity of the soft tissue structures of the knee. The purpose of this study was to evaluate knee kinematics after implantation of the UniSpacer during a functional weight-bearing activity as a function of the efficiency of the cruciate ligaments.

Methods: Six fresh-frozen lower limb specimens were mounted in a 6 degree-of-freedom joint simulator and loaded with a system of 4 external forces to generate a deep knee bend from full extension to full flexion. During knee motion, the three-dimensional positions of the femur and tibia were tracked in real time using a motion analysis system (NDI, Waterloo, CANADA). All measurements were repeated after medial meniscectomy and subsequent implantation of a UniSpacer using standard surgical techniques in three conditions: 1) with both cruciates intact, 2) with a deficient ACL, and 3) with both cruciates deficient. During flexion, the three-dimensional motion of both the UniSpacer and the tibia were measured using a fluoroscopic imaging system (Medical Metrics, Inc, Houston TX).

Results: Cruciate integrity significantly affected the anteroposterior position of the femur relative to the tibia in full extension and throughout flexion with both cruciates intact. Implantation of the UniSpacer shifted the overall dwell position of the femur an average of 2.0 ± 4.0mm posteriorly and reduced the net femoral rollback throughout flexion from 16.9 ± 2.1mm to 14.6 ± 1.2mm. Resection of the ACL, with the PCL intact, shifted of the dwell position an additional 4.1mm (6.1 ± 3.1mm) while also reducing the net rollback to 11.8 ± 3.5mm. Further resection of the PCL resulted in an additional 4.1mm (10.6 ± 4.3mm) posterior shift in the dwell position and reduced net rollback to 8.4 ± 3.7mm. Sequential resection of the cruciates significantly altered the axial rotation of the knee during flexion to 140 .

Discussion and Conclusion: As in the intact knee, tibiofemoral kinematics are significantly affected by the integrity of the cruciates after implantation of the UniSpacer. As full range of motion following implantation requires substantial intra-articular motion of this device, compromising rollback and altering axial rotation may have a substantial effect on its clinical and functional performance. Patient selection criteria for UniSpacer arthroplasty should include the presence of both cruciates.

E-poster #528
Medial Opening Wedge Tibial Osteotomy Utilizing a New Fixation System
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Medial opening wedge osteotomy of the tibia is a treatment option for patients with symptomatic medial compartment knee arthritis. To maximize the advantages of both internal and external fixation techniques, a new plate system has been developed consisting of a two-piece plate with a one-way ratcheting mechanism with two degrees of freedom. In addition to stable fixation, this device offers intra-operative adjustability and provides the opportunity to perform post-operative adjustment should it be necessary. Our hypothesis is that this new plate can be used in a safe and effective manner to achieve a successful proximal opening wedge valgus tibial osteotomy. Twenty opening wedge tibial osteotomies were performed using a new, adjustable internal fixation plate. A variety of concomitant procedures were performed including arthroscopic meniscectomy, OATS, tibial tubercle transfer, and ACL reconstruction. The change in mechanical tibio-femoral alignment and the overall shift in lower extremity mechanical axis was determined. Union rates, complications, and device survival were reported. The average shift in lower
extremity mechanical axis was 20 mm, or 24% of the tibial plateau in a lateral direction. The mechanical tibio-femoral axis (normal=180°) averaged 175° (5° varus) pre-operatively and 182° (2° valgus) post-operatively, representing an average valgus shift in the mechanical tibio-femoral alignment. Two cases required revision (one non-union, one valgus collapse). No deep infections or clinical DVTs occurred. No device failures occurred. Nine devices were removed and no plates demonstrated mechanical failure or cracking on fluorescent penetrant inspection. The Osteotrac plate provides safe and effective fixation and intra-operative adjustability to achieve and maintain a lateral shift of the lower extremity mechanical axis and valgus correction of the tibio-femoral mechanical alignment in patients with varus knees undergoing proximal tibial opening wedge osteotomy and associated meniscal and chondral procedures.

E-poster #529
Does Prior Knee Arthroscopy Affect Peri-operative TKR Results?
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Liz W. Paxton, El Cajon, CA, USA
Pamela D Bottom, San Diego, CA, USA
Donald C Fithian, El Cajon, CA, USA
SCPMG, Harbor City and San Diego, CA, USA

Introduction:
While questions about the effectiveness of knee arthroscopy as a treatment for knee arthritis have led to a firestorm of controversy recently, still unanswered is the question regarding the effect prior knee scope might have on peri-operative results of subsequent total knee replacement (TKR). The purpose of this study is to compare early TKR results in 2 groups: those who have had prior knee scope (Group A) and those who have not (Group B) in order to see if the prior knee scope may have had any effect on TKR outcomes.

Methods:
1725 TKR were prospectively enrolled in an IRB approved multi-center registry. 442 had prior scope, 1143 had no prior operation, and 140 were excluded due to complex prior surgery. All were assessed at set intervals after TKR and the 2 groups compared via uni- and multivariate statistical analyses.

Results:
The mean time from scope to TKR was 61 months. The average post-TKR follow-up was similar in both groups. Patients in Group B were older and more likely to be retired than patients in Group A, had greater reduction in pain and were more satisfied with surgery (all p<.001). Group A was more likely to smoke, to be of male gender, and to have higher rates of steroid use, as well as need for revision. The infection rate was 155% higher in Group A (p=.026) and the nerve palsy rate trended higher in the same group.

Discussion/Conclusion:
Early results in this preliminary report based on emerging data from a community-based registry were worse and complication rates higher in the prior scope group. These data are worrisome and call into question the safety of scope prior to TKR. Longer term outcomes with higher power will be needed to answer this question definitively.

E-poster #530
Lipoma Arborescens of Bilateral Knees Associated with Osteoarthritis: Report of a case
Gota Ohi, Fukushima City, JAPAN, Presenter
Shin-ichi Kikuchi, Fukushima City, JAPAN
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Lipoma arborescens is a rare condition usually found in the knee. We experienced a 73 year-old man who had lipoma arborescens. He showed swelling, slight pain and recurrent effusion in bilateral knees for twenty years. He had been treated conservatively in diagnosis of osteoarthritis. However pain had gradually increased and osteoarthritis had progressed on radiograph. MRI revealed a frond-like synovial mass with the same intensity as mature fat. To decrease pain, total knee arthroplasty was performed. Villous lipomatous proliferation of synovial tissue was seen in suprapatellar pouch. Additional synovectomy and histological examination was performed. The diagnosis was lipoma arborescens.

It has been suggested that long-standing lipoma arborescens may lead to secondary osteoarthritis. Correct diagnosis of this disease can be achieved because of its characteristic clinical and MRI findings, if we keep this disease in mind. Making early diagnosis and resection is necessary.
E-poster #531
Relationship Between Age and the IKDC Knee Score
Andrea Nelson, Alexandria, MN, USA, Presenter
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Jeff Brand, Alexandria, MN USA
Alexandria Orthopaedic Associates, Alexandria, MN, USA

INTRODUCTION: The International Knee Documentation Committee (IKDC) devised a subjective knee scoring sheet to evaluate patient knee pain and function. Our purpose was to evaluate the subjective knee score in individuals without known knee pathology of varying ages. We proposed that the knee function as measured by the IKDC subjective knee scoring sheet declines with advancing age.

MATERIAL: Individuals of varying ages were assessed with the subjective IKDC knee scoring sheet. The individuals have no known knee pathology, injury or previous surgery.

METHODS: Seventy four individuals answered the IKDC subjective knee questions. The data was divided into age groups: 10-19 (N=11), 20-29 (N=4), 30-39 (N=18), 40-49 (N=18), 50-59 (N=18), and 60 and over (N=5). The data was collected on an Access database (MicrosoftTM, Redmond, WA), downloaded to Statview (SAS, Cary, NC). ANOVA for each age group was compared with Scheffe post hoc statistics.

RESULTS: The mean subjective total score for each group in parenthesis: 10-19 (89.1), 20-29 (99.2), 30-39 (88.2), 40-49 (87.2), 50-59 (83.6), and 60 and over (85.0). These differences were not statistically significant despite the slight decline in knee score with advancing age. None of the subcategories were significantly different.

DISCUSSION: In this investigation the mean knee score in each age group despite a slight decrease with advancing age, were not significantly different. Individual knee scores as assessed by the IKDC subjective knee sheet reflects knee pathology rather than advancing age. Of all subjects surveyed only 25% scored at or above 99 of a possible 100.

E-poster #536
Development and Validation of a Novel Activity Scale Appropriate for Total Knee Arthroplasty Revision.
Khaled J. Saleh, Charlottesville, VA, USA, Presenter
Edward Ranier Santos, Minneapolis, Minnesota USA
Boris Bershadsky, Minneapolis, MN USA
Hassan Ghomrawi, Minneapolis, MN USA
Kenneth A Krackow, Buffalo, New York USA
University of Minnesota, Minneapolis, MN &, Buffalo, NY, USA

Introduction
Improved outcome measurement tools are required in order to demonstrate the effectiveness and clinical outcomes of total knee arthroplasty revision (TKAR). We describe the development and validation an Activity Scale (AS) as an instrument for assessing the frequency and intensity level of daily physical activity of patients to allow more reliable, objective and accurate analysis of clinical outcomes in TKAR.

Methods
The scale was developed using a consensus group process, and initially validated using pedometry and by comparing self-assessment by patients with a relatives assessment. As part of a prospective seventeen-center study, 297 consecutive patients undergoing TKAR had data collected on demographics, co-morbidities, Activity Scale (AS) scores and the Western Ontario and McMaster Universities Osteoarthritis (WOMAC) Index. Statistical models were developed in order to validate the activity scale. Univariate, bivariate and multivariate analytic methods were used to validate AS in this population both at baseline and 6-month follow-up. The scale was further tested for reliability over time as well as sensitivity to change.

Results
Once initial content and construct validity (p=0.0001) and reliability (p<0.0001) were obtained, the scale was applied to the TKAR cohort. With very few non-respondents (<4%), the distribution of the AS scores at baseline and 6-month follow-up was close to normal. No ceiling or floor effects were observed. Using correlation analysis, convergent validity of the activity scale was established at baseline. Reduced activity level among subjects correlated significantly with difficulty in function and elevated pain (as indicated on the WOMAC index) as well as increased number of patient comorbidities (p=0.000). Stiffness was not significantly correlated with AS at baseline thus reinforcing divergent validity assumptions. Similar results were obtained for follow-up data. Predictions of the multivariate regression analyses also
demonstrated the validity of AS. Difficulty of function (p=0.000) and number of diseases (p=0.001) were significant explanatory variables. Although pain was significantly correlated with AS scores, its effect on activity is indirectly through limiting function. Besides its validity at a certain point in time, AS was sensitive to change in patient status between baseline and follow-up (p=0.000). Reliability of AS was also established since baseline values correlated with follow-up scores (p=0.000). Correlation of change in AS with changes WOMAC pain, stiffness, and difficulty in function as well as comorbidities were similar to time point correlations.

Conclusions
This study has developed and validated an AS as an effective instrument in the assessment of TKAR patients. This will allow more accurate analysis of, and ultimately the ability to predict, outcomes. It may also, therefore, eventually prove to be a useful adjunct to practical and objective clinical decision-making in total knee arthroplasty revision.

E-poster #537
Kellgren-Lawrence (K-L) Scores and Arthroscopic Findings in the Degenerative Knee
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Introduction: Other studies have shown that Kellgren-Lawrence (K-L) score can differentiate severity of osteoarthritis as compared to MRI, however this has not been done compared to arthroscopic findings. The purpose of this study was to determine if differences exist between knees with grade III and grade IV K-L based on arthroscopic findings.

Methods: Tibiofemoral knee osteoarthritis was graded according to the Kellgren-Lawrence (K-L) scale in 89 knees presenter for arthroscopic treatment of osteoarthritis of the knee. The study group consisted of 55 males and 34 females with an average age of 55 (range 37 to 88) years. There was no age difference between gender. All radiographs were examined by an orthopedic surgeon and arthroscopic data was collected prospectively and recorded by orthopedic surgeon.

Results: On examination of radiographs, 5 knees had a grade II K-L, 47 had grade III K-L, and 37 had grade IV K-L. All knees had documented osteophytes and sclerosis on radiographs. 87 knees had joint space narrowing.

At arthroscopy, kissing lesions in one compartment were noted in 49 knees, and kissing lesions in both the medial and lateral compartment were noted in 17 knees. Meniscal pathology was present in 78 knees (37 had medial and lateral pathology). In comparing Grade III & IV K-L, there was no difference in age. There was a difference between K-L grade III & IV and gender, with more males having Grade IV K-L (p=0.001).

There was a difference between the number of cartilage surfaces with Grade 3 or 4 damage, as visualized on arthroscopy, and K-L grade III and K-L grade IV. More knees with Grade IV K-L had more grade 3 or 4 lesions on 3 or 4 surfaces than grade III K-L (p=0.001). Grade IV K-L also had significantly more kissing lesions than grade III K-L (p=0.0001).

There was a significant difference between grade III & IV K-L and the presence of meniscal pathology (p=0.032). However, of those knees with meniscal pathology, the presence of both medial and lateral meniscal pathology was not different between K-L grade III and K-L grade IV (p=0.49).

Conclusion: In this study population, a difference was found in gender, chondral surfaces and meniscal pathology between Grade III K-L and grade IV K-L. The K-L scale can differentiate between moderate and severe osteoarthritis.

E-poster #539
The Anterior Femoral Cortical Line as a Landmark in Total Knee Arthroplasty
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Chris T Servant, Woodbridge, Suffolk, UNITED KINGDOM
Harish Kurup, Southampton, Hampshire, UNITED KINGDOM
Salisbury District Hospital, Salisbury, UNITED KINGDOM

Introduction: Accurate placement of the femoral component in total knee arthroplasty, particularly in rotation, is vital to ensure a biomechanically stable construct. Reproducible femoral landmarks such as the anteroposterior axis (APA or Whiteside’s line), the
epicondylar axis (EA) or the posterior condylar axis (PCA) have all been used to locate the optimal position for femoral component rotation. We have assessed the anterior femoral cortical line (AFCL) as a reproducible landmark in the femur.

Methods:
We analysed the rotational position of the AFCL with respect to the EA using axial MRI scans of 32 knees. Each line was identified using defined criteria and reproducible landmarks and the angle between them measured on the medial side of the axial slice to determine a mean value. The process was repeated for the APA and the PCA and the results analysed.

Results:
The mean total value for the AFCL with respect to the EA was 11.3º (range 5 - 18, Standard Deviation 3.22) measured on the medial side of the knee (externally rotated with respect to the EA). There was no statistically significant difference between right and left knees or men and women. Measurements derived from the other landmarks were similarly consistent.

Conclusion:
The anterior femoral cortical line is a reproducible landmark in the knee with a relatively consistent relationship with other axes of femoral rotation. It may be useful when determining optimal rotation for the femoral component, particularly in revision surgery or other circumstances where other landmarks may be lost. We are currently analysing greater numbers to confirm the data presented in this initial study.

E-poster #541
Revision Total Knee Arthroplasty: Baseline Information from the North American Knee Arthroplasty Revision (NAKAR) Study Group.
North American Knee Arthroplasty Revision (NAKAR), USA
Edward Ranier Santos, Minneapolis, Minnesota USA
Khaled J. Saleh, Charlottesville, VA USA
Kevin James Mulhall, Charlottesville, VA USA
Presenter
University of Minnesota, Minneapolis, MN, USA

Introduction: Revision total knee arthroplasty (TKAR) is on the rise. There is a paucity of information regarding the demographic characteristics, etiology or mode of failure, functional disability, and socioeconomic status of patients Presenter for TKAR. The objective of this seventeen-center prospective study is to document pertinent baseline information on candidates for TKAR.

Methods: The cohort consisted of 290 consecutive subjects Presenter for TKAR from March 2002 to December 2003. Baseline demographic data were retrieved from standard patient-completed questionnaires. Relevant clinical information was obtained from surgeon-completed documents. Subjects enrolled in the study also completed quality of life and functional questionnaires, including the Short-form 36 (SF-36) and Western Ontario and McMaster Universities (WOMAC) Osteoarthritis Index. Modes of failure were also recorded.

Results: There were 137 males and 153 females with a mean age of 68.6 years (34 to 85 years). The mean SF-36 and WOMAC score at baseline indicated significant functional disability. The subjects were composed of Caucasian (83%), African-American (14%) and other races (3%). Approximately 20% of the subjects had only primary education, 34% graduated from high school, 22% had some college education, 9% had a postgraduate degree. Thirty-nine percent of the patients had an annual household income below $25,000; 31% were in the $25,000-$50,000 bracket, and 22% had annual incomes greater than $55,000. The predominant modes of failure were instability (28.9%), tibial osteolysis (27.5%), polyethylene wear (24.5%), femoral osteolysis (22.5%) and tibial loosening (22.2%)

Conclusion: We were able to define baseline demographics for 290 consecutive TKAR cases. The results show that these patients are relatively young, and considerably disabled by their failed primary procedure. Majority of the patients had lower educational and income status, and lacked health care coverage, a fact that becomes more significant in light of the generally high cost of these revision procedures, as well as the greater awareness of health care cost in general. The modes of failure were similar to those in previous studies and consist of instability, osteolysis, polyethylene wear, and aseptic loosening. The findings give us insight into the specific groups of TKA patients that are at risk for failure and may allows the formulation of measures and proper resource allocation that may prevent TKARs.
**E-poster #542**
**Validation of Two Systems of Bone Loss Measurement in Total Knee Arthroplasty Revision.**
Khaled J. Saleh, Charlottesville, VA, USA
Edward Ranier Santos, Minneapolis, Minnesota USA
North American Knee Arthroplasty Revision (NAKAR), Study, Group USA
Kevin James Mulhall, Charlottesville, VA, USA, Presenter
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**Background**
A key challenge to orthopaedic surgeons in revision total knee arthroplasty (TKAR) is the management of bone loss. A valid and reliable system of measuring bone loss preoperatively aids in proper planning for revision and permit meaningful comparison between different series of patients and treatment methods. The Anderson Orthopaedic Research Institute (AORI) system describes three types of defects, depending upon the ability of the remaining bone to support a prosthesis. The University of Pennsylvania (UPenn) assessment system resembles a finite element grid (200 for the femur and 200 for the tibia) onto which areas of bone defects that are seen on antero-posterior and lateral radiographs can be superimposed. The intraoperative validity of the AORI and the UPenn systems was investigated in a large, consecutive series of TKAR patients.

**Methods**
Two hundred and ninety consecutive patients with a failed total knee replacement in need of revision surgery were prospectively followed in 17 centers. Based on preoperative anteroposterior and lateral radiographs, bone loss was assessed using the AORI and UPenn systems by 31 orthopaedic surgeons trained in the use of these systems. These two systems were then used to assess bone loss intraoperatively. Kappa statistics (categorical variable test) was used to assess validity of the AORI classification. Paired t-test (continuous variable test) results and scatter graphs were examined to assess validity of the UPenn system.

**Results**
Among the 290 subjects, 215 (74.1 %) were assessed to have some degree of bone loss preoperatively and 222 (76.4 %) intra-operatively. Using the AORI classification system agreement between preoperative and intraoperative classification was moderate for the femur (k = 0.50) and good for the tibia (k = 0.63). For the UPenn system, the mean number of grids with bone loss was 31 (2 to 200) for the femur, and 30 for the tibia (1 to 144), with resultant mean scores of 0.137 for both. Intraoperatively, a mean of 34 grids (2 to 200) had bone loss for the femur, and 32 grids (1 to 125) for the tibia. The resultant mean intraoperative scores were 0.14 and 0.143 for the femur and tibia, respectively. There was no statistically significant difference between preoperative and intraoperative scores for the femur and tibia (p < 0.02).

**Conclusions**
This study shows a high incidence of bone loss among patients undergoing TKAR. The results demonstrated that both the AORI and UPenn systems are valid tools for assessing the actual bone loss that will be encountered intraoperatively, information that will help in the accurate planning of management of bone loss in these cases.

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**E-poster #543**
**The Influence of Femoral Component Rotation on the Flexion Gap In Deep Knee Flexion**
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Chong Bum Chang, Seoul, KOREA, Presenter
Sahnghoon Lee, Seoul, KOREA
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**Purpose:** The aim of this study was to evaluate the influence of the femoral component rotation on the status of the flexion space in deep knee flexion.

**Materials and Methods:** We performed preoperative, intraoperative and postoperative evaluation of the 36 osteoarthritic knees. Using preoperative and postoperative multi-detector computed tomography, we measured the angle among the rotational reference axes and calculate the actual amount of the femoral component rotation. Intraoperatively, we measured the medial and lateral flexion gaps at 90 and 130 degrees of knee flexion. Pearson correlation test was used to determine whether the amount of external rotation of femoral component was associated with the change in the status of the flexion space as the knee flexed from 90 to 130 degrees.

**Results:** Through the intraoperative measurements of the flexion gaps, we found that the balanced flexion space at 90 degrees became...
asymmetrical space with the narrowing of the medial gap and maintaining or widening of the lateral gap at 130 degrees. Even up to 6.8 degrees external rotation of the femoral component (4.5 degrees on average), there was no case showing a larger medial gap than lateral at 90 degrees flexion. The statistical analysis revealed that increased external rotation of the femoral component significantly reduce the amount of the medial flexion gap narrowing at 130 degrees. Conclusion: Our results indicate that the commonly reported 3 degrees of external rotation relative to the PCA and aligning the femoral component parallel to the surgical TEA would be an insufficient external rotation especially in the Asian female osteoarthritic patients whose lifestyle frequently requires deep knee flexion.

E-poster #544
The Early Results of LPS-Flex Fixed Bearing Total Knee Arthroplasty
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Introduction: LPS-flex knee prosthesis was specially designed to safely accommodate deep knee flexion of up to 155 degrees. The purpose of this study was to evaluate the early results of LPS-flex fixed bearing prosthesis to assess whether this new implant had achieved its design objectives.

Materials and Methods: Between Jul. 2001 and Mar. 2003, 99 total knee arthroplasties of 72 patients were performed with LPS-flex prosthesis and followed for a minimum of one year (mean: 22months). Of the 72 patients, 68 patients (94 knees) were female and 4 patients (5 knees) were male. The mean age at the time of surgery was sixty nine years and mean weight and height were 63kg and 153cm. The preoperative diagnoses included osteoarthritis in 95 knees and rheumatoid arthritis in 4 knees. We evaluated the change in postoperative range of motion over time. Knee rating system of the Hospital for Special Surgery and Knee Society clinical rating system were used for clinical evaluation.

Results: The mean range of motion improved from 119.3 degrees to 127.2 degrees at the time of latest follow-up. The mean range of motion at six months was 123 degrees, 128 degrees at one year and 127.8 degrees at two years. The change in mean range of motion from six months to one year was significant but no significant change was found after one year postoperatively. The mean Hospital for Special Surgery knee score improved from 60 points to 86 points (p<0.001) and the mean Knee Society score improved from 51 points to 87 points (p<0.001).

Conclusion: Total knee arthroplasty with LPS-flex showed excellent range of motion and satisfactory early clinical results. However, the long term results should be followed in the future.

E-poster #545
Deep Knee Flexion Needs More External Rotation of Femoral Component in Total Knee Arthroplasty
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Chong Bum Chang, Seoul, KOREA, Presenter
Sahnghoon Lee, Seoul, KOREA
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Purpose: To investigate the optimal rotational alignment of the femoral component in Asian population and for deep knee flexion in total knee arthroplasty (TKA).

Materials and Methods: In forty volunteers (20 males and 20 females), we analyzed the relationship among the rotational reference axes on the axial magnetic resonance images of the distal femur in knee extension and the coronal images of the distal femur and entire tibia at 90 and 130 degrees flexion. Results: The clinical transepicondylar axis (TEA), rather than the surgical TEA, was found to most consistently provide a balanced flexion space at 90 degrees. To align the femoral component parallel to the clinical TEA, about 4 (male) to 6 (female) of external rotation relative to the posterior condylar axis (PCA) is required. As the knee flexed from 90 to 130 degrees, the clinical TEA was internally rotated relative to the tibial mechanical axis, which implies that even the symmetrical flexion space at 90 degrees flexion changes into an asymmetrical space with the narrowing of the medial flexion gap relative to the lateral one in TKA. We are concerned that this phenomenon may be exaggerated in the osteoarthritic knee with tight medial compartment. Conclusion: This study suggests that the commonly reported 3 degrees of external rotation relative to the PCA and aligning the femoral component parallel to the surgical
TEA would be an insufficient external rotation especially in the Asian female osteoarthritic patients whose lifestyle frequently requires deep knee flexion.

**E-poster w/ Standard #547**

New Parameter of Flexion Status After Posterior Stabilized Total Knee Arthroplasty: Posterior Condylar Offset Ratio on X-ray Photographs

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Introduction:
The demand for acquiring deep flexion needed in the life style of Asian countries including JAPAN is higher than ever. In cruciate-retaining type TKA, the increase in posterior condylar offset (PCO), Bellemans reported in 2002, is generally considered to be correlated to flexion angle acquired postoperatively. However, the significance of PCO differs according to the size of joint. Furthermore, correction is required for the difference in scale of photographs. Thus, for comparison of posterior clearance, it was considered reasonable to study the ratio by some standard. We have therefore defined a new parameter of posterior condylar offset ratio (PCOR= PCO/ antero-posterior diameter of femoral component).

Objectives:
The purpose of this study was to compare PCOR in PS type TKA of postoperative flexion satisfactory group and postoperative flexion unsatisfactory group and to study the significance of this value.

Patients & Methods:
From January 1999 to December 2003, PS type TKA was conducted on 179 joints at our institution. Of these, the subjects of this study were 80 knees (8 males and 72 females, with mean of 75 years-old) with osteoarthritis more than 6 months postoperatively. Patients were divided into groups as follows: In postoperative flexion angle (FA), patients with FA of less than 100 degrees were divided into Group A, patients of 100 degrees and greater were divided into Group B. In flexion achievement rate (AR), patients with AR of less than 100% were divided into Group C, patients of 120% and greater were divided into Group D.

Results:
In FA, PCOR in Group A (n=14; 0.375) was significantly lower (p=0.027) than that in Group B (n=29; 0.428). In AR, PCOR in Group C (n=23; 0.376) was significantly lower (p=0.0018) than that in Group D (n=11; 0.456).

Conclusions:
This study demonstrated that PCOR in flexion satisfactory group is significantly higher than that in unsatisfactory group. We have concluded that our defined PCOR could serve as a parameter of postoperative flexion status of PS type TKA.

**E-poster w/ Standard #548**

Clinical Outcome Following Bilateral Staged Total Knee Arthroplasty

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Introduction: Clinical outcome studies have shown excellent results following unilateral total knee arthroplasty (TKA). A wide Pub Med search failed to find any literature on the outcome of results following bilateral staged TKA.

Aim: To determine the clinical outcomes of patients undergoing bilateral staged TKA.

Material & Methods: Patients who underwent bilateral staged TKA between 1994 - 2002 were assessed using the Knee Society Score (KSS) and Western Ontario and MacMaster Osteoarthritis Index (WOMAC) scoring systems. They were also asked regarding which TKA they considered better and why.

Results: We clinically reviewed 110 patients who underwent bilateral staged TKA. The mean clinical follow-up time was 5.13 years. The mean pre-operative KSS was 95.8 for the right knee and 95.5 for the left knee. The mean post-operative KSS was 154.1 for the right knee and 155.9 for the left knee. Patients mean post-operative WOMAC scores for the right knee were; Pain - 1.67, Stiffness - 1.17 and Function - 10.78. Patients mean post-operative WOMAC scores for the left knee were, Pain - 1.77, Stiffness - 1.14 and Function - 10.69. Objectively there was no
statistical significance between right and left KSS pre-operatively. There was no statistical significance between right and left KSS and WOMAC scores post-operatively. Subjectively, 44 patients reported their first TKA was better than their second. 48 patients reported both TKA’s were as good as each other. 18 patients reported their second TKA was better than their first. The 2 main reasons why one TKA was better than the other were pain and range of movement.

Conclusion: Objectively, staged bilateral TKA results in equally good outcome. Subjectively, the first TKA is better or equal to the second TKA in 84% of cases. We feel that this information is important during counseling of patients undergoing bilateral staged TKA.

E-poster w/ Standard #549
Closed Suction Drains in Total Knee Arthroplasty: Are they Necessary and do they Affect Transfusion Rates?
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Aims: To determine if closed suction drains are necessary in primary Total Knee Arthroplasty (TKA).
Methods: A retrospective review was performed on two consecutive groups of patients who underwent primary TKA. Group 1 - patients who underwent TKA and had 1 deep closed suction drain. Group 2 - patients who underwent TKA who had no drain. Parameters assessed were - Pre and 48 hour post-operative Haemoglobin and Haematocrit; Transfusion rates, Daily Temperature, Length of Stay, Complications and Range of Knee movement at 3 months. Blood Transfusions were given post-operatively on the basis of clinical need without a pre-determined Haemoglobin trigger factor.
Results: There were 100 patients in each Group. Group 1 drained a mean of 537 ml of blood in 24 hours and 701 ml in 48 hours. The mean fall in haemoglobin and haematocrit 48 hours post-operatively in both groups was 3.34 g/dl and 10% respectively. 5 patients required a blood transfusion in both Groups. The mean length of hospital stay in Group 1 was 8.00 days, and Group 2 was 8.54 days (p<0.5). There was a comparable number of complications and no evidence of deep infection in both groups at 3 months post-operatively. Knee flexion in Group 1 was 97 degrees and in Group 2 was 100 degrees at 3 months; which was not statistically significant (p<0.1).

Conclusion: There was no significant difference any of the parameters measured in each of the two groups of patients. Transfusion of primary TKA patients on the basis of clinical need can result in post-operative transfusion rates of 6% in both groups. We do not recommend the use of closed suction drains in primary TKA.

E-poster w/ Standard #550
Closing Wedge High Tibial Osteotomy: Review of 352 Cases
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Closing wedge high tibial osteotomy has been a reliable treatment option for varus osteoarthritis of the knee. There has been a shift towards opening wedge tibial osteotomy techniques partially due to perceived high complication rate with closing wedge osteotomies. The purpose of this study was to review our experience with tibial osteotomies and this paper reports the early postoperative outcome of a large series of closing wedge tibial osteotomies.

We reviewed the case records of 314 patients who underwent a total of 352 closing wedge high tibial osteotomies by three surgeons for medial compartment osteoarthritis between 1989 and 2003. The mean outpatient follow up was 15.8 months and the mean time post-surgery was 68 months. Postoperative complications and early clinical outcome was documented along with information regarding those known to have proceeded to joint replacement. All patients underwent a laterally based wedge excision. The mean size was 9° (4 to 18°). The osteotomy was stabilised with 1 or 2 stepped staples. The mean age at time of surgery was 52 years (20 to 72). In the early follow up period only 9.1% of patients complained of continuing knee pain. 3.7% of knees are known to have deteriorated requiring total knee replacement at a mean of 63.9
months (16 to 112) following osteotomy. No intra-operative difficulties were encountered with these replacements. The complication rate was acceptable at 8.81%. One patient required early revision due to inadequate initial correction and one developed a transient peroneal nerve neuropathy. There were no other neurovascular or intra-operative complications. All osteotomies united although 9 patients had delayed union taking a mean of 5.3 months for union to occur. 13 patients developed symptomatic venous thrombo-embolism, 5 with pulmonary emboli but there were no deaths. Other complications included 4 patients who required removal of staples due to irritation and one deep wound infection which responded to treatment. Closing wedge high tibial osteotomy for medial compartment osteoarthritis is a safe and reliable procedure with a good early outcome and a low complication rate of 8.81% in this series. This compares favourably with the quoted complication rates for opening wedge tibial osteotomy.

E-poster w/ Standard #551
Total Knee Replacement Following High Tibial Osteotomy: A Medium-term Review.
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Mario Tartarone, Rome, ITALY
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Introduction
Total knee replacement is an effective treatment for degenerative joint disorders. There have been conflicting reports in the literature regarding the results of post high tibial osteotomy knee arthroplasty. Aim of this study is to evaluate long term data of total knee replacement following high tibial osteotomy. Five years data are presented.

Material and method
Of the patients with knee osteoarthritis treated by cemented TKR in 1999, two groups were selected. Group I consisted of 20 patients who had knee replacement without previous tibial osteotomy; the average age of the patients was 72.2 years and the average follow-up was 5.4 years. Group II comprised 20 patients with high tibial osteotomy before total knee replacement. The average age was 73.7 years and average follow-up was 5.2 years. The results of knee arthroplasty were evaluated, in terms of function, according to the Knee Society Clinical Rating System, using the knee scoring system (KSS) and functional system (FS). The length of the patella and patellar ligament were measured, the Insall-Salvati index was calculated and the height of the patella was determined.

Results
Intraoperatively, no notable differences were identified in the number of medial, lateral, or lateral patellar releases required. However, less lateral tibial bone was resected in the group with a previous high tibial osteotomy (average, 3.3 millimeters) than in the group without a high tibial osteotomy (average, 7.5 millimeters). The average duration of follow-up was 5.2 years (range, 4 to 6.5 years) in the group with a previous high tibial osteotomy and 4.9 years (range, 3 to 6 years) in the group without a high tibial osteotomy. At the time of the final follow-up, the knee and function scores were similar for the two groups. The average KSS scores were 87.3 and 82.1 points for groups I and II, respectively. Excellent and good outcomes were achieved in 16 (group I) and in 12 (group II). The average FS scores were 84.1 and 80.2 points in groups I and II, respectively. The average Insall-Salvati index in groups I and II were 1.07 and 0.93, respectively. No patella infera was recorded in group I, but it was found in 10 (50%) patients of group II. Although more knees were free of pain in the group without a previous high tibial osteotomy (16) than in the group with a previous osteotomy (12), this difference was not found to be significant with the numbers available (p = 0.4810). Knee alignment and stability, femoral and tibial component alignment, and range of motion also were similar in both groups postoperatively. There were no deep infections.

Conclusions
While patients with a previous high tibial osteotomy may have important differences preoperatively, including valgus alignment, patella infera, and decreased bone stock in the proximal part of the tibia, the present study suggests that the clinical and radiographic results of primary total knee arthroplasty in knees with and without a previous high tibial osteotomy are not substantially different. In our relatively small group of patients, the previous high tibial osteotomy had no significant adverse effect on the outcome of the subsequent total knee replacement. The IKS function score and the HSS
score were not statistically different. Conversion of a failed tibial osteotomy is a technically demanding procedure. Careful preoperative planning is needed. Results, especially on pain, appeared to be inferior to those for primary arthroplasties. High tibial osteotomy provides symptomatic relief for approximately 10 years, but is unlikely to provide permanent relief.

**E-poster w/ Standard #552**  
**Two Stage Reimplantation TKA with Articulating Cement Spacer of Articular Geometry using Intra-operatively Created Custom Mold**  
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**PURPOSE:** This paper is to report a technique of creating articulating cement spacer having the same articular geometry of removed implants, and the clinical result of two-stage reimplantation total knee arthroplasty (TKA) in the treatment of infection by this technique.  
**TECHNIQUE:** We applied a batch of bone cement on the articular surfaces of removed implants. We could obtain custom mold after the cement hardened. Then two or three batches of antibiotics loaded cement were put into the molds. The cement spacers having the same articular geometry of the removed implants were created and were applied to femoral and tibial side respectively. Excellent stability and good motion was provided immediately.  
**MATERIALS & METHODS:** Twelve patients of infected TKA treated with the authors' technique were reviewed with 1 year minimum follow-up. The degree of full flexion at preop., just before reimplantation, postoperatively after reimplantation were analyzed. Any additional procedure required for adequate exposure and operative time in the reimplantation surgery, and any complications were reviewed.  
**RESULTS:** The degree of full flexion was 85(40-130) preoperatively and 100(70-110) before reimplantation. Postoperatively, degree of full flexion was 103(40-130) at 2weeks, 112(90-140) at 6 weeks, 108(70-140) at 3 months, and 110(75-140) at 1 year. Rectus snip was required in 8 out of 12 cases, and 4 cases were performed without any specific procedure added to the routine TKA approach. We had no complication regarding this technique. There was no evidence of recurred infection in all cases at final follow-up.

**CONCLUSION:** Our technique of two-stage reimplantation TKA facilitated further flexion of the knee during the time for infection control between the 1st and 2nd stage, and thus seem to have prevented quadriceps contracture. It resulted in relative ease in reimplantation surgery, and a good flexion of knee postoperatively with no specific complications. We believe our technique offers practical advantage over previously described techniques. It offers ease and convenience of surgical technique without considerable increase in surgical cost or time, and it eliminates the need for costly commercial mold or special implants. Unexpected loss of flexion between stages seems to be no longer a concern with our technique of two-stage reimplantation.

**E-poster w/ Standard #553**  
**Efficacy of Femoral Nerve Block in Conjunction with Epidural Analgesia for Total Knee Arthroplasty**  
Lorenzo Sensi, Florence, ITALY, Presenter  
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Roberta Coppini, Florence, ITALY  
Andrea Baldini, Florence, ITALY  
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**Introduction:** Inadequate control of postoperative pain after total knee arthroplasty (TKA) has been associated with a poor functional recovery. This study investigated whether the addition of a single injection femoral nerve block (FNB) to continuous epidural analgesia (EA) provides improved pain control, lowered side effects, and a further acceleration in achievement of rehabilitation goals.  
**Material and methods:** Eighty patients undergoing TKA and receiving EA with 18 ml of 0.5% marcaine were randomized whether to receive or not a single dose of FNB. A nerve stimulator and 30 ml of 0.375% marcaine with 5 µg/ml of epinephrine were used to perform FNB prior to surgery. Postoperative continuous EA was self-administered by the patient adding bolus (up to 4bolus/hour) to the basal infusion rate of 2 ml/hour of 0.175% marcaine. Standardized post-operative rehabilitation protocol were followed for both groups. Therapists and clinicians were blinded to treatment group. Over-all narcotic consumption, bolus dosing, and side effects were recorded.  
Outcomes measurements included post-operative strength and sensation, range of motion and
progression, pain score (VAS) and achievement of functional milestones.

Results: Femoral nerve block group had significantly lower pain scores and lower epidural consumption in comparison to the group without block (p<0.01). Range-of-motion was significantly greater through post-operative day three in the FNB group (p<0.04). There was a consistent trend toward improved achievements in rehabilitation milestones after FNB. Decreased quadriceps strength was noted in 33% of the FNB patients on post-operative day one compared to 10% of the patients with isolated EA.

Discussion: We found significant improvements both in terms of analgesia and in functional parameters adding a FNB to continuous EA following TKA. Combination of the two techniques has a sound basis for preventing severe post-operative pain after TKA.

**E-poster w/ Standard #554**

**Early Postoperative Results After MIS TKA with Subvastus Approach**

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Aim of the study: to evaluate the early postoperative results after a PS TKA using a minimally invasive subvastus approach.

Material: 39 patients were included in the study. A matched control group of patients with a standard incision was selected. The mean age in the study and control group was 69 and 68 years respectively. There were 26 females in the study group and 25 in the control. The BMI was 28.4 in the study group and 29.3 in the control. The mean preoperative flexion was 105° on average in both groups. All the patients in both groups were affected by osteoarthritis. Three patients in both groups had a previous high tibial osteotomy and one per group had a previous tibial plateau fracture. Five patients per group had a valgus deformity (mean mechanical angle: 11° in the control). Thirty-four patients had a varus deformity with a mechanical angle of 11° on average in both groups.

Method: all the patients received a Legacy Posterior Stabilised knee. Postoperative rehabilitation was aggressive, starting 0-90° continuous passive motion on the same day as well as ambulation with crutches and weight bearing as tolerated. Tourniquet time, intraoperative and postoperative blood loss were recorded. Pain using a 10 points visual analogue scale, days to reach 90° of flexion and to perform a straight leg rise (SLR), 30 and 60 days flexion angle were compared between groups. Postoperative long standing x-rays were studied with regard to global alignment and component position. Statistical analysis was performed using the t-Student test (significance p<0.05)

Complications: intraoperative fracture of the lateral femoral condyle occurred in the study group. In another patient the patellar tendon was inadvertently sectioned and the procedure was converted to a standard approach. No intraoperative complications occurred in the control group.

Results: Study group (control group): tourniquet time was 84 (74) minutes (p<0.0001); total blood loss was 1000 (1140) mL (p<0.001); pain at day 1 during CPM scored 2.6 (3.9) points (p<0.0001); 90° of flexion were reached at 3.2 (4.5) days (p<0.0001); a SLR was possible after 3.8 (5.2) days (p<0.001); thirty and sixty days flexion was 98 (94) degrees (p=0.05) and 110 (106) degrees (p=0.02) respectively. Mechanical axis angle was correct (0±2°) in all the patients. Component position was correct in all patients with the exception of one tibial component in the study group which had a varus angulation of 3°.

Conclusions: minimally invasive approach in TKA resulted in less tourniquet time, blood loss and pain and allows earlier flexion and strength recovery. By the way intraoperative complications are more frequent.

**E-poster w/ Standard #555**

**Simultaneous Bilateral Total Knee Revision Arthroplasty**

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Introduction: As the number of primary total knee arthroplasties (TKA) performed continues to increase, so will the number of obligate number of revision TKA. Occasionally, a patient may present with significant disability associated with failed bilateral TKA. This has traditionally been treated as a staged reconstruction, because of concerns regarding surgical morbidity and mortality. However, certain patients might best functionally benefit from bilateral simultaneous revision TKA. The purpose of this study is to evaluate the safety
and efficacy of simultaneous bilateral revision TKA.

Methods: This study cohort included 40 knees in 20 patients who underwent simultaneous bilateral revision arthroplasty for aseptic failure of a total knee arthroplasty under the same anesthetic. The study group was compared to two similar control groups of 40 knees in 20 patients who underwent staged bilateral total knee revision arthroplasty and 20 knees in 20 patients who underwent unilateral total knee revision arthroplasty. Follow-up averaged 4 (range, 3-5) years in the study group and 8 (range, 6-12) years in the control groups. Clinical and radiographic results were evaluated by the Knee Society rating system.

Results: Average knee scores improved by 41 points for the revision TKA in the study group, 38 points in the staged group, and 39 points in the unilateral group. Range of motion improved from 8-85 degrees to 2-115 degrees and tourniquet times averaged 57 minutes (range 37-78 minutes). There were no lasting adverse cardiovascular or thromboembolic complications. However, there was one transient episode of post-operative confusion that was attributed to fat embolism.

Conclusion: Simultaneous bilateral revision total knee arthroplasty has a favorable outcome. Although the need for simultaneous bilateral revision knee arthroplasty may be rare. It may be a viable option in carefully selected patients. Furthermore, these results suggest that this combined procedure is a safe and favorable alternative to staged revision total knee arthroplasty.

E-poster w/ Standard #556
Outcomes of an Arthroscopic Treatment Regimen for Severe Osteoarthritis of the Knee
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Arun Ramappa, Vail, CO USA Presenter
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Introduction: Recently the benefits of arthroscopy for the treatment of osteoarthritis (OA) of the knee have been questioned. Although joint replacement has yielded successful results, many patients wish to delay this procedure. In addition, knee arthroplasty at a physiologically young age has significant long term implications.

Purpose: The purpose of this study was to evaluate the functional and subjective outcomes of patients with severe OA of the knee who underwent a comprehensive arthroscopic treatment and physical therapy regimen.

Methods: Between August 2000 and November 2001, 90 knees in 81 patients were treated with a novel arthroscopic regimen. Inclusion criteria included severe osteoarthritis, as defined by a Kellgren-Lawrence Score of 3 or 4, and minimum 2 year follow-up. Under anesthesia, prior to arthroscopy, knees were insufflated with an average of 170cc of sterile saline (range 120 to 240). The arthroscopic treatment consisted of: lysis of adhesions, anterior interval release (interval between patella and tibia), contouring of cartilage defects to a stable rim, shaping of meniscus tears to a stable rim, limited synovectomy, removal of loose bodies, removal of osteophytes that affected terminal extension, and careful homeostasis prior to removal of the arthroscope. This was followed by a strict physical therapy regimen that included partial weight-bearing post-operatively, early achievement of full range of motion, and maintenance of patellar mobility. Exclusion criteria included treatment of chondral defects with microfracture. All patients completed a pre-operative questionnaire and follow-up questionnaire. Failure of the arthroscopic protocol was defined as knees requiring arthroplasty due to lack of improvement in symptoms.

Results: The average patient age was 57 (range 37 to 78), with 51 males and 39 females. Patients had an average of 1.5 previous surgeries (range 0 to 12). The average pre-operative Lysholm score was 51 (range 14 to 90) and the average Tegner activity level was 3 (range 1 to 9). Knees had an average of 3.4 mm of medial joint space and 6.2 mm of lateral joint space on the AP view. On the AP view at 45° of flexion, the average medial joint space was 3.4 mm and the lateral joint space was 4.6 mm. The weight bearing axis (WBA) was defined as a line between the center of the hip and center of the talus. The distance between the point the WBA crosses the knee joint and the center of the knee was noted. This distance divided by the width of the compartment that the WBA intersected was defined as the shift in the WBA. The average shift in the WBA was 42% (range 0 to 129%).

Nine knees failed at an average time from surgery of 24 months (range 17 to 31 months. There was no difference in any pre-operative
subjective or objective measurement between the failures and the non-failures within the follow-up period.

For the non-failure group average follow-up was 30 months (range 24 to 40). Average Lysholm was 71 (range 19 to 100), with an average improvement of 30 points (range -15 to 95). Knees with greater than a 20% shift in WBA had follow-up lower Lysholm scores (70) at follow-up compared to knees with less than 20% shift (Lysholm=79) (p=0.045). The average Tegner was 4 (range 0 to 8). Average patient satisfaction was 8 (range 1 to 10). Average WOMAC pain was 4 (range 0 to 14), WOMAC stiffness was 2 (range 0 to 4), and WOMAC function was 12 (range 0 to 47).

Independent predictors of improvement in Lysholm score included shift in WBA, and pre-op Lysholm score. (r²=0.43)

Conclusion: This comprehensive arthroscopic treatment regimen and post-operative physical therapy program can improve function and activity levels in patients with significant OA and can delay arthroplasty. However, patients with severe varus or valgus deformity and lower pre-op Lysholm scores may expect significant but lesser degrees of improvement.

E-poster w/ Standard #557
Development of a Composite Improvement Scale in a Prospective Multi-centre Study of Total Knee Arthroplasty Revision.
Khaled J. Saleh, Charlottesville, VA, USA, Kevin James Mulhall, Charlottesville, VA USA
Presenter
North American Knee Arthroplasty Revision (NAKAR), Study, Group USA
University of Minnesota, Minneapolis, MN, USA

Introduction:
Improvement is the ultimate objective of any total knee arthroplasty revision (TKAR) procedure. Improvement is however a multi-dimensional concept. Although there are numerous instruments available for the assessment of knee arthroplasty patients it can be difficult to ascertain which is the most appropriate or how these tests complement each other. The purpose of this paper was to develop a novel analysis of the structure of improvement by devising a novel improvement scale for total knee arthroplasty revision (TKAR) using validated generic and disease-specific quality of life measures.

Methods:
As a part of a seventeen-center prospective cohort study, 186 consecutive patients undergoing TKAR had data collected on SF-36, the Western Ontario and McMaster Universities Osteoarthrits (WOMAC) Index, the Knee Society Score (KSS), the Activity Scale (AS), and physician assessment of patient severity a baseline and 6-month follow-up. Factor analysis was applied to change in scores between the two time points (standardized) for all instruments to derive an improvement scale.

Results:
Improvement in mean scores for respondents from baseline to follow-up (97% response rate) were significant for all measures except for SF-36 MCS. Improvements on individual scales were either non correlated or significantly correlated and positive. Factor analysis was performed to identify possible patterns of improvement among these measures. Four factors were elucidated.

Factor 1 was mainly composed of change in SF-36 PCS and WOMAC components. Factor 2 was mainly based on change in KSS- functional component and physician assessment of patient severity and change in AS score. Factor 3 depended mainly on change in SF-36 MCS; factor 4 depended mainly on change in KSS-knee assessment. Factors 1 and 2 showed high internal consistency (factor 1: Cronbach Alpha =0.77; factor 2: Cronbach Alpha =0.64). Four variables were created as a result of factor analysis. Mean scores for these variables were large and positive. Correlation between these variables was <0.3 when significant.

Discussion and Conclusion:
The results of this study allow us to propose 4 dimensions of improvement: improvement in 1) patient perception of physical capabilities, 2) actual activity level, 3) mental health, and 4) knee clinical condition. This demonstrates the multidimensional structure of improvement following TKAR. The factors identified in this study will enable more comprehensive analysis of outcomes for patients undergoing TKAR. Further work with this novel system will lead to greater accuracy and comparability between studies of the TKAR population and may also enable prediction of outcomes for these patients. This is important to ensure both the quality of patient care and the efficient use of resources. It may also be possible to refine the use of the constituent instruments used here to develop a more easily applicable instrument for measuring overall improvement following TKAR.
E-poster w/ Standard #558
Distal Femoral Allograft Reconstruction for Massive Osteolytic Bone Loss in Revision Total Knee Arthroplasty
Hari Prasad Bezwada, USA, Presenter
Drexel University College of Medicine, Philadelphia, PA, USA

Background: Massive osteolytic bone loss in revision total knee arthroplasty has been an uncommon challenge. However, oxidized polyethylene inserts in modular total knee arthroplasties with poor tibial locking mechanisms have been associated with substantial osteolysis. In cases where the bone loss is massive, the use of distal femoral allograft may be necessary in the reconstruction. The purpose of this study is to review the clinical and radiographic results of distal femoral allografts utilized in revision knee arthroplasty for massive bone loss.

Methods: From 2001-2002, 9 knees in 8 patients underwent revision of failed modular PFC® total knees arthroplasties with distal femoral allografts and long-stemmed revision implants for massive osteolytic induced femoral bone loss. Bone defects were classified according to the AORI rating system for femoral and tibial bone defects. Clinical and radiographic results were evaluated with the Knee Society rating system. The mean follow-up was 29 months (range, 24-36 months).

Results: All 9 knees were found to have Type-III femoral bone defects and Type-I tibial defects both by pre-operative radiographic evaluation and intraoperatively. Radiographic graft incorporation was demonstrated in all 9 knees. There were no cases of loosening and the overall frontal plane alignment was 5 degrees of valgus. The knee society pain scores improved by an average of 25.4 points and the function scores improved by an average of 23.3 points.

Conclusion: The outcomes of distal femoral allografts in the reconstruction of massive osteolytic bone loss associated with failed modular PFC® total knees arthroplasties are favorable. Moreover, this is a durable reconstruction technique for massive femoral bone defects encountered during revision total knee arthroplasty.

E-poster #559
Open Wedge High Tibial Osteotomy with Allogogenous Bone Graft
Byoung Hyun Min, Suwon, KOREA

Purpose : The purpose was trying to clarify utility of allogenous bone graft on open type high tibial osteotomy, among the method of treatment of osteoarthritis with genu varum deformity.

Materials and Methods : Working with ten patients who have osteoarthritis with genu varum deformity, performed the open type high tibial osteotomy, and after transplanting allogenous bone graft, fixed using L-shaped plate. Before and after the operation, measured the degree of correction of genu varum through radiography of anterior and posterior of weigh load, understudied degree of union by testing bone histology during removal of implant, and evaluated functional factor as well as improvement of patients using Lysholm’s knee score and HSS knee score.

Results : According to radiography of anterior and posterior of weigh load, the average of varus angle was 5.3±3.2 before operation, the average of correction angle was 16.1±4.1 after operation and the average of valgus angle was 10.7±4.3. By radiography of anterior and posterior of weigh load and lateral taken during the continual observation, complete bone union was seen and the average of correction loss angle was 1.5±1.0 and it got result that bone histology of transplanted part was composed of osteologic tissue and ratio of live bone and dead bone was 3.3:1, which live bone was 76.7±8% by image analyzer (Pro Plus? system) during the implant removal. After 15.3 months, average period of observation, Average of Lysholm’s score and HSS knee score were increased from 66.2±8.3 to 75.7±9.1 and from 55.2±9.0 to 79.0±7.5 respectively.

Conclusion : The method that using a transplantation of allogenous bone graft on open type high tibial osteotomy, can be a fine surgical technique because it gains a perfect union, has an inconsiderable loss of correction angle and precision of correction angle, can be contribute to the improvement of functional knee joint.
**E-poster #560**  
**New Method of Intra-operative Registration for Computer-assisted Total Knee Arthroplasty**

Ten Sobue, Niigata City, Niigata JAPAN, Presenter  
Yoshio Koga, Niigata City, JAPAN  
Takashi Sato, Niigata City, Niigata JAPAN  
Go Omori, Niigata City, JAPAN  
Daisuke Miyakoshi, Niigata city, JAPAN  
Niigata kobari hospital, Niigata city, JAPAN

**INTRODUCTION:**  
We have developed the three-dimensional lower extremity alignment assessment system (3DLEAAs) to evaluate the alignment of entire lower extremity in standing position, by superimposing 3-D CT model to biplanar x-ray images. Pre-operative planning of total knee arthroplasty (TKA) can be performed by fitting 3-D component model to the x-ray images, and intra-operative registration can be controlled by applying image-scan technique. In this presentation, we give a preliminary report of the new method for registration as well as bone cutting of femur during computer-assisted TKA.

**MATERIALS AND METHODS:**  
Pre-operative planning - Simultaneous biplanar long-leg x-rays (AP and 60-degree oblique) were taken in standing position. Long leg CT was also taken and 3-D bone model was constructed and fit to x-ray images. 3-D component model was superimposed to CT bone model and was moved to suitable position at surgeon’s preference. The red marker was placed to roof of intercondylar space of femur. Then, the positions of distal femoral cutting level and two pegs for femoral component were determined and saved to personal computer.

Intra-operative registration - Red marker was placed to roof of intercondylar space. By image-scan technique, three images of distal femur (coronal, sagittal, and axial) with marker were taken and downloaded to personal computer immediately. 3-D CT bone model with pre-operative planning was superimposed and moved to fit the position of red marker in each computer image. Throughout these procedures, the positions of distal femoral cutting level and pegs, which were determined preoperatively, were indicated in the surgical field.

**RESULTS AND DISCUSSION:**  
There are several methods for the registration of pre-operative planning in the surgical field. We have used fluoroscopy to take biplanar images during surgery. The new method we described has several advantages: the positions of cutting level and pegs can be indicated directly under visualization of surgeon’s eyes: simple procedure: no irradiation needed during surgery. We will evaluate the efficacy of this method by error analysis, comparing with the old method.

**KNEE - LIGAMENT/PATELLA**

**E-poster #600**  
**Evaluation of Patella Alta Prevalence and Causes Related to it on Taleghani Hospital**

Kamran Badizadeh, Tehran, IRAN  
Soheil Mehdipoor, Tehran, IRAN, Presenter  
Taleghani Hospital, Tehran, IRAN

Patella alta is brought up as one of the most common causes of anterior knee pain that yet it has not been studied in our country (IRAN). Due to this reason, for 2 years, since 1997, study was done on 400 patients based on patella lta prevalence and its risk factors and approximately 50 quantitative variables were analyzed. The research method was descriptive and its technique was interview and observation and inspection of patient with information forms. The acquired information was analyzed by computer. In this study the general prevalence of patella alta in patella alta in patients with anterior knee pain was 27.6% also the insall index in our mentioned population was 1.09 which is near 10 % more than the average of this index in population of western countries. Osgood Schlatter, generalized joint laxity and patella dx and subluxation Wiberg Type 3, Hypermobile Patella and some other conditions had meaningful (statistical) higher incidence with patella alta in our study. On the result of this study we introduce a test which we named it “Inferior Pole Compression Test” that sets forths for as a suggestions of patella alta diagnosis, which consists of feeling pain, while there is pressure on inferior pole of patella in knee in full extension. Also there was not any meaningful correlation between Iranian life style (toilet manner, less exercise, kind of sitting manner...) and the incidence of patella lata. The accomplishment research of great inforamtion about recognition and diagnosis of patellat malalignment in anterior knee pain and it could be used as a good guidance for orthopaedists in order to think about patella alta as a reason for anterior knee pains and use suitable radiological methods.
This study was performed to find a simple method for evaluating acl deficient knees. Ten reconstructed knees were examined. All patients were male. Ages ranged between 20 and 30 years. All patients were active in sports. The evaluation was performed 4 months after surgery. The overall score was based on a point score ranging from 500 (highest) to 0 (lowest). Scores between 500 and 250 were defined as intermediate high, and between 250 and 0 intermediate low. The patient were asked to indicate their symptoms, and the examiner entered the results in a standard questionnaire. The form included several basic questions to eliminate examiner bias: subjective rating of muscolar weakness; ligament instability, pain and swelling. There followed several objective evaluations for instrumental acl deficient knees and flexion-extension measurements designed not so much to correlate subjective assessments with specific sports (e.g. pivoting or jumping sports) but rather with all knee movements (i.e. twisting, extreme flexion-extension, prolonged kneeling or squatting, going up and down stairs) to eliminate bias associated with patients performed sports. To test the validity of the approach, the point score was compared with the overall score, which is an evaluation of the physical activity correlated with the intermediate high and low score. The content was validated by verifying several ceiling and floor effects. Of the ten patients in the study, 8 scored 450, one scored 300 and another, who was initially scored 450, dropped to 200 after his knee partially gave way. There was a good correlation between the point score and the level of activity associated with the overall score. The content validity was good because there was no ceiling and floor effect. All the patients but one scored intermediate high, revealing a good correlation with the point score obtained by other authors with the Lisholm or IKDC knee forms in the same patients category. We can therefore state that this system is simple and quick to perform, with good patient compliance. The content validation is high.
We have observed with the software autocad R 14 double outline on the external patellar facet on the preoperative digital photos which is corrected or attenuated in most cases on postoperative x-ray standard. The results allow us to accept the hypothesis that the patella not only would turn around its longitudinal axis in 3D but it would do it on its transversal and anteroposterior axes as well considering that the retinaculum retraccion would not be uniform from proximal to distal, another inference from this study would affirm that this sign vanishing in the postoperative would make it sure that the full cut was complete in length and thickness.

E-poster #604
Analysis of the Kinetics and Kinematics Parameters of Gait and Running in Subjects with Rupture and Reconstruction of the Posterior Cruciate Ligament
Wagner Monteiro, Sao Paulo, BRAZIL
Francisco Marcelo Ribeiro, Sao Paulo, BRAZIL
Carlos Alberto Cury Faustino, Sao Paulo, BRAZIL
Wilson Mello Alves, Sao Paulo, BRAZIL, presenter
Charli Tortoza, Rio Claro, Sao Paulo, BRAZIL
Andre Polli Fujita, Sao Paulo, BRAZIL
Ismael Fernando de Carvalho Fatarelli Campinas, Sao Paulo, BRAZIL
Universidade do Vale do Paraba, Sao Paulo, BRAZIL

INTRODUCTION: During the gait and running, the ligaments present a viscoelastic behavior, restricting translational and rotational movements between bone structures. The Posterior Cruciate Ligament (PCL) is the major restrictor of the posterior translation of the tibia in relation to femur. As well as other structures, the PCL also has an important sensorial role, thus its rupture, in many cases can cause articular instability and modify the motor control. This study shows the variable of kinetic and kinematic analysis related to the vertical component of the resultant ground reaction force (VCRGRF) in individuals with rupture and reconstruction of the PCL, during the gait, in different inclinations and running without inclination.

METHODS: Fifteen adult volunteers were analyzed, divided in 3 (three) groups. The first group was the control group (n=05); the second group consisted of individuals with rupture of the PCL (n=05), and the third group consisted of individuals who had suffered the PCL reconstruction surgery. The surgical technique used was to introduce a graft of one third of the central-medium patelar ligament and a double-tendon graft of the semitendinous and gracilis muscle, and with a postoperative time with a minimum of 24 months (n=05). For the quantification and analysis of the VCRGRF, an instrumented Gaitway system treadmill with a system of force platforms with piezoelectric sensors made by Kistler Inc. was used. The data had been collected in the frequency of 1000 Hz, during ten seconds, with one minute of interval between each data selection. The referring results to the kinetic and kinematic analysis were normalized respectively, for the corporal weight (in Newtons), time between each stride (in seconds) and height of each individual (in cm).

RESULTS: With the values obtained during the gait without inclination, the limbs with rupture of the PCL, presented an increase of the weight acceptance rate and a reduction in the impulse, when compared to the values of the control group. It shows that individuals with injury of the PCL, tend to prevent discharges of the corporal forces in the ground during most part of the phase that the leg is in touch with the ground. During running without inclination, the individuals with rupture of the PCL, presented a reduction of the stride length, step length and a reduction in the impulse. They also presented an increase of contact time compared to the control group. Individuals with PCL reconstruction also presented a reduction in step length. However, for the gait with inclination, significant alterations were not observed.

DISCUSSION AND CONCLUSION: It is possible that the results found can be associated to inhibitory mechanisms of activation of extensor and flexor muscles of the hip and knee. These mechanisms can be modified in consequence of neuro-sensorial deficits and viscoelastic deficits due to the rupture of the PCL, as well as for possible adaptations in the motor control system in inferior limbs, during the gait and running.

E-poster #606
Outcome of Extensor Re-alignment for Patellofemoral Dysfunction
Ian J Henderson, East Melbourne, VIC AUSTRALIA, Presenter
Ramces Francisco, Manila, PHILIPPINES
St Vincents & Mercy Private Hospital, Melbourne, Victoria, AUSTRALIA
Anterior knee pain has for many years been attributed to the presence of an underlying chondromalacia or patellofemoral arthritis. Recent findings however would suggest that this may actually be secondary to damage to the articular cartilage of the patella and associated strain to the peripatellar retinaculum. Such findings have been further suggested to result from an abnormality of the patellar alignment. While most cases would respond to conservative treatment, certain cases require surgical intervention to adequately treat the condition. Through the years, various extensor realignment techniques have been developed to treat this problem.

