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Philippe Beaufils, Le Chesnay, FRANCE

Use of an Interpositional Spacer for Treatment of Medial Compartment Arthritis

Alan H Beyer, Newport Beach, CA, USA

Valgus TKA Results of 255 LCS Mobile-Bearing TKA With 5 to 15 Year Follow-up

Jens Boldt, Zurich, SWITZERLAND

Long-Term Results of LCS Mobile Bearing TKA: Evaluation of 457 TKA with 10 to 13 Year Follow-Up

Jens Boldt, Zurich, SWITZERLAND

Physical Activity and Occupational Status in Patients Younger Than 55 Years with LCS Mobile Bearing TKA: Evaluation of 228 Cases

Jens Boldt, Zurich, SWITZERLAND

arthrosis in TKA. Is There a Correlation With Femoral Component Mal-rotation?

Jens Boldt, Zurich, SWITZERLAND

Quadruple Arthroplasty in the Lower Extremity

Jens Boldt, Zurich, SWITZERLAND

Arthroscopic Debridement and High Tibial Osteotomy for Knee Osteoarthritis in Aging Athletes

Jesús Ignacio Cardona, Zapopan, MEXICO

The Role of the Orthopaedic Nurse Practitioner in Unicompartmental Knee Replacement Revision Surgery. Is it Really an Easy Job?

Enzo Cenna, Torino, ITALY

The Often Poor Clinical Outcome of Infected Total Knee Arthroplasty

Wang Ching-jen, Kaohsiung Hsien, TAIWAN

Change of the Patellofemoral Alignment by Technique Modification in Total Knee Arthroplasty Using LCS Prosthesis

Jaehoon Chung, Kwangju, SOUTH KOREA

The Management of Degenerative Knee Arthritis in the Active Middle Aged Arthroscopic Approach

Moises Cohen, Sao Paulo, BRAZIL

Autologous Osteochondral Graft on Chondral Lesion Treatment – Experimental Study in Goats

Antonio Delcogliano, Rome, ITALY

Lateral Condylar Release for High Valgus Knee Replacement

James K DeOrio, Jacksonville, FL, USA

Axial Parameters Influencing Lower Limb Realignment in High Tibial Osteotomy

Mehmet Rifat Erginer, Istanbul, TURKEY

Coronal Tibial Osteotomy for Unicompartmental Arthritis of the Knee

Stephan Fealy, New York, NY, USA

Quantitative Gait Analysis After Medial Unicompartmental Knee Replacement for Osteoarthritis

Julian A Feller, Melbourne, AUSTRALIA

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Alex Finsterbush, Jerusalem, ISRAEL

Indications for Arthroscopy in Elderly Patients

Alex Finsterbush, Jerusalem, ISRAEL

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Kazumasa Fukushima, Tokyo, JAPAN

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Hugo González, Santiago, CHILE

Early Patient Outcomes Following Primary and Revision Total Knee Arthroplasty: A Prospective Study

Richard C Hartley, Lower Heswall, UNITED KINGDOM

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Richard C Hartley, Lower Heswall, UNITED KINGDOM

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Akiko Hoshino, Saitama, JAPAN

Restricting Postoperative Weightbearing in Mobile Bearing Cementless Total Knee Arthroplasty Is Inept

Yoshinori Ishii, Gyoda, JAPAN

Post-operative Functional Status of Mobile Bearing and Fixed Bearing Total Knee Arthroplasty in Patients With Osteoarthritis and Rheumatoid Arthritis (Cochrane Review)

Wilco Jacobs, Nijmegen, THE NETHERLANDS

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Jean-Yves Janny, Illkirch, FRANCE

Arthroscopy or Total Knee Replacement for Old Patients With Serious Osteoarthritis: Our Experience

Yu Iikuo, Beijing, CHINA

Analysis of Initial Fixation Strength of Press-Fit Fixation Technique in Anterior Cruciate Ligament Reconstruction

Hyunchul Jo, Seoul, KOREA

Drilling from the Intercondylar Area for Treatment of Osteochondritis Dissecans of the Knee Joint

Kenzo Kawasaki, Izumo, JAPAN

Standardised Mortality Ratios and Fatal Pulmonary Embolism Rates Following Primary Total Knee Arthroplasty – A Cohort of 1018 Consecutive Cases

Amer Khan, London, UNITED KINGDOM

Balanced Placement of the Femoral Component in Revision Total Knee Arthroplasty

Katsuhiko Kitaoa, Kanazawa, JAPAN

A Three Dimensional Evaluation for Positioning of Total Knee Arthroplasty and its Application for Osteotomy Control by the System of the Three Dimensional Leg Alignment Assessment With Digital X-ray

Yoshio Koga, Niigata City, JAPAN

The FDA has not cleared the drug and/or medical device for the use described in this presentation (i.e., the drug or medical device is being discussed for an “off-label” use).
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| Poster #213 | Limitations of the MDM EM Knee Core Instrument in Detecting Improvement Following Total Knee Arthroplasty | Robert G Marx, New York, NY, USA |
| Poster #214 | •The Role of Long-term Weekly Intra-articular Injections of Sodium Hyaluronate for Osteoarthritis of the Knee | Shin Miyatake, Kagawa, JAPAN |
| Poster #215 | The Unix Unicompartmental Knee Arthroplasty | Hayden Morris, East Melbourne, AUSTRALIA |
| Poster #216 | Does Pain Severity Correlate with Bone Marrow Lesion Pattern Detected With MR Imaging in Knee Osteoarthritis? | Yoshihiro Nagaosa, Fukushima City, JAPAN |
| Poster #217 | The Result of Osteochondral Graft and High Tibial Osteotomy in the Osteonecrosis of Medial Femoral Condyle | Yasuaki Nakagawa, Kyoto, JAPAN |
| Poster #218 | •Loss of Correction Following High Tibial Osteotomy | Dietrich Pape, Homburg/Saar, GERMANY |
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| Poster #220 | Primary Total Condylar Arthroplasty of the Knee – PFC nd PFC Sigma Knee | Zoran Zdravko Popovic, Belgrade, YUGOSLAVIA |
| Poster #221 | The Oxford Unicompartmental Knee Prosthesis: An Independent 10-Year Follow-up. | Nicole Pouliart, Antwerp, BELGIUM |
| Poster #222 | Measurement of the Valgus Angle of the Femur on Computerised Axial Tomography Scans | Arvind Rawal, Warrington, UNITED KINGDOM |
| Poster #223 | Correlating the Outcome of Knee Intraarticular Visco-Submission With Radiological Changes of Osteoarthritis | Arvind Rawal, Warrington, UNITED KINGDOM |
| Poster #224 | Comparing the Efficacy of Two Hyaluronic Acid Derivatives: Is There a Difference? | Arvind Rawal, Warrington, UNITED KINGDOM |
| Poster #225 | Primary Total Knee Arthroplasty with Intramedullary Nail Fixation for Supracondylar Femoral Fracture in Rheumatoid Arthritis of the Knee | Keinosuke Ryu, Shinjuku, JAPAN |
| Poster #226 | The Patello-Femoral Joint (PFJ) Status in Revision Knee Arthroplasty, A New Classification System & Its Reliability. | Vishal Sahni, Liverpool, UNITED KINGDOM |
| Poster #227 | Clinical and Radiological Evaluation at Five Years Follow-up of 177 PFC Total Knee Arthroplasty | Giulia Sandrucci, Torino, ITALY |
| Poster #228 | Hinged Total Knee Replacement in Severe Knee Revision Surgery | Giulia Sandrucci, Torino, ITALY |
| Poster #229 | Standing Knee Radiographs: AP vs PA Prospective Evaluation Arthroscopically Confirmed Arthritis | Kurt P Spindler, Nashville, TN, USA |
| Poster #230 | New Method for Bone-grafting for the Huge Bone Defect in TKA – Bone Scintimetric Evaluation and Clinical Outcomes | Takehiko Sugita, Sendai, JAPAN |
| Poster #231 | Total Knee Arthroplasty Preserving or Not the PCL Gait Analysis | Luis Turquetto Veiga, Rio de janeiro, BRAZIL |
| Poster #232 | •Five Year Review of the Rotaglide Total Knee Arthroplasty | Christopher J Wilson, Glasgow, UNITED KINGDOM |
| Poster #233 | Extensor Mechanism Recovery After Medial Parapatellar and Tri-Vector Retaining Approaches for Total Knee Arthroplasty: A Prospective, Randomised, Double Blind Study | Edward V Wood, Liverpool, UNITED KINGDOM |
| Poster #234 | Posterior-Anterior Weight-Bearing Radiograph in Fifteen Degree Knee Flexion in Medial Osteoarthritis | Norio Yamanaka, Kochi, JAPAN |
| Poster #235 | The Blood Management in Total Knee Replacement. The Effectiveness of Postoperative Reinfusion | Athanasios N. Zacharopoulos, Kirra Fokidas, GREECE |
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| Poster #237 | Does Proximal Tibio-Fibular Arthrolysis Produce Posterolateral Instability? | Guillermo R. Arce, Buenos Aires, ARGENTINA |
| Poster #238 | The Long-term Results of Maquet – Type Tibial Tubercle Elevation for Patellofemoral Arthritis | Semih Aydogdu, Izmir, TURKEY |
| Poster #239 | Isolated Posterior Cruciate Ligament Reconstruction in Chronic Posterior Instability: A Retrospective Study With a 2 to 19 Years Follow Up. | Mario Bizzini, Zürich, SWITZERLAND |
| Poster #240 | Patello-Femoral Unenveloped Hamstring Tendon  | Chih-Hwa Chen, Kweishan, TAIWAN |
| Poster #241 | •Comparison of Quadruple Hamstring Tendon Graft and Quadriceps Tendon Graft in Anterior Cruciate Ligament Reconstruction | Chih-Hwa Chen, Kweishan, TAIWAN |
| Poster #242 | Arthroscopic PCL Reconstruction With Quadriceps Tendon Autograft | Chih-Hwa Chen, Kweishan, TAIWAN |
| Poster #243 | The Effects of Knee Position, Graft Tension and Mode of Fixation in Posterior Cruciate Ligament Reconstruction | Wang Ching-Jen, Kaohsiung Hsien, TAIWAN |
| Poster #244 | Outcome study of the surgical treatment of 48 chronic patellar tendinitis | Pascal Christel, Paris, FRANCE |
| Poster #245 | Anatomical and Histological Study in Knees of Rabbits with Epiphysial Cartilage, After the Section of Posterior Cruciate Ligament | Moises Cohen, Sao Paulo, BRAZIL |
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Poster #250  Comparison of Two Different Grafts for the Treatment of 48 Chronic Posterior Instabilities with Two Years Follow-up  Patrick Djian, Paris, FRANCE

Poster #251  Patellar Tenoplasty With Gracilis and Semitendinosus Tubercle Transfer – A Biomechanical Study  Abbas Madani, Tehran, IRAN

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Poster #253  Management of Knee Dislocations – Experience of 67  Lars Engbrethsen, Oslo, NORWAY

Poster #254  International Patellofemoral Study Group (IPSG) Lateral Release Survey Results  Donald C Fithian, San Diego, CA, USA

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Poster #257  Reconstruction of the Posterolateral Corner: A New Surgical Procedure  Bent Wulf Jakobsen, Aarhus, DENMARK

Poster #258  Dynamic Patellar Tracking in Pathological Conditions  Ryosuke Kuroda, Pittsburgh, PA, USA

Poster #259  Arthroscopic PCL and Combined Ligament Reconstruction in the Athlete  Mario Victor Larrain, Buenos Aires, ARGENTINA

Poster #260  Posterior Cruciate Ligament Reconstruction Using Hamstring Tendon With Preservation of Posterior Cruciate Ligament Remnant  Beom Koo Lee, Seoul, KOREA

Poster #261  Comparative Analysis of Delayed Laxity Developing After Arthroscopic PCL Reconstruction in Isolated and Combined Injury of Posterior Cruciate Ligament  Kwang-Won Lee, Daejeon, KOREA

Poster #262  Analysis of Relationships Between Subjective and Objective Groups of IKDC Score  Janne T Nurmi, Tampere, FINLAND

Poster #263  Reconstruction of the ACL-PCL Deficient Knee: A Biomechanical Study of Graft Pretension and Knee Laxity  Keith L Markolf, Los Angeles, CA, USA

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Poster #266  Trochleoplasty – An Effective Surgical Option in Recurrent Patellar Dislocation Due to Dysplastic Patellofemoral Groove  Rolf F Oetiker, Cham, SWITZERLAND

Poster #267  Comparison of Endoscopic and 2-Incision PCL Reconstruction Using Autogenous Hamstring Tendons  Yasumitsu Ohkoshi, Hakodate, JAPAN

Poster #268  Posterolateral Knee Instability: Surgical Treatment and Clinical Results  Iraklis Ioannis Patsopoulos, Athens, GREECE

Poster #269  The Treatment of Combined Injuries of the Posterior Cruciate and Medial Collateral Ligament: MCL Stability Depends on PCL Status  Seung-Suk Seo, Pusan, SOUTH KOREA

Poster #270  Subjective Evaluation of the Medical Transfert of the Anterior Tibial Tuberosity in Objective Patellar Instability  Elvire Servien, Caluire et Cuire, FRANCE

Poster #271  Surgical Treatment Invertex Dislocation of the Knee  Nilson R. Severino, Sao Paulo, BRAZIL

Poster #272  Anatomical Advancement of the Medial Collateral Ligament Combined With Anterior Cruciate Ligament Reconstruction: Series Long-Term Follow-up  Takashi Soejima, Kurume, JAPAN

Poster #273  Does the Arthroscopic Release of the External Patellar Retinacula Represent a Valuable Method in the Treatment Recurrent Dislocation of Patella?  Cristian Ioan Stoica, Bucharest, ROMANIA

Poster #274  Serial Evaluation of the Restored Stability After Posterior Cruciate Ligament Reconstruction  Atsushi Sugita, Ibaragi, JAPAN

Poster #275  Comparison of the Magnetic Resonance Imaging of Acute Grade III Medial Collateral Ligament Injury With the Surgical Pathology  Yasuhiro Tagawa, Amagasaki, JAPAN

Poster #276  Delayed Medial Collateral Ligament Reconstruction Using Looped Semitendinosus Tendon Graft for Combined Anterior Cruciate Ligament/Posterior Cruciate Ligament/Medial Collateral Ligament Injuries of the Knee  Harukazu Tohyama, Sapporo, JAPAN

Poster #277  Patella Fractures: A New Classification System for Postoperative Outcome Evaluation  Anastasios V Tokis, Anatoli- Ioannina, GREECE

Poster #278  Ligament Referencing to Determine Femoral Component Rotation and Effect on Patella Tracking in Total Knee Arthroplasty  Ate Binne Wymenga, Nijmegen, NETHERLANDS

Poster #279  Tightening and Augmentation of Posterior Cruciate Ligament (Using Modified Tibial Inlay Technique)  Jung Yong Bok, Seoul, REPUBLIC OF KOREA

Poster #442  Operative Management of Multiligament Injuries in Athletes  Luis A Vargas, Coral Gables, FL, USA

Poster #453  Arthroscopic Repair of Medial Retinacular Ruptures Associated With Acute Patella Dislocations: Report of a New Technique  Michael R. Redler, Trumbull, CT, USA

KNEE - MUSCLE/TENDON/BONE

Poster #280  Arthroscopic Assisted Reduction and Minimal Osteosynthesis in Tibial Plateau Fractures  Georgios Anastasios Babalis, N. Iraklio Attikis, GREECE
Poster #321  Allograft ACL/Meniscus Transplantation in Patients With Prior Meniscectomy, ACL Deficiency and Early Degenerative Arthritis .................................................. Steven D. Levin, Wilmette, IL, USA

Poster #322  Healing of Osteochondral Defects in the Rat Patella After Periosteum Transplantation – Evaluation of Cartilage Repair and Nerve Fiber Sprouting ................................................. Magnus Lundberg, Stockholm, SWEDEN

Poster #323  Outside-In Meniscus Suture Technique, 5 Years Follow-Up ....................................................... Rodica Marinescu, Bucharest, ROMANIA

Poster #324  Inter-observer Agreement for the Assessment of intra-articular Pathology in Knee Arthroscopy ...................... Robert G Marx, New York, NY, USA

Poster #325  A Prospective Outcome Analysis of Patients Treated with Microfracture Abrasion for Chondral Lesions of the Knee: A Preliminary Review .......................................................... Robert G Marx, New York, NY, USA

Poster #327  Autogenous Osteochondral Grafting for Osteonecrosis of the Knee .............................................................. Yoshitaka Matsusue, Otsu, JAPAN

Poster #328  Matrix Associated Autologous Chondrocyte Transplantation (MAC) in Clinical Practice .......................................................................................................................... Johann Georg Meinhart, Wels, AUSTRIA

Poster #329  All Inside Meniscal Repair: A Cadaveric Study Comparing the Fast-Fix to the Rapid Loc Device ........................................................... Mark David Miller, Charlottesville, VA, USA

Poster #330  Postoperative Results in the Donor Site of the Mosaicplasty ........................................................................... Yasuaki Nakagawa, Kyoto, JAPAN

Poster #331  Reduced Planter Force-Time Integral During Partial Weight Bearing Gait Using the Easy Strutter Functional Orthosis System .................................................................................. John Nyland, Louisville, Kentucky, USA

Poster #332  Syndrome of the Anterior Synovial Impingement: Classification, Diagnosis and Treatment ....................................................... Paulo Roberto Rockett, Porto Alegre, BRAZIL

Poster #333  Consumer Meniscal Lesion ......................................................................................................................... Paulo Roberto Rockett, Porto Alegre, BRAZIL

Poster #334  Short-term Results of Treatments for Meniscal Tears in Anterior Cruciate Ligament Reconstructed Knees ...................... Hideki Sato, Hirosaki, JAPAN

Poster #335  Osteonecrosis of the Medial Femoral Condyle Following Arthroscopy – Is it a Complication of the Surgical Intervention? ........................................ Stefan Seitz, Herne, GERMANY

Poster #336  All-Inside Sutural Meniscus Repair ........................................................................................................ Ronald M Selby, New York, NY, USA

Poster #337  Arthroscopic Meniscal Repair with Suture and Fibrin Clot of Horizontal Meniscal Tear in Young Adult ... Seung-Suk Seo, Pusan, SOUTH KOREA

Poster #338  Bucket-Handle Medial Meniscus Tears in the ACL Reconstructed Knee: Long-Term Outcome ............ K. Donald Shelbourne, Indianapolis, IN, USA

Poster #339  Clinical Evaluation of Meniscus Repair With a Bioa ......................................................................................... Rainer Siebold, Walldorf, GERMANY

Poster #340  Prospective Comparison of Arthroscopic Medial Meniscus Repair Technique: Inside-Out Sutures vs Entirely Arthroscopic Arrows ............................................................ Kurt P. Spindler, Nashville, TN, USA

Poster #341  Hyaluronan Matrix-Associated Chondrocyte Transplantation for the Treatment of Posttraumatic Chondromalacia Patella – Early Clinical Results of a Pilot Study ................................................................. Gabriele Striessnig, Vienna, AUSTRIA

Poster #342  Matrix Associated Chondrocyte Transplantation (MAC) for the Repair of Cartilage Defects – Early Clinical Results After 12 Months .............................................. Gabriele Striessnig, Vienna, AUSTRIA

Poster #343  Arthroscopic Subtotal Meniscectomy for Discoid Meniscus in Student Athletes ................................................................. Hideaki Takeda, Tokyo, JAPAN

Poster #344  Tibial Erosions Associated With Radial Cleavage Tears of the Lateral Meniscus ..................................................... Barry R Tietjens, Auckland, NEW ZEALAND

Poster #345  Evaluation of Hyaluronan Synthesis by Retroversus-Mediated Gene Transfer of Hyaluronan Synthase 2 ................................................................. Kan Tsuchiya, Chiba, JAPAN

Poster #346  Arthroscopic Assessment of Human Cartilage Stiffness of the Femoral Condyles and the Patella With a New Tactile Sensor .................................................................................. Yuji Uchio, Izumo, JAPAN

Poster #347  Ultrasound and MRI Evaluation of Knee Meniscal Extrusion .................................................................................... Rene E Verdonk, Gent, BELGIUM

Poster #348  Articular Cartilage Defect Healing Using Paste Gra ......................................................................................... William R Walsh, Randwick, AUSTRALIA

Poster #349  Biomechanical Testing of Meniscal Devices ........................................................................................................... William R Walsh, Randwick, AUSTRALIA

Poster #350  1.0 Tesla Magnetic Resonance Imaging Accuracy Correlated With Clinical Symptoms and Arthroscopic Findings ................................................................. Yuichi Yoshii, Tsukuba, JAPAN

Poster #351  Autologous Chondrocyte Transplantation for Articular Cartilage Defects in the Knee Histological Evaluation Sabreena Mahroof, London, UNITED KINGDOM

Poster #354  Arthroscopic Treatment of Osteochondritis Dissecans of the Knee With Autologous “Bone Sticks” ................................................................. Rogério Teixeira Da Silva, Perdizes, BRAZIL

Poster #355  Bioabsorbable Pin Fixation of Osteochondral Lesions of the Knee .......................................................... Matthias Rolf Schurhoff, Coral Gables, FL, USA

Poster #356  The Value of MRI to Diagnose Meniscal and ACL Tears Sensitivity, Specificity and Likelihood Ratio .................................................................................................................. Graeme Campbell Brown, Geelong, AUSTRALIA

Poster #357  Intraarticular Opioid Injections After Knee Arthroscopy ......................................................................................... Artur Gadek, Krakow, POLAND

Poster #358  A Simple and Safe Method to ConfirmAccuracy of Intraarticular Knee Injection .......................................................................................................................... Rudolph C. Glattes, Nashville, TN, USA

OTHER

Poster #359  • The FDA has not cleared the drug and/or medical device for the use described in this presentation (i.e., the drug or medical device is being discussed for an “off-label” use).
| Poster #354 | Proximal Tibiofibular Joint Ganglion Cysts: Excision, Recurrence and Joint Arthrodesis | Christopher C. Kaeding, Columbus, OH, USA |
| Poster #355 | Biomechanical Analysis of Distal Biceps Tendon Repair Methods | Christopher C. Kaeding, Columbus, OH, USA |
| Poster #356 | The Introduction of the Simple Body Conditioning Equipment for Patients at Home | Tamiko Kamimura, Saitama, JAPAN |
| Poster #357 | Posterior ‘Back and Forth’ Arthroscopic Approaches on the Posterior Knee Compartments | Stephane Louisia, Kenthurst, AUSTRIA |
| Poster #358 | Surgical Approach to the Achilles Tendon and a Programme of Physiotherapy After Surgical Treatment of Achilles Tendinosis | Mikael Mardna, Tallinn, ESTONIA |
| Poster #359 | Ruptured Baker’s Cyst Mimicking Compartment Syndrome | Sefa Muezinoglu, Kocaeli, TURKEY |
| Poster #360 | Perioperative Autotransfusion in Total Knee Arthroplasty | Raj K Reddy, Midland, TX, USA |
| Poster #361 | Anterior Knee Pain After Tibial Intramedullary Nailing | Christos K Yiannakopoulos, Athens, GREECE |
| Poster #362 | The Incidence of Vascular Complications in Patients Submitted to Knee Arthroscopy Based on Color Flow Duplex Scanning Findings | Emerson Zanoni, Curitiba, BRAZIL |

**SHOULDER INSTABILITY**

| Poster #363 | Arthroscopic Findings in Chronic Anterior Shoulder Instability in Males 18 to 30 Years old | Emmanouel M Antonogiannakis, Athens-Cholargos, GREECE |
| Poster #364 | The Prevalence of Glenohumeral Osteoarthritis in Patients with Chronic Shoulder Instability | Michelle Cameron-Donaldson, Cheyenne, WY, USA |
| Poster #365 | Thermal Capsulorraphy for the Treatment of Multi-Directional Shoulder Instability in Female Volley Players | Daniel Comba, La Loggia-TO, ITALY |
| Poster #366 | Arthroscopic Labrolasty for Instability Due to Ligamentous Laxity | Joe De Beer, Oranjezicht, SOUTH AFRICA |
| Poster #367 | The Modified Latanet Procedure for Instability With Bone Loss | Joe De Beer, Oranjezicht, SOUTH AFRICA |
| Poster #368 | Monopolar Electrothermal Shoulder Repair for Instability | Stephen W. Houseworth, Colorado Springs, CO, USA |
| Poster #369 | Long Term Follow-up of Radiofrequency Heat Probe Use During Arthroscopic Stabilization of the Shoulder | Peter Benjamin MacDonald, Winnipeg, CANADA |
| Poster #370 | Some Original Techniques and Simple Devices for Performing the Arthroscopic Bankart Repair Securely With Two Portals | Yasumoto Matsui, Obu, JAPAN |
| Poster #371 | Arthroscopic Stabilization of Collision Athletes | Augustus D. Mazozzica, Farmington, CT, USA |
| Poster #372 | Thermal Capsular Shrinking in the Treatment of Unstable Shoulders in Athletes – An Alternative Method? | Hans-Gerd Pieper, Essen, GERMANY |
| Poster #373 | Role of the Latissimus Dorsi in Antero-Inferior Shoulder Dislocation in Cadavers | Nicole Pouliart, Antwerp, BELGIUM |
| Poster #374 | Mid-substance Tear of Glenohumeral Ligament as a Cause of Recurrent Anterior Dislocation of the Shoulder Evaluation With Abduction and External Rotation MR Imaging | Minoru Yoneda, Osaka, JAPAN |
| Poster #375 | Clinical Outcome of Arthroscopic Anterior Shoulder Stabilization: Two-to-Six Year Follow-up | Seung-Ho Kim, Seoul, KOREA |
| Poster #376 | Arthroscopic Treatment of Posterior Instability of the Shoulder Mid-Term Results: Evaluation of 16 Patients with Posterior Instability of the Shoulder Operated With Arthroscopic Capsular Shift | Daniel Adolfo Slullitel, Rosario, ARGENTINA |
| Poster #377 | Subacromial Instability Syndrome: Laxity as a Late Cause of Rotator Cuff Failure | Miguel Slullitel, Santa Fe, ARGENTINA |
| Poster #378 | Correct Diagnosis and Augmented Transglenoid Repair: A Key to Success in Shoulder Instability on Young Rugby Players | Daniel Adolfo Slullitel, Rosario, ARGENTINA |

**Shoulder Other**

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SPORTS MEDICINE

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The FDA has not cleared the drug and/or medical device for the use described in this presentation (i.e., the drug or medical device is being discussed for an “off-label” use).
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Ankle/Foot/Calf

Poster #1
MORPHOLOGIC STUDY OF THE FEET IN LONG DISTANCE RUNNERS
Rogério Teixeira Da Silva, Perdizes, BRAZIL
Caio Augusto Nery, Sao Paulo, BRAZIL
Milton Luiz Mispuxen, Sao Paulo, BRAZIL
Moises Cohen, Sao Paulo, BRAZIL
Jose Felipe Alloza, Sao Paulo, BRAZIL, Presenter
UNIFESP/EPM, Sao Paulo, BRAZIL

Participating in sporting and physical activities has played a vital role in our society. However, greater duration and intensity in the practice of sports has increased the number of injuries. Running, which is seen as a therapeutic, recreational and competitive activity available to all as well as not requiring much in terms of equipment and expenditure may, however, lead to injuries and overloading of the lower limbs in particular, a result both of continuous and prolonged impact as well as individual propensities. Once an important correlation was observed between lower limb injuries and postural foot variations, a study was designed of the morphology and identification of deviations or misalignments of the distal end of the lower limbs. To this end, 94 feet of 47 medium and long distance male runner were analysed. Their ages ranged between 18 and 51 and all had been regular runners for a period of at least 6 months. The runners were assessed both clinically and radiologically. From the podographic classification of the different foot types (12% flat, 9.6% cavus and the other 77% normal or neutral) statical similarities and relationships of clinical and radiological parameters were analysed. No significant anomalies were observed in the runner, however, considerable variations in the physical relation of one bone with another in the adults became evident which, in turn, alerted to the possibility of taking one radiological variable alone as absolute in determining the nature of the bone architecture or the classification of different types of feet. It was clear that the Talus-1 metatarsal angle (±4°), Talonavicular Congruence angle (±4°-27°) and Articular Congruence Measure (3-9 mm) are radiological parameters which may be used to analyse foot types as they demonstrate sound statistical similarities and relationships. From anatomical, biomechanical and image considerations, it became clear that the assessment of complex articular movements such as pronation or hyperpronation in walking or running call for joint analyses of structural static and dynamic aspects.

Poster #2
POST TRAUMATIC OSTEOARTHRITIS ROLE OF FIBULAR LENGTH AND WIDTH OF ANKLE MORTISE AFTER MALLEOLAR FRACTURE.
Saqib Amin, Sharjah, UNITED ARAB EMIRATES, Presenter

Introduction: Conservative and inappropriate operative treatment of malleolar fractures often results in post traumatic osteoarthritis. The aim of this study was to analyse the role of abnormal length of the fibula, and the width in development of osteoarthritis.

Method & Material: 40 patients, 30 male and 10 female. (18-55 yrs age). 25 were treated from 1998-2001 for the fracture of the malleolus by open reduction and internal fixation, 15 were treated by closed reduction and immobilise with the cast for 6 weeks. Anterio-posterior X-ray of the both ankle joints were taken after 2 years, shortening of fibular malleolus and widening of the ankle was measured. Fractures were classified accord-ingly. Type A fracture lay below syndesmosis. Type fracture at the level of syndesmosis. And type C above this site.

Result: of 40 patients, 15 (37.5%) had type A fracture 18 patient (49%) type B, 7 patient (17.5%) type C. After either open or closed reduction, a shortened fibular was observed in 22 patients (55%) and an elongated fibular in 15 patient (37.5%), and a fibular of normal length in 7 patient (17.5%). The mortise was widened in 28 patients (70.5%), narrowed in 7 patients (17.5%), an of normal length 5 patients (12.5%). Radiological finding shows of fibular malleolar, and wide ankle mortise.

Discussion: previous measurement using other methods have confirm the relationship of a short fibula and widened ankle mortise with radiological osteoarthrosis, especially in type B fracture, clinically osteoarthrosis was not associated with reduced joint immobility, which has been noted before. Painful joint was noted in all type of class. Our study suggest a relation between poor late results in the treatment of malleolar fractures, with bone incongruity (a shortened fibula), and joints instability (irrespective of mode of management).

Poster #3
ARTHROSCOPIC ARTHRODESIS OF SUBTALAR JOINT: THE NEW TECHNIQUE AND SHORT TERM RESULTS
Eiichiros Asou, Sasebo, JAPAN, Presenter
Kazuhiro Yamaguchi, Sasebo, JAPAN
Hiroyuki Kitaibara, Sasebo, JAPAN
Naosaki Rosai Hospital, Sasebo, JAPAN

(PURPOSE) The purpose of this study was to describe a new technique of arthroscopic arthrodesis of subtalar joint and to know the short term results of this surgery. (MATERIALS AND METHOD) Six patients were treated with arthroscopic arthrodesis. Four patients were male and two patients were female. The age of patients were 24-63 years old (mean 39.3 years old). Diagnosis of the patients were subtalar osteoarthritis after calcaneal fracture and ankle sprain. Lidocaine test for the subtalar joint was very effective for all six patients. We did not use any external fixation devices or joint widening instruments at surgery. At first, we inserted 3.5mm arthroscope in 1-2 cm above to subtalar joint from lateral side, and remove soft tissues including interosseous ligament. Secondly, articular cartilage and bone were cut by chisel and electronic shaver. We could continue to gain the space for the view after bone resection. Medial facet was clearly viewed by the arthroscope. After enough resection of all articular surface of subtalar joint, fixation of the joint was performed by two cannulated screw. (RESULTS) Plain radiograph of the joint showed the bone union at ten weeks after surgery in all six patients, and the patients did not complain of subtalar pain.

Poster #4
CALCANEO-FIBULAR LIGAMENT PLASTY IN ANKLE INSTABILITY: A MINIMINVASIVE DAY SURGERY TECHNIQUE
Gian Luigi Canata, Torino, ITALY, Presenter
Centro di Traumatologia dello Sport e Chirurgia Ar, Torino, ITALY

Only a minority of ankle sprains develop a chronic instability. We evaluated retrospectively a mini invasive calcaneofibular ligament plasty to treat anterolateral posttraumatic chronic ankle instability.

Material and methods
26 patients, all practicing sports activities, 20 females and 6 males (mean age 25.3 years, 17-62) were operated on with a miniminvasive technique for instability due to chronic posttrau-
mastic calcaneofibular ligament laxity. The calcaneofibular liga-
ment was retened to the fibula with reabsorbable stitches.
Mean time between injury and surgery 52 months. All cases
showed painful ankle instability with a pathologic talar tilt. All
cases were treated in Day Surgery. An arthroscopic synove-
tomy or chondroplasty was associated in 5 cases.
After surgery a rigid bandage was prescribed. Full weight bear-
ing was allowed after 15 days. Results were evaluated with the
Ogilvie Harris Scale and the Kaikkonen scale. A proprioceptive
side to side evaluation was made with Delos board. Mean fol-
low up 43 months (18-67). Statistical analysis was performed
with the Student's t test

Results
Ogilvie Harris Scale showed 21 excellent and 5 good results.
Kaikkonen scale - 26 excellent results. Proprioceptive evalua-
tion did not show a significative side to side difference (p>
0.005). All subject resumed their previous sports activities in
the third month after surgery.

Conclusions
This simple technique aimed to an anatomic repair is effective
and can be performed in Day Surgery with excellent results.
Calcaneofibular ligament plastic alone can restore stability in
chronic anterolateral ankle instabilitys.

Poster #5
ARTHROSCOPIC TREATMENT OF OSTEOCHONDRTIS
DISSECANS IN THE TALUS
Chong-Hyuk Choi, Seoul, SOUTH KOREA, Presenter
Yong-Min Cheon, Seoul, SOUTH KOREA
Dept. of Orthopaedic Surgery, Yongdong Severance H, Seoul, SOUTH KOREA

Purpose: To evaluate the long term results of arthroscopic simple excision for osteochondritis dissecans in the talus clinically, and to investigate the gross change and histologic findings in the defect area through second look arthroscopy and biopsy.

Materials and Methods: This study included twenty two patients who were treated with osteochondritis dissecans in the talus. After arthroscopic excision of loose fragment, debridement for underlying necrotic tissue was done. Active bleeding bed was confirmed in all cases when tourniquet was released. The average follow up was 3.5yrs (25month-8yr). In nine cases, second look arthroscopy was done (post op 7 months - 8yr). The final results were evaluated with ankle-hindfoot scale (maximum 100 points) and functional scale (maximum 90 points).

Results: According to Berndt and Harty classification, 8 cases were stage IV, 12 in stage III and 2 in stage II. The average size of lesion was 1.6cm² (3.75 - 0.75cm²) and depth was 0.8cm (0.5-
1.1cm). In seven cases, cartilage lesions were found in the tibial plafond contacting with the lesion. In final evaluation, ankle-hindfoot scale was improved from 67 (pre-op) to 81 (p<0.01). The average of ankle functional score was 72. In second look arthroscopy, no associated pathological changes was found in the ankle joint except two cases who had degenerative arthritis due to chronic ankle instability. With lapse of time, the defects had a tendency to fill up with fibrous tissue. A serial change of microscopic findings also showed a progression of fibrous tissue to mature fibrocartilage.

Conclusion: The arthroscopic simple excision and debridement were effective for the treatment of osteochondritis dissecans in the talus in terms of clinical and functional outcome. The defect did not influence the development of secondary changes and showed a tendency of filling up with fibrocartilage.

Poster #6
SEMRIGID CONTRA PLASTER CAST FIXATION OF THE
ANKLE SPRAIN IN ATHLETES
Milan Handl, Prague, CZECH REPUBLIC, Presenter
Tomas TRC, Prague, CZECH REPUBLIC
Orthopaedic Clinic, University Hospital Motol, Prague, CZECH REPUBLIC

Summary:
The ankle sprain is very common injury in athletes. Author evaluated 2 parallel groups of total 46 patients treated after the severe ankle sprain by plaster cast or semirigid synthetic cast. The evaluation was based on clinical tests and X ray findings. Both testing were performed in 3 periods after the casts were removed. The results show a positive effect of early semirigid treatment than in classic plaster cast treatment.

Purpose
The aim of the study was to evaluate the effect of a early semi-
rigid fixation of the ankle sprain in the comparison to conser-
ervative plaster cast therapy in high level athletes.

Methods
Two groups of patients - high level athletes were treated imme-
diately after the severe ankle sprain (hematoma, swelling, sta-
ble ankle, X ray negative) immediately within 24 hours after the
injury by the cast immobilisation. The first group (25 pts) used
a semirigid synthetic cast, the other one used typical plaster cast. The former were released the heel by partially cutting the
cast after ten days. In both groups was cast removed after four
weeks. The following rehab procedure were the same. The clin-
ical testing were performed in 6, 9 and 12 weeks after removing
the cast. Early load, early mobility, pain-free gait and stability
were observed.

Results
Semirigid fixation group appear better early load, early mobility and pain-free gait than in plaster cast group. Stability of the ankle remained the same as it was before the injury. (See table). Stability of the ankle remained the same as it was before the injury. (See table).

Discussion
The early possible come-back in high level athletes is still dis-
cussed. In case of non-operative treatment of the ankle sprain there are two basic ways for recovering. The risk of early semi-
rigid fixation from the worse stability of the joint is suspected.

Conclusion:
Results show the semirigid fixation preferably than plaster cast is worth to perform in ankle sprains where no ligaments dam-
age occurs. The recovery to full athletic load was better in the
semirigid group.

Poster #7
DO I HAVE A FLATFOOT – THE RUNNER’S IMPRESSION,
THE DOCTOR’S FINDINGS
Erik Hofmann, Rockhampton, AUSTRALIA, Presenter
Andreas B Imhoff, Munich, GERMANY
Department of Orthopaedic Sportsmedicine Munich, Munich, GERMANY

Introduction: It is suggested that there is a link between arch type of the foot and overuse injuries. The use of individual selected running shoes can reduce running injuries substanti-
ally. To select the correct shoe the runner needs to have

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POSTER ABSTRACTS

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Andreas B Imhoff, Munich, GERMANY
Department of Orthopaedic Sportsmedicine Munich, Munich, GERMANY

Introduction: It is suggested that there is a link between arch type of the foot and overuse injuries. The use of individual selected running shoes can reduce running injuries substan-
ially. To select the correct shoe the runner needs to have
appropriate knowledge of his own foot anatomy and biome-
chanics.

Methods: The feet of runners were examined. A questionnaire
was used to assess the runner's knowledge about his arch
height and biomechanics of running. The clinical examination
was performed by 5 Orthopaedic Surgeon and experienced
orthopaedic technicians. Weight-bearing podograms were
taken to further delineate the arch.

Results: We examined 92 volunteers with a mean age of 35.4
(12-63) years, a mean height of 176 cm (154-195) with a mean
body weight of 70.38 kg (45-95). 18 out of 47 runners with a flat-
foot deformity identified their deformity correctly. 25 out of 43
with a normal arch were correct in identifying their foot
anatomy. 2 runners with a cavus foot were correct in identifying
their deformity. Only 4 out of 38 runners that diagnosed them-

Conclusion: This study demonstrates the poor knowledge of
their deformity. The long-term results of anatomical reconstruc-

Introduction: Ligament injuries of the ankle joint are the most
common sports-related injuries. Although most patients with
these injuries are managed non-surgically, some will develop
recurrent ligament instability. The common treatment in such
cases is ligament reconstruction. In several recent studies
anatomical reconstruction is recommended as the best choice.
The long-term results of anatomical reconstructions of the lat-
eral ankle ligaments are, relatively unknown. Further, the
assessment methods previously used, have probably not been
sensitive or specific enough to evaluate patient-relevant out-
comes and changes over time. Recently a new, patient-relevant
assessment scale, assigned to be used for patients with foot
and ankle problems (FAOS) has been validated and published.1

The aim of this study was to evaluate the long-term results after
anatomical reconstruction for recurrent ankle instability, using
the FAOS evaluation tool and especially to compare the out-
come parameters in women and men.

Material and method: 213 patients (85 women) operated on
with anatomical reconstruction due to recurrent ankle instabil-
ity were evaluated on average 12 (range, 3-24) years postopera-
tively using clinical and radiological (standardized stress
radiographs) assessments. Patient-relevant outcomes were
assessed using the FAOS-scales (pain, other symptoms, activi-
ties of daily living, sport & recreation function, foot & ankle-
related quality of life) scored on a 0-100, worst-best, scale.

Results: The mean ages and years to follow-up were similar in
men and women. There was no difference in the relevance of
each item with regard to gender. Women reported worse out-
comes in all five FAOS subscales, the differences being signifi-
cant for pain (81 v 86 points; p=0.005), other symptoms (74 v 81
points; p=0.009), sport and recreation function (65 v 75 points;
p=0.004), and foot & ankle-related quality of life (62 v 72 points;

p=0.001). 43% of the women experienced pain from their ankle
at least weekly as opposed to 25% of the men. 44% of the
women experienced at least moderate difficulty with twist-
ing/pivoting on the operated ankle as opposed to 34% of the
men. 65% of the women were aware of their ankle at least
weekly as opposed to 35% of the men.

Conclusion: The long-term outcome after anatomical ligament
reconstruction is worse in women than in men. On average 11
years after operation, nearly half of the women had ankle pain
at least weekly and two-thirds of the women were aware of their
ankle at least weekly.

Reference:
1. Roos EM, Brandsson S, Karlsson J. Validation of the Foot
Ankle Outcome Score (FAOS) for ankle ligament reconstruc-
tion. Foot Ankle Int 22, 788-794: 2001

Poster #9

ORAL HYDROLYTIC ENZYMES IN PATIENTS WITH ACUTE
ANKLE SPRAIN: EFFICACY AND SAFETY ASPECTS

Gino M.M.J. Kerkhoffs, Amsterdam, THE NETHERLANDS, Presenter
Peter Struijs, Amsterdam, THE NETHERLANDS
Herman Zwipp, Dresden, GERMANY
Volker Rahlfs, Gauting, GERMANY
Nick CN van Dijk, Amsterdam, THE NETHERLANDS
Orthopaedic Research Center Amsterdam, Dept of Orti, Amsterdam, THE
NETHERLANDS

Objective
To compare the effectiveness and acceptable safety of the triple
combination Phlogenzym (rutidoside, bromelain and trypsin)
with double combinations, single substances and placebo.

Design
Multinational, multicenter, double masked, randomised, par-
allel group design with 8 groups (factorial).

Setting
Departments of orthopaedic surgery and emergency depart-
ments in 27 European hospitals.

Participants
Patients aged between 16 and 53 years presenting with acute
one-sided sprain of the lateral ankle joint.

Main outcome measures
Pain on walking 1 or 2 steps, as defined by the patient on a
visual analogue scale (VAS). The range of motion, as measured
by the investigator and expressed as a sum of flexion and exten-
sion. The volume of the injured foot with the "Volumeter".

Results
A total of 721 patients were randomised, 674 were analysed on
an intention to treat bases. At the primary endpoint at 7 days,
the highest reduction of pain was observed in the bromelain-
trypsin group (-73.7%). The Phlogenzym group showed a
median reduction by -60.3%, while the placebo group showed a
median decrease by -73.3%. The highest increase of the range
of motion with regard to the medians is seen in the placebo
group (percent change from baseline 60.0%). The Phlogenzym
group showed a median increase of 42.9%. The highest decrease
of swelling was observed in the trypsin group (change from
baseline -9.3%). The Phlogenzym group showed a percentage
change from baseline of -2.3% and the placebo group of -2.9%.
The safety population included 692 patients. The vast majority
of physicians and patients rated the tolerability of all tested
treatments either as very good or at least as good.

p=0.001. 43% of the women experienced pain from their ankle
at least weekly as opposed to 25% of the men. 44% of the
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visual analogue scale (VAS). The range of motion, as measured
by the investigator and expressed as a sum of flexion and exten-
sion. The volume of the injured foot with the "Volumeter".

Results
A total of 721 patients were randomised, 674 were analysed on
an intention to treat bases. At the primary endpoint at 7 days,
the highest reduction of pain was observed in the bromelain-
trypsin group (-73.7%). The Phlogenzym group showed a
median reduction by -60.3%, while the placebo group showed a
median decrease by -73.3%. The highest increase of the range
of motion with regard to the medians is seen in the placebo
group (percent change from baseline 60.0%). The Phlogenzym
group showed a median increase of 42.9%. The highest decrease
of swelling was observed in the trypsin group (change from
baseline -9.3%). The Phlogenzym group showed a percentage
change from baseline of -2.3% and the placebo group of -2.9%.
The safety population included 692 patients. The vast majority
of physicians and patients rated the tolerability of all tested
treatments either as very good or at least as good.
Conclusions
Superiority of Phlogenzym in treatment of patients with acute one-sided sprain of the lateral ankle joint could not be demonstrated in comparison to the three 2-drug combinations, or in comparison to placebo. No additional benefit was revealed from the three single substances.

Poster #10
ARTHROSCOPIC ANKLE ARTHRODESIS WITH ARTHREX ACL GUIDE
Myung K. Kim, Inchon, SOUTH KOREA, Presenter
Inha University, Inchon, SOUTH KOREA

Arthroscopic ankle arthrodesis has advantages of small skin incision, faster recovery time, short hospitalization and short union time. But, for the successful result, it requires well-experienced skill and accurate screw insertion. For them, fluoroscopy or repetitive radiography are needed during operation. So, the surgical time may be extended and surgeon may has a risk of radiation. Here, the author used Arthrex ACL guide during arthroscopic ankle arthrodesis. We could inserted cannulated screws accurately and precisely without helping of fluoroscopy or repetitive radiography. We could get solid bone union within 3 months after operation in all cases. The application of Arthrex ACL guide is successful method on arthroscopic ankle arthrodesis. This can minimizes the risk of radiation and surgical time.

Poster #11
CLINICAL RESULT OF CORTICAL BONE PEG AUTOGRRAFT FOR OSTEOCHONDRAL LESION OF THE TALUS
Hideji Kura, Sapporo, JAPAN, Presenter
Seiichi Ishii, Sapporo, JAPAN
Shinsuke Mera, Sapporo, JAPAN, Presenter
Dept. Orthopedic Surgery Sapporo Medical University, Sapporo, JAPAN

Purpose: The purpose of this study was to evaluate the clinical results of cortical bone peg autograft for osteochondral lesion of the talus.

Materials and Methods: From 1993 to 2000, thirty four feet of 34 patients who had osteochondral lesion of the talus were treated by cortical bone peg autograft. Ten were male and 24 were female. Twenty five were medial type and 9 were lateral type. The average age at surgery was 31 years old (15 - 70 yrs.). The average follow up period was 4.5 years (2 - 9 yrs.). The evaluation was performed as follows: AOFAS hindfoot score, ROM of ankle joint, arthroscopic findings (postsurgery 1 year).

Result: Flap tear of full thickness articular cartilage without subchondral bone was found in 11 ankles. Remaining 23 ankles had osteochondral bone fragment. AOFAS score was averaged 54 points at presurgery and 97 points at final follow up. Dorsiflexion of the ankles averaged 17.5 at presurgery and 14.3 at final follow up. Plantarflexion of the ankles averaged 47.2 at presurgery and 45.6 at final follow up. In arthroscopic investigation, Mild local synovitis in 13 ankles, mild fibrilation in 5 ankles, and partial defect of articular cartilage in 2 ankle.

Conclusions: These results suggested that the cortical bone peg autograft kept strong fixation for the chondral or osteochondral lesion to achieve biological heeling. Mild synovitis was found in about one third of the ankles after 1 year of the surgery. This might be limitation of this procedure.

Poster #12
POST TRAUMATIC LATERAL ANKLE PAIN RESULTING FROM INTRA-ARTICULAR SOFT TISSUE
Gideon Mann, Givat Shaul, ISRAEL, Presenter
Shay Shabat, Kfar Saba, ISRAEL
David Morgenstern, Kfar Saba, ISRAEL
Naama Constantini, Netanya, ISRAEL
Joseph Lowe, Jerusalem, ISRAEL
Meir Nyska, Kfar Saba, ISRAEL
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Introduction:
Continuous pain on the lateral aspect of the ankle after acute ankle sprain is often a troublesome phenomena, yet under diagnosed and unexplained. Bony injuries as fracture of the lateral process of the talus, Osteochondritis or minor displaced avulsion fracture of the lateral maleolus impacted under the maleolus should be excluded as should fractures of the anterior process of the calcaneum or calcaneal fracture causing peroneal tendon impingement on the fibula. Injury to the sinus tarsi structures should be excluded by using local anesthesia. Partial or full tears of the peroneal tendon would occasionally comprise an extra articular cause for continuous pain.

In this presentation, we shall observe the intra-articular soft tissue impingement as a yet under-diagnosed cause of pain. Post traumatic synovitis after ankle sprain or following chronic bony impingement and osteophyte formation will not be included in the scope of this presentation.

Bony Anatomy and Bony Impingement.
The talus side saddles the calcaneum so that its axis is directed to the first web space while the calcaneal axis is directed to the fourth web space. Thus bony impingement would usually be antero-medial in dorsiflexion between the neck of the talus and the tibia or the postero-lateral between the calcaneum and the tibia in plantarflexion. Antero-lateral and postero-medial pain is usually from soft tissue in origin as a bony impingement does not occur in these areas (Hamilton, 1995).

Antero-Lateral Pain Caused by Soft Tissue:
The following entities are described:
2. Ferkel’s Phenomena: In 1991, Ferkel described the accumulation of scar tissue and inflamed synovium in the antero-lateral gutter usually post-traumatic.
3. Syndesmotic Pathology: Syndesmotic sprain or partial disruption could be painful for a long time, felt especially in dorsiflexion. This could be exaggerated by avulsion of a bony chip form the tibia (Tillot’s Fracture) or rarely form the fibula or exagerrated by synovial hernia into rents in the tibiofibular ligament (McLaughlin, 1960).
4. “Meniscoid Ankle”: First described by Wolin in 1950 and further developed by Tomasen in 1982 this interesting pathology evolves from soft tissue being trapped between the lateral shoulder of the talus and the lateral maleolus. This could assume a classic “meniscoid” shape or could seem more like scar and synovial unorganized tissue rather similar to Ferkel’s phenomenon.

Diagnosis:
Clinical examination would be assisted by imaging modalities: x-ray, bone scan, CT or MRI. It seems the best imaging modality for soft tissue intra-articular impingement syndromes is the CT-Arthrography.

Treatment:
When conservative methods fail, inclusive of rest, activity modification, NSA and occasionally taping, bracing and orthotics, surgical methods would be used, mainly arthroscopy both for diagnosis and for definitive and final treatment.

Summary:
Lateral pain after an acute ankle sprain is often hard to diagnose. It may be a result of a minor fracture or bony impingement of extra-articular origin, tendon injury or soft tissue intra-articular pathology typical to the antera-lateral pain syndrome. Diagnosis by clinical and imaging methods should be attempted prior to treatment which would be conservative, arthroscopic or occasionally by open surgery.

Poster #13
CLINICAL RESULT OF ARTHROSCOPIC REDUCTION FOR TRIMALLEOLAR FRACTURE OF THE ANKLE
Kohei Naito, Oda, JAPAN, Presenter
Fumito Komatsu, Oda, JAPAN
Masatoshi Tohda, Izumo-shi, JAPAN
Hidetoshi Yamaguchi, Oda, JAPAN
Masato Takao, Izumo, JAPAN
Kazunori Oae, Izumo, JAPAN
Mitsuo Ochi, Izumo-shi, JAPAN
Yuji Uchido, Izumo, JAPAN
Department of Orthopaedic Surgery, Shimane Medical, Izumo, JAPAN

Introduction
When we treat the trimalleolar fractures, anatomical reduction of the articular cartilage and rigid fixation of the fracture site are important for good postoperative results. We have utilized an ankle arthroscopy to assist the anatomical reduction of the articular cartilage in osteosynthesis. The purpose of this study is to evaluate the results of the arthroscopic reduction and internal fixation with trimalleolar fractures of the ankle.

Materials and Methods
Between 1999 and 2001, 26 patients with trimalleolar fractures were treated surgically at our institution. There were 16 males and 10 females with the mean age at surgery 36 years old (range, 19-77 years). They were followed up 6 to 25 months (mean, 18 months). Anteroposterior, lateral and mortise radiographs were made preoperatively in order to classify the fracture types. According to the Lauge-Hansen classification system, 21 cases were supination-external rotation type, 3 cases were pronation-eversion type, 2 cases were supination-adduction type. In operation, before osteosynthesis, we performed ankle arthroscopy to make sure the condition of the cartilage at the fracture site. And we reduce the cartilage anatomically as far as possible. If there were any other lesions, they were treated respectively in operation. After that, all patients were undergone screw and/or plate fixation of the fracture site. At the latest follow-up, we evaluated all patients using the Burwell’s evaluation system.

Results
At the time of osteosynthesis, there were 10 cases of osteochondral lesion. In these cases, 5 cases had been performed arthroscopic drilling, and one case had been removed the chondral fragment and performed abrasion. In 13 cases with the instability of the tibiofibular syndesmosis, we stabilized the distal tibiofibular joint using a syndesmosis screw. There were all good results in radiographic evaluation, and in subjective clinical evaluation. 24 cases were good, and 2 cases were fair in objective evaluation.

Discussion
If the trimalleolar ankle fractures were treated non-anatomically, the cartilage at the fracture site will degenerate and eventually cause osteoarthritis. We regard that there are two advantage of arthroscopy assisted treatment of intra-articular trimalleolar fractures. The first advantage is that chondral surface was reduced accurately. The second advantage is that ankle arthroscopy can confirm the associated lesions such as osteochondral lesion and the instability of the distal tibiofibular joint.

Poster #14
FOOT PRESSURE DISTRIBUTION DURING GAIT IN ATHLETES WITH FUNCTIONAL INSTABILITY OF THE ANKLE JOINT
Koji Nawata, Yonago, JAPAN, Presenter
Ikuta Hayashii, Yonago, JAPAN
Shinji Nishihara, Yonago, JAPAN
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Objective: Functional instability of the ankle joint is one of the most common residual disabilities after an acute ankle sprain. It is defined by Freeman as a condition characterized by a tendency of the ankle repeatedly sprain or the subjective feeling of the ankle giving way. The aim of this study was to investigate the foot pressure distribution during gait in athletes with functional instability of the ankle joint.

Methods: Two groups were examined. FI group comprised 8 college athletes with functional instability of the ankle joint. Control group comprised 10 healthy college students. Pressure, area and force during gait were measured using a pressure measuring system (MP-4800, Anima, Japan). The dynamic foot angle and the pronation-spination (PS) index were calculated.

Results: FI group demonstrated significantly lower (p<0.05) dynamic foot angle and greater (p<0.01) PS index at the push-off phase of gait than those in control group.

Conclusions: The results showed the increase in adduction-spination of the foot at the push-off phase of gait with functional instability of the ankle joint.

Poster #15
DIAGNOSTIC VALUE OF MAGNETIC RESONANCE IMAGING FOR INJURY OF THE ANTERIOR TALOFIBULAR LIGAMENT
Kazunori Oae, Izumo, JAPAN, Presenter
Masato Takao, Izumo, JAPAN
Yuji Uchido, Izumo, JAPAN
Kohei Naito, Oda, JAPAN
Taisuke Kono, Izumo, JAPAN
Mitsuo Ochi, Izumo-shi, JAPAN
89-1, Enya, Izumo, JAPAN

PURPOSE. To evaluate the diagnostic value of Magnetic resonance (MR) imaging in comparison with that of operative findings for clarifying the portion of the anterior talofibular ligament disruption.

METHOD: This study involved 22 patients with anterior talofibular ligament disruptions who had a surgery at Shimane Medical University Hospital. All of these patients were examined with MR imaging to diagnose the portion of the anterior talofibular ligament disruption. When imaging revealed discontinuity (criterion 1) and a high intensity area in the ligament (criterion 2), the injury was considered to be a ligament disruption. The portion of the ligament tear was classified in three
types to 1) At the attachment of fibula, 2) Substance, 3) At the attachment of talus.

RESULTS: On the basis of operative findings, in 4 cases, the ligament was disrupted at the attachment of fibula. In 12 cases, the ligament was disrupted at the substance. In 6 cases, the ligament was disrupted at the attachment of talus. On the basis of MR imaging findings, in 4 cases, the ligament was seemed to be disrupted at the attachment of fibula. In 11 cases, the ligament was seemed to be disrupted at the substance. In 5 cases, the ligament was seemed to be disrupted at the attachment of talus. These cases were correctly diagnosed. On the other hand, in one case, the ligament was seemed to be disrupted at both the attachment of fibula and talus. In another one case, the ligament was not clearly demonstrated and it could not be diagnosed the lesion of ligament tear. These two cases were not correctly diagnosed. A diagnostic value to clarify the portion of the ligament tear is made with a rate 90.9% (20/22).

CONCLUSION: When we repaired the acute anterior talofibular ligament disruption, we decide the operative methods properly to the ligament tear. Our study showed that MRI is one of the useful tools to clarify the portion of the ligament tear preoperatively.
Osteochondral lesions of the talus are associated with trauma
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Purpose: We investigated differences in the cause of chondral (C), subchondral (S), and combined chondral-subchondral (CS) lesions of the talus dome based on the presence of distal fibular fractures and anterior talofibular ligament (ATFL) disruptions.

Materials and Methods: There were 92 cases of distal fibular fractures and 86 cases of ATFL disruptions, including 36 feet with subacute ATFL and 50 feet with chronic ATFL disruptions. In diagnosing C, S, or CS lesions, we used a combination of magnetic resonance imaging to evaluate the subchondral conditions and ankle arthroscopy to evaluate the chondral conditions.

Results: Out of a total of 92 distal fibular fractures, 65 cases (70.7%) had C, S, or CS lesions at the time of osteosynthesis, and 27 did not (29.3%); among the latter group, 2 developed C, S, or CS lesions about one year after the operation. Out of a total of 86 ATFL disruptions, 35 (40.7%) had C, S, or CS lesions. Among the subacute cases, 7 of 36 (19.4%) had C, S, or CS lesions, versus 28 of 50 cases (56.0%) with chronic ATFL disruptions.

Discussion: There have been several reports regarding the etiology of OCL of the ankle joint. Many investigators have concluded that OCL of the ankle is primarily traumatic in origin. However, it remains to be clarified whether OCL is usually initiated by a single acute trauma or develops gradually after repeated microtraumas. Our study shows that almost all of the C, S, or CS lesions occurred at the time of initial trauma in distal fibular fractures. In the cases of ATFL disruption, repetitive microtrauma with remaining lateral instability was the major cause of C, S, or CS lesions of the talus dome.

Vasculo-neural origin to chronic Achilles tendon pain
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Purpose: The purpose of this study was to investigate the pain that comes from chronic Achilles tendinosis, by using ultrasonography and colour doppler, enzyme histochemistry, gene technology, and diagnostic injections.

Methods: All patients had the diagnosis chronic Achilles tendinosis. In 32 patients (mean age 47 years), ultrasonography and colour doppler was used to study tendon structure and occurrence of neovascularisation. In 20 patients, a local anaesthetic (polidocanol) was injected in the area with neovascularisation outside the ventral part of the tendon. Biopsies taken from tendinosis tissue and normal tendon tissue in 6 patients were used for immunohistochemical and gene expression studies.

Results: In all 32 tendons, structural tendon changes and neovascularisation was demonstrated on the painful (injured), but not on the non-painful (non-injured) side. Twelve patients with demonstrated neovessels before treatment, were treated with eccentric calf-muscle training for 12 weeks. After follow-up, 10 patients were satisfied with treatment (no tendon pain during activity). 9/10 satisfied patients there were no remaining neovessels. After injection of the local anaesthetic, all patients experienced a significantly diminished level of pain during tendon-loading activity (heel-raises). The VAS-score (max) decreased from 81 before injection, to 6 after injection. In biopsies, enzyme histochemistry showed nerve structures in close relation to blood vessels. cDNA-arrays demonstrated significantly higher expression levels for vasculoendothelial growth factor (VEGF) in tendinosis tissue compared to normal tendon tissue.

Conclusions: We demonstrate that there seems to be a significant relationship between vessel ingrowth (neovascularisation) and chronic Achilles tendinosis pain, and that nerve structures are accompanying the vessels. Furthermore, by using a local anaesthetic it was determined that the tendon pain originated from the area with neovascularisation at the ventral part of the tendon. These findings might have implications for treatment.

Positional variation in in vivo tibial strains during jumping exercises
Carin Olin, Huddinge, SWEDEN
Anton Arndt, Huddinge, SWEDEN, Presenter
Charles Milgrom, Jerusalem, ISRAEL
Ingrid Ekenman, Stockholm, SWEDEN
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Introduction
Stress fractures are a common overuse injury in athletes in a variety of sports and the most frequent localisation is the tibial shaft. The two major types are the postero-medial and the anterior stress fracture and these types have a different etiology, patho-anatomy and natural course. Stress fractures at the anterior location are regarded as more difficult to treat and are a problem for athletes performing frequent jumps such as in ballet dancing, long jump and basketball (Ekenman, 1998). The purpose of this study was to use a strain gauge instrumented staple system to measure local bone deformation at two defined sites during various jumping exercises.

Materials and Methods
Ten physically fit male patients (mean(SD) age: 33(4.5), weight: 84(9.3) kg, height: 185(4.8) cm) participated in the study. Strain gauge problems were encountered for three subjects and the presented results are therefore, for seven subjects. Strain gauges were attached to surgical staples, which were inserted under local anaesthetic in predrilled holes in the postero-medial and anterior tibial sites. Subjects performed zig zag hopping, vertical hopping and footfoot landings. All landings were on a Kistler force platform for definition of ground contact.

Results
Peak tension strains were greater than compression for all three exercises at the more proximal, anterior location. The highest strains at this location were for zig zag hopping (tension: 1242 ± 1828 me, compression: 646 ± 985 me). The absolute highest

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tension strain was, however, measured at the postero-medial location during zig zag hopping (tension: 1768 ± 2214 me, compression: -1078 ± 1491 me). Compression was greater than tension at the postero-medial site for vertical hopping and forefoot landing.

Discussion
All results showed high standard deviations resulting from high intersubject differences. The strains recorded were not greater than those in running (Milgrom et al., 2000). Variations were found between the two locations with tension strain being a greater factor at the anterior site as indicated for a single subject by Ekenman (1998). Greater anterior tension may be the result of plantarflexor contraction when landing on the forefoot. Tension at the anterior location is suggested as a possible mechanism in stress fracture etiology in athletes engaged in frequent jumping activity.

References

Poster #22
FROZEN SHOULDER: EFFECTS OF SUPERIOR AND ANTERIOR CAPSULAR RELEASE. A CADAVERIC STUDY.
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Pascal Gaudin, Le Chesnay, FRANCE
Fabrice Duparc, Rouen, FRANCE
Philippe Beaufils, Le Chesnay, FRANCE, Presenter
Department of Orthopaedics Surgery, Andre Mignot H, Le Chesnay, FRANCE

Introduction: The aim of this study was to determine the effects of arthroscopically assisted superior and anterior capsule release, on motion in an experimental model of frozen shoulder.

Material and methods: 12 cadavers shoulders were used. Passive range of motion (ROM) was initially normal. Capsular shrinkage was performed to simulate a frozen shoulder (Arthrocare®, energy 2). Then, 12 selective cuttings sequences under arthroscopically control were done (Arthrocare®, energy 9). Following structures were studied: rotator interval, medium glenohumeral ligament, inferior glenohumeral ligament, and the intraarticular part of m. subscapularis. Posterior capsule was not studied. After each section, two independent examiners measured ROM. An open approach was finally performed to confirm cuttings and to look for potential nervous or vascular damage.

Results: Measures were reproducible (+/- 5°). In all shoulders, cuttings were satisfying. There was no vascular or nervous damage. The role of each studied structure could be resumed as well as:
- rotator interval: external rotation increase in 0° of elevation (ER1) (mean 40°), and 90° of elevation (ER2) (mean 35°). This increase was superior to the decrease during shrinkage.
- inferior glenohumeral ligament: increase of elevation (mean 33°)
- rotator interval and inferior glenohumeral ligament: more important increase of elevation and ER2, than after each isolated cutting (synergy).
- medium glenohumeral ligament: poor increase of external rotation at 45° of elevation and flexion.

Discussion: Our frozen shoulder model was reproducible. Arthroscopically superior and anterior capsular release seemed to be secure in our experimental study (no vascular or nervous damage). Our study emphasized on the importance of rotator interval release to retrieve external rotation. Combined release of rotator interval and inferior glenohumeral ligament leaded to better results on mobility. Lack of posterior shoulder capsule study was a limit of our work.

Poster #23
BONE MARROW PERFUSION IN HEALTHY SUBJECTS ASSESSED BY SCINTIGRAPHY AFTER APPLICATION OF A TOURNIQUET
Lars Blond, Solrod, DENMARK, Presenter
Jan Lysgård Madsen, Frederikshg, DENMARK
Dept. of Orthop. Surg., Amager Hospital and Dept., Copenhagen, DENMARK

Introduction
So far, only few studies have dealt with bone marrow perfusion distally to a tourniquet. This study addressed the topic.

Material and methods
Eighteen male and six female healthy volunteers of mean age 50 years (range 20-86) had a tourniquet inflated on either upper arm (14 subjects) or thigh (10 subjects). After bolus injection of autologue 99mTc-labeled erythrocytes, dynamic imaging of arm or leg was performed as 1-sec frames for 15 min with a gamma camera. The time for arrival of the labeled erythrocytes to the condyles was recorded and the velocity of the progression of erythrocytes was calculated. All subjects had a DXA-scan in order to evaluate body composition.

Results
In all subjects we observed labeled erythrocytes to ooze beneath the cuff through the bone marrow and reach the condyles. The erythrocytes passed on via periarticular vessels to reach soft tissue distally to the joint. The median velocity for the progression was 4.0 cm/min (quartile 3.1-5.3) in the upper limb and 3.7 cm/min (quartile 2.7-4.4) in the lower limb. Kendall rank test did not reveal any correlation between gender, age, body composition or blood pressure and velocity for the progression.

Conclusions
This study shows that while the use of a tourniquet can effectively occlude the extra-osseous blood supply, some intra-osseous blood supply is retained, making it difficult to obtain a bloodless field in some patients, despite the use of a tourniquet. The present scintigraphic technique might be valuable for visualisation of osteonecrosis of the condyles, for evaluation of the intra-osseous blood supply in long bone fracture sites or aseptic loosening of knee prothesis.

Poster #24
EXSANGUINATION OF LIMBS IN ELDERLY SUBJECTS BEFORE SURGERY
Lars Blond, Solrod, DENMARK, Presenter
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Dept. of Orthop. Surg., Amager Hospital and Dept., Copenhagen, DENMARK

Introduction
Until now, no study have compared the efficacy of different methods for exanguination of limbs in elderly subjects before...
surgery. This was done in the present study by means of a new scintigraphic technique.

Materials and methods

Gamma camera scintigraphy after autologous injection of 99mTc-labeled erythrocytes was used to evaluate the percentage reduction of blood volumes in both lower and upper limbs after different exsanguination procedures in 10 healthy individuals with a mean age of 82 years (range 76-86). The exsanguination methods were elevation for various time periods or Esmarch bandage.

Results

The different exsanguination procedures gave rise to the following median percentage reduction of blood volumes. In the lower limbs: Elevation 5 sec 42 %, 15 sec 46 %, 30 sec 45 %, 60 sec 46 %, 120 sec 47 %, and Esmarch bandage 61 %. In the upper limbs: Elevation 5 sec 31 %, 15 sec 33 %, 30 sec 35 %, 60 sec 34 %, 120 sec 32 %, and Esmarch bandage 53 %. Elevation of the lower limbs for 15 sec was significantly more effective than elevation for 5 sec (p<0.02). For the upper limbs no significant differences were found between the effects of elevation for the various time periods. Esmarch bandage was significantly more efficient than elevation in both upper limbs (p<0.001) and lower limbs (p<0.001).

Conclusions

When using elevation alone 15 sec is needed for the lower limb and 5 sec is needed for the upper limb. Esmarch bandage are significantly more effective the elevation alone.

Poster #25

TIME-DEPENDENT MODULATION OF COLLAGEN TYPE I AND III GENE EXPRESSION IN HUMAN FIBROBLASTS UNDER CYCLIC STRAIN

Ullrich Besch, Hannover, GERMANY, Presenter Johannes Zieken, Hannover, GERMANY Michael Skater, Hannover, GERMANY Martijn van Grienesten, Hannover, GERMANY Laboratory of Histology and Cell Biology, Department, Hannover, GERMANY

Objective: Mechanical strains have the capacity to modulate cell behavior through several different signaling pathways. Understanding the response of ligament and tendon fibroblasts to mechanically induced strains may provide useful knowledge for treating injuries, improving rehabilitation regimens and for engineering functional grafts for tissue repair. The aim of the in vitro study was to determine collagen (col) I and III gene expression in human patellar tendon derived fibroblasts under cyclic strain.

Methods: Human patellar tendon fibroblasts were obtained from specimens of 5 donors (18-40 years) undergoing surgical treatment of knee joint instability. Fibroblasts were cultured and 500 000 2nd passage cells from each donor were plated on flexible silicon dishes. Monolayers of these subconfluently grown cells were then stretched along their longitudinal axes by an electromechanical device. Cyclic strain (5%, 1Hz) was applied for 15' and 60', respectively. Col I and III mRNA was measured by RT-PCR: 0', 15', 30' and 60' after stretching, respectively. Fibroblasts from each donor without any mechanical stimulation served as individual control. The paired t-test was used for statistical analysis (p<0.05).

Results: 15' of stretching results in a significant increase in col I mRNA 30% (67%) and 60' (69%) after stretching, respectively. After 60' of stretching, no significant increase in col I mRNA was observed. Similar results were observed in col III mRNA expres-

Conclusion: Collagen gene transcription is revealed to be rapidly responsive to cyclic stretching of fibroblasts. Dependent on stress time, fibroblasts respond differentially to cyclic stretching. This may have implication for the healing process in tendon/ligament injuries. Cyclic stretching of engineered tendon/ligament tissues may also affect the mechanical properties of cell/collagen composites used to repair/reconstruct tendons and ligaments. With different stretch time periods, the quality and thus the mechanical properties of in vitro generated tissues could be modulated.

Poster #26

INSERTION TORQUE, PULLOUT STRENGTH RELATIONSHIP DURING BIOABSORBABLE INTERFERENCE SCREW FIXATION OF A SOFT TISSUE TENDON GRAFT:
A SYNTHETIC AND HUMAN CADAVERIC BONE BIOMECHANICAL STUDY WITH OPERATIVE CORRELATES

David N. M. Caiborn, Louisville, KY, USA, Presenter John Nyland, Louisville, KY, USA Peter Hester, Louisville, KY, USA University of Louisville, Louisville, Kentucky, USA

Purpose: This study attempted to determine the relationship between the insertion torque of bioabsorbable interference screws used for soft tissue tendon graft fixation in synthetic and human cadaveric bone and the biomechanical characteristics of pullout strength including load to failure, stiffness and displacement. A secondary objective was to determine the operative efficacy of using an insertion torque-measuring device during ACL reconstruction with a soft tissue tendon graft.

Materials and Methods

Twelve doubled, 100 mm long tibialis anterior allografts of similar size (length = 100 mm, diameter = 9 mm) prepared for ACL reconstruction were randomly divided into 2 equal groups (n = 6). Group 1 was distally fixed in tunnels created in 10 lb/ft² dense synthetic bone and group 2 were distally fixed in tunnels created in 20 lb/ft² dense synthetic bone (FR-6700, General Plastics, Tacoma, WA). Tunnels of 7.5-mm diameter were drilled in 5 cm3 synthetic bone blocks and then dilated to 9.5 mm. The soft tissue tendon grafts for both groups were fixed in their respective tunnels with a single 10-mm diameter, 35-mm long, bioabsorbable Delta interference screw using the Torque Measuring Device (Arthrex Inc., Naples, FL) to record maximum insertion torque. Following fixation, the proximal end of each graft was secured with clamps in a servo hydraulic-testing machine (Model# 1331, Instron Corp., Canton, MA) with the displacement force vector aligned directly with the tibial tunnel ("worst case scenario"). The graft was then preloaded to 25 N, cycled from 0-50 N, and was then subjected to a 20-mm/min traction force. Identical procedures were used to test the fixation characteristics of 8 tibialis anterior allografts in human cadaveric tibias (BMD = 0.84 g/cm²). Insertion torque and subject age relationships were determined during operative efficacy testing.

• The FDA has not cleared the drug and/or medical device for the use described in this presentation (i.e., the drug or medical device is being discussed for an "off-label" use)
Results: All grafts failed by tunnel pullout. Biomechanical testing of synthetic bone revealed strong relationships between insertion torque and material density ($r = 0.97$) and between insertion torque and load to failure ($r = 0.80$). A moderate relationship was observed between insertion torque and stiffness ($r = 0.70$), and no relationship was observed between insertion torque and displacement ($r = 0.07$). Using human cadaveric tibiae a strong relationship ($r = 0.86$) was observed between insertion torque and BMD, and moderate relationships were observed between insertion torque and load to failure ($r = 0.70$) and between insertion torque and stiffness ($r = 0.72$). An insignificant relationship ($r = 0.23$) was observed between insertion torque and displacement. Operative efficacy testing revealed a strong inverse relationship between tibial insertion torque and subject age ($r = -0.74$) and a similar, but weaker relationship between femoral insertion torque and subject age ($r = -0.47$).

Conclusions and Significance: Results display the close relationship between femoral insertion torque and subject age ($r = -0.74$) and a similar, but weaker relationship between femoral insertion torque and load to failure ($r = 0.80$). A moderate relationship was observed between insertion torque and stiffness ($r = 0.72$). An observed between insertion torque and load to failure ($r = 0.80$). A moderate relationship was observed between insertion torque and stiffness ($r = 0.72$). An insignificant relationship (almost 50%) constituted by fibrocartilageous tissue. We conclude that the new-formed cartilage seems firmly attached to the bone, but many concerns still remain regarding the function of this disorganized cells in the long period.

Discussion and Conclusion: We obtained excellent clinical results (confirmed also by MR) with autologous condrocyte transplantation, the patients were free of pain with a complete R.O.M., histology showed, at two years, that new cartilage was inserted into bone but condrocytes were non arranged in layer like normal articular cartilage, there was a significant part (almost 50%) constituted by fibrocartilageous tissue. We conclude that the new-formed cartilage seems firmly attached to the bone, but many concerns still remain regarding the function of this disorganized cells in the long period.

Material and methods: In two patients (age 29 and 31 years) we performed autologous condrocyte transplantation, the patients had severe chondral lesion, 3 and 4 cm 2 on medial femoral condyle. We harvested small cartilage fragments on non weight bearing surface of the affected knee, then condrocytes were isolated and cultured. After five weeks the cells were implanted on the lesions using a proteoglycan substrate (Hyalograf). At two years we performed an arthroscopy with a biopsy of the treated lesion, the specimens were observed by routine and polarized light microscopy. The patients were also evaluated clinically (ICRS score) and subjected by standard x-ray and MR of the knee.

Results: Both patients had symptomatic improvement. MR imaging showed a well appearing cartilage layer, arthroscopically the lesions were completely healed, but they were soft when evaluated by probe. The lower part of biopsy showed a hyaline cartilage while in the upper side there was fibrocartilageous tissue. The transplanted tissue was inserted into bone, but no tidemark was observed. Polarized light microscopy showed fibrous bundles in the superficial and middle part of biopsy.

Discussion and Conclusion: We obtained excellent clinical results (confirmed also by MR) with autologous condrocyte transplantation, the patients were free of pain with a complete R.O.M., histology showed, at two years, that new cartilage was inserted into bone but condrocytes were non arranged in layer like normal articular cartilage, there was a significant part (almost 50%) constituted by fibrocartilageous tissue. We conclude that the new-formed cartilage seems firmly attached to the bone, but many concerns still remain regarding the function of this disorganized cells in the long period.

Poster #28

HISTOLOGIC EVALUATION OF AUTOLOGOUS CHONDROCYTES TRANSPLANTATION
Antonio Dellospagno, Rome, ITALY, Presenter
Salvatore Franceso, Rome, ITALY
Silvio Chiossi, Roma, ITALY
Amerigo Menghi, Roma, ITALY
Giuseppe Rinonapoli, Roma, ITALY
Ernesto de Santis, Roma, ITALY
Antonio Caporaso, Roma, ITALY
Università Cattolica - Clinica Ortopedica, Roma, ITALY

Autologous chondrocyte implantation now is very popular technique, however many concerns there are about the type of this cartilageous layer and the ability of this new tissue to bond to subsiding bone.

Aim: in our study we evaluated two patients, of our series of autologous cartilage implantation, to check with a biopsy, at two years, the type and organization of cartilage tissue and its attachment to the bone.

Material and methods: In two patients (age 29 and 31 years) we performed autologous condrocyte transplantation, the patients had severe chondral lesion, 3 and 4 cm 2 on medial femoral condyle. We harvested small cartilage fragments on non weight bearing surface of the affected knee, then condrocytes were isolated and cultured. After five weeks the cells were implanted on the lesions using a proteoglycan substrate (Hyalograf). At two years we performed an arthroscopy with a biopsy of the treated lesion, the specimens were observed by routine and polarized light microscopy. The patients were also evaluated clinically (ICRS score) and subjected by standard x-ray and MR of the knee.

Results: Both patients had symptomatic improvement. MR imaging showed a well appearing cartilage layer, arthroscopically the lesions were completely healed, but they were soft when evaluated by probe. The lower part of biopsy showed a hyaline cartilage while in the upper side there was fibrocartilageous tissue. The transplanted tissue was inserted into bone, but no tidemark was observed. Polarized light microscopy showed fibrous bundles in the superficial and middle part of biopsy.

Discussion and Conclusion: We obtained excellent clinical results (confirmed also by MR) with autologous condrocyte transplantation, the patients were free of pain with a complete R.O.M., histology showed, at two years, that new cartilage was inserted into bone but condrocytes were non arranged in layer like normal articular cartilage, there was a significant part (almost 50%) constituted by fibrocartilageous tissue. We conclude that the new-formed cartilage seems firmly attached to the bone, but many concerns still remain regarding the function of this disorganized cells in the long period.

Poster #29

TIME-DEPENDENT MECHANICAL AND HISTOLOGICAL CHANGES OF LIGAMENTS AFTER THERMAL SHRINKAGE: EFFECT OF IMMOBILIZATION
Mohmet Demirhan, İstanbul, TURKEY
Mustafa Uysal, İstanbul, TURKEY
Onder Kilicoglu, İstanbul, TURKEY, Presenter
Istanbul University, İstanbul Faculty of Medicine, İstanbul, TURKEY

Aim: To investigate the possible effects of immobilization on biomechanical and histological properties of collagenous tissue treated with thermal shrinkage in an in-vivo rabbit model.

Material and methods: 52 medial collateral ligaments in 26 mature New Zealand rabbit knees were divided into 8 groups. Monopolar radiofrequency-assisted thermal shrinkage procedure was performed on all ligaments, except 5. In half of the knees, joints were immobilized. Animals were sacrificed at 0, 3, 6, 9 weeks postoperatively. All ligaments were tested biomechanically using a material testing machine. Histological changes were evaluated using electron microscopy.

Results: Average ultimate failure load in the unshrunken control group was 56.40±11.05 N. Failure loads of the shrunked ligaments were 54.92±9.63 N after 3 weeks, 51.45±14.03 N after 6 weeks, 24.28±5.30 N after 9 weeks in immobilized knees and
Conclusion
Shrinkage causes an acute loss in the tensile strength of tissues. Although immobilization within the first 6 weeks following operation might be helpful for protecting the ligament, prolonged immobilization seems to have negative effects on tissue healing after shrinkage.

Poster #30
FAILURE STRENGTHS OF IN VIVO DEGRADED BIOABSORBABLE INTERFERENCE SCREWS
Onder Kilicoglu, ISTANBUL, TURKEY
Mehmet Demirkiran, Istanbul, TURKEY, Presenter
Senol Aksen, Istanbul, TURKEY
Ata Can Atalar, Istanbul, TURKEY
Serhat Ozyog, Istanbul, TURKEY
Umit Ince, Istanbul, TURKEY
Istanbul University, Istanbul Faculty of Medicine, Istanbul, TURKEY

Aim: To investigate the effect of in vivo degradation on the failure strengths of polylactide bioabsorbable interference screws. Study design: Animal model experiment.

Method: Ten bioabsorbable (poly-L-lactide) interference screws (BioInterference, Arthrex) were used to fix ipsilateral patellar tendon grafts in 10 live sheep knees. The animals were sacrificed in the 6th and 12th postoperative weeks. The screws were retrieved and re-implanted using the same technique in 10 cadaveric sheep knees. Fixation strength of the screws were determined by pulling on the patellar tendon. Results were compared to a control group consisting of 4 screws, placed in cadaveric knees. The mechanical tests were followed by macroscopic and microscopic examination of the specimens.

Results: Mode of failure was tendon pull-out in all tested screws. Tendons pulled out with an average force of 357±30 N in the control group consisting of cadaveric knees. The screws, retrieved after a degradation period of 6 weeks, failed with a mean load of 399±119 N, and 12-week screws at 447±72 N, which was significantly lower than the control group (p<0.10). Although this difference was statistically significant only on the 9th week (p<0.10).

Conclusion
Shrinkage causes an acute loss in the tensile strength of tissues. Although immobilization within the first 6 weeks following operation might be helpful for protecting the ligament, prolonged immobilization seems to have negative effects on tissue healing after shrinkage.

Poster #31
IMMUNOHISTOCHEMICAL ANALYSIS OF MECHANORECEPTORS IN THE HUMAN INFERIOR GLENOHUMERAL LIGAMENT.
Benno Ejinisman, Sao Paulo, BRAZIL, Presenter
Eduardo Da Freta Carrera, Sao Paulo, BRAZIL

The neural histology of the human shoulder ligament were studied using anti-protein S100 immunohistochemical analysis of mechanoreceptors. The inferior glenohumeral ligament were obtained at autopsy from 18 fresh cadavers (36 shoulders), age average of 37 years and 10 months. The purpose of this study was to describe the sensory innervation, number and types of mechanoreceptors according to side and age. The ligaments were splitted in two section, one more medial and another lateral to the labrum. We classified the neural structures using morphological studies (freeman and Wyke, 1967) and size (Del Valle et al, 1998). The immunohistochemical analysis showed 1197 neural elements in the inferior glenohumeral ligament, mainly near the attachment in the glenoid. There was no statistical difference in the right and left shoulder. The cadavers older than 30 years old showed more Ruffini like receptors in the medial portion of the ligament, and in the younger cadavers we found more free nerve endings.

Poster #32
INFLUENCE OF THE BONE TUNNEL ANGLE ON THE GRAFT-BONE HEALING PROCESS
Kensaku Hashiba, Kanazawa, JAPAN, Presenter
Katsukiyo Kitaoka, Kanazawa, JAPAN

INTRODUCTION] Implantation of an autogenous tendon graft into the bone tunnel is a common procedure in soft tissue reconstruction surgery, and many studies have been reported on this. However, no study has been conducted in which a variety of mechanical stresses were exerted in the same model.

PURPOSE] The purpose of this study was to assess the graft-bone healing process in the light of the time, location and bone-tunnel angle.

MATERIALS & METHODS] Sixty-five rabbits were used. Under general anesthesia, the extensor digitorum longus tendon was dissected and inserted into the bone tunnel made in the proximal tibia. The bone tunnel was drilled at 30, 45 and 60 degrees to the lateral cortex of the tibia with custom-made drill guides. The inserted tendon was fixed on the medial cortex with suture and washer. The screws were sacrificed at 2, 4, 6, 8 and 12 weeks after operation, and eight areas were observed in each specimen. Each specimen was evaluated and scored according to our evaluation criteria.

RESULTS & CONSIDERATIONS] There were obvious differences in the healing process of the graft-bone junction in terms of time, location and bone-tunnel angle, and these were found to be interactive. The biological bond was finally established at the entrance of the bone tunnel which appeared to be due to stress shielding. When the bone-tunnel angle was closed in the direction of the load, the continuity appeared early. It seems that the shearing force accelerates the healing process. We are currently performing mechanical testing, and hope to show the results of this in the near future.

Poster #33

The FDA has not cleared the drug and/or medical device for the use described in this presentation (i.e., the drug or medical device is being discussed for an “off-label” use).
Background: The aim of this study was to quantify how a mild surgical trauma such as arthroscopy alters synovial metabolism and local blood flow. We used the microdialysis technique to monitor synovial physiology in vivo.

Methods: Basic carbohydrate metabolism and blood flow was monitored in the synovial membrane with in vivo microdialysis following knee joint trauma using arthroscopy as trauma model. Arthroscopy was performed with or without a tourniquet in order to differentiate the grade of ischemic trauma.

Results: Lactate levels were higher in the synovial membrane than in reference tissue (subcutaneous fat). There was a significant increase in lactate postoperatively. Blood flow, measured as ethanol ratio was stable in both tissues. These findings indicate an increase in local lactate production since the levels of lactate in blood and reference tissue were comparable and did not show a significant increase. There was a consumption of glucose in the synovial membrane which was not observed in the reference tissue. Pyruvate levels were higher in the synovial membrane.

Conclusion: A state of reperfusion occurs in the synovial membrane following a moderate trauma such as standard surgical trauma such as arthroscopy alters synovial metabolism and local blood flow. We used the microdialysis technique to monitor synovial physiology in vivo.

Poster #34
THE MECHANISM OF THE DEVELOPMENT IN RAT KNEE JOINT.
Masakazu Ito, Urakawa, JAPAN, Presenter
Japanese Red Cross Urakawa General Hospital, Urakawa, JAPAN

(Introduction) The findings of some researchers suggested the dense accumulation of blastemal mesenchymal cells is apparently distinguishable between two osseous primordia of the pre-chondral mesenchyme at an early stage in the development of a synovial joint. The joint develops within this accumulation, which is generally called, the interzone, and consists of three layers. The middle layer of the interzone is also called the intermediate zone. As far as the developmental mechanism of the synovial joint is concerned, hypotheses can in principle be clustered into two groups. The classical one is that a partial cavity emerges somewhere within the interzone and becomes enlarged by mechanical stimulation due to movement. In other, there is a revival in terms of cell disappearance in the interzone, including cell degeneration and cell death. We could not find any report clearly indicating no contribution of apoptosis to cavitation by means of both immunohistochemistry and morphology. Thus, we investigated the development of the rat knee joint using light and electron microscopy, using immunological and biochemical methods to show precise structural cellular changes (morphological differentiation) in the interzone.

(Material & Methods) We used 126 hindlimbs and 12 forelimbs of 63 white Wistar rat embryos of the stages from E14 to P1, and investigated the development of the rat knee joint by light and electron microscopy. TUNEL methods and electrophoresis of DNA fragments were examined to detect apoptosis in this study.

(Results) Mesenchymal cells gradually showed elongation, cytoplasmic vacuolization and pyknosis in the intermediate zone where the elongated cells were parallelized in some strata. Some of these cells were further flattened into spindle cells and the number of strata decreased to two. Concerning cavitation, the initial separation was detected between the elongated cells in the intermediate zone in paraffin sections at E16.5 and the spindle cells in epoxi sections at E18.5. No positive cells were detected in the knee joint at any stage from E16 to E18.5 with TUNEL methods. A ladder pattern showing the occurrence of DNA fragmentation due to apoptosis was obtained from the samples of forelimbs at E16. But the pattern was not found in the samples from the knee joint at all stages.

(Discussion) The micro- and ultracellular alterations in the interzone seemed to reflect the differences in the arrangement and density of collagen fibers and developmental condition of extracellular matrix between layers, and these alterations also did not seem to be likely inhibit the synthesis of hyaluronan at the presumptive joint line because this synthesis is performed at the plasma membrane. Conclusions Separation between spindle cells should be the developmentally programmed cavitation, and it is probably natural that the rationalization of the milieu of extracellular matrix for cavitation accords with cellular metamorphoses in the interzone.

Poster #35
•CALCITONINE GENE-RELATED PEPTIDE AND NEUROPEPTIDE Y AFTER ECCENTRIC EXERCISE
Sven Jonhagen, Bromma, SWEDEN, Presenter
Paul W Ackermann, Stockholm, SWEDEN
Tonu Saartik, Visby, SWEDEN
Per A Renstrom, Stockholm, SWEDEN
Karolinska Hospital, Stockholm, SWEDEN

Microdialysis followed by radioimmunoassay was used in an attempt to detect neuropeptides in human skeletal muscle and also to study the effect of eccentric exercise. Eight healthy subjects participated in the study. Microdialysis of the distal part of vastus lateralis of the quadriceps was performed at rest, immediately after eccentric exercise and two days after the exercise. The microdialysate was analysed by radioimmunoassay focusing on detection of Calcitonine Gene-Related Peptide (CGRP) and Neuropeptide Y (NPY) as peptides representing the sensory and autonomic nervous system. Overall, the measured concentrations were low, some even below the detection limit. At rest, CGRP was detected in 2 of 8 subjects (20%), directly after exercise in 6 of 8 (75%) and two days after exercise in 6 of 8 (75%). At rest, NPY was detected in 0 of 8 subjects (0%), directly after exercise in 4 of 8 (50%) and two days after exercise in 6 of 8 (75%). The results indicate a short lasting increase in NPY levels and long lasting increase in CGRP levels after eccentric exercise. The results indicate a short lasting increase in NPY levels and long lasting increase in CGRP levels after eccentric exercise. Both CGRP and NPY can be detected in skeletal muscle after eccentric exercise.

Poster #36
CHONDROCYTE TRANSPLANTATION AGAINST THE FULL THICKNESS CARTILAGE DEFECT HAS THE PROTECTIVE EFFECT FOR SURROUNDING NORMAL CARTILAGE
Kenichi Kajitani, Izumo-shi, JAPAN, Presenter
Mitsuo Ochi, Izumo-shi, JAPAN
Yuji Uchida, Izumo, JAPAN
Kenzo Kawasaki, Izumo, JAPAN

(Introduction) The findings of some researchers suggested the dense accumulation of blastemal mesenchymal cells is apparently distinguishable between two osseous primordia of the pre-chondal mesenchyme at an early stage in the development of a synovial joint. The joint develops within this accumulation, which is generally called, the interzone, and consists of three layers. The middle layer of the interzone is also called the intermediate zone. As far as the developmental mechanism of the synovial joint is concerned, hypotheses can in principle be clustered into two groups. The classical one is that a partial cavity emerges somewhere within the interzone and becomes enlarged by mechanical stimulation due to movement. In other, there is a revival in terms of cell disappearance in the interzone, including cell degeneration and cell death. We could not find any report clearly indicating no contribution of apoptosis to cavitation by means of both immunohistochemistry and morphology. Thus, we investigated the development of the rat knee joint using light and electron microscopy, using immunological and biochemical methods to show precise structural cellular changes (morphological differentiation) in the interzone.

(Material & Methods) We used 126 hindlimbs and 12 forelimbs of 63 white Wistar rat embryos of the stages from E14 to P1, and investigated the development of the rat knee joint by light and electron microscopy. TUNEL methods and electrophoresis of DNA fragments were examined to detect apoptosis in this study.
Introduction: Cartilage, once destroyed, doesn't recover but degenerates, with the surrounding and facing cartilage further deteriorating into osteoarthritis. Transplantation of cartilage-like tissue by tissue engineering is promising for repairing cartilage defect with hyaline cartilage-like tissue. However, it is obscure whether this procedure would prevent deterioration of the surrounding and facing cartilage. The purpose of this study was to investigate its protective effects for progressing to osteoarthritis.

Materials and Methods: 36 rabbits were divided into three groups. A cartilage defect (size: 6mm x 4 mm in width and 3 mm in depth) was created on the patellar groove of the knee. The defects were filled with allogeneic chondrocytes which were isolated from joints, embedded in atelocollagen gel, and cultured for 3 weeks (G group). As controls, the same defect was left empty (D group), and a sham operation was performed (S group). At 12 and 24 weeks after operation, the cartilage in the surrounding area and the patella was assessed macroscopically, histologically, biochemically, and biomechanically.

Results: Macroscopically, many osteophytes were observed in the surrounding cartilage in the D group. Mankin's score of the surrounding area and the patella was assessed macroscopically. Histologically, the stiffness of the surrounding cartilage in the D group was significantly lower than that in the other two groups at 24 weeks. The ratio of C6S to C4S in the D group was significantly higher than that of the G and S groups at 12 and 24 weeks (p<0.05). The stiffness and the concentration of chondroitin sulfate in the D group were significantly decreased at 1 and 3 months after operation. The ratio of C6S to C4S of the OA model, while the amount of CS was increased at 1 month after operation, it was significantly decreased at 3 months after operation. The ratio of C6S to C4S and C6ST mRNA expression gradually decreased after operation. The amount of CS and the ratio of C6S to C4S and C6ST mRNA expression in the regenerative cartilage tissue gradually increased after operation although these scores were significantly lower than those of the control group. In the control group, there were no significant changes in the amount of CS, ratio of CS isomers or C6ST mRNA expression.

Conclusion: C6ST was correlated with the ratio of CS isomers in articular cartilage. Moreover, C6ST may play important roles in maintaining or improving the quality of CS in articular cartilage.

Poster #38
REGIONAL DIFFERENCES IN THE HEALING POTENTIAL OF THE MENISCUS - AN ORGAN CULTURE MODEL TO ELIMINATE THE INFLUENCE OF MICROVASCULATURE AND SYNOVIOUM

Materials and Methods
A full-thickness circular defect, 1.5 mm in diameter, was placed in the avascular zone of the meniscal specimens harvested from both knees of rabbits. The menisci were divided into two groups by following treatment. In Group T, the defects were filled with meniscal grafts, 1.5 mm in diameter, from the peripheral zone of the same specimens after resection of the femoral surface to match the recipient. In Group C, the tissue removed for creating the circular defect in the avascular zone were implanted in the defects after cutting the femoral end of the tissue as meniscal grafts. Menisci of both groups were cultured in multiwell culture plate (one meniscus per one well). After the incubation for 2, 4 or 6 weeks, each of the meniscal explants was evaluated grossly and histologically using the semiquantative scorings. The association between the graft and the recipient tissue was rated with a 3-point scale for gross evaluation, and was rated with a 4-point scale for histological evaluation. The high score was assigned to the good association. The differences between the 2 groups were analyzed by the means of unpaired Mann-Whitney test. Immunohistochemical analysis with anti-proliferating cell nuclear antigen (PCNA) were also carried out to assess the healing reaction.

Results
The morphological difference was not detected after incubation for 2 and 4 weeks. After the incubation for 6 weeks, the score of Group T was significantly higher than that of Group C (p = 0.0152). Histologically, healing reactions in the interface between the graft and the recipient tissue occurred in 7 (16%) of 37 explants in Group C. In contrast in Group T, healing reactions such as the cross-link formation and fibrous continuity were observed in 27 (59%) of 37 explants. The histological score of Group T was higher than that of Group C after incubation for each periods, and there were significant differences between
two groups after 4 and 6 weeks incubation (p=0.0237, p=0.0281). The PCNA-positive cells were detected in the interface between the two components in Group T.

Discussion
Our group previously reported that meniscus has slow-cycling cells (implication for precursor cells) at peripheral region. We used an organ culture to evaluate whether peripheral region containing slow cycling cells has superior reparative potential, without the influence of blood supply and synovial tissue. More reparative reactions were observed in implanting the grafts from peripheral region (Group T). These results suggest that meniscal tissue of the peripheral region have higher healing potential than that of the inner region. The difference of the regional healing response of the meniscus in vivo may be due to not only the vascularity but also the healing potential of the cells in the meniscus.