In the present study, a combined proximal and distal re-alignment procedure was carried out on 108 knees. With a technique developed to ensure anatomical patella tracking without over correction, results obtained demonstrated 81.4% to have good or excellent outcome. Complications noted included anterior compartment syndrome with foot drop in one case, which fully recovered, and arthrofibrosis in another, which responded to arthroscopic release. Second-look arthroscopic findings in 65 patients demonstrated good patellar tracking in all with Grade II articular changes only in 16.

We conclude that extensor realignment surgery with a combined proximal and distal realignment procedure is a reliable technique in correcting patellar malalignment and relieving patellofemoral pain.

E-poster #608
Medial Patellofemoral Ligament Reconstruction with Quadriceps-Patella Autograft for Post-Traumatic Patellofemoral Instability
Scott E Sexton, Manalapan, NJ, USA, Presenter
Harry A Bade III, Tinton Falls, NJ USA
Jonathan Stieber, Tinton Falls, NJ USA
Glenn Gabisan, Red Bank, NJ USA
Arthur Christiano, Boston, MA USA
Christopher Spagnoula, Fair Haven, NJ USA
Monmouth Medical Center, Long Branch, NJ, USA

Patellofemoral instability remains a challenging orthopedic entity. The condition ranges in severity from subtle instability to frank dislocation. Causative mechanisms include anatomic malalignment, ligamentous laxity, and trauma. Most orthopedic surgeons employ conservative measures to stabilize the patellofemoral articulation, focusing on strengthening the quadriceps mechanism, specifically the vastus medialis obliquus, and stabilizing the patella through bracing or taping. Despite adequate nonoperative treatment, in some cases, patellofemoral instability persists. Recent clinical and cadaveric studies have demonstrated that post-traumatic patellofemoral instability results from disruption of the Medial Patellofemoral Ligament (MPFL). This has become the essential lesion of patella instability and dislocation, similar to the Bankhart injury of the shoulder. Based on this information, several surgical procedures have been developed to reconstruct the MPFL. To our knowledge, there exists no documented procedure that utilizes an autograft patella-quadriceps tendon composite for recreation of the MPFL. This is a description of the procedure and the results in five patients.

Five patients underwent reconstruction of the MPFL using quadriceps-patella bone autograft. There were three females and 2 males. The average age at the time of surgery was 18 years (17-20). The average follow-up was 15 months (7-39). Patients underwent a physical examination, specifically analyzing thigh circumference and patella mobility, and completed a questionnaire, including the Lysholm knee score with Tegner activity scale. There were no recurrent dislocations following surgical reconstruction of the MPFL. Thigh circumference averaged 1 cm less on the operative side. Lateral patella glide was similar on the operative and nonoperative sides. The average Lysholm score was 74.4 (22-96) with a Tegner score of 6 (3-7). One patient suffered a patella fracture from a fall 4 months following the surgery and is recovering from an open reduction and internal fixation of his patella. Excluding his results, the average Lysholm score was 87.5 (83-96) with a Tegner score of 7. No other complications were reported and the remaining 4 patients were satisfied with their results and would have the procedure done on the opposite side if confronted with similar pathology.

Treatment of patellofemoral instability is fraught with peril. The key to a successful outcome is an accurate history and physical examination, including radiographs. In the absence of ligamentous laxity or anatomic malalignment, traumatic disruption of the MPFL will predispose to recurrent dislocations. We present a new technique for surgical
reconstruction of the MPFL, which has been successful, but is not without complications.

E-poster #609
Long-term Collagen Fiber Alterations in the Patellar Tendon Following Harvest of its Central Third
Michael Svensson, Trollhattan, SWEDEN, Presenter
Juri Toomas Kartus, Trollhattan, SWEDEN
Lars Rostgard, Trollhattan, SWEDEN
Eva Blomen, Stockholm, SWEDEN
Kjell Hultenby, Stockholm, SWEDEN
Jon Karlsson, Goteborg, SWEDEN
Tomas Movin Stockholm, SWEDEN
NAEL-Hospital, Trollhattan, SWEDEN

Introduction: The aim of the study was to evaluate the ultrastructure of the central and peripheral parts of the patellar tendon six years after harvesting its central third.

Methods: Thirteen consecutive patients, who had undergone anterior cruciate ligament (ACL) reconstruction using a central third patellar tendon autograft were included in the study. Biopsies were obtained both from the central and lateral third of the patellar tendon under ultrasound guidance using a 1.2 mm needle at median 71 (68-73) months after the index procedure. Ten open biopsies from asymptomatic patellar tendons obtained during ACL reconstruction served as controls. The sections were immediately fixed and prepared for transmission electron microscopy. Longitudinal sections served for morphological evaluation and the fiber thickness were measured on the transversal sections. A minimum of 100 fibres were analysed in each specimen and grouped into five fibre size classes.

Results: All controls were found to have a compact extracellular matrix (ECM) with regular oriented collagen fibres. Lateral biopsies displayed a more heterogeneous ECM. In 3 out of 13 specimen the ECM was different compared to controls. Central biopsies displayed an even more heterogeneous ECM. Eight out of 13 specimens were judged as influenced. The fibre diameter distribution among the controls displayed the most heterogeneous pattern and all fibre sizes were present. This was also found in the lateral areas, however the two smallest fibres sizes (0-30 nm and 31-60 nm) were more dominant in the lateral biopsies (88.4%) compared to controls (72.5%). In the central biopsies, only three fibre sizes were found and 31-60 nm was found to be the most dominant class.

Conclusion: Six years after harvesting its central third the patellar tendon revealed a tendon-like repair tissue with an immature matrix with alterations in ultrastructural morphology and relative fiber diameter distribution.

E-poster #610
One Year Results with a New Tibial Aperture Fixation Device in Soft Tissue ACL Reconstruction
Matthias Klepsch, Munich, GERMANY, Presenter
Ulrich Nieper, Munich, GERMANY
Tomas Buchhorn, Munich, GERMANY
Center for Sports Medicine, Orthozentrum Muenchen, Muenchen, GERMANY

Background: Clinical experience and one year results with the Retroscrew® - a new device for tibial aperture fixation of soft tissue grafts in acl reconstruction - are to be reported.

Material and Method: In Fifty-two patients the Retroscrew system was used for tibial fixation of a quadrupled hamstring graft in acl reconstruction. The screw diameter was chosen dependent on bone stock quality, either the same diameter or one millimeter larger than the diameter of the tibial drill hole. Intraarticular positioning of the Retroscrew was anterior of the tibial tunnel. A bioabsorbable interference screw was used for femoral fixation of the graft. All patients were evaluated with preoperative and postoperative examination and x-rays. Follow up was after six and twelve weeks, six month and one year. Final follow up IKDC subjective evaluation, final follow up IKDC objective evaluation and Tegner activity score were performed in all patients.

Results: The average KT-1000 side difference was 2,8 mm (1-5 mm) after six weeks and 3,2 mm (1-6 mm) after 12 weeks. After six month and one year the side difference was 3,5 mm (1-7 mm) respectively 4,1 mm (1-7 mm). X-rays after 12 weeks and one year demonstrated no tibial tunnel widening or other abnormal radiologic changes. In 8 patients (15%) the tibial fixation method had to be changed intraoperatively due to different reasons. In 3 patients the Retroscrew did not grip the tibial bone and could not be inserted into the tibial tunnel. In 5 patients the screw with the fiber wire got caught in the Hoffa fat pad. In all cases a bioabsorbable tibial interference screw was inserted from anterograd. In 2 patients we
performed an additional endobutton back up fixation. Follow-up objective IKDC evaluation distribution was as follows: A, 8 knees; B, 29 knees; C, 13 knees; and D, 2 knees. Average final follow-up IKDC subjective score was 80.2 (40-100).

Conclusion: The first cases we performed demonstrated the learning curve as it is immanent with every new fixation device. The change of the fixation device due to technical problems occurred within the first twenty patients. Meanwhile a device to notch the tibial aperture is available. The retrograde aperture fixation of soft tissue grafts in tibial cortical bone allows a safe and rigid graft fixation. Till today there are no studies about graft slippage under cyclic loading with the Retrocrew. Screw diameter should be adapted to bone stock quality as it is measured while drilling the tibial tunnel. Recommendation is to choose the same screw size as tunnel diameter for hard bone quality and a one millimeter larger screw for soft bone quality. Load to failure measurements have to be performed for different screw sizes for different bone stock qualities. The Retrocrew is easy to apply and is possible to combine with another distal tibial fixation (hybrid fixation) like endobutton or another anterograd back up screw.

E-poster #611
The Utility of Medial Patellofemoral Ligament Reconstruction for Recurrent Patellar Dislocation and Subdislocation.
Yoshinori Mikashima, JAPAN, Presenter
Zenshukai Gunma Sports Medicine Reserch Center, Maebashi, JAPAN

Background: Although more than 100 different surgical techniques for the treatment of patellar instability have been described during the past 100 years, various problems continue to be raised. Recently, the medial patellofemoral ligament (MPFL) has been recognized as being an important stabilizer of the patella, preventing lateral dislocation.

Hypothesis: Reconstruction of the MPFL will useful for the treatment of recurrent patellar dislocation and subdislocation.

Study Design: Prospective randomized clinical trial.

Methods: We reviewed 25 patients with recurrent patellar dislocation and subdislocation who had undergone realignment surgery from July 1999 to December 2001. In these, there were 11 patients who had undergone Elmslie-Trillat procedures designated Group E. And there were 14 patients who had received reconstructions of the MPFL with the Elmslie-Trillat procedure designated Group M. We investigated the postoperative assessment of both groups, and compared them.

Results: At the 2-year follow up, the apprehension sign remained positive in 4 knees in Group E, but negative in all knees in Group M. And on stress skyline view, stability in Group M was better than that in Group E significantly.

Conclusions: We concluded that reconstruction of the MPFL is useful for the treatment of recurrent patellar dislocation and subdislocation.

E-poster #612
Periosteum-Enveloping Hamstring Tendon Graft For Arthroscopic Anterior Cruciate Ligament Reconstruction - Minimal Three Years Clinical Outcome
Chih-Hwa Chen, Keelung, TAIWAN, Presenter
Chang Gung Memorial Hospital, Keelung, TAIWAN

Introduction: Tendon-bone incorporation of a tendon graft within the bone tunnel is of priority concern when using for anterior cruciate ligament ligament reconstruction. Superior healing process and stronger healing strength can be achieved when periosteum is sutured on the tendon inserted into a bone tunnel. We applied this idea to ACL reconstruction to enhance tendon-bone healing.

Materials and Methods: A 4-stranded hamstring tendon graft was used. A piece of periosteum was harvested from the anterior cortex of proximal tibia, and split into two rectangular flaps. These periosteum flaps are wrapped and sutured around the tendon graft near the femoral and tibial tunnel openings. From 2000, 104 patients with complete final follow-up data for minimal 3 years were analyzed. The average follow-up time was 27 (36 to 48) months.

Results: 96 (92%) patients achieved good or excellent results by Lysholm knee rating. The median Lysholm knee score was 56 (40 to 70) and 94 (58 to 100) points before and after surgery. 86 (83%) patients could return to moderate or strenuous activity after reconstruction. 6 (6%) patients were found to exhibit grade 2 or more ligament laxity. Complete range of motion could be achieved in 90% of patients. 5 patients (5%) had positive pivot shift. Finally, 96 (92%) patients were assessed as normal or nearly normal rating
by IKDC guideline. Bone tunnels enlargement of more than 1 mm was identified in 5 femoral tunnels (5%) and 4 tibial tunnels (7%). One patient suffered from re-rupture and received revision operation.

Conclusions: Periosteum has the potential to enhance tendon-bone healing. It can be expected to seal the intra-articular tunnel opening in an early period to avoid synovial fluid influx and undesirable tendon motion in the tunnel between the tendon and the bone. Femoral and tibial tunnel enlargement could be effectively reduced. Periosteum can be easily harvested at the proximal tibia from a routine incision for hamstring tendons harvesting. Satisfactory result can be achieved with the periosteum-enveloping hamstring tendon graft in ACL reconstruction.

E-poster #613
Conservative Treatment of Acute Isolated Posterior Cruciate Ligament Injury
Young Bok Jung, Seoul, KOREA, Presenter
Suk Kee Tae, Seoul, KOREA
Yong Seuk Lee, Seoul, KOREA
Kee Hyun Lee, Seoul, KOREA
YONG SAN HOSPITAL CHUNG-ANG UNIVERSITY, SEOUL, KOREA

INTRODUCTION: PCL (posterior cruciate ligament) injuries have the potential for intrinsic healing and it is known that functional or clinical status could not be correlated with degree of clinical laxity. The goal of our study was to investigate the outcome of conservative treatment of the acute isolated PCL injury using cylinder cast immobilization with tibial supporter.

MATERIALS AND METHODS: The subjects were 10 acute isolate PCL injuries, with more than 2 years of follow-up from January 1998 to July 2001. There were 9 male and 1 female patients, with an average age of 23 (12-47) years (the epiphyseal plate was not completely closed in 3 patients). Originally there were 14 patients, but some patients were excluded by combined injuries and operations at other hospital. Diagnosis of the isolated PCL injury was done by physical examination and stress push radiography using Telos® device, KT 2000 maximal manual test and MRI. We applied a long leg splint or cylinder cast immobilization with tibial supporter with full extension of the knee for 6 weeks and then another six weeks of PCL brace with tibial supporter and posterior elastic rubber band to prevent posterior sagging of the proximal tibia.

During treatment, we recommended quadriceps setting exercise and straight leg raising exercise. Contact sports were allowed 6 months after trauma.

RESULTS: There were 7.5 mm (4-10 mm) side to side difference at initial stress film, and 3.4 mm (1-8 mm) at last follow-up. 4 patients had A, 6 had B in IKDC objective score and 88.2 (63-94) points in IKDC subjective score, 95.4 (86-100) points in OAK score at last follow-up.

CONCLUSIONS: Acute isolated PCL injury treated with cylinder cast immobilization and PCL brace with tibial supporter to prevent posterior sagging, improved stability but some residual laxity remained. However, most of the patients were satisfied and the scores were excellent. The conservative treatment with cylinder cast immobilization and brace may be one of the recommendable treatment methods in isolated acute PCL injury.

E-poster #614
Patellar Osteomyelitis Presented as Prepatellar Bursitis
Ho-Rim Choi, Cheon-An, KOREA, Presenter
Jong-Seok Park, Cheon-An, Choong-Nam SOUTH KOREA
Joon-Min Song, Cheon-An, Choong-Nam SOUTH KOREA
SoonChunHyang University Hospital, Cheon-An, KOREA

Osteomyelitis of the patella is a very rare condition and it is generally considered as a disease of childhood. The diagnosis is frequently delayed because of its rarity and variability in presentation. Authors report two cases of patellar osteomyelitis which was presented as prepatellar bursitis in children.

E-poster #615
Medial Patello-Femoral Ligament Reconstruction in Children After Patella Dislocation
Michal Drwiega, Warsaw, POLAND, Presenter
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Aim
Dislocation of the patella are very often cause of knee dysfunction in children. This is a result of abnormal knee anatomy as well as an inborn joint laxity. The most common way of treatment in this kind of injury is joint punction and immobilization
for a few weeks in a plaster of Paris. After that, children are usually preserved from physical activity. It is forbidden to perform osteotomy until the end of the bone growth. We present a surgical technique that allow to stabilize patella in children. After that, a normal physical development is possible.

Materials and methods
We performed a reconstruction of the medial patello-femoral ligament in 5 children at the mean age of 14 year (range 10-17). In one case there was only one episode of patella dislocation, in two cases two episodes, and multiple dislocations in the rest of children. Before each surgery arthroscopic evaluation of the knee joint was made. The medial patello-femoral ligament was reconstructed with use of autologic tendon of the semitendinosus muscle. Mean time of observation after surgery is 14 weeks (range 8 - 20 weeks).

Results
Results of this kind of surgery are very promising. A good stability of patella was achieved. Children are physically active and come back to sport.

Conclusion
Presented method of treatment seems to be efficient in stabilization of the patella in children with theirs growth plates open.

E-poster #616
Clinical and Radiographic Results of Low-Intensity Pulsed Ultrasound for the Treatment of Painful Bipartite Patellae
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Purpose: The purpose of this study was to evaluate the clinical and radiographic results of low-intensity pulsed ultrasound for the treatment of painful bipartite patella.

Methods: Six patients with ten painful bipartite patella were included this study. There were five boys and one girl, whose average age was 12 years. All patients were irradiated with low-intensity ultrasound for 20 minutes per day on the site of the separated bone fragments. The average therapeutic and follow-up period were 8.7 and 10.6 months, respectively. Clinical assessment was performed by an Ogata’s score. Bone union was checked by plain X-ray films. We also compared the preradiative and postradiative data of side-to-side ratio of the peak torque of extension of the knee at the angle velocity of 60 and 180 per second with the Cybex 6000.

Results: Clinical assessment was classified as excellent in five knees, good in four knees and fair in one knee. In nine of ten patients, pain over the fragments disappeared within 7.5 months after irradiation. Bone union was complete in four knees and incomplete in three knees, and three knees were graded as not healed. The average period of it was 7.0 months. Side to side ratio of peak torque of extension was not significantly different between preradiation and postradiation at both 60 and 180 per second. No complication was detected such as length discrepancy and abnormal alignment.

Conclusions: Irradiation of low-intensity pulsed ultrasound showed good clinical and radiographic results, suggesting that it might be effective in the treatment of painful bipartite patella.

E-poster #617
The Arthroscopic Findings and Assessment of the Popliteofibular Ligament
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Purpose: The purpose is to investigate the normal view of popliteofibular ligament and to assess the function of popliteofibular ligament arthroscopically.

Material and method: The subjects were succeeding 101 patients in whom the arthroscopic treatment was performed between April and October, 2002. The patients with ligamentous injuries were excluded. We examined not only the arthroscopic finding of the lateral gutter of the knee whether the popliteofibular ligament was identified or not, but also the stability of the popliteus tendon by probing in figure four position for assessing the function of popliteofibular ligament.

Results: In 69 cases the whole popliteus complex were able to be observed arthroscopically. Therefore, the popliteus complex was not able to
be observed in 32 cases because of synovitis. Among 69 cases, the popliteofibular ligament was identified in 51 cases, and was not identified in 18 cases. In 75 of 101 cases we were able to examine the stability of the popliteus tendon by probing, and in 26 cases we were not able to examine the stability of the popliteus tendon because of tightness of lateral joint space. Among 75 cases that were examined by probing, the anterior-inferior instability of the popliteus tendon was observed in all cases and the posterior-superior instability of the popliteus tendon was observed in 5 cases. Among 75 cases that were examined stability of the popliteus tendon, the popliteofibular ligament was observed in 39 cases and those did not show the posterior-superior instability. In 5 cases that showed the posterior-superior instability, the popliteofibular ligament were not observed arthroscopically. [Conclusion] The popliteofibular ligament were able to be seen arthroscopically in only 51 of 101 cases. The arthroscopic view of popliteofibular ligament is not incredible for diagnostic method of the popliteofibular ligament injury. But the popliteus tendon was stable against posterior-superior force and not stable against anterior-inferior force. This result suggests that the probing of the popliteus tendon arthroscopically serves to assess the function of the popliteofibular ligament.

E-poster #618
Collateral Ligament Releases and the Effect on Femoral Component Rotation in Total Knee Arthroplasty
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Introduction: Internal rotation of the femoral component in total knee arthroplasty has been reported to cause patellofemoral problems. Common references for determining the rotation of the femoral component are the epicondylar line, the condylar line (three degrees), and the Whiteside (antero-posterior groove) line. Measurements on human femora have shown that using these references insert the femoral component in external rotation. When ligament balance is used (lamina spreader or tensioner in flexion) to determine femoral rotation, control of the amount of rotation is lost, but assumed to be safe if set in external rotation.

Goal: The goal of this study was to register the collateral releases performed to acquire ligament balance in extension and evaluate the influence on femur component rotation.

Methods: Subjects for this study were 60 patients undergoing primary total knee arthroplasty by one surgeon. The releases needed to create correct alignment were recorded. These structures are deep ligament, tibial tract, popliteal tendon, fibular ligament, and posterolateral condyle for the lateral side and deep ligament, superficial ligament, posteromedial condyle and semimembranosus for the medial side. After the releases in extension, a tensioner (150 N) was used to determine the femoral component rotation required to create a balanced flexion gap. The rotation of the posterior bone cut was measured relative to the posterior condylar line. A custom-made goniometer was used.

Results: Preoperative alignment was 1.6 degrees (from -14 to +15). Average external rotation of the femoral component with the ligament balancing technique was 2.7 degrees (from 4 internal to 10 external rotation; SD 3.5 ). Eleven components were placed in slight internal rotation. There was a significant difference between the rotation of the femoral component between lateral released knees and medial released knees.

Conclusion: The ligament balancing technique places the femoral component in an average of 2.7 degrees external rotation, with a large inter-individual variation. This variation is within a safe range, but more research is necessary on the influence of the release of the separate structures to enable control of the femoral component rotation.

E-poster #619
Ligament Reconstruction After Traumatic Knee Dislocation
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Purpose: The objective of this study was to evaluate the results of surgical treatment of knee dislocations.

Material/Method: Review of our patients’ records revealed that the last 8 years, 24 patients were
surgically treated, during the acute phase. Mean age was 33.1 years. Cause of injury was road traffic accident in 21 cases, sport accident in 2 cases and work accident in 1 case. In 12 incidents accompanied rupture of lateral structures was seen and in 6 rupture of medial structures, while in 20 cases participation of posterior structures was observed. Isolated injury of central structure (ACL and PCL) was in only 2 patients observed. 3 second fractures were seen, 2 chondral lesions, 3 neurological events while no vascular injury was observed.

In all cases the damaged ligaments were anatomically exposed and reconstructed. The autologous grafts mostly used for reconstruction, are BPTB for PCL and quadriceps tendon for ACL reconstruction.

Postoperatively, an accelerated program of rehabilitation was introduced, aiming in progressive mobilization of the joint and muscle endurance.

Results: Twenty-three out of 24 patients (95.8%) were followed up. Three patients were reoperated because of inadequate movement of the knee joint. Evaluation of the results was performed with KT-1000, IKDC, Lysholm and Tegner score and at an average 54.7 months after the injury. Mean anterior translation on KT-1000 testing was 7.1 mm (20° flexion - 89 Newton’s), mean posterior translation was 5.0 mm (70° flexion - 89 Newton’s) and mean difference compared to the uninvolved side was 1.8 mm and 2.3 mm, respectively. IKDC score was A in 5 cases, B in 10, C in 5 and D in 3. Average Lysholm score was 86,78% (range 53 to 100); Average Tegner score was 4.69 before accident and 4.04 in reexamination.

Conclusions: Treatment of such injuries remains controversial. Recent literature tends to abandon conservative treatment and inclines to operative procedures. In our opinion aggressive evaluation, treatment and rehabilitation of these injuries are necessary to achieve optimal results.

E-poster #620
Combination Posterior Drawer Test to Differentially Diagnose Isolated or Combined Injuries to the Posterior Cruciate Ligament and Posterolateral Structures of the Knee
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In order to differentially diagnose isolated or combined injuries to the PCL and posterolateral structures, we developed a novel clinical examination, ‘Combination Posterior Drawer Test’, in which integrity of the PCL or that of the posterolateral structures is directly reflected on the results, based on our previous experimental data. This test is consisted of two steps; neutral posterior drawer test (NPDT), as conventional manner, which is performed at 90 degrees of knee flexion with axial tibial rotation constrained to the neutral position, and the other, new concept, maximum external posterior drawer test (MEPDT), in which the tibia is held at maximum externally rotational position during the push phase. The aim of this study was to verify the usefulness of combination PDT clinically. Eleven cases of chronic PCL injury and 3 cases of combined PCL and posterolateral structures injuries were examined. In all 14 patients, NPDT and MEPDT were performed. In all isolated PCL injured patients, anterior-posterior tibial displacement was measured with KT-2000 first at neutral tibial rotation, then at maximum external rotation in the 70 degrees flexed knees. In isolated PCL deficient patients, NPDT was all positive (grade 1 in 3 cases, grade 2 in 6, grade 3 in 2) and MEPDT was all negative. On the other hand, in combined cases, both tests were grade 3 positive. In isolated PCL injured patients, anterior-posterior tibial displacement (under between 134N anterior force and 87N posterior force) measured at neutral rotation was significantly larger in the injured side (14.8±3.5mm) than that in the contralateral normal side (7.5±2.0mm). However, at maximum external rotation, there was no significant difference in the values measured between the injured side and the normal side. These results indicate that combination PDT is useful to distinguish isolated PCL injury from combined PCL and posterolateral structures injuries.
E-poster #621
Double Bundle Technique: Endoscopic Posterior Cruciate Ligament Reconstruction Using Tibialis Posterior Allograft
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Recently, attentions have been headed for double bundle technique for posterior cruciate ligament (PCL) deficient knee. We present an one incision arthroscopic PCL reconstruction technique using a double-bundle with 3-stranded tibialis posterior (TP) allograft fixation sequence. The anterolateral bundle of the PCL is reconstructed using 2-stranded TP allograft and the posteromedial bundle using 1-stranded TP allograft successfully. 3-stranded TP allograft will be an alternative graft choice for PCL reconstruction.

E-poster #622
A Newly Arthroscopic Reduction and Fixation Technique for the Avulsion Fracture of the Tibial Attachment of the Posterior Cruciate Ligament
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We established a newly arthroscopic reduction and fixation technique for the avulsion fracture of the tibial attachment of the posterior cruciate ligament (PCL) utilizing the posteromedial portal. At surgery, the tibial bone tunnels on medial and lateral sides of the avulsion fragment can be created with the arthroscopic view via the intercondylar notch and posteromedial portal. This procedure is performed only in the posteromedial compartment without perforation of the posterior septum. The looped wires are introduced into the posteromedial compartment through the tibial tunnels. Fixation wires or nylon threads are passed through the looped wires using posteromedial portal, pulled into the tibial tunnels, and pulled out on the tibial cortex. Our procedure can be minimally invasive treatment for the avulsion fracture of the tibial attachment of PCL without special equipments.

E-poster #626
Quadriceps Contracture in Permanent or Habitual Dislocation of the Patella
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Purpose: Permanent dislocation of the patella (PDP) and habitual dislocation of the patella (HDP) are relatively rare conditions. The pathological mechanisms of the diseases are thought to be associated with laterally displaced extensor mechanism and secondary bony changes around the patella. In addition, several authors indicated that the diseases might be associated with shortening of the extensor mechanism, so called quadriceps contracture. The objective of the study was to assess the association between the amount of quadriceps lengthening and postoperative results in PDP and HDP.

Methods: Six patients, who had PDP or HDP in their unilateral knee and underwent surgery of the index joint, were enrolled in the study. PDP was seen in 4 patients and HDP in 2. All patients were women, and the age at operation ranged from 8 to 31 years, (average 15 years). Associated disease was noted as follows: severe Down syndrome in one patient, hydrocephalus with mental retardation in one patient, none in 4 patients. Post-operative follow-up period ranged from 7 months to 6 years, mean 31 months. Proximal tube realignment was performed in one patient. Modified Stanisavljevic’s extensive lateral release combined with Insall’s medial imbrication was performed in the other patients. Medialization of the tibial tuberosity was performed only in patients with a closed physis. Quadriceps lengthening was additionally performed in a prospective fashion if easy dislocation of the patella still remained following the above procedures.

Results: Three patients needed quadriceps lengthening. The amount of the lengthening ranged from 2 to 4 cm, mean 2.7 cm. In this group patellar tracking following the operation was good without any dislocation of the patella, while an extension lag was noted: within 10 degree in 2 patients and more than 40 degree in a patient who...
had severe Down syndrome. On the other hand, 3 patients who did not undergo quadriceps lengthening during the operation showed abnormal patellar tracking; patellar subluxation in 2 patients and recurrence of patellar dislocation in one patient.

Summary: Six patients with PDP or HDP were reviewed. Quadriceps lengthening was associated with postoperative results. Quadriceps contracture is considered to be one of the main pathological mechanisms. Adequate operative procedure should be based on the amount of quadriceps contracture.

E-poster #627
Evolution of Patellar Luxation: Operative and Non-operative Treatment
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The evolution of 84 patients is presented, 117 knees with at least one well characterized episode of patella luxation, and a minimum of 5 years of evolution. These are classified according to the following criteria: operated: 60 patients, 70 knees treated by proximal, distal realignment or both associated through open surgery, follow-up time 5-31 years (mean 8.9); non operated: 41 patients, 47 knees, sickness time 5.8-64 years (mean 16.3) contralateral knees without instability: 44 knees. Seven cases excluded, 5 for being operated less than 5 years before, and 2 for having started the symptoms less than 5 years ago. Even though the operated cases had a higher frequency of pre-operatory luxation and giving way, the clinical results were better than those of the non operated ones according to LYSHOLM score. However they presented a higher grade III and IV rate by SPERNER score than the non operated knees. This means that in spite of being clinically better the operated knees present higher seriousness in arthrosis. The comparison of the pre-operative and postoperative radiographic demonstrates that operative treatment didn’t stop the evolution to arthrosis. There wasn’t significant arthrosis incidence between the non-operated knees and the stable patelofemoral knees. The chondral lesion seriousness found at surgery was correlated with the clinical and radiographic evolution. The frequency of pre-surgery giving ways was not correlated with the clinical nor with the radiographic results among the operated knees. However, they were correlated with the non-operated ones. The older the patients, the worse the clinical and radiographic results were, except the clinical evolution among the non-operated knees.

The pre-operative history time did not influence the clinical results but the longer the waiting for surgery decision, the higher the arthrosis incidence in the present. The postoperative follow-up was correlated with the clinical results as well as with the evolution to arthrosis. A correlation between the length of the disorder and the clinical results was observed; however, such correlation was not noted in the disease evolution to arthrosis.

In addition, a group of 17 special patients who presented bilateral instability but with only one side operated was analyzed. It is important to mention that the operated side was in general the most critical one. The results were similar to the analysis in general, that is, the operated side was clinically better but more severe in relation to arthrosis.

E-poster #628
Femoral Trochleoplasty: Surgical Procedure and Indication
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Introduction
The trochlear dysplasia is the most fundamental factor of patellar instability that is present in 96%. Femoral trochleoplasty has been proposed in the treatment of femoral trochlear dysplasia. The interest of femoral trochleoplasty is to create a trochlear groove. At the contrary of Albee or Masse’s Trochleoplasty, this procedure does not elevate the lateral facet of the trochleal and respect the articular cartilage. The aim of this study is to describe an original deepthening trochleoplasty with a special ancillary and to precise the different surgical steps.

This operation was always associated with a tibial tuberosity transfer and a proximal realignment.

Material and Methods
15 patients had undergone 17 deepthening trochleoplasty with a mean follow-up of 73 months (6 -150). The mean age at time of surgery was 22.6 years (15-46). CT-scan and x-rays allowed to analyse the trochlear dysplasia according to the David Dejour’s classification. There were 5 trochleas graded B, 2 C and 11 D. The trochlear
angle was measured on axial views at 30. We decided this surgical procedure in case of severe trochlear dysplasia or obvious abnormal tracking of the patella. We performed the trocleoplasty with special ancillary to preserve the cartilage in four steps.

We did
- a clearance of the subchondral region of the groove starting above the groove
- a division of the cartilage at the midline
- a progressive deepthening
- and fixation with two millimetric staples embedded in the cartilage to recreate a groove.

Results
No serious complication was observed. The trochlear angle decreased from an average pre-operative value at 151° to a post-operative average value at 133°. No recurrence of patellar dislocation was noted at the last follow-up. Detailed clinical results will be reported.

Discussion
In severe trochlear dysplasia, the presence of a high bump and an insufficient trochlear depth are responsible for patellar instability, and their persistence may limit the efficiency of the others surgical procedures.

Conclusion
Trocleoplasty is an option either in case of severe trochlear dysplasia with a proeminent bump or in case of recurrent dislocation after surgery. Nevertheless, we are still concerned to propose this operation in young population. A longer follow-up is needing.


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E-poster #630
Elevation of the Tibial Tubercle for Patellofemoral Pain Syndrome. An 3 to 10 years follow up study.
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Background. The elevation of the anterior tibial tubercle, although it has been first described 40 years ago, remains controversial both on a clinical and on a bio-mechanical basis. It still offers a solution to the problem of chronic patellofemoral pain for young patients in their most productive years, who fail to respond to conservative treatment.

Objective. This study aims to present the mid to long term results of a modification of the original Maquet procedure of a selected patient group.

Materials & Methods. Retrospective review of pre- and peri-operative findings of 11 patients (7 males), aged 28-61 years, treated by elevation of the tibial tubercle between 1993 and 2002. In all the cases the indication was persistent anterior knee pain that has not responded to conservative measures, excluding cases with proven osteoarthritis of the other knee compartments. The operation consisted of an 1.3 to 1.9 cm elevation of a short tibial shingle. At a median follow up period of 5 years we evaluated the post-operative results by using subjective criteria (Cox’s, Schmid’s), a pain questionnaire (GR-SF/MPO), the Oxford Knee score and objective criteria (Fulkerson’s, Kujala’s functional knee scores).

Results. All but one reported excellent results subjectively. We found a statistically significant improvement of the post-operative GR-McGill score and of the Oxford Knee score. An “excellent” median Fulkerson score of 92 and a “good” median Kujala score of 87 were found. No significant short and long term complications were noticed. Ten of the patients report difficulty in kneeling.

Conclusions. The modified Maquet technique seems to be an effective operative procedure only for the treatment of symptomatic patellofemoral osteoarthritis after conservative means have failed. A strict patient selection process must be used. The complication rate can be limited by strict adherence to the details of the surgical technique.

E-poster #632
Double Bundle PCL Arthroscopic Reconstruction with Two Femoral and Two Tibia Tunnel
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Recent biomechanical studies have shown that an anatomic double-bundle PCL reconstruction is superior in restoring normal knee laxity compared
with the conventional single-bundle isometric reconstruction. These two bands reproduce more precisely the natural behavior of the PCL in all the mobility range.

The purpose of this study is to describe a modification of an endoscopic PCL reconstruction technique using a double-bundle tendon allograft creating 2 femoral tunnel and 2 tibial tunnel.

Surgical Technique: The tunnels in the tibia are arthroscopically viewed through the posteromedial portal. A pin is introduced through a tibial guide entered by the anteromedial portal. Previously, neurovascular structures in the posterior area of the joint are protected with a curette. After that, an 8mm- canulated drill is passed. It is advisable to perform the most distal tunnel first and later the most proximal one. In general, it is necessary to carry out an arthroscopic desinsertion of the posterior capsule in order to gain more space and avoid the two tunnels meeting. The graft passage is performed independently. First the posteromedial band and then the anterolateral band. They are first fixed in the femur and then in the tibia. The main anterolateral band is fixed first at 90° of flexion performing an anterior knee displacement, and then the posteromedial band at 20° flexion. Finally the graft tension is verified.

The use of the allograft does not produce morbidity in the patient, decreases the surgical time and the rehabilitation is faster and painless. It also maintains the proprioception of the knee and keeps the dynamic stabilizers as the structures surrounding the knee are not touched. The difference in performing two tunnels in the tibia enables the graft passage and its fixation in an independent way. The disadvantage is that increases the risk of vascularnervous lesions associated to the tunnels (being technically more demandable). Our preliminary results with this technique are satisfactory, however, it is necessary a higher number of patients and follow-up in order to finally evaluate this procedure.

E-poster #633
Epidemiologic Research of Patella Fractures - 6 Year Review
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Introduction: patellar fractures represent 1% of all the skeleton fractures, considered a rupture of the extensor device. The surgical treatment is praised for fractures dislocated more than 3 mm of interfragmentary fracture or with bigger displacement that 2 mm in the articular surface. Objective: To evaluate the results of the surgical and conservative treatment of patellar fractures in our institution. Material and Method: 156 patients had been studied during the period of January of 1998 to January of 2004 and had been chosen 127 patients who had filled the inclusion criteria.

Results: The majority was men (68%), the average of age was 46,1 years. Average time of follow-up was of 28,1 months. More frequent trauma mechanism was the direct trauma with 52%. The injury was isolated in 89,5%. In the anatomical classification, the more prevalent type of fracture was transverse (51,8%). The conservative treatment was instituted in 29% of the patients. The surgical treatment in 78% of the patients was the AO tension band method. Dislocated fractures was observed in 9 patients. Using the Mcnab criteria, good and regular results were achieved in 87.8%. Only 18 patients had been submitted to new surgical intervations. Conclusions: Satisfactory results can be achieved with the Ao treatment method, promoting not only an anatomical reduction of the articular surface, as well as a restoration of the extensor mechanism.

•E-poster #634
Tibial Tubercle Osteotomy Arthroscopically Assisted
Victor N Henriquez, CHILE. Presenter
Clinica Tabancura, Santiago, CHILE

We present the results of a new arthroscopic technique designed to perform tibial tubercle osteotomies , assisted by arthroscopy, using the normal arthroscopic portals. We reviewed the results of 40 patients, with 43 knees, that were operated on between November 2000 and September 2003. In 26 knees we did an anteriorization, in 11 we did a medialization and in 6 a combined procedure was done( AnteromediaZalization). All of them except the last 9 cases, were fixated using one 4.0 mm. cancellous screw. In the most recent cases we used a newly designed screw, developed by the author,that permits to advance the tubercle and fixate it at the same time, thus saving time. This, so called Distraction -Fixation Screw ( TDF in spanish )is describe in detail.
All our patients were treated postoperatively in the same way, allowing weight bearing since the first postop. day, using a crutch for a total of one month. We did not use any immobilization. Physiotherapy was initiated after a week. We followed the patients with monthly X-ray controls. All of them were evaluated at least at six months, using the Lysholm scale. We did not have any complication and only two patients had to be reoperated in order to do a total arthroplasty. We obtained good and excellent results in over 85%. All the patients were satisfied with the cosmetic and functional results. We believe that it is perfectly possible to perform the osteotomy in an arthroscopic way with less morbidity and with encouraging results.

E-poster #635
Arthroscopic Repair of Medial Retinaculum Ruptures Associated with Acute Patella Dislocations
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Purpose: Acute patellar dislocation in athletes is a well-recognized entity that can cause significant impairment both acutely as well as long term. Treatment options for an initial patella dislocation include immobilization, functional treatment or surgical repair. The rationale for each treatment choice is dependent on the nature of the injury, including the associated intra-articular damage, predisposing extensor mechanism malalignment as well the individual surgeon’s preference. In instances when pre-operative evaluation suggests a complete rupture or detachment of the medial retinaculum, surgical repair becomes a viable option. The purpose of this study was to do a preliminary report of a new technique for arthroscopic repair of the medial retinaculum associated with acute patella dislocation using absorbable suture and anchors.

Materials and Methods: Eleven patients with acute patella dislocations presented to our sports medicine clinic. None of the patient had a previous history of patella dislocation or significant patella-femoral maltracking. Each injury occurred with the foot firmly planted on the ground and then a violent twisting episode to the affected knee. Each patient reported obvious visual evidence of patella dislocation with immediate onset of swelling. Evaluation in the office revealed a large hemarthrosis and lateral patella tilt with the knee in an extended position. A palpable rent in the medial retinaculum could be appreciated. Plain x-rays revealed a lateral patella tilt without evidence of bony damage. Each patient underwent an MRI, which showed a complete rupture of the medial retinaculum. The decision was made to treat all of the patients who were college and high school athletes operatively.

Operative technique involved a diagnostic arthroscopy done with standard anterior-medial and anterior lateral portals. Assessment of associated damage was done. Intra-articular evaluation of all patients revealed a significant hemarthrosis, traumatic chondromalacia of the articular surface of the patella and complete rupture of the medial retinaculum off the insertion into the medial non-articular portion of the patella. The hemarthrosis was flushed using copious amounts of arthroscopy fluid. Mechanical chondroplasty of patella was done using a shaver. Arthroscopic lateral release was accomplished using a Mitek VAPR ((Mitek Products, Westwood, MA). Care was taken to leave all fibres of the vastus lateralis intact. A shallow bony trough was then created along the medial aspect of the non-articular surface of the patella using a round arthroscopic burr. A medial para-patella portal was created and after creating pilot holes, two to three Panalock anchors ((Mitek Products, Westwood, MA) were placed proximally to distally along the previously created bony trough. Using a suture passer, one arm of the Panacryl suture was passed through the medial para-patella portal using a suture passer. Arthroscopy fluid inflow was turned off and manual pressure was placed on the lateral aspect of the patella allowing for medial translation. Arthroscopic knot tying was then done through the medial para-patella portal. Excellent re-approximation of the medial retinaculum was noted through a gentle range of motion. Postoperatively the knee was placed into a post-op range of motion brace locked into full extension. Immediate weight bearing was encouraged and limited progressive motion was dialed into the brace starting at post-op week number three. The brace was discontinued at six weeks and aggressive therapy ensued.

Results: At 24-month follow-up all 11 patients demonstrated full range of motion and strength, as well as normal sunrise view x-rays.
They deny any anterior knee pain or feeling of patella subluxation. There have been no recurrent episodes and all patients have returned to full previous level of sports participation.

Conclusion: This study represents a small series of arthroscopic treatment of acute patella dislocations. Limitations of this report include the fact that it is a retrospective evaluation of a new technique and not a double-blinded prospective study. We believe, however, that the technique described is easy to perform and has the potential to provide excellent clinical results. It provides the surgeon with a minimally invasive arthroscopic option when encountering the athlete with an acute patella dislocation associated with complete rupture of the medial retinaculum.

E-poster w/ Standard #636
The Potential Role of the Infrapatellar Fat Pad in the Anterior Knee Pain Syndrome
Michael Bohnsack, Hannover, GERMANY, Presenter
Arne Wilharm, Hannover, GERMANY
Chris Hurschler, Hannover, GERMANY
Oliver Rahmann, Hannover, GERMANY
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Purpose: The study was designed to evaluate the biomechanical and neurohistological properties of the infrapatellar fat especially concerning its potential role in the anterior knee pain syndrome.

Methods: Isokinetic knee extension from 120° of flexion to full extension was simulated on 10 human knee cadaver specimens (6 male, 4 female, average age at death 44 years). Joint kinematics was evaluated by ultrasound sensors (CMS 100TM, Zebris, Isny, GERMANY), and retro-patellar contact pressure was measured using a thin-film resistive ink pressure system (K-ScanTM 4000, Tekscan, Boston). The infrapatellar tissue pressure was analyzed using a closed sensor cell. The patellar contact pressure was measured before and after resection of the infrapatellar fat pad. The distribution of nerve fibres in the infrapatellar fat pad was assed immunohistologically in a second part of the study.

Results: Infrapatellar tissue pressure significantly increased during knee extension <20° and flexion >100° ranging from 343 (±223) mbar at 0° to 60° (±64) mbar at 60° of flexion. A total resection of the infrapatellar fat pad resulted in a significant decrease of the tibial external rotation of 3° in full knee extension (p=0.011), combined with a significant medial translation of the patella between 29° and 69° knee flexion (p=0.017 to 0.028). Retro-patellar contact pressure was significantly (p<0.05) reduced at all flexion angles, at 120° knee flexion more than in full knee extension. Studying all the detectable nerves present in 50 fields (x200 objective) we found an average of 6.6 substance-P- (25%) of a total of 24.7 nerve fibres in the infrapatellar fat pad. There was a significantly (p<0.01) higher number of substance-P-fibers (24.4 (28%) of 105.7) in the surfacing synovial tissue. The number of S-100-fibers was significantly (p<0.05) higher in the central and lateral part of the fat pad.

Conclusions: Based on these results, we conclude that a resection of the infrapatellar fat pad could potentially reduce clinical symptoms in the anterior knee pain syndrome, and that, contrary to commonly believed, the infrapatellar fat pad may have a biomechanical function and play a role in the anterior knee pain syndrome.

E-poster w/ Standard #637
Operative Treatment in High-Energy Knee Dislocations
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IRAN University of Medical Sciences, Tehran, IRAN

Introduction:
The most effective treatment for traumatic dislocation of the knee remains controversial. Experience in our unit suggests that knees which have been Treated by POP immobilization was disappointing, with a high incidence of persistent instability.

The purpose of this study was to evaluate the clinical results of the early repair of the collateral structures and reconstruction of the ACL and PCL in high-Energy Knee Dislocations.

Patients and method:
Between 1995 and 2001, 27 patients with 27 dislocations of The knee presented to our unit. activity level was B in all patients before trauma. Nine of these patients were not included in this series because of confounding variables: Four were treated with cast immobilization, one had open dislocation, and four had major associated fracture. The remaining eighteen patients underwent surgical treatment for the knee dislocation with our standard approach. Sixteen (3
female and 13 male) of the eighteen patients returned for subjective and objective evaluation with use of two different knee rating scales at a mean of twenty months after the operation. 9 patients were in group KDIV group and four in KDIIM group and five in KDIV group of injured ligaments classification. With mean interval of 6 days (4 to 10 days), open surgical Treatment was done. combined cruciate ligament surgery with repair of the collateral ligaments was performed. Results: The mean Lysholm score was 91 points for the acutely reconstructed knees. The final overall IKDC rating was nearly normal for one knee, abnormal for nine, and severely abnormal for six. No knee received a normal overall IKDC rating. Of the knees with a severely abnormal overall IKDC rating, received this rating because of activity-related symptoms and flexion loss. Patient subjective assessment (patients satisfaction) was near normal in 70% of patients. Mean knee flexion was 105 (60 - 135), Heterotopic Ossification were seen in four patients in group KDIV. Pseuduaneurysm of femoral artery was seen in one patient after surgery. Conclusions: Heterotopic Ossification is an uncommon complication following Severe injury to the knee and our study documents a trend toward increased Heterotopic Ossification in patients with group KDIV knee Dislocations. Nearly all patients were able to perform daily activities with few problems, but the ability of patients to return to sports and strenuous manual labor was less predictable.

E-poster w/ Standard #638
The Risk of Neurovascular Injury During Bicortical Screw Placement for Anterior Cruciate Ligament Graft Tibial Fixation: A Comparison of Two Techniques
Todd A. Curran, Portsmouth, VA, USA, Kevin F. Bonner, Chesapeake, VA USA, Jon K. Sekiya, Chesapeake, VA USA, Presenter Bone & Joint/Sports Medicine Institute, Portsmouth, VA, USA

A bicortical screw and washer is a commonly used tibial fixation device in ACL reconstructive surgery. This technique involves multiple steps including bicortical drilling, depth gauge measurement, tapping, and screw placement in the proximal tibial metaphysis, each of which have the potential to injure neurovascular structures. The purpose of this study was to compare the distance to neurovascular structures between exit holes for screws drilled towards the fibula in a medial to lateral orientation versus the standard technique of drilling perpendicular to the cortex of the proximal tibial metaphysis. 35 cadaveric knees were evaluated, 19 with the drill hole directed posterior to the fibula (posterior group) and 16 with the drill hole directed at the fibula (fibula group). A bicortical screw and washer was used for the tibial fixation and the specimens were dissected and the major neurovascular structures identified, including the popliteal bifurcation, anterior tibial vein, anterior tibial artery, common peroneal nerve, and the tibial nerve. The screw exit site on the posterolateral tibial cortex was determined and using a fine caliper, the distances from the exit hole to the neurovascular structures were measured. An independent samples T-test was used to compare the two groups with significance set at p<0.05. There were significant differences in distances measured between our two groups for the popliteal bifurcation (p=0.019, mean difference 6.8mm), anterior tibial vein (p<0.001, mean difference 9.7mm), and the anterior tibial artery (p<0.001, mean difference 10.9mm), with the fibula group measuring larger distances away from the individual structures. There were no significant differences between the groups with regard to the measured distances for the common peroneal nerve (p>0.05, mean difference 0.4mm) and the tibial nerve (p>0.05, mean difference 5.2mm).

During bicortical screw placement in the proximal medial tibial metaphysis commonly used in ACL fixation, aiming toward the fibula significantly reduces the risk of vascular injury compared with the standard technique of drilling perpendicular to the cortex. This increased safety and reduced risk was inferred from the larger distances measured from vascular structures in the fibular group and thus an increased margin of safety.

E-poster w/ Standard #639
The Course of the Patellar Tendon After Reharvesting its Central Third for ACL Revision Surgery
Mattias Liden, Trollhattan, SWEDEN, Presenter Juri Toomas Kartus, Trollhattan, SWEDEN, Ake Bovaller, Trollhattan, SWEDEN, Ninni Sernert, Trollhattan, SWEDEN, Lars Ejerhed, Uddevalla, SWEDEN, Jon Karlsson, Goteborg SWEDEN, Trollhattan, SWEDEN
Background: The optimal choice of graft for ACL-revision surgery is controversial. Reharvesting the patellar tendon has been suggested as one graft alternative.

Methods: Thirteen consecutive patients (4 female, 9 male) who underwent anterior cruciate ligament (ACL) revision surgery using reharvested ipsilateral patellar tendon grafts were included in the study. The patients underwent bilateral MRI evaluations of the patellar tendon and were tested for clinical outcome after 25 (20 - 35) and 115 months (90 - 127).

Results: The serial MRI evaluations revealed that the width and thickness of the patellar tendon at the donor site were significantly increased compared with the non-harvested normal contralateral side and that the donor site gap was still visible. No significant differences were seen between the 2 year and 10 year MRI evaluations. Clinical results in terms of the Tegner activity level, Lysholm score, IKDC evaluation system, one-leg-hop test and the KT-1000 laxity test revealed no significant difference between the 2 and 10 year assessments. Over all the clinical results were considered poor at both occasions. Two major complications were registered; one patellar fracture and one patellar tendon rupture.

Conclusion: The patellar tendon at the donor site had not normalized at 10 years after reharvesting its central third as seen on MRI. Furthermore, the clinical results were poor. Reharvesting the central third of the patellar tendon for ACL revision surgery can therefore not be recommended.

E-poster w/ Standard #640
Computerized Fluoroscopic Navigation in Surgical Treatment for Avulsion Fracture of Posterior Cruciate Ligament: A Report of Two Cases
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Yuji Uchio, Izumo, Shimane, JAPAN
Masatoshi Tobita, Ohda, Shimane, JAPAN
Junji Iwasa, Izumo, Shimane, JAPAN
Nobuyuki Kumahashi, Izumo, Shimane, JAPAN
Toru Nagatani, Izumo, Shimane, JAPAN
Masato Takao, Izumo, Shimane, JAPAN
Oda municipal hospital, Oda, Shimane, JAPAN

Purpose: To report our surgical technique under computerized fluoroscopic navigation for avulsion fracture of posterior cruciate ligament in two patients.

Surgical technique: We utilized the Stealth-Station Treatment Guideline Platform System (Medtronic, Sofamor Danek, Broomfield, CO). A calibration target with affixed infrared-emitting diodes (IREDS) is attached to a C-arm fluoroscope. The reference flame was rigidly attached to the ipsilateral tibial shaft. After registration using preliminary fluoroscopic view, no further fluoroscopic radiation is necessary during surgery. A cannulated drill guide containing 4 IREDS transmit infrared light to the CCD camera, and the camera tracks the position of the drill guide on the patient’s anatomy and continuously updates its three-dimensional position simultaneously on all displayed images. First, we inserted a PCL guide under arthroscopic view and reduced the fracture site. Next, we determined the entry point, direction of screw, correct length of the screw by means of a virtual line. After that, we inserted the cancellous screw and immobilized the fracture site using conventional cannulated screw system.

Results: We treated two cases of avulsion fracture of posterior cruciate ligament. Their Lysholm knee scoring scales were improved from 29 and 32 point at pre-operation to 94 and 100 at 1 year after surgery.

Discussion: Recently, the fluoroscopy based computerized navigation system has been improved, and it allows the surgeon to determine the accurate entry point and direction of the screw with a little use of fluoroscopic radiation. Our present cases showed the usefulness of this system for the surgery of avulsion fracture of posterior cruciate ligament.

Conclusion: Computerized fluoroscopic navigation makes it possible to determine accurate entry point, direction, and length of the screw in surgical treatment for avulsion fracture of posterior cruciate ligament.

E-poster w/ Standard #641
Usefulness of MR Imaging Evaluation and its Limitations in Medial Collateral Injury of the Knee
Hisanori Ikuma, Okayama, JAPAN, Presenter
Nobuhiro Abe, Okayama-shi, Okayama, JAPAN
Ikuko Danura, Fukuyama, Hiroshima, JAPAN
Hiroyuki Hashizume, Okayama, Okayama, JAPAN
Hajime Inoue, Okayama, JAPAN
Okayama University Graduate School of Medicine, Okayama City, JAPAN

Background context: The American Medical Association (AMA) classification of the knee instability, often used to indicate treatment of
medial collateral ligament (MCL) injury, is inadequate for qualitative evaluation of the severity and site of the MCL injury. Among the various reported MRI classifications of MCL injury, the most frequently used methods include the Mink and Deutsch (M&D) classification, which evaluates the superficial layer of the MCL, and the Petermann classification, which evaluates both the superficial and deep layers of the MCL. How these systems relate to clinical instability, which informs surgical indication, remains obscure.

Purpose: The purpose of this study was to examine the usefulness and limitations of the M&D and Petermann classifications of MCL injuries that have been commonly employed in recent years.

Methods: 24 patients with MCL injury underwent MRI and treated surgically within one week of injury. The patients were divided into two groups: 12 had isolated injuries, and 12 had multiple ligament injuries. The MCL injuries in both two groups were classified with M&D and Petermann systems. The evaluation of each system were compared with the AMA classification, and then with the surgical findings to assess the correlation between each of the classification systems and knee instability. We also compared the accuracy of prediction of the location of injury with the surgical findings to assess the accuracy of MRI detection of the injuries.

Results: Neither MRI classification system correlated with AMA classification in either patient group. Only the Petermann classification correlated significantly with surgical findings, and only in the multiple injury group. Both classification systems were accurate for assessment of disruption of the femoral insertion in the isolated injury group, (sensitivity 85.2%, specificity 89.0%). Both classification systems were accurate for disruption of mid-substance in the multiple injury group, (sensitivity 72.2%, specificity 83.3%).

Conclusions: Our study showed that instability of the knee and the severity of MCL injury cannot be thoroughly assessed by the M&D or Petermann classification systems?but the predicted location of MCL injury corresponded with surgical findings. Both of the systems focus on partial or complete tears of the MCL irrespective of the site of injury. A future classification system that accurately predicts the location and the severity of MCL injury needs to be developed.

E-poster w/ Standard #642

Novel Technique for Ligament Fixation Using Bone Graft

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Nobuo Adachi, Hiroshima, Hiroshima, JAPAN
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Hiromi Kazusa, Hiroshima, Hiroshima, JAPAN
Hiroshima University, Hiroshima, JAPAN

(Purpose) The purposes of this study are to introduce our novel technique for ligament fixation using bone graft for the reconstruction of medial collateral ligament (MCL) or posterolateral structures (PLS) in the combined ligamentous injuries, and to evaluate the efficacy of this technique.

(Materials and Methods) In this technique, a cylindrical bone plug (6.5mm in diameter, 15mm in length) is harvested at the anatomical femoral attachment of MCL or popliteal tendon using Mosaicplasty system. After placing the graft in the created bone socket, the bone plug is replaced over the graft. The graft is secured with a spike staple, after appropriate tension is applied to the graft. Six patients with the combined ligamentous injury underwent the MCL or PLS reconstruction using this technique. They were 4 males and 2 females with the average age of 36.3 years (18 - 60). We performed the MCL reconstruction in 3 cases and the PLS reconstruction in 3 cases. Autologous gracilis tendons were used in 5 cases as a graft and allogeneic fascia lata in 1 case.

(Results) We chronologically evaluated the functions of reconstructed ligament with MRI and stress radiography. Postoperatively, joint stability was excellent in all cases and the reconstructed ligaments were well demonstrated by MRI. There were no major complications during the operation and postoperatively.

(Conclusion) This study clearly demonstrated the efficacy of our novel technique to fix the graft with bone block and staple in the reconstruction of MCL or PLS. This ligament fixation technique can provide rigid and less invasive fixation, because distance between the fixation sites can be shorter than that in the Endobutton technique. Comparing to the fixation with only staple without bone graft, bone graft may enhance the healing process of tendon to bone fixation.
Background: The results of treatment for chronic medial instability of the knee have been rarely reported. The purpose of this study was to present the operative technique and analyze clinical results of semitendinosus tenodesis for the chronic medial instability of the knee.

Methods: Thirty-eight patients underwent semitendinosus tenodesis. The average of pre-operative side-to-side difference of the medial opening on stress radiographs was 8.2 mm. For reconstructing the medial collateral ligament (MCL), the semitendinosus tendon was sectioned at the musculotendinous junction and was overlapped and parallel with MCL by dissecting the accessory insertion of the semitendinosus tendon. An isometric point for replacing MCL was located on the medial epicondyle. A 6.5-mm cancellous screw with a 18-mm washer was placed in the drill hole 9 mm above the isometric point. An inverted V-shaped bony trough was made. The graft tendon was hooked around the screw, and the screw with a washer was tightened to hold the tendon on isometric point. The free end of the tendon was pulled diagonally and passed through the insertion of the direct head of the semimembranosus tendon to reconstruct the posterior oblique ligament. The average follow-up period was 5 years and 4 months.

Results: The average of Lysholm and Gillquist score was 89.1. The average of HSS score was 89.5. The IKDC score was A for thirteen patients, B for twenty, C for four and one patient got D score. The average of side-to-side difference of the medial opening was 1.2 mm in stress radiographs. Complications were superficial wound infection, loosening of the screw, saphenous nerve irritation, stiff knee and degenerative changes. Conclusion: The semitendinosus tenodesis provided clinically reliable technique in patients with chronic medial instability of the knee.

Introduction: Recurrent dislocation and subluxation of patella is more common in the 2nd decade of life and is caused by different anatomical and functional abnormalities. Different conservative and surgical procedures are described by many authors in the treatment of this abnormality.

Materials and methods: In this before and after study, 19 patients with documented recurrent dislocation and subluxation of the patella underwent arthroscopic realignment procedure including lateral release and medial reefing by the main author. From 1998 to 2002, just patients with severe valgus, varus, and rotational deformities excluded from this procedure. Loose body and chondral lesion type III were seen in ten cases and type IV in the other nine. Neoprene patellar support or patellar bandage was used postoperatively for the average of 2 weeks. The average follow up period was 28.5 months and a designed questionnaire and Lysholm score was used for evaluation of patients pre and postoperatively.

Results: Full ROM achieved in all cases and functional ability improved significantly in all patients. Limping, swelling, stepping, squatting, locking, using knee support and instability were evaluated pre and postoperatively and improved significantly. Preoperative average Lysholm score was 48.5 and improved to 88.5 postoperatively. Average Lysholm pain score was 5.8 preoperatively which improved to 20.5. In this study there was no relation between severity of chondral lesion and final functional ability of the patients.

Conclusion: Many authors have recommended diagnostic arthroscopy and treatment of combined lesions including loose bodies and chondral lesions before open surgical intervention of this problem. As there is no doubt that arthroscopic patellofemoral realignment has less morbidity, we tried to limit the number and intensity of the operations by using this technique in patients suffering from patellofemoral instability but mild to moderate knee.
malalignment. We recommend this procedure according to our good results.

E-poster #645
Effects of Pretension in ACL Reconstruction
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The mechanisms by which pretension affects the results of ACL reconstructions were studied in clinical, biomechanical and computer model analyses.

Methods:
Pretensions of 60 N and 40 N applied to a Dacron ligament prosthesis were compared in 2 groups of 13 patients by means of IKDC-, Lysholm-, and Tegnerscores and isokinetic testing, in 4 fresh knee specimens tested in a 6 DOF motion and loading rig, and in a 3D computer model simulation.

Results:
The higher pretension (60 N) resulted in a decreased squatting ability in the patients at 4 years follow-up, in large tibial position errors and abnormal graft forces in the biomechanical analysis, and in significant changes in knee kinematics and knee force balance as compared to the 40 N pretensioned knee and the ACL intact knee.

Conclusion:
The pretension exerts its effects on the knee kinematics and the knee force balance by means of the position of the tibia affecting the anterior laxity and the tibiofemoral migration pattern and by means of the graft force balanced by the PCL and the joint cartilage surfaces. The working mechanisms by which pretension variation results in underconstrained, overconstrained or normal reconstructed knees were established.

E-poster #646
Percutaneous Drilling for Painful Partite Patella
Keisuke Inoue, Yamato Koriyama City, JAPAN, Presenter
Masao Ishimura, Ikoma, Nara, JAPAN
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Since 1984, we treated painful partite patella with new operative technique that the painful patellar fragment is drilled percutaneously to the main portion of the patella. This technique is lower invasive and more easy for post-operative treatment than the other technique. Thirty patients (mean age thirteen years) were treated by percutaneous drilling for painful patella partite. Drilling is performed with Kirschner wire (1.2~1.8 mm) at supra-lateral portion of patella(Saupe ?), percutaneously. Radiological findings were excellent in all patients except for 3 patients. Clinical results were excellent in all patients except for one patient. All patients except for one patient, were returned to sports from 2 to 3 months. This technique is more effective than the other technique for return to sports in children.

E-poster #647
Medial Collateral Ligament Release of the Knee
Ronald M Selby, New York, NY, USA, Presenter
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Hospital for Special Surgery, New York, NY, USA

This paper describes a technique supplementing arthroscopic surgery for improving access and visualization of the posteromedial aspect of the knee. Used extensively by the senior author (SJO) and recommended particularly for young arthroscopists still honing their skills in gaining mastery of tight places in the knee this technique has proven useful in cases of meniscal repair, partial menisectomies, and other cases requiring better visualization and access to the posteromedial sector than achievable by conventional methods.