Poster #39
EFFICIENT TRANSDUCTION OF MENISCAL FIBROCHONDROCYTES IN VITRO AND IN VIVO BY RECOMBINANT ADENO-ASSOCIATED VIRUS VECTORS
Henning Madry, Homburg, GERMANY
Magali Ciecziorni, Homburg, GERMANY
Ernest Terrilliger, Boston, MA, USA
Stephen Trippel, Indianapolis, IN, USA
Dieter M Kohn, Homburg-Saar, GERMANY, Presenter
Laboratory for Experimental Orthopaedics, Departme, Homburg, GERMANY

Introduction: Successful gene transfer into menisci is a prerequisite for gene therapy of meniscal lesions. In the present study we tested the hypothesis that recombinant adeno-associated virus (rAAV) vectors are capable of effecting gene transfer in isolated human meniscal fibrochondrocytes in vitro, human meniscal tissue in vitro and sites of meniscal damage in vivo.

Methods: Recombinant AAV vectors expressing the E. coli β-galactosidase (lacZ) gene under the control of the CMV-IE promoter/enhancer were packaged, purified, and titrated by real-time PCR. Human meniscal fibrochondrocytes were enzymatically isolated from menisci obtained at the time of total knee arthroplasty and transduced in monolayer culture with graded doses of rAAV-lacZ. Human meniscal explants obtained at the time of total knee arthroplasty were transduced with rAAV at a dose of 8 µl of virus stock per sample either onto the surface of untreated human meniscus or injected into meniscal tears that were created using a scalpel. In vivo, 2.5 µl of rAAV-lacZ were applied to medial meniscal tears in the knee joints of rabbits. When rAAV-lacZ was applied in vivo to medial meniscal tears, reporter gene expression was achieved for at least twenty days following transduction.

Results: Isolated human meniscal fibrochondrocytes were transduced with an efficiency of 14.4 ± 9.5% when 0.1 µl virus stock were applied. Increasing the amount of rAAV-lacZ induced a dose-dependent increase in efficiency. Maximal transduction efficiency was 87.2 ± 14.8% with 16 µl virus stock (n = 3). ANOVA revealed significant differences between all treatment groups (P < 0.05; n = 3), except when the dose of 8 µl was compared with 16 µl of virus stock (P > 0.05; n = 3). When rAAV-lacZ was applied to the surface of human meniscal explants or injected into meniscal tears in vitro, X-Gal staining was observed over the entire surface of the explants or in the tissue surrounding the injection site (n = 7). Gene expression persisted until day 28 post-transduction, the longest time point analyzed. On histological analysis of transduced human menisci, X-Gal staining was observed in human meniscal fibroblasts adjacent either to the surface or to the injection site, depending on the application method. When rAAV-lacZ was applied in vivo to medial meniscal tears, reporter gene expression was achieved for at least twenty days following transduction.

Conclusion: These data suggest that AAV-based vectors can efficiently transduce and stably express foreign genes in human meniscal fibrochondrocytes. The reported efficiencies are comparable to the previously reported data using adenoviruses or retroviruses in vivo. The data further indicate direct application of rAAV vectors results in successful transduction of human menisci in explant culture. Finally, the data demonstrate that these rAAV vectors are capable of effectively delivering recombinant genes to meniscal lesions in vivo. This approach may form the basis for novel treatments of meniscal lesions.

Poster #40
CHONDROCYTES INDUCE CHONDROGENIC DIFFERENTIATION OF SYNOVIOCYTES UNDER THE COCULTURE CONDITION
Sokichi Maniwa, Izumo, JAPAN, Presenter
Tetsuya Nishikori, Izumo, JAPAN
Kenichi Kajitani, Izumo-shi, JAPAN
Mitsuo Ochi, Izumo-shi, JAPAN
Shinnane Medical University, Izumo, JAPAN

Purpose: To evaluate the chondrogenic differentiation of synoviocytes (Sys) cocultured with chondrocytes (Chs).

Methods: Sys were obtained by explant culture of the synovial membrane of the knee joint of a young rabbit. Chs were prepared from articular cartilage by enzymatic digestion with 0.25% trypsin and 0.25% collagenase. Sys were seeded at a concentration of 25000 cells/cm2 and cocultured with Chs at a 1:1 ratio. Locomotion of the cells was monitored using a phase contrast microscope and a time-lapse video. Immunocytochemistry was performed using anti-S-100 protein and anti-collagen type II antibodies. Indirect coculture was also performed using a membrane separated trans-well culture chamber (MSTC).

Results: Migration velocity of Sys decreased from 13.7µm/h to 7.4µm/h 4 hours after coculture and the spindle-shaped morphology of Sys became polygonal similar to Chs. Positive immunostaining of S-100 protein was observed in Chs (72%), cocultured cells (55%), but was not in Sys (0%) (p<0.01). Collagen type II was detected in Chs and cocultured cells. S-100 protein was not detected in Sys when cocultured using a MSTC (indirect coculture).

Discussion and Conclusion: Under the coculture condition, Chs induced chondrogenic differentiation of Sys, which have the nature of mesenchymal stem cells (MSC). Our results suggest that cell-to-cell interaction rather than soluble factors may play a role in chondrogenic differentiation of Sys. MSCs in the synovial tissue are promising cell source for articular cartilage repair.

Poster #41
THE EFFECTS OF MECHANICAL COMPRESSIONAL STRAIN ON THE ARTICULAR CHONDROCYTES. A STUDY USING MRNA EXPRESSION OF CULTURED CHONDROCYTES AGAROSE GEL.
Kensuke Mio, Tokyo, JAPAN, Presenter
Sasji Saito, Tokyo, JAPAN
Taisuke Tomatsu, Tokyo, JAPAN
Hideo Matsumoto, Tokyo, JAPAN

[5.27]
**Poster #2**

**AG-041R, A CHOLECYCTOKININ-B/GASTRIN RECEPTOR ANTAGONIST, STIMULATES THE REPAIR OF OSTEOCHONDRAль DEFECT IN RABBIT MODEL.**

Torus Nakashita, Izumo, JAPAN, Presenter
Kenzo Kawasaki, Izumo, JAPAN
Yuji Ukike, Izumo, JAPAN
Mitsuo Ochi, Izumo-shi, JAPAN
Shimane Medical University, Izumo, JAPAN

Purpose: AG-041R, 3R-1-(2, 2 Diethoxyethyl) - ((4 methylphenyl) amino-carbonyl methyl)-3- ((4 methylphenyl) ureido-indole-2-one), is a cholecyctokinin-B /gastrin receptor antagonist, which was originally developed to treat gastric ulcers. In a preclinical toxicological study on rats, oral administration of a high dose of AG-041R was found to stimulate systemic cartilage hyperplasia, including the trachea, the intervertebral disk and the articular cartilage. Following this unexpected discovery, daily intraarticular injections of a high dose of AG-041R for 3 weeks into the normal knee joints of rats have induced cartilage hyperplasia in marginal regions of the femoral condyle without other tissues being affected. In this study, we examined the effect of AG-041R on the repair of osteochondral defects in the rabbit knee joints. Materials and Methods: Osteochondral defects (cylindrical, 4-mm diameter) was created in the patellar groove of the rabbit knee joint. At the time of operation, 100-1 of 1-M of AG-041R was administered, followed by 200-1 with an osmotic pump for 14 days. Histological and biochemical evaluations were performed at 12 and 24 weeks after surgery.

Results: The histological score of the AG-041R-treated group, the quantity of glycosaminoglycan and the ratio of chondroitin sulfate in the AG-041R-treated tissue were significantly higher than in the untreated group. Moreover, the degeneration of cartilage around the defect was suppressed in the AG-041R-treated group.

Conclusion: These findings suggest that AG-041R is effective for the repair of osteochondral defects.

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**Poster #43**

**CLINICAL AND IMMUNOLOGICAL EVALUATION OF PATIENTS WITH SYMPTOMATIC METAL HYPERSENSITIVITY FOLLOWING KNEE ARTHROPLASTY. IS METAL HYPERSENSITIVITY A CAUSE OF PROSTHETIC LOOSENING?**

Yasuo Niki, Tokyo, JAPAN, Presenter
Hidé Matsamoto, Tokyo, JAPAN
Toshiro Otani, Shinjuku-ku, JAPAN
Yasunori Sada, Tokyo, JAPAN
Takashi Toyoda, Tokyo, JAPAN
Department of Orthopaedic Surgery, Keio University, Tokyo, JAPAN

Introduction: Although metal hypersensitivity can undoubtedly occur after prosthetic implantation, the role of metal hypersensitivity in prosthetic loosening has yet to be established. Several reports have documented prosthetic-induced metal sensitization as assessed by skin-patch test. However, the interpretation of skin-patch test is not exactly straightforward in situations with prosthetic implantation, and most metal-sensitized patients are in fact asymptomatic. In the present study, we performed radiographical and biological analyses on 10 patients with symptomatic metal hypersensitivity such as severe dermatitis or urticaria following knee arthroplasty. In addition, we discussed potential diagnostic factors for symptomatic metal hypersensitivity and relationships between metal hypersensitivity and subsequent loosening.

Methods: The subject population comprised 10 patients who developed eczematous dermatitis after knee arthroplasty (9 TKAs and 1 UKA). Continuous joint effusion co-existed to various degrees in all patients. Peripheral blood and joint fluid samples were obtained from each patient. Mononuclear leucocyte fractions were obtained from heparinized whole blood, followed by a modified lymphocyte stimulation test in which T-cell proliferative activity in response to metal ions such as nickel, cobalt, and chromium was measured. Phenotypic characteristics of joint fluid cells were also determined using flow cytometry (FCM). Samples from patients without any evidence of metal hypersensitivity following knee arthroplasty were used as controls.

Results: Of the 10 patients, 7 displayed localized eczema around operative scars and 3 demonstrated generalized eczema. Eczematous reactions started at a mean of 3 weeks after implantation. The 7 patients with localized eczema and 1
bone-patellar tendon-bone (BPTB) graft and a novel semitendinosis/bone composite (SBC) allograft. Tibial fixation remains the most compromised component of ACL reconstruction in the first eight to twelve weeks postoperatively. Although the BPTB graft has demonstrated efficacy when used for ACL reconstruction, the morbidity associated with its harvest remains problematic. This study investigated the biomechanical properties of the SBC allograft, which is comprised of a quadrupled semitendinosus tendon with cortical bone struts at each end. The SBC allograft is designed to provide comparable stability to the BPTB graft, but without the adverse sequelae associated with harvestation.

Materials and Methods: Seven paired, fresh frozen cadaveric knees (20-45 years) were stripped of all soft tissue attachments and randomly assigned to receive either the BPTB graft or SBC allograft. After each specimen was DEXA scanned with a threshold of 0.7 g/cm² for study inclusion, the grafts were placed into tibial tunnels via a standard protocol and secured with 28 mm bioabsorbable screws. The proximal end of each graft was secured to a clamp and positioned in a servo hydraulic device during pullout testing. Grafts were cycled ten times from 10-50 N prior to pull to failure at a rate of 20 mm/min with the force vector aligned with the tibial tunnel ("worst case scenario"). Paired t-tests were used to evaluate biomechanical differences between graft types ($p < 0.05$).

Results: Bone mineral densities were statistically equivalent between graft types (BPTB = 0.86 +/- 0.16 g/cm² vs. SBC = 0.85 +/- 0.14 g/cm², $p = 0.49$). Significant differences were not observed between graft types for load to failure strength (BPTB = 620.8 +/- 209 N vs. SBC = 601.2 +/- 140 N, $p = 0.80$) or stiffness (BPTB = 4.9 +/- 3.7 N/mm vs. SBC = 4.1 +/- 3.7 N/mm, $p = 0.74$). The SBC allograft yielded significantly more displacement prior to failure than the BPTB graft (15.1 +/- 4.9 mm vs. 9.2 +/- 1.3 mm).

Conclusions and Significance: In this limited sample, the SBC allograft displayed statistically equivalent load to failure strength and stiffness compared to the BPTB graft. This finding in combination with avoidance of tissue morbidity from graft harvest suggests that the SBC allograft may be an effective alternative for ACL reconstruction. Further studies are being designed to determine if the displacement difference observed prior to failure is due to the suture configuration connecting bone to soft tissue and whether this difference has any clinical significance.

Poster #45
THE MENISCOFEMORAL LIGAMENTS: AN ANATOMIC STUDY
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Introduction: The menisco femoral ligaments are accessory liga-
ments of the knee. They extend from the posterior horn of the
lateral meniscus to the lateral aspect of the medial condyle
close to the femoral attachment of the posterior cruciate liga-
mament (PCL). The fibers running along the anterior surface of the
PCL are called anterior meniscofemoral ligament or Humphrey's ligament and those passing along the posterior
surface are called posterior meniscofemoral ligament orWirberg's ligament. The purpose of this study was to evaluate the
incidence of the menisco femoral ligaments in cadaverics
knees.

Materials and methods: Forty cadaverics knees were dissected.
There were 20 female and 20 male specimens. All the soft tis-
ues except the cruciate ligaments and the meniscus were
removed and the distal femur was cut sagittally at the inter-
condilar notch. These technique permitted the observation of
the ligaments and their insertion site.

Results: In all 40 knees, the posterior horn of the lateral menis-
cus was connected to the femur. The anterior meniscofemoral
ligament was present in the forty knees (100%) dissected and
the posterior meniscofemoral ligament in 28 (70%).

Discussion: The incidence of the meniscofemoral ligaments
reported in the literature is dispairs. We found both ligaments
present in the 70% of the knees and the anterior or Humphrey's
ligament as a constant structure.
TISSUE ENGINEERED CARTILAGE BY IN VIVO CULTURING OF CHONDROCYTES IN A PLLA-COLLAGEN HYBRID SPONGE

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Introduction

Tissue engineering of cartilage has been proved to be one of the most promising approaches for cartilage repair. Temporary biodegradable porous scaffolds play an important role in this approach. Many different scaffolds have been constructed from a variety of biomaterials. Biodegradable synthetic polymers such as poly(glycolic acid) (PGA), poly(lactic acid) (PLA), their copolymer of poly(DL-lactic-co-glycolic acid) (PLGA), and biodegradable naturally derived polymers such as collagen have been most frequently used. Because each of these polymers has their respective advantages, hybrid scaffolds have been developed to combine these advantages [1–5]. In our previous study, we developed a novel kind of hybrid scaffold by introducing a collagen sponge into the pores of a synthetic polymer sponge [1,2]. In the present study, the PLLA-collagen hybrid sponge was used as a scaffold for in vivo tissue engineering of bovine articular cartilage.

Materials and methods

PLLA sponge and PLLA-collagen hybrid sponge were prepared as follows. Sieved NaCl particulates ranging in diameter from 600 to 710 micron were mixed with a PLLA solution in chloroform at a concentration of 20% (w/v). The mixture was air-dried and the NaCl particulates were leached out by washing with deionized water to form the PLLA sponge. The PLLA sponge was immersed in bovine collagen type I acidic solution (0.3%) under a vacuum, frozen, and freeze-dried to form PLLA-collagen hybrid sponge. The hybrid sponge was cross-linked with glutaraldehyde vapor, subsequently treated with 0.1 M glycin aqueous solution, and washed with deionized water. The sponges were cut into 8 x 8 x 2.2 mm-sized cubes and sterilized with ethylene oxide gas. Bovine articular chondrocytes were isolated from shoulder and elbow joints of a two-week old calf by collagenase digestion. After being subcultured in flasks in DMEM containing 10% FBS for two weeks with two passages, the chondrocytes were collected with trypsin treatment and suspended in culture medium at densities of 5 x 10^7 cells/mL for seeding. The cell suspension was seeded in the PLLA and PLLA-collagen sponge (140 micro L/sponge) twice. The constructs were cultured statically in the medium under a 5% CO2 atmosphere at 37 degree C for one week. Subsequently, the constructs were implanted subcutaneously in the dorsum of athymic nude mice. Each mouse carried four different constructs (PLLA sponge with cells, PLLA-collagen sponge with cells, PLLA sponge without cells, and PLGA-collagen sponge without cells). The implants were harvested after in vivo incubation of 2, 4, 6, and 8 weeks. The implants were fixed in neutral buffered formalin, embedded in paraffin, and sectioned (10 micron thick). Histological analyses were performed using hematoxylin and eosin, safranin O/fast green staining and immunohistochemistry of collagen type II.

Results

The cell seeding in PLLA-collagen hybrid sponge was easier than PLLA sponge which required prewetting with the medium. No evidence of superficial infection or fistula formation was observed. In sponges seeded with chondrocytes, all constructs were easily dissected from the subcutaneous tissue. These constructs preserved their original rectangular shapes for all implantation periods. Hematoxylin and eosin stains revealed an increase of chondrocytes in their natural round morphology and a decrease of vascularization with increased implantation time. A greater number of round morphological chondrocytes were observed in the PLLA-collagen hybrid sponge than in the PLLA sponge. Safranin O/fast green stains revealed that more GAGs were detected in the PLLA-collagen hybrid sponge than in the PLLA sponge. The amount of GAGs also increased with increased implantation time. Collagen type II was detected in all the implants seeded with chondrocytes. The PLLA-collagen hybrid sponge seeded with chondrocytes showed a more homogeneous distribution of collagen type II than in the PLLA sponge seeded with chondrocytes. In sponges without chondrocytes, only fibroblasts and a high degree of neovascularization were observed. Neither GAGs nor collagen type II was detected.

Discussion

Tissue engineered cartilage grafts should meet certain criteria to enable surgical handling and mechanical loading. Because biodegradable synthetic polymers can easily be processed into intended shapes with good mechanical strength, they have been used as skeletons to hybridize with other more mechanically weak biomaterials. In this study, we hybridized PLLA sponge with collagen sponge and used it as a scaffold for in vivo tissue engineering of bovine articular cartilage. The PLLA-collagen sponge maintained its original shape, as did the PLLA sponge, whereas the collagen sponge collapsed as we previously reported [5]. The mechanically strong PLLA sponge worked as a skeleton, preventing collapse of the embedded collagen sponge, and thus would provide easy surgical handling. Histological examination of the implants revealed that more chondrocytes maintained their original morphology and the cartilaginous matrices were more homogeneously distributed in the PLLA-collagen hybrid sponge than in the PLLA sponge. The PLLA sponge needed to be prewetted for cell seeding, while the PLLA-collagen hybrid sponge did not require such treatment. Hybridization of the PLLA sponge with the collagen sponge facilitated cell seeding, perhaps because of the increased hydrophilicity after hybridization. The increase of cartilaginous extracellular matrices and the decrease of vascularization with a longer implantation period in the PLLA-collagen hybrid sponge suggest the progression of cartilaginous tissue formation. The PLLA-collagen hybrid sponge retained the advantages of both PLLA and collagen, and facilitated the formation of cartilaginous tissue, suggesting that it would be a useful scaffold for cartilage tissue engineering.

References


Poster #47

IGF-I GENE TRANSFER BY ELECTROPORATION PROMOTES REGENERATION IN A MUSCLE INJURY MODEL

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Poster 5.30

• The FDA has not cleared the drug and/or medical device for the use described in this presentation (i.e., the drug or medical device is being discussed for an “off-label” use).
Purpose: The goal of this study was to determine whether IGF-I gene delivery by electroporation promotes repair after muscle injury.

Materials and methods: An injury-repair model was created using mice in which a hamstring muscle was cut and sutured. Fifty micro gram of IGF-I DNA or GFP DNA (both in pCAGGS) were injected into the lesion and introduced into muscle cells by electrostimulation using an electric pulse generator. Injured muscles from mice injected with IGF-I DNA group were compared to those from mice injected with GFP DNA group or those from uninjected mice (sham operated group). Experimental muscles were compared with respect to histologic analysis, IGF-I concentration at 1, 2 and 4 weeks after injection, and electromyographic examination at 4 weeks after injection.

Results: The mean number of regenerated muscle fibers in the IGF-I DNA injected group was significantly more than that in the GFP-DNA injected and control groups at 2 weeks after injection. The mean diameter of regenerated muscle fibers from the IGF-I DNA injected group was larger than that of the GFP-DNA injected group at 4 weeks after injection. There was no significant difference in the serum IGF-I concentration between the IGF-I DNA group and the GFP DNA group at 1, 2, and 4 weeks after injection. However, the ratio of injected/non-injected (contralateral) hamstring muscle IGF-I concentration was significantly greater in mice injected with IGF-I DNA than the ratio for those injected with GFP DNA at 1, 2 and 4 weeks. The ratio (injected/uninjected, contralateral) of the amplitude of compound muscle action potentials (CMAP) in the IGF-I DNA injected group was greater than that of the GFP DNA injected group after 4 weeks.

Conclusions: This study also demonstrated that IGF-I gene transfer by electroporation increased the number and diameter of regenerated myofibers. These results demonstrated that the effects of enhanced IGF-I production were local and limited to the injected area. IGF-I gene transfer by electroporation proved to be a simple, safe, inexpensive and effective method to promote the regeneration of injured muscles in our injury model.

Poster #48
ANGIOGENIC RESPONSE TO BIPOLAR RADIOFREQUENCY TREATMENT OF NORMAL RABBIT ACHILLES TENDON
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Frederick Harwood, La Jolla, CA, USA
Scott Ball, La Jolla, CA, USA
James P Tasto, San Diego, CA, USA, Presenter
San Diego Sports Medicine and Arthroscopy Fellowship, San Diego, CA, USA

Introduction: Normal tendons are characterized by a well-organized collagenous fibrillar network sparsely interspersed with fibroblastic cells and vascular structures. Alfredson and Lorentzon showed that tendons experiencing tendinosis contained no inflammatory cells but exhibited changes in the collagen fiber ultrastructure. Ahmed et al theorized that poor vascularity may be a factor and may prevent adequate tissue repair leading to further weakening of the tendon and potential rupture. Currently, operative treatment of tendinosis has been limited to debridement of the abnormal degenerative tissue to stimulate a healing response. CoblationR devices are bipolar radiofrequency (RF) probes which use accelerated particles to cause molecular disintegration to effect a controlled ablation of tissue. The purpose of the present study was to evaluate the effects of bipolar RF on the macroscopic and microscopic structural and cellular characteristics of the rabbit achilles tendon and to determine if bipolar RF treatment can stimulate an angiogenic response.

Materials and Methods: Following animal subjects committee approval, the achilles tendons of seventeen New Zealand White rabbits underwent bipolar radiofrequency coblation with a Topaz WandTM (Arthrocare, Sunnyvale, CA) model Perc D at a probe setting of 4 (175 V RMS). Under general anesthesia the left and right tendons were surgically exposed using a posterior midline incision from heel to mid-calf. Under cooling conditions (continuous infusion of sterile Ringer’s solution), leftside tendons received RF over a 2 cm length at intervals of 0.5 cm at durations of 500 milliseconds each touch. Rightside tendons received no RF and served as sham controls. Following the procedure, incisions were closed with a 3-0 vicryl suture for the paratenon layer and a 4-0 vicryl subcuticular suture for skin closure. Eight animals were sacrificed at 9 days, three at 28 days and six at 90 days. At sacrifice all tendons were examined grossly and histological evaluation (H&E) was performed using non-polarized and polarized light microscopy (n=3 at each time point). Analysis of the angiogenetic markers, alphav integrin subunit and vascular endothelial growth factor (VEGF) by semi-quantitative reverse transcription polymerase chain reaction (RT-PCR) was carried out to determine evidence of angiogenesis. RT-PCR analysis was performed at 9 days (n=5) and 90 days (n=3). Statistical analysis was performed using paired T-test and a priority level of significance was set at p<0.1

Results: At nine days tendons treated with bipolar radiofrequency showed severe inflammation with mild adherence to adjacent tissue and no effusion. Control tendons appeared macroscopically normal. Histological assessment of RF-treated tendons showed thickening of the sheath, inflammatory cells within the tendon and a slightly disorganized collagen fiber crimp pattern. Control tendons exhibited normal collagen fiber organization and structure along with normal appearing fibroblasts, i.e. no inflammatory cells present. RT-PCR analysis at this time point revealed an increase (p=0.1) in the alphav and VEGF mRNA levels relative to controls. At 28 days RF-treated tendons exhibited minimal inflammation, no edema or effusion and mild scarring with adherence to adjacent tissue. Histologically, RF-treated tendons contained fewer inflammatory-like cells than was observed at 9 days but had a sheath, which continued to exhibit hypercellularity relative to sham controls. Control tendons continued to show a normal appearance grossly and at the microscopic level. By 90 days post-treatment the macroscopic appearance of the treated tendons was normal with no inflammation, edema or effusion in evidence. Histologically, collagen fiber organization and cellularity appeared normal. Control tendons continued to show no changes. RT-PCR analysis at 90 days demonstrated no differences in alphav or VEGF expression in RF-treated tendons compared to sham controls.

Discussion: A common goal in treatment options to combat tendinosis is to limit tissue injury and stimulate a healing response of which angiogenesis is a vital part. Importantly, the present study has demonstrated histological evidence for new blood vessel formation and an increase in angiogenic markers in tendons treated with bipolar radiofrequency coblation. While the results revealed macroscopic and microscopic changes in the early term, bipolar RF-treated tendons assumed a normal appearance by 90 days. These results suggest that bipolar radiofrequency coblation may provide a viable option for the surgical treatment of tendinosis.

Poster #49

5.31
Introduction: Much effort has been made to clarify the effects of overloading on articular cartilage and bone. However, little is known about the effects of reduced loading, despite its possible contribution to the pathogenesis of certain clinical diseases, such as so-called chondromalacia patellae. In addition, although skeletal response to long-term space flight will become more crucial in the near future, such effects have not been elucidated, especially with regard to articular cartilage. The purpose of this study is to investigate the effect of long-term skeletal unloading on patellar cartilage and bone using the tail suspension model of growing rats.

Materials and Methods: Forty 9-week-old male F344/N rats were randomly divided into two groups: caged control (C) and tail suspended (TS). Hindlimbs of the TS rats were subjected to unloading for up to 12 weeks by the Morey-Holton method of tail suspension with some modification. The rats were sacrificed at 3, 6, 9, and 12 weeks. Sequential changes of the patella in the TS group compared with the C group were analysed macroscopically and by pathology using hematoxylin-eosin stain. Total cartilage area (TCA), calcified cartilage area to TCA (CCA/TCA), and bone volume/tissue volume (BV/TV) corresponding to the cancellous and cortical spaces in the medial and lateral facets, respectively, of the patella were analysed by personal computer using NIH image 1.62.

Results: Macroscopic findings revealed that in the TS group the surface of the distal patellar cartilage became purplish, particularly in the medial margin at 3 weeks, suggesting a decrease in cartilage thickness. The purple color became more intense at 6 weeks, and after 9 weeks a partial defect of patellar cartilage was found. Pathological findings demonstrated that in the TS group a significant decrease in thickness of the entire articular cartilage was found. On the other hand, the remaining articular surface did not show any fibrillation. A partial defect of patellar cartilage at the margin of the medial facet was found in 94% of the TS animals after 9 weeks or more of tail suspension. In the remaining articular surface, the remaining articular cartilage did not change. However, neither the effect of longer-term skeletal unloading on articular cartilage nor details of pathological changes due to unloading have been reported. This study, in which unloading was applied for 12 weeks by modification of a standard method, revealed that skeletal unloading accelerated the advancement of not only tidemark but also subchondral ossification front. Also revealed was a full-thickness cartilage defect of the patella in the medial facet without any surface fibrillation of the remaining articular cartilage. These results suggest that long-term skeletal unloading in children could cause so-called chondromalacia patellae described by Goodfellow.

Conclusion: This study suggested that skeletal unloading as well as overloading cause destruction of articular cartilage. Patellar bone atrophy, particularly in the medial part, was rapidly induced by skeletal unloading in the first 3 weeks and slowly progressed thereafter.

Poster #50
THE EFFECT OF EXTRACELLULAR MATRIX ON ACL CELL
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[Purpose]
The extracellular matrix (ECM) acts not merely as a scaffold for cells but also regulates their functions. The importance of the ECM is recognized especially in tissue engineering. We have explored the utilization of ECM to promote the regeneration of anterior cruciate ligament (ACL) by tissue engineering methods. In this study, the effect of type I and type III collagens, which are the main ECM of ACL, on proliferation of ACL cells is reported.

[Materials and Methods]
ACL cells were isolated by digestion with 0.025% collagenase from ACL obtained aseptically from Japanese white rabbits (6 weeks of age). The cells in this study were used after the first passage in culture. To examine morphological changes and cell proliferation induced by type I and type III collagens, cells were inoculated at a density of 1 x 10^4 cells/0.5ml/well onto type I, or type III collagen-coated dishes prepared by coating with each collagen solution (Nitta Gelatin, Japan). Cells were cultured in Dulbecco’s modified Eagle’s medium (DMEM) containing 10% FBS at 37°C in a humidified atmosphere of 95% air and 5% CO2. Controls were uncoated dishes. Morphological changes of the cells in each dish were observed by phase contrast microscopy and scanning electron microscopy (SEM). At 2, 4 and 6 days after starting incubation, cell proliferation was measured using WST-1.

[Results]
Cells cultured on collagen-coated dishes had a markedly different morphology compared to those in uncoated dishes. The cells on type I collagen extended more processes, whereas some cells on type III collagen elongated and had more slender shapes. Cell proliferation on type I collagen had a tendency to be decreased, but in contrast, culture on type III collagen significantly increased proliferation compared to controls or type I collagen.

[Discussion and Conclusion]
Type I and type III collagen affected cell morphology and proliferation. These results suggest that both collagens may be important factors for tissue engineering of ACL regeneration.
TENDON GRAFT INCORPORATION IN A BONY TUNNEL BY FRACTURE CALLUS FORMATION
Ido Zion, Jerusalem, ISRAEL, Presenter
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Introduction: The use of hamstring tendons instead of the gold standard bone-patellar tendon-bone as ACL autografts has become more frequent. The weak link in early hamstring graft healing and rehabilitation remains the graft fixation technique. The biological and biomechanical attributes of tendon-bone healing are not well defined and may be inferior to those of bone to bone healing. Supplementation of the fixation by manipulation of the healing process may be desirable. Our study was aimed at improving double staple tibial fixation of tendon grafts in ACL reconstruction by impaction of bone graft into the tibial tunnel.

Materials and Methods: The study utilized a dog model, in which the long digital extensor tendon was transplanted into an extra-articular tunnel in the proximal tibia and fixed with a periosteal suture and, in the experimental group with an additional staple impacted into the tunnel roof.

Histological and radiographic parameters were however equivalent. The tunnel was not obliterated by callus at any stage - Apparent tunnel obliteration on X-ray was shown to be an artifact on CT scan. There was no bony ingrowth into the graft, and the presence of healing callus did not change histological picture of tendon-bone healing by fibrous tissue interzone, as demonstrated in the literature.

Conclusions: We concluded on the basis of biomechanical data that tendon graft incorporation in the surrounding bony tunnel in ACL reconstruction may have been enhanced by fracture callus formation in the vicinity of the tunnel. This technique may lead to a more rapid and secure fixation of the graft at the tibial site. The method we propose may provide a simple and inexpensive method of supplementing early double staple tibial fixation strength when utilizing tendon grafts for ACL reconstruction.

Elbow/Wrist/Hand

ARTROSCOPIC TREATMENT FOR LATERAL EPICONDYLITIS: AN OUTCOME ASSESSMENT
Craig Michael Ball, Auckland, NEW ZEALAND, Presenter
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Introduction: Arthroscopic release of the ECRB tendon has recently generated considerable interest as an alternative treatment option for refractory lateral epicondylitis. The purpose of this study was to evaluate patient reported outcome and objective measures of elbow function following this procedure with a minimum follow-up of 12 months.

Methods: Fifteen elbows in 14 consecutive patients were treated with arthroscopic release of the ECRB tendon for recurrent lateral epicondylitis. All patients had undergone non-operative treatment for an average of 16 months prior to surgery. Standardized pre and post-operative examinations were performed which included goniometric measurements of range of motion and an assessment of strength. The ASES Elbow Assessment Form was completed in all patients both pre-operatively and at final review.

Results: All patients reported significant pain and functional limitations pre-operatively, with an average pain score of 7.5 and ASES score of 46.5. Five patients had a pending Workers Compensation Claim. At an average follow-up of 18 months all but 2 patients were satisfied with the procedure, with 86.7 % reporting minimal or no pain (average pain score 1.1). Significant pain relief had usually occurred by the first post-operative visit. Two elbows in 2 patients (13.4 %) did not improve and subsequently underwent further surgery. At final follow-up all patients had a full range of motion with no significant difference in measured strength between operated and non-operated sides. The average ASES score had improved to 85.7. There were no complications.

Discussion: Arthroscopic release of the ECRB tendon provides excellent pain relief and satisfactory return of elbow function and strength in patients who have failed an extensive period of non-operative treatment for lateral epicondylitis. Patient satisfaction is high and the average ASES Elbow Score can be significantly improved. Improvements in pain are seen early and complications are rare, making this an attractive alternative to more traditional open techniques.

DIFFERENT OUTCOME MEASURES
Poster #53

ELBOW ARTHROSCOPY: A COMPARISON BETWEEN DIFFERENT OUTCOME MEASURES
Luca Capuano, Parma, ITALY
Philippe P Hardy, Boulogne, FRANCE, Presenter
Samuel Poulain, Boulogne, FRANCE
Hopital Ambroise Pare, Boulogne, FRANCE

Introduction: The results of orthopaedic procedures as described by commonly used scoring systems are difficult to evaluate since they may not necessarily correlate with patients’ satisfaction.

Material and methods: This is a clinical outcome analysis on a group of patients treated with elbow arthroscopy. We reviewed 14 patients of 22 patients managed with elbow arthroscopy at our institution between march 1995 and march 2001 with a mean follow up of 24 months (range 1-64 months). Only 2 patients claimed for workers compensation. Two independent orthopaedic surgeon evaluated all patients using 3 elbow scoring systems (Mayo Clinic Elbow Scoring System, Hospital for Special Surgery, and American Sport Medicine Institute of Alabama scoring systems). A simple satisfaction question and a visual analogue scale (V.A.S.) for pain and satisfaction were also administered. Spearman’s non-parametric correlation coefficients were calculated for estimating correlation between the three scoring systems and the patient satisfaction. The Wilcoxon signed-rank test was used to compare the statistical association between the three scoring systems. The Friedman test was used to confirm the results at the Wilcoxon test.

Results: the three scoring systems showed significant correlation with each other (p<0.05) but failed to correlate to patients’ satisfaction as expressed by a simple satisfaction question.
which relate to the pre-operative status and to a global visual analogue scale which considers both pain and satisfaction (V.A.S.). Patients with the same level of satisfaction can perform differently at the scoring systems.

Discussion and conclusions: Clinical outcome measures should be more detailed and reliable in describing the efficacy of orthopaedic procedures. The aim of this preliminary study was not to criticise well-established elbow scoring systems but to evaluate the relationship between those and the patients’ subjective perception of satisfaction that seems to be one of the most important indicator of treatment success. This assumption is at present leading the investigators to utilise as an integration of traditionally accepted scoring systems, general health and disease-specific quality of life measurement tools that have showed to be very sensible at detecting minimal differences of the health status. Another comparison between the results at the scoring systems and V.A.S. and those obtained using health-related quality of life (MOS-SF36) and disease-specific measures (Disability of Arm and Shoulder and Hand) is at present under investigation.

Introduction:
Diagnostic and operative elbow arthroscopy has come a long way from its early beginnings and is now an accepted treatment modality for numerous conditions about the elbow although initially deemed unsuitable because of small joint capacity and dangerous proximity to neuro-vascular structures. Initially indications included diagnosis of pain of undetermined cause, removal of loose bodies, evaluation and for debridement of osteochondritis dissecans lesions of the capitellum and chondromalacia of the radial head, excision of olecranon osteophytes, synovectomy and synovial biopsy, lysis of adhesions. Recently indications have been expanded to include release of collateral ligaments caused by trauma or degenerative arthritis, tennis elbow release, olecranon bursectomy, radial head excision and selected fracture treatment. (1) O’ Driscoll and Morrey in 1992 reviewed 71 patients to critically analyse the diagnostic and therapeutic benefit of the procedure and reported a 10% of complication rate (2). Reddy and Jobe review of 172 patients and 187 elbows in 2000 is, to our knowledge the largest group of patients yet reported in the literature. In their study they report a very high success rate with only a 1.6% complication rate(3). Other smaller series report complication rates between 0 and 15% (3). The purpose of the study was initially just to review the patients operated with elbow arthroscopy to obtain surgical results data. The analysis of this group of patients using different outcome measures made us understand that the results of elbow arthroscopy as described by commonly used scoring systems may not necessarily correlate with patients’ satisfaction, therefore, we decided to evaluate the statistical correlation between 3 widely accepted elbow scoring systems and the patients’ subjective perception of satisfaction as expressed by a simple satisfaction test and by a global visual analogue scale which investigate both pain and satisfaction.

Material and methods:
We reviewed 14 of 22 patients managed with elbow arthroscopy at our institution between march 1995 and march 2001 with a mean follow up of 24 months (range 1-64 months). One patient had a diagnostic of osteochondritis dissecans, 1 patient of post-traumatic osteochondritis of humeral condyle, 4 patients of primitive osteochondromatosis, 1 patient of non specific synovitis, 1 patient of RA, 1 patient of post-traumatic pseudoarthrosis of the apex of the olecranon, 3 patient of post-traumatic arthrofibrosis and 2 patient of fracture of capitulum-humeri. Four patients had loose bodies as concurrent diagnosis. Only 2 patients claimed for workers compensation. Three patients were women and eleven were men. The mean age was 46 years (range 14 to 69 years). Four patients were left handed and 10 right handed, 5 patients were operated at their non-dominant side and 9 at their dominant side. There were 2 recreational and 1 competitive basketballers, 1 recreational tennis player, 1 competitive judoka and 1 competitive gymnast at national level. The mean time to return to practice sport was 2.6 months (range 1-6 months), only the competitive gymnast went back to the same preoperative level when practising sport. All the other patients either did not perform sports at all or did not practice sports involving the upper limbs. The mean time to return to work was 16.5 days (range 0-60 days). The 2 patients who claimed for worker compensation were the only two who necessitated respectively 30 and 60 days to go back to work. The mean duration of symptoms before surgery was 31.4 months (range 0-240 months), the mean duration of observation, treatment was 3.4 months (range 0-24 months). Only one patient had previous surgery for a supracondylar elbow fracture occurred two years before the date of arthroscopy. One patient had a diagnostic arthroscopy followed by an arthrotomy to excise fragments of a radial head fracture. All patients had an x-ray follow up, in 9 cases a TDM or arthro-TDM was performed. All procedures except 3 were performed by the senior Author. The arthroscopic procedure consisted in 1 case of the excision of an articular fragment from a Hahn Steinthal fracture of the humeral condyle, in another patient a similar fracture with a larger fragment was fixed with a canulated screw, in 7 cases of an anterior and posterior synovectomy, in 3 cases of an osteotomy of an impinging olecranon osteophyte, in 1 patient the excision of the pseudoarthrotic fragment of the apex of the olecranon was performed, in 8 cases multiple loose bodies were excised, in 1 case an anterior capsulotomy was carried out and in 2 patients an anterior and posterior arthrolysis was performed. All patients were reviewed from two independent orthopaedic surgeon who evaluated all charts and x-ray follow up, in the physical examination, the physiotherapeutic examination, the surgical procedure, the patient’s functional status was evaluated. A neurological examination was performed. All patients were evaluated with 3 commonly used elbow scoring systems: Mayo Clinic Elbow Scoring System (referred hereafter as Morrey’s scoring system), Hospital for Special Surgery of New York, referred hereafter as Figgie’s, and American Sport Medicine Institute of Alabama scoring system (referred hereafter as ASMA). To achieve a homogeneous statistical comparison the latter was normalized to 100 points. The structure of the different domains and relative weight of the objective and subjective component on the total score was different in the three utilised scoring systems (40% subjective component in Morrey’s system, 50% subjective component in both Figgie’s and ASMA’s Scoring systems). A simple satisfaction question (S.S.Q.) and a visual analogue scale (V.A.S.) for pain and satisfaction were also administered. The simple satisfaction question relates to the pre-operative status asking whether the patient feels worse, the same, better or much better as compared to his pre-operative condition (0-3 range). A Visual Analogue Scale of 100 mm was presented to all patients asking to quantify both the residual pain and satisfaction following the surgical procedure. As usual the 0 point was referred to no pain and/or complete function/satisfaction, while 100 was associated with the most excruciating pain and/or complete disability/dissatisfaction. For an easier visualisation of scatter plots the complement to 100 for the VAS was utilised. Spearman’s non-parametric correlation coefficients were calculated for estimating correlation between the three scoring systems and the patient satisfaction. The Wilcoxon signed-rank test was used to evaluate the statistical association between the three scoring systems. The Friedman test was used to confirm the results at the Wilcoxon test.
Results:
Even considering the total of 22 patients there were neither minor nor major complications in this study group. When asked if they would have repeated the arthroscopy if necessary 10 patients over 14 answered positively (71%). With reference to the simple satisfaction question, 7 patients affirmed to feel much better, 4 better, 2 the same, 1 worse than pre-operatively. Only 2 patients reported an excellent result at the Morrey's scoring system, 11 patients were classified as having a good result and 1 patient a poor result. The mean Morrey's scoring system was 89.6/100 points (median 92.5, mode 88). The same group reported 7 excellent, 2 goods and 4 fairs results when analysed with the Figgie's scoring system. The mean Figgie's score was 85.6/100 points (median 90, mode 71). Finally, 6 excellent, 2 goods, 5 fairs and 1 poor results were reported at the ASMIA scoring system. The mean ASMIA scoring system was 79.4/100 points (median 81.2, mode 97.5). The mean V.A.S for pain and satisfaction was 25mm (median 23 mm, mode 20 mm). Despite the initial impression when looking at the data distribution, the three scoring systems showed significant correlation with each other (p<0.05), but they failed to correlate to patients' satisfaction as expressed by the simple satisfaction question which relate to the pre-operative status and to a global visual analogue scale which considers both pain and satisfaction (V.A.S.) when analysed with Spearman's non-parametric correlation coefficients. Patients with very similar level of satisfaction can perform differently at the scoring systems and vice-versa (Morrey's, Figgie's and ASMIA/100 scoring systems reported respectively p=0.21, p=0.11 and p=0.17 when correlated with the VAS). No statistically significant association between the three scoring systems was found at the Wilcoxon signed-rank test and confirmed with the Friedman test (p>0.05). The lack of statistical significance of the last tests is probably due to the small size of the sample.

Discussion and conclusions:
This preliminary study with a sample of 14 patients examined on one single occasion providing no information on reproducibility of data, is certainly not exhaustive. Further studies with larger groups and a deeper statistical analyse are needed. In our patients we found no significant correlation between physicians administered rating systems and the patients perceptions of results, in agreement to the findings of other Authors (6,7). Differences of outcome seem to be needed when a complete assessment of results has to be achieved. Scoring systems have been widely used to assess results in all domains of orthopaedics since they are usually good at detecting differences in pain and function. Current elbow-scoring systems are based on the observer-derived assessment of a variety of clinical and functional criteria, which are scored separately and then aggregated. The aggregate score then is assigned a categorical ranking that ranges from excellent to poor. The developers of different elbow-scoring systems have chosen different outcome criteria, assigned different weights to each criterion, and accorde different ranges of values to each categorical ranking (5). These observations and the small size of the sample can probably account for the lack of statistically significant association found at the Wilcoxon and Friedman tests. The results at the scoring systems are usually expressed by arbitrary numbers that are often difficult to interpret in a quantitative way. The association of descriptive categories to score ranges does not improve things significantly. Health questionnaires have been subjected to severe psychometric validation. General health and disease-specific quality of life measurement tools have showed to be very sensitive and reliable and therefore, they have been employed increasingly in medical research. To increase their relevance, health questionnaires need to be used in a longitudinal manner, such a way that the patients act as their own controls (5). Unfortunately health questionnaires can be cumbersome, and it is known that for self-administered postal survey's the higher the patients burden the lower the response rate (8,9,10). When extensive questionnaires cannot be used for practical reasons other simpler tools such as a single question on satisfaction that refers to the pre-operative status and a Visual Analogue Scale for pain and satisfaction can provide useful information regarding the effect of the intervention. Previous studies have highlighted the importance of patients' perception of results when evaluating the outcome of an index procedure (5,6,7). These findings are confirmed in our preliminary study.

Commonly used rating systems should be more detailed and reliable in describing the efficacy of orthopaedic procedures. The aim of this preliminary study was not to criticise well-established elbow scoring systems but to evaluate the relationship between those and the patients' subjective perception of satisfaction that seems to be one of the most important indicator of treatment success. This assumption is at present leading several investigators to utilise as an integration of traditionally accepted scoring systems, general health and disease-specific quality of life measurement tools that have showed to be very sensible at detecting minimal differences of the health status. Another comparison between the results at the scoring systems and V.A.S. and those obtained using health-related quality of life (MOS-SF36) (11) and disease-specific measures (Disability of Arm and Shoulder and Hand) (12) is in present under investigation. Apparently we are still far away from our "target" of a single outcome evaluation system that is under all condition, reliable, valid and sensitive to changes of clinical importance, that takes into account both patients’ and physicians perspective and that is short and practical to use.

References:

**Poster #54**

**CORRELATION OF PREOPERATIVE MRI AND ARTHROSCOPICALLY PROVEN CHONDRAL LESIONS IN THE ELBOW**

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Purpose: MRI has proved useful in detecting lesions of the knee and shoulder joints. The purpose of this study was to evaluate its usefulness in detecting elbow articular surface injuries by comparing the findings of preoperative MRI with the findings on arthroscopy. Type of Study: Outcome study and retrospective analysis. Method: Preoperative MRI evaluations of articular chondral injuries of the elbow were compared with arthroscopic findings in 31 consecutive patients. Results: The accuracy of MRI in predicting lesions was 45% for the radial head, 65% for the capitellum, 20% for the olecranon, and 30% for the trochlea. MRI arthrography did not significantly increase the predictive accuracy. Conclusions: MRI is less useful for detecting isolated articular surface injuries in the elbow than in other joints, such as the knee. The accuracy of the MRI findings does not justify its substitution for arthroscopic evaluation.

**Poster #55**

**ADVANCES IN ELBOW ARTHROSCOPY – UTILIZING LEVERAGE FOR VISUALIZATION**

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Visualization and access are of fundamental importance in arthroscopy including arthroscopy of the elbow. A new technique in elbow arthroscopy utilizes the application of gentle leverage to pry apart the surfaces of the ulnohumeral joint to gain an improved arthroscopic visualization and access for instrumentation to work within these confined spaces. A thorough knowledge of anatomy combined with techniques of retraction and leverage are expanding our ability to operate safely in even narrow confines of the elbow.

**Poster #440**

**THE ROLE OF VALGUS STRESS RADIOGRAPHY IN THE EVALUATION OF PARTIAL TEARS OF THE ULNAR COLLATERAL LIGAMENT**

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OBJECTIVES: The purpose of this study is to examine the value of stress radiographs in conjunction with physical exam and magnetic resonance imaging (MRI) findings in the treatment of partial tears of the ulnar collateral ligament (UCL). In addition, we describe a consistent, reproducible, and reliable method for performing proper stress radiography.

METHODS: Over a 3-year period 174 patients were diagnosed with UCL injuries based on history and the presence of pain on valgus stress testing. Of this group, 25 athletes (14.4%) were diagnosed with partial tears of the UCL by MRI read by one radiologist. All patients had plain and stress anteroposterior radiographs taken of both the affected and unaffected sides. The valgus stress was applied by a single physician to all patients with the shoulder in 65° of abduction, maximal external rotation, forearm pronated, and the elbow flexed to 30°. The ulnohumeral distance in the plain radiograph was measured and subtracted from the measured distance in the stress view. The difference in opening between the affected and unaffected side was calculated. All patients underwent conservative therapy for the symptomatic elbow including avoidance of valgus stress, physical therapy, and range of motion braking.

RESULTS: The 25 patients were separated into two groups based on the calculated side-to-side difference in radiographic ulnohumeral distance. Thirteen patients were found to have a 0.5mm difference or less. In 12 (92.3%), symptoms resolved with conservative treatment and the patients returned to their baseline level of activity. One out of 13 (7.7%) failed conservative treatment and required reconstruction. Twelve patients had a 0.5mm difference or greater, 8 (75.0%) of which failed conservative therapy and underwent UCL reconstruction. Four (25.0%) of these patients had complete resolution of their symptoms after conservative treatment.

CONCLUSION: Stress radiography is a useful adjunct to physical exam and MRI when evaluating treatment options for partial UCL tears. Since the majority of these patients are high-level athletes whose careers are performance-dependent, it is important to offer them treatment that permits their return to play as soon as possible. Our results show that overhead athletes with partial tears of the UCL who have a 0.5mm or less side-to-side difference with valgus stress radiography will likely resolve with conservative therapy. Those patients exhibiting a more than 0.5mm difference in laxity will likely not benefit from non-operative management.

**Poster #454**

**ARTHROSCOPIC TREATMENT OF COMBINED TFCC LESIONS: A NEW CLINICAL ENTITY**

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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 a 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 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. To the best of our knowledge, lesions of the TFCC involving both central and peripheral tears have not previously been described. 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 post operatively had and excellent outcome with a Modified Mayo wrist score of 100. Since this first patient, review of our series of TFCC repairs has yielded five additional patients with Combined Lesions of the TFCC for a total of six patients. This report is an evaluation of these six patients with combined TFCC lesions. There were four males and two female patients. Their average age was thirty-three years old. There were four right wrist injuries and two left wrist injuries. The dominant wrist was injured 5/6 times. Mechanism of injuries included three 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.

Results: Follow up ranged from ten to 48 months and averaged 22 months. Average Mayo Modified wrist score was 90. This compared favorable with our previous series of peripheral TFCC repairs where the average score was 92.3.

Conclusions: 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.

Knee - ACL

Poster #56
CONTRIBUTION OF MECHANORECEPTORS IN THE ANTERIOR CRUCIATE LIGAMENT TO THE JOINT POSITION SENSE OF THE KNEE

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Purpose: The purpose of this study was to clarify the correlation between the number of mechanoreceptors in ACL remnants and proprioceptive ability of the patients.

Method: We studied 29 knees in 29 patients who underwent ACL reconstruction due to insufficiency of their ligament. There were 12 males and 17 females with an average age of 27 years (range: 14 to 47 years). Joint position sense test evaluated the ability of patients to reposition their knee to a previously placed angle according to Skinner's method. The test was performed 3 days before the ACL reconstruction. The total number of mechanoreceptors in ACL remnants that had been obtained intraoperatively was examined histologically, using the Gairns gold chloride method. Spearman's correlation coefficient was used for statistical analysis.

Results: The average final inaccuracy of the joint position sense was 1.3 (0-5.4) degrees. The average number of mechanoreceptors in an ACL remnant was 18 (8-30). There was a significant inverse correlation between the number of mechanoreceptors and the inaccuracy of the joint position sense of the knee (p=0.032, r=-0.41).

Conclusion: This study clearly demonstrated that a higher number of mechanoreceptors in the ACL remnants were correlated with lower final inaccuracy of joint position sense, suggesting that mechanoreceptors in ACL remnant contribute to the proprioceptive function of the knee. In ACL reconstructions, surgeons should consider preserving ACL remnants to preserve proprioceptive function, if possible. In any event, ACL reconstructions should aim to restore the proprioceptive function of the ligament as well as its mechanical function.

Significance: This is the first study that investigated the correlation between histological status of mechanoreceptors in ACL remnants and the proprioceptive function of the knee in a same patient.

Poster #57
COMPARISON OF TWO BIODEGRADABLE INTERFERENCE SCREWS FOR TENDON-TO-BONE FIXATION IN ACL RECONSTRUCTION. EXPERIMENTAL STUDY WITH ROENTGEN-STEREOMETRIC-ANALYSIS (RSA).

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Introduction
Biodegradable interference screws are frequently applied devices for Hamstring graft fixation in ACL reconstruction. Some doubt exists about the primary stability that can be achieved. This experimental RSA study was performed to measure micromotion between tendon graft and bone under increasing load with different screw designs. In addition maximum load at failure and linear stiffness were evaluated and the failure mode was recorded.

Materials and Method
We used 20 porcine specimen for the study. The extensor hallucis longus tendon of the front leg was folded to a four-stranded graft and sutured with a baseball stitch. Graft diameter was 9mm in all samples. The graft was anchored within a tibial tunnel of the same diameter and 40mm length either with a standard 7x25mm Polylactid screw (BioScrew, Linvatec) or a special
designed biodegradable screw for soft tendon graft fixation with maximum diameter of 8mm and 23mm length (Sysorb, Sulzer). The tibial bone, the tendon-graft and the interference screw were marked with tantalum beads. After fixation preloading with 100N was performed over 2 minutes. The grafts were then loaded axially under RSA control increasing the force in steps of 50N. Micromotion between tendon graft, screw and tibial bone was measured with RSA.

Results
Accuracy of RSA for the in vitro study was evaluated 0.03mm. Placement of the slightly thicker Sysorb screw with a blunt thread was technically difficult compared to the sharper BioScrew. Load at failure was significantly higher for the Sysorb screw (730±145) compared to the BioScrew (445±37N). Linear stiffness of the Sysorb screw fixation was about 3 times higher compared to the standard screw (1687±728N/mm versus 517±218N/mm, p<0.01). Graft slippage of more than 0.5mm was observed at lower loads for the BioScrew (250N versus 461N, p<0.05). Slippage of the graft at 200N was 0.09±0.04mm for the Sysorb screw compared to 0.38±0.15mm for the BioScrew in average (p<0.05).

Conclusions
Compared to the standard interference screw we found a higher ultimate failure load, less graft slippage and increased stiffness for the specially designed Sysorb screw. Placement of the relatively thick blunt threaded Sysorb screw may be difficult in real ACL reconstruction. Graft slippage was observed for the BioScrew fixation at loads that may occur during rehabilitation.

Poster #58
CENTRAL THIRD BONE-PATELLAR TENDON-BONE ARTHROSCOPIC ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION: A 5-YEAR FOLLOW-UP
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PURPOSE: In this retrospective study, we report on the five-year follow-up results of 56 patients, who had arthroscopic reconstruction of the anterior cruciate ligament (ACL) using a central third bone-patellar tendon-bone free autologous graft, to assess the intermediate-term effectiveness of this technique.

MATERIALS and METHOD: 56 patients underwent arthroscopic ACL reconstruction using bone-patellar tendon-bone autograft by the same surgeon. The mean follow-up was 62.4 months (range, 31-99 months). There were 44 males and 12 females with a mean age of 30.17 years (range, 17-44 years). Sport injury was the primary cause of the ACL deficiency by almost all of the patients (52, 92,86). We used cannulated interference screws (kurosaga) for bone-patellar tendon-bone graft fixation. The day after the operation, an intensified rehabilitation program is begun to perform under the supervision of a physical therapist. We assessed the flexor-extensor balance of the knees with a Cybex 6000 model isokinetic apparatus. The average interval between operation and assessment was 5 months. We allowed the patients to return to sports, when the difference between the injured and uninjured sides was less than 15% on the assessment. Isokinetic rehabilitation program was applied to the patients, who demonstrated a difference more than 15%. The patients were evaluated according to International Knee Documentation Committee’s (IKDC) grading system preoperatively and postoperatively.

RESULTS: Fourteen patients (%)25 scored poorly (severe abnormal, IKDC grade D), and forty-two patients (%)75 scored abnormal (grade C) preoperatively. Fifty-four patients had improved on their prereconstruction IKDC scores. Postoperatively 41 patients (%)73,21 were rated as normal (grade A), 12 patients (%)21,43 nearly normal (grade B) and 2 patients (%)3,57 were rated as abnormal (grade C) on the assessment of IKDC. Only one case (%)1,79 scored poorly (grade D), who demonstrated graft lysis one year postoperatively. Fifty-four patients (%)96,43 obtained full range of motion. One (%)1,79 patellar fissure, and one (%)1,79 deep venous thrombosis were noted. Three patients sustained anterior knee pain during one year postoperatively.

CONCLUSION: These results suggest that arthroscopic reconstruction using a central third bone-patellar tendon-bone free autologous graft compares favorably with other alternatives and provides still gold-standart in the intermediate-term treatment of ACL rupture. The long-term follow-up results will be seen in time.

Poster #59
A LARGE INTRA-ARTICULAR GANGLION BLOCKING FLEXION OF THE KNEE
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Introduction: Few cases have been reported concerning ganglion cysts arising from the anterior cruciate ligament (ACL). However, these ganglion cysts may produce knee discomfort without a clear etiology. They should be suspected in patients having pain and clicking sensation during terminal knee extension or painful limitation of the range of motion.

Case report: A 53-year old male gradually developed uncomfortable restriction to full extension of the right knee for a duration of 9 months. On examination he had 10 degrees loss of extension and 40-45 degrees flexion. The results of the tests for Lachman’s sign, anterior drawer, pivot shift, posterior drawer were negative. The pain in the anterior aspect of the knee was aggravated during forced flexion of the joint.

Imaging results: Radiographs were negative. Magnetic resonance (MR) imaging of the right knee was performed. It showed a ‘cystic’ mass 2 x 1.5 x 1.5 cm in size in the femoral insertion of the ACL.

Treatment: Based on the above findings, the patient was brought to arthroscopy for further evaluation and proper treatment. The meniscal and articular surfaces were found to be intact. This intra-articular ganglion was the result of mucinous degeneration of the ligament. This mass was spread in the medial intra-articular space and posterior horn of the medial meniscus. The evacuation of the mass by arthroscopically guided needle aspiration was impossible. We performed an extended debridement of the ligamentum mucosum using a shaver in order to remove all the mass avoiding the fear of recurrent formation of the cyst. Then, we tested the laxity of the remaining ACL fibers with a probe. As the mechanical role of the ACL was insignificant, we decided to remove them all. Subsequent histologic examination confirmed a ganglion cyst. At 3 months follow-up patient was symptom free, with no complaints of instability and knee pain.
Discussion: A ganglion cyst of the anterior cruciate ligament is a rare disorder. In our case, it has been related to the femoral insertion of the anterior cruciate ligament. When this lesion is discovered early it can be treated successfully with an arthroscopic debridement. Late discovery makes the total resection of the ganglion impossible and may result in the weakening of the ACL due to extensive debridement.

Poster #60
ACL RECONSTRUCTION USING THE QUADRICEPS TENDON AUTOGRRAFT WITH AND WITHOUT PATELLAR BONE PLUG: COMPARISON OF RESULTS
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We present the results from the use of a quadriceps autograft for the reconstruction of an ACL deficient knee. Between March 1999 and December 2000 we treated 13 patients with chronic ACL deficiency using a quadriceps tendon autograft, harvested from the middle third of the tendon without patellar bone block and 14 patients using quadriceps tendon autograft harvested with a patellar bone block. The tendinous side of the graft was stabilized using the Mark II and Patella Soffix fixation systems (Surgicraft, UK). In the tibia the graft was passed through a tunnel and in the femur it was passed over the top. The graft side with the bone block was stabilized in the tibia using interference screw fixation. Postoperatively an accelerated rehabilitation program was followed. The results were evaluated at a mean follow-up of 25 months. The results have been evaluated using the IKDC, the Lysholm and the Tegner scales. Most patients returned to their preinjury level of sports activity. According to the International Knee Documentation Committee rating system, 24 of the 27 patients had normal or nearly normal ratings. Knee laxity was evaluated using the arthrometer Rolilmeter. There were no significant complications related to the use of the autograft. There was no significant differences between the two groups regarding stability and function. A quadriceps tendon-patellar autograft is a reasonable alternative to ACL reconstruction in primary and probably revision ACL reconstruction.

Poster #61
ACL RECONSTRUCTION USING QUADRUPLED HAMSTRING TENDON GRAFT: COMPARISON OF TWO TYPES OF SOFT TISSUE FIXATION
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We present the results from the use of a quadrupled hamstring tendon graft in the over the top position using a novel soft tissue fixation system. Between March 1999 and December 2000 we treated 87 patients with chronic ACL deficiency using a quadrupled hamstring tendon graft using the Mark II fixation system (Surgicraft, UK). The graft was passed in the tibia through a tunnel and in the femur it was passed over the top. This group of patients was compared to a group of 59 patients where the Endobutton fixation system (Smith & Nephew) was used. The two groups were compared using subjective and objective evaluation, and isokinetic and functional strength tests. Assessment using the IKDC knee scoring as well as the Tegner and the Lysholm scores revealed no significant differences between the two groups. Isokinetic evaluation revealed also similar results. Both techniques proved to be safe, effective and reproducible restoring knee function.

Poster #62
EVALUATION OF THE ENDOPEARL OF FEMORAL FIXATION IN HAMSTRING ACL RECONSTRUCTION: A BLIND PROSPECTIVE RANDOMIZED CLINICAL TRIAL
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Purpose: An adjunct to bio-interference screw fixation in the femoral tunnel in ACL reconstruction using autogenous semitendinosus and gracilis tendons is available called the EndoPearl (Linvatec, Largo, FL). The EndoPearl, biodegradable poly-(L-lactide) in composition, is sutured to the leading end of the graft and placed proximally in the femoral tunnel. The EndoPearl and bioabsorbable interference screw interact to form an interlocking system which may provide greater femoral fixation strength in vivo. The purpose of the study was to assess the clinical relevance of the EndoPearl using the KT-1000 Knee Arthrometer and the Mohtadi ACL Quality of Life (ACL-QOL) Questionnaire.

Study Design: Prospective Randomized Clinical Trial.

Methods: ACL reconstruction with autogenous semitendinosus and gracilis tendons was performed on 37 patients. Pre-operatively, three months, six months and one year post-operatively, patients were evaluated using the KT-1000 Knee Arthrometer and the ACL-QOL questionnaire.

Results: In comparing side-to-side differences in KT-1000 outcomes pre-operatively, the study group (EndoPearl) showed no difference statistically from the control group. Three months post-operatively, the difference between the study group (1.93 ± 1.28 mm) and the control group (3.07 ± 2.15 mm) approaches significance (p=0.09). Six months post-operatively, the difference between the study group (1.58 ± 1.12 mm) and the control group (2.64 ± 1.40 mm) is statistically significant (p=0.024). Statistically significant differences could not be detected when comparing the ACL-QOL questionnaire between the two groups. Post-operative 1 year follow-up results are pending.

Conclusion: The application of the EndoPearl in conjunction with a bioabsorbable interference screw in the femoral tunnel in autogenous ACL reconstruction using semitendinosus and gracilis tendon grafts provides a significantly decreased laxity six months post-operatively in terms of KT-1000 side-to-side differences. Clinical Relevance: In an accelerated post-operative rehabilitation program, patients and doctors have increased confidence in terms of graft stability with the application of the EndoPearl.

Poster #63
ANTERIOR KNEE PAIN AFTER ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

5.39
Poster 5.40

Poster

Over thirty and weak preoperative knee extension strength are after ACL reconstruction with hamstring tendon. Female, aged less than 30 and 20% in aged 30 and over. As regard to anterior knee pain was 14.4% in female, 7.4% in male and 9.3% in patients with less than 60% of contralateral limb and 10.4% in patients with 60% and over.

CONCLUSION: The incidence of anterior knee pain was 10.7% in patients with 60% and over.

METHODS: Four hundred forty-one patients who underwent ACL reconstruction with hamstring tendon were evaluated to determine the incidence of anterior knee pain and the associated affecting factors (gender, age, preoperative knee extension strength). We defined anterior knee pain as a pain occurred in patello-femoral joint or patellar tendon and lasting more than one month.

RESULTS: Forty-seven patients (10.7%) indicated anterior knee pain after operation. The major cause of pain is patellar tendinitis. These pains occurred averaged 2.4 months after operation and lasting averaged 10.6 months. The incidence of anterior knee pain was 14.4% in female, 7.4% in male, 9.3% in aged less than 30 and 20% in aged 30 and over. As regard to preoperative knee extension strength, the incidence was 18.6% in patients with less than 60% of contralateral limb and 10.4% in patients with 60% and over.

CONCLUSION: The incidence of anterior knee pain was 10.7% after ACL reconstruction with hamstring tendon. Female, aged over thirty and weak preoperative knee extension strength are risk factors of anterior knee pain after ACL reconstruction.

Poster #64

PARTIAL ANTERIOR CRUCIATE LIGAMENT TEARS

Denis Atkinson, Havelock North, NEW ZEALAND, Presenter

Royston Centre, Hastings, NEW ZEALAND

25 partial ACL tears are reviewed. In 21 cases the diagnosis was confirmed by EUA and arthroscopy. Despite a vigorous rehabilitation protocol the prognosis in the active athlete was poor. 8 cases could not return to sport and were troubled by everyday instability. All went on to ACL reconstruction. 17 cases returned to sport but suffered a further major giving way event on average 12 months after diagnosis. 14 of these cases went on to ACL reconstruction. Partial ACL tears in the active athlete have a prognosis similar to complete ACL tears. The extent and type of tear did not influence outcome. Diagnosis and management of the condition is discussed.

Poster #66

REVISION OF FAILED ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

Georgios Anastassios Bafalis, N. Iraklio Attikis, GREECE, Presenter

Grigorios Papadopoulos, Athens, GREECE

Kostas Karlaftis, Athens, GREECE

Emmanuel Antonogiannakis, Athens-Ciolaros, GREECE

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Orthopaedic Department 401 Athens General Military, Athens, GREECE

PURPOSE: Purpose of this retrospective study is the outcome (mid-term) of revision anterior cruciate ligament reconstruction due to recurrence of instability in young soldiers.

PATIENTS AND METHOD: 35 young patients (military personnel, all male), mean age 24.6y (19-31y) underwent a revision arthroscopy- assisted ligamentplasty of the anterior cruciate ligament through Jan 97 to Nov 99. Full range of knee joint motion was standard before revision surgery. A patellar tendon graft was used in 15 of them at the primary ligamentplasty, in 3 hamstrings, in 3 iliotibial band and in 14 others synthetic. 2 patients from the last subgroup were undergoing a 2nd revision. In all, 32 patients were revised because they suffered the consequences of instability, 6 others because of synovitis due to synthetic graft, while 3 patients suffered both. The revision procedure was performed arthroscopically using an autologous tendon graft in 22 cases (4 hamstrings, 8 patellar tendon, 4 quadriceps tendon) and patellar tendon allograft in 9 cases. Mean follow up was 3 years, while the outcome was accessed using the IKDC score at 2 years after the revision reconstruction.

RESULTS: In 7 patients we recognized a misdiagnosed anterolateral ligament insufficiency, in 25 technical error, in 8 narrow notch. 8 patients were not collaborated to rehabilitation protocol while 5 others sustained a true re-injury. According to the last follow-up IKDC score, we had: A 7 patients (20%), B 19 (54.3%), C 5 (14.3%) and D 4 (11.4%) patients. 20 out of 35 patients regained their sport activity. 10 in the pre-injury level, 9 patients were satisfied while refused to enable in sports with pivoting activity. We had 2 patients with superficially wound donor site infection without compromising the graft and one case with deep-vein thrombosis. Factors of poor prognosis were associated with medial meniscectomy (p=0.03), damaged articular cartilage (p=0.02) and a longstanding misdiagnosis of the initially ruptured ACL (p=0.02).

CONCLUSIONS: Despite the usage of arthroscopic technique, the success rate of revision anterior cruciate ligament reconstruction, is lower than the primary surgery. The deleterious effect of previous meniscectomy, articular cartilage lesions and delayed primary reconstruction lowers even more the success rate of the revision procedure.

Poster #65

HOUR-GLASS (BARGASH) TECHNIQUE IN ARTHROSCOPIC ACL RECONSTRUCTION

Nael Abdou Bargash, Jeddah, SAUDIA ARABIA, Presenter

Khalid Baterijee, Jeddah, SAUDIA ARABIA

Saudi German Hospital, Jeddah, SAUDIA ARABIA

A new technique for ACL reconstruction was implemented in Saudi German hospital – Jeddah-Kingdom of Saudia Arabia 36 month ago.

Fifty three patients with clinically and radiologically proven ACL tears were operated by arthroscopic ACL reconstruction using an autogenous bone-patellar tendon-bone graft. All patients were active male athletes with mean age of 27 years. The new technique, which was implemented in all patients, was fixation of the femoral component of the graft using an hour-glass technique without interference screw. All patients were evaluated postoperatively for a mean period of 24 month both clinically and radiologically. The results of this new technique was superior to that obtained with the classical technique of using interference screw presented in the literature everywhere after eliminating the well-known and sometimes disastrous complications of interference screws.

Poster #67

ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION IN PROFESSIONAL BALLET DANCERS. A RETROSPECTIVE CASE SERIES.
Background: Ballet dancers perform at highest level, exposing their knee joints to tremendous loads. Anterior cruciate ligament (ACL) injury in professional ballet dancers represent a potential career-ending injury. Very little knowledge is available in the literature concerning injury and management of the ACL in this specific population.

Purpose: To describe the mechanisms, surgical/rehabilitation management and the functional outcome in 5 professional ballet dancers.

Methods: From 1990 to 1999, 5 professional ballet dancers sustained an acute ACL injury (two of them during a particular jump), that required surgical intervention. The surgical procedure was performed by the same surgeon (TD). The used autograft was the Bone Patellar tendon Bone of the ipsilateral knee. One patient had an open-, the other four had an arthroscopic-assisted reconstruction. After an intensive rehabilitation, all the 5 dancers returned to perform at pre-injury level. Follow up evaluation included: the complete IKDC 2000 (with clinical examination, questionnaires, X-rays), instrumented laxity, isokinetic strength and balance measurements. The activity level was also carefully documented.

Results: The results of this ongoing study will be first presented at the ISAKOS Knee Committee Workshop in Florence (November 28th-December 1st, 2002).

Poster #68
ANTERIOR CRUCIATE RECONSTRUCTION COMBINED WITH VALGUS TIBIAL OSTEOTOMY – LONG TERM RESULT
Philippe Negret, Caluire, FRANCE
N. Bonin, Lyon, FRANCE, Presenter
T. Ait Si Selmi, Lyon, FRANCE
Henri Dejour, Lyon, FRANCE
Hopital de la Croix Rousse, Caluire, FRANCE

The Hypothesis – What is the question?
Untreated ACL deficient knee in active individual will predispose them to instabilities, meniscal tears, and radiographic changes. ACL reconstruction itself may increase the onset of osteoarthritis. The goal is to precise subjective, objective, functional, and radiological results of patients that underwent anterior cruciate ligament (ACL) reconstruction combined with a valgus tibial osteotomy.

Method – How was the question investigated?
From 1983 to 1999, we treated 66 knees by this combined procedure. We only studied the 47 ACL deficient knees that presented abnormal radiological findings in the medial tibiofemoral joint (remodelling changes (Grade B: 35%), prearthritic changes (Grade C: 65%)). We excluded 3 knees with evolved osteoarthritis (Grade D), 11 knees with asymmetrical opening of the lateral compartment and 5 knees with excessive constitutional genu varum without medial radiological compartmental changes. 35 (74.5%) of the 47 knees were retrospectively reviewed at 11 years mean follow-up (range, 1-16 years). A free bone-patellar tendon-bone graft was harvested to reconstruct the ACL. Often a Lemaire type extra articular procedure was performed (24 knees). The tibial osteotomy was a lateral closing wedge in 23 cases and a medial opening wedge in 10 cases. IKDC score was used. Radiologically we checked axis, anterior tibial translation in monopodal stance and radiological findings in 34 of the 35 knees. Long leg films were available in 30 patients. The mean age at operation was 32 years (18-49). Delay between injury and surgery averaged 8 years (range, 1-33 years). Sixty-six percent of the patients (N=23) had previously lost the medial meniscus at time of surgery.

Results – What were the results?
Data
At review, 93% of the patients were very satisfied or satisfied with their operated knee. Subjective score including knee function, symptoms and activity level average 78/100 (range, 46-96). 48% of the patients could regularly practice leisure sports like tennis or skiing.

Statistical analysis
The overall IKDC objective score was normal (A) for 5 knees (14%) and nearly normal (B) for 16 knees (46%). It was abnormal (C) for 12 knees (34%) and severely abnormal (D) for 2 knees (6%). The IKDC score was correlated with monopodal weight bearing translation pre and post operatively.

In medial compartment, radiological progression of osteoarthritis was seen in 5 knees (15%). 3 of 14 knees have evolved from grade B to C and 2 of 20 knees from grade C to D. Axial femoro-tibial correction was 6.8 degrees at follow up in group B and 4.7 degrees in group C. In lateral compartment, remodelling changes occurred in 18 knees (53%) and pre osteoarthritic changes in 2 knees (6%) without correlation with axial correction.

Conclusions
Performing a valgus tibial osteotomy combined with an ACL reconstruction stabilizes the knee and stop the early progression of osteoarthritis. It has to be considered in chronic ACL deficient knees when radiological pre-arthritis is noticed particularly in case of previous medial meniscectomy or acquired malalignment.

Poster #69
ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION – A NEW PRESS-FIT TECHNIQUE
Matheos Tsiroukis, Athens, GREECE
Aristidis Bordokas, Athens, GREECE, Presenter
Andreas Panagiotis Diamantopoulos, Athens, GREECE
Anastasios Smyrnis, Athens, GREECE
Iraklis Ioannis Patsopoulos, Athens, GREECE
2nd Orthopaedic Department, Evangelismos General H, Athens, GREECE

Purpose: The aim of this study is to present a new press-fit technique for ACL reconstruction and our clinical results of patients operated with this technique.

Methods: From 1995 until now we apply our arthroscopically assisted press-fit technique for ACL reconstruction using autologous bone-patellar-tendon-bone graft (BPTB). Stable bone fixation on the femoral tunnel without using any hardware (press-fit fixation), is considered as the main feature of this technique. Appropriate instruments have been developed therefore. The technique involves the harvesting of the middle-third patellar-tendon with two bone blocks. The bone block from the tibial tubercle is cut and removed in a trapezoid shape with the short edge on the tendon side. Femoral and tibial tunnel are then drilled. The femoral tunnel is prepared in conical shape, using the appropriate instruments. The graft is pulled from laterally first into the femur tunnel until a sudden jolt indicates that the trapezoid femoral bone block is stabilized in the conical shaped tunnel, while for tibial graft fixation sutures over a distal bone bridge, is used. 127 patients underwent ACL reconstruction with this technique (acute:47, subacute:15,
chronical 65). The average age was 26.2 years (range, 17 to 45). All patients were operated by the same team of doctors. Postoperatively an aggressive rehabilitation program was followed. The patients have been evaluated with the IKDC, Tegner and Lysholm scoring systems.

Results: 113 patients (88.9%) were reexamined. The average follow up period was 42.4 months. Average Lysholm-score was 94.2%, IKDC score was A in 43%, B in 46.5%, C in 8% and D in 2.5%. Average Tegner-score was before injury 6.6 and in reexamination 6.

Conclusions: This study indicates that this press-fit technique offers stable graft fixation with very good clinical results, without any of disadvantages associated with “hard-ware”. It not only reduces significantly the overall cost, but it facilitates revision surgery and postoperative MRI.

**Poster #70**

**REHABILITATION AFTER DAY SURGERY ACL RECONSTRUCTION: A PROSPECTIVE, RANDOMIZED STUDY**

Gian Luigi Canata, Torino, ITALY, Presenter
Alasdair Sutherland, Mentone, AUSTRALIA
Ozgur Ahmet Atay, Ankara, TURKEY
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Day surgery reduces costs and lowers the risk of hospital acquired infection. This prospective study evaluates the effect of day surgery on post-operative rehabilitation time.

Material and Methods:
Between July 1996 and December 1997, 122 patients with symptomatic ACL deficient knees were randomly allocated to Day Surgery reconstruction (Group A: 62 patients, mean age 28 years) or In Patient reconstruction (Group B: 60 patients, mean age 30 years). Cases were carried out under regional anaesthesia. The reconstructions, with patellar tendon-bone autografts, were carried out by a single surgeon using a single technique, and the same rehabilitation protocol was used in all cases. Results were evaluated with the IKDC form, and time to walking without support, time to recover complete RoM and the time from surgery to resuming running and sports activities were also evaluated. Statistical analysis was performed with the Student’s t test.

Results:
There were no statistical differences in IKDC scores, time to walking without crutches, time to full RoM, time to running or time to return to sports. 97% in group A declared that they were satisfied with the day surgery.

Conclusions:
Day surgery ACL reconstruction is well tolerated and allows the same rapid rehabilitation of sportmen as In Patient surgery.

**Poster #71**

**PREVENTION OF VENOUS THROMBOEMBOLISM AFTER ACL RECONSTRUCTION: A PROSPECTIVE, RANDOMIZED STUDY**

Gian Luigi Canata, Torino, ITALY, Presenter
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There are few data on the incidence of venous thromboembolism after knee arthroscopic surgery. This prospective study was aimed to evaluate the risk of venous thromboembolism and the clinical results after ACL arthroscopic reconstruction with or without prophylaxis with low-molecular weight heparin (LMWH).

Methods:
Between January and December 1999, 36 patients with symptomatic ACL deficient knees were randomly allocated to receive either no treatment or enoxaparin sodium once daily subcutaneously for 6 days. Group A, 18 patients, 13 males, 5 females mean age 32.5 (16-59) no treatment. Group B 18 patients, 12 males 6 females mean age 29.6 (22-59) receiving LMWH. Both groups were comparable regarding demographics and baseline characteristics. The reconstructions with patellar tendon-bone autografts, were carried out by a single surgeon using a single technique, and the same rehabilitation protocol was used in all cases. Immediate free RoM and full weight bearing were allowed after surgery. Results were evaluated with the 2000 IKDC form and full weight bearing were allowed after surgery. Results were evaluated with the 2000 IKDC form and full weight bearing were allowed after surgery. Results were evaluated with the 2000 IKDC form and full weight bearing were allowed after surgery. Results were evaluated with the 2000 IKDC form and major or minor bleedings, were also evaluated. Compression color-coded sonography in case of clinical suspect of venous thrombosis. Statistical analysis was performed with the Student’s t test.

Results:
No differences could be demonstrated between the two groups. No case of venous thrombosis was detected in either group. Group A 3 minor bleedings Group B 2 minor bleedings (p > 0.005)

IKDC subjective evaluation: mean score group A 80.7 (45.9-95.4) group B 75.5 (45.9-88.5) (p>0.05)

IKDC knee examination form: Group A 16 A 1 B 1 C Group B 11 A 5 B 2 C (p>0.05)

Conclusions:
Thromboprophylaxis with LMWH is not necessary in patients immediately mobilized after arthroscopic ACL reconstruction.

**Poster #72**

**WOULD ACL DEFICIENT PATIENT HAVE MORE PROBLEMS IN SINGLE LEG HOP INCORPORATED WITH AN ELEMENT OF ROTATION?**

Eric Ping Chien, Hong Kong, HONG KONG, Presenter
Candace YH Wong, Hong Kong, HONG KONG
Dept Ortho Surgery, Hong Kong, HONG KONG

ACL deficient (ACLD) patients always complain that they have difficulty in sports with cutting and turning action. They noticed fewer problems in running in straight line. While single leg hop is a common functional test of ACL deficiency performed in straight line, it did not incorporate element of cutting and turning. In this study, we studied the kinematic pattern of knee during single leg hop with and without knee rotation. The subjects were requested to hop with single leg in straight line, single leg hop with pre-internal rotated leg, single leg hop with pre-external rotated leg, single leg hop and land with internal rotated leg and single leg hop and land with external rotated leg. Penny and Giles Electrogoniometer, Biomed Ltd (P&G Electrogoniometer) was used to document the kinematic pattern of knee rotation during these single leg hop tests. The validity of P&G Electrogoniometer in assessing knee rotation was tested by a specially designed jig with a traditional goniometer attached. Significant correlation was found between them at level of 0.001. Kinematics of 15 ACLD knees and 15 normal knees during functional tests were recruited. Rotation patterns of knees during functional tests were ranked into 3 groups according to the smoothness of the change of
INTRODUCTION: A classification algorithm for acute anterior cruciate ligament (ACL) rupture soon after injury (Fitzgerald et al. 2000) was used to prospectively categorize the entire population of highly active individuals diagnosed with acute, ACL rupture in the practice of a single orthopedic surgeon during the five-year period from May 1996-April 2001.

METHODS Concomitant injury, unresolved impairments and a screening examination including clinical measures (number of episodes of giving way, hop tests) and patient self-report were used to classify individual as non-copers or potential copers.

RESULTS: 395 highly active patients presented with complete, acute ACL rupture during the 5-year period. 76 subjects had repairable meniscal tears or full-thickness articular cartilage damage on MRI. 81 had concomitant ligamentous injury, bilateral injury or concomitant fracture and 20 patients had unresolved impairments (quadriceps weakness n=5, knee flexion contracture n=2, effusion n=6, pain n=6, other n=1). This group had the same age and sex distribution as the entire sample. 43/395 did not participate in the classification algorithm because of immediate surgery, distance, missed appointments or declining to participate in the research study. This group also had the same age and sex distribution as the entire sample. The remaining 185 patients participated in the screening examination an average of 1.5 months after injury. The population included 117 men and 68 women. 131/185 (71%) were injured in a non-contact manner. 60 (51%) men and 39 (57%) women moved anteriorly (undisturbed: 1.4 mm; disturbed: 5.43 mm, lateral = -3.0 mm), while the tibial position of uninjured subjects moved anteriorly (undisturbed: 1.7 mm; disturbed: 2.1 mm, lateral = 1.9 mm). Non-copers' tibial position differed significantly from uninjured subjects in every condition (undisturbed: p < 0.05; disturbed: p < 0.01). EMG analysis provides evidence for a muscular component to the differing stabilization strategies between the non-copers and uninjured subjects.

CONCLUSION: Non-copers appear to over-constrain the knee, keeping the tibia in a posterior position, compared to uninjured subjects. This stiffening strategy reflects an unsophisticated adaptation to the ACL rupture for which appropriate muscle activation strategies to stabilize the knee have not yet developed. This compensation strategy, which may reduce anterior tibial translation at the knee, may also lead to less shock absorption and excessive joint compression that exacerbate joint destruction.

Poster #73
FIVE-YEAR PROSPECTIVE CLASSIFICATION OF PATIENTS WITH ACUTE ACL RUPTURE
Terese L. Chmielewski, Newark, DE, USA, Presenter
Lynn Snyder-Mackler, Newark, DE, USA
Michael Axe, Newark, DE, USA
University of Delaware, Newark, DE, USA

Introduction: Anterior cruciate ligament (ACL) injury is prevalent and often leads to instability, quadriceps muscle weakness and osteoarthritis (OA). Most individual with chronic ACL deficiency have evidence of knee OA years after ACL rupture. Weakness and instability experienced by ACL deficient persons who do not compensate well for the injury (non-copers) independently lead to compensation strategies that could precipitate or worsen knee OA.

Objective: Determine strategies for controlling tibial position in subjects with ACL rupture and uninjured subjects using knee kinematics and muscle activity during disturbed unilateral standing.

Methods: Seven subjects with an acute unilateral ACL rupture, who were active in high level sports prior to injury and were classified as non-copers, participated in the study. Ten highly active, uninjured subjects were recruited as control subjects. All subjects participated in motion analysis (6 dof rigid body analysis) and muscle activity (EMG) testing consisting of ten trials of undisturbed unilateral standing, followed by 10 trials each of unilateral standing during which the support surface translated horizontally in an anterior, posterior or lateral direction (disturbed condition). Translation direction order was randomly assigned. Translations in the anterior and posterior direction were applied at 40 cm/s for a distance of 5.8 cm. Lateral translations were applied at 25 cm/s for a distance of 3 cm. Sagittal plane knee angle and sagittal plane tibial position with respect to the femur were averaged over a 2 second interval in the undisturbed condition and over the interval of surface translation in each disturbed condition. Knee angle and tibial position in all trials were referenced to the position in a calibration trial (hip, knee and ankle in a neutral position) taken in bilateral stance. Analysis of Variance (ANOVA) was used to determine differences between groups. Statistical significance was set at p < 0.05. EMG activity was normalized to EMG during an MVC. EMG timing and magnitude were used to describe cocontraction as described by Rudolph et al (2001).

Results: Non-copers stand with greater knee flexion than uninjured subjects in all conditions (p < 0.01). Compared to the calibration trial, non-copers' tibias moved posteriorly in relation to the femur during every unilateral standing condition (undisturbed: -0.9 mm; disturbed: anterior = -1.8 mm, posterior = -3.0 mm, lateral = -3.0 mm), while the tibial position of uninjured subjects moved anteriorly (undisturbed: 1.4 mm; disturbed: anterior = 2.1 mm, posterior = 1.7 mm, lateral = 1.9 mm). Non-copers' tibial position differed significantly from uninjured subjects in every condition (undisturbed: p < 0.05; disturbed: p < 0.01). EMG analysis provides evidence for a muscular component to the differing stabilization strategies between the non-copers and uninjured subjects.

Conclusion: Non-copers appear to over-constrain the knee, keeping the tibia in a posterior position, compared to uninjured subjects. This stiffening strategy reflects an unsophisticated adaptation to the ACL rupture for which appropriate muscle activation strategies to stabilize the knee have not yet developed. This compensation strategy, which may reduce anterior tibial translation at the knee, may also lead to less shock absorption and excessive joint compression that exacerbate joint destruction.
Poster #75

THE CASES OF THE RERUPTURE OF RECONSTRUCTED ACL USING MULTI-STRAND HAMSTRING TENDON
Sadakiro Cho, Kawaguchi, JAPAN, Presenter
Sadao Niga, Kawaguchi, JAPAN
Hiroski Asano, Tino, JAPAN
Akiho Hoshino, Saitama, JAPAN
Kawaguchi Kohgyo General Hospital, Kawaguchi, JAPAN

PURPOSE: The purpose of this study is to investigate the rerupture case of reconstructed anterior cruciate ligament (ACL) using multi-strand hamstring tendon (M-ST).

MATERIALS AND METHODS: Five hundred ninety-seven patients who underwent reconstruction of ACL using M-ST from 1995 through 2001 were reviewed. There were 343 male and 254 female patients, with an average 22.2 years (range, 13 to 50 years). Femoral tunnel was made by inside-out technique. To the cases of rerupture of reconstructed ACL, we searched terms: length difference at operation, trauma history, tibial tunnel placement, anterior stability, knee extensor muscle strength and arthroscopic observation. We also compared the rate of rerupture cases of reconstructed ACL using patella tendon (BTB) from 1990 through 1994 with M-ST.

RESULTS: There were 7 patients (1.2%) who had sustained a rerupture of the reconstructed ACL in M-ST group. An average time from primary surgery to rerupture was 20 months (range, 4 to 36 months). There were clearly traumatic episodes in all seven patients. Length differences using isometric Positioner at operation were average 3.2 mm (1-5 mm). Length pattern in all seven patients was over-the-top pattern. The tibial tunnel placements were posterior to the Blumensaat’s line in X-ray findings of the lateral view at full extension knee position in all seven patients. Before rerupture, no statistically significant difference in postoperative Lachman test, Pivot shift test, KT-1000 side to side difference, knee extensor muscle strength and range of motion of the knee between rerupture group and the others. There were no graft impingements at second-look arthroscopy before rerupture. In BTB group, eighty-six patients were reviewed. There were 4 patients (4.7%) who had sustained a rerupture of the reconstructed ACL. To compare the rate of rerupture cases, the rate in M-ST group was significantly lower than that in BTB group.

CONCLUSION: There were 7 patients (1.2%) who had sustained a rerupture of the reconstructed ACL using M-ST.

Poster #76

ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION IN CHILDREN AND SKELETAL IMMATURE ADOLESCENTS
Svend Erik Christansen, Aarhus, DENMARK, Presenter
Sten Kjeldsen, Aarhus, DENMARK
Bent Lund, Aarhus C., DENMARK
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Reconstruction of the anterior cruciate ligament in skeletal immature adolescents using soft tissue autograft crossing the physe seems to be a recommendable treatment (ref 1-3). However the treatment of ACL lesions in younger children (Tanner I-II) with significant growth potential is controversial due to risk of disturbance of the epiphysis resulting in bony bridging, angular deformity or leg length discrepancy (ref 4).

Material:

In the period from 010197 - 311201 45 children and adolescents (mean age 13 y, range 8 - 15) with ACL rupture were treated operatively. Mechanism of injury was nearly exclusively sport-related trauma (soccer, handball, basketball and skiing). Sex-ratio were 27 girls/18 boys. 40% had concomitant lesions, (meniscal tears, medial collateral ligament and chondral fractures). One child were excluded due to multiple ligament injury (ACL, PCL and MCL).

Method:

Group 1: Of special interest were 10 skeletally immature patients (age 8 - 13y, mean 11y, Tanner I-II) with radiographically “wide” open growth plates treated with intra-articular reconstruction using a soft-tissue autograft (hamstrings with femoral endo-button fixation and screw/spiked washer fixation on the tibia-side). Trans-epiphyseal technique was used in both tibia and femur.

Group 2: 21 adolescents (age 14 -15y, mean 14.5, Tanner III) with open physes were treated operatively with soft tissue autografts whereas the remaining (group 3) 7 patients (Tanner IV) approaching skeletal maturity were reconstructed with patellar bone-tendon-bone technique.

Group 4: 6 children had avulsion fractures at the tibiplateau. 4 of these patients had displacement with ≥ 2 mm and were treated operatively with reduction and fixation with cerclage-wire fixation through 2 drill-holes in the tibia epiphysis.

Results: Mean FU was 28 month. No growth plate disturbances were seen in any groups. Mean Lysholm score improved from 61 preop. to 92 postop. The KT-1000 analysis improved from 7 mm to 1 mm laxity (Lachman, 25 flex, 30 lbs). The overall functional outcome was good except in one girl (Tanner group IV) who sustained of instability grade I - II and Pivot shift grade I. In group I one 10 years old boy had an excellent result and removed to sport (soccer and skiing) but 11 month after primary reconstruction he had a new injury resulting in graft-rupture. A revision has been performed (Feb. 2002). Accurate graft-sizing and equivalent drilling (min 0.5 mm interval) is optional.

Ref.

Poster #77

SPECIFIC QUESTIONNAIRE FOR KNEE SYMPTOMS: LYSHOLM KNEE SCORING – TRANSLATION AND VALIDATION FOR PORTUGUESE LANGUAGE
Moises Cohen, Sao Paulo, BRAZIL, Presenter
Maria Stella Peccin, Sao Paulo, BRAZIL
Rozana Ciconelli, Sao Paulo, BRAZIL
UNIFESP (CETE), Sao Paulo, BRAZIL

Introduction: Knee disorders have various consequences for the individual’s quality of life and functional capacity.

In the period from 010197 - 311201 45 children and adolescents (mean age 13 y, range 8 - 15) with ACL rupture were treated operatively. Mechanism of injury was nearly exclusively sport-related trauma (soccer, handball, basketball and skiing). Sex-ratio were 27 girls/18 boys. 40% had concomitant lesions, (meniscal tears, medial collateral ligament and chondral fractures). One child were excluded due to multiple ligament injury (ACL, PCL and MCL).

Method:

Group 1: Of special interest were 10 skeletally immature patients (age 8 - 13y, mean 11y, Tanner I-II) with radiographically “wide” open growth plates treated with intra-articular reconstruction using a soft-tissue autograft (hamstrings with femoral endo-button fixation and screw/spiked washer fixation on the tibia-side). Trans-epiphyseal technique was used in both tibia and femur.

Group 2: 21 adolescents (age 14 -15y, mean 14.5, Tanner III) with open physes were treated operatively with soft tissue autografts whereas the remaining (group 3) 7 patients (Tanner IV) approaching skeletal maturity were reconstructed with patellar bone-tendon-bone technique.

Group 4: 6 children had avulsion fractures at the tibiplateau. 4 of these patients had displacement with ≥ 2 mm and were treated operatively with reduction and fixation with cerclage-wire fixation through 2 drill-holes in the tibia epiphysis.

Results: Mean FU was 28 month. No growth plate disturbances were seen in any groups. Mean Lysholm score improved from 61 preop. to 92 postop. The KT-1000 analysis improved from 7 mm to 1 mm laxity (Lachman, 25 flex, 30 lbs). The overall functional outcome was good except in one girl (Tanner group IV) who sustained of instability grade I - II and Pivot shift grade I. In group I one 10 years old boy had an excellent result and removed to sport (soccer and skiing) but 11 month after primary reconstruction he had a new injury resulting in graft-rupture. A revision has been performed (Feb. 2002). Accurate graft-sizing and equivalent drilling (min 0.5 mm interval) is optional.

Ref.
Objective: To translate, validate and verify the measurement properties of the Lysholm Knee Scoring Scale for the Portuguese language.

Methods: Fifty patients with knee lesions (meniscal, anterior cruciate ligament lesions, chondromalacia and arthrosis) were selected.

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 (a = 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's and a prospective study in 54 selected competitive athletes following ACL reconstruction with compacted hamstring tendons correlated with 2 interference bio-absorbable screws + a metallic staple on the tibia.

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.

Poster #78
A NEW TECHNIQUE OF PREPARATION AND FIXATION OF AN ACL SEMI-TENDINOSUS GRAFT (MECHANICAL EVALUATION BY PULL-OUT AND CYCLIC LOADING TESTS)
Mikel Callette, Bruxelles, BELGIUM, Presenter
Yvan de Moors d'Argenteuil, Tervuren, BELGIUM
Clinique Edith Cavell, Bruxelles, BELGIUM

For more than six years, we have been routinely and satisfactorily using an original method of preparing an isolated semitendinosous graft in our ACL reconstructions. The semitendinosous tendon is harvested in isolation. Each graft's end is then sewn to each other to make a closed ligament ring. By twisting it and folding it back on itself, we then get a four strand tendon loop with one single suture. As proximal and distal fixation bands can pass and slide freely through the loop, any tension on the graft will automatically be divided equally into each of the four graft's strands unlike conventional methods where each free tendon graft's end should be equally tensioned before fixation. However, our ligament loop has implied so far the use of synthetic suspension bands whose mechanical drawbacks have now been very well documented. Therefore, a new method of fixation was developed in order to address these problems. It consists of a fully end-tunnel device, fixing the graft close to its extremity and, suitable for both femoral and tibial fixation. It provides a very strong primary fixation (up to three times the interference screw-type fixation strength) and also an excellent stiffness.

This paper reports the results of the mechanical study performed on 45 specimens using human tissue (femoral heads collected from hip arthroplasties and semi-tendinosus tendons from cadaver donors). It includes single pull-out strength tests and cyclic loading tests to 250 N and 500 N (by 1500 cycles). These tests were applied selectively to the isolated graft loop first, then to the isolated fixation in bone and, finally to the complex bone-ligament after fixation.

Prior to these experiments, a bone densitometry was performed on each bone specimen.

Poster #79
ACL RECONSTRUCTION WITH DOUBLED HAMSTRING TENDONS FIXED WITH 2 BIO-ABSORBABLE INTERFERENCE SCREWS IN COMPETITIVE ATHLETES
Daniel Comba, La Loggia-T0, ITALY, Presenter
Enzo Cenna, Torino, ITALY
Mauricio Xavier Motta-Nahas, Torino, ITALY
FisioSport, Torino, ITALY

PURPOSE OF THE STUDY: to evaluate the results with a prospective study in 54 selected competitive athletes following ACL reconstruction with compacted hamstring tendons fixed with 2 interference bio-absorbable screws + a metallic staple on the tibia.

METHODS: between March 1997 and February 2001 a series of 54 competitive athletes (ranging from amateur to professional level) with isolated ACL tears were operated upon using an hamstring autograft (DLSTG) fixed with 1 femoral and 1 tibial bio-absorbable interference screws (BioScrew) and 1 metallic staple on the tibia. Preparation of all the grafts was extremely accurate, requiring compacted ends of the tendons (35-45 mm) with absorbable threads. A high density of the bony wall of the tunnels was achieved using cannulated compacters. A rehabilitation program including immediate motion and weight bearing followed surgery. Return to sport activities was allowed after 6 months. Final evaluation at 2 years follow-up was performed according the IKDC and Tegner score and arthrometric KT1000 measurements.