Under direct arthroscopic visualization, with the knee held in extension and with valgus stress the deep band of the MCL is palpated. Following this a spinal needle is brought in percutaneously and is brought through the fibers of the MCL just inferior to the medial meniscus. The spinal needle is then moved in and out in a sewing machine type of motion, keeping it at all times under the skin, until the MCL is felt to release. Improved visualization and increased opening is thus obtained. No added mobidity or increased post-op pain has been noted to result.
E-poster w/ Standard #648
Arthroscopic single- versus double-bundle posterior cruciate ligament reconstructions using hamstring autograft
Ching-Jen Wang, TAIWAN, Presenter
Chang Gung Memorial Hospital, Taiwan, Kaohsiung, TAIWAN
This prospective study compared the clinical results of single- and double-bundle posterior cruciate ligament (PCL) reconstruction with a minimum follow-up of 2 years. There were 35 patients including 19 single- and 16 double-bundle posterior cruciate ligament reconstructions using hamstring autograft. The average age was 29.4 ± 13.6 years versus 28.2 ± 10.4 years; and the average follow-up was 41.0 ± 13.1 months versus 28.2 ± 4.2 months for single- and double-bundle reconstruction, respectively. The indication for surgery was functional disability of the knee due to pain and instability as the result of high-energy PCL injury. The evaluation parameters included functional assessment, ligament laxity, functional score and radiographs of the knee. The results showed no significant difference in functional assessment, ligament laxity, functional score and radiographic changes of the knee between the two techniques. The rate of overall satisfaction with the operation was comparable from patient and surgeon perspectives. Contrary to many recent reports, the results of this study showed that single- and double-bundle PCL reconstruction using hamstring autograft produced comparable clinical results in medium-term follow-up. The difference between single- and double-bundle PCL reconstruction, if any, can be concluded only with long-term results and larger number of patients.

KNEE - MUSCLE/TENDON/BONE

E-poster #650
Transient Osteoporosis of the Knee
Sandra Lasurt, Barcelona, SPAIN, Presenter
Jenaro Angel Fernandez-Valencia, Barcelona, SPAIN
Francisco Macula, Barcelona, Catalonia, SPAIN
Sergi Sastre, Barcelona, Catalonia, SPAIN
Josep Maria Segur, Barcelona, Catalonia, SPAIN
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Santiago Suso, Barcelona, Catalonia, SPAIN
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TRANSIENT OSTEOPOROSIS OF THE KNEE:
1. Introduction:
Transient osteoporosis is cause of joint pain described in the hip but less frequently can appeared in other joints such as the Knee, ankle and foot. The diagnosis is suspected by the history and examination. MRI scan is required for establishing the firm diagnose. The cause is unknown, and that is why this condition can be referred to as idiopathic transient osteoporosis. Symptomatology is solved spontaneously, reason of why the prognosis is good at medium-long term. So it is important to be cautious with its management and the need to avoid surgical intervention.
Patients present acute pain coming from the affected knee, in the area of the involved femoral condyle. Weight bearing is difficult and mimicked a meniscal lesion. There was no relation to a previous trauma or risks factors of Avascular Necrosis.
2. Materials and Method:
We followed up five patients during one year. Four of them were men (80%) and one was a woman. The average age was of 50.6 years old and the condyle affected was the lateral in three cases and the medial in two. In the same way, there were three of right knees and two of them of the left side. It were practised MRI and Scintigraphy in each of the patients at the beginning of symptomatology and 6 months later.
3. Results:
Clinical symptoms and signs in image exams (MRI and Scintigraphy) were completely recovered at the end of the year. Actually, most of them the remission can be appreciated at six months after the symptoms had appeared.
4. Discussion:
The cause of transient osteoporosis remains uncertain. The most commonly accepted theory is that microvascular injury causes tissue ischaemia, resulting in marrow oedema and limited cell injury, which also occurs in Avascular necrosis. The absence of necrosis and the presence of osteoclastic activity suggest that Transient Osteoporosis is distinct from AVN.
Differentiation from Avascular Necrosis has an important prognostic and therapeutic significance. It can be possible by MRI scans details.
Diferential diagnose should be done as well with stress fracture, septic arthritis, tumors, soft
tissue injury, tuberculosis and radiculopathy. MRI must be practised, as well as, a detailed history and a clinical examination in order to establish the diagnosis of transient osteoporosis. Scintigraphy demonstrates a focal increased uptake in the condyle affected. This is in contrast to AVN where a decreased tracer uptake may be found.

5. Conclusions:
All patients has been recovered in six months and image exams become normal.
We doubt about necrotic-like images in MRI making a clinical differentiation of transient osteoporosis.
Partial weightbearing is the treatment proposed in our cases because we think that no bearing can be harmful for the extremity affected.
All cases were treated with Calcitonin and Calcium.
We refused arthroscopic diagnosis for this condition so that its natural evolution can be worse.

E-poster #651
Multi-ligament Knee Injuries: Assessment of Mechanism, Pattern, Associated Injury, and Treatment
Brett A Fritsch, Leichhardt, NSW AUSTRALIA,
Presenter
David Anthony Parker, Sydney, NSW AUSTRALIA
Myles Raphael Coolican, Sydney, New South Wales AUSTRALIA
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Royal North Shore Hospital, Sydney, NSW, AUSTRALIA

Knee dislocation is an uncommon, but serious injury. This study assessed the mechanism of injury, osteochondral and peri-articular soft-tissue trauma, and associated neurovascular injuries in the multi-ligament knee injury. Outcomes following operative and non-operative management were reviewed following a retrospective review of patients with multi-ligament knee injuries. Inclusion criteria were either a confirmed knee dislocation, or complete rupture of two or more ligaments. Systematic review of hospital records and imaging resulted in 45 patients with 47 knee injuries being identified over a 13 year period (1990-2003). All ligament reconstructions were performed by the two senior authors, and clinical assessment, including validated outcome scores, were performed in the majority of patients.
The most common mechanisms of injury were motor bike and motor vehicle accidents. Other mechanisms included pedestrians hit by cars, sporting injuries, and falls. Approximately half had a documented knee dislocation, whilst the remainder were located at the time of presentation. Vascular injury occurred in around 25% of patients, all having positive clinical findings. Routine angiography was not performed in the absence of positive clinical findings. Neurological injury also occurred in approximately 20% of patients. Transient neuropraxia was more common than permanent nerve palsy, and there was an association between neurological and vascular injury. Associated injuries were varied, the most frequent significant injury being long-bone fracture. A significant number of patients had no associated injuries.
Injury patterns were varied, though associations were found between the reported mechanism and the pattern of ligament rupture and osteochondral injury. The majority of cases were managed with operative repair, and assessment of outcomes revealed that most returned to a good level of function, with some minor objective residual laxity and/or stiffness.
Whilst multi-ligament injuries of the knee are uncommon they are serious injuries with potentially catastrophic consequences. This detailed analysis provides some correlation between mechanism and resulting injury to the knee joint and periarticular structures. The evaluation of injury mechanism, resultant pattern, and eventual outcome in this large series provides valuable information to guide and improve future management of these injuries.

E-poster #652
Long term Results of Retrograde Femoral Nailing for Supracondylar Fractures of the Femur in Multiply Injured Patients
Bel Jean-Christophe, Lyon, FRANCE, Presenter
Erhard Lionel, Lyon, FRANCE
Forissier David, Lyon, FRANCE
Frebault Christine, Lyon, FRANCE
Herzberg Guillaume, Lyon, FRANCE
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Aims: To investigate the long term effects of retrograde femoral nailing in treating supracondylar fractures of the femur in multiply injured patients and to establish optimal indications for using this technique.
Methods: The study was prospective and consecutive. 29 multiply injured patients with 33 supracondylar fractures were treated with a retrograde femoral nail between May 1994 and November 1998. There were 15 A (45%) extra-articular and 18 C (55%) intra-articular in 12 men and 17 women with an average age of 61 (range 16-96). There were 9 (27%) open fractures (3 grade II, 2 III A, 4 III B) and 24 (63%) were closed. The Main Outcome Measures were: Fracture pattern, surgical procedure, operative blood loss and time, incidence of hardware failure, misalignment, healing rate and time, post-operative range of motion, long term effects and follow up.

Results: There were 6 (18%) trans patellar tendon and 27 (82%) Para patellar approaches. Open fractures were treated after debridement. The average blood loss was 250 cubic centimetres; the average time procedure was 150 minutes. There were no bone graft, no hardware failure, and no infection. There were 4 misalignments (2 valgus, 1 varus, 1 shortening). All the patients healed. The average time to union was 12 weeks (range 10-20). The average range of motion was 110 degrees (range 60-130). The mean follow up was 100 months. The results were consolidated and no complications were observed once the first year after trauma is achieved.

Conclusion: The results suggest that retrograde supracondylar nailing is a versatile technique that lends itself to a variety of femoral fractures applications. The rate of union and infection, the ranges of motion are associated with a closed, biological surgical technique. The long term results confirm our initial choices.

E-poster #653
Huge Fibrous Histiocytoma in the Knee Joint
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We report the case of huge intra-articular benign fibrous histiocytoma of the knee joint in a 40 year-old woman.

The patient presented at our hospital exhibited pain and difficulty achieving full extension in her right knee. Physical examination revealed swelling on the lateral side of the knee. The range of motion of the joint was slight extension block but flexion was no restriction. Plain radiograph showed an unremarkable. MRI showed a large intra-articular mass in the region of the antero-lateral side of the knee joint. The T-1 weighted image showed a nodular mass of inhomogeneous hypointensity and heterogeneous dark and high signal intensities were shown on the T-2 weighted image.

Following the diagnostic work, arthroscopy was carry out. A large oval shape floating mass (5cm x 3cm x 2.5cm) rooted with small rope like cord on the lateral side of the patellar tendon was found but other structures of the joint were found to be intact. An arthrotomy involving an incision 5-cm long was made on just the lateral side of the patellar tendon. An ovoid, firm tumor was removed.

Histopathological investigation revealed a fibrohistiocytic tumor, composed of spindle cells, some giant cells, histiocyte and foamy histiocyte. The pathological diagnosis was benign fibrous histiocytoma.

At the one year postoperative follow up, the patient was free of pain and without functional disability.

E-poster #654
Arthroscopic Reduction and Internal Fixation of Tibial Plateau Fractures
Takuryo So, Yokohama, JAPAN, Presenter
Kenichi Yamamoto, Chigasaki City, Kanagawa Pref. JAPAN
Chigasaki Municipal Hospital, Chigasaki, Kanagawa, JAPAN

Purpose: Our aim was to determine the outcome of arthroscopic reduction and internal fixation for the treatment of tibial plateau fractures. Type of study: Case series. Methods: 11 consecutive patients (4 men, 7 women) with tibial plateau fractures were enrolled in this study. The average age at surgery was 48 years (range, 18 to 75 years). The follow-up period ranged from 12 to 18 months, with an average of 14 months. Using the Schatzker classification, there were 5 type-2, 4 type-3 and 2 type-6 fractures. Type-2 and type-6 patients underwent arthroscopic-assisted open reduction and screw fixation or plate fixation. Type-3 patients underwent arthroscopic reduction and percutaneous screw fixation. In this procedure for type-3 patients, we used ACL tibial guide and coring reamer to manipulate depressed bone fragments and grafted iliac bone core to the defect and fixed it percutaneously by screws. 9 (82%) patients had associated intraarticular injuries that was diagnosed and treated arthroscopically. There were eight lateral meniscal tears, one chronic
partial ACL tear and one MCL tear. There were four lateral meniscal repairs and two partial lateral meniscectomies performed. The clinical and radiological outcomes were determined according to Rasmussen’s system. In 9 patients, second look arthroscopy was performed 10 to 15 months after their index procedure and we evaluated intraarticular lesions including menisci and cartilage. Results: There were no episodes of nonunion, failure of fixation, wound infection, compartment syndrome, or arthrofibrosis. Overall, 6 (55%) patients were rated as excellent, 4 (36%) good, and 1 (9%) fair. All type-3 patients were rated excellent in every factor. Preoperative fracture depression averaged 10.7 mm (range, 6 to 23 mm). Fracture depression at final follow up averaged 1.7 mm (range, 0 to 5 mm). Second look arthroscopy revealed all repaired menisci were healed and there could be seen some superficial fissures and cracks of cartilage. Conclusions: Arthroscopic reduction and internal fixation provides an accurate fracture reduction, diagnosis and treatment of associated intraarticular injuries. The arthroscopic technique allows less soft tissue stripping than with traditional methods.

E-poster #655
Effects of Patellar Taping and Thera-band on the Onset of Electromyographic Activity of Vastus Medialis and Vastus Lateralis in Different Hip Positions in Healthy Subjects
Defne Kaya, Ankara, TURKEY, Presenter
Mehmet Fatih Ozdag, Ankara, TURKEY
Ozgur Ahmet Atay, Ankara, TURKEY
Inci Yuksel, Ankara, TURKEY
Nazan Tugay, Ankara, TURKEY
Egemen Turhan, Ankara TURKEY
Mahmut Nedim Doral, Ankara, TURKEY
Hacettepe University and GATA, Ankara, TURKEY

The aim of this study is to investigate the onset of VMO and VL muscle activity in straight leg raise position with neutral, 30° internal and 45° external hip rotation and with/without patellar taping and with/without Thera-band in healthy subjects. Thirty-seven knees of nineteen male subjects were evaluated electrophysiologically. The subjects with a history of knee trauma or surgery, patellofemoral pathalogy, or different skinfold value between knees were excluded from our study. EMG activity was recorded with surface electrodes in an oscilloscope program from the VMO and VL muscles. VMO started to contract before VL in only two examination procedures: 30° IR without patellar taping and Thera-band, and 30° IR with patellar taping and without Thera-band. In all the other examination procedures VL started to contract earlier than VMO, though no statistical significance between onset activities of VMO and VL was found in any of our examination procedures. Although no differences were found between onset activities of VMO and VL muscles in our study, patellar taping and SLR exercises were used for treatment of patients with patellofemoral pain by increasing VMO activity, correcting patellar position and decreasing the pain.

Key Words: Onset activity, VMO and VL muscle, Patellar Taping, Thera-band, Hip Rotation Angle.

E-poster #657
Patellar Tendon Bilateral Giant Cell Tumor
Fabiano Kupczik, Curitiba, BRAZIL, Presenter
Daniel Pundek Tenius, Curitiba, Parana, BRAZIL
Joel Takashi Totsugui, Curitiba, Parana, BRAZIL
Marcio Hiroaki Kume, Curitiba, Parana, BRAZIL
Lucio Sergio Rocha Ernlund, Curitiba, Parana, BRAZIL
Cajuru University Hospital - Pontific Catholic Uni, Curitiba, BRAZIL

Introduction: Giant cell tumor of the patellar tendon is relatively common injuries of fibrosis proliferation in the orthopaedic practice. It occurs predominantly in women in a ratio of 2:1 in relation to men, and it is characterized as a concrete and painless mass. Generally, they are located in the palm of fingers and have ample distributions, having stories of manifestations in individuals of 8 to 80 years. However, this tumoral presentation in the patellar tendon, with bilateral manifestation concomitantly, is rare. The ability to make the diagnosis appropriately and to treat benign tumors adequately, as well as distinguishing them from the malignant injuries consists of a vital quality for the orthopaedic surgeon. Objective: To report a case of giant cell tumor in patellar tendon and to carry through pertinent bibliographical revision. Material and Method: Patient F K, masculine, 16 years, student, presented with bilateral masses in patellar tendon topographies, with a diameter of 4 cm of the right side and of 7 cm of the opposing side, of fibro-elastic characteristics, mobile and painless. They did not present signs of infection or inflammatory signals. The patient denied any previous history of pain or trauma. Results: X-rays had been inconclusive for
the diagnosis. The ultrasonography presented suggestive images of soft tissue tumors. The histologic study of the excisional parts detected histiocitics cells and multinucleated giant cells, confirming the diagnosis. Conclusions: The giant cells tumors had been removed by aesthetic questions. However, it has necessity of surgical intervention when it has manifestations of compressive pictures of adjacent structures or when malignancy must be discarded. All orthopaedic surgeon must be familiar to the evaluation of the tumoral processes in this region to differentiate of other orthopaedic diseases.

E-poster w/ Standard #658
Anatomic Vascular Zones of the Quadriceps Tendon
Horacio Yepes, Halifax, Nova scotia CANADA, Presenter
Maolin Tang, Halifax, Nova scotia CANADA
Steve Morris, Halifax, Nova scotia CANADA
William David Stanish, Halifax, CANADA
Dalhousie University, Halifax, Nova Scotia, CANADA

Background: Ruptures of the quadriceps tendon (QT) are a common problem in the middle age patient. The density of vascularity of the tendon may explain the pattern of spontaneous ruptures of the QT. Our purpose was to describe the vascular anatomy of the QT and assess the density of vascularity in an attempt to correlate hypovascular areas with the clinical pattern of ruptures. Methods: Twenty adult human cadavers underwent whole body arterial perfusion with 26 ml/kg of a mixture of lead oxide, gelatine and water though the femoral artery. All quadriceps musculotendinous units were dissected and radiographed. The obtained angiograms were scanned to a computer, converted to digital pictures and analyzed with a digital picture statistical software analyzer. Pixel-maps based on the radio-opacity of the vessels of the tendon were created. Results: Three main anastomotic arcades were identified, and based on the density of vessels observed, different vascular zones were described: Zone I, located between 0 and 1 cm from the proximal edge of the patella, contains the superior peri-patellar arcade and is highly vascularized. Zone II (intermediate) located between 1 and 2 cm was found to be hypovascular mainly in its central third, also in some specimens avascularity of central zone II was noted, zone III, located from 2 cm beyond the patella to the musculotendinous junction showed a variable vascular supply, rich near the laterals portions and poor at the center of the tendon. Conclusion: The hypovascular zones identified, correlate with the clinical pattern of rupture of the QT.

E-poster w/ Standard #659
Results of Arthroscopic Inside to Out Repair of Meniscus Tear
Jae-Yong Byun, Cheongju, KOREA, Presenter
Juseok Yoo, Cheongju, Chungbuk KOREA
Cheongju St. Mary hospital, Cheongju, KOREA

Purpose:
It is to analyze clinical cure and patient’s satisfaction according to the affecting factors after applying arthroscopic inside-to-out suture on the tear of meniscus, using nonabsorbable suture material.

Subjects and methods:
The subjects are 110 cases of 95 patients who were able to be followed up for more than 12 months (from Aug. 1999 ~ June 2002), after arthroscopic inside-to-out suture treatment was given for the tear of meniscus, using nonabsorbable suture material. The results were evaluated in terms of clinical cure and subjective satisfaction level, which were followed by an analysis of effects of age, period from the injury occurrence to operation, tear site, tear length, type of tear, injury level of articular cartilage and accompanying anterior cruciate ligament operation on the results.

Results:
Clinical cure accounts for 76% of 84 cases, while patients’ subjective satisfaction for 89% of 98 cases. In case of accompanying tear of anterior cruciate ligament, tear length of less 2 cm and light case of degeneration in articular cartilage show significantly higher clinical cure and patients’ satisfaction levels. In case of the tear of medial meniscus, shorter period from the injury occurrence to operation and longitudinal tears among many types of tears show higher level of clinical cure. Complicated or degenerative tears show high level of patients’ satisfaction despite lower level of clinical cure.

Conclusion:
The arthroscopic inside-to-out suture on meniscus using nonabsorbable suture material is an easy technique that allows a variety of sutures. It can be concluded that patients’ age is not absolute consideration in determining the suture
of meniscus, and that cases accompanying degenerative or complicated tears and articular cartilage injuries call for special attention to patient selection and operation.

**E-poster #660**

**Reconstruction of the Quadriceps Tendon using the Leeds-Keio Ligament**

Tomoyuki Abe, Nagoya, JAPAN, Presenter  
Hideo Matsumoto, Tokyo, JAPAN  
Toshiro Ohtani, Shinjuku, Tokyo, JAPAN  
Tatsuo Kobayashi, Nisitokyo, Tokyo, JAPAN  
Kenichi Tazaki, Suginami, Tokyo, JAPAN  
Nobuki Terada, Nagoya, Aichi, JAPAN  
Kyoosuke Fujikawa, Tokorozawa, Saitama, JAPAN  
Fujita Health University Second Hospital, Nagoya, Aichi, JAPAN

**[Purpose]**

A rupture of the quadriceps tendon is a severe injury with a long recovery period and often results in an extension lag and limitation of flexion. The reconstruction of this tendon using Leeds-Keio (LK) artificial ligament was firstly reported by Fujikawa in 1994. The present study aimed to reevaluate its clinical results.

**[Patients and Methods]**

Six knees in 6 patients (5 men and one woman; average age 55.8 years, ranged from 43 to 67) with rupture of the quadriceps tendon were involved in this study. Two of the six cases were pathological ruptures secondary to renal failure and Werner syndrome.

The quadriceps tendon was reconstructed using Leeds-Keio artificial ligament following Fujikawa’s report. One day, or a few days after operation, ROM exercise was started. Two or three weeks after operation, partial weight-bearing in a brace was permitted. Patients were followed for an average of 1.8 years (range, 3 months to 4 years).

**[Results]**

In all patients, passive extension was 0 degrees. The average of knee passive flexion was 143 degrees (ranged from 130 to 150). All patients regained 90 degrees flexion within one month. Two patients had no extension lag, and the other four had an extension lag of less than 15. Within 5 months, two patients were able to play golf and one to return to work as a taxi driver.

**[Discussion]**

Several procedures, involving end-to-end anatomic repair and other reconstructions have been described for repair of the quadriceps tendon. However, most of these procedures require cast immobilization and a long rehabilitation since they have insufficient tensile strength to allow early mobilization. Therefore, such procedures have the potential to fail to attain a good ROM.

The advantages of the reconstruction reported by Fujikawa are that it is simple and enables a quick start to ROM exercise without immobilization. In our cases, all patients quickly gained good ROM and remained little extension lag. Some of the patients were able to return to sporting activities and to resume normal work within several months. We concluded that reconstruction using the LK ligament is an excellent procedure for repair of a quadriceps tendon rupture.

**E-poster #661**

**Arthroscopic Evaluation After Surgical Repair of Intercondylar Eminence Fractures**

Hwang-Jung Park, Sagamihara, JAPAN, Presenter  
Ken Urabe, Sagamihara, JAPAN  
Jun Aikawa, Sagamihara, JAPAN  
Mamoru Fujita, Sagamihara, JAPAN  
Motoi Miyabe, Sagamihara, JAPAN  
Moritoshi Itoman, Sagamihara, JAPAN  
Department of Orthopaedics, Kitasato univ., Sagamihara, Kanagawa, JAPAN

**[Purpose]**

We used arthroscopy to evaluate outcomes after surgery to repair intercondylar eminence fractures. Material and methods: Ten patients (8 men, 2 women; average age 27.9 years) with fractures of the tibial intercondylar eminence underwent an arthroscopic reduction and internal fixation with non-absorbable sutures. Preoperative radiological examination showed that there were one Meyer’s type-II, eight type-IIIA and one type-IIIB fractures. Clinical symptoms and physical findings for all patients were evaluated one year later. Radiographic assessment and the Lysholm functional rating were also utilized. All patients underwent second-look arthroscopy when removing the fixation device. Arthroscopy was used to assess the appearance of the surface of the ACL, check for the existence of cyclops, and look for interposition of tissue in the lateral and medial joint spaces. Results: All patients achieved bony union, and had negative Lachman and anterior drawer tests. The average Lysholm knee score was 94.5 points (100-75 points). Arthroscopy showed an irregular surface on the ACL in 2 of 10 patients, cyclops in 2 patients, and interposition in the lateral joint space in 2 patients, and interposition in the medial joint space in 1 patient. Two
patients who had cyclops showed loss of knee extension (5~10°), which was regained by resection of the cyclops. One patient who had an interposition into the lateral joint space complained of catching which was released by resection of the interposing tissue. Conclusion: Cyclops syndrome, which is recognized following anterior cruciate ligament reconstruction, is one of the causes of loss of knee extension after surgery to repair a fracture of the intercondylar eminence. Furthermore, in those cases that have knee complaints such as catching and loss of knee extension, second-look arthroscopy is important to identify and correct the problem.

**KNEE - CARTILAGE/MENISCUS**

**E-poster #700**

**Arthroscopic Visualization of the Posterior Compartments of the Knee**

James H Lubowitz, Taos, NM, USA, Presenter
Michael Rossi
Brad Baker
Dan Guttmann
Taos Orthopaedic Institute Research Foundation, Taos, NM, USA

Our purpose is to test the hypothesis that efficacy of knee posterior compartment arthroscopic evaluation outweighs morbidity or inefficiency. 100 consecutive knee arthroscopy patients have posteromedial and posterolateral evaluation according to an algorithm designed to minimize inefficient technique(s). Number of attempts required for visualization (or visualization not accomplished), morbidity (scuffing or complications), and findings are recorded. Loose bodies are defined as expected when preoperative imaging or arthroscopy of the rest of the knee reveals loose bodies.

With regard to posteromedial, inserting the camera directly (no obturator) may result in instrument breakage. 82 percent were visualized on the first attempt. 3 percent were not accomplished. 34 percent had scuffing. Loose bodies were found in 36 percent when expected and 0 percent when not expected, a significant difference (p less than 0.05). 5 findings were recorded in addition to loose bodies.

With regard to posterolateral, 93 percent were visualized on the first attempt, inserting the camera directly via the anterolateral portal. All were visualized. 4 percent had scuffing. Scuffing occurred significantly less frequently than with posteromedial (p less than 0.05). No findings were recorded.

Despite inefficiency, we recommend posteromedial visualization via the anterolateral portal using an obturator. Posteromedial visualization is associated with morbidity but is efficacious in some cases and strongly recommended when loose bodies are expected. Posterolateral visualization directly with the camera via the anterolateral portal is efficient and associated with minimal morbidity but was not efficacious in the cohort evaluated.

**E-poster #701**

**Arthroscopic Meniscal Repair: Outcome Analysis**

Hemang B Mehta, Abergavenny, UNITED KINGDOM, Presenter
Atif M Nada, Abergavenny, Monmouthshire, UNITED KINGDOM

Arthroscopic meniscal repair is a promising technique for treating peripheral meniscal tear.

**Aim:** Assess clinical results and satisfaction after meniscal repair in District General Hospital set up.

**Material and methods:** Retrospective analysis of patients’ details who had meniscal repair between January 1996 and December 2001. Various data regarding occupation, mechanism of injury, waiting time before diagnosis and surgery and type of repair carried out was gathered from patients notes. A questionnaire was sent to all these patients regarding satisfaction, recovery and function based on international knee scoring criterion.

**Results:** During this period total of 69 arthroscopic meniscal repair were carried out (Age group 9-65 years.) About 60% of patients had sporting injury and about 70% had operation within six months of their injury. Mean duration at the time of review was 31 months (60-12 months). Methods of repair were vicryl suture, darts, clearfix screw fixation and combination two different methods. 84% of the patients were back to normal activity and sporting activity by 12 weeks and remaining had associated procedures like ACL reconstruction which delayed their progress. 72% of patients had normal knee function. 4 patients out of 69 had failure of the procedure and required subsequent excision of meniscus.
Conclusion: Excellent functional scoring was found in young patients with isolated meniscal repair compared to those who had associated other procedures and patients with articular and ligamentous injury at the time of the procedure. Results are also dependent on duration between injury and surgery.

E-poster #702
Popping Sound with Radial Tears of the Meniscus Among the Elderly Patients
Kyung Wook Nha, Koyang-Si, KOREA, Presenter
Gyu Won Park, Koyang, Kyunggi SOUTH KOREA
Byung Gik Kim, Koyang, Kyunggi SOUTH KOREA
Jung Ro Yoon, Seoul, KOREA
Inje University, Ilsanpaik Hospital, Koyang, KOREA

(INTRODUCTION) Popping sound is characterized by a clinical sign associated frequently with ACL or MCL injury. Popping is a sharp, explosive sound happened in the initial attack. However its description related with meniscal tear has been rarely mentioned.

(MATERIALS AND METHODS) We experienced seventeen cases of meniscal tear with audible popping sound and evaluated them with MR imaging and arthroscopic examination. All patients were over middle age group (ranged from 47 to 86 years), the average age was 62.5 years, denied having any preceding trauma and complained of the knee pain.

(RESULTS) Interestingly all seventeen cases showed the radial tears of meniscus (sixteen cases showed the radial tears in the root of the posterior horn of the medial meniscus and one case showed the radial tear in the middle portion of lateral discoid meniscus), confirmed by arthroscopic examination. MR imaging performed in 16 out of 17 cases showed 43% (7/16 cases): diagnostic accuracy in coronal MR image. In our study, popping sound showed a higher accuracy rate (100%) compared to MR imaging.

(DISCUSSION) Meniscal tears in elderly patients happened commonly without trauma due to the degenerative changes. Popping may be transecting sound of the circumferentially oriented fibers of meniscus during the swing phase of gait (forced flexion).

(CONCLUSIONS) Popping sound of the meniscus could be recognized as making a diagnosis of meniscal injury, especially radial tear over middle age group.
found in IKDC grading form. In T2*-weighted MRI after three months, resurfacing of OCD lesion and union of the osteochondral fragments was achieved in all patients. Donor site problems were not observed in any cases.

[Discussion]
Although mosaicplasty is widely accepted to be one of the successful treatments for the repair of articular cartilage defects of the knee, the donor site morbidity and articular congruence fit are still potential problems. In the treatment of unstable OCD lesions, if possible, we recommend the Berlet technique to minimize these problems. This technique also provides for biological internal fixation and obviates the need for later removal of internal fixation. An added benefit is the potential stimulation of vascularization of the subchondral bone surrounding the recipient sites, which may help heal the OCD fragment.

E-poster #704
Autologous Chondrocyte Implantation for Treatment of Focal Chondral Defects of the Knee: A Clinical, Arthroscopic, MRI & Histologic Evaluation at Two Years
Ian J Henderson, East Melbourne, VIC AUSTRALIA, Presenter
Ramces Francisco, Manila, PHILIPPINES
Barry Oakes, Clayton, AUSTRALIA
Julie Cameron, Melbourne, AUSTRALIA
St Vincents & Mercy Private Hospital, Melbourne, Victoria, AUSTRALIA

To determine the efficacy of autologous chondrocyte implantation (ACI) in treating focal chondral defects of the knee, we reviewed the two year treatment outcome of ACI in 53 patients through clinical evaluation, MRI, second-look arthroscopy and core biopsies obtained. From November 2000 to December 2003, 54 consecutive knees with 72 focal chondral defects (grade III or IV by modified Outerbridge) were treated with ACI using the Peterson periosteal patch technique. In this method, an initial arthroscopy was carried out to confirm the suitability for repair and when appropriate, cells were harvested either from the margins of the lesion, the intercondylar notch or both. The harvested cells were proliferated in vitro. Three to four weeks later, the cells were implanted in the defect with a medial or lateral parapatellar arthrotomy approach. A standardized post-operative rehabilitation protocol was carried out depending on the site of the lesion or lesions. Improvement in mean subjective score from pre-operative (37.6) to 12 months (56.4) and 24 (60.1) months post-ACI were observed. Knee function levels also improved (86% IKDC III/IV to 66.6% I/II) from pre-operative period to 24 months post-implantation. Objective IKDC score of A or B were observed in 88% pre-operatively. This decreased to 67.9% at three months before improving to 92.5% at 12 months and 94.4% at 24 months post implantation. Transient deterioration in all these clinical scores was observed at three months before progressive improvement became evident. MRI studies demonstrated 75.3% with at least 50% defect fill, 46.3% with near normal signal, 68.1% with mild/no effusion and also 66.7% with mild/no underlying bone marrow edema at three months. These values improved to 94.2%, 86.9%, 91.3% and 88.4% respectively at 12 months. At 24 months, further improvement to 97%, 97%, 95.6% and 92.6% respectively were observed. Second-look arthroscopy carried out in 22 knees (32 lesions) demonstrated all grafts to be normal / nearly normal based on the International Cartilage Repair Society (ICRS) visual repair assessment while core biopsies from 20 lesions demonstrated 13 (65%) grafts to have hyaline / hyaline-like tissue. Improvement in clinical and MRI findings obtained from second-look arthroscopy and core biopsies evaluated indicate that, at 24 months post-ACI, the resurfaced focal chondral defects of the knee remained intact and continued to function well.

E-poster #705
Membranous/Matrix Autologous Chondrocyte Implantation for the Treatment of Large Chondral Defects in the Knee and Ankle
Pedro Guillen, M.D., Madrid, SPAIN, Presenter
Tomas Fernandez Jaen, M.D., Madrid, SPAIN
Clinica CEMTRO, Madrid, SPAIN

Purpose:
To examine the effectiveness of Membrane/Matrix Autologous Chondrocyte Implantation on large, full-thickness articular cartilage lesions in athletes. This technique theoretically reduces implant morbidity, avoids the use of a periosteal patch, avoids the use of
sutures, and potentially enhances cell proliferation and maturation.

Large, full-thickness articular cartilage defects greater than 2.5 to 3.0 cm² pose a special problem in young athletes. These lesions are often too large for marrow stimulation procedures to be predictably successful. Unpublished, these lesions often progress to posttraumatic arthritits and disability.

Autologous Chondrocyte Implantation (ACI) has yielded encouraging results in greater than 88% of the cases of deep chondral lesions.

Matrix/Membrane Autologous Chondrocyte Implantation (MACI) is a new biotechnology allowing the impregnation of autologous cultured chondrocytes onto an autologous collagen matrix which is templated to the chondral defect and applied without sutures.

The procedure can be performed arthroscopically.

Methods:

Forty-one patients were prospectively evaluated for the effectiveness of the MACI procedure (35 knees, 6 ankles) on large, full-thickness (size 2-12 cm²) cartilage lesions (ages 16-52).

A second generation Membrane/Matrix Autologous Chondrocyte Implantation (MACI) technique was used after a previous arthroscopic harvesting of articular chondrocytes (Verigen, Leverkusen, GERMANY). The implant is fixed to the chondral defect with a fibrin glue (Tissucol, Baxter, SPAIN).

Patients were evaluated by clinical evaluation using standardized scales, MRI, and several second-look arthroscopies with cartilage biopsy and histological study.

Results were also compared to 152 previously performed ACIs.

Results:

Clinically, there were better than 86% good-to-excellent results. The results compared favorably to previously published ACIs.

Histologically, a “hyaline-like” cartilage similar to ACI was produced.

There was no case of delamination of the MACI series and one in the ACI series. No cases of infection or phlebitis. Two (2) cases of stiffness (treated by epidural and manipulation under anesthesia at eight weeks).

Conclusion:

The MACI technique is a simple surgical technique that produces a “hyaline-like” cartilage. It reduces pain, improves activity level and quality of life. The technique is substantially easier and quicker than ACI; easier to template the lesion, no peristeme needs to be harvested, no suturing of the peristeme flap, and no injection of cells under the flap into the defect.

MACI can be implanted by mini-arthrotomy or arthroscopically and offers easier access to certain sites where suturing of peristeme flaps are difficult or even impossible.

E-poster #706

The Chondropenia Severity Score: A New Clinical Tool for Articular Cartilage Defects

Jason Matthew Scopp, Salisbury, MD, USA, Presenter
Bert R. Mandelbaum, Santa Monica, CA USA
Santa Monica Orthopaedic and Sports Medicine Group, Santa Monica, CA, USA

Objective: We are presenting a new classification system to facilitate the assessment and translation of knee arthroscopic findings. This objective score serves as a comprehensive method to develop a management algorithm with prognostic indications. The purpose of this study is twofold: First, we will introduce the Chondropenia Severity Score (CSS). We define the term chondropenia as cartilage loss over time. The CSS is a simple arthroscopic score that incorporates lesion size, depth, location and meniscal integrity to form an objective description of knee joint morphology. Second, we will introduce the algorithm of the Chondropenic Pathway. This pathway organizes patients with articular cartilage defects (ACD’s) into 10 separate situations. Each situation has a specific treatment plan.

Methods: Data was prospectively collected from 175 consecutive knee arthroscopies performed by the senior author over a 6 month period. The arthroscopic findings and epidemiologic data were recorded after each arthroscopy. The CSS is a 100 point scale. Points are lost for increasing grade of articular cartilage lesion based upon the International Cartilage Repair Society (ICRS) articular cartilage injury classification. The meniscus is also included in the CSS. Points are lost based upon the percentage of meniscal debridement. The patients were then stratified into 1 of 10 situations as outlined in a Chondropenic Pathway.

The Chondropenic Pathway:
Situation 1-- Partial thickness ACD’s;
Situation 2-- Femoral ACD’s < 2 cm;
Situation 3-- Femoral ACD’s > 2 cm;
Situation 4-- Tibial ACD.
Situation 5-- Patellofemoral ACD isolated;
Situation 6-- Patellofemoral ACD combined;
Situation 7-- Ligamentous or meniscal deficiency;
Situation 8-- Bipolar ACD (femoral + tibial);
Situation 9-- Early OA (chondropenia);
Situation 10-- End-stage OA.

Results: There were 90 male patients and 85 female patients with a mean age of 44 years (SD 16; range: 14-80 years). 3.4% had an isolated femoral articular cartilage defect < 2 cm². 2.3% had an isolated femoral articular cartilage defect > 2 cm². Isolated tibial articular cartilage defects were rare and only seen in 1.1%.

Mean CSS (+/- S.D.):
Situation 1-- 90 (6);
Situation 2-- 77 (3);
Situation 3-- 81 (12);
Situation 4-- 78 (2);
Situation 5-- 86 (5);
Situation 6-- 73 (9);
Situation 7-- 86 (14);
Situation 8-- 61 (10);
Situation 9-- 46 (6);
Situation 10-- 32 (3).

Conclusions: The CSS is an objective and quantifiable arthroscopic tool that reflects a spectrum of injury to the articular and meniscal cartilage. The Chondropenic Pathway is an instrument used to stratify these patients into 1 of 10 situations. Both tools can be used together to assess and translate arthroscopic findings into a treatment algorithm.

E-poster #707
Pseudoaneurysm of the Lateral Inferior Genicular Artery After Arthroscopic Meniscectomy
Seigen Mori, Fukuoka, JAPAN, Presenter
Michiya Hara, Fukuoka, JAPAN
Saburo Inagaki, Fukuoka, JAPAN
Fukuoka rehabilitation hospital, Fukuoka, JAPAN

A 66-year-old woman, whose case was complicated by preexisting low platelet level, which led to cirrhosis of the liver, presented with continuous hemarthrosis after arthroscopic meniscectomy. A second arthroscopy, performed twelve days after initial operation, confirmed that there was no bleeding in the joint. But hemarthrosis was existing continuously. Ten days after the second arthroscopy, thrombocyte transfusion was administered, which successfully rectified the hemarthrosis. Fifty days after initial arthroscopy, a pulsatile swelling was noted presented at the lateral arthroscopy portal, subsequent angiography showed a pseudoaneurysm of the lateral inferior genicular artery. Surgical exploration and ligation of the vessel feeding the pseudoaneurysm was performed, and the patient made a full recovery. Vascular injury should be considered in patients with hemarthrosis following arthroscopy of the knee.

E-poster #708
Autogenous Osteochondral Grafts for Osteonecrosis of the Femoral Condyle
Akihiro Kotani, Mitaka, Tokyo, JAPAN, Presenter
Yoshiaki Ishii, Mitaka, Tokyo, JAPAN
Shigeru Sasaki, Kashiwazaki, Niigata, JAPAN
Kazuhiro Satomi, Mitaka, Tokyo, JAPAN
Dept. of Orthopedic Surgery Kyorin University, Tokyo, JAPAN

Purpose:
To evaluate the long-term outcome following use of osteochondral autografts for the treatment of osteonecrosis of the femoral condyle.

Methods:
Clinical, radiographic and arthroscopic findings were evaluated at follow-up. Patients were 14 women and 2 men, with a mean age of 64.9 years (range, 58-74 years). The osteochondral lesion was equivalent to Lotke 1-B in 12 knees, and was equivalent to 1-C in 4 knees. Preoperative femoral tibia angle ranged from 178 to 190.

Results:
The follow-up period ranged from 28 months to 111 months (mean, 67 months). Functional scores improved from 60 to 75 preoperatively to 80 to 100 postoperatively. And the grafts were satisfactorily accepted. Patients with a femoral tibia angle of less than 180 in particular were found to respond favourably.

Conclusion:
Transplant surgery using osteochondral autografting appeared effective for the treatment of osteonecrosis of femoral condyle.
E-poster #710
Three Cases of Meniscal Cysts Arising in the Popliteal Space
Kazushige Nomura, JAPAN, Presenter
Gunma Sports Medicine Research Center, Maebashi, JAPAN

OBJECTIVE: The purpose of this study is to describe the MR imaging features of an unusual type of meniscal cyst arising from tears of the posterior horn of the medial meniscus and its treatments.

MATERIALS AND METHODS: Retrospective review of MR examination of the knee was performed on 3 patients (one man, two women; mean age, 50 years) in whom evidence of a meniscal tear and a cyst-like structure in the popliteal space was seen. An oval mass with low signal intensity on T1-weighted MR images and increased signal intensity on T2*-weighted MR images in the popliteal space, simulating a PCL ganglion cyst, was seen in all 3 patients. A tear of the posterior segment of the medial meniscus was also seen in all 3 patients. Arthroscopy in 3 patients and open cystectomy in 2 patients confirmed the meniscal tear and the meniscal cyst.

CONCLUSIONS: In our case, only partial meniscectomy was performed, and to date there have been no recurrences. The treatment strategy for meniscal cysts and PCL ganglion cysts differ. Accurate preoperative diagnosis of a pericruciate meniscal cyst is important.

E-poster #711
The Meniscal Ossicle Revisited: Etiology and a Novel Treatment
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The etiology, significance, and treatment options of the meniscal ossicle are unclear. Although only 41 cases are described in the literature, several theories exist on its origin, including a phylogenetic theory and a post-traumatic theory. MRI and arthroscopic findings have suggested a radial tear or meniscal root avulsion, and a calcified posterior horn of the medial meniscus. Removing this ossicle may further destabilize the posterior root attachment of the medial meniscus and create laxity in the circumferential collagen bundles. Since the clinical significance is uncertain, there is no consensus on treatment options. We present our evolving experience with a case series of meniscal ossicles, including a series of arthroscopic cases and one total knee arthroplasty case that led us to believe that the ossicle results from an avulsion of the posterior root of the medial meniscus. Lastly, in an acute presentation, we present a novel technique for repair of a meniscal ossicle in two cases.

A series of arthroscopic cases presented with MRI’s and clinical findings ranging from possible loose bodies to radial tears of the posterior medial meniscus. Intraoperatively, each case revealed a rounded, calcified posterior horn of the medial meniscus detached from its root insertion similar to a radial tear. Using accessory portals posteromedially and through the notch, visualization of an apparent avulsion donor site from the tibia at the normal root attachment was evident. An open arthroplasty case with removal of the tibial plateau and meniscus en bloc confirmed the root avulsion theory. The detached ossicle and tibial donor site were easily visualized with apparent secondary laxity in the meniscus circumferential tension.

With this working theory, we acutely encountered a 15-year old male soccer player following a twisting, contact injury. His clinical exam, MRI, and arthroscopy were consistent with a posterior root avulsion of his medial meniscus. Visualization of his meniscal ossicle was aided by passing the arthroscope under the PCL into the notch. The avulsed posterior root was folded back on itself, exposing the osseous undersurface, and the two opposing superior surfaces of the meniscus were beginning to scar together. Following preparing the donor bed, a posteromedial portal was created to perform the repair. The avulsion could be reduced to the donor site, resulting in reduction of the entire meniscus into its original position and tension on the tibial plateau. The root of the medial meniscus and the avulsed ossicle were pierced twice with a Beath needle which was drilled into the anterolateral edge of the donor site and out through the anterolateral tibial cortex to create an outside-inside-outside, mattress suture repair. The sutures were pulled thought the tibia, tensioned, and tied over a 10mm bone bridge on
the anterolateral tibial cortex. Excellent reduction and stable fixation was achieved, as well as improved circular tension around the entire medial meniscus. Shortly thereafter we also encountered a 50-year old male who sustained an acute injury to the knee involving an ACL avulsion as well as the meniscal ossicle avulsion. Using the same technique, the meniscal ossicle was successfully fixed with less difficulty. The ACL avulsion fracture was also fixed at the same time.

These cases support the avulsion theory of the posterior root of the meniscus as the etiology of the meniscal ossicle. Furthermore, we describe a novel technique for repair of an acute meniscus ossicle. It is reasonable to consider this repair technique in subacute and chronic cases to restore biomechanical integrity of the knee joint.

E-poster #712
Osteochondritis Dissecans (OCD) of the Lateral Femoral Condyle
Mitsuo Ochi, Hiroshima, JAPAN,
Nobuo Adachi, Hiroshima, Hiroshima JAPAN
Yoshio Sumen, Onomichi, Hiroshima JAPAN
Kenzo Kawasaki, Izumo, Shimane JAPAN
Masataka Deie, JAPAN, Presenter
Orthopaedic surgery Hiroshima University, Hiroshima, JAPAN

We examined the relationship between osteochondritis dissecans (OCDs) of the lateral femoral condyle and lateral menisci. From 1993 to 2002, we experienced 43 OCDs of the lateral femoral condyle. OCD locations were graded by the Cahill and Berg 17 classification. From the anterior-posterior view, 26 OCDs were located in zone 4 and 17 OCDs were located in zone 5. The lateral menisci were complete discoid in 19 knees, incomplete discoid in 15, normal in 4, and post-menisectomy in 5. Ten of the 19 complete discoid menisci were damaged. The type of a lateral meniscus was significantly graded a complete discoid meniscus without tears when the OCD was located in zone 4, was significantly an incomplete discoid meniscus when the OCD was located in zone 5. We determined that OCDs of the lateral femoral condyle were affected by the type and state of the lateral meniscus.

E-poster #713
Study on Human Chondrocyte Culture Viability for Autologous Transplantation in Clinical Application
Moises Cohen, Sao Paulo, BRAZIL, Presenter
Christiane Lombello, Sao Paulo, BRAZIL
G. M. Reis Jr., Campinas, SP BRAZIL
ALBERT EINSTEIN ISRALE HOSPITAL/UNIFESP, Sao Paulo, BRAZIL

Objective: The limited regenerative capacity of the cartilage tissue makes the treatment of chondral lesions difficult. The currently available techniques to treat lesions of the articular cartilage may relieve symptoms, but do not regenerate the injured tissue. Autologous chondrocyte transplantation uses techniques of cell biology and cell culture to regenerate the hyaline cartilage. Methods: In this study, the collection and chondrocyte culture phases were analyzed, aiming at autologous transplantation. Ultrastructural analyses of biopsies from the hyaline cartilage were performed 0, 6, 24 and 48 hours after collection. Even after 48 hours, the tissue was well preserved. Eleven cell culture assays were performed to evaluate isolation, viability, morphology, proliferation and absence of contaminants. Results: Conditions of the cell culture techniques used allowed chondrocyte proliferation. Rates on cell viability were maintained above the acceptable patterns (above 90%). Control of cell culture laboratory conditions showed absence of contaminants, assuring safety of the process. The cells obtained presented the typical morphology of chondrocytes cultivated as monolayers. Conclusion: The results indicate viability of the technique of chondrocyte culture for clinical application in autologous transplantation.

KEYWORDS: Cell culture; Chondrocytes/transplantation; Transplantation, autologous/methods; CARTILAGE

E-poster #714
The Pathogenesis of Osteochondritis Dissecans in the Lateral Femoral Condyle Associated with Lateral Discoid Meniscus Injury
Takashi Terashima, Hokkaido, JAPAN, Presenter
Yasumitsu Ohkoshi, Hakodate, Hokkaido, JAPAN
Kazuki Yamamoto, Hakodate, Hokkaido, JAPAN
Wataru Ebata, Hakodate, Hokkaido, JAPAN
Shinya Nagasaki, Hakodate, Hokkaido, JAPAN
Jun Nishiike, kushiro, Hokkaido, JAPAN
Tomoyuki Hashimoto Hakodate, Hokkaido, JAPAN
Shigeru Yamane Hakodate, Hokkaido, JAPAN
Hakodate Central General Hospital, Hokkaido, JAPAN

Objective: The anterolateral tibial cortex. Excellent reduction and stable fixation was achieved, as well as improved circular tension around the entire medial meniscus. Shortly thereafter we also encountered a 50-year old male who sustained an acute injury to the knee involving an ACL avulsion as well as the meniscal ossicle avulsion. Using the same technique, the meniscal ossicle was successfully fixed with less difficulty. The ACL avulsion fracture was also fixed at the same time.

These cases support the avulsion theory of the posterior root of the meniscus as the etiology of the meniscal ossicle. Furthermore, we describe a novel technique for repair of an acute meniscus ossicle. It is reasonable to consider this repair technique in subacute and chronic cases to restore biomechanical integrity of the knee joint.

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Mitsuo Ochi, Hiroshima, JAPAN,
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Kenzo Kawasaki, Izumo, Shimane JAPAN
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Objective: The limited regenerative capacity of the cartilage tissue makes the treatment of chondral lesions difficult. The currently available techniques to treat lesions of the articular cartilage may relieve symptoms, but do not regenerate the injured tissue. Autologous chondrocyte transplantation uses techniques of cell biology and cell culture to regenerate the hyaline cartilage. Methods: In this study, the collection and chondrocyte culture phases were analyzed, aiming at autologous transplantation. Ultrastructural analyses of biopsies from the hyaline cartilage were performed 0, 6, 24 and 48 hours after collection. Even after 48 hours, the tissue was well preserved. Eleven cell culture assays were performed to evaluate isolation, viability, morphology, proliferation and absence of contaminants. Results: Conditions of the cell culture techniques used allowed chondrocyte proliferation. Rates on cell viability were maintained above the acceptable patterns (above 90%). Control of cell culture laboratory conditions showed absence of contaminants, assuring safety of the process. The cells obtained presented the typical morphology of chondrocytes cultivated as monolayers. Conclusion: The results indicate viability of the technique of chondrocyte culture for clinical application in autologous transplantation.

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E-poster #714
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Takashi Terashima, Hokkaido, JAPAN, Presenter
Yasumitsu Ohkoshi, Hakodate, Hokkaido, JAPAN
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Tomoyuki Hashimoto Hakodate, Hokkaido, JAPAN
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Hakodate Central General Hospital, Hokkaido, JAPAN
PURPOSE: The purpose of this study was to determine the pathogenesis of osteochondritis dissecans (OCD) of the lateral femoral condyle associated with lateral discoid meniscus injury.

MATERIALS AND METHODS: Between January 1999 and August 2003, a total of 47 patients (58 knees) underwent arthroscopic surgery for a lateral discoid meniscus tear at our hospital. Six males (7 knees) had concomitant OCD of the lateral femoral condyle (Group I, mean age 11.3 years). Group II consisted of 7 male patients (8 knees) with lateral discoid meniscus injury without OCD (mean age 13 years). Thirteen males (13 knees) with a normal meniscus were randomly sampled as a control group. The clinical symptoms and knee alignment of these patients were evaluated. The femoro-tibial angle (FTA), femoral condyle angle (FCA) and tibial plateau angle (TPA) were measured on plain roentgenograms. Statistical analysis was performed using Student's t-test and analysis of variance (ANOVA).

RESULTS: The FTA in Group I and Group II were 172.86±0.9 and 176.86±1.96 degrees (p<0.01), the FCA+TPA in Group I and Group II were 172.14±1.57 and 176.13±1.89 degrees (p<0.01), respectively. Each value in Group I was significantly smaller than that in Group II. There were no significant differences between the Group II and the Control Group.

CONCLUSION: Based on the results of this study, a lateral discoid meniscus tear, young age and high activity, and valgus alignment were concluded to be the predisposing factors for OCD of the lateral femoral condyle.

E-poster #715
Meniscal Contusion Associated with Subsynvial Anterior Cruciate Ligament Tear: A Case Report
Tamiko Kamimura, Kamakura, Kanagawa, JAPAN, Presenter
Masaki Shiono, MD, Kamakura, Kanagawa, JAPAN
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INTRODUCTION: Secondary signs such as bone contusion, buckled PCL, anterior translation of the tibia are common findings on MRIs of anterior cruciate ligament (ACL) tears. In 2001, Cothran et al, originally reported six cases which displayed abnormal focal signals of the meniscus associated with ACL tears that could not be classified into any of the categories of either meniscal tear and meniscal degeneration. Consequently, they named this syndrome meniscal contusion and described its finding as an aspect of acute knee trauma. However, to present there has not been a detailed clinical description of meniscal contusion. We report a case of 62-year-old man who had symptoms of extention disturbance of his left knee after acute knee trauma that we diagnosed as a meniscal contusion associated with ACL tear.

CASE REPORT: A 63-year-old man who injured his left knee after falling on the stairs: His first examination in our clinic was five days after the trauma. He showed limping due to his left knee locking at 30 degrees of flexion. There was slight swelling but no joint effusion. Applying the McMurray maneuver, there was shooting pain exhibited, but we couldn't feel or hear a clear click. There were no varus and valgus, and anterior or posterior instabilities. He complained of severe tenderness on the medial side of his knee. After an injection of 6cc of lidocaine in his left knee, it could be flexed 120 degrees with assistance. His pain was reduced after the injection but the extension disturbance remained at 30 degrees flexion.

Eight days after his trauma and three days after the first examination in our outpatient clinic, he was given an MRI. During this period, his extension disturbance had decreased to 20 degrees flexion. The MRI showed a band-like lesion as the low signal intensity with T1 weighted and high signal with T2 weighted images in front of the anterior cruciate ligament (ACL). There was focal abnormal irregular high signal on the femoral side of the medial meniscus in T1 weighted images that showed running into the intrasubstance of the medial meniscus as a horizontal tear in T2 weighted images. An arthroscopic examination was performed at the period of eleven days after trauma and five days after the initial examination. We found that there is abnormal injection and hypervascularity as pannus surrounding the medial meniscus and synovium assumed red as fresh bleeding. We also found a subsynovial tear of the ACL, however there was no meniscal tear or meniscocapsular separation of the medial and lateral meniscus. We applied thermal shrinkage treatment to
specific portions of the swollen synovium adjacent to the medial meniscus. The patient went home on the same day of the surgery. The extension disturbance improved to full extension to 140 degrees two weeks after surgery. Three months after the arthroscopy, he had full range of motion, but with slight pain on the medial side of the knee. However, an MRI performed at this period revealed the same abnormal signal on the medial meniscus.

DISCUSSION:
In 2001, Cothran et al, described the focal abnormal signal of the meniscus on MRI in the knees of patients who had acute trauma and concluded that this signal could not be classified within the criteria of the meniscal tear. Furthermore, they found ACL tears in almost in all their patients. However the arthroscopic findings were not described in detail.
In our case, we found abnormal hypervascularity of the synovium that surrounded the medial meniscus and subsynovial ACL tear on arthroscopy. As Cothran described, this is one of the compressive forces exerted on the meniscus that may be similar to the mechanism of the bone contusion. However we did not observe changes of the meniscal signal on the MRI as the patient’s symptoms improved. We suggest that this abnormal signal of the meniscus on the MRI of the knee may reveal the hypervascularity of the meniscus without meniscal tear as a result of contusion associated with an ACL tear.

In 1999, we described the classification of abnormalities of the meniscus in MRIs in patients over 40 years of age. This case cannot be classified into any of the groups in that description. However it is similar to the group 4 abnormalities of the osteoarthritis in our classification. This particular case is a 62-year old man who hasn’t had symptoms of osteoarthritis. Therefore the pathology of the abnormal signal in this case is unknown over the long-term and it is necessary to observe this case over a period to further investigate the changing of the signal in the MRI into reduction or production and how this signal in MRI relates to acute trauma and osteoarthritis in the elderly.

E-poster #716
A Study of the Occurrence of Lateral Discoid Meniscus in Both Knees
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Hirofumi Hanada, Fukuoka, JAPAN
Seigen Mori, Fukuoka, JAPAN

Takahiko Kiyama, Fukuoka, JAPAN
Toyonobu Yoshimura, Fukuoka, JAPAN
Keihan Cho, Fukuoka, JAPAN
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[Purpose] Lateral discoid meniscus reportedly has a high rate of occurrence in both knees. Clinically, however, the opposing knee to that which has been diagnosed with lateral discoid meniscus is often found to be normal upon examination. In this study we investigated the rate at which discoid meniscus occurred in both knees.

[Materials and Methods] Of the 90 cases diagnosed with lateral discoid meniscus in our department, we studied 50 cases in which diagnosis of the opposing knee was possible. These 50 cases comprised 15 males and 35 females with ages ranging from 6 - 79 years (mean 49.4 years). Diagnoses were made by arthroscopic examination or MRI. Discoid meniscus morphology was classified using the Watanbe classifications of normal type, incomplete type and complete type. The Wrisberg type was included in the incomplete type.

[Results] In 39 cases (78%) discoid meniscus occurred simultaneously in both knees. In 30 of these cases (60%) both knees were of the complete type, 6 cases (10%) were a combination of the complete type and the incomplete type, and in 3 cases (8%) both knees were of the incomplete type. In the remaining 11 cases (22%) one knee was normal. The opposing knee was of the complete type in 9 cases (18%) and the incomplete type in 2 cases (4%).

[Discussion] With few reports of investigations, the epidemiology of the occurrence of lateral discoid meniscus in both knees is still unclear. A high rate of occurrence in both knees (95%) in cadavers has been reported, but the reliability is low due to the small number of cases. The number of cases in this study is sufficiently large and therefore reliable. Our results suggest that in 20% of cases with lateral discoid meniscus the opposing knee is normal.
E-poster #718
Results of Arthroscopic Meniscal Suturing with and without Anterior Cruciate Ligament Injury as Evaluated by Second-look Arthroscopy
Yuji Uchio, Izumo, Shimane JAPAN, Presenter
Mitsuo Ochi, Hiroshima, Hiroshima JAPAN
Nobuo Adachi, Hiroshima, Hiroshima JAPAN
Junji Iwasa, Izumo, Shimane JAPAN
Nobuyuki Kumahashi, Izumo, Shimane JAPAN
Department of Orthopaedics, Shimane University, Izumo, Shimane, JAPAN

Purpose: The purposes of this study were to assess arthroscopically the results of meniscal suturing and analyze the factors affecting meniscal healing.

Materials and Methods: Thirty-six torn menisci in 36 patients (range 13-47 years, average 25 years) treated arthroscopically with the meniscal suturing technique were evaluated by second-look arthroscopy. The interval between the injury and the time of surgery ranged from 2 weeks to 15 years. There were 15 lateral and 21 medial meniscal tears associated with 25 anterior cruciate ligament injuries. The length of the tears ranged from 6 to 30 mm (mean, 17.6 mm). The distance from the capsule to the tear ranged from 0 to 4 mm (mean, 1.8 mm).

Results: Twenty-one menisci (59%) healed completely (without a marked visible unhealed area), 12 (33%) healed incompletely, and 3 (8%) showed no evidence of healing. There were no relationships between outcome and age, gender, injured side, or time from injury and rasping. Both the distance from the capsule to the tear and the length of the tear were longer in the unhealed menisci. Stable knee after the ACL reconstruction had a high healing rate.

Conclusion: The healing potential of the meniscal suturing is affected by the distance from the capsule to the tear site and the length and the stability of the knee joint.

E-poster #719
Maturation-dependent Change of Articular Cartilage: An Ultrasonic Measurement in Rabbit Knees
Hiroshi Kuroki, Kyoto, JAPAN, Presenter
Takashi Nakamura, Kyoto, JAPAN
Yasuaki Nakagawa, Kyoto, JAPAN
Koji Mori, Kyoto, JAPAN
Makoto Takenaka, Kyoto, JAPAN
Tetsuo Ohashi, Kyoto, JAPAN
Yasuyuki Mizuno, Kyoto, JAPAN
Takashi Suzuki, Kyoto, JAPAN
Keiji Ando, Kyoto, JAPAN
Ken Ikehuchi, Kyoto, JAPAN
Dept. of Orthopaedic Surgery, Kyoto University, Kyoto, JAPAN

Purpose: High-frequency pulsed echo system (ultrasonic system) is a novel apparatus to evaluate stiffness, surface irregularity and thickness of articular cartilage. Because no ultrasonic study has focused on maturation-dependent change of cartilage, we aimed to evaluate these three indexes of knee articular cartilage and to examine the effect of maturation on the three indexes.

Materials and methods: Twenty-five male Japanese white rabbits, 3-week (3W, n=5), 8-week (8W, n=5), 24-week (24W, n=5), 48-week (48W, n=5) and 120-week old (120W, n=5) were used. Knee specimens obtained were evaluated using the ultrasonic system. Non-contact evaluation was performed in saline at four sites of the specimens (lateral condyle (LC), medial condyle (MC), lateral tibial plateau (LTP), medial tibial plateau (MTP)). Echogram from the 4 sites of articular cartilage was transformed into a wavelet map using wavelet transformation. The signal maximum magnitude (MM), signal duration time (DT) and signal time interval (IT) on the wavelet map was selected as quantitative indexes of stiffness, surface irregularity and thickness of cartilage, respectively. The data obtained for the ultrasonic evaluation were averaged values of three measurements. The points were the center of each site and 2 points 0.25-mm up and down. Ultrasonic data were analyzed by parametric repeated-measure ANOVA (as comparison of both sides), and ANOVA and Sheffe’s post hoc test (as comparison among the sites and maturation).

After the ultrasonic evaluation, the specimens were fixed in 10% neutral buffered formalin, decalcified in EDTA and embedded in paraffin wax. Sagittal sections of 6-micrometer thickness were observed histologically (staining with hematoxylin/eosin and safranin-O/fast green).

Results: MM of LC, which was the lowest in 3W, became the highest in 24W (P < 0.01) and it significantly decreased in 120W (P < 0.01). MM of MC, which was also the lowest in 3W, became the highest in 24W (P < 0.01) and it insignificantly decreased in 120W. MM of LTP, the lowest in 3W, slightly increased until 24W (P < 0.01) and it was maintained the value until 120W. MM of MTP, which was also the lowest in 3W, insignificantly...
increased until 48W and the MM decreased in 120W (P < 0.01). No significant feature of DT was observed. IT of LC, MC and LTP, which was the highest in 3W, significantly decreased in 8W (P < 0.01) and the value was maintained until 120W. Contrary to them, IT of MTP was the lowest in 3W. It slightly and insignificantly increased in 8W, then it was maintained until 48W and significantly increased in 120W (P < 0.01). Actual thickness of cartilage observed was agreed with the data of IT. Discussion: Ultrasonic evaluation revealed maturation-dependent change of cartilage, especially in MM and IT. In any sites, stiffness of cartilage, which was represented as MM, was low in 3W. Although most of data indicated that cartilage became stiff in 24W or 48W, there were some differences after 48W. In LC, MC and MTP, MM was significantly or insignificantly decreased in 48W or 120W, i.e. the cartilage became soft, but in LTP, MM was maintained the value after 24W, i.e. the cartilage maintained stiff. Data of surface irregularity, which was represented as DT, revealed that the surface of cartilage was smooth regardless of maturation. Results of IT indicated that thin cartilage of MTP in 3W became thick in 120W, which is late stage of maturation, and that thick cartilage of LC, MC and LTP became thin in 8W, which is early stage of maturation. Conclusion: Although the number of animals was limited, maturation-dependent change in stiffness and thickness was revealed. The differences in the maturation-dependent change at the 4 sites may suggest which site is easy to be affected after the late stage (120W) of maturation.