RESULTS: KT1000 (man.max.) 0-2mm 45 athletes (83%); 3-4mm 7 (13%); >5mm 2 (3%). Tegner activity level: pre-injury 8.2 (7-10); follow-up 7.8 (6-9). IKDC: 51 normal and nearly normal (94%), 3 abnormal (5,5%), no severe abnormal.

CONCLUSIONS: Our overall results in competitive athletes using an ACL hamstring graft fixed with bio-absorbable interference screw plus a tibial metallic staple indicate that this technique is a valid choice even for a high-performance population. We think it is essential to achieve a strong fixation of the graft, with an extremely accurate preparation of the tendons and tunnels, in order to obtain good results, comparable to others graft-fixation methods.

Poster #80
POSTEROLATERAL CHONDRAL INJURY IN ANTERIOR CRUCIATE LIGAMENT RUPTURE
Adam Dalajies, Auckland, NEW ZEALAND, Presenter
Hayden Morris, East Melbourne, AUSTRALIA

Arthroscopic examination of forty-three consecutive patients with Anterior Cruciate Ligament 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 lesion of the posterolateral tibia was not correct in predicting the presence of a posterolateral chondral lesion. We report a new arthroscopic finding not previously mentioned in the literature.
POSTER ABSTRACTS

Poster #81
ARThROSCOPIC ACL RECONSTRUCTION WITH NO TORNIOQuET USE IN ROUTINE BONE-PATELLAR TENDON-BONE
Roberto José Batista Dorea, Salvador, BRAZIL, Presenter
Centro Medico AlainÂa, Salvador, BRAZIL

Purpose: This presentation demonstrates a new method to control bleeding during the ACL arthroscopic reconstruction surgery, intending to diminish the risk of the development of a deep-vein thrombosis or of a lesion of the peripheral nervous system or muscle fibers.

Method: The procedure is performed with 0.5 ml of adrenaline diluted in 100 ml of isotonic solution. 20 ml of this solution is injected into the entering portals. At the supero-medial portal 10 ml of the solution is injected, and at the infero-lateral and infero-medial portals 5 ml are injected into each one. During the following 5 minutes flexion-extension movements are made to spread the solution throughout the knee articulation. After this the knee is ready for the arthroscopic part of the surgery. Eventually, if a strong bleeding persists, one can inject 20-30 ml more of the solution, wait 5 minutes to let it take effect and afterwards the structures will be able to be visualized with clarity. Next, a central incision is made and the strengthener tendon is removed from the Bone-patellar tendon-bone. The hemostasis must be done with care because the tourniquet is not used. After this procedure, we restart the arthroscopic part of the surgery to perform the tendinous transposition with fixation. P.S.: The same procedure of ACL reconstruction is also used with the semitendinosus and gracilis.

Results: During a period of 42 months, we have performed 180 operative arthroscopic ACL reconstructions and have had only one case of deep-vein thrombosis and no problems with lesions on the peripheral nervous system or muscle fibers. The age of the patients varied from 17 to 50 years.

Conclusion: This procedure renders good visability during the arthroscopic part of the surgery and is a technically safer method, thus avoiding and lowering the possibility of post-operative problems.

Poster #82
MRSA TOXIC SHOCK SYNDROME AFTER ARTHROSCOPIC ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION
Kasuké Ebina, Suita, JAPAN, Presenter
Norinao Matsumoto, Toyonaka, Osaka, JAPAN
Tatsuo Mar, Osaka, JAPAN
Dept of Orthopaedics, Osaka Kouseinenkin Hospital, Osaka, JAPAN

We report a rare case of MRSA toxic shock syndrome after arthroscopic anterior cruciate ligament reconstruction.

Case report: A 25-year-old man who had atopy in past history underwent arthroscopic anterior cruciate ligament reconstruction. At 10 days after surgery, he suddenly presented extreme leg pain, fever (>39°C), hypotension, renal and liver dysfunction; nevertheless operated knee presented little infectious lesions on the peripheral nervous system or muscle fibers. The objective of a degradable ACL augmentation device is to improve the knee-stability by protecting the ACL-autograft during remodeling and allow early rehabilitation during healing without worries about the graft. The mechanical properties of the device gradually decreases, and the autograft increases in strength. The purpose of the present investigation was to evaluate the surgical technique, the long-term stability and the tissue.}

Poster #83
THE EFFECT OF ACL SURGERY ON BONE MINERAL IN THE CALCANEUS
Lars Eriksson, Uddevalla, SWEDEN, Presenter
Jari Toomas Kartus, Trollhättan, SWEDEN
Jon Karlsson, Göteborg, SWEDEN
Department of Orthopaedic Surgery, Norra Hôsbit/ Uddevalla, Trollhättan/Uddevalla, Göteborg, SWEDEN

Purpose: The aim of the study was to evaluate the effect of anterior cruciate ligament (ACL) reconstruction on the bone mineral areal mass (BMA) in the calcaneus on the injured and non-injured side.

Type of study: Prospective cohort study of bone mineral in the calcaneus before and after ACL reconstruction.

Results: Thirty-one of thirty-four patients (20 men and 11 women) underwent all the BMA measurements. The median age at the index operation was 27 (16-50) years and the reconstruction was performed 12 (2-192) months after the injury. The median preoperative activity level increased from 3 (2-8) to 7 (2-9) at 26 months (p=0.0001). The BMA in the calcaneus on both the injured and non-injured side decreased by 16% and 17% respectively from the preoperative measurement to the 26-month control (p=0.0014, p=0.0006). On all occasions, the BMA was lower on the injured side than on the non-injured side (p=0.012).

Conclusions: Patients with a unilateral ACL rupture had a lower BMA in the calcaneus on the injured side compared with the non-injured side. Although the patients increased their activity level after the reconstruction, the BMA in the calcaneus decreased on both the injured and the non-injured side in the perspective of two years after the operation.

Poster #84
A DEGRADABLE POLYURETHANEUREA AUGMENTATION DEVICE FOR ACL RECONSTRUCTION
Ingrid Ekeman, Stockholm, SWEDEN, Presenter
Ulf Eklund, V. Frolunda, SWEDEN
Elisabeth Liljensten, Göteborg, SWEDEN
Barbro Danielson, Göteborg, SWEDEN
Lars Peterson, Billdal, SWEDEN
Goteborg Medical Center, Göteborg, SWEDEN

The objective of a degradable ACL augmentation device is to improve the knee-stability by protecting the ACL-autograft during remodeling and allow early rehabilitation during healing without worries about the graft. The mechanical properties of the device gradually decreases, and the autograft increases in strength. The purpose of the present investigation was to evaluate the surgical technique, the long-term stability and the tissue.

Discussions: Only one case of toxic shock syndrome after arthroscopic surgery has been reported. Considering this case, we must take care of 1) dermatitis such as atopy, 2) presence of MRSA toxic shock syndrome.
sue response to a bone-patella tendon-bone autograft and a degradable polyurethane urea-ACL augmentation device.

Method
Patients with an isolated ACL instability have been reconstructed with a BPTB autograft augmented with a degradable (PUUR) ACL augmentation device. In two pilot studies including 20+10 patients, the aim was to elaborate the surgical technique and to evaluate the knee-joint stability after ACL reconstruction and accelerated rehabilitation. In these prospective, single center studies the patients have been operated on and followed-up at 3, 6 months, and then every 6th month up to four years. Arthroscopies and MRI were performed in 5 patients and biopsies for histological analysis were harvested. In addition, the second pilot study with 10 patients, operated on with BPTB-autograft and ACL-augmentation with a polyurethanurea-band was started, and accelerated rehabilitation was performed. MRI in all patients were made after six month.

Results
All 30 patients, in both pilot studies, had a side-to-side difference (KT1000, max manual) of less than 3 mm. In three patients, the bands had to be explanted (all within one year) due to postoperative complications related to the surgical technique. Although the bands had to be explanted, the stability was still good. MRI showed ingrowth of bone in the femoral and the tibial tunnel. Histological observations showed ingrowth of organized connective tissue parallel with the PUUR fibers. Blood vessels and collagen type I was identified using immuno-histochemical methods.

Conclusions
In the two pilot studies, the first of 20 patients with follow up for four years and the second with accelerated rehabilitation and a follow up time for one year, the combination of a BPTB autograft and the PUUR augmentation device allowed early ROM-training, and functional training with preserved stability. MRI showed ingrowth of bone in the femoral and tibial tunnels. The complications that occurred were related to the surgical technique, which resulted in modifications of the procedure. No signs of severe inflammatory reactions or foreign body reaction were detected in the patient biopsies. Ingrowth of vascularized organized connective tissue parallel with the PUUR fibers containing collagen type I was demonstrated.

Poster #85
REHABILITATION USING AN ACTIVE MOTION DEVICE AFTER ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION
Seen Fell, Heidelberg, GERMANY, Presenter
Hans H Paessler, Heidelberg, GERMANY
Alos clinic center, Heidelberg, GERMANY

Aim: The aim of this prospective and randomised study is to evaluate an early functional follow-up treatment with an active knee motion device, CAMOPED®, after reconstruction of the anterior cruciate ligament (ACL). We put forward as a hypothesis that a low postoperative loss of muscular strength and coordination can be achieved after a muscle-activating therapeutic exercise.

Material and Method: 36 patients with an isolated cruciate ligament injury took part in the study. 12 men and 4 women (average age ±30.7 years) use an active motion device 4-7 days after surgery in addition to a standardised rehabilitation journal (Group CAM). With this, the patients exercised for half an hour four times a day, every day for 4 weeks. An additional 20 patients (average age ±37.1 years) only completed the standardised rehabilitation journal (Group CO). The following tests were carried out: One-leg hop test, isokinetic muscle strength measurement by angle speeds of 60, 90, 180°/sec., and a coordination test on the Kinesthetic Ability Trainer “KAT 2000”, static on one leg and static on two legs. Both the injured and uninjured legs were tested. The test periods were 1 day before surgery (V.U.), then 6 (6 postop.) and 12 (12 postop.) weeks after surgery.

Results: For the one-leg hop, the results for both measurement periods of the check-up in the CAM group (6 postop.: 56.44 ± 21.73; 12 postop.: 74.56 ± 21.72) were significantly better than in the control group (6 postop.: 33.75 ± 23.82; 12 postop.: 62.66 ± 10.59; p = 0.006; 12 postop.: p = 0.043). The isokinetic strength measurement gave a significantly better result at both an angle speed of 60°/sec. (p = 0.028) and 90°/sec. (p = 0.040) in the CAM group (60°/sec.: 1.19 ± 0.51; 90°/sec.: 1.20 ± 0.41) compared to the control group (60°/sec.: 0.82 ± 0.46; 90°/sec.: 0.89 ± 0.45). After 12 weeks no more significant differences could be determined, but even here there tends to be a better result (60°/sec.: p = 0.228; 90°/sec.: p = 0.126) for the CAM group (60°/sec.: 1.61 ± 0.59; 90°/sec.: 1.64 ± 0.49) compared to the control group (60°/sec.: 1.38 ± 0.54; 90°/sec.: 1.37 ± 0.51). At an angle speed of 180°/sec. there was a trend to better values in the CAM group (6 postop.: 1.00 ± 0.36; 12 postop.: 1.34 ± 0.39) compared to the control group (6 postop.: 0.84 ± 0.41; 12 postop.: 1.21 ± 0.39) without significance being achieved (6 postop.: p = 0.261; 12 postop.: p = 0.331). For the coordination test, a better but not significant result was achieved in the first check-up with measurement of the injured leg (CAM: 350.25 ± 147.16; CO: 413.40 ± 113.74) for the CAM group (p = 0.155). With the second check-up, the CAM group (p = 0.035) achieved a significantly better result (CAM: 275.44 ± 179.49; CO: 363.25 ± 104.07). The static test for both legs showed a significantly better result for both measuring periods (6 postop.: p = 0.022, 12 postop.: p = 0.025) for the CAM group (6 postop.: CAM: 269.00 ±177.95; CO: 407.75 ± 168.91; 12 postop.: CAM: 236.18 ± 136.48; CO: 340.15 ± 127.40).

Discussion and Summary: The significant improvement of muscle strength and coordination after using this new type of active motion device for 4 weeks can be explained by a reduction of neural blockage of the extensor mechanism. The contralateral transfer of muscle activation might also play a role. The active motion device CAMOPED® seems to us to be a sensible addition to the standard rehabilitation programme after ACL reconstruction.
Aim: To establish whether there is any difference in outcome between patients who have attended physiotherapy frequently following ACL reconstruction and those who have not.

Methods: Through an interview process involving 143 patients, 10 patients were identified who had attended physiotherapy on three or fewer occasions during the first six months after ACL reconstructive surgery. The patients in this ‘minimal physiotherapy’ group were matched for age, gender, graft type, pre-injury activity level and occupation with 10 patients (from the same cohort of 143 patients) who had attended physiotherapy on 12 or more occasions - the ‘regular physiotherapy’ group. At 12 months following surgery participants were assessed using the International Knee Documentation Committee (IKDC) form, the Cincinnati form, and hop tests.

Results: Compared with the regular physiotherapy group, patients in the minimal physiotherapy group achieved better outcomes at 12 months in terms of Cincinnati symptoms (mean 46 vs 43, p = 0.03), overall Cincinnati score (mean 94 vs 87, p = 0.02) and triple hop symmetry (mean 102% vs 93%, p = 0.03).

Conclusion: Patients who had attended physiotherapy infrequently achieved better outcomes than patients who attended more than 12 times. These results demonstrate that patients who choose not to attend physiotherapy regularly after ACL reconstructive surgery can still achieve satisfactory outcomes.

Poster #87
THE EVOLGATE: A NEW METHOD FOR ANATOMIC TIBIAL FIXATION OF QUADRUPLED HAMSTRING GRAFT IN ACL RECONSTRUCTION: A BIOMECHANICAL STUDY
Andrea Ferretti, Rome, ITALY, Presenter
Fabio Conteduca, Rome, ITALY
Eduardo Monaco, Rome, ITALY
Luca La Bianca, Taranto, ITALY
Dept. Orthopedics, II School of Medicine, S. Andre, Rome, ITALY

PURPOSE. The Evolgate (Citieffe, Bologna, Italy) is a low profile titanium alloy device developed to augment the tibial interference screw fixation of hamstring tendon in ACL reconstruction. The first objective of this study was to compare the initial fixation strength of the Evolgate with interference screw’s one. The second objective was to determine the fatigue behaviour of the Evolgate and interference screw under cyclic loading in both constant (150 N) and incremental loading (50 N increments per cycle).

TYPE OF STUDY: Biomechanical Study. METHODS: Pull out test. This study compares the initial pull-out strength, stiffness and failure modes of five pairs of four strand human semitendinosus and gracilis grafts fixed to porcine tibia using either the evolgate or one round threaded titanium interference screw. Structural test of the graft-fixation method-tibia complexes were administered using a materials testing machine at a strain rate of 50 mm/sec. Cyclic loading: two paired tests were performed using, for each test, five pairs of common digital extensor bovine tendons fixed to porcine tibia: critical graft fixation conditions were simulated by applying to the graft 1100 subsequent cycles with a constant load of 150 N and by progressively loading the graft in increments of 50 N until failure.

RESULTS. Pull out test: The mean failure load was 1207N (SD259) for the evolgate and 561N (SD70) for the interference screw (p< 0.05) as the mean stiffness of the graft-fixation method-tibia complex was 160 N/mm (SD 47) for the evolgate and 106 N/mm (SD 23) for the interference screws (p<0.05). Cyclic test to constant load: All the cases fixed with the evolgate resisted to 1100 cycles at 150 N with an ultimate strength of 671 N (SD 174) as only one case fixed with interference screw resisted to 1100 cycles with an ultimate strength of 448 N; the other cases failed after less than 300 cycles. Cyclic test to 50 N increments load: the ultimate load was 1032 N (SD 126) for the evolgate and 400 N (SD 94) for the interference screw as the slippage at 250 N was 0,376 mm (SD 0,06) for the evolgate and 0,702 mm (SD0,12) for the interference screw; the mean stiffness of the fixation method was 358 N/mm (SD 77) for the evolgate and 177 N/mm (SD 27,4) for the interference screw.

CONCLUSIONS: in all the test performed the evolgate was demonstrated to significantly improve the strength and reduce the construct slippage of hamstring tendon grafts fixed to tibia with interference screw.

Poster #88
3-D GAIT ANALYSIS OF ACL DEFICIENT PATIENTS USING THE CHAOS THEORY
Tina Moraiti, Ioannina, GREECE
Giannis Giarakis, Ioannina, GREECE
Nick Stergiou, Omaha, NE, USA
Christos Papagiorgiou, Ioannina, GREECE
Elias Tsepis, Ioannina, GREECE
Stavros Ristanis, Ioannina, GREECE
Anastasios Georgoulis, Ioannina, GREECE, Presenter
University of Ioannina, Ioannina, GREECE

Introduction
Numerous studies have been conducted regarding gait analysis in anterior cruciate ligament deficient (ACLD) patients. Although several of these studies have shown that ACLD patients develop protective mechanisms (i.e., quadriceps avoidance) to increase knee stability, it seems that these adaptations fail to protect the knee from future pathology. It seems that further in-vivo biomechanical investigation is required to understand the mechanisms of pathological knee joint motions and develop rehabilitation programs, which would delay the development of future degenerative diseases. One of the ways to enhance our understanding of these mechanisms is to examine the stride-to-stride variability. Stride-to-stride variability has been related with changes in sensory feedback and has been associated with locomotor stability. In addition, this variability has been described as a “healthy flexibility” within the neuromuscular system. Severe injury can possibly result in a loss of this flexibility that may not be regained despite surgical treatment. Conventional methods to examine the variability of human movement include the analysis of standard deviation and coefficient of variation. Recently the theory of chaos and non-linear dynamic methods were used to investigate various complex phenomena in the areas of immune system, genetics, etc. We used one of these techniques to examine the effect of ACL deficiency on the complexity of gait patterns during walking. Specifically, we hypothesized that the ACL deficient knee will be less complex (which means less flexible to external influences) when compared with the healthy knee.

Methods
A six-camera Peak Performance system (50 Hz) was used to record 3D kinematics from 11 ACL deficient patients (mean age 34, mean mass 78 kg). Knee joint laxity was tested with KT-1000 in all patients and side to side differences were at least 3mm. The Lysholm score for all patients was between 40 and 89. The subjects had approximately 10 minutes to familiarize with the experimental setup. The subjects walked at their self selected speed on a motorized treadmill. Fifteen markers set were positioned at specific bony landmarks of the lower limbs to indicate the movements of the lower segments. Segmental angular data...
of the foot, the tibia, and the thigh were calculated from approximately 120 continuous footfalls. Subsequently, the knee joint data were analyzed for complexity using the Approximate Entropy (ApEn). Smaller ApEn values will indicate decreases in complexity and lack of flexibility and variability (more periodic move patterns). ApEn group mean differences between the affected and unaffected sides were examined with a paired t-test at a 95% level of significance.

Results and Discussion
Our findings of 11 ACL deficient patients showed that the ApEn values for the deficient knee were lower than the ApEn of the healthy knee (p<0.05). These results are in agreement with previous studies which examined patients after reconstruction and found that the reconstructed knee is less complex than the healthy knee. It is therefore indicated that the deficient knee moves along more periodical patterns (known patterns). This decreased variability creates smaller adaptations and increases the risk of injury in possible unexpected movements.

**Poster #89**
**CHANGES IN SINGLE STEP BALANCE OF ACL DEFICIENT PATIENTS BEFORE AND AFTER LOW DEMAND EXERCISE**
Giannis Giabas, Ioannina, GREECE
Tina Moraiti, Ioannina, GREECE
Stavros Ristantis, Ioannina, GREECE
Elias Tzepis, Ioannina, GREECE
Christos Papageorgiou, Ioannina, GREECE
Nick Stergiou, Omaha, NE, USA
Anastasiou Georgoulis, Ioannina, GREECE, Presenter
University of Ioannina, Ioannina, GREECE

Introduction
Previous research indicated that degenerative joint changes are not only due to joint instability but also due to a disruption of proprioceptive function. The ACL contains mechanoreceptors and it has been suggested that it also functions as a sensory organ. The injury of ACL would result in deterioration of proprioception and changes in body balance. This hypothesis however is still under discussion. Moreover, non-fatiguing exercise induces no significant changes or a decrease in sway in healthy subjects. Therefore the purpose of this study was to examine the effect of low demanding exercise on the balance of ACL deficient patients. We hypothesised that fatigue will decrease balance especially at the leg with ACL deficiency. It has been shown that running deteriorates balance more than walking and a possible explanation is the more excessive head movement and disturbance of vestibular and visual information centres of running compared to walking. In our study we eliminated this factor and used cycling instead.

Methods
Ten healthy and nine ACL deficient patients were recruited. At the beginning of each test each subject had as many trials as required in order to get familiar with the one-leg static balance procedure. The KAT2000 system was used to examine the single stance ability (Hansen et al., 2000). Then three trials for each leg were recorded and the best was used as the representative. The low-demand exercise was the same for all subjects. Each subject cycled on a Tunturi cycle ergometer for 10 minutes at 50 rounds per minute (50W). The subjects were tested for balance immediately after. In both tests (before and after exercise) the leg examined was randomly selected by the examiner. Statistical differences were examined using a two-way ANOVA test (group x exercise).

Results and Discussion
The exercise decreased the balance ability of all healthy subjects for both legs (p<0.05). In the deficient group the balance ability of the healthy leg was also decreased (p<0.05), however in the deficient side five of the patients similarly decreased but the other four of them were able to sustain their score as before the exercise. Further analysis on MRI scans and concentric knee flexion extension peak torque values revealed that there this result was not related to meniscus lesion or hamstrings and quadriceps isokinetic torque. These results indicate that some patients possibly adapt to use other mechanisms or that they avoided using their injured leg equally with the healthy side during the exercise. Data are still collected to increase the power of our analysis.

**Poster #90**
**TWO-YEAR COMPARATIVE STUDY AFTER ACL RECONSTRUCTION: BPTB VS D-STG**
Francesco Giron, Firenze, ITALY, Presenter
Paolo Aglietti, Florence, ITALY
Flavio Biddau, Florence, ITALY
Francesco Sasso, Florence, ITALY
First Orthopaedic Clinic - University of Florence, Florence, ITALY

Purpose: To prospectively assess differences in clinical and radiographic results at 2-year minimum F.U. after ACL reconstruction performed using either a BPTB or a D-STG autograft.

Material and Methods: 100 knees with a chronic isolated ACL lesion were randomly assigned to one of the two graft choices. Both groups were comparable in terms of age at surgery, injury-surgery interval, activity level, gender, surgical technique and rehabilitation. All patients were evaluated by an independent and blind observer using the IKDC form, the patient self-administered Knee Injury and Osteoarthritis Outcome Score (KOOS), the Functional Score for Anterior Knee Pain (FSAKP, by S. Werner), the KT-1000 dynamometer, and Cybex NORM testing for concentric isokinetic strength. A radiographic study using standard image amplifier controlled views was performed.

Results:

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<tr>
<th></th>
<th>Average</th>
<th>D-STG</th>
<th>BPTB</th>
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<td><strong>IKDC</strong></td>
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<tr>
<td>B</td>
<td>48%</td>
<td>64%</td>
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<td>58%</td>
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<td><strong>Final</strong></td>
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<td>58%</td>
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<td>76%</td>
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<td>10%</td>
<td>p&lt;.001</td>
</tr>
<tr>
<td>Tibial Tunnel</td>
<td>30%</td>
<td>18%</td>
<td></td>
</tr>
<tr>
<td>Sagittal plane</td>
<td>54%</td>
<td>45%</td>
<td></td>
</tr>
</tbody>
</table>

Conclusions: The subjective evaluation showed slightly less pain and symptoms (not statistically significant) in the D-STG group. The objective evaluation showed no significant differences between groups in all the analysed parameters except for kneeling discomfort (higher in the BPTB group) and femoral tunnel widening (higher in the D-STG group).
ACL RECONSTRUCTION WITH D-STG FIXED TO THE FEMUR WITH A MITEK ANCHOR: 5 YEAR RESULTS
Francesco Giron, Firenze, ITALY, Presenter
Paolo Aglietti, Firenze, ITALY
Pierluigi Cuomo, Firenze, ITALY
Antonio Ciardullo, Firenze, ITALY
First Orthopaedic Clinic - University of Florence, Firenze, ITALY

Purpose: To prospectively evaluate the 5-year results of ACL reconstruction using a double semitendinosus and gracilis graft (D-STG) rigidly fixed to the femur with a Mitek anchor.

Material: 46 patients with an isolated complete subacute or chronic ACL injury (injury-surgery interval 19 months, range 1-156) were included. The average age at surgery was 28 years (range 17-48). We were able to personally review 42 patients at 5-year minimum follow-up. Two patients were lost, one had had a rerupture in the mid-substance at 3 months while playing soccer and the fourth had had a knee fracture in an accident.

Technique: The femoral tunnel was drilled first with the knee in 120° - 130° of flexion through the antero-medial portal. The position of the K wire was checked fluoroscopically with intra-operative lateral views with condylar superimposition and only positions less than 30% from the back of the condyles were accepted or the K wire was repositioned. The tibial K wire was introduced using the One Step tibial guide (Arthrotek) which references off the roof of the notch in extension to avoid impingement. The fixation of the graft was achieved with a Mitek anchor in the femur, with the 2 tendons directly passed in the slot of the anchor, and an RCI screw, supplemented with a spiked washer and bicortical screw, in the tibia. The 4 strands of the graft were individually tensioned and fixed at 25° after cycling. Rehabilitation was aggressive controlled and without braces.

Methods: IKDC form, KT-1000 dynamometer, and Cybex testing (concentric isokinetic strength) were employed. An X-ray study using standard image amplifier controlled views was performed.

Results: At 5 years one patient (2.3%) revealed a lack of extension of 3° and another (2.3%) complained of some pain during sports activities. Two patients had giving way. The KT ssd was 1.8 mm at 30 lbs (range 0-7 mm) and 76% of the knees were within 2 mm. Final IKDC score showed 95% satisfactory results. Extensor and flexor deficits were 4.6% and 1.1% on average at 60%/79 patients treated by ACL reconstruction and having difficulties from chondropathy before the surgery. The former group was treated by HA, the latter not. The evaluation was based on clinical tests and X ray findings. The results show a positive effect of early postoperative additional treatment by HA.

Conclusion: We believe that the D-STG graft, with strong fixation to bone, can give excellent results similar to the so called gold standard patellar tendon.

Poster #93
HYALURONIC ACID; ADDITIONAL THERAPY AFTER ACL RECONSTRUCTION
Milan Handl, Prague, CZECH REPUBLIC, Presenter
Tomas TRC, Prague, CZECH REPUBLIC
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Summary:
ACL reconstruction is a frequent knee procedure. Sometimes the chronic effusion after the surgery can be observed, esp. in the knee with cartilagenous defects before the ACL reconstruction. The additional therapy by hyaluronic acid (HA) was performed in this study. Author evaluated 2 parallel groups of total 79 patients treated by ACL reconstruction and having difficulties from chondropathy before the surgery. The former group was treated by HA, the latter not. The evaluation was based on clinical tests and X ray findings. The results show a positive effect of early postoperative additional treatment by HA.

Purpose
The aim of the study was to evaluate the effect of an early additional treatment by HA in cases when chronic effusion in the knee after ACL reconstruction can be expected.

Methods
Two groups of patients (79 pts., age 18 - 43 yrs., chronic effusion, chondropathy or OA I grade) - treated by ACL reconstruction were observed. The treatment in the first group (43 pts.) - HA was delivered intraarticular after 4,5 and 6 weeks after surgery. The other group (36 pts.) remained without any special treatment, esp. without any intraarticular shots. Both groups were tested clinical and X-ray. before surgery and after 4, 6 and 9 weeks (clinical) and 12 weeks (clinical and X-ray). Presence of effusion, ROM and muscle strength were evaluated.
Results
The HA group showed less effusion, better early ROM and earlier onset of muscle strength esp. in 6 and 9 weeks check-up.

Discussion
The chronic effusion slowing down the rehab therapy, ROM and muscle strength is suspected from being caused by cartilage-defects prior the LCA reconstruction. The possible positive influence of HA in the postoperative treatment is observed.

Conclusion:
Results show HA has a positive effect on lowering chronic effusion, improving ROM and better muscle strength after the ACL reconstruction in the comparison to group without any additional treatment.

Poster #94
EFFECT OF 80N INITIAL GRAFT TENSION ON ANTERIOR TIBIAL TRANSLATION WITH TIME AFTER ACL RECONSTRUCTION
Kazuhisa Hatayama, Maebashi, JAPAN, Presenter
Hiroshi Hiqachi, Maebashi-shi, JAPAN
Atsushi Kobayashi, Maebashi-shi, JAPAN
Masashi Kimura, Maebashi, JAPAN
Funiaki Kobayashi, Maebashi, JAPAN
Masanori Terachi, Maebashi-shi, JAPAN
Kenji Shirakura, Maebashi-shi, JAPAN
Kenji Takagishi, Maebashi-shi, JAPAN
Department of Orthopaedic Surgery, Gunma University, Maebashi, JAPAN

Purpose: We evaluated a time series analysis on changes of anterior tibial translation (ATT) after anterior cruciate ligament (ACL) reconstruction with 80N initial graft tension.

Material & Methods: Twenty-five patients (male 9, female 16) were enrolled in this study. ACL-Reconstruction was performed using autogenous semitendinosus tendon in all cases. ATT was evaluated at side to side difference (STSD) before surgery, 3, 6, 12 months postoperatively.

Results: Average STSD of ATT were 6.8±3.9mm, 0.8±3.8mm, 1.7±1.1mm and 2.6±3.6mm at before surgery, 3Mo, 6Mo, 12Mo after surgery, respectively. In chronic ACL-torn cases, STSD of ATT was significantly larger than subacute cases at 12Mo postoperatively. In addition, STSD of ATT was significantly large at before surgery and 12Mo postoperatively in cases with medial meniscal tear. Preoperative ATT was correlated with that of 6 and 12Mo postoperatively. However, Age and gender did not effect on postoperative ATT.

Conclusions: This study suggested that ACL-Reconstruction with 80N initial graft tension reduced the postoperative anterior laxity of the knee joint. However, postoperative stability of knee joint are worse in chronic cases and combined medial meniscal tear cases as the others.

Poster #95
MONOPOLAR ELECTROTHERMAL TIGHTENING OF CHRONIC, INTERSTITIAL PARTIAL ACL TEARS
Stephen W. Houseworth, Colorado Springs, CO, USA, Presenter
Premier Health Plaza, Colorado Springs, Colorado, USA

Purpose: To assess the results of monopolar electrothermal tightening of chronic, partial interstitial ACL tears performed by a single surgeon.

Methods: This study began in January 1998 and continues. 28 patients underwent arthroscopic tightening of their native ACL or ACL graft at a minimum of 3 months after injury. All patients had failed a physical therapy program and were unwilling to modify their activities or use a brace. Each patient underwent a pre-operative MRI that reported the ACL to be “normal” or as a “minor sprain”. All patients underwent a postoperative, carefully followed physical therapy program including the use of a brace allowing range of motion 15 to 90 degrees for the first 6 weeks after surgery. The physical therapy program lasted a minimum of 4 months after surgery and stressed the same reverence for soft tissue healing as our program for formal arthroscopic assisted ACL reconstructions.

Results: 25 of 28 patients experienced excellent or good results from this procedure. There were 3 failures. 24 patients had “Normal” or “Nearly normal” IKDC Standard Form ratings at a minimum of 6 months after surgery (range 6-47 months, average 22 months). Lysholm Scale ratings improved from an average of 59.7 to 88.1. The average Tegner Activity scale was 3 preoperative and 7 postoperative. The pre/post KT-2000 data was not statistically significant. Additional procedures were performed on 26 patients at the time of the ACL tightening.

Conclusions: Monopolar tightening of chronic, interstitial partial ACL tears is effective in a very carefully selected group of patients. Patients must have an intact ACL or ACL graft on both preoperative MRI and during evaluation at the time of arthroscopy. The postoperative physical therapy program is critical to the success of this procedure. The author believes that this technique will be seldom used for ACL instability as few patients meet the stringent preoperative selection criteria.
Results: Causes of graft failure were unknown three and trauma three. However, all of traumas were classified light ones. There were no obvious complications in our two-stage ACL revision. There were no obvious progressive OA changes but one between graft removal to ACL revision. Clinical results were evaluated five cases that had half years or more follow-up periods. There were no positive anterior drawer and no positive pivot shift test. The mean JOA score was 97 and the mean Lysholm score was 95.

Discussion: Several papers recommended two-stage ACL revision. One paper recommended that two stages ACL revision is good procedure in theoretically but it is not realistic because of the causes of patient’s inconvenience and cost. Brown reported that indications for two-stage ACL revision include decreased ROM and large bone defects. Our indications for two-stages ACL revision at this moment are that pre-revised MRI demonstrated a large tibial tunnel or misplacement of the tibial tunnel expected to cause a large bone defect.

Conclusions: 1. Clinical results were studied in six knees that received two-stage ACL revision. 2. Our indications for two-stages ACL revision at this moment are that pre-revised MRI demonstrated a large tibial tunnel or misplacement of the tibial tunnel expected to cause a large bone defect.

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Poster #97
IN VIVO SIMULTANEOUS MEASUREMENT OF LENGTH CHANGES OF THE ANTEROMEDIAL AND POSTEROLATERAL BUNDLES OF THE ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTED WITH THE FOUR-TUNNEL TWO-ROUTE PROCEDURE WITH HAMSTRING TENDON Grafts

Kazuaki Yasuda, Sapporo, JAPAN, Presenter
Eiji Kondo, Sapporo, JAPAN
Nobuto Kitamura, Sapporo, JAPAN
Yasunari Ikoma, Sapporo, JAPAN
Toshikiyo Yoshikawa, Sapporo, JAPAN
Harukazu Tofuya, Sapporo, JAPAN
Department of Medical Bioengineering & Sports Medi, Sapporo, JAPAN

Introduction: The normal ACL is composed of the anteromedial (AM) and posterolateral (PM) bundles. In the single-route ACL reconstruction procedures, it is impossible to reconstruct these two bundles. The four-tunnel two-route ACL reconstruction procedure has been developed to anatomically reconstruct the AM and PM bundles of the ACL. However, no in vivo studies have been conducted to clarify functional differences of the two bundles reconstructed in this procedure. The purpose of this in vivo study is to compare the length change patterns during knee motion for the AM and PL bundles reconstructed with the four-tunnel two-route ACL reconstruction procedure using hamstring tendon grafts.

Materials and Methods: An in vivo study was conducted using 15 patients (8 men and 7 women) with chronic isolated ACL tear. An average age was 22.7 years. The patients underwent arthroscopy-assisted ACL reconstruction with doubled hamstring tendon autografts. All surgeries were performed by the first author using the four-tunnel two-route procedure. The roof or wall plasty was not performed. A tibial tunnel for the PL bundle was created with a canulated drill (6- or 7-mm diameter). The extraarticular outlet was located at the point 15 mm distal from the joint line and just anterior to the medial collateral ligament, while the intraarticular outlet was located at the center of the insertion of the normal PL bundle. A tibial tunnel for the AM bundle (7- or 8-mm diameter) was drilled through the center of the insertion of the normal AM bundle in the standard manner. For the PL bundle reconstruction, a Kirschner wire was drilled at the femoral aiming point, which was located at the 4 or 8 o'clock orientation using the trans-tunnel technique. For the AM bundle reconstruction, another wire was drilled at the point located at the 2 or 10 o'clock orientation. Then, the commercially available isometer system (Smith & Nephew) was used to measure the length between the two intraarticular outlets for the AM and PL bundles. In addition, we used specially designed cylindrical devices to fill the vacant space of the tibial tunnels so that a suture for measurement was passed through the center of each outlet. After a metal tags was attached to each femoral aiming point, an isometer was set at the end of each suture attached the tag. Thus, the length changes for the AM and PL bundles were simultaneously determined during passive knee motion, the angle of which was measured with an electrogoniometer. After the measurement was repeated 10 times, each femoral tunnel was created through each aiming point with the Endobutton technique. The doubled tendon graft was transplanted in each pair of tunnels, and fixed with an Endobutton and polyester tapes. The standard postoperative management was applied after surgery. The patients were followed up for 1 year. Objective evaluation was performed with a range of motion, the side-to-side anterior laxity measured with KT2000, and IKDC evaluation. Statistical analysis was made with the two-way ANOVA with post-hoc test for multiple comparisons.

Results: When the knee was flexed from zero degree of extension to 15, 30, 60, 90, and 120 degrees of knee flexion, the average length between the tunnel outlets for the AM bundle decreased by 2.1, 3.3, 4.3, 4.5, and 3.6 mm, respectively, while that for the PL bundle decreased by 2.8, 4.8, 6.9, 8.3, and 8.1 mm, respectively. The two-way ANOVA demonstrated significant differences between the two bundles and the knee flexion angles (p<0.0001). The post-hoc test showed that the degree of the decrease was significantly greater for the PL bundle than for the AM bundle at 60, 90, and 120 degrees (p=0.0346, 0.0146, and 0.0039, respectively). Concerning the 1-year follow-up results, each patient restored the full range of knee motion. The IKDC Evaluation showed ‘Normal’ in 12 out of the 15 patients and ‘Nearly normal’ in the remaining 3 patients.

Discussion: This in vivo simultaneous measurement study clearly demonstrated that the length change pattern between the tunnel outlets is significantly different between the AM and PL bundles. The PL bundle is considered to be more tensioned than the AM bundle in near extension position. The present length patterns were similar to those for the normal AM and PL bundles that were measured in our previous in vitro study (CORR, 1987). The postoperative results of our patients were excellent. This study suggested that the four-tunnel two-route ACL reconstruction procedure may be able to create the AM and PL bundles that have different functions.

Poster #98
EVALUATION OF GRAFT AFTER ACL RECONSTRUCTION

Michael Ilias Iosifidis, Thessaloniki, GREECE, Presenter
Stergios Papastergiou, Triandria, GREECE
Ioannis Tsitouridis, Thessaloniki, GREECE
Christos Papageorgiou, Ioannina, GREECE
Ioannis Giannakopoulos, Thessaloniki, GREECE
Kostas Parisis, Athens, GREECE
Dep of Sports Injuries “Saint Paul” Gen Hospital, Thessaloniki, GREECE

The question about the ligamentization of the graft is still existing without a clear answer, and the postoperative behavior of a ligament graft is still a matter of debate. The purpose of this
study is to record the tissue changes of an autologous bone patellar-central third patellar tendon-bone tibial (BPTB) graft after surgical ACL reconstruction, using MRI and to combine them with the clinical image respectively.

During the period 1998-2001 we operated 265 patients for ACL insufficiency with autologous BPTB graft. Seventy nine of them (45 men and 34 women, ranging from 17 to 44 years -mean: 25.3 years), were imaged with MRI postoperatively at specific intervals from the operation, ranging from 3-36 months. We used interference screws of poly-L-lactic acid (PLLA) in 34 patients and titanium screws for the rest of them. We examined the graft and the surgically created bone tunnels.

All grafts were intact except for one with complete tear and one with partial tear. The orientation of the grafts on sagittal images was straight at about 80%. There was a gradually change of the graft's signal during the pass of time. A homogenous “high” signal after the 3rd p.o. month indicated the inflammatory reaction to the graft's embodiment procedure. After the 1st p.o. year a “low” signal such as the normal ACL was dominant. Spontaneously, we recorded ingrowth of periligamentous connective tissue - an evidence of graft maturity. The critical time was about 18 months postoperatively. There was a slight widening of both femoral and tibial tunnels, more remarkable on the tibia, whose peak time was in the same period (for the femur 11mm to 12,1mm at the critical time and then back to 10mm, and for the tibia 11.7mm to 12.9mm and finally 11mm). It was mainly “pear” shaped, but without any correlation with knee stability.

Rehabilitation is matched to the presumed load that the graft is considered to tolerate. That is, any information about graft healing or “maturation” is quite useful. There are few studies of bone tunnel enlargement, but clinical significance and etiology of this phenomenon remains unclear.

Poster #99

ACL RECONSTRUCTION WITH HAMSTRINGS AND BIOABSORBABLE
Ben I Besnette, Ottawa, CANADA
Ari E Pressman, Ottawa, CANADA
Don H Johnson, Ottawa, CANADA, Presenter
The Ottawa Hospital, Ottawa, CANADA

In an initial study, a prospective evaluation of 49 patients treated between December 1996 and May 1998 with a double-looped semitendinosus and gracilis graft for anterior cruciate ligament reconstruction was undertaken. Grafts were secured with bioabsorbable interference soft tissue screws (Bioscrew; Linvatec, Largo, FL) made of poly L-lactic acid. Patients were followed for a minimum of two years (average 2.31 ±0.27 years). Tenger and Lysholm scores were used to determine pre and post-operative knee function and IKDC scores were calculated at the two-year follow up. The average IKDC score was 84.8±14.3 at the final follow up. A pivot shift was absent in all but two patients at the final follow up. Despite the clinical success as determined by patient based subjective outcome and the IKDC score, the KT scores showed a 4-5 mm side-to-side difference in 20.8%. Although this degree of laxity has been experienced in some series with other methods of fixation such as the Endobutton™ (Acufex microsurgical, Mansfield MA), we felt that this represented substantially more laxity than had been experienced with our bone-patellar tendon-bone cohort of ACL reconstruction fixed in the same manner during the same period of time. It is possible that this laxity represents differences in graft material or in bone fixation. In the second part of our study, improvements in fixation were made in an attempt to minimize the observed side-to-side laxity. On the femoral side, Endobutton™ fixation was added and the proximal 3cm of the graft sutured to improve screw-graft fixation. We performed tunnel dilation, advancement of the Bioscrew™ to the proximal tunnel aperture and supplementary fixation on the tibial side with a perosteal button. The results of ACL reconstruction with double-looped semitendinosus and gracilis graft with improved fixation were compared to those with Bioscrew™ fixation only.

Poster #100

EFFECT OF AXIAL ROTATION OF THE TIBIA ON ACTIVATION OF THE EXTERIOR MECHANISM: IMPLICATION FOR NON-CONTACT ACL INJURY
Akihiro Kanamori, Tsukuba, JAPAN, Presenter
Shizuka Michigami, Tsukuba, JAPAN
Toru Okezaki, Tokyo, JAPAN
Yuka Miyanaga, Tsukuba, JAPAN
Naoyuki Ochiai, Tsukuba, JAPAN
Toru Fukushima, Tokyo, JAPAN
University of Tsukuba, Tsukuba, JAPAN

[Purpose] The exact mechanism of a non-contact anterior cruciate ligament (ACL) injury remains unknown. Historically, the potential for an ACL tear occurs when the knee is subjected to a valgus and external rotational torque. However, cadaveric studies have shown little increase in the force in the ACL in response to such a torque, which suggests that the application of the torque alone is not a risk factor. Dynamic factors are also implicated in ACL injury, specifically the extensor mechanism of the knee pulls the tibia anteriorly and increases the force in the ACL. The objective of this study was to determine the activation of the quadriceps muscles upon landing from a jump with the tibia in three different positions of axial rotation. It was hypothesized that positioning the tibia in axial rotation would increase the activation of the quadriceps muscles.

[Material and Method] Three female collegiate basketball players with no previous report of knee injury participated in this study. Surface electrodes were placed over the vastus lateralis (VL) and vastus medialis obliquus (VMO) muscles of the subjects’ right limb. Reflective markers were also placed on the hip, knee, and ankle. Subjects were then asked to mimic basketball maneuvers by jumping and landing on their right foot with three different positions of the tibia: neutral, internally rotated, and externally rotated. The two dimensional (coronal and sagittal view) kinematics were collected using two high-speed digital cameras. The EMG data obtained during the landing activity were normalized to those obtained during a maximum voluntary contraction of the quadriceps muscles (%EMG).

[Results and Discussion] The flexion angle of the knee upon landing for all positions of tibial rotation ranged from 22 to 30 degrees. Upon landing with neutral tibial rotation, the %EMG of the VL and VMO were 131 and 165, respectively. When the foot was rotated either internally or externally, the %EMG of the VL increased up to 240, while those of the VMO did not change significantly. The results of this study show that the activation of the extensor mechanism increases according to the position of axial rotation of the tibia upon landing. The increased activation of the vatus lateralis, as well as the lower knee flexion angle may be an important factor in non-contact ACL injuries that occur upon landing from a jump.

Poster #101

SERIAL CHANGES IN THE MRI OF ANTERIOR CRUCIATE LIGAMENT GRAFT IN TIBIAL BONE TUNNEL
Objective: Although maturation of the graft in the bone tunnel following the anterior cruciate ligament (ACL) reconstruction is very important factor affecting results of the surgery, there are not many clinical study examining intra-tunnel graft changes. The purpose of this study was to examine intra-tunnel graft maturation by serial MRI following ACL reconstruction.

Methods: Twenty-five patients who received three-times of postoperative MRI examination were included in this study. Twelve patients received ACL reconstruction using the multiply folded hamstring tendon graft (Group 1), and 13 patients received ACL reconstruction using the rolled iliotibial tract graft (Group 2). MRI examinations were performed within four weeks, at three months, and at 12 months after the surgery using 1.5T MRI unit (Signa, GE) with intravenous administration of gadolinium. Axial views of the tibial bone tunnel were evaluated.

Results: Within four weeks, ring-shaped enhancement around the graft which showed almost homogeneous low signal intensity bundle were observed in all subjects. At three months and 12 months after the surgery, the grafts in group 1 were separated into several segments by enhancement, and the grafts in group 2 showed ring-shaped enhancement inside the graft. Ring-shaped enhancement around the graft were also observed in the both group.

Conclusions and Significance: Differences were found between MRI taken within four weeks and later than three months after the surgery, which seems to represent graft maturation process during this period. Differences were also found between the two groups. Enhancement inside the graft observed later than three months looks like invading between folded tendons in group 1, and between rolled iliotibial tract layers in group 2. The graft maturation in the bone tunnel seems to be influenced by the form of the graft, and the graft in the bone tunnel does not seem to become homogeneous at least within one year after these two types of surgery.
the donor site were performed 6 (5-10) weeks (n=19), 6 (6-8) months (n=18), 27 (24-29) (n=19) months and 71 (68-73) (n=17) months postoperatively. The contralateral normal side (n=19) was only examined at the first occasion.

Results: The size of the donor site gap decreased significantly (p=0.0001) between 6 weeks and 6 years after the harvesting procedure. The thickness of the patellar tendon at the donor site was increased compared with the contralateral healthy side until 2 years after the index operation (p=0.0004). However, the thickness decreased over time and was normalised at 6 years. The width of the patellar tendon at the donor site was increased compared with the contralateral side regardless of when the examination was performed (p<0.01), (Table 1).

Conclusions: Prospective MRI examinations revealed that the patellar tendon at the donor site was not completely normalised 6 years after harvesting its central third.

Poster #105
RETURN TO SPORTS ACTIVITIES AFTER ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION
Masayoshi Katayama, Maebashi City, JAPAN, Presenter
Masashi Kinuma, Maebashi, JAPAN
Hiroshi Higuchi, Maebashi-shi, JAPAN
Yasukazu Kobayashi, Maebashi, JAPAN
Fumiaki Kobayashi, Maebashi, JAPAN
Junta Kawaihara, Maebashi, JAPAN
Kenji Shinakura, Maebashi-shi, JAPAN
Kenji Takagishi, Maebashi-shi, JAPAN
Masanori Tenbauchi, Maebashi-shi, JAPAN
Gunma University Faculty of Medicine, Maebashi, JAPAN

[PURPOSE] The purpose of this study is finding out of factors for missing to play the previous sports after anterior cruciate ligament (ACL) reconstruction.

[METHODS AND MATERIALS] One hundred and thirty-nine athletes who had undergone ACL reconstruction were studied. They applied if they could return to the previous sports activities or not, and retrospectively checked by manual tests, X-ray stress view, and IKDC score.

[RESULT] One hundred and eleven athletes were able to play their previous sports (84.2%) (group ABLE). The other who were unable to play their previous sports was 22 athletes (group UNABLE). In Lachman test 96 athletes of ABLE (86.5%) and 17 of UNABLE (77.3%) were negative, and in knee jerk test similarity 90 (81.1%) of ABLE and 15 (68.1%) of UNABLE were negative. In X-ray stress view the instability for the contra lateral side were 3.2mm in ABLE and 3.6mm in UNABLE. IKDC score showed A:14 B:79 C:19 D:5 in ABLE and A:1 B:15 C:4 D:2 in UNABLE.

[DISCUSSION] There were no significant differences between the ABLE and the UNABLE, but it tended to less instability in ABLE. It could be one of factors for missing to play the previous sports to remain instability after the ACL reconstruction.

Poster #106
EFFECTS OF ACL-RECONSTRUCTION ON JOINT SURFACE PRESSURE PATTERN
Richard Kolarczy, Vienna, AUSTRIA, Presenter
Basil ALARASHID, Vienna, AUSTRIA
Martin Fuchs, St. Poelen, AUSTRIA
Rudolf Schabus, Vienna, AUSTRIA
Vilmos Vecsei, Vienna, AUSTRIA

Aim of the study was to compare the preinjury knee joint pressure pattern with the pattern after ACL-resection and after reconstruction using a BTB-graft without preloading and with 25N and 50N preload. In 6 cadaver knee joints the pressure probes were simultaneously applied into the medial and lateral joint space. The knee was flexed and hanging - imitating the position in a leg holder. Then the knee was extended to 0° and again brought to hanging position. The ACL was resected and the measurement repeated. After implantation of a BTB-graft again the pressure relation was measured as well as after preloading of the BTB-graft with 25N and 50N. The relative pressure values between the medial and lateral compartment were used. The curve in the injured joint served as basic curve for determining the correct pressure curves after reconstructions. After resection of the ACL the pressure curve showed rather similarity to the injured joint; after BTB-grafting an almost identical curve compared to the uninjured knee was recorded. The similarity disappeared the more preloading was put onto the BTB-graft.

The pressure relation between the medial and lateral knee compartment was recorded before and after ACL-resection and with BTB-graft loaded and unloaded. Almost similar curves to the uninjured knee were recorded when an unloaded BTB-graft was implanted. Quality of ligament reconstructions can be defined intraoperatively by restoration of normal pressure relation curve.

Poster #107
ARTHROSCOPIC ACL RECONSTRUCTION USING PATELLAR TENDON-BONE AUTOGRFT AND BIOABSORBABLE INTERFERENCE SCREW
Myung Ku Kim, Incheon, SOUTH KOREA, Presenter
In Suk Oh, Incheon, KOREA
Inha University, Incheon, SOUTH KOREA

Purpose: Authors reported the results of arthroscopic ACL reconstruction using patellar tendon-bone autograft and bioabsorbable interference screw (Bioscrew: poly-L Lactic acid).

Materials and methods: From Jan. 1998 to Dec. 1998, we performed 39 cases of arthroscopic ACL reconstruction using PTB autograft and Bioscrew. An average 3 years and 2 months follow-up was available. We measured KT-200 test, IKDC score, Tenger score and Lysholm score at preoperative evaluation and compared with the results of final evaluation. We performed re-arthroscopy on 4 cases and observed the degree of degradation of Bioscrews.

Results: At preoperative evaluation, an average KT-2000 test was 8.1. Lysholm score 66.2. IKDC score below C on all cases and Tenger score 3.7, but, at final evaluation, KT-2000 test was 2.8, Lysholm score 91.7, IKDC score above B on all cases and Tegner score 6.9. Re-arthroscopic finding at 3 and 12 months after implantation showed that there was no degradation of PLLA screws, but 21 and 33 months, there was partial degradation of PLLA screws.

Conclusion: Bioabsorbable interference screw is a reasonable alternative to metallic screw during ACL reconstruction. But, bioabsorbable screw implanted in human takes a much longer degradation time than had been anticipated.
ANTEOR CRUCIATE INJURIES IN CHILDREN WITH OPEN PHYSES
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Kyosuke Fujikawa, Tokorozawa, JAPAN
Satoshi Tsukazaki, Tokorozawa, JAPAN
Atsushi Sugihara, Tokorozawa, JAPAN
Masato Tomiya, Tokorozawa, JAPAN
Yoshitiro Aoki, Tokorozawa, JAPAN
Takeo Kawanuki, Tokorozawa, JAPAN
National Defense Medical College, Tokorozawa, JAPAN

[INTRODUCTION] In these days sporting activities such as foot-
ball, baseball and so on have been spreading into young gen-
eration. Furthermore, diagnosis of ACL injury has become
precise owing to prevalence of MRI and arthroscopy. The inci-
dence of ACL injuries in children with open physeal joints seems to
have increased. However, treatment of ACL injuries with open physeal joints is still controversial. We will report the results of conservative treatment of ACL injuries with open physeal joints.

[CASES] This study includes 38 fresh ACL injuries in children with open physeal joints. There are 32 boys and 5 girls, and one boy had bilateral ACL injuries.

[TREATMENT] All of cases were treated conservatively by immobilation at 30 degree of knee flexion with cast for 3 weeks and ACL-grip brace afterwards. For 4 - 5 months after their injuries any kinds of sporting activities were prohibited. After that light sport with ACL-grip was allowed.

[RESULTS] At 5 years or longer follow-up, Lachman test was positive in 71%, anterior drawer test in 76.3% and jerk test in 60.5%. However subjective complaints of children such as pain and giving way were not so remarkable as in adults cases. The typical secondary OA change was spike formation of the tibial spine. Meniscal tears were noted in cases continuing sporting
activities. Advance OA change was observed in the elder boys.

[CONCLUSION] The results of conservative treatment of ACL injuries with open physeal joints were not satisfactory at over 5 years follow-up.

Poster #109
THERMAL SHRINKAGE METHOD USING HOLMIUM; YAG LASER ON ACL DEFICIENT KNEE
Akihiro Kotani, Mitaka-shi, JAPAN, Presenter
Kyorin University School of Medicine, Mitaka, JAPAN

Purposes
Recently, thermal surgery using heat energy such as lasers has been tried primarily in arthroscopic surgery. Thabit reported in 1994 that satisfactory results were obtained when the laser-assisted capsular shift was tried for capsular instability. In 1998, a thermal shrinkage procedure that causes ligament shrinkage in the instability of the knee anterior cruciate ligament (ACL), which contains Type I collagen, has been used. In 1999, Caron referred the results of capsular shift using the TS method at 15W and 20W at 15Hz with a total energy of 500mmJ, two models per group. Before and after the TS method, the forward sliding improvement rates were measured on the X-ray lateral images. Subsequently, the ligaments were extracted and histological findings were examined.

Results
Experiment 1: The thermal shrinkage rates were 4% at 50C, 8.5% at 55C, 35 3% at 60C, 56.2% at 65C and 63.4% at 70C. Therefore, the shrinkage rate increased significantly with heating. From the histological findings, no shrinkage was found in collagen fiber at 50C, but the shrinkage became clear at 50C. The shrinkage became most remarkable at 60C, and thermal denaturation occurred at 65C, showing unclear fibrous structure. Therefore, 60C was assumed to be an optimal temperature giving an effective thermal shrinkage and minimal structural denaturation.

Experiment 2: The forward sliding mean improvement rates were 44.0% at 5W, 58.5% at 10W, 83.0% at 15W and 79.0% at 20W. Significant improvements were found at 15W and 20W. From the histological findings, shrinkage of the collagen fiber, which was detected at 60C in Experiment 1, was found at 15W. On the other hand, thermal denaturation progressed into the deeper layers of the tissue at 20W. Therefore, the TS method at 15W was found to show significant improvements in forward sliding without causing strong thermal denaturation. Therefore, optimal conditions for lasers were 15Hz and 15W.

Discussion
In 1994, Thabit tried a laser-assisted capsular shift and reported 80% satisfactory results. In 1996, Garcia performed an internal knee joint capsular shift for knee capsular instability and reported that functions and adaptability were regained at an early stage. In 1998, Thabit tried the thermal shrinkage method on damaged ACLs containing large amounts of Type I collagen as in the case of capsules. From the results after an average of 1 year and 6 months after the operation, KT-1000 was found to be 2mm or less in 23 cases out of 25 cases, reporting satisfactory results. However, in 1999, Caron referred the cases of failure within 6 months after the operation in 4 cases out of 12, indicating unstable results. In 1997, Schaefer et al. applied a laser to rabbit knee tendon and the length of the tendons was observed without external fixing. The shrinkage immediately after laser irradiation was 6.6%, but the length of the tendons extended in contrast to that before irradiation due to tension of the quadri-
ceps femoris muscle after 4 weeks and 8 weeks. Thus, the diffi-
culty of after-care was pointed out. In the present study, we
caused shrinkage in the loosened anterior cruciate ligament to achieve tightening when using heat energy from lasers. Although it is important to thoroughly investigate case selec-
tion, surgical techniques and after-care in the future, it may become one of the treatments for anterior cruciate ligament instability.

Conclusions
1) Thermal shrinkage was tried using a holmium: YAG laser for ACL knee instability.
2) The optimal condition for laser energy was 15W.
3) Knee forward sliding was reduced so that the Thermal Shrinkage may become one of the treatments for anterior cruciate ligament instability.
Antero-Lateral Rotatory Instability of the Knee

Andreas K. Kreuz, Homburg-Saar, GERMANY; Presenter
Dietrich S. Hammer, Homburg-Saar, GERMANY
Jochen Duchow, Homburg-Saar, GERMANY
Dieter M Kohn, Homburg-Saar, GERMANY
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Introduction
Acute or chronic antero-lateral capsulo-ligamentous laxity of the knee is not always detected on clinical examination and is therefore wrongly thought to be uncommon. However, even in moderately mild lesions, the functional deficit is often quite severe, particularly in athletes. An accurate diagnosis following the acute injury is the basis of effective treatment.

Method
We have measured anterior and rotatory displacement in 20 knees with chronic deficiency of the anterior cruciate ligament (ACL). We performed stress radiography and stress MRI using a simple apparatus which maintained the knee in Lachman test position (20° of flexion) while a 9 kg load was applied to the distal femur the tibia fixed. Associated lesions were evaluated clinically and via MRI. Knee instability was evaluated clinically using different knee scores.

Results
None of the knees showed secondary lesions like meniscal tear, injured collateral ligaments or damage to the postero-lateral corner (PLC) but twelve knees showed degenerative changes of the medial meniscus according to clinical and MRI data. Thirteen knees showed 10mm or more (grade III) anterior translation of the tibia, six knees had a tibia translation between 5 and 10mm (grade II) and one knee showed less than 5mm (Grade I) without significant difference between radiological and MRI findings. In nine knees a lateral rotation displacement was found according to MRI scan while five knees showed lateral and two knees medial rotation instability according to radiological data. The tibia head size differs from 7,5mm to 15mm (mean 9,1cm) in medio-lateral direction. All patients showed clinical signs for ACL deficiency but none of them were clinically rated as rotatory unstable. However, none of the patients got back to the same level of sport.

Conclusion
Stress radiological evaluation of anterior - posterior displacement of the knee in Lachman position correlates well with stress MRI findings but differ in the amount of rotation displacement. The tibia head size and the distance between the femur condyles might influence the amount of inaccuracy. However, regarding antero-lateral rotatory instability neither radiological findings nor MRI measurements correlate well to clinical results.

Bone-Mulch-Screw/WasherLoc Fixation of Doubled Flexor Tendon Graft in Anterior Cruciate Ligament Reconstruction - Biomechanical Evaluation on the Effect of Initial Graft Tension Using Cyclic Elongation

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[Introduction] Anterior cruciate ligament (ACL) reconstruction using the hamstring tendon graft has some disadvantages compared to that using the bone-patellar tendon-bone graft. One of the disadvantages is that the stiffness of the femur-graft-tibia (FGT) complex is low, when the graft is fixed with sutures. In order to increase the stiffness of the FGT complex with the hamstring tendon graft, Bone-Mulch-Screw/WasherLoc fixation system has recently been developed. However, biomechanical behaviors of the FGT complex reconstructed using this system have not been clarified during and after cyclic loading. In order to understand these biomechanical behaviors, it is important to know the effect of the initial graft tension on the behaviors. The purpose of this study is to clarify the effect of initial graft tension on biomechanical behaviors of the FGT complex reconstructed using the double-looped flexor tendon graft with Bone-Mulch-Screw/WasherLoc fixation system, during and after cyclic elongation.

[Methods] In the present study, a porcine ACL reconstruction model was used. In this model, a pair of digital flexor tendon was trimmed so that their cross-sectional area became the average value of human hamstring tendons (Noyes et al. 1984; the gracilis: 7 mm²; the semitendinosus: 14 mm²). Twenty-one porcine knees were used. In each knee, ACL reconstruction was performed with the double-looped flexor tendon graft, which was fixed using Bone-Mulch-Screw/WasherLoc fixation system (arthrotek, naples, FL). Then, the FGT specimens were randomly divided into 20-N, 80-N, and 140-N groups (n=7 in each group). For 20-N, 80-N, and 140-N groups, a tensile load of 20 N, 80 N, and 140 N, respectively, was applied to the graft for 2 minutes as an initial graft tension. Then, cyclic elongation of 2 mm was applied 5000 times to the FGT complex at 0.2 Hz. Finally, each FGT specimen underwent the tensile failure test. Statistical comparisons were made using a one-way ANOVA and Fischer PLSD tests.

[Results] The peak load values at the first cycle were significantly different among 20-N, 80-N, and 140-N groups. The peak load rapidly decreased during the first 1000 cycles in each group. At the 5000th cycle, the mean peak load value was 57N, 105N and 126N in 20-N, 80-N, and 140-N groups, respectively. We found a significant difference in the peak load between 20-N and 80-N groups, while there were no significant differences between 80-N and 140-N groups. After cyclic elongation, the initial stiffness (the slope in the toe-region of the load-displacement curve) of the FGT complex in 20-N group was significantly lower than that in 80-N and 140-N groups, while there were no significant differences between 80-N and 140-N groups. There were no significant effects of the initial graft tension on the linear stiffness or the ultimate failure load of the FGT complex after cyclic elongation.

[Discussion and Conclusion] The present study demonstrated, first, that cyclic elongation significantly affected biomechanical behaviors of the FGT complex reconstructed using the double-looped flexor tendon graft and Bone-Mulch-Screw/WasherLoc system under each initial tension. Secondly, an increase of initial tension from 80 N to 140 N did not significantly increase the initial stiffness of the complex after cyclic elongation. Based on previously reported data of the normal ACL force at the full-extension, 16 to 87 N (Markolf et al. 1990), the mean peak load of 105 N at 5000th cycle in 80-N group is considered to be too high. Therefore, this study implied that the optimal initial tension for Bone-Mulch-Screw/WasherLoc fixation system should be less than 80 N.
# Poster #112
**INTRAOPERATIVE MEASUREMENT OF GRAFT ISOMETRY BY GRAFT FIXATION OF ONE OF THE TWO BUNDLES IN TWO-ROUTE ACL RECONSTRUCTION**

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**PURPOSE.** to measure each bundle length change by fixing the other bundle in two-route ACL reconstruction to clarify the effects of stress sharing among multi-strand bundle in multi-strand graft ligament reconstruction.

**METHOD.** Graft length changes were measured with the Isometric Positioner (Acufex) in 43 endoscopic two-route ACL reconstructions using hamstring tendons. Measurements for anteromedial (AM) and posterolateral (PL) bundles were performed in following three ways: First, with the Isotac and a suture, secondly, with the graft itself passed through bone tunnels and locked to femoral cortex with Endobuttons, and then, with the graft itself after the other bundle was fixed with a No.5 suture to tibia. Length changes from in full extension to 30, 60, 90, 120 degrees of knee flexion were plotted and compared at each angle.

**RESULTS.** In anteromedial (AM) bundles, mean length changes from in full extension to each angle were -2.5mm, -3.4mm, -3.2mm, -2.4mm with the Isotac, -1.3mm, -1.3mm, -1.1mm, -0.6mm with the AM graft when PL bundle was not fixed, -0.9mm, -1.0mm, -0.8mm, -0.2mm when PL was fixed. There were slight but significant differences at 30 and at 60 degrees of flexion between PL not fixed and fixed. In posterolateral (PL) bundles, mean length changes at each angle were -3.1mm, -4.3mm, -4.7mm, -4.2mm with the PL graft when AM bundle was not fixed, -1.7mm, -2.0mm, -2.1mm, -1.9mm when AM was fixed. There was not significant difference at each angle between before and after AM fixation.

**CONCLUSION.** In our measurements, differences of graft length change after fixation of the other bundles were generally smaller than differences between with the Isotac and with the grafts. However, in anteromedial bundles, length changes at smaller flexion angle became slightly shorter after fixation of PL bundles probably due to more tight “over the top pattern” of PL bundles. In posterolateral bundles, changes of patterns after AM fixation had no tendency.

**SIGNIFICANCE.** These results may show the possibility of stress sharing in two-route ACL reconstruction. Our methods might be useful to predict tension pattern after fixation and to decide the sequence of fixation.

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*The FDA has not cleared the drug and/or medical device for the use described in this presentation (i.e., the drug or medical device is being discussed for an “off-label” use)*

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Poster #113
**SIMULTANEOUS BILATERAL ACL RECONSTRUCTION**

Guillermo R. Arce, Buenos Aires, ARGENTINA
Pablo Lacroz, Buenos Aires, ARGENTINA, Presenter
Santiago Butler, Buenos Aires, ARGENTINA
Eduardo Diego Abalo, Capital, ARGENTINA
Juan Pablo Previeliano, Capital, ARGENTINA
Enrique Pereira, Capital, ARGENTINA
Roberto Valentini, Capital, ARGENTINA
Gabriel Pinazo, Buenos Aires, ARGENTINA
IADT, Buenos Aires, ARGENTINA

**Purpose:** Evaluate the clinical outcome of simultaneous bilateral ACL autograft reconstruction.

**Methods:** From March 1991 to February 2000, eighteen patients were operated on by two of us due to bilateral ACL insufficiency on a single operation basis. Fifteen patients were available at a mean follow up of 38.4 months. The central third of the patellar tendon was used as an autograft in 7 cases and a quadrupled hamstring reconstruction was performed in the other 8 cases. The rehabilitation program was similar to that adopted for the corresponding unilateral operation during the same period. The perioperative morbidity and the IKDC score were evaluated.

**Results:** Perioperative morbidity was higher than in unilateral surgery, but significantly lower than for the same operation performed consecutively. Four patients with joint effusions due to full weight bearing the day after surgery, needed to be drained. None of them developed infections. Resumption of work and physical activity times were 30% longer than after a unilateral operation, whereas the short and mid-term results were similar. Twenty seven knees (90%) got a normal or nearly normal IKDC score.

**Discussion & Conclusions:** In the presence of bilateral ACL insufficiency the arthroscopic simultaneous autograft reconstruction seems to be a reliable option. With an aggressive rehabilitation protocol, excellent results could be expected in this group of individuals.

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Poster #114
**AUGMENTED ARTHROSCOPIC REPAIR OF ACUTE RUPTURES OF THE ANTERIOR CRUCIATE LIGAMENT**

Franz Landsiedl, Vienna, AUSTRIA, Presenter
Siegfried Schenk, Vienna, AUSTRIA
Nicolas Aigner, Vienna, AUSTRIA
Thomas Motycka, Vienna, AUSTRIA
Orthopädisches Spital Wien-Speising, Vienna, AUSTRIA

**Aim of the study:** Acute repair of ACL ruptures is rarely used as it is considered to give worse results than reconstruction using bone tendon patellar ligament or hamstrings. We started augmented arthroscopic acute repair of ACL ruptures in selected cases in 1988 and wanted to find out if the objective follow up done by an independent examiner could confirm the subjective high patient satisfaction and if any difference between semitendinosus (ST) and PDS band augmentation could be found.

**Material and methods:** Between December 1988 and January 1997 28 patients with acute ACL ruptures were operated on. In 12 patients the ST and in 16 the PDS band was used for augmentation. Only patients between the second and tenth day post injury with ruptures of the femoral attachment and a solid long stump of the ACL were included in the study. Routine diagnostic arthroscopy was performed using a tourniquet. If primary repair was considered to be possible a transcondylar 5mm tunnel was drilled in the 1 or 11 o’clock position using an inside out technique. The notch was debrided carefully. A 4.9mm working cannula was inserted through the drill hole into the joint to facilitate the passage of the sutures and the augmentation. Using 25cm long flexible needles 3-4 U-sutures were applied to the stump of the ACL using # O PDS or Maxon threads. The sutures were delivered through the working cannula to exit at the distal lateral femur.
After sufficient fixation of the ACL stump a tibial tunnel was drilled from the anteromedial tibia to the most posterior tibial foot print of the ACL. A double loop of 10mm woven PDS band or the ST of which the tibial attachment was left intact were used for augmentation. Femoral fixation was achieved using a post screw for the PDS band and a screw and a small Burri-plate for the ST. For tibial fixation of the PDS band we used staples, the semitendinosus tibial attachment was left intact.

Results:
10 of the 12 ST patients and 13 of the 16 PDS patients could be reevaluated clinically and radiologically by performing an instrumeted Lachman X-ray with 8 years follow up (range 4-12). One patient of the PDS group sustained a traumatic rerupture of the ACL after 5 years of excellent clinical follow up. An ACL reconstruction was performed in our institution. 1 patient refused the follow up examination, 3 patients were lost.

No significant differences were found in the results of the two groups (ST and PDS), therefore the results of the two groups are presented together. A radiological Lachman (load 15 kp) difference to the uninjured knee of 0-2mm was found in 10 patients, 3-5mm in 10 patients and 6-10mm in two patients. Two patients were in IKDC group A, 18 in group B and 3 in group C. Evaluating the average OAK score resulted in 90 points (range 60-111). The range of motion was excellent with all but one patients having > 135° of flexion and only one patient with 3° of extension loss. There were three + (gliding) pivot shifts. The patients' satisfaction was very high with an average of 1,35 (range 1-3) points on a scale from 1 (excellent) to 5 (failure). In 3 patients (2 of the PDS and 1 of the ST group) arthroscopic adhesiolysis had to be performed 6 to 9 months postoperatively because of severely restricted range of motion. All remaining patients were satisfied and no arthroscopic adhesiolysis was necessary. 4 patients had had previous surgeries and had had previous surgery for meniscal lesions or traumatic cartilage lesions. Rehabilitation protocol was the same in both groups. The revision case was necessary in 4 cases, average aged 26 years, three after a post-traumatic event, a case of persistent laxity of a sportsman operated in another service. The revision technique was completely arthroscopic by using allografts. The follow-up for revision cases (follow-up year 1) was favorable with the resumption of sport activity at 6 months.

CONCLUSIONS
Main advantage of allograft reconstruction is the less invasive, completely arthroscopic technique. Rehabilitation is easier and faster, cosmetics are improved. At 3 years follow-up, functional results are similar in both groups (allograft versus autograft). For revision cases, the most usual clinical situation is that of a persistent laxity or repeated trauma following the first intervention by failure of the transplant which is autograft or allograft. Tendinitis or partial rupture was found at the level of the remaining tendon. The use of the old tunnels is generally not possible either for the femur or for the tibia or for both, and a new tunnel is necessary in 4 cases, average aged 26 years, three after a post-traumatic event, a case of persistent laxity of a sportsman operated in another service. The revision technique was completely arthroscopic by using allografts. The follow-up for revision cases (follow-up year 1) was favorable with the resumption of sport activity at 6 months.

Poster #115
ALLOGRAFT ACL REVISION RECONSTRUCTION – 3 YEARS FOLLOW-UP
Dan Laptoiu, Bucharest, ROMANIA, Presenter
Orthopaedics and Trauma Department, Colectina Clin, Bucharest, ROMANIA

PURPOSE
We report the results of a study evaluating our arthroscopic technique for ligamentoplasties (primary and revision) of the anterior cruciate ligament (ACL) of the knee.

METHOD
51 ligamentotomies of the ACL were carried out under arthroscopy by the same operational team between 1997 and 2001 (21 patellar bone-tendon-bone autografts and 30 achilles and patellar tendon allografts). All these ligaments were re-examined with 3 years of average follow-up, and a minimum of 1 year follow-up. Arthroscopy second-look was routinely performed at 12 months in order to remove the screws, clinical examination (Lysholm score) and radiologic laxometry being performed every 6 months. 70% of cases had had previous surgery, for meniscal lesions or traumatic cartilage lesions. Rehabilitation protocol was the same in both groups. The revision case was necessary in 4 cases, average aged 26 years, three after a post-traumatic event, a case of persistent laxity of a sportsman operated in another service. The revision technique was completely arthroscopic by using allografts. The follow-up for revision cases (follow-up year 1) was favorable with the resumption of sport activity at 6 months.

CONCLUSIONS
Main advantage of allograft reconstruction is the less invasive, completely arthroscopic technique. Rehabilitation is easier and faster, cosmetics are improved. At 3 years follow-up, functional results are similar in both groups (allograft versus autograft). For revision cases, the most usual clinical situation is that of a persistent laxity or repeated trauma following the first intervention by failure of the transplant which is autograft or allograft. Tendinitis or partial rupture was found at the level of the remaining tendon. The use of the old tunnels is generally not possible either for the femur or for the tibia or for both, and a new tunnel is necessary in 4 cases, average aged 26 years, three after a post-traumatic event, a case of persistent laxity of a sportsman operated in another service. The revision technique was completely arthroscopic by using allografts. The follow-up for revision cases (follow-up year 1) was favorable with the resumption of sport activity at 6 months.

Poster #116
HAMSTRING ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION USING THREE SURGICAL TECHNIQUES AND SECURE FIXATION: AN OUTCOME ANALYSIS COMPARING WOMEN AND MEN
Stephen M. Howell, Sacramento, CA, USA
Keith W. Lawhorn, Clarksville, MD, USA, Presenter
Steven M. Traina, Denver, CO, USA
University of California at Davis, Davis, California, USA

Background: Females reconstructed with a double-looped semitendinosus and gracilis (DLSTG) graft and interference screw and suture fixation have poorer anterior laxity and clinical outcome than males. The effect of gender on clinical outcome has not been reported with other surgical techniques that use a DLSTG graft.

Hypothesis: Females have the same stability and clinical outcome as males with three surgical techniques that use a DLSTG graft and secure fixation.

Study Design: Retrospective review of prospectively collected data.

Methods: The surgical technique for the Multicenter 2001 treatment group (61 F, 58 M) included drilling the femoral tunnel through the tibial tunnel, looping the graft around a post in the femur (Bone Mulch Screw), and fixing the DLSTG graft to the tibia using a WasherLoc. The technique for the One-Incision 1999 treatment group (20 F, 47 M) included drilling the femoral...
tunnel through the tibial tunnel, looping the DLSTG graft around a post in the femur, and fixing the graft to the tibia with two soft tissue staples. The technique for the Two-Incision 1996 treatment group (13 F, 28 M) included drilling the femoral tunnel through a second incision, fixing the DLSTG graft to the femur with either one or two ligament washers, and looping the graft around a post in the tibia.

Results: We observed no clinically significant differences in the final IKDC score, activity level, anterior laxity, single-leg hop test, flexion, and extension between females and males when a DLSTG graft is used with the three surgical techniques.

Conclusions: Females with a DLSTG graft have the same outcome as males with the three surgical techniques and the secure fixation methods evaluated in this study. The outcome in females treated with a DLSTG graft is dependent on the surgical technique and type of fixation. The DLSTG graft is not the cause of the poor outcome in females with interference screw.

Poster #117
ARTHROSCOPIC ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION USING CENTRAL QUADRICEPS TENDON AUTOGRRAFT
Myung-Chul Lee, Seoul, KOREA, Presenter
Sang Hoon Lee, Seoul, KOREA
Hyunchul Jo, Seoul, KOREA
Sang Cikoe Sleng, Seoul, KOREA
Department of Orthopedic Surgery, Seoul National U, Seoul, KOREA

Background: Patellar tendon bone autograft is widely used for ACL reconstruction because of good mechanical properties, but donor site morbidity including anterior knee pain has been reported by many orthopaedic surgeons. The purpose of this study is to evaluate the clinical results of anterior cruciate ligament reconstruction using central quadriceps tendon autograft.

Materials and Methods: From November 1997 to January 2000, 46 patients who received primary ACL reconstruction using central quadriceps tendon grafts were followed up for more than two years. We analyzed the clinical results, Lysholm score, KT-2000 score and quadriceps strength using Cybex II dynamometer.

Results: Quadriceps strength measured by Cybex II recovered to 80% of unaffected side at 1 year after surgery and patellar positioning, in terms of Insall-salvati ratio and congruence angle, did not show any change postoperatively. No anterior knee pain was observed at all.

Conclusion: Central quadriceps tendon grafts in ACL reconstruction showed satisfactory results without any half of donor morbidity, but in the present study. Furthermore, MRI analysis suggests the evidence of postoperative remodeling in the donor sites.

Poster #118
DONOR-SITE MORBIDITY IN ACL RECONSTRUCTION USING QUADRICEPS TENDON AUTOGRRAFT
Myung Chul Lee, Seoul, KOREA, Presenter
Hyunchul Jo, Seoul, KOREA
Sang Hoon Lee, Seoul, KOREA
Sang Cikoe Sleng, Seoul, KOREA
Department of Orthopedic Surgery, Seoul National U, Seoul, KOREA

Introduction: This study evaluated the donor site change after arthroscopic ACL reconstruction using central quadriceps tendon-patellar bone autograft.

Materials and Methods: Sixty-six knees that had had ACL reconstruction using quadriceps tendon were investigated with mean follow up period of 1 year 6 months (12 to 41 months).

Results: Quadriceps strength measured by Cybex II recovered to 80% of unaffected side at 1 year after surgery and patellar positioning, in terms of Insall-salvati ratio and congruence angle, did not show any change postoperatively. No anterior knee pain was observed at all. On MRI, wide intermediate signal intensity, higher than that of quadriceps tendon before harvest, was observed at donor sites in 13 out of 16 knees until 6 months after reconstruction, but after 12 months, much lower intensity signal was observed at donor sites suggesting some regeneration of quadriceps tendon in harvest site. The thickness of quadriceps defect was found to be increased to 9.7mm at 6 months and decreased to 7.7mm at 1 year postoperatively. Positive anterior drawer, pivot shift, and Lachman test over grade II was not found at final follow up in all knees. Anterior translation measured by KT-2000 arthrometer diminished from mean preoperative value of 4.8mm to 2.3mm. Lysholm score improved from 72 to 90.

Conclusion: Central quadriceps tendon grafts in ACL reconstruction showed satisfactory results without any half of donor morbidity, but in the present study. Furthermore, MRI analysis suggests the evidence of postoperative remodeling in the donor sites.

Poster #119
THE ANATOMY OF TibIAL EMINENCE FrACTURES: ARTHROSCOPIC OBSERVATIONS FOLLOWING FAILED CLOSED REDUCTION
Joseph Lowe, Jerusalem, ISRAEL, Presenter
Gershon Chaimsky, Jerusalem, ISRAEL
Adi Freedman, Jerusalem, ISRAEL
Ido Zion, Jerusalem, ISRAEL
Charles Howard, Jerusalem, ISRAEL
Hadassah Hospital, Jerusalem, ISRAEL

Background: Failed manipulative reduction of avulsion fractures of the anterior cruciate ligament tibial insertion is attributed in the literature to interposition of soft tissues. The objective of the presentation is (a) to show that failure to reduce McKeever type 3 fractures of the tibial eminence was not due to interposition of soft tissues, and (b) to discuss the significance of the observed attachment of the anterior third of the lateral meniscus to the avulsed anterior cruciate ligament insertion site in all the cases studied.

Method: A series of twelve cases of type 3 anterior cruciate ligament tibial eminence avulsions after failed attempts at manipulative reduction underwent arthroscopic reduction and fixation of the avulsed fragment.

Results: The following findings were consistent. The avulsed intercondylar eminence was displaced superiority into the intercondylar notch. Attached to this fragment was no only the anterior cruciate ligament, but also in all cases the anterior horn of the lateral meniscus. The anterior third of the lateral meniscus was torn from its tibial attachment and displaced together with the bony fragment into the intercondylar notch. No interposition of soft tissues was observed. Reduction of the bony fragment was facilitated by traction on sutures passed around the
Conclusions: The concept that anterior cruciate ligament tibial avulsion irreducible by manipulation is caused by soft tissue interposition was not observed in the 12 cases reported. The attachment of the anterior horn of the lateral meniscus to the avulsed tibial insertion of the anterior cruciate ligament may not be an irrelevant incidental finding. The observation that the displaced bony fragment is attached simultaneously to the anterior cruciate ligament and to the anterior horn of the lateral meniscus, both pulling in different directions, may explain the irreducibility of type 3 tibial eminence fractures by manipulation.

Poster #120
TRANSVERSEAL ACL REPAIR IN THE SKELETALLY IMMATURE ATHLETE
Peter Benjamin McDonald, Winnipeg, CANADA, Presenter
Brian Black, Winnipeg, CANADA
Michael Davidson, Winnipeg, CANADA
David Dillon, Winnipeg, CANADA
University of Manitoba, Winnipeg, CANADA

Objective: The purpose of this retrospective project is to study the effects of the conventional ACL repair using intra-articular transphyseal techniques on young adolescent patients.

Design: Retrospective Follow-up Study

Setting: Outpatient Sport Medicine Clinic

Patients: 19 adolescents (average age at surgery = 15.2) who had their ACL repaired through their femoral physes.

Interventions: Two year follow-up appointments were conducted with 19 adolescents (average age at surgery = 15.2) who had their ACL repaired through their femoral physes. KT measurements were taken, ACL “Quality of Life” questionnaires completed, scanograms and MRI images of their femoral physes were collected. IKDC scores were assessed. Results were tabulated and studied using descriptive statistics.

Outcome Measures: All patients were seen by their operative surgeon for post-operative follow-up (as well as the research nurse for further assessment). Functional outcomes were documented. Self-administered “Quality of Life Assessment in ACL-deficiency” (Dr. N. Mohtadi, Calgary, AB) questionnaires were completed at the patients’ two-year anniversary date. IKDC scores were calculated based on subjective and objective patient data.

Results: None of the patients who participated experienced any leg length discrepancies as supported by pre and post surgical heights and scanograms. Of the patients who were able to participate in physical assessments, most had functioning ACLs at least two years after their surgeries. MRIs showed that the physes were now closed and bony development had occurred normally.

Conclusions: Current transphyseal ACL repair techniques when used in the young adolescent population prior to physeal closure did not result in long term negative results. This technique has its place in the ACL repair in young adolescents.

Poster #121
ANATOMIC DOUBLE BUNDLE ACL RECONSTRUCTION WITH HAMSTINGS. TECHNICAL NOTE.
Maurilio Marcacci, Bologna, ITALY, Presenter
Alessandro Paladini Molgora, Angera (VA), ITALY
Stefano Zaffagnini, Bologna, ITALY
Alberto Vascellari, Bologna, ITALY
Francesco Iacono, Bologna, ITALY
Istituto Ortopedico Rizzoli, Bologna, ITALY

OBJECTIVE: Various surgical procedures and graft selections have been proposed for ACL reconstruction, with the goal to restore stability and normal knee kinematics. The variables that influence the final outcome are exact graft location, orientation, tension and biomechanical implant features close to normal ACL. With the aim to guarantee a good stability and restoration of normal kinematics we have developed a double bundle gracilis and semitendinosus technique, trying to reproduce the mechanical effect of both anteromedial and posterolateral bundle of ACL.

MATERIAL AND METHODS: The semitendinosus and gracilis tendons are harvested preserving their tibial insertion to maintain their neurovascular supply and sutured together at the free proximal tendons end. Tibial and femoral tunnel are performed using guide pins positioned under arthroscopic visualization. The diameter of the femoral tunnel is smaller than tibial one. After execution of a lateral incision and dissection of muscle fascia the prepared tendons are passed over the top to reproduce the posterolateral bundle of ACL and reinserted in the femoral tunnel previously prepared and pulled down in the tibial tunnel again to reconstruct the anteromedial bundle. After pretensioning of the tendons, they are fixed to the anteromedial aspect of the tibia with a transosseus suture knot.

DISCUSSION: The technical features of this technique are high mechanical resistance by the use of a four bundle grafts, reproduction of the two anatomical bundles of ACL and avoidance of any hardware implant.

Poster #122
THE RELATIONSHIP BETWEEN ANTERIOR CRUCIATE LIGAMENT LAXITY AND PATIENT FUNCTION
Robert G Marc, New York, NY, USA, Presenter
Timothy Stump, New York, NY, USA
Edward C. Jones, New York, NY, USA
John T. Carannaugh, New York, NY, USA
Thomas L. Wickiewicz, New York, NY, USA
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INTRODUCTION: Laxity of the knee in the antero-posterior plane has long been considered to be a reliable, valid and objective measure for the evaluation of ACL deficient or reconstructed patients. The aim of this study was to determine whether there is a relationship between laxity of the ACL (as documented by instrumented laxity testing) and the stated functional ability of patients.

METHODS: Patients who were ACL insufficient as well as patients who had undergone ACL reconstruction were evaluated. Patients with previous contralateral ACL injuries were excluded to avoid error calculating the difference in side to side laxity. Patients under-
went KT-1000 testing (side to side difference, maximum manual at 30 degrees) by experienced sports therapists and were asked to rate their ability to run, cut, pivot and decelerate on a four point scale. They also completed the Lysholm and Tegner scales to measure their level of symptoms and disability, as well as their level of activity.

RESULTS:
Eighty-two patients were evaluated: 48 had undergone ACL reconstruction and 34 were ACL deficient. The mean KT-1000 scores in the non-operative group was 3.9 mm side to side difference compared to 2.7 mm in the post-surgical group (p < 0.05). The mean Lysholm and Tegner scores were 87.7 and 5.8, respectively. There was no statistically significant correlation between the patients’ stated ability to run, cut, pivot or decelerate and their KT-1000 side to side differences.

DISCUSSION and CONCLUSION:
Patient function following ACL injury or reconstruction is multifactorial and KT-1000 measurements in isolation do not necessarily reflect patients’ ability to perform athletic maneuvers such as running, cutting, pivoting and deceleration.

Poster #123
DONOR SITE MORBIDITY AFTER ACL RECONSTRUCTION USING IPSILATERAL VS. CONTRALATERAL BPT GRAFT
Dimitrios Stylianos Mastrokalos, Leimen, GERMANY, Presenter
Sebastian Maerler, Heidelberg, GERMANY
Hans H Paessler, Heidelberg, GERMANY
ATOS - Clinic Heidelberg Centre for Knee and Foot, Heidelberg, GERMANY

Aim: The aim of this study is the evaluation of the activity level and the remaining symptoms concerning the graft donor site in patients having anterior cruciate ligament (ACL) reconstruction with either ipsilateral or contralateral bone-patellar-tendon (BPT) graft.

Method: 100 patients aged from 18 to 49 years (mean 34) having an ACL reconstruction with BPT-graft from 1997 to 1999 were included in this study. In 52 of them a BPT-graft (central third) from the ipsilateral side was used (group I). In 48 patients the contralateral BPT was used (group II). The BPT graft with a bone plug only from the tuberositas for femoral pressfit fixation was choosen to diminish additional morbidity from harvesting a second bone plug from the patella. All patients were followed up by questionnaire at an average of 35 months (25-53 months) postoperatively. The questionnaire included the Cincinnati score the Tegner activity score and special questions concerning persisting symptoms at the donor site such as tenderness, numbness, kneeling pain and pain while walking on the knees. For statistical analysis the paired t-test was used.

Results: The time from surgery to uptake of sport activities was in both groups similar. The average Cincinnati Scoring was 85.2 in Group I and 86.3 in Group II. There was no statistical significance in the Tegner score between the two groups. Impressive was that 88% of all the patients had complaints at the donor site such as paraesthesias and pain, when walking on their knees. Within group II there were 3 major complications concerning the donor knee: 1 rupture of the patellar tendon, 1 severe tendinitis, resolved only by surgery, 1 chronic severe tendinitis which continued for more than 3 years postoperatively. No similar complications were observed in group I.

Conclusion: Donor site problems after harvesting the central third of the patellar tendon even with only one bone plug seems to be an underestimated problem. This study showed that there are no benefits if the contralateral BPT graft is used.

All major postoperative complaints concerning the harvesting site are shifted from the injured knee into the healthy knee if the graft is taken from the contralateral knee. This may be an argument for favoring alternative grafts like semitendinosus and gracilis, or quadriceps tendons.

Poster #124
SPORTS AND ALL-DAY-LIFE ABILITY FOLLOWING ACL RECONSTRUCTION USING THE HAMSTRINGS VS BPT- GRAFT IN AN IMPLANT-FREE PRESSFIT TECHNIQUE
Jan Springer, Heidelberg, GERMANY
Robert Kilgaer, Heidelberg, GERMANY
Dimitrios Stylianos Mastrokalos, Leimen, GERMANY, Presenter
Hajo Thermann, Heidelberg, GERMANY
Hans H Paessler, Heidelberg, GERMANY
Center for Knee and Foot Surgery. Atos Clin Centre, Heidelberg, GERMANY

The goal of this prospective, randomized study is the functional evaluation of two different techniques of ACL reconstruction by using the bone-patella tendon (BPT) vs. hamstrings (ST/G).

Material/Methods: 62 ACL-insufficient patients without any concommitent sport injuries took part in a prospective randomized study. 18 men and 13 women underwent an ACL-reconstruction with BPT graft (Group I) with average age 29.87 (16-46) years. 31 patients (16 women and 15 men) with average age 34.23 (16-55) years underwent ACL-reconstruction using a quadrapled hamstrings graft (Group II). Both techniques were performed by using a press-fit and implant-free technique. We used the same rehabilitation protocol for both groups (accelerated rehabilitation). The patients were evaluated by IKDC, Lysholm and Tegner scoring systems, KT 1000, one leg hop, isokinetics, internal torque, kneeling and knee walking test, 1 day preoperatively (VU), and 3 (NU I), 6 (NU II) and 12 months (NU III) postoperatively.

Results: One year postop. the results of Group II (30 patients classified as A and B) were according to IKDC scoring system better than those in Group I (Group I: 24 patients classified as A and B). We had similar results according to Lysholm-scoring evaluation (Group II: 95.61 points vs. 90.87 in Group I (p=0.017)) and Tegner-score (Group II: 7.07 vs. 6.61 in Group I (p=0.00)). According to the KT 1000 stability evaluation there was no statistical significant difference between injured and uninjured knees in both groups. The evaluation of the strength of the hamstrings by isokinetics showed statistical significant differences between both groups (Group II: 90.34 Nm vs. 99.19 Nm in Group I, (p=0.008)). However our results concerning internal torque evaluation were not statistically significant. Concerning the evaluation of the one leg hop comparing injured and non-injured leg there was a significant difference between group II and group I (Group II: 96% vs. 91% in Group I, (p=0.012)). We had worse results in Group I vs. Group II at kneeling and kneewalking-testings ((p=0.00) vs. (p=0.00)), concerning the anterior knee pain.

Conclusion: From our results concerning IKDC, Lysholm, Tegner, kneeling and knee walking tests it seems that the harvesting of both semitendinosus and gracilis tendon can be recommended for ACL reconstruction. Only the isokinetic evaluation of hamstrings showed a statistical significant deficiency of the hamstrings-group compared to the BPT-group. But this result could not be confirmed with the methods of the internal torque evaluation and “one leg hop”.

Poster #125

The FDA has not cleared the drug and/or medical device for the use described in this presentation (i.e., the drug or medical device is being discussed for an “off-label” use).

5.62
TIBIAL TUNNEL ENLARGEMENT AFTER ACL RECONSTRUCTION WITH HAMSTRINGS.
A COMPARISON OF SINGLE AND DOUBLE POINT TIBIAL GRAFT FIXATION.
Julian Rossis, Heidelberg, GERMANY
Yu Jiakuo, Beijing, CHINA
Hans H Paessler, Heidelberg, GERMANY
Dimitrios Stylianos Mastrokalos, Leimen, GERMANY, Presenter
Atos Clinic, Center for Knee Surgery, Foot Surgery, Heidelberg, GERMANY

Introduction: Radiographic tibial bone tunnel enlargement has been observed following ACL reconstruction with hamstrings. It has been hypothesized that mechanical factors such as graft tunnel motion and stiffness of the fixation technique contribute to tunnel enlargement. The purpose of this study was to evaluate whether additional aperture fixation to distal fixation (two-point fixation or 2P) may diminish tibial tunnel widening compared to distal fixation alone (one-point fixation or 1P).

Methods: Two groups of patients were evaluated. In group 1P (44 pts, 20 female and 24 male, mean age 33.4±10.2) the grafts were fixed using a press fit technique plus two 4 mm Mersilene tapes passed and tied over a 10 mm bone bridge created in the anterior cortex 1 cm distal to the exit of the tibial tunnel as a post (one-point fixation). In group 2P (51 pts, 19 female and 32 male, mean age 33.9±10.4) the same technique was used as in group 1P except for an additional fixation using 1 absorbable cross pin in 27 pts. and 2 absorbable cross pins (Rigid fix, Mitek) in 24 pts., which were inserted through the graft parallel and close to the tibial plateau in the coronal plane (double point fixation). All patients in both groups were operated on by the senior surgeon (HP) and followed the same rehabilitation protocol. AP and lateral radiographs with a 10 mm reference ball as well as patients evaluation were performed 3, 6 and 12 months post-op. After scanning and correcting for magnification, tibial tunnel size was measured at the widest dimension on both AP and lateral radiographs using the Scion Image software and changes in tunnel width were recorded relative to the diameters drilled at surgery. Statistical analysis was done using t-test (significance p < 0.05).

Results: Tunnel enlargement occurred in both groups. On AP radiographs the mean enlargement in group 1P was 30.2±13.6 % while in group 2P it was 31.07±12.08 % (p=0.5). On the lateral radiographs the mean enlargement in group 1P was 25.61±13.99 % and in group 2P 19.63±10.92 % (p<0.05). Significant increase in tibial tunnel width was observed in both groups at 3 months post-op (p<0.05) but not thereafter (6m and 12 m). No statistical relationship was found between tunnel enlargement and gender, age, IKDC, and KT 1000 side-to-side difference in both groups.

Conclusion: This study shows that suspensory tibial graft fixation with cross-pins results in less tibial tunnel enlargement in the sagittal plane. This may be explained by the fact that the cross pins are inserted in the coronal plane thus reducing tibial graft movements mainly in the sagittal plane. The study supports the hypothesis that tibial graft micro-movement during the period of tendon healing to bone (up to 3m) plays a role in tibial tunnel enlargement after ACL reconstruction using hamstrings. Additional cross-pin fixation may reduce tunnel enlargement to a certain degree.

Poster #126
KNEE FUNCTION AFTER ANTERIOR CRUCIATE LIGAMENT INJURY IN ELITE COLLEGIATE ATHLETES
David R. McAllister, Los Angeles, CA, USA, Presenter
Sharow L. Hame, Los Angeles, CA, USA

Introduction: Few studies have examined long-term results after ACL reconstruction in elite athletes. This study retrospectively evaluated knee function and quality of life at a minimum of two years follow-up in elite collegiate athletes who had sustained an ACL injury, and compared them to a matched cohort of their uninjured teammates.

Methods: 42 Division I-A collegiate athletes who had sustained an ACL injury over a ten year period were identified. Of these, 33 were contacted, as well as 33 uninjured control athletes from the same team who played a similar position. Knee function was evaluated with the modified Lysholm, Tegner, and subjective portion of the IKDC forms. Quality of life was assessed with the SF-36 questionnaire. Athletes were further questioned on their mechanism of injury, time until return to sport, and self-assessment of performance level compared to pre-injury status. Appropriate statistical analysis was used.

Results: The sports involved during ACL injury were football (14), basketball (7), soccer (3), gymnastics (3), track and field (2), skiing (2), baseball (1), and tennis (1). 29 of the 33 ACL injured athletes underwent ACL reconstruction surgery. 3 of the 33 control athletes subsequently sustained ACL injury after leaving college. Mean Tegner score was 6.0 in the ACL injury group and 7.1 in the control group (p = 0.054). Modified Lysholm score was 85.9 in the ACL injury group and 89.9 in the control group (p = 0.25). All component and summary scores of the SF-36 were not significantly different between the groups. In the ACL injury group, 16 patients scored A or B in the subjective portion of the IKDC, 17 patients scored C or D. In the control group, 24 patients scored A or B, 9 patients scored C or D. A chi-squared analysis revealed differences between these two groups to be significant (p=0.04). Self-assessment of current performance level was 77.6% in the ACL injury group and 77.9% in the control group (p = 0.054). Appropriate statistical analysis was used.

Discussion: Quality of life in elite collegiate athletes who sustained an ACL injury was not significantly different from their uninjured teammates. Knee function between these groups was not significantly different with the exception of the subjective portion of the IKDC.

Poster #127
PRIMARY ACL RECONSTRUCTION WITH B-T-B ALLOGRAFT: TWO TO NINE YEAR OUTCOMES AND MRI ASSESSMENTS
Eric C. McCarty, Nashville, TN, USA, Presenter
Airron Richardson, Nashville, USA
Eric C. McCarty, Nashville, TN, USA, Presenter
Thomas L. Wickiewicz, New York, NY, USA
David W Allieck, New York, NY, USA
Jose Stein, New York City, USA
Holly G. Potter, New York, NY, USA
John Thomas, New York, USA
Hospital for Special Surgery, New York, NY, USA

Introduction: Despite widespread use of allograft tissue for ACL reconstruction, there are very few series with long-term follow-up and none with complete MRI follow-up for primary reconstructions.

Methods: Thirty patients underwent a follow-up assessment a minimum of two years (avg. 4.6) after undergoing an ACL recon-
Poster #128
DIFFERENCES BETWEEN BIOABSORBABLE FEMORAL FIXATION AND INTERFERENCE SCREW FIXATION DURING RECONSTRUCTION OF THE ANTERIOR CRUCIATE LIGAMENT
Mladen Miskulin, Zagreb, CROATIA, Presenter
General Hospital “Zabok”, Zabok, CROATIA

The purpose of this paper is to present a study of the differences between two systems for the femoral fixation of the bone-tendon-bone graft (patellar ligament) during ACL reconstruction. Since May 2001, for the femoral graft fixation during procedure of the ACL reconstruction in General Hospital “Zabok”, Croatia, we are using the Mitek RIGIDFix cross pin Bone-Tendon-Bone System. On the other hand, we didn’t stop using a “traditional” interference screw.

To check the difference between two types of the fixation device we formed two groups of patients (experimental and control group) with 30 and more patients in each group. It has to be mentioned that all ACL reconstruction has been performed in day surgery. The hypothesis of the study is that a new fixation device offers better fixation, faster rehabilitation and faster return to the sport activities. During study we are searching for the difference between two groups of patients according to the IKDC Standard Knee evaluation score. We expect to find a statistically significant difference between two methods that will justify employment of the suggested fixation. All procedures were, and still are performed in day surgery with 1 day hospitalization.

Poster #129
BONE TUNNEL CHANGES FOLLOWING ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION FIXED AT THE TIBIAL ANATOMIC POSITION: COMPUTED TOMOGRAPHIC EVALUATION
Akihiko Nagao, Mutsu City, JAPAN, Presenter
Satoshi Toh, Hirosaki, JAPAN
Yasuyuki Isikibashi, Aomori, JAPAN
Koichi Shikimori, Hirosaki, JAPAN

Mutsu General Hospital, Mutsu City, JAPAN

<INTRODUCTION>
The goal of anterior cruciate ligament (ACL) reconstruction is to reestablish normal joint stability and to maintain it with sports activity. Though fixation of the graft should be ideally close to the joint lines as possible, attaining anatomic graft fixation on both the femoral and tibial sides is difficult indeed in any graft. We have done bone grafting to the proximal end of the tibial bone plug in bone-patellar tendon-bone (BPTB) to avoid tibial tunnel enlargement. Fink reported the utility of computed tomography (CT) to detect the bone tunnel enlargement. The purpose of this study was to precisely evaluate with CT scans the tibial tunnel changes following ACL reconstruction with BPTB graft fixed at the tibial anatomic position.

<MATERIALS AND METHODS>
Thirteen consecutive patients who had undergone ACL reconstruction with BPTB were retrospectively reviewed at one year postoperatively. We routinely use the 10mm diameter coring reamer to create the tibial bone tunnel, harvesting a cored cancellous bone plug. We add it to the proximal end of the tibial bone plug to secure the graft closer to the articular surface with interference screws. To evaluate the tibial tunnel changes, CT was performed consecutively. Multidetector-row helical CT (LightSpeed QX/I; GE Yokogawa Medical Systems, Milwaukee, WI, USA) was used of the tibial metaphysis with following the protocol: the section thickness was 5mm and the table speed was 5mm/sec, resulting in a pitch of 1. Secondary sagittal and coronal reconstructed images were obtained. Digital measurement was done at the tibial tunnel aperture (level I), at the mid-point of the tunnel length (level II) and at the proximal end of the bone plug (level III) in both sagittal and coronal planes. To assess the effectiveness of bone graft added to the BPTB, seven other cases who had undergone endoscopic ACL reconstruction without bone graft were reviewed with CT as a control. Statistical analysis was performed using Unpaired t-test (p < .05).

<RESULTS>
The mean tunnel size in CT sagittal plane was 11.7mm at level I, 11.5mm at level II and 10.2mm at level III at 12 months postoperatively. In the control group the average was 11.4mm at level I, 11.1mm at level II and 10.2mm at level III. The mean size in CT coronal plane was 10.3mm at level I, 10.1mm at level II and 9.6mm at level III. In the control group the average was 11.4mm at level I, 10.9mm at level II and 11.4mm at level III. The differences in enlargement between the groups was not significant (p > .05). The tunnel expansion was largest at level I in both sagittal and coronal planes, but it was not significant statistically (p > .05).

<DISCUSSION>
Fink reported that CT was a reliable method to evaluate bone tunnel changes, especially in the early postoperative phase when absence of sclerotic margin on radiographs. He found the expansion was largest at the midpoint of the tunnel and suggested one of the etiology of tunnel enlargement was synovial fluid leakage into the tunnel. On the contrary our results showed that bone-grafting to BPTB would reduce the motion of the graft and avoid the enlargement of the middle of the tibial tunnel. Another explanation could be the fact that cancellous bone-grafting had the advantage of early bony fusion and prevented the inflow of joint fluid to the tunnel. We also believe that bone-grafting increased the stiffness of BPTB biomechanically, and anatomical fixation minimized functional length and maximized the stiffness of the graft. We concluded that less
tunnel enlargement could be detected where the bone graft was placed in a more anatomical position close to the joint line.

Poster #130
THE EFFECT OF TENDON HARVEST ON THE CLINICAL RESULTS AFTER ENDOSCOPIC ACL RECONSTRUCTION: TWO-TENDONS (ST & G) VS ONE-TENDON (ST)
Skiy a Nagasaki, Hakodate, JAPAN, Presenter
Yasumitsu Okoshi, Hakodate, JAPAN
Kazuki Yamamoto, Hakodate, JAPAN
Tomoyuki Kishimoto, Hakodate, JAPAN
Shigeru Yamane, Hakodate, JAPAN
Hakodate Central General Hospital, Hakodate, JAPAN

Purpose: The purpose of this study is to clarify the effect of harvesting of two-tendons (semitendinosus tendon, ST and gracilis tendon, G) on the clinical results after ACL reconstruction compared with harvesting of one-tendon (ST).

Materials and Methods: Between 1995 and 1998, 224 patients underwent one-incision ACL reconstruction. Cases were specified according to the inclusion criteria of this study. As a result, 50 patients who underwent two-tendons harvest (group STG) and 40 patients who underwent one-tendon harvest (group ST) were included in this study. Rosenberg’s procedure was performed in every case. The graft size, the clinical evaluation (IKDC form), the muscle strength (Biodex II), the period for achieving full extension after surgery and active flexion angle were compared between the two groups.

Results: The average diameter of the graft was significantly larger in group ST and length of the grafts was significantly longer in group STG. The average period for achieving full extension after surgery was 11.4 ±12.6 days in group STG and 5 ±4 days in group ST (p<0.05). There were no significant differences between the two groups tested with respect to the overall IKDC rating score. Side to side differences of anterior laxity (KT 1000, manual max.) was 1.8 ±1.8mm in group STG, and 1.87 ±1.4mm in group ST. Loss of active flexion angle was observed more frequently in group STG.

Conclusion: Quicker and better postoperative recovery of ROM and muscle strength was advantages of the one-tendons harvest.

Poster #131
USE OF RADIOFREQUENCY ENERGY TO CONTROL NOTCH REGROWTH IN ACL RECONSTRUCTION
Kazuhiko Nakano, Sapporo, JAPAN, Presenter
Mitsuhito Aski, Sapporo, JAPAN
Kosei Saito, Hakodate, JAPAN
Toshio Yamamura, Sapporo, JAPAN
Seichi Ishii, Sapporo, JAPAN
Nishiooka Daichi Hospital, Sapporo, JAPAN

(Purpose) In anterior cruciate ligament (ACL) reconstruction, notchplasty is occasionally performed to avoid graft impingement against the notch. However, the regrowth of fibrous tissue in the notch (notch regrowth) may take place to cause loss of full extension, or to partially damage the graft. The prevention of this tissue regrowth in the notch is desirable, once the notchplasty is added. The purpose of this study was to investigate the effect of radiofrequency (RF) treatment on the notch regrowth following notchplasty and the surrounding cartilage.

(Methods) Twelve Japanese white rabbits with an average age of 26 weeks were used. The bilateral knee joints were opened following notchplasty and the surrounding cartilage. Therapeutic notchplasty is occasionally performed to avoid graft impingement against the notch. After 2 seconds. The left knee was served as a control without any treatment after surgery. At 12 weeks after surgery, all the animals were sacrificed to observe the state of notch regrowth, the surrounding cartilage and the synovium. The regrowth was classified into the following three grades: grade I, regrowth less than 1/2; grade II, regrowth of more than 1/2; grade III, full regrowth in the notch defect. The data were statistically analyzed with c-square test.

(Result) In the control group, 22% was grade I, 33%, grade II; 45% was grade I; 8%, grade II; 8%, grade III. The two groups were significantly different in notch regrowth with a p-value of < 0.05. In the RF-treated group, the minimum cartilage damage was found in the surrounding area, and only one knee showed effusion and synovitis.

(Discussion) There have been few experimental and clinical reports on the prevention of the notch regrowth following notchplasty. This study has clearly shown that RF treatment is effective on the suppression of the regrowth. Therefore, the thermal treatment is recommendable, once the notchplasty is added in ACL reconstruction.

Poster #132
HOW TO REDUCE PATELLAR TENDON GRAFT HARVESTING MORBIDITY – CADAVEROUS STUDY OF A NEW TECHNIQUE
N. Boux, Lyon, FRANCE, Presenter
Jeanret Laurent, Besancon, FRANCE
Garbkuo Patrick, Besancon, FRANCE
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Service d’Orthopédie Traumatologie Plastique - chu, Besancon, FRANCE

Introduction: To reduce donor-site morbidity, the authors performed a new device and tested a new surgical technique of patellar tendon graft procurement employing one small vertical incision taking care of the paratenon and the infrapatellar nerves. They report the results of 27 bone-patellar tendon-bone autograft harvesting on fresh frozen cadaver.

Material and Method: Conception, realization and optimization of an instrument and its surgical technique was preliminary performed on several dissections. The instrument and the technique were then evaluated on a consecutive series of 27 fresh frozen cadaver knees. Harvesting procedure last, graft and incision size were measured. Infrapatellar nerve or its branches, and paratenon were examined for injury. Harvesting problems were analyzed.

Results: Time of harvesting procedure was 15 minutes (9-22). Incision length measured 29 millimeters (24-33). Infrapatellar nerve or its branches were undamaged in 21/27 graft procurements. It was partially damaged above the apex of the patella in 5 graft procurements. Paratenon was safe in 23/27 harvesting procedures. Harvesting complications were:
- Rupture of traction suture: 3/27
- Tibial bone block fracture without discontinuity: 2/27
- Distal patellar ligament insertion avulsion: 3/27

Discussion - Conclusion:
Patellar tendon autograft is a commonly used graft for anterior cruciate ligament reconstruction. However, persistent donor-site complications such as unsightly scar, tenderness, disturbance in anterior knee sensitivity are still a problem.

The principal finding in this study was that it was possible to harvest a consistent bone-patellar tendon-bone graft through 30 mm vertical incision using a new instrument. This technique gives cosmetic and probably functional benefit, leaving the infrapatellar nerve or its branches intact and the paratenon closed in most of the specimens. However, this technique can have complications. Surgical progress and computer assisted surgery should lower the risks. A prospective clinical study is started.

Poster #133
ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION IN COMPETITIVE SOCCER PLAYERS
Hiroaki Nase, Kawaguchi, JAPAN, Presenter
Sadas Niga, Kawaguchi, JAPAN
Akiho Hishino, Saijima, JAPAN
Kawaguchi Kogyo General Hospital, Kawaguchi, JAPAN

Purpose: In ACL reconstruction, the bone-patellar tendon-bone (BTB) and the semitendinosus and gracilis (STG) are used for the grafts. In this study, for competitive soccer players, we compared BTB with STG concerning the time to return to the game.

Materials: 59 competitive soccer players who underwent surgical reconstruction of ACL with BTB or STG from 1992 to 2000 were followed up over one year (21 BTB, 38 STG). In the patients reconstructed with BTB, there were 18 males and 3 females with an average age of 19.8 years at the time of surgery. In the patients reconstructed with STG, there were 29 males and 9 females with an average age of 21.7 years at the time.

Methods: The postoperative period until jogging and competitive level were assessed. Also, overall percentage for returning to competitive level players were noted. Knee extensor muscle strength, anterior knee pain and anterior laxity (KT-1000 arthrometer) were evaluated.

Results: All 21 cases with BTB and 33 cases (87%) with STG returned to the game. There was no difference between BTB and STG in the time to restart jogging (4.2+/-1.9 months in BTB, 4.2+/-1.8 months in STG). It took more time to return to the game in BTB than in STG (10.6+/-3.8 months versus 8.3+/-3.8 months). There was no difference concerning knee extensor muscle strength. Anterior knee pain was more frequent in BTB (33% in BTB versus 15% in STG) and patients with anterior knee pain needed more time to return to the game. There was no difference in KT-1000 arthrometer.

Discussion: There was no difference between BTB and STG in knee extensor muscle strength. However, BTB group had more anterior knee pain and took more time to return to the game. It may be considered that anterior knee pain affected the return to the game.

Poster #134
GLUTEUS MAXIMUS PROVIDES A GREATER CONTRIBUTION TO DYNAMIC FRONTAL AND TRANSVERSE PLANE KNEE CONTROL AMONG FEMALES WITH INCREASED FEMORAL ANTEVERSION
John Nyland, Louisville, KY, USA, Presenter
David N.M. Caborn, Louisville, KY, USA
University of Louisville, Louisville, Kentucky, USA

Purpose: Females are at particular risk for sustaining non-contact ACL injury, particularly during jump landings, and sudden deceleration during running directional changes. Frontal and transverse plane femoral control through the hip joint is essential to the prevention of ACL injury. The muscles of the pelvic deltoid (tensor fascia lata, gluteus medius and gluteus maximus) provide dynamic three-dimensional control of the femur. This study evaluated the influence of femoral anteversion on pelvic deltoid muscle EMG amplitudes during the performance of a non-weight bearing combined hip abduction-external rotation movement.

Materials and Methods: Twenty-one nonimpaired, athletic female college students (age = 20.5+/- 2.4 yrs, height = 161 +/- 8.6 cm, weight = 60 3 +/- 11 kg) participated in this study. The hip anteversion angle of the preferred jump landing leg was estimated by measuring passive medial hip rotation with a handheld goniometer with subjects positioned prone on a plinth. Bipolar surface electrodes were placed over the tensor fascia lata, gluteus medius, and gluteus maximus muscles and a ground electrode was placed over the superior iliac spine of the opposite lower extremity. Subjects were positioned in side lying with bilateral hips and knees flexed 45 deg and 90 deg, respectively, and the preferred jump landing leg placed superiorly. A padded 10.2 cm wide non-extendable belt was applied distally around the thighs. Following practice, subjects performed maximal volitional effort isometric hip abduction-external rotation against the belt. A 30 sec rest interval was provided between each of 6 total repetitions. EMG signal amplitudes were analyzed with a peak averaging function (Norquest 96 version 4.03, Noraxon, Scottsdale, AZ) and compared between subject groups based on hip anteversion angle (group 1 < 42 deg, n = 11 or group 2 > 42 deg, n = 10). Pearson product moment correlations were used to delineate the individual contributions of tensor fascia lata, gluteus medius and gluteus maximus muscle activity to average pelvic deltoid muscle group function.

Results: Mean medial hip rotation was 34.7 +/- 6 deg and 51.2 +/- 7 deg for group 1 and group 2, respectively. Group 1 displayed greater gluteus medius muscle activation amplitude (686 +/- 452 mV vs. 370 +/- 212 mV, p < 0.0001) and average pelvic deltoid muscle activation (707 +/- 215 mV vs. 602 +/- 246 mV, p = 0.01) than group 2. Significant differences were not observed between group 1 and group 2 for gluteus maximus (600 +/- 226 mV vs. 644 +/- 331 mV), or tensor fascia lata (836 +/- 358 mV vs. 791 +/- 424 mV) muscle activation amplitudes (p > 0.05). Group 1 displayed a strong relationship between average pelvic deltoid and gluteus medius (r = 0.85) and tensor fascia lata (r = 0.82) muscle activation amplitudes, but an insignificant relationship between average pelvic deltoid and gluteus maximus (r = 0.15) muscle activation amplitudes. Group 2 subjects displayed strong relationships between average pelvic deltoid and gluteus maximus (r = 0.80) and tensor fascia lata (r = 0.83) muscle activation amplitudes, and a fair relationship between average pelvic deltoid and gluteus maximus muscle activation amplitude (r = 0.61).

Conclusions and Significance: Subjects with increased femoral anteversion displayed EMG muscle activation amplitude relationships that suggested a greater use of the gluteus maximus muscle for frontal and transverse plane control of the femur through the hip joint. Athletically active subjects with this posture may particularly benefit from a knee injury prevention program that focuses on gluteus maximus muscle training for three-dimensional long axis control of the femur through the hip joint.
We analyzed the relationship between knee stability and arthroscopic findings, MRI of reconstructed ACL using autogenous hamstring tendons. 27 patients (16 male, 11 female; mean age 26) were included in this study and evaluated clinical stability (KT-2000 arthrometer side to side difference measuring), arthroscopic findings and MRI at mean 22 months postoperatively. KT-2000 difference were 22 normal, 4 nearly normal and 1 abnormal according to IKDC classification. Arthroscopic findings were 13 excellent, 10 good and 4 fair according to modified Sakai classification. MRI were 13 well-defined, 11 intermediate and 3 indiscernible according to Rak classification. The cases of arthroscopic findings excellent and MRI well-defined tended to small at KT-2000 difference. There were cases which didn’t correlated with arthroscopic findings and MRI. Our results showed that the cases assessed good at arthroscopic findings and MRI restored A-P translation of reconstructed ACL using autogenous hamstring tendons, but MRI more contributed the knee stability than arthroscopic findings.

Background: Anterior cruciate ligament (ACL) rupture in the juvenile athlete poses a management dilemma. Recent evidence has suggested that non-operative treatment in this group results in high rates of symptomatic giving way, meniscal damage and the specter of premature osteoarthrosis. A variety surgical reconstruction methods have been described to address this problem without adversely affecting remaining growth.

Method: From 1995-2001, twenty-two skeletally immature athletes less than 16 years of age (17 male, 5 female; average age 14 yrs 8 mths, range 11-15 yrs) with wide open epiphyses have undergone anterior cruciate ligament reconstruction by a single surgeon using an anatomical, trans-epiphyseal, four-strand hamstring graft technique. Graft fixation was achieved distant to the epiphyses.

Results: The average delay from injury to surgery was 10.4 mths (range 1 - 42 mths). Initial surgery revealed 13 meniscal injuries (14%) re-ruptured their grafts at 11-19 months in new injuries, treated by debridement and removal of the tibial screw. There were complications included two low-grade, tibial wound infections atracted attention in many studies because of their possible stabilizing effect on the tibia. The first aim of this study was to investigate if the torque of QUADS and HAMS can be a discriminating factor between patients who adapt well to the problem and the non-adapters. The second aim was to investigate how the dynamic profile of the thigh muscles evolves with time since injury.

Poster #137
SHORT AND LONG TERM ACL DEFICIENCY: THE ROLE OF HAMSTRINGS

Elias Tsipis, Ioannina, GREECE
George Vagenas, Athens, GREECE
Giannis Giakas, Ioannina, GREECE
Christos Papagiorgiou, Ioannina, GREECE, Presenter
Anastasios Georgoulis, Ioannina, GREECE
University of Ioannina, Ioannina, GREECE

Introduction
ACL rupture leads to a mechanical deficit that may be compensated through functional and proprioceptive adaptations. The force deficit of the thigh muscles as a consequence of the ACL rupture is well established. Although the quadriceps (QUADS) suffer the greatest deficit, the hamstrings (HAMS) have attracted attention in many studies because of their possible stabilizing effect on the tibia. The first aim of this study was to investigate if the torque of QUADS and HAMS can be a discriminating factor between patients who adapt well to the problem and the non-adapters. The second aim was to investigate how the dynamic profile of the thigh muscles evolves with time since injury.

Methods
A homogenous group of twenty-eight physically active men (soccer players) with unilateral ACL deficiency and twelve healthy controls were examined on a Biodex isokinetic dynamometer. Knee laxity was measured with the KT-1000, knee function was assessed with the Lysholm questionnaire and the level of activity was estimated with the Tegner scale. The patients were split into three groups according to the chronicity of the injury: short term group (T1), the intermediate group (T2) and the long term group (T3). The time after the ACL injury was about 3, 9 and 62 months for the three groups respectively. The Lysholm score was used to discriminate the patients who adapted well (group F1, 86 ± 2 mean score) from the poorly adapted ones (group F2, 62 ± 4 mean score). A one-way Anova was used to examine differences between short term, intermediate and long term groups and an independent t-test to compare the groups of the different Lysholm scores. Differences were tested at a 95% level of significance.

Results and Discussion
The subgroups formed to test the hypotheses were similar in age, weight and height as well as knee laxity. In the control group there was no significant asymmetry, either between left and right or between dominant and non-dominant side. The long-term group was significantly better than the T1 group in peak torque production (p<0.05). It is remarkable that especially for the hamstrings the asymmetry between the two legs vanished in the long-term group (-0.07% vs 17.7%). Regarding the level of knee function, the only parameter which was significantly different between groups F1 and F2 was the hamstring peak torque (p<0.05). There was a minimal deficit in peak torque production during active knee flexion in the compensators (-2.3%), while in the non-compensators the injured side was 16.6% weaker. According to our findings the hamstrings muscle group is very important for the stability of the ACL deficient knee. The compensators tend to balance the injured leg with the healthy leg regarding the HAMS while the QUADS of
the injured leg remained weaker than the healthy leg. It is possible that this enhanced capacity of the HAMS provides adequate stabilization of the tibia while the QUADS are not as important for this role. Additionally, the improved function of these muscles might have been evident from the start in certain patients and these are the ones who are more competent of using their knee in a more satisfactory way. The symmetry in HAMS performance is also a characteristic of the long-term deficient patients. Again, the enhanced ability the hamstrings might have been the reason why these patients did not seek ACL reconstruction. Based on these results, it is prudent to assume that poor performance of the hamstrings in the ACL deficient knee is a contributing factor to the demand and decision for ACL reconstruction. On the other hand, intensive exercise of the hamstrings must be an issue to focus on, during either on ACL deficiency or after ACL reconstruction.

Poster #138
THE EFFECT OF ACL RECONSTRUCTION OF THE INTERNAL-EXTERNAL ROTATION OF THE KNEE JOINT
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Eleftheria Siavara, Ioannina, GREECE
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University of Ioannina, Ioannina, GREECE

Introduction
The success of ACL reconstruction is widely evaluated with arthrometers (i.e., KT-1000). However, such an evaluation is actually a measure of joint laxity and not a measure of dynamic joint stability during an activity. Thus, it is possible that the differences observed in gait biomechanics between individuals with ACL reconstructions and healthy controls are the result of differences in dynamic knee stability. Previous in-vitro studies showed that the ACL reconstructed knee still has a wider range of internal-external rotation compared to the intact knee. The purpose of this study was to examine the internal-external rotation range of movement in vivo in a high demanding activity. In order to simulate this condition we selected the descending steps-and-turn movement. We hypothesised that the reconstructed knee will have greater internal-external rotation than the healthy knee.

Methods
Ten patients (mean age 23 years; mean mass 73 Kgr) with ACL reconstruction participated in this study. The period between the time of the reconstruction and the examination was ranged between 6 to 40 months. Knee joint laxity was tested wit ha KT-2000 in all patients and side to side differences were less than 3 mm. The Lysholm score for all patients was higher than 85. At the time of the reconstruction patients and these are the ones who are more competent of using their knee in a more satisfactory way. The symmetry in HAMS performance is also a characteristic of the long-term deficient patients. Again, the enhanced ability the hamstrings might have been the reason why these patients did not seek ACL reconstruction. Based on these results, it is prudent to assume that poor performance of the hamstrings in the ACL deficient knee is a contributing factor to the demand and decision for ACL reconstruction. On the other hand, intensive exercise of the hamstrings must be an issue to focus on, during either on ACL deficiency or after ACL reconstruction.

Results and Discussion
The reconstructed knee had a greater internal-external rotation than the healthy side (p<0.04) confirming our hypothesis. This finding is in agreement with in-vitro studies and indicates that ACL reconstruction may not fully restore normal movement especially during loading and extreme rotation conditions. Future research needs to be undertaken on ACL reconstruction not only to prevent anterior translation of the tibial but also to prevent excessive internal-external rotation.

Poster #139
ACL RECONSTRUCTION WITH PATELLAR TENDON. THE EFFECT OF USING A GRAFT WITHOUT A PATELLAR BONE PLUG
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Brita Schmidt, Greifswald, GERMANY
Niels Follak, Greifswald, GERMANY
Harry Merk, Greifswald, GERMANY
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PURPOSE: To determine the effect of taking a patellar tendon graft for ACL reconstruction without harvesting a patellar bone plug postoperatively patellar problems.

METHOD: Fifty patients with a traumatic rupture of the anterior cruciate ligament (ACL) underwent an arthroscopically assisted reconstruction. We performed this ACL reconstruction in two different techniques with 25 patients each group: I transtibial technique with a bone patellar tendon bone graft (BPTB) and II all-inside technique with bone patellar tendon graft without a patellar bone plug (BPT). A standard rehabilitation program was used for all patients after surgery. The patients were evaluated 3, 6 and 12 month postoperatively measuring subjective complaints (pain!), range of motion and patellofemoral crepitation. Additionally we performed the one leg hop test. The results were assessed in connection with the IKDC.

RESULTS: The results of both groups differ especially in patellar pain. With the IKDC score for pain the results were graded normal in only 30% in group I and 50% in group II three month postoperatively and 60% group I and 70% group II one year postoperatively. There was a similar situation for the range of motion of the operated knee three and six month postoperatively. After one year there was no difference in ROM between the BPTB and BTP group. The patellofemoral crepitation was always less in group II. Also was the one leg hop test better in the group using a graft without a patellar bone plug.

CONCLUSION: Patellar problems like pain and crepitation are known after ACL reconstruction with BPTB grafts. They are less using Hamstrings. This study showed that there is an other possibility to reduce patellar problems. The use of patellar tendon grafts without a patellar bone plug decreases the patella associated problems but it needs of course a reconstruction technique which doesn’t afford a second bone plug.

SIGNIFICANCE: ACL reconstruction with patellar tendon grafts may cause patellar problems postoperatively. Considerations on decreasing these problems should be done.

Poster #140
DONOR SITE PROBLEMS AFTER ACL BTB AUTOGRAFT RECONSTRUCTION: LONG TERM RESULTS

• The FDA has not cleared the drug and/or medical device for the use described in this presentation (i.e., the drug or medical device is being discussed for an “off-label” use).
Objective: to analyse the influence of donor site problems to sports and normal life activity 5 - 6 years after ACL BTB autograft reconstruction.

Materials and methods: Between 1996 and 1997 54 patients (9 female, 45 male, mean age 25.4 years) with chronic instability (3-216 months) underwent arthroscopic ACL BTB autograft reconstruction from central part of patellar tendon harvesting with longitudinal skin incision. 21 of 54 patients had associated intraarticular injuries. Clinical results were evaluated by means of the Tegner activity scale, Lysholme score, IKDC form, kneeling ability, disturbance of donor site sensitivity and patients subjective assessment of donor site morbidity to their sports and normal life activity. To compare objective and subjective donor site problems, patients were divided: Group A (18 patients): with normal kneeling and normal sensitivity, Group B (9): with normal kneeling, abnormal sensitivity, Group C (8): with unpleasant kneeling, normal sensitivity, Group D (19): with unpleasant kneeling, abnormal sensitivity.

Results: 88.9% (48/54) of patients returned to their preinjury sports activity level (Tegner activity scale 4 - 10), Lysholme score was 92 (78 - 100), using IKDC score 66.1% were as normal, 31.5% - as nearly normal, 5.5% - as abnormal and 1.9% - as severely abnormal. 51.9% (28/54) of patients were with donor site sensitivity problems (loss of sensitivity 6.6 - 106.5 cm²) and 50% (27/54) - with kneeling problems. Patients in Group A nd B did not have any problems from donor site to returning to sports and normal life activity. In Group C 50% of patients had no significant problems in their sports activities, 37.5% - in normal life activity and 12.5% - significant problem in normal life activity. In Group D: 31.6% of patients were found donor site problem as none significant, 5.3% - as significant to their sports activity and 42.1% - as none significant, 5.3% as significant to their normal life activity.

Conclusion: In long term results abnormality of kneeling and disturbance of donor site sensitivity were correlated with patients subjective assessment, making more problems in normal life, but did not affect significantly their returning to previous sports activity level.

METHODS: The healing response procedure was performed on 198 patients, average age 50 years (range 40 to 74 yrs), between 1991 and 1998. Average time from injury to surgery was 13 days (range 1 to 42 days). Complete mid-substance ACL tears were excluded. Healing response was performed only on complete proximal one-third ACL tears. Six to ten microfracture holes were made into the cortical bone at the origin of the disrupted ligament, and multiple perforations were made into the ligament itself. No other ligament fixation was used. Postoperative rehabilitation was similar to that used following ACL reconstruction.

RESULTS: Five patients (2.5%) re-injured their involved ACL and underwent full ACL reconstruction. Two patients died of unrelated causes. Of the remaining 191 patients, 169 (88%) had a minimum 2-year subjective follow-up. Average follow-up was 41 months (range 24 to 116 months) after the healing response procedure. At the most recent follow-up, 155 patients (92%) experienced no or minimal pain, 165 (98%) had no or minimal swelling, and 161 (95%) had no giving way. Average Lysholm scores improved from 63 to 94. ADL scores improved from 4 to 8.7 (10=normal function). One hundred fifty-nine patients (94%) considered their knee function to be normal or nearly normal using IKDC criteria. Average patient satisfaction at final follow-up was 9.1 (1-10 scale). Clinical examinations were performed at 2 or more years post-healing response on 122 of 191 patients (64%). Average clinical follow-up was done at 45 months (range 24 to 116 months). The clinical examinations revealed that 85 patients (70%) had a negative pivot shift, 30 (25%) had a 1+ and 7 (5%) had a 2+. KT-1000 MMD testing improved from an average of 5.0mm preoperatively to 1.9mm postoperatively, a mean difference of 3.1mm (p<0.05).

CONCLUSIONS: We believe that the surgically induced marrow clot that results from the healing response procedure supports progressive development of healing tissue at the site of the ligament injury. The marrow clot appears to provide an enriched milieu conducive to ligament healing. The healing response technique restored stability and knee function in patients over age 40 years with torn proximal ACLs. These data show that the healing response technique is an effective alternative to restore structural integrity to the proximally torn ACL.

Poster #142
ANTEROMEDIAL VS. TRANSTIBIAL FEMORAL TUNNEL PLACEMENT IN ACL RECONSTRUCTION. AN IN VIVO STUDY.
Julian Rossis, Heidelberg, GERMANY, Presenter
Hans H Paessler, Heidelberg, GERMANY
Alos Clinic, Centre for Knee Surgery, Foot Surgery, Heidelberg, GERMANY

Introduction: The proper graft placement during ACL reconstruction is essential for achieving successful results. It is widely accepted that an ACL graft should be positioned at the original anatomic position at 10 resp. 2 o’clock. The purpose of this study was to evaluate whether a guiding pin for a femoral tunnel could be positioned through the tibial tunnel into the center of the anatomical ACL attachment.

Methods: We studied 77 knees (36 left and 41 right, 44 male and 33 female, mean age 34.8 ±11.1) who underwent arthroscopic ACL reconstruction with hamstrings. Femoral tunnel was drilled through an antero-medial portal at the center of the anatomic insertion at about 10 resp. 2 o’clock position at 125 degrees of flexion under fluoroscopic control. The tibial tunnel (mean diameter 7.55±0.54 mm) was drilled using a guide inserted at 90 degree of knee flexion. The position of the guide
was documented with AP and lateral radiographs in full extension. Mean inclination angle of the tibial tunnel in the coronal plane was 27.53±3.13° and in the sagittal plane 25.84±3.19°. Then, through the tibial tunnel, a 4mm offset femoral drill guide was positioned as close as possible to the femoral tunnel and a 2.5 mm guide wire was drilled. The position of the guide wire was photographed arthroscopically in each knee with the scope in the anteromedial porta. After scanning and correction for magnification the deviation was measured as distance between the center of the femoral tunnel and guide wire in each knee using a Scion Image Software. For statistical analyses the t-test (significance p<0.05) was used.

Results: The mean deviation between the center of the femoral tunnel and the transtibial guiding pin was 4.50±1.54 mm. This was statistical highly significant (p=0.00000004). In 74 knees (96.1 %) the guidewire did not reach the femoral tunnel. Only in 3 knees it reached the superomedial edge of the femoral tunnel. In the coronal plane, for inclination tibial tunnel angles 22°-26° the mean deviation was 4.8±1.4mm, while for angles 27°-32° was 4.1±1.7mm. In the sagittal plane, for inclination tibial tunnel angles 22°-26° the mean deviation was 4.39±1.6 mm while for angles 27°-32° was 4.52±1.2mm. These differences in both planes were not statistically significant (p=0.3 and p=0.7 resp.) When tibial tunnel diameter of 7.0 or 7.5mm were used, the mean deviation was 4.64±1.5mm. For tibial tunnel diameter of 8.0 or 8.5 mm the mean deviation was 4.01±1.6 mm. This difference was not statistically significant (p = 0.4).

Conclusion: This study shows that transtibial femoral tunnel drilling does not reach the anatomic side of the ACL insertion, even with larger tibial tunnels (for hamstring grafts up to 8.5 mm) and confirms the results of a recent cadaveric study by Arnold et al. This may explain why in many studies comparing tunnel drilling should be replaced by drilling through the tunnels with diameters < 9 mm.

Conclusions: The ACL reconstruction using quadruple semitendinosus and bioabsorbable screws fixation provided satisfactory result with minimal donor site morbidity but caused some tissue reaction.

Poster #143
ARTHROSCOPIC ACL RECONSTRUCTION UTILIZING A QUADRUPLE SEMITENDINOSUS AND BIOABSORBABLE SCREWS: EARLY RESULT
Suriyajpong Saowaprut, Bangkok, THAILAND, Presenter
Wichan Kanchanatawan, Bangkok, THAILAND
Charles Sumetavanich, Bangkok, THAILAND
Institute of Orthopaedics, Bangkok, THAILAND

Purpose: To evaluate the early result [minimum 2 years] of anterior cruciate ligament reconstruction using quadruple semitendinosus and fixation with bioabsorbable screws.

Type of Study. Case series.

Methods: 154 primary ACL reconstruction with quadruple semitendinosus and fixation with bioabsorbable screws [polyglycolic] without association with other ligament injury were evaluate of minimum 2 years follow-up. All patients underwent the same postoperative rehabilitation protocol.

Results: 95% of the meniscal intact group showed anterior laxity differences of 3 mm or less [KT-2000]. Tegner scale was maintained at the pre injury level in 70%. IKDC grading form showed 89% in normal and near normal group. 2 patients had screw reaction and had drainage through skin without intra-articular reaction.
Unilateral ACL reconstruction using an autologous Achilles tendon graft and rigid button fixation was performed in the right knees of 12 of 18 Merino sheep. (Gruppe 2: Durchmesser Transplantat = Tunnel (5 mm); Gruppe 3: Transplantat = 3 mm, Tunnel = 5 mm). In the remaining 6 animals the original ACL was resected (group 1). All animals were euthanized after 6 months. Both knees were marked using 9 Tantalum beads. RSA was performed using a calibration cage in 30° of knee flexion before and after manual maximum AP translation. The amount of degenerative chondral lesions were macroscopically assessed and quantified on the distal femur and proximal tibia of both knees.

Results:
Macroscopic evaluation revealed intact ACL grafts in all animals. The amount of chondral lesions were 90.7 (+/- 66.7) mm in group 1; 116.3 (+/- 35.4) mm in group 2 and 161.8 (+/- 68.4) mm in group 3. RSA allowed for a highly precise measurement of AP knee laxity: mean side-to-side differences: 1.3 (+/- 0.8) mm in group 1; 1.0 (+/- 0.8) mm in group 2 and 2.0 (+/- 0.5) mm in group 3. There was a positive correlation between AP-laxity and the amount of chondral lesions (correlation coefficient r = 0.6 in group 1 and 0.7 in groups 2 and 3). In those animals with a mean side-to-side difference of less than 1 mm (N = 6) the amount of chondral lesions was 76.7 (+/- 50.8) mm. In animals with a mean side-to-side difference of more than 1 mm (N = 12) the surface of the chondral lesions was 156.3 (+/- 65.9) mm (p<0.05).

Conclusions:
1. RSA allowed for highly precise measurements of AP knee laxity.
2. There was a positive correlation between the amount of chondral lesions and AP knee laxity
3. The data indicate that the goal of ACL surgery should be to minimize AP laxity in order to prevent secondary osteoarthritic changes in the long-term.

Poster #146
THE INFLUENCE OF GRAFT-TUNNEL MOTION AND INITIAL SYNOVIAL FLUID LEAKAGE INTO THE TIBIAL TUNNEL ON TIBIAL TUNNEL ENLARGEMENT AFTER ACL REPLACEMENT.
Romain Sel, Homburg/Saar, GERMANY, Presenter
Diethard Papke, Homburg/Saar, GERMANY
Frank Adam, Homburg/Saar, GERMANY
Dirk M. Kohn, Homburg/Saar, GERMANY
Dept. of Orthopaedic Surgery, University of Saarland, Homburg/Saar, GERMANY

Objective:
To determine the effect of graft-tunnel motion and synovial fluid leakage into the tibial tunnel on tibial tunnel enlargement after ACL replacement using Achilles tendon autografts in a sheep model.

Methods:
Unilateral ACL reconstruction using an autologous Achilles tendon graft and rigid button fixation was performed in 12 four-months-old Merino sheep. In group 1 (N=6) a double stranded graft with a diameter of 5 mm was used. In group 2 (N=6) a single-stranded graft with a diameter of 3 mm was used. All grafts were tensioned at 40 N. In both groups the bone tunnel diameter was 5 mm. For RSA measurements tantalum beads were inserted in the grafts, the femur and the tibia. Conventional postoperative arthrography was performed to analyze fluid leakage from the joint into the tibial tunnel. Graft-tunnel micromotions were evaluated at 3, 6, 12 and 24 weeks using RSA. Six months after the procedure, the animals were euthanized. Knee laxity measurements were performed using RSA stress x-rays. MRI was used to analyze changes in tibial tunnel volume.

Results:
Postoperative radiography revealed fluid leakage from the joint into the tibial tunnel only in group 2. Macroscopic evaluation revealed stable grafts and no abnormal graft positioning. The initial volume of the tibial tunnel was 412 mm³ in all animals. After 6 months it was significantly higher in group 1 (841 (+/- 206) mm³ vs. 597 (+/- 124) mm³ in group 2 (p<0.05). Significant differences in tunnel diameter were found until a depth of 9 mm from the articular surface. RSA revealed decreasing graft-tunnel micromotions over time (0-3 weeks: 1.57 mm; 3-6 weeks: 1.05 mm; 6-12 weeks: 0.85 mm; 12-24 weeks: 0.78 mm). Graft-tunnel motions were higher in group 2 during the first 6 weeks after surgery. There was no correlation between tunnel volume and AP knee laxity (correlation coefficient r=-0.2).

Conclusions:
Our data showed that synovial fluid leakage from the joint into the tibial tunnel does not seem to be the major determinant of tibial tunnel enlargement after ACL replacement. The initially higher graft-tunnel motion and the smaller amount of increase in tunnel volume in group 2 indicate that biomechanical factors might be the main cause of tunnel widening.

Poster #147
LOCKED KNEE MASKING EXAM OF ANTERIOR CRUCIATE LIGAMENT
Ronald M Selby, New York, NY, USA, Presenter
Brian C. Halpert, New York, NY, USA
Steve Weintraub, Marlboro, NJ, USA
Robert Wood Johnson University Hospital, New Brunswick, NJ, USA

This is a case report of an entity felt by the authors to be useful to keep in mind as an examination “pearl.” Essentially this young, athletic patient presented a few months after an episode of repelling while mountain climbing. He had felt his knee shift and “pop” and detected swelling. He was unable to fully extend his knee following that event. Physical examination was, of course, affected by this. Excursion and endpoint were both notably affected on Lachman examination. The MRI showed a bucket-handle meniscus tear but was unclear regarding the anterior cruciate ligament. A high index of suspicion from the history was helpful in this case. As a rule a torn ACL should not be excluded with a locked knee even when not evident on an MRI.

Poster #148
NOTCHPLASTY: DESCRIPTION OF TECHNIQUE
Ronald M Selby, New York, NY, USA, Presenter
Stephen O’Brien, New York, NY, USA
The Hospital for Special Surgery, New York, NY, USA

Lateral notchplasty is a commonly performed step in anterior cruciate ligament reconstruction. In this paper we describe a systematic and reproducible technique for performing a notchplasty that allows satisfactory visualization in the crucial posterior aspect of the intercondylar notch, resection to avoid impingement either laterally or on the roof, and effectively aid in positioning the femoral insertion of the graft.

Poster #149
THE CASE FOR ACUTE ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION
Christopher Terence Servant, Bath, UNITED KINGDOM, Presenter
Neil Bradbury, Bath, UK
Our aim was to determine whether acute ACL reconstruction (performed within 3 weeks of injury) is associated with an increased risk of knee stiffness due to arthrofibrosis, when compared with chronic reconstruction (performed more than 8 weeks after injury).

METHODS
We performed a prospective study of 114 patients who underwent a patellar tendon ACL reconstruction and who returned for formal independent assessment at an average of 7 months post-operatively. 62 patients underwent acute reconstruction and 52 patients underwent chronic reconstruction. All patients were operated on by a single surgeon using a standardised arthroscopic technique and accelerated rehabilitation programme.

RESULTS
There was no significant difference in the incidence of arthrofibrosis between the acute and chronic groups. Flexion of less than 125° or a loss of extension of more than 10° occurred in 8 (12.9%) of the acute group and in 9 (17.3%) of the chronic group. All knees were clinically stable, but the mean KT1000 difference was 1.21mm in the acute group and 1.89mm in the chronic group (p<0.05). There were also significantly more meniscal injuries (65% versus 31%) and chondral lesions (31% versus 18%) in the chronic group. There were no significant differences in muscle strength or functional scores between the two groups.

CONCLUSION
Acute ACL reconstruction is not associated with an increased risk of arthrofibrosis. However, it is associated with increased stability and less meniscal and chondral pathology. This study suggests that the optimum time for ACL reconstruction is within the first 3 weeks after injury.
Introduction: The purpose of this study was to analyze sagittal obliquity and divergence angle of reconstructed anterior cruciate ligament (ACL) using magnetic resonance (MR) scans.

Materials and Methods: ACL reconstruction through use of hamstring tendons and endobutton technique were performed and MR images were taken 2 weeks and 6, 12, 18, 24 months following surgery on 12 knees (7 male, 5 female, average age 21.3). ACL tibia plateau (ACLTP) angle, ACL divergence (ACLDV) angle at femoral tunnel and long axis of femorotibial (FT) angle were measured on sagittal images. Twenty normal ACL (10 male, 10 female, average age 23.7) were also analyzed as normal control.

Results: ACLTP angle of reconstructed ACL at 2 weeks (58.5 degrees) was significantly larger than normal ACL angle (47.7 degrees, p<0.05). ACLTP angle increase, observed between 6 and 12 months, was greater than 5 degrees in 3 cases (25.0%) and less than 5 degrees in 9 cases (75.0%). ACLDV angle was also observed to increase during this period. Anterior laxity side-to-side difference (KT-2000) was 2.7 mm in the angle-increased group and 1.3 mm in the non-increased group with no significant difference.

Conclusions: Although tibial and femoral tunnels were created at the ideal place, ACLTP angle was larger than normal ACL. Full return of patient's ADL was observed between 6 and 12 months, with concurrent increase of ACLTP angle. Anterior laxity was observed to increase during this period. Anterior laxity side-to-side difference (KT-2000) was 2.7 mm in the angle-increased group and 1.3 mm in the non-increased group with no significant difference.

CONCLUSIONS: We hypothesize the reduced frequency of IA injuries observed at high school level in females in soccer (MM) and basketball could lead to better long-term functional outcomes after ACL reconstruction given equal stability. Long-term evaluation for activity level, function, and arthritis is currently being evaluated. Since there are significant differences in articular cartilage injuries and meniscus tears, further detailed investigation into mechanism of injury, anatomic knee differences, and anthropometric measurements is needed.
whip stitch fashion between the two cerclage sutures to tightly unite the four strands of tendon graft and provide a possibly improved interface for the interference screw. The tendon grafts were fixed in individually sized bone tunnels with 28 mm bioresorbable screws with a diameter that matched the graft size. The looped end of the graft and the attached tibia were fixed in a materials testing machine and pre-conditioned with 10 cycles of 5-20 N. This was followed by 100 cycles of 20-250 N, followed by pullout to failure. Tendon motion in relation to the bone was measured with an infrared motion analysis system during cycling.

Results
Ultimate fixation strength for the grafts without the interlocking sutures averaged 597 N (range 476 - 697 N); grafts with the sutures averaged 1023 N (range 870 - 1176 N); the average increase in strength was 436 N. Ultimate stiffness in the non-suture group was 250 N/mm and in the suture group 305 N/mm. Total graft motion during cyclic loading averaged 5.4 mm in the non-suture group, and 3.2 mm in the suture group.

Summary
Uniform suturing of human quadrupled hamstring grafts prior to interference fixation improved the ultimate graft fixation strength. Uniform suturing also decreased graft motion relative to the bone tunnel during cycling at force levels assumed to be similar to those encountered by the tendon graft construct in vivo during activities of daily living. These results suggest that uniform suture preparation of the tendon graft may increase fixation strength of the graft during cruciate ligament reconstruction, and contribute to a successful clinical outcome.

Poster #156
BILATERAL ANTERIOR CRUCIATE LIGAMENT (ACL) RECONSTRUCTION WITH AUTOLOGUS PATELLAR TENDON 1 TO 9 YEARS FOLLOW UP
Edison Swansee Thiele, Curiitiba, BRAZIL, Presenter
Alvaro Chamecki, Curiitiba, BRAZIL
Emerson K. Zanoni, Curiitiba, BRAZIL
Marilo Cesar Santos, Curiitiba Parana, BRAZIL
Henrique Carvalho, Curiitiba, BRAZIL
Clinica do Joelho, Curiitiba, BRAZIL

The ACL lesion is an incapacitating lesion for the sports active person, and its incidence is increasing with more people everyday participating in sports. Between 1990 and 1999, 905 ACL lesions were operated in our clinic, and in the same period 28 patients with bilateral ACL lesion were diagnosed. 18 patients were operated on both knees (not simultaneously), and 15 of them (30 knees) were reviewed in this retrospective study. These knees were analyzed subjectively according to a modified Cincinnati knee scoring questionnaire. For objective evaluation we evaluated the mobility, swelling, Lachmann test, anterior drawer in neutral rotation, pivot shift test and degenerative changes. We concluded that our incidence is lower than the American literature, and despite the surgical technique, the result was better in patients with less time between the lesion and the reconstruction.

Poster #157
EVALUATION OF THE RETURN TO SPORTS AFTER BILATERAL ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION
Edison Swansee Thiele, Curiitiba, BRAZIL, Presenter
Marilo Cesar Santos, Curiitiba Parana, BRAZIL
Alvaro Chamecki, Curiitiba, BRAZIL
Emerson K. Zanoni, Curiitiba, BRAZIL

The anterior knee instability secondary to an ACL lesion leads to a physical and sports activities reduction observed in all ages. The purpose of this retrospective study is to evaluate the functional results, objectives and complications of the ACL reconstruction with autologous graft of the central third of the patellar tendon. Between May 1990 and March 2001, 1276 patients were operated with the isolated autologus patellar tendon. For the objective, subjective, and sports/activities analyses was used the Lysholm, Tegner, IKDC criteria; the difference between double-incision versus single-incision reconstruction, open or arthroscopic ACL reconstruction, graft fixation, degenerative radiologic changes associated with meniscus lesions and the rehabilitation program were also analyzed.

Poster #158
ISOCINETIC EVALUATION OF PATIENTS SUBMITTED TO ACL RECONSTRUCTION WITH PATELLAR TENDON. AN ANALYSIS OF 30 CASES
Edison Swansee Thiele, Curiitiba, BRAZIL, Presenter
Luciene Bittencourt, Curiitiba, BRAZIL
Marilo Bradi, Curiitiba, BRAZIL
Clinica do Joelho, Curiitiba, BRAZIL

The objective of this study is to evaluate the muscular deficit in 30 patients submitted to an n ACL reconstruction using the autologous central third of the patellar tendon. We used the cybex norm equipment with isocinetetic test pre-op, and with 2, and 4 months pos-op. We analyzed the data regarding flexors/extensors muscles, agonist/antagonist relation, eccentric/concentric deficit and the mixed functional relation between agonists and antagonists.

Poster #159
ARTHROSCOPIC VERSUS MINI-ARTHROTOMY ACL RECONSTRUCTION. AN INITIAL COMPARISON OF RESULTS
Henrique Carvalho, Curiitiba, BRAZIL
Edison Swansee Thiele, Curiitiba, BRAZIL, Presenter
Alvaro Chamecki, Curiitiba, BRAZIL
Marilo Cesar Santos, Curiitiba Parana, BRAZIL
Emerson K. Zanoni, Curiitiba, BRAZIL
Clinica do Joelho, Curiitiba, BRAZIL

The ACL reconstruction surgery can be considered one of the more versatile surgery, since even if we vary the type of graft, the fixation device, and the incision, generally we have a satisfactory result. The objective of this study is to compare the initial results between these reconstructions done arthroscopically assisted and with a mini arthrotomy. There were evaluated as parameters: a- Intra articular effusion. b- Thigh hipotrophy at the end of the third month post-op. c- Muscle strength measured with a dynamometer d- range of motion. In the period from June 98 to March 99 were evaluated 60 patients who had been submitted to an ACL reconstruction. 44 arthroscopically assisted and 16 with mini arthrotomy. The average age was 31.3 years old, 88% were males and 58% had their right knee operated. All patients followed the same protocol, preconized by Shelbourne. The results we obtained showed that despite 31% of the patients from the arthroscopically assisted group had effusion in post op, and necessitated to drain the fluid, and in the same group there was a bigger mus-
cular deficit in the first month, there were no significant differ-
ence in the final results (p < 0.005).

**Poster #160**

ANTERIOR CRUCIATE LIGAMENT INJURY MECHANISM IN SNOWBOARDERS AND SKATEBOARDERS

Barry R. Teflejens, Auckland, NEW ZEALAND, Presenter

Andrew Meighan, Glasgow, UNITED KINGDOM

Eastwood Orthopaedic Clinic, Auckland, NEW ZEALAND

The purpose of this study was to investigate the mechanism of injury causing anterior cruciate ligament ruptures in snowboarders and skateboarders. Knee injuries occurring when snowboarding and skateboarding are rare. We reviewed 22 anterior cruciate ligament ruptures with an identical injury mechanism that has not been previously described. 15 injuries occurred in snowboarders and 7 in skateboarders. All were advanced or expert boarders. All injuries occurred on landing a high jump, which resulted in significant knee compression. All described a flat landing on a flexed knee with no twisting component. The front leg knee was the one injured in every case.

We postulate that anterior cruciate rupture in these patients is due to explosive eccentric quadriceps contraction when landing from a jump. The injury mechanism is not boot-induced as has been described in downhill skiers landing from a jump.

**Poster #161**

OUTCOME OF BI-SOCKET ACL RECONSTRUCTION USING MULTIPLIED HAMSTRING TENDONS

Yukijoshibi Toritsuka, Osaka, JAPAN, Presenter

Kosui Nishio, Hikinuki, Osaka, JAPAN

Yasuharu Yonemura, Suita, Osaka, JAPAN

Sasato Nakayama, Osaka, JAPAN

Noriyuki Matsumura, Toyonaka, Osaka, JAPAN

Shoichi Miyama, Osaka, JAPAN

Hideo Kawakami, Mino, Osaka, JAPAN

Shuji Horibe, Sakai, JAPAN

Department of Orthopaedic Surgery, Osaka University, Suita, JAPAN

Purpose: To clarify short-term results of bi-socket ACL reconstruction.

Patients and Methods: The subjects were 184 patients (94 female, 90 male; average age 25 yo) out of 481 patients who had undergone endoscopic ACL reconstruction using multistranded autogenous hamstring tendons via twin femoral sockets (bi-socket technique) from 1994 to 1999 and consented to have follow-up evaluation at 24 months or later postoperatively. Nine patients had received revision surgery due to re-injury before the 2-year-follow-up. The mean follow-up period was 26 mos. and traced in 140 patients (91%). The mean follow-up was 2 and 7 years following arthroscopic ACL reconstruction using multi-strand hamstring tendon autograft.

Method: One hundred and three patients (53 men and 50 women; 23 years of mean age) with isolated ACL rupture had undergone arthroscopic ACL reconstruction with multi-stranded hamstring tendon autograft using drill hole technique. Meniscal repair and/or meniscectomy were added in 65 patients. Follow-up time points were 2 and mean 7 years (5 to 10 years) after surgery. The assessments included IKDC subjective evaluation, side-to-side difference in anterior laxity by KT-2000, and IKDC radiographic evaluation of the patello-femoral (PF) and femoral-tibial (FT) joint using skyline and Rosenberg views. Chi-squared test, paired t-test, and Mann-Whitney-U test were used for statistical analysis.

Results: Ninety-eight % of patients graded their index knee function as normal or nearly normal at 2 years, while 96% of them were graded as normal or nearly normal at 7 years. Eighty-nine % of the cases were identically graded at both evaluation points.

The mean side-to-side differences in anterior laxity at manual maximum force at 2 and 7 years were 1.5±1.4mm and 1.6±1.8mm, respectively. Follow-up evaluation was performed based on the IKDC Knee Ligament Evaluation Form. The harvested semitendinosus tendon was cut in half and doubled respectively to separately prepare anteromedial and posterolateral grafts. If necessary, the gracilis tendon was additionally harvested to reinforce the graft. Through the single tibial tunnel of 7-9 mm created in the center of the footprint, the two femoral sockets were created at 1:00 and 2:30 in the left knee or at 11:00 and 9:30 in the right. Endobuttons were used for the femoral fixation and a post screw was used for the tibial side. Postoperative rehab was performed according to the non-accelerated standard protocol.

Results: One hundred six out of 184 patients (58%) rated the index knees as normal; 72 (39%), nearly normal, 5 (3%), abnormal; 1 (1%), severely abnormal. Loss of extension and flexion of more than five degrees was observed in five and three patients, respectively. Lachman test showed negative in 167 patients (91%) and trace in 15 (8%) and mildly positive in one (1%) with a firm end point. Pivot shift was negative in 170 patients (92%) and trace in 4 (8%). The average side-to-side difference in anterior laxity @ man. max. force with KT-1000 was 1.0±1.4 mm (-4 to 6 mm). Ninety patients (94%) showed the side-to-side difference of less than 3 mm.

Conclusion: The bi-socket ACL reconstruction provides satisfactory outcome at short-term follow-up.

**Poster #162**

ARTHROSCOPIC ACL RECONSTRUCTION USING MULTI-STRANDED HAMSTRING TENDON AUTOGRAFT: 2 VS. 7 YEAR RESULTS

Norimasa Nakamura, Sakai, JAPAN

Shuji Horibe, Sakai, JAPAN

Tomoki Mitsuoka, Kashiwa, JAPAN

Yukijoshibi Toritsuka, Osaka, JAPAN, Presenter

Masayuki Hamada, Hirakata, JAPAN

Yoshiki Shiozaki, Sakai, JAPAN

Konsei Shino, Huhikuni, Osaka, JAPAN

Osaka Rosai Hospital, Sakai, JAPAN

Purpose: To assess changes in the subjective patient outcomes, knee laxity, and knee radiographic indicators of arthrosis between 2 and 7 years following arthroscopic ACL reconstruction using multi-strand hamstring tendon autograft.

Method: One hundred and three patients (53 men and 50 women; 23 years of mean age) with isolated ACL rupture had undergone arthroscopic ACL reconstruction with multi-stranded hamstring tendon autograft using drill hole technique. Meniscal repair and/or meniscectomy were added in 65 patients. Follow-up time points were 2 and mean 7 years (5 to 10 years) after surgery. The assessments included IKDC subjective evaluation, side-to-side difference in anterior laxity by KT-2000, and IKDC radiographic evaluation of the patello-femoral (PF) and femoral-tibial (FT) joint using skyline and Rosenberg views. Chi-squared test, paired t-test, and Mann-Whitney-U test were used for statistical analysis.

Results: Ninety-eight % of patients graded their index knee function as normal or nearly normal at 2 years, while 96% of them were graded as normal or nearly normal at 7 years. Eighty-nine % of the cases were identically graded at both evaluation points.

The mean side-to-side differences in anterior laxity at manual maximum force at 2 and 7 years were 1.5±1.4mm and 1.6±1.8mm, respectively. Follow-up evaluation was performed based on the IKDC Knee Ligament Evaluation Form. The harvested semitendinosus tendon was cut in half and doubled respectively to separately prepare anteromedial and posterolateral grafts. If necessary, the gracilis tendon was additionally harvested to reinforce the graft. Through the single tibial tunnel of 7-9 mm created in the center of the footprint, the two femoral sockets were created at 1:00 and 2:30 in the left knee or at 11:00 and 9:30 in the right. Endobuttons were used for the femoral fixation and a post screw was used for the tibial side. Postoperative rehab was performed according to the non-accelerated standard protocol.

Results: One hundred six out of 184 patients (58%) rated the index knees as normal; 72 (39%), nearly normal, 5 (3%), abnormal; 1 (1%), severely abnormal. Loss of extension and flexion of more than five degrees was observed in five and three patients, respectively. Lachman test showed negative in 167 patients (91%) and trace in 15 (8%) and mildly positive in one (1%) with a firm end point. Pivot shift was negative in 170 patients (92%) and trace in 4 (8%). The average side-to-side difference in anterior laxity @ man. max. force with KT-1000 was 1.0±1.4 mm (-4 to 6 mm). Ninety patients (94%) showed the side-to-side difference of less than 3 mm.

Conclusion: The bi-socket ACL reconstruction provides satisfactory outcome at short-term follow-up.
between 2 and 7 years after arthroscopic ACL reconstruction using multi-stranded hamstring tendon graft. On the other hand, as previously reported, the observed arthritic change was associated with meniscal injury at the time of surgery in most cases. However, some did show deterioration in the lateral FT joint narrowing over time without associated meniscal pathology. Longer-term follow-up is required to verify the effectiveness of ACL reconstruction in preventing knee arthrosis.

**Poster #163**
**A COMPARISON OF TWO DIFFERENT METHODS FOR ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION USING THE SEMITENDINOSUS TENDON**
Gen Tsuji, Koriyama, JAPAN, Presenter
Masasuki Kimura, Maedashi, JAPAN
Yasukazu Kabayashi, Maedashi, JAPAN
Dept of Orthopaedic Surgery Southern Tohoku Genera, Koriyama, JAPAN

Sixty patients with unilateral instability of the anterior cruciate ligament were prospectively randomized to anterior cruciate ligament reconstruction with either the "bilateral sockets method" (two tunnels in the femur) and "the two routes method" (two tunnels in femur and tibia) using the semitendinosus tendon with an endobutton fixation technique. The same postoperative rehabilitation protocol was used for all patients and the follow-up was performed by an independent observer (median 13 months, range 10 to 14). We evaluated the Lysholm score and side to side difference of stress X-p. No significant differences were found between the groups regarding Lysholm score and stress X-p. We conclude that the "bilateral sockets method" and the "two routes method" have similar outcomes in early term. We assume, however, that since the shape of the bone tunnel for the "two routes method" is more anatomically correct than for the "bilateral sockets method" the long-term outcome may be more favorable for the "two routes method".

**Poster #164**
**KNEE MUSCLE FUNCTION IN PATIENTS FREE OF ANTERIOR KNEE PAIN AFTER ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION USING BONE-PATELLAR TENDON-BONE GRAFT**
Eiichiro Tsuada, Hiroaki, JAPAN, Presenter
Kazutoshi Miura, Hiroaki, JAPAN
Yasuharu Hiraoka, Hiroaki, JAPAN
Hiroshi Katano, Hiroaki, JAPAN
Yasuyuki Ishikawa, Aomori, JAPAN
Satoshi Toh, Hiroaki, JAPAN
Hiroaki Memorial Hospital, Hiroaki, JAPAN

INTRODUCTION: Preventing anterior knee pain after anterior cruciate ligament (ACL) reconstruction using bone-patellar tendon-bone graft (BPTB) is the key to facilitate early recovery from muscle weakness of the knee extensor and flexor. The objective of this study was to evaluate the knee muscle function in the early postoperative period in patients who experienced no anterior knee pain after the ACL reconstruction using BPTB.

MATERIALS AND METHODS: Forty-two patients who did not complain of anterior knee pain after ACL reconstruction using BPTB were studied. Hamstring and quadriceps isokinetic strength were evaluated preoperatively and at 3 and 6 months postoperatively. The parameters examined were concentric and eccentric peak torque at 120 deg/sec. The statistical analysis was performed using the paired t-test and significance was set at p<0.05.

RESULTS: Preoperative isokinetic peak torque of the hamstring and that of the quadriceps were significantly lower in the ACL-deficient knees compared to the contralateral uninjured knees. At 3 and 6 months postoperatively, the concentric peak torque of hamstrings in the ACL-reconstructed knees reached to 95 ± 25% and 94 ± 22% of the contralateral side, representing no significant side-to-side difference, while those of the quadriceps were 68 ± 19% and 84 ± 23%, representing significant reduction. In contrast, the eccentric peak torque of hamstrings and that of quadriceps in the ACL-reconstructed knees were 81 ± 23% and 84 ± 23%, and significantly lower than in the contralateral side.

CONCLUSIONS: The results suggest that the successful recovery of the quadriceps function within the early period after ACL reconstruction with BPTB is a challenge even in patients free of anterior knee pain. Additionally, the reduction in eccentric peak torque of the hamstring indicates that the functional recovery of the hamstring is not complete at 6 months postoperatively, even though the ACL reconstruction is performed without surgical intervention to the hamstring tendon.

**Poster #165**
**TWO-BUNDLE RECONSTRUCTION OF THE ANTERIOR CRUCIATE LIGAMENT**
Takashi Tsukahara, Gifu, JAPAN, Presenter
Takahiko Saginoshita, Gifu, JAPAN
Yoshiaki Kusaka, Gifu, JAPAN
Dept of Orthopaedic Sports Medicine, Murakami Mem, Gifu, JAPAN

Introduction: A normal ACL can be morphologically divided into the anteromedial and posterolateral portions, each of which shows different tension patterns. We carried out two-bundle anterior cruciate ligament (ACL) reconstruction using multiple strands of semitendinous and gracilis tendon. The purpose of this study is to assess the advantages for the stability of the knee using this method.

Materials and Method: 33 patients (17 men, 16 women; average age 24) who had two-bundle ACL reconstruction prospectively followed-up at a minimum of 18 months (range 18-24). The fourth fold semitendinous tendon was used for anteromedial bundle and the fourth fold gracilis for posterolateral bundle. The following parameters were investigated: Range of motion manual knee laxity test, anterior laxity measured with the KT-1000 arthrometer and anterior shift rate (anterior drawer stress radiograph).

Results: The average maximum knee extension was -0.5 degrees (SD: 4.2) and flexion was 146 degrees (SD: 8.8). No patients showed positive Lachman test. Three patients (9.1%) showed positive anterior drawer test (all were +), and no patients showed positive pivot-shift test. The side-to-side difference of anterior laxity measured with the KT-1000 arthrometer at manual maximum stress was -0.8 mm (SD: 1.00). The side-to-side difference of anterior shift rate was 2.2% (SD: 8.6).

Conclusion: This method can reconstruct anteromedial and posterolateral bundles of ACL separately, and these reconstructed ligaments are more similar to normal ACL form than single bundle reconstructed ligaments. Our results suggest that this method shows a better trend with respect to anterior stability than single bundle reconstruction.
Biological Fixation After Anterior Cruciate Ligament Reconstruction with Hamstring Tendons Using an Endobutton on the Femoral Side
Yuji Uchio, Izumo, JAPAN, Presenter
Kenzo Kawasaki, Izumo, JAPAN
Junji Iwasa, Izumo, JAPAN
Masakazu Kuriwaka, Izumo, JAPAN
Mitsuo Ochi, Izumo-shi, JAPAN
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To investigate whether a hamstring tendon graft would be biologically fixed in the femoral bone tunnel after anterior cruciate ligament reconstruction, 64 patients were evaluated by serial biomechanical testing and magnetic resonance imaging (MRI) during 2 years after surgery. At the second-look arthroscopy at 2 years postoperatively, biological fixation of the graft was confirmed by probing and injecting a contrast medium within the femoral bone tunnel. In 56 stable knees at 2 years postoperatively, 42 grafts were biologically fixed in the femoral tunnel with a well-covered synovium, excepting one. This group maintained a high stiffness (120% of normal), and showed low signal intensity in an early postoperative MRI (12+/-8 months). Fourteen stable knees without graft fixation in the femoral tunnel had gradually increased anterior displacement with nearly normal stiffness. Five unstable knees with graft fixation retained low stiffness (70%), and showed low signal intensity late in the postoperative period (20+/-9 months). Three unstable knees without biological fixation rapidly increased anterior displacement, with half the stiffness of a normal knee. These results suggested that postoperative low stiffness of the reconstructed knee might indicate late biological fixation of the grafts in the femoral tunnel, predicting a possibility of postoperative anterior knee instability.

Poster #167
A BioDelivery Interference Screw and Growth Factors for Augmentation of Tendon-Bone Healing
Richard Evans, Randwick, AUSTRALIA
Peter Hughes, Randwick, AUSTRALIA
Jim Iliopoulos, Randwick, AUSTRALIA
Yan Yu, Randwick, AUSTRALIA
Craig Waller, Randwick, AUSTRALIA
Warwick JM Bruce, Randwick, AUSTRALIA
William R. Walsh, Randwick, AUSTRALIA, Presenter
University of New South Wales, Sydney, AUSTRALIA

A number of biological agents are available for use in orthopaedics to augment healing (growth factors, BMPs etc.). A potential application is at the healing tendon-bone interface in an ACL reconstruction. An interference screw was designed which allows delivery of any biological agent to the tendon-bone interface. This study evaluated the use of a new bio-delivery interference screw and autologous growth factors (AGF) at the tendon-bone interface in a sheep knee model.

An open intra-articular reconstruction was performed in 20 adult sheep using an extensor tendon model following ethical approval. A titanium bio-delivery interference screw was used for fixation in the tibial and femoral tunnels. Animals were allocated to 2 groups (control or AGF treated) and killed at 4 and 12 weeks (n=5 per group). Concentrated platelets (AGF) were harvested at the time of surgery using a cell separator and concentrating unit. AGF was introduced into the screw and infiltrated to the interface at the time of surgery. Endpoints included computed tomography (CT), serial histology and immunohistochemistry.

There was no evidence of infection or adverse effects in either group. The AGF treated samples demonstrated a more mature tendon-bone interface compared to controls at both time points. CT scans presented an increased signal intensity in the tunnel margins with AGF treatment compared to controls. Sharpey’s fibres were noted by 4 weeks with AGF treatment. A generalised improvement in vascularity was also observed in the treated group based on presence of new blood vessels.

The bio-delivery interference screw provides a novel method for delivery of factors at the tendon-bone interface without compromising the fixation concept of an interface screw. Initial experience using this device and growth factors from autologous platelets (AGF) demonstrated accelerated healing compared to controls.

Poster #168
Computational Analysis Reveals the Significance of Anatomical ACL Reconstruction
Masayoshi Yagi, Kobe, JAPAN, Presenter
Kiyonori Mizuno, Kobe, JAPAN
Naohiro Oka, Kobe, JAPAN
Mitsumasa Matsuda, Kobe, JAPAN
Takuzo Iwatsubo, Kobe, JAPAN
Shintichi Yoshiya, Kobe, JAPAN
Masahiro Karosaka, Kobe, JAPAN
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Objective: Recently, it has been suggested that anatomical ACL reconstruction, which reproduces AM and PL bundles of the ACL, improves functional outcomes. The objective of our study was firstly to assess the change in length of both AM and PL bundles during active knee motion, and secondly to evaluate the effect of the graft placement on stabilization in the ACL reconstructed knee joint using computational analysis.

Methods: An intact fresh-frozen human cadaveric knee was used in this study. Before the experiment, extra-articular soft tissue was removed while keeping the ligaments and joint capsule intact. The femur and tibia were potted into plastic tubes, and a magnetic position sensor (3 SPACE FASTRAK, Polhemus Inc., Colchester, VT) was mounted on both the femur and tibia. The femur was then fixed to a non-metal test stand in a horizontal orientation and the tibia was allowed to hang freely with a weight corresponding to that of the lower leg. The knee was extended from 90 degrees of flexion to full extension by exerting a quadriceps force with a constant loading speed (500mm/min). Six-degrees of freedom of knee kinematics were calculated from the data obtained by the sensors. A bony surface contour of the knee was reconstructed from the CT scan images. For the first objective of the study, the change in length between both femoral and tibial anatomical insertions of AM and PL bundles during active knee extension was assessed using the computational knee model. For the second objective, constraining forces in response to anterior tibial loading and rotational torque were calculated for the ACL grafts routed between various combinations of the insertions.

Results: The length of the PL bundle increased as the knee was flexed, while that of AM bundle was relatively constant throughout the range of motion. The optimal graft placement which exhibited a stabilizing effect for both anterior tibial loading and rotational torque was different in orientation.

Discussion: The significance of anatomical ACL reconstruction was assessed using a mathematical model. First, the results showed that the AM and PL bundles each have different roles
to play during knee motion. Secondly, it is suggested that single bundle ACL reconstruction cannot provide an effective constraint in response to complex loading.

**Poster #169**
ADVANTAGES OF COMPUTER ASSISTED NAVIGATION SYSTEM USING MAGNETIC TRACKING TECHNOLOGY IN ANATOMICAL ACL RECONSTRUCTION

Masayoshi Yagi, Kobe, JAPAN, Presenter
Makito Saito, Kobe, JAPAN
Kigomori Mizuno, Kobe, JAPAN
Nobuji Matsui, Kobe, JAPAN
Shinichiro Yoshiya, Kobe, JAPAN
Masahiro Kajikawa, Kobe, JAPAN

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Objective: Recently, anatomical ACL reconstruction, which reproduces the AM and PL bundles of ACL, has been proposed as achieving better functional results. However, a surgical technique, which is both accurate and meticulous, is required to anatomically reproduce both bundles in the procedure. The objective of our study was to compare the accuracy of tunnel placement in anatomical ACL reconstruction using two techniques: 1) navigation system (Shimadzu Inc., Japan) in combination with a magnetic tracking system, and 2) arthroscopic surgery by an experienced surgeon using a conventional ACL drill guide.

Material and Methods: Sixteen knees (Sawbones, Inc., U.S.A) from the same mold were used in this study. The targeting point was determined as the center of an anatomically appropriate insertion point of the AM and PL bundles of the ACL. The femoral and tibial tunnels (pilot holes) for both bundles for two-route ACL reconstruction were then drilled using either the navigation system (n=8) or conventional drill guide (n=8) in random order. Femoral tunnels were drilled using a transitiabular technique. In the case of the navigation system (Group I), reference points were placed in the femur and tibia and a CT scan was performed for image data acquisition. Pilot holes were then created under the guidance of the navigation system. In the case of the conventional technique (Group II), an experienced surgeon drilled pilot holes under arthroscopic control. The distance between the target point and the pilot hole was measured by a caliper. Unpaired t-test was used for statistical analysis.

Results: When deviation from the target point for the tibia tunnel was compared, no significant differences were found between Group I (AM: 1.6mm, PL: 1.3mm) and Group II (AM: 1.6mm, PL: 1.5mm). However, in the case of the femoral tunnel, significant differences (p<0.05) were observed between Group I (AM: 1.6mm, PL: 1.6mm) and Group II (AM: 4.3mm, PL: 3.6mm).

Conclusion: A computer assisted navigation system using a magnetic tracking system appears to achieve accurate and consistent tunnel placement in anatomical ACL reconstruction.

**Poster #170**
SUBJECTIVE EVALUATION OF PATIENTS AFTER ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION USING VISUAL ANALOG SCALE

Junya Yamazaki, Tokyo, JAPAN, Presenter
Takeshi Muneta, JAPAN
Yoshiaki Kurihara, Nagano, JAPAN
Hiroo Ikeda, JAPAN
Kazuyoshi Yajishita, Tokyo, JAPAN
Ichiro Sekiya, Tokyo, JAPAN

Tokyo Medical and Dental University, Tokyo, JAPAN

The purpose of this study is to evaluate knee stability after anterior cruciate ligament (ACL) reconstruction using an autogenous multistrand hamstrings tendon, and to compare the single-socket technique (SS) and bi-socket technique (BS). Single- or bi-socket reconstruction with Endobutton femoral fixation and double staple tibial fixation was performed for unilateral ACL injuries in 30 patients (SS: 13, BS: 17). In the SS group, the femoral socket was made at a position of 11 or 1 o'clock relative to the femoral ACL attachment site, while in the BS group the additional socket was created at 9-10 or 2-3 o'clock position. The tibial side was fixed under 50N initial graft tension. At five phases (before operation, immediate after operation, 3, 6, and 12 months after operation), anterior displacement at 133 N, anterior terminal stiffness at 133 N and initial stiffness were evaluated using a KT-2000 arthrometer. At 12 months after surgery, there were no significant differences in range of motion, Anterior drawer test, Lachman test and Pivot...
shift test between the two groups. Immediately after surgery the mean side-to-side difference in anterior displacement was -1.2 6plus;mm, 2.9mm for the SS group and -5.2 6plus;mm, 2.4mm for the BS group (p<0.01). But 3 months after the operation, there were no significant differences between the two groups. There were no significant differences in stiffness throughout the post surgical period. The results of this study suggest that adequate initial force on the grafted tendon differed between patient treated using the single- socket technique and those treated using the bi-socket technique for anterior cruciate ligament reconstruction using an autogenous hamstring tendons.

Poster #172
CLINICAL RESULTS OF ACL RECONSTRUCTION USING LEEDS-KIEO ARTIFICIAL LIGAMENT IN HIGH LEVEL ATHLETES OF AMERICAN FOOTBALL AND RUGBY
Tsukimura Yasunori, Tokyo, JAPAN, Presenter
Matsumoto Hideo, Tokyo, JAPAN
Kitasato Institute Hospital, Tokyo, JAPAN

[OBJECTIVES] Activities in top level American-football and rugby players after ACL reconstruction were investigated Leeds-Keio artificial ligament was used as the substitute for all the athletes and benefits to use an artificial ligament were analyzed.

[MATERIALS AND METHODS] Seventy-nine top level American-football and rugby players were studies. All of them were men and their mean age was 21.6. Left knee was involved in 33, right in 32, and bilateral in 7 cases. The period from the injury to the ACL reconstruction was 6.2 months on average. The mean follow-up period was 25.3 months.

[RESULTS AND DISCUSSION] Satisfactory stability was obtained after the surgery, and the side to side difference in the anterior laxity measured with KT-2000 knee arthrometer was 1.7 mm on average at 12 months after the operation. Re-injury of the ACL occurred in 6 cases within two years. All the patients had returned to their pre-injured level of sporting activities at least once. The average period to the return was 6.5 months. The period to the return was found to have a negative correlation with recovery of the extensor muscle strength and a positive correlation with presence of bilateral meniscal tear. It was also found that the longer the period from injury to the reconstruction, the more frequently present the meniscal tear. These results suggested that using the artificial ligament has an advantage for early return to the sporting activities and that an early ACL reconstruction after the injury is desirable to prevent secondary meniscal damages.

Poster #173
DONOR SIDE MORBIDITY AFTER ACL RECONSTRUCTION USING THE QUADRICEPS TENDON GRAFT WITH AND WITHOUT PATELLAR BONE PLUG
Christos K Yannakopoulos, Athens, GREECE, Presenter
Emmanuel Antonogiannakis, Athens-Cholargos, GREECE
Kostas Karlaftis, Athens, GREECE
Christos Karabalis, Athens, GREECE
Christos Thanassas, Athens, GREECE
Panos Efstatious, Athens, GREECE
Antonis Iliaidis, Athens, GREECE
401 General Army Hospital, Athens, GREECE

Following ACL surgery significant donor site morbidity may result in substantial impairment. We present the results from 27 patients who underwent surgery for chronic ACL deficiency using a quadriceps tendon autograft. From March of 1999 through March of 2000, a quadriceps tendon autograft was used in 27 patients with ACL injuries with a patellar bone block (13 cases) or without bone block (14 cases). The follow - up ranged between 15 and 31 months. The presence of effusion, pain on kneeling, local tenderness was especially evaluated. Most patients could return to the same level of preinjury sports activity. Anterior knee pain was noted in 5 patients (18.5%) but was severe in only 1 (3.7%). No patient reported pain on kneeling and no effusion was present in any of our patients. Local scar tenderness was present during the first 3 months but disappeared later. There were no significant complications related to the graft-harvesting site. The use of quadriceps tendon autograft appears to cause little postoperative donor-site morbidity and anterior knee pain compared to other autografts.

Poster #437
IS THE SUCCESSFUL TREATMENT OF THE ACL SUFFICIENT TO RETURN ATHLETES BACK TO SPORT?
Alberto Coletti, Milan, ITALY, Presenter
Benjamin Tuy, Milano, ITALY
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INTRODUCTION: The risk of ACL injury is significantly greater in individuals doing pivoting and cutting sports. Today, ACL reconstruction is the gold standard after ACL injury in the youn athlete engaged in high-risk sports. Evaluation of success is usually based on measurable parameters such as strength, stability, subjective assessment, and functional level. Our goal was to determine whether the commonly utilized knee rating systems could predict the successful return of athletes to their previous sports participation level.

METHODS: We reviewed one hundred athletes who underwent ACL reconstruction using either a bone-patellar tendon-bone graft (n=50) or a quadrupled semitendinosus graft (n=50) and followed an aggressive rehabilitation protocol. The average age was 28.3 years; there were 61 males and 39 females. At an average follow-up of 3 years (range, 2-5 years), the patients were assessed using the following rating systems: IKDC, Lysholm, Tegner, and Noyes scales. Clinical evaluation, isokinetic strength tests, computerized knee laxity analysis and functional strength tests were also done. More than 60% of athletes were engaged in high-risk sports.

RESULTS: The average scores were: Lysholm, 90, Noyes, 88, subjective evaluation, 85%; pre-injury Tegner, 7.6; final Tegner, 6.0. There were 89 normal or nearly normal knees by IKDC scoring. Only 65% were able to return to their previous level of sports participation.

DISCUSSION: Normalization of structural and biomechanical parameters of the ACL-injured knee did not always mean recovery of optimal athletic function. Other factors such as restoration of neuromuscular control mechanisms may play a role. Psychological factors and patient motivation also contribute but are difficult to quantify.

CONCLUSION: Successful ACL reconstruction based on presently established knee scores does not accurately predict the return of the athlete to the same pre-injury level of sports participation.

Poster #438
QUADRUPLE SEMITENDINOSUS ACL RECONSTRUCTION IN A GROUP OF ATHLETES
Alberto Coletti, Milan, ITALY, Presenter
INTRODUCTION: The hypothesis of our study was that a quadrupled bone-semitendinosus (STB) graft could combine the advantage of bone-to-bone healing with the high cross-sectional area of a quadrupled hamstring graft in ACL reconstruction.

MATERIALS AND METHODS: ACL reconstruction with an STB graft was performed on 80 athletes with isolated ACL injury from January 1996 to December 1999. Femoral fixation was obtained with Endobutton and tibial fixation with Fastlok. At a mean follow-up of 36 months, they were evaluated with the following: standard knee scores and functional strength tests; post-operative pain rating; knee x-rays taken post-surgery and at final follow-up. MRI at 3-6 months; isokinetic flexion-extension and internal-external rotation tests at 3, 6, and 12 months; and computerized laxity analysis at 6 months and final evaluation. Parametric and non-parametric tests were used for statistical analysis.

RESULTS: Average surgical time was 85 minutes, including 13 minutes graft preparation. Ninety percent were discharged within 24 hours. Subjective knee rating was 87%; kneeling test was positive in 7% and average Werner score was 44/50. Lachmann test was negative in 90% at final evaluation. Sensory changes were present in 30% at 3 months and 10% had definite hyposthesia. MRI showed graft incorporation at 3 months. Computerized laxity analysis revealed 90% with less than 3mm side-to-side difference. Isokinetic testing showed normal hamstring and quadriceps peak torques at 12 months. The one-leg hop test and vertical jump were normal by 6 months. Average Noyes score was 88, Lysholm score 91, and Tegner activity rating 6.5 (pre-op, 7.5). IKDC score showed 72 knees normal or nearly normal, 7 abnormal, and one severely abnormal. Sixty-five percent returned to the same pre-injury sports level.

CONCLUSION: Quadrupled bone-semitendinosus is a viable graft for ACL reconstruction and should be considered specially in patients with extensor mechanism problems.

Knee - Arthritis

Poster #174
WINDSWEPT DEFORMITY AS A RESULT OF SERONEGATIVE KNEE ARTHRITIS
Tomoeaki Abe, Utsunomiya, JAPAN, Presenter
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Tatsumi Shiraishi, Utsunomiya, JAPAN
Yasunori Suda, Tokyo, JAPAN
Tatoe Shiraishi, Utsunomiya, JAPAN
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We report a case of atypical arthritis that rapidly progressed to joint destruction as in the windswept deformity.

Case: A 72-year-old woman. She complained of bilateral knee pain after bruising her knees. On the initial examination, she was diagnosed as osteoarthritis and had a conservative treatment. However, she continued to complain of knee swelling and pain. When examined 1 year later, she had developed a valgus deformity of the right knee and a varus deformity of the left knee. The X-rays showed knee joint destructions involved with the large bone defects on the lateral plateau of the right knee and the medial plateau of the left knee. The laboratory tests for diabetes mellitus, rheumatoid factor, and TPHA were negative, but CRP and ESR were positive. X-ray examinations of other joints were normal, except for Heberden nodules in both hands. Two years after the initial examination, total knee arthroplasty was performed on both knees, and a synovia and an articular cartilage of the surgical specimens showed histological characteristics resembling those of rheumatoid arthritis. Ten months postoperatively, there was no pain or deformity, and the CRP value had decreased.

Discussion: Most of windswept deformity is seen in osteoarthritis, and its progression is slow. In our patient, relatively rapid destruction occurred, but the typical rheumatoid arthritis and neuroarthropathy were absent. Histological findings resembling those of rheumatoid arthritis were observed. This seems to have been a case of an atypical seronegative arthritis. And, since she continued to complain of knee pain and swelling after both knee bruises, it seems to have occurred insufficiency fractures. We speculate that atypical seronegative arthritis and insufficiency fractures after both knee bruises caused this windswept deformity.

Poster #175
MID-TERM RESULTS OF THE AGC TOTAL KNEE REPLACEMENT
Jose Alemparte, Santiago, CHILE, Presenter
Rodrigo Hernandez Hernandez Tage, Santiago, CHILE
Jose Marcelo Maradones Acevedo, San Miguel, CHILE
Hospital DIPRECA, Santiago, CHILE

A total of 148 total knee arthroplasties were performed in DIPRECA hospital between 1993 and 1999. Ninety-four of them were AGC total knee replacements and these are included in the report. All patients had implantation with a cemented posterior cruciate-substituting design, with resurfacing of three components in all cases. Mean age at surgery was 69 years and the patients were followed for a minimum of 2 years (range 2-8). The survival analysis at 8 years was 96.65%, with revision for any reason as the endpoint. Lost to follow-up was 3.19%. The mean knee score for pain and function were 89 and 64 out of 100. The scores were analyzed by categories also. This knee arthroplasty shows excellent results in mid-term follow up in the population we report. Key words: Anatomic Graduated Components, total knee arthroplasty, cruciate-substituting, survival analysis.

Poster #176
IS ROUTINE PROPHYLAXIS OF DEEP VEIN THROMBOSIS AFTER TOTAL KNEE ARTHROPLASTY NEEDED? A REPORT FROM AN EASTERN MEDITERRANEAN COUNTRY
Semih Aydogdu, Izmir, TURKEY, Presenter
Umut Aydogan, Izmir, TURKEY
Mustafa Parildar, Izmir, TURKEY
Ahiyet Menis, Izmir, TURKEY
Hakki Sur, Izmir, TURKEY
Ege University Hospital, Izmir, TURKEY

Introduction: There are conflicting reports about the relative infrequency of deep vein thrombosis (DVT) seen after total knee arthroplasty (TKA) in oriental people, questioning routine use of pharmacological prophylaxis (PP).

Materials and methods: The purpose of this prospective clinical study was to test our clinical observations on the low prevalence of DVT after TKA in the absence of any form of PP.
184 patients who had undergone unilateral TKA were assessed by ascending venography (AV) in post-operative 6 to 10 days period. No prophylaxis other than early active mobilization was used. If AV has detected DVT, its localization, uni or multi-focality, degree of occlusion and clinical importance were examined. The possible interactions between AV findings and clinical parameters like sex, clinical diagnosis, type of surgical approach (standart or subvastus) and use of tourniquet were searched statistically (tested using Chi Square test, alpha=0.05).

Results: The overall DVT prevalence was found to be 54/184 (2.9%), but only 9 cases of DVT (4.9%) were considered to be clinically important (popliteal and above levels). In the first 3 months post-operative period no cases of clinically diagnosed pulmonary embolism and mortality was observed. The effect of two different surgical approaches, use of tourniquet and sex on the prevalence of DVT was not found to be statistically significant.

Conclusions: Results we obtained do not encourage us the routine use of pharmacological DVT prophylaxis in the absence of risk factors in our TKA cases, as the percentage of clinically important DVT cases are identical to those obtained with prophylaxis in Western studies.

Poster #177
TOTAL KNEE ARTHROPLASTY FOR GONARTHOsis WITH PRE OP PATELLAR SUBLUXATION. INTEREST OF THE LATERAL APPROACH ON PATELLAR TRACKING.
Zniler Boulker, Le Chesnay, FRANCE
Jean Brillault, Chambay-les-Tours, FRANCE
Philippe Boisrenoult, Le Chesnay, FRANCE
Philippe Beaufils, Le Chesnay, FRANCE, Presenter
Department of Orthopedics Surgery, Andre Magnot H, Le Chesnay, FRANCE.

Introduction: The purpose of this study was to compare the results of lateral versus medial approach on patellar tracking of total knee arthroplasty (TKA) with lateral patellar subluxation.

Material and methods: Two groups of 13 patients with patellar subluxation (patellar shift > 5 mm) underwent TKA with patellar component using CEDIOR posterior-stabilized prosthesis (Sulzer®). Both groups were similar for angular deformities and patellar measurements. In the A group patellar imbalance were performed using a lateral approach with tibial tuberosity osteotomy whereas medial approach with lateral retinacular release were used in the B group. A comparison of the clinical and radiological results was done.

Results: One knee required femoral revision for patellar dislocation in the B group. There was no specific complications after tibial tuberosity osteotomy. Patellar tilt were significantly different (p=0.006): medial in group A (mean - 3.3°) and lateral in group B (mean + 3.8°). Patellar were centered in both groups (mean 0.3 mm).

Conclusion: Using two groups of similar knees, our data demonstrated that the lateral approach with tibial tuberosity osteotomy was more efficient to cure patellar lateral tilt than the medial approach even with lateral retinacular release. Therefore we recommend this approach to perform TKA in osteoarthritic knees with lateral subluxation of the patella.

Poster #178
USE OF AN INTERPOSITIONAL SPACER FOR TREATMENT OF MEDIAL COMPARTMENT ARTHRITIS

Poster #179
VALGUS TKA. RESULTS OF 255 LCS MOBILE-BEARING TKA WITH 5 TO 15 YEAR FOLLOW-UP
Jens Boldt, Zurich, SWITZERLAND, Presenter
Peter Keblish, Allentown, USA
Urs Munzinger, Zurich, SWITZERLAND
Schulthess Klinik, Zurich, SWITZERLAND

Introduction: Correction of fixed valgus is a challenge in primary TKA. Achieving patello-femoral and femoral-tibial stability requires superficial/deep lateral side releases if non-constrained prostheses are utilized. The medial approach has disadvantages with more reported complications. The direct lateral approach, with/without tubercle osteotomy, is an approach option utilized in two reporting centers.

Methods: 255 valgus TKAs with 5- to15-year follow-up were reviewed. Demographics included 91% females, 15% rheumatoid, mean age 69. Prostheses utilized were LCS mobile-bearing (meniscal PCL-retaining/rotating PCL-sacrificing). Patella was non-resurfaced in 90%, cementless fixation in 86%. The direct lateral approach with similar lengthening techniques was used with tubercle osteotomy in one center and osteo-periosteal joint exposure in another.

Results: Good/excellent 91%, modified HSS score improvement 57 to 85. Deformity (12) improved <8 to 12 points (>15° valgus to <5° valgus). ROM improved from mean 11°/97° to 1/110° latest Technical/prosthetic-related complications included: 7 bearing failures (5 meniscal, 2 rotating platform), 2 aseptic loosenings (tibial). 1 patella ligament rupture and 2 screw loosenings in the osteotomy group, 1 patella re-dislocation in a 75-year-old female with dislocation since age 15 (non-osteotomy group), 2 infections, and 1 re-operation for arthrofibrosis.

Discussion/Conclusion: Valgus TKA using LCS moveable bearings implanted via a direct lateral approach are highly successful regarding stability and patella tracking. Failures correlate with inadequate/de-stabilizing releases and meniscal PCL-retaining prostheses. Rotating bearings allow for better stability and self-adjustment of common mal-rotation variables. The
lateral approach allows for direct (step-wise) lengthening releases, improved patellar tracking, and precise gap balancing.

**Poster #180**

**LONG-TERM RESULTS OF LCS MOBILE BEARING TKA. EVALUATION OF 457 TKA WITH 10 TO 13 YEAR FOLLOW-UP.**

Jens Boldt, Zurich, SWITZERLAND, Presenter
Urs Munzinger, Zurich, SWITZERLAND
Schulthess Klinik, Zurich, SWITZERLAND

**Purpose:** Evaluate of clinical outcome of 457 LCS mobile bearing TKA from one centre.

Materials and Methods: From a cohort of over 3,5000 mobile bearing TKA in one large center, 457 cases were performed more than 10 years ago (mean 11 years). Drop-out were 63 (13.8%) cases. 128 patients were known to have died and 63 (13.2%) cases could not be included leaving 86.2% that entered the study. Patient demographics included 76% females and 8% rheumatoids. There were 275 (60%) meniscal bearing and 182 rotating platform design components. The patella was resurfaced in 95 (21%) cases.

Results: Preoperative KSS scores improved from a mean of 84 to 157 points and range of motion from 97 to 110 degrees post-operatively. Clinical scores were excellent or good in 88%, moderate in 10% and poor in 2%. Kaplan Meier survival analysis was 96.9% after a mean of 11 years taking any revision into account. Worst track record were polyethylene meniscal bearings with 91.2% and best the femoral component with 99.8% after a mean of 11 years. Other complications will be listed in depth.

Conclusions: The data of this study with a survival rate of 96.7% after a mean of 11 years support the use of this mobile bearing device. Best track record was noted with the all cruciate sacrificing rotating bearing device and worst with the ACL and PCL retaining meniscal bearing device.

**Poster #181**

**PHYSICAL ACTIVITY AND OCCUPATIONAL STATUS IN PATIENTS YOUNGER THAN 55 YEARS WITH LCS MOBILE BEARING TKA. EVALUATION OF 228 CASES**

Jens Boldt, Zurich, SWITZERLAND, Presenter
Urs Munzinger, Zurich, SWITZERLAND
Schulthess Klinik, Zurich, SWITZERLAND

**PURPOSE:** Evaluation of TKA in a younger population with special regards to patient’s general activity level pre- and postoperatively, sports activities, work related changes, relationship of BMI and activity.

**METHOD:** From 3300 mobile bearing TKA performed in non-inflammatory knee arthritis from 1988 - 2000, a total of 228 LCS TKA entered the study. A questionnaire was send out, of which 86% were received.

**RESULTS:** Follow-up time was 2 to 11 years, mean total score was 95.2 points (out of 100). Currently in occupation were 61%, and retired 39%. There were 2% complications that will be discussed in depth. Of the group 89% participated in active exercises with a mean of 475 min / week on 2.5 days. Average walking distance / day ranged from less than 1 km in 8% to more than 10 in 10% of the group. Sports activities included: swimming 36%, fitness 18%, hiking 14%, cycling 11%, tennis 7%, alpine skiing 7%, and jogging 7%. Daily gardening and housework was noted in 51%.

**Poster #182**

**ARTHRFOBROSUS IN TKA. IS THERE A CORRELATION WITH FEMORAL COMPONENT MAL-ROTATION?**

Jens Boldt, Zurich, SWITZERLAND, Presenter
Urs Munzinger, Zurich, SWITZERLAND
Schulthess Klinik, Zurich, SWITZERLAND

**Background:** The purpose of this study was to determine whether internal mal-rotation of the femoral component is associated with arthrofibrosis in TKA. Multiple etiological factors have been suggested, but specific causes have not been identified. We hypothesized arthrofibrosis may be triggered by a combination of non-physiological kinematics (femoral component internal rotation) and a tight medial compartment.

**Methods:** From a consecutive cohort of 3058 mobile bearing TKA forty-four (1.4%) cases were diagnosed as having arthrofibrosis, of which thirty-eight (86%) cases could be recruited. Thirty-eight patients with a well functioning TKA served as matched controls. Evaluation included CT investigation to determine femoral component rotation with reference to the transepicondylar axis (TEA).

**Results:** Femoral components in the AF group were significantly (p<0.00001) internally mal-rotated by a mean of 4.7 degrees ranging from ten degrees internal rotation (IR) to one degree external rotation (ER). Mean femoral rotational in the control group was parallel (0-3 degrees IR) to the TEA (six degrees IR to four degrees ER). Arthrofibrosis was not associated with age, gender, body-mass-index, or preoperative diagnosis.

**Conclusions:** There is a highly significant association between arthrofibrosis in TKA and internal mal-rotation of the femoral component. On the base of these results it was hypothesized that non-physiological kinematics in TKA with mal-aligned femoral components influence and/or trigger arthrofibrosis in TKA.