E-poster #720
Arthroscopic Analysis of the Lateral Meniscal Variants
Hee-Soo Kyung, Daegu, KOREA, Presenter
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Joo-Chul Ihn, MD, Daegu, KOREA
Seong-Ki Park, MD, Daegu, KOREA
Kyungpook National University Hospital, Daegu, KOREA

OBJECTIVES: The purpose of this study was arthroscopic analysis of the lateral meniscal variants.

METHODS: 164 cases of 158 patients were analyzed in recent 10 years. This was 13.6% of the arthroscopic surgery and 28.2% of the arthroscopic meniscectomy in the same period. Male was 85, female 79 cases. The mean age was 27.9 years (3-62). Left side was 69, right side 81 cases. and 14 cases (8.5%) were bilateral. We classified the types as complete, incomplete, Wrisberg, and ring-shaped type. The tear pattern was simple transverse tear, complex transverse tear, longitudinal tear, complex tear, radial tear and central-wear tear. We also compared MRI and arthroscopic findings between ring-shaped meniscus and central-wear type of discoid meniscus.

RESULTS: There were complete type 131 cases (79.9%), incomplete type 25 cases (15.2%), ring-shaped meniscus 4 cases (2.4%), and Wrisberg type 4 cases (2.4%). About tear pattern, transverse tear was most common 54 cases (32.9%) with simple transverse tear 33 cases (20.1%) and complex transverse tear 21 cases (12.8%). And there were longitudinal 37 cases (22.6%), central-wear 27 cases (16.4%), complex tear 14 cases (8.5%) and radial tear 12 cases (7.3%). Discoid meniscus without evidence of any tear were 20 cases (12.2%). We performed subtotal meniscectomy 77 cases, partial 43 cases, total 24 cases and no resection 20 cases. Twelve patients (13 knees, 7.9%) had osteochondritis dissecans of lateral femoral condyle: nine patients (10 knees) of them had central tear, two patients (2 knees) of them had simple horizontal tear, and one patient (1 knee) had ring-shaped meniscus. Among 31 knees with central tear or ring-shaped meniscus, we reviewed 25 MR images, which were interpreted to all bucket-handle type tear of normal meniscus by trauma.

CONCLUSIONS: Careful history about trauma and careful reading of MRI finding were very important for diagnosis of the discoid meniscus. It was essential to distinguish ring-shaped meniscus or central tear of discoid meniscus from the bucket-handle tear of normal meniscus.

E-poster #721
Radial Displacement of the Torn Medial Meniscus on MRI
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Takashi Natsu-ume, Sakai, Osaka, JAPAN
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INTRODUCTION: Radial displacement of the medial meniscus is considered loss of the meniscal function resulting in progression of varus osteoarthritis. However, either its etiology or correlation to osteoarthritis is unknown. The
purpose of this study was to measure radial displacement of the torn medial meniscus on MRI and to clarify its relationship to both the type of meniscal tear and combined cartilage damage.

MATERIALS & METHODS: From 1999 to 2003, 16 patients with symptomatic isolated medial meniscal tears underwent preoperative MRI evaluation and arthroscopic surgery. There were 7 males and 9 females with an average age of 51 years. MR imaging was performed on a 0.4-T unit (Aperto, Hitachi Medico). For evaluation of radial displacement, medial displacement index (MDI) defined as the ratio of meniscal overhang to meniscal width was calculated on the midcoronal view (Kenny C, CORR, 1997). Meniscal tears were classified into two groups: horizontal or radial tear at the middle and/or posterior segment in 9 knees (group I) and radial tear at the posterior horn in 7 knees (group II). ICRS classification was used for evaluation of the combined cartilage damage.

RESULTS: MDIs were 0.13±0.13 for group I and 0.49±0.11 for group II. There was statistically significant difference between two groups (p<0.01). Grade III or IV cartilage injuries were found in 5 knees (71%) in group II, while no such injuries were found in group I.

CONCLUSION: Greater radial displacement of the medial meniscus was seen in the knee with radial tear at the posterior horn. Such displacement results in dysfunction of the meniscal hoop and may lead to osteoarthritis.

E-poster #722
The Condylar Cut-off Sign - A New Radiographic Sign in Knees with Discoid Lateral Meniscus-
Chul-Won Ha, Seoul, KOREA, Presenter
Jae-Chul Park, Seoul, KOREA
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PURPOSE: This paper is 1) to report the condylar cut-off sign, a new radiographic sign in knees with discoid lateral meniscus, 2) to report the sensitivity, specificity, positive and negative predictive value of the sign for the diagnosis of complete discoid meniscus, and 3) to identify the reliability of the radiological assessment of the sign. MATERIALS & METHODS: A retrospective review of 100 knees that were arthroscopically examined included 50 knees with complete discoid lateral meniscus and 50 normal knees. We developed a method to measure the prominence of the femoral condyle adjacent to the intercondylar notch on tunnel view of knee. The prominence ratio, the ratio of the medial and lateral condylar prominence, was compared and analyzed. The measurements were performed by three observers at two separate occasions to determine reliability.

RESULTS: The prominence ratio showed statistical significance by t-test (p<0.0001, t value -11.071) between the two groups. Chi-square test using cut point 0.8 showed significant difference between the two groups, with more than 76% sensitivity, 96% specificity, 95% positive predictive value and 80% negative predictive value. The intra- & inter-observer variability study revealed excellent reliability with correlation coefficient more than 0.93 in every set of measurement.

CONCLUSION: The condylar cut-off sign was defined as positive when the prominence ratio was less than 0.8 on tunnel view from the result of this study. The sign is an excellent radiographic sign that can be used in the diagnosis of complete discoid lateral meniscus. It showed excellent specificity and positive predictive value, and was highly reliable in terms of intra- & inter-observer variability.

E-poster #724
Treatment Results of Chondral Lesions Using Plasma Rich in Growth Factors and Other Substances. First Part.
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Summary
This study’s goal is to compare articular cartilage lesion treatments evaluating joint’s function, pain and macro and microscopic lesion development after different protocol treatments with: Plasma Rich in Growth Factors (PRGF), chondroitine sulphate, hyaluronic acid, and the possible synergy when applied together.

Material & Method
51 female rabbits (Oryctolagus cuniculus) were studied, none of which had given birth, and musculoskeletally mature: 18-21 weeks old. All conditions met European Community requirements about protection in animal experiments. (86/609/CEE, Modified 18th March 1988).
The rabbits were divided into 6 groups according to the treatment protocol established: HI
(Hyaluronic Acid), PRGF (Plasma Rich in Growth Factors), CO (Chondroitin Sulphate), PCB (Placebo), HIRPGF (Hyaluronic Acid + Plasma Rich in Growth Factors), COPRGF (Chondroitin Sulphate + Plasma Rich in Growth Factors) and each group was divided into 3 sub-groups according to survival time: 35 days, 70 days and 140 days post-treatment.

Surgery:
- Sedation: dissociative agent + ?2 agoniste sedant + opiate
- General blood exam (auricular artery)
- Knee x-rays
- Limb shave and lavage
- Induction: Isofluorane inhalation.
- Surgical set-up
- Medial knee arthrotomy: a chondral lesion of 2 mm reaching subchondral bone was created in support area of the medial femoral condyle
- Joint injection according to group
- Post-op period:
  - Medical treatment: analgesic, antiinflammatory and antibiotic.
  - Daily dressing until complete healing
- During survival time, the animals had complete freedom of movement and limb functional exercises were assisted by staff.
- All animals in joint injection groups received 4 injections with 1-week intervals. The same sedation protocol was done each time.
- The chondroprotectors animals' group received the substance via esophagic catheter. The treatment started 15 days pre-surgery and continued during all the survival period.
- When survival period finished, all animals were sacrificed following:
  - Sedation: dissociative agent + ?2 agoniste sedant + opiate
  - Functional exam + synovial citology
  - Sacrifice: commercial euthanasic
- Collection of samples

Results
- The data statistically analysed to determine the treatment's effectiveness in each experimental group were:
  1. - Active and passive function
  2. - Blood exam
  3. - Synovial citology
  4. - Specific X-rays
  5. - Macroscopic vision post-arthrotomy
  6. - Chondral histological exam

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E-poster #725
Repair of Large Osteochondral Defect After Septic Arthritis Using Mesenchymal Stem Cell
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Mitsuo Ochi, Hiroshima, Hiroshima JAPAN
Masataka Deie, Hiroshima, Hiroshima JAPAN
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In this case report, we present a patient with severe osteochondral defect after septic arthritis, successfully treated by the transplantation of cultured mesenchymal stem cells (MSC) and interconnected porous calcium hydroxyapatite ceramics (IP-CHA) hybrid material.

In July 2001, a 21-year-old male construction worker sustained an open dislocation fracture of his right knee in a traffic accident. Osteosynthesis of open medial femoral condyle fracture was performed in a local hospital. Pus discharge from his right knee joint appeared 13 days after the operation, and Methicillin-resistant staphylococcus aureus grew in a culture of the pus discharge. After several operations, including curettage of the lesion and continuous irrigation of the joint, the patient presented in April 2002 with severe right knee pain and limited range of motion. The flexion angle of the right knee joint was severely limited to 40 degrees. He complained of severe right knee pain especially while walking and his daily activity was severely restricted due to pain and motion disturbance of the joint.

In November, 2003, after diagnostic arthroscopy, we aspirated bone marrow cells from his left tibia under local anesthesia, and MSC were harvested and expanded in a monolayer culture system. Culturing for 24 days produced 1.15x106 MSC. IP-CHA had been made to order according to the osteochondral defect size measured by 3-dimensional computed tomography. The cultured MSC and IP-CHA hybrid material were transplanted to the osteochondral defect of his right medial femoral condyle. His right knee pain and click disappeared soon after the operation. The flexion angle of the knee joint was restored to 120 degrees, enabling him to resume his daily activities. The second-look arthroscopy 1 year after the operation revealed that the osteochondral defect was repaired with smooth
cartilaginous tissue and no bony defects. Tissue biopsy demonstrated excellent trabecular bone and hyaline-like cartilage regeneration. When last seen in January 2004, he was very satisfied with the results, especially because had returned to his previous work.

In conclusion, we clearly demonstrated successful bone and cartilage regeneration with cultured MSC and IP-CHA hybrid material. The fact that we could regenerate new bone and cartilage in a one-stage operation without sacrificing autologous bone or other tissues is clinically important. This cultured MSC and IP-CHA hybrid material transplantation technique represents a novel treatment for patients with severe osteochondral defect of the joint.

**E-poster #726**

**Anomalous Insertion of the Medial Meniscus into the Intercondylar Notch of the Femur**

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Abstract. We present the prevalence and accompanied pathologies of anomalous insertion of the anterior horn of the medial meniscus into the intercondylar notch of the femur in KOREAn patients with characteristic arthroscopic and magnetic resonance image (MRI) findings. In 957 consecutive knee arthroscopies from March 2001 through December 2003, we found 13 (11 patients) anomalous medial meniscus insertions into the intercondylar notch of the femur (1.4%). There were all male patients in the series. In 2 patients, the anomaly was bilateral. Tears of the posterior horn of the medial meniscus were in 9 knees, lateral meniscal cyst in one and discoid meniscal tears were in 2 knees. Complete septa of infrapatellar plica was accompanied in 9 knees. The anomalous band was excised in all knees. Before arthroscopy, the diagnosis of the anomaly was made in 11 knees through the characteristic MRI findings, hyperintensity band separates the anterior cruciate ligament and the anomalous portion of the medial meniscus. This anomaly can be detected before arthroscopic invasion by the awareness of this characteristic MRI findings.

Key Words: Meniscus - Anomalous insertion - Magnetic resonance Imaging

**E-poster #727**

**Sinovial Cyst Formation after Arthroscopic Medial Meniscus Repair with Outside-in Suture Technique. Report of Four Cases.**

Raul Torres, Madrid, SPAIN, Presenter
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Santiago Arauz, Madrid, SPAIN
Clinica Cemtro, Madrid, SPAIN

**INTRODUCTION:**

Meniscal repair is a viable alternative to resection in many clinical situations. Repair techniques traditionally have utilized a variety of suture methods, including inside-out, outside-in and all inside techniques. This report describes a problem arising after arthroscopic medial meniscal refixation using permanent sutures with the outside-in technique.

**MATERIAL AND METHODS:**

Between January 2000 and December 2001 we performed 42 medial meniscus repairs. In 20 of them we used the outside-in technique. 8 patients had an isolated longitudinal tear on the posterior horn of the medial meniscus and 12 patients had unstable bucket-handle tears of the medial meniscus with an associated ACL injury. 2-0 or 0 prolene stitches were passed with a spinal needle, through the injured area and the synovium, and the knots were tied outside the capsule. The minimum follow-up was 12 months.

**RESULTS**

Overall 3 of 42 meniscal repairs failed and eventually required partial meniscectomy. Between 3 and 6 months after surgery four patients developed a painful bultoma on the medial side of the knee. Initially it was thought to be a foreign body granuloma due to the permanent suture. Removal of the lump proved it to be a cyst with synovial fluid adjacent to the suture knot. Two of the cysts were aspirated but they recurred and the four cysts eventually required removal. In two patients an arthroscopy was performed which showed complete healing of the meniscal tear. Six months after cyst removal all the patients were free of symptoms.

**CONCLUSION**

The overall results with use of the outside-in technique are comparable with those reported with other methods. However, the use of nonresorbable sutures may be associated with the development of a painful synovial cyst.
E-poster #728
Validity and Responsiveness of the Tegner Activity Scale for Meniscus Injuries of the Knee
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Mininder Kocher, Boston, MA USA
J. Richard Steadman, Vail, CO USA
William G Rodkey, Vail, CO USA
Steadman Hawkins Sports Medicine Foundation, Vail, CO, USA

Background: Outcomes assessment after the treatment of meniscus injuries of the knee has involved the use of various condition-specific knee outcome instruments. The purpose of this study was to determine the psychometric properties of the Tegner activity scale for meniscus injuries of the knee.

Methods: Content validity, criterion validity, construct validity, and responsiveness to change were determined for the Tegner activity scale within 2 subsets of patients. Group 1 contained patients with only meniscus pathology at surgery (no ligament pathology or chondral surface pathology). Group 2 consisted of patients with meniscus pathology with other pathology possible. Constructs included: Patients with moderate to severe pain with activity would have lower Tegner scores than patients with none to mild pain with activity; patients with moderate to severe difficulty running would have lower Tegner activity scores than patients with none to mild difficulty; patients with more difficulty with activities of daily living would have lower Tegner activity scores than patients with none to mild difficulty; patients with more difficulty with activities of daily living would have lower Tegner scores than patients with less difficulty with activities of daily living; patients with more difficulty working because of their knee would have lower Tegner scores than patients with less difficulty working because of their knee; patients with more difficulty with sports because of their knee would have lower Tegner activity scores than patients with less difficulty with sports because of their knee; and patients with abnormal or severely abnormal assessment of overall knee function would have lower Tegner activity scores than patients with a normal or nearly normal assessment of overall knee function.

Results: There were acceptable floor (8.1%) and ceiling (2.5%) effects for the Tegner activity scale (Group I and Group II). There was acceptable responsiveness to change (Group I: effect size=0.61; standardized response mean=0.60, Group II: effect size=0.836; standardized response mean=0.704).

Discussion: The use of outcome instruments whose psychometric properties have been vigorously established is essential. The Tegner activity scale demonstrated overall acceptable psychometric performance for outcomes assessment of meniscus injuries of the knee.

E-poster #729
Does the Irregularity of the Grafted Osteochondral Plugs Affect the Clinical Results?
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Hiroshi Kuroki, Kyoto, JAPAN
Masahiko Kobayashi, Kyoto, Kyoto, JAPAN
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[Purpose] There are several reports that the operative results of the mosaicplasty for the localized cartilage defects were good. Though it is ideal that the smooth surface is made at the mosaicplasty, the irregularity of the grafted osteochondral plugs sometimes exists at the operation. Therefore, we report its effect into the clinical result, especially in respect of the second look arthroscopic evaluation.

[Materials and Methods] We studied 6 knees and 6 patients who had the irregularity (protuberance or depression) of the grafted osteochondral plugs at the mosaicplasty in our hospital from May 1997 to August 2002. Their irregularities were more 1 mm than the surrounding normal cartilages. Their diseases included two osteochondritis dissecans, three osteonecrosis and one anterior cruciate ligament injury. There were 4 men and 2 women, and there were 2 right knees and 4 left. The mean age at surgery was 33.5 years (range from 15 to 65 years). The mean follow-up period was 32.2 months (range 20 to 49 months). All patients underwent second-look arthroscopy. The mean period of time between surgery and second-look arthroscopy was 14.8 months (range 3 to 18 months). Because one patient had protuberant plug and depressed one, we divided 3 cases in the protuberant group (P) and 4 cases in the depressed group (D). In P, there were 2 men and 1 woman, 1 right knee and 2 left. The mean age at surgery was 22.0 years old, the mean follow-up
period was 33.7 months, and the mean period of time between surgery and second-look arthroscopy was 15.0 months. In D, there were 3 men and 1 woman, 1 right and 3 left, 41.3 year old, 29.0 months and 15.5 months. The causes of P were the protuberance at the surgery in our early experience, the obliquely grafted plug at the arthroscopic mosaicplasty and one protuberant plug due to the large recipient site. The cause of D was one depressed plug due to the multiple grafted plugs into the recipient site.

[Results] In P, 2 patients had catching sensation about 4 months after their surgery and sometimes knee joint pain. In second-look arthroscopy, they had fissuring of the plugs and fibrillation around the recipient site. Another patient had depressed area in the tibial joint surface, where was contralateral of the recipient site. In D, there were no symptoms due to the depressed plugs. In second-look arthroscopy, the depressed areas covered with fibrocartilage-like tissue, and the smooth joint surface was obtained.

[Conclusion] In respect of the clinical results and second-look arthroscopic evaluation, the depression of localized and about 1 mm around the cartilage was no problem. However, we should avoid the protuberance of the plug at mosaicplasty.

E-poster #730
Expression Profiles during Differentiation of Chondrogenic Cells
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INTRODUCTION
The differentiation of many mesenchyme-derived cells, including cells that form the cartilage, is regulated by gene transcription. However, many factors involved in this regulation have not been identified yet. Current advancements in molecular biologic technology are facilitating the systematic analysis of numerous genes. Using cDNA microarray, systematic studies on expression patterns of thousands of genes are now expected to provide good understanding on the global molecular basis of chondrogenesis. In this study, we combined two powerful technologies. One is a full-length enriched cDNA library derived from the mouse chondrogenic ATDC5 cell line and the mouse bone and cartilage tissues. The other is an in-house cDNA microarray using these cDNAs, as a high-throughput methodology to identify cDNA clones that are differentially expressed in differentiation in cultures of ATDC5 cells. The purposes of this study are to evaluate the validity of this in-house cDNA microarray, and to determine the expression profile during differentiation of chondrogenic ATDC5 cells.

MATERIALS and METHODS
(1) Cell culture condition and RNA preparation: The maintenance and differentiation of the ATDC5 cells were described previously. Total RNA was extracted using TRIZOL reagent (Gibco-BRL, Gaithersburg MD) Total RNA was prepared from the ATDC5 cells at 7, 14 and 28 days after induction of chondrogenesis. The mouse cartilage and bone tissues were collected from pregnant mice on generation days of 14,15 and 17, and mice aged 3 days.

(2) Construction of full-length enriched cDNA library and in-house cDNA microarray: The full-length enriched cDNA library was constructed by oligo-capped method as previously described using 500-ug total RNA from various stages of differentiated ATDC5 cells and the mouse cartilage and bone tissues. The cDNA clones were randomly picked up from the library, and their 5-end nucleotide sequences determined using a Dye Terminator Cycle Sequencing Kit (Applied Biosystems) and ABI 3700 DNA sequencer. The cDNA microarray containing these cDNA clones was constructed as previously described. We constructed a full-length enriched cDNA library using the oligo-capping method with RNA from the mouse chondrogenic ATDC5 cell line. We determined 5-end sequence of 3,680 cDNA clones from the library and the nucleotide sequences were compared with the NCBI nucleotide database using the BLAST programs. About 3,680 cDNA clones were assembled into 1,960 clusters when overlapping clones were integrated. Compared with the public databases, these clones were judged to be full-length since 68% of the cDNA clones had the first ATG codon. The average length of the cDNA insert was approximately 2.0 kb pairs. Excluding overlapping clones, 1,960 independent clones were selected. In addition, 1,240 clones derived from mouse fetus cDNA library were included in the production of the microarray. Our in-house cDNA microarray was used to analysis gene profiles of differentiation in
cultures of ATDC5 cells (cultured for 28 days in the differentiation medium).

(3) Analysis of mRNA expression by cDNA microarray and real-time PCR procedures: Microarray analysis was performed as described previously [4]. To control for labeling differences, experiment was carried out in duplication in which the fluorescent dyes were switched during cDNA synthesis for each experiment. Real-time PCR analysis was carried out to verify the microarray data using a Lightcycler fluorescence temperature rapid-air cycler (Roch Molecular Biochemicals). PCR was performed using SYBR Green PCR system according to the manufacture’s instructions (Roch Molecular Biochemicals).

(4) Statistical analysis: To examine statistical significance for frequencies of functionally categorized genes in each cluster, values of the other groups in the relevant cluster, and values of other clusters in the relevant group were analyzed with Fisher’s exact test by computing with the statistical program StatView (SAS, Cary, NC)

RESULTS:
516 genes were up- or down-regulated 1.5-fold or more at least at one time point after chondrogenic induction. The 516 genes were subjected to clustering analysis based on expression patterns, and were classified into 5 clusters. Each cluster was characterized as follows: cluster A, gradual or lagging decrease; cluster B, transient decrease; cluster C, lagging increase; cluster D, gradual increase; and cluster E, transient increase. In cluster A, genes for the category RNA turnover and protein turnover were significantly frequent gradual or lagged decreases in expression of genes for RNA turnover and protein turnover may reflect decreasing proliferation rates of ATDC5 cells during differentiation. In cluster C, genes for the category RNA turnover and cytokines and growth factors were significantly frequent. Lagged increases in expression of genes for cytokines and growth factors in the later chondrogenic differentiation stages appear to be related to complexity of the differentiation processes. 9 genes for cytokines and growth factors were up-regulated at least at one time point after chondrogenic induction. 8 of these genes were categorized in cluster C, 2 of these genes were categorized in cluster D. In cluster C included these for osteoglycin (Ogn, accession No. AI596220), transforming growth factor beta 2 (Tgfb2, No X57413), interferon activated gene 203 (Ifi203, No BC008167), lymphocyte antigen 86 (Ly86, No AB007599), rcd1 (required for cell differentiation) homolog 1 (S. pombe) (Rqcd1, No D87957), pre-B-cell colony-enhancing factor (Pbepending, No U02020), chemokine (C-C motif) ligand 9 (Ccl9, No U15209) and tumor necrosis factor receptor superfamily, member 12a (Tnfrsf12a, No AK013438).

DISCUSSION:
In the postgenome sequencing era, the development of functional genome resources is essential to understand and use information generated from the genome sequencing projects. Full-length cDNA cloning and sequencing most significantly contributes to the development of this technology because of clarification of coding and noncoding mRNA and because of suitability for functional analysis. Therefore, it is important to construct full-length enriched cDNA library and to obtain full-length cDNA clones. Our library is expected to be a useful tool to analyze gene functions and interactions among the genes in chondrogenesis. In this study, many candidate genes associated with chondrogenesis were screened rapidly. In these genes, expression patterns of some important genes were confirmed with the real-time PCR method. Thus, our in-house cDNA microarray system is evaluated as an excellent tool to analyze the expression status of many genes in this field. The large number of differentially expressed genes identified from this analysis and the characterization of these genes will provide valuable information to precisely understand the biology of chondrogenesis.

E-poster #731
A New Evaluation Method for Measuring the Mechanical Properties of Meniscus Using Ultrasound
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Purpose: The object of this study was to examine the usefulness of ultrasound for assessing the mechanical properties and quality of the meniscus (degree of degeneration).
Materials and methods: This original system was developed for evaluating the material properties of articular cartilage by analyzing the reflected waves by means of wavelet transformation. Using this system, information on the material and structural properties of articular cartilage can be obtained easily and non-invasively. In addition to intensity (index of stiffness), duration time (index of surface irregularity) and interval (index of cartilage thickness) can be assessed simultaneously. Therefore this system appears to be useful for evaluating the material and structural properties of, not only articular cartilage, but also the meniscus, especially in vivo.

Five pairs of menisci were obtained from five knee joints of mature 6-month-old pigs and each meniscus was divided equally into three sections to make block-shaped specimens. Both the femoral and tibial articular surfaces of these specimens were measured with the ultrasound system. Three-millimeter and 1-mm-thick discs with a diameter of 6-mm were harvested from both articular surfaces of each specimen and measured in the same way. An unconfined compression test was also carried out with 1-mm-thick discs harvested from another five pairs of menisci, and a stress-strain curve was prepared.

Results: There was no statistically significant difference in the maximum magnitude of the wave reflected at the articular surface of the meniscus between the three shapes of specimen. This indicated that the shape of the specimen did not influence this index. This index also had a good correlation with the gradient of the stress-strain curve at 20-30% strain in unconfined compression (r=0.61, p<0.01). Therefore, the maximum magnitude represented the compressive stiffness of the articular side surface of the meniscus at low strain. On the other hand, the relationship between the duration time of the reflected wave from 3-mm-thick discs and that from 1-mm-thick discs (r=0.54, p<0.01) did not give a high enough correlation coefficient to apply this to index of irregularity of the meniscus surface.

Discussion: In this study, the maximum magnitude of the reflected wave was found to correlate with gradient in the range of 20-30% strain in a stress-strain curve of the meniscus surface. As the meniscus is generally under a condition of physiological compression, it is presumed that, in vivo, collagen fiber networks at the articular surface of the meniscus are changed and show material properties different from those without any compression. In this meaning, this index represents the compressive stiffness of the articular side surface of the meniscus at low strain that is similar to physiological condition. On the contrary, this study could not find enough correlative indices for evaluating the surface roughness of meniscus. Sophisticating the analyzing technique of waveforms and additional tests with a wide variation of specimens are necessary to solve this problem.

Conclusion: This new evaluation method using ultrasound could be used to measure the compressive stiffness of the meniscus surface easily and non-invasively.

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Purpose and Background: Thermal chondroplasty using radiofrequency energy (RF) results in visually appealing cartilage smoothing but also results in tissue damage (matrix ablation plus chondrocyte death). Scientific investigation of thermal chondroplasty is confounded by multiple variables associated with the technique. The purpose of this study was to determine the relative importance of the following variables on tissue damage after thermal chondroplasty: probe design, generator power setting, speed of probe application, force of application, and number of passes of probe over treated tissue. We hypothesized that the relative importance of these variables would be as follows: power, passes, speed, force, and design (ordered from most to least important).

Methods: 48 sections of healthy adult bovine patellae were treated using monopolar RF in a room temperature saline bath. Sample size was based upon a half-factorial design matrix (16 combinations tested in triplicate). A testing apparatus controlled speed and force of probe application. The following values (and combinations thereof) were chosen to represent
low and high extremes of the variables tested: power (50W versus 110W), passes (1 versus 5), speed (3mm/sec versus 10mm/sec), force (15g versus and 60g) and probe design (electrode protrusion 0.001 inch versus 0.005 inch). Samples were incubated with cell viability stain and visualised using confocal laser microscopy to determine depth of tissue damage. Data was analyzed using multiple regression analysis.

Results: All five variables significantly influenced depth of damage (p<0.05, adjusted R2= 0.92). Based upon the model coefficients derived from the regression analysis, power setting was identified as having the greatest effect upon tissue damage, followed by probe design, speed, passes, and force. In addition, the following combinations of variables were significant: interaction of design and force and interaction of power and passes. The configuration of 50W, 0.001 inch, 10mm/sec, 1 pass, and 15g resulted in the least depth of tissue damage (99±22 microns).

Discussion and Conclusion: The hypothesis that power is the most important variable was supported by our data; however, the relative importance of the other variables was probe design, speed, number of passes, and force. Our results demonstrate that power and probe design were most influential, selecting these parameters preoperatively could minimize tissue damage. 99±22 microns of tissue damage is less than the full thickness of articular cartilage; this finding suggests that thermal chondroplasty might be safe in vivo. Future research is required to determine if values minimizing damage result in chondral smoothing.

E-poster #733
Discoid Meniscal Cyst: Report of 3 Cases
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Cysts of the discoid menisci are extremely rare. Authors report 3 cases of discoid meniscal cyst confirmed by magnetic resonance imaging and arthroscopy. Intermittent knee pain was the chief complaint in all 3 patients, and one of three had a history of trauma. Physical findings were localized tenderness along the joint line in all 3 cases, palpable mass in one, 10 degrees of flexion contracture in one, and positive McMurray test in one. Of the 3 discoid menisci, 2 were lateral and one was medial. All 3 discoid menisci were categorized as complete type and had horizontal tears. The cysts were located anteriorly in one lateral discoid meniscus and at the mid portion in others. Treatment of the discoid meniscal cyst was arthroscopic partial meniscectomy and decompression of the cyst, which is same as the treatment of the meniscal cyst. We could get excellent results in all cases with patients returning to daily activities.

E-poster #735
Evaluation of Fast-fix Meniscal Repair System
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Introduction
To evaluate the Fast-fix meniscal repair system, which is a disposable, pre-knotted ‘all-inside’ suture with similar pull out strength to vertical mattress suture.

Materials and Methods
Between September 2001 and March 2004 we performed 55 meniscal repairs in 54 patients. The average age was 24 (11-55). The time from injury to repair was 2-12 weeks. The majority had associated ACL injury (70%). The majority of the tears were displaced ‘bucket-handle’ tears. The tear was repaired if the tear was reducible and in the red-red or red-white zone. Concomitant ACL injury was reconstructed 6 weeks later.

Meniscus was considered to have healed if a) confirmed at arthroscopy or b) no mechanical symptoms. 43 patients had repeat arthroscopy for ACL reconstruction, 2 for mechanical symptoms and 1 for reinjury.

Results
In 38 patients healing was confirmed at arthroscopy. The healing rate was 86%. 5 menisci were excised later and 2 were re-repaired. The healing rate with associated ACL injury was 92% and for isolated tears was 70%.

Discussion
Early results show the Fast-fix to be a safe simple all-inside technique. There were no serious complications. It allowed the majority of displaced bucket-handle tears to be repaired rather than excised. During the same period only 10 bucket handle tears were excised.
E-poster #736
The Pattern of Meniscal Pathology
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The pattern of meniscal pathology was last reported upon by Dandy in 1990. He commented on the findings of over 1000 arthroscopies noting the demography of the patient and the pattern and extent of injury. We have collected the data on greater than 1000 arthroscopies performed by a single surgeon over a 10 year period in order to revisit the pattern of injury. Also change in practise, positive scope rate and re-scope rate was analysed.

E-poster #737
Meniscal Repair with an Absorbable Screw (Clearfix)
Dimitrios Stylianos Mastrokalos, USA, Presenter
Elias S Kotsovolos, Ioannina, GREECE
Michael Elias Hantes, Larisa, GREECE
Hans H Paessler, Heidelberg, GERMANY
ATOS-Clinic Heidelberg, Heidelberg, GERMANY

The results of a new method for arthroscopic all-inside meniscus repair using a biodegradable cannulated screw (Clearfix meniscal screw) were assessed in a medium-term follow-up prospective study. The Clearfix meniscal screw system consists of delivery cannulae, screw driver, and screw implants. After tear debridement, a screw is located on the driver and passed through the cannula to the insertion site, holding the two sides of the tear together under linear compression. Forty-eight patients (48 repairs) with a mean age of 32.7 years were included in the study. Ligament stabilizing procedures were done in 39 patients (81%) who had anterior cruciate ligament deficient knees. Only longitudinal lesions in the red/red or red/white zone were repaired. Follow-up averaged 19 months with a range from 12 to 48 months. Patients were evaluated using clinical examination, the OAK knee evaluation scheme and magnetic resonance imaging. Criteria for clinical success included absence of joint line tenderness, swelling and a negative McMurray test.

Postoperatively, there were no complications directly associated with the device. Twelve of 48 repaired menisci (25%) were considered failures according to the above mentioned criteria. According to the OAK knee evaluation scheme 38 patients (79%) had excellent or good result. Magnetic resonance imaging, however, showed persisting grade 3 or 4 lesions in 35 (73%) patients. Analysis showed that age, length of tear, and simultaneous anterior cruciate ligament reconstruction did not affect the clinical outcome. In contrast, risk factors for failure of meniscus repair are chronicity of injury, location of tear more than 3 mm from the meniscosynovial junction and meniscus side (medial).

E-poster #738
Early Results of Arthroscopic All-inside Meniscus Repair Using the Fast-Fix
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Olaf Lohrbach, Heidelberg, GERMANY
Dimitrios Stylianos Mastrokalos, Dionysos, Attiki USA, Presenter
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The early results of a new method for arthroscopic all-inside meniscus repair using the Fast-FixTM (Smith & Nephew) suture system were assessed in a prospective study. Fifty-eight patients (61 repairs) with a mean age of 32.6 years were included in the study. Ligament stabilizing procedures were done in 39 cases (64%) who had anterior cruciate ligament deficient knees. Only longitudinal lesions in the red/red or red/white zone were repaired. Follow-up averaged 12.6 months with a range from 6 to 25 months. Patients were evaluated using clinical examination, the OAK knee evaluation scheme, the Tegner score and magnetic resonance imaging. Criteria for clinical success included absence of joint line tenderness, swelling and a negative McMurray test. Six of 61 repaired menisci (9.8%) were considered failures according to the above mentioned criteria. Postoperatively, there were no complications directly associated with the device. According to the OAK knee evaluation scheme 53 patients (87%) had excellent or good result. Magnetic resonance imaging, however, showed persisting grade III or IV lesions in 25 (45.5%) of 55 cases.
with successful result, while 67.3% (35) of them retained their preoperative activity level. Risk factors for failure of meniscus repair are chronicity of injury, location of tear more than 3 mm from the meniscosynovial junction and meniscus side (medial). At all events, the Fast-FixTM absorbable anchor seems to be a very promising all-inside meniscus repair device because of its efficacy, safety and ease to use.

E-poster #739
The Relationship Between Complete Discoid Lateral Meniscus and Cartilage Degeneration: A Cadaver Study
Yuki Kato, Tokyo, JAPAN, Presenter
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Shin Aizawa, Tokyo, JAPAN
Akiyoshi Saito, Tokyo, JAPAN
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[Objective] The prevalence and tear morphology of complete discoid lateral meniscus (CDLM) and its relationship to osteoarthritic (OA) changes were investigated using cadavers.
[Subjects] The authors examined 577 knees (311 male and 266 female) of cadavers used for autopsy practice at Nihon University between 1991 and 2003. Twenty one knees with CDLM served as subjects.
[Methods] In 21 knees with CDLM, the incidence and morphology of tear and the severity of OA changes were investigated. The average age of the cadavers was 80.7±7.3 years (range: 65 to 98 years). The P-F joint (patellar surface of the femur and patellar groove) and F-T joint (femoral condyle and tibial plateau) were macroscopically assessed for OA changes, and severity was classified into the following four grades: 0, normal; I (mild) cartilage roughness, fibrosis or shallow abrasion; II (moderate) regional full-layer cartilage loss or partial bone exposure; and III (severe) extensive subchondral bone exposure.
[Results] The incidence of CDLM was 2.9% (9/311 knees) for men and 4.5% (12/266 knees) for women; there was no statistically significant difference between the sexes. Overall incidence of CDLM was 3.6% (21/577 knees). Torn CDLM was seen in six knees (28.6%), and the mode of tear was transverse in five knees and complex in one knee. No OA change was seen in four knees; No F-T OA was seen in six knees with P-F OA; medial OA was seen in nine knees; and lateral OA was seen in two knees. The incidence of OA on the lateral tibial plateau was significantly higher for torn CDLM (p=0.004).

E-poster #740
Biochemical Changes in Synovial Fluid of the Contra-Lateral Knee in Unilateral Focal Osteochondral Defects with or without Treatment
Hakan Ozsoy, Ankara, TURKEY, Presenter
Semih Aydogdu, Izmir, TURKEY
Dilek TaskIRAN, Izmir, TURKEY
Murat Sezak, Izmir, TURKEY
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Fikri Oztop, Izmir, TURKEY
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Purpose: In order to disclose possible involvement of contra-lateral knee, in focal osteochondral defects with or without treatment on the other side, we analyzed early biochemical changes in the synovial fluid samples of both osteochondral-defected (right) and contra-lateral (left) knees in rabbits.

Method: A 3.5x4mm tubular osteochondral defect was created on the right medial femoral condyles of 51 adult white rabbits. In 18 rabbits, (control group (CG)) the defects were left alone. In 15 rabbits, (early treatment group (ETG)), defects were treated by an osteoperiosteal graft, 7 to 15 days after the index procedure. In 18 rabbits, (the late treatment group (LTG)), defects were grafted at 12th weeks. The rabbits were followed-up to 24 weeks. Synovial fluid samples of both right and left (unoperated) knees were collected regularly (0, 1, 4, 8, 12, 18, 24th weeks) and proteoglycan fragments (PF), total collagen (TC) and collagenase (MMP-1) levels were measured. For statistical analysis, ANOVA and post-hoc tests were used.

Results: In CG, all markers displayed a significant increase in the operated/right knee during whole study period, which indicates an ongoing degenerative process. Unoperated/left knee levels never displayed an increase probably related to early intervention.

In ETG, biochemical markers of operated knees displayed a faster recovery to normal values after grafting. Unoperated knee values also displayed an increase probably related to early intervention.

In LTG, all markers displayed an increase until treatment (12th week), and then some decrease, but never reached normal values in most of parameters. Unoperated knee values also
increased until grafting, and then parallel to the defected-treated knee, decreased and returned back to normal values.

At longest term (24th week), PF levels of unoperated knees were significantly different between CG (120.55±50.90mg/ml) and ETG (60.78±45.12mg/ml) (p<0.05). LTG values (110.92±49.76mg/ml) were also higher than those of ETG, but difference was not statistically significant.

Conclusion: Unoperated or undefected knees display a parallel, but less significant catabolic process. Early treatment of defected side could also protect contra-lateral side from undergoing a degenerative course.

E-poster #741
Meniscal Repair: Experience of 111 Cases from a Single Centre over 3 Years
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Simon Roberts, Clutton, Cheshire, UNITED KINGDOM
Dai Rees, Oswestry, Shrops, UNITED KINGDOM
Robert Jones and Agnes Hunt Hospital, Oswestry, UNITED KINGDOM

Meniscal repair is a well accepted treatment modality, however departments must have knowledge of their performance.

We reviewed 111 cases between 2000-2002 (minimum follow-up 6 months). Most were male (75%), with primary repairs (90%), affecting the medial meniscus. 69% had co-existent pathology especially involving the anterior cruciate ligament (ACL). The main modality of repair was bioabsorbable screw fixation. No classification system was used.

Success rates overall were 76%; primaries 86%, revisions 35%, isolated injuries 70%, with an ACL reconstruction 90%. The all inside technique works well however 3 cases required rearthroscopy directly attributable to screw failure.

E-poster #742
Concomitant Surgeries in Autologous Chondrocyte Implantation
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Sang Jun Song, Seoul, KOREA
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Introduction: The purpose of this study is to assess the outcome of the autologous chondrocyte implantation, which was performed in patients who had multiple chondral defects or chondral defect with associated pathologies.

Materials and methods: We analyzed 67 chondral defects in 39 knees in 36 patients for whom autologous chondrocyte implantation had been performed from 2001 to 2003. There were 24 males and 12 females with a mean age of 31 years.

Minimum follow-up was 1 year. The defect was located on the lateral femoral condyle in 22 patients, on the medial femoral condyle in 20 patients, on the patella in 14 patients, and on the femoral trochlea in 11 patients. The mean lesion size was from 3.0 cm² to 10 cm². We classified 4 cases of single chondral defect without associated pathologies to group I, 3 cases of multiple chondral defects without associated pathologies to group II, 5 cases of OCD to group III, 9 cases of single chondral defect with associated pathologies to group IV, and 18 cases of multiple chondral defects with associated pathologies to group V. Additional concomitant surgeries such as ligament reconstruction, meniscus transplantation, realignment osteotomy, or bone graft were performed in patients who had chondral defect associated with joint malalignment, instability, meniscus tear, or bone defect.

The clinical results were evaluated according to the IKDC subjective knee scores, IKDC knee examination grades, and ICRS functional status. Twelve knees with 21 chondral defects consented to arthroscopic second look evaluation of the graft integrity.

Results: IKDC subjective knee scores were improved from a mean score 39.8 before the operation to a mean of 64.1 at the last follow-up. IKDC knee examination grades improved from A 26%, B 18%, C 28%, D 28% before the operation to A 74%, B 23%, C 3% at the last follow-up. ICRS functional status showed the following results of improvement; II 8%, III 74%, IV 18% before surgery while I 15%, II 85% at the last follow-up. The results of the arthroscopic second look evaluation of graft integrity were I 9%, II 67%, III 24%.

Conclusion: When additional concomitant surgeries are done, the autologous chondrocyte implantation can be a useful treatment option of multiple chondral defects or chondral defect with associated pathologies in knee.
**E-poster #743**  
**Clinical Result According to Associated Injuries in Allograft Meniscus Transplantation**

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**Purpose**: This study analyzes and compares the clinical result according to associated injuries in allograft meniscus transplantation.

**Materials and Methods**: We retrospectively analyzed 36 knees in 35 patients who underwent allograft meniscus transplantation from 1999 to 2003. Fourteen cases involved the medial meniscus, and 22 cases involved the lateral meniscus. The mean period from the total meniscectomy to the meniscus transplantation was three years and one month, the mean follow-up period was 2 years and 4 months, and the mean age of the patients was 32.5 years. Thirteen cases had an isolated meniscus deficiency (Group I), 5 cases were combined with injury of the anterior cruciate ligament (ACL) (Group II), 11 cases combined with chondral defect (Group III), and 7 cases combined with both the injury of the ACL and the chondral defect (Group IV). The clinical results were evaluated using the Lysholm knee scoring system. Patients consented to arthroscopic second look evaluation of fifteen knees.

**Results**: Regarding operative methods, 30 cases used a key hole method and 6 cases, for whom both reconstruction of the ACL and medical meniscus transplantation were performed simultaneously or in sequence, used a bone plug method. Out of 18 cases with chondral defect, additional autologous chondrocyte implantation was performed in 17 cases and the high tibial osteotomy in one case. The mean Lysholm knee scores improved 60.4 preoperatively to 93.1 at the latest follow-up. No statistically significant differences were found in Lysholm knee scores among the groups, between medial and lateral meniscus, and according to the operative methods. Two cases in Group I showed the problem of uneven tension in the transplanted allograft due to a size mismatch of the meniscus. The one case involving the high tibial osteotomy in Group III presented an intra-articular fracture. One case in Group IV demonstrated a postoperative partial ankylosis. Arthroscopic second look evaluation showed good or excellent peripheral healing in all cases.

**Conclusion**: Allograft meniscus transplantation may be a viable option for the treatment of symptomatic patients with a meniscus-deficient knee. Patients whose injury is combined with a chondral defect or ligament instability should be treated with concomitant surgeries.

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**E-poster #744**  
**Osteoarthritis After Total Meniscectomy of the Medial, Lateral, Discoid Meniscus, and Medial Meniscus with Anterior Cruciate Ligament Injury**

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**Purpose**: The purpose of this article is to analyze the clinical and radiologic results with patients who have undergone total meniscectomy of the medial meniscus, lateral meniscus, discoid meniscus, and medial meniscus with anterior cruciate ligament (ACL) injury.

**Materials and Methods**: Seventy-eight patients with 78 knees, who underwent total meniscectomy between 1992 to 1998 and were followed up for at least 5 years, were evaluated. There were 16 medial meniscus cases (Group I), 17 lateral meniscus cases (Group II), 29 discoid meniscus cases (Group III), and 16 medial meniscus cases with ACL injury (Group IV). The mean follow-up period was 7 years 2 months (range: 5 years to 11 years 9 months). There were 54 men and 24 women, aged from 10 to 39 years, who weighed from 36.5 to 103 kg. We exclude the cases which involved bilateral knees or both medial and lateral meniscus, had degenerative changes at the time of operation or mal-alignment, or whose weight was over 2 standard deviations for their age. For each group, functional and clinical results were evaluated with the Lysholm knee scoring system, and radiographic measurements were made with the Fairbank sign and the Alback classification system. The Kaplan-Meyer survivorship method was used for statistical analysis, while the knee joint space which narrowed over 50% (Alback Grade II) was defined as osteoarthritis.
Result: The mean Lysholm knee score was 72.9 points (range 48 to 99) at the latest follow-up. No statistically significant difference was found in Lysholm knee scores among the groups. Radiographic development of osteoarthritis was seen in 9.1% of the patients in Group I, in 14.0% of Group II, in 29.0% of Group III, and in 28.2% of Group IV after 5 years. After 7 years, osteoarthritis increased to 18.2% of Group I patients, 29.1% of Group II, 46.4% of Group III, and 54.5% of Group IV. There was statistically significant difference in radiographic evaluation among the groups.

Conclusion: The development of osteoarthritis after total meniscectomy was highly observed in cases involving the medial meniscus with ACL injury. To a lesser extent it was also seen, in order of incidence, in cases involving the discoid meniscus, the lateral meniscus, and the medial meniscus.

E-poster #745
Clinical Results and MRI Findings After Collagen Meniscus Implant (CMI)
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Aim: To report clinical results and MRI findings observed in 50 patients, who underwent collagen meniscus implant (CMI) between March 2001 and June 2003.

Methods and materials: Fifty patients, who were affected by irreparable meniscal lesions or had previously undergone partial medial meniscectomy, were arthroscopically treated with CMI, a tissue engineering technique designed to promote meniscal regeneration. Average age at the time of surgery was 38.4 years. The average size of the lesion/defect was 4.3 cm. Additional procedures included 16 ACL reconstruction, 8 high tibial osteotomy and 2 autologous chondrocyte implantation. All knees were evaluated according to the Lysholm II and Tegner activity scales. MRI (FSE Fat-Sat T2, SE T1, GRE T2) was performed 6, 12 and 24 months postoperatively. Six arthroscopic examinations of the implant were performed at different times (6 to 16 months postoperatively).

Results: Postoperative complications included saphenus neuroapraxia in 3 patients and CMI rupture in 1 patient who presented persistent knee swelling. Follow up averaged 15.7 months, with a minimum of 6 months. At most recent evaluation, 46 patients showed improvement of the clinical scores. MRI was useful to document healing of CMI to the meniscal stump and parameniscus, followed by tissue invasion and ingrowth inside the scaffold. A progression toward a more homogeneous signal was detected in the implants with a two-year follow-up. At second arthroscopic look, free fragments of the implant were observed in the knee of the patient, who suffered CMI rupture. In another patient, partial resorption of CMI was observed at the posterior horn. The remaining four arthroscopic examinations demonstrated regeneration of meniscal-like tissue with healing of the implants to the parameniscus and to the residual meniscal stump; good consistency and stability was detected by probing.

Conclusions: Clinical results achieved with CMI are promising, once correct indications are respected and patients are compliant with rehabilitation program. MRI demonstrated to be an effective tool for monitoring the evolution of the implant and showed good correlation with clinical outcomes and arthroscopic findings at follow up.

E-poster #746
All-Inside Meniscus Suture: A New Technique
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The indications for meniscal tears have become better defined over recent years. The surgical options for a meniscal repair include open, inside-out, outside-in and all-inside repair using various implants.

Materials & Methods: Four cases of meniscal repair using a posterior portal to perform an all-inside suture have been performed. Three involved the medial meniscus and all were associated with an ACL reconstruction. The technique will be described. Results: Three have been adequately reviewed at an average follow-up of 6 months and all are clinically healed. No MRI or second-look arthroscopies have been performed. There have been no complications attributable to the posteromedial portal or the technique. Discussion: The perceived advantages of this technique are that repairs are anatomical and performed under direct vision. There is less
risk to the neurovascular structures and low risk of capsular tethering. The potential disadvantages are that it requires the use of a posterior portal and the ability to tie knots arthroscopically.

E-poster #748
Arthroscopic Autologous Chondrocyte Implantation for the Treatment of Chondral Defects in the Tibial Plateau
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Aims: To evaluate the clinical-functional and MRI results achieved in two patients, who underwent arthroscopic autologous chondrocyte implantation for the treatment of chondral defects in the lateral tibial plate.

Methods and materials: The matrix-induced autologous chondrocyte implantation (MACI\textsuperscript{\textregistered}) technique, which requires the use of a chondrocyte-seeded collagen membrane, was performed arthroscopically on two male patients affected by traumatic chondral lesions, sized respectively 2.5 and 2 cm\textsuperscript{2}. The procedures were performed through traditional arthroscopic portals and the seeded membrane was fixed on the defects with fibrin glue. Clinical-functional evaluation was performed according to ICRS score, modified Cincinnati knee score, Lysholm II and Tegner scales. MRIs (FSE Fat-Sat T2, SE T1, GRE T2) were taken 6, 12 and 24 months postoperatively.

Results: No complications were observed in the postoperative period. At two-year follow up, all the clinical scores were improved in both patients. MRI showed filling of the defects with hyaline-like tissue with reduction of subchondral bone edema and restoration of a regular articular surface. Conclusions: Even though the MACI\textsuperscript{\textregistered} technique is mostly performed with an open procedure, the site of these lesions could not be reached without sacrificing tendinous and ligamentous structures of the knee. The arthroscopic approach allowed to achieve an optimal view of the lesion and appeared the best solution for these patients. The use of fibrin glue for fixing the seeded membrane has made possible to perform the procedure arthroscopically in a simple and safe way. No specifically designed instruments were used in these cases. The size of these defects was too large for bone marrow stimulation techniques and/or osteochondral grafts to be successful.

E-poster #749
Matrix-Induced Autologous Chondrocyte Implantation (MACI): Clinical Results, MRI Findings and Morphological Analysis of Implants
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Eugenio Genovese, Varese, ITALY
Marina Protasoni, Varese, ITALY
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Aim: To prospectively evaluate clinical results and MRI findings on a series of 47 patients treated by Matrix-induced Autologous Chondrocyte Implantation (MACI) for knee and ankle chondral defects. Histological and ultrastructural analysis of the implants were performed on 2 biopsies, harvested from 2 patients who underwent a second arthroscopic look in the knee.

Methods and materials: This series of patients included 30 males and 17 females, with an average age of 31.7 years (range, 17 to 55 years). The sites of the defects were the following: 30 femoral condyle, 1 femoral trochlea, 4 patella, 2 lateral tibial plate, 5 talar dome, 3 femoral condyle + patella, 1 lateral tibial plate + patella, 1 kissing lesion in the ankle. The average size of the defects was 3.5 cm\textsuperscript{2} (range, 2 to 4.7 cm\textsuperscript{2}). Clinical-functional evaluation was carried out according to ICRS score, modified Cincinnati knee score, Lysholm II and Tegner scales. The AOFAS score was used for the evaluation of the ankle. MRIs (FSE FAT SAT T2, GE T2, SE T1) were taken before the operation as well as at 6 and 12 months postoperatively; at 2 years, arthro-MRI was performed. Among 10 second arthroscopic looks (4 knees, 6 ankles), two biopsies were carried out after 2 years, respectively from the medial femoral condyle and the patella. Light microscopy, immunohistochemistry (type I and II collagen), SEM and TEM were used for morphological analysis.

Results: Follow-up averaged 25.6 months (range, 6 to 49 months). Two cases of knee hemarthron were observed in the immediate postoperative period; no other complications occurred. At the latest follow up, knee scores improved after
surgery. AOFAS did not improve in one ankle. MRIs showed filling of the defect in all the treated knees. At one-year follow up, subchondral bone edema was evident in 4 knees. In the ankle, the patient with the kissing lesion showed failure of the implant with bone to bone contact at MRI. Histological analysis on the biopsies revealed good definition of the tidemark, presence of type II collagen and chondroitinsulphate. Ultrastructural findings included reorganization of the fibrillar network and cellular cluster. Cells presented well developed sarcoplasma, Golgi apparatus with secretory vescicles testifying an intense metabolic activity. Conclusion: Clinical results and MRI findings support the efficacy of the MACI technique. Morphological findings are indicative for hyaline-like tissue formation in the implant site.

E-poster #750
Non-treatment of Stable Medial Meniscal Tear Seen During Anterior Cruciate Ligament Reconstruction
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Purposes: The purpose of this study is to describe our experience with untreatment therapy of stable and asymptomatic medial meniscal tear during ACL reconstruction.

Material and Methods: Between Sep 1994 and Jan 2002, we performed 505 ACL reconstruction using multi-strands autogenous hamstring tendons. A total of 288 medial meniscal tears were identified at the time of ACL reconstruction. These tears were treated by partial removal or meniscal repair (184), or were left alone (104). Of the 104 patients with medial meniscal tear left alone, 47 patients had a minimum of 2 year’s clinical follow-up (average 3.1 years, range, 2 to 7.3) and underwent second-look arthroscopy. This group included 21 men and 26 women. The average age was 22.4 years (range, 13-38 years).

Results: During the follow-up periods, no patients came to the hospital with a suspected medial meniscal tear. At the second-look arthroscopy, 37 medial meniscal tears had healed; however, 10 medial meniscus had a tear. Of the 10 medial meniscal tear, 2 medial meniscal tear were unstable by probing, treated by partial medial meniscus removal, 8 medial meniscal tear were stable and asymptomatic, left untreated again. The KT-1000 arthrometer mean side-to-side difference at manual maximum was 0.7+/-1.1mm. The mean isokinetic peak extension torque for the ipsilateral knee was 95% of the contralateral knee. The mean Lysholm score was 98 (range, 85-100). Of the 47 patients, 40 patients returned to their preinjury sport activity by the time of the follow-up examination. There is no case that medial meniscal tear could be considered as a cause of inhibiting their sports return.

E-poster #751
Incidence and Magnetic Resonance/Arthroscopic Correlation Over Knee Osteochondral Lesions. A Prospective Study.
David Figueroa M.D., Rafael Calvo M.D., Miguel Carrasco M.D., Rodrigo Mardones M.D., Alex Vaisman MD.

Introduction: Articular cartilage damage represents a diagnostic and therapeutic challenge specially in young population. Different surgical alternatives has been described for the treatment of these lesions. Each one has its advantages and disadvantages. In order to select the appropriate surgical treatment, it is necessary to have an effective preoperative diagnostic and adequate preoperative plan. Unfortunately preoperative diagnosis is often difficult in chondral lesions. Magnetic resonance tend to be helpful in the diagnosis of cartilage damage. However even with specific new techniques for cartilage the efficacy of the MRI is variable.

Materials and Methods - From March 2003 to February 2004, 250 (two hundred and fifty) knees arthroscopies were done by the investigator group. Of these, 190 (one hundred and ninety) patients (116 men and 74 women) needed
preoperative magnetic resonance, and were included in the study. The average age was 34.8 years old. Arthroscopy was indicated because: ACL rupture =74, MML=55, LML=30, MML+LML=6, PF=11 and others= 14. The osteochondral lesions were evaluated using a protocol, that included: the radiologist report, intra-operative finding and the elected treatment. The lesions were classified using the ICRS score and the Outerbridge classification.

Results.- In 82 of the 190 arthroscopies (43.16%) the presence of a chondral / osteochondral lesion was observed. An unique lesion was observed in 59 cases (72%). Twenty six (23) patients presented multiples lesions (28%). The magnetic resonance was positive for chondral lesions in only 37 of the 82 cases (45%). There were no false positives.

Of a total of 115 chondral / osteochondral lesions; 58 were classified as III and IV grade of Outerbridge and 57 as a grade I and II. Using the ICRS classification, 59 resulted being III and IV grade of ICRS, (IIIA=32, IIIB=10, IIIC=1, IIID=2, IVA=13, IVC=1) and 56 grade I y II (IIA=14, IIB=2, II=40).

With respect to the size of the lesion: 26 of them represented an area < 1 cm2, 54 in-between 1-2 cm2, and 35 > 2 cm2. In 86/115 a therapeutic arthroscopic procedure was necessary (Radio frequency ablation= 63, micro fracture= 34, arthroscopic debridement and abrasion= 16, OATS= 2).

Discussion. The high prevalence of chondral and osteochondral lesions observed in during knee arthroscopic surgery is remarkable (43.6%). Magnetic resonance still present a low diagnostic sensibility (45%), however a high specificity was observed (100%). In 55% of the cases the chondral lesion was diagnosed intraoperatively, which enhances the importance of diagnostic arthroscopy and having a clear intraoperative decision making diagram. The direct correlation between age and size of the defect suggests an articular degenerative process with aging.

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E-poster #753
Bilateral Discoid Medial Menisci: A Report of Five Patients
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Tomomaro Kawamata, Sendai, Miyagi, JAPAN
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Introduction:
Discoid medial meniscus is extremely rare. The first discoid medial meniscus was described by Cave and Staples in 1941. Since then approximately 50 patients have been reported. Bilateral discoid medial menisci are rarer; only 16 patients have been reported. This study presented the clinical outcomes of our 5 patients with 3 years follow-up.

Patients:
Five patients with bilateral discoid medial menisci were treated at our hospital from 1997 to 2003. They were 4 males and 1 female. Their average age was 32 years and ranged from 16 to 47 years. The average follow-up period was 4 years and ranged from 2 to 8 years. Patients were evaluated with physical examination and X-ray at follow-up.

Results:
Chief complaint was pain on medial joint line in all knees. Sudden onset of pain was experienced in only one patient. There were restrictions of ROM in 3 knees. Six knees had complete discoid and the other four had incomplete. All patients were asymptomatic at follow-up on examination. On radiographs, 2 knees showed osteophyte formation and other 4 knees showed the narrowing of the medial joint spaces.

Summary:
Five bilateral discoid medial menisci were presented. Subjective and objective characteristic findings of discoid medial menisci could not be clarified. Four knees showed the narrowing of the medial joint space less than three years after meniscectomy. Long-term follow-up is needed to clarify the progression of degenerative changes after the resection of discoid medial meniscus.

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E-poster #754
Potential Healing of Meniscal Injury in the Avascular Zone After Radiofrequency Stimulation
James P Tasto, San Diego, CA, USA, Presenter
Kevin Paul Hansen, San Diego, CA USA
Sakae Sano, San Diego, CA USA
David Amiel, La Jolla, CA USA
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Introduction:
The first discoid medial meniscus was described by Cave and Staples in 1941. Since then approximately 50 patients have been reported. Bilateral discoid medial menisci are rarer; only 16 patients have been reported. This study presented the clinical outcomes of our 5 patients with 3 years follow-up.
Meniscus injury is one of the most common indications for orthopedic surgery today. Extensive research into the effects of meniscectomy on the biomechanics and long term function of the knee has led to a prevailing attitude toward meniscal preservation. Excellent results have been obtained with meniscal repair of the peripheral one third, red-red zone, of the meniscus. To date, no reliable method for repair with consistent healing has been developed for tears involving the white-white zone of the meniscus. Our previous work with radiofrequency to stimulate healing in tendinosis has led us to consider this adjunct to repair in such tears. The purpose of this study is to evaluate the effect of radiofrequency stimulation, in conjunction with suture repair, on the healing of tears in the white-white zone of the meniscus.

Materials and Methods:
A meniscus tear was created in the white-white zone in 18 NEW ZEALAND white rabbits. Six of these were left without further treatment, six were treated with suture repair alone, and six were treated with suture repair in combination with radiofrequency stimulation at the inner portion of each side of the tear. Half of each study group was harvested at 4 weeks and the other half at 12 weeks postoperative. Morphologic and histologic analysis and grading were performed for each of the specimens. The grading was as follows:
Grade A  Complete healing. Trace of injury is hardly distinguishable.
Grade B  Nearly complete healing. Trace of injury remains on surface.
Grade C  Incomplete healing. Full thickness injury remains but will not open fully upon stress.
Grade D  No healing. Injury site remains fully open.

Results:
No evidence of healing was seen in the twelve specimens that had either no treatment, or treatment with suture repair alone. Grade D was observed in all the specimens. Of the six specimens treated with radiofrequency in combination with suture repair, three showed evidence of a healing response on both morphologic and histologic analysis: One Grade A and one Grade C at 4 weeks. One Grade C was shown at 12 weeks. The remainder showed grade D. We find this evidence of healing encouraging and anticipate using these results as a framework for further study into cell proliferation (3H thymidine), matrix synthesis (35 SO4) gene regulation, i.e. alpha(v)IGF1, bFGF, and the cytokine involvement in this healing stimulus. We also plan to investigate improvements on the technique itself to provide more consistent results.