**Clinical Relevance:** In TKA with arthrofibrosis, we now consider femoral CT evaluation with the view to surgically rebalancing the flexion gap and realigning the femoral component, when internal mal-rotation is confirmed.

**Poster #183**

**QUADRUPLE ARTHROPLASTY IN THE LOWER EXTREMITY**

Jens Boldt, Zurich, SWITZERLAND, Presenter
Urs Munzinger, Zurich, SWITZERLAND
Schulthess Klinik, Zurich, SWITZERLAND

**PURPOSE:** Outcome of bilateral hip and knee arthroplasty in the same patient with special regards to schedule planning, postoperative complications and follow-up.

**METHOD:** Since 1985 more than 6000 THA and 5500 TKA were implanted at Schulthess Klinik, of which 8% were rheumatoid patients. Quadruple THA and TKA were performed in a total of 58 (0.1%) of which 88% were RA. Mean follow-up knees was 8.5 years (1-17), of hips 9.5 years (1-18). On average 67% of implants were uncemented. In 21% of the cases all four prostheses were implanted within one year and over 50% within five years.

**CONCLUSION:** Patients younger than 55 perform well in general physical activity, work performance, and sports activities. Better quality of life after mobile bearing TKA can be expected in younger patient. Young age should not be a contraindication for TKA.
RESULTS: Taking revision of components as failure there were three infections (CLS hip, GSB and LCS knee), two aseptic loosening (Endler cup, GSB knee), two recurrent hip dislocations, three knee bearing exchanges (LCS, INNEX), and four patella component removal (GSB, PCA).

CONCLUSION: Quadruple arthroplasty in the lower extremity did not show an increased failure rate compared with single arthroplasty in this center. The results of this study support the indication for quadruple procedure with early postoperative rehabilitation and full weight bearing. Data suggest a procedure with hips before knees and at least two weeks between arthroplasty operations.

Poster #184
ARTHROSCOPIC DEBRIDEMENT AND HIGH TIBIAL OSTEOTOMY FOR KNEE OSTEOARTHRITIS IN AGING ATHLETES
Jesus Ignacio Cardona, Zapopan, MEXICO, Presenter
Jorge Alfredo Majarro, Zapopan, MEXICO
Joaquin A. Torres, Zapopan, MEXICO
Centro de Ortopedia y Medicina del Deporte, Zapopan, MEXICO

OBJECTIVE: To evaluate the functional results of arthroscopic debridement plus high tibial realignment osteotomy in the osteoarthritic knee in active aging athletes

METHODS: Records from 121 active elder recreational and competitive athletes underwent arthroscopic debridement plus high tibial osteotomy for moderate an severe knee osteoarthritis from 1992 through 2000 were retrospectively reviewed. 103 patients were interviewed to compare the pre-operative vs real functional and sports activities. The results were analyzed using non parametric tests.

RESULTS: The results were evaluated a minimum of one year, with an average of 4.7 years of follow-up. 68.4% back to sports, 31.6% left sports but kept active and exercising regularly. All patients were completely satisfied with the results of surgery and would recommend the procedure. No one has needed other treatments than analgesic and physical therapy eventually.

CONCLUSIONS & SIGNIFICANCE: Our results determine that arthroscopic debridement plus high tibial osteotomy is an acceptable and valuable procedure for the treatment of osteoarthritic aging athlete’s knee. The time required for symptoms relief is not consistently predictable but finally a high average of patients recover a desired daily and sports activities level. The high significant improvement of pain and other symptoms of knee osteoarthritis in active aging athletes, make this procedure a secure option in such patients who do not accept to change their style of life because a total knee replacement.

Poster #185
THE ROLE OF THE ORTHOPAEDIC NURSE PRACTITIONER IN
Paul Carter, Wirral, ENGLAND, Presenter
Rose Finley, Upton, UK
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We report the role of our advanced nurse practitioner (ANP) with particular relevance to cost effectiveness, patient satisfaction and data collection. Our nurse practitioner has been involved in arthroplasty care since 1996. Her duties include pre-operative assessment, health advice, informed consent, clinical follow up and maintenance of a database for research and audit. Follow up radiographs are reviewed regularly by the entire medical team in a teaching environment. Relative costs of this service were calculated using outpatient changing data. 100 postal questionnaires were used to assess patient satisfaction. Patients answered 13 questions relating to the service they received. Knee arthroplasty follow up through the nurse lead clinic was half the cost of follow up through the consultant lead clinic. 80 patients returned the postal questionnaire. Responses were very supportive of the ANP service. 79 (95%) of patients were happy to be assessed by the ANP and felt that their problems were dealt with appropriately. 17 (21%) of patients felt they should be seen by a surgeon at some stage during their routine follow up. Overall, 75 (94%) of patients were very satisfied or satisfied with the service. 1 (1%) was dissatisfied and 4 (5%) did not answer this question. Increasing patient numbers and demand for high quality care combined with a decrease in doctors hours worked has lead to a shortage of time for discussion of ‘prehabilitation’ and post-operative care. Long term clinical and radiological follow up leading to adequate research and audit must not be compromised. A trained nurse practitioner working in conjunction with the surgical team is a cost effective way of improving total patient care, audit and research within a department. We have found a high degree of patient satisfaction with this approach.

Poster #186
UNICOMPARTMENTAL KNEE REPLACEMENT REVISION SURGERY: IS IT REALLY AN EASY JOB?
Enzo Cenna, Torino, ITALY, Presenter
Giulia Sandruci, Torino, ITALY
Daniel Combi, La Loggia-TO, ITALY
Alessandro Bistolfi, Torino, ITALY
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Il Ortopaedic Clinic, Turin, ITALY

Despite almost 30 years of controversy the status of unicompartmental knee replacement (UNI) remains uncertain. It would appear to offer a good alternative to osteotomy or total knee replacement (TKR). Compared to osteotomy there is a higher initial success rate and also compared to TKR the UNI knee replacement offers better results with faster recovery and improved function, with mini-open surgical approach, too.

The UNI failures percentage in the long period (ten to twenty years follow-up) seems to be higher than in TKR and with some differences as regarding causes. The UNI failures are more commonly due to:
- femoral or tibial loosening: condylar osteonecrosis, cement loosening
- instability anterior cruciate or medial collateral ligament failure
- high correction with valgus deformity: rapid evolution of the arthritis to the opposite side
- persistent deformity in varus: severe polyethylene wear
- lack of motion: wrong rehabilitation protocol, wrong components position
- inadequate selection of the patient: obesity, total knee arthritis, anterior laxity.

The more important steps in revision surgery are discussed:
- ligament balancing: how to choose among posterior stabilised tibial component, CCK or hinged replacements.
- bone loss management: when to use bone graft from the lateral side, wedges, spacers, or cement.
- component selection and modularity: where to provide mobile bearing devices and stemmed components
Furthermore every orthopaedic surgeon should remember what Insall wrote in 1991: “the unicompartmental arthroplasty is not a conservative procedure that allows a total knee arthroplasty to be done easily after”. UNI as TKR should be considered definitive replacement surgery.

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Poster #187
THE OFTEN POOR CLINICAL OUTCOME OF INFECTED TOTAL KNEE ARTHROPLASTY
Ching-Jen Jen Wang, Kaohsiung Hsien, TAIWAN, Presenter
Ting-Wen Huang, Kaohsiung Hsien, TAIWAN
Jue-Wen Wang, Kaohsiung Hsien, TAIWAN
Han-Shiang Chien, Kaohsiung Hsien, TAIWAN
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This study compared the clinical outcomes of various options of treatment in 26 infected TKA with successful eradication and no recurrence of infection for at least two years. There were 20 women and 6 men with an average age of 77 years. The average follow-up time was 48 (range 24, 83) months. The evaluation parameters included pain score, knee score functional score and radiograph of the knee. The knees with acute infection showed significantly better outcome, and the clinical results were comparable to non-infected TKA. The clinical outcome of chronic infection was less favorable. Arthrodesis achieved better pain relief, while reimplantation TKA showed better function. However, no significant difference in knee scores was observed between reimplantation TKA and arthrodesis. Approximately 50% of reimplantation TKA had mild to moderate knee pain.

Poster #188
CHANGE OF THE PATELLOFEMORAL ALIGNMENT BY TECHNIQUE MODIFICATION IN TOTAL KNEE ARTHROPLASTY USING LCS PROSTHESIS
Jaehoon Chung, Kwangju, SOUTH KOREA, Presenter
Dong-A Hospital, Kwangju, SOUTH KOREA

Background: It is well known that the internal rotation of the femoral component may be the cause of the patellar maltracking in total knee arthroplasty. The purpose of this study was to evaluate the change of the patellofemoral alignment and the femoral component rotation by modifying the femoral anteroposterior cutting references in total knee arthroplasty using LCS prosthesis without patellar resurfacing.

Materials and Methods: We performed 206 total knee arthroplasties and classified them into two groups based on the femoral anteroposterior cutting reference during the operation. Group A was 102 knees which femoral anteroposterior cutting was done parallel to the proximal tibial cut surface using the femoral guide posioner rather than parallel to the proximal tibial cut surface using femoral guide posioner may give a better patellofemoral alignment by decreasing the risk of the internal rotation of the femoral component.

Results: The internal rotation of the femoral component was 6.60 degrees (3.88 SD) in group A and 3.40 degrees (2.39 SD) in group B (P<0.001). The congruence angle was 27.79 degrees (15.29 SD) in group A and 17.60 degrees (14.47 SD) in group B (P<0.001).

Conclusion: Making the femoral anteroposterior cutting parallel to the transepicondylar axis without using the femoral guide posioner rather than parallel to the proximal tibial cut surface using femoral guide posioner may give a better patellofemoral alignment by decreasing the risk of the internal rotation of the femoral component.

Poster #189
THE MANAGEMENT OF DEGENERATIVE KNEE ARTHRITIS IN THE ACTIVE MIDDLE AGED - ARTHROSCOPIC APPROACH
Moises Cohen, Sao Paulo, BRAZIL, Presenter
Rene Jorge Abdalla, Sao Paulo, BRAZIL
Federal University of Sao Paulo, Sao Paulo, BRAZIL

In the last past years the improvement of sports practice contributed to increase the number of active middle aged patients with degenerative arthritis in the knee. The goals of the surgical treatment are to relief the symptoms, maintain the patient's active lifestyle and delay the need for arthroplasty, by: minimal morbidity, cost effective, arthroscopically procedure, outcomes measurable and good long term results. Arthroscopic Lavage and Debridement - The effect of lavage of degenerative joints was first noted by Bircher in 1921, followed by Burman et al in 1935 and Watanabe et al in 1964, when an extensive clinical study has been conducted and extended to other joints. This procedure has been advocated as a treatment for degenerative joint processes of the knee to effect removal of loose bodies, proinflammatory mediators and cartilaginous degradation products. The debridement of degenerated and partial thickness articular cartilage defects has been shown to provide a short term symptomatic pain relief but does not stimulate regeneration of articular cartilage.

PERSONAL EXPERIENCE: study design- single center, randomized, prospective; preop VAS > 60 for pain and ADL; Patients:116 (M 77, F 39); Age: 38 - 58 yr (mean age 48.4 yr) ; Follow up 26, 52 and 104 weeks; Outcomes measures - Pain and ADL VAS. Results: Improvement rate 26 wk - 63%, 52wk - 54%, 104 wk - 20%. CONSIDERATIONS: Arthroscopic lavage and debridement provide a positive, but often short lived reduction in the severity of symptoms. It may be indicated as a minor procedure to reduce symptoms before the major procedure indication.

Abrasion, Drilling and Microfracture - After the loss of the articular cartilage in progressive degenerative arthritis of the knee, the sclerotic lesion occurs. The question is how to stimulate the repair in that area. The concept is that an abrasion, drill hole or microfractures, made into the cancellous bone reach the blood supply and the pluripotential cells for healing. The second look arthroscopy in drilling or microfractures procedures usually shows the healing of each dumple, but no coalescence of repair tissue between the defects. In abrasion procedure the healing is continue but many papers show less long time improvement than drilling or microfractures. In all those procedures the earliest repair tissue is fibrocartilage. The indications are: pain, swelling, crepitus, loss of function due to degenerative arthritis and in active middle aged patients before knee arthroplasties.
Some contraindications are: morbid obesity, ankylosis, instability, deformity and inflammatory arthritis. The surgical technique involves 1 to 4 mm deep, depending on the procedure. The intraoperative observation when the inflow is decreased or the tourniquet is released, is necessary to make sure that the surface vessels bleed and blood clots form on drilled or abraded areas, filling the defects. In the postoperative management is necessary about four to six weeks for healing and maturation of the regenerative tissue.

PERSONAL EXPERIENCE: Study design - single center, retrospective; preop VAS > 60 for pain and ADL; Patients- 513, knees 532 (M 385, F 128); Procedures- 213 abrasion and 68 microfractures, Age: 36 to 99 yr (mean age 49.6 yr); Follow up: 2 to 16 yr (mean 9.3 yr) Outcomes measures - Pain and ADL. VAS: analysed in three groups of patients’ follow-up, two to five years- 63% of improvement, more than five to ten years- 38% of improvement and more than ten years- 9% of improvement. We didn’t find significant differences between drilling and microfracture procedures results, but the abrasion procedures were associated to the worst results after five years. We performed the second look arthroscopy and biopsy in 28 patients, all associated to some new procedure, 6 between 2 to 5 yr f.u, 14 between 5 and 10 yr f.u, and 8 with more than 10 yr. We didn’t see any hyaline cartilage tissue, even in longer follow-up patients, in all cases the biopsy showed fibrocartilage tissue. CONSIDERATIONS: The procedures showed a temporary benefit but remains a reasonable alternative before knee replacement in middle aged active patients. CONCLUSIONS: The arthroscopic procedures to treat the degenerative arthritis and transplant and matrix alteration is clearly present.

Poster #190
AUTOLOGOUS OSTEOCHONDRAL GRAFT IN CHONDRAL LESION TREATMENT – EXPERIMENTAL STUDY IN GOATS
Antonio Delcogliano, Rome, ITALY, Presenter
Silvio Chiassi, Roma, ITALY
Salvatore Franzese, Rome, ITALY
Giuseppe Rinonapoli, Roma, ITALY
Amerigo Menghi, Roma, ITALY
Mario Cillo, Roma, ITALY
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Autologous osteochondral graft (AOG) has begun in recent years the treatment of choice for many surgeons; however the fate of transplanted tissue and its ability to bind with surrounding cartilage still remains unclear. Aim: to evaluate experimentally osteochondral autograft transplant in goats.

Material and Methods: We performed AOG in 10 adult goats; a chondral lesion of 0.5 cm was created on weight bearing surface on medial condyle. Multiple small graft were harvested on lateral trochlea using commercial arthroscopic tools (OATS), osteochondral plugs were then press-fit in to prepared recipient site on medial condyle without using any fixation device. The animals were sacrificed at 3-6 (4 animals) - 9 and 12 months (6 animals) The specimens were observed with light microscopy and polarized light microscopy.

Results: The animals were able to walk without limitation, the joint were free of infection. Range of motion was completely restored. At macroscopic evaluation (in all cases) chondral lesions were completely covered by chondral tissue, slight depression was always present between graft and adjacent borders of native cartilage. Histology at 3 months showed in middle of the implant the four layers of articular cartilage while peripherically we observed clusters of cells with many hypertrophic chondrocytes. Between the transplanted cartilage and surrounding tissue there was in all animals a fibrocartilaginous tissue. A well appearing tidemark was observed at 3-6-9 and 12 months. Histologic appearance was similar at 6-9 and 12 months; the fibrocartilaginous tissue seems to be more dense at 12 months. We observed also peripherically a modification of colourability of intercellular matrix. The donor sites were full of fibrocartilaginous tissue.

Discussion: Clinically we had good results with AOG, but when checked arthroscopically in our patients always we observed a fibrous layer between implant and cartilage and a softening of transplanted cartilage evaluated with a probe. The results of our experimental study confirm this macroscopic appearance, also after 12 months the graft is viable but is not integrated with surrounding cartilage; a fibrocartilaginous tissue is always present.

Conclusion: Multiple osteochondral autograft seems to be clinically a good alternative in young chondral lesion treatment, but there is always a fibrocartilaginous layer between cartilage and transplant and matrix alteration is clearly present.

Poster #191
LATERAL CONDYLAR RELEASE FOR HIGH VALGUS KNEE REPLACEMENT
James K DeOrio, Jacksonville, FL, USA, Presenter
Mayo Clinic, Jacksonville, Florida, USA

Objective: To obtain a balanced knee in the face of a high valgus knee without damaging the peroneal nerve when performing total knee arthroplasty.

Material and Methods: Six patients with genu valgum over 20 degrees were treated with a standard total knee cruciate sacrificing knee arthroplasty. These six knees represented 2% of the total knees done in our institution from ‘94-‘01. In order to obtain ligamentous balancing, in lieu of sequential release of soft tissues, a large osteotome was taken and the entire lateral condyle is split off the femur.

Results: The single event of the lateral condylar release was sufficient to obtain balancing in all the knees without additional soft tissue release. One patient with a 45 degree valgus knee still developed a peroneal nerve palsy. All patients were satisfied (including the patient with the postoperative peronal palsy). The Hospital for Special Surgery Knee score was 92 and 91 for the subjective and functional scores respectively.

Conclusions: Lateral condylar boney release is effective for balancing high valgus total knee arthroplasty. However, when the valgus knee exceeds 30 degrees, increased femoral shortening with advancement of the medial collateral ligament may still be necessary.

Poster #192
AXIAL PARAMETERS INFLUENCING LOWER LIMB REALIGNMENT IN HIGH TIBIAL OSTEOTOMY
Mohmet Rifat Engin, Istanbul, TURKEY, Presenter
Hagrettin Kesmezacar, Istanbul, TURKEY
Tahir Ogut, Istanbul, TURKEY
Richard Nyman, Uppsala, SWEDEN
University of Istanbul, Cerrahpasa Faculty of Med., Istanbul, TURKEY

PURPOSE: To investigate axial parameters affecting lower limb alignment after high tibial osteotomy, to find a method for determining the appropriate correction angle.

METHOD: Between 1990 and 2001 118 knees of 91 patients underwent HTO with a closing-wedge technique. The same author performed all of the procedures. Three staples were use for internal fixation in most cases. Clinical and radiological details have been evaluated retrospectively for 61 knees of 47 patients. The average duration of follow-up was 91 months. The Hip-Knee-Ankle Angle (femorotibial mechanical angle), the femorotibiotalar angle, the femoral condylar - femoral shaft angle (lateral distal femoral angle), the femoral condylar - tibial plateau angle (joint line convergence angle), the tibial plateau - tibial shaft angle (medial proximal tibial angle) were measured from preoperative and postoperative standing anteroposterior radiographs for all the patients. Statistical differences among the preoperative and postoperative averages were analyzed using the Student’s t-test. The strength of the linear relationship between the variables had been measured with Pearson’s correlation coefficients. The significance of the coefficients was evaluated using the t-test.

RESULTS AND CONCLUSIONS: Before and after the operations the femorotibiotalar angle correlated significantly (p 0.001) with the tibial plateau - tibial shaft angle. The regression line of the correlation (Y = - 0.95 X + 260.42) revealed that a correction resulting in a tibial plateau - tibial shaft angle of 95° should be achieved intraoperatively in order to obtain a final femorotibial angle of 170°. A statistically significant (p 0.001) difference was achieved among the preoperative and postoperative averages were analyzed using the Student’s t-test. The strength of the linear relationship between the variables had been measured with Pearson’s correlation coefficients. The significance of the coefficients was evaluated using the t-test.

Poster #193
CORONAL TIBIAL OSTEOTOMY FOR UNICOMPARTMENTAL ARTHROSI0S OF THE KNEE
Stephen Fealy, New York, NY, USA, Presenter
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Thomas L. Wickiewicz, New York, NY, USA
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Introduction: Unicompartmental gonarthrosis in properly selected patients is often treated with high tibial osteotomy. HTO corrects varus/valgus, but doesn’t address flexion and rotation of tibia. We sought to mechanically evaluate a coronal-plane tibial osteotomy (CTO) that addresses varus/valgus, rotation, and flexion of tibia. We also sought to assess short-term clinical outcome in a cohort who had undergone the procedure.

Methods: 5 standard tibial sawbones were used. 3-D coordinates of the distal tibia relative to plateau were taken using the Polhemus tracking device. CTO performed on specimens. Distal segment was rotated around an instant center of rotation at osteotomy, calculated for each specimen. Specimens rotated by 5° intervals into varus/valgus. Corresponding change of distal tibia relative to proximal tibia regarding varus/valgus, flexion/extension, and rotational correction measured. 11 knees (9pts. avg age 33.6yrs) were evaluated at a minimum of 2 yrs post-op. All patients had varus gonarthrosis pre-op.

Results:
There was a surprising linear correlation between correction at the osteotomy site and degree of correction achieved distally. (Tables)

Poster #194
QUANTITATIVE GAIT ANALYSIS AFTER MEDIAL UNICOMPARTMENTAL KNEE REPLACEMENT FOR OSTEOARTHRITIS
Kate E Webster, Melbourne, AUSTRALIA
Juliane A Feller, Melbourne, AUSTRALIA, Presenter
Jo Wittwer, Melbourne, AUSTRALIA
La Trobe University Musculoskeletal Research Centre, Melbourne, AUS-TRALIA

Purpose: To characterise the footstep pattern and knee kinematics during walking after unilateral medial unicompartmental knee replacement.

Method: Five females and seven males (mean age 69 +/- 8 yrs) who had undergone unicompartmental replacement for unilateral medial compartment osteoarthritis of the knee participated in the study. Each patient was tested at least 12 months after surgery (mean follow up: 22 months), and had achieved a successful recovery (return to normal daily activities, no ongoing joint pain and a Knee Society Score of 80 or greater). For gait analysis six cameras were connected to a Vicon 3-dimensional motion analysis system to provide kinematic data. In addition, an 8.2m long GaitRite electronic walkway was used to calculate spatial and temporal parameters. Patients completed four walks at both self-selected comfortable and fast speeds.

Results: The mean self-selected comfortable walking speed (1.36 m/sec, SD: 0.2), cadence (117.6 steps/min, SD: 7.5) and stride length (1.41 m, SD: 0.2) fell within the range of published norms for a healthy adult sample. Patients were able to increase their walking speed by 30% during the fast pace mode. There was no significant difference between operated and contralateral limbs for stance time, step length, or single support time. All but one patient showed a normal biphasic pattern of flexion-extension motion about the operated knee. In 8 of the 12 patients there was, however, a significant increase in knee flexion on the operated limb throughout the gait cycle compared to the contralateral limb. This pattern of increased knee flexion was most marked during stance.

Conclusions: Following medial unicompartmental knee replacement a spatio-temporal gait parameters were within normal limits and patients had the ability to vary their walking speed, indicating a good functional outcome based on these two measures. A significant increase in knee flexion in the operated knee was observed in 67% of patients. The cause of this
increased flexion and its ramifications in terms of function are yet to be determined.

Poster #195
ARThROSCOPIC SURGERY WITH HTO EFFECT FOR OSTE-ARTHritic PATIENTS WITH KNEE FLEXION CONTRACTURES AND GENU-VARA
Alex Finsterbusch, Jerusalem, ISRAEL, Presenter
Joseph Lowe, Jerusalem, ISRAEL
Gershon Chaimsky, Jerusalem, ISRAEL
Gideon Mann, Givot Shaul, ISRAEL
James D. O’Halloran, Boston, MA, USA
Jon IP Warner, Boston, MA, USA
Hadassah University Hospital, Jerusalem, ISRAEL

107 patients over 50 years old underwent arthroscopic surgery for a variety of indications between 1989 and 1991. 36 patient presented genu-vara with knee flexion contracture on top of osteo-arthritis. 32 of 36 patients had on grade 4 arthritic changes on arthroscopy, 4 patients had grade 3 changes. 19 patients had additional tear of the posterior horn of the medial meniscus. On arthroscopy 26 were found to have obliterated intercondylar notch, mostly by soft tissue; 14 had osteophytes in the notch and 12 had large osteophytes blocking the patella. Knee flexion contracture, as measured before surgery, was as following: 20 degrees or more - twenty one patients; 10-20 degrees - eleven patients; less than 10 degrees - four patients. Following surgery and intensive physiotherapy, knee flexion contracture was reduced to 10-20 degrees in six patients; sixteen patients - less than 10 degrees; the rest had straight knees. Only nineteen patients from this group were located for evaluation ten years later. Three patients had 10-20 degrees of flexion; nine patients had less than 10 degrees of flexion and seven patients maintained straight knees. Patients that had residual knee flexion contracture after surgery deteriorated during the time. Analyzing the good results we found that these patients had normal or nearly normal articular cartilage in the front part of the femoral condyles and achieved full correction of their contractures. At present, we recommend MRI examinations for evaluation of articular cartilage before suggesting this procedure. However, even partial reduction of knee flexion contracture resulted in temporary improvement in pain and function in most cases.

Poster #196
INDICATIONS FOR ARTHROSCOPY IN ELDERLY PATIENTS
Alex Finsterbusch, Jerusalem, ISRAEL, Presenter
Joseph Lowe, Jerusalem, ISRAEL
Gershon Chaimsky, Jerusalem, ISRAEL
Gideon Mann, Givot Shaul, ISRAEL
Hadassah, Jerusalem, ISRAEL

During our fifteen years experience of arthroscopic surgery, we have noted the increasing number of elderly patients undergoing Arthroscopic surgery. Following about 12 years of follow-up, we have concluded the following indications for surgery in this group of patients:
1. As with young patients, sport trauma or any trauma followed by typical signs of meniscal, ligamentous or other injury, should be treated.
2. In cases of a sudden deterioration in knee condition, acute pain on full flexion with or without knee effusion, in patients without previous knee problems or who suffered from chronic aches on activity - suspect a degenerative tear of the posterior horn of the medial meniscus.
3. Patients with a progressive development of genu vara, with lack of full extension of the knee, who suffer from a chronic osteo-arthritic knee condition. ACL impingement in the intercondylar notch or patellar fixation due to osteophytes should be suspected. Arthroscopic notchplasty, or removal of osteophytes around the patella, followed by physiotherapy, can produce full or improved knee extension and produce HTO-like effect.
4. Patients with a recurrent swelling of the knee with effusion, with or without X-Ray evidence of osteoarthritis. Suspect joint polution by debries or loose bodies. Synovitis can be eliminated by removal of debries.
5. Patients with unicompartamental (mostly median) joint narrowing and x-ray evidence of osteo-arthritis for evaluation of other compartments, before deciding on a definite surgery (HTO or TKR). The secondary goal is “house cleaning”.
6. Patients after intra-articular joint injury with continuous complaints after a rehabilitation period. Joint incongruity in weight bearing surface and or loose bodies.

Relative indications for arthroscopy in the treatment of elderly patients:
1. Cristaline synovitis with recurrent effusions.
2. Synovial chondromatosis with recurrent effusion and/or locking of the knee.
3. Sudden knee pain at night, with normal x-ray, with evidence of AVN by scan of MRI for evaluation of cartilage congruity and integrity. Arthroscopy-guided drilling procedure can be performed.

When is Arthroscopy NOT indicated in the treatment of elderly patients with knee problems:
1. Chronic pain on activity, without knee effusion.
2. Multiple joint involvement.
3. Advanced multicompartamental osteo-arthritis.

Poster #197
POST-OPTERATIVE RESULTS OF MOBILE BEARING TKA FOR OSTEOARTHRITIS OF THE KNEE
Kazumasa Fukusuhina, Tokyo, JAPAN, Presenter
Atsushiiko Sakamoto, Tokyo, JAPAN
Toshinori Yoshimatsu, Tokyo, JAPAN
Yuki Kato, Tokyo, JAPAN
Keinosuke Ryo, Tokyo, JAPAN
Department of Orthopaedic Surgery, Nihon Unversit, Itabashiku, JAPAN

Purpose
A short-term clinical result of mobile bearing TKA, which had been used by since 1996, was evaluated and compared with standard type TKA.

Object and Method
41 cases (51 joints), where mobile bearing TKA was performed on osteoarthritics of the knee(OA) from June 1996 through December 2001, involved 8 male and 33 female, aging from 64 to 90 (mean age 71.3). 6 months to 4 years follow-up (mean 2 years) was the period of study. In Mobile group, 27 cases (31 joints) used Rotaglide mobile bearing TKA and 14 cases (20 joints) used that of Kneeopus. In Control group, using standard type TKA, 24 cases (28 joints) used Axiom, 8 cases (10 joints) used PFC, 5 cases (10 joints) used Nexgen and 6 joints used others. Both groups were evaluated by JOA scorebased on their improvement in Range of Motion (ROM) and contamination levels.

Results
JOA score was 49.5 points before and 76.3 points after surgery in the Mobile group, 46.1 points before and 73.5 points after surgery in the Control group, respectively. There was no significant difference between the 2 groups in JOA score. ROM was 15.5-108.4 degrees pre-operatively and improved to 5.2-119.5 degrees.
degrees post-operatively in the Mobile group. In Control group, pre-operative ROM was 2-106.5 degrees, and 5.9-111 degrees post-operatively. We observed a significant difference in the increase of ROM between the two groups statistically. No contaminations were observed in both groups in a short time follow-up.

Conclusion
Results of mobile bearing TKA were compared with standard type TKA. The Mobile group had an advantage of gain in ROM. There was no problem in a short-term result and also an excellent result was obtained. But the generation of contaminations such as Polyethylene wear is necessary to consider in a long-term follow-up.

Poster #198
THE SIGNIFICANCE OF PRELIMINARY ARTHROSCOPY IN PROXIMAL TIBIAL OSTEOTOMY FOR THE CORRECTION OF VARUS KNEE
Danilo Gervasini, Niardo, ITALY, Presenter
Antonio Mallegni, Esine, ITALY
Gianpalo Chitoni, Esine, ITALY
Mauro Ballerini, Esine, ITALY
Augusto Trombini, Esine, ITALY
Andrea Salvini, Esine, ITALY
Vallecamonica Hospital, Esine, ITALY

PURPOSE: Evaluate the real condition of the medial and lateral varus knee compartment before the valgus osteotomy and treat the associated damages.

MATERIALS AND METHODS: Since 1994 we have employed tibial proximal osteotomy in varus knee or in medial symptomatic overload of any origin in patients under 65 years by means of emicallotasis correction thanks to unilateral external fixator. We have treated 87 cases in total. In the last 37 cases we have associated a preliminary arthroscopy to evaluate endoarticular damages. This has allowed us to treat possible meniscal or chondral lesions (shaving, chondral abrasions, perforations according to Pridie, microfractures or osteochondral autografts). The treatment of chondral or meniscal lesions in varus knee without associating a valgus osteotomy is going to fail. The patients have been evaluated using standard and tele-radiographs under load and by means of TC and MRI. After arthroscopic time and possible treatment of articular damages we have performed an incomplete proximal tibial osteotomy, and thanks to unilateral external fixator, a progressive emicallotasis with 2° overcorrection. In corrections over 7° we have performed distal peroneal osteotomy.

RESULTS: Since 1998 we have associated arthroscopy to valgus tibial osteotomy in 37 patients, male 28, female 9, average age 49.4 years (min.21 max.65). The medium correction has been 8° (min.7 max.9). The origin of the medial overload has been:
- Previous medial total meniscectomy
- Previous medial condylar tibial fractures
- Osteochondral traumas
- Medial condylar femoral necrosis
- Previous arthroscopical chondral treatment without osteotomy

The osteotomy is restored in 100% of the cases, in an average of 53 days (min.45 max.55).

Associated arthroscopical surgery has been:
- Subtotal medial meniscectomy: 9 cases
- Treatment of chondral damages in medial femoral condyle: 11 cases

In 10 cases we have treated both the meniscal and the chondral damages.

DISCUSSION AND CONCLUSION: The association of preliminary arthroscopy to tibial osteotomy in varus knee considerably improves the clinical and anatomical results. The contemporaneous treatment of articular lesions and the direct arthroscopic inspection of the lateral knee compartment permit to decide on more accurate surgical procedures. Moreover, a second look one year after surgery, has shown an important improvement of the medial condyle cartilage.

Poster #199
TOTAL KNEE ARTHROPLASTY BILATERAL SEQUENTIAL IN ONE STAGE. CLINICAL RESULTS AND COMPLICATIONS.
Hugo Gonzalez, Santiago, CHILE, Presenter
Jaime Duboy, Santiago, CHILE
Alvaro Ferrer, Santiago de Chile, CHILE
Giovanni Carcuco, Santiago, CHILE
Instituto Traumatológico y Clínica Santa Marta, Santiago, CHILE

Purpose: The goal of this study is to evaluate clinical results and complications in total knee arthroplasty bilateral sequential in one stage.

Patients and methods: We performed a prospective and protocolized study of patients with bilateral gonarthrosis. From April 1994 to November 2000, 38 patients underwent 76 cemented posteriorly stabilized TKA bilaterally sequential in one stage. We excluded patients with severe systemic diseases. The evaluation was made using HSS score and alignment measured by monopodal weightbearing x-rays.

Results: The mean age of the patients was 60 years (range 28 to 84), the mean follow-up period was 62 months (range, 25 to 104). The etiology was degenerative joint disease in 53% and rheumatoid arthritis in 47%. 88% of patients had angular deformity (varus knee 58%, range: 176 to 190 degrees and valgus knee 42%, range: 152 to 170 degrees) 97% had excellent or good clinical results. The incidence of systemic complications was 13% (5 patients) all resolved with specific treatment. The rate of infection was 2.7% (2 knees).

Conclusions: The bilateral sequential surgical procedure in one stage is a safe option of treatment in selected patients, with functional results and complications similar to previous reports. We believe it’s important point out that the results depend in large part on the expertise of the surgeon and the protocolized management of these patients.

Poster #200
EARLY PATIENT OUTCOMES FOLLOWING PRIMARY AND REVISION TOTAL KNEE ARTHROPLASTY: A PROSPECTIVE STUDY
Richard Hartley, Wirral, UNITED KINGDOM, Presenter
Nicholas G Barton Hanson, Liverpool, UK
Rose Finley, Upton, UK
Richard W Parkinson, Wirral, UK
Richard W Parkinson, Upton, UK
Department of Orthopaedics, Arrowe Park Hospital, Upton, UNITED KINGDOM

There has been speculation as to whether the outcome of revision total knee arthroplasty (TKA) is as successful as primary TKA, this study was designed to compare the outcomes of primary and revision TKA in order to address this question.
Methods
The study collected data prospectively from patients operated upon by one surgeon using one prosthesis design in each group. All patients undergoing revision TKA between 1997 and 2000 were included in the study. 100 consecutive patients undergoing primary TKA between 1997 and 1999 were included in the study. All surgery was performed by the senior author. Patients completed SF-12 and WOMAC questionnaires pre-operatively and at six and twelve months post-operatively. Mean scores were calculated for the different areas within both outcome measures (WOMAC pain, stiffness and function; SF-12, physical constant score [PCS] and mental constant score [MCS]). The results were entered into a database and analysed using a combination of two way and simple repeated measures analysis of variance (ANOVA) and t-tests. Only if the result of the ANOVA was significant were post-hoc adjusted t-tests performed on the data values.

Results
WOMAC scores did not differ between the two groups pre-operatively. Both patient groups showed a significant improvement in WOMAC scores at six months (P<0.0005). In the primary group the pain and function scores improved significantly between six and twelve months (P=0.0258 and P=0.0019 respectively). This was not the case in revision patients. SF-12 PCS scores were significantly better in the primary patients pre-operatively (P<0.0005). Both groups showed a significant improvement at six months assessment (P<0.0005). Neither group demonstrated an improvement between six and twelve months. SF-12 MCS scores did not show any difference between the two groups pre-operatively. No significant change in MCS score occurred during the study in either the primary or revision patients.

Conclusion
The SF-12 and WOMAC health questionnaires are valid, reliable and responsive outcome measures. The study has collected data prospectively from patients operated upon by one surgeon using one prosthesis design in each group. These findings support the concept that revision TKA leads to a comparable improvement in patient perceived outcomes of physical parameters as does primary TKA in both generic health outcome measures and disease specific outcome measures.

Poster #201
DOES A PATIENT'S PRE-OPERATIVE MENTAL STATE INFLUENCE POST-OPERATIVE PHYSICAL OUTCOMES IN TOTAL KNEE ARTHROPLASTY? A PROSPECTIVE STUDY.
Richard Hartley, Wirral, UNITED KINGDOM, Presenter
Edward V Wood, Upton, UK
Nicholas G Barton Hanson, Liverpool, UK
Rose Finley, Upton, UK
Richard W Parkinson, Upton, UK
Wirral Hospitals NHS Trust, Upton, UK

Introduction
There have been many studies concerned with the outcomes of total knee arthroplasty (TKA). A number of outcome predictors have been identified, however, no study has been published to date that specifically assesses the influence of patients' pre-operative mental state on the post-operative physical outcomes of TKA.

Aims
This study aims to identify any correlation between patients' pre-operative mental status and post-operative physical scores, as assessed using the SF-12 and WOMAC outcome measures, in primary and revision TKA.

Methods
100 primary TKA and 60 revision TKA patients were prospectively assessed using the validated SF-12 and WOMAC outcome measures. They were assessed pre-operatively and at six and twelve months post-operatively. All surgery was performed by a single surgeon (the senior author) using one prosthesis design in each group.

Mean scores were calculated for the different areas within both outcome measures (WOMAC pain, stiffness and function; SF-12 - physical constant score [PCS] and mental constant score [MCS]).

The information was entered into a database and assessed for any correlation between the pre-operative MCS and post-operative PCS, pain, stiffness and function scores using Spearman's Rank Correlation.

Results
The results reveal a significant positive correlation between pre-operative MCS and post-operative PCS scores at six and twelve months (P=0.01 and P=0.011 respectively) in the primary patients. There was no correlation in the revision patients. There was a statistically significant negative correlation between pre-operative MCS and six month WOMAC pain, stiffness and function scores (P=0.025, P=0.019 and P=0.01 respectively) in the primary patients. There was no significant correlation with twelve months WOMAC scores. There was no significant correlation in terms of pre-operative MCS and six months WOMAC scores in the revision patients, but there was a statistically significant negative correlation between pre-operative MCS and the twelve months pain score (P=0.039).

Conclusion
The SF-12 and WOMAC health questionnaires are valid, reliable and responsive outcome measures. The study has collected data prospectively from patients operated upon by one surgeon using one prosthesis design in each group. The results of this study support the concept that high generic mental health scores in patients prior to primary TKA are associated with good physical outcomes in terms of both generic health outcome measures and disease-specific outcome measures.

Poster #202
MEASUREMENT OF THE SOFT TISSUE TENSION IN TOTAL KNEE ARTHROPLASTY
Akiho Hoshiba, Saitama, JAPAN, Presenter
Hiroshi Asano, Tino, JAPAN
Tim J. Wilton, Derby, UK
Kawaguchi Kogyo General Hospital, Kawaguchi, JAPAN

Introduction
Soft tissue balancing is the major concern in the surgical procedure of TKA; however, proper value of the soft tissue tension strength has been decided by the surgeons' hands and judged by their own experiences. Soft tissue tension in the past was created by surgeons' feeling as “just enough”. New instruments were developed by the authors, which indicate varus-valgus balancing and gap difference at both extension and flexion. Also, this balancer shows absolute value of the soft tissue tension from the torque driver attached to the instruments. This balancer was used in 77 consecutive knee arthroplasties and proper soft tissue tension for TKA was investigated. In our surgical procedure, proper soft tissue tension was noted as 126+/−24N in extension and 121+/−23N in flexion. There was no significant correlation between soft tissue tension and postop-

POSTER ABSTRACTS
Objective: To assess if a mobile bearing total knee prosthesis can be fixed to the tibial plateau or it can have freedom of rotation and/or translation. It is not yet clear what the differences can be fixed to the tibial plateau or it can have freedom of rotation and/or translation. It is not yet clear what the differences can be fixed to the tibial plateau or it can have freedom of rotation and/or translation. It is not yet clear what the differences can be fixed to the tibial plateau or it can have freedom of rotation and/or translation. It is not yet clear what the differences can be fixed to the tibial plateau or it can have freedom of rotation and/or translation. It is not yet clear what the differences can be fixed to the tibial plateau or it can have freedom of rotation and/or translation. It is not yet clear what the differences can be fixed to the tibial plateau or it can have freedom of rotation and/or translation. 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RESULTS: The mean intra-observer variation of the localization of the transepicondylar axis was 4° in comparison to the reference axis, with a maximum of 11° for the first surgeon and 9° for the second one, in either internal or external rotation. The mean inter-observer variation of the localization of the transepicondylar axis was 4° in comparison to the reference axis, with a maximum of 14°, in either internal or external rotation. There were significant differences in both intra- and inter-observer measurements.

CONCLUSION: The peroperative measurement of the localization of the transepicondylar axis involves a high intra- and inter-observer variation, with mean values about 9° and maximum value over 10°. This variation can be explained by the anatomical, smooth shape of both femoral epicondyles. The exact influence of this variation on the clinical, functional and anatomical results after total knee prosthesis has to be studied.

Poster #206
ARTHROSCOPY OR TOTAL KNEE REPLACEMENT FOR OLD PATIENTS WITH SERIOUS OSTEOARTHRITIS, OUR EXPERIENCE
Yu Jiakuo, Beijing, CHINA, Presenter
Institute of Sports Medicine of Beijing University, Beijing, CHINA

Now the number of total knee replacement operation is increasing year by year, the composing of patients is also changing. During early period, most of the patients for total knee replacement suffered from rheumatoid arthritis, now it has been changed into osteoarthritises. Is it necessary to do arthroscopy before total knee replacement? Our research told us we should do arthroscopy at first for 85% percent of serious osteoarthritises.

Material and Method:
From 1985-2001, 85 patients included 90 knees with serious osteoarthritises were treated with arthroscopy. Male 31, female 54. Age: 56.6 ± 18 years old. Mean follow up time 4 years. During operation, Cartilage debridement, synovial membrane shaving, taking out of lose bodies and cartilage fragments, partial and total meniscectomy and subchondral bone decompensation for patellar, femur and tibia plateau has been used to different patients. All of the operations has been done by one surgeon. Knee Society Clinical Rating System and Lysholm score was used.

Result:
1. Knee Society Clinical Rating System result: Knee pathology score before operation 19.61 ? 9.6, post operation 41.12 ? 17, p=0.0000. Knee function score before operation 44.38 ? 30, post operation 69.69 ? 17, p=0.0000. Total score pre-operation: 64.57 ? 26, post-operation: 110.80 ? 73, p=0.0000. 2. Comparing Lysholm score pre- and post-operation, p=0.0000.
   3. According to the Knee Society Clinical Rating System and Lysholm, excellent, good, improvement and fail clinical results were as: excellent 53.13%, good 31.25%, improvement 9.37% and fail 6.25%.

Conclusion:
Considering the result of 3-6 years follow up, 85% arthroscopy results has excellent and good result, only 15% with improvement and fail result. Attention should be paid that before operation the total Knee Society Clinical Rating System score was only 64.5. No relationship between pathology degree, varus and valgus degree and clinical result was found. It was suggested arthroscopy should be done at first for all of the osteoarthritis patients, even serious patients.

Poster #207
ANALYSIS OF INITIAL FIXATION STRENGTH OF PRESS-FIT FIXATION TECHNIQUE IN ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION
Hyunchul Jo, Seoul, KOREA, Presenter
Myung Chul Lee, Seoul, KOREA
Sang Cikool Seong, Seoul, KOREA
Department of Orthopaedic Surgery, Seoul National U, Seoul, KOREA

Purpose: We performed a controlled laboratory study to evaluate the initial fixation strength of press-fit technique.

Methods: Fifty porcine lower limbs were used and divided into 5 groups according to the method of fixation and the diameter difference between the bone plug and the femoral tunnel. The specimens underwnt 250 loading cycles between 0-2 mm of displacement. Thereafter, the specimens were loaded to failure.

Results: The average ultimate failure loads of the group 2 (press-fit+1.4mm) and group 5 (press-fit+1.4mm & 30 degrees) were 571.40 N and 605.40 N, respectively, which were not significantly different from those of the group 3 (titanium interference screw), 691.10 N and group 4 (bioabsorbable interference screw), 707.40 N, respectively.

Conclusion: The complete circular shape and increased diameter difference between the bone plug and the femoral tunnel seemed to contribute to the stronger fixation.

Poster #208
DRILLING FROM THE INTERCONDYLAR AREA FOR TREATMENT OF OSTEOCHONDRITIS DISSECANS OF THE KNEE JOINT
Kenzo Kawasaki, Izumo, JAPAN, Presenter
Mitsuo Ochi, Izumo-shi, JAPAN
Yuji Uchio, Izumo, JAPAN
Nobuo Adachi, Izumo, JAPAN
Junji Iwasa, Izumo, JAPAN
Shimane Medical University, Izumo, JAPAN

Purpose: To demonstrate a new method in which drilling is made from the intercondylar space and its efficacy in treating osteochondritis dissecans (OCD) of the knee in skeletally immature patients with relatively stable lesions with an intact articular surface in cases where there was failure of initial non-operative management. Methods: The lesions of 16 knees of 12 patients with OCD of the femoral condyles failed to heal by conservative treatment for more than 3 months (average 5.6 months) and thereafter were arthroscopically treated with drilling from not transarticular but intercondylar base area without damaging articular surface. Eight lesions involved the medial femoral condyle, and 8 involved the lateral femoral condyle. The average follow-up was 16 months. Results: All lesions healed after drilling, and the average time of healing was 4 months by x-p and 7 months by MRI. The average Lysholm score improved from an average of 70.4 points at pre-operation to an average of 97.8 points after operation. The
results of the Hughston Rating Scale were similar: 10 of the 12 patients showed excellent results and the remaining 2 patients showed good results. Conclusion: We advocate our new and less invasive procedure of drilling from the bare area of the intercondylar space for OCD without damaging the articular cartilage in the knee joint of skeletally immature patients who have had failure of initial nonoperative management.

Poster #209
STANDARDISED MORTALITY RATIOS AND FATAL PULMONARY EMBOLISM RATES FOLLOWING PRIMARY TOTAL KNEE ARTHROPLASTY – A COHORT OF 1018 CONSECUTIVE CASES.
Amer Khan, London, UNITED KINGDOM, Presenter
Jonathan Emerson, London, UNITED KINGDOM
George S E Dowd, Herts, UNITED KINGDOM
The Royal Free Hospital, London, UNITED KINGDOM

AIM
To determine retrospectively the post-operative mortality and fatal pulmonary embolism (PE) rates in 1018 consecutive primary total knee replacements (TKR) in the three month period after surgery where chemical thromboprophylaxis was not routinely used.

METHODS
Operations were performed over a period of twelve years by eight different senior orthopaedic surgeons on 280 men and 566 women. One hundred and seventy-two patients had bilateral TKRs and the mean age at the time of operation for men and women was similar (69.4 and 72.2 years respectively). Patients were traced by out-patient appointments, telephone and through their general practitioners (GPs). Post-mortem examinations were used to verify the cause of death in all save three of the cases. All but one of the patients were followed-up.

RESULTS
At post-mortem examination there were no deaths from PE. Since three patients were certified dead without post-mortem examination and one patient could not be traced this meant that, at worst, our fatal PE rate was 0.39% (4/1018; CI 0.13% - 1.08%). However we suspect our fatal PE rate to be 0.2% (2/1018, 0.03% - 0.79%). At worst the all-cause mortality rate was 0.69% (7/1018, CI 0.3% - 1.48%). The patient mortality was compared with the population mortality for England and Wales using standardised mortality ratios (SMRs). The SMR for both sexes combined was 0.74 (CI 0.29 - 1.52). We observed a lower mortality in females SMR = 0.67 and males SMR = 0.84 during the first three post-operative months than compared to the general population.

CONCLUSION
Fatal pulmonary embolism after total knee replacement without routine chemical thromboprophylaxis is uncommon. The overall death rate in patients undergoing total knee replacement in our series appears to be lower than that in the general population.

Poster #210
BALANCED PLACEMENT OF THE FEMORAL COMPONENT IN REVISION TOTAL KNEE ARTHROPLASTY
Katsuki Kitaoka, Kanazawa, JAPAN, Presenter
Kensaku Hashiba, Kanazawa, JAPAN
Katsuhiko Kitaoka, Kanazawa, JAPAN, Presenter
Jonathan Emerson, London, UNITED KINGDOM

Purpose: To introduce a method for revision total knee arthroplasty (Re-TKA) with the concept of the balanced placement of the femoral component.

Surgical technique & subjects: The first step consists of releasing soft-tissue and cutting the proximal tibia. The second step involves the decision of the femoral component rotation referring to the joint gap in 90 degrees of flexion. The third step involves the decision of the joint line referring to the joint gap in 0 and 90 degrees of flexion. Finally, tibial and femoral components are placed with or without stems and augmented blocks. Since 1998, we have performed Re-TKA using this technique on 20 knees. Thirteen knees were followed more than 2 years. There were 3 men and 10 women with an average age of 73 years. The average follow-up was 30 months.

Results and conclusion: All patients using this technique had excellent results at the time of follow-up. Re-TKA contains difficult problems such as bone defects and soft tissue scarring. Therefore, common soft-tissue balancing after independent-cut technique is not fit for Re-TKA. Furthermore, the decision of the properly rotating of the femoral component and the properly joint line is very hard comparing to primary TKA. This technique of the balanced placement of the femoral component is very simple and essential to create better clinical results in Re-TKA.

Background: We developed the system of three-dimensional leg alignment assessment using biplanar (simultaneous, AP and 60-degrees oblique) computed radiography (Fuji Film Co., Japan) in standing position. The anatomical coordinates system which is determined by the reference points (femoral side: femoral head and bilateral posterior condyles of femur as a spherical shape, tibial side: proximal and distal joint surface and line of mid-points of tibia and fibula shaft) is established in biplanar X-ray image by fitting technique with the computed tomography model. After this fitting the anatomical coordinates can be re-established in any 0-90 degrees biplanar X-ray projection with more than a half length of femur and tibia.

Design/Methods: By this system and the projection matrix of the component, a three dimensional image of the component can be introduced to the biplanar X-ray image. After the fitting of the shadow of the components to the femoral and tibial joint geometry, a suitable size and a three dimensional position assessment of component to anatomical coordinates system can be evaluated in the personal computer (Pre-operative planning). For the intra-operative registration, by use of this system, the osteotomy can be controlled by routine X-ray with digital X-ray system. The method and its accuracy are presented.

Objectives: By three dimensional leg alignment assessment system, a computer assisted Total Knee Arthroplasty can be controlled by routine X-ray with digital X-ray system. The method and its accuracy are presented.
pre-operative planning related to X-ray marker of the intramedullary rod is calculated, and the special osteotomy jigs that consisted of a small rod connected by universal joint (a central point of the joint is the same as the poison of a central point of X-ray marker) are attached to the intramedullary rod. The direction and distance of the small rod is set to control flexion, abduction, rotation, and anterior and proximal translation of the osteotomy surface. Post-operative evaluation of three dimensional positioning of the components can be assessed by biplanar X-ray with the same technique as the pre-operative planning.

Results: A three dimensional positioning of component can be determined within 1 degrees or 1 mm variation. Osteotomies of total knee replacement can be controlled within 5 minutes within 1 degree and 1 mm accuracy.

Conclusions: This computer assisted surgery can be performed in any hospital by a routine X-ray in shorter time by assessment of three dimensional leg alignment assessment to detect the anatomical coordinates system.

Poster #212
RESULT OF POSTERIOR CRUCIATE RETAINING TOTAL KNEE ARTHROPLASTY
Dong Chul Lee, Taegu, SOUTH KOREA, Presenter
Wook Jin Shon, Taegu, KOREA
Byung Won Park, Taegu, KOREA
Young Nam University Hospital, Taegu, KOREA

< Purpose >
The posterior cruciate ligament retaining design in the total knee arthroplasty had a good clinical results in the long term follow up and its results can be affected by the preoperative deformity, degree of limitation of motion and flexion contracture. The purpose of study was to evaluate clinical result of posterior cruciate retaining TKA (PRTKA) according to the degree of deformity and range of motion.

< Materials and Method >
From January 1993 to March 1999, seventy-seven cases in 46 patients were followed up for more than 3 years. Average follow up period was 44 months and average age was 68 year old. They were divided to three groups according to degree of varus deformity (group I: ≤5 group II: 6~10 group III: ≥11, and degree of range of motion (group I: ≤90 group II: 90~110 group III: ≥110). The clinical results according to the presence of flexion contracture were evaluated. Evaluation systems were used with Hospital for special surgery criteria and radiographic evaluation of American knee society for radiologic assessment.

< Result >
1. Knee rating scales of HSS in group I, II, III according to degree of preoperative deformity were improved from preoperative average 40.8, 30.7, and 18.0 to postoperative average 73.2, 81.0, and 90.0 and functional scales were improved from preoperative average 40.8, 30.7 and 18.0 to postoperative average 73.2, 81.0, and 90.0.
2. Range of motion in group I, II, III according to ROM were improved from preoperative average 81.9°, 100.8°, and 121.7°, to postoperative average 99°, 109°, and 117°, and knee rating scales were improved from preoperative average 49.0 and 49.0 to postoperative average 84.3, 86.1, and 85.8.
3. The changes of flexion contracture in group I (absence of knee contracture) and group II (presence of knee contracture) were changed from preoperative 0° and 13° to postoperative average 1° and 1° and knee rating scale were improved from preoperative average 45.0 and 31.0° to postoperative average 86.6 and 84.6°.
4. Tibiofemoral angle was corrected from preoperative average 5.7° varus to post-operative average 6.9° valgus.
5. α, β, γ and δ angles in postoperative radiologic assessment were respectively 97 3°, 89 6°, 7 0°, 6.3° and 85 8°.

< Conclusion >
There was statistical significance(P<0.05) in postoperative knee rating scale and functional score in all case compared to pre-operative states. In comparing the subgroups of limited motion, there was statistical significance(P<0.05) of functional scale in group III which had more severe limitation of motion. The more preoperative limitation of motion, the more increasing in functional scores at last follow up. If appropriate technique of maintaining adequate balance in the deformed knee with the preoperative knee limitation and soft tissue deformity can make good clinical results and solve the problems of deformity and motion limitation.

Poster #213
LIMITATIONS OF THE MODEMS KNEE CORE INSTRUMENT IN DETECTING IMPROVEMENT FOLLOWING TOTAL KNEE ARTHROPLASTY
Edward C. Jones, New York, NY, USA
Robert G Marx, New York, NY, USA, Presenter
Nawal Atwan, New York, NY, USA
Margaret G. E. Peterson, New York, NY, USA
Eduardo A. Salvati, New York, NY, USA
Thomas P. Sculco, New York, NY, USA
Hospital for Special Surgery, New York, NY, USA

Introduction:
The use of patient-derived outcome scales to measure improvement following orthopedic surgery has gained importance in the last decade. A new outcome scale, the MODEMS Knee Core instrument was developed by the American Academy of Orthopedic Surgeons to measure improvement following treatments for disorders of the knee. The goal of this study was to evaluate the ability of this instrument to measure early functional recovery at six months after total knee arthroplasty.

Methods:
Prior to total knee arthroplasty, 266 knee patients completed the MODEMS Knee Core instrument and the SF-36 General Health Scale. They also completed these questionnaires at six months after surgery. Sixty-two percent of the patients were female and the age range was 28 to 90 years with a mean age of 70 years. The ability of these tools to measure improvement was assessed with the standardized response mean.

Results:
The MODEMS Knee instrument did not detect increased improvement for the patients when compared to the SF-36 PCS (standardized response mean: .50 for MODEMS Knee Core, 1.51 for PCS of the SF-36 and 1.21 for MCS of SF-36). The mean baseline scores were as follows: Knee score 58.32±15.72; SF-36 PCS 29.92±8.24. The mean six month post-operative scores were: Knee score 79.91±15.22; SF-36 PCS 41.71±10.79. At six months post-op, nine percent of the knee replacement patients were female and the age range was 28 to 90 years with a mean age of 70 years. The ability of these tools to measure improvement was assessed with the standardized response mean.

Conclusion:
The MODEMS Knee Core instrument exhibits a significant ceiling effect and has a limited capacity to detect a wide range of improvement following total knee replacement at six months post-operatively.
Introduction

Some clinical studies demonstrated that five weekly intra-articular injections of sodium hyaluronic acid (HA) were superior to placebos and well tolerated in patients with moderate osteoarthritis (OA) of the knee. The mid-term effects of this therapy for moderate OA of the knee have been reported to be favorable. In Japan, it is not rare to continue intra-articular injections of HA for six weeks or more to treat moderate and severe OA patients who decide against surgery. At our hospital, about 70% of the patients who were injected with HA continued to undergo injections for six months or more. However, it is unclear whether long-term weekly intra-articular HA injection is effective for patients with OA of the knee. The purpose of this prospective study was to evaluate the effects of long-term weekly intra-articular injections of HA for patients with OA of the knee.

Materials and Method

Twenty-three patients who underwent weekly intra-articular HA injections for six months or more participated in this study. The average age was 73.2 years (range 50 to 82 years). Patients treated with steroids or topical anesthetics were excluded.

Patients were divided into two groups according to the grading system of Kellgren and Lawrence (grade I-IV); group 1: grade I and II (n=11), group 2: grade III and IV (n=12). One hundred mm visual analog scale (VAS) was used to evaluate the effects of intra-articular HA injections for knee pain. VAS of patients were recorded prior to administration, at 20:00 on the day of injection and every night for one week. We selected the following four points. They were VAS prior to administration, VAS at 20:00 on the day of injection, minimum VAS value and VAS of the final day. The changes of VAS in both groups were evaluated. Statistical analysis was performed using one-way ANOVA and Fisher’s PLSD for post hoc test. For all statistical analyses, the P<0.05 level of significance was used.

Results

In group 1, average VAS decreased from 52 mm prior to administration to 38 mm at 20:00 on the day of injection. The average minimum VAS was 28 mm and was observed at 2.7 days after HA injection on average. On the final day, average VAS was 31 mm. There were statistically significant differences between the average VAS prior to administration and the average minimum VAS and between the average VAS prior to administration and VAS of the final day. In group 2, average VAS decreased from 49 mm prior to administration to 37 mm at 20:00 on the day of injection. The average minimum VAS was 28 mm and was observed at 1.1 days after HA injection on average. On the final day, average VAS was 36 mm. There was a significant difference between the average VAS prior to administration and the average minimum VAS, however, significant difference between the average VAS prior to administration and VAS of the final day was not observed.

Discussion

These results showed that the effect of HA injections were maintained for one week in group 1, however, those in group 2 were not maintained. From these results, it was thought that weekly intra-articular HA injections are effective for patients with moderate OA. However, patients with severe OA need shorter interval intra-articular HA injections. HA has lubricating, anti-inflammatory and analgesic effects, and the half-life of extrinsic HA has been reported to be 10 to 20 hours. In this study, the minimum VAS was observed 2.7 days after injection on average in group 1 and 1.1 days in group 2. This result indicates that volume decrease of extrinsic HA aggravated symptoms more directly in patients with severe OA. It was thought that a larger volume of HA is necessary to manage patients with severe OA.

Conclusion

Long-term weekly intra-articular HA injections are effective for patients with moderate OA. However, patients with severe OA need shorter interval or larger volume intra-articular HA injections.
ated with pain in knee OA. To investigate this hypothesis, 58 patients with symptomatic knee OA, fulfilling the ACR criteria, were enrolled in the study. MR imaging of the knee was performed in all patients. On MR imaging, TI-, T2-weighted, proton-density fast spin-echo and STIR sequences were used. A single observer who classified the size of BML into 3 grades and who detected subchondral bone cyst and low intensity lesion suggesting abnormal trabeculae performed a retrospective review. Severity of knee pain was evaluated with the English version of WOMAC pain subscale. BML on MRI was noted in 43 patients (74%) with knee OA, localized type 55%, intermediate type 24%; wide type 21%. Pain score was not associated with BML size, the presence of bone cyst, or low intensity lesions. On the other hand, varus malalignment on the radiograph was significantly correlated with BML size in a group of varus knee OA (p<0.01). In conclusion BML of knee OA was not associated with pain correlated with BML size in a group of varus knee OA (p<0.01).

In high tibial closing wedge osteotomies (HTO), closure of an osteotomy gap after resection of a bony wedge can be associated with a fissure of the medial cortex of the tibial head (MCT). Clinically, the integrity of the MCT is crucial for the maintenance of correction during the healing period. Biomechanically, a broken MCT can lead to lateral displacement of the distal tibial segment and early revarisation. Roentgen Stereometric Analysis (RSA) studies on HTO patients with an intact MCT show persisting translations between the tibial segments when COVENTRY staples were used. In this study, serial RSA was used to determine the in vivo stability of rigid internal fixation after HTO over time in patients with varying degree of varus malalignment and correction.

Methods: Fifteen patients with varus gonarthrosis stage I-III (AHLBACK) were treated with HTO and internal fixation with an L-shaped rigid plate. Patients were followed by serial RSA, conventional radiographs and clinical evaluation over a 12 months period.

Results: In 9 of 15 succeeding patients, the MCT could be preserved during surgery (group 1). The average wedge size was 7.1° in this group. In 6 of 15 of patients, the MCT was unintentionally fissured intraoperatively either during approximation of the tibial segments or during internal fixation. In these patients, an average 10.7° wedge was resected (group 2). In group 2, RSA revealed a 1.3 mm increase in lateral displacement of the distal in relation to the proximal tibial fragment within three weeks after surgery. Between six to twelve weeks after HTO, RSA data were comparable between both groups and the translations between tibial segments were below the accuracy of the RSA set-up.

Conclusion: Resecting larger wedge sizes (≥ 10°) was frequently followed by a fissure of the MCT leading to an early lateral displacement of the distal tibial segment after HTO. A rigid plate fixation could not prevent a loss of correction in cases with a fissure of the MCT. Six weeks after surgery, the osteotomy was stable according to RSA and weight bearing was allowed without a further loss of correction.

Poster #217
THE RESULT OF OSTEOCHONDRAL GRAFT AND HIGH TIBIAL OSTEOTOMY IN THE OSTEONECROSIS OF MEDIAL FEMORAL CONDYLE
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Takashi Sakaki, Kyoto, JAPAN
Yoshitaka Matsusue, Otsu, JAPAN
Takashi Nakamura, Kyoto, JAPAN
Department of Orthopaedic Surgery, Faculty of Medi, Kyoto, JAPAN

[Purpose] Mosaicplasty is also indicated to the osteochondral defect. We reported 6 cases performed osteochondral graft and high tibial osteotomy in the osteonecrosis of medial femoral condyle. [Materials and Methods] We experienced 6 cases 6 knees from 1998 to 2001 in our hospital. Two men and 4 women, 2 right knees and 4 left ones, and the mean operative age was 62-years-old. According to the Koshino classification, stage 3 was 3 cases and stage 4 was 3 ones. The mean follow-up period was 19 months. We evaluated the area of osteochondral defect, the number of implanted plugs, femorotibial angle, IKDC evaluation form and range of motion. [Results] The mean area was 404 mm2, and the mean number of plugs was 3.2. The mean osteotomy angle was 11.7 degrees, and the mean femorotibial angle changed from 180.5 degrees to 168.7 degrees. In the preoperative IKDC, all cases were abnormal, and 4 cases were normal and 2 cases were nearly normal in follow-up IKDC. All cases except one could sit straight. [Discussion] Souccos recommended total knee arthroplasty in such cases as ours. However, the patients who were performed total knee arthroplasty could not sit straight. In our operative technique, almost cases could sit straight. [Conclusion] The result of osteochondral graft and high tibial osteotomy in the osteonecrosis of medial femoral condyle was good, especially in the range of motion.

Poster #218
LOSS OF CORRECTION FOLLOWING HIGH TIBIAL OSTEOTOMY
Dietrich Pape, Homburg/Saar, GERMANY, Presenter
Frank Adam, Homburg/Saar, GERMANY
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Background: In high tibial closing wedge osteotomies (HTO), closure of an osteotomy gap after resection of a bony wedge can be associated with a fissure of the medial cortex of the tibial head (MCT). Clinically, the integrity of the MCT is crucial for the maintenance of correction during the healing period. Biomechanically, a broken MCT can lead to lateral displacement of the distal tibial segment and early revarisation. Roentgen Stereometric Analysis (RSA) studies on HTO patients with an intact MCT show persisting translations between the tibial segments when COVENTRY staples were used. In this study, serial RSA was used to determine the in vivo stability of rigid internal fixation after HTO over time in patients with varying degree of varus malalignment and correction.

Methods: Fifteen patients with varus gonarthrosis stage I-III (AHLBACK) were treated with HTO and internal fixation with an L-shaped rigid plate. Patients were followed by serial RSA, conventional radiographs and clinical evaluation over a 12 months period.

Results: In 9 of 15 succeeding patients, the MCT could be preserved during surgery (group 1). The average wedge size was 7.1° in this group. In 6 of 15 of patients, the MCT was unintentionally fissured intraoperatively either during approximation of the tibial segments or during internal fixation. In these patients, an average 10.7° wedge was resected (group 2). In group 2, RSA revealed a 1.3 mm increase in lateral displacement of the distal in relation to the proximal tibial fragment within three weeks after surgery. Between six to twelve weeks after HTO, RSA data were comparable between both groups and the translations between tibial segments were below the accuracy of the RSA set-up.

Conclusion: Resecting larger wedge sizes (≥ 10°) was frequently followed by a fissure of the MCT leading to an early lateral displacement of the distal tibial segment after HTO. A rigid plate fixation could not prevent a loss of correction in cases with a fissure of the MCT. Six weeks after surgery, the osteotomy was stable according to RSA and weight bearing was allowed without a further loss of correction.

Poster #219
IS POLYETHYLENE WEAR A PROBLEM IN TOTAL KNEE ARTHROPLASTY? A REVIEW AT 12 YEARS FOLLOW UP. 113 CASES.
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Premature wear and osteolysis in TKA, is a frequent problem in literature. The authors use the HLS Total Knee Arthroplasty (TKA) (Ste TORNIER) since year 1985. The results of 113 TKA implanted between 1985 and 1989 are presented here. 4 patients are lost of follow-up. 41 died. 2 prosthesis were removed (1 for infection and 1 for mechanical failure because of malalignment).

Mean follow up is 12 years and maximum 16 years.

Survival analyse of this serial using Kaplan meier method is 98% at 16 years with a confidence interval at 95% using greenwood formula equal to [92%, 99%].

We studied the wear looking at front standing X-rays. We found 8 cases of wear (4 lateral side, 4 on medial side), all related to slight malalignment. Wear appeared at 10 years, with no clinical signs at 12 years of follow-up. Carreful examination of X-rays showed no sign of osteolysis except decalcification of the medial femoral condyle.
We did no revision for wear or osteolysis. All tibial plateau had a minimal thickness of 10 mm. There is a correlation between wear and femoro-tibial alignment.

In conclusion, our experience with the posterostabilized TKA, HLS, wear was not a problem at all.

Poster #220

PRIMARY TOTAL CONDYLAR ARTHROPLASTY OF THE KNEE • PFC ND PFC SIGMA KNEE
Zoran Zdravko Popovic, Belgrade, YUGOSLAVIA, Presenter
Dragan Nikoli, Belgrade, YUGOSLAVIA
Milimir Kotic, YUGOSLAVIA
Jose Rajo, YUGOSLAVIA
Military Medical Academy, Belgrade, YUGOSLAVIA

At the department for orthopaedics and traumatology of Military Medical Academy in Belgrade, Yugoslavia, from 01.01.1998 year till 31.12.2001 year it was performed 137 total-condylar arthroplasties of the knee on 100 patients. At 37 (37%) of patients the surgery was done bilaterally in one procedure. There were 33 (33%) of male and 67 (67%) of female patients. Average age was 67 years (from 20-78). Average period of follow up was 1,5 years (from 6 months to 2 years). The frequency of deep infection in this period was 9 (6,56%) at 8 (5,83%) patients. At 8 (5,83%) of those patients infection happened in second half of year 2000 and 1 (0,72%) during 2001. There is possibility that such a frequency of infection in this particular period was caused by technical insufficiency in preparation for performing of surgeries. At 6 (4,3%) of infected patients the procedure of bilateral totalcondylar arthroplasty performed at once. In one case, patient with who in dialysise, both endoprosthesis implanted in at once caused the infection. It is all about orthopaedics – surgical procedure that requires excellent technical conditions for its performance, right choice of total condylar endoprosthesis of knee and competent surgical team.

Poster #221

THE OXFORD UNICOMPARTMENTAL KNEE PROSTHESIS: AN INDEPENDENT 10-YEAR FOLLOW-UP.
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Van Isacker Tom, Brussels, BELGIUM
Cottene Dominique, Gent, BELGIUM
Vorlat Peter, Brussels, BELGIUM
Verdonk Rene, Gent, BELGIUM
Handelberg Frank, Brussels, BELGIUM
Casteleyn Pierre-Paul, Brussels, BELGIUM
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Purpose: To assess the long-term results of the Oxford unicompartmental knee prosthesis for unicompartmental osteoarthritis and to discuss these results in comparison to other, scarce, long-term follow-up data.

Methods: Sixty-five medial and 6 lateral prostheses were placed in 67 patients. After an average of 10 years, they were evaluated with the Hospital for Special Surgery (HSS) knee score.

Results: Eight prostheses were lost to follow-up. Fifteen patients passed away after a mean of 7 years, all of them with their prostheses in place. Ten (16%) revisions were noted: in 4 cases (6%) this was associated with an initially poor operative indication or a postoperative malalignment. The mean HSS score in 35 medial and 3 lateral prostheses was 164 (79% excellent or good, 10.5% moderate and 10.5% poor results) compared to 168 at 4-years of follow-up. There is no significant difference between the score of patients older and patients younger than 65 years of age.

Conclusions: Because this type of prosthesis preserves a maximum of bone stock and is revised to a total prosthesis without much difficulty it is the first choice prosthesis for medial unicompartmental osteoarthritis in the relatively young patient. In the light of other, very scarce long-term follow-up series, and compared to follow-up of total knee prostheses, the revision rate is high. Therefore, in spite of the very good and lasting HSS score in this group, this prosthesis is not the first choice in the elderly.

Poster #222

MEASUREMENT OF THE VALGUS ANGLE OF THE FEMUR ON COMPUTERISED AXIAL TOMOGRAPHY SCANS
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Graham W Keys, Macclesfield, UNITED KINGDOM
Graham J Kemp, Liverpool, UNITED KINGDOM
Macclesfield General Hospital, Macclesfield, UNITED KINGDOM

Purpose

The aim of knee replacement surgery is to restore physiological alignment. For reasons of radiation safety and cost most surgeons simply cut the distal femur at 5° valgus angle. However, this is specific to an individual, and the replaced knee should reproduce that angle. We set out to evaluate the accuracy and reproducibility of measuring the valgus angle on a preoperative CT scanogram, and to ask whether this permits restoration of individual knee alignment postoperatively.

Subjects & Methods

Preoperative CT scannograms were performed on 94 patients (188 knees) for measurement of valgus angle. The anatomical and mechanical axes were drawn and the angle subtended by these axes at intercondylar notch gave the Hip Knee Shaft (HKS) or valgus angle for the femur. This angle was transferred onto the femoral jig system in order to perform the distal cut. Two persons measured this angle to analyse intra- and inter-observer variation. Twenty sets of pre- and post-operative scannograms were used to validate the practice of making the distal femoral cut based on HKS angle.

Results

The overall standard deviation of intra-observer variation was 0.40°, while the coefficient of determination (R2) was 0.86; for inter-observer variation the coefficient of determination (R2) was 0.83. Thus reproducibility was good. The pre- and the post-operative HKS angles were not significantly different (P = 0.2 by paired t-test). Thus the physiological knee alignment was restored.

Conclusion

Measurement of the knee axes on the CT scanogram is safe, feasible and permits accurate realignment of the knee, thus minimising prosthetic failure.

Poster #223

CORRELATING THE OUTCOME OF KNEE INTRAARTICULAR VISCO-SUPPLEMENTATION WITH RADIOLOGICAL CHANGES OF OSTEOARTHRITIS
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E M Toh, Liverpool, UNITED KINGDOM
Arvind Rawal, Bolton, UNITED KINGDOM, Presenter
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Purpose:
This study was designed to correlate the radiological changes of the knee with a favorable outcome when treated with an intraarticular knee viscoelastic supplementation.

Material and Methods
A prospective cohort of 60 patients receiving a standard course of intraarticular knee viscoelastic supplementation with a commercial uncrosslinked hyaluronic acid derivative of an intermediate molecular weight. Follow up was for 12 weeks post treatment with clinical improvement measured using the Western Ontario and McMasters Universities Osteoarthritis Index. X-rays of the relevant knee were viewed and graded for the severity of joint space, osteophyte, tibial spine, sclerosis, cyst formation, alignment and general severity by an observer blinded to the outcome of the treatment. There were no appreciable differences noted in the age, sex, length of follow up and number of intraarticular injections given per course in each x-ray category.

Results
There is a significant correlation between a significant improvement in stiffness with mild changes in the tibial spine as well as lateral and medial joint space and general x-ray changes. Improvement in pain correlated with changes in joint space, tibial spine and general x-ray changes whilst improvement in function correlated with changes in joint space only. Overall improvement correlated with joint space changes, tibial spine and general x-ray changes.

Conclusion
We conclude that patients with severe osteoarthritic changes in joint space on x-ray will not significantly benefit from intraarticular knee viscoelastic supplementation. In particular minor

Poster #224
COMPARING THE EFFICACY OF TWO HYALURONIC ACID DERIVATIVES: IS THERE A DIFFERENCE?
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Purpose
This study was designed to check the clinical validity of a previous study that had concluded that the clinical efficacy of intraarticular knee viscoelastic supplementation was directly related to the molecular weight of the hyaluronic acid derivative.

Material and methods
A prospective cohort of 92 patients receiving a standard course of intraarticular knee viscoelastic supplementation with two commercial hyaluronic acid derivatives of differing molecular weights were studied. There were no appreciable differences in the age, sex, length of follow up, number of intraarticular injections given per course and x-ray changes between the two groups. 32 were given a crosslinked hyaluronic acid derivative (hylan) with an average molecular weight of 6.0x10^6D. The remaining 60 received an uncrosslinked hyaluronic acid derivative (hyluronan) with an average molecular weight of 1.55x10^6D. Follow up was for 12 weeks post treatment with clinical improvement measured using the Western Ontario and McMasters Universities Osteoarthritis Index.

Results
The group injected with hyluronan was noted to have a better outcome compared to the group injected with hylan in all categories measured. However this result lacked absolute statistical significance due to the small number of patients involved in the study.

Conclusion
We conclude that the efficacy of action may be more significantly related to the biochemical property of hyaluronic acid derivatives compared to its molecular weight. We also postulate that this biochemical property may be affected by the attempt at increasing the molecular weight by crosslinking the hyaluronic acid derivative. A randomised control trial with a greater number of candidates would be able to provide a clearer understanding of this issue.

Poster #225
PRIMARY TOTAL KNEE ARTHROPLASTY WITH INTRAMEDULLARY NAIL FIXATION FOR SUPRACONDYLAR FEMORAL FRACTURE IN RHEUMATOID ARTHRITIS OF THE KNEE
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Kazumasa Fukusshima, Tokyo, JAPAN
Syu Saito, Tokyo, JAPAN
Ichiro Shimizu, Tokyo, JAPAN
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(Introduction) Operative treatment is usually chosen for the treatment of supracondylar femoral fracture to restore knee function. However, it is very difficult, when supracondylar femoral fracture occurs in patients who plan to undergo total knee arthroplasty (TKA) due to osteoarthritis or rheumatoid arthritis of the knee. In these cases, we have to consider treatment options, which are including 1-stage surgery and 2-stage surgery. 1-stage surgery is primary TKA with additional fracture fixation. 2-stage surgery consists of fracture fixation performed at first, and then after bone union, TKA is performed. We report 2 cases with supracondylar femoral fractures in patients with rheumatoid arthritis of the knee, which were treated with a 1-stage procedure. We present our 1-stage technique with using TKA with retrograde intramedullary nail.

(Case 1) A 59-year-old woman fell while walking and sustained a right supracondylar femoral fracture. Previously, she underwent conservative treatment for rheumatoid arthritis of the knee, and TKA has been scheduled. 12 days following the injury, she was treated surgically by a primary TKA with retrograde intramedullary nail fixation additionally. 12 weeks after surgery, the range of motion of the knee was 0 to 110 degree, and the patient had no complaints.

(Case 2) An 80-year-old woman fell while walking and sustained a supracondylar femoral fracture on the left side. She has been treated as a rheumatoid arthritis for 30 years. 25 years ago, she was treated due to a left femoral neck fracture with hip endoprosthesis. Currently, her rheumatoid knee arthritis was treated conservatively, and TKA has been scheduled. 14 days following the injury, she was treated surgically by a primary TKA with retrograde intramedullary nail fixation additionally. 6 weeks after surgery, she started full weight bearing 8 weeks following surgery, the range of motion of the knee was 0 to 110 degree, and patient had no complaints.
There are advantages for both 1-stage and 2-stage surgery for the supracondylar femoral fracture in patients with rheumatoid arthritis of the knee. Elderly patients with rheumatoid arthritis usually have not only poor systemic conditions but also osteoporosis. 2-stage surgery takes a long period for bone union, especially in osteoporotic cases. Additionally, the patients dealing with poor systemic conditions would not allow the necessary long time rehabilitation. According to these reasons, 1-stage surgery is better than 2-stage surgery in those patients. In 1-stage surgery, primary TKA with fracture fixation and we achieved good results. In our cases, both patients' systemic condition was improved before this challenging operation of the femoral joint surface. In our cases, both patients' systemic condition was improved before this challenging operation, and we achieved good results.

(Discussion) There are advantages for both 1-stage and 2-stage surgery for the supracondylar femoral fracture in patients with rheumatoid arthritis of the knee. Elderly patients with rheumatoid arthritis usually have not only poor systemic conditions but also osteoporosis. 2-stage surgery takes a long period for bone union, especially in osteoporotic cases. Additionally, the patients dealing with poor systemic conditions would not allow the necessary long time rehabilitation. According to these reasons, 1-stage surgery is better than 2-stage surgery in those patients. In 1-stage surgery, primary TKA with fracture fixation and we achieved good results. In our cases, both patients' systemic condition was improved before this challenging operation, and we achieved good results.

Poster #226
THE PATELLO-FEMORAL JOINT (PFJ) STATUS IN REVISION KNEE ARTHROPLASTY: A NEW CLASSIFICATION SYSTEM & ITS RELIABILITY.

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Sanjay Suresen, Manchester, ENGLAND
Richard W Parkinson, Upton, UK
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We sought to develop and validate a classification system for assessing patello-femoral joint (PFJ) status prior to revision knee arthroplasty. Many factors influence the outcome of revision knee surgery. The importance of bone stock and stability with regard to the femur and tibia has been documented. The importance of the extensor mechanism has not been addressed. Our classification system grades the condition of the PFJ by describing both the patella bone stock and the patello-femoral tracking. Four grades ranging from ‘normal’ to ‘disrupted extensor mechanism’ describe patella bone status. Four grades ranging from ‘normal’ to ‘complete dislocation’ describe patello-femoral tracking.

145 sets of pre- and post-operative radiographs, each set consisting of an AP, lateral and skyline patella view, were studied. Three clinicians graded all radiographs according to the classification system on two separate occasions. These assessments were performed at least six weeks apart. The results were analysed by an independent observer who was blinded. Both intra- and inter-observer agreement was quantified using kappa values.

Intra-observer kappa values were 0.89, 0.96 and 0.82. Inter-observer kappa values were 0.94, 0.87 and 0.97 between the three clinicians. This indicates excellent levels of agreement. We conclude that this classification system provides a convenient, specific, descriptive and reproducible method of denoting PFJ status. Our system may be used to accurately communicate PFJ status. Our system may be used to accurately communicate PFJ status. Our system may be used to accurately communicate PFJ status.

Poster #227
CLINICAL AND RADIOLOGICAL EVALUATION AT FIVE YEARS FOLLOW-UP OF 177 PFC TOTAL KNEE ARTHROPLASTY

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Enzo Cenna, Torino, ITALY
Alessandro Bistolfi, Torino, ITALY
Pier Franco Triolo, Torino, ITALY
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II Orthopaedic Clinic, Turin, ITALY

Total knee replacement (TKR) is worldwide recognised as the treatment of choice for knee arthritis. At the II Orthopaedic Clinic of Turin, from September 1993 and July 1998 we implanted 243 PFC TKR which is a posterior stabilised cruciate substituting prosthesis. We evaluated 177 TKR in 143 patients (144 F, 33 M, mean age 69.5 years), the average follow up period was 5 years (range 35-84 months), the pathology was arthritis in 87%, rheumatoid arthritis in 11.3%, for post-traumatic arthritis in 1.7%. The patella was resurfaced in 60.5% of the knees, using an all polyethylene component. Scoring was carried out according to the Hospital for Special Surgery (HSS). Survivorship analysis was done to determine the cumulative rate of survival of the implant during the period of the study (16). The end point for the analysis was a revision operation for any reason. Radiographs were evaluated for overall alignment and radiolucent lines using the Knee Society TKA radiographic evaluation and scoring system. Preoperatively the mean HSS score was 61.26 points (range 35 to 88 points). At the time of the most recent follow up, the mean HSS score was 90.56 (range 60 to 100 points), p < 0.001. The clinical result was excellent in 87.6%, good in 19.2%, fair in 8.5%, and poor in 3.9%. Radiolucencies were found around the femoral component in nine knees (8%), and in the views of the tibial tray in 33% knees. One prosthesis had aseptic loosening by the time of the most recent follow up examination. The rate of survival of the implant was 95% at five years and nine revision was carried out (5%). In the present series, patients had relief of pain, an excellent range of movement, and restoration of function with improvement in quality of life. These good results could be related to the technique of alignment and soft tissue balance, which was performed after the distal femoral cut and before the tibial resection and to the femoral locating device orientation, that is placed in slight external rotation with reference to the epicondylar axis.

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Poster #228
HINGED TOTAL KNEE REPLACEMENT IN SEVERE KNEE REVISION SURGERY

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Total knee arthroplasty revision surgery is a complex procedure and it is increasing in the last ten years. It usually requires implants with particular technical features. The difficulty and complexity of this kind of surgery is due to the great meta-epiphysial bone loss, both femoral and tibial, and to the severe capsular-ligamentous instability. We choose the Endomodel arthroplasty, this implant has tibial and femoral stems and it allows to fill large tibial bone loss using specific polyethylene inserts. Between 1993 and 2001 41 complex knee revisions were performed in 39 patients (30 F, 9 M, mean age 70.3 years). We evaluated the patients clinically with the HSS scoring system and radiologically with the Knee Society TKA radiographic evaluation and scoring system, with a mean follow up of 5 years (min 24, max 109 months). The revi-
sion was performed for aseptic loosening in 21 cases, for septic loosening in 16 cases (we used the “two stages” technique in 11 cases and the “one stage” in 5, always associated with antibiotic-addicted cement) and for instability in 2, 1 case for fracture and 1 for other reasons. None of these cases presented signs of loosening, all the cases maintained the correct alignment of 7° valgus given by the prostheses design. Two cases required a revision surgery with the substitution of the femoral component for the rupture of its PE component. According to the clinical results, the range of motion and degree of satisfaction, in our opinion the right answer in salvage revision total knee arthroplasty is the use of a hinged total knee arthroplasty like the “Endomodel”.

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Poster #229
STANDING KNEE RADIOGRAPHS: AP VS PA PROSPECTIVE EVALUATION ARTHROSCOPICALLY CONFRMED ARTHRITIS
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Eric C. McCarty, Nashville, TN, USA
Todd Mickener, Nashville, TN, USA
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OBJECTIVE: Despite the near universal use of radiographs (XR) used for screening and diagnostic purpose of detecting knee arthritis, no prospective studies have investigated their routine use in general sports medicine practice. Prior investigations have a selection bias to a high-risk population, then compared XR to arthroscopic evaluation of arthritis. Since the detection of early osteoarthritis has both prognostic and treatment implications, we initiated a prospective comparison of standing AP and Rosenberg PA films in all patients presenting to a sports medicine practice who had subsequent arthroscopic surgery. We compared the sensitivity and specificity between radiographic techniques and for both medial and lateral compartments. Our hypothesis was there was no difference between radiographic techniques for either compartment.

METHODOLOGY: As part of a prospective protocol, all new patients with indications for knee radiographs had bilateral AP and Rosenberg PA x-rays. Over a two-year time period, 349 patients subsequently had arthroscopic surgery where grading of arthritis by chondromalacia (CM) Grades 1-4 (Modified Outerbridge) on scale diagrams was performed by a single surgeon (KPS). All x-rays had articular cartilage interval measured independently, by an observer blinded to side, in millimeters (mm) by compartments in both knees. In Group A, comparison was identical to Rosenberg with a positive radiograph defined as a 2-mm difference side to side (by compartment) for CM 0, 1, 2 vs. 3, 4. In Group B, only the definition of disease was changed, with Grade 2 CM now grouped with CM Grades 3 and 4. The statistical evaluation compared sensitivity and specificity between x-ray procedures with p<0.05 as significant.

RESULTS: For Group A comparison (Rosenberg Method Analysis), the sensitivity was not significantly different between AP vs. PA for either the medial or lateral compartment. The values were extremely low in the 3-16% range (AP 3% vs. PA 6% medial, AP 16% vs. 6% PA lateral). However, the specificity was very high in the 92-98% range with PA significantly better (p<0.05) at 96% vs. 92% AP for lateral compartment only. For Group B comparison, where Grade 2 chondromalacia is considered disease, the sensitivity is still low but the AP was significantly more sensitive (p<0.05) than PA (11% vs. 2%) for the lateral compartment only. No statistical differences were observed for very high values for specificity in the range 92-99%. Both results are probably of little clinical significance with the magnitude of change of 4% for specificity values over 90% and 9% for the extremely poor values (<2%) for sensitivity.

CONCLUSIONS: Both radiography techniques (AP vs. PA) demonstrated extremely low sensitivity but high specificity for arthritis whether analyzed by Rosenberg definition CM 1-2 vs. CM 3-4 (Group A) or CM 1 vs. CM 2, 3, 4 (Group B). Thus radiographs are poor screening tests for arthritis (CM Grades 2-4) (poor sensitivity) but are good diagnostic tests for chondromalacia with >90% specificity. No clinical difference or consistent statistical difference was observed between standing PA vs. AP; therefore, either could be ordered with similar accuracy. Clearly, a more sensitive screening tool is required for detection of early knee arthritis detected arthroscopically.

Poster #230
NEW METHOD FOR BONE-GRAFTING FOR THE HUGE BONE DEFECT IN TKA – BONE SCINTIMETRIC EVALUATION AND CLINICAL OUTCOMES
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Masahiro Okudama, Sendai, JAPAN
Dept. of Ortho. Surgery Tohoku University Graduate, Sendai, JAPAN

New method for bone-grafting for the huge bone defect (more than 10 mm in depth) in total knee arthroplasty (TKA) is presented. There were five osteoarthritic knees (in three patients) and five rheumatoid arthritic knees (in four patients). They were followed for at least two years. The status of the grafted bone was evaluated using three-phase bone scintigraphy. Bone scintigraphic findings showed that revascularization to the grafted bone began four weeks after TKA and the activity of bone remodeling continued for one year after TKA and gradually subsided. Radiographic findings showed neither loosening of components nor collapse of the grafted bone. No patients complained of knee pain in daily living. Average range of motion of the knee was from 0 to 114 degrees.

Poster #231
TOTAL KNEE ARTHROPLASTY PRESERVING OR NOT THE PCL: GAIT ANALYSIS
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José Sergio Franco, Rio de Janeiro, BRAZIL
Mauricio Cady, Rio de Janeiro, BRAZIL
Paulo I. Guimarães Silva, Rio de Janeiro, BRAZIL
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Objective: The study of gait analysis parameters in patients who had a primary total knee arthroplasty, preserving or sacrificing the posterior cruciate ligament.

Patients and Method: From April 7th, 2000 to November 11th, 2000, 60 patients who underwent total knee arthroplasty (70
cases) were submitted to Gait Analysis (kinematic parameters and dynamic electromyography), at the Centro de Pesquisa do Movimento Humano (CPMH: Human Movement Research Center). From the total number of patients, 21 were male and 39 female, with age ranging from 45 to 85 years (average 68.3 years). The indication for total knee arthroplasty was due to osteoarthritis in 66 cases, and to rheumatoid arthritis in the remaining cases. The cases were further divided into three groups according to the type of prosthesis as follows: Group I: Prosthesis with posterior cruciate ligament (PCL) preservation (24 cases); Group II: Osteonics prosthesis; 7000 series (Osteonics, Allendale, NJ) with PCL sacrifice (22 cases); Group III: LCS prosthesis (DePuy, Warsaw, IN), platform type, with PCL sacrifice (24 cases). A Vicon 140 system, with three infrared cameras, two Bertec force platforms and a Motion Lab dynamical EMG system compose the Gait Laboratory in CPMH (Rio de Janeiro).

Results: The angular flexion values of the knee during the phase of stance (initial contact, load acceptance, mid-stance and preswing) were submitted to the Anderson-Darling test to evaluate if the data could be seen as originated from a gaussian population, which was satisfied for a significance level (a) of 5%. Hence, one could use the t Student test to compare the average of the knee flexion values with values assumed as normal in CPMH. The patients from Group I showed a gait pattern more physiological for a = 5%, i.e., exhibited a gait pattern more close to normal. Based on the graphical analysis of the 70 cases, we could note a great inter-individual variability of the gait patterns. No case could reproduce the normal gait pattern. The co-contraction phenomenon occurred more pronouncedly in the patients from group II (81.8%), followed by the ones from group III (66.6%). The least frequent cases of such phenomenon were seen in group I (54.1%).

Conclusion: Changes in gait (specifically regarding to knee flexion) occurred in some level depending on the kind of implant used in the total arthroplasties. In group where the PCL was preserved, the best results were shown, regarding to both Gait Analysis and Dynamical EMG.

Poster #232
• FIVE YEAR REVIEW OF THE ROTAGLIDE TOTAL KNEE ARTHROPLASTY
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Gavin Tait, Kilmarnock, SCOTLAND UK
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In this study we present the outcomes of patients with the Rotaglide mobile meniscal knee prosthesis implanted for osteoarthritis. All patients reviewed had this prosthesis implanted in Crosshouse Hospital Scotland by two Surgeons. The minimum follow up period was 5 years (Range 5 – 8.2). Patients were assessed clinically and the results were standardised using the Hospital for Special Surgery (HSS) knee score. Standard radiographs were taken in AP and Lateral planes to assess for evidence of loosening. Case note were then examined for evidence of complications.

Sixty Seven patients (73 Knees) were reviewed. 97% of patients had an excellent clinical outcome with HSS scores of 85 or more. Two Knees (2.7%) were revised one for meniscal fracture and one for meniscal dislocation. Both knees were found to be lax in flexion due to problems with soft tissue balancing. To date there have been no failures due to loosening and no deep infections. Both meniscal revisions may have been caused by problems with balancing the flexion and extension gaps early in our learning curve. In a series of over 300 knees to date there have been no further meniscal complications.

We feel this prosthesis offer a safe and effective treatment for osteoarthritis with a good clinical outcome at five years with a low level of complications.

Poster #233
EXTENSOR MECHANISM RECOVERY AFTER MEDIAL PARAPATELLAR AND TRI-VECTOR RETAINING APPROACHES FOR TOTAL KNEE ARTHROPLASTY: A PROSPECTIVE, RANDOMISED, DOUBLE BLIND STUDY
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Introduction
In order to perform daily activities the knee must fully extend and flex through to 95 degrees. Several studies have shown that knee flexion after total knee arthroplasty (TKA) continues to improve after discharge from hospital. However, extension does not, and therefore early post-operative rehabilitation must concentrate on achieving full or near-full extension. Therefore if a specific type of surgical approach causes less damage to the extensor mechanism, but still allows adequate exposure, this could be of significant benefit to the patient by improving the outcome of surgery. The tri-vector retaining arthrotyomy (TVRA) was described by Bramlett as a hybrid between the medial parapatellar arthrotyomy (MPPA) and the subvastus arthrotyomy.

Aims
The aim of the study was to examine whether the TVRA facilitates the faster recovery of the extensor mechanism following TKA.

Methods
Patients undergoing primary TKA for osteoarthritis were randomised into MPPA and TVRA groups (15 and 17 patients respectively). All surgery was performed by one surgeon using a single implant design. The patients and assessors were blinded as to which approach was used.

The patients were assessed pre-operatively and at three and six weeks post-operatively. The Hospital for Special Surgery Score (HSS) was used for clinical assessment. Extensor mechanism strength was assessed using isokinetic dynamometry in terms of peak torque generated, torque at 30 and 60 degrees flexion, total work generated and average power generated. Muscle damage was assessed by electromyography of the following muscle areas: vastus medialis obliquus (VMO), vastus medialis longus (VML), distal rectus femoris (DRF), proximal rectus femoris (PRF) and vastus lateralis (VL). The results were analysed statistically.

Results
The HSS scores showed no significant differences between the two groups pre-operatively and post-operatively (P=0.161 and P=0.495 respectively). The isokinetic dynamometer results revealed a statistically faster recovery of extensor mechanism power in the TVRA group in all domains (P=0.0188, 0.0303, 0.0254, 0.0285 and 0.0374 respectively). Electromyographic testing revealed less post-operative inhibition of muscles close to the knee in the TVRA group. The MPPA group demonstrated significant drops in activity in VMO, DRF and VL (P=0.0080, 0.0415 and 0.0051 respectively). The TVRA group did not demonstrate significant decreases in activity in any muscle area tested.
Conclusion
The results of this study support the concept that the TVRA causes less damage to the extensor mechanism than MPPA, allowing faster recovery of the extensor mechanism on both isokinetic dynamometry and EMG testing.

Poster #234
POSTERIOR-ANTERIOR WEIGHT-BEARING RADIOGRAPH IN FIFTEEN DEGREE KNEE FLEXION IN MEDIAL OSTEOARTHRITIS
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Hiroshi Yamamoto, Kochi, JAPAN
Norishige Ichioka, Aki, JAPAN
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Purpose: The aim of this study is to evaluate what angles of flexion in the coronal radiographic view are useful for assessing medial osteoarthritides of the knee.

Methods: We compared four views of conventionally extended, 15 degrees, 30 degrees, and 45 degrees flexion of the knee with respect to joint space narrowing, and medial tibial plateau (MTP) and tibiofemoral angles in 113 knees from 95 patients with medial osteoarthritides of the knee (22 male, 71 female patients, mean age: 67 years.).

Results: At the midpoint and the narrowest point of the medial compartment, joint space narrowing values at 15 degrees, 30 degrees, and 45 degrees flexion of the knee were smaller than that of the conventional extended view. Satisfactory data of superimposition of the medial tibial plateau (MTP) was 12% at the extended, conventional, 36% at 15 degrees, 20% at 30 degrees, and 19% at 45 degrees of flexion of the knee. A view of 15° flexion of the knee revealed a smaller difference of the tibiofemoral angle with the knee extended than did that at 30 degrees and 45 degrees flexion of the knee in cases of medial osteoarthritides.

Conclusions: A postero-anterior new view of a 15 degrees flexed knee was able to accurately detect joint space narrowing, good alignment of the MTP in the medial compartment, and less difference of tibiofemoral angle with a view of extended knee for cases of medial osteoarthritides.

Poster #235
THE BLOOD MANAGEMENT IN TOTAL KNEE REPLACEMENT. THE EFFECTIVENESS OF POSTOPERATIVE REINFUSION.
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Purpose of the study: To determine the effectiveness of a postoperative autologous blood reinfusion system, as an alternative to homologous, banked blood transfusions in total knee arthroplasty.

Material and Methods: We have carried out a prospective randomized, controlled study on 60 patients having unilateral total knee replacement. In all these patients the same surgical team applied the same surgical technique and they follow the same rehabilitation program. In 30 of these patients (group A) a reinfusion system of unwashed blood salvaged was applied and they supplemented postoperatively with banked blood transfusions when required. A control group of 30 patients (group B), in whom standard suction drains were used, received one unit of homologous banked blood transfusion intraoperatively and additional blood transfusions postoperatively when required. The admission of banked blood transfusion determined by haemoglobin value (<9mg/dL) and/or clinical signs (blood pressure, pulses, etc). The value of haemoglobin, haematocrit and platelets recorded preoperatively and the 1st, 5th and 15th day after operation.

Results: 5 patients of group A required postoperatively 9 units of homologous blood (0.3 units/patient). 10 patients of group B required additional 15 banked blood units postoperatively (totally 45 banked blood units for group B, 1.5 units/patient). In the study group the total homologous blood requirements reduced by 80%, while the postoperative blood requirements reduced by 60%. There was no significant difference in the postoperative haematocrit and haemoglobin values between the two groups. None of the patients developed any adverse reactions after reinfusion.

Conclusions: The use of an autologous blood reinfusion system reduces highly effectively the demands of homologous banked blood transfusion in total knee arthroplasty.

Poster #41
TKA USING THE ESKA SEMICONSTRAINED PROSTHESIS IN SEVERE KNEE DESAXATIONS
Jose Maria Cavallines, Barcelona, SPAIN, Presenter
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Ruiz Juan Antonio, Badalona, SPAIN
Soler Minoves Jose maria, Badalona, SPAIN
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The use of tricompartimental prostheses is not recommended in patients with a varus or valgus deformity greater than 20° nor in those patients with a flexum or recurvatum contracture. This is because the impairment of the capsula articularis and insufficiency of the collateral ligaments might lead to the appearance of postoperative instability. In our opinion the best option for these patients is a semi constrained prosthesis, since the stability of this type of implant is not provided by the capsuloligamentous structures but by the prosthesis design itself.

Material and methods:
The aim of this study was to review the results obtained in a series of 32 patients who had an ESKA semi constrained prosthesis inserted. All patients were operated by the same surgeon and the indication for TKA was either degenerative or rheumatic. The mean follow-up period was 5 years. This series include 15 cases of dynamic genu valgum in patients affected with Charcot-like arthropathy which is not rare among our patient population.

Results:
Data have been evaluated according to the Knee Society Knee Score with the following results:
- excellent (90-100 points) in 14 cases (43.7%)
- good (80-90 points) in 9 patients (28.1%)
- fair (60-79 points) in 7 patients (21.8%)
- poor (less than 60 points) in 2 patients (6.2%).

Conclusions
The ESKA semi constrained prosthesis is designed with cemented intramedullary stems on both femoral and tibial
Knee - Ligament/Patella

Poster #236
PROPRIOCEPTION IN PATIENTS WITH ANTERIOR KNEE PAIN: DESCRIPTION OF A NEW MEASUREMENT METHOD
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Ugur Ozci, Izmir, TURKEY
Aziz Vatansever, Manisa, TURKEY
Celal Bayar University, School of Medicine, Dept., Izmir, TURKEY

Purpose: Deterioration of the proprioceptive capability has been shown in patients with anterior knee pain in a limited number of studies. Although joint position sense (JPS) has been used in most of these studies, its reliability, however, has been found to be questionable in patients with patellar compression syndrome. To our knowledge, vibration sense has not been used for measurement of proprioceptive capability in patients with anterior knee pain. Purpose of the study was: 1. To introduce a new and simple method to measure proprioceptive capability of the knee, 2. To compare it with the method of joint position sense, and 3. To test the reliability of joint position sense, in patients with unilateral anterior knee pain syndrome.

Materials and Methods: Ten patients with clinically diagnosed unilateral anterior knee pain syndrome (2 male, 8 female) whose ages ranged between 25 to 48 years (av: 38.3 years) were included in the study. The left knee was involved in 6, and right one was involved in 4. Average duration of symptoms was 10.7 months (range, 1 to 32 months). Cinema finding was positive in all. Lysholm score was average 66.6 (range, 44 to 89). On clinical examination, positive patellar crepitus and positive patellar compression and friction tests were accepted as diagnostic criteria for anterior knee pain syndrome. Exclusion criteria were as follows: 1. All the patients with findings of a torn meniscus, 2. Knee ligament injuries on history and/or clinical examination, 3. Demonstrated tibiofemoral arthrosis in any grade on x-rays, and 4. A history of knee pain also in the past on contralateral knee. To test the JPS, the patient attempted to replicate four target angles (15°, 30°, 45°, 60°), actively. Vibration sense was measured by a diaposone (Riesta-128F) with the knee in extension and in flexion. It was seated to the center of the patella and the tibial attachment of the popliteus muscle. To test the vibration sense in asymptomatic individuals and found no differences (p>0.05). The mean perception time of vibration was 9.03 and 7.31 seconds for right; 8.55 and 6.82 for left knees of asymptomatic individuals in extension and in flexion respectively. Mean perception time of vibration sense in asymptomatic knees of patients (in extension and in flexion) were also compared with perception times of right and left knees of asymptomatic individuals and found no differences (p>0.05).

Conclusion: Decreased patellar vibration sense in extension is a good indicator of decreased proprioception in anterior knee pain. Increased contact pressure on the patellar chondral surface in flexion is sought to eliminate the proprioceptive difference between the symptomatic and normal knees. According to the results of this study JPS is not a recommendable method to measure the knee proprioception in patients with unilateral patellofemoral pain.

Poster #237
DOES PROXIMAL TIBIO-FIBULAR ARTHROLYSIS PRODUCE POSTEROLATERAL INSTABILITY?
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Pablo Lacoste, Buenos Aires, ARGENTINA
Santiago Butler, Buenos Aires, ARGENTINA
Santiago Arce, Buenos Aires, ARGENTINA
Enrique Pereira, Capital, ARGENTINA
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Introduction: Proximal tibio-fibular joint arthrosis (PTFA) performed during high tibial osteotomy (HTO) relaxes the posterolateral structures of the knee due to proximal migration of the fibular head and the tibial attachment of the popliteus muscle.

Purpose: To evaluate the influence of proximal tibio-fibular joint arthrosis (PTFA) over the posterolateral corner, in the simultaneous high tibial osteotomy and ACL reconstructions.

Type of Study: Case series

Methods: Eleven patients were retrospectively evaluated to assess the influence of the proximal tibio-fibular arthrosis in the posterolateral corner stability. The varus alignment was corrected performing a wedge resection osteotomy of the proximal tibia. A soft tissue release and rongeur resection of the proximal tibio-fibular joint was performed in all cases for wedge closure. In the same surgical procedure an ACL reconstruction was done. The lateral collateral ligament and popliteo-fibular ligament status were evaluated with the Tibial External Rotation (dial) Test in prone position and the Posterolateral External Rotation Test. Both tests were done in 30 degrees of flexion, and the side to side differences in the thigh-foot angle were recorded.

Results: A side to side differences of 15 degrees or more was considered as an increase in posterolateral corner instability. All cases except one had normal posterolateral corner examination.

Discussion and Conclusions: In a simultaneous varus alignment and ACL reconstruction procedure, a closed wedge HTO with PTFA seems to be safe and effective. Even though the PTFA produces a proximal slide of the
the fibular head, the findings of this study suggest that the PTFA does not jeopardize the posterolateral stability in these group of patients.

Poster #238
THE LONG-TERM RESULTS OF MAQUET – TYPE TibIAL TUBERCLE ELEVATION FOR PATELLOFEMORAL ARTHROSIS
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The aim of the study:
Evaluating the long-term durability of and the changes seen after Maquet procedure in both patellofemoral and tibiofemoral compartments of the knee joint.

Material and Method:
21 patients (5 males, 16 females, mean age at the time of operation 59.3) treated by Maquet tibial tubercle elevation with minimum follow-up of 8 years (average 11.5 years) were reviewed both clinically and radiologically. A detailed questionnaire was used to assess the functional impairment during daily activities. An evaluation score was used based on both subjective and objective assessment of the knee joint. The changes in the geometry of the extensor mechanism of the knee joint which could interfere subsequent knee arthroplasty were analysed by scanning tomography.

Results:
Maquet-type osteotomy yielded an average 7.5 years of pain-free period but objectively only 3 of 21 cases (%15) was graded as good or excellent. The complication rate was %19 (4 of 21 procedures). All indices for the length of patellar tendon displayed significant shortening of the tendon. An average tibial tubercle elevation of 1.59 cm remained unchanged with some medial displacement. Q angle calculated by CT scans, was significantly lowered in comparison to the control side. CT parameters displayed a significant improvement in CT parameters for patello-femoral congruence was still present on the operated side even after long-term follow-up.

Discussion and conclusions:
Maquet-type tibial tubercle elevation has the capability of long-term pain relief and functional improvement for patellofemoral arthroisis. The most important factor which defines the status of the knee joint in long-term is the progression of the arthritis in medial tibio-femoral compartment. The improvement in the parameters of patellofemoral congruence obtained by the osteotomy is durable.

Poster #239
ISOLATED POSTERIOR CRUCIATE LIGAMENT RECONSTRUCTION IN CHRONIC POSTERIOR INSTABILITY. A RETROSPECTIVE STUDY WITH A 2 TO 15 YEARS FOLLOW UP.
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Tomas Drobný, Zurich, SWITZERLAND
Mario Bizzi, Zurich, SWITZERLAND, Presenter
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Background: Injuries of the posterior cruciate ligament can represent an invalidating knee condition for the patients. The surgical management of PCL injury is controversial, and often only short-term results are published. In the literature there is little knowledge about the long-term outcome after PCL reconstruction.

Purpose: To evaluate and compare the long-term functional outcome after isolated reconstruction (with two different autografts) in a recreational sport population.

Methods: From 1985 to 2000, 35 patients had an isolated PCL reconstruction, with a 2 to 15 years follow up. All the patients had a chronic posterior instability, with an average time injury to surgery of 1.1 year. Excluded were patients with combined reconstructions, PCL/ACL, and PCL with high tibial osteotomy.

All open procedures were performed by the same two surgeons (UM, TD). The utilized autografts were the Bone Patellar Tendon Bone (single tunnel technique) and Semitendinosus/Gracilis Tendons (double tunnel technique). The patients were evaluated by an independent experienced clinician (MB). Follow up examination included the complete IKDC 2000 (including clinical examination, questionnaires and X-rays), instrumented laxity, isokinetic strength and balance measurements.

Results: The results of this ongoing study will be first presented at the ISAKOS Knee Committee Workshop in Florence (November 28th-December 1st, 2002).

Poster #240
PERIOSTEUM-ENVELOPED HAMSTRING TENDON GRAFT IN ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION
Chih-Hwa Chen, Kaohsiung, TAIWAN, Presenter
Wen-Ier Chien, Taoyuan, TAIWAN
Chun-Hsiang Shih, Taoyuan, TAIWAN
Chang Gang Memorial Hospital, Kaohsiung, TAIWAN

Introduction: Tendon-bone incorporation of a tendon graft within the bone tunnel is a major concern when performing for ligament reconstruction. The periosteum consists of multipotent stem cells to form osteogenic and chondrogenic tissues. Our histological and biomechanical studies in animal had shown superior healing process and stronger healing strength within a bone tunnel when wrapping the periosteum on the tendon graft. This concept was applied on the ACL reconstruction to enhance tendon-bone healing when using the hamstring tendon graft.

Materials and methods: A 4-stranded semitendinosus and gracilis tendon is used as the graft. A piece of periosteum, 3 cm x 3 cm, harvested from the anterior cortex of proximal tibia, is split into two rectangle flaps with size of 1.5 cm x 3 cm each. The periosteum flaps are wrapped and sutured around the tendon graft at the portions near the femoral and tibial tunnel openings. The cambium layer is faced outside to the bone tunnel.

Results: From 2000, this technique has been used in 21 patients with follow-up for 12 to 18 months. 18 of 21 patients (92%) could return to the same or higher level of pre-injury sports activity. Average Lysholm knee scores were 94 points. Overall outcome of IKDC rating was normal or nearly normal in 19 patients (90%). Bone tunnels enlargement of 1 mm was identified in 1 femoral tunnel (5%) and in 1 tibial tunnel (5%).

Conclusion: Periosteum is easy to harvest from proximal tibia where has a routine incision for hamstring tendons harvesting. Besides the potential for enhancement of tendon-bone healing, enveloped-periosteum may aid in sealing off the intra-articular tunnel opening in a early period to avoid synovial fluid reflux into the tunnel. Bone tunnel enlargement could be decreased. This clinical results showed that arthroscopic ACL reconstruc-
Poster #241
COMPARISON OF QUADRUPLE HAMSTRING TENDON GRAFT AND QUADRICEPS TENDON GRAFT IN ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION
Chi-hwa Chen, Kaoshiung, TAIWAN, Presenter
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Introduction: Quadruple hamstring tendon graft and quadriceps tendon autograft are two of the graft using in the ACL reconstruction. The purpose of this study is to compare, at minimal two-year follow-up, the outcomes of ACL reconstruction when using quadruple hamstring tendon autograft versus quadriceps tendon autograft.

Materials and methods: A hamstring tendons graft consisted of a 10 cm of 4-stranded semitendinosus tendon and gracilis tendon graft. A quadriceps tendon graft consisted of a 20x10x8 mm bone plug and 80x10x6 mm tendon portion. During 1996-1997, there were 32 patients with hamstring tendon autograft and 29 patients done with quadriceps tendon autograft. 28 of hamstring tendon autograft and 26 of quadriceps tendon group with complete follow-up data for at least 3 years were included for final analyses. Clinical assessments included Lysholm knee scores, IKDC scores, thigh muscle girth and strength, and radiographic evaluation.

Results: In the Lysholm knee rating, 93% of patients demonstrated good or excellent results in the hamstring tendon group, as did 92% of patients in the quadriceps tendon group. The IKDC rating revealed no difference between two groups in terms of activity level, symptoms, and range of motion. 5 patients (18%) in the hamstring tendon group and 4 patients (15%) in the quadriceps tendon group revealed a 3-5 mm ligament laxity. 2 patients (7%) with hamstring tendon grafts and 2 patients (8%) with quadriceps tendon grafts revealed grade II laxity. There was no difference in the IKDC final rating of normal and nearly normal grading between two groups. There is no significant difference in flexor or extensor muscle deficit between two groups.

Conclusions: Comparable satisfactory results between the two surgical groups were demonstrated at a minimal 3 years follow-up. The four-stranded hamstring tendon graft is a strong graft and associated with minimal harvesting morbidity. The quadriceps tendon autograft had one side bone plug and adequate graft size. We regard that both grafts could afford good ligament reconstruction likelihood and are reasonably acceptable graft choices for ACL reconstruction.

Poster #242
ARTHROSCOPIC PCL RECONSTRUCTION WITH QUADRICEPS TENDON AUTOGRRAFT
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Introduction: Indications for surgical reconstruction of PCL include a grade III or IV injury, combined ligaments injuries, symptomatic posterior instability. Surgical treatment for PCL injury with arthroscopic technique has been developed. But considerable controversy continues in regard to the choice of graft tissues. Autograft (patellar tendon, hamstrings) or allo-
N with interference fixation, and 367 (149±01) N with postfixation when the patellar bone-tendon graft was tested. There was no statistical difference in the failure load between interference fixation and postfixation (P = 0.793), however the modes of failure differ. The sites of failure for interference fixation were 25% due to rupture of ligament substance, and 75% bone plug pullout; and those of postfixation were 25% due to rupture of ligament substance, 37.5% due to fracture, and 37.5% as a result of suture breakage.

Conclusion: The results of this study suggested that a 15 pound tension to the graft at 200 to 300° of knee flexion is optimal in PCL reconstruction. There was no statistical difference in the failure load between interference fixation and postfixation despite different modes of fixation failure.

Poster #244
OUTCOME STUDY OF THE SURGICAL TREATMENT OF 48 CHRO
Pascal Christel, Paris, FRANCE, Presenter
Patrick Dijia, Paris, FRANCE
Marc Branfaux, LYON, FRANCE
Clinique Nollet, PARIS, FRANCE.

This is a prospective and continuous study of 48 posterior chronic instabilities operated between 1995 and 2000. In this series, the PCL was always reconstructed with a 2-bundle technique.

Material and Methods: the series includes 33 males and 15 females, 29 y.o. average at injury. The average disability time was 32 months; 26 patients had sustained previous surgery without PCL reconstruction. The pre-operative clinical examination showed 17 isolated posterior instabilities (PI), 17 combined postero-postero-lateral instabilities (PPLI), 6 combined postero-postero-medial instabilities (PPMI), 1 PPMI + PPL instability, and 7 complex antero-posterior instabilities (PCL + ACL + 2ndary restraints). In the current series the PCL has always been arthroscopically reconstructed with a tibial tunnel technique using two-bundle autograft either made of bone-patellar tendon-bone for the 22 first cases, or quadriceps tendon (26 cases). Depending on the lesions, combined secondary restraints insufficiency was always treated by reefing, autologous augmentation or reconstruction. In case of a varus knee associated to a PPLI, a HTO was performed prior to ligament reconstruction. Outcome was evaluated by using the IKDC 93 scoring system and the posterior laxity was measured with stress X rays.

Results:
The average follow-up was two years. All the patients have been followed at least for one year. No post-operative complication was noticed. We will focus on the results of the 3 first groups: PI, PPLI, PPMI.

Pre-operative status:
PI: subjective evaluation: 4C, 13D. Symptoms: 2B, 2C, 12D. Final score: 4C, 14D. Laxity: 9.9 ± 3.3 mm.
PPLI: subjective evaluation: 7C, 10D. Symptoms: 2B, 6C, 9D. Final score: 3C, 14D. Laxity: 11.7 ± 4.6 mm.
PPMI: subjective evaluation: 6D. Symptoms: 1B, 5D. Final score: 6D. Laxity: 13.0 ± 3.7 mm.

Last follow-up:
PI: subjective evaluation: 6A, 8B, 3C. Symptoms: 5A, 10B, 2C. Final score: 1A, 10B, 6C. Laxity: 4.0 ± 2.0 mm, gain: 62%.
PPLI: subjective evaluation: 2A, 11B, 14C. Symptoms: 3A, 10B, 4C. Final score: 4B, 12C, 1D. Laxity: 5.7 ± 3.5 mm., gain: 54%.
PPMI: subjective evaluation: 6B. Symptoms: 6B. Final score: 5B, 1C. Laxity: 5.9 ± 3.0 mm, gain: 61%.

Whatever the parameter, the D category has almost disappeared at the last follow-up. This improvement was statistically significant (p<0.001).

Discussion and conclusion:
PCL reconstruction with a two-bundle autograft combined with secondary restraints repair, augmentation or reconstruction or limb alignment, when needed, leads to a laxity gain similar to ACL surgery. However, the combination of a postero-lateral instability to PCL insufficiency has a lower prognosis on the final outcome (p=0.01).

Poster #245
ANATOMICAL AND HISTOLOGICAL STUDY IN KNEES OF RABBITS WITH EPISIFICAL CARTILAGE, AFTER THE SECTION OF POSTERIOR CRUCIATE LIGAMENT.
Moises Cohen, Sao Paulo, BRAZIL, Presenter
Fernando Luiz de Arruda, Sao Paulo, BRAZIL
Rene Jorge Afdallia, Sao Paulo, BRAZIL
UNIFESP (CETE), Sao Paulo, BRAZIL

Summary:
The aim of this experiment was to study morphology of rabbit knees with the epiphyses opened after section of the posterior cruciate ligament. Young and male rabbits were divided into two groups: control group and experimental group with 60 knees in each group. Section of the posterior ligament was performed in the knees of the experimental group and only an arthrotony was made in the control group. The animals were re-operated after 3, 6 and 12 weeks being submitted to euthanasia immediately after re-operation. A statistically significant result in the experimental group was found in the following items of macroscopic evaluation: knee diameter, bicondylar diameter, increase in synovial liquid, osteophite in the femur and lesion in the articular cartilage. No significant values were found regarding lesion of the medial meniscus. In relation to histological evaluation, all the subgroups of the control group did not present alterations and were considered as normal. In the experimental group, the items synovitis, hyperplasia of chondrocyte, penetration of subchondral vessels in the patellar cartilage and alteration in the anterior cruciate ligaments of the experiment showed significant results in the statistical analysis. These alterations had similar intensity and location no matter if it was the right or left experimental knee. The anterior cruciate ligament of the experimental group presented significant alterations in the three subgroups.

Poster #246
MEDIAl PATello-FEMORAL LIGAMEnt RECONSTRUCTION
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Yoshio Sumen, Hiroshima, JAPAN
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Kenji Kobayashi, Hiroshima, JAPAN
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Hiroshima University, Hiroshima, JAPAN
The Medial patello-femoral ligament (MPFL) functions to stabilize the patella preventing lateral dislocation. This study followed 3 cases (4 knees) of recurrent dislocation patellae and 2 cases (4 knees) of habitual dislocation patellae after MPFL reconstruction. The average at time of surgery was 8.5 years (range 6-10 years). The follow-up terms averaged 5.5 years (2-10 years). None of the cases were complicated by other syndromes. Our MPFL reconstruction method involved transfer of the semitendinosus tendon to the patella via the pulley of the posterior one-third part of proximal medial collateral ligament. The transferred tendon was then sutured on the surface of the patella. There were no patella dislocations after surgery and the average Kujala’s score was 96 points. X-ray evaluations revealed the average values of the congruence angle, the tilting angle, and the lateral shift ratio, were to be normal. However, the values of the lateral stress shift ratio, the medial stress shift ratio, and Insall-Salvati ratio remained abnormal. We concluded that our MPFL reconstruction method might be considered a suitable method for the treatment of recurrent and habitual patellar dislocation of children, although hyper-mobility of patellae and the high position of the patellae remained.

Poster #247
LONG TERM RESULTS OF ARTHROSCOPIC POSTERIOR CRUCIATE LIGAMENT RECONSTRUCTION WITH BONE PATELLAR TENDON BONE AUTOGRRAFT
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Amerigo Menghi, Roma, ITALY
Silvio Chiassi, Roma, ITALY
Giuseppe Rinonapoli, Roma, ITALY
Salvatore Franzone, Rome, ITALY
Antonio Caporaso, Roma, ITALY
Università Cattolica - Clinica Ortopedica, Roma, ITALY

Aim: The goal of this paper is to evaluate the results of our patients who underwent an arthroscopically assisted PCL reconstruction using patellar tendon graft.

Material and method: In this paper we report results obtained in surgical treatment of 16 cases of chronic injury of the PCL. (The average age of patients was 26 years). All patients underwent an arthroscopically assisted bone-patellar tendon-bone autograft reconstruction. All patients were examined clinically and radiographically with an average follow-up of 38 months. All patients were evaluated according to IKDC scoring system, KT-1000 arthrometer, standard radiographic views and magnetic resonance imaging. 13 patients (81.2%) graded normal (A) or near normal (B) with IKDC scoring system.

Results: Posterior translation measured by KT-1000 arthrometer improved from 10.8 mm preoperatively to 4.9 mm postoperatively. X-rays excluded any sign of arthrosis. MRI has shown a correct placement and alignment of tibial and femoral tunnel in 15 of 16 patients.

Discussion and conclusion: Posterior cruciate ligament (PCL) injuries are more common than once believed and may represent up to 30% of all knee ligament tears. Recent advances have increased our knowledge of the anatomy and mechanical characteristics of the PCL, but current treatment of injuries involving the PCL remains a controversial issue in the field of sports medicine. Our results confirm that BPTB arthroscopic technique of PCL reconstruction allows a precise location of the graft and achieves good clinical and functional results at mid and long term follow up.

Poster #248
SURGICAL TREATMENT OF COMBINED ACL-PCL INJURIES OF THE KNEE. A CLINICAL STUDY
Andreas Panagiotis Diamantopoulos, Athens, GREECE, Presenter
Iraklis Ioannis Patsopoulos, Athens, GREECE
Aristidis Boroikas, Athens, GREECE
Emanouel Papadakis, Athens, GREECE
Mathesos Tsarbakis, Athens, GREECE
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Purpose: The aim of this paper is to study the knee injuries with simultaneous ACL and PCL rupture and the results of their reconstruction.

Material and method: The last eight years 24 patients were treated, during the acute phase, by the same team of doctors. The average age was 33.1 years (range, 20 to 61); 22 males and 2 females. 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 the central structure (ACL and PCL) was observed only in 2 patients. 3 Segond fractures were seen, 2 chondral lesions, 2 neurogical 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. 3 patients were reoperated because of inadequate movement of the knee joint.

Results: 23 patients (95.8%) were reexamined. The average follow-up period was 54.7 months. The evaluation of the results was performed with IKDC, Lysholm and Tegner score and KT-1000. Average Lysholm-score was 86.78% (range, 53 to 100). IKDC score was A in 5 cases, B in 10, C in 5 and D in 3. Average Tegner-score was before accident 4.69 and in reexamination 4.04. The mean anterior translation on KT-1000 testing was 7.1 mm (20° flexion - 89 Newton’s), the mean posterior translation 5.0 mm (70° flexion - 89 Newton’s) and the mean differences 4.04. The mean anterior translation on KT-1000 testing was 7.1 mm (20° flexion - 89 Newton’s), the mean posterior translation 5.0 mm (70° flexion - 89 Newton’s) and the mean differences 4.04. The mean anterior translation on KT-1000 testing was 7.1 mm (20° flexion - 89 Newton’s), the mean posterior translation 5.0 mm (70° flexion - 89 Newton’s) and the mean differences 4.04. The mean anterior translation on KT-1000 testing was 7.1 mm (20° flexion - 89 Newton’s), the mean posterior translation 5.0 mm (70° flexion - 89 Newton’s) and the mean differences 4.04.

Conclusion: Surgical treatment of combined ruptures of PCL and ACL must be immediate. The aim is to obtain anatomical restoration of all knee compartments. The rehabilitation program must be aggressive. If the knee joint mobilization is not accomplished within 4-6 weeks, arthroscopic adhesion’s release must take place.

Poster #249
THE MULTIPLE LIGAMENT INJURED KNEE. OUTCOMES OF SURGICAL TREATMENT.
Andreas Panagiotis Diamantopoulos, Athens, GREECE, Presenter
Iraklis Ioannis Patsopoulos, Athens, GREECE
Christina Neila, Athens, GREECE
Ioannis Georgilas, Athens, GREECE
Mathesos Tsarbakis, Athens, GREECE
2nd Orthopaedic Department, Evangelismos General H, Athens, GREECE

Purpose: The aim of this paper is to study the complex ligament knee injuries and to evaluate the results of surgical treatment. Material and method: Between 1993 and 2001, 51 patients with 52 injured knees were treated. The average age was 32.9 years (range, 18 to 68); 45 males and 6 females. Our material was classified according to Strobel’s classification (1999): isolated injury of central structure (ACL and PCL) was found in 2 patients, injury of 2 anatomical structures in 22 patients, 3 structures in 23 and more than 3 in 5. In 10 incidents accompa-
nied fractures were seen, in 5 chondral lesions, in 3 neurological damage while no vascular injury was observed. All patients were operated, during the acute phase, by the same team of doctors. All the damaged structures were anatomically exposed and restored (first capsular tears, then meniscal lesions and collateral ruptures and finally ACL and PCL ruptures). All grafts for ligament reconstruction were autologus. Postoperatively the knee was placed in a brace, set in 10°-60° and isometric quadriceps exercises were begun followed by progressive mobilization of the joint. After 3 weeks full extension was permitted and weight bearing was permitted after 6 weeks. Full activity was achieved after 6 months.

Results: 46 patients/47 knees (90.2%) were reexamined. The average follow up period was 52 months. The evaluation of the results was performed with IKDC, Lysholm and Tegner score and KT-1000. Average Lysholm-score was 86.6% (range, 53 to 100); IKDC score was A in 9 cases, B in 23, C in 8 and D in 6; Average Tegner-score was before accident 4.8 and in reexamination 4.1. The mean anterior translation on KT-1000 testing was 6.9 mm (20° flexion-89 Newton’s), the mean posterior translation 4.6 mm (70° flexion-89 Newton’s) and the mean differences from the uninvolved side was 1.5 mm and 2.2 mm, accordingly.

Conclusion: Immediate surgical reconstruction of the complex knee injuries must be obtained with great care and all the ruptured anatomical structures must be restored. The rehabilitation program must be aggressive, aiming in progressive mobilization of the joint and muscle endurance. The surgeon must know all the alternative methods of reconstructing the main knee ligaments and adjust them according to cases.

Poster #250
COMPARISON OF TWO DIFFERENTS GRAFTS FOR THE TREATMENT OF 48 CHRONIC POSTERIOR INSTABILITIES WITH TWO YEARS FOLLOW-UP
Patrick Dijan, Paris, FRANCE, Presenter
Pascal Cirstel, Paris, FRANCE
Clinique Nollet, Paris, FRANCE

This is a prospective and continuous study of 48 posterior chronic instabilities operated between 1995 and 2000.

Material and Methods: Two different graft were used to reconstruct the PCL. In group I, the PCL has been arthroscopically reconstructed with a two-bundle autograft of bone-patellar tendon-bone in 22 cases and in group II there were 26 cases in which the PCL has been reconstructed arthroscopically with a two-bundle quadriceps tendon.

The two groups do not show any difference in term of sex ratio, average at injury and number of previous surgery. The pre-operative clinical examination showed in group I, 9 isolated poste-rior instabilities (PI) and 8 in group II, 10 combined postero-postero-lateral instabilities (PPLI) and 7 in group II, 3 combined postero-postero-medial instabilities (PPMMI) and 3 in group II, 1 PPMMI + PPL instability in group I, and 7 complex antero-posterior instabilities (PCL + ACL + 2ndary restraints). Combined secondary restraints insufficiency has always been treated either by reefing, autologous augmentation or reconstruction. In case of varus knee associated to a PPLI, a HTO was performed prior to ligament reconstruction. Outcome was evaluated by using the IKDC 93 scoring system and the posterior laxity was measured with stress radiography.

Results

The average follow-up is two years. All the patients have been followed at least one year. No post-operative complication was noticed. We will focus on the results of the 3 first groups: PI, PPLI, PPMMI.

Pre-op status

<table>
<thead>
<tr>
<th>Graft</th>
<th>Subjective</th>
<th>Symptoms</th>
<th>Global Score</th>
<th>Laxity mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full serie</td>
<td>A B C D</td>
<td>A B C D</td>
<td>A B C D</td>
<td>Laxity mm</td>
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<tr>
<td>PI</td>
<td>12/36</td>
<td>6/10/32</td>
<td>9/39</td>
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<td>PPLI</td>
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<td>2/3/3/5/4</td>
<td>1/2/9/5</td>
<td>10 x 4.3 / 11.5 ± 5</td>
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<tr>
<td>PPMMI</td>
<td>3/0</td>
<td>0/1/3/2</td>
<td>3/3</td>
<td>11.0 ± 3.2 / 11.6 ± 5</td>
</tr>
</tbody>
</table>

Discussion and conclusion

PCL reconstruction with a two-bundle autograft combined with secondary restraints repair, show better result with OT graft (p=0.02). The gain with OT is significantly better (p=0.03). The combination of a postero-lateral instability to the PCL insufficiency has a lower prognosis on the final outcome (p=0.01).

Poster #251
PATELLAR TENONYSTIXY WITH GRACILIS AND SEMITENDINOSUS: A CASE PRESENTATION
Roberto Jose Batista Dorea, Salvador, BRAZIL, Presenter
Centro Medico Aliança, Salvador, BRAZIL

Purpose: This presentation demonstrates a new technique to give support to the recovery of the lesioned patellar tendon, maintaining the original strength and function, with the return to normal activities, permitting the blood supply of the strengthener tendon (gracilis and semitendinosus).

Method: A central incision from the patella to tibial tuberosity is made, the tendon lesion is identified and the debridement of the injured edges of the patellar tendon is performed. The approximation of the edges with sutute is realized, using Ethibond no2. Another incision is made on a level with the patellar tendon (gracilis and semitendinosus). The transporta-tion to the patellar tendon is realized, where it will be fixed with a zig-zag suture, strengthening the previous patellar tendon’s suture.

Results: On the 48th day after surgery the patient presented full extension of the knee, with 180° and flexion degree of 140°. He returned to his athletic activities, partially, after 4 months and completely, after 6 months, in combination with an intensive phyisotherapy support.

Conclusion: This procedure has been demonstrated to be an effective method in correcting the patellar tendon lesion, while maintaining the original strength and function, thus permitting the return to athletic activities with the same intensity.

Poster #252
PATELLAR DISTAL REALIGNMENT WITH MINI-INCISION IN RECIDIVATING LUXATION OF THE PATELLA
Roberto Jose Batista Dorea, Salvador, BRAZIL, Presenter
Centro Medico Aliança, Salvador, BRAZIL

The average follow-up is two years. All the patients have been followed at least one year. No post-operative complication was noticed. We will focus on the results of the 3 first groups: PI, PPLI, PPMMI.

Pre-op status

<table>
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<tr>
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<td>A B C D</td>
<td>Laxity mm</td>
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<tr>
<td>PI</td>
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<td>3/0/6/8</td>
<td>9.3 ± 3.1 / 9.5 ± 3.6</td>
</tr>
<tr>
<td>PPLI</td>
<td>4/3/6/4</td>
<td>2/3/3/5/4</td>
<td>1/2/9/5</td>
<td>10 x 4.3 / 11.5 ± 5</td>
</tr>
<tr>
<td>PPMMI</td>
<td>3/0</td>
<td>0/1/3/2</td>
<td>3/3</td>
<td>11.0 ± 3.2 / 11.6 ± 5</td>
</tr>
</tbody>
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Discussion and conclusion

PCL reconstruction with a two-bundle autograft combined with secondary restraints repair, show better result with OT graft (p=0.02). The gain with OT is significantly better (p=0.03). The combination of a postero-lateral instability to the PCL insufficiency has a lower prognosis on the final outcome (p=0.01).
Introduction: This technique originally appeared in 1888 when it was described by Roux, and consisted of performing, by means of a large incision, the transplantation of the tuberosity of the tibia, medially, and lowering it when necessary. The technique was improved by Hauser in 1938 and in 1989 Roberto Dorea attempted to improve on the technique once again by markedly diminishing the size of the incision and fixing the tuberosity of the tibia with two small fragment screws which provided greater stability and dispensed with post-operative immobilization.

Purpose: This presentation demonstrates the realignment with mini-incision technique which provided greater stability and dispensed with post-operative immobilization.

Technique: An incision measuring approximately 3.5 cm is made on the distal portion of the patellar tendon. The tendon is separated from the subcutaneous cellular tissue without the use of a cutting instrument, extending to the patella. The lateral part of the tendon is carried out. After partially disengaging of the distal insertion of semitendineous, gracilis and semimembranous muscles, a new bone attachment is formed. The removal of the patellar tendon with the bone block centralized and temporarily attached onto the new site is then completed. After verifying if the patella centralization is satisfactory it can be reinserted. The closing is done by planes and after that a compressive bandage is used.

Results: In the period comprised of December 1989 to December 2001, 38 surgeries were performed with this technique, 34 with good results (89.5%), 03 with satisfactory results (7.8%) and 01 with an unsatisfactory result (2.6%).

Conclusion: This procedure is a technically easier and more effective method for recidivating luxation of the patella, with promising results.

Poster #253
MANAGEMENT OF KNEE DISLOCATIONS – EXPERIENCE OF 67
Lars Engbreten, Oslo, NORWAY, Presenter
Steinar Johansen, Stabekk, NORWAY
Tom Clement Ludvigsen, Oslo, NORWAY
Steinar Johansen, Stabekk, NORWAY
Oslo Orthopaedic University Clinic, Oslo, NORWAY
As a level I trauma hospital, OOU receives an increasing number of knee dislocations. This report is based on the treatment of acute knee dislocations seen at OOU from May 1. 1996 through July 2001.

Patients and methods: 66 patients with 67 dislocated knees were admitted in the period. All patients were students or working prior to the injury and all had a high functional level. 50% of the dislocations occurred in conjunction with major traffic accidents- the majority of which were motorbikecyclists, while the remaining injuries were sustained during sports. 4 patients had a complete injury of the peroneal nerve on admittance, while an additional 4 had decreased motor strength and /or sensory dysfunction. In addition one patient had a ruptur of the patellar tendon and one a patella dislocation. Two of the patients in this group had a vascular injury. On admittance the patients underwent a diagnostic exam in the emergency room. All the patients then had a MRI with a special protocol for the posterolateral corner. The patients were the placed in a brace and on a CPM 2 hours 2 times a day for 7 days, and the vascular status was monitored closely. After 7-10 days the patients underwent surgery including arthroscopic reconstruction of the ACL and PCL with auto or preferably, if available, allograft. Results for patient with a followup for more than 6 months are presented including IKDS, Cincinnati, Tegner and a clinical exam with KT1000.

Results: No serious complication occurred in conjunction with surgery or the hospital stay. Two infections with staf aureus occurred and was successfully treated. Three patients underwent secondary arthroscopic debridement for arthrofibrosis > 90 % of the patients have returned to work, but the majority have had to reduce or change their sports activities. The Cincinnati score was 69 (36-99).

Conclusion: We have designed a treatment protocol for this difficult patient group. Short term (6-60 months) follow up suggest promising results.

Poster #254
INTERNATIONAL PATELLOFEMORAL STUDY GROUP (IPSG) LATERAL RELEASE SURVEY RESULTS
Donald C. Frithian, San Diego, CA, USA, Presenter
Liz W. Paxton, El Cajon, CA, USA
William R. Post, Morgantown, WV, USA
Southern California Permanente Medical Group, San Diego, CA, USA
The aim of this study was to identify consensus and disagreement on lateral release (LR) indications and techniques. A survey was sent to all members of an international group of orthopedic surgeons with interest in knee extensor mechanism disorders. The survey asked about indications, procedure volume, and LR mechanisms. Twenty-seven surgeons completed the survey (60% response rate). The median number of operative procedures performed per year was 300. Few surgeons (15%) performed more than 10 LR cases per year. The median number of LR was 1-5 per year (<2% of surgical volume). The majority performed at least one LR per year as primary or secondary surgery (70%). The preferred technique for isolated LR was open or mini-open (59%). Fewer than 40% used LR in treating patellar dislocation. Fewer than 20% used LR in patellar subluxation or dislocation. Over 50% identified lateral tilt by examination as a requirement to justify LR. Most respondents (70%) identified systematic hypermobility as a contraindication to LR. Over 70% obtained informed consent for LR during routine arthroscopy. Most respondents (78%) identified relief of tension in the retinaculum as the mechanism for how LR works. Conclusions: There is strong consensus that objective evidence is needed to support lateral release. That is, few surgeons would perform LR on basis of history alone. There is little agreement as to what physical or imaging evidence provides the best indication for LR. Isolated lateral release is performed infrequently even among surgeons with specific interest in disorders of the patellofemoral joint.

Poster #255
ONE VERSUS TWO INCISION PCL RECONSTRUCTION USING MULTIPLIED HAMSTRING TENDONS.
Masayuki Hamada, Hirakata, JAPAN, Presenter
Koike Shino, Hachikino, Osaka, JAPAN
Shuji Horibe, Sakai, JAPAN
Tomoki Mitsuoka, Kashiba, JAPAN
Ken Nakata, Amagasaki, JAPAN
Noriyasu Nakamura, Sakai, JAPAN
Yukiyoshi Toritsuka, Osaka, JAPAN
The FDA has not cleared the drug and/or medical device for the use described in this presentation (i.e., the drug or medical device is being discussed for an "off-label" use)

• The FDA has not cleared the drug and/or medical device for the use described in this presentation (i.e., the drug or medical device is being discussed for an “off-label” use)
Atsushi Sugita, Ibaragi, JAPAN
Osaka Univ. Medical School, Suita, Osaka, JAPAN

(Objective)
Recent innovation in arthroscopic surgery has made it possible to perform one-incision technique PCL reconstruction without femoral skin incision. The purpose of this study was to clarify difference in clinical outcome between the conventional two-incision and the newer one-incision PCL reconstruction.

(Materials and Methods)
There were 30 patients (male 26, female 4) with a mean age of 26 suffering from unilateral chronic PCL insufficiency. The tibial tunnel was created from anterior cortex to the center of the PCL footprint, while the femoral drill hole was positioned at the center of the footprint of the anterolateral bundle. In the former 15 patients, the femoral drill hole was created in outside-in fashion using a drill guide (two-incision group), while it was created inside-out fashion through the far lateral anterior portal in the latter 15 patients (one-incision group). After the graft of 3-4 stranded hamstring tendons was introduced into the joint, it was first fixed to the femur with a button or screw post in the two-incision group or with Endo-button in the one-incision group. Then, it was fixed to the tibia under manual maximum tension at 0° with a screw post in both groups. Postoperatively, all the patients were rehabilitated according to the same protocol. At 2 years post operation, they were evaluated with IKDC Knee Ligament Standard Evaluation Form, quantitative laxity measurement using plain radiography (gravity sag view) and isokinetic thigh muscle power analysis.

(Results)
While 22 of the patients (74 %) regained full ROM, 8 of them (26 %) showed flexion loss of 5° to 10°. According to the IKDC subjective assessment, 53 % of the two-incision group patients were graded as normal; 33 %, nearly normal; 13 %, abnormal, while 53 % of the one-incision group were graded as normal; 47 %, nearly abnormal; 0 %, abnormal. The mean side-to-side posterior laxity difference of 4.2 ± 2.9 mm for the two-incision group was significantly greater than the value of 2.4 ± 0.0 mm for the one-incision group (p < 0.05). There was no difference in thigh muscle strength between the two groups.

(Conclusion)
One-incision technique provides better outcome than two-incision one in restored stability.

Poster #256
BIOMECHANICAL COMPARISON OF TRANS-TIBIAL VERSUS TIBIAL INLAY PCL RECONSTRUCTIONS
Fabrizio Mangherlini, Rome, ITALY
Craig S. Maruo, Pittsburgh, PA, USA
Jeffrey Rillke, Pittsburgh, PA, USA
Kathryn J. Stahl, Pittsburgh, PA, USA
Savio L-Y. Wun, Pittsburgh, PA, USA
Christopher D. Harner, Pittsburgh, PA, USA, Presenter
University of Pittsburgh, Pittsburgh, PA, USA

PURPOSE: The objective of this study was to determine the biomechanical efficacy of the tibial inlay and trans-tibial techniques of PCL reconstruction in restoring knee kinematics and in situ forces of the intact knee.

METHODS: Ten human cadaveric knees (34-80 years) were tested. Using a robotic/universal force-moment sensor testing system, a 134 N anterior-posterior load was applied at 0°, 30°, 60°, 90° and 120° of knee flexion. Each knee was tested under four conditions: intact, PCL-deficient, and single bundle trans-tibial reconstruction, and single bundle tibial inlay reconstruction. The same 10 mm fresh frozen Achilles tendon graft was used for both reconstructions in a given specimen. The graft was preconditioned for 15 cycles with 10 lbs (44 N) and fixed at 90° of knee flexion with a tension of 20 lbs (88 N). The kinematics for each of the four knee conditions and the in situ forces in the intact PCL and the PCL grafts were determined. Statistical analysis was performed using repeated measures ANOVA (p<0.05).

RESULTS: Posterior tibial translation with each reconstruction was significantly greater than that in the intact knee at all flexion angles by 1.7 to 2.1 mm (p<0.05). There were no significant differences in posterior tibial translation between the two techniques at any flexion angles (p>0.05). The in situ forces in the PCL grafts with both techniques were significantly lower than those of the intact PCL at 30°, 60°, 90°, and 120° by 7 to 39 N (p<0.05). There were no differences in in situ forces in the PCL grafts between the trans-tibial and tibial inlay techniques (p>0.05).

CONCLUSION: These data suggest that either technique may be performed with similar biomechanical results. The finding that neither technique was able to restore intact knee kinematics or in situ forces in the PCL suggests that the single bundle graft used in both techniques was inadequate in resisting a posterior tibial load when compared to the intact PCL. However, this study evaluated the efficacy of PCL graft constructs at initial fixation. Biological healing studies are needed to address issues such as graft elongation and remodeling over time, and only a randomized controlled clinical study will truly determine if there is any clear advantage of either technique.

Poster #257
RECONSTRUCTION OF THE POSTEROLATERAL CORNER. A NEW SURGICAL PROCEDURE
Bent Wulff Jakobsen, Aarhus, DENMARK, Presenter
Bent Lund, Aarhus C., DENMARK
Sten Kjaeldsen, Aarhus, DENMARK
Svend Erik Christiansen, Aarhus, DENMARK
Division of Sports Trauma, University Hospital of, Aarhus, DENMARK

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 lesion of 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. Primary repair with or without augmentation is recommended. In chronic cases stability should be established using an anatomic reconstruction.

Material: In the period from May 1887 to Jan 2001 51 patients with posterolateral instability were treated with primary repair with augmentation or reconstruction. Median age were 30 years, 29 were males. Chronic cases constituted 72,5% and 31 4% had previous surgery. Cause of injury were RTA in 35% and sport in 41%. The concomitant ligament lesions were:

- Isolated PLC/LCL 6
- PLC & ACL 20
- PLC & PCL 15
- PLC & ACL & PCL 1
- PLC & ACL & MCL 1
Method: All had reconstruction of the lateral structures with a new procedure using hamstring grafts. 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 ligament and the popliteus tendon with semitendinosus and gracilis grafts were performed. Concomitant ligament instability were treated with reconstruction using either autografts or allografts. All were evaluated with subjective assessment and objectively using KT1000 according to the IKDC form >12 months post-op.

Results: Preop 93% had > 10° lateral rotatory instability at 90° knee flexion, postop all were stable (74% grade A, <5°, 26% grade B, 6-10°).

Conclusion: It can be concluded that significant PCL instability often is combined with PLC instability and non-diagnosed PLC instability concomitant to ACL instability may lead to ACL reconstruction failure. A 2 double bundle reconstruction of the LCL and PLC result in good objective stability with low complication risk.

Poster #258

DYNAMIC PATELLAR TRACKING IN PATHOLOGICAL CONDITIONS

Ryosuke Karoda, Pittsburgh, PA, USA, Presenter
Kiyomori Mizuno, Kobe, JAPAN
Masahiro Karosaka, Kobe, JAPAN
Sukinici Yoshiya, Kobe, JAPAN
Nobuue Matsui, Kobe, JAPAN
Hirotsuga Maratsu, Kagaoku, JAPAN
Masayoshi Yagi, Kobe, JAPAN
Department of Orthopaedic Surgery, Kobe University, Kobe, JAPAN

Objective: Symptoms of patellar instability may be caused by various abnormalities, such as patellofemoral dysplasia and malalignment, dysfunction of medial soft tissue restraints, articular surface injury. However, the pathogenesis of the patellar instability is still unknown. The purpose of this study was to know the dynamic patellar tracking under the pathological conditions and investigate the pathogenesis of the patellar instability.

Methods: Six fresh-frozen human cadaveric knees were used. The knees were extended using a material testing machine. Magnetic position sensors (3 SPACE FASTRAK, Polhemus Inc., Colchester, VT) were mounted on the femur, tibia and patella. The dynamic patellar tracking was measured using position sensors from the angle of 90° to 0° degree of the knee joint with the following conditions; 1) Medial patellofemoral ligament (MPFL) dysfunction, 2) lateralization of tibial tuberosity (10mm lateral), 3) realignment of the direction of the extensor mechanism muscle force (10 degrees lateral), 4) the abnormal internal rotation (10 degrees) of the femur. The lateral shift of the patella and the lateral tilt angle of the patella with respect to the femur were calculated.

Results: In the intact knees, the maximum patellar tilt was 4.4 degrees and the maximum patellar shift was 4.9 mm. The patellar shift was affected by lateralization of tibial tuberosity and abnormal direction of the extensor mechanism muscle force (increased Q-angle). The lateral patellar tilt and shift were significantly affected by loss of MPFL. The average of the maximum tilt angle changed from 4.4 to 8.1 degrees. Furthermore, MPFL deficiency combined with increased Q-angle significantly increased the patellar tilt and shift. The average of maximum tilting angle was 35.4 degrees and the maximum patella shift was 30.2 mm. Patellar tracking was not changed by the femoral rotation.

Discussion: Our study demonstrated that patellar tracking was affected significantly by MPFL deficiency. Studies of the surgical findings in acute patellar dislocation indicated that the MPFL was torn as the patella dislocates. Our study indicated that the MPFL deficiency caused recurrent lateral patellar dislocation in patients with abnormal Q-angle.
(6.5%) fair, and only 1 case (2.1%) poor. With the stress x-ray evaluation comparing to the contra lateral side, we found:

- **Grade 0:** posterior translation negative: 6 cases (13%)
- **Grade 1 (< = 5 mm.):** 30 cases (65.2%)
- **Grade 2 (6 - 10 mm.):** 7 cases (15.2%)
- **Grade 3 (> 10 mm.):** 3 cases (6.3%)

Conclusions:
The isolated PCL reconstruction is not very frequent (19%) because of it's good healing potential and his good tolerance. Using the arthroscopic transtibial one single bundle technique is difficult to obtain similar objective results comparing with the non injured contralateral side (6 cases -13%- with negative posterior translation). Most of the cases had grade I posterior translation (30 cases -65.2%-). 80% of the cases (37 patients) required multiple ligament reconstruction. The simultaneous repair was possible in our hands with this technique. On the other hand, the Lisholm score showed in 42 cases (91.3%) excellent and good results, with a high percentage of return to sport. We know is very difficult to restore all the biomechanical of PCL, but with an adequate diagnosis and a correct reconstruction of the PCL and the associated lesions, we obtained satisfactory results.

**Poster #260**
**POSTERIOR CRUCIATE LIGAMENT RECONSTRUCTION USING HAMSTRING TENDON WITH PRESERVATION OF POSTERIOR CRUCIATE LIGAMENT REMNANT**
Beom Koo Lee, Seoul, KOREA, Presenter
Gachon Medical College, Gil Medical Center, Incheon, KOREA

Purpose: The purpose of study is to evaluate the clinical results of PCL (posterior cruciate ligament) reconstruction using the quadruple hamstring tendon with preservation of the PCL remnant.

Type of Study: Case series.

Methods: Twenty PCL reconstructions have been performed by one surgeon. The average follow-up period were at 31 months. Isolated injuries were eleven cases and associated injuries were nine cases. Arthroscopic findings, preoperative and postoperative posterior displacement at stress radiograph, Lysholm knee score and complications were evaluated.

Results: As a functional result, the average postoperative Lysholm knee score was 92, showing more than good in eighteen cases (90%). The average preoperative posterior displacement with stress radiograph was 14 and the postoperative one was 3.2. Postoperatively in isolated injuries, the average posterior displacement at stress radiograph was 2.6. In associated injuries, the average posterior displacement at stress radiograph was 3.7. In case of reconstruction within three weeks, the average laxity was 2.6. And in case of reconstruction after three weeks, average posterior laxity was 3.7.

Conclusions: Good stability and function of knee could be obtained by PCL reconstruction using Hamstring tendon with preserving the PCL remnant and slow rehabilitation.

**Poster #261**
**COMPARATIVE ANALYSIS OF DELAYED LAXITY DEVELOPING AFTER ARTHROSCOPIC PCL RECONSTRUCTION IN ISOLATED AND COMBINED INJURY OF POSTERIOR CRUCIATE LIGAMENT**
Kwang-Won Lee, Daejeon, SOUTH KOREA, Presenter
Dept. of Orthopaedic Surgery, Eulji University Hos, Daejeon, SOUTH KOREA

Purpose: To analyze the clinical and radiological results of the delayed laxity developing after arthroscopic PCL reconstruction of isolated and combined PCL-deficient knees.

Materials and Method: From June 1994 to June 2000, we retrospectively evaluated 45 subjects with PCL-deficient knees who were treated by arthroscopic PCL reconstruction using Achilles tendons (allograft). At a mean follow-up of 49 months (range: 12-72), the functional results were evaluated according to the IKDC knee ligament evaluation form and Lysholm knee score and KT-2000 arthrometer. The postoperative posterior laxity was measured with difference of posterior translation between the injured and uninjured knee.

Results: Preoperative mean side to side differences of the posterior translation were 11.83mm in 18 isolated PCL-deficient knees and 12.7mm in 27 combined PCL-deficient knees, respectively. Postoperative mean differences of the posterior translation were 6.38mm in isolated PCL-deficient knees and 6.7mm in combined PCL-deficient knees, respectively (P=0.05). The Lysholm mean score was 87.4 points in isolated PCL-deficient knees and 81.2 points in combined PCL-deficient knees at last follow up postoperatively.

Conclusion: The functional results were no relationship to the degree of laxity. Tendency of posterior laxity may be influenced by associated injury of the knee.

**Poster #262**
**ANALYSIS OF RELATIONSHIPS BETWEEN SUBJECTIVE AND OBJECTIVE GROUPS OF IKDC SCORE**
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INTRODUCTION
Recent analyses of knee ligament surgeries have attempted to quantify the functional outcome after surgery. Among accepted outcome measures used to evaluate knees following ligament injury are the IKDC knee rating scale. Although outcome studies using IKDC have documented the positive impact of ACL reconstruction, variations in the functional outcome after Lig reconstructions have not clearly correlated with objective measures of stability. The purpose of this study was 1) to determine if guidelines established by the International Knee Documentation Committee (IKDC) could distinguish differences in outcome, as indicated by the patients' subjective rating of knee function and The resumption of sporting activities following ACL reconstruction, and 2) to determine which subgroups included in the IKDC rating system contribute to the prediction of the outcome result.

MATERIAL & METHOD
Sixty-six patients were studied prospectively following four strands hamstring ACL reconstruction by a single surgeon. Average follow up was 15.92 months. The graft fixed by A.O screw and spiked washer to suprapatryle of femur. after completion of a brace free, intensive rehabilitation program, results were recorded using the IKDC knee score, Objective measures of stability included Lachman, anterior drawer and pivot-shift.
tests, we named the patient subjective assessment box of the form as "patient's satisfaction" and the combined results of the lachman, pivot-shift, and the anterior drawer test as "lig tests" in this study. Improvement of activity level and patient's satisfaction was our two criteria for the outcome result.

RESULTS:
63 patients (%59.5) considered their knee function normal or near normal. One leg hop were >90% of opposite side in 35 patients (%53) and >76% in 18 patients (%27.3). In ligament examination group of IKDC 18 patients (%27.3) were graded A and 44 patients (%66.7) B. An overall IKDC assessment 59 (%89) were considered normal or nearly normal. Patient satisfaction were A in 24 patients (%36.4) and B in 36 (%54.5), 52 patients (%78.8) had improvement in their activity level but only 41 patients (%62.1) could return to preinjury activity level patient's satisfaction correlated with one leg hop (p<0.024), final result (p<0.001) and with the pivot shift test (p=0.019). The resumption of sporting activities and work mostly correlated with the one leg hop (p<0.001) and med meniscus tear (p=0.031) but did not correlate with the lig tests. Furthermore, none of the laxity tests correlated with the return to preinjury activity level. Final result had significant relationship with presents activity level (P<0.001), ant drawer test (P=0.032), patient's satisfaction (p<0.001) and one leg hop (P<0.001).

Conclusion:
Although lig exams is commonly used for evaluation of the results in ACL reconstruction in the clinics and had relationship with patient's satisfaction, but as the results of this study one leg hop could be the most sensitive predictor of postoperative outcome result and highly correlated with the patient's satisfaction and resumption of activities.

Poster #263
RECONSTRUCTION OF THE ACL-PCL DEFICIENT KNEE: A BIOMECHANICAL STUDY OF GRAFT PRETENSION AND KNEE LAXITY
Keith L. Markolf, Los Angeles, CA, USA, Presenter
Geoffry O'Neill, Los Angeles, CA, USA
Steven Jackson, Los Angeles, CA, USA
David R. McAllister, Los Angeles, CA, USA
University of California, Los Angeles, California, USA

Introduction: Reconstruction of the ACL-PCL deficient knee remains a significant orthopaedic challenge. Clinical results from these procedures are often poor, with a failure to restore normal knee laxity. Various graft pretensioning protocols have been previously described but none have been studied biomechanically. The purpose of this study was to determine the levels of ACL and PCL graft pretension necessary to restore a near-normal knee laxity profile between 0° to 90° of flexion, and to determine the best graft pretensioning sequence.

Methods: Laxity testing at 200N of applied AP force was performed on twelve fresh-frozen knee samples at 0°, 30°, and 90° of knee flexion. After resection of both cruciates, load cells were installed to record forces at the tibial insertion of an ACL graft replacement and at the femoral origin of a PCL graft replacement; both grafts were fashioned from B-PT-B preparations. Both grafts were pretensioned at 30° of knee flexion. Through trial and error, levels of graft pretensions were found which best restored AP laxity and also generated reasonable graft force profiles over a 90° degree range of passive knee flexion; these were referred to as the nominal ACL and PCL pretensions. Knee laxities were also measured while first applying the nominal pretension to one graft, and then over-tensioning the other graft by 40N. Graft forces at 0° and 90° of flexion which resulted from applying nominal pretensions at 30° were also recorded. An ANOVA with repeated measures was used to determine differences in knee laxities at each flexion angle for the various test conditions.

Results: The ACL and PCL graft pretensions were found to be interrelated; applying tension to one graft produced a change in the pretension in the other (fixed) graft. This was due to the tendency of the tibia to sublux posteriorly from applied ACL pretension, and anteriorly from applied PCL pretension. The PCL graft had to be pretensioned first to consistently restore near-normal knee laxities. When the ACL graft was pretensioned first, in most cases the graft had to be slackened or pretensioned to a very low level to achieve the final nominal mix of ACL and PCL force; this was an inconsistent and non-reproducible pretensioning strategy. The nominal graft pretensions applied at 30° degrees of flexion were 23.7 N for the PCL and 9.8 for the ACL. The corresponding graft forces which developed when the knee was subsequently extended to 0° were 76.8 N for the PCL and 30.4 for the ACL. When the knee was flexed to 90° the graft forces were 68.8 for the PCL and 17.3 for the ACL. It was not possible to match laxity of the intact knee at 0° flexion in all specimens: mean laxity at full extension with nominal graft pretensions was 1.6 mm greater than the intact knee. Overtensioning the PCL by 40N (at 30° flexion) significantly reduced knee laxity at all flexion angles, while over-tensioning the ACL did not. At 0, 30 and 90 degrees the mean laxities were 9.4, 14.4, and 13.0 for the intact knee; 11.0*, 14.6, and 13.2 when the nominal pretensions were used; 9.7 †, 13.0 †, and 10.4 † when nominal PCL pretension + 40 N was used; 10.1, 13.3, and 14.0 † when nominal ACL pretension + 40 N was used.

* sign. diff. from intact (p < .05); † sign. diff. from nominal (p < .05);
† † sign. diff. from PCL (nom. +40N) (p < .05)

Conclusions: Pretensioning both grafts at 30° degrees of flexion (PCL pretension first) generated the most consistent knee laxity patterns. The mean PCL pretension was 2.4 times that for the ACL. The graft pretensions determined in this study were somewhat lower than those believed to be used in clinical practice.

Poster #264
MEDIAL SOFT TISSUE RESTRAINTS TO THE DYNAMIC PATELLAR TRACKING
Kyogonori Mizuno, Kobe, JAPAN, Presenter
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Shinichi Yoshiaki, Kobe, JAPAN
Masafumi Kuratake, Kobe, JAPAN
Hirotsugu Matsumoto, Kakoigawa, JAPAN
Nobuzo Matsui, Kobe, JAPAN
Masayoshi Yagi, Kobe, JAPAN

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Objective: Previous studies of the pathoanatomy of acute patellar dislocation indicated that the medial retinaculum is torn as the patellar dislocates and can lead to the chronic lateral instability and recurrent dislocation. Anatomic studies have identified that the medial patellofemoral ligament (MPFL) was the primary stabilizer against the lateral patellar displacement. However, the importance of the MPFL on dynamic patellar instability has been still unknown. The purpose of this study was to investigate the role of MPFL and the effectiveness of MPFL reconstruction on dynamic patellar tracking. Methods: Five fresh-frozen human cadaveric knees were used. The knees were extended using a material testing machine. Magnetic position sensors (3 SPACE FASTRAK, Polhemus Inc., Colchester, VT) were mounted on the femur, tibia and patella.

• The FDA has not cleared the drug and/or medical device for the use described in this presentation (i.e., the drug or medical device is being discussed for an "off-label" use).
The dynamic patellar tracking was measured using position sensors from 90 to 0 degrees of the knee joint with the following conditions: 1) the medial restraints intact and then cut to determine their contribution to lateral translation of the patella, 2) MPFL reconstruction using hamstrings tendon. The lateral shift of the patella and the lateral tilt angle of the patella with respect to the femur were calculated. Results: In the intact knees, the maximum patellar tilt was 7.3 degrees and the maximum patellar shift was 5.6 mm. Patellar tracking was not significantly affected by loss of medial restraints except MPFL. Patellar tracking was changed significantly by loss of the MPFL at 40 - 0 degree of the knee flexion angle. The maximum patellar shift was 11.5 degrees and the maximum tilt was 7.9 mm. These were significantly different from the intact knees. Normal dynamic patellar tracking was substantially restored after reconstruction of the MPFL. Discussion: Recently the importance of MPFL has been described in the literature. However, only a few papers of the dynamic patellar tracking have been published. Our study demonstrated that MPFL played an important role to stabilize the patella at knee flexion angle of less than 40 degrees and that the reconstruction of MPFL restored normal patellar tracking.

**Poster #265**

**BIOABSORBABLE VERSUS METAL SCREW IN ANTEROMEDIAL TIBIAL TUBERCLE TRANSFER – A BIOMECHANICAL STUDY**

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Janne T. Nurmi, Tampere, FINLAND, Presenter
Pekka Kannus, Tampere, FINLAND.
Harri Sievänen, Tampere, FINLAND
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Anteromedial tibial tubercle transfer has been proven successful in the treatment of patellar malalignment. In this operation the osteotomized and transferred tibial tubercle is fixed with screws, commonly with 1-2 bicortical or cancellous metal screws. In this study, twenty-two pairs of human cadaver tibiae (44 tibiae in total) were used to compare the initial fixation strength of 4.5-mm bicortical bioabsorbable and metal screw. The volumetric bone mineral density of the knee pairs was determined at the proximal tibia using peripheral quantitative computed tomography (pQCT) and no significant difference was found in the bone densities between the bioabsorbable screw group (total: 215 +/- 30 mg/cm³, trabecular bone: 174 +/- 31 mg/cm³) and the metal screw group (total: 217 +/- 34 mg/cm³, trabecular bone: 178 +/- 40 mg/cm³). In our two-phase biomechanical testing protocol, the specimens were first subjected to a cyclic loading test (1900 loading cycles between 50 and 300 N at 0.5 Hz frequency), after which they were loaded to failure at a rate of 1.0 mm/min (single cycle load-to-failure test). No significant displacement differences were observed between the two groups in the cyclic loading test. In the subsequent single cycle load-to-failure test, the average yield load was 566 +/- 234 N in the bioabsorbable screw group and 984 +/- 630 N in the metal screw group (p=0.002). However, no significant group differences were found between the two screws with regards to stiffness. The mode of failure was screw breakage and/or bending in the bioabsorbable screw group, and screw bending and/or pull-out in the metal screw group. In conclusion, considering the average maximum quadriceps pull measured in humans (390 +/- 76 N, Rupp et al. Arthroscopy 15: 179-184, 1999), even a single bioabsorbable bicortical screw seems to provide a sufficient strength of fixation for the anteromedial tibial tubercle transfer.

**Poster #266**

**TROCHLEAPLASTY – AN EFFECTIVE SURGICAL OPTION IN RECURRENT PATELLAR DISLOCATION DUE TO DYSPLECTIC PATELLOFEMORAL GROOVE**

Rolf F. Oetiker, Chur, SWITZERLAND, Presenter
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Purpose: Numerous pathologies are known to be a possible cause of chronic recurrent patellar dislocation. Among these the dysplasia of the trochlea is considered to be most important. According to Dejour the dysplasia of the patellofemoral groove can be recognized in strictly lateral x-rays (crossing sign). The surgical goal in patients with recurrent dislocations due to dysplasia of the patellofemoral groove (trochlea) should therefore be the reconstruction of the patellofemoral groove.

Patients and Methods: From 1990 to 2001 73 Patients - mainly previously operated inefectively - with recurrent patellar dislocation due to dysplasia of the trochlea have been reconstructed by an osteotomy with formation of a new, deepened patellofemoral groove (trochleaplasty). A distally connected osteochondral flake is removed from the distal and ventral part of the dysplastic trochlea and is then refixed after having deepened the osseous groove in a v-shaped manner. Surgical strategy was determined by preoperative X-ray and CT. Postoperative results were verified clinically with additional Visual Analog Scale (VAS) and conventional X-rays. CT-Scan, MRI and arthroscopy were performed in selected patients in the earlier series as well as histologic examinations in three cases.

Results: Preliminary results of our 1 to 10 year follow-up show a marked subjective and objective functional improvement in over 90% of the patients. No relevant cartilage damage due to the surgical technique was found in post MRI and arthroscopy examinations. The longterm success seems to depend highly on the correct diagnosis of a dysplastic patellofemoral groove causing recurrent patellar dislocation and a precise technique of this demanding surgical procedure.

**Poster #267**

**COMPARISON OF ENDOSCOPIC AND 2-INCISSION PCL RECONSTRUCTION USING AUTOGENOUS HAMSTRING TENDONS**

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Shinya Nagasaki, Hakodate, JAPAN
Ryozuke Ishida, Hakodate, JAPAN
Tomoyuki Hashimoto, Hakodate, JAPAN
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Purpose: The purpose of this study is to determine the advantages of our endoscopic technique (a new single running route of the graft) over the conventional two-incision technique in PCL reconstruction.

Surgical technique: The concept of our surgical technique is to minimize the graft angulation at the inner edge of the bone tunnel. The tibial entry point of the guide pin is under the tibia lateral condylar flare approximately 1-2 cm anterior to the posterior cortex. This creates less graft angulation on the posterior aspect of the tibia. A new drill system has been devised to allow antegrade femoral drilling starting from inside the notch. This method also allows better femoral tunnel orientation. As a substitute graft material, we employ autogenous hamstring tendons, and we secure them with an Endobutton and Post-screw.
Materials & Methods: From 1992 to 1995, 43 two-incision PCL reconstructions with autogenous hamstring tendons were performed. And from 1995 to 2001, 90 endoscopic PCL reconstructions with looped autogenous hamstring tendons using an Endobutton were performed. Cases were specified according to the inclusion criteria of this study. As a result, fifty-one patients were included in this study. The two-incision group comprised 22 patients (group I) and the endoscopic reconstruction group comprised 29 patients (group II). The clinical evaluation was performed using the IKDC form. The quadriceps strength was measured using Biodex II. The period for achieving 90 degrees of flexion after surgery was also compared.

Results: There were no significant differences between the two groups tested with respect to the overall IKDC rating score. The mean value of side to side differences of AP total laxity (KT 1000, manual max.) was 3.95mm in group I, 2.38mm in group II (p<0.05). The average period for achieving 90 degrees of flexion after surgery was 16.6 days in group, 12.1 days in group II. Achievement of ROM in group II was significantly shorter. The peak torque of isokinetic contraction in group II was significantly greater than group I at one year after surgery.

Discussion & Conclusion: Better posterior stability and quicker postoperative recovery of ROM and muscle strength were advantages of the endoscopic technique over the two-incision technique in PCL reconstruction.

Poster #268
POSTEROLATERAL KNEE INSTABILITY. SURGICAL TREATMENT AND CLINICAL RESULTS.
Iraklis Ioannis Patsopoulos, Athens, GREECE, Presenter
Andreas Panagiotsis Diamantopoulos, Athens, GREECE
Emmanuel Papadakis, Athens, GREECE
Ioannis Georgilas, Athens, GREECE
Matthios Tzurakis, Athens, GREECE
2nd Orthopaedic Department, Evangelismos General H, Athens, GREECE

Purpose: The aim of this paper is to study the posterolateral knee instability and to evaluate the results of surgical treatment.

Material and method: Between 1995 and 2001, 20 patients were treated, by the same team of doctors. The average age was 29.4 years (range, 20 to 61); 19 males and 1 female. Eight patients suffered from acute injury, while the rest (12) were chronic. In 14 incidents accompanied rupture of PCL was seen, while in 12 cases an ACL rupture was observed. The aim of treating chronic cases, was to make an augmentation of posterolateral structures by using reconstruction techniques and to correct the joint alignment. In acute cases ruptures of posterolateral corner were identified and repaired, or an augmentation of posterolateral corner with autograft (iliotibial, band-popliteus bypass) took place, if it was necessary. Postoperatively the knee was immobilized in plaster for 6 weeks, followed by intensive physiotherapeutic program.

Results: 16 patients (80%) were reexamined. The average follow up period was 34.8 months. The evaluation of the results was performed with IKDC, Lysholm and Tegner score and KT-1000. The average Lysholm-score was 86.3% (range, 57 to 100); IKDC score was A in 3 cases, B in 8, C in 3 and D in 2. Average Tegner-score was before accident 5.87 and in reexamination 4.5. The mean anterior translation on KT-1000 testing was 6.1 mm (20° flexion-89 Newton’s), the mean posterior translation 5.2 mm (70° flexion-89 Newton’s) and the mean differences from the uninjured side was 1.4 mm and 2.6 mm, accordingly. All patients returned to their previous activities in 8 months time.

Conclusion: Posterolateral instability of the knee is a complex injury, mainly treated surgically. Surgical failure leads to great functional disability, not easily treated. That is why rehabilitation must be achieved in terms of tremendous care.

Poster #269
THE TREATMENT OF COMBINED INJURIES OF THE POSTERIOR CRUCIATE AND MEDIAL COLLATERAL LIGAMENT. MCL STABILITY DEPENDS ON PCL STATUS
Seung-Suk Seo, Pusan, SOUTH KOREA, Presenter
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Purpose: There are many reports on the management of combined injuries of the anterior cruciate ligament (ACL) and MCL. Reports on the treatment of combined posterior cruciate ligament(PCL) and MCL injuries are rare. The purpose of this study is to evaluate the results of the treatment of combined PCL and MCL injuries and factors effecting on the MCL stability.

Materials and Methods: we retrospectively studied 10 patients with combined PCL and MCL injuries. The mean age of patients was 33.6 years. The causes of injury were sports trauma in 2 and traffic accidents in 8 cases. 4 PCL were repaired or augmented with autogenous hamstring tendons and 6 PCL were reconstructed. 2 MCL were conservatively treated and 8 MCL were repaired. The results were evaluated with Lysholm score, IKDC form, Telos stress radiograph at mean follow up 3.9 years.

Results: According to Lysholm score 2 were excellant, 2 good, 3 fair, 3 poor. Using the IKDC grade 2 were A, 2 B, 4 C, 2 D. According to stress X-ray the PCL laxity were classified with group 1 (less than 5 mm posterior laxity) and group 2 (more than 6 mm posterior laxity). Group 1 were 4 and group 2 were 6 cases. Group 1 showed mean 1.7 mm valgus laxity and group 2 showed mean 3.2 mm valgus laxity at the stress radiograph.

Conclusions: The results of the treatment of combined PCL and MCL injuries were less satisfactory. MCL stability depended on the PCL status. This study showed that a more sophisticated PCL reconstruction was needed to obtain the secure medial stability.

Poster #270
SUBJECTIVE EVALUATION OF THE MEDICAL TRANSFERT OF THE ANTERIOR TIBIAL TUBerosITY IN OBJECTIVE PATELLAR INSTABILITY
E. Servien, Caluire, FRANCE, Presenter
T. Ait Si Selmi, Lyon, FRANCE
Philippe Negrét, Caluire, FRANCE
Centre Libet, Caluire, FRANCE

Introduction
The aim of this study is to analyse the functional results of recurrent patellar dislocations operated between 1998 and 1999. Objective evaluation is difficult. Rate of recurrent dislocation after surgery is one criteria of assessment. Subjective evaluation seems to be an interesting criteria.

Material and methods
190 knees (140 patients) were included in this study. Mean follow-up was 5 years (2 years - 12 years). Knees subjective evaluation of IKDC was used in post-operative. This evaluation has 18 items for estimate the sport activities level and the functional level of the knee. 118 patients (83%) have answered to the questionnaire.
Results
88 patients (63%) have been reviewed by questionnaire and clinically, and 29 patients (20%) by questionnaire only. 68 patients (58%) were very satisfied and 43 (36%) were satisfied. One patient (0.86%) was disappointed and 5 (4.27%) were dissatisfied. We have evaluated our results for the pain (37.6% of discomfort), the swelling, the clamping, the instability, the daily activities living (68% of discomfort in the kneeling), the sportive level. The mean subjective score was 77.2 (45.9 - 95.4).

Discussion
Some authors (Insall) disagree with the surgical treatment in recurrent patellar dislocation due to the onset of secondary femoro-patellar arthritis. But for us, the surgical treatment is indicated when there was at least one dislocation with morphologic anomalies (trochlear dysplasia, patella alta, TT-TG). We didn’t found patello-femoral arthritis. It’s the patient himself who appreciate the results of surgery and it shows the treatment by tibial tubercle transfer is efficient with good satisfactory score. The quality of results depends on good analysis of patellar pathology and factors of patellar instability (trochlear dysplasia, patella alta, AT-TG value, quadriceps dysplasia, patellar tendon length). Our revision score is not very important because the young age of the series but the other series of litterature are similar.

Conclusion
The surgery of recurrent patellar dislocation gives good results in long range (10 years). The subjective evaluation score IKDC allowed a precise appreciation by the patient. This study is the first that presents a subjective evaluation of the result of medial transfer of the anterior tibial tuberosity in patellar dislocation. Finally, we need to know subjective score in different group of age in a control group. It would make possible to create a ponderation score.

Poster #272
ANATOMICAL ADVANCEMENT OF THE MEDIAL COLLATERAL LIGAMENT COMBINED WITH ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION: SERIES LONG-TERM FOLLOW-UP
Takashi Satojima, Karume, JAPAN, Presenter
Hidetaka Marakami, Karume, JAPAN
Nobuhiko Tanaka, Karume, JAPAN
Kenshi Nagata, Karume, JAPAN
Takanobu Abe, Karume, JAPAN

Poster #273
DOES THE ARTHROSCOPIC RELEASE OF THE EXTERNAL PATELLAR RETINACULA REPRESENT A VALUABLE METHOD IN THE TREATMENT RECURRENT DISLOCATION OF PATELLA?
Cristian Ioan Stoica, Bucharest, ROMANIA, Presenter
Laurentiu Ciprian Nicolae, Bucharest, ROMANIA
Galia Teodor, Bucharest, ROMANIA
Karoloukas Theodoros, Bucharest, ROMANIA
Dina Antonescu, Bucharest, ROMANIA
Foisor Orthopaedic Hospital, Bucharest, ROMANIA

Poster #274
SERIAL EVALUATION OF THE RESTORED STABILITY AFTER POSTERIOR CRUCIATE LIGAMENT RECONSTRUCTION
Atsushi Sugita, Ibaragi, JAPAN, Presenter
Osaka University, Suita, JAPAN
It is generally known that restored stability obtained by posterior cruciate ligament (PCL) reconstruction is inferior to that obtained by anterior cruciate ligament (ACL) reconstruction. As it is important to learn when posterior laxity recurs after operation, this study was conducted to determine when posterior laxity increases after PCL reconstruction.

Results: While all patients showed more than 2+ posterior laxity preoperatively, ten patients showed less than 3 mm laxity throughout the follow up periods, while the remaining eight cases showed more than 3 mm laxity. Seven of the latter eight patients already showed abnormal posterior laxity at 1 month. There were no type B cases. Deep layer. Eight cases were classified as type I by the MRI and surgical exposure verified the disruption of the menisco-femoral ligaments in all cases. One case was a type II injury and the intra-operative findings confirmed the rupture of the menisco-tibial ligament. Two cases were classified as type III. One case had a rupture of the menisco-femoral ligament and the other case involved the disruption of both the menisco-femoral and menisco-tibial ligaments at the time of surgery.

Discussion & Conclusion: This study shows that, in most cases, the MRI accurately reveals disruption of the superficial fibers of the femoral attachment of the MCL, and also those of the deep fibers. On the other-hand, MRI less reliably predicted the status of midsubstance tears in the superficial layer. However, the results in this study support that the presence of diffuse abnormality in the signal intensity within the superficial fibers of the MCL is suggestive of the presence of a large gap between the stumps of the torn MCL. This information could be helpful to surgeons in deciding whether to surgically repair or to conservatively treat MCL injuries.

Poster #276
DELAYED MEDIAL COLLATERAL LIGAMENT RECONSTRUCTION USING LOOPED SEMITENDINOSUS TENDON GRAFT FOR COMBINED ANTERIOR CRUCIATE LIGAMENT/Poster #275
COMPARISON OF THE MAGNETIC RESONANCE IMAGING OF ACUTE GRADE III MEDIAL COLLATERAL LIGAMENT INJURY WITH THE SURGICAL PATHOLOGY
Yasuhito Tagawa, Sakai,Osaka, JAPAN, Presenter
Norimasa Nakamura, Sakai, JAPAN
Tomoki Mitsuoka, Kashiwa, JAPAN
Yoshiki Shiozaki, Sakai ,JAPAN
Masayuki Hamada, Hirakata, JAPAN
Kensuke Shin, Hachinoe, Osaka, JAPAN
Sakai Hospital, Sakai, JAPAN

Introduction: To contrast the preoperative magnetic resonance imaging (MRI) with the surgical pathology of the acute grade III medial collateral ligament (MCL) injury of the knee.

Methods: Eleven consecutive cases with acute grade III MCL injury combined with torn ACL and/or PCL were studied. All cases underwent primary MCL repair in addition to ACL and/or PCL reconstruction. The interval from the injury to the surgery ranged from 5 to 14 days (mean, 8.7 days). Using the MRI (three successive T2-weighted coronal images), MCL injury was classified into three types according to the location of the damaged superficial layer (type A: at the femoral attachment site, type B: at the tibial insertion site type C: diffuse damage of the superficial layer over the whole length) and also into three types by the location of deep layer damage (type I: at the menisco-femoral ligament, type II: at the menisco-tibial ligament, type III: neither type I nor II). Each MRI type was contrasted with the operative pathology of the superficial and deep MCL.

Results: Superficial layer: Four cases were classified as type A by the MRI. As predicted by the MRI, intra-operative observation revealed that the superficial fibers were ruptured or detached at the femoral attachment in all these cases. Seven cases were type C injury. Surgical exposure revealed that the superficial fibers were ruptured in the midsubstance. Both stumps were folded back from each other and there was a big gap between them in all cases. Contrary to the MR imaging which suggested extensive damage over the whole length, the superficial fiber damage was localized to the disruption site. Discussion & Conclusion: This study shows that, in most cases, the MRI accurately reveals disruption of the superficial fibers of the femoral attachment of the MCL, and also those of the deep fibers. On the other-hand, MRI less reliably predicted the status of midsubstance tears in the superficial layer. However, the results in this study support that the presence of diffuse abnormality in the signal intensity within the superficial fibers of the MCL is suggestive of the presence of a large gap between the stumps of the torn MCL. This information could be helpful to surgeons in deciding whether to surgically repair or to conservatively treat MCL injuries.
Poster #277

PATELLA FRACTURES: A NEW CLASSIFICATION SYSTEM FOR POSTOPERATIVE OUTCOME EVALUATION

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Anastasios V Tekis, Anapolli-Ioannina, GREECE, Presenter
Christos Charitos, Ioannina, GREECE
Anastasios V Tokis, Anatoli-Ioannina, GREECE, Presenter
Vasilios Kostopoulos, Ioannina, GREECE

Purpose: To introduce a quantitative classification system for patella fractures.

Material-Methods: One hundred patella fractures had been treated surgically at our institution during a 10 year follow-up period. There were 67 men and 33 women from 15 to 82 years old (average age 43.8 years). Fifty-seven fractures resulted from a fall or from a bumper direct blow; twenty-eight, from a dashboard injury; eleven were involved in a motorcycle accident and direct blow; three, from a forced quadriceps contraction and one large osteochondral fracture due to lateral patella dislocation. Sixteen patients had an associated ipsilateral injury. There were nine open fractures. We classified the patella fractures in 10 patterns according to their radiographic configuration: A1 (transverse), A2 (vertical), B1 (transverse upper pole), B2 (transverse lower pole), C1 (comminuted upper pole), C2 (comminuted lower pole), D1 (fractures with 3 fragments), D2 (fractures with 4 fragments), D3 (comminuted inferior half) and D4 (comminuted). The management was based on the pattern of the injury. The frequencies were: 1. A1+A2 fractures (25%). Most of them were treated with 2 Kirschner wires (KW) and anterior tension band (21 fractures). 2. B1+B2 (16%) were treated with equal proportion, partial excision (6 fractures), fixation via sutures (5 fractures) or using tension band and 2 KW (5 fractures). 3. C1+C2 fractures (19%) were treated with partial excision (5), suturing (3) and tension band combined with 2 KW (5) or with screws (2 fractures). Most variable was the treatment of type D (44%) fractures.

Results: Seventy-two out of the 100 patients were retrospectively evaluated (fifteen could not be contacted, eleven had died) during a mean follow-up period of 68.8 months (5 to 151 months). Postoperative radiographic evaluation showed cortical separation less than 4 mm and step-off less than 3 mm related to the fracture configuration. Patients were graded according to a functional scale which included assessment of: range of motion, pain, limitation of activity, atrophy of thigh, use of assistive devices during walking, swelling, giving-way and stair climbing. Results were scored as excellent: 28-30 points, good: 20-27 and poor: <20 points. The mean postoperative score for type A, B, C, D1, D2, D3, D4 was 28.8, 28.9, 29.4, 28, 27.8, 28.5, 25, 3 respectively.

Discussion: We introduce a new classification system for patella fractures, which is based on preoperative radiographic evaluation. This system can be utilized for the optimal choice of operative technique based on the fracture type as well as for detailed postoperative outcome evaluation.

Poster #278

LIGAMENT REFERENCING TO DETERMINE FEMORAL COMPONENT ROTATION AND EFFECT ON PATELLA TRACKING IN TOTAL KNEE ARTHROPLASTY

Ate Wymenga, Nijmegen, THE NETHERLANDS, Presenter
Wilco Jacobs, Nijmegen, THE NETHERLANDS
Sint Maartenskliniek, Nijmegen, THE NETHERLANDS

Introduction: Internal rotation of the femoral component in total knee arthroplasty can cause patella subluxation or dislocation. Therefore many knee systems are 'bone referenced' and use 3 degrees external rotation for the femoral component. When ligament referenced systems are used, (lamina spreader or tensioner in flexion), the amount of rotation will vary, but is assumed to be within a safe range.

Goal: The goal of this study was to measure the rotation applied to the femoral component with a ligament tensioner in flexion and relate this rotation to patella tracking on axial radiographs.

Methods: Subjects for this study were 47 patients undergoing primary total knee arthroplasty by one surgeon. After the releases in extension, a tensioner (150 N) was used to determine the femoral component rotation. Intraoperatively, the rotation of the posterior bone cut was measured relative to the posterior condylar line. A custom-made goniometer was used. During follow-up, the patella position from the center of the trochlear groove was measured on standardized axial radiographs with the leg relaxed.
Results: Average external rotation of the femoral component with the ligament balancing technique was 2.0 degrees (from 4° internal to 10° external rotation; SD 3°). Ten components were placed in slight internal rotation. Average position of the patella was 1.7 mm lateral (from 9 mm medial to 6 mm lateral, SD 3.2 mm). The correlation between component rotation and patella position was not significant (p=0.47). Two patients needed a lateralization of the tuberosity.

Conclusion: The ligament balancing technique places the femoral component in an average of 2.0 degrees external rotation, with a large inter-individual variation. There was no correlation with patella tracking. Therefore, applying the ligament referencing technique should not lead to patella subluxation or dislocation.

Poster #279
TIGHTENING AND AUGMENTATION OF POSTERIOR CRUCIATE LIGAMENT (USING MODIFIED TIBIAL INLAY TECHNIQUE)

Jung Yong Bok, Seoul, REPUBLIC OF KOREA, Presenter
Jin Soo Kim, Seoul, REPUBLIC OF SOUTH KOREA
Dept of Orthopaedic Surgery, Yong-San Hospital, Seoul, REPUBLIC OF KOREA

Tightening and Augmentation of Posterior Cruciate Ligament - Using modified Tibial Inlay Technique -
Young Bok Jung, M.D., Suk Kee Tae, M.D., Ho Joong Jung, M.D., Jae Sung Lee, M.D., Tae Ho Kim, M.D.
Department of Orthopaedic Surgery, Yong-san Hospital, Chung-Ang University, Seoul, Korea

Purpose: To introduce a new surgical method in chronic PCL injury and to evaluate the outcome of the tightening and augmentation of posterior cruciate ligament (PCL) in chronic PCL deficient knees.

Materials and Methods: Eighteen patients who underwent tightening and augmentation of PCL were evaluated at average 36.7 months (24-49) after operation. Tightening of remnant fiber of PCL by distally transferring tibial bony attachment and augmentation with one among 4 bundles of semitendinosus and gracilis tendons, autologous patellar tendon or allograft tendon were performed through a posterior approach in supine position. The results were assessed by stress radiographs using Telos stress device (Telos stress device; Austin & Associates, Inc., G. Scheuda, MD), maximal manual test with KT-1000 arthrometer (MED metric, USA), IKDC and OAK knee scores before operation and at final follow-up.

Results: Average side to side difference in posterior stress radiographs using Telos stress device improved from 9.9mm (6-20) to 2.2mm (0-8). Average side to side difference in maximal manual test with KT-1000 arthrometer also improved from 6.9mm (5-10) to 1.9mm (0-5). Final IKDC score was A in three patients, B in eleven and C in four, which was C in 9 and D in 9 preoperatively. At last follow-up IKDC score was excellent in 7 patients, good in 10 and fair in 1, which was fair in 7 and poor in 11 preoperatively. Average OAK score improved from 67.5 (42-79) to 87.0 (79-97).

Conclusion: The above results show favorable outcome after tightening and augmentation of PCL without sacrificing the remaining fibers in reconstructive surgery for chronic PCL injury.

Poster #442
OPERATIVE MANAGEMENT OF MULTILIGAMENT INJURIES IN ATHLETES

Matthias Rolf Schurhoff, Coral Gables, FL, USA
Luis A Vargas, Coral Gables, FL, USA, Presenter
John William Uribe, Coral Gables, FL, USA
John E Zvijac, Coral Gables, FL, USA
Keith Sheldon Hechtman, Coral Gables, FL, USA
UHZ Sports Medicine Institute, Coral Gables, Florida, USA

Introduction: The purpose of this study was to evaluate the outcome of surgical treatment of patients who suffered a knee dislocation.

Materials and Methods: 22 patients with sports related injuries were identified over a ten year period. 17 were available for evaluation. The average follow-up was 51.5 months. All patients were male with a mean age of 29.5 years. 12 patients (70%) had concomitant meniscal injury, two (12%) had popliteal artery injury, and three (18%) peroneal nerve injury. The outcome was measured utilizing the IKDC scale, KT-1000 testing, and Biodek isokinetic testing.

Results: All patients rated their knee normal preinjury and severely abnormal after injury and preoperative. At last follow-up, 5 patients rated their knee as normal, 8 nearly normal, 3 abnormal, and 1 severely abnormal. Range of motion was normal in 10 and nearly normal in 7. Stability was normal in 6, nearly normal in 11. Functional level was nearly normal in 12, abnormal in 4, and severely abnormal in 1. KT-1000 testing for anterior instability found no patients with greater than 3 mm difference, and 3 patients with 4 mm side to side difference posteriorly. Biodek testing for extension deficits was 17.4% for peak torque, and 16.8% for total work. For flexion the peak torque was -6.8%, and the total work -7.1%. There were 5 complications which included arthrofibrosis, cellulitis, heterotopic ossification, posterior laxity, and loose body formation.

Discussion: Early surgical intervention, with repair or reconstruction of all involved structures, followed by a rehabilitation program can yield good to excellent results in the majority of cases.

Poster #453
ARTHROSCOPIC REPAIR OF MEDIAL RETINACULAR RUPTURES ASSOCIATED WITH ACUTE PATELLA DISLOCATIONS: REPORT OF A NEW TECHNIQUE

Lauren E Redler, Trumbull, CT, USA
Michael R. Redler, Trumbull, CT, USA, Presenter
Steven P Fries, Trumbull, CT, USA
The Orthopaedic and Sports Medicine Center, Trumbull, CT, USA

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 where 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: Three patients with acute patella dislocations presented to our sports medicine clinic within hours of their dislocation. None of the patients 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 both 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 both 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 retinaculum over a cannula to create a mattress suture configuration. 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 multiple short-term referred in literature.

Poster #280

Knee - Muscle/Tendon/Bone

Poster #281

INFRA PATELLAR TENDONITIS IN PROFESSIONAL VOLLEYBALL PLAYER

Alvaro Chamecki, Curitiba, BRAZIL, Presenter
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The extensor mechanism of the knee lesions are extremely common in sports with repetitive jumping, like volleyball, basketball and athletics. There are few study analyzing the predictive factors, as well as how to prevent them. With this objective we analyzed 64 knees, 32 in high-level professional players (National volleyball team) and 32 recreational athletes (control group). There were analyzed by magnetic Ressonance Imaging, the width, thickness, length and height of the infra patellar tendon, and presence or not of inflammatory signs. We concluded that:

Poster #281

INFRA PATELLAR TENDONITIS IN PROFESSIONAL VOLLEYBALL PLAYER
a - The professional athletes tendon length was bigger than the control group. (p<0.05)
b - The relation p:as (articular facet/extra articular) was significant bigger in the athletes group than the control group.

Poster #282
HIGH TIBIAL OSTEOTOMY AND ALTERATION OF THE TIBIAL SLOPE
Erik Holmman, Rackhampton, AUSTRALIA, Presenter
Andreas B Imhoff, Munich, GERMANY
Department of Orthopaedic Sportsmedicine, Munich, GERMANY

Introduction: High tibial osteotomies are commonly performed for varus/valgus malalignment of the knee. In the past we have been well aware of correcting the coronal plane but did not consider the sagittal plane when planning our osteotomies. Altering the sagittal plane might have an impact on the in situ forces of the cruciate ligaments and influence the stability of the knee. The purpose of this study was to investigate the amount of alteration of the tibial slope by closed wedge osteotomy.

Material/Methods: The study was conducted retrospective. From 1/01 to 9/01 we reviewed all Xrays of patients that underwent a high tibial osteotomy or were admitted for removal of hardware. A total of 80 patients were operated. 67 patients could be followed up. There were 41 males with an average age of 36.6 years (17-67) and 26 females aged on average 39.4 years (19-62).

Results: The slope of the preoperative Xrays was measured 6.1 degrees (0-12). The frontal plane was changed by a mean of 7.93 degrees. A closed wedge osteotomy decreased the slope by a mean of 4.88 degrees. Alteration of the coronal plane by six degrees decreased the slope by 4.92 degrees, eight degrees by 7 degrees, ten degrees by 4.75 and twelve degrees by 6.5 degrees. Discussion: A closed wedge osteotomy decreases the tibial slope. This causes an anterior shift in the starting position of the tibia potentially decreasing in situ forces acting on the ACL. There was no correlation between the correction of the coronal plane and alteration of the sagittal plane.

Poster #283
TRANSIENT OSTEOPOROSIS OF THE KNEE. DIAGNOSIS AND AETIOLOGY
Makoto Kawaakubo, Ichikawa-shi, JAPAN, Presenter
Takehiro Koyanagi, Ichikawa, JAPAN
Masanori Takahasi, Ichikawa, JAPAN
Tatsuo Kabashiri, Nishitokyo city, JAPAN
Kyoosuke Fuchikawa, Tokorozawa, JAPAN
Tokyo Dental College Ichikawa General Hospital, Ichikawa, JAPAN

PURPOSE: To represent nine cases of transient osteoporosis of the knee.

MATERIALS AND METHODS: Nine patients (Three women and six men) aged 35-84 years with debilitating knee pain were examined. All patients underwent physical examination, clinical testing, radiography, scintigraphy, and magnetic resonance (MR) imaging. Two patients underwent biopsy.

RESULTS: All patients had conventional radiographs that were rather normal or showed nonspecific osteopenia. Eight patients had bone scansgrams that showed focal increased radionuclide uptake in the region of the painful joints. In each case, MR imaging of the affected joint showed regional decreased signal intensity of the bone marrow on T1-weighted images and increased signal intensity on T2-weighted images. This MR imaging pattern has known as bone marrow edema (BME) pattern. Biopsy results showed that bone marrow edema without any ischemic necrosis. The symptoms resolved spontaneously in all cases within four months. The nine patients were followed up for 12-36 months, and one case had relapsed in the opposite knee, which took on the regional migratory osteoporosis. DISCUSSION AND CONCLUSION: Transient osteoporosis typically occurs in middle-aged men or in women in the third trimester of pregnancy, especially observed in the hip joint. However, there are few definite reports about the transient osteoporosis of the knee. The BME pattern on MR images is useful for diagnosis of the transient osteoporosis of the knee. In other words, familiarity with the distinct features of transient osteoporosis on MR imaging is extremely important in the differential diagnosis in the patients with knee pain.

Poster #284
THE HISTOLOGICAL PATHOLOGY OF CHRONIC TENDON LESIONS
John B King, London, UNITED KINGDOM, Presenter
Sports Medicine at the Royal London Hospital and Q, London, UK

The chronic tendon lesion remains confusing as evidenced by the variety of names used to describe the condition. This paper describes the consistent histological change seen in the tendon in which the term tendonosis has been applied on clinical grounds.

Method
The histological data of tendons explored within the last 18 months are presented. Over this period 30 tendon lesions in active athletes have been explored by the author. All have had extensive non surgical treatment including exclusion of metabolic lesions, stretching and physiotherapeutic modalities, orthotic correction and where appropriate, injection. All have had scanning by MRI, CT or Ultrasound. Although the site of the lesion varies the surgical technique has been consistent, namely stripping of the paratenon and excision of the central core lesion. The tendons involved have been the patella tendon, the achilles tendon and the tibialis posterior.

RESULTS
All specimens were reviewed in the Professorial Department of a Teaching Hospital. The invariable finding was neovascularisation. In addition there was variable myxoid degeneration, cleft formation and calcific deposition. In no specimen was there an inflammatory cell response. Where the paratenon had been sent to the lab there were inflammatory cells.

Conclusion
The lesion within the tendon of an athlete is not inflammatory. Under light microscopy it shows degeneration with repair. The clinical result which is not the thrust of this paper showed a return to previous activity in 26 of these patients within the study window. The mechanism whereby surgical manipulation of this lesion is effective needs to be reviewed. It is a justifiable hypothesis that the major surgical insult simply starts a new genuine inflammatory process which may be the effect of eccentric muscle exercises (proven in muscle but not tendon) or needling.

Poster #285
TREATMENT OF CHRONIC PATELLAR DISLOCATION WITH A MODIFIED ELMSLIE-TRILLAT PROCEDURE

5.120
• The FDA has not cleared the drug and/or medical device for the use described in this presentation (i.e., the drug or medical device is being discussed for an "off-label" use)
The paper describe a modification of Elmslie Trillat procedure that usually is performed in severe cases of habitual or recurrent patellar instability.