E-poster #755
Jakob Fay, Kiel, GERMANY, Ralph Wischatta, Kiel, GERMANY, Dragan Milasinovic, Kiel, Schleswig-Holstein GERMANY, Heinz Laprell, Kiel, GERMANY, Presenter Lubinus-Clinicum, Hospital for Orthopaedic Surgery, Kiel, GERMANY

The symptomatic discoid lateral meniscus is a well-documented pathology. Three different types of this congenital anomaly are described: complete, incomplete and Wrisberg-ligament type. Treatment is proposed by arthroscopic resection up to total meniscectomy. In contrast, only little is known about pathological meniscofemoral ligaments (MFL) or related posterolateral ligamentous structures. At least one MFL is reported to be present in over 90% of population with a higher incidence and more voluminous shape in younger people. Since the Wrisberg-ligament type of discoid meniscus is synonymous to posterior MFL one might hypothesize MFL or other posterolateral structures to be responsible for knee pathology usually referred to discoid menisci.
We discuss the management of knee pathology in a 5 and 8-year-old child, both suffering from pain, limited range of motion (Ex/Flex 0/10/110 ) and significant limp. Pre-operative MRI described discoid lateral menisci and a hyperintense structures corresponding to the posterior horn of the meniscus.
Knee arthroscopy showed a complete lateral discoid meniscus without any meniscal tears. Furthermore no signs of cartilage degradation were observed. The meniscus appeared uplifted in the posterior region with an abnormal movement during knee extension. The presence of a pronounced posterolateral cordlike structure was demonstrated, originating from the lateral meniscus’ posterior horn region, extending to the CLs and inserting into the lateral femoral condyle. Using a razor-blade and an electric cutting device we dissected and cut the tighten cordlike
structure, but did not perform surgery on the
discoid meniscus.
The postoperative healing was asymptomatic.
Within days the activity level was elevated
compared to the pre-operative status. Physical
examination showed free range of motion without
clicking, catching or other symptoms affiliated to
the discoid meniscus.
The symptomatic cordlike structure we
demonstrated here, does not refer to the MFL or
one of the widely known intraarticular ligaments.
We therefore conclude to have introduced a new,
not yet described intraarticular cordlike structure
of the childish knee. It might be associated to
discoid menisci and is therefore an important
differential diagnosis. Successful treatment
contains cutting of the cordlike structure. The
whole meniscus remains untreated and
osteoarthritis following loss of meniscal tissue
can be prevented.

E-poster w/ Standard #757
Vascular Risk Associated with Meniscal Repair using RapidLoc versus FasT-Fix: Comparison of
Two All-Inside Meniscal Devices
Steven B Cohen, Charlottesville, VA, USA,
Presenter
Mark David Miller, Charlottesville, VA USA
University of Virginia Health Center,
Charlottesville, VA, USA

Introduction: Previous reports have documented the complications associated with use of all-
inside meniscal repair devices. Several studies assessed the risk to the neurovascular structures
during meniscal repair using an all-inside repair and highlighted some potential concerns with the
use of these devices. The current study evaluated the risk to the popliteal artery related to the use of
two commonly used all-inside meniscal repair devices, the Mitek RapidLoc (12.5 ), and the Smith
and Nephew FasT-Fix (curved).
Methods: Eight fresh-frozen cadaver legs were
used in this study (average age=72 years, range: 63-76). The lumen of the femoral artery was
identified and injected with barium. AP and lateral radiographs were obtained to ensure
visualization of the popliteal artery and its anatomic location. One cadaver artery was unable to
be cannulated, thus seven cadavers were used for the study. The needle applicator length on the
FasT-Fix is 25 mm (17 mm with the penetration limiter) and 13 mm on the RapidLoc. Both
deVICES were inserted into the posterior horn of
the medial meniscus up to the hub of the needle
under direct arthroscopic visualization. After
needle insertion, a second set of radiographs was
obtained. The distance between the needle and
the artery was measured on each radiograph. The
width of the tibial plateau was measured, and the
shortest distance to the artery was calculated as a
percentage of that distance. Distances for each
device were compared for both views using
student’s t-test.
Results: Measurements taken from the
radiographs obtained revealed the average
distance from the needle to the popliteal artery to
be 0.5 mm (0.5+0.8 mm, range: 0-2 mm) on the
lateral radiograph and 6.0 mm (6.0+6.2 mm,
range: 0-19 mm) on the AP radiograph using the
FasT-Fix system. None of the RapidLoc needles
were within 20 mm of the popliteal artery on
either radiograph. When these distances for the
FasT-Fix needles were calculated as a percentage
of the tibial plateau width, the average was 0.9%
on the lateral and 7.1% on the AP radiograph. The
FasT-Fix device came within 3 mm of the artery on
both AP and lateral radiographs in 43% of the
specimens. The risk to the popliteal artery was
significantly greater using the FasT-Fix devices
when compared to the RapidLoc devices (p<0.05).
Conclusion: Meniscal repair using an all-inside
technique can be an effective and safe treatment.
This study found that there is significant risk to
the popliteal artery during insertion of the FasT-
Fix meniscal device due to the length of the
insertion needle. The RapidLoc device appears to
be safer with respect to risk to the popliteal artery
as a result of a shorter insertion needle. We
recommend using traditional suture techniques or
the RapidLoc meniscal device for meniscal repair.
Although the FasT-Fix device comes with an
adjustable sleeve to prevent penetration to its full
depth, we recommend that the FasT-Fix device be
modified to prevent penetration to its full depth
without the sleeve. The RapidLoc device appears
to be safer with less risk to the popliteal artery
than the current FasT-Fix meniscal repair device.

E-poster w/ Standard #758
Zolpidem Reduces Post-Operative Pain Following Outpatient Knee Arthroscopy
Robert Zaray Tashjian, Providence, RI, USA
Rahul Banerjee, Providence, RI USA
Michael P Bradley, Jamestown, RI USA, Presenter
Winslow Alford, Chicago, IL USA
Paul D. Fadale, Providence, RI USA
Brown Medical School, Providence, RI, USA
Background: Arthroscopy of the knee is commonly performed as an outpatient surgical procedure and effective post-operative pain management continues to be a challenging problem. Previous studies have addressed post-operative management by examining use of intra-articular analgesia and/or modification of anesthesia techniques. No previous studies have however, evaluated the relationship between sleep deprivation and post-operative pain after knee arthroscopy. The purpose of this double-blinded prospective placebo-controlled randomized study was to evaluate the effectiveness of a non-benzodiazepine hypnotic sleep-aid (zolpidem) in improving post-operative pain and fatigue in patients undergoing outpatient knee arthroscopy.

Methods: Sixty-eight patients undergoing outpatient knee arthroscopy for treatment of meniscal tears and/or loose bodies were randomized to three treatment groups (ZOLPIDEM [24 patients], NONE [24 patients], and PLACEBO [20 patients]). All groups received post-operative hydrocodone and ibuprofen. Patients in the ZOLPIDEM group received a single dose of zolpidem for the first seven post-operative nights. Patients in the PLACEBO group received a gelatin capsule similar in appearance to zolpidem. Patients in the NONE group received only hydrocodone and ibuprofen.

Results: Patients in the NONE group and PLACEBO group (no zolpidem received) demonstrated significantly worse mean daily post-operative pain scores on a visual analog scale when compared with the ZOLPIDEM group ($p = 0.01$ and $p = 0.04$, respectively). Patients in the NONE group consumed significantly higher quantities of hydrocodone/acetaminophen when compared to the ZOLPIDEM group ($p = 0.04$). Patients in the PLACEBO group also consumed higher quantities of hydrocodone/acetaminophen and had more daily postoperative fatigue although these differences did not reach statistical significance ($p = 0.4$ and $p = 0.1$, respectively).

Conclusion: This study demonstrates that sleep and fatigue may be an important factor in the effective management of pain after outpatient knee arthroscopy. Future post-operative treatment regimens should address sleep and fatigue in order to maximize analgesic effects in these patients.

E-poster w/ Standard #759
Functional Outcome of the Arthroscopic Meniscal Transplantation Compared with the Open Meniscal Transplantation
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Presenter
Westeinde Hospital, Den Haag, NETHERLANDS

Introduction:
from 1998 on, 79 patients had a meniscal transplantation with a cryopreserved meniscal allograft. The first group of 63 consecutive meniscal allografts (57 patients) were transplanted through an open technique. The second group of 22 consecutive patients were operated through an arthroscopic assisted technique. The purpose was to assess the arthroscopic technique on decreasing the rehabilitation period.

Materials and methods:
A retrospective cohort investigation in which the open technique of meniscal transplantation was compared to the arthroscopic assisted technique. Both groups were scored according to the Lysholm score pre-operative and at 6 months and 12 months postoperative. The failures were analysed. To compare the groups a student-t test was used ($p<0.05$).

Results:
The first group consisted of 63 meniscal allografts in 57 patients (34 lateral, 17 medial, 6 both menisci combined). This group had a mean pre-operative Lysholm score of 35 (6-59), after 12 months of 80 (19-100). This group showed 1 failure. Two allografts became partially detached which were re-fixated arthroscopically. There were no complications.
The second group consisted of 23 meniscal allografts in 22 patients (13 lateral, 2 medial, 6 both menisci combined with an ACL reconstruction) with a minimal follow-up of 12 months. This group had a mean pre-operative Lysholm score of 47 (25-62), after 6 months of 85 (54-99), and at 12 months of 84 (54-100). Two meniscal allografts became partially detached which were re-fixated arthroscopically. One patient had a reversible neurovascular complication. One lateral meniscal allograft failed after 3 years.

Conclusion:
The arthroscopic assisted group was small. The results showed that the arthroscopic assisted meniscal transplantation had a significant better regain of function compared to the open technique at 6 and 12 months follow up (p=0.02).

E-poster w/ Standard #760
Motion Alterations Six Months and One Year After Partial Medial Meniscectomy
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Alessandro Manelli, Varese, ITALY
Paolo Bulgheroni, ITALY, Presenter
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Introduction.
Knee joint’s degenerative changes after meniscectomy are well known. Less evidence exists on underlying biomechanical alterations. Aim of this study is the investigation of lower limbs biomechanics before and after meniscectomy.
The focus is on gait and squatting exercises. Gait is chosen because of its daily life role while squatting implies high stress of knee joint structure. Both the movements show high statistical repeatability intra and inter subjects.

Materials and methods.
Ten volunteers candidate to partial medial meniscectomy for meniscal tear underwent motion analysis just before surgery, six months and one year after. Ten healthy volunteers acted as a control group.
All the subjects perform three gait trials and three squatting movements.
Data were acquired by means of Vicon motion analyser and AMTI forces platform.
Results.
In gait patterns investigation, joint kinematics does not show significant modifications before and after surgery, while dynamic analysis stresses alterations in knee sagittal moment. Before surgery, healthy and affected limbs show significant differences, also referring to control group. at first impact and late stance. After surgery, asymmetries between limbs are no more significant at first impact. While the behaviour in late stance shows a reduced knee extension moment in the affected limb not present before surgery.
In squatting investigation, main focus was on repeatability, being the mean behaviour consistent before and after surgery. Before surgery high inter subjects variability affects knee joint angle, stating pain response; while after surgery high variability affects also hip and ankle, suggesting a new approach to mechanical equilibriums.

Conclusions.
After menisectomy, gait and squatting patterns are still altered. Before surgery, the joint mechanical structure is not highly altered and modifications are mainly due to pain avoidance schemas. After partial menisectomy, pain disappears and the new joint behaviours are probably caused by the new mechanical asset and/or proprioceptive mechanisms.

E-poster w/ Standard #761
Influence of Tibial Slope on Knee Kinematics, Tibial Cartilage Pressure and Ligament Strain: A Biomechanical Study in Human Cadaveric Knees
Jens Agneskirchner, Hannover, GERMANY, Presenter
Chris Hurschler, Hannover, GERMANY
Christina Stukenborg-Colsman, Hannover, GERMANY
Andreas B Imhoff, Munich, GERMANY
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Department of Surgery Henriettenstiftung Hannover, Hannover, GERMANY

Introduction:
Valgus high tibial osteotomy is an established treatment for unicompartmental varus osteoarthritis. However, only little is known about the influence of an osteotomy in the sagittal plane on biomechanical parameters such as cartilage pressure and joint kinematics. In this study, we investigated the effects of a high tibial flexion osteotomy in a human cadaver model.

Materials and methods:
In 7 fresh human cadaveric knees a flexion osteotomy of the proximal tibia was performed and the tibial slope was gradually increased. An isokinetic flexion-extension motion was simulated in a kinematic knee simulator. The contact pressure and topographic pressure distribution in the medial joint space was recorded using an electronic pressure sensitive film. Simultaneously the motion of the tibial plateau was analysed 3-dimensionally with an ultrasonic tracking system. The traction force to the quadriceps tendon which was applied by the simulator for extension of the joint was continuously measured. Strain in the anteromedial bundle of the ACL was analysed.
using implantable force transducers. The experiments were carried out with intact ligaments and then after successively cutting the PCL and ACL.

Results:
Tibial flexion osteotomy resulted in an anterior shift of the tibiofemoral contact area and contact pressure, leading to a decompression of the posterior half of the plateau (p=0.002). The increase of the slope resulted in a significant anterior and superior translation of the proximal tibia at all angles of knee flexion with a maximum at 30 degrees (p=0.01). Posterior subluxation of the tibial head after cutting the PCL was completely neutralized with a flexion osteotomy of 5 degrees (p=0.001). Strain in the anteromedial bundle of the ACL was significantly increased with a flexion osteotomy of 15 degrees and more (p=0.01). The increase in tibial slope resulted in a significant higher quadriceps strength which was necessary for full knee extension (p=0.02).

Conclusion:
We conclude from these results that changes in tibial slope have a strong influence on cartilage pressure and kinematics of the knee. Therapeutically a flexion osteotomy may be used for decompression of the degenerated cartilage in the posterior part of the plateau e.g. after arthroscopic partial posterior meniscectomy. If a valgus osteotomy is combined with a flexion component of the proximal tibia, complex knee pathologies consisting of posteromedial cartilage damage, posterior and posterolateral instability can be addressed in one procedure, which facilitates a quicker rehabilitation of these patients.

E-poster w/ Standard #762
An Experimental Study of the Effect of Vascular versus Minimal Vascular Microenvironment in Cartilage Healing
Asbjorn Aroen, Oslo, NORWAY, Presenter
Stig Heir, Oslo, NORWAY
Sverre Laken, OSLO, NORWAY
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University of Oslo, Oslo, NORWAY

Introduction: To investigate the repair potential in a cartilage defect with or without access to bone marrow elements at the basis of the defect sealed by a rim-sutured periosteal flap.
Method: A partial thickness cartilage defect (diameter 4 mm) was created in both patella of 35 rabbits at the age of 22 weeks. Two weeks later access to the bone marrow was obtained by drilling holes (diameter 0.6 mm) at the base of the defect in one knee, treatment A, (vascular microenvironment); whereas in the other knee the base of the defect was left untreated, treatment B (minimal vascular microenvironment). The defect was covered with a rim-sutured periosteal flap in both knees. In additional seven rabbits were sham-operated at the same time points in one knee, while the other knee was left untouched as control. Animals were sacrificed 1, 2 and 36 weeks after the second surgery and macroscopical changes, synovial fluid contents, degree of filling, thickness of cartilage rim and the subchondral bone were evaluated.

Results: Histomorphometric measurements of extend of filling (mainly fibrous tissue) of the defect showed 50 % filling in treatment A compared with 33 % in treatment B (p = 0.011). A significant difference in height of the cartilage rim between the experimental groups and sham-control was measured, (p=0.005). Histological signs of cartilage degeneration were observed at the cartilage rim of the original defect and included loss of chondrocytes and disruption of the surface continuity in both experimental groups. In additional treatment A resulted in a significant increased thickness of the subchondral bone in the defect in comparison to treatment B at 2 weeks and at 36 weeks, (p= 0.021).

Interpretation: Both experimental treatments showed incomplete repair consisting of fibrous scar tissue and structural changes indicative of a degenerative process in the defect and the adjacent cartilage, but the degree of filling was greater with a vascular than with minimal vascular microenvironment.

E-poster w/ Standard #763
The Operative Results of the Mosaicplasty for Osteochondral Diseases in the Knee Joints who were more than 40 years old
Yasuaki Nakagawa, Kyoto, JAPAN, Presenter
Takashi Suzuki, Kyoto, JAPAN
Yukihiro Okamoto, Kyoto University, Kyoto, JAPAN
Hiroshi Kuroki, Kyoto, JAPAN
Masahiko KOBAYASHI, Kyoto, Kyoto, JAPAN
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[Purpose] It is said that the operative results of the mosaicplasty for osteochondral diseases in
the knee joints are good, but that the indicative limit age is less than 40 or 50 years old. We report that our operative results of the mosaicplasty for osteochondral diseases in the knee joints whose operative ages were more than 40 years old.

[Materials and Methods] Our patients were 21 knee joints in 18 patients whose operations were performed in our hospital from March 1998 to February 2003. There were 6 men and 12 women, 8 right knee joints and 13 left ones, and their mean operative age was 55.4 years old (from 40 to 76 years old). The indications for mosaicplasty were osteonecrosis (13 knees), early stage osteoarthritis (4 knees) and traumatic cartilage injuries following anterior cruciate ligament rupture, meniscus tear and intraarticular fracture (4 knees). The combined operations were 8 high tibial osteotomies in osteonecrosis, ACL reconstruction or meniscus repair in traumatic cartilage injuries, and anterior translation of the tibial tuberosity in early stage osteoarthritis. The mean follow-up period was 29 months (from 13 to 56 months). The assessment criteria used were recipient sites, the area used as the recipient site, the number of osteochondral plugs taken, range of motion, JAPANese Orthopaedic Association knee OA score (JOA score) and IKDC evaluation form. In 14 knees we performed second-look arthroscopy. The mean period from mosaicplasty to the arthroscopy was 13.6 months. In these knees we assessed arthroscopic evaluation.

[Results] In 3 knees the recipient site was femoral trochlea, in 3 knees the recipient site was lateral femoral condyle, and in 15 knees the recipient site was medial femoral condyle. The mean recipient area was 374.6mm² (from 64 to 800mm²), and the mean number of plugs was 3.4. In the follow-up period, the knee flexions in all patients were more than 130 degrees, and 11 patients could sit straight. The preoperative mean JOA score was 72, and the follow-up mean score was 95. There was no relationship between their score and age, recipient area and so on. In the IKDC evaluation form at follow-up period, there were seven normal knees and fourteen nearly normal knees. Fourteen knee joints whose had second-look arthroscopy obtained smooth articular surfaces.

[Discussion] Some people report that the indicative limit age for mosaicplasty is less than 40 or 50 years old. However, we think that the operative results of the mosaicplasty whose operative ages were more than 40 years old were good. We experienced 4 suggestive cases; the occurrence of another cartilage degeneration, the detachment of the survived cartilage and the exposure of the subchondral bone in the tibial plateau which was the contralateral side of the mosaicplasty. Including the above 4 cases, we need careful follow-up examination in our patients.

[Conclusion] The mosaicplasty for osteochondral diseases in the knee joints whose operative ages were more than 40 years old may be actively performed.

E-poster w/ Standard #764
Computed Tomography Arthrosan Evaluation of the Meniscal Healing After Meniscus Repair
Olivier Charrois, Paris, Paris FRANCE, Presenter
Philippe Beaufils, Le Chesnay, FRANCE
Ludovico Panarella, Paris, FRANCE
Tarik Ait Si Selmi, Lyon, FRANCE
Francois MKelberine, Aix en Provence, FRANCE
Xavier Cassard, Toulouse, FRANCE
French Arthroscopy Society Paris FRANCE
Hopital Andre Mignot, Versailles, FRANCE

BACKGROUND: Functional results after meniscal repair have been reported as good. However, the entity of meniscal healing remains unevaluated. It needs an objective examination. The purpose of this prospective study was to evaluate the meniscal healing after meniscal repair by arthrotomography. The spiral arthrotomography scan is a reliable exam to evaluate the meniscal healing, less invasive than arthroscopy, more specific than MRI.

METHODS: In this prospective multicenter study, 62 meniscal repairs of a vertical longitudinal tear in the red-red or red-white zones were included. 41 were medial menisci, 21 lateral. The mean length was 20.8 mm. An ACL lesion was present in 34 cases and was reconstructed at the same time. All the knees were controlled 6 months later by a spiral arthrotomography scan; the healing of the meniscus thickness, segment by segment according to Henning criteria was assessed.

The spiral arthrotomography scan is a reliable exam to evaluate the meniscal healing, less invasive than arthroscopy, more specific than MRI. METHODS: In this prospective multicenter study, 62 meniscal repairs of a vertical longitudinal tear in the red-red or red-white zones were included. 41 were medial menisci, 21 lateral. The mean length was 20.8 mm. An ACL lesion was present in 34 cases and was reconstructed at the same time. All the knees were controlled 6 months later by a spiral arthrotomography scan; the healing of the meniscus thickness, segment by segment according to Henning criteria was assessed.

- the healing of the meniscus thickness, segment by segment according to Henning criteria
- the healing of the meniscus surface, including thickness as well as length to evaluate the reduction of tear length by comparison with per-operative data
The arthroCTscan images have been collegially reviewed, independently from the surgeon.

**RESULTS:** According to Henning criteria, the healing was complete in 42% of the cases, partial in 31%, absent in 27%. The location of the tear in red-red or red-white zones had no influence. No significant differences were found between medial and lateral menisci excepted in case of associated ACL lesions: in this group lateral meniscus had better results (complete healing: 50%, partial healing: 50%, no failure). The healing of meniscus surface was complete in 37%, tear healed more than 50% in 39%, less than 50% in 12%, healing was absent in 12%. The overall result was at least 50% of tear surface healing in 76% of cases.

**CONCLUSIONS:** Our results confirm that meniscus may heal completely or partially. Lateral meniscus associated to a repaired ACL rupture has a better prognosis. In 76% of cases, tear surface reduces more than 50%, that leads an unstable meniscal tear to be transformed in a stable one. At the opposite, 24% of meniscal tears remains unstable (tear heals less than 50%). This percentage is similar to the secondary meniscectomy rate (23%) that we observed in a retrospective series of 203 repairs. We conclude that the goal of a meniscal repair is not to obtain a complete healing but a meniscal stability by reduction of the tear surface.

**E-poster w/ Standard #765**
**Long Term Result of Arthroscopic Meniscal Repair 3-11 Years Follow-Up**
Carsten Bo Perlick, Aalborg, DENMARK, Presenter
Bent Wulff Jakobsen, Aarhus, DENMARK
Rebekka Perlick, Aalborg, DENMARK
Aarhus University Hospital, Aarhus, DENMARK

**INTRODUCTION:**
The long-term serious consequences of total meniscectomies have initiated research for improved understanding and development of better methods to treat meniscal tears. By using more recent knowledge of the meniscal blood supply and meniscal repair techniques, the postoperative prognosis has been enhanced. Although several studies have focused on short-term healing rates, only a few studies focus on the long-term healing rates of arthroscopic meniscal repair. The aim of this retrospective study was to evaluate the results of meniscal repair in an intermediate to long-term follow-up and compare the clinical outcome to MRI and the radiographic evaluation.

**MATERIAL AND METHODS:**
Between February 1989 and July 1998 112 patients were treated with meniscal repair at the Division of Sports Trauma, Aarhus University Hospital. 83 medial and 29 lateral meniscal tears had meniscal fixation with either suture meniscal arrows. All knees were stable. Between March 1992 and June 1998 a re-arthroscopy was performed in 58 patients due to symptoms of re-injury. Out of these 46 had a re-tear that was resected, 5 were re-sutured and 12 had healed. Out of the remaining 66 patients we were able to evaluate 31 patients clinical and subjectively with KOOS and Lysholm scores. Radiographic examination was evaluated according to the Fairbanks classification. An MRI was available in 27 patients.

**RESULTS:**
Out of the 31 patients 27 had no problems during daily activity (Lysholm score >84 points). The patients’ assessment of the knee function was high after repair. 12 had no problems, 15 had minor problems and 4 had major complaints. Radiographs were obtained for all 31 patients. 17 showed no further degenerative changes, 11 had a grade I and 3 had a grade III changes according to Fairbanks.

**CONCLUSION:**
After meniscal repair 59% healed primarily. Clinical evaluation in 47% of the clinical healed cases showed good clinical long-term results. MRI, however, showed signs of mucoid degeneration or scar tissue in 41% of the patients, and in 35% X-ray showed Fairbanks changes. Although MRI is an ideal diagnostic tool in discovering meniscal tears, its use in observing meniscal tear healing is limited, and the importance of the diagnosed changes is unknown.
E-poster w/ Standard #766
Meniscal Repair Using Bone Marrow-derived Mesenchymal Stem Cells: Experimental Study Using Green Fluorescent Protein Transgenic Rat
Yasunori Izuta, Hiroshima, JAPAN, Presenter
Mitsuo Ochi, Hiroshima, Hiroshima JAPAN
Nobuo Adachi, Hiroshima, Hiroshima JAPAN
Masataka Deie, Hiroshima, Hiroshima JAPAN
Takuma Yamasaki, Hiroshima, Hiroshima JAPAN
Rikuo Shinomiya, Hiroshima, Hiroshima JAPAN
Hiroshima University, Hiroshima, JAPAN

PURPOSE: The purpose of this study was to evaluate the efficacy of mesenchymal stem cell transplantation for meniscal repair in avascular status using an organ culture model. The cellular origin of the repaired tissue was also investigated using mesenchymal stem cells from green fluorescent protein transgenic (GFP) rats.

METHOD: Mesenchymal stem cells from bone marrow of GFP rats were isolated and expanded in monolayer culture. A full-thickness circular defect, 1.2mm in diameter, penetrating vertically on the anterior portion of the lateral and medial menisci of Sprague-Dawley rat was produced. The meniscal defects were treated in one of the following three ways: in the M group, the defect was filled with 1.0×10^6 cells/ml of mesenchymal stem cell in fibrin glue, in the F group, the defect was filled with fibrin glue without cells, and in the C group, the defect was left empty without cells and fibrin glue. Each of the meniscal explant was placed in a tissue culture plate and cultured. After culturing the explants for 2, 4, 12 weeks, 8 explants at every time point were examined histologically. A fluorescent microscope was used to detect the GFP positive cells derived from the donor cells in the repaired tissues.

RESULTS: In the M group, transplanted mesenchymal stem cells could survive and proliferate in the meniscal defect in the organ culture model. After 4 weeks of culture, round cell proliferation was found in the fibrin glue with new production of extracellular matrix around the cells. After 12 weeks of culture, the reparative tissue with many round cells surrounded by abundant extracellular matrix stained by toluidine blue was observed. We could detect the transplanted GFP cells in the repaired tissue under a fluorescent microscope after transplantation. In the C group and F group, extracellular matrix stained by toluidine blue was not observed at every time point.

CONCLUSION: This study demonstrated that, mesenchymal stem cell transplantation can be used as a novel cell source for the treatment of meniscal tear in the avascular zone.

E-poster w/ Standard #767
Use of Basic Fibroblast Growth Factor Combined with a Biodegradable Gelatin Hydrogel to Enhance Healing of the Avascular Region of Canine Menisci
Seiji Kubo, Pittsburg, PA, USA, Presenter
Nobuzo Matsui, Kobe, Hyogo, JAPAN
Shinichi Yoshiya, Kobe, Hyogo, JAPAN
Ryosuke Kuroda, Kobe, Hyogo, JAPAN
Takehiko Matsushita, Kobe, Hyogo, JAPAN
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Kobe University Graduate School of Medicine, Kobe, Hyogo, JAPAN

Introduction: Because only the outer third of the meniscus is vascularized, cartilaginous meniscal tissue has a limited healing capacity. Although previous studies have demonstrated that the use of basic fibroblast growth factor (bFGF) can facilitate healing process of meniscal tear, it seems difficult to maintain an effective concentration of bFGF at the injury site. One possible measure to overcome this obstacle is to deliver bFGF in combination with a biodegradable hydrogel composed of acidic gelatin that forms a polyion complex with bFGF molecules enabling gradual release of bFGF over an extended time period. The purpose of our study was to evaluate the effect of a bFGF-incorporating gelatin hydrogel on healing of the defects in the avascular region of the canine menisci.

Materials and Methods: A full-thickness defect, two millimeters in diameter, was created in the avascular region of each canine medial meniscus. The defects were treated with one of three ways: Defects were left empty in Group A; filled with gelatin hydrogels without bFGF in Group B; and filled with bFGF-incorporating gelatin hydrogels in Group C. Three defects from each group were evaluated histologically and biomechanically at 2, 4, 12, and 24 weeks after surgery.

Results: Histology: We observed either no healing or poor healing with formation of a thin layer of tissue at the defects in the Group A specimens at all time points. Week Two: In the Group B, granulation tissue covered the superficial areas of the defects, but the gelatin in the deep areas contained only a few spindle-shaped cells.
Granulation tissue also covered the superficial areas of the defects in the Group C. However, the gelatin in the deep areas contained more cells than those observed in the Group B, and most of the cells in the Group C defects were round in shape. We also observed a small volume of hyaline cartilage at the periphery of the defects. Week Four: Irregular connective tissue containing spindle-shaped cells had filled the defects in the Group B, while a small volume of hyaline cartilage was visible at the periphery of the defects. In contrast, hyaline cartilage containing round, actively-proliferating cells filled the defects in the Group C. Week Twelve: In the Group B, reparative tissue comprising connective tissue and hyaline cartilage with randomly oriented collagen fibers filled the defects and the border between the reparative tissue and the normal meniscal tissue remained clearly identified. In the Group C, the reparative tissue mostly contained parallel circumferential collagen fibers (like fibrous cartilage), and the border between the reparative fibrous cartilage and the normal meniscal tissue could hardly be identified. Week Twenty-Four: The reparative tissue primarily contained collagen fibers in the Group B. In contrast, in the Group C, the reparative fibrous cartilage had grown in thickness and the border between the reparative tissue and the normal adjacent meniscal tissue had become more indistinguishable than at the prior time point.

Mechanical analysis using the tactile sensor: We used a tactile sensor (AXIOM Co., Ltd., Fukushima, JAPAN) to evaluate mechanical properties of the repaired tissues at each time period. The measured stiffness of the repaired tissues in the Group C exceeded that in the Group B. Two factorial ANOVA showed that both the presence of bFGF and the time after surgery were significant factors for the results of the mechanical testing (p=0.05). A post hoc test indicated a significant difference in mechanical properties of the reparative tissue between the Groups B and C at the 12-week time point (p<0.05).

Conclusion: We used histological and mechanical methods to demonstrate that a bFGF-incorporating gelatin hydrogel can stimulate healing of the avascular region of canine menisci. Our findings suggest that the controlled release of bFGF is an important factor in healing enhancement of meniscal repair.

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**E-poster w/ Standard #768**

**Meniscus Transplantation in Patients with Grade IV Chondromalacia**

John Barlow Reid, III, Taos, NM, USA, Presenter
Dan Guttmann
James H Lubowitz, Taos, NM USA
Taos Orthopaedic Institute Research Foundation, Taos, NM, USA

**Purpose:** The purpose of this study was to compare outcomes of meniscal transplantation in patients with Grade IV chondromalacia to outcomes in patients with Grade I-III disease. Our hypothesis was that outcomes would be equal.

**Type of Study:** Retrospective case-control.

**Methods:** Included in this study were patients greater than 24 months status post meniscal transplantation performed by a single surgeon. Patients were stratified to a study group (SG) with Grade IV chondromalacia and a control group (CG) with less than Grade IV disease.

Demographic data was recorded for age, gender, length of follow-up, and number of previous operations. Patients were compared using IKDC Subjective Knee Evaluation Form (primary outcome criteria), satisfaction rating, whether they would choose the procedure again, complications, and additional operations.

**Results:** All 17 consecutive patients meeting the inclusion criteria were evaluated. The groups were not significantly different with regard to age (SG 38.0 years, CG 32.3 years; p=0.27), gender (SG 2/8 female, CG 2/9 female; p=0.89), length of follow-up (SG 64.1 months, CG 48.0 months; p=0.10), or number of previous operations (SG 1.8, CG 1.4; p=0.50).

IKDC Subjective Knee Score was significantly lower (p=0.04) in the SG (51.3) compared to the CG (72.8). There were no significant differences between groups with regard to satisfaction (SG 5/8, CG 7/9; p=0.33), choosing the procedure again (SG 5/8, CG 8/9; p=0.22), complications (SG 0/8, CG 1/9; p=0.53) or additional operations (SG 2/8, CG 4/9; p=0.29).

**Conclusion:** We demonstrate that outcome of meniscus transplantation in patients with Grade IV chondromalacia does not equal outcome in patients with Grade I-III disease. Despite the demographic similarities between groups, our study is limited by selection bias (patients in SG may have different prognosis than patients in CG). In addition, our study is limited by small sample size (post-hoc power analysis). Grade IV
chondromalacia may represent a relative contraindication to meniscus transplantation.

**E-poster #769**  
**Granulate or Rigid Wedge Tricalcium Phosphate Performs in Open Wedge High Tibial Osteotomy: A Radiologic Study with a New Evaluation System.**  
Ronald van Heerwaarden, Nijmegen, NETHERLANDS, Presenter  
Wouter van Hemert, Nijmegen, NETHERLANDS  
Karel Willems, Nijmegen, NETHERLANDS  
Patsy Anderson, Nijmegen, NETHERLANDS  
Ate Binne Wymenga, Nijmegen, NETHERLANDS  
Sint Maartenskliniek, Nijmegen, NETHERLANDS

The capacity of two forms of porous beta-tricalcium phosphate bone substitutes (TCP) to promote bone healing in open wedge high tibial osteotomy (OWHTO) was studied. We reviewed the X-rays of 27 osteotomies, with either TCP-wedges or TCP granules as filling material, to compare the bone healing rates and bone remodelling, at specific postoperative intervals. A new radiologic rating system for OWHTO was created and tested for clinical applicability. All osteotomies healed uneventfully and complete resorption of TCP was demonstrated at 1 year postoperative in 85% (n=23) of the procedures. In 44% (n=10) of these 23 procedures, the osteotomy site was no longer visible. No difference in bone healing rate and bone remodelling was found when comparing the use of granules to a wedge, and no adverse effects of TCP were observed. The good interobserver (k=0.7) and intraobserver (k=0.6) reliability of the new radiologic rating system enables clinical use. Good bone healing was found in OWHTO with both wedges and granules of TCP.

**E-poster #770**  
**Clinical Results of Patellofemoral Full Thickness Chondral Defects Treated With Hyalograft®-C.**  
Alberto W. Gobbi, Milan, ITALY, Presenter  
Ranace A. Francisco, Milan, ITALY  
OASI, Milan, ITALY

Aim of the study: Patellofemoral chondral lesions represent a severe problem for the orthopaedic surgeons. The use of tissue engineering has emerged as a potential therapeutic option for cartilage regeneration. The aim of our prospective study was to evaluate the efficacy of Hyalograft®-C, hyaluronan-based scaffold cultivated with autologous chondrocytes, in a group of patients with full thickness patellofemoral defects.

**Method.** We conducted a prospective evaluation of 14 patients (10 male and 4 females) treated with Hyalograft®-C at our institutions for patellofemoral chondral lesions. Average age was 34 yrs. (min 18 max 55) and the mean follow-up period was 24 months (max 37). The defect area was 8.2 cm² and the lesions were due to trauma in 8 patients, malalignment in 2 and sports-related microtrauma in 4. Three patients had underwent previous surgery and 1 patient had concomitant lateral release. Subjective evaluation, pre- and post-op pain assessment with VAS scale, ICRS-IKDC 2000 scores were used for final evaluation. All patients underwent MRI at 12 months. In two patients a 2nd-look arthroscopy and biopsy was performed. Student-T Test was used for statistical analysis.

**Results.** A significant improvement (p<0.0001) was found with VAS scale and subjective evaluation according to ICRS 4-level scale and 80% demonstrated an improvement in quality of life. A statistically significant improvement was reported with ICRS-IKDC scoring systems. MRI showed an almost normal cartilage aspect in 70% of our patients with positive correlation to clinical outcomes. Second-look arthroscopies showed a good integration of the graft with the surrounding cartilage and biopsies were characterized as hyaline-like cartilage (strong GAGs and collagen type II, absence of collagen type I, presence of cell-isogenic units).

**Conclusion.** Based on the results obtained, we conclude that Hyalograft C is a successful option for treatment of patellofemoral cartilage lesions particularly for those with large dimensions. Additional follow-up assessments will allow confirmation of the long-term durability of these results.

**E-poster #771**  
**Treatment of the Locked Knee Due to Bucket-handle Tear of the Medial Meniscus in Stable Knees**  
Masayuki Hamada, Hirakata, Osaka JAPAN, Presenter  
Kosie Shino, Habikino, Osaka, JAPAN  
Shuji Horibe, Sakai, Osaka, JAPAN  
Tomoki Mitsuoka, Yao, Osaka, JAPAN  
Yukiyoshi Toritsuka, Amagasaki, Hyogo, JAPAN  
Norimasa Nakamura, Suita, Osaka, JAPAN  
Takashi Natsu-ume Sakai, Osaka, JAPAN
Treatment of the locked knee due to bucket-handle tear of the medial meniscus in stable knees is controversial, while that with ACL insufficiency could be successfully treated by meniscal repair as well as ACL reconstruction. The purpose of this study was to clarify the effectiveness of one-stage treatment of reduction of the displaced meniscus followed by its repair.

(Materials and Methods)
Of the more than 900 arthroscopic meniscal surgeries during the past 10 years, as many as 17 cases (17 knees) were diagnosed isolated bucket-handle tear of the medial meniscus due to athletics. They were 16 male and 1 female patients with a mean age of 19 years (range 12-43). Eleven knees (65 %) were injured during kicking, 3 (18 %) were during twisting, 2 (12 %) were injured during landing and 1 (6 %) was during contact maneuver. All of them showed the knee locked. They were treated with one-stage treatment of reduction of the displaced meniscus followed by its repair.

(Results)
Sixteen menisci were repaired (average 12 sutures; range 8-16) and the remaining irreparably one was partially excised. While inside-out technique was applied using Henning instrumentation for repairing the middle to posterior segment, the zone specific cannula system and/or all-inside technique with the suture hook were utilized for the anterior segment tear. Postoperatively, all repaired cases were returned to their preinjury level at 4-5 months postsurgery. Second-look arthroscopy at average 12 months postsurgery in six knees revealed complete healing in 4 and incomplete healing in 2.

(Conclusion)
The locked knee due to bucket-handle tear of the medial meniscus in stable knees can be successfully treated with reduction of the displaced meniscus followed by its repair, while as many as 12 sutures were needed for repair.

E-poster #772
Autologous Chondrocyte Transplantation: Two Case Report
G. M. Reis Jr., Campinas, BRAZIL
Moises Cohen, Sao Paulo, BRAZIL, Presenter
UNIFESP-FEDERAL UNIVERSITY OF Sao PAULO-GMREIS, Sao Paulo, BRAZIL

INTRODUCTION: The use of cultured cells to regenerate cartilage lesions has been widely applied in the Autologous Chondrocyte Transplantation technique. Chondrocytes do not proliferate in vivo and damaged cartilage has a very limited capacity. Some surgical techniques, such as drilling, and abrasion, induce the filling of the damaged site with fibroblastic cells. The repair tissue formed shows fibrous characteristics, with distinct composition and biomechanics. The biological option for cartilage treatment, Autologous Chondrocyte Transplantation, results in the formation of cartilage maintaining the composition and function of the original tissue. In the Latin America this treatment was firstly applied in two patients with traumatic condyle lesion.

METHODS: LK, woman, thirty-nine years old and LSP, woman, thirty-nine years old showed osteochondral lesion, trochlea femoral and patellar chondromalacea. Previous surgeries and conventional treatments were unsuccessful. Autologous chondrocyte transplantation was indicated. During arthroscopy procedure the articular surfaces were regularized and cartilage samples were obtained form a non-weigh bearing area. The autologous chondrocyte transplantation was made 20 days after the arthroscopy. The follow up was made using MRI. A second arthroscopy was made in both cases.

RESULTS AND DISCUSSION: The 10 months follow-up of the two full chondral defect of the femoral condyle treated with autologous chondrocyte transplantation showed satisfactory clinical results. The second arthroscopy made showed periosteum integration and the appearance of normal cartilage. The tissue formed at the lesion site was soft, indicating chondromalacea, level I. The MRI showed a cartilage formation at the site of the lesion.

CONCLUSION: The conclusion that the autologous chondrocyte transplantation can be safety carried on in BRAZIL came from the satisfactory clinical evaluation of the patient, the MRI images and the second arthroscopy showing graft integration. Other clinical cases are in progress to extend the data.
Introduction: The aim of this retrospective study is to demonstrate the experience of three Brazilian Centers of Extracorporeal Shockwave Therapy using an electro hydraulic high-energy device (REFLECTRON-HMT) to treat Soft Tissue Pathologies.

Materials and Methods: From March 2001 to May 2003, 260 consecutive patients were treated in 6 different orthopaedic practices: 60 tendinosis calcarea of the shoulder, 26 tendinosis of the shoulder, 42 epicondylitis; 24 hip bursities, 39 Achilles tendon calcifying (or not) tendinosys; 69 plantar fasciitis.

Inclusion criteria was a minimum of 6 months of unsuccessful conservative treatment. One treatment was performed on 235 patients, 21 patients underwent a second treatment and 2 patients underwent a third treatment. Depending on the localization 1200 to 1500 pulses at E3 to E7 were applied as the parameters suggested by HMT.

We used the analogical-visual scale of pain intensity as subjective evaluation, considering optimum/good values between 0-3, fair 4-6, unsatisfactory 7-10.

We observed side effects such as local irritation, petechia, hematomas, swelling and increase in pain 24-36 hours after treatment. Through an objective point of view, we matched x-rays and ultrasound exams which had been performed before treatment with those that were performed 90 and 180 days after treatment.

Results:
The Roles and Maudsley criteria were used for outcome analysis:
Grade 1: excellent - no pain, full movement and activity.
Grade 2: good - occasional pain, full movement and activity.
Grade 3: acceptable - some discomfort after prolonged activity.
Grade 4: poor - pain limiting activity.

Seven patients were excluded because of inadequate follow-up. The remaining 253 patients were included in the analysis with follow-up ranged from 6 to 14 months.

We considered excellent and good (Grade 1 - 2): 46 cases (77.96%) of tendinosis calcarea of the shoulder, 23 cases (88.46%) of tendinosis of the shoulder, 32 cases (80%) of epicondylitis; 22 cases (91.66) of hip bursitis; 24 cases (66.66%) of Achilles tendon calcifying (or not) tendinosys and 52 (74.47%) of plantar fasciitis.

The improvement in pain score (VAS) was statistically significant when a follow-up examination was performed after 30, 90 and 180 days.

Intra-Articular Synovial Lipoma of the Knee Located in the Intercondylar Notch, between ACL and PCL. A Case Report.
Harilaos S. Vasiliadis, Ioannina, GREECE, Presenter
Efstathios Motsis, Ioannina, GREECE
Theodoros Xenakis, Ioannina, GREECE
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We report a case of a 16 year old girl with persistent knee pain. No history of trauma or any joint disorder or general disease was evident. Pain sustained for the last two years, especially after stressing activities, with no respond to conservative treatment. Clinical evaluation revealed no effusion of the knee joint which was stable, with no signs of ACL or PCL laxity or other ligament or meniscal injury. From the palpation of the joint, a slight protrusion was felt at the popliteal region. MRI showed an intraarticular tumor arising from the posterior synovium extending between the ACL and PCL. Characters were completely compatible with lipoma.

Arthroscopy confirmed the presence of the tumor, and the histological examination ensured the diagnosis of synovial lipoma. Excision of the lipoma led to immediate relief of the symptoms postoperatively. Intra-articular synovial lipoma is a very rare situation usually seen in adults, with only a few references in the literature. One more case found in an adolescent and also one more have been described located in the intercondylar notch. Intra-articular synovial lipoma although rare, should be considered in the differential
diagnosis of knee pain in young patients with no history of trauma.

E-poster #802
Injuries in Naval Special Warfare Sea, Air and Land (Seal) Personnel: Epidemiology and Surgical Management of this New Elite Athlete
Shaun N Peterson, Suffolk, VA, USA, Presenter
John K Sekiya, Portsmouth, VA USA
Michael H Call, Virginia Beach, VA USA
Daniel V Unger, Portsmouth, VA USA
Bone and Joint Institute, Naval Medical Center, Portsmouth, VA, USA

Purpose: No previous studies have been performed looking at the epidemiology of injuries within the Naval Special Warfare (SEAL) commands. The purpose of this study is to determine the injury incidence of the Naval Special Warfare community and correlate these injuries with surgical management.

Methods: Subjects included personnel assigned to our East Coast SEAL commands, including SEAL operators, Special Boat squadrons, Explosive Ordinance and Disposal staff, supply and logistics teams, and medical support, that presented to our clinic during a 3-year period. The diagnoses obtained from clinic visits were stratified according to body part and location, and further subdivided according to ICD-9 diagnostic codes. The surgical management of these same patients was correlated to the corresponding ICD-9 diagnosis and also subdivided according to body part and location.

Results: A total of 1,165 clinic visits and 169 surgeries were recorded during the study period. While back/neck injuries were most common (27%, 308), the majority were successfully treated with non-operative methods (6% visits progressed to surgery). The knee (21%, 243) and shoulder (19%, 219) were the 2nd and 3rd most common reasons for clinic visits, and most frequently went on to surgical management following presentation (33% knee, 32% shoulder). The 3 most common diagnoses were shoulder bursitis, lumbar sprain/sprain, and ankle sprain/instability. The 3 most common surgeries were arthroscopy meniscectomy, distal clavicle excision, and subacromial decompression.

Conclusions: The SEAL commands have a high percentage of injuries that progress to surgical intervention. Mission and training demands may all contribute to delays in seeking medical attention until injuries that would have been amenable to rehabilitation become surgical. The diverse nature of their injuries may be secondary to their high level of performance and need to perform a variety of activities including climbing, swimming, diving, running, jumping, and hand to hand combat. This research has allowed us to better stratify the injury patterns in the Naval Special Warfare community and direct future preventive and rehabilitative efforts to reduce the risk of injury and the incidence of overuse injuries. This is truly a unique elite athlete with a pattern of injuries and treatment that has not been previously described.

E-poster #803
Ultracongruent-type Total Knee Arthroplasty versus Posterior Stabilized-type Total Knee Arthroplasty - Prospective Randomized Comparison for Postoperative Stability
Kenzo Takatoku, Kawachi Gun Minami Kawachi, Tochigi JAPAN,
Hisashi Takada, Tochigi, JAPAN
Kakuko Tobita, Nikko, Tochigi JAPAN
Munetada Kamimoto, Tochigi, JAPAN
Yusei Kariya, Tochigi, JAPAN
Hitoshi Sekiya, JAPAN, Presenter
Jichi Medical School, Tochigi, JAPAN

Posterior stabilized (PS) type knee prosthesis is one of the most prevalent types of total knee arthroplasty (TKA) supported by long-term favorable results. However, it has some drawbacks such as patellar clunk, knee dislocation, tibial spine wear and breakage, and click sensation during knee flexion. One possible solution for these problems is usage of ultracongruent (UC) type knee prosthesis which has a high anterior lip and deep dished surface to enhance the congruity to femoral prosthesis. To clarify the stabilizing effect of UC knee prosthesis, stability of two types of knee prostheses were compared. We had prospectively performed two types of TKA made by the same manufacturer (Natural Knee ® total knee system, Centerpulse Inc, Zurich, SWITZERLAND). PS and UC type prostheses were used in 36 and 37 knees, respectively. Distribution of patient age, sex, causative disease, and preoperative range of motion were similar in both groups. One year or more after the surgery, stability of the knee was evaluated. Lateral stability was evaluated using with Telos stress machine ® at 15 degrees of knee flexion applying the varus or valgus force of 70 N. Anteroposterior laxity was evaluated using the KT-
1000 arthrometer® at 20 and 80 degrees of knee flexion applying the anterior force of 89 N or posterior force of 133 N. No difference was found between two groups at anteroposterior laxity at 20 degrees of flexion (8.9 mm in PS; 9.4 mm in UC), postoperative range of motion (106.8 degree in PS; 107.6 degree in UC), and lateral laxity (7.6 degree in PS; 7.9 degrees in UC). However significant difference was found in anteroposterior laxity at 80 degrees of flexion (5.6mm in PS; 7.0mm in UC) (p=0.008), the difference was 1.4 mm on average. Since UC knee prosthesis has little drawbacks compared with PS knee prosthesis, similar stability found in UC knees as PS knees in this study might indicate the superiority of the UC knees.

E-poster #804
Effects of Isokinetic Training for Leg Flexion and Extension Muscle: A Review
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UNIFESP-FEREAL UNIVERSITY OF Sao Paulo, BRAZIL

The purpose of this study is a literature review about isokinetic training for leg flexion and extension muscles, in order to allow applicability based in scientific evidence for the clinical practitioner, or those who intend to include the isokinetic dynamometer in a training or rehabilitation process in their daily practice. An analytical review of clinical trials, retrospective and case studies in which isokinetic training of any type for leg flexion and extension muscles was performed with a group of healthy subjects and/or with those with knee diseases, was performed. The used sources of studies were: the electronic data bases LILACS, MEDLINE, Cochrane, a list of references of the found studies, manual search in indexed magazines, and finally, e-mail communication with the author. Thirty eight studies were selected from a total number of five hundred and forty two articles found in the bibliographical search. They were classified and described. It was possible to observe that isokinetic tests and training protocols are variable, besides that, most of them did not meet all the standard requirements that could interfere in tests results. Accomplishment of studies that have a thorough standard method, fulfilling the necessary standardizations of isokinetic tests and which follow more homogeneous training protocols that can be possibly compared permitting a clinical and experimental reproduction of the results are required, besides the need for a systematic review about the subject.

E-poster #805
Continuous Femoral Block: A Comparison with Endovenous Continuous Analgesia in Reconstruction of Anterior Cross Knee Ligament Under Arthroscopic Assistance
Alvaro Cristian Ojeda, CHILE, Presenter
Victor Contreras, Concepcion, CHILE
Paulina Carbonell, Concepcion, CHILE
Esteban Diaz, Concepcion, CHILE
Edgardo Sanzana, Concepcion, CHILE
Fredy Cristian Montoya, Concepcion, CHILE
Worker’s Hospital Concepcion. University of Concepcion, Concepcion, CHILE

BACKGROUND:
Continuous Femoral Block (CFB) is use for postoperative analgesia in joint replacement of hip and knee with very good results, because it offers advantages in comparison with other locoregional or endovenous analgesic techniques and has low incidence of complications. The aim of this study was to clinically evaluate the utility of the continuous femoral block compared with endovenous analgesia in reconstruction of anterior cross knee ligament under arthroscopic assistance.

METHODS:
Controlled prospective study of 31 patients ASA I scheduled for surgery between December 2001 and March 2003. The patients were divided into two grups: Group I (n=15) received a continuous femoral block installed under neurostimulation with an infusion of bupivacaine and clonidine; Group II (n=16) received endovenous infusion of ketoprofen. All patients received spinal anesthesia and sedation for the surgical procedure. For postoperative pain, all patients received morphine in PCA. Postoperative pain was recorded at 2, 4, 6, 24 and 36 hours after surgery using the Visual Analog Scale (VAS). Morphine consumption is compared between the two. Results were analyzed using ANOVA and t Student test, considering p < 0.05 significant.

RESULTS:
In Group I postoperative VAS between 4 and 24 hours was 1.3 mm +/- 0.2 and in Group II was 4.7 mm +/- 0.4 (p=0.001). Morphine consumption between 4 and 24 hours after surgery in Group I was 3 mg +/- 1.5 and in Group II was 15 mg +/- 1.5.
In 6.7% of patients of Group I nausea or vomiting were registered and 18.8% in Group II. One case of intense motor blockade appeared after 18 hours in Group I.

CONCLUSIONS:
The Continuous Femoral Block (CFB) installed under neurostimulation it’s a useful and secure technique for the management of postoperative analgesia after reconstruction of Anterior Cross Knee Ligament under arthroscopic assistance.

E-poster #806
Rapid Destruction of the Knee Joint: A Report of Six Cases
Akira Okano, Kanazawa city, Ishikawa, JAPAN, Presenter
Katsuhiko Kitaoka, Kanazawa city, Ishikawa, JAPAN
Yoshinobu Maruhashi, Kanazawa city, Ishikawa, JAPAN
Ryuichi Nakamura, Kanazawa, Ishikawa, JAPAN
Kenichi Nakamura, Kanazawa, Ishikawa, JAPAN
Takeshi Tsuyama, Kanazawa city, Ishikawa, JAPAN
Kanazawa University, Kanazawa city, Ishikawa, JAPAN

(Introduction)
Rapid destruction of the knee joint is relatively uncommon and is associated with a variety of disease states, such as steroid-induced arthropathy, insufficiency fracture, osteonecrosis, and Charcot joint. Its differential diagnosis is uncertain. The purpose of this study was to evaluate the etiology of rapid destruction of the knee joint.

(Materials & Methods)
We reviewed the cases of six patients with rapidly destructive changes of the knee joint who had been treated with total knee arthroplasty. The patients included four women and two men, and their mean age was 72.7 years (range, 64 to 78 years). The destruction was located in the tibial medial plateau in three cases, the lateral plateau in one, the femoral medial condyle in one, and the lateral condyle in one. We investigated these patients with regard to period of rapid destruction, history of corticosteroid injection, minor trauma, hemarthrosis, and histopathological findings.

(Results)
The average duration of rapid destruction was 5.3 months (range, 3-7 months). Four patients had a history of intraarticular corticosteroid injection with an average duration of 40 months (range, 2 months-8 years). Three patients have a history of minor trauma before knee destruction, and two patients had a history of hemarthrosis. Histopathological study showed necrotic findings in four cases. Rapid destructive coxopathy (RDC) is a syndrome of unknown etiology that causes rapid destruction of the hip joint. However, rapid knee gonarthrosis is not a recognized clinical entity. The present study was performed to investigate the etiology of rapid destruction of the knee. We considered rapid destruction of the knee joint to be caused by multiple factors, such as steroid injection, leg length discrepancy, obesity, genu varus, and osteoporosis. As rapid destruction of the hip caused by multiple factors is defined as RDC, we concluded that rapid destruction of the knee caused by multiple factors should be considered rapid knee gonarthrosis (RDG) syndrome for investigation of its etiology and prevention.

E-poster #807
Reflex Sympathetic Dystrophy of the Knee Following Arthroscopy
Rodica Marinescu, Voluntari, ROMANIA, Presenter
Dan Laptoiu, Bucharest, ROMANIA
Ioana Simion, Bucharest, ROMANIA
Colentina Clinical Hospital, Bucharest, ROMANIA

Reflex sympathetic dystrophy of the knee has been documented in a series of 9 cases - 7 females, age 36 to 49. Medical history, physical examination, X-rays and bone scans supported the diagnosis - the trigger moment being the arthroscopic intervention (1 ligamentoplasty, 8 meniscectomies).

Due to close follow-up of our arthroscopy cases, the patients were diagnosed and treated early (from weeks to less than three months). All received sympathetic nerve blocks performed by a trained anesthesiologist which detailed the therapeutic protocol - multiple blocks separated by brief intervals with close monitoring of pain and function; sequential oral drugs followed in the scheme - sympathetic blocking agents, NSAID’s, vitamins.

Conclusions:
- early diagnosis is vital to successful therapeutic management;
- the anesthesiologist remains the key in administering the complex therapeutic protocol;
- nerve blocks were minimally invasive and the most efficient method
- surgery in the affected knee should not be performed until the syndrome is controlled.

E-poster #808
The Operative Treatments of Bakers Cyst: A Prospective Comparative Study Between Simple Cyst Excision with Orifice Penetration and Cyst Removal with Repair
Hyung-Cheon Kim, Busan, KOREA
Jae-Do Kang, Busan, KOREA
Kwang-Yul Kim, Busan, KOREA
Dong-Gil Harm, Busan, KOREA
Sin-Kweon Choi, Busan, KOREA
Jun-Hyeong Kwon, Busan, KOREA
Seong-Ju Lee, Busan, KOREA
Moon-Sup Lim, KOREA, Presenter
Wallace Memorial Baptist Hospital, Busan, KOREA

Introduction:
Since Adams first described popliteal cysts in 1840, many treatments, including conservative method, have been introduced. But recurrence of Bakers cyst, despite of developed operative method, has been countered unsolved problem to surgeon.
We devised arthroscopic cyst removal with orifice penetration technique and evaluated the recurrence rate with score prospectively.

Material and Methods:
Between March 1998 and February 2002, fifty-eight cases of Bakers cyst were operated and lost 6 patients during follow-up. Mean age was 49.6 years old (ranged, 34 to 65 years old), mean follow-up was 3.4 years (ranged, 2.1 to 6 years).
Arthroscopic cyst removal with orifice penetration group and cyst removal with orifice repair group were analyzed and compared subjective and objective scores with recurrence rate.

Results:
Twenty-three of the 25 patients who had cyst removal with orifice penetration were rated excellent or good and had only one case of cyst recurrence, eighteen of the 27 patients who had simple cyst excision with repair were rated excellent or good and had a 5 cases of recurrence.

Conclusion:
Cyst removal with orifice penetration operation technique shows superior results in subjective and objective scores and lower recurrence rate compared with simple cyst excision with repair technique.

•E-poster #809
The Treatment of Scaphoid and the fifth Metatarsus non-union with Shockwave Therapy - Story of Cases
Ana Claudia Souza, Rio de Janeiro, BRAZIL, Presenter
Paulo Roberto Rockett, Porto Alegre, BRAZIL

Introduction:
The incidence of non-union is directly on the factors as adequate conservative treatment to the breaking trace, presence or not of shunting line of the fragments, and time of immobilization. In the symptomatic cases of non-union, the surgical treatment using allograft and internal fixation, has demonstrated success of 97% consolidation. However, the Extra corporeal Shock Waves Therapy appears with the scientific and technological evolution for less invasive techniques, beginning an alternative method in the scene of the International Orthopaedic Surgery, non invasive, without significant complications and with high economic advantages.

Objective:
Presentation of two cases of non-union treated with Extra corporeal Shock Wave Therapy using only one application with electro hydraulic device (REFLECTRON).

A case of Scaphoid and a case of the fifth metatarsus non-union treated, in doctor's office, excusing the internment process.

Material and Methods:
First patient, male, 31 years old, suffered fall from motorcycle in 05/10/02 occurring fracture of Scaphoids tuberosity and developing a non-union due to non-treatment in the attendance in the emergency.
The second patient was a female, 57 years old, suffered fall in 12/23/02 with twist from the left foot being a refugee pulling up fracture of the base of the fifth metatarsus that was treated with a synthetic plaster boot per 29 days immobilized. Presenter since this date pain and lameness it always consulted some doctors making others radiological exams being guided for physiotheraphic treatments. After 6 months we confirmed the diagnosis of non-union of the base of the fifth metatarsus demonstrating mobility of the distal small fragment through dynamic echo graphical exam with stress.
They were submitted to the Shock Wave therapy in doctor’s office, with an only application of 4000 impulses, with high energy (E9), after local anesthesia. After the application, the patients remained immobilized with a cast per 8 weeks (the first one) and 6 weeks (the second one) being evaluated in 4 weeks, 6 weeks, 8 weeks with and 13 X-rays control.

Results:
To the end of 8 weeks after the application and use of the cast glove, the patient of the Scaphoid’s non-union presented formation of bone bridge enters the fragments in the control x-rays and remission of the painful symptoms.
To the end of 13 weeks the simple x-rays evidenced consolidation of the bone fail line.
In the patient with non-union of the base of the fifth metatarsus we removed the synthetic plaster boot with 43 days when presented in the x-rays control consolidation of the fracture line.

Conclusion:
The Extra corporeal Shockwave Therapy must be considered as alternative in the treatment of Scaphoid’s and the fifth Metatarsus’s non-union. It presents as advantages not to be invasive, not to present significant complications beyond lesser operational costs; being prevented on the other hand, the significant potential risks described in literature, of the traditional surgical procedures.

E-poster #810
Cementing Techniques in Total Knee Replacement
Royden Harvey Austin, Liverpool, UNITED KINGDOM, Presenter
Richard W Parkinson, Neston, Cheshire, UNITED KINGDOM
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There is a large deficit of evidence in the modern literature upon cementing techniques in the procedure of Total Knee Replacement compared to that published for Total Hip Replacement and there is no recognised ‘best’ or standardised technique.
We set out to investigate the most common techniques in modern practise in the UK today by modern laboratory based research. Variables included cement preparation, cement application and temperature. Our aim was to see if there was any measureable differences between the techniques with special regard to the cement pressurisation and strength of fixation in order to define a standardised technique.

In our study we have used Tibial saw bones, electronic pressure transducers, and industrial standard stress rigs to evaluate the pressures that each technique generates and the strength of prosthesis fixation that is acheived for a variety of cements at a spectrum of temperatures.

E-poster #813
Comparison of Blood Loss in TKA in Relation to Use Tourniquet
Etsuo Shoda, Nishinomiya, Hyogo, JAPAN, Presenter
Yoshitaka Tomita, Hikami-gun, Hyogo, JAPAN
Takashi Oribe, Hikami-gun, Hyogo, JAPAN
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Although minimizing blood loss in TKA, the use of tourniquet is controversial due to the risk of pulmonary thromboembolism. In this study, we compared blood loss in relation to use tourniquet during TKA.

Materials and Methods> This study was retrospective study of 62 patients receiving cemented or hybrid TKA (NexGen, Zimmer). In the T group, 25 patients received TKA with tourniquet after synovectomy. In the LT group, 18 patients had surgery with tourniquet after osteotomy. In the NT group, 19 patients had surgery without tourniquet. ConstaVac blood conservation system II (CBC II, Stryker) was used in all cases after surgery. Intraoperative and postoperative blood loss, decreased Hb, and the effect of CBC II were investigated.

Results> Mean intraoperative blood loss was 141ml in the T group, 414ml in the LT group, and 409ml in the NT group. There was a significant difference between T and LT, NT groups. Mean postoperative blood loss was no difference in each group (T:412ml, LT:519ml, NT:672ml). Total blood loss was significantly less in T group. However, ther was no difference in the decrease in Hb among each group (T:3.8, LT:3.9, NT:3.8g/dl). Postoperative autotransfusion was performed in 17 of 25 cases in the T group (mean reinfusion: 303ml), 14 of 18 cases in the LT group (354ml), and all of 19 cases in the NT group (393ml). Alloegenic blood transfusion was necessary in 3
cases in the T group, 1 case in LT group, and 2 cases in the NT group.