MATERIAL AND METHODS
18 knees (7 men and 8 women) treated for recurrent or habitual patellar dislocation evaluated clinically and radiographically at mean follow-up of 5 years (range 24 months- 9 years). The mean age at the follow-up was 26.3 years (range 17-44 years). IKDC and the Kujala’s score, were used for clinical evaluation. At preoperative X ray all cases had patella “alta” (mean ratio 1.49). Nine cases showed severely abnormal congruence angle with a mean value of + 35° (min +8° max +54°) while 9 cases presented a dislocated patella. Mean preoperative sulcus angle was 141° (min 134° max 160°) and trochlea Bump [18] was in 5 cases grade III and in 13 cases grade II. Anteroposterior, lateral and Merchant views for X-ray control

SURGICAL TECHNIQUE
When patella is still unstable during dynamic evaluation after execution of Elmslie Trillat procedure the medial third of the patellar tendon is isolated and harvested with corresponding of 1 cm length and 0.5 cm bone plug maintaining its insertion to the inferior medial side of the patella. This ligament is medialized and put in tension, trying to found a medial insertion that usually is performed in severe cases of habitual or recurrent patellar instability. The technique described try to achieve a dynamic stability of the patella through the all range of motion in severe patellar instability. The stability must be obtained with motion and in most cases were able to perform strenous activities. The paper describe a modification of Elmslie Trillat procedure that usually is performed in severe cases of habitual or recurrent patellar instability.

RESULTS
IKDC showed 11 knees A (normal) 4 knees B (most normal) 2 knees C (abnormal) and 1 knee D (severely abnormal). Kujala score, showed excellent results in 16 knees, 1 fair and bad knee respectively. The bad case presented at X-ray an overcorrection of congruence angle. At follow-up X rays, the congruence angle had a mean value of -6° (min -13° max +4°). The mean Insall Salvati ratio at follow up was 1.19

DISCUSSION
The technique described try to achieve a dynamic stability of the patella through the all range of motion in severe patellar instability where Elmslie Trillat procedure is insufficient. No recurrence of patellar instability has been observed. Kujala and IKDC score have shown 88% of satisfactory results with only two cases of minor discomfort. All patient regained full range of motion and in most cases were able to perform strenous activity with no discomfort. The stability must be obtained with dynamic control in the first degrees of flexion trying to avoid an excessive patellar medialization.

Poster #286
ILEOTIBIAL BAND SYNDROME IN TRIATHLETES
Sergio Migliorini, Cameri, ITALY, Presenter
Marco Merlo, Basto Aviro, ITALY
Italian Triathlon Federation - Medical Committee, Rome, ITALY

Ileotibial band syndrome (ITBS) is an overuse injury caused by repetitive friction of the ileotibial band and underlying bursa across the lateral femoral epicondyle. Once considered an injury indigenous to runners, ITBS is also the most frequent injury in triathletes. The purpose of this study is to identify ITBS as a significant problem in triathletes and to propose both operative and non operative measures for treating triathletes. The development of ITBS is usually caused by a combination of factors as training errors, anatomic factors, biomechanics of running, sport shoes and training surfaces; in triathlon we have to consider also the combination of the anatomical variants of the lower extremity with improper cycle fit. For example, varus knee or external rotation of greater than 20°, place a significant stretch on distal ITB when riding with internally rotated cleats. In fact, abnormal lateral knee stress is most often the result of incorrect cleat pedal alignments. In triathlon the transition cycling-running with the change from concentric muscular contractions of cycling to eccentric contraction of running, and from unloaded cycling fase to the load state of running, is an extremely delicate phase in which the kinematics are required to regain neuromuscular efficiency and elasticity indispensable for proper running style. In this phase the inability to dissipate the load forces of the locomotor apparatus by the lower limbs can favour the transmission of stress to the knee. Consequently the triathletes (particularly those that have sporting backgrounds in swimming) normally tend to have very little strength in the hip abductor (gluteus medius) and the triathletes fatigued after cycling fraction, are prone to increased thigh adduction and internal rotation at midstance, leading to an increased varus vector at the knee. This situation increases tension on the ITB, making it more prone to impingement on the lateral epicondyle of the femur, especially during foot contact, when maximal deceleration absorbs ground reaction forces. Furthermore the triathletes that have sporting backgrounds in cycling tend to be too tight in hip flexors and tensor fascia lata and ileotibial band.

Clinical examination included a knee examination, assessment of lower extremity alignment, evaluation of biomechanics of running and of triathletes on their bicycles. All the athletes were examined with magnetic resonance to confirm the diagnosis. Treatment measures consist of training modifications, bicycle adjustments, stretching of TFL and ITB, strengthening of gluteus medius, rest or decreasing training distance, shoes changes, physiotherapy and deep tissue massages. Indication for cortisone injections was considered for those triathletes not responding to initial therapy. Surgery is indicated only after extensive nonoperative measures have failed to relieve symptoms. The surgical release excision of ITB was performed under local anaesthesia and was preceded in some case by an arthroscopic evaluation of the knee joint to rule out possible causes of their symptoms. Triathletes underwent surgical release in the last 5 years excision of ITB where 15 among a group of 200 triathletes with ITBS and they return to preoperative sport levels in two months.
Purpose:
One of the popular treatments for anterior cruciate ligament injuries is reconstruction using the semitendinosus and gracilis (ST/G) tendon graft. However, many studies have suggested that the initial bonding strength between a graft and bone surface is insufficient for preventing graft motion within the bone tunnel. We developed a novel apparatus to coat calcium phosphate (Ca-P) on/in living-tendon to augment initial bonding strength. The purposes of this study were to evaluate the efficacy of our novel apparatus and to quantitatively and histologically access deposit on/in human ST/G tendon graft.

Materials and methods:
Twenty-five sets of fresh frozen human ST/G tendons were used for this study. A 6cm-long quadrupled-strand ST/G graft was prepared. The tibial end was secured using the Krackow technique with No. 2 non-absorbable sutures. The Endobutton-CL (Smith & Nephew, USA) was passed through the looped femoral end. Central one third of the graft, as an intra-articular (IA) portion, was covered with sleeve of a rubber glove. Each end of the sheet was secured with a tie gun to prevent Ca-P deposit on/in the IA portion of the graft. After these procedures, graft was treated through the alternate soaking method using the custom made automatic Ca-P coating apparatus. The alternate soaking method was reported by Taguchi et al. in 1999. The cycle of the alternate soaking is consisted of four steps. First, the graft was soaked in CaCl2 (200mM)/Tris-HCl (pH 7.4). Then it was washed with saline solution. After washing the graft, it was soaked in Na2HPO4 + NaH2PO4 (128.7 mM, pH 7.4). Then it was washed with saline solution again. Three different sets of soaking time and cycle were applied. In group A, the graft was soaked with each solution in 30 seconds and went through twenty cycles. In group B, one-minute of soaking time and fifteen cycles was applied. In group C, soaking time was three minutes and cycle was five times. Total time for coating Ca-P on/in the tendon was timed in each group. The tibial end (TE), central one third (IA), and the femoral end (FE) of the graft were transversely sectioned. Inorganic material in the each portion of the graft was analyzed using a thermogravimetric analysis. Histological evaluation of the specimen was performed using von Kossa staining. Statistical analysis was performed using analysis of variance, followed by Fisher's PLSD test as a post-hoc test.

Results:
Inorganic material contained in femoral end in the group A and B were significantly larger than that in the group C. In the tibial end, there was significantly greater amount of inorganic material deposited in the group A and B, when comparing to that in the group C. However, there was no statistical difference in intra-articular portion among three groups. Ca-P deposit in tibial end was statistically greater than that in femoral end in all groups. Histological analysis showed von Kossa staining from the surface area though 250 ?m inside of the graft. However, inorganic material was not stained with von Kossa staining in the group C. When using our novel automatic coating apparatus (ESCOM Corp, Tokyo), total working time was reduced from 90 to 45 minutes in group C, respectively.

Discussion:
Ca-P coating on/in the graft has capability of increasing the initial strength in bone-graft interface. Clinical setting, total time for coating procedure should be short enough to prevent patients' mobidity. Our novel apparatus was able to reduce the total working time. In our previous study, more soaking cycle made greater deposition in the graft when the soaking time was the same. In this study, we altered combinations of soaking time and cycle to seek the appropriate setting for clinical application. Although Ca-P depositions in group A and B were greater than that in group C, it took more time for coating the graft when compared with that in group C. Further study will be needed to find the appropriate amount of Ca-P deposit on/in the graft to increase the initial strength in the bone-graft interface. Another concerning, regarding Ca-P deposition in the intra-articular portion of the graft may cause joint inflammation. Our data showed that covering the intra-articular part with the rubber sheet had the effect on preventing Ca-P deposition. The greater amount of Ca-P deposit in the tibial end was occurred because suture holes increased the total contact area with the solution.

Poster #288
PLICA SYNDROME AFTER THE INJURY OF THE RECTUS FEMORIS MUSCLE – A CASE REPORT

Toshiro Otani, Shinjuku-ku, JAPAN, Presenter
Hideo Matsumoto, Tokyo, JAPAN
Yasunori Sada, Tokyo, JAPAN
Takahsi Toyoda, Tokyo, JAPAN
Taku Yatabe, Tokyo, JAPAN
Shinnichi Maeno, Tokyo, JAPAN
Department of Orthopaedic Surgery, Keio University, Shinjuku, JAPAN

This is the report of a case of the plica syndrome after the injury of the rectus femoris muscle.

Case: A 20-year-old male was involved in a motorcycle accident in May 1999, and suffered from the incomplete rupture of the right rectus femoris muscle. After the conservative treatment for four months, he complained medial para-patellar pain on motion when he returned to work. He came to our department on January 2000, complaining recurrent pain with tenderness on the just medial area of the right patella, particularly when he suddenly stand up from chair. There was a dele on the rectus femoris muscle, but there was no loss of quadriceps muscle power. We diagnosed as a plica syndrome combined with the partial rupture of the rectus femoris muscle, and performed arthroscopy (AS). AS findings and procedure: We confirmed the impingement of the large plica during knee flexion and extension, without using saline, and resected it under AS procedure.

Results: The pain disappeared immediately after the surgery. He returned to the work a month after the procedure.

Discussion: We evaluate this case as a plica syndrome after the incomplete rupture of the rectus femoris muscle. Although this patient did not have any loss of muscle power in the knee extensor mechanisms, subsequent dysfunction of the articularis genu muscles and/or imbalance between quadriceps and hamstring muscles might be caused the impingement of the plica. This case also suggests that the plica itself is not the cause of the plica syndrome.

Poster #289
ORIGINAL TECHNIQUE FOR THE TREATMENT OF LIGAMENT RELATED GENU RECURVATUM. PRELIMINARY RESULTS.

Philippe Piriou, Garches, FRANCE, Presenter
Thierry Lulet, Paris, FRANCE
Hopital Raymon PoincarÈ, Garches, FRANCE

The authors report an original technique for the treatment of the genu recurvatum of ligamentous origin.
Therapeutic modalities for genu recurvatum are complex and vary specifically for each type of etiology. Moreover, the operations that are designed to correct posterior capsuloligamentous laxity in the knee by exclusively non-osseous procedures, are frequently subjected to secondary distension or, conversely, to limitation of knee extension by excessive tightness. The authors propose a technique of tightening the posterior capsule without altering its integrity as would section followed by suturing. The technique, which consists in rolling the bony insertions of the posterior capsule, is described along with preliminary results in 11 patients.

**Poster #290**

THE RELATIONSHIPS BETWEEN TORQUE OF THE KNEE EXTENSORS AND FLEXORS AND LIMPING GAIT

Kenji Sato, Funabashi, JAPAN, Presenter
Koichi Wakiyama, Funabashi, JAPAN
Akiko Tsuchiya, Ichikawa, JAPAN
Kouji Michinaga, Funabashi, JAPAN
Hidenori Shiratsuchi, Funabashi, JAPAN
Funabashi Orthopedics, Funabashi, JAPAN

**Purpose:** Limping gait for knee disorder has a great influence on an everyday life and return to sports. Patients who had knee disorder were divided into limping group and non-limping group. We examined the point for a limping improvement through analyzing knee extensors and flexors torque.

**Method:** Gait Training System (Biodex Medical Systems, USA) was used to measure the time of stance phase. It was defined, in this study, that 10% or more differences between right and left is limping group, and less than 10% differences is non-limping group. Furthermore, as for the non-limping group, it was decided that the deficit of peak torque about the knee extensors or flexors is 30% or more. 63 patients who had knee disorder were divided into the limping group (26 patients) and the non- limping group (37 patients). The patients of both groups performed isokinetic muscle strength test at 60 deg/sec using Biodex System 3 Isokinetic Dynamometer (Biodex Medical Systems, U.S.A) to both groups. We examined 4 items: 1) peak torque/weight 2) total work/weight 3) deficit of peak torque 4) torque after starting 0.2 seconds, and compared both groups.

**Results:** Significant reductions in the knee flexors for the limping group were found in the results 1, 2, and 4, and no significant difference was found between the limping and the non- limping groups in the knee extensors.

**Conclusion:** The knee flexors start contracting from the later half of the swing phase to the first half of the stance phase in a gait cycle, and produce the maximum contraction immediately after heel contact. At this time, momentary muscle strength of the knee flexors is needed for the stability of the knee joint. It is considered that the function of the hamstrings responsibility is reduced in the limping group because the results indicated reductions of peak torque, total work, and torque after 0.2 seconds in the knee flexors. It is important to consider the reactant contraction function of the knee flexors as well as the function of the knee extensors in the improvement of limping gait.
EVALUATION OF THE PATELLAR TENDON BY MAGNETIC RESONANCE IMAGING(MRI)
Marilo Cesar Santos, Curitiba Parana, BRAZIL
Edison Schwansee Thiele, Curitiba, BRAZIL
Alvaro Chamecki, Curitiba, BRAZIL
Emerson K. Zanoni, Curitiba, BRAZIL
Henrique Carvalho, Curitiba, BRAZIL
Clinica do Joelho, Curitiba, BRAZIL

The patellar tendinitis is a pathology that affects sports players that require sudden knee extension or repetitive straining of the patellar tendon. These activities include runners, but mainly sports that require jumping, like volleyball, basketball among others.

The diagnosis of infrapatellar tendinitis is typical, but the radiologic criteria are not so good. The width, length, thickness and extra articular surface of the patella in randomized 1300 MRI, with the objective of having normative data to analyze the structures involved in patellar tendinitis.

Knee - Other

Poster #294
ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION USING A NEW FEMORAL FIXATION DEVICE. 1 YEAR EXPERIENCE
Hennig Laprell, Kiel, GERMANY
Ralph Wischatta, Kiel, GERMANY, Presenter
V. Stein

Purpose: To assess the one year functional results after ACL reconstruction using a new femoral fixation device.

Material and Methods: 92 patients (64 men, 28 women) with an average age of 31.8 years (16-58) underwent ACL reconstruction between November 1999 and October 2000. 62 patients were reconstructed using the central 1/3 of the BPTB (group I). 30 patients were reconstructed using the 4-strand Hamstrings (group II) both in arthroscopic transtibial technique. All ACL grafts from both groups were fixed at the femoral site with a new, fully absorbable crosspin device (Mitek Corp ). Tibial fixation was performed with fully absorbable interference screws in group I and with a hybrid fixation with additional staples in group II. Postoperative rehab programme was the same in both groups with full weightbearing and CPM, careful physiotherapy with muscle strengthening exercises. Sports like jogging, swimming and biking were allowed as part of the rehabilitation 6 weeks after surgery. Return to strenuous sports was allowed 9 months postoperatively. 4 months after surgery 42 patients had a MRI of their operated knee to assess the situation of the graft and the biological degradation of the crosstabs. At an average of 16 months after surgery (min. 12, max. 23) 48 patients came to our hospital for a standard clinical and subjective assessment. For clinical evaluation we used the Tegner activity scale, the Lysholm score and the IKDC subjective score. Objective assessment included side-to-side laxity testing with the Rolimeter™ (Aircast corp. Europe)

Results: According to the MR Images no pin-breakage or slippage was noted. No cystic formations around the pins were observed 4 months after surgery. According to the Lysholm score patients had moved from an average of 98.55 points preinjury to 52.58 preoperatively and increased to 83.01 points one year postoperatively. According to the IKDC score we saw an improvement by two categories in 16 cases, by 1 category in 25 cases and no change in 7 cases between preop and 1 year postoperatively. In the side-to-side laxity testing we observed a slightly higher difference in the hamstring group 1.55 mm compared to the BPTB group with 1.15 mm. No patient showed a side to side laxity difference bigger than 3mm in both groups. However this had no influence on the functional outcome according to the Tegner activity scale and the IKDC subjective questionnaire.

Conclusion: We found the rigid-fix™ crosspin femoral fixation device to be an easy to handle tool for ACL graft fixation with no intraoperative complications. The results are comparable to other fixation techniques. Further investigations and studies will be necessary to show the long term fate of the pins and the grafts.

Knee/Cartilage/Meniscus

Poster #295
MICROFRACTURE TECHNIQUE IN THE TREATMENT OF OSTEONECROSIS
Isik Karli Akgun, Istanbul, TURKEY, Presenter
Hayrettin Kesmezacar, Istanbul, TURKEY
Taihir Ogu, Istanbul, TURKEY
Alper Kebudi, Istanbul, TURKEY
Kaya Kanberoglu, Istanbul, TURKEY
University of Istanbul, Cerrahpasa Faculty of Medi, Istanbul, TURKEY

OBJECTIVE: Our objective was to evaluate the results of arthroscopic subchondral bone plate microfracture technique performed to the patients with osteonecrosis in the knee joint due to a variety of etiology including inflammatory diseases, vasculitis, steroid therapy, trauma and idiopathic.

PATIENTS AND METHODS: 28 patients with various degrees of chondral defects in the knee joint underwent arthroscopic subchondral bone plate microfracture technique between 1997-2000. Ten of these (Group 1) were with inflammatory disease association including systemic lupus erythematosus, vasculitis, inflammatory arthritis or had received steroid therapy in the past for several reasons. The mean age of the group was 28 (range 20-34) and the distribution of sex was 4 male and 6 female.

Group 2 included 18 patients who had idiopathic osteonecrosis or osteonecrosis due to the trauma, osteoarthritis. The mean age was 47 (range 16 - 67). Grade IV chondral lesions were located in the medial femoral condyle in 5 (50%) patients in group 1 and in 17 (94%) in group 2. The remaining lesions were in the lateral femoral condyle. In three knee of the group 1, the lesions were larger than 400 mm² and the average defect size was 350 mm². The second group had 180 mm² average lesion size. Multiple perforations were placed 3 to 4 mm apart and 4 mm deep into the subchondral bone to obtain the revascularization. Early passive and active range of motion exercise was begun at the day of procedure but weight bearing was protected for 6 weeks. For 2 cases in group 2 anterior cruciate ligament reconstruction was performed using bone-patellar tendon-bone graft due to the chronic instability.

RESULTS AND DISCUSSION: The patients of the two groups were evaluated clinically and radiologically. The chondral defects with inflammatory disorders or with previous steroid therapy for the chronic disease were larger. The average scores of group 1 showed significant improvement and satisfaction of patient after surgery (Preoperative and follow-up average Lysholm scores were 39 and 80 respectively with mean follow-up of 34 months). This group included young patients with
chronic disorders and the preoperative functional status according to the ICRS Subjective Rating System was grade IV in all cases. After microfracture technique performed that is not indicated classically in such a patient group, we observed the improvement of the function level: grade I in one case, grade II in 7 and grade III in 2. These results showed that the microfracture could be simple and cost-effective procedure in osteonecrosis secondary to such chronic diseases to gain time for arthroplasty. Regarding the group 2 eight patients (44%) rated their knee as feeling normal and 9 (50%) stated better than before the microfracture. No improvement was seen in one case that had spontaneous osteonecrosis 1 month after arthroscopic partial meniscectomy. An increase of the average Lysholm scores from 57.8 to 89 was detected. Sixty six percent of patients could partake in strenuous sports with no or minimal limitation. Functional status of this group according to the ICRS Subjective Rating System was grade III or IV in 16 (89%) cases before treatment. This rate was 6% at follow-up. For the posttraumatic lesion, the time between the injury and the surgery was seen important prognostic factor in outcome. In our series three patients who were treated by microfracture within 12 weeks of injury had excellent results with Lysholm score 100 all three. The control MRI of the cases revealed the continuity of normal cartilage with the fibrous-hyaline cartilage of the treated areas. However an increase of the size of osteonecrosis in the subchondral bone was detected in 20% of the large lesions.

CONCLUSIONS: Microfracture technique, being safe and less demanding for the treatment of full thickness chondral defects, may be an alternative of the replacement surgery in young patients with large lesions. Clinical results, even in cases with associated inflammatory or chronic disease, were positive and encouraging.

Poster #296
•PRE-EMPTIVE ANALGESIC EFFECT OF INTRARTICULAR TENOXICAM AFTER ARTHROSCOPIC KNEE SURGERY
Devrim Aksel, Izmir, TURKEY, Presenter
I. Ozkan Akinci, Istanbul, TURKEY
Umit Altman, Manisa, TURKEY
Celal Bayar University, School of Medicine, Dept., Manisa, TURKEY

Purpose: Postoperative, intraarticular injections of non-steroidal antiinflammatory (NSAI) drugs have been documented to be effective in pain relief after day-case arthroscopy. Preemptive analgesia using intraarticular pubivacaine and morphone have also resulted in lower pain scores. The effectiveness of preoperative intraarticular NSAID drug injections have not been studied previously. The purpose of this study was to investigate the analgesic effect of administering intraarticular tenoxicam preoperatively.

Materials and Methods: A prospective randomized study was conducted in 30 patients undergoing arthroscopic partial meniscectomy in Sirt Military Hospital. All the patients were male whose ages ranged between 20 to 26 years (av 21 ±0.268). The patients received a standard general anesthetic and were operated by the same surgeon (D.A.). 20 mg tenoxicam in 20 ml normal saline was administered into the knee joint preoperatively in group A (n=10), and postoperatively in group B (n=10). Patients in group C (n=10) were received 20 ml of intraarticular saline postoperatively. Verbal rating and visual analogue pain scores (at rest, on active knee flexion and on passive knee flexion) were recorded for the next 48 hours. Total analgesic requirements and the time for first analgesic requirement were measured. Mann-Whitney U and Wilcoxon-T tests were used for statistical analysis.

Results: There were no statistically significant differences between the groups in age, body-weight, operation time and tourniquet time. Pain scores were significantly lower in group A than in group B at 1 and 2 hours, than in group C at 1, 2 and 4 hours postoperatively, at rest (p<0.05). Lower pain scores were obtained in Group A compared to group B during active and passive knee flexion at 2 and 3 hours; and compared to group C at 1, 2, 3, and 4 hours postoperatively (p<0.05). Significantly more analgesics were required in significantly more patients within the first six hours of arthroscopy in groups B and C than in group A (p<0.05).

Conclusion: Preoperative intraarticular administration of tenoxicam provides better pain relief and less analgesic use than its postoperative administration in active male patients. Pain is also regressed during the active and passive movements of the knee with the pre-emptive use of intraarticular tenoxicam.

Poster #297
DESCRIPTION OF A NEW MENISCUS TEST AND ITS COMPARISON WITH THE MCMURRAY’S TEST AND JOINT LINE TENDERNESS
Devrim Aksel, Izmir, TURKEY, Presenter
Ozal Ozcan, Izmir, TURKEY
Hakan Boya, Izmir, TURKEY
Halit Pinar, Yncityl, TURKEY
Celal Bayar and Dokuz Eylul Universities, Manisa-Izmir, TURKEY

Purpose: Clinical diagnosis of meniscal tears may be difficult even for the experienced knee surgeon. Most of the meniscus tests are performed with the patient supine and non-weight-bearing, whereas most of the symptoms of a torn meniscus occur during weight-bearing activities. The purpose of this study is to describe a new meniscus test performed under weight-bearing conditions; and then to compare its diagnostic value with the two commonly used meniscus tests.

Materials and Methods: A prospective study was undertaken on 150 consecutive patients (110 male, 40 female) whose ages ranged between 17 and 73 years (av 35.7 years). All the patients had had symptoms related to an intraarticular knee pathology, and 89 of them had had a history of trauma. Minimum six weeks of conservative treatment including non-steroidal antiinflammatory drugs, rest and physical therapy had failed in all of the patients, and the average Lysholm score was 65.9%±15.01 (range 25 to 98). After a detailed history, physical examination and standard x-ray evaluation, patients underwent arthroscopy. The arthroscopic findings were accepted as the gold standard and final diagnoses were correlated to the results of meniscus tests. To detect a meniscal tear, McMurray’s test, joint line tenderness and the new test, that is the weight-bearing McMurray’s test (Ege’s test-Ridvan Ege M.D.) were performed. In Ege’s test, the patient squats while both lower extremities are in internal and then in external rotation. Interpretation of the test is the same as the McMurray’s test. The diagnostic values of the three tests were calculated and compared.

Results: A meniscus tear was found in 127 of the 150 patients. Medial and lateral meniscal tears were found in 90 and 28 patients, respectively, and nine had tears of both menisci. Additionally, an ACL tear was found in 32, patellar chondromalasia in 17, suprapatellar plica in 9, tibiofemoral arthrosis in 22, generalized synovitis in 2 and loose body in 2 patients. Accuracy of JLT was 71% for medial meniscus tears. The sensitivity was 88% and the specificity was 44%. McMurray’s test was accurate in 66%, sensitive in 67% and specific in 69% for medial
Conclusion: Any of the tests used in the study were predictive for the diagnosis of a meniscus tear. The newly described test seems to be more specific and more accurate than the others in determining both medial and lateral meniscal tears. According to our results, we believe that the new test reflects the symptoms of a torn meniscus more accurately than the tests performed with the patient supine, because of it is performed in a functional position. As the patient performs the test by himself, misinterpretations depending on the experience of the examiner are eliminated with the new test.

Poster #298
THE MENISCAL “PSEUDOCYST”
Saqib Amin, Sharjah, UNITED ARAB EMIRATES, Presenter

ABSTRACT: 30 patients requiring knee surgery underwent detailed preoperative assessment. All had clinical sign of a lump on the joint line when the knee was examined at 45 degree of flexion, which has been thought to indicate meniscal cyst. Of these 30 patients 14 had a meniscal cyst. The remaining 16 had a meniscal tear without a cyst. In these 16 cases, the clinical sign of a lump protruding from the joint line was termed a “pseudocyst”. This new clinical sign is important because of its frequency of occurrence and the complete correlation with meniscal tears requiring surgical intervention.

METHOD & MATERIAL: 30 patients were operated for meniscal cyst over a period of one year. All these patients had pain in a small area on the joint line, usually worse at night and radiating up and down the ipsilateral aspect of the leg. There was a palpable or visible swelling on the joint line on examination of the all patients. At operation out of 30 patients 14 had cyst, in remaining 16 there was swelling which was termed “pseudocyst”.

RESULT: The meniscal pseudocyst was defined as a lump protruding on the lateral joint line, tender in palpation, and varies in prominence on flexion of knee and appeared prominent at 45 degree of flexion and disappears at 90 degree of flexion and full extension. Patients with pseudocyst usually complain of pain in lateral joint line, radiating of pain on the thigh and distally into the lower leg. All these 16 patients with the pseudocyst sign, 11 were male and 5 females with an average age of 30. Pseudocyst occurred on the lateral aspect of the joint in 16 patients and 4 patient on the medial aspect of the leg. All the 16 patient gave the history of trauma to knee. At the time of operation all the 16 patients with pseudocyst were found to have tear of the meniscus warranting partial meniscectomy. The majority of tear were cleavage type (87%) the remaining 13% were classic buckle handle tear.

DISCUSSION: There are number of possible explanations for the appearance of joint-line pseudocysts associated with torn menisci, particularly in the lateral compartment of the knee. It appears evident that the tibiofemoral contact area changes at about 45 degree of flexion, causing tension of the thickened portion of the meniscus and thus increasing the prominence of the joint-line swelling around this point. Clinical examination of the knee joint should routinely include inspection, palpation with side-to-side comparison of the medial and lateral jointlines. This should be performed with the knee in varying degrees of flexion, particularly 45 degree short of full extension. The pseudocyst sign elicited in this manner is of considerable clinical importance because of the frequency of its occurrence and complete correlation with meniscal tears requiring surgical intervention.

Poster #299
BONE SPECT IMAGING FOR DIFFERENTIAL DIAGNOSIS OF ATRAUMATIC MEDIAL JOINT SPACE KNEE PAIN.
Ron Ariel, Tel Aviv, ISRAEL, Presenter
Tali Becker, Tel Aviv, ISRAEL
Moshe Yaniv, Ramat Gan, ISRAEL
Einat Ezen-Sapir, Tel Aviv, ISRAEL
Tel Aviv Sourasky Medical Center, Tel Aviv, ISRAEL

Introduction
Chronic pain in the medial aspect of the knee without any history of trauma is a common complaint in the adult population. In most cases X-Rays will be normal. Plane bone scan may reveal increase uptake in the medial joint space. The main problem is diagnostic, to differentiate the patients suffering from curable meniscal tears from those with osteoarthritis. MRI is an excellent diagnostic tool, but is expensive and sometimes unavailable. According to our experience, SPECT bone scintigraphy is a reliable and accessible diagnostic tool for diagnosis of degenerative meniscal tears and allows the pre selection of the patients that will be treated successfully arthroscopically.

Material and Methods:
Forty patients above 45 years old with pain in the medial joint space of their knee, without history of trauma were evaluated. All underwent SPECT bone scintigraphy followed by Arthroscopy. Twenty-eight patients were included in the final statistical analysis. The other fourteen patients were eventually excluded because only printed results of their SPECT were available and not our interpretation of the exam. (Although their results showed the same trend as the other group).

Results:
Sixteen patients showed typical crescent-like increase uptake on SPECT and classified as “sure” diagnosis of a meniscal tear, all had a treatable meniscal tear proved by arthroscopy. Five patients were diagnosed by SPECT as “suspected” to have meniscal tear and only three patients had a meniscal tear. Seven patients were suspected to have pathologies other than meniscal tears on SPECT like osteoarthritis or synovitis and these findings were also confirmed by arthroscopy.

Conclusions:
In our opinion, SPECT bone scintigraphy is a good diagnostic tool for differential diagnosis of degenerative meniscal tear from early osteoarthritis, especially when there is typical crescent-like increase uptake. These enable us to select the exclusive group of patients who will benefit from arthroscopy and avoid unnecessary surgery in the others. We recommend the use of SPECT instead of plane bone scan as a routine in evaluation of chronic atraumatic medial joint space knee pain.

Poster #300
VASCULAR ENDOTHELIAL GROWTH FACTOR EXPRESSION AFTER BUCKET HANDLE MENISCUS TEARS IN RELATION TO THE SITE OF THE LESION IN A RABBIT MODEL
Roland Becker, Magdeburg, GERMANY, Presenter
INTRODUCTION: Only 20% of the meniscus periphery shows vascularisation which might explain the poor healing response of meniscus lesions (1). The formation of capillaries from pre-existing vessels (angiogenesis) is essential for tissue repair. Angiogenesis is controlled by a variety of mitogenic and chemotactic peptides, that act on invading endothelial and smooth muscle cells. One of the most important angiogenic factor is the vascular endothelial growth factor (VEGF)(2). The purpose of the study was to find out, whether the expression of VEGF is influenced by the site of the meniscus lesion.

MATERIAL & METHODS: A bucket handle lesion was created either at the vascular periphery or the avascular inner zone of the medial meniscus using forty New Zealand White Rabbits. The rabbits were sacrificed either after one, two, five or ten weeks. Immunohisto-chemistry, enzyme-linked immunosorbent assay (ELISA) and reverse transcription-polymerase chain reaction (RT-PCR) was performed for qualitative and quantitative analysis of VEGF expression. The contralateral medial meniscus of each animal served as the control.

RESULTS: No healing was noticed of lesions at the inner zone after ten weeks. Four of the five lesions at the periphery were healed after five weeks and all lesions were healed after ten weeks. VEGF mRNA and protein was detected in all specimens regardless of the site of the lesion and in the control group. VEGF expression was noticed in endothelial cells, but also in peripheral fibroblastic cells and fibrochondrocytes of both intact menisci and menisci with lesions. Significantly higher VEGF-expression was found in specimens with meniscus lesions in comparison to the contralateral side up to ten weeks (p<0.05). After seven days the highest VEGF-expression occurred at the inner zone of 1537±129pg/ml, which was twice as high in comparison to the periphery (727.2±129.2pg/ml; p<0.001). Similar VEGF-expression was noticed after two weeks between the inner zone and the periphery of 709,4±343,4pg/ml and 600±78pg/ml respectively. VEGF expression declined at both the inner zone and the periphery after five and ten weeks. Immunostaining for the VEGF receptors VEGFR-1 and VEGFR-2 was positive in all operated animals but not in the unoperated ones. Immunostaining for VEGFR-1 was restricted to vascular endothelial cells of capillaries. In larger vessels such as arterioles or venuoles smooth muscle cells of the vessel wall were also VEGFR-1 positive. The staining pattern of VEGFR-2 was similar but single fibrochondrocytes and some of the fibroblastic cells of the peripheral reparative tissue labeled positive for the VEGFR-2 too.

DISCUSSION: This study has shown that protein and mRNA of the vascular endothelial growth factor (VEGF) is expressed during meniscus healing. Specimens with lesions at the avascular region showed initially significantly higher VEGF-protein concentration in comparison to lesion at the vascular periphery of the meniscus. One of the reason for higher VEGF-protein concentration at the avascular region of the meniscus tissue might be caused due to hypoxia. Despite high VEGF concentration, lesions in the avascular inner zone failed to heal. VEGF seems to be involved in meniscus healing only at the periphery, providing an environment which allows successful healing of a tear. The effect of other angiogenetic or antiangiogenetic factors during meniscus healing remains unclear and should be investigated in further studies.

and replaced during the operation, because either the knot or both threads couldn’t be pushed tight or because of misplace-
ment of the Fast-Fix. No other complications occurred.

d. Conclusion: Meniscus repair with the Fast-Fix is a time sav-
ing and efficient fixation method. The all-inside technique
reduces operating time, avoids cartilage damage and reduces
the risk of serious neurovascular injuries and infection.

Poster #303
• ARTHROSCOPIC AUTOLOGOUS CHONDROCYTE
IMPLANTATION FOR THE TREATMENT OF A CHONDRAL
DEFECT IN THE TIBIAL PLATEAU. A CASE REPORT
Paolo Bulgheroni, Varese, ITALY, Presenter
Mario Ronga, Varese, ITALY
Federico A. Grassi, Varese, ITALY
Paolo Cherubino, Varese, ITALY
Institute of Orthopaedics and Traumatology. Univer, Varese, ITALY

INTRODUCTION. An evolution of the traditional autologous
chondrocyte implantation (ACI) technique is represented by
the matrix-induced autologous chondrocyte implantation
(MACI®). This method requires seeding of autologous chon-
drocytes on a type I-III collagen membrane, which is
implanted in the chondral defect using exclusively fibrin glue.
The authors report the arthroscopic MACI® technique, which
was adopted for the treatment of a chondral defect in the pos-
terior part of the lateral tibial plateau.

SURGICAL TECHNIQUE. The chondral defect was studied pre-
operatively by MRI (FSE Fat-Sat T2, GE T2) and accurately
defined during arthroscopic harvesting of chondrocytes. The
patient was a 25-year old man presenting a deep chondral
lesion (2.5 mm x 10 mm in size) at the posterior portion of the
lateral tibial plate of the left knee. A pneumatic tourniquet was
placed on the proximal thigh and a 30° oblique arthroscope
was inserted through the standard anteromedial portal.
Operative instruments were inserted through the anterolateral
portal, in which a 7.0 mm arthroscopic cannula was placed.
After debridement with curettes and shaver (full radius blade
5.5 mm), haemostasis was carried out using an arcomioplasty
electrode. The chondral defect was sized with a measuring rod
and the dimensions transferred onto the seeded collagen mem-
brane, which was subsequently cut reproducing the shape of
the lesion. The membrane was folded and inserted into the
joint using atraumatic arthroscopic forces. Saline solution
flow was stopped and fibrin glue was injected through a Tuohy
needle (17 G), inserted previously under the middle third of the
lateral meniscus, in order to reach the chondral defect.
Pressure on the membrane was applied with the probe in order
to achieve optimal contact with the underlying bone. Saline
solution flow was restored and stability of the implant was
checked with repeated flexion/extension movements of the
knee.

RESULTS. No complications were observed in the postopera-
tive period. At 6 months, the ICRS score was normal from pre-
operative severely abnormal; modified Cincinnati knee score
was 7/10 points from preoperative 4/10 points. The implant was
evaluated by MRI at 3 and 6 months postoperatively. At 3
months the graft filled the chondral defect and its signal was
hyperintense in T2-weighted fat-suppressed and gradient echo
scans. Subchondral bone showed reduction of the edema that
was observed preoperatively. At 6 months, subchondral edema
was further reduced and the thickness of the implant appeared
increased with restoration of a regular articular surface.

DISCUSSION. In the ACI technique the need of suturing the
peristeal flap to the margin of the chondral lesion did not allow
to carry out the procedure arthroscopically. The use of fib-
rin glue for fixing the seeded membrane has permitted to per-
form the procedure arthroscopically in a simple and safe way. In
the reported case, no specifically designed instruments were
used and the posterior portion of the lateral tibial plate was
approached according to a standard arthroscopic procedure.
Even though the MACI® technique is mostly performed with an
open procedure, the site of this lesion could not be reached
without sacrificing tendinous and ligamentous structures of the
knee, and even in this case the sight and operating space could
not compare with an arthroscopic approach. There are several
procedure that can be performed arthroscopically for treating
cartilage lesions, but the size of this defect was too large for
bone marrow stimulation techniques and/or osteochondral
grafts to be successful. Consequently, the arthroscopic MACI®
technique appeared the best solution for this patient.

Poster #304
• TREATMENT OF DEEP ARTICULAR CARTILAGE
DEFECTS OF KNEE AND ANKLE WITH MATRIX-INDUCED
AUTOLOGOUS IMPLANTATION (MACI®): EARLY RESULTS
Paolo Cherubino, Varese, ITALY
Federico A. Grassi, Varese, ITALY
Paolo Bulgheroni, Varese, ITALY, Presenter
Mario Ronga, Varese, ITALY
Institute of Orthopaedics and Traumatology. Univer, Varese, ITALY

INTRODUCTION. Since 1999 the MACI® (Matrix-induced
Autologous Chondrocyte Implantation) technique have been
used for the treatment of deep articular cartilage defects at the
authors’ institution. This method requires seeding of autolo-
gous chondrocytes on a type I-II collagen membrane, after
their arthroscopic harvesting from the knee and subsequent in
vitro expansion of the cellular population using autologous
serum. The seeded membrane is implanted in the chondral
defect using exclusively fibrin glue, through a limited exposure
joint approach.

MATERIALS AND METHODS. Membrane structure and its cel-
ular population were investigated by light microscopy,
immunohistochemistry, SEM, and electrophoresis (SDS PAGE
7%) before implantation. There was evidence of chondroblasts
and type II collagen inside the seeded membrane. The MACI®
technique was used for the treatment of 24 patients (17 males
and 7 females), with an average age of 35 years (range, 17 to 52
years). As isolated lesions, the sites of the defects were the fol-
lowing: 11 medial femoral condyle, 3 lateral femoral condyle, 1
femoral trochlea, 1 patella, 2 lateral tibial plate, 3 talar dome.
As combined lesions, there were 1 medial femoral condyle +
patella, 1 lateral tibial plate + patella, 1 kissing lesion in the
ankle. The average size of the defects was 3.5 cm² (range, 2 to
4.5 cm²). The treatment of 2 chondral defects in the lateral tibi-
al plate was performed arthroscopically. MRIs (FSE FAT SAT T2,
GE T2, SE T1) were taken before the operation as well as at 6,
12 and 24 months post-operatively.

RESULTS. The average follow-up was 11.1 months (range, 3 to
25 months). No complications were observed in the postopera-
tive period. Among the eighteen patients with a minimum fol-
low-up of 6 months (15 knees, 3 ankles), 17 showed an
improvement in the clinical and functional status after the
operation while the patient with a kissing lesion of the ankle
did not improve from his preoperative status. At the latest fol-
low-up, the ICRS score was normal in all the knees; modified
Cincinnati knee score averaged 8.25/10 points (range, 7-10)
from preoperative 3.2/10 points (range, 2-4); Lysholm II and

The FDA has not cleared the drug and/or medical device for the use described in this presentation (i.e., the drug or medical device is being discussed for an "off-label" use)
COLLAGEN MENISCUUS IMPLANT (CMI): EARLY RESULTS AND HISTOLOGICAL ANALYSIS OF THE IMPLANT

INTRODUCTION
Collagen meniscus implant (CMI) is a tissue engineering technique for the management of irreparable meniscal lesions. This method requires a collagen scaffold, derived from the bovine Achilles tendon, which is shaped like the human menisci and enriched with GAG in order to enhance cellular ingrowth, thus leading to gradual regeneration of meniscal tissue. Aims of this study were to assess the early clinical results achieved on 20 patients treated with CMI, and evaluate the evolution of the implant by MRI imaging and histological analysis.

MATERIALS AND METHODS
Twenty patients (16 male, 4 female), affected by irreparable meniscal lesions, were arthroscopically treated with CMI at the authors’ Institution since March 2001. The average age at the time of surgery was 37.6 years (range, 22 to 53 years). The main indication for CMI was represented by primary meniscal lesions (16 cases), while 4 patients underwent the operation for persistent pain after a previous meniscectomy. The average size of the lesion/defect was 3.8 cm (range, 2 to 4.6 cm). An inside-out technique was adopted in 10 patients, and an all-inside technique in 10 patients. Additional procedures included 6 ACL reconstruction, 1 high tibial osteotomy and 1 matrix-induced autologous chondrocyte implantation (MACI®). The clinical-functional assessment was performed according to the Lysholm II and Tegner activity scales. All the knees were evaluated by X-rays examination and CT-scan or MRI preoperatively. Patients with a longer follow up were studied by MRI (GE and FSE. Fat suppressed T2W scans) at 6 and 12 months post-op. A biopsy of the implant was performed in occasion of a second arthroscopic look in two patients, respectively 5 and 7 months after surgery. The specimens, as well as the scaffold before implantation, were studied by light microscopy (LM), TEM, SEM and EDAX microanalysis.

RESULTS
Follow up averaged 5.4 months (range, 2 to 12 months). Postoperative complications included 2 cases of neuropraxia (1 saphenus, 1 infrapatellar) after inside-out sutures: in one patient symptoms subsided spontaneously, while in the second one surgical neurolysis was required. All the patients with a minimum follow up of 3 months showed an increase in the clinical scores with respect to the preoperative status. A non homogeneous signal of the scaffold was observed at MRI after 6 months, while a more uniform aspect was evident at 12 months. In the two second looks, a 10% bulk reduction of the implant was noted; the newly formed menisci appeared healed to the parameniscus and to the residual meniscal stumps. Good consistency and stability was detected by probing. Histological and ultrastructural analysis of the scaffold showed a parallel arrangement of collagen fibers connected by thinner fibrils (LM, TEM). Orthogonal views at SEM demonstrated at the surface a dense collagen barrier, which prevents cellular ingrowth, and in the frontal sections a porous meshwork allowing cellular migration. Microscopic observations on the two implant biopsies were similar. Hyalin tissue infiltrated by cells and vessels, surrounded by the scaffold fibers, was evident at LM. Chondroblast-like cells, with newly synthesised collagen fibers, were observed inside the porous meshwork of the scaffold at SEM. Vitality and activity of these cells, as well as the new matrix organization, were clearly shown by TEM. At EDAX microanalysis no calcifications were detected inside the specimens. Statistical analysis of the collagen fibers diameters indicates a trend to lower values in the biopsies, as would be expected in human connective tissue.

CONCLUSIONS
According to this study, clinical results with CMI are promising. Pain relief cannot be attributed exclusively to the concomitant meniscectomy, since satisfactory outcomes were also achieved in symptomatic knees for previous meniscectomies. Follow up is too short for drawing conclusions, but morphologic observations indicate that the scaffold is progressively infiltrated and remodeled by cells reconstituting a meniscal tissue.
studied. Group 1 patients (n=20) received postoperative injection of 10cc intraarticular bupivacaine 0.25%. Group 2 patients (n=20) received 60 mgr of intraarticular Ketorocac. Group 3 patients (n=20) received intraarticular morphine, 1 mg diluted in 10 cc saline. Group 4 patients (n=20) received only 10 cc saline and were considered the control group. Several parameters were evaluated, including the postoperative analgesic effect (period measured from the end of the surgery until further analgesia was demanded), the level of postoperative pain as calculated with the visual analog scale (VAS) 1, 2, 3, 12 and 24 hours after, and need for supplemental pain medication (during the first 24 hours following the surgical procedure).

Results: No statistical differences were appreciated in demographic data between groups. Patients treated with intraarticular ketorolac got better analgesic effect that was statistical significant in postoperative analgesic effect (p=0.02), and after 24 hours (p=0.007). No complications were found related to the intraarticular treatment. Conclusions: a dose of 60 mgr of intraarticular ketorolac has better analgesic effect than bupivacaine or morphine.

Poster #307
REPRODUCIBILITY AND RELIABILITY OF THE OUTERBRIDGE CLASSIFICATION
Michelle Cameron, Cheyenne, WY, USA, Presenter
Karen K Briggs, Vail, CO, USA
J. Richard Steadman, Vail, CO, USA
Steadman Hawkins Sports Medicine Foundation, Vail, CO, USA

The purpose of this study was to determine the accuracy, reliability, and reproducibility of the Outerbridge classification system. Six cadavaric knees underwent diagnostic arthroscopy. Following knee arthroscopy, an arthrotomy was performed. Arthroscopically identified lesions were measured using calipers. Nine individual orthopaedic surgeons (4 attendings and 5 sports medicine fellows) reviewed each video and graded each chondral lesion 2 separate times. The accuracy of all observers was calculated based upon the percent of agreement between arthroscopy and the arthrotomy “gold standard”. The overall accuracy was 68%. The accuracy rate by lesion graded ranged from 22-100% with lower grade lesions being diagnosed with less accuracy than higher-grade lesions. For those observations that did not agree with the gold standard, the observer graded the lesion higher than the standard 63% of the time and lower than the standard 37% of the time. The accuracy rate was highest for patella and trochlear groove lesions and least accurate for lateral tibial plateau lesions. The kappa score between the arthroscopy grade and arthroscopy grade was calculated. The kappa coefficient between the two scores was 0.602 indicating excellent agreement. The inter-observer kappa coefficient was 0.80, indicating excellent agreement. The intra-observer kappa coefficient was 0.52, indicating good agreement. The mean inter-observer kappa between the 2 physicians in practice less than 5 years and fellows was 0.72, compared to a kappa of 0.50 for the inter-observer reliability between the physicians in practice less than 5 years and fellows. In this study, we found good agreement between the grades of cartilage lesions at arthrotomy and arthroscopy based on the Outerbridge classification. Arthroscopy grades tended to be more severe than arthrotomy grades. When the grade did not agree with what was seen at arthrotomy, arthroscopy was more likely to assign a higher grade to the lesion. Inter-observer and intra-observer reliability and reproducibility was good to excellent.

Poster #308
DIAGNOSTIC CORRELATION BETWEEN MAGNETIC RESONANCE IMAGING WITH ARTHROSCOPY IN THE INTRA-ARTICULAR LESION OF THE KNEE.
Alvaro Chamecki, Curitiba, BRAZIL, Presenter
Henrique Carvalho, Curitiba, BRAZIL
Edison Schwanzser Thiele, Curitiba, BRAZIL
Marilo Cesar Santos, Curitiba Parana, BRAZIL
Emerson K. Zanoni, Curitiba, BRAZIL
Clinica do Joelho, Curitiba, BRAZIL

The objective of this study is to evaluate the role of Magnetic Resonance Imaging (MRI) in the diagnosis of intra articular lesions of the knee. 312 patients, who had an MRI and posteriorly an arthroscopy, have their chart analyzed by the authors. The results regarding sensitivity, specificity and accuracy were as follows:

- 89%, 72% and 81% for medial meniscus
- 64%, 88% and 92% for lateral meniscus
- 90%, 93% and 92% for anterior cruciate ligament.

The authors concluded that the MRI is an adequate exam for the diagnosis of meniscus and ligament lesions of the knee, and is the exam we choose when the clinical exam is inconclusive.

Poster #309
TREATMENT OF FOCAL ARTICULAR CARTILAGE LESIONS OF THE KNEE WITH AUTOGENOUS OSTEOCHONDRAL GRAFT: A 2 TO 4 YEAR FOLLOW-UP STUDY
Ching-Jen Ion Wang, Kaoshiung Hsien, TAIWAN, Presenter
Chang Giang Memorial Hospital at Kaoshiung, Kaoshiung Hsien, TAIWAN

A retrospective study of 15 patients with 16 knees undergoing osteochondral autografts for focal full thickness articular cartilage defects of the knee with 2- to 4-year follow-up showed 80% good or excellent clinical results. There was no correlation of the clinical results with the underlying diagnoses including osteonecrosis, osteochondritis dessicans and traumatic cartilage defect; or the size of the lesion smaller than 600 mm². However, cartilage lesions larger than 600 mm² were associated with increasing fibrous tissue formation and fissuring between the grafts and the host tissues and poor results. The improvement in symptoms appeared time dependant ranging from 6 to 16 weeks that postoperative protection of the graft is warranted. There was no radiographic progression of degenerative changes of the knee in medium term follow-up. Therefore, autogenous osteochondral graft is considered a good method in the treatment of knees with moderate size articular cartilage defects.

Poster #310
PROSPECTIVE RANDOMIZED STUDY ON UNICOMPARTMENTAL K
Norberto Confalonieri, Serago, ITALY, Presenter
Kuous Motavalli, Milan, ITALY
Pietro Cerea, Milan, ITALY
Presidio Centro Ortopedico Traumatologico (CTO), Milan, ITALY

INTRODUCTION
It is now a fact that unicompartmental knee replacement is not merely “half a total knee arthroplasty”, rather it is a separate world, characterised by a specific and well-established conservative philosophy. “Mini-incision”; “minimally invasive technique”; sophisticated instruments that guide the insertion of the components; computer-assisted navigation and “one day surgery” are increasingly heard of. And even the strongest
opponents have now included unicompartmental arthroplasty among the treatment options for the arthritic knees.

**MATERIALS AND METHOD**

Between 1996 and 1997 at the Orthopaedics Department of the Milan Trauma Center, a series of consecutive patients were assigned randomly to two groups receiving two different unicompartmental knee designs. 20 patients (Group A) were implanted knees with a fixed plateau (Allegretto, Sulzer) and 20 (Group B) with mobile bearings. The implant used for Group B was the AMC knee (Gleitlanger, G.) - which is similar to the Oxford meniscal knee (Biomet) - because of the wider range of sizes available both for the femur and the tibia. The mean follow-up was 4 yrs; patients’ mean age was 70 yrs.; the knee undergoing surgery was mainly the left knee and the medial compartment was the only compartment involved.

**DISCUSSION**

Considering the short follow-up, no definitive conclusions can be drawn about polyethylene wear or loosening of the components. However, the results achieved show that unicompartmental knees are a valid option to treat compartmental osteoarthritis and deformities. The scores assigned to the various parameters were in general much higher than the patients’ overall final score as patients were classified according to the parameter that had recorded the worst score. Nonetheless, 90% of excellent and good results were achieved in both groups using the GIUM Score Card which is much stricter than the one used to evaluate TKA patients. No total failures were recorded, despite one revision case, which testifies that this technique is more forgiving and associated with low morbidity, few complications, early and full function recovery and absence of somatoagnosia which is sometimes observed in TKA patients. No statistically significant differences were observed between the two groups, though mobile bearings knees required more extensive femoral and tibial bone resection. To the best of the authors’ knowledge, this is the only study of this kind ever published.

**Poster #311**

**MENISCUS ALLOGRAFT TRANSPLANTATION: AN EXPERIMENTAL STUDY IN RABBITS.**

Ricardo Paula Cury, Sao Paulo, BRAZIL, Presenter
Nilson R. Severino, Sao Paulo-SP, BRAZIL
Osmar Pedro Camargo, Sao Paulo, BRAZIL
Tatsuo Aihara, Sao Paulo, BRAZIL
Victor Marques Oliveira, Sao Paulo, BRAZIL
Santa Casa Medical School, Sao Paulo, BRAZIL

This experimental study was designed to evaluate the feasibility of frozen meniscus allograft transplantations in rabbits. The studied population consisted of twelve rabbits who underwent a unilateral medial meniscectomy. The material was frozen at -80°C for 30 days and then re-implanted into a different rabbit. Sixty days after re-implantation the meniscus was removed for gross and microscopic analysis. Results were compared to the opposite untouched knee (control group). Ten of the transplanted menisci presented complete healing and 2 only partial healing of the area peripheral to the synovial membrane. The gross size and aspect of the meniscus were the same as those of the control group in 8 specimens. The 2 menisci with partial healing presented morphological changes, another meniscus was smaller than its control, and a fourth meniscus was torn at the medial third. Histology showed collagenous fibers displayed in a random pattern and two types of cells, fibroblasts and fibrochondrocytes. These findings were typical of the remodeling that takes place in the meniscus 3 or 4 months after transplantation. There were no histological findings suggesting rejection of the graft.

**Poster #312**

**ARTHROSCOPIC FINDINGS IN SPORT AND NON-SPORT INJURIES IN YOUNG PATIENTS OF THE GENERAL POPULATION**

Georgios Drosos, Athens, GREECE, Presenter
J Louis Pozo, Bath, UNITED KINGDOM
Vlachonikolis, Heraklion, GREECE
Royal United Hospital, Bath, UK

**Aim**

The aim of this study was to analyse the arthroscopic findings following a significant soft tissue knee injury in the general population, and to evaluate the influence of Cause of injury, Gender and Age upon Meniscal tear, ACL tears and Combined Meniscal and ACL tears.

**Patients and methods**

215 patients (of a group of 1025 patients arthroscoped) with no history of previous knee injury or surgery, no history of arthritis, and normal X-rays who had undergone arthroscopy by the same surgeon were studied.

**Statistical analysis**

The data was analysed by an independent bio-statistitian using Pearson’s chi square test or Fisher’s Exact test and unconditional logistic regression analysis.

**Results**

Sports related injuries (group 1) occurred in 62.8% and Non-sporting injuries (group 2) occurred in 37.2% of total patients. Patients in group 1 were younger than patients in group 2 (p<0.001). More men than women underwent arthroscopy in both groups. Patients in group 1 had greater likelihood than patients in group 2 to have suffered: an ACL tear, a combined meniscal and ACL tear, or a lateral meniscal tear. Women had lower incidence than men to have sustained: a meniscal tear, a combined meniscal and ACL tear.

**Conclusion**

In the general population:

- a more patients underwent arthroscopy after a sporting than after a non-sporting injury
- men had a higher representation than women in both groups
- the cause of injury was predictive for an ACL and combined meniscal and ACL tears as well as the meniscus involved
- in both sporting and non-sporting injuries women had lower incidence and hence lower risk of sustaining a meniscal or a combined meniscal and ACL tear.

**Poster #313**

**ARTHROSCOPIC PARTIAL MENISCECTOMY FOR DEGENERATIVE TEAR OF THE MEDIAL MENISCUS IN PATIENTS OVER 50 YEARS - 10 YEAR FOLLOW UP**

Alex Finsterbusch, Jerusalem, ISRAEL, Presenter
Joseph Lowe, Jerusalem, ISRAEL
Gershon Chaimsky, Jerusalem, ISRAEL
Gideon Mann, Givat Shaul, ISRAEL
Hadassah, Jerusalem, ISRAEL

During the years 1989-1991, 105 patients ages 50-82 underwent a variety of arthroscopic procedures. 65 of the 105 were found to have a degenerative tear, mostly of the posterior horn of the medial meniscus; seven had additional damage to the lateral meniscus; two patients had a solitary tear of the lateral menis-
cus. Typical history was sudden pain, with or without swelling or effusion in the knee, following squatting or a sudden change in knee position, like standing from the sitting position on a low sofa. 36 patients had previous knee pain on effort, related to osteoarthritic changes. Evaluation of patients following arthroscopic meniscectomy and occasional joint debridement was based on PAIN, FUNCTION and TIME (duration of the relief after surgery): 1 = worse than before arthroscopy; 2 = same as before arthroscopy; 3 = better, but worse than pre-exacerbation stage; 4 = same as pre-exacerbation; 5 = better than pre-exacerbation condition; 6 = no pain, almost normal function. Results were calculated by pain score multiplied by function score and time (in years). Score of 40-60 points = failure; 61-120 points = fair result; 121-220 = good result; 221-330 = very good result; above 330 = excellent. Only 39 patients were found for evaluation ten years after surgery. Results were as follows. 9 scored excellent; 17 scored good and very good; 10 scored fair (short term improvement); 3 failed (deteriorated within a year after surgery); 2 patients from the “fair” and “failed” groups (each) underwent knee replacement. Good results were directly correlated to articular cartilage condition at time of surgery, but patients’ condition improved for a limited period even in advanced stages of osteoarthritis.

Poster #314
ETIOLOGY OF POST-MENISCECTOMY OSTEONECROSIS
Hiroshi Higuchi, Maebashi-shi, JAPAN, Presenter
Masashi Kimura, Maebashi, JAPAN
Yasuakazu Kubayashi, Maebashi, JAPAN
Masanori Terachi, Maebashi, JAPAN
Kenji Shiokura, Maebashi-shi, JAPAN
Kentaro Tokuma, Maebashi, JAPAN
Kenji Takagishi, Maebashi-shi, JAPAN
Department of Orthopaedic Surgery, Gunma Univer., Maebashi-shi, JAPAN

Purpose: In the past decade, a number of authors reported that juxta-articular bone marrow signal changes on magnetic resonance imaging (MRI) following arthroscopic meniscectomy meant postmeniscectomy osteonecrosis. However, since bone marrow changes in those studies were only evident on MRI without histological confirmation, we need to take care in drawing conclusions regarding real osteonecrosis with clinical features. The purpose of this study was to investigate an etiology of signal changes on MRI following meniscectomy.

Materials and Methods: We experienced 48 patients with juxta-articular bone marrow signal changes on MRI after arthroscopic meniscectomy. Conservative therapy was chosen for these patients; however, clinical symptoms and radiographic changes were deteriorated with time in eight patients. These eight patients had not only clinical but also radiological osteonecrotic features. Of these eight, six patients (mean age, 64.3) were performed a surgical treatment for osteonecrotic lesions. At the surgery, every six patients were applied both arthroscopic and pathological examination to investigate an etiology of bone marrow signal changes on MRI.

Results: Three cases of articular cartilage fibrillation, one case of segmentation and two cases of cartilage defect on the lesion were detected from MRI. Articular cartilage damages were correlated with radiological grade for osteonecrosis. Histological study confirmed that subchondral bone fracture on the lesion of bone marrow signal changes was recognized in all cases. However, osteonecrotic lesion was detected only in three cases pathologically. These three patients were accompanied with deteriorated radiological grade for osteonecrosis.

Conclusion: Our data suggested that postmeniscectomy osteonecrosis would be caused by the result of subchondral bone fracture after arthroscopic meniscectomy.

Poster #315
MENISCAL REPAIR WITH BIOABSORBABLE DEVICES
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Ari E. Pressman, Ottawa, CANADA
Don H. Johnson, Ottawa, CANADA, Presenter
The Ottawa Hospital, Ottawa, CANADA

Intro: Meniscal knee pathology is a common cause of morbidity in the active adult population. In the past, such injuries were managed by resection until it became evident that this resulted in premature knee osteoarthritis. In order to facilitate preservation of meniscal tissue, biodegradable fixation implants have recently been introduced. However, the impact on clinical and functional outcome of these devices remains to be clarified. The goals of this study were to determine: 1) the impact of biodegradable meniscal implants on meniscal repair rates at the time of ACL reconstruction, and 2) the clinical outcome of the meniscal fixation technique.

Methods: Of 2101 consecutive patients treated for ACL reconstruction over a ten-year period (1990-99), 251 had a concomitant meniscal repair. Patient charts were reviewed to determine annual meniscal repair rates and repair techniques for the period described. Functional outcome was then determined with the aid of the Cincinnati Knee Questionnaire, Lysholm, and Tegner functional activity questionnaires. Scores were then compared as a function of the repair technique chosen (sutures vs bioabsorbable vs hybrids).

Results: The annual meniscal repair rate for the period 1990-95 increased from 9.2 ± 1.6% to 20.8 ± 0.6% after the introduction of biodegradable implants (1996-99). Failed repairs were noted in 27 of 109 suture repairs, 2 of 17 hybrid repairs and 1 of 25 with bioabsorbable devices. There were no complications in the patients who received a repair with bioabsorbable devices, and none required repeat surgery.

Discussion: The introduction of bioabsorbable implants has stimulated an increase in annual meniscal repair rates. With the judicious selection of meniscal tears appropriate for fixation with bioabsorbable devices, a change in failure or functional outcome was not seen.

Conclusion: Bioabsorbable meniscal fixation devices are a safe and viable alternative to conventional suture repair.

Poster #316
A STUDY ON DISCOID LATERAL MENISCI IN JAPANESE CADAVER KNEES
Yuki Kato, Tokyo, JAPAN, Presenter
Midori Oskuda, Tokyo, JAPAN
Akiyoshi Saito, Tokyo, JAPAN
Kazumasa Fukushima, Tokyo, JAPAN
Toshinori Yoshimatsu, Tokyo, JAPAN
Keinosuke Rya, Tokyo, JAPAN
Shin Aizawa, Tokyo, JAPAN
Dept. of Orthop. Surg., Nihon Univ. School of Med., Tokyo, JAPAN

Purpose: The purpose of this study was to determine the accurate incidence rate of the discoid lateral menisci and the relationship between the shape of the lateral meniscus and its influence on causing a tear by observing the knees of Japanese cadavers.
Method: Observations were made on anatomical materials dissected at Nihon University by its medical students and the authors from 1991 to 2002. 276 cadavers (145 male, 131 female) were dissected. The mean age of the cadavers was 77.41 ± 11.29 (ranging from 43 to 103). The investigation of 275 cadavers (542 knees) was made according to their age and gender and the shape and the tear of their lateral menisci. According to Ikeuchi’s classification, the lateral menisci of our cadaver's dissections were classified into three different types (Normal type, N; Incomplete discoid type, ICD; Complete discoid type, CD).

Results: Lateral menisci from 542 knees were classified as follows; 350 N menisci (64.6%), 193 ICD menisci (28.2%), 14 CD menisci (2.58%). The rest (25 menisci) was not clear because their lateral menisci have either disappeared or priorly been removed. There were 266 cadavers who had bilateral knees. There were 161 who had bilateral normal menisci. There were 14 who each had a N meniscus and an ICD meniscus. There were 65 who had bilateral ICD menisci. There were 5 who each had an ICD and a CD meniscus. There were 4 who had bilateral CD menisci. Lateral meniscal tears were seen in 12% of N, 27.4% of ICD and 14.3% of CD. Evidently, an ICD meniscus significantly led to tears (p<0.05).

Conclusion: Complete discoid menisci were more scarce in this study than in previous reports about Japanese people. This paper shows that the rate of complete discoid menisci in this study than in previous reports about Japanese people. This study also showed the relationship between the shape of the lateral meniscus and its influence on causing a tear.

Significance: In this major study on cadaver’s knees, the accurate incidence rate of discoid lateral meniscus was determined. This study also showed the relationship between the shape of the lateral meniscus and its influence on causing a tear.

Poster #317
CLINICAL AND RADIOLOGICAL RESULTS OF THE ARTHROSCOPIC PARTIAL MENISCCTOMY
Hayrettin Kesmezacar, Istanbul, TURKEY, Presenter
Mehmet Rifat Erginer, Istanbul, TURKEY
Tahir Cagat, Istanbul, TURKEY
Ali Uzap, Istanbul, TURKEY
Turgut Dincal, Istanbul, TURKEY
University of Istanbul, Cerrahpasa Faculty of Medi, Istanbul, TURKEY

OBJECTIVE: The purpose of this study was to evaluate the results of 47 arthroscopic partial meniscectomy cases and to analyze the possible correlation between preoperative findings and the clinical and radiological results of the follow-up period.

PATIENTS AND METHODS: 229 patients with medial or lateral meniscus tears, underwent arthroscopic partial meniscectomy between 1993 - 1999. However only 47 of the patients (50 knees) could be found and thus formed the group for the present study. The mean age of the patients at operation was 42.53 (range 16 - 68) years. Of the 47 patients, 21 (%) were men and 26 (%) were women. Thirty nine medial meniscectomy and 10 lateral meniscectomy were performed. One case had both menisci partially removed. A Lysholm score was determined for each patient and standart graphies were assessed to compare with the axis and clear spaces of the uninvolved knees.

RESULTS: The average follow-up of the patients was 56.74 months (range 25 - 103 months). One patient underwent total knee arthroplasty and was excluded. Of the 48 knees, 29 (60%) had excellent, 17 (34%) good and 2 (4%) had poor results (Preoperative and follow-up average Lysholm scores were 52 and 95 respectively). The result of the cases under 40 years old or without articular cartilage damage was superior to the others. The follow-up graphies of the patients revealed an average of 0.88 degree of an increase to the varus, especially in the medial meniscectomy group. Regarding the clear space, medial joint space narrowing was 0.41 mm and 1.12 mm for the knees that underwent medial and lateral meniscectomy respectively.

CONCLUSION: Early functional and subjective results of arthroscopic partial meniscectomy can be expected to be satisfactory with 94% good or excellent results. However radiological findings reveal joint space narrowing and angulation to the varus with increasing time after surgery.

Poster #318
EVALUATION OF THE WATER CONTENT IN ARTICULAR CARTILAGE USING NEAR INFRARED SPECTROSCOPY
Tatsuya Kikuchi, Niigata, JAPAN, Presenter
Yuji Tanabe, Niigata, JAPAN
Makoto Sakamoto, Niigata, JAPAN
Naoto Endo, Niigata, JAPAN
Yoshio Koga, Niigata City, JAPAN
Niigata Civil Hospital, Niigata, JAPAN

Introduction: Besides of histological investigation, there is no method to evaluate biomaterial properties of the degenerated articular cartilage. A specific characteristic of near infrared spectroscopy to measure the internal water content of specimens can be utilized to evaluate the properties of articular cartilage. In this basic study, the possibility of new arthroscopic technique is presented.

Materials and Methods: By the self-developed indicator and sensor of near infrared spectroscopy, specimens were irradiated with 0.00146 mm. After partial absorption by hydroxyl, reflected spectroscopy was measured. The relation between the intensity of incident and reflected light is defined as: Absorbance: A=log10 (Ii/Ir), where Ii is intensity of incident light and Ir is that of reflected light. The absorbance means the index of the internal water content in the specimen.

Experimentations: 1) Change of absorbance by saline drop into the water absorbing materials. 2) Relation between thickness and absorbance of porcine articular cartilage and menisci. 3) Change of absorbance before and after indentation.

Results: 1) Absorbance was directly proportionate to an amount of drop within 5 drops. 2) From 1.5 mm to 0.2 mm in thickness, no change of absorbance was measured. 3) A specific characteristic of near infrared spectroscopy can detect the change of water content in a biphasic specimen. This method can be utilized arthroscopically to evaluate the biomechanical property of the cartilage.

Poster #319
BIOMECHANICAL EFFECT OF AUTOGENOUS OSTEOCHONDRAL GRAFT ON ARTICULAR CARTILAGE
Hirosi Kuroki, Kyoto, JAPAN, Presenter
Yasuaki Nakagawa, Kyoto, JAPAN
Koji Mori, Kyoto, JAPAN
Mao Oiba, Kyoto, JAPAN
Takashi Suzuki, Kyoto, JAPAN

INTRODUCTION: The measurement of absorbance by near infrared spectroscopy can detect the change of water content in a biphasic specimen. This method can be utilized arthroscopically to evaluate the biomechanical property of the cartilage.
Purpose
In the procedures of surgical operation of the autogenous osteochondral graft, the osteochondral plugs and surrounding cartilage are under the mechanical stress twice, i.e. when harvesting and grafting. The purpose of this study is to analyze the biomechanical effect of autogenous osteochondral graft on articular cartilage. Using the ultrasonic system which was developed for the measurement of stiffness, smoothness and thickness of the cartilage, we measured the biomechanical properties of cartilage in human and in an animal model.

Materials and methods
Clinical measurement: During surgical operation for two human subjects of osteonecrosis, the stiffness, smoothness and thickness were measured using the ultrasonic measurement system. Using Osteochondral Autograft Transfer System, 11 full-thickness osteochondral plugs were harvested from the donor site and grafted into the cylindrical holes of the recipient site. The measurement just on the osteochondral plugs was carried out at before harvesting and after grafting the plugs.

Experimental measurement: Twelve frozen knee joints of mature pigs were used for the measurement. In each of 7 knees defrosted overnight, three plugs (6-mm in diameter) were harvested from the donor site of the femoral trochlea and grafted into the holes (5-mm in diameter) in the recipient site of the femoral trochlea (the 6-mm model, n=21 plugs). In remaining 5 knees, total of 28 plugs (5-mm in diameter) were harvested from the donor site and returned to its original site (the 5-mm model). The measurement was carried out three times, i.e. before and after harvesting and after grafting the plugs. The points of measurement were just on the plugs and surrounding 4 points (at approximately 5-mm proximal, distal, medial and lateral to the plugs). The data obtained were analyzed statistically using paired t-test and analysis of correlation.

Results
In both of human and pigs, no differences in stiffness, smoothness and thickness of articular cartilage between before harvesting and after grafting the 6-mm plugs were observed. Stiffness and thickness of human plugs after grafting were significantly correlated with those before harvesting. All of these three parameters of 6-mm plugs of pigs after grafting were significantly correlated with those before harvesting. In the 6-mm model of pigs, there were no differences in the three parameters of surrounding cartilage of the holes after harvesting the 6- and 5-mm plugs. The parameters after harvesting the plugs were significantly correlated with those before harvesting. There were no differences in smoothness and thickness of surrounding cartilage between after harvesting the 5-mm plugs and after grafting the 6-mm plugs. The three parameters after grafting were significantly correlated with those after harvesting. In the 5-mm model, no differences in the three parameters of articular cartilage between before harvesting and after grafting the 5-mm plugs. The parameters after grafting were significantly correlated with those before harvesting.

Conclusions
During the operative technique of the osteochondral graft using Osteochondral Autogenous Transfer System, the biomechanical parameters on the osteochondral plugs did not change.

Poster #321
ALLOGRAFT ACL/MENISCUS TRANSPLANTATION IN PATIENTS WITH PRIOR MENISCOTOMY, ACL DEFICIENCY AND EARLY DEGENERATIVE ARTHRITIS
Steven D. Levin, Wilmette, IL, USA, Presenter
Northwestern University, Evanston, Illinois, USA

Post-traumatic arthritis is a well known sequela in patients with chronic ACL deficiency and prior meniscectomy. Few treatment options are available for patients with post-traumatic arthritis and instability. The objective of this study was to evaluate the results of ACL/meniscus allograft transplantation in these active patients. Nineteen of 20 patients who underwent ACL/meniscus allograft transplantation between 7/97 and 2/00 were available for follow-up. All patients presented with pain, instability, and had documented prior meniscectomy and ACL deficiency. The average age was 35(20-53), 16 males and 3 females. Thirteen cases were sports related and 6 trauma. Each patient had an average of 1.6 prior surgical procedures (1-4). Fourteen years on average transpired between the time of the first surgery and the index procedure. Four patients required revision ACL surgery and 15 had a previously undiagnosed or untreated ACL. Thirteen patients had prior medial meniscectomy, 3 lateral and 3 both. All patients underwent a combined medial or lateral cryopreserved meniscus allograft and endoscopic ACL allograft transplantation. Average follow-up was 2.6 yrs. All patients were evaluated by clinical exam, x-ray, MRI, Lysholm and Tegner activity scores and KT-1000. Clinical results yielded 8 excellent, 6 good, 1 fair, and 4 poor. Lysholm scores improved on average 23 points. Tegner activity level increased to 5.8. KT-1000 was less than 2.6mm maximum side to side difference on average. Complications consisted of 2 patients with arthrofibrosis, 1 infection and 1 neurona. The poor results were
in patients who initially presented with grade III arthritis. Combined ACL/meniscus allograft transplantation is a good procedure for carefully selected patients who present with pain, instability, documented prior meniscectomy, and ACL deficiency. Patients with post-traumatic arthritis beyond grade III tend to do more poorly than patients with less advanced arthritis. Combined ACL/meniscus allograft transplantation is a good procedure for carefully selected patients who present with pain, instability, documented prior meniscectomy, and ACL deficiency. Patients with post-traumatic arthritis beyond grade III tend to do more poorly than patients with less advanced arthritis.

Poster #322
HEALING OF OSTEOCHONDRAL DEFECTS IN THE RAT PATELLA AFTER PERIOSTEUM TRANSPLANTATION – EVALUATION OF CARTILAGE REPAIR AND NERVE FIBER SPROUTING
Magnusランドシュ, Linkoping, SWEDEN, Presenter
Karin Edoff, Linköping, SWEDEN
Hälsouniversitetet, Linköping, SWEDEN

Repair of articular cartilage is an important clinical problem. Availability of chondrogenic stem cells has been pointed out as one key factor in cartilage repair and application of periosteal autografts has been used clinically to improve healing. In addition, neuropeptide containing nerve fibers may contribute to healing by stimulating cell proliferation and/or differentiation. In the rat, peptidergic nerve fibers invade the callus formation during fracture healing and peptidergic nerve fibers are abundant in cartilage related connective tissue during skeletal development in young mammals. The purposes of the present study were to evaluate healing of an experimental full thickness osteochondral defect in the rat patella with and without application of a periosteal autograft, and to find out if a local nerve sprouting is part of the healing process. The periosteum flap was applied with the cambium layer facing the defect. Osteochondral healing was evaluated with a histological score and the presence of nerve fiber profiles in relation to the defect was assessed by protein gene product 9.5 immunohistochemistry. The results showed (i) that osteochondral defects in the rat patella heal spontaneously but incompletely, (ii) that healing consistently is less satisfactory with the application of a periosteal autograft and (iii) that healing is not accompanied by nerve fiber sprouting. Periosteum coverage alone does not provide sufficient healing conditions for osteochondral repair in this model.

Poster #323
OUTSIDE-IN MENISCUS SUTURE TECHNIQUE; 5 YEARS FOLLOW-UP
Rodica Mannescu, Bucharest, ROMANIA, Presenter
Dan Lăptoiu, Bucharest, ROMANIA
Mihaia Negrusoia, Bucharest, ROMANIA
Orthopaedics and Trauma Department, Colentina Clin, Bucharest, ROMANIA

PURPOSE
We present the results of a prospective study evaluating the arthroscopic technique of outside-in meniscal suture.

MATERIAL AND METHOD
Between January 1997- January 2001, 68 patients were enrolled in this study. This group consisted in 57 men and 11 women. Average age was 27.6 years (range 17 to 45). There were 63 right knees and 5 left knees. The types of tears suitable for suture consisted in acute longitudinal tears, unique or in association with radial tear in middle third. The technique was always outside-in. The type of used suture was resorbable (2-0 PDS, 2-0 MAXON). The evaluations included clinical examination, radiographic exams and second look arthroscopies (6 cases).

RESULTS
There were 4 failures in this study, consisted in re-rupture of the meniscus. The clinical results were good in 91.4% with complete recovery and return to physical and sportive activity, good in 2.8% with mild symptoms and failure in 5.8% consisting in meniscus re-rupture. Imaging and anatomopathological samples will be presented and discussed.

CONCLUSIONS
The meniscus healing does occur. The healed meniscus has a protective role towards articular cartilage. The cases selection is important for success. The arthroscopical approach permits the identification and treatment of associated lesions. The outside -in technique is easy and does not require expensive tools.

Poster #324
INTER-OBSERVER AGREEMENT FOR THE ASSESSMENT OF INTRA-ARTICULAR PATHOLOGY IN KNEE ARTHROSCOPY
Robert G Marx, New York, NY, USA, Presenter
Jason T. Connor, Cleveland, OH, USA
Annunziato Amendola, Iowa City, IA, USA
Jack T Andrish, Cleveland, OH, USA
Christopher Keading, Columbus, OH, USA
Eric C. McCarty, Nashville, TN, USA
Richard D Parker, Cleveland, OH, USA
Rick W. Wright, Saint Louis, MO, USA
Kurt P. Spindler, Nashville, TN, USA
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INTRODUCTION
Acute and chronic cartilage injury of the knee have an important impact on prognosis. The gold standard for the diagnosis of cartilage and meniscal injury of the knee is arthroscopic evaluation. The presence and severity of such pathology may be the most important factor in the long-term prognosis of acute knee injuries. Surgeons must be able to accurately grade meniscal and chondral pathology at arthroscopic evaluation to allow prospective multi-center collaborative research trials. The goal of this study was to quantify inter-observer agreement among fellowship trained sports medicine surgeons.

METHODS
A single orthopedic surgeon with fellowship training in sports medicine performed diagnostic arthroscopies on thirty knees in thirty patients. Twenty patients had acute anterior cruciate ligament (ACL) injury and ten had degenerative disease, to allow for a broad spectrum of knee pathology. Six sports medicine fellowship trained surgeons (mean: ten years in practice; range: 2-25) viewed the videos and rated each chondral surface as either normal, grade 1 (softening), grade 2 (fissures and superficial changes), grade 3 (fragmentation and deep changes); and grade 4 (exposed bone). Meniscal pathology was graded as normal, partial tear and complete tear. The Kappa statistic was used to quantify agreement among the surgeons.

RESULTS
For articular cartilage lesions, the Kappa statistic ranged from 0.51 to 0.80 with the exception of the medial tibial plateau, which was 0.35. Medial meniscal pathology had a kappa value of 0.63 and the lateral meniscus 0.53. This indicates moderate to excellent agreement, with the exception of the medial tibial platform.

DISCUSSION and CONCLUSION
Agreement among surgeons with respect to articular cartilage and meniscus injury at arthroscopy is good, but not excellent.
Conclusion: The results of this prospective study suggest that patients with chondral and osteochondral lesions, who undergo the microfracture abrasion technique, experience significant clinical improvement at an approximate two-year follow-up interval.

Poster #326

CHOICE OF OPERATIVE METHODS FOR OSTEOCHONDROSIS DISESCANS OF THE FEMORAL CONDYLES
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Takahiro Toyoda, Tokyo, JAPAN
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PURPOSE: The results of various operative methods for osteochondritis dissecans of the femoral condyles were reviewed, and choice of these operative methods were discussed.

METHODS: Thirty-six cases (26 males and 10 females) which underwent operative treatments were reviewed. The operative methods included drilling, repositioning and fixation of the osteochondral fragment, and bone graft or osteochondral graft. The minimum follow-up period was two years. The medial femoral condyle was involved in 25 cases, and the lateral, in 11. Lateral discoid meniscus or meniscal injury was combined in all the 11 cases in the lateral. The operative methods were decided from the condition of the cartilage. Drilling was performed in cases with no or minimal cartilage damages (12 cases). Repositioning (if required) and fixation of the fragment using absorbable pins was carried out in cases with a partial or total fragmentation (10 cases). Bone graft or osteochondral graft was performed when the original site was already degenerated (14 cases). Partial meniscectomy was added when the meniscal injury was combined.

RESULTS: In patients who received drilling, the lesion healed radiographically in all the cases and they complained of no or minimal symptoms. In patients who received the fragment fixation, re-union of the fragment was observed in 70% and the clinical outcomes were satisfactory in most of the cases. In patients who received bone graft or osteochondral graft, although union of the graft was observed in all the cases radiographically, 71% of the patients complained of residual pain.

CONCLUSIONS: From the results, drilling is sufficient if the cartilage surface is not damaged. When the fragmentation occurred already, the fragment should be repositioned and fixed to the original site before degenerated, as its clinical symptoms were much better than those with bone graft or osteochondral graft.

Poster #327

AUTOGENOUS OSTEOCHONDRAL GRAFTING FOR OSTEOEONECROSIS OF THE KNEE
Yoshitaka Matsu sas, Otsu, JAPAN, Presenter
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INTRODUCTION: Repair of the osteochondral lesion of osteonecrosis of the knee is a difficult and controversial issue. In this paper, we present the clinical results of autogenous osteochondral grafting for osteonecrosis of the knee.
MATERIALS AND METHOD: Ten patients with at least 6-monts follow-up periods were included in this study. The age ranged from 29 to 71 years of age, with a mean of 48. The follow-up period ranged from 6 to 66 months with a mean of 33. The cause of osteonecrosis was steroid-induced in 2 and idiopathic in 8. There was one knee with osteonecrosis of the medial tibial plateau. High tibial osteotomy was performed in 8 knees at the same time of osteochondral grafting. The size of the osteochondral defect ranged from 180 to 1080 mm² with a mean of 380. The number of transplanted grafts ranged from 1 to 5 with a mean of 2.5.

RESULTS AND DISCUSSION: The clinical results by ICRS cartilage evaluation form were normal in 2, nearly normal in 7, and abnormal in 1 knee. The range of motion was normal except in one knee with a flexion of 135 degrees. Second-look arthroscopy revealed good fibrous cartilage regeneration in the gap between the grafts and integration to the adjacent healthy cartilage in most of the cases. Satisfactory result was obtained for the patient who had a large chondral lesion on the whole lateral femoral condyle. Abnormal result was obtained in the patient who had high tibial osteotomy but lost the correction angle during the follow-up period. Resurfacing of osteochondral defect of the tibial plateau could be performed through an arthroscopic technique. When a proper alignment (FTA: 170+/−2 degrees) was obtained, autogenous osteochondral grafting for osteonecrosis of the knee can provide a good knee function including full flexion.

CONCLUSION: Autogenous osteochondral grafting can give satisfactory results for the osteonecrosis of the knee if a proper alignment is obtained.

Poster #328
•MATRIX ASSOCIATED AUTOLOGOUS CHONDROCYTE TRANSPLANTATION (MACT) IN CLINICAL PRACTICE
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Martin Fussenegger, Wels, AUSTRIA
Ernst Ortner, Wels, AUSTRIA
Erwin Ploberger, Ried, AUSTRIA
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Objective: Autologous chondrocyte transplantation has proven its clinical feasibility for the treatment of traumatic articular cartilage defects. The cells are applied to the defect in an aqueous solution. The defect then has to be sealed with a perifocal flap. In order to avoid perifocal flap procurement and cell loss by leaking, we used matrix associated autologous chondrocyte transplantation (MACT).

Method: Chondrocytes were isolated from a small biopsy of an unloaded part of the articular cartilage. A sufficient cell number for transplantation was reached after 3-4 weeks in cell culture. On the day of operation, cells were harvested and chondrocyte-fibrin-collagen composite constructs were produced in the operating theater. This constructs were then grafted into the defect either by arthroscopy or arthroscopically by using a new device, designed especially for arthroscopic MACT. 15 patients were treated with MACT for traumatic articular cartilage defects. Patients were followed for up to 6 months.

Results: All patients treated with MACT showed good two excellent results. No patients experienced locking or swelling.

Conclusion: MACT avoids perifocal flap procurement and technical difficulties of the cell solution application, as observed in ACT. Arthroscopic MACT additionally avoids open knee surgery and can be performed save and quick with the new device.
associated with proper use of the Rapid Loc device. Neither device could be effectively inserted into the anterior meniscus or extreme posterior horn. For both devices, we do remain concerned regarding the profile of the device on the meniscus and the risk for chondral damage.

Conclusions: The Rapid Loc can be placed more safely than the Fast-Fix device, with less technical problems and with reproducible results. However, long term function and in vivo risks could be evaluated in the cadaver model.

Poster #330
POSTOPERATIVE RESULTS IN THE DONOR SITE OF THE MOSAICPLASTY
Yasuyuki Nakagawa, Kyoto, JAPAN, Presenter
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[Purpose] There are few reports of the postoperative results in the donor site of the mosaicplasty. We examined the effect of the donor site including second look arthroscopy. [Materials and Methods] There were 23 patients and 24 knees we operated mosaicplasty from 1997 to January 2001. Fifteen men and 8 women, 11 right knees and 13 left ones, the mean operative age was 31.1 years old, and the mean follow up period was 24 months. The assessment we used was the area of the donor site, the number of the osteochondral plugs, how to fill up in the donor site, patella compression test, the symptom due to donor site and radiography. There were 16 patients and 17 knees we performed second look arthroscopy. The mean period from the mosaicplasty to the second look arthroscopy was 14.9 months. [Results] The areas of the donor sites were 12 knees in only lateral trochlea of the femur and 8 knees in the lateral and medial trochleas. The mean number of the plugs was 3.9. How to fill up in the donor site was 9 knees of autogenous bones, 7 ones of osteochondral composites in the lesions, 4 ones of artificial bones and autogenous bone, and 4 ones of nothing. There was only one patient who had symptoms due to the donor site. He continued his knee pain and swelling 5 months after his mosaicplasty, and had irregularity of the patellofemoral joint in his radiography. We divided the donor sites into three types in second look arthroscopy: swelling 3 knees, flat 8 knees and depression 5 knees. [Discussion] The cause of the patient who had symptoms due to the donor site was supposed to be early returned to sport. [Conclusion] We divided the donor site into three types in second look arthroscopy: swelling, flat and depression. There was only one patient who had the symptoms due to the donor site.

Poster #331
REDUCED PLANTAR FORCE-TIME INTEGRAL DURING PARTIAL WEIGHT BEARING GAIT USING THE EASY STRUTTER FUNCTIONAL ORTHOSIS SYSTEM
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Purpose: With the evolution of surgical procedures designed to preserve or restore hip, knee and ankle joint articular cartilage there is a greater need to provide more controllable, weight bearing progressions during both assisted ambulation and early rehabilitation. This study compared the mean peak plantar force-time integrals during a modified 3-point gait pattern with a 50% involved side weight bearing reduction using auxillary crutches and the Easy Strutter Functional Orthosis System (ESFOS) (Orthotic Mobility Systems, Inc., Kensington, MD, USA).

Materials and Methods: Twenty subjects (7 females, 13 males, age = 52.1 +/- 6.3 yrs) who were more than 1 year status-post unilateral total hip (n = 13) or total knee reconstruction (n = 7) participated in this study. All subjects had used axillary crutches at least briefly during post-operative rehabilitation. Following involved side instrumentation with a plantar force sensor (Pedar, Novel, Munich), subjects were instructed in 50% involved side weight bearing using a digital scale and in appropriate ambulatory assistive device use. During data collection subjects ambulated 15.2 m at a self-directed comfortable pace as plantar force data were sampled at 50 Hz. Subjects completed the course with each assistive device, with alternating device order between subjects. Mean peak plantar force-time integral data were determined from the initial 3 steps taken with each device. A series of one-way ANOVA were used to evaluate condition (device differences).

Results: The mean peak plantar force-time integral was reduced during unilateral partial weight-bearing ambulation using the ESFOS compared to axillary crutch use (394.6 +/- 169 N/sec vs. 526.8 +/- 209 N/sec, mean difference = 132.2 N/sec, p = 0.03). Statistically significant differences were not evident for mean peak plantar forces during 50% unilateral weight bearing reduction (crutches 326 +/- 155 N vs. ESFOS 339 +/-114 N, p > 0.05) or for mean peak plantar force onset timing following initial foot-ground contact (crutches 0.68 +/- 0.29 sec vs. ESFOS 0.81 +/- 0.37 sec, p > 0.05).

Conclusions and Significance: Despite being unfamiliar with the ESFOS and having limited practice time, subjects who were more than 1 year status post unilateral total knee or total hip replacement displayed a more controlled rate of loading at their involved lower extremity during flat surface ambulation when using the device. The ability to effectively control weight bearing during both assisted ambulation and during closed kinetic chain exercise tasks following articular cartilage preservation or restoration procedures may enhance the self-lubrication of articular cartilage during weight bearing thereby improving its elasto-hydrodynamic properties. The more physiologically relevant loading provided by the ESFOS may help improve patient functional outcomes following articular cartilage surgery.

Poster #332
SYNDROME OF THE ANTERIOR SYNOVIAL IMPINGEMENT: CLASSIFICATION, DIAGNOSIS AND TREATMENT
Paulo Roberto Rockett, Porto Alegre, BRAZIL, Presenter
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Objective: The purpose of this study is to classify the lesions caused by the syndrome of anterior synovial impingement, the mechanism of injury and to evaluate the results obtained with the arthroscopic treatment.

Method: From September 1986 to May 1998, 36 resections of hypertrophic synovitis causing anterior impingement were made from a total of 2032 knee arthroscopies. This represents only 1.77% of the patients undergoing knee arthroscopy. We excluded cases of systemic diseases, widespread synovitis and other concomitant intra-articular diseases. Thirty-six patients were included in this retrospective study. The average duration
of symptoms was 20.6 months with a range of 3 to 180 months. Patients were 22 females and 14 males. Eighteen cases occurred in the right knee and eighteen were in the left knee. The mechanism of injury was noted in these cases. Eight of the patients had direct traumatic blows to the knee and two, indirect. Four of the patients reported twisting injuries to the knee. Seven patients reported repetitive minor trauma. The remaining fifteen patients had no trauma reported.

Clinical Signs: pain in the anterior joint line, pseudo-locking, giving way, effusion, swelling and sensibility increase above the anterior horn of the meniscus. They had no pain at rest, and they had very localized symptoms, especially in the extension. They stroll with painless attitude of discreet flexion of the knee and they avoid movements that need hyperextension (climbing or descending stairs).

Physical Exam: Tests of strained hyperextension, causing acute pain, were accomplished and potentialized by the application of pressure above the anterosuperior border of the meniscus.

Ultrasonography: Ultrasonography can show the site of synovitis to evaluate the knee anterior soft tissue. Hipoechoic lesions of synovial and volume increase in the comparative exam of the contralateral knee were found. On advanced phases we can notice heterogeneous echo-pattern related to a chronic inflammatory change (fibrosis). Power Doppler Ultrasonography assessment showed an increase of the arterial and venous flow.

Dynamic Ultrasonography: An interposition between the femoral condyle and the superior surface of the anterior medial meniscus can be observed with the knee close to full extension. With the knee fully extended, when the transducer is pressed on the anterior horn of the meniscus, the patient experiences acute pain.

Treatment: It is conservative in the initial phase the treatment. We suggest surgery when there is no symptoms improvement after 3 months. In all cases, the only common finding was the presence of a localized synovitis producing an impaction area approximately 2.5 X 2 cm on the anterior femoral condyle; this was the main indication for partial synovectomy. The anterior hypertrophy synovitis was excised with full radius blade (3.5 mm) introduced through the anteromedial portal. Anterolateral portal was used for better arthroscopic visualization (Visualization was possible through a standard anterolateral portal). Special care was taken in order not to violate the anterior capsule. In this series, the fat pad was not resected in all cases. The cartilaginous surfaces lesions were treated with chondrectomy using full radius whisker blade (3.5 mm) and in one case abrasion was accomplished (1 cm²). The superficial meniscal lesions were treated with full radius whisker blade and partial meniscectomies were performed in larger lesions. One case was sutured.

Pathologic Findings:
Anterior synovial impingement medial was mostly found (83.33%). The hypertrophic synovial was found reddish or whitish. It projects beyond the superior margins of the meniscus and it is interposed between the femur and the anterior horn of the meniscus. In four cases, there was an exuberant growth of villous. Synovial bleeding secondary to mechanical damage was found.

Initially, we can observe the meniscus marked by hemosiderin deposition originated from crushing of the synovial tissue against articular cartilage of femoral condyle. In the most advanced cases of synovial hypertrophic there were cartilaginous injuries of the anterior condyle (Central and Lateral site of lesions - ICRS Classification), anterior horn of the meniscus lesions and, less frequently, tibial cartilage injuries. Areas of chondromalacia changes in the adjacent articular surfaces were usually present. These were probed, and any loose fragments were removed. In the anterior horn were meniscal fraying and degenerative tears noted in superficial layer. Tears ranged from discrete meniscal transverse tears to a true waste (consume) of inner margin. The lesion were arthroscopically classified in:

Type I: alterations restricted to the synovial tissue: swelling, synovial hypertrophy, redness, vascular hypertrophy, ecchymosis, crushing of the synovial tissue and fibrosis.
Primary alterations that occur in the synovial tissue due to repetitive minor trauma. (2.78%)

Type II: lesions in the femoral joint cartilage. Secondary alterations caused by the interpositions of synovial tissue causing lesions in the articular cartilage of the femur. (61.11%)

Type III: lesions in the anterior horn of the meniscus and/or tibial cartilage. Secondary alterations caused by the interposition of hypertrophic synovitis with lesions in the meniscus and/or tibial cartilage. (2.78%)

Type IV: (Type II + Type III) Lesions in the femoral joint cartilage and concomitant in the anterior horn of the meniscus and/or tibial cartilage. Secondary alterations caused by the interposition of synovial hypertrophic that provokes superior (femoral cartilage) and inferior (meniscus and/or tibial cartilage) injuries. (33.33%)

Results:
The average age was 36. 24 presented Type II lesions, 1 had Type III and 11 had Type IV lesions. The average time to follow-up was 95 months with a range of 17-155. Biopsies confirmed synovial pathology in all cases. All the patients presented pain recovery in the first 2 months of postoperative, 2 persisted with some limitation of the flexion and 3 had pain crisis after efforts.

Conclusion:
The anterior synovial impingement is characterized by a synovial hypertrophy protruding into the join cavity. The pathogenesis of the pain is the entrapment of the hypertrophic synovium in the joint space. The removals of synovitis will relief the symptoms and avoid further meniscal and cartilaginous injuries in the anterior femoral condyle. The synovial impingement caused anterior pain in the knee mainly hurting the cartilage and medial meniscus. The arthroscopic surgical treatment reached satisfactory clinical result, especially, in the relief of the pain. We believe that the synovitis was the primary cause of symptoms, was not secondary to a cartilage injury and its etiology was not necessarily related with trauma or other intra-articular pathologies.

Poster #333
CONSUMER MENISCAL LESION
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Objective:
The purpose of this study is to describe the meniscal consumer lesion. It is a specific lesion, provoked by the anterior synovial impingement, which happens in the anterior horn of the meniscus with waste of your margin. This lesion can be confused with “Parrot-Beak Flap”, between the anterior horn and the body of the meniscus.
Conclusion:

ACL lesions, cartilage erosion (Grade IV) in the trochlear causing cartilage lesions, 4 lesions in the other meniscus, 2 and 3 had limitation of the flexion comparatively. Concomitant anterior hypertrophic synovitis. All the patients got relief of the limitations. Seven were female, and 2 male. All the 10 lesions were in the medial meniscus. The treatments of the meniscal were balanced in all cases.

Clinical Signs:

They had very localized pain in the anterior join line especially in the extension. They stroll with painless attitude of discreet flexion of the knee. Tests of strained hyperextension, causing acute pain, were accomplished and potentialized by the application of pressure above the anterosuperior border of the meniscus.

Pathologic Findings:

Classification of the lesions:

Type I: crushing and degenerative tears restricted to the superficial meniscal layer (74.3%).
Type II: incomplete longitudinal tears (9.6).
Type III: consumer lesion (16.1%).

Treatment:

Degenerative superficial meniscal lesions were treated with debridement with full radius whisker blade. Partial meniscectomies were performed in larger lesion and in all consumer lesions the flap tear has been removed in order to balance the remaining tissue. Segmental resection of a torn meniscus would leave this leading edge. These edges were trimmed to balance the remaining rim.

Two cases (33.3%) of incomplete longitudinal tears were sutured. The anterior hypertrophy synovitis was excised with full radius blade in all cases.

Results:

The average age of the patients that underwent arthroscopy treatment was 40 years old, ranged from 15 to 87. Thirty-four were in the right knee and twenty-eight, in the left. Thirty patients were male and thirty-two were female. The lesions were localized: 44 in the meniscus medial and 18 in the lateral meniscus. We found 10 meniscal consumer lesions in 9 patients. They were 31 years old of average age with minimum of 15 and maximum of 58. Eight were in the left knee and 2 in the right. Seven were female, and 2 male. All the 10 lesions were in the medial meniscus. The treatments of the meniscal lesions were accomplished together with the resection of the anterior hypertrophic synovitis. All the patients got relief of the pain within 2 months. Six patients had pain after some effort and 3 had limitation of the flexion comparatively. Concomitant lesions found in these 62 knees: 14 with medial pathologic plica causing cartilage lesions, 4 lesions in the other meniscus, 2 with radial lesions in the posterior horn of the same meniscus, 2 ACL lesions, 1 cartilage erosion (Grade IV) in the trochlear groove.