<Conclusion> The tourniquet was effective to minimize blood loss in TKA. However, there was no difference in the decrease in Hb among each group after autotransfusion using CBC II.

E-poster #814
Maximiliano Ranalletta, Buenos Aires, ARGENTINA, Presenter
Walter O. Rossi, Capital, Buenos Aires, ARGENTINA
Nestor Abel Brigatti, Tolosa, Buenos Aires, ARGENTINA
Alejandro Ranaletta, Buenos Aires, ARGENTINA
Medicina del Deporte SA, Buenos Aires, ARGENTINA

Introduction: A prospective arthroscopic study to evaluate the incidence of the anterior meniscofemoral ligament (aMFL) in 100 consecutive knees was performed. Material and methods: Between June 2002 and September 2003, 100 knees were prospectively evaluated to determine the incidence of the aMFL during arthroscopic anterior cruciate ligament reconstruction procedures. The mean patient age was 30 years-old (range: 16-45), 93 patients were male and 7 female. In 49 patients, the right knee was evaluated, and in 51, the left.
Inclusion criteria: skeletally mature patient under 45 years-old, isolated ACL injury. Exclusion criteria: degenerative articular changes, lateral meniscus injury, ligament insufficiency other than ACL, previous knee surgery. Previous to the ACL reconstruction the intercondylar notch was examined. Shaver and radiofrequency were utilized to expose the posterior cruciate ligament (PCL). The anterior surface of the PCL was carefully debrided from sinovial tissue and any connection between the posterior horn of the lateral meniscus and the medial condyle was assessed.
Results: All the knees presented fibers connecting the posterior horn of the lateral meniscus to the medial condyle running anterior to the posterior cruciate ligament. The aMFL or Humphrey’s ligament was present in all the knees as a constant structure.
Discussion: Traumatic, degenerative (age) and racial differences have been proposed as a cause of the considerable variation of the reported incidence of these ligaments.
In our study, healthy young patients with no degenerative changes, no meniscal injuries and no ligament disruption except from the ACL, presented the aMFL as a constant structure. No attempt to find the posterior menisco-femoral ligament of Wrisberg was done due to its position behind the PCL. To the best of our knowledge this is the first arthroscopic study conducted to evaluate the incidence of the aMFL.

E-poster #815
Spontaneous Osteonecrosis of the Medial Femoral Condyle of the Knee and Medial Meniscal Tears
Matias Costa-Paz, Buenos Aires, ARGENTINA, Presenter
D. Luis Muscolo, Buenos Aires, ARGENTINA
Miguel Angel Ayerza, Buenos Aires, ARGENTINA
Arturo Makino, Buenos Aires, ARGENTINA
Italian Hospital of Buenos Aires, Buenos Aires, ARGENTINA

The etiology of SON of the knee is uncertain and a number of factors have been implicated in the development of this pathology. Several authors have emphasized the association of the medial meniscal tears with osteonecrosis, although the exact temporal and casual relationship between the two conditions is controversial. Also osteonecrosis of the knee developing after arthroscopic meniscectomy has been previously reported.
We reviewed a series of five elder patients that were referred to our institution with indication of an arthroscopic meniscectomy, showing medial meniscal tears confirmed by MRI with negative findings of ON. Patients were alerted of the potential complication of developing an ON and were treated conservatively. All patients had recurrent pain and were re-evaluated with a second MRI study, showing images compatible with ON.
The purpose of this study was to evaluate the association of medial meniscal tears and spontaneous ON of the knee with the intention of clarifying the etiology of postarthroscopy ON. The average age was 68 years (range 63-77). There were five men. Clinically all the patients had tenderness at the medial joint line which increases with the activity. At initial MRI evaluation all five patient had tears of the
posterior horn of the medial meniscus. There were no findings of ON in these studies. Reevaluation with MRI revealed abnormalities at the medial femoral condyle consistent with ON. The mean time from initial MRI to second MRI was 3.5 months. The size of the osteonecrotic image showed at the MRI was measured, and values obtained averaged 21%. The development of osteonecrosis following arthroscopic knee surgery is rare, but the role of the procedure may be questioned. Our data support the contention that meniscal injury may be the first event, followed by the development of ON of the knee without meniscectomy arthroscopy. This series would elucidate the natural sequence of events as well as rule out arthroscopic procedure as a cause. Elderly patients with medial meniscal tears should be alerted of this potential sequence of events and the impossibility at that stage to predict or prevent this situation, specially before performing an arthroscopic meniscectomy. This injury may occur during the creation of the posteromedial portal, the manipulation of the tissues in the posterior part of the capsule of the knee joint or drilling the tibial hole. If an injury to the popliteal artery is suspected, immediate consultation with a specialist in vascular surgery is mandatory. Prompt arteriography and vascular repair is indicated in view of the high rate of amputation that is associated with this injury. Surgeons should be aware of this potential problem and should protect the soft tissue on the posterior tibia distal to the insertion of the PCL.

E-poster #816
Popliteal Artery Laceration During Arthroscopic Double Bundle Posterior Cruciate Ligament Reconstruction
Arturo Makino, Buenos Aires, ARGENTINA, Presenter
Matias Costa-Paz, Buenos Aires, ARGENTINA
D. Luis Muscolo, Buenos Aires, ARGENTINA
Sebastian Concaro, Buenos Aires, ARGENTINA
Miguel Angel Ayerza, Buenos Aires, ARGENTINA
Italian Hospital of Buenos Aires, Buenos Aires, ARGENTINA

Arthroscopic posterior cruciate ligament (PCL) reconstruction may carry risk of complications, including injury to the neurovascular structures in the popliteal region. However, to our knowledge, its occurrence during arthroscopic PCL surgery has not been reported. We report a case of acute popliteal artery laceration during arthroscopic PCL reconstruction. Surgery presented no complication and when the tourniquet was removed a sudden decrease of the blood pressure was detected and copious bleeding from the posteromedial incision occurred. A intraoperative angiography showed extravasation of the contrast through the anterior aspect of the popliteal artery. A vascular surgeon applied a saphenous vein graft to the laceration and fixed it. The patient underwent a standard rehabilitation protocol without any complication.

INTRODUCTION: osteitis pubis is a common cause of pain in the groin and pubis areas in soccer players who perform repetitive movements of kicking during training and games. PURPOSE: to determine a routine of clinical and subsidiary evaluation of the osteitis pubis as well as surgical treatment and physical therapy. METHOD: 20 (twenty) male soccer players with ages ranging from 18 to 30 years, complaining of pain in the groin and pubis area for over 12 months and without improvement with conservative treatment were prospectively evaluated. The patients were submitted to a routine of clinical evaluation, including specific maneuvers and image tests (XR and MR) and submitted to surgical treatment predominantly consisting of debridement of symphysis pubis adductor tenotomy. Patients were submitted to physical therapy, returning to sports activity after a mean period of 6 weeks. CONCLUSION: Diagnostic and surgical routine allowed a standardization to conduct osteitis pubis, returning to sports activity with improvement of pain.
E-poster #818
Arthroscopic Treatment of Traumatic Knee Joint with Hematoma in Children and Adolescents
Urszula Zdanowicz, Warsaw, POLAND, Presenter
Robert Smigielski, Warsaw, POLAND
Stefan Matuszewski, Warsaw, POLAND
Michal Drwiega, Warsaw, POLAND
Carolina Medical Center, Warsaw, POLAND

Goal: Our goal was to evaluate retrospectively the indications for arthroscopic treatment in children and adolescents after acute knee trauma.

Material and methods: In the 1997-1998 and from April 2003 till March 2004 we have established program of arthroscopic treatment in children and adolescents with knee hematoma after trauma. In this time we performed 116 arthroscopies in children and adolescents, in 37 cases after acute sport-related trauma - mean age was 13.5 (6-17), 32% girls, 68% boys. Each child had a recent history of acute knee trauma and presented very painful and swollen knee joint. In every case we did bilateral X-ray A-P, lateral and Merchant's views. Arthroscopy was performed under general anesthesia.

Results: In all cases except two we found hematoma. Other intraarticular injuries: cartilage injuries in 48.25% cases, ACL - 15.62%, plica mediopatellaris - 19.1%, medial retinaculum injury - 52%, medial meniscus - 13.5%, lateral meniscus - 10.75%, loose bodies - 27.5%, synovitis - 59.9%, compressive fracture - 36%, intercondylar eminencia fracture - 9.19%, patella subluxaction - 52% of cases. In all cases of intercondylar eminencia fractures other injuries were presented: partial ACL injuries (posterolateral part) - 3, meniscal injury - 1, patella cartilage fractures - 1. Only in 36.6% cases X-ray was Presenter some pathology.

Conclusion: Knee arthroscopy in children and adolescent patients being safe, gives a high diagnostic accuracy, and what’s the most important allows treatment of a variety of intraarticular conditions, which are not seen in routine X-Rays. We do believe that urgent (within 48 hours) knee arthroscopy should become a standard in children after trauma and with clinical symptoms of hemarthromata, even if routine X-ray is normal.

E-poster w/ Standard #820
Video Informed Consent Improves Knee Arthroscopy Patient Comprehension

Michael Rossi, Presenter
James H Lubowitz, Taos, NM USA
Dan Gottmann
Megan J. MacLennan
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Purpose: The purpose of this study is to test the hypothesis that video informed consent improves knee arthroscopy patient comprehension and satisfaction as compared to traditional verbal informed consent.

Type of Study: Prospective, randomized, case-control study.

Methods: Consecutive patients having informed consent in preparation for knee arthroscopy by a single surgeon were stratified by educational level less than or equal to 12th grade or greater than 12th grade, then randomized to video or traditional verbal informed consent groups. Immediately after the informed consent process, patients completed an outcome questionnaire evaluating comprehension and satisfaction.

Results: Patients in the video group demonstrated significantly higher comprehension (78.5%) than patients in the verbal group (65.4%) (p=0.00001). In the subgroup with less than or equal to 12th grade education level, the video patients scored 73.1% comprehension and the verbal patients only 54.2% (p=0.0011). In the subgroup with greater than 12th grade education level, the video patients scored 82.3% and the verbal patients scored 72.2% (p=0.0002).

There was no significant difference in subjective self-assessment of satisfaction between groups.

Conclusion: Video informed consent improves knee arthroscopy patient comprehension as compared to traditional verbal informed consent.

E-poster w/ Standard #821
Internal Fixation of Osteochondral Lesion of the Knee with PLLA Pins
Takashi Natsu-ume, Sakai, Osaka JAPAN, Presenter
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Type of Study: Retrospective Analysis
Introduction: Among several methods for fixation of osteochondral lesion, fixation with biodegradable pins has the advantage of easy handling and no need for hardware removal. In this study, we reported our experience of internal fixation of unstable osteochondral lesion of the knee with poly-L-lactic acid (PLLA) pins.

Materials and Methods: Thirty patients with symptomatic osteochondral lesions (14 osteochondritis dissecans [OCD] and 16 osteochondral fractures) were treated with PLLA pins. There were 22 males and 8 females with a mean age of 20 years, ranging from 11 to 36 years. All lesions were unstable and the average size was 4.3 (2.1~8.8) centimeter square. The medial femoral condyle was affected in 11 patients, and the patellofemoral joint was affected in 19 patients. These lesions were fixed by multiple PLLA pins (1.5 - 3mm diameter) after curettage of the bone bed, followed by autogeneous iliac bone grafting when necessary. Their clinical symptoms and healing scores were evaluated by X-ray, MRI and reconstructed CT. Second-look arthroscopy was performed in 13 OCD and 8 fracture patients.

Results: Mean follow-up was 14 months. All patients but one had no or decreased knee pain. Only one patient experienced joint effusion. Healing scores improved in all the patients. At second-look arthroscopy, union of the fragment was confirmed in all the fracture patients. In one of the OCD patients, detachment of the lesion was found. Pin protrusion from the articular surface and cartilage damage at the opposite surface was observed in two cases.

Conclusion: Internal fixation with PLLA pins is effective method for the treatment of osteochondral lesion of the knee. However, considerable caution should be directed to the possibility of pin protrusion and subsequent risk of erosion of the opposite cartilage and tissue reaction.

E-poster w/ Standard #822
Postoperative Range of Motion for Cruciate-Retaining Total Knee Arthroplasty - Relationships with posterior condylar offset and evaluation of rollback-
Jun Nishiike, Kushiro, Japan, Presenter
Humihiro Oha, Hakodate, Hokkaido, Japan
Takashi Ishida, Hakodate, Hokkaido, Japan
Shigeru Yamane, Hakodate, Hokkaido, Japan
Yasumitsu Ohkoshi, Hakodate, Hokkaido, Japan
Kazuki Yamamoto, Hakodate, Hokkaido, Japan
Shinya Nagasaki, Hakodate, Hokkaido, Japan
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(Objective) Many factors influence the flexion angle after total knee arthroplasty (TKA). In this study, the relationships of the postoperative range of motion with the posterior condylar offset (PCO) and femoral rollback were investigated.

(Materials and Methods) From January 1996 to June 1999, 45 patients (52 joints) underwent cruciate-retaining TKA (NexGen, Zimmer, Inc.) in our department. Thirty-one patients (38 knees) were directly examined (the CR group). The mean follow-up period was 6.2 mos (4.7 - 8.5 mos). A postoperative lateral roentgenogram of the knee joint at maximum flexion was taken under image TV. The PCO and the contact point (CP) of the tibio-femoral joint were measured from each film. As a control group, lateral roentgenograms were taken at every 10° for 30 normal knees (mean age: 27.1 yrs). CP values within 1 SD of the control group were defined as normal. Values above the normal range were evaluated as excessive rollback (ER), while lower values were evaluated as insufficient rollback (IR).

(Results) In the CR group, the mean postoperative maximum flexion angle was 119.5 ± 16.5°. There was no relationship between the range of motion and the PCO (pre-post op. difference; R² = 0.004). The CP value was 0.62 ± 0.02 in the control group and 0.65 ± 0.09 in the CR group. In the CR group, the CP value showed considerable variance and had no relationship with the postoperative flexion angle. The percentage of the cases assessed as normal CP was 36.8%, while ER and IR were 52.7% and 10.5%, respectively.

(Conclusion) In this study, no relationship was found between the PCO and the postoperative range of motion. Analysis of the CP showed that only 36.8% of the CR group evaluated as normal the postoperative rollback. It was concluded that the mechanical environment for the posterior cruciate ligament was not physiologically reconstructed in more than 60% of the cruciate-retaining TKA.
An Evaluation of the Neurosensory Response of Internal Structures of the Knee to Arthroscopic Procedures with Femoral Nerve Block and Intra-Articular Anesthesia

Tamiko Kamimura, Kamakura, JAPAN, Presenter
Masaki Shiono, MD, Kamakura, Kanagawa, JAPAN
Kunihiko Andoh, MD, Nagano, Nagano, JAPAN
Shonan Kamakura General Hospital, Kamakura, Kanagawa, JAPAN

INTRODUCTION: Femoral nerve block (FNB) and intra-articular anesthesia (IAA) are commonly used for postoperative analgesia for anterior cruciate ligament reconstruction. However, there is no general consensus for using these anesthetic procedures in arthroscopic surgery. In our study, we used these anesthetic techniques for outpatient knee arthroscopy and studied the sensory impact on the intra-articular structures to evaluate the effectiveness of these two methods.

MATERIALS & METHODS: We obtained informed consent from all patients for FNB and IAA, because these analgesic methods are not commonly used for knee arthroscopic surgery. Outpatient knee arthroscopy with FNB and IAA was performed on 27 knees for 26 patients, all of whom had clinical symptoms. The patients' ages ranged from 16 to 79 years (mean 47.4). 27 knees from 14 males and 13 knees from 12 females were involved, consisting of 15 right and 12 left knees. We performed the following arthroscopic procedures: four examinations, two lavages, two partial meniscectomies, one medial meniscal repair, one rasping of medial meniscus, one thermal shrinkage of medial meniscus, one partial lateral meniscectomy, two subtotal meniscectomies for lateral discoid meniscus, three removals of free body, two plica resections, three chondrectomies for medial femoral condyle necrosis, four partial synovectomies and one tumor resection. We did not administer preoperative medication to any patient, nor did we use an air tourniquet. At the operating theatre all patients underwent FNB with 10-15 cc 1% mepivacaine and IAA with 20cc 1% lidocaine and the arthroscopy started 20 minutes or more after injection. We made medial and lateral infrapatellar portals for arthroscopy and placed irrigation on the lateral suprapatellar region without local anesthesia. Normally, outpatient arthroscopic procedures progress through three steps: arthroscopic examination, diagnosis and surgery. All patients received an explanation of their procedure and shown the monitor throughout the surgery. We rated their anxiety and discomfort levels using the visual analogue scale (VAS; in which the max score is 10) at the stage of palpation with the probe at the anteromedial bundle of the anterior cruciate ligament (ACLa), posterolateral bundle of ACL (ACLp), anterior horn of medial meniscus (MMa), posterior horn of medial meniscus (MMp), anterior horn of lateral meniscus (LMa), posterior horn of lateral meniscus (LMp) and patellofemoral chondral surface (PF).

RESULTS: ACLa/ACLp: VAS scored 1-8 (mean 4.12) for the ACLa, 1-9 (mean 4.39) for the ACLp. Eight knees that were diagnosed for ACL injury scored ACLa 0-3 (mean 1.25), ACLp 1-7 (mean 3.0). 19 knees without ACL injury were ACLa 3-7 (mean 5.34), ACLp 3-9 (mean 4.97). There were statistical differences between injured and non-injured ACLs (p<0.01).

MMa/MMp: VAS of MMa for all patients was 0-1.5 (mean 0.74), MMp 0-3 (mean 0.91). The cases that had lesion of the medial compartment scored MMa 0-3 (mean 0.61), MMp 0-3 (mean 0.86). The cases without lesion at this site scored MMa 0-4 (mean 1.06), MMp 0-4 (mean 1.17) and the discomfort levels of the MMa and MMp cases were slightly different than expected considering the pathological condition of the medial compartment.

LMa/LMp: LMa 0-7 (mean 24.4); LMp all scored 3-9 (mean 5.28). The cases that had lesion at the lateral compartment scored LMa 0-7 (mean 2.83), LMp 3-7 (mean 5.06). Without lesion at this site scored LMa 0-6.5 (mean 2.25), LMp 2-9 (mean 5.39). The lateral compartment of the knee was very sensitive.

PF: All scored 0-10 (mean 0.093). The cases that had lesions at this area scored 0-0.5 (mean 0.07). The cases without lesion scored 0-1 (mean 0.095). FNB and IAA were effective analgesia methods at this site.

DISCUSSION: In recent years, the description of the effectiveness of FNB for knee arthroscopy consisted mostly as a recommendation as a part of the technique of 3-in-1 block or postoperative analgesia. However, our technique (FNB + IAA) and its postoperative management are easier than other anesthetic techniques although we did have some problems with the analgesia during surgery. The analgesia of the PF and MM were effective enough to perform surgery. However, we couldn't get enough analgesia at the ACL and LM using FNB and IAA. LM is innervated with the lateral
cutaneous nerve more than the femoral nerve and there was no statistical significance of VAS scores between injured and non-injured LM. On the other hand, the injured ACL conspicuously lost its sensory impact compared to an intact ACL. We suggest that there is an extra innervation in the ACL that cannot be anesthetized by FNB and IAA and that this innervation fails easily with ACL injury.

E-poster w/ Standard #824
Experimental Study on Collagen Changes in Pathological Achilles Tendons
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L. Trentani, Busto Arsizio, ITALY
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INTRODUCTION: At present time the role of intrinsic factors in Achilles pathology is not well known and so the treatment is difficult according an etiopathogenetic approach. The purpose of this study was to evaluate the collagen quantitative changes in pathological Achilles tendons.

METHODS: 22 patients (range, 25-65 years) were included in the study. 14 specimens were harvested during surgery for Achilles tendon rupture or Achilles tendinopathy. 8 specimens were from patients without Achilles tendinopathy operated on other pathologies close to the Achilles tendon (calcaneal fractures, etc.). Collagen was extracted by 48 hours pepsin digestion in 0.5 M acetic acid and analyzed by SDS-PAGE. Gels were stained with Comassie Blue and digITALyzed by VersaDoc 3000 system (BioRad). Quantitative assessment was performed by Quantitative One Software (BioRad). The ratio of collagen types III and I was measured. RESULTS: The ratio of collagen types III to I increased compared with healthy specimens (p<0.001) in all tendon ruptures, without relationship with the age of patients. Only one specimen of tendinopathies was assessed and the ratio of types III and I increased. CONCLUSIONS: Preliminary reports, according to the literature, support the hypothesis that Achilles tendon rupture is due to changes in protein composition and therefore to modified biomechanical qualities. No relationship was found between different composition of tendons and age of patient, but further specimens will analyzed just to confirm this assessment.

E-poster w/ Standard #825
Outcome of Revision Knee Replacement - Results at 3 to 5 years
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R W Parkinson, Wirral, Merseyside, UNITED KINGDOM
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The number of revision and subsequent revisions are on rise in last decade. There are no actual published articles of pure re revision knee replacement. The literature is unclear about re revision and has hetrozygous case mixes. We define Re revision as a procedure where there was exchange of both Femoral and Tibial components in a patient who already had a revision knee replacement after a failed primary TKR.

This is a Prospective study and has 21 cases in the cohort. The patients are scored using Knee society score (KSS) pre op , 3 months post op and every year subsequently. All the patients had modular Knee Revision prosthesis.

The analysis of results show there is statistically significant difference ( p<0.05) between pre and post op KSS pain score. There is no statistically significant difference between pre and post op KSS function score. We used paired T test for this assessment.

We acknowledge the fact that this is the only series in the literature. It shows short to early medium term results. The patients improved as regards the pain which is the main benefit. However functionally they show marginal difference. We hence support the clinical use of this procedure. It provides satisfactory pain relief and restores stability in the Knee.

E-poster w/ Standard #826
Kinematics of the Windmill Fast Pitch: Preliminary Results of High School Softball Pitchers
Jeff Phillips, Shreveport, LA, USA,
Brian Bouillon, Shreveport, LA USA
Shane Rollins, Shreveport, LA USA
Sharon Dunn, Shreveport, LA USA Presenter
Margaret Olmedo, Shreveport, LA USA
Kim Cox*, Bossier City, LA USA
LSUHSC and BPCC*, Shreveport and Bossier City, LA, USA
Although softball has become one of the most popular sports in recent years, more attention has been directed to shoulder injuries in baseball pitchers, focusing on the biomechanics and muscle firing patterns associated with that sport. Research on the overhand pitch has identified critical instances during the pitching motion where injuries occur, and with proper intervention, may be prevented. However, there is very little information pertaining to softball pitchers and the biomechanics of the underhand windmill pitch. Due to the paucity of literature about the biomechanics of the windmill softball pitch, phases and motions of the pitch have not been standardized. By developing a better understanding of the mechanics, we can identify at-risk tissues leading to better diagnosis of injuries and more specific rehabilitation and conditioning programs. The purpose of this study was to determine the kinematics of the windmill softball pitch with video analysis. Digitizing software was used to find shoulder position at stride foot contact, elbow angle at ball release, shoulder angular velocities through different intervals, and ball speed at ball release, as these variables have been associated with risks of shoulder injury and performance. Five healthy, female, high school student athletes participated in this study. Kinematic data was taken from 6 pitches from each of the 5 subjects with three digital camcorders. Reference points were subjects’ bilateral feet, ankles, knees, hips, shoulder, elbow, wrist, and hand, as well as her chin, forehead and the ball. These landmarks were used to calculate angular velocity and linear displacement of different joints and/or segments throughout the pitch. Data also helped us establish different measurements per athlete, averages, and standard deviation among athletes in shoulder and knee position at stride foot contact, elbow position at ball release, ball speed, and angular velocity of the arm at each phase of the pitch. A Pearson product moment correlation was used to determine if there was any correlation between these measurements and ball speed. Only knee position at stride foot contact had a significant correlation of -0.967 with ball speed. The average stride length of the five subjects was 40.84 with a standard deviation of 1.88, with an average body height to stride ratio of 63.5%. Average shoulder angle and knee angle at stride foot contact was 133 degrees and 32 degrees with a standard deviation of 15 degrees and 5 degrees, respectively. Elbow angle at ball release averaged 9 degrees with a standard deviation of 0.8 degrees. Ball speed averaged 54.88 mph with a standard deviation of 6.5 mph.

As determined from our results, knee angle at stride foot contact inversely influences ball speed. Angular velocity may influence ball speed, but can be affected by other variables.

E-poster w/ Standard #827
The Influence of Knee Replacement Type on Joint Proprioception; Total versus Unicompartmental Replacement
Sherif Mouneir Isaac, Oxford, UNITED KINGDOM, Presenter
Karen Barker, Oxford, Oxon, UNITED KINGDOM
Irini Nabil Danial, Oxford, Oxon, UNITED KINGDOM
David Beard, Headington, Oxford, UNITED KINGDOM
Richie Gill, Oxford, Oxon, UNITED KINGDOM
Max Gibbons, Oxford, Oxon, UNITED KINGDOM
Christopher Dodd, Oxford, Oxfordshire, UNITED KINGDOM
David Murray, Headington, Oxford, UNITED KINGDOM
Nuffield Orthopaedic Centre NHS Trust, Oxford, UNITED KINGDOM

Introduction: Proprioception protects joints against injurious movements and is critical for joint stability maintenance under dynamic conditions. Knee replacement effect on proprioception in general remains elusive. This study aimed to evaluate the changes in proprioceptive performance after knee replacement; comparing Total (TKA) to Unicompartmental Knee Arthroplasty (UKA).

Methods and Materials
Thirty-four patients with osteoarthritis were recruited; 15 patients underwent TKA using the AGC prosthesis and 19 patients underwent UKA using the Oxford prosthesis. Both cruciate ligaments were preserved in the UKA group, while only the PCL was preserved in TKA patients. Patients’ age was similar in both groups. Joint Position Sense (JPS) and postural sway were used as measures of proprioception. Both groups were assessed pre- and 6 months post-operatively in both limbs. JPS was measured as the error in actively and passively reproducing five randomly ordered knee flexion angles between 30 and 70 using an isokinetic dynamometer. Postural sway (area and path) was measured using a Balance Performance Monitor.
Functional outcome was assessed using the Oxford Knee Score (OKS).

Results
Pre-operatively, no differences in JPS or sway were found between limbs in either group. No differences existed between the two groups. Post-operatively, both groups had significant improvement of JPS in the operated limb (UKA mean 4.64, SD 1.44 and TKA mean 5.18, SD 1.35). No changes in JPS were seen in the control side. A significant improvement (P<0.0001) in sway area and path was found in the UKA group only in both limbs. No significant changes in sway occurred in either limb of TKA patients. The OKS improved from 21.4 to 35.5 for TKA patients and from 23.9 to 38 for UKA patients.

Conclusion
Both UKA and TKA improve proprioception as assessed by JPS. However, UKA alone improves postural sway in both limbs. This may impart explain why UKA patients function better than TKA patients.

E-poster #828
Factors Affecting the Outcome of Distal Realignment for Patellofemoral Disorders of the Knee
Ching-Jen Wang, TAIWAN, Presenter
Chang Gung Memorial Hospital, Taiwan, Kaohsiung, TAIWAN

Purpose: This study was performed to correlate the risk factors with the clinical outcome of distal realignment for patellofemoral disorders. Patients and Methods: This series included 48 patients with 53 knees with an average age of 41 ± 13 years (range 19 to 57) and the average follow-up of 55 months (ranged 25 to 96). There were 15 males and 33 females. The indications for surgery included pain and disability due to patellofemoral disorders with failure of at least 6 months of conservative treatments. The optimal transfers were 20 mm anterior plus 0 medial for knees with no patellofemoral malalignment, 15 mm anterior plus 5 to 10 mm medial for mild to moderate malalignment and 10 anterior plus 10 to 15 mm medial displacement of the tibial tubercle. Postoperatively, the knee was kept in a knee immobilizer until bony union. Patients ambulated with partial weight bearing and performed quadriceps and hamstring exercises. The evaluations included pain scores, Lysholm functional scores and radiographs of the knee. Results: The overall results were satisfactory in 47 knees (88.7%) and unsatisfactory in 6 knees (11.3%). There was no correlation of the clinical results with age, gender, body weight and body height, preoperative pain scores and Lysholm scores. However, the clinical outcome correlated with the severity of articular damage and the correction of patellar malalignment. Conclusion: With proper patient selection and adequate surgical technique, distal realignment achieved 88.7% good or excellent results. Error in patient selection and inadequate surgical technique were attributable to poor outcomes.

SHOULDER INSTABILITY

E-poster #850
Anterior Capsuloraphy: An In Vitro Comparison of Volume Reduction-Arthroscopic Plication versus Open Capsular Shift
Steven B Cohen, Charlottesville, VA, USA, Presenter
Vipool K. Goradia, Christiansburg, VA USA
Mark David Miller, Charlottesville, VA USA
Orthopaedic Research of Virginia, Richmond, VA, USA

Introduction: Shoulder instability is a result of several pathologic processes including capsular laxity, labral detachment, and a rotator interval defect. The anterior capsular shift has become a well-established procedure for the treatment of the unstable shoulder. Multiple techniques have been used to reduce capsular volume from both open and arthroscopic approaches. The purpose of this study was to objectively compare volume reduction following arthroscopic plication and open lateral capsular shift. Methods: Fifteen fresh frozen human cadaver shoulders were assigned to one of two groups: arthroscopic plication (N=7), or open lateral capsular shift (N=8). Initial capsular volume was measured by repeated injection of a viscous fatty acid sulfate solution and recorded for each specimen. Repeated measurements were taken post-procedure to determine volume reduction. Results: Both procedures resulted in reduction of capsular volume. The arthroscopic plication (N=7), or open lateral capsular shift (N=8). Initial capsular volume was measured by repeated injection of a viscous fatty acid sulfate solution and recorded for each specimen. Repeated measurements were taken post-procedure to determine volume reduction. Results: Both procedures resulted in reduction of capsular volume. The arthroscopic plication resulted in a 22.8% volume reduction and the open lateral capsular shift resulted in a 49.9% volume reduction. Comparison of the two procedures revealed significant volume reduction following open lateral capsular shift to arthroscopic plication (p=0.00001). Repeated measurements confirmed that the injection
technique was valid and reproducible.

Conclusion: The lateral capsular shift resulted in significantly greater volume reduction when compared to arthroscopic plication. Based on these results we recommend an open lateral based capsular shift for patients with multidirectional instability and a large patulous shoulder capsule. The amount of volume reduction required to eliminate instability still remains unknown for patients with shoulder instability due to capsular laxity.

E-poster #851
Operative Time in Arthroscopic Shoulder Instability Treatment
Ronald A. Navarro, Harbor City, CA, USA, Presenter
Liz W. Paxton, El Cajon, CA USA
South Bay Kaiser Permanente Medical Center, Harbor City, CA, USA

Objectives:
Operative time (OT) is costly. We wanted to define whether OT was saved when switching to arthroscopic shoulder instability treatment (ASIT) and compare with open shoulder instability treatment (OSIT).

Methods:
From 1997 to 2003 a single fellowship trained surgeon performed 91 SIT's. There were 57 ASIT's and 34 OSIT's. During all cases, nursing staff independently recorded cut to close times. This defined the individual OT. A surgical information services administrator independently queried the operative cases and provided the final data set. Statistical analysis was performed on the results.

Results:
Over the period evaluated, the surgeon transitioned from OSIT to ASIT gradually. The average OT in OSIT cases was 161 minutes. The average OT in ASIT cases was 88 minutes. An Independent t-test was used to compare OSIT and ASIT OT. The scope group’s procedure time was significantly lower than the open group (p<.001). Open cases where bankart repair and shift were performed averaged 161 minutes. Open cases where shift only occurred averaged 160 minutes. Scope cases where the bankart was fixed averaged 104 minutes and where only capsular surgery was performed averaged 62 minutes. A one-way ANOVA comparing procedure time of the four sub-groups was significant: p<.001. Bonferroni post-hoc multiple comparisons indicated that a.) the scope capsular group’s procedure time was less than the scope Bankart (p<.001), open both (p<.001), and open shift only (p<.001) groups, b.) the scope Bankart mean procedure time was less than the open both (p<.001), and open shift only (p<.001) groups.

Conclusions:
The length of OT decreased during ASIT. This has significant fiscal implications. Whether the benefits of reduced OT will correlate well with long term outcomes, remains to be seen. A larger sample size and assessment in relation to outcome will ultimately be the final determinant as to the true benefit of arthroscopic shoulder instability treatments.

E-poster #852
Supracondylar Fractures of the Humerus in Young Sportsmen
Vitaly F. Kuksov, RUSSIA, Presenter
Pirogov City Hospital, Samara, RUSSIA

To one of hardest sections of children sporting traumatology concern supracondylar fractures of the humerus with bone displacement. Difficulties in exact diagnostic, selection of adequate treatment and realization of a rational aftertreatment.

The purpose: Correctly and it is well-timed to reveal all components of fragment displacement epicondyle fractures of a humerus and to define adequate treatment.

For last 10 years under our observation were 117 young patients with epicondyle fractures of a humerus with fragment displacement. The boys were 90, girls - 27. The age group (8-9 years) - 75 patients dominated. The fractures more often arose in sections of sporting gymnastics, free strife and judo, bicycle, football and hockey. At X-ray research detail decryption of the obtained data. The constant kinds of displacement peripheral fragments are detected: on width, lengthwise, on an axis and rotatory. For 102 patients (87, 2 %)-fractures unbended (displacement to the back), for 15 (12, 8 %)-bended (to the front). Rotation displacements - 88 patients (75, 0 %).

Exact and well-timed distinguishing of this displacement has an exceptional value, for it depends medical tactics. We detect not separate kinds of displacement peripheral fragment, and speeds key them, occasionally composite. The primary complications of nerves were watched for 31 patients (median nerve - for 17, radial -? 12,
ulnar - for 2) Compression of humerus artery - for 5 patients. Adequate the treatment for the young sportsmen with supracondylar fractures of the humerus with fragment dislocation is a constant skeletal traction. Kirshner wire is conducted through proximal metaepiphysis of the ulnare and the vertical skeletal traction on Balkan frame (freight of 2-3 kgs). At unbended types on a forearm is adjusted superimposed a Zinc - gelatinous extension. A forearm stacked on cotton-gauze ’gamachok’. In the maiden day - constant control behind oscillation peripheral artery, follow-up injured nerves. For 2 day a radiography of an injured ulnare on an extension. At available displacement peripheral fragments executed a manual reposition on an extension. At bended types - the injured finiteness in a rule of unbending in ulnar, is padding to Balkan frame fixed a bracket. Terms of a skeletal traction - 14-16 days. Then for 2-3 days superimposed gypsum longine and started complex physio-functional therapy. The long terms results of treatment for 100 patients in terms from 2 till 8 years after a trauma are studied. Functional parameters - excellent for all inspected. X-ray-anatomic parameters: excellent - for 70; good - for 20, satisfactory - for 10. They have replaced a sporting profile. Prolong occupations in former sporting sections remaining 90.

E-poster #855
Surgical Outcome of Arthroscopic Bankart Repair Using the Knotless Suture Anchor
Hideki Sato, Hirosaki, JAPAN, Presenter
Yasuyuki Ishibashi, Hirosaki, Aomori JAPAN
Eiichi Tsuda, Hirosaki, Aomori JAPAN
Satoshi Toh, Hirosaki, Aomori JAPAN
Hirosaki University School of Medicine, Hirosaki, Aomori, JAPAN

Purpose: We have used the Knotless Suture Anchor for arthroscopic Bankart repair from January 2000. The purpose of this report is to present 28 cases followed for 2 years or more after surgery.

Methods: Twenty-eight patients (24 males and 4 females) who had traumatic recurrent shoulder dislocation or subluxation were treated by this procedure. Twenty-one patients were actively involved in sports activity (13 in overhead sports, 8 in contact sports). The average age was 23.6 years old, ranged from 13 to 47 years old. All cases were diagnosed with positive anterior apprehension test, positive relocation test, and Bankart lesion on arthro-MRI. All cases were evaluated using Rowe’s score, recurrence, return to activity level, and range of motion.

Results: The average postoperative Rowe’s score for all patients was 93. There were two postoperative redislocations and one subluxation. All patients except 2 with dislocations returned to the previous activity level. Compared with the opposite shoulder, the average loss of flexion was 4 degrees, and that of external rotation with the arm in the abduction position was 4 degrees.

Conclusion: The advantages of this device are the simple technique that does not require knotting, the tight fixation, and the easy capsular advancement. The clinical results suggested the Knotless Suture Anchor is a useful device for arthroscopic Bankart repair.
E-poster #856
Humeral Avulsion of the Glenohumeral Ligaments - Incidence and Treatment in Contact Sports Athletes
Mario Larrain, Buenos Aires, ARGENTINA, Presenter
Hugo J. Montenegro, Buenos Aires, ARGENTINA
David M. Mauas, Buenos Aires, ARGENTINA
Cristian Collazo, Buenos Aires, ARGENTINA
Horacio Carlos Galante, Buenos Aires, ARGENTINA
Mansilla, Buenos Aires, ARGENTINA

PURPOSE: Humeral avulsion of the glenohumeral ligaments (HGHLA) may be the cause for anterior shoulder instability. The purpose of this study is to analyse the incidence of this lesion in our series of shoulder instability, its characteristics and anatomical variants, its treatment and results.

METHODS: We retrospectively analysed 313 patients, operated for anterior shoulder instability between March 1992 and March 2002. We detected 9 cases (2.88%) with humeral detachment of the glenohumeral ligaments. All of them were males and contact players, 7 were rugby players and the other two basquetball players. MRI reports were as follows: 3 capsular pockets (laxity), 3 glenohumeral ligament lesions with anteroinferior labrum alteration, and 3 normal images. Definite diagnosis was performed arthroscopically. We found that 3 of the cases had detachment of isolated glenohumeral ligaments and the remaining 6 were associated to lesions on the glenoid side of the capsulolabral complex. We call these lesions "bipolar". These presented as partial detachments of the labrum with some degree of lesion in the capsular structures in that area. The surgical technique used in this pathology was. First, arthroscopy, debridment and repair of the lesion on the glenoid side if this was present in bipolar lesions, then, because the angle was not convenient for arthroscopic repair, mini-open reconstruction of the lesion on the humeral side. Bone anchors were used for both sides.

RESULTS: The mean follow-up was 3.7 years (range 2-12 y). The results obtained using the Rowe Scale were excellent in all the cases, with no relapses, nor residual instability, complete motion range, no functional deficits and a 100% return to competitive sports practice.

CONCLUSIONS: It is necessary to perform a thorough arthroscopic evaluation to identify this lesion, especially when there are significant capsular pockets (laxity) and/or alterations in the labrum insertion. The lack of diagnosis and proper treatment of this lesion would be the cause of failure in its reconstruction. Treatments performed in a combined fashion (arthroscopy + open surgery) offer great possibilities to contact athletes.

E-poster #857
A Technique to Improve Anchor Capsular Fixation and Tightening on Shoulder Instability Surgery
Daniel Slullitel, Santa Fe ARGENTINA, Presenter
Sebastian Malier, Rosario, Santa Fe ARGENTINA
Elisabet Vaieretti, Rosario, Santa Fe ARGENTINA
Instituto Dr. Jaime Slullitel, Rosario, Santa Fe, ARGENTINA

Introduction
As anchors can carry only 1 or 2 sutures, they have a limited capability of capsular fixation and tightening. In case we need multiple sutures we have to add multiple anchors, but the numbers of anchors we can use is limited. We would like to report a technique to improve anchor capability of carrying sutures and also to present a modified punch to bite thin capsules without harming them that is the other weak spot in the arthroscopic reconstruction of fragile capsules.

Material and Methods
With a modified Caspary punch, through an anteroinferior portal, we passed 1 to 3 0 PDS sutures as needed on the articular capsular side as far anteroinferior possible, then we retrieved one limb on the posterior portal in a canula and the other one out of the anteroinferior portal canula while viewing from anterosuperior. Through the anteroinferior canula, we put on the 5 o’clock position an anchor using the PDS sutures, as traction devices. We capture one limb of the anchor stitch with a regular instrumentation and then by using a sliding knot we began to settle it, but just before finishing to tighten the knot and into the residual hole of it, we retrieved one of each limb of the PDS sutures already passed. Then we finished to tie the anchor stitch, using the knot as anchor to fix the PDS sutures. Thus transforming each one pair suture anchor in a 2 to 4 carrying device. Also we show a modified Caspary punch so we can harm less the fragile capsule as we can bite a minimum surface of capsule.

Conclusion
Due to difficulties on passing PDS sutures in the anchors knot this is a method with a large learning curve. Besides, it improves the arthroscopic capability of tightening lax and fragile capsules and as we can bite thinner capsule without loosing fixation because larger amount of sutures are used.

E-poster #858
Shoulder Micro instability and SLAC lesions
Luciano Quevedo, San Isidro, Buenos Aires ARGENTINA,
Alberto Pienovi, San Isidro, ARGENTINA
Presenter
CTO San Isidro, Buenos Aires, ARGENTINA

Purpose: The purpose of this presentation is to establish the relationship between shoulder instability or micro instability, and Rotator Cuff lesions.

Materials and methods: The study involved young sportsmen and the cases were selected according to pre-defined inclusion criteria. Sportsmen, younger than 40 years of age, lesions associated to instability, with and without dislocation were selected.

The classification used was the following: Grade I or Hemorrhagic; Grade II or Fibrous; Grade III or Rupture (Total-Partial; Bursal-Articular)

Diagnosis, treatment and arthroscopic options are analyzed, according to the degree of Rotator Cuff lesions and joint instability. Thirty-seven patients and their results were studied.

Conclusions: It was concluded that the etiology of the rotator cuff lesions should be further studied in order to perform combined bursal and intra-articular treatments, so as to decrease the incidence of poor results and post-op recurrences in this pathology frequently found in sportsmen.

E-poster #859
Severe Recurrent Posterior Instability - New Technique - Infraspinatus Advancement to the Posterior Glenoid
Mauricio Gutierrez, Cali, Valle, COLOMBIA,
Presenter
Orlando Avila, Calio, COLOMBIA
Centro Medico Imbanaco, Cali, COLOMBIA

Introduction The treatment of recurrent posterior instability of the glenohumeral joint continues to be a challenge. Higher failures rates than with anterior stabilization procedures may result from misdiagnosis or when not all the pathologic conditions are well addressed. Higher failure rates are found in shoulders with ligament hyperlaxity and capsular deficiency. For these types of shoulders we describe an arthroscopic technique that consists of: Labrum repair, capsular plication, rotator interval closure and advancement of the infraspinatus as a graft to the posterior glenoid.

We describe a case series study.

Material and Methods From years 1999-2003 we performed this operation to 10 shoulders. At the time of final evaluation 5 patients had at least 2 years of follow up. 4 men and 1 woman. Mean age was 31.5 ( range 18-55 ) There were no professional athletes. 2 patients had reverse Bankart lesion. 4 patients had a MDI 1 patient had a significant traumatic episode (convulsion) The capsule was deficient in all cases. Labrum repair was done in 2 patients. Posterior capsular plication was done in all as well as rotator interval closure. Anterior capsular plication was done in the 4 MDI patients. Advancement of the infraspinatus to the posterior glenoid was done in all patients. The mean preoperative ASES score was 30 points and improved to a mean of 55 points postoperative. There was significant reduction of humeral translation in all patients. Internal rotation was reduced in all but there wasn’t a significant restriction and were able to work normally. There were no dislocation recurrences. 1 patient complained of posterior pain after 2 years post surgery. Conclusion We suggest that this procedure is effective for treating severe recurrent posterior instability associated with capsular deficiency and hyperlaxity. Severe posterior instability is a relatively rare entity. Longer follow up is needed.

E-poster #860
Arthroscopic Shoulder Instability Reconstruction: The Learning Curve Effect
Emmanuel M Antonogiannakis, Athens-Cholargos, GREECE,
Christos K Yiannakopoulos, Nea Smyrni, Athens GREECE Presenter
Constantinos Karliaftis, Athens, GREECE
Ioannis Chiotis, Athens, GREECE
George Stamatakis, Athens, GREECE
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2nd Orthopaedic Dept., General Army Hospital, Athens, GREECE
Traumatic anterior shoulder instability is a common cause of functional impairment in young athletic individuals and is the most common type of glenohumeral joint instability. A major disadvantage of arthroscopic surgery is a historically reported higher failure rate, especially during the learning curve period. The purpose of this paper was to present the results of our first 72 cases treated with arthroscopic stabilization of the anteriorly unstable shoulder. Between August 1999 and November 2001 57 patients with traumatic anterior instability were treated arthroscopically by the same surgeon group. The mean age of the patients was 23 years old and the number of dislocations and subluxations ranged between 5 and 50. The operation had to be cancelled or converted to open surgery in 7 patients (12.2%). All operations were performed in the lateral decubitus position and the avulsed labrum and capsule was reattached using 2-5 bone anchors. The duration of the surgery ranged between 110 and 246 minutes. A Bankart lesion was evident in 46 patients (88.4%). Arthroscopic stabilization was aborted in patients with a HAGL lesion. Forty-four patients (88% follow up rate) were followed up for 28-53 months (mean 27 months) and evaluated using the Rowe-Zarins score. Range of motion was almost normal in most patients and only 2 patients report limitation of external rotation greater than 10°, but only 1 patient necessitated arthroscopic arthrolysis. The redislocation rate was 9% (4 out of 44 patients). Despite the poor selection criteria and the initially faced technical difficulties performance of satisfactory capsule reattachment was possible in most patients. The negative effects of the learning curve can be minimized with appropriate dry lab practice and careful performance of the surgery.

E-poster #862
Early Specific Rehabilitation After Arthroscopic Shoulder Stabilization: 36 Cases with a 7 Months to 4, 5 Year Follow-up.
Ewa Witek, Warszawa, POLAND. Presenter
Dariusz Straszewski, Warszawa, POLAND
Renata Jopek, Warszawa, POLAND
Carolina Medical Center, Warszawa, POLAND

Purpose: Presentation of practiced in our clinic early specific program of rehabilitation without postoperative full cast immobilization, after arthroscopic shoulder stabilization procedure.
Material/Method: Thirty six patients with symptomatic instability of the shoulder were qualified for arthroscopy. Among them 7 professional athletes (tennis, ballet, javelin throwing, judo), 19 amateur (windsurfing, ski, snowboard, judo) and 10 non active in sports. Four patients had physiotherapy before arthroscopy. Patients were immobilized in Dosoul’s splint for six weeks. Rehabilitation was initiated during first 24 hours after the surgery. The most important objective of the rehabilitation was to achieve muscular stability, full functionality of the upper limb and for the patients to return to everyday activity and regular sport life. We applied: manual techniques, PNF, proprioception, stretching, contraction and specific sport rehabilitation programs. After 10-12 weeks, the upper limb was fully functional. Patients ended their rehabilitation period after 4-5 months and returned to active sport after 4 months. A questionnaire was issued which evaluated subjectively: stability, pain, ROM and functionality.

Results: We treated thirty six patients after arthroscopic shoulder stabilization. Patients were followed from 7 months up to 4.5 years after surgery. Final results: twenty five excellent notes, eight good notes, three fair, one bad. Three patients had crepitation, one patient with chronic joint instability had dislocation of the shoulder, three of our patients had limitation of motion. Thirty two patients finished rehabilitation, four patients are still continuing rehabilitation. In all thirty two cases we achieved full functionality, in sport as well as in normal life. Except two persons, all patients returned to sport activity at pre-injury level.

Conclusion: The application of immobilisation only in Dosoul’s splint and rehabilitation, in the first 24 hours after the surgery, had a positive impact on the final result of the treatment. It allowed, in a short period of time, the recovery of muscular stabilization, regaining osrhythm and functionality of the upper limb. Our results confirm the effectiveness of the proposed rehabilitation program allowed for early movement of the scapulohumeral joint according to PNF patterns for the scapula, cocontraction and with great emphasis on proprioception and sport specific rehabilitation.
E-poster #864
Arthroscopic Bankart Repair Using Suture Anchors in Athletes: Patient Selection and Postoperative Sports Activity
Junji Ide, Kumamoto, JAPAN, Presenter
Satoshi Maeda, Kumamoto, JAPAN
Fumio Ushijima, Kumamoto, JAPAN
Tomoki Takahashi, Kumamoto, JAPAN
Katsumasa Takagi, Kumamoto, JAPAN
Dept of Orthopaedic Surgery, Kumamoto University, Kumamoto, JAPAN

Background: The purpose was to evaluate the results in selected high-risk patients who underwent arthroscopic stabilization of the shoulders with recurrent anterior instability.

Hypothesis: Arthroscopic stabilization using suture anchors is useful for athletes aged less than 25 years or contact athletes without a large bone loss of glenohumeral articulation.

Study design: Prospective cohort study.

Methods: Study group comprised 55 patients with a mean follow-up of 42 months (range, 25 to 72 months). Thirty-two had recurrent dislocations, 14 recurrent subluxations and nine recurrent subluxations after a single dislocation. Rowe score, range of motion, recurrence, and sports activities were evaluated.

Results: Mean Rowe score improved from 30.1 to 92.3 points; 45 (82%) were excellent, six (11%) good, zero fair, and four (7%) poor. Patients had lost a mean of 4 of external rotation in adduction. Four (7%) had recurrence. Recurrence rate in contact athletes (9.5%, two of 21) was not statistically different from that in non-contact athletes (5.9%, two of 34). Forty-four (80%) returned at the same levels. Complete return rate in overhead athletes (68%, 17 of 25) was lower than that in non-overhead athletes (90%, 27 of 30) (p=0.0423).

Conclusion: Arthroscopic stabilization is a reliable procedure in selected high-risk patients.

E-poster w/ Standard #865
Arthroscopic Treatment of Posterior Shoulder Instability: Results in 33 Patients
Matthew Thomas Provencher, Coronado, CA, USA, Presenter
Steven Josh Bell, San Diego, CA USA
Timothy S Mologne, San Diego, CA USA
Naval Medical Center San Diego, San Diego, CA, USA

Objectives: Posterior shoulder instability is a diagnostic challenge and a poorly understood clinical problem. Due to the complexity and relative infrequency of diagnosis, several surgical techniques have been described to treat this disorder. The purposes of this study are to evaluate arthroscopic posterior shoulder stabilization and to evaluate multiple preoperative and intraoperative variables as predictors of outcome.

Materials and Methods: Thirty-four consecutive patients who underwent posterior arthroscopic shoulder stabilization with suture anchors and/or suture capsulo-labral plication from October 1999 through April 2003 were reviewed. One was lost to follow-up. All but one were male, and all but one were active duty military. The mean age was 25.5 yrs. Nine patients had failed prior surgical intervention. Shoulder outcomes rating scores were determined using the American Shoulder and Elbow Surgeons Rating Scale (ASES), the Subjective Patient Shoulder Evaluation, and the Single Assessment Numeric Evaluation (SANE).

Results: Mean follow-up was 28 months. Overall, symptoms were improved, and outcomes scores rated as good or excellent in 26 of 33 shoulders with a mean ASES score of 97, Rowe Score of 95.5, Subjective Shoulder Rating of 21.7, and SANE of 92. There were a total of seven failures four for recurrent instability and three for pain. Mean ASES score for the failures was 86, Rowe Score of 67.1, Subjective Shoulder Rating of 14, and SANE of 72. Preoperative versus postoperative range of motion examination demonstrated improved values for flexion (172º vs. 165º, p>0.05) and abduction (168º vs. 158º, p>0.05). The amount of posterior translation averaged +3.4 (range 3+ to 4+) preoperatively versus +0.8 postoperatively (range 0+ to 2+), p <0.001. Six out of the seven failures were medically separated from the military. Patients with voluntary instability demonstrated worse outcome (p<0.0004), and those with prior surgery on the shoulder also did worse (p<0.04). The underlying pathology and method of repair (capsule-labral plication versus labral suture anchor repair) demonstrated a trend to significance with more failures undergoing capsule-labral plication (p=0.062).

Conclusions: The arthroscopic treatment of posterior shoulder instability is an effective means to improve symptoms associated with recurrent posterior subluxation of the shoulder. Careful attention to surgical technique and an
understanding of the underlying pathology are critical for success.

**E-poster w/ Standard #866**

**Absorbable Implants for Open Shoulder Stabilization. A Seven to Eight Year Clinical and Radiographic Follow-Up.**

Lennart Magnusson, Vasteras, SWEDEN, Presenter
Lars Ejerhed, Uddevalla, SWEDEN
Lars Rostgad, Trollhattan, SWEDEN
Juri Toomas Kartus, Trollhattan, SWEDEN
Ninni Sernert, Trollhattan, SWEDEN
Jon Karlsson, Goteborg, SWEDEN
Trollhattan, SWEDEN

Patients and Methods: Eighteen consecutive patients with recurrent, unidirectional, post-traumatic shoulder instability were included in the study. All patients underwent open Bankart reconstruction involving absorbable suture anchors. The patients underwent serial radiographic evaluations during a follow-up period of 90 (80-95) months.

Results: The median age at the index operation was 27 (16-50) years. Two patients suffered re-dislocations during the follow-up period. At follow-up the Rowe and Constant scores were 94 (63-100) and 88.5 (65-100) points respectively. Strength measurements in 90º abduction displayed 8.1 (3.7-17.2) kg on the index side and 7.6 (2.7-17.6) kg on the contralateral side (n.s.). The external rotation in abduction was 80º (60-95) compared with 100º (70-120) on the contralateral side (p=0.0015).

Signs of minor or moderate degeneration were found in 5/18 (28%) patients on the pre-operative radiographs. On the 90-month radiographs 12/18 patients (67%) revealed minor, moderate or severe degenerative changes. Compared with the pre-operative assessments there was a significant increase in degenerative changes during the follow-up period as seen on the 33 and 90-month radiographs, (p=0.01, p=0.03 and p=0.01 respectively). On the seven-month radiographs 2/18 patients revealed invisible or hardly visible drill holes in conjunction with the absorbable implants. The corresponding on the 90-month radiographs was found in 12/18 patients (p=0.003, seven v 90 months).

Conclusion/Discussion: In the long-term stable shoulders were found in 16/18 patients. The stabilisation could, however, not prevent an increase in degenerative changes as seen on the serial radiographs obtained until seven to eight years after the index procedure. The drill-holes used for absorbable implants appeared to heal in a majority of patients during the follow-up period.

**E-poster w/ Standard #868**

Arthroscopic Rotator Interval Closure as a Supplement to Arthroscopic Bankart Repair for Recurrent Anterior Dislocation of the Shoulder

Gavriel Mozes, Tel Aviv, ISRAEL,
Eran Maman, Tel-Aviv, ISRAEL Presenter
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Introduction: The increasing use of Arthroscopic surgery for recurrent anterior shoulder dislocations (RASD) has questioned the indications and contraindications for this procedure. The ideal candidate for this kind of surgery is an overhead athlete, who participates in a no contact sport, with traumatic unidirectional anterior instability with a well-defined Bankart lesion.

Purpose of the paper: To demonstrate that complementing the Arthroscopic Bankart Repair (ABR) with an Arthroscopic Rotator Interval Closure (ARIC) the indication for Arthroscopic management of anterior shoulder instability can be broaden for patients who has a less defined Bankart lesion and has additional multidirectional Hyperlaxity.

Patients and Methods: Between January 1, 1999 and June 30, 2002, 145 patients (153 shoulders) suffering from recurrent anterior dislocations were treated by ABR. In the first two years, only patients who had unidirectional instability with no Hyperlaxity or grade 1 Hyperlaxity were selected for this specific method of treatment. Encouraged by the results, beginning of October 2001, in addition to the first group of patients we started to operate patients suffering of recurrent dislocations having grade 2 or grade 3 Hyperlaxity. In this second group of patients we added to the ABR an ARIC procedure. In the first group 121 shoulders whereas in the second group 32 shoulders were operated on. We used Panalok-Panacryl (Mitek), TwinFix 3.5mm x2 Ethibond sutures (OBL, Smith & Nephew) suture anchors or Bioknotless (Mitek) anchors. 139 cases had one side operated whereas in 7 cases both sides were operated on. There were 133 male patients and 13 females in these two groups, 82 patients had the left shoulder, 57 patients had the right shoulder and seven patients had both shoulders operated.
on. In 78 cases the dominant and in 75 cases the non-dominant shoulder were involved. In 10 cases the Arthroscopic procedure was used to review and to correct failed Arthroscopic (6 cases) or open (4 cases) stabilization procedures. Additional findings: in 87 cases an ALPSA lesion was corrected, and in 15 cases an additional superior labral lesion was repaired and in 4 cases a small osteochondral fragment (bony Bankart lesion) was removed. The mean follow-up was 2.2 years ranging between 3.5 to 1.1 years.

Results: In spite of the relatively short follow-up for the second group of patients we encountered very good preliminary results. At revision of all the cases we found 9 recurrences for the ABR group (rePresenter 7.43%) in comparison of the one reoccurrence in the ABR supplemented by ARIC procedure (3.12%) thus indicating that recurrent shoulder dislocations associated with multidirectional Hyperlaxity should be treated arthroscopically. The operating time was pronged with an average of 14 minutes for the ARIC procedure.

The average shortened external rotation was 9 degrees in the second group compared to the 6 degrees encountered in the ABR group. Longer rehabilitation period was needed in the ARIC group due to shortened external rotation.

Conclusions: The ARIC is a new technique that permits a strong reliable closure of the Rotator Interval. This technique broadens the indications for Arthroscopic shoulder surgery as a solution for recurrent dislocations associated with joint Hyperlaxity.

Key words: shoulder instability, Hyperlaxity, rotator interval closure, arthroscopy.

E-poster w/ Standard #869
Latarjet Procedure for Anterior Shoulder Instability in Rugbymen
Elias Dagher, Paris, FRANCE, Presenter
Bertrand Sonnery-cottet, Lyon, FRANCE
LaurentNova-Josserand, Lyon, FRANCE
Gilles Walch, Lyon, FRANCE
Clinique Sainte Anne Lumiere, Lyon, FRANCE

Introduction: Rugby players have been reported to be at high risk for failure after shoulder stabilisation for anterior shoulder instability. We report the results of the Latarjet procedure in 85 rugbymen shoulders with a mean follow-up of 7 years.

Materials and Methods: Retrospective analysis of 1518 patients who underwent open stabilisation for anterior shoulder instability by the Latarjet procedure in our department between 1988 and 2002 revealed 125 rugby players. 85 shoulders in 79 patients were reviewed for this study with a mean follow-up of 7 years (range, 1-15). The average age was 19.5 years (range, 12-40). 46 patients had a national or international level. 60 patients had recurrent dislocations and 19 patients had recurrent subluxations. Pre-operative X-rays revealed 56 osseous Bankart lesions (66%) and 53 Hill-Sachs lesions (62%). The mean interval between instability and surgery was 33 months (range, 2-288). At the last follow-up patients were questioned about the return to sports. They were further evaluated according to the Duplay score system.

Results: 93% of the patients were satisfied (40%) or very satisfied (53%). 53 patients (67%) returned to playing rugby in an average time of 6 months (range, 3-24). 16 patients (20%) decided to give up for reasons unrelated to their shoulder. Rate of recurrent instability was 7%, one patient (1.1%) sustained a dislocation (pseudarthrosis due to biodegradable screw fixation) and subluxation occurred in 5 patients (5.8%). The average Duplay score was 76 points. 89% of the patients had excellent (36%) or good (43%) results. Better results were observed in patients who were operated in the first year after the occurrence of instability (Duplay score=84, 42% excellent and 51% good results).

Conclusion: The Latarjet stabilisation procedure is a safe and efficient procedure in anterior shoulder instability. Post-operative stability appears to be satisfactory in this population in comparison to that reported with other techniques. We still recommend it in contact sports.

E-poster w/ Standard #870
Arthroscopic Bankart Repair using Knotless or BioKnotless Suture Anchors
Matthew Nofziger, Bennington, VT, USA, Presenter
Raymond Thal, Reston, VA USA
Mark Bridges, Reston, VA USA
Town Center Orthopaedic Associates, Reston, VA, USA

A retrospective evaluation of 73 consecutive patients with traumatic anterior instability of the shoulder treated with arthroscopic Bankart repair using Knotless or BioKnotless Suture Anchors is reported. Results at a minimum 2-year follow-up
(range 2-7 years) are reported on 72 patients available for follow-up evaluation.

The study population consisted of 57 males and 15 females at an average age of 27 years (range 15-64). Thirty-seven of the patients were 22 years of age or younger. The average duration of preoperative symptoms was 55 months (range 1-300 months). All patients had an initial traumatic event and recurrent instability. Forty-seven patients had preoperative dislocations (average 2.3 dislocations) and 47 patients had recurrent subluxations (average 6.1 episodes). Metallic Knotless suture anchors were used in 45 patients, BioKnotless suture anchors were used in 27 patients. Forty patients in this study were athletes involved in contact or collision sports.

The average postoperative loss of external rotation, at 90 degrees of abduction, was one degree. Five patients (6.9%) experienced a post-repair dislocation. Redislocation rate was 8.8% in the Metallic Knotless anchor group (4 of 45 patients) and 3.7% in the BioKnotless anchor group (1 of 27 patients). All patients who experienced a post-repair dislocation were 22 years old or younger. Redislocation rate in this age group was 13.5% (5 of 37 patients). There were no redislocation episodes in patients over 22 years of age. Two of the post-repair dislocations were in patients involved in contact or collision sports (7.5% redislocation rate).

Revision arthroscopic repair using Knotless suture anchors was performed on 4 of the 5 patients who experienced redislocation. Three remained stable at last follow-up of a minimum of 2 years.

E-poster #871
Arthroscopic Bankart Repair Using Anchor Suturing and Thermal Capsulorrhaphy for Traumatic Anterior Instability of the Shoulder
Shigeru Sasaki, Kashiwazaki, JAPAN, Presenter Akihiro Kotani, Mitaka, Tokyo, JAPAN Masahiko Kemmochi, Setagaya-ku, Tokyo, JAPAN Yoshiaki Ishii, Mitaka, Tokyo, JAPAN Kazuhiro Satomi, Mitaka, Tokyo, JAPAN Dept. of Orthop. Surg., Kashiwazaki Chuo Hospital, Kashiwazaki, JAPAN

This study describes the clinical results of arthroscopic Bankart repair using anchor suturing and thermal capsular shrinkage for traumatic anterior instability of the shoulder in 18 patients with an average follow-up of 22.9 months. The subjects were 12 males and 6 females, with an average age of 27.6 years (range: 16-53) at the time of operation. Each subjects Bankart lesion was identified and mildly decorticated; capsulolabral tissue was mobilized by using an abrader burr and meniscal rasp, then 3 or 4 absorbable PLLA suture anchors were implanted. The capsule was sutured to the anterior margin of the glenoid with the anterior inferior glenohumeral ligament complex to provide restraint. Then, thermal capsular shrinkage was performed mainly on the unstable anterior and anteroinferior aspects of the capsule, at 20 W and at an average temperature of 67.3, using the Mitek bipolar VEPR system. Postoperatively, immobilized with a sling with a pillow spacer for 3 weeks. A physical therapist began mild assisted-passive movements of abduction at 10 days after the operation; then, activities were increased toward full sporting participation at 6 months. The clinical treatment results were assessed based on Rowe score, recurrence of dislocation/subluxation, and average range of motion (ROM) limitations of passive external rotation at 0 and 90 degree of abduction.

Preoperatively, none of the patients had an overall rating of good or excellent according to the system of Rowe et al. However, our results indicated that 94.4% (17 of 18 patients) had a rating of good or excellent at the time of the final follow-up, except for one patient who had recurrent subluxation after the surgery. The average ROM limitations of passive external rotation at 0 and 90 degree of abduction measured 6.6 and 5.8 degrees. Mologne et al. reported that 75% of unsuccessful arthroscopic Bankart repair operations were associated with capsular laxity. Gartsman et al. reported that the combination of suture anchor and thermal capsulorrhaphy (with a Holmium laser) was effective in cases with traumatic anterior instability of the shoulder. Our results also indicated that the instability was reduced by eliminating the laxity of the anterior aspect of the capsule through arthroscopic Bankart repair with thermal capsular shrinkage.
E-poster #872
The Histopathology of Glenoid Bone Lesions and Its Relevance to Surgery for Glenohumeral Instability
Joe F De Beer, Cape Town, SOUTH AFRICA, Presenter
Chris Paul Roberts, Ipswich, Suffolk, UNITED KINGDOM
Pol Huysmans, NETHERLANDS
Tim Cresswell, Cape Town, Western Cape, SOUTH AFRICA
Karin van Rooyen, Cape Town, SOUTH AFRICA
Christo J.F. Muller, Tygerberg, Western Cape, SOUTH AFRICA
Don F. du Toit, Tygerberg, SOUTH AFRICA
University of Stellenbosch, Tygerberg, SOUTH AFRICA

INTRODUCTION: The management of bony lesions associated with glenohumeral instability has been open to debate. Invariably a significant period of time elapses between injury and surgery during which the bony fragment may atrophy and reduce both in size and in quality.

METHOD: Histomorphometric bone analyses were prospectively performed on the glenoid bone fragments harvested during the modified Latarjet operation. The main purpose of the study was to assess the viability of the bone.

RESULTS: Biopsies were obtained from 21 patients that had given informed consent. Median age was 21 years (range 16-50). All were male patients. The most important sports identified were rugby (64%) and water sports (surfing, water polo, water skiing, surfing (21%)). Mean glenoid bone loss on CT scan was 17% (range 10-50%). Thirty-three percent had bone loss greater than 20%.

Gross morphology of gleno-labral fragments identified a single large fragment (11/21); dominant large fragment plus smaller fragments (7/21); multiple fragments (4/21). Single large fragments comprised 52% of the study. Mean volume and mass of bony fragments were 2.18 ml (range 1-3 ml) and 1.64 gms (range 0.43-2.8 g), respectively. Histology of the specimens revealed no bone in three of the 21 specimens. Bony necrosis was present in 8/18 (44%) of the specimens.

CONCLUSION: From a histopathological point of view, reattachment of these devitalized bone fragments by screws or anchors may result in predictable operative failure and recurrent instability. We can therefore not support the practice of repair of bony Bankart lesions based on the above findings.

E-poster #873
Latarjet Procedure for Glenoid Bone Loss after Recurrent Dislocations
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Pol Huysmans, NETHERLANDS
Tim Cresswell, Cape Town, Western Cape, SOUTH AFRICA
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Johannes Barth, San Antonio, Texas, USA
Don F. du Toit, Tygerberg, SOUTH AFRICA
Stephen S. Burkhart, San Antonio, TX, USA
Cape Shoulder Institute, Cape Town, SOUTH AFRICA

INTRODUCTION: The purpose of this multi-centre retrospective study was to determine the outcomes of the Latarjet procedure for shoulder instability with glenoid bone loss.

METHOD: From March 1996 to December 2002, 102 patients underwent an open Latarjet procedure by the two senior authors. Forty-six of them were available for a follow-up.

RESULTS: Mean age of the patients was 26.7 years old. There were 45 male patients and 1 female patient. Pre-operative mean forward elevation was 175 degrees, external rotation was 47 degrees, external rotation from 90 degrees of abduction was 76 degrees and internal rotation was 83 degrees. All patients had a pre-operative positive apprehension sign. The mean number of dislocations before surgery was 15.

The mean follow-up time was 38.5 months (range: 12 to 88). Post-operative mean forward elevation was 175 degrees, external rotation was 47 degrees, external rotation from 90 degrees of abduction was 76 degrees and internal rotation was 83 degrees. No patient suffered a further dislocation although one of them still had a positive apprehension sign (2.2%). The post-op WALCH and DUPLAY score was 91.8±8.4 and the CONSTANT score was 94.2±6.07 (range 79 to 100).

CONCLUSION: Glenoid bone loss represents a strong indication of a bone grafting procedure to restore the articular arc of the glenoid and avoid any further dislocation. The Latarjet procedure should be considered as the Gold standard for
this type of indication. In addition, in these cases, neither arthroscopic, nor open Bankart repairs should be performed.

**SHOULDER OTHER**

**E-poster #900**  
Arthroscopic Rotator Cuff Repair: The Learning Curve  
Dan Guttmann  
Robert Duane Graham, USA, Presenter  
Megan I. MacLennan  
James H. Lubowitz, Taos, NM USA  
Taos Orthopaedic Institute, Taos, NM, USA

**PURPOSE:** To quantitate the learning curve for arthroscopic rotator cuff repair.  
**METHODS:** Rotator cuff repair time (RCRT) in minutes is prospectively recorded for 100 consecutive patients having arthroscopic rotator cuff repair performed by a single surgeon beginning with his first case in private practice. Mean RCRTs for consecutive blocks of ten cases are compared. Learning is graphically represented by plotting RCRT by case number and generating a logarithmic trend curve. A best-fit linear equation (y equals mx plus b) allows comparison of the initial ten cases with the subsequent 90 cases where m, the slope, represents the rate of decrease in RCRT.  
**RESULTS:** Mean RCRT decreased significantly (p less than 0.05) from the first block of ten cases to the second block of ten cases and from the fifth block of ten cases to the sixth block of ten cases. There were no significant changes in mean RCRT when comparing other consecutive blocks of ten cases. The slope of the line fitting the first block of ten cases is -8.75; the slope (m) of the line fitting the subsequent 90 cases is -0.23; the difference is significant (p less than 0.05). There is no significant difference in mean RCRT when cases are stratified by tear size.  
**CONCLUSION:** Graphic representation of RCRT by case number generates a learning curve whereby learning is quantitatively demonstrated as a significant decrease in operative time as surgical experience is gained.

**E-poster #901**  
Is The Superior Medial Shoulder Portal Safe?  
Michael Maximus Karch, Presenter  
Robert Duane Graham  
Dan Guttmann  
James H. Lubowitz

**PURPOSE:** To test the hypothesis that the superior medial (supraclavicular) arthroscopic shoulder portal is a safe distance from the suprascapular nerve.  
**METHODS:** A safe distance was defined as 10mm. In 12 fresh cadaveric shoulders, the skin and trapezius were resected, the supraspinatus was retracted, and the suprascapular nerve was identified. The portal was established at the apex of the angle bordered by the posterior distal clavicle and the anterior superior scapular spine. A 5.5mm short burr sheath was positioned, via the portal, at the posterior inferior corner of the A-C joint. The shortest distance between the sheath and the nerve was measured six times in each specimen using calipers. The mean was calculated for each specimen, and these values were analyzed for mean, range, standard deviation, and statistical power (non-comparitive analysis).  
**RESULTS:** The distance between the sheath and the suprascapular nerve averaged 24.1, range 18.0 mm to 35.5mm, standard deviation 4.9mm. Assuming a standard deviation of 5mm, confidence that the nerve is greater than 10mm from the sheath is 99.7 percent.  
**CONCLUSION:** The distance between the superior medial arthroscopic shoulder portal and the suprascapular nerve safely exceeds 10mm.

**E-poster #902**  
SLAP (Superior Labrum Anterior Posterior) Repair Using the Neviaser Portal  
Keith D. Nord, Jackson, TN, USA, Presenter  
John P. Masterson, Jackson, TN USA  
Benjamin M. Mauck, Jackson, TN USA  
Sports, Orthopedics & Spine, Jackson, TN, USA

Arthroscopic reattachment of the superior glenoid labrum is the primary treatment for Type II SLAP(Superior labrum anterior posterior) lesions and is also utilized in types III through X to various degrees. Once the suture anchors are inserted in the glenoid rim, SLAP repair requires successful passing of the sutures through the labrum. A penetrating suture retriever is a simple device for easily passing suture. The optimal angle for passing a penetrating suture retriever is perpendicular to the superior labrum. This optimal angle is achieved by using the Neviaser(superior medial) portal, without a cannula. Thomas J. Neviaser described the Neviaser portal in 1987 as the superior medial
portal. He described this portal as bordered by the clavicle, the acromioclavicular joint and the spine of the scapula. A cannula was inserted 15-20 degrees from vertical aimed laterally and 15 degrees anteriorly. The authors will demonstrate their technique and review the anatomy of this portal. The Neviaser portal is illustrated as an important working portal and not merely for inflow or outflow. Additionally, by not using a cannula, a much smaller hole is produced in the rotator cuff. By placing the arm at 30 degrees of abduction, the track is through the muscle and not through the tendon. This further protects the rotator cuff tendon during SLAP repair. The authors will demonstrate that this is a safe and easy technique for SLAP repair.

**E-poster #903**

**Further Classification of SLAP Tears(Superior Labrum Anterior Posterior)**

Keith D. Nord, Jackson, TN, USA, Presenter
Richard K N. Ryu, Santa Barbara, CA USA
Sports, Orthopedics & Spine, Jackson, TN, USA

The superior labrum anterior posterior (SLAP) lesion was described by Snyder et al in 1990, as an injury of the superior glenoid labrum that begins posteriorly and extends anteriorly stopping at the mid-glenoid notch. SLAP lesions are classified into seven subtypes based upon morphologic pattern and involvement of the biceps brachii tendon. Type I lesions are associated with degenerative tears or fraying of the superior glenoid labrum without the detachment of the biceps tendon. Type II lesions, the most common type of SLAP lesions, are associated with the detachment of the superior labrum at the biceps tendon anchor. Type II lesions are subsequently divided into three subtypes depending the location of the detached labrum i.e., anterior, posterior, or both. Type III lesions involve a bucket-handle tear of the superior labrum without the involvement of the biceps tendon. Type IV lesions are described as a bucket-handle tear of the superior aspect of the labrum with a tear that extends into the biceps tendon. Portions of the biceps tendon tend to displace with the labral flap into the joint. Maffet et al described Type V, Type VI, and Type VII lesions that did not fit into the standard four lesions presented by Snyder et al. Type V lesions are associated with continuation of a Bankart detachment superiorly to involve the anterosuperior labrum and the biceps anchor. A Type VI lesion is a biceps tendon separation accompanied by either an anterior- or posterior-based flap tear of the superior labrum. A Type VII lesion involves an extension of the biceps tendon superior labrum separation anteriorly to the area below the middle glenohumeral ligament. The authors present their experience and introduce the classification for three additional types of SLAP lesions. A Type VIII lesion involves a superior labral tear with extension as far as 6 O'clock, a type IX lesion involves the continuation of the SLAP tear entirely around the glenoid and Type X involves a posterior inferior labral tear associated with a Type II SLAP tear. Classification and treatment of each type of SLAP lesion will be reviewed.

**E-poster #904**

**A Capsular Distention to Facilitate Shoulder Manipulation in Patients with Frozen Shoulder**

Somsak Kuptniratsaikul, Bangkok, THAILAND, Presenter
Chulalongkorn University Hospital, Bangkok, THAILAND

Abstract
Eighty patients with a diagnosis of frozen shoulder who had symptom for an average of 8 months and failed conservative treatment of at least 6 weeks of physical therapy were treated with capsular dilatation facilitated shoulder manipulation. Post-manipulation, the patient underwent arthroscopy for visualization, fibrin debridement and bleeding point coagulation. All the essential intra-articular structures i.e., glenohumeral ligament, rotator cuff were intact. Post-operatively, all patients revealed substantial gain in shoulder range of motion as well as diminished shoulder pain. The average flexion, abduction, and internal rotation gain were 77.8±7.2, 17.5±5.7, 9.5±7.2 degrees respectively. External rotation gain in the position of 90 degrees shoulder abduction and shoulder adduction were 55.3±9.2 and 32.5±6.9 degrees respectively. The average pain score by visual analogue scale pre and 6-month post-manipulation were 81.2±8.2 and 7.8±6.6 respectively with the average of pain score of 75.2±8.7. The authors proposed an effective and safe technique employing intra-articular pressure to facilitate shoulder manipulation in order to treat frozen shoulder. The correlation coefficient between intra-articular volume and pressure was proposed for
explanation of the mechanism to release the fibrosis.
Key word: Frozen Shoulder, Manipulation, Intra-articular Pressure, Visual Analgue Scale

KUPTNIRATSAIKUL S.

E-poster #905
A Comparative Study of Rotator Cuff Tendon Tears Treated by Mini-Open vs. Arthroscopic Techniques
Alejandro Pagan, Elche, SPAIN, Presenter
Alfredo Sanchez Martan, Santa Pola, Alicante SPAIN
Carlos Verde, Elche, Alicante, SPAIN
Emilio Chavarra, Murcia, SPAIN
Jose Luis Vispo, Murcia, SPAIN
Francisco Martinez Corbalan, Murcia, SPAIN
Jaime Clabo Murcia, SPAIN
Jesus Nicolas Murcia, SPAIN
Miguel Crespo Murcia, SPAIN
Ibermutuamur, Murcia, SPAIN

Goals: A prospective analysis of arthroscopic subacromial decompression (ASD) associated to rotator cuff repairing by mini-open technique vs. arthroscopic technique in 48 and 64 respective cases operated between December 1997 and April 2003.

Material and method: 112 patients were reviewed. 42 patients (48 cases) were operated with the mini-open procedure and arthroscopy (group 1) and 59 patients (64 cases) were operated with a total arthroscopic procedure (group 2). The same model of implant was used in both groups, and surgery consisted in bursectomy, coracoacromial ligament resection, acromioplasty, and rotator cuff tendon fixation with titanium implants of non-absorbable sutures. Clinical results were compared in both techniques by CONSTANT and UCLA scales.

Results: follow-up in group one was of 16 months. Pain and mobilisation improved in 80% of patients, in both clinical scales.

Follow-up in group two was of 9 months. Pain and mobilisation improved in 90% of patients. There were no complications. Altogether, 84% of patients showed complete satisfaction after surgery. Statistical differences between groups were not found related to clinical and functional recovery.

Conclusions: Rotator cuff repair by arthroscopic technique and/or mini-open procedures has become a common surgical procedure in shoulder surgery and makes open classic procedures as a method of treatment of the past.

E-poster #906
Evaluation of Clinical Osteology and Bending Strength for Three Acromioclavicular Reconstruction Methods
Augustus D. Mazzocca, Farmington, CT, USA,
Stephen A. Santangelo, Farmington, CT USA
Clifford G. Rios, Farmington, CT USA, Presenter
Mark L. Dumonski, Farmington, CT USA
Sean T Johnson, Farmington, CT USA
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Kevin P. Shea Farmington CT USA
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The purpose of this study was to identify the attachment sites, clavicle osteology and bending strength of the distal clavicle, for a new anatomic reconstruction of the coracoclavicular ligaments (ACCR). The new technique required two tunnels placed in the distal clavicle. Therefore, the bending strength after creation of a single and double tunnel reconstruction was also evaluated. 118 Clavicles (48.3±16.6 yrs) were analyzed and used for osteologic measurements. 14 fresh frozen cadavers (72.8±13.4 yrs) had bone density measurements, were potted and distributed into one of four tunnel configuration groups and subjected to a 3-point cantilever load at 12.7 mm/min.

There was no correlation between bone density and ultimate load. There was no difference (p=0.3) in ultimate failure between intact, single tunnel (Arthroscopic AR 4.0mm), two tunnel (ACCR 5.5mm), and 4 drill hole techniques (Weaver-Dunn WD). The mean length to the coracoclavicular ligaments was 46.3±5.2 mm. The anterior/posterior clavicle thickness was (19.1±2.9mm), the superior/inferior thickness was (11.5±1.6mm) and the distance between the CC ligaments was (21.4±4.2mm).

This study demonstrates that the placement of two 5.5mm tunnels for the anatomic reconstruction of the CC ligaments does not decrease ultimate failure load of the distal clavicle. The osteology will promote accurate anatomic coracoclavicular reconstructions.
The present study investigated the influence of throwing on the range of motion of the shoulders of high school baseball pitchers. Sixty-one pitchers, who took part in the national high school baseball tournament and reached the quarterfinals or semifinals, were investigated with regard to their range of motion. External and internal rotation in 90 degrees of abduction was examined prior to the tournament and immediately after the quarterfinal or semifinal, and the average difference between the two shoulders was compared. Prior to the tournament, the throwing shoulder showed 7.5 degrees more external rotation and 12.8 degrees less internal rotation compared with the other shoulder on average. At the time of investigation after the quarterfinal or semifinal, the average increment of external rotation and deficit of internal rotation was 5.6 degrees and 11.6 degrees, respectively. Among the individual patients, the increment of external rotation and internal rotation deficit prior to the tournament were reduced in 27 and 33 players, respectively, at the final investigation. When 2 groups with a difference of more than and no more than 10 degrees in external rotation prior to the tournament were compared, external rotation decreased from 19.6 degrees to 8.2 degrees in the 22 players with a difference of more than 10 degrees, but increased from 0.6 to 4.1 in the 39 players with a difference of no more than 10 degrees. Similarly, the average internal rotation deficit changed from 22.3 to 11.4 in 32 players and from 2.2 to 10.5 in 29 players, respectively. In conclusion, the increment of external rotation and internal rotation deficit of the throwing shoulder tended to normalize during the baseball tournament. While microinjury to the soft tissues around the shoulder appears to influence this kind of change, the actual changes varied among the players.
repairs due to large sized tears and one had a labral procedure which developed stiffness. There were no complications attributable to the use of the fixation device. Radiographs at one year showed the presence of a circular defect, the same size of the device at the cortical margin of the glenoid and an occasional linear density could be noted in the region of the greater tuberosity in patients that had undergone cuff repair. There were no cystic lesions or evidence of pathologic changes on the radiographs. DISCUSSION: This represents the first clinical study of a combined PGA/PLA soft tissue fixation device used for shoulder surgery to our knowledge. Other reports of all PGA devices have demonstrated good results but with occasional episodes of synovitis. Anecdotal reports have circulated of device failures of PLA devices and manufacturers have withdrawn from sale certain PLA devices for shoulder surgery. Our results suggest that the combined PGA/PLA device performs well in the short term and that no post-surgical complications were attributable to its use.

E-poster #911
Shoulder Cyst with a Partial Destruction of the Scapula as a Cause of the Shoulder Dysfunction in Tennis Player
Michal Drwiega, Warsaw, POLAND, Presenter
Robert Smigielski, Warsaw, POLAND
Urszula Zdanowicz, Warsaw, POLAND
Carolina Medical Center, Warsaw, POLAND

Aim
To present diagnostic findings and treatment process of shoulder disability caused by cyst with a partial scapula destruction.

Materials and methods
44 - year old women presented to our clinic with increasing pain of the right shoulder. She played tennis 3 times weekly. Rtg, MRI and CT3D examinations showed a large cyst localized at the column of the right scapula, causing its destruction. There was a connection between the cyst and joint cavity. The whole cyst was removed and the hole at the scapula was filled with bone autograft from the hip. An intensive rehabilitation protocol was administrated starting from the second day after surgery. MRI was performed 24 weeks after surgery.

Results
Patient was completely free of pain 24 weeks after surgery. She presented a full range of motion. MRI showed a complete excision of the cyst and a proper healing of the scapula column destruction. An objective evaluation using Shoulder Severity Scoring System and Athletic Shoulder Outcome Scoring System was performed. Results are very good. Nowadays this patient returned to tennis.

Conclusion
A cyst arising from shoulder joint cavity may cause pain and muscle weakness but also a dangerous bone destruction. Early diagnosis and surgery allow to return athletes to sport.

E-poster #913
Arthroscopic Treatment of Calcifying Rotator Cuff Tendinitis
Benno Ejnisman, Sao Paulo, BRAZIL, Presenter
Carlos Vicente Andreoli, Sao Paulo, BRAZIL
Alberto Castro Pochini, Sao Paulo, BRAZIL
Gustavo Cara Monteiro, Sao Paulo, BRAZIL
Wander Guimaraes Ama, Sao Paulo, BRAZIL
Moises Cohen, Sao Paulo, BRAZIL

Federal University of Sao Paulo, Sao Paulo, BRAZIL

Calcifying tendinitis can be a cause of pain in the shoulder giving considerable disability in adults. Conservative treatment is effective in 90% of cases. The indication for the surgical treatment of these pathology is taken when the conservative treatment was failed. The aim of this study was analyzed the advantages and disadvantages of arthroscopy procedures. In a prospective clinical study, during a period of 4 years, 17 patients with calcareous deposits was treated arthroscopically with 26 months follow-up (minimum of 12 months and maximum of 57 months). Of them, 10 (58,8%) patients showed supraspinatus calcification, 2 (11,8%) in the infraspinatus tendon, 4 (23,5%) in the both and 1 (5,9%) patient presented deposits in the subescapular tendon. There was no surgical complications, 4 patients was submitted to subacromial decompression Results were analyzed using UCLA classification: 13 (76,5%) excellent results; 3 (17,6%) good results and 1 (5,9%) fair results. The arthroscopic treatment is a effective management in patients with calcifying tendonitis when the conservative treatment fails.
Simultaneous Bilateral Posterior Dislocation of the Shoulder: Case Report

Michael Ilias Iosifidis, Thessaloniki, GREECE
Presenter
Leonidas Malioufas, Naoussa, GREECE
John Giannoulis, Naoussa, GREECE
Peter Sarriggiannidis, Naoussa, GREECE
Konstantinos Antoniou, Naoussa, GREECE
Konstantinos Tomtsis, Naoussa, GREECE
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Posterior dislocation of the shoulder is a rare injury. In a literature review including 8140 cases of shoulder dislocations, there were only 139 patients (1.7%) with posterior dislocation of the shoulder reported. Simultaneous bilateral posterior dislocation of the shoulder is even rarer. It is also of special interest because most are missed on the initial examination. Despite the presence of pain, swelling, and typical limitation of motion, false initial diagnosis is mentioned in retrospective reviews in the literature in a rate of 50-80%. An epileptic seizure or an electric shock usually causes posterior dislocation of the shoulder.

We present the case of a 47-year-old patient with simultaneous bilateral posterior dislocation of the shoulder, after a possible epileptic fit. The complete evaluation of the diagnosis needed more x-rays views, such as an axillary and lateral scapula views. But the bilateral dislocation and the limitation of abduction made further x-ray check impossible. So we used urgently a CT tomographer and the CT scan showed the size and the kind of the injury, a bilateral posterior shoulder dislocation with an impression defect of the humeral head. Under general anesthesia, close reduction of the dislocation was done.

Posterior dislocation of the shoulder -especially the bilateral one- is a very rare injury, which demand careful clinical and radiological evaluation, when the history describes electric shock or convulsive seizure. It is usually associated reverse Hill-Sachs lesion (an impression defect of the anteromedial aspect of the humeral head), which size determines the treatment of the injury.

Incidence of SLAP Lesions Associated with Surgical Acromioclavicular Injuries

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Mark H. Getelman, Simi Valley, CA USA, Presenter
Stephen J Snyder, Van Nuys, CA USA
Ronald P. Karzel, Van Nuys, CA USA
Southern California Orthopedic Institute, Van Nuys, CA, USA

Purpose:
The purpose of this paper is to study the incidence of SLAP (Superior Labrum Anterior to Posterior) lesions in patients undergoing acromioclavicular (AC) joint reconstruction.

Type of Study:
Retrospective review.

Materials and Methods:
A retrospective chart review was performed on patients who underwent an acromioclavicular joint reconstruction along with concurrent shoulder arthroscopy between 1990 and 2003. Patients from three experienced shoulder surgeons were included. 59 patients that underwent a Weaver-Dunn reconstruction or one of its variants were identified.

Results:
Of the 59 patients identified, 22 (37%) had documented intraarticular pathology. 18 patients (31%) had documented SLAP lesions and 8 (14%) had other pathology. In those patients with SLAP lesions, 10 patients (55%) had type I lesions, 3 (17%) had type II lesions, 3 (17%) had type III lesions, and 2 (11%) had type IV lesions. Debridement was performed for type I and III SLAP lesions (14 patients, 78%) and repair was performed for type II and IV SLAP lesions (4 patients, 22%). In addition to the SLAP pathology, two rotator cuff tears were identified, with one patient undergoing arthroscopic repair and the other debridement of a partial tear.

Conclusion:
At our institution, we routinely perform arthroscopy for patients undergoing AC joint reconstructions, and concomitant pathology has been identified frequently. The diagnosis of SLAP pathology in patients with AC joint injury can be difficult. The mechanisms of injury can be similar and result in unrecognized superior labral pathology in light of the AC injury. In our study, 18 patients (31%) had documented SLAP lesions and 8 patients (14%) had other treatable shoulder pathology. These lesions would not have been discovered without the addition of shoulder arthroscopy. Failure to diagnose intraarticular pathology, particularly SLAP lesions, in patients
with AC injuries can result in unexplained operative failures and morbidity. There is a high incidence of SLAP lesions in these surgically treated patients. Therefore, we recommend the use of shoulder arthroscopy in patients undergoing operative treatment of acromioclavicular injuries and careful consideration for possible SLAP pathology in patients with AC joint injuries, particularly those which fail to improve with conservative care.

E-poster #917
Glenohumeral Arthrodesis. Functional Results After 7.8 Years.
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Jan Erik Madsen, Oslo, NORWAY
Per Siewers, Baerum, NORWAY
Orthopedic Centre, Ullevaal University Hospital, Oslo, NORWAY

Aims. The complications and functional long time results after glenohumeral arthrodesis are described.
Methods. 22 patients (9 men, 13 women) with a median age of 64 (19 - 75) years were operated with a glenohumeral arthrodesis between 1982 and 2000. The indications for surgery were fracture sequelae (11), severe osteoarthritis (4), deltoid dysfunction (3), failed revision arthroplasty (1), chronic posterior dislocation (1), tuberculosis (1) and gunshot wound (1). Standard AO surgical technique with stable plating was used. 6 patients are dead and 1 refused examination. The remaining 15 patients were examined retrospectively after a mean of 7.8 years. The American Shoulder and Elbow Surgeons (ASES) score and Oxford score were registered and radiographs taken.

Results. 8 patients had intermittent or continuous pain with a mean pain score (VAS) of 1.5 (0-8). 1 patient was reoperated after 4 months due to excessive pain and one was operated due to a humeral shaft fracture after 8 months. The implants had been removed in 5 patients and 1 had a lateral clavicle resection after 3 years. No patients had infections, but 1 had reflex sympathetic dystrophy. Radiologically all but two arthrodesis fused, the remaining 2 were painfree. Mean Oxford score was 33 (20 - 49), mean ASES score was 59 (15 - 95).

Conclusions. The functional results after glenohumeral arthrodesis are comparable with results reported after shoulder arthroplasty. The arthrodesis has a wide range of indications and the long time complications related to shoulder prosthesis may be avoided.

E-poster #918
Bursoscopy Findings in Patients with Symptomatic Acromio-clavicular Joints
Chris PaulRoberts, Ipswich, UNITED KINGDOM, Presenter
Pol Huysmans, NETHERLANDS.
Karin van Rooyen, Cape Town, SOUTH AFRICA
Don F. du Toit, Tygerberg, SOUTH AFRICA
Joe F De Beer, Panorama, Cape Town, SOUTH AFRICA

INTRODUCTION: The co-existence of impingement syndrome and acromio-clavicular joint disease is widely reported. It is recommended by some that ACJ resection is combined with subacromial decompression.
METHOD: During the period November 1998 to November 2003 201 patients with symptomatic ACJs were taken to theatre. Bursoscopy was performed and recorded in 183 of these 201 patients. Exclusion criteria were patients that had previous ipsilateral shoulder surgery and patients with sonographically proven rotator cuff tears. There were 129 males and 54 females with a mean age of 41 (range 16 to 72 years). One hundred and thirty-six of these patients had a pre-operative diagnosis of isolated ACJ disease. Forty-seven had a combined diagnosis of ACJ disease and impingement.

RESULTS: No abnormal findings were present at bursoscopy in 124 of 136 patients diagnosed pre-operatively to have isolated ACJ disease. In two minimal bursal fraying was noted but no decompression performed. In 10 significant impingement lesions were seen, all these patients were over the age of 35. Our experience is therefore that a symptomatic ACJ coexists with impingement (lesion or signs) in only 31% (57/183) of patients. Also, no patients under age 35 with a pre-operative diagnosis of isolated ACJ disease had abnormal bursoscopy findings.

CONCLUSION: We recommend that with careful pre-operative evaluation unnecessary surgical violation can be avoided in patients with acromio-clavicular joint disease.
E-poster #919
The Treatment of Glenohumeral Osteoarthritis in the Young and Active Patient with the GraftJacket®: Pre-Liminary Results
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Don F. du Toit, Tygerberg, SOUTH AFRICA
Joe F De Beer, Panorama, Cape Town SOUTH AFRICA
Pol Huysmans, NETHERLANDS, Presenter
Cape Shoulder Institute, Cape Town, SOUTH AFRICA

INTRODUCTION:
Treatment of osteoarthritis of the shoulder in young active patients is a difficult and unsolved problem.
Present treatment options are debridement, microfracturing, arthrodesis or shoulder replacement.
We report the preliminary results of soft-tissue interposition arthroplasty with an acellular allograft skin-derived collagen matrix (GraftJacket®, Wright Medical).

MATERIAL AND METHODS:
Between July and December 2003 6 patients (5 men, 1 woman) with severe glenohumeral osteoarthritis had a soft-tissue interposition arthroplasty of the shoulder.
The average age of the patients was 47 years (34-58).
The operative procedure was done arthroscopically in 4 patients.
The GraftJacket® was sutured to the labrum with a minimum of 5 sutures.
Average duration of post-operative follow-up was 6.2 months.

RESULTS:
Four patients had significant pain relief after the operation. The average pre-operative VAS-score was 7.2 and 2.6 post-operatively.
1 patient had no improvement, but wants to wait with further treatment, 1 patient was not successful and had a hemi-arthroplasty.
The range of motion improved only in 1 patient.
The average Constant score improved 14 points (from 45 to 59).
There were no complications per- or post-operatively.

CONCLUSION:
Soft-tissue interposition arthroplasty with the GraftJacket® shows promising results in the treatment of osteoarthritis in the young and active patient especially for pain relief.

When the procedure is performed arthroscopically the morbidity for the patient is very low.
Long term results of this new treatment are still unknown.

E-poster #920
Clinical Results of Ultrasound Guided Needling of Calcific Tendinitis of the Shoulder
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Don F. du Toit, Tygerberg, SOUTH AFRICA
Christo J.F. Muller, Tygerberg, Western Cape, SOUTH AFRICA
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Cape Shoulder Institute, Cape Town, SOUTH AFRICA

INTRODUCTION:
Calcific tendinitis of the shoulder is a common cause for shoulder pain.
Conservative treatment is the first method of choice.
In this study we evaluate the ultrasound guided needling procedure for calcium deposits in the rotator cuff.

MATERIAL AND METHODS:
Between Sept 2002 and September 2003 26 patients (8 men, 18 women) with calcific tendinitis of the shoulder were treated with an US-guided needling procedure.
The mean age was 49 and the mean duration of symptoms was 29 months.
Before the procedure started the skin and subacromialbursa were infiltrated with a local anaesthetic.
The calcium deposit was perforated and aspirated when possible.
With saline a lavage was done to wash-out the calcium.

RESULTS:
Complete dissolution of the calcium deposit on the X-ray was seen in 3 patients (11.4%).
In 11 patients the calcium was partially dissolved and in 8 patients it was unchanged.
11 patients (42.3%) had significantly improvement of the pain and did not need any further treatment.
4 patients required a re-needling procedure and 4 patients needed repeated subacromial injections during the absorption phase of the calcium.
For 6 patients an arthroscopic calcium removal was needed.
The mean VAS-score for pain during the procedure was 2.63. There were no complications.

CONCLUSION:
The US-guided needling procedure for calcific tendinitis of the shoulder is an effective and well tolerated method of treatment and avoids the need of an operative removal in 77% of the cases. In cases where no complete dissolution is achieved re-needling can be performed.

E-poster #922
Long Head of Biceps Tendon Lesion Associated with Full Thickness Rotator Cuff Tear
Young-Kyu Kim, Inchon, KOREA, Presenter
Gachon Medical School, Gil Medical Center, Inchon, KOREA

Introduction: The aims of this study were to evaluate the pathologic patterns and to assess the outcomes of the treatment of a long head of biceps tendon lesion associated with a full-thickness rotator cuff tear.

Materials and Methods: Eighty-Two patients, who were treated for FTRCT and in whom the biceps tendon lesion could be observed with arthroscopy, were retrospectively reviewed with minimum 1 year follow-up between 1997 and 2002. There were 13 patients with a small RCT, 26 with a medium RCT, 22 with a large RCT, and 21 with a massive tear. 12 had associated partial thickness tears of the deep surface of the subscapularis tendon. The pathologic spectrum of the biceps tendon was classified into the following 4 types; tenosynovitis, degenerative change, tear, and subluxation or dislocation. All but 4 patients with a massive cuff tear were repaired. The biceps tendon lesions were treated with a debridement in 29, a tenotomy in 7, a tenodesis in 4, recentering 3, and no treatment 20.

Results: 63 patients (77%) had a biceps tendon lesion. 18 patients (22%) had either tenosynovitis or tendinitis, 20 (24%) had fraying or flattening, 14 (17%) had a partial tear, 4 (5%) had a complete tear, 4 (5%) had subluxation, and 3 (4%) had a dislocation. According the involvement of the RCT, a biceps tendon lesion was observed in 62% of the small RCT, 73% of the medium RCT, 82% of the large RCT, and 86% of the massive RCT. In 12 cases with the associated subscapularis partial tear, 11 (92%) had a biceps tendon lesion and 4 out of the 11 cases had either a subluxation or dislocation. The outcomes according to the pathology of the biceps lesion were a pain score of 8.4 and UCLA score of 29.6 in the absent biceps lesion, and a pain score of 8.0 and UCLA score of 28.3 in the present biceps lesion. In 3 cases with recentering, the pain score was 7.7 and UCLA score was 27.7. In 9 cases of either tenotomy or tenodesis with a reparable RCT, the pain score was 8.2 and UCLA score was 28.2.

Conclusion: There was a higher incidence and severity of a biceps tendon lesion with a larger RCT. Therefore, the cause of a biceps tendon lesion might be related to the cause of the RCT. A biceps tendon subluxation or dislocation had a higher incidence in the RCT associated with a subscapularis tear. It is possible that a tenotomy or tenodesis may be more effective in providing pain relief and restoring the function among the several surgical options for biceps lesion than recentering.

E-poster #924
The Arthroscopic Rotator Cuff Repair of the Partial Rotator Cuff Tear
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Purpose: We evaluated the clinical outcome of arthroscopic rotator cuff repair (ARCR) in eight patients who had partial rotator cuff tear (PRCT) involved more than 50% depth of the tendon.

Materials: 8 patients who underwent ARCR from 2000 to 2003 were followed up over one year (15.1±9.3 months). There were 4 males and 4 females with an average age of 64.4 years at the time of surgery. All tears were involved more than 50% depth of the rotator cuff. Tow cases were bursal side tears, one case was intratendinous tear, and five cases were articular side tears. All patients received acromioplasty and rotator cuff repair under the arthroscopy. Three cases who suffered from shoulder stiffness were underwent arthroscopic capsular release. The results were graded on the UCLA Shoulder Rating Scale.

Results: At one-year follow up, the average postoperative UCLA Shoulder Rating Scale score increased by an average of 14.5 points to 18.3. The pain scores improved from 2.1 points preoperatively to 9.8 points at the time of follow up. The function scores improved from 4.5 to 8.8. Forward flexion scores improved from 3.5 to 4.8. Strength scores improved from 4.4 to 5.0.
Discussion: The arthroscopic technique has advantage of allowing accurate inspection of the articular side tear, and treating coexisting intra-articular lesions. In this series, five of the eight cases were articular side tear, and three patients who suffered from shoulder stiffness were undergone arthroscopic capsular release in addition of rotator cuff repair. There are many reports of the arthroscopic debridement and subacromial decompression for PRCT, but there are few reports of the ARCR of PRCT, which involved more than 50% depth of the tendon. In this study, this arthroscopic treatment revealed the good results as rated by the UCLA Shoulder Rating Scale.

E-poster #925
Muscle Tendinous Lesions in Athletes
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Carlos Vicente Andreoli, Sao Paulo, BRAZIL
Alberto Castro Pochini, Sao Paulo, BRAZIL
Gustavo Cara Monteiro, Sao Paulo, BRAZIL
Wander Guimaraes Ama, Sao Paulo, BRAZIL
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Muscle injuries-lacerations, contusions or strains are the most common injuries in sports. Most muscle injuries can be treated conservatively with excellent recovery, but complete ruptures with complete loss of function should be managed surgically. This retrospective study examined 252 shoulder muscle lesions for 4 years and age between 16 and 65 years old (media 29.32). Contusions and muscle pain were most often lesions(132-52%), cuff rotator tendon tears (92-36.5%), pectoralis major lesions (15-5.95%), 6 proximal biceps ruptures, 2 triceps braquial ruptures, 1 latissimus dorsi lesion and 1 anterior serratil lesion. SLAP lesions were excluded. Volleyball(20%), weightlifting(19.1%), swimming(7.4%), handball(5.3%) and contact fight(5%) were the most often sports involved. Of them, 87% return to competitive sport practice. The muscle-tendinous lesions are the most common injuries and needs treatment protocols and clinicals studies more specifics.

E-poster #926
Arthroscopic Findings of Biceps Pulley in Shoulder Pathology
Chang-Hyuk Choi, Taegu, KOREA, Presenter
Shin-Kun Kim, Taegu, Taegu KOREA
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Purpose: The role of biceps pulley is stabilizing sling for the long head of the biceps tendon against anterior shearing stress in the rotator interval. The purpose of this study was to classify arthroscopic findings of biceps pulley and to evaluate the relationship with shoulder pathology. Materials and Methods: From January 2002 through July 2003, we observed biceps pulley in 128 cases of shoulder pathology treated with arthroscopically, including 42 cases of anterior instability, 42 of rotator cuff tear, 14 of impingement syndrome, 10 of frozen shoulder, 5 of superior labral injury, 2 of snapping scapula, 6 of calcific tendinitis, 5 of biceps dislocation or tear, each 1 of acromioclavicular arthritis and suprascapular ganglion. We classified biceps pulley as four types according to the arthroscopic appearance. Type I as stretched type, type II as sling type, type III as detached sling type, and type IV as concealed type.

Results: We observed stretched type in 85 cases(66%), sling type in 9 cases(7%), detached sling type in 4 cases(3%), concealed type in 2 cases, and unidentified cases in 28 cases(22%). Conclusion: Development and variation of biceps pulley may have symptomatic correlation according to the degree of shoulder motion or pathologic status.

E-poster #927
Interscalene Block Anesthesia for Shoulder Surgery. Is It Safe and Effective?
Guillermo R. Arce, Buenos Aires, ARGENTINA, Presenter
Carlos A Bollini, Buenos Aires ARGENTINA
Pablo Lacroze, Buenos Aires, ARGENTINA
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Matias Canete, Buenos Aires, ARGENTINA
IADT, Buenos Aires, ARGENTINA

Background: There has been resistance to the use of Interscalene Regional Block (ISB) for shoulder surgery due to concerns about potential complications and failed blocks. Objective: The purpose of this study was to clarify the advantages of the IB in shoulder surgery and to review its complications. Method: Out of 521 cases of shoulder procedures a retrospective review was performed of 445 consecutive patients in a six year period.
Complete orthopaedic and anesthetic records were available. The planned type of anesthesia, occurrence of block failure, the surgical procedure and the presence of complications were noted. Results: Of 445 patients, 372 underwent full arthroscopic procedures and 73 underwent open surgery (open repairs, ORIF or arthroplasties). General anesthesia was the initial planned choice in 64 cases due to complexity of the operation or lateral decubitus position of the patient. Fifty eight of these 64 also received an ISB. ISB alone was planned for 381 patients. Three hundred sixty six (96%) were successful, while 15 cases (4%) required GA due to inadequate block. 94% of the arthroscopic procedures and 54% of the open cases received ISB alone. Among all 439 patients receiving ISB, only one major complication was seen. One patient presented a sudden death leaving the hospital two hours after the procedure. There were no pneumothoraces, seizures, other cardiac events or major complications. Three patients suffered sensory neuropathies which resolved at a mean period of five weeks.

Conclusions: ISB provides adequate analgesia during the surgical procedure and postoperative period. When administered by an anesthesiologist skilled in the technique, the ISB is a safe and effective anesthesia for shoulder surgery.

E-poster #929
Open Surgical Treatment of the Acromio Clavicular Dislocation Grade III in Athlete
Ronaldo Dalla Bernardina, BRAZIL, Presenter
Centro de trauma ortopedia do Esporte (CETE), Sao Paulo, BRAZIL

Authors: Benno Ejnisman, Carlos Vicente Andreoli, Ronaldo Dalla, Alberto Pochini, Gustavo CarÃ¡ Monteiro, MoisÃµs Cohen.
The Acromio Clavicular Dislocation grade III of Rockwood classification (ACD G III) is a common traumatic injury in the sports, corresponding between 10 and 20% of the injuries of the shoulder of the athlete. The objective of this work was to evaluate the surgical treatment of ACD G III by means of the surgery of Weaver-Dunn modified with the setting of the acrÃ´mio clavicular joint with Kirschner wires. Between 1998 and 2002 24 athletes had been operated, being the soccer of bigger prevalence of the injury with 10 cases (41.6%) followed by martial arts/fight and basquete both with 4 cases (16.6%). The average age of the patients was 28.9 years (between 19 to 38 years). A postoperative evaluation second to the criteria of Poigenforst(1987) specific for Acromio Clavicular Dislocation was carried through after one year of pursuing getting itself 17 cases excelente(70%), 6 good(25.1%) and 1 case bad(4.1%). The return to the sport if gave in all the patients. The surgery of Weaver-Dunn modified associated to the setting of the acrÃ´mio clavicular joint with Kirschner wires is an efficient procedure for the treatment of ACD GIII in athlete.

E-poster #930
Frozen Shoulder - Arthroscopic Release
Manoel Antonio Delatre Bonfim, BRAZIL, Presenter
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Eight patients with a diagnosis or primary(four) and secondary (four) frozen shoulder, who had symptoms for an average eight months and failed conservative treatment of at least eighteen weeks of physical therapy, were treated with an arthroscopy capsular release. Standard shoulder arthroscopy was done and radiofrequency(VAPR) was used to divide the anterior inferior capsule, the intra articular portion of the subscapularis tendon, and middle glenohumeral, the superior glenohumeral and the coracohumeral ligaments. The subacromial space wasn’t inspected in all patients, and only two sub acromial decompression were done All patients showed a good gain of shoulder range of motions, as well as diminished pain. The autor concluded that arthroscopic capsular release is an effective an safe alternative to failure of conservative methods to treatment or frozen shoulder.
prospectively with 151 patients having 1 year subjective and 38 with objective follow-up at an average of 586 days (range 342-2267 days). The dependant variable was patient satisfaction with outcome, graded ordinally on a 1-10 scale. Independent variables included various demographic, surgical, objective and subjective parameters. Diagnoses included instability (n=63), rotator cuff pathology (n=70) and associated anterior labral pathology (n=54). Multiple stepwise linear regression analysis was utilized to determine multivariate predictors of patient satisfaction.

Results: Worker’s compensation, re-injury status, prior surgery and gender were significant for patient satisfaction (p>0.05). For surgical variables, there were significant differences in patient satisfaction for a torn biceps, articular cartilage pathology and use of thermal treatment (p>0.05). For Objective variables, there were significant differences in satisfaction for passive forward elevation and pain with cross-arm-abduction (p>0.05). For subjective variables, all question regarding pain and function were significant with satisfaction (p>0.05). ASES score, painless use of arm, pain with daily activities or recreation, returning to pre-injury competition level and age are independent predictors of patient satisfaction (R²=0.59).

Conclusion: Univariate and multivariate determinants of patient satisfaction with outcome after SLAP surgery were established. Some specific surgical and objective variables were associated with satisfaction. However, subjective variables of pain and function had the most robust associations with satisfaction. Thus, in assessing the outcomes of SLAP surgery, we would like to emphasize the importance of patient-derived assessment of symptoms and function.

E-poster #932
The Interest of Arthroscopy in Shoulder Arthroplasty
Yves Lefebvre, Strasbourg, FRANCE, Presenter
Elias Dagher, Paris, FRANCE
Francois Bonnomet, Strasbourg, FRANCE
Jean-Francois Kempf, Strasbourg, FRANCE
Hautepierre hospital, Strasbourg, FRANCE

Introduction: Total shoulder arthroplasty is mostly successful, however several factors can be involved in failure and poor clinical results. In this study, we report our experience in shoulder replacement arthroscopy trying to define its diagnostic and therapeutic indications.

Materials and Methods: Between 1994 and 2000, 12 patients with painful shoulder replacement underwent arthroscopy as a diagnostic or therapeutic procedure (11 hemiarthroplasty, 1 total shoulder arthroplasty). Arthroscopy was performed with an average of 28 months (6-36) after arthroplasty. In this period all patients were placed on a conservative program (home exercises, outpatient physical therapy and analgesic medication) in order to avoid surgery. We used the Constant score for clinical evaluation preoperatively and the last follow up (average 19 months, 6-72). X-rays and CT arthrogaphy were performed before arthroscopy. Postoperatively, rehabilitation program included early mobilization in all cases.

Results: Arthroscopy established the etiologic diagnosis in all cases. It was a therapeutic procedure in 9 cases: 5 capsular release, 4 biceps tenotomy, 2 loose bodies (cement) removal and 1 subacromial decompression. In 3 cases, arthroscopy was not sufficient to treat the problem. The first one needed a totalisation of the hemiarthroplasty because of important glenoid cartilage damage. The second presented an important cement bar not removable by arthroscopy. In the third patient, we performed open repair for a massive rotator cuff tear.

Postoperatively, the absolute Constant score increased from 25 to 43 concerning the 9 patients treated arthroscopically. Pain and shoulder function were significantly improved but there was no improvement in strength evaluation.

Conclusion: Arthroscopy for diagnostic or therapeutic purposes in prosthetic shoulder appears to be reliable, safe, worthwhile and technically feasible. Although open revision of the shoulder replacement is sometimes required, arthroscopic management may be an effective alternative in certain cases. Biceps tenotomy and capsular release improve significantly pain and stiffness.

E-poster #933
Arthroscopic Repair of Type II SLAP Lesions with Absorbable Anchors
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Steven P. Fries, Trumbull, CT USA
Lauren E. Redler, Trumbull, CT USA
The OSM Center, Trumbull, CT, USA
Purpose: To evaluate an arthroscopic technique for Type II SLAP lesion repair using absorbable anchors and sutures. Type of Study: Retrospective Case follow-up. Materials and Methods: Sixty-eight patients were identified who underwent arthroscopic repair for type II SLAP lesions using absorbable Panalock anchors (Mitek Products, Westwood, MA). The patients averaged 39 years old, 77% were male, 23% female. Surgical method involves initial debridement of the SLAP lesion and adjacent glenoid rim, followed by decortication of the glenoid rim using the Burr. Special drill guide cannulas were developed for both drilling the pilot hole and insertion of the Panalock anchor in an arthroscopic fashion. A suture passer is then used to pass one arm of the suture through the adjacent labrum. Arthroscopic knot tying is then done allowing for a secure repair. This procedure is repeated until the tear has been completely repaired. Postoperatively, the patients are kept in a shoulder immobilizer for three weeks and then started on a range of motion and strengthening program in therapy. Results: 68 patients met the criteria for 24-month minimum follow-up. Good or excellent results were observed in 97.6% to 100% of cases depending on the scale. The Rowe score (average 96.59) indicated 60 excellent scores and 8 good results. The Modified-Rowe score (average 95.37) indicated 63 excellent scores and 5 good scores. The average UCLA score for pain was 9.07 (50 excellent, 17 good, 1 fair), motion was 9.44 (95 excellent, 13 good), and function was 9.17 (61 excellent, 7 good). Conclusions: The results of this study demonstrate that absorbable anchors can give results similar to those previously noted with permanent anchor placement, and if necessary, revision surgery is facilitated by the absence of permanent implants. We conclude that arthroscopic repair with absorbable anchors is a viable option available for treatment of Type II SLAP lesions.

E-poster #934
Arthroscopic Treatment of Chronically Painful Calcifying Tendinitis of the Supraspinatus Tendon
Romain Seil, Luxembourg, LUXEMBOURG, Presenter
Dietrich Pape, Homburg/Saar, GERMANY
Heike Litzenburger, Homburg / saar, GERMANY
Stefan Rupp, Homburg/Saar, GERMANY

Purpose: The purpose of this prospective study was to analyze the outcome of arthroscopic removal of calcifying tendinitis of the rotator cuff, to document the postoperative pain evolution and to analyze structural changes of the supraspinatus tendon by ultrasonography. Methods: 54 of 58 patients with a mean age of 45.4 (+/- 8) years enrolled in the study were available for follow-up. The calcific deposits were exclusively located in the supraspinatus tendon. Shoulder function was evaluated by using the Constant-score. Radiographic controls were performed preoperatively as well as in the immediate postoperative period and at 3, 6, 12 and 24 months. The integrity of the rotator cuff was assessed by using ultrasonography. Results: Shoulder function improved from 29.0 (+/-17) to 84.4 (+/-13.5) points at 2 years (p<0.001). The evolution of postoperative pain was very irregular. 31% of the patients were pain free or reached their minimum pain level after 3 months, 17% after 6 months, 20% after 9 months and 28% after 12 months. 80% of the patients returned to work within 6 weeks, irrespective of their profession. At the final follow-up 92% of the patients were very satisfied with the outcome. Sonography revealed minor structural changes of the supraspinatus tendon in 66% of the patients. Conclusions: The study confirmed the previously reported successful results of arthroscopic treatment of calcifying tendinitis of the rotator cuff. Complete intraoperative removal of the deposit did not appear to be essential. Even if most of the patients were able to return to work within 6 weeks, postoperative recovery was prolonged over several months in most of the patients. The clinical relevance of the ultrasonographic changes of the supraspinatus tendon has not been determined yet.
Habitual Inferior Subluxation of the Clavicle at the Acromioclavicular Joint

Kazuhiko Kikugawa, Matsuyama, JAPAN, Presenter
Yu Mochizuki, Hiroshima, JAPAN
Mitsuo Ochi, Hiroshima, Hiroshima, JAPAN
Matsuyama Red Cross Hospital, Matsuyama, Ehime, JAPAN

The traumatic acromioclavicular dislocation is a common injury, the clavicle most often dislocates superiorly in relation to the acromion. But non-traumatic acromioclavicular dislocation is quite rare and the clavicle rarely dislocated inferiorly. We report a rare case of habitual inferior subluxation of the clavicle at the acromioclavicular joint.

(Case report) A 14-year-old female, who had a 6-years career of table tennis felt a pain on right shoulder when she hit a ball at the top position on her forehand. By moving her shoulder backward and forward, he felt a click and a severe pain. The clavicle dislocated beneath the acromion when the shoulder was abducted from 20 degree to 90 degree. There were no other sign of joint laxity. A-P roentgenograms and cineradiograms in the dislocated position, the gap between the clavicle and coracoid was lower compared with the reduced position. Treatment was by reconstruction of the acromioclavicular joint using her palmaris longus tendon. Postoperatively, there was good pain relief and the subluxation of the acromioclavicular joint was disappeared.

Forced Shoulder Abduction and Elbow Flexion Test: A New Simple Clinical Test to Detect Superior Labral Injury in the Throwing Shoulder

Shigeto Nakagawa, Osaka, JAPAN, Presenter
Minoru Yoneda, Osaka, Osaka, JAPAN
Naoko Mizuno, Osaka, Osaka, JAPAN
Yukioka Hospital & Osaka Kosei-nenkin Hospital, Osaka, JAPAN

Although several provocation tests for detecting superior labral injury of the shoulder have been reported, some of the maneuvers involved are complicated and diagnosis is still inaccurate. The purpose of this report is to introduce our forced shoulder abduction and elbow flexion test (forced abduction test) along with an assessment of its efficacy in the throwing shoulder by comparison with other clinical tests. Fifty-four throwing athletes who underwent arthroscopic surgery were prospectively studied. Superior labral injury was present in 24 cases (Snyder’s classification was type 2 in 17, type 3 in 2, type 2+3 in 4, and type 2+4 in 1), and there was loose attachment of the superior labrum in 6. Several clinical tests were performed preoperatively and the results were recorded on our original chart. Then, the condition of the superior labrum was examined during arthroscopic surgery and the results of these tests were compared with the arthroscopic findings. The forced abduction test was classified as positive when pain at the postero-superior aspect of the shoulder on forced maximal abduction was relieved or diminished by elbow flexion. As results, the sensitivity, specificity, and accuracy of the forced abduction test was 67%, 67%, and 67%, respectively. It was one of the effective tests, along with the crank test and O’Brien’s test. (crank test: 58%, 72%, 66%, O’Brien’s test: 54%, 60%, 57%, respectively).

Furthermore, the results of the forced abduction test showed a significant correlation with the presence of superior labral injury (p=0.0275, chi-square test). In conclusions, the forced abduction test is a simple and effective method of diagnosing superior labral injury in throwing shoulders.

Arthroscopic Distal Clavicle Resection in Subtle Acromioclavicular Instability

Yon-Sik Yoo, Pohang, KOREA, Presenter
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Il-hyun Nam, Pohang, Gyung-buk, KOREA
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Distal clavicle resection is reported to be a successful method of addressing various level of pain originating in the acromioclavicular(AC) joint. However, recent clinical studies on arthroscopic distal clavicle resection for treatment of subtle instability tells a different story. Many articles have been written by those who doubt the use of arthroscopic distal clavicle resection for unstable AC joint. Failure to attain good results have led them to consider surgery to stabilized the AC joint. But reconstruction of AC ligament is practically impossible because of the lack of data on previous reconstruction attempts and difficulty in making new AC ligament due to their short in
length. In response to this phenomenon, my colleagues and I have been performing distal clavicle resection to safeguard against the failure of conservative treatment in subtle AC instability. We have executed a study with the purpose of evaluating the midterm evolution of subtle AC instability treated with arthroscopic distal clavicle resection. Seventeen consecutive patients with subtle instability of distal clavicle after grade II injury were identified. The mean follow up was 2 years (1-4 years). Shoulder function was assessed using the Constant - Murley score, which ranges from 37 to 69. Pain was assessed using a linear visual analogue pain scale ranging from 0 to 10. Postoperative constant score ranged from 51 to 88 (average 70). Review of postoperative radiographs recorded an average distal clavicle resection of 5.5mm. The overall result for the 17 shoulder were very satisfy in 3 (18%), satisfy in 10 (59%), and dissatisfy in 4 (23%). therefore satisfactory result were noted in 75% of this overall treatment group.

In conclusion, Arthroscopic distal clavicle resection in patient with subtle distal clavicle instability is a reasonable initial treatment option with lower morbidity.

E-poster w/ Standard #938

Computer-Assisted Analysis of Gleno-humeral Joint and Rotator Cuff Passive Kinematics
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1 Introduction
Accurate knowledge of the intrinsic kinematics of the shoulder and the relation between different structures inside the joint are fundamental to achieve an overall comprehension of the mechanism of failure or inflammation of the rotator cuff muscle during specific sport activity or during the early degenerative phase of such district [1,2]. The study was developed to describe accurately, utilizing a computer-assisted method, the anatomic features of a shoulder joint including centre of rotation, articular joint surface of the humerus and glenoid, the coracoid process, the acromion and the coraco-acromial ligament as well as the supraspinatus and infraspinatus insertion area on the humerus and scapula. Experimental data were then elaborated in order to reconstruct the relative position among all anatomical structures during the recorded abduction, forward elevation as well as internal and external rotation. In this way the distances, elongation and relationship of anatomical structures with respect to the others were obtained during the determined range of motion in a set of normal joints.

2 Material and Methods
We recorded motion and articular surfaces with the Faro Arm digitizer (FARO Technologies, Lake Mary, Florida, USA), a 6-degrees-of-freedom electromiometer, that allows a computer elaboration of anatomical and kinematics data with submillimetric accuracy, as described in detail in [3]. We examined three normal shoulders randomly chosen. All specimens had full range of motion, no evidence of rotator cuff tears, arthritis or bone deformity. The scapula was fixed to the experimental desktop, while the humerus was left intact up to the elbow and mobile. Passive motions were recorded with the intact joint and repeated without deltoid and teres minor. The relative position of humerus and scapula was recorded thrice at different range of passive motion (ROM): elevation (ELEV), in abduction (ABD), and in internal and external (IE) rotation at 0° and 90° of the humerus. Then the coraco-acromial ligament and the supraspinatus and infraspinatus muscles were isolated and their insertion area on humerus and scapula was digitized. We also identified four main fibers on the mentioned muscles, digitizing couples of corresponding insertion points on humerus and scapula to have a description of tendon fibers behaviour during ROM. In order to have a complete description of the joint, we recorded the bone surfaces of the gleno-humeral joint, the scapula, coracoid and acromion surfaces accurately. Typical anatomical features, such as centre of glenoid cavity, extremity of acromion and posterior point of coracoid were elaborated from these data.

3 Results
The gleno-humeral joint was reconstructed during the passive motion. A first group of results concerned the anatomy of the gleno-humeral joints, the humerus head of our joints had a diameter of $43.3 \pm 0.7$ mm, while the size of the minimal parallelepiped containing
the glenoid cavity were 26.9±0.7 mm, 15.1±1.4 mm, 3.9±1.8 mm.

The rotator cuff geometrical measurements was measured interpolating the bone surface with polygonal facets. The infra-spinatus insertion area was 170±23 mm, and his distance from the humeral head was 38.4±0.3 mm. The supra-spinatus insertion area was 170.2±19 mm and his distance from humeral head was 33.8±0.7 mm.

A second group of results concerned the rotator cuff behavior during passive motion. The rotator cuff behavior was analyzed through the distance between muscle insertion on the humeral head and reference points on the scapula.

The distance of center of supra and infra-spinatus insertion from coracoids, acromion and ligaments coraco-acromial was similar and the standard deviation due to repeated motions overcomes the difference between the two tendons. The distance of infra and supra-spinatus from these points decreased during abduction up to 35% and during elevation up to 25%, even if absolute value depended on the specimen. During internal-external stress tests both infra and supra-spinatus showed the minimal distance from acromion, coracoid and coraco-ligament ligament at extreme internal rotation in almost all cases. The internal rotation of the shoulder ranged between 30 and 40 and the minimal distance of infra and supra-spinatus from the scapular was similar (but in a few cases infra-spinatus had a smaller minimum with respect to supra-spinatus). We also examined 4 different fibers of the same muscle. Fibers of the same specimen had different length at neutral position (up to 60 mm), ranging from 120 to 140 mm for infra-spinatus fibers and 125 to 140 mm for supra-spinatus fibers. All the fibers showed the same elongation pattern during passive elongation and abduction and extreme positions: they decreased their length in a variable way from 5% to 25%. During IE test, the minimum distance from acromion and coracoid was achieved at internal rotation except for single fibers or case.

Discussion
This study showed no significant differences between the supraspinatus and infraspinatus behaviour with respect to the acromion, coracoid and the coraco-acromial ligament. This confirm that both muscles have similar function in the joint, generating the torque and compression for humerus rotation on the glenoid cavity [6].

Examining the distance of their humeral insertion areas from the scapula, we concluded that the most critical positions are near the maximum passive abduction, maximum elevation and maximum internal rotation. These data confirm that during overhead sports the higher degree of motion are the one at the most risk for cuff lesion. The fact that in several specimens the minimal distance between infra-spinatus and supraspinatus and scapula was achieved with the coraco-acromial ligament confirmed the importance of this structure in the impingements mechanism and rotator cuff disease [4,7]. These data could also be important for surgical release of this ligament especially in athletes thrower. These can suggest indications for explaining the patho-physiology of impingements, as it provides numerical distances of infraspinatus and supraspinatus from the coracoid and acromion. Further planned elaborations on a more extensive number of specimen will help in increasing knowledge of functional behavior of shoulder structures.

References
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**E-poster w/ Standard #939**  
**Arthroscopic Management of Partial Articular Side Tear of the Rotator Cuff**  
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Cristian Collazo, Buenos Aires, ARGENTINA  
Horacio E. Rivarola, Buenos Aires, ARGENTINA  
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**PURPOSE:** There is no consensus as regards the pathogenesis and management of partial articular side tears of the rotator cuff. The purpose of this study was to evaluate the incidence, associated injuries, treatment options and results.