Conclusion:

The most advanced meniscal lesion caused by anterior synovial impingement is the meniscal consumer lesion. It is characterized by the disappearance of the free inner margin of the anterior horn of the medial meniscus. This disappearance occurs because of the continuous and progressive waste of the meniscus caused by the interposition of the hypertrophic synovial tissue between the articular surfaces. The treatment with partial meniscectomy should be made together with the resection of the hypertrophic synovitis with the aim of solving the cause of the meniscal lesion.
Among the patients of our clinic, who underwent arthroscopic surgery since 1989 an osteonecrosis of the medial femoral condyle occurred in 14 cases during the early postoperative period. The mean age of these patients was 61 years. While during the operation a lesion of the medial meniscus could be found in 11 patients, in 3 cases the complaints could not be explained by the intraoperative findings. Chondromalaciopal resp. arthrotic changes did not exceed the usual age-related extent in any of the mentioned cases. During the opertion we only used mechanical arthroscopy instruments. Retrospectively regarding the patients for their preoperative profile of pain we discovered, that the complaints had to be related to arthrotic disease rather than to a meniscal tear due to degeneration, although x-rays did not show major arthritic development.

The postoperative occurrence of osteonecrosis of the medial femoral condyle accompanied by generally unchanged problems and complaints independent of the intraoperative findings has convinced us to delay arthroscopic intervention for a group of 12 patients of the same age, who suffered from comparable complaints. All of these patients were treated by non-operative means within 2 to 5 months after initial occurrence of the complaints. In 6 cases an osteonecrosis of the medial femoral condyle appeared during the above mentioned period of time. For one of these patients an MRI had revealed first signs for this only 2 weeks after the clinical occurrence of problems. These findings suggest, that for patients of the mentioned age suffering from pain symptoms which are – despite of missing radiological changes – rather related to arthrosis than to a meniscal lesion, the decision to do an arthroscopic intervention should be made very carefully. A development of an osteonecrosis due to the arthroscopic surgery is considered unlikely.

**Poster #336**

**ALL-INSIDE SUTURE MENISCUS REPAIR**

Ronald M Seling, New York, NY, USA, Presenter
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An arthroscopic all inside technique for the repair of meniscus tears utilizing suture is presented. This is a modification of the Mulberry Knot Technique. Meniscus preparation, reduction, and the use of a spinal needle to introduce the suture is performed the same way as with the Mulberry Knot Technique. After the first limb of the suture is brought through the knee, instead of tying the end of the suture, the spinal needle is withdrawn from the meniscus and capsule but still kept under the skin. It is then reinserted into the capsule, and meniscus and the second limb of the suture is retrieved through the same portal as the first suture limb. This allows the suture to be tied inside the knee with arthroscopic knot tying techniques. We find that it gives a consistent, strong, and reproducible repair and can be used as a hybrid technique with implants, other suture techniques, or as a stand alone technique for meniscus repair or transplantation.

**Poster #337**

**ARTHROSCOPIC MENISCAL REPAIR WITH SUTURE AND FIBRIN CLOT OF HORIZONTAL MENISCAL TEAR IN YOUNG ADULT**

Seung-Suk Seo, Pasan, SOUTH KOREA, Presenter
Paik Hospital, Pasan, SOUTH KOREA

Introduction: The preservation of meniscus is crucial for maintaining a normal knee joint function. A horizontal tear of meniscus is usually treated with a meniscectomy. Fibrin clot would promote a healing process in the avascular zone of horizontal tear of meniscus. The purpose of this study is to evaluate the effectiveness of the fibrin clot in the healing of horizontal meniscal tear in the young adults.

Materials and Methods: 5 cases of horizontal meniscal tear were repaired with vertical mattress suture(2-0 Ethibond) and fibrin glue was enhanced with autogenous fibrin clot. Mean age of cases was 21 years old. Cause of tear was 3 sports associated injury, 1 traffic accident, 1 unknown. All patients had no associated intraarticular lesions. All cases had a horizontal tear at posterior horn of medial meniscus. Mean length of tear was 21 mm. During postoperative 6 weeks the knee was locked in full extension with a motion limited brace and was permitted a partial weight bearing with crutch.

Results: All patients were followed at an average of 45 months. 5 cases was evaluated with MRI which showed 1 healed, 1 incompletely healed, 1 not healed. On 2 cases of second look arthroscopy 1 case showed the healed meniscus and 1 case showed the reteared meniscus. 5 cases was evaluated with Lysholm score which showed 3 excellent, 2 fair. Postoperative complication was 1 painful neuroma at the infrapatellar branch of saphenous nerve.

Conclusions: The use of fibrin clot in the repair of horizontal meniscal tear did not showed the satisfactory morphological result. A more sophisticated methods were needed to obtain an complete meniscal healing.

**Poster #338**

**BUCKET-HANDLE MEDIAL MENISCUS TEARS IN THE ACL RECONSTRUCTED KNEE: LONG-TERM OUTCOME**

K. Donald Shelbourne, Indianapolis, IN, USA, Presenter
Donald R. Carr, Indianapolis, IN, USA
Francois Bonnetot, Strasbourg, FRANCE
Philippe Clavert, Strasbourg, FRANCE
Jean Francois Kempf, Tremblay en France, FRANCE
Methodist Sports Medicine Center, Indianapolis, IN, USA

We sought to determine the level of superiority meniscus repair had above partial meniscectomy in patients undergoing ACL reconstruction with isolated, unstable, bucket handle medial meniscal tears with regard to subjective and objective outcomes at greater than 2 years follow-up. Between 1992 and 1995, 155 patients met the inclusion criteria. All patients underwent ACL reconstruction using patellar tendon autographs. Fifty-six patients underwent meniscal repair using inside-out technique. In 99 patients, the tear was felt to be non-salvageable and a partial meniscectomy was performed. Subjective follow-up was obtained with a modified Noyes questionnaire. Patients were objectively evaluated using the IKDC knee examination criteria. The mean subjective score of 51 patients in the repair group was 90.9 +/- 11.6 points at a mean of 8.9 years after surgery; the mean for 87 patients in the meniscectomy group was 90.9 +/- 16.7 points at a mean of 7.8 years after surgery (P=0.634). When repair group was subdivided into nondegenerative tears (n=27) and degenerative tears (n=24) the mean Noyes score was 93 and 87.1 respectively (P=0.02). IKDC overall grades on 56 patients in the removal group (mean time 7.1 years) were normal in 13 (52%), nearly normal in 9 (36%), and abnormal in 3 (12%). IKDC overall grades on 56 patients in the removal group (mean time, 6.0 years) were normal in 26 (46%), nearly normal in 25 (45%), and abnormal in 5 (9%). IKDC radiographic sub-scores for the repair group were normal in 20,
nearly normal in 3, and abnormal in 1; the radiographic subscores for the removal group were normal in 41, nearly normal in 8, and abnormal in 3. The distributions in grades were not statistically significant for a difference between groups (P=0.7467, overall grade; P=0.8977, radiographs). In patients with ACL reconstructed knees with unstable and isolated bucket handle medial meniscus tears, the data at 7 years follow-up did not demonstrate superior subjective and objective outcomes with meniscus repair versus partial removal. A subset of repaired tears determined to be degenerative at the time of repair showed a statistically significant difference in subjective scores at 8.9 years follow up. This difference is believed to be due to the non-functioning of these menisci. These results reinforce the need to critically analyze the risks, benefits, and criteria for meniscal repair in patients undergoing ACL reconstruction with unstable bucket handle medial meniscus tears.

Poster #339
CLINICAL EVALUATION OF MENISCUS REPAIR WITH A BIOA
Rainer Siebold, Heidelberg, GERMANY, Presenter
Andrea Ellermann, Pforzheim, GERMANY
Jens-Ulrich Buelow, East Fremantle, AUSTRALIA
Ludwig Boes, Neulingen, GERMANY
Christian Sobau, Viernheim, GERMANY
ARCUS-Sportklinik, Pforzheim, GERMANY

Purpose of the study: Several new fixation devices for meniscus repair were developed in recent years. One of the most popular ones is the Bionx Meniscus Arrow. Short-term results are promising, but long-term clinical outcome is still in question. We present a 2 to 3 year study of all-inside meniscus repair with the Bionx Arrow.

Material and Methods: 100 consecutive patients (100 menisci, average age 29.5 [18-50] years) were evaluated prospectively following all-inside meniscus repair with the bioabsorbable arrow. OP was performed between 9/1997 and 4/1999. F/u was 33 [24 to 43] months and 96 patients were available for f/u. Repairs were performed in either the medial (80%) or lateral (20%) posterior horn in the red-red or red-white meniscal zone. 70% of patients underwent concomitant ACL reconstruction. F/u consisted of a history, clinical examination, Lysholm- and Cincinnati Knee Score.

Results: 22 (22.9%) patients showed signs and symptoms consistent with a meniscus tear (17 medial, 5 lateral) and underwent meniscectomy. In 12 (55%) of revised patients concomitant ACL reconstruction was performed and 5 (22.7%) of patients were > 35 years. In the non-revisioners Lysholm Score was 92.5 and Cincinnati Score was 89.9. We found 2 cases of distinct femoral cartilage damage.

Conclusions: Meniscus repair with the bioabsorbable arrow leads to clinical results comparable to those of traditional suture techniques. The simple and time saving all-inside insertion obviates the need for additional incisions and avoids knot tying. A proper tear selection and arrow positioning is necessary and should avoid cartilage damage. Concomitant ACL reconstruction and age had no significant influence on the revision rate.

Poster #340
PROSPECTIVE COMPARISON OF ARTHROSCOPIC MEDIAL MENISCUS REPAIR TECHNIQUE: INSIDE-OUT SUTURES VS ENTIRELY ARTHROSCOPIC ARROWS

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Todd A. Warren, Nashville, TN, USA
Jason T. Connor, Cleveland, OH, USA
Clinton J. Devin, Nashville, TN, USA
Eric C. McCarty, Nashville, TN, USA
Vanderbilt Sports Medicine Center, Nashville, TN, USA

OBJECTIVE: Entirely arthroscopic techniques of meniscus repair have increasing popularity because they have reduced postoperative morbidity and easier insertion than traditional arthroscopically-guided inside-out repair with sutures. Despite this shift in clinical practice technique, no prospective comparative studies of clinical success have been published. This comparative study on meniscus repair technique was initiated when the senior author (KPS) prospectively switched in the 1996 from inside-out (PDS sutures) to entirely arthroscopic (arrows) while keeping rehabilitation and weight-bearing constant. Our hypothesis was there would be no significant difference in clinical success between repair techniques as defined by reoperation for meniscus repair failure.

METHODS: As the first component of the Multicenter Orthopaedic Outcomes Network (MOON) initiated in August 1991, all ACL reconstructions were prospectively entered into a database. A single surgeon’s posterior horn medial meniscus repairs with ACL reconstruction from 8/91-12/99 were evaluated. Forty-seven consecutive patients (8/91-6/96) had arthroscopically assisted inside-out repair utilizing PDS sutures. Ninety-eight consecutive patients (6/96-12/99) had entirely arthroscopic technique with bioabsorbable arrows. In both time periods the percentage of menisci repaired were approximately 20% of all ACL reconstructions. Clinical success was defined as no reoperation for medial meniscus debridement of failed repair site as previously documented on scale diagrams. Patient follow-up was by an 11-page Multi-Dimensional Health Assessment Questionnaire which included the validated KOOS, WOMAC, SF-36, Lysholm, and IKDC-99, in addition to any previous operations on the knee. Statistical analysis consisted of Kaplan-Meier curves to investigate time to reoperation between patients with these two techniques. A Cox proportional hazards model was fit to compare times to reoperation and proportional hazards assumptions verified.

RESULTS: The inside-out suture technique had 85% follow-up (40/47) with median 65 months. Follow-up in the entirely arthroscopic arrows group was 86% (84/98) with median 26 months. There were 6 failures for the inside-out group and 5 failures in arrows. Kaplan-Meier curves demonstrate no difference in clinical outcomes between techniques as defined by reoperation between techniques (p=0.88). The risk of reoperation is 0.90 times (95% CI 0.23-3.47) as high in the arrows group than in the inside-out suture group at any point in time after meniscus repair. Three-year success rates (proportions with no reoperations) were 90% (suture) vs 91% (arrows). While the observed difference was just 1% at 3 years, the current sample sizes offer 80% power to detect a difference of 28% at 3 years.

CONCLUSIONS: Posterior horn medial meniscus repair with concomitant ACL reconstruction (NWB 5-6 wks postop) has a clinical success of 90% at 3 years. No significant statistical or clinical differences were observed between techniques with our protocol. However, this study did not include lateral meniscus repairs, large bucket-handle tears of the medial meniscus, or meniscus repair in the absence of ACL reconstruction; therefore, no conclusions can be inferred from this study on these types of meniscus tears.
INTRODUCTION
Chondromalacia of the patella in younger patients is still an unsolved problem and can lead to significant pain and reduction of quality of life. For the treatment of posttraumatic chondromalacia of the patella, the transplantation of autologous chondrocytes cultured on a hyaluronan matrix a non-woven hyaluronan polymer was used and the cells were cultivated for three weeks on this carrier (Fidia Advanced Biopolymer, Abano, Italy). In a second step an arthroscopy was performed followed by a debridement of the defect. The cell aggregate of the hyaluronan matrix was transferred in the defect and fixed with fibrin glue (Baxter, Vienna, Austria). The postoperative rehabilitation was defined with non-weight bearing for 12 weeks, followed by partial weight-bearing for 4 weeks and forced mobilization of the knee. The clinical outcome was evaluated with different knee scores including Lysholm-Score, Marshall-Score, IKDC, and KOOS.

RESULTS
In the postoperative period no infection was observed. In 6 patients (60%) a diffuse swelling and effusion was present for more than 14 days postoperatively. The major change after 6 months compared to the preoperative clinical findings were the reduction of pain and crepitus. The Lysholm score showed a mean value of 57 (SD±7.8) preoperative and reached after 6 months 73.25 (SD±19.3) of 100 possible points (figure 1). The Marshall Score showed a similar result with significant improvement 6 months after operation (figure 2).

CONCLUSION
The matrix-associated techniques for the repair of cartilage defects with autologous chondrocyte transplantation are a further development with good clinical results after 12 months.

Poster #342
MATRIX ASSOCIATED CHONDROCYTE TRANSPANTATION (MACI) FOR THE REPAIR OF CARTILAGE DEFECTS – EARLY CLINICAL RESULTS AFTER 12 MONTHS
Stefan Marlovits, Vienna, AUSTRIA
Gabriele Striessnig, Vienna, AUSTRIA, Presenter

Poster #343
ARTHROSCOPIC SUBTOTAL MENISCETOMY FOR DISCOID MENISCUS IN STUDENT ATHLETES
Hidetoshi Takeda, Tokyö, JAPAN, Presenter
Yasuhiro Samejima, Tokyö, JAPAN
Takaos Saito, Tokyö, JAPAN
Yuutaro Terashima, Tokyö, JAPAN
Koiji Watanai, Tokyö, JAPAN
Takashi Matsushita, Tokyö, JAPAN
Kenji Oguro, Tokyö, JAPAN
Tokyo University School of Medicine, Tokyo, JAPAN
The purpose of this study is to report the clinical results of arthroscopic subtotal meniscectomy for lateral discoid meniscus in student athletes. Between 1991 and 1996, 49 knees of 46 patients with discoid lateral meniscus were treated under arthroscopy in our institution. Of these, 27 knees of 27 patients were selected for this study: student athletes from 12 to 22 years of age at surgery, involved in athletic activities (more than 5 times per week) and without bilateral discoid meniscus, ligamentous instability and/or medial meniscal tear. The average age at surgery was 15.3 years, ranged from 13 to 22 years. There were 19 males and 8 females. The follow-up period was from 69 to 135 months (average: 95 months). All patients underwent arthroscopic subtotal meniscectomy: about 2 to 4 millimeters were resected in all cases. Twenty-three patients returned to active sport, 21 at their previous level. Arthroscopic subtotal meniscectomy is an effective treatment for discoid lateral meniscus in young athletes.

Poster #344
TIBIAL EROSIONS ASSOCIATED WITH RADIAL CLEAVAGE TEARS OF THE LATERAL MENISCUS
Barry T. Tietjens, Auckland, NEW ZEALAND, Presenter
Paul M. Sutton, Auckland, NEW ZEALAND
Neal Stewart, Auckland, NEW ZEALAND
Eastwood Orthopaedic Clinic, Auckland, NEW ZEALAND

The aim of this study was to determine the prevalence of Tibial bone erosions (a valuable radiographic sign) in patients with radial cleavage tears of the lateral meniscus. Radial cleavage tears of the lateral meniscus are uncommon and may be associated with a lateral meniscal cyst. Erosion of the lateral tibial plateau has been described in association with lateral meniscal cysts but is reported to be rare. We believe this radiographic feature is more common than previously reported and not widely recognised by Orthopaedic Surgeons. We identified 44 patients with arthroscopically proven radial cleavage tears of the lateral meniscus. A Skeletal Radiologist (NS) independently assessed the preoperative radiographs specifically looking for an erosion of the tibia just below the lateral joint margin.

Poster #345
EVALUATION OF HYALURONAN SYNTHESIS BY RETROVIRUS-MEDIATED GENE TRANSFER OF HYALURONAN SYNTHASE 2
Kani Tsukiya, Chiba, JAPAN, Presenter
Yuichi Wada, Chuo-Ku, JAPAN
Kan Takase, Chiba, JAPAN
Kouichi Nakagawa, Chiba, JAPAN
Takeshi Yamashita, Chiba, JAPAN
Hiroki Sakai, Chiba, JAPAN
Norimasa Takahashi, Chiba, JAPAN
Sakae Sano, Chiba, JAPAN
Atsuya Watanabe, Chiba, JAPAN
Rie Kofu, Chiba, JAPAN
Yoshikuni Kawaguchi, Chiba, JAPAN
Hiroyasu Moriya, Chiba, JAPAN
Department of Orthopaedic Surgery School of Medicine, 1-8-1 Inohana, Chuo-Ku, Chiba, JAPAN

In this study, we evaluated hyaluronan synthesis using gene transfer of hyaluronan synthase 2 (HAS2) with retrovirus into the clonal chondrogenic cell line ATDC5. Plasmids containing HAS2 with the PMX-IRES-GFP vector which was the retrovirus were transfected into undifferentiated ATDC5. As a control, cells transfected with the empty PMX-IRES-GFP vector were used. And then GFP positive cells were collected by flow cytometry carried out on a FACStar. Transfected undifferentiated ATDC5 cells differentiated in the presence of insulin and we evaluated visualization of pericellular coats which were composed of newly synthesized hyaluronan using by immunofluorescent staining and analysed hyaluronan concentration in culture medium by high performance liquid chromatography. The signal of the cells transfected with HAS2 was visually much stronger than that of control on 3 days and 14 days after differentiation was started and also the hyaluronan concentration of the cells transfected with HAS2 in culture medium was much higher than that of control for 21 days. By transfection of HAS2 with retrovirus, we were able to expect the continuous synthesis of hyaluronan. Therefore this technique may be a great significance in case of autologous chondrocyte implantation.

Poster #346
ARTROSCOPIC ASSESSMENT OF HUMAN CARTILAGE STIFFNESS OF THE FEMORAL CONDYLE AND THE PATELLA WITH A NEW TACTILE SENSOR
Yuji Uchio, Izumo, JAPAN, Presenter
Mitsuo Ochi, Izumo-shi, JAPAN
Nobuo Adachi, Izumo, JAPAN
Kenji Kawasaki, Izumo, JAPAN
Junji Iwasho, Izumo, JAPAN
Masaakazu Karwaka, Izumo, JAPAN
Department of Orthopaedics, Shimane Medical Univ, Izumo, JAPAN

We measured the stiffness of the cartilage of the human femoral condyles via an ultrasonic tactile sensor under arthroscopic control. The stiffness and the degeneration of articular cartilage were assessed in 105 knees in 74 patients (39 men, 35 women, age: 9 - 72 years) who underwent arthroscopic observation or surgery. Twenty-five knees suffered from traumatic cartilage injury, 14 from osteochondritis dissecans, 13 from osteoarthritis, 11 from meniscal injury and 6 from ligamentous injury, bipartita patellae (3 knees), and symptomatic plica synovialis (2 knees). The degeneration of cartilage was classified according to Outerbridge’s grading system. The relationships between the stiffness and the grade of cartilage degeneration, and gender were analyzed. The stiffness of grade I (softening) and II (fissuring less than 0.5 inches in length) was significantly lower than that of intact cartilage. In contrast, the stiffness of grade IV (exposed subchondral bone) was significantly higher than that of any other group. The cartilage stiffness of the patella in women was significantly lower than that in men. The tactile sensor was useful for determining the intraoperative stiffness of healthy and diseased human cartilage in all grades.

Poster #347
ULTRASOUND AND MRI EVALUATION OF KNEE MENISCAL EXTRUSION
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Stefan Desmyter, Gent, BELGIUM
Yves Depaepe, Gent, BELGIUM
Karl Fredrik Almqvist, Gent, BELGIUM
Martine De Muynck, Gent, BELGIUM
Rene E. Verdonk, Gent, BELGIUM, Presenter
Ghent University Hospital, Gent, BELGIUM

Investigation of knee loading has shown that some 50% of the load is distributed through the tibial plateau surface. Some 50% goes through the normal meniscal bodies if intact. In case of partial meniscectomy the presence or the absence of the meniscal wall is of the utmost importance to efficient sharing of the knee load in the disturbed joint. The functional efficacy of...
the meniscus in place under load can be assessed by MRI, but this cannot be routinely done as yet. We have studied meniscal ultrasound images in the normal knee joint and have compared extrusion profile versus meniscal allograft transplantation in weightbearing and nonweightbearing conditions. Individual variation does not yet allow clear validation of results.

Introduction

Full thickness articular cartilage defects have difficulty healing spontaneously and can lead to substantial degenerative changes. Whilst a variety of surgical techniques have been described, no single technique has been shown to have superior efficacy. The Microfracture technique, as described by Steadman, is proposed to release marrow elements (mesenchymal stem cells, growth factors, etc.) to form a “super clot”. The Paste Graft technique, as described by Stone, utilises an osteochondral plug, which is hammered into a paste and grafted into the defect. This study evaluated the biomechanical and histologic properties of full thickness articular cartilage defects in an osteoarthrosis model comparing the paste graft technique, microfracture and a control untreated defect.

Methods

Bilateral anterolateral meniscectomies were performed in 8 adult sheep following ethical approval, and housed for 3 months. Bilateral bicondylar defects (4.3 mm) were created on the femoral condyles. The defects allocated to three groups; control defect, Microfracture or Paste graft technique. The animals were euthanised at 12 weeks. Three additional age matched control animals, that had not undergone meniscectomy, were also evaluated. The femoral condyles were harvested for macroscopic assessment, biomechanical testing and histology. Unconfined compression was performed on the defect sites (meniscectomy group only) and adjacent cartilage using a Mach-ITM Micromechanical Tester (Biosyntech, Canada). Four steps of 50 µm at a ramp rate of 50 µm/s was applied with a relaxation time between each step of 900 seconds. Load versus time data was fitted to the biphasic theory. The defect sites were subsequently fixed in formalin, decalcified in formic acid-formalin, paraffin embedded and stained with H&E and Saffrin-O for light microscopic evaluations.

Results and Discussion:

All samples failed at the fixation site. Both devices performed similarly with mean ultimate loads of 53.0 N in the Fastfix group and 60.0 N in the Rapidloc group.

Arthroscopic repair of meniscal tears has progressed over the past few years with a variety of fixation devices. Bellemans et al., (The Knee, 9:11-14, 2002) recently reported the ultimate load of 8 different repair techniques using the same protocol used in the current study. The Fastfix and Rapidloc devices tested in the current study achieved greater ultimate loads compared to horizontal mattress sutures PDS 1 (52.5 N), vertical loop sutures PDS 1 (46.3 N), T-fix device (47.5 N) as well as all types of Bionix arrow devices as reported by Bellemans and co-workers. The Fastfix and Rapidloc devices are easy to use and provide similar static fixation strength for meniscal tears that are superior to other reported techniques.

Conclusion:

Since the magnetic resonance (MR) imaging has no demonstrated adverse biological effects, it is widely used to assess a wide spectrum of internal knee derangements. The MR imaging contrasting small pathological changes to normal structure has

Poster #349

BIOMECHANICAL TESTING OF MENISCAL DEVICES

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Warwick IM Bruce, Randwick, AUSTRALIA
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Introduction

The meniscus plays an important biomechanical role in knee stability and load transmission. Arthroscopic repair of meniscal tears has been facilitated through a number of devices and techniques. This study examined the static tensile strength of 2 new devices designed for use in the repair of meniscal tears.

Methods

Five pairs of fresh frozen medial human menisci (mean age 42 years old) were harvested from cadaveric donor tissue. All menisci were macroscopically free of any pathology. A longitudinal full thickness tear was made 3 mm from the peripheral rim. The tears were repaired with 2 Fastfix (Smith & Nephew) or 2 Rapidloc (Mitek) devices. The menisci were tested in uniaxial tension using and MTS 858 Bionix testing machine. The menisci were held in the testing machine by two sutures placed 7 mm from the lesions. The tear was extended so that only the repaired portion was allowed to resist loading. The holding sutures were fixed in pneumatic grips and distracted at 50 mm per minute until failure. The ultimate load and failure site were recorded for all samples. Data was analysed using a paired Student’s t-test using SPSS.

Results and Discussion:

All samples failed at the fixation site. Both devices performed similarly with mean ultimate loads of 53.0 N in the Fastfix group and 60.0 N in the Rapidloc group.

Conclusion:

Arthroscopic repair of meniscal tears has progressed over the past few years with a variety of fixation devices. Bellemans et al., (The Knee, 9:11-14, 2002) recently reported the ultimate load of 8 different repair techniques using the same protocol used in the current study. The Fastfix and Rapidloc devices tested in the current study achieved greater ultimate loads compared to horizontal mattress sutures PDS 1 (52.5 N), vertical loop sutures PDS 1 (46.3 N), T-fix device (47.5 N) as well as all types of Bionix arrow devices as reported by Bellemans and co-workers. The Fastfix and Rapidloc devices are easy to use and provide similar static fixation strength for meniscal tears that are superior to other reported techniques.

Poster #350

1.0 TESLA MAGNETIC RESONANCE IMAGING ACCURACY CORRELATED WITH CLINICAL SYMPTOMS AND ARTHROSCOPIC FINDINGS

Yuichi Yosui, Tsukuba, JAPAN, Presenter
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Kotaro Ikeda, Tsukuba, JAPAN
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Introduction:

Since the magnetic resonance (MR) imaging has no demonstrated adverse biological effects, it is widely used to assess a wide spectrum of internal knee derangements. The MR imaging contrasting small pathological changes to normal structure has
capability to improve the clinical diagnosis and decrease the cost associated with arthroscopic examinations that yield negative results. Since the larger magnetic fields have more chance to detect small abnormality, there is tendency to have an apparatus to yield larger magnetic fields. However, the apparatus having higher magnetic field will be costly. This economical disadvantage allows only the clinic that has massive demand for MR imaging to have such an apparatus. Although the 1.0 tesla MR imaging apparatus is still expensive, it is affordable for most of the clinic that is managing variable knee injuries. Therefore, the purpose of our study was to evaluate the efficiency of the 1.0 tesla MR imaging and to find the limitation of the apparatus.

Materials and Methods:
We reviewed eighty-three cases who had been diagnosed meniscal or ligament injury, or both meniscal and ligament injuries by the MR imaging before arthroscopic knee surgeries. There were forty-seven males and thirty-six females. The age range was nine to sixty-four years. We used the 1.0 tesla MR imaging equipment made by Toshiba Inc. A circumferential surface coil was positioned on the patient routinely. The gradient echo method was used for echo formation. The founding from MR image that was read by a resident in our department was compared with that from arthroscopic knee surgery. Accuracy, sensitivity and specificity of MR images were calculated.

Results:
Among 83 cases, medial meniscal tears, lateral meniscal tears, and torn ACLs were found in thirty-seven, thirty-four, twenty-nine cases respectively. Eleven meniscal tears were detected as false-positive study in the MR image. All of those cases showed high intensity change in T-2 weighted image. There were eight false-positive ACL tears. High intensity changes within the ligament in T-2 weighted image were found in those cases. Accuracy, sensitivity, and specificity of meniscal tears in medial and lateral compartment and the torn ACL were as follows. Tears of the medial meniscus: accuracy 86.7%, sensitivity 82.5%, specificity 90.7%. Tears of the lateral meniscus: accuracy 81.9%, sensitivity 85.2%, specificity 90.7%. Tears of the anterior cruciate ligament: accuracy 89.2%, sensitivity 77.8%, specificity 97.9%.

Discussion:
The accuracy and sensitivity of our study was a little lower than that of the previous study. This result could be affected by the differences in the learning curves of an orthopaedic surgeon, and the equipment and protocols we used. It could also be possible that the high intensity change in the T-2 weighted image caused by degenerative change within the meniscus was detected as the non-injured portion by arthroscopy. The intensity change in the ACL is possibly affected by synovium fluid around the ligament because of the accumulative effect during MR image processing. False-positive ACL tear in our study may be caused by this effect.

Poster #443
AUTOLOGOUS CHONDROCYTE TRANSPLANTATION FOR ARTICULAR CARTILAGE DEFECTS IN THE KNEE

Historical Evaluation
Sabreena Mahroof, London, UNITED KINGDOM, Presenter
Lee A David, London, UNITED KINGDOM
Jean Pringle, London, UNITED KINGDOM
Bayliss Mike, London, UNITED KINGDOM
Timothy WR Briggs, London, UNITED KINGDOM
Bone Tumour Unit, Royal National Orthopaedic Hosp, London, UNITED KINGDOM

The purpose of this study is to analyse the short-term clinical and histological results of the treatment of deep chondral defects with autologous chondrocyte transplantation.

This is a prospective study involving 34 consecutive patients receiving autologous chondrocyte transplantation. Chondrocytes from a non weight bearing area of the knee are harvested, then isolated and cultured in vitro. Re-implantation involves injection of the chondrocytes into the defect which is then sealed with a porcine 1/111 collagen membrane. Evaluation consists of clinical assessment, arthroscopy and histological examination. Histological evaluation consists of examination of a biopsy of the transplanted area one-year post-op. Staining techniques include the use of Erlich’s, H&E, Safranin 0 and S100. Using polarised light, the absence of the fibrillar nature of fibrocartilage confirms the presence of hyaline cartilage. Further confirmation can be gained by the examination of messenger RNA content, confirming the presence of type II collagen.

The patients were treated between July 1998 and December 2000. The age range of the patients was 16-51 years (mean age 31 years). Of the 34 patients treated, 19 had right-sided lesions, 17 had left-sided lesions with two patients receiving bilateral procedures. Solitary lesions were treated in 35 knees with two defects being treated in one knee (37 defects in total). The defects were located on the medial femoral condyle in 22 cases, the lateral femoral condyle in 8, the trochlea in two and the patella in 5 cases. The defect size ranged from 1-7cm (mean area 2.88cm2). The follow-up of the patients ranges from 1-39 months (mean 19 months). 25 patients have at least one-year follow-up. Of these patients, using the Britberg Rating, 6 patients have excellent results, with 11 good, 6 fair and 2 poor. The mean Lysholm and Gillquist scores improved from 44.7 pre-op to 76.2 one-year post-op and the mean Verbal Numerical Pain Scores improved from 7.1 to 1.1. Arthroscopy revealed that the transplants were level with the surrounding surface in most cases. Biopsy at one year confirmed the presence of hyaline cartilage in 13 out of 19 cases.

Although the results are short-term, autologous chondrocyte transplantation can provide, with careful patient selection and meticulous surgical technique, an effective treatment for cartilage defects of the knee. The histological results are extremely encouraging and chondrocyte transplantation may be the only procedure to allow regeneration of hyaline cartilage.

Poster #444
ARTHROSCOPIC TREATMENT OF OSTEOCHONDRIITIS DISSECONS OF THE KNEE WITH AUTOLOGOUS “BONE STICKS”
Rogerio Teixeira Da Silva, Peruíbe, BRAZIL, Presenter
Moises Cohen, São Paulo, BRAZIL
Mário Carneiro Jr., São Paulo, BRAZIL
Rogerio Teixeira Da Silva, Peruíbe, BRAZIL
Federal University of São Paulo, São Paulo, BRAZIL

Autologous bone sticks were taken from the ipsilateral tibial metaphysis and used in the arthroscopic fixation of unilateral osteochondritis dissecans of the knee in 11 patients; five of them were female and 6 male. Age varied from 11 to 20 years (mean age 16 years) All of them were involved in sports activities and competitions. Follow-up varied from 15 to 108 months (mean follow-up 48 months). Based on Hughston et al (1984) modified criteria results were satisfactory in 90.9% and unsatisfactory in 9.1% of the cases. Arthroscopic fixation of the osteochondritis dissecans of the knee with autologous bone sticks is technically simple and non-agressive and provides satisfactory results, confirming the presence of hyaline cartilage.
results in most cases. In press, Arthroscopy: The Journal of Arthroscopic and Related Surgery

Poster #452
BIOABSORBABLE PIN FIXATION OF OSTEochondRAL LESIONS OF THE KNEE
Mattikai Rolf Schurhoff, Coral Gables, FL, USA, Presenter
Robin Facis, Coral Gables, FL, USA
John E Zvijar, Coral Gables, FL, USA
Keith Sheldon Hechtman, Coral Gables, FL, USA
John William Unrhe, Coral Gables, FL, USA
UHZ Sports Medicine Institute, Coral Gables, Florida, USA

Purpose: Osteochondral lesions of the knee have been reported extensively in the orthopaedic literature. The purpose of this study is to report our experience of arthroscopic treatment of completely separated osteochondral lesions of the knee with internal fixation using bioabsorbable pins.

Type of Study: Retrospective Analysis

Materials and Methods: 35 patients with symptomatic osteochondral lesions were treated with arthroscopic curettage of the bone bed and fragment, followed by autogenous bone grafting when necessary, and pinning of the lesion with bioabsorbable pins. The patients ranged from fourteen to forty-three years of age (mean age twenty-four). All lesions were completely separated from subchondral bone and the average size was 4.5 square centimeters. The medial femoral condyle was affected in 25 patients, and the lateral femoral condyle was affected in 10 patients. Clinical outcomes were measured using the Lysholm and IKDC scoring systems, follow-up radiographs and MRI, and clinical examination.

Results: Mean follow-up was 48 months. Average Lysholm score was 95. On IKDC assessment 30 of 35 patients reported normal or nearly normal knee function. Radiographic and MRI evidence of incorporation and healing correlated with clinical outcome. Four patients required re-arthroscopy for removal of loose fragments following partial union of osteochondral fragments. Only one patient experienced recurrent effusions and no patients experienced unremitting synovitis.

Conclusions: We have experienced good success with use of bioabsorbable pin fixation for completely separated osteochondral lesions of the knee, and conclude bioabsorbable pins offer an effective method of internal fixation and may alleviate the need for hardware removal.

Poster #351
THE VALUE OF MRI TO DIAGNOSE MENISCAL AND ACL TEARS: SENSITIVITY, SPECIFICITY AND LIKELIHOOD RATIO.
Graeme Campbell Brown, Geelong, AUSTRALIA, Presenter
Geelong Hospital, Geelong, AUSTRALIA

MRI is widely used to image the knee for suspected meniscal and ACL injury. The purpose of this study was twofold: to perform a literature review of this diagnostic modality and to report the “likelihood ratio” (an index of how good a test is). Strict inclusion criteria included: results presented so as to enable a “2x2” table construction and arthroscopy or open procedure as the diagnostic standard. Exclusion criteria included: the use of healthy controls and if the MRI affected the decision to operate. There were 13 papers found that met the criteria. The pooled results were:

1. For medial meniscus tear (MMT): True positive(TP)=332; False Positive(FP)=67; False Negative(FN)=47; True Negative(TN)=293; which gives a Sensitivity=87.6% & Specificity=81.4%
2. For lateral meniscus tear (LMT): TP=144; FP=35; FN=75; TN=469; which gives a Sensitivity=65.8% & Specificity=93.1%
3. For an ACL tear:TP=265; FP=23; FN=28; TN=480; which gives a Sensitivity=90.4% & Specificity=95.4%

The likelihood ratio (LR) expresses the odds that a given test result would be expected in a patient with (as opposed to one without) the target disorder. It is independent of the prevalence so has advantages over the use of the positive and the negative predictive value. Using the above tables for a MMT the LR for a positive result (LR+) = 4.7 while the likelihood ratio for a negative result (LR-) = 0.15; for a LMT, LR+ = 9.5 & LR- = 0.06; and for ACL, LR+ = 19.8 & LR- = 0.1. This implies, for example, that for an MRI that demonstrates a MMT, its 4.7 times as likely that the patient has a MMT as opposed to not having a MMT. Alternatively, if the MRI is negative with respect to a MMT it is about one seventh as likely that the patient has a MMT as against not having a MMT.

Poster #352
INTRAARTICULAR OPIOID INJECTIONS AFTER KNEE ARTHROSCOPY
Artur Gadek, Krakow, POLAND, Presenter
Jerzy Wordliczek, Krakow, POLAND
Wojciech Popiela, Krakow, POLAND
Jagiellonian University, Krakow, POLAND

INTRODUCTION: The discovery of the peripheral opioid receptors, the expression of which takes place mostly during the inflammation process in the peripheral tissues, led to the modification of the analgesic management of the patients after knee arthroscopy.

AIM OF THE STUDY: The study aimed at establishing the role of intra-articular fentanyl or morphine injections to release pain after knee arthroscopy.

MATERIAL AND METHODS: The study was carried out in a group of 360 patients (men and women) qualified for knee arthroscopy due to various reasons. The procedure was performed under general anaesthesia. The patients were randomly assigned to 3 groups. Immediately before surgery the patients from group I received 1mg morphine in 10ml 0.9% NaCl, group II 25 mcg fentanyl in 10ml 0.9% NaCl, and group III 10ml 0.9% NaCl. To relieve pain postoperatively the patients received additionally ketoprofen 100-300mg/24 h, and paracetamol 500mg - 2g/24 h. In all patients daily requirement of additional analgesics was monitored for seven postoperative days, and pain intensity was measured every 6 hours on VAS scale.

RESULTS: Group I and II patients had significantly lower pain intensity measured on the VAS scale in the first 3 postoperative days which correlated with significantly lower requirement of additional analgesics in these groups.

CONCLUSIONS: Postoperative use of intra-articular opioid injections significantly improved patients comfort after knee arthroscopy.
CONCLUSION: An audible squishing sound after IA injection of 1 to 2 cc air will provide a reliable method of confirming accurate IA placement. This simple method is easily reproduced and failure of clinical response to injection with audible confirmation is, therefore, due to patient disease or another diagnosis, not failure of placement.

Poster #354
PROXIMAL TIBIOFIBULAR JOINT GANGLION CYSTS: EXCISION, RECURRENCE AND JOINT ARTHRODESIS
Shana Miskovsky, Columbus, OH, USA
Christopher C. Kaeding, Columbus, OH, USA, Presenter
Lawrence Weis, Columbus, OH, USA
The Ohio State University, Columbus, OH, USA

Objective:
In this paper, we will review the presentation, treatment and outcomes of 13 patients with proximal tibiofibular joint cysts. We will also discuss an alternative treatment option: proximal tibiofibular joint (PTFJ) fusion. Ganglion cysts of the proximal tibiofibular joint are rare entities associated with significant patient disability. The mainstay of treatment is cyst excision however, several authors in the literature have noted recurrence as a significant problem. Our series of patients represents one of the largest to date reported in the literature. No studies to date have evaluated the utility of proximal tibiofibular joint fusion in relieving symptoms and preventing recurrence. Our study includes four patients with successful PTFJ fusions using 6.5mm AO partially threaded cancellous screws.

Methods:
This is a retrospective review of thirteen patients who presented to our institution between 1987 and 1999. Two patients had prior surgery at an outside institution. Medical records and office charts were reviewed for each patient in the study. After this review all patients were contacted and interviewed to complete a phone survey describing their level of activity, any symptoms or mass recurrence, current pain level, any additional knee procedures, and if they currently have no activity restrictions. Morbidity of the procedure and overall satisfaction. Average follow-up from surgery to date of phone survey was 6.3 years (ranged from 1-3-12.9). Average follow-up from surgery to last office visit and to date of detailed functional survey was 1.7 and 6.3 years respectively.

Results:
At presentation, most patients (75%) described a mass or “fullness” of their lateral knee. Seven patients (54%) complained of peroneal nerve dysesthesias. On MRI, cysts appeared dark on T1 and bright on T2-weighted images. Twelve patients elected to undergo surgery. Eight patients underwent cyst excision and four underwent cyst excision combined with arthrodesis of the proximal tibiofibular joint. There is no recurrence rate for this type of cyst quoted in the literature due to the rarity of the disorder, small patient samples and limited follow-up. However, over our post-operative follow-up period, we observed a recurrence rate of 25% following simple cyst excision. Our study includes four patients (two with a history of recurrence) with successful PTFJ fusions using 6.5mm cancellous screws. All of these patients are without subsequent cyst recurrence and currently have no activity restrictions. Morbidity of the procedure itself appears to be minimal. One patient developed tenderness over the screw tip necessitating removal and another developed mild lateral ankle pain which did not significantly interfere with her activity.

Conclusions:
Proximal tibiofibular cysts are rare entities that can cause significant disability in active patients. These cysts appear to have a high rate of recurrence after simple surgical excision. In the
setting of multiple recurrences, joint arthrodesis seems to have a valuable role. Due to its low morbidity, when used as a primary procedure, arthrodesis may be more effective than traditional cyst excision. Additional studies are needed to further examine the role of PTFJ fusion in the treatment of these peculiar ganglion cysts.

Poster #355
BIOMECHANICAL ANALYSIS OF DISTAL BICEPS TENDON REPAIR METHODS
Jon Henry, Manitowoc, WI, USA
Grant L. Jones, Columbus, OH, USA
Christopher C. Kaeding, Columbus, OH, USA, Presenter
Alan Litisky, Columbus, OH, USA
The Ohio State University, Columbus, Ohio, USA

Objective:
The distal biceps brachii tendon inserts on the posterior-ulnar aspect of the bicipital tuberosity, and its principal function is forearm supination. We hypothesized that repair of the distal biceps tendon to the anterior aspect of the tuberosity would compromise forearm supination function. The purpose of this study was to compare the biomechanical properties of a distal biceps tendon repair to the anterior aspect of the bicipital tuberosity, typical of a single incision technique, with a repair to the posterior aspect of the tuberosity, as accomplished with a two-incision technique.

Methods:
Each of four matched pairs of fresh-frozen cadaveric upper extremity specimens were dissected and prepared for repair of the distal biceps tendon using either an anterior or posterior reattachment with transosseous suture fixation. Specimens were tested on a MTS (Minneapolis, MN) with an intact distal biceps insertion and again following repair. A load cell at the level of the DRUJ determined the resultant elbow flexion force and forearm supination torque produced by a 100 N force applied to the proximal aspect of the tendon.

Results:
A Student's T-test (p<0.05) was used to evaluate this data among three groups: group A, anterior distal biceps tendon repair versus intact tendon; group B, posterior repair versus intact tendon; and group C, posterior repair versus anterior repair. For both elbow flexion force and forearm supination torque no significant differences were found within any of the three groups.

Conclusion:
This study supports our null-hypothesis demonstrating equivalent biomechanical results for repair of the distal biceps tendon to either the anterior or posterior aspect of the bicipital tuberosity.

Poster #356
THE INTRODUCTION OF THE SIMPLE BODY CONDITIONING EQUIPMENT FOR PATIENTS AT HOME
Tamiko Kamimura, Satama, JAPAN, Presenter
Kunikiko Andoh, Nagano, JAPAN
Shin Sugiura, Tokyo, JAPAN
Sports Medicine Institute for Life Enhancement, Itabashi, JAPAN

The muscle exercises around the joints especially knee at home were described as one kind of the way of daily rehabilitation for orthopedic disorders. And a lot of tools and methods have been developed and some of them had problems because of their complicated direction of use, higher prices as a personal product or unwelcome appearances for living space.

However home programs of body conditioning without tool and machine like Yoga or Pilates’ matwork are beginning to spread among all age groups with orthopedic disorders.

We focused on recent popular home programs of body conditioning and designed a simple tool which consists of 23.0 by 14.0 by 7.5 cm E.V.A. block named FITBLOCK (Sports Medicine Institute for Life Enhancement, Tokyo, Japan) to assist home exercises of patients at low price, without disturbance of living space. We designed this block for various home exercises including stretches and we used its 7.5 cm width mainly. This width could fill the gap between popliteal region and floor of hamstring string and fill the intercondylar gap of supine pelvic tilt. For strengthening we placed it at innerthigh for buttck squeeze as a substitution for towels. Other cushion squeeze exercises could be done easier to make use of elasticity and resistance of E.V.A. And for squat exercise of the osteoarthritic knee, we placed it at intermalleolar gap for valgus deformity and at intercondylar gap for varus deformity. We also used for unsymmetrical squat. The material of this product has moderate consistency which is comfortable for patients’ skins and muscles. We will introduce these exercises with this block using illustrations and photos.

Poster #357
POSTERIOR “BACK AND FORTH” ARTHROSCOPIC APPROACHES ON THE POSTERIOR KNEE COMPARTMENTS
Stephane Loussia, Fresnes, FRANCE, Presenter
Olivier Charrois, Le Chesnay, FRANCE
Philippe Beaufils, Le Chesnay, FRANCE
Mignot Hospital, Le Chesnay, FRANCE

Purpose: To evaluate the feasibility, indications, and usefulness of a new arthroscopic approach to the posterior knee compartments.

Type of study: experimental in one cadaver and descriptive in six patients.

Methods: We developed an arthroscopic approach to the posterior knee compartment involving use of a postero medial portal and a posterolateral portal opposite each other. Each posterior portal is used in alternation for the arthroscopic and instruments. The posterior portals are established using an original “back and forth” technique.

Results. The cadaver study showed that the technique was feasible. It allowed us to define safety rules to protect the vessels and nerves that course through the popliteal fossa. The approach provided a broader field of view as compared to previously described techniques. After removal of the septum dividing the posterior compartment, the synovial fold enclosing the posterior cruciate ligament and lining the upper and posterior parts of the posterior capsule was readily accessed, suggesting that this approach may be particularly valuable for total synovectomy. This was confirmed by results in six patients with villonodular synovitis, in whom the new approach was used in combination with arthroscopic anterior synovectomy.

Conclusions: This approach allows removal of parts of the synovium that are difficult to access through conventional arthroscopic approaches. For total synovectomy, it can be used as an alternative to open posterior synovectomy, in combination with arthroscopic anterior synovectomy.

Poster #358
SURGICAL APPROACH TO THE ACHILLES TENDON AND A PROGRAMME OF PHYSIOTHERAPY AFTER SURGICAL TREATMENT OF ACHILLES TENDINOSIS

Mikkêl Marined, Tallinn, ESTONIA, Presenter
Egle Seppe, Tallinn, ESTONIA
Eldar Annus, Tallinn, ESTONIA
Mustamäe Hospital, Tallinn, ESTONIA

We evaluated retrospectively a "S-type" scar after Achilles tendon repair. 102 sporty active people, 13 females (17-55 yrs, mean 36 yrs) and 89 males (17-62 yrs, mean 37 yrs) were operated because of Achilles tendon rupture or Achilles tendinosis, in all cases "S-type" skin incision was used. The incision starts proximally in the middle of the tendon and curves laterally making a figure of "S" ending distally on the lateral edge of the Achilles tendon. All patients returned to their previous activities during a year following the operation. There were no cases of reruptures, nor any major problems with wound healing. All patients were satisfied with the cosmetic result of a scar. This incision gives a superb low-tension opening to the Achilles tendon and what we consider most important – a highly elastic scar for sporty active people and a good cosmetic result. Additionally we propose a physio-therapy programme for athletes after surgical treatment of Achilles tendinosis.

Poster #359
RUPTURED BAKER’S CYST IMITATING COMPARTMENT SYNDROME
Lerent Baluc, Kocaeli, TURKEY
Hakare Kurt, Kocaeli, TURKEY
Sefa Mazizinoglu, Kocaeli, TURKEY, Presenter
Kocaeli University School of Medicine Dept of Orth, Ismit, TURKEY

We present two patients with ruptured Baker’s Cyst that had been referred to us with the diagnosis of compartment syndrome and thrombophlebitis. Both patients were middle-aged previously healthy males. On physical examination they both had a swollen and tender calves with minimal pain in passive dorsiflexion of toes and feet. Laboratory tests were normal including prothrombin and partial thromboplastin times. Doppler venous ultrasonography was unremarkable. Magnetic resonance imaging showed popliteal cyst formation in both patients, one dissecting between gastrocnemius and soleus muscles in the proximal calf. Both patients had similiar treatment regimen including immobilization and elevation of the involved extremity, cold dressing and non-steroidal antiinflammatory drugs. Their symptoms subsided on the second day.

In patients presenting with calf compartment syndrome symptoms, one has to consider knee internal derangements involving the Baker’s Cyst. In almost all previous reported cases of ruptured Baker’s Cyst and compartment pressure changes resulted in fasciotomies. In our cases, early diagnosis of the cyst rupture avoided us doing a fasciotomy. Thorough examination including knee should be done in order to avoid overtreatment of this rare disorder.

Poster #360
PERIOPERATIVE AUTOTRANSFUSION IN TOTAL KNEE ARTHROPLASTY
Raj K Reddy, Midland, TX, USA, Presenter
Midland Memorial Hospital, Midland, TX, USA

Blood loss could be significant followed by total knee arthroplasty. 50 consecutive arthroplasties were performed. Transfusion was utilised by “ortho pat” processing system. Salvaged blood was recovered concentrated washed “PRBC” was reinfused therby minimising the blood usage with no complications reducing the strain on the present blood bank. Preoperative HB,HCT and post operative HB,HCT showed acceptable drop. All transfusions were uneventful and well tolerated. Tourniquet was utilised in all patients. Closed suction drainage was used as recommended by the manufacturer. Average operative time was one hour and thirty minutes. Majority procedures were primaries and some revisions were included in the study. With the increase in demand of blood and dwindling blood supplies this will be an alternative to utilize in all orthopedic procedures safely.

Poster #361
ANTERIOR KNEE PAIN AFTER TIBIAL INTRAMEDULLARY NAILING
Christos K Yiannakopoulos, Athens, GREECE, Presenter
Emmanuel Antoniogiannakis, Athens-Cholargos, GREECE
Georgios Anastasias Baalakis, N. Iraklio Attikis, GREECE
Kostas Karlafts, Athens, GREECE
C. Karamoulis, GREECE
Antronios Ilialis, Athens, GREECE
401 General Army Hospital, Athens, GREECE

Anterior knee pain is considered to be a common complication of tibial nailing. We studied the incidence of anterior knee pain in 49 patients with closed tibial diaphyseal nailing treated at our institution between 1999 and 2001. In all cases the nail was inserted into the tibia without allowing any prominence. The length of follow-up was 14.6 months (9-36 months). The presence of spontaneous pain and pain on palpation and several activities was ascertained. In 22 patients the surgical trauma to the knee was drained postoperatively and in 27 not. There was no difference between these two groups regarding wound complications. The incidence of anterior knee pain of any intensity at latest follow-up was 19.14% (9 patients). Scar tenderness was noted in 19 patients (38.77%) but was significant in only 2 patients. The length of the incision was longer in the group of patients with anterior knee pain (6.5 cm vs 4.2 cm). Anterior knee pain is common following tibial intramedullary nailing but it severity is not incapacitating.

Poster #362
THE INCIDENCE OF VASCULAR COMPLICATIONS IN PATIENTS SUBMITTED TO KNEE ARTHROSCOPY BASED ON COLLOR FLOW DUPLEX SCANNING FINDINGS.
Emerson K. Zanoni, Curitiba, BRAZIL, Presenter
Edilson Schwanser Thiele, Curitiba, BRAZIL
Marilo Cesar Santos, Curitiba Parana, BRAZIL
Henrique Carvalho, Curitiba, BRAZIL
Alvaro Chamecki, Curitiba, BRAZIL
Clinica do Joelho, Curitiba, BRAZIL

Between November 1998 and May 1999, 35 patients previously submitted to a knee arthroscopy were submitted to a colored eco-doppler exam, performed by the Siemens Elegra device, between November 1998 and May 1999. 35 patients previously submitted to a knee arthroscopy were submitted to an colored eco-doppler exam, performed by the Siemens Elegra device, with a 5 mhz transducer. Examining the deep venous system submitted to a knee arthroscopy were submitted to an colored eco-doppler exam, performed by the Siemens Elegra device, with a 5 mhz transducer. Examining the deep venous system were submitted to a knee arthroscopy were submitted to an colored eco-doppler exam, performed by the Siemens Elegra device, with a 5 mhz transducer. Examining the deep venous system included in the study. With the increase in demand of blood and dwindling blood supplies this will be an alternative to utilize in all orthopedic procedures safely.
was repeated in the 9th and 10th post-op day. 6 patients (4 men and 2 women) had DVT in the post-op, 2 in the right knee and 4 in the left knee. 4 cases occurred in the fibular vein, 1 in the muscular vein of the calf and one in the posterior tibial vein. One of them had pulmonary thromboembolism. The main objective of this study was to evaluate the DVT incidence in otherwise healthy patients submitted to a knee arthroscopy and the eventual necessity of prevention.

**Shoulder Instability**

**Poster #363**

**ARTHROSCOPIC FINDINGS IN CHRONIC ANTERIOR SHOULDER INSTABILITY IN MALES 18 TO 30 YEARS OLD**

Emmanuel Antonomiannakis, Athens-Ciliorgios, GREECE, Presenter
Christos K Yiannakopoulos, Athens, GREECE
Kostas Karielaitis, Athens, GREECE
Georgios Anastasios Bafidis, N. Iraklio Attikis, GREECE
Christos Karabalis, Athens, GREECE
Gerassimos Gialas, Athens, GREECE
Panos Efstatistou, Athens, GREECE
Antonios Iliadis, Athens, GREECE
401 General Army Hospital, Athens, GREECE

We report our results from the treatment of male patients with chronic anterior shoulder instability who have been treated arthroscopically. Between 1999 and 2002 we treated 76 patients with anterior shoulder instability. All patients have been examined arthroscopically prior to the final treatment which was arthroscopic reconstruction in 59 and open reconstruction in 17. Mean time between first dislocation and operation was 2-10 years. The number of dislocations and subluxation ranged between 9 and over 50. All patients were male soldiers, aged 18-30 years. All intraoperative findings have been recorded. Bankart lesion and its variants was noted in 71 patients (93.42%), Hill-Sachs lesion in 42 patients (55.25%), HAGL lesion in 2 cases (2.6%), SLAP lesions in 16 patients (21.05%) and loose bodies in 7 patients (9.21%). There was no case with lesion in 2 cases (2.6%). SLAP lesions in 16 patients (21.05%) and loose bodies in 7 patients (9.21%). There was no case with a rupture of the capsule. In all cases the labrum detachment was achieved using suture anchors. High incidence of labrum lesions was ascertained in our series of young males with chronic shoulder instability. This group of patients is amenable to arthroscopic reconstruction.

**Poster #365**

**THERMAL CAPSULORRAPHY FOR THE TREATMENT OF MULTI-DIRECTIONAL SHOULDER INSTABILITY IN FEMALE VOLLEY PLAYERS**

Daniel Comba, La Loggia-TO, ITALY, Presenter
Mauricio Xavier Motta-Navas, Torino, ITALY
Ospedale Evangelico Valdese, Torino, ITALY

**PURPOSE OF THE STUDY:** The aim of this prospective study was to evaluate the Arthroscopic Thermal Shrinkage for the treatment of multi-directional shoulder instability in a selected population of female volleyball players (amatorial).

**METHOD:** Thermal capsulorraphy has controversial results in the previous published study. We performed a prospective study of a population of 6 female athletes (amatorial) with capsular redundancy and multi-directional shoulder instability. All patients failed at the non-operative rehabilitation program. The predominant direction of the instability was anterior/inferior (4/6). None of the athletes had a complete or voluntary dislocation. Thermal Capsulorraphy was performed with the “grid” technique. No shrinkage was done between 5.30 to 6.30 position to avoid damage to the axillary nerve. The treated shoulders were maintained 5 weeks in a sling immobilization. Patients were reviewed at the follow-up at 12 and 24 months with measurements of subjective and objective instability, function, pain and range of motion.

**RESULTS:** 1 patient had recurrence of the instability (posterior direction predominant). No axillary nerve disfunction were found at the 12 months follow-up. 1 patient had a limited range of motion at 12 months, recovered at 24 months.

**Poster #366**

**ARTHROSCOPIC LABROPLASTY FOR INSTABILITY DUE TO LIGAMENTOUS LAXITY**

Jar De Beer, Oranjepoort, SOUTH AFRICA, Presenter
Barr Berghs, Brugge, BELGIUM
Karrie van Rooyen, Cape Town, SOUTH AFRICA
Cape Shoulder Institute, Cape Town, SOUTH AFRICA

**AIM OF THE STUDY:** To evaluate the clinical outcome of arthroscopic labroplasty for shoulder instability.

**Material and Methods:** 56 Patients were treated with arthroscopic labroplasty for shoulder instability due to ligamentous laxity. In our technique, the antero-inferior labral-capsular complex is detached and mobilized from the glenoid. It is advanced superiorly and plicated, hereby re-creating a new labrum, re-tensioning the capsule and decreasing the articular volume. Usually, a rotator interval plication was added as well. Postoperatively, an adduction sling was applied for comfort during the first 3 weeks, but patients were allowed to move within pain limits. They were clinically reviewed and scored (Walch-Duplay) after 12 to 74 months (average: 26 months).
Results: No intra-operative complications or nerve injuries were encountered. There was only 1 failure with frank re-dislocation. The mean Walch-Duplay score was 88/100 (range: 10-100).

Discussion: Redundant capsule and a hypoplastic labrum are common in unstable shoulders due to ligamentous laxity. The labroplasty creates a bumper and addresses the excess of capsule. In our short term experience, this arthroscopic technique is superior to the open capsular shift and has become our surgical method of choice to deal with this type of shoulder instability.

Poster #367
THE MODIFIED LATARJET PROCEDURE FOR INSTABILITY WITH BONE LOSS
Bart Bergis, Brugge, BELGIUM
Joe De Beer, Oranjezicht, SOUTH AFRICA, Presenter
Hein De Jongh, Cape Town, SOUTH AFRICA
Cape Shoulder Institute, Cape Town, SOUTH AFRICA

Aim of the study: To evaluate the clinical outcome of our method of the Latarjet procedure for instability with bony insufficiency of the glenoid

Materials and Methods: 70 such patients were treated (1996-2001). Our modification of the Latarjet: 1.A long piece of coracoid is detached. 2. It is rotated to match its concave inferior surface with the edge of the glenoid 3. The capsule is repaired with bone anchors to the edge of the glenoid, placing the coracoid graft extra-articular. Postoperatively no sling is applied and early rehabilitation is started. They were clinically reviewed and scored (Walch-Du Play) after 9-72 months (av.: 24)

Results: Excellent: 68%, Good: 25%, Moderate: 6%, Poor: 1%
There were no re-dislocations.

Discussion: The results of this procedure were most satisfactory in this group of patients who were mostly contact sports persons, where soft tissue procedures (e.g., open and arthroscopic Bankarts) are associated with unacceptable failure rates.

Poster #368
MONOPOLAR ELECTROTHERMAL SHOULDER REPAIR FOR INSTABILITY
Stephen W. Houseworth, Colorado Springs, CO, USA, Presenter
Premier Health Plaza, Colorado Springs, CO, USA

PURPOSE: This is an ongoing clinical study to assess the efficacy of monopolar electrothermal shoulder capsular repairs performed by a single surgeon.

METHODS: This study began in July 1997 and continues. To this date, 160 shoulder stabilization procedures have been performed. The indications for this procedure have evolved during this time and now excludes those patients who have multidirectional instability. The causes of instability have been both direct direct trauma such as from sports or motor vehicle accidents and/or from “cumulative micro-trauma” such as from weight lifting over many years. All other shoulder pathologic conditions such as SLAP lesions, Bankart lesions, rotator cuff tears, and biceps tendon instability have been addressed at the time of surgery. The monopolar electrothermal radio frequency device from Oratec International (Menlo Park, CA, USA) has been used for all procedures. Critical to the success of this technique is a physical therapy program customized for each patient to weekly assess progress after surgery. Further rehabilitation is advanced or delayed as indicated for a minimum of 4 months after surgery.

RESULTS: 148 of 160 patients have obtained stable shoulders (92.5%). Each patient with a stable shoulder has returned to within 91% of their preoperative range of motion. The failures have occurred in patients who had multidirectional instability (included in the initial months of this study) and those who were noncompliant with postoperative instructions. The overall patient satisfaction with this procedure has been excellent.

CONCLUSIONS: Monopolar electrothermal shoulder repair has been a very useful adjunct to the treatment of unidirectional shoulder instability when combined with repair of other shoulder pathologic conditions. The author believes that the postoperative physical therapy program is equal to if not more important than the surgical techniques to ensure the success of this technique.

Poster #369
LONG TERM FOLLOW-UP OF RADIOFREQUENCY HEAT PROBE USE DURING ARTHROSCOPIC STABILIZATION OF THE SHOULDER
Peter Benjamin MacDonald, Winnipeg, CANADA, Presenter
Myrna Gwen Dyck, Winnipeg, CANADA
University of Manitoba, Winnipeg, CANADA

The purpose of this study was to follow results of arthroscopic stabilization using a new technique either as an adjunct or as the primary method of stabilization. Seventy-five (75) cases of arthroscopic stabilization using a radiofrequency heat probe were reviewed at a follow-up of 24-51 months. Of these cases, there were fifty-eight with a diagnosis of anterior instability (41 of those had a Bankart lesion which was also repaired), ten with a diagnosis of posterior instability, and fourteen with a diagnosis of multidirectional instability. In the anterior instability patients with an associated Bankart lesion, the Bankart repair was done with suture anchors and knot tying with supplementary stabilization using the heat probe on the superior, middle and inferior glenohumeral ligaments. In the other cases, the heat probe was used alone on either the posterior capsule in posterior instability or the anterior and posterior capsule in multidirectional instability patients.

There were no complications of infection or nerve injury. There were seventeen cases of recurrent instability (22.67%). Four of the seventeen (23.3%) recurrences were revision cases of previous failed open stabilization. One of the cases of recurrent instability was in a patient with an ALPSA lesion, which had not been repaired. Of the remaining, two were in traumatic unidirectional instability with a Bankart lesion, one of which was later determined to be an inadequate repair.

The heat probe was most successful in first time stabilization of traumatic unidirectional instability as an adjunct to a Bankart repair (recurrence rate 3/40, 7.5%). Results seem to indicate some clinical situations in which this method of stabilization is not recommended. In particular, we do not recommend this technique in revision cases of previous failed open surgery.

Poster #370
SOME ORIGINAL TECHNIQUES AND SIMPLE DEVICES FOR PERFORMING THE ARTHROSCOPIC BANKART REPAIR SECURELY WITH TWO PORTALS
Yasumoto Matsui, Oita, JAPAN, Presenter
Takaaki Omacchi, Togohashi, JAPAN
Chiude National Hospital, Oita, JAPAN
[Purpose] One of the merits of the arthroscopic Bankart repair is its less invasiveness, and the less portal the more cosmetic advantage. We present our original techniques and simple device for performing the arthroscopic Bankart repair securely with two portals.

[Operative techniques] Patients are laid in the lateral decubitus position with the traction in 60 degree abduction and 20 degree flexion. View is got from the posterior portal. The anterior portal is made just above the superior tendon slip of the subscapularis, and 8 or 10 millimeter semi-transparent plastic canula is inserted. The key for our Bankart repair technique is to make the best use of loop relays described as follows. First anterior labrum and glenoid edge are refreshed and a suture anchor (mini-revo screws) with No2 thread is inserted into the glenoid edge. Threads are pulled out of the posterior portal once. Anterior tissues (labrum, IGHL or capsule) is pieced with suture hooks (Linvatec Co.), fixed with our original holder (made by Meira Co. Nagoya Japan). The holder is then detached and both ends of 75cm nylon thread are inserted into the suture hook hole and they are grasped by a small punch inside of the joint. Then the hook is retrieved, letting the thread as it is with the loop remained outside of the joint. Crossing another thread with the loop, and by pulling the first thread, the loop is exchanged (the direction of the loop is forward). The loop is once pulled out of the joint and hooked by a suture retriever and then pulled back into the joint together with the retriever. The thread attached to the anchor is taken with the retriever through the loop and is pulled anterior out of the joint. By pulling the loop of nylon, the thread goes through the tissue. (For mattress suture, this procedure is repeated.) And the knot is tied using knot pusher.

[Discussion] This procedure may appeared to be complicated, but once you get accustomed, it is a safe and effective way. The third portal is not necessary because the shuttle relays are not used. And it can be applied to the repair of the any types of Bankart lesions.

**Poster #371**
**ARTHROSCOPIC STABILIZATION OF COLLISION ATHLETES**
Augustus D. Mazzucca, West Hartford, CT, USA, Presenter
Dominic S. Carreira, Chicago, IL, USA
Frederick M. Brown, Chicago, IL, USA
Jennifer Hayden, Chicago, IL, USA
Anthony Romeo, Chicago, IL, USA
Midwest Orthopaedics, Rush-Presbyterian-St. Luke’s, Chicago, IL, USA

Introduction: Repair of the anterior labrum (Bankart lesion) with tightening of the ligaments (capsulorrhaphy) is the recommended treatment for recurrent anterior glenohumeral dislocations. Current arthroscopic anterior stabilization results are similar to open techniques. However, most surgeons still consider future participation in collision or contact sports as a contraindication to arthroscopic stabilization. Purpose: The purpose of this study is to examine the long-term results of arthroscopic anterior shoulder stabilization of high demand collision and contact athletes. Methods: Thirty collision and 5 contact athletes were identified from the senior surgeons case registry. The analysis was limited to patients under the age of 20 that were involved in collision athletics (Football) or contact athletics (Wrestling, Soccer). Objective testing included pre- and post-operative range of motion and stability. Outcome measures included the ASES score, Simple Shoulder Test, SF-36, visual analogue scale and Rowe scores. The surgical procedure was performed in a consistent manner: suture anchor repair of the displaced labrum, capsulorrhaphy with suture placement, supplemented with thermal treatment of the capsule when indicated, and occasional rotator interval closure, all performed in the beach-chair position. Average follow-up was 37 months (range 24-66). Results: Two of 13 (15%) collision athletes experienced recurrent dislocations after the procedure. One patient failed after 5 years when diving into a pool; he had played three years of high school football. One patient failed in his second season after his stabilization (>2 years) when making a tackle. None of the contact athletes experienced a recurrent dislocation with all of them returning to high school or college athletics. Discussion: 100% of all collision and contact athletes returned to organized high school or college sports. Fifteen percent of those collision athletes had a recurrence (subluxation not dislocation), which has not required treatment. Participation in collision and contact athletics is not a contraindication for arthroscopic anterior shoulder stabilization using suture anchors, proper suture placement, capsulorrhaphy, and occasional rotator interval plication.

**Poster #372**
**THERMAL CAPSULAR SHRINKING IN THE TREATMENT OF UNSTABLE SHOULDERS IN ATHLETES – AN ALTERNATIVE METHOD?**
Hans-Gerd Pieper, Essen, GERMANY, Presenter
Nicole Alexandra Hunger, Essen, GERMANY
Rene Tibussek, Essen, GERMANY
Sabine Sørries, Essen, GERMANY

Introduction
Arthroscopic thermal capsulorrhaphy either by laser or by radiofrequency has recently been considered an alternative in operative stabilization of the shoulder joint. It can be used to tighten elongated capsulo-ligamentous structures in multidirectional instabilities as well as recurrent shoulder dislocations. If there is global capsular laxity without an injury of the capsulo-labral insertion, a so-called Bankart lesion. Some authors describe the use of thermal capsuloplasty in addition to arthroscopic Bankart repair.

Materials and Methods
Between March 1999 and February 2001, arthroscopic thermal capsulorrhaphy was performed as the only operative procedure in 35 patients (21 males, 14 females) with either recurrent shoulder dislocations (n = 14), subluxations (n = 4) or subacromial syndrome secondary to antero-inferior or multidirectional instability (n = 17). In all of these patients the capsulo-labral complex was intact at the time of surgery - none of them had a Bankart or HAGL lesion. The average age at surgery amounted to 28.9 years (15 - 62). Of those 35 patients operated on, 29 (19 males, 10 females) could be examined at a follow-up time of one year or more (average 22.1 months, 12 - 33) either personally (n = 18) or by use of a questionnaire (n = 11) specifically designed to get information on pain, function, strength, and degree of activity exhibited in daily life, which are needed for the Constant Score and the Rowe Score. Of these patients, 4 were professional athletes, 11 participated in competitive and 10 in recreational sports. 4 patients were not active in sports at all.

Results
Mid-term results of this procedure are very encouraging. The professional athletes had the best results (average Constant Score 102.7 %, average Rowe Score 98.5), followed by those active in recreational sports (C.S. 93.5 %, R.S. 91.4) and the competitive athletes (C.S. 89.9 %, R.S. 87.0). Those patients not active in any sports still had very good average results with a mean of 90.2 % (C.S.) and 88.0 (R.S.) respectively. Only 2
patients in this study developed any recurrent instability within the time of follow-up.

Poster #373

ROLE OF THE LATISSIMUS DORSI IN ANTERO-INFERIOR SHOULDER DISLOCATION IN CADAVERS
Nicole Pouliart, Antwerp, BELGIUM, Presenter
Olivier Gagey, le Kremlin-Bicêtre, FRANCE
Institut d'Anatomie, Paris, FRANCE

Purpose: To determine the possible role of the latissimus dorsi in preventing shoulder dislocation.

Material and methods: In twenty fresh cadaver shoulders a capsuloligamentous lesion from the inferior glenohumeral ligament complex up to and including the superior glenohumeral ligament was created through an axillary approach, leaving the surrounding muscles intact. In ten shoulders the section was carried out on the glenoid side and in ten on the humeral side, followed by a dislocation manoeuvre. If no locked antero-inferior dislocation resulted, the latissimus dorsi (in 7 shoulders) or the subscapularis (in 3 shoulders) were detached from their humeral insertion. The dislocation manoeuvre was then repeated.

Results: With lesions on the glenoid side, a locked antero-inferior dislocation always could be produced after section of only the ligaments. Ligamentous lesions on the humeral side, however, resulted only in a locked anterior dislocation in 7 shoulders and in a metastable dislocation in 3 shoulders. After sectioning the latissimus dorsi a locked antero-inferior dislocation was possible in all 10 specimens.

Conclusion: In a cadaver model where the muscular envelope of the shoulder is left intact, the latissimus dorsi can prevent inferior glenohumeral dislocation when the capsuloligamentous lesions are situated on the humeral side. The latissimus dorsi plays no role when the lesions are situated on the glenoid side.

Poster #374

MID-SUBSTANCE TEAR OF GLENOHUMERAL LIGAMENT AS A CAUSE OF RECURRENT ANTERIOR DISLOCATION OF THE SHOULDER: EVALUATION WITH ABDUCTION AND EXTERNAL ROTATION MR IMAGING
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Purpose: To investigate the value of the abduction and external rotation MR imaging (ABER-MRI) for detection of mid-substance tear of glenohumeral ligament (capsular tear) in patients with recurrent anterior dislocation of the shoulder.

Materials & methods: Both shoulders of the 10 patients (mean age, 30 years; range, 15-46 years; 5 male and 5 female patients) with recurrent anterior dislocation caused by capsular tear were assessed. The tears were located at glenoid-side in 5, mid-portion in 3, and humeral-side in 2. MR imaging with the shoulder in abduction and external rotation was performed with a permanent magnetic system (0.3-T Hitachi MRP 20, Hitachi Medical, Japan). Gradient-echo images (TR/TE=600/23, FA=40°) in the axial plane were obtained. The assessments were compared with thearthroscopic findings.

Results: The thinning of the capsule was detected in affected side of the 8 patients. Five patients with glenoid-side tear showed the signal change near the glenoid. Three patients with mid-portion tear showed severe thinning or disappearance of the capsule. In 2 patients with humeral-side tear showed normal capsular appearance. All the unaffected sides showed the low signal intensity of normal capsule without thinning, which were clearly different from the abnormal findings in the eight affected shoulders. Comparison between findings in both sides of the shoulder was useful in evaluation of the thinning.

Conclusion: The ABER-MRI appears to be valuable in detection of capsular tear at the glenoid-side and the mid-portion except for the humeral-side tear.

Poster #445

CLINICAL OUTCOME OF ARTHROSCOPIC ANTERIOR SHOULDER STABILIZATION: TWO-TO-SIX YEAR FOLLOW-UP
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Background: The purpose of this study was to retrospectively evaluate the surgical outcome of the arthroscopic repair of the capsulolabral lesion using suture anchors in a large series of patients who were followed-up for mid-term.

Materials: We evaluated 167 patients with traumatic recurrent anterior shoulder instability after an arthroscopic Bankart repair using suture anchors. The mean age at the time of the operation was 26.2 years (15-46 years). There were 149 male and 18 female patients. Before the index surgical procedure and at the time of follow-up at a mean of 44 months (range, 24-75 months), we used three documented tools for the outcome measurement. The rating scale of the University of California at Los Angeles (UCLA), the America Shoulder and Elbow Surgeons Standardized Shoulder Assessment Form (ASES), and the Rowe et al. We also utilized patients' subjective assessment of their shoulder function compared to the preinjury level by a visual analogue scale. Examination of shoulder range-of-motion focused on the loss of external rotation with the arm at the side and 90° abduction, compared to the opposite shoulder. We used paired sample T-test to assess the difference between the preoperative and postoperative shoulder scores. To evaluate preoperative risk factors that are associated with the postoperative recurrence of the instability, we used survival analyses because the follow-up duration was not the same in all patients. The Gehan test was used for the survival analyses. Fisher exact test was used to evaluate the relationship between the return to activity and sports activity in patients with postoperative recurrent instability.

Results: Seven patients (4.2%) had recurrent instability, including 1 patient with frank dislocation, 2 patients with subluxation, and 4 patients with positive anterior apprehension test. At the follow-up, the mean shoulder scores were improved (p<0.05). According of the rating scale of Rowe et al., one hundred and thirty patients (77.8%) had excellent, 29 (17.7%) good, 6 (3.6%) fair, and 2 (1.2%) poor scores. The mean loss of range of motion was 2.2° for forward elevation, 2.0° for external rotation, and less than one vertebral level for internal rotation. Patients' activity increased significantly after the surgery (p<0.001). One hundred and fifty-eight patients (95%) returned satisfactory to previous activities. Two patients had transient sensory change in the operated arm, which was relieved completely in a few
days. Three patients had postoperative adhesive capsulitis, which eventually resolved. There was no infection, skin problem, or hardware problem. Within the follow-up periods, none of the patients showed sign of degenerative arthritis in the plane radiographs. The degree of glenoid defect was significantly related with the postoperative recurrence of the instability as a risk factor \( p<0.0001 \). Survival analyses showed that patients with glenoid defect greater than 30% of the glenoid circumference showed higher risk of instability recurrence than patients with less than 20% of the glenoid defect \( p<0.003 \) in patients with postoperative instability, the recurrent episode was less frequent and shoulder function was related with the activity level (Fisher Exact test, \( p=0.029 \)). Revision arthroscopic Bankart repair stabilized 3 out of 4 patients.

Conclusion: Unlike to the previous reports on the results of the arthroscopic repair, arthroscopic capsulolabral repair using suture anchors provided satisfactory outcomes in terms of the recurrence, activity, and range of motion.

Poster #446
ARthroSCopic TREATMENT OF POSTERIOR INSTABILITY OF THE SHOULDER. MID-TERM RESULTS: EVALUATION OF 16 PATIENTS WITH POSTERIOR INSTABILITY OF THE SHOULDER OPERATED WITH ARTHROSCOPIC CAPSULAR SHIFT.
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Miguel Slullitel, Santa Fe, ARGENTINA
Miguel Angel Capomassi, Santa Fe, ARGENTINA
Instituto Dr. Jaime Slullitel, Rosario, ARGENTINA

Introduction
Between 1989 and 2001, 28 patients were treated because of posterior instability of the shoulder. Four had a posttraumatic acute dislocation without relapse after reduction, 8 exhibited posterior locked dislocation of the shoulder that underwent open surgery and 16 suffered from posterior instability with symptoms ranging from pain, voluntary and involuntary subluxation and dislocation of the shoulder that are part of this report.

Material and Method
Patients age ranged from 13 to 22 (mean 19 years old). One patient was female and 18 were male. One case had bilateral involvement. Follow up of patients treated arthroscopically ranged from 36 to 12 months (mean 18 months). Six are athletes - 3 rugby players and three tennis players - and 9 are not athletes. Concerning surgical findings, there were 4 posterior Bankart lesions, 2 of them also had a loose capsule; 10, had loose capsules with a small, almost absent labrum.

Labral anchorage was carried out as a single procedure or with latero medial plication on the glenoid aspect. Superior inferior plication with free capsular suture was the approach chosen in the case of significant residual laxity. When applying this technique the capsule increases its thickness, due to the folding in 5 cases labral anchorage was associated with rotator interval plication due to posteroinferior laxity.

Results
No relapses were observed so far. A frozen shoulder had to be manipulated as well as a painful shoulder with persistent acromial impingement. This patient had a deficit of 30° of internal rotation. Patients lost an average of 10° of internal rotation.

Conclusion
Results obtained as regards stability were satisfactory. It is difficult to accurately determine the amount of posterior capsular plication very important since a significant acromial impingement might develop as a consequence of the ascent of the humeral head, more frequently observed in relation to this condition than in the cases of anterior instability.

Poster #447
SUBACROMIAL INSTABILITY SYNDROME: LAXITY AS A LATE CAUSE OF ROTATOR CUFF FAILURE
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Introduction
From 1989 to 2002, ten families (father and son) were operated because of shoulder disease.

Material and Method
The ten sons whose ages ranged from 14 to 22 (mean 18 years old) were operated because of anterior glenohumeral instability. Among these patients the following symptoms were observed: six episodes of dislocation, 1 with pain, 3 with continuous subluxations. 3 have bilateral symptoms when practising sports. Four were rugby players, 4 were soccer players and 2 did not practice any sports at all. Upon physical examination, shoulders external rotation in 90° abduction was 125° in average. During arthroscopy a loose capsule with a wide gap of the rotator cuffs was observed; 3 cases also had a Bankart lesion, the remaining patients had a small labrum; the posterior capsule was redundant in 3 cases. All fathers were operated of rotator cuff disease. Their ages ranged from 45 to 70 (mean age 55 years old). Four of them had symptoms on the contralateral shoulder, four were amateur tennis players and 6 practised no sports. X-Rays confirmed the presence of an inferior polar osteophyte in 5 cases. During arthroscopy, 6 advanced partial tears of the rotator cuff were revealed on the supraspinatus. In 4 cases the tear was complete. In 6 cases there were degenerative disorders on the intraarticular portion of the biceps tendon. There were two additional cases where the patients sons had bilateral subluxation of shoulders that responded to conservative treatments. One of the fathers had advanced unilateral glenohumeral arthrosis while the other had bilateral involvement without prior symptoms.

Conclusion: In the literature there are no reports on family cases operated upon. We believe that in these families, laxity is manifested in two different disorders: instability at younger age and tend of the rotator cuff in older maybe because of subacromial space instability. Minimum glenohumeral laxity can damage the rotator cuff and the glenohumeral joint without prior instability symptoms. The family and personal history of laxity should be taken into account as another factor to surgically approach the rotator cuff thus preventing deterioration from occurring. Further research should be carried out to detect laxity as a key factor in rotator cuff involvement and glenohumeral arthrosis.

Poster #448
CORRECT DIAGNOSIS AND AUGMENTED TRANSGLENOID REPAIR, A KEY TO SUCCESS IN SHOULDER INSTABILITY ON YOUNG RUGBY PLAYERS.
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Poster #375
THE USE OF KINEMATIC MRI IN THE DIAGNOSIS OF SHOULDER INJURY IN THROWING ATHLETES
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Kenji Satoh, Funabashi, JAPAN
Takashi Horaguchi, Tokyo, JAPAN
Sakichi Negishi, Saitama, JAPAN
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Evaluation of 30 arthroscopic surgeries in rugby players minimum follow up over one full season.

Material and methods
From 1996 to 2001, 30 rugby players with shoulder instability were operated on. The age range was from 16 to 26 years (mean 20 years). Patients with first episode surgery were excluded. Minimum 2 maximum 12 months. A transglenoid suture was used in all cases. A modified Caspary punch was used to pick the capsule double on the joint side improving the capsule plication, creating a neolabrum with the folded capsule without repairing the detached labrum, if present. Based on the extent of the rotator cuff gap and the sulcus sign, the rotator cuff interval was aggressively plicated and the posterior branch of the glenohumeral inferior ligament was tightened in the postero-inferior area of the labrum with anchors. In case of associated posterior instability, the postero-inferior capsule was also plicated with on. In three cases radiofrequency was used since the laxity was estimated not to be corrected. Anterior plication and closure of the rotator cuff gap was performed in 30 out of the 30 patients. In 20 patients together with the plication of the posterior branch of the LGLHI. In five of these latter cases, posterior capsule was also tightened.

Results
These patients recovered range of motion on 90° abduction within an average of 190° between external and internal rotation. The aim was not to get the same range of motion of the shoulder given that in 50% of cases ROM was excessive and in average there was a 10° loss of shoulder forward flexion. No recurrences were observed. However there was a case of frozen shoulder because of the use of radiofrequency and the removal of 5 posterior sutures.

Conclusion
Contact athletes suffer from different subtypes of instability. In our patients, 50% had pre-existing laxities. If this defect is corrected with the corresponding plications, better results can be achieved. The shoulder should have an average of 190° of motion without relying on the opposite shoulder motion since it is often hyperloose. When having a decreased forward flexion as a result, stability to tackle is improved. However, the follow up has not been long enough to see whether limited ROM will eventually end in glenohumeral arthritis. We believe that the modified transglenoid suture together with the aggressive closure of rotator interval and the posterior retightening if needed is a valid alternative for the treatment of young contact athletes.

Shoulder Other

Poster #376
ARTROSCOPIC MANAGEMENT OF THE IMPINGEMENT SYNDROME OF THE SHOULDER
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Impingement syndrome of the shoulder is one of the most common causes of anterior shoulder pain and disability. We studied the functional outcome of the patients who had been managed arthroscopically due to impingement syndrome of the shoulder. 67 patients with impingement syndrome of the shoulder underwent arthroscopic subacromial decompression. 24 were males 43 were females. Average age was 57.2 (37-73 years). 29 mini-open rotator cuff repair, 6 biceps tenodesis, 1 biceps tenotomy, 2 removal of the calcific tendonitis, were done. Additional to the index procedure 10 patients had massive irrepara-
ble tear of the supraspinatus tendon. Dominant arms were operated in 58 patients. 22 were smoking patients. Night pain was positive in 60 patients. Average duration of symptoms were 8 months (3-24 months). The average preoperative forward flexion and external rotation in adduction were 109 and 24 degrees, respectively. Internal rotation was gluteal in 34, lumbosacral in 6, at L3 in 7, at T12 in 20 patients. 32 patients had interscalene block and 35 patients had general anesthesia. The average follow-up period was 19 months (6-40 months). The average postoperative forward flexion and external rotation in adduction were 139 and 35 degrees, respectively. Internal rotation was gluteal in 12, lumbosacral in 5, at L3 in 10, at T12 in 35 and interscapular in 5 patients. The average preoperative and postoperative Constant scores were 54 (40-67) and 86 (82-96), respectively. In 5 patients. The average preoperative and postoperative Constant scores were 54 (40-67) and 86 (82-96), respectively. In conclusion, with meticulous surgical technique in selected patients, arthroscopic management of the impingement syndrome of the shoulder can be a safe and effective procedure.

Results
As a result, there were no surgery or postoperative complications and radiological fusion was achieved at a mean time of 8 weeks. All patients are painless with a good functional upper limb that let them to do all daily living activities without any problem.

Conclusions
Although nowadays shoulder arthrodesis is becoming a low frequent procedure, we present a new surgical technique of shoulder fusion assisted by arthroscopy that has successfully been used in three cases. Therefore, we recommend it whenever is indicated because it is a minimally invasive technique that minimizes complications of a high-risk open surgery.

References

Poster #377
ARTHROSCOPIC-ASSISTED SHOULDER ARTHRODESIS: A MODIFIED TECHNIQUE.
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Fusion of the glenohumeral joint should be considered as an end-stage salvage procedure. Any other procedure that restores some of the glenohumeral motion and rotation has significant advantages over arthrodesis. Patients who are candidates for shoulder arthrodesis require significant preoperative counselling for a full understanding of their postoperative limitations and functional capacities. Nevertheless, actual indications for glenohumeral fusion still have proven good functional results. These indications include chronic and irreparable comminute glenoid and/or glenoid fractures, neurological failure as complete brachial plexus injuries and paralysis of the deltoid muscle, previous history of deep surgical infection, certain failed revision arthroplasties with a large amount of bone loss and for the treatment of intractable painful shoulder such as chronic irreparable rotator cuff injuries with articular arthropathy and multi-operated unstable shoulder. All open procedures (1,2,3) require a large exposure of the shoulder with all the subsequent complications specially infection and non-union. These complications can be minimized with the arthroscopic techniques in a both intra and extraarticular arthrodesis as we describe it afterwards. To our knowledge, this is the second description of an arthroscopic arthrodesis of the shoulder and represents a modified technique of that proposed by Morgan (4).

Material and Method
We present three cases of shoulder arthrodesis assisted by arthroscopic control. First patient was a 45 year old female with a chronic multidirectional instability of the left shoulder that required six failed open surgeries. Second patient was a 52-year-old male who sustained a fracture dislocation of the left shoulder that led to a chronic irreducible and irreparable posterior dislocation of the glenohumeral joint. Third case was a 50 year old male with four previous rotator cuff surgeries on his right shoulder and intractable pain. A two-part technique has been performed. First part includes arthroscopic cartilage debridement on both humeral and glenoid articular surfaces, and internal fixation with percutaneous canulated screws. Second part consists on a subacromial arthrodesis with iliac crest graft fixated with a screw, by a lateral mini-open approach. We performed the same operation technique in all tree cases. The patient was placed in a lateral decubitus position at 50° of abduction, 15° of forward flexion and neutral rotation.

Results
As a result, there were no surgery or postoperative complications and radiological fusion was achieved at a mean time of 8 weeks. All patients are painless with a good functional upper limb that let them to do all daily living activities without any problem.

Conclusions
Although nowadays shoulder arthrodesis is becoming a low frequent procedure, we present a new surgical technique of shoulder fusion assisted by arthroscopy that has successfully been used in three cases. Therefore, we recommend it whenever is indicated because it is a minimally invasive technique that minimizes complications of a high-risk open surgery.

References

Poster #378
ARTHROSCOPIC BICEPS TENODESIS USING BIOABSORBABLE INTERFERENCE SCREW FIXATION
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Nicolas Jaquet, Nice, FRANCE
Gilles Walik, Lge, FRANCE
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Aim of the study:
We report the technique and the results of a new technique of arthroscopic biceps tenodesis using bioabsorbable interference screw fixation.

Material and methods:
Prospective study of 43 patients treated for a pathology of the LHB between 1997 and 1999. The technique was used in 3 clinical situations: 1) with arthroscopic cuff repair (3 cases), 2) isolated pathology of the biceps tendon with an intact cuff (6 cases); 3) as an alternative to biceps tenotomy in patients with massive, degenerative and irreparable cuff tears (34 cases). Biceps pathology included: tenosynovitis (4 cases), pre-rupture (15 cases), subluxation (11 cases), and dislocation (13 cases).

Results:
All patients were followed clinically for at least two years. The Constant score improved from 43 points preoperatively to 79 points at review (p<0.001). There was no loss of the elbow movement and biceps strength was 90% of the strength of the other side. Two patients, operated early in the series, presented with a rupture of the tenodesis. In both cases the bicipital tendon was very friable and the diameter of the screw proved to be insufficient (7 mm). No neurological or vascular complications occurred.

Discussion/Conclusion:
Interference screws have been used successfully for several years in hamstring anterior cruciate ligament reconstruction of the knee. This technique uses the same principles of interference screw fixation for performing biceps tenodesis using bioabsorbable screws. Using interference screws of a larger
Poster #379
MODIFIED WEAVER-DUNN PROCEDURE IN THE TREATMENT OF COMPLETE ACROMIOCLAVICULAR DISRUPTION
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Weaver-Dunn procedure has been a widely accepted treatment of complete acromioclavicular (AC) joint disruption (Rockwood type III- VI dislocations) since its introduction in 1972. It has also been used in patients with fracture-dislocations at the AC joint. The results of the operation have been very satisfactory. However, loss of reduction due to occasional pullout of the transferred coracoacromial (CA) ligament is not uncommon. Over the years, there have been numerous modifications of this novel technique with good functional results. We present our technique, which is a modification of procedure described by Weaver and Dunn. To our knowledge, this modified technique has not been reported in the literature.

After exposing the acromion and distal clavicle, subperiosteal flaps are raised from the distal 2-3 cm of clavicle. The distal end of clavicle, usually 1.0 -1.5 cm in length, is excised. The medullary canal of the distal clavicle is drilled out and curetted to receive the transferred CA ligament. Two small drill holes are made through the superior cortex of the distal clavicle. The CA ligament is carefully detached from the acromion process. One large (2mm) drill hole is made through both superior and inferior cortices of the clavicle 1.5cm proximal to the previous two small drill holes. Protection of the ligament transfer can be achieved by using a loop of absorbable PDS® cord (Ethicon Ltd., Edinburgh, UK) through this transosseous channel and passed carefully round the coracoid process (Figure1). The tip of the coracoid process is identified and drilled to allow insertion of Mitek® anchor (Ethicon Ltd., Edinburgh, UK) (Figures 2 and 3). The Ethibond suture is then weaved into the CA ligament so that both ends of the suture exit through the acromial end. The ends of the suture are passed out through the small drill holes in the distal end of the clavicle. When the clavicle is reduced the PDS® cord suture is tied to maintain reduction. The CA ligament is then pulled up into the canal and the sutures tied.

Suture anchors have been widely used in reconstructive shoulder surgery. This includes biceps tenodesis, capsular shift/ capsulolabral reconstruction, deltoid repair and rotator cuff repair. The use of Mitek® super anchor in this modified procedure allow secure fixation of the suture into bone and helps prevent ‘cheese-wiring’ of the suture through the ligament.

The PDS® cord is used to protect the transferred CA ligament, acting as a temporary reconstitution of the coraco-clavicular (CC) ligament. The use of bioabsorbable PDS® cord obviates the need for a second procedure to remove the screw.

We recommend the use of this surgical technique, as we believe it provides better fixation and less chance of suture cutting through CA ligament, resulting in loss of reduction.

Poster #380

ARTHROSCOPIC ROTATOR CUFF REPAIR BY FOOTPRINT RECONSTRUCTION: SHORT TERM RESULTS
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Aim of the study: To evaluate the clinical and sonographic outcome of arthroscopic rotator cuff repair by “footprint reconstruction”.

Material and Methods: Between 1998 and 2001, 260 symptomatic acute and chronic rotator cuff tears were arthroscopically repaired by medial and lateral anchorages of the tendons, referred to as “footprint reconstruction”. Postoperative regime consisted of an adduction sling and passive mobilisation for 6 weeks. Ultrasound examination was routinely performed on all shoulders 3 weeks postoperatively. All patients were invited for a clinical review and an ultrasound examination after a minimum of 6 months.

Results: Preliminary results of the first 60 patients were very satisfactory with an average adjusted Constant score of 90%. No major complications were encountered. The ultrasound at 3 weeks had a predictive value for healing: an intact cuff at 3 weeks corresponded with an intact cuff at follow up. In the sonographic cuff deficient shoulders, significant lower power was found at follow up, but this did not compromise the overall favourable clinical score.

Discussion: Arthroscopic rotator cuff repair has distinct advantages over an open procedure and appears to be as reliable as open repair, still the golden standard. We performed cadaver dissections to map the normal footprint of the rotator cuff tendons, and developed the “footprint reconstruction” to create a more anatomic repair. We use this technique as the treatment of choice in acute and chronic tears of all sizes.

Poster #381
MAJOR PECTORALIS MUSCLE RUPTURE IN THE ATHLETES
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The authors presented seven cases of rupture of the major pectoralis muscle (MPM) in male athletes of which four underwent surgery and three non-surgically, diagnosed by physical examination and subsidiary tests. All athletes were at the competitive level, five presenting lesion on the pectoralis muscle when lifting weight (Bench press exercise) and two in the fight practice. The injury occurred during movements of abduction and neutral rotation of the humerus against a maximum resistance. Athletes presented pain and hematoma, of which six with deformity of the axilla and difficulty in the abduction of the injured limb. Among these cases, four presented total rupture of the distal portion of the major pectoralis muscle in the bony insertion at the proximal muscle, two partial rupture in the muscular portion and one partial rupture in the distal insertion to the humerus without total desinsertion. One of the athletes was submitted to surgical treatment in the acute phase (three days) and three in the chronic phase (23 days, 35 days and one year). The surgical technique used was the use of anchors or screw into the bones in order to reinsert the major pectoralis tendon. The authors concluded that complete dam-
age to the major pectoralis muscle of the athletes would be better treated surgically than nonsurgically.

Poster #382
MUSKULOSKELETAL INJURIES ON 320 ATHLETES’ SHOULDERS: MECHANISM OF INJURY, DIAGNOSIS, AND RETURN TO SPORTS PRACTICE
Benno Etnisman, Sao Paulo, BRAZIL, Presenter
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The authors evaluated prospectively three hundred and twenty athlete with shoulder injuries, 216 (67.5%) being throwers, 256 (76.8%) male athletes, 224 (70%) competitive athletes. The dominant side was affected in 221 (69%). Follow-up was over 1 year and eight months. The highest incidence of injury was in volleyball players with 52 (16%) athletes, followed by swimmers with 30 (9.3%). Atraumatic injury with 198 (61.8%) was most frequent than traumatic injury (122 / 61.8%). Pain complaint was present in 215 (67%) athletes. Shoulder instability (140 / 43.7%) cases, were the most frequent, followed by rotator cuff lesions with 106 (33%) and by the achorialalvacular pathologies in 41 (12.8). The return to sports pracitce was resumed within a mean period of six weeks, 254 (79.3%) athletes returned to the same level of competition, 49 (15.3%) athletes reduced their performance and 17 (5.3%) athletes did not return to sports practice. In the sports orthopaedic practice the biomechanic, sports modalities, level of activity, reabilitaiton and surgical treatment are the basis to achieve a good result and return to sports activities in the same level.

Poster #383
MEDIUM-TERM RESULTS AFTER ARTHROSCOPIC THERAPY OF THE FROZEN SHOULDER
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Stefan Heidersdorf, Herne, GERMANY
Stefan Seitz, Herne, GERMANY
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Introduction:
In this prospective study we checked the short and medium-term results after arthroscopic therapy of the so-called frozen shoulder.

Methods:
34 patients (20 women and 14 men) at the age of 52 years (41-62) with the diagnosis frozen shoulder were treated arthroscopically. The painful movement restriction amounted praecentric 12.8 months (7-25): In the operation we shaved accretions, performed synovectomy, notched the medial glenohumeral ligament with laser, dissected the subacromial bursa and performed a subacromial decompression, depending on the findings. Finally, we did a moderate mobilisation