**METHODS:** We retrospectively analyzed our shoulder arthroscopic procedures performed between December 1998 and December 2002. Out of 89 procedures performed due to symptoms in the subacromial space-rotator cuff, we found 62 (71.95%) rotator cuff tears, 17 (23.7%) were partial. Ten of these lesions were located in the articular side, 6 on the bursal side, and 1 on both sides (7.9%). In 6 cases treated for internal impingement syndrome, we found 3 partial articular lesions of the rotator cuff; and of 208 patients with anterior shoulder instability, 11 cases had rotator cuff lesions and 6 (2.9%) of these were partial lesions on the articular side. Of the 20 patients treated, 13 were male and 7 female. Average age at surgery was 42 years. Twelve of these patients were athletes.

Neither physical examination nor MRI imaging were diagnostic. Definite diagnosis was made arthroscopically, settling the depth and extension of the lesion after debridment, and if the lesion was < 50% of the tendon thickness this was the treatment (15 cases, 75%). If the lesion was > 50%, arthroscopic repair depended on age and functional demand. For good quality tissue we performed transtendon repair (2 cases 10%), for bad quality tissue repair by completing the lesion (3 case, 15%). The most frequently associated lesions were in relation to the biceps (50%): 6 SLAPS, 4 with tendon damage.

**RESULTS:** The incidence of partial articular side tears was 12.4% in arthroscopies performed for subacromial space-rotator cuff symptoms, 50% for internal impingement and 2.9% for instability. The average follow up of our patients was 3.4 years with a high percentage of excellent and good results using the Burkhart's modified UCLA scoring system.

**CONCLUSION:** The diagnosis of these lesions is mainly arthroscopic, since MRI has low sensitivity. Debridment allows us to identify, measure and treat the lesion. The arthroscopic surgical technique used and final prognosis depend on tissue quality. The arthroscopy is an excellent method for the management of partial articular side tear.

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**E-poster w/ Standard #940**  
**Arthroscopic Acromio-clavicular Joint Excision via Superior Portals**  
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Tim Cresswell, Cape Town, Western Cape, SOUTH AFRICA  
Hennie Bosch, Cape Town, Western Province, SOUTH AFRICA  
Karin van Rooyen, Cape Town, SOUTH AFRICA  
Don F. du Toit, Tygerberg, SOUTH AFRICA  
Joe F De Beer, Panorama, Cape Town, SOUTH AFRICA  
Cape Shoulder Institute, Cape Town, SOUTH AFRICA

**METHOD:** During the period June 1994 to October 2003 155 isolated ACJ resections using the direct superior approach were performed. Exclusion criteria were previous ipsilateral shoulder surgery, simultaneous arthroscopic procedures and osteoarthritis.

We were able to contact 90 of these patients, 94 shoulders, who completed a telephone questionnaire (Simple Shoulder Test). There were 72 males and 18 females with a median age of 38 (range 16 to 62 years). 54 were dominant shoulders and 44 had a history of trauma, of which 11 were rugby related.

**RESULTS:** The follow-up period had median of 29 months, with a range of 6 to 118. The post-operative Simple Shoulder Test scores had a median of 12 (mean 11.5) with a range from 6 to 12. Patients evaluated their outcomes as excellent in 63, good in 22, moderate in 5 and poor in 4. There was one portal infection that resolved with debridement and antibiotics. Five patients underwent revision surgery: four open revision Mumford's and one subacromial decompression.

**CONCLUSION:** The technique provides consistently good or excellent results (90%) and allows rapid return to normal function. There was a complete resolution of pain in 73 of the 94
E-poster w/ Standard #941
Evaluation of Prognostic Factors of Adhesive Capsulitis of the Shoulder
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Laura Deriu, Sassari, ITALY
Angelino Sanna, Sassari, ITALY
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Purpose of the study: To find out the prognostic factors of adhesive capsulitis of the shoulder treated by arthroscopic capsular release in a prospective study. Type of the study: Prognostic prospective study. Level of evidence: Level I.

Materials and Methods: We evaluated prospectively 47 patients (18 males and 29 females) affected by primary adhesive capsulitis of the shoulder. All patients underwent an arthroscopic capsular release. Mean age of the patients was 53.5 years. Dominant arm was involved in 61.7% of the cases. Time elapsed from onset of symptoms to surgery ranged between 3 and 48 months (average: 15.8 months). We found a diabetes mellitus in 42.6% of the cases and a full-thickness rotator cuff tear in 29.8% of the cases. Cuff tears were not repaired. All the patients were evaluated at follow-up, which ranged from 12 to 60 months (average: 27.2 months). Preoperative and outcome evaluation were performed with the Constant-Murley score. Absolute score, relative score (corrected for gender and age) and improvement in points were evaluated according to the following variables: gender, age, dominance, timing, diabetes mellitus, rotator cuff tear, duration of follow-up, and preoperative score. Statistical analysis was performed using t-test for dichotomic variables and linear correlation for continuous variables. Significance was considered for p<.05.

Results: Overall results were 69.5 for absolute score, 87 for relative score and 42.1 for improvement in points. We did not find a significant correlation between outcome and all the variables considered, except for preoperative score, which showed a significant correlation with follow-up score. Conclusion: Age, gender, dominance, timing, diabetes mellitus, rotator cuff tear, and duration of follow-up had not prognostic value for the outcome of adhesive capsulitis treated by arthroscopic release. The only significant prognostic factor we found out was preoperative score.

E-poster w/ Standard #942
Soulder Idiophatic Adhesive Capsulitis: Manipulation Vs. Arthroscopic Release
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Pablo Lacroze, Buenos Aires, ARGENTINA
Juan Pablo Previgliano, Buenos Aires, ARGENTINA
Eduardo Humberto Costanza, Buenos Aires, ARGENTINA
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Background: Manipulation and Arthroscopic Debridement (MAD) of Idiophatic Adhesive Capsulitis (IAC) after failure of conventional treatment has a high recurrence rate. Arthroscopic Capsular Release (ACR) with radiofrequency may improve surgical outcomes. Objective: The purpose of this study was prospectively to determine whether ACR was as good as or better than MAD for IAC.

Method: Arthroscopy was performed in 30 patients with persistent pain and stiffness for at least 6 months despite conventional treatment of IAC. In the first 15 patients (Group A) the manipulation under anesthesia was followed by an arthroscopic debridement of the joint. In the second 15 patients (Group B), the contracted structures were divided through arthroscopy. Radiofrequency was used for rotator interval section and anterior and posterior capsular release. Coracohumeral ligament was sectioned in all cases. Arthroscopic subacromial decompression was performed in 4 cases in group A and 2 cases in group B. Mean age, gender and preoperative range of motion were the same in both groups.

Results: Twenty seven (Group A: 13; Group B: 14) patients were available for a 6 week, 3, 6 and 12 month follow up. The results were assessed on the basis of pain, stiffness and function with the UCLA and Constant & Murley Scores. Two recurrences were seen in group A and deserved a second procedure. No differences were found in VAS analysis of pain but ROM values of group B
demonstrated better improvement at 3 and 6 months postoperative evaluations. At one year, all the patients except one obtained a satisfactory result.

Discussion & Conclusions: ACR seems to have a better outcome when compared with MAD. Radiofrequency release of rotator interval, coracohumeral ligament and capsule may prevent early healing and adhesions, obtaining a quicker functional recover.

E-poster w/ Standard #943
Arthroscopic Subacromial Decompression: Clinical Outcome After 2 - 9 Years of 422 Shoulders
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NP Sudkamp, Freiburg, GERMANY
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Purpose:
Arthroscopic subacromial decompression (ASD) is a frequently performed procedure. Goal of the study was evaluation of the clinical outcome with respect to rotator cuff pathology and other factors as e.g. SLAP-lesion. Additionally the reliability of inquest of various shoulder-scores by phone interview was evaluated.

Methods:
From 1993 to 2001 ASD was performed with 511 shoulders (mean age 51 years, range 20 - 79 years). 422 shoulders (follow-up 82%) were evaluated by detailed standardized phone interview. 155 patients (follow-up 43%) underwent clinical examination 10 days following phone interview. Average follow-up was 58 month after surgery. Constant-, UCLA-, ASES-score, spimple shoulder test and VAS were used.

Results:
The average Constant-score (raw-score) did improve from 46 preoperatively to 81. For all scores 65% of patients reached good and excellent results, while 15% were not satisfied. Patients over the age of 60 years had significantly more benefit from the operation. The númer of patients which were very satisfied with operation was higher with the diagnosis tendinitis calcarea and full thickness rotator cuff tear (however not significant, p=0.41). The númer of patients unsatisfied was higher with the diagnoses re-operation, SLAP-lesion and running workers compensation application (not significant). All shoulder-scores, except the Constant-score did show high agreement between phone interview and clinical examination (p<0.05)

Conclusions:
In our patients series the clinical outcome after ASD showed in more than 60% very good and good results after average 4.8 years. Patients who received revision surgery, intended to go to retirement or had a SLAP-lesion showed worse results. The presence of rotator cuff lesion had no negativ influence on outcome. The evaluation of various shoulder scores, except the Constant-score by phone is a reliable and enables a higher follow-up rate.

E-poster w/ Standard #944
The Effect of Shoulder Stretching on Elementary School Baseball Players
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We evaluated the effects of medical checkup feedback on elementary school baseball players, especially regarding shoulder stretching. Thirty-three elementary school baseball players (range of age, 10 to 12 yrs old) medical checkups which they had twice a year (2001 and 2002) were evaluated. Our physiotherapists instructed the players shoulder stretching at the feedback of the medical checkup in 2001. Measurements of the range of shoulder internal rotation were made with the shoulder at 90 abduction (2nd IR). The loss of 2nd IR of the throwing shoulder and the practice of shoulder stretching were compared between 2001 and 2002. The mean loss of 2nd IR of the throwing shoulder was 18.9 ±12.5 in 2001 and 11.5±6.9 in 2002, and the difference was significant. There were 18% of the players performing proper shoulder stretching in 2001, and 70% in 2002 respectively. This study showed the effects of shoulder stretching on elementary school baseball players.
**E-poster w/ Standard #945**
Comparison and Performance Characteristics of Two Suture Materials Used for Shoulder Arthroscopy
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Andrew Mahar, San Diego, CA USA
Robert A Pedowitz, San Diego, CA USA, Presenter
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Background: Persistent defects and early failures of arthroscopic rotator cuff repairs may be due in part to the technical challenges with both knot and loop security.

Purpose: To compare the biomechanical performance of a standard suture material with a new suture material using several arthroscopic knot configurations.

Type of study. Controlled laboratory study.

Methods: Three knots were evaluated (Duncan loop, Weston, and San Diego knot) using two suture materials (No. 2 Ethibond (Ethicon) and No. 2 Force Fiber (Stryker)). Ten Samples were tested for each knot and suture configuration. All knots were tied by a single surgeon using arthroscopic instruments via cannulas in order to standardize surgical technique. Samples were pretensioned to 10N and loaded from 10N to 45N for 1000 cycles using a MTS machine. Intact knots were then subjected to a load-to-failure test, and maximum load was calculated as the ultimate failure strength of the material.

Results: Force Fiber was significantly stronger than Ethibond across all knot types (p<0.001). For Ethibond suture, the Weston knot had the highest load to failure (148 +/- 22 N), followed by the Duncan knot (142 +/- 12 N), and lastly the San Diego knot (133 +/- 9 N) although these values were not significantly different. All Ethibond knots failed by suture breakage except in one Weston knot case where failure occurred by knot slippage. For Force Fiber suture, the San Diego knot (279 +/- 41 N) was statistically similar to the Weston knot (254 +/- 41 N), but significantly stronger than the Duncan knot (224 +/- 70 N, p<0.03). In contrast to Ethibond knots, knot slippage was noted prior to overt suture failure in some of the Force Fiber samples. Force Fiber failed by knot slippage in 60% of Duncan knots and 70% of Weston knots, whereas only 10% of the San Diego knot slipped early.

Conclusions: A statistically significant difference was noted in load to failure when comparing Ethibond to Force Fiber across all knot types tested. The Force Fiber suture demonstrated a bimodal failure load pattern, with some knots slipping at lower loads and some sutures breaking at higher tensions. However, knot slippage with Force Fiber occurred at loads that were higher than the typical breakage load for No. 2 Ethibond. Force Fiber is a new material that should be useful for various arthroscopic procedures. Surgeons should pay close attention to knot configuration and security in order to minimize the risk of early slippage, even with very strong suture materials.

**E-poster w/ Standard #946**
Rotator Interval Lesion Associated with Subluxation of the Long Head of Biceps Tendon: Arthroscopic Evaluation and Treatments
Naoko Mizuno, Osaka, JAPAN, Presenter
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[Introduction]
The subtle instability of the long head of biceps tendon (LHB) has been considered as one of possible causes of recalcitrant anterior shoulder pain. The purpose of this study was to assess the arthroscopic findings around the rotator interval in patients with instability of LHB and to clarify the effectiveness of the arthroscopic treatments.

[Materials and Methods]
We investigated the arthroscopic findings around the rotator interval in 19 shoulders (18 patients including 12 males and 6 females) with instability of LHB at the entrance of bicipital groove, who underwent the arthroscopic surgery. The mean age at operation was 42.9 years and the mean postoperative follow-up period was 15 months. We classified the severity of instability of LHB into 3 grades arthroscopically. Grade I (presubluxation); LHB was hypermobile at the entrance of bicipital groove, who underwent the arthroscopic surgery. The mean age at operation was 42.9 years and the mean postoperative follow-up period was 15 months. We classified the severity of instability of LHB into 3 grades arthroscopically. Grade I (presubluxation); LHB was hypermobile at the entrance of bicipital groove because of the redundancy. Grade II (transient subluxation); LHB transiently strayed out of the entrance of bicipital groove with probing. Grade III (fixed subluxation); LHB ran off the entrance of bicipital groove without probing. For Grade I, the suture plication of superior
glenohumeral ligament (SGHL) or rotator interval capsule was performed, whereas the repair or debridement of subscapularis tendon with the LHB tenotomy or tenodesis was performed for Grade II or Grade III.

[Results]
Grade I was seen in 6 shoulders, Grade II in 6, and Grade III in 7. The associated pathologies around the rotator interval showed hyperemia of LHB in 16 shoulders, tear of SGHL in 14, partial tear of superior portion of subscapularis tendon in 10, significant synovitis in 9, hypertrophy of LHB in 6, complete tear of supraspinatus tendon in 6, and elongation of SGHL in 5. In Grade I, all 6 shoulders had the tear/elongation of SGHL and hyperemia of LHB. In Grade II, all 6 shoulders had significant synovitis and 4 of 6 shoulders also had partial tear of subscapularis tendon. In Grade III, all 7 shoulders had partial tear of subscapularis tendon and 4 of 7 shoulders had complete tear of supraspinatus. According to the shoulder scoring system, average score was 67.7 points before operation and 94.8 points after operation (P<0.0001, paired-t test).

[Discussion]
The arthroscopic examination could visually demonstrate instability of LHB and associated pathologies around the rotator interval. The instability of LHB appeared to be caused by the following two types of pathologies, the tear/elongation of SGHL as Grade I and the tear of subscapularis tendon as Grade II or III. Arthroscopic treatment for each lesion could be successfully performed, however further clinical investigations need to be done to clarify the strict indication of LHB tenotomy/tenodesis, which might sacrifice the LHB function of stabilization to the shoulder joint.

[Conclusion]
The shoulder arthroscopy is effective for diagnosis and treatment of intra-articular instability of LHB and the associated lesions around the rotator interval.

E-poster w/ Standard #947
Minimally Invasive Endoscopic Reconstruction Technique in AC Joint Dislocations
Michael Osti, Homburg / Saar, GERMANY, Romain Seil, Luxembourg, LUXEMBOURG
Presenter
Felix Bachelier, Homburg Saar, GERMANY
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Introduction:
The treatment of Rockwood type III AC-joint dislocations is controversial. Problems related to open surgery are soft tissue healing, residual instability and the necessity of hardware removal. After nonoperative treatment the cosmetic result is often problematic and in some cases symptomatic instabilities occur. The goal of the present cadaver study was to develop a new, minimally invasive endoscopic technique for AC-joint reconstructions, and to analyze its potential risk for neurovascular injuries.

Material and Methods:
10 cadaveric shoulder specimens were used. The technique was based on an arthroscopically assisted reconstruction of the coracoclavicular ligaments and the AC-joint capsule. The base of the coracoid was visualized with a 30° arthroscope over a modified Neviaser portal. After soft-tissue debridement a BioCorkscrew-Anchor (Arthrex, Naples, FL) armed with a FibreWire No. 5 suture (Arthrex, Naples, FL) was inserted beneath the origin of the coracoclavicular ligaments. The base of the clavicle was passed through a 2.0 mm vertical drill hole in the clavicle. The other end was passed over the ventral border of the clavicle and sutured over the bone. The reconstruction of the acromioclavicular capsule was done with a figure of 8-shaped suture-cerclage. For this purpose a FibreWire No. 2 suture (Arthrex, Naples, FL) was passed percutaneously through two 2.0 mm drill holes in the acromion and the lateral clavicle. After surgery all shoulder specimens were dissected to analyse the position of anchors and sutures. K-wires were inserted through the portals in order to measure the distance to the neurovascular structures at risk. Furthermore, the anatomy of the two parts of the coracoclavicular ligament was analyzed.

Results:
The supraspinatus muscle was never injured by the modified Neviaser approach. The coracoid was reached in a depth of 2.5 cm and could be visualised in all cases. The insertion of the suture anchors never failed, resulting in a secure and reproducible anchor position in all specimens. The mean distance between the coracoid and supraspinacual nerve was 1.8 (1.5-2.2) cm, between the coracoid and the supraspinacual artery 1.5 (1.3-1.9) cm. These structures were never injured. The
central insertion point of the two parts of the coracoclavicular ligament were found to be at an average distance of 3.8 (Lig. trapezoideum) and 5.6 cm (Lig. conoideum) from the AC-joint. The resulting force vector of the suture located between the anchor and the drill hole was close to the anatomic force vector of this ligament. The suture cerclage was always correctly positioned. Its oblique arms approached a 45° angle in relation to the longitudinal axis of the AC-joint.

Conclusion:
The presented technique is at minimal risk for the surrounding neurovascular structures and allows for a minimally invasive and anatomically correct reconstruction of the AC-joint. It is therefore a reasonable alternative to existing invasive techniques of open reconstruction of Rockwood type III AC-dislocations in high-demand patients.

E-poster w/ Standard #949
Biomechanical Analysis of Arthroscopic Rotator Cuff Repair Suture Configurations: Double Row vs Single Row Fixation
C. Benjamin Ma, USA, Presenter
Lyn Comerford, San Francisco, CA, USA
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Background: Arthroscopic rotator cuff repairs have been limited to simple and horizontal stitches. Recent objective evaluations have demonstrated high failure rates of arthroscopic rotator cuff repairs. Our previous study has demonstrated that the massive cuff stitch can increase the strength of the suture-tendon interface. In this study, we evaluated the biomechanical properties of a few novel arthroscopic rotator cuff repair stitches, including variations of single row fixations such as the simple, massive cuff and arthroscopic Mason-Allen with the double row fixation.

Methods: Six pairs of human supraspinatus tendons were harvested and split in half to yield a set of four tendon specimens per cadaver. Four stitch configurations (simple, massive cuff, arthroscopic Mason-Allen and double row fixation) were randomized and biomechanically tested on each set of tendon specimens. Each specimen was first cyclically loaded on an MTS uni-axial load frame under force control from 5-100N at 0.25Hz for 50 cycles. Each specimen was then loaded to failure under displacement control at a rate of 1mm/sec. Cyclic elongation, peak-to-peak displacement, ultimate tensile load and stiffness were measured using an optical motion analysis system and load cell output. The type of failure (suture-breakage or pull-out) was also recorded. A repeated-measures ANOVA was performed on the results with the alpha level of statistical significance set at p< 0.05.

Results: For the cyclic loading test, there was no significant difference in peak-to-peak displacement among the four stitches. However, the double row fixation does have the lowest peak-to-peak displacement 1.2 ± 0.2 mm when compared with the three single row fixations, 1.4 ± 0.6mm. Ultimate load for the double row fixation (318 ± 72N) was significantly higher than the simple (207 ± 47N) but not significantly different than the arthroscopic Mason-Allen (229 ± 81N) and massive cuff stitch (243 ± 60N). There was no significant difference in the stiffness between the 4 stitch configurations. However, the arthroscopic Mason-Allen stitch does have the lowest stiffness (35 ± 11N/mm) when compared with the other three stitch configurations (42-44 N/mm).

Conclusions: Double row fixation has significantly higher ultimate tensile load when compared with the traditional simple stitch configuration. Peak-to-peak displacement is also lowest although the difference was not significant when compared with the three single row fixations. Arthroscopic Mason-Allen stitch has comparable ultimate tensile load as the massive cuff stitch, however, stiffness of the construct is less comparable. Double row fixation can provide a more secure and biomechanically improved construct when compared with the three single row fixation suture configurations.

E-poster #950
Slap Lesion in Athletes: An Epidemiologic Study.
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We rewied 632 arthroscopies in athletes, and found 57 slap lesions(9%). According to snyder’s classification, the occurrence of each type was 18(33.3%) type ii slap lesion,
5(8.8%) type iii, 4(7%) type iv, and 29(50.9%) type v slap lesion (described by maffet). The most common associated lesions were the bankart lesion in 50.9% of the patients, and partial articular side tear in 31%.

The most frequent mechanism of injury was the traumatic anterior shoulder dislocation, in 49.1% of the patients. The sports involved more frequently were handball, basketball, surfing, and boxing. The superior labrum and glenohumeral ligaments works as a complex to provide stability to the anterosuperior shoulder, and these structures are damaged in the type v slap lesion. In comparison with other series we found a high number of type v slap lesion, and it is probably related to the type of population studied (most athletes were high performance contact sports players).

**E-poster #951**

**Arthroscopic Trans-tuberosity Cuff Repair: Technique and Preliminary Results**

Kazuhiro Yamaguchi, JAPAN, Presenter
Nagasaki Rosai Hospital, Sasebo, Nagasaki, JAPAN

Purpose: Arthroscopic cuff repairs using suture anchors have been reported and the clinical results of this procedure were successful. The purpose of this study is to report our purely arthroscopic technique without using suture anchors and the preliminary results of this procedure.

Methods: Thirty-nine arthroscopic cuff repairs were performed by a single surgeon in our hospital from December 2000 to September 2003. Full thickness cuff tears were found by arthroscopy in all cases. Suture anchors were used for thirty-seven cases, and our new procedure without using suture anchors was performed for two cases. These two patients were evaluated preoperatively and postoperatively with JAPANese orthopaedic association (JOA) shoulder scoring system.

Results: Two patients were available for two-year follow-up. The JOA scores were 76 (case 1) and 52 (case 2) preoperatively, and 98 (case 1) and 96 (case 2) postoperatively. Both patients were satisfied with improvement of pain and motion, and could be reinstated in their former occupation.

Conclusion: We found that full thickness cuff tear was successfully treated using arthroscopic trans-tuberosity cuff repair technique without using suture anchors.

**E-poster #952**

**Evaluation of Partial Rotator Cuff Injuries in Athletes**

Benno Ejinisman, Sao Paulo, BRAZIL, Presenter
Carlos Vicente Andreoli, Sao Paulo, BRAZIL
Alberto Castro Pochini, Sao Paulo, BRAZIL
Gustavo Cara Monteiro, Sao Paulo, BRAZIL
Flavio Falopha, Sao Paulo, BRAZIL
Moises Cohen, Sao Paulo, BRAZIL
Federal University of Sao Paulo, Sao Paulo, BRAZIL

Introduction: The partial injury of the rotator cuff in the athletes occurs due to traumatic events or to the repetitive movements. The real incidence is unknown but in athletic shoulder it seems to be more frequent. Objective: To evaluate the incidence of the partial injuries of the rotator cuff in the athletes. Material: In the period from 1999 to 2002 had been revised 720 charts of athlete being that the diagnosis of partial injury occurred in 83 (11.5%) cases. 34 (40%) cases had no improved with physiotherapy and had been submitted to arthroscopy. The average age of the athletes was of 28.3 years and 65% male with average follow-up of 27 months (24 months to 5 years). The most frequent sports was volleyball, handball and power lifting. In the surgical cases, the repetitive movement injuries had occurred in 22 (64.7%) cases and 12 (35.3%) cases had been traumatic. Results: The partial articular injuries were found in 23 (67.6%) cases being that 66% involved throwing athletes. The partial injuries of the bursal side had occurred in 11 (32.3) cases, predominating (75%) in power lifting athletes. The association of partial joint tear and SLAP lesion occurred in 7 cases, being 87% throwing athletes. Conclusion: The partial injury of the rotator cuff in athlete must always be questioned. In the surgical cases, the arthroscopy technique facilitates the diagnosis and immediate treatment. The association of partial articular tears with SLAP lesions must always be searched. Bursal side tears are more related to power lifting, however throwing athletes have high incidence of joint side tears.
E-poster w/ Standard #954
Complications in Shoulder Arthroscopy in Athletes
Benno Ejnisman, Sao Paulo, BRAZIL
Carlos Vicente Andreoli, Sao Paulo, BRAZIL
Presenter
Alberto Castro Pochini, Sao Paulo, BRAZIL
Gustavo Cara Monteiro, Sao Paulo, BRAZIL
Flavio Faloppa, Sao Paulo, BRAZIL
Moises Cohen, Sao Paulo, BRAZIL
Federal University of Sao Paulo, Sao Paulo, BRAZIL

Introduction: Shoulder arthroscopy presents low morbidity when compared to the open procedures, however it is not free of complications.

Objective: To evaluate the incidence of complications of the arthroscopic procedures in the shoulder of athlete during intraoperative and postoperative period (1 year follow-up)

Material: In the period of 1999 to the 2003, the authors had been evaluated and revised 320 shoulder arthroscopies of athlete with different pathologies, 72% were male and 28% were female. The average age was 24.2 years old.

Results: 61 (19%) complications had been found, being that 38 (62.2%) intraoperative complications. In 19 cases breakage the suture during knot tying, 4 cases of reversion for the open procedure, 8 of anchor loosening, 5 cases of anchor breakage, 2 cases of salient anchor (intrarticular). According to postoperative complications, we found 23 (37.7%) case related to regular and fair results. The complications had been divided in: 8 cases of functional limitations in some range of motion (4 athletes with SLAP lesion, 4 cases involving frozen shoulder and subacromial pathology), 6 cases of residual pain, 5 cases of redislocation after stabilization, 2 cases of superficial infection and 1 case of condrolysis. We had solved the intraoperative complications in 94% of the cases and 88% of the postoperative complications.

Conclusion: The arthroscopic surgery presents complications that could be managed in 94% of intraoperative and 88% of postoperative procedure. In shoulder arthroscopy complications, the surgeon should be skilled and have adequate surgical material.

E-poster #955
Biceps Long Head to Conjoint Tendon Transfer
Ronald M Selby, New York, NY, USA, Presenter
Stephen J O’Brien, New York, NY USA

This presentation will include the rationale, technique and 2 year follow up for patients undergoing biceps transfer. Comparison to a study of a peer group who underwent release of the long head of the biceps including a head-to-head comparison with validated instruments. A review of pertinent anatomy, literature review with historic approaches to the problem of bicipital tendinitis and partial tears, and presented for the first time recommendations for dynamic evaluation of the long head tendon. Video step-by-step presentation review of the technique with pertinent anatomic landmarks will be cited. Two year follow-up evaluations on the patient group with validated instruments will be presented.

SPINE/HIP/THIGH
E-poster #1000
Minimal Invasive Technique in Total Hip Arthroplasty, Short Term Results
Tarik Aitsiselmi, Lyon, FRANCE, Presenter
Srdan Dojcinovic, Lyon, FRANCE
Sebastien Lustig, Lyon, FRANCE
Philippe Neyret, Lyon, FRANCE
Centre Livet, Croix Rousse, Lyon, FRANCE

Aims:
The purpose of this prospective study is to present our experience with a mini-incision technique for total hip arthroplasty with specific instrumentation and using commonly posterior surgical approach (Moore) and to evaluate technical and clinical results.

Material and Method:
36 patients with mean age of 55 years were reviewed after 9 months to total hip arthroplasty through minimally invasive posterior approach. The mean BMI was 26.45. Underlying diseases were: 24 primary arthrosis, 7 avascular necrosis, 5 inflammatory disease and 1 fracture of the hip neck.

An analysis of complications, the length of hospital stay, radiographic position of prosthetic components as well as of clinical status at follow-up using scores by Harris, Womac and Merle Aubign was performed.

Results:
Complications were one fracture of acetabular rim requiring screws and one instability of socket and was immediately revised. The mean blood loss...
was 477 ml. The duration of operation was 88 min. The average length of the scar 66mm (+/- 8). The visual analog scale was 2.5 at day 1, 1.5 at day 2 and 1.18 at day 3. The length of stay was 8 days. We don’t have any postoperative neuropathy or dislocation. A significant increase in a mean of Harris and Merle Aubign scores were observed, respectively from 57 to 82 and from 11 to 15 and decrease of score of Womac of 40 points. Average abduction of cup was 43 (+/- 6). The femoral stems were in 1.2 (+/- 1.81) varus position. There is no discrepancy of length more than 5 mm. Conclusions:

This study confirms that the mini-incision technique and specific instrumentation allows a good positioning of prosthetic components, this been one of the primary objectives of total hip arthroplasty without lengthen the duration of operation. There are several contraindications for this mini-incision technique which include obesity, severe dysplasia, malunions and arthrodesis of the hip. Esthetically the scar is more pleasing, which is important in our society. This technique seems to give good preliminary results and encourages us to go on with technique.

E-poster #1001
A Case of OS Odontoideum Incidentally Detected by Sports Medical Check

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Yasunori Tsukimura, Minato, Tokyo, JAPAN
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Morio Matsumoto, Shinjyuku, Tokyo, JAPAN
Hideo Matsumoto, Tokyo, JAPAN
Shoei Takeshima, Minato, Tokyo, JAPAN
Morio Matsumoto, Shinjyuku, Tokyo, JAPAN
Hideo Matsumoto, Tokyo, JAPAN
Kazuhiro Chiba, Shinjuku, Tokyo, JAPAN
Yoshiaki Toyama, Shinjuku, Tokyo, JAPAN
Orthopaedic Department of Kitasato Institute Hospital, Minato, Tokyo, JAPAN

Purpose: Os odontoideum is considered to be congenital or secondary to odontoid fracture. We experienced a case of os odontoideum incidentally detected by sports medical check.

Case: Sixteen-year-old boy had played rugby for three years and had occasionally felt numbness in the upper and lower extremities when he was tackled. He had an episode of transient quadriparesis, but no medical investigation was conducted at that time. When he joined a high school rugby team, he underwent obligatory sports medical check. Os odontoideum was found on plain radiograph. He was referred to our hospital for further investigation and treatment.

At the time of initial examination, he had no symptom at all, and neurological examination revealed no abnormality. On X rays, os odontoideum was evident, and atlantoental interval in flexion was 12mm. This anterior subluxation was perfectly reduced by extension of the neck. On MRI, compression of the spinal cord was not observed. Because of marked atlantoaxial instability and of history of transient quadriparesis, surgery was deemed to be necessary and performed on March 13, 2003. The operation was performed by the Magerl and Brooks method. Instability between C1/2 was remarkable, but rigid fixation of the atlantoaxial joint was achieved by transarticular screwing and sublaminar wiring. One year after surgery, solid arthrodesis was obtained, and the patient had no pain or neurological abnormality. However, ranges of neck motion were reduced to the halves of preoperative values.

Discussions: The etiology and choice of treatment of os odontoideum are controversial. Patients of os odontoideum with no or mild symptoms are sometimes found incidentally by radiographic examination taken after mild trauma or at medical checks as was this case. In the present case, the sports medical check was extremely useful, preventing the patient from catastrophic neurological damage. Since the patient had a history of transient quadriparesis and remarkable instability on flexion-extension X-rays, atlantoaxial arthrodesis was thought to be mandatory. Return to rugby play after surgery was also a matter of controversy. Although the patient achieved solid bone union, he was not allowed to return to rugby play because his limited neck motion might make his cervical spine more vulnerable to trauma due to hard contusion to the neck during rugby play.

E-poster #1002
Associated Changes in Glenohumeral Joint in Rotator Cuff Tear

Chang-Hyuk Choi, Taegu, KOREA, Presenter
Koing-Woo Kwun, Taegu, Taegu, KOREA
Shin-Kun Kim, Taegu, Taegu, KOREA
Myung-Rae Cho, Taegu, Taegu, KOREA
Sang-Bong Ko, Taegu, Taegu, KOREA
Catholic University of Taegu, Taegu, KOREA

Purpose: To identify associated findings in glenohumeral joint in rotator cuff tear and evaluate its clinical significance, we examined
Materials & Methods: We reviewed 66 patients of rotator cuff tear treated from March, 2001 to January, 2004. Of 38 cases of small to medium tear, average age was 53 years old and involved in dominant arm in 27 cases. Of 28 cases of large to massive tear, average age was 58 years old and involved in dominant arm in 26 cases. Minor and major associated changes of the glenohumeral joint were evaluated in the tendon of biceps long head, biceps pulley, cartilage of the glenoid and humeral head, labrum and synovium.

Results: Minor changes in biceps tendon were in 35% of cases, biceps pulley in 38%, cartilage of humeral head in 27%, cartilage of glenoid in 18%, labrum in 38%, and synovium in 42%. Major changes in biceps tendon were in 6% of cases, biceps pulley in 35%, arthritis of humeral head in 3%, arthritis of glenoid in 2%, labrum in 6%, and synovium in 21%. Minor changes of biceps tendon and glenoid cartilage, and major changes of biceps pulley were more prevalent in large to massive tear compared to small to medium tear.

Focal to generalized synovitis were identified in 55% of small to medium tear and 75% of large to massive tear.

Conclusion: During arthroscopic examination of rotator cuff tear, it needs careful evaluation in the rotator interval including biceps tendon and pulley. Focal to generalized synovitis were prevalent regardless of the size of tear.

E-poster #1003
Groin Pain in the Athletes. Still a Challenge for Imaging.
Kimmo T. Mattila, Turku, FINLAND, Presenter
Jouni T Heikkilu, Turku, FINLAND
Sakari Y Orava, Naantali, FINLAND
Turku University Hospital, MR ClinTurun
TeslaVagus, Turku, FINLAND

Groin pain in association with sports activities continues to be a major problem in sports. The incidence of groin symptoms varies depending on the activity, in soccer it is 5-18% per year and in football around 7%. Acute or chronic injury can be a diagnostic and therapeutic challenge. The pain may originate from several anatomic structures such as muscles, tendons, ligaments and bones, but additionally referred pain, nerve entrapment, abdominal or gynecologic disorders may cause similar symptoms.

Traditionally, X-rays have been used in acute trauma to exclude acute avulsions. In most conditions involving the groins and pelvis it still is the first choice. In chronic disorders soft tissue calcifications, joint space narrowing or symphyseal irregularities help in focusing the clinical examination and treatment. Additionally, it gives an overview of the bone structures excluding neoplastic processes masked by the diagnosis of chronic groin strain. Computer tomography gives important information in cases with fractures and helps in preoperative planning. Radionuclide studies have been used to detect bone stress in the pubic rami or femoral neck. However, nonspecific nature of the method is well known, neoplasms, infection, osteoarthritis, or entesopathy may cause identically increased uptake as bone stress. Ultrasound has been used in soft tissue pathology to detect muscle strains and tendon avulsion. It is fast and easy in acute trauma with hematoma and loss of function to localize and grade the injury. Retracted tendons and muscle tears are usually easily depicted as well as bursitis, calcifications and joint effusion in chronic cases.

Magnetic resonance imaging (MRI) has obvious advantages such as lack of ionizing radiation, multiplanar capability, high sensitivity and specificity in bone and soft tissue pathology. The relatively high cost is the major disadvantage in this examination. Especially on fat supressed T2 weighted (or STIR) images pathology is typically depicted as bright signal intensity lesions. In runners bone stress reaction in the ischial ramus near the hamstring insertion is sometimes associated with hamstring insertion tendinitis or tendinosis, both easily discerned by MRI. More commonly bony stress reactions may develop at the symphysis pubis, or at the inferior pubic rami adjacent to the symphysis. These injuries may be related to overuse of adductor muscles. Tendinitis, or more chronic tendinosis is common at the insertion of adductor longus tendons, especially in soccer or ice hockey players. Acute tears at adductor insertions are easily differentiated from tears at musculotendinous junction. MRI is useful in determining the extent of the injury. MRI discerns cases of acute iliopsoas friction syndrome, or iliopsoas bursitis from hip joint pathology such as labral tears or loose bodies. Experience and technically adequately performed examinations with thin slices and high resolution images are needed to interpretate the small pathological alterations correctly. Additional
dedicated MR protocols have been tried to correctly diagnose sports hernia. However, this condition caused probably by a weakness of the posterior inguinal wall without a clinically obvious hernia seems to be the biggest challenge for imaging, even for the MRI.

A review of imaging different acute and chronic groin problems will be given in the presentation. A dedicated MRI protocol will be presented for imaging a patient with groin pain but doubtful clinical diagnosis.

E-poster #1005
Complete Ruptures of the Proximal Adductor Muscles in the Professional Soccer Player
Robert Smigielski, Warsaw, POLAND, Presenter
Urszula Zdanowicz, Warsaw, POLAND
Zbigniew Czyrny, Warsaw, POLAND
Carolina Medical Center, Warsaw, POLAND

Goal: Adductor muscle injuries are one of the most common injuries in soccer, but there are only a few cases described in the literature of complete rupture. The aim of this study is to present diagnostic, surgical procedure and rehabilitation in patients, professional soccer players with complete proximal adductor muscles rupture.

Material and method: Three professional soccer player underwent an operation due to complete rupture of the proximal adductor longus muscle. In all of the cases there were partial injuries and degenerative changes of adjacent muscles (gracilis muscle, adductor brevis muscle and rectus abdominal muscle). All patients were men, mean age 29 (26-33). All patients before the main injury suffered from pain in this area. Mean time from injury to operation was 2.6 days (2-4). In all cases we performed reinsertion of the muscle into the pubic bone. Mean observation time is 7.3 months (5-11). Postoperatively all patients underwent careful clinical evaluation as well as USG.

Results: In all cases we obtained very good results allowing patients coming back into regular training program.

Conclusion: Operation treatment of complete ruptures of adductor muscles combined with intensive rehabilitation and some modifications in the training program allows soccer player coming back into professional sport.

E-poster w/ Standard #1006
Relation between Radiological Findings of the Cervical Spine and Neck Muscle Strength in American Football Players and Rugby Football Players
Hitoshi Abe, Shirokane, JAPAN
Hiroomi Kamikura, Tokyo, JAPAN
Hideo Matsumoto, Tokyo, JAPAN
Morio Matsumoto, Shinjyuku, Tokyo JAPAN
Masaki Nagashima, Shibuya, Tokyo JAPAN
Yasunori Tsukimura, JAPAN, Presenter
Kitasato Insutitute Hospital, Shirokane, Tokyo, JAPAN

The purpose of this study was to investigate the relation between radiological findings of the cervical spine and the muscle strength of the neck. Radiographs of the cervical spine were taken in the 1st grade of 345 American football players, which consist of 324 collegiate players and 21 high school players, and 87 high school rugby football players, and were retrospectively studied. Radiological findings, all subjects were classified into 3 groups, normal with anterior bowing(N), and two groups of abnormal alignment, characterized by disappearance of anterior bowing(DAB) or formation of posterior bowing(PB), based on the findings in plain radiographs of the lateral view of the cervical spine in the neutral position. Flexion(F) and Extension(E) of neck muscle strength were measured using with Micro FET. F/neck diameter(F/ND), E/ND, F/body weight(F/BW), E/BW and percentage of F/E(%F/E) were analyzed statistically. E, E/ND and %F/E showed significantly related to radiological findings of the cervical spine.

E was 284.1N in DAB, 266.2N in PB and 277.2N in N. E/ND date was 7.5N/cm, 7.1N/cm and 7.3N/cm in N. %F/E was 90.6% in DAB, 95.4% in PB and 88.9% in N, respectively.

We conclude from this study that relative decreasing the neck muscle strength of extension was low, compared with that of flexion in the PB group.
Introduction:
While syringomyelia is associated with progressive neurological symptoms in most cases, cases without progression of symptoms or change in the cavity diameter over a prolonged period of time and cases exhibiting spontaneous reduction of the cavity size have occasionally been reported. We encountered three American football (AF) players who were diagnosed as having syringomyelia during a medical check-up (MC), were allowed to continue playing sports, and did not experience any particular problems.

Case presentation:
A total of 1535 AF and rugby players (645 high school students, 826 college students and 64 workers) underwent MC at our hospital between 1993 and 2003. Magnetic resonance imaging (MRI) of the cervical spine was conducted in all of the athletes, and syringomyelia was detected in three AF players (0.2%).

Case 1: 24-year-old man. His playing position was a corner back. There was no neurological symptom. MRI showed a syringomyelia at the level between C5 and C6 vertebrae.

Case 2: 21-year-old man. His playing position was an offense line. MRI showed a syringomyelia at the C6/7 intervertebral level. During follow-up of the clinical course, symptoms similar to burner syndrome appeared, but by one year later, the symptom had resolved.

Case 3: 20-year-old man. His playing position was a running back. No neurological symptom was present. MRI showed syringomyelia at the level of C6 vertebra.

Clinical course:
Since none of the three patients had any obvious neurological symptoms, or any accompanying bony malformations, they were allowed to continue playing AF after being provided with adequate information. At the follow-up of 6 to 26 months (mean, 14.3 months), MRI did not demonstrate any change in the cavity size in any of the three athletes, and no neurological symptom developed.

Discussion:
Since syringomyelia develops in the background of impaired circulation of the spinal fluid due to various pathological conditions including Chiari I malformation, it is progressive in most of the cases. On the other hand, reports of asymptomatic syringomyelia and spontaneous reduction of the cavity size have occasionally been reported. All of our three cases were asymptomatic, and had no underlying disorder such as Chiari I malformation or spinal cord tumor. Since the cause of development of the cavity could not be identified, the condition in all three cases was considered idiopathic. Our experience suggests that athletes with syringomyelia may be allowed to continue playing sports under regular follow-up of clinical courses, only if no neurological symptom is observed and no underlying disorder, such as the Chiari I malformation, is present.

**SPORTS MEDICINE**

**E-poster #1100**
**Injuries and Overuse Syndromes in Golf**

Dennis Liem, Muenster, GERMANY, Presenter
Joern Steinbeck, Muenster, GERMANY
Bjoern Marquardt, Muenster, GERMANY
Wolfgang Oetzl, Muenster, GERMANY
Winfried Winkelmann, Muenster, GERMANY
Georg Gosheger, Muenster, GERMANY
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Background:
Golf is becoming more popular while there is a lack of reliable epidemiologic data especially regarding severity of suffered injuries and overuse syndromes.

Objective:
The objective was to perform an epidemiological study of the variety of different musculoskeletal problems for golfers and to examine associations of the golfers age, gender, physical stature (BMI), warming up routine and playing level with the occurrence of reported injuries.

Study design:
Retrospective cohort study

Methods:
We analyzed the injury data from a total of 703 golfers who were randomly selected over two
golfing seasons and interviewed using a six-page questionnaire.

Results:
We found overuse was the most important factor for golf injuries regardless of a player’s skill.
Overall 82.6% (n= 526) of reported injuries were overuse problems, 17.4% (n=111) were single trauma events. Back and upper extremity injuries were the most reported injuries. Professional golfers were injured more often, typically on back, wrist and shoulder. Amateurs reported many elbow, back and shoulder injuries. Severity of reported injuries was minor (< 1 week) in 51.5%, moderate (1 week - 1 month) in 26.8% and major (> 1 month) in 21.7% of cases.

Carrying one’s bag proved to be hazardous to lower back, shoulder and ankle. Warming up routines should be at least 10 minutes long to have a positive effect. Age and gender were not associated with prevalence and severity of injury.

Conclusions:
Overall golf can be considered a rather benign activity, if overuse or rather overplay can be avoided. If not golf can result in serious chronic musculoskeletal problems.

E-poster #1101
Injury Profile in Competitive Karate.
Prospective Analysis of Three Consecutive World Karate Championships
Rafael Arriaza, La Coruna, SPAIN, Presenter
Manuel Leyes, Madrid, SPAIN
Hospital USP-Santa Teresa, La Coruna, SPAIN

A prospective recording of the injuries resulting from 2837 matches in three consecutive World Karate Championships, from 1996 to 2000 was performed. 891 injuries were recorded, with an incidence of 0.31 injuries per match or 157.03 injuries per 1000 athlete exposures. Occurrence of injuries was higher among lighter categories, under 60 kg in males (0.56) and under 53 kg in females (0.42), with no significant differences between individual and team categories. Punches (737, 82.7%) caused more injuries than kicks (75, 8.4%). The injuries were most commonly located in the face (646, 72.5%) followed by the head (103, 11.6%) and lower limbs (57, 6.4%). The injuries consisted primarily of contusions (448, 50.3%) epistaxis (144, 16.2%) and lacerations (122, 13.7%) followed by concussions (34, 3.8%) and sprains (31, 3.5%). There was some kind of external haemorrhage in 296 injuries (33.7%). The injury rate was similar in the three World Karate Championships but the number of severe injuries declined from 1996 to 2000.
We conclude that competitive karate is associated with a relatively high injury rate, as in one in every three matches medical attention is required, but mainly for minor injuries, and due to the fact that karate competition rules punish those attacks that cause an injury to the opponent, and the referees look for a doctor’s advice on injury objectivation. Severe injuries are rare.

E-poster #1102
Bilateral Stress Fracture of the Tibia in a Professional Soccer Player: A Case Report and Review the Literature
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Fabiola Marzola, SÂ£o Paulo, SÂ£o Paulo BRAZIL
University of Sao Paulo, Sao Paulo, BRAZIL

The authors report a bilateral stress fracture of the tibia in a professional soccer player. Symptoms, diagnosis, conservative and surgical treatments and the two-year postoperative follow-up are described. The purpose is to discuss etiology, the best diagnostic methods and possible ways to treat this disease.
Keywords: fractures, stress, fracture fixation, tibia, prevention & control

E-poster #1103
Injury Rates in Taekwondo Players
Metin Lutfi Baydar, Isparta, TURKEY, Presenter
Hijseyin Yorgancigil, Isparta, TURKEY
Ozgur Ozer, Isparta, TURKEY
Suleyman Demirel University, Isparta, TURKEY

INTRODUCTION
The term martial arts means those arts concerned with the waging of war and points at the aggressive nature of taekwondo. It is a 2000 years old sportive activity and no longer has a military role. Taekwondo is an Olympic sport since 1988. Consisting of three words Tae: foot, Kwon: fist, and Do: good manner/respect, it now appears in the arena with more tolerance, respect, delicacy, discipline and patience. Though, this sport with some forms of kicks and punches is not liberated from injuries, as many other physical activities, despite using protective equipment.
Large number of people in the world participates in this activity, but little is known of the physical
forces involved and little concern is given to potential morbidity.

MATERIAL AND METHODS
We conducted a study to investigate the frequency and type of musculoskeletal injuries of taekwondo among 220 national team players between the years 1996 and 2003. The records of the Turkish National Taekwondo Federation were retrospectively scanned.

Interviews or mail-questionnaires were performed with players and instructors/trainers who were involved in national team in the given period. The relationship between injuries and the type of the performance (competition or training), age and sex of the player were investigated.

RESULTS
There were 220 national team players including 111 males with an average age of 21.3 during participation in the national team, and 109 females with an average age of 18.7.

The injuries mostly happened during a competition or training were minor skin and muscle injuries causing pain and rigidity. Minor skin and muscle injuries included sprain, strain, spasm, inflammation and high jumper’s strain. Other than skin and muscle injuries, bone and joint injuries were encountered with a less frequency.

The most frequent serious injury was found to be contusion of the dorsum of the foot (54 cases), which clearly explained the necessity of foot taping. We encountered ankle sprains in 27 players. Knee injuries were considerably high in frequency; 15 medial meniscus lesions, 8 ACL injuries, 7 lateral meniscus lesions, 3 medial collateral ligament lesions, and 2 PCL injuries.

Shoulder dislocations were detected in three players, one of which recurred many times and necessitated a reconstructive surgical procedure. There were also 3 Colles fractures, one mandible fracture, one partial rupture of adductor femoris tendon, and a case of complete rupture of extensor hallucis communis tendon.

CONCLUSION
The relatively significant rates of injury among high-level taekwondo players increase the responsibility of team physicians. It also implicates the necessity of using protective gear.

E-poster #1104
Epidemiological Analysis of Injuries in J-league Football Players
Minoru Shiraishi, JAPAN, Presenter
extrinsic factors; inappropriate training(overuse)(PC; 47%, NT; 46%), as well as by foul plays(PC; 26%, NT; 26%). Intrinsic factors influenced statistically more strongly in the NT than PC group.

Discussion and Conclusion:
This study revealed that many factors concerning physicians, coaches, players and club administrators are related to treatment results. All the members make efforts in various fields to improve player's condition and to prevent injury. To do sufficient daily medical care, to do adequate rehabilitation not affected by head coach's opinion, to advise proper training program to coaches from a medical standpoint, to educate players in a field of medicine, and to do fair play are most important strategy to get better performance.

E-poster #1105
Athletic Injuries in Professional Sumo Wrestlers
Hideo Matsumoto, Tokyo, JAPAN
Yasunori Suda, Tokyo, JAPAN
Kenichiro Matsuzaki, Tokyo, JAPAN
Toshiro Otani, JAPAN, Presenter
Department of Orthopedic Surgery, Keio University, Tokyo, JAPAN

Sumo wrestling, a national sport in JAPAN, is very popular, and opens professional fifteen-day game, "Basho", six times a year in JAPAN. Recently it has been discussed whether the athletic injuries in professional Sumo wrestlers really increased or not, because many wrestlers absent themselves from the games.

Objectives: The aim of this study was to make base-line data to compare the latest incidence of the athletic injuries in professional Sumo wrestling to the former one.

Materials and Methods: Three games among six are held at Ryogoku Sumo Arena in Tokyo, that is called "Tokyo Basho", in January, May and September. The Sumo clinic, an official medical support of the JAPAN Sumo Association, is opened all fifteen days during Tokyo Basho at the Arena to make a first aid for the injured wrestlers and audience. The materials of this study were all the wrestlers who came to the Sumo clinic, during three games a year, from May 2002 to January 2003. The number of the patients, estimated as the number of the injuries, and the location of the injuries were investigated. Injury ratio (number of the injuries/number of the wrestlers) and injury index ((number of the wrestlers x number of the matches / 2) / number of the injuries) were also defined and investigated. We compared these data to the same series in five years ago.

Results: The number of the injuries was 9.7/day in averages, (10.2/day), injury ratio; 0.14 (0.13), injury index; 27.1(25.0). Data sets indicated this time (last time) correspondingly, and all of these deferences were statistically not significant. The location of the injury this time had a same tendency as that of the last time, i.e. (pelvis and lower extremities) > (shoulder girdle and upper extremities) > (head, neck and trunk).

Discussion: From the results of this study, we could not find the difference in numbers or location of the injuries in professional Sumo wrestlers during these five years. Further analysis will be needed in characteristics of each wrestler, such as age, height, weight, body fat ratio, etc.

E-poster w/ Standard #1107
American Intercollegiate Men's Ice Hockey: An Analysis of Injuries
Kyle Rudiger Flik, Oak Park, IL, USA, Presenter
Stephen L Lyman, New York, NY USA
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Hospital for Special Surgery, New York, NY, USA

Background:
Reported rates and types of ice hockey injuries have been variable. Ice hockey combines tremendous speeds with aggressive physical play and therefore has great inherent potential for injury.

Purpose:
To identify rates and determinants of injury in American men's collegiate ice hockey.

Study Design:
Prospective cohort study

Methods:
Data were collected from eight teams in a Division 1 athletic conference for one season. An anonymous ice hockey injury data capture form was developed to record detailed information regarding each injury. An athlete-exposure (AE) consisted of a single player participating in a single game or practice. An injury was defined specifically as any injurious episode that led to loss of participation in the immediate subsequent AE, whether it was a practice or a game. Descriptive statistics consisted of the calculation of frequencies and percentages. Injury rates were calculated as the number of injuries per 1000 AE. Inferential analysis consisted of Chi-square tests comparing rates within subgroups. A p-value of
less than 0.05 was considered statistically significant.

Results:
There were a total of 113 injuries in 23,096 AE for a total overall injury rate of 4.9/1000 AE (Table 1). The game injury rate was 13.8/1000 AE (74 injuries in 259 games) while the practice rate was 2.2/1000 AE (39 injuries in 676 practices) for a risk ratio of 6.3. Therefore game injuries were 6.3 times more common than practice injuries (p-value <0.001). Forwards and defensemen had similar injury rates, while goalies had significantly lower injury rates during games (p<0.05). A collision, either with an opponent (32.8%) or the boards (18.6%) was the cause for over half of all injuries. Concussion was the single most commonly sustained injury (18.6% overall)

Conclusions:
The risk of injury in men’s collegiate ice hockey is much greater during games than practices. Overall injury rates were similar for forwards and defensemen, but the rate of concussion injury was highest among forwards. Concussions are a main cause for time lost and remain an area of major concern. Contact among players is the major cause of injury, and this occurs mainly during game situations. Stricter enforcement of rules relating to illegal blows to the head may reduce the rate of this significant injury.

E-poster w/ Standard #1108
Fractures in Track and Field Athletes
Sharon L. Hame, Los Angeles, CA, USA, Presenter
Julie K. Tran, Los Angeles, CA USA
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Introduction: Fractures are common overuse injuries suffered by track and field athletes. The purpose of this study was to evaluate the distribution and types of fractures sustained by track and field athletes at a Division-1 university, as well as assessing the risk of fracture by gender, class, weight, BMI, and event.

Materials and Methods: Track and field athletes who sustained fractures from 1988-2000 were identified through the Sports Injury Monitoring System. Gender, event, class, and body composition were recorded. Athletes were grouped into distance runners, sprinters, impact and other. The 2002-2003 track and field team was used as the control.

Results: From 1988-2000, 56 athletes sustained fractures. Twenty-five were male and 31 were female athletes. Forty-one (65%) athletes were distance runners. Thirty-seven were freshmen/sophomores, and 19 were juniors/seniors. The total number of fractures sustained was 76. Of the primary fractures, there were 26(46%) tibial fractures, 11 (20%) foot fractures, 6 (11%) femur fractures, 5 (9%) hand fractures, 4 (7%) fibular fractures, and 4 (7%) were other. The average weight and BMI of the males and females were 62 kg and 20 kg/m2, and 55 kg and 19 kg/m2, respectively. Risk of injury was not influenced by gender (p>0.05), year in school (p>0.05) or height (p>0.05). Fracture athletes were generally lighter (males, p=0.031 and females, p=0.001). Athletes in distance events had more fractures (p=0.001) while other events had similar rates of fractures (p>0.05).

Conclusions: Lighter weight athletes and distance event athletes have a higher risk for injury. BMI was related (males, p=0.014 and females, p=0.001), however the relationship is probably more due to weight. Hence, the training regimen of these athletes should evaluate the risk for stress fracture, complaints noted, and immediate examination made upon onset of pain.

E-poster w/ Standard #1109
Does Long Distance Running Cause Osteoarthritis. A MRI Investigation
Erik Hohmann, Rockhampton, QLD AUSTRALIA, Presenter
Klaus Woertler, Munich, GERMANY
Andreas B Imhoff, Munich, GERMANY
Department of Orthopaedic Sportsmedicine, Munich, GERMANY

Long distance running remains a popular sport worldwide. Despite the obvious positive effects on cardio-vascular fitness the possible deleterious effects on the musculoskeletal system especially on the hyaline cartilage remain controversial. The repetitive loading could potentially predispose to the subsequent development of osteoarthritis. The purpose of this study was to investigate whether external impact loading in marathon runners creates internal stresses on bone and cartilage. Six recreational, two semi-professional runners and seven beginners underwent magnetic imaging of the hip and knee before and after a marathon run using coronal body phased-arrayed coil and the following pulse sequences: a coronal T1 weighted spin echo sequence and STIR
sequences. The pre- and post run scans failed to demonstrate marrow oedema, periosteal stress reactions or joint effusions in 7 runners. One patient who underwent a reconstruction of his anterior cruciate ligament 18 months ago demonstrated a small effusion in the reconstructed knee before and after the race. Six of the beginners demonstrated minimal effusions in the hip and knee joints. However no bone oedema was seen in any of the beginners. Our results suggests that the high impact forces in long distance running are well tolerated and subsequently not demonstrate on MR images in experienced runners. Beginners do demonstrate the impact stresses to a certain extent and it is postulated that long distance runners undergo a natural selection process.

E-poster w/ Standard #1110
Do Athletes use Analgetics during Training and Competition?
Sven Jonhagen, Bromma, SWEDEN, Presenter
Per A. Renstrom, Stockholm, SWEDEN
Karolinska Institutet, Stockholm, SWEDEN

Pain is often considered as a natural result of hard athletic training. Athletes often suffer from major or minor injuries, and treatment and rehabilitation of injuries from the musculoskeletal system is common. Our aim was to study the use of analgetics during training and competition, and if coaches suggest the athletes to take analgetics to be able to participate in competitions.

Method: 500 track and field athletes were sent a questionnaire. The athletes were chosen from different Swedish national teams, the athletic sport high schools and from a few major clubs. The subjects were asked about their consumption of analgetics during the last year and the number of injuries during the last year.

Results: 315 (63%) subjects replied. 61% reported one or more injuries during the last year. The most common injuries reported were muscle ruptures (12%) and achillodynia (9%). A majority of the subjects (85%) had used analgetics for longer or shorter periods during the last year. Most of them (69%) used analgetics for less than a week, and only 4% took analgetics for a longer period than one month. Analgetics used were mainly NSAID (179 subjects), paracetamol (154) and Cox-2 inhibitors (22). 24% reported that one time or more during their career they had taken analgetics to be able to compete and 8% reported that the coach had told them to take the analgetics.

20% of the subjects reported that they had suffered from side effects from the analgetics, most common were gastrointestinal problems (13%).

Conclusions: Analgetics use is common among athletes in the Swedish athletic community, however analgetics are mainly consumed for very short periods. Very few athletes use analgetics to mask pain during competition, and not many have been told by their coaches to do so.

E-poster w/ Standard #1111
Differential Sensitivity of Symptoms and Neuropsychological testing following Sport-Related concussion.
Derk Anton van Kampen, Deventer, NETHERLANDS, Presenter
Mark R Lovell, Pittsburgh, PA USA
Michael W. Collins, Pittsburgh, PA USA
Jamie Stump, Pittsburgh, PA USA
Freddie H. Fu, Pittsburgh, PA USA
UPMC, Pittsburgh, PA, USA

Neuropsychological testing has become a valuable tool in the diagnosis and management of sports-related concussion and has become particularly helpful in making return to play decisions following injury. In fact, neuropsychological testing has recently been endorsed as the cornerstone of concussion management by the Vienna Concussion in Sports Group (CIS). Neuropsychological testing is particularly important because athletes often under-report or deny post-concussive symptoms following injury. Merely relying on the athlete’s report of symptoms may therefore result in the premature return to play of the athlete to the playing field, potentially exposing him/her to additional injury. This study was designed to evaluate the individual and combined sensitivity of player symptom reporting and neuropsychological testing in a group of high school and collegiate athletes. Our hypothesis is that the use of a computer-based neuropsychological testing (ImPACT) would result in an increased capacity to detect post-concussive abnormalities, following injury. The subject pool consisted of 201 athletes who had suffered a concussion within the context of a high school or collegiate sporting event. All athletes had previously undergone baseline neuropsychological testing and completed post-
injury testing within one week of injury (mean=2.0 days). Abnormal test performance was determined by the application of reliable change index scores (RCIs). 65% of concussed athletes reported a significant increase in symptoms compared to baseline. 35% of the subjects did not report increased symptoms. However, 82% of the concussed sample did demonstrate significantly poorer neuropsychological test results, as measured by the Verbal Memory, Visual Memory, Reaction Time or Processing Speed indices from ImPACT. Therefore, the addition of neuropsychological testing resulted in a net increase in sensitivity of 17%. The combined sensitivity of symptoms reporting and neuropsychological testing was 88%. Reliance on player self-reported post-concussive symptoms is likely to result in poor diagnostic sensitivity and is also likely to result in the premature return to play by concussed athletes. The addition of a computer-based neuropsychological protocol increases diagnostic sensitivity significantly. The careful evaluation of both player symptoms and neuropsychological test results represents the most useful approach to concussion management.

E-poster w/ Standard #1112
Effect of Multiple Concussions
Derk Anton van Kampen, Deventer, NETHERLANDS, Presenter
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Introduction: The management of concussion has become a public health issue since approximately 300,000 concussions occur a year in the USA alone. Most discussion is focused on return to play decision-making, based on the athletes symptoms and neurocognitive performance. Currently there is no consensus on the risk of having multiple concussions although general previous studies have shown an indication for decline of performance. The current study was designed to evaluate the importance of a history of concussions on a new concussion based on neuropsychological test performance, conducted at 2 days and 7 days post injury.
Method: A group of 201 High school and college athletes were tested pre-season, 2 days and 7 days post concussion. All the athletes were evaluated using the ImPACT computer-based test battery. We compared two groups: first concussion (N=155) and athletes who sustained ?? concussion (N=46) based on Verbal-, Visual memory, Processing speed, Reaction time and Symptoms composite score.
Results: Comparing the No concussion History group to the History of concussion group did show increase in on field -symptoms for the history group. But there is neither significant difference in their neurocognitive performance nor for their symptoms looking at 2 days and 7 days post injury.
Discussion: Athletes who had experienced a concussion in the past did not perform worse on neuropsychological testing than athletes with no History of concussion. Neither did the group differ on their on- field symptoms. These results suggest that if an athlete has symptom free period between his concussions he is likely to recover without any residual problems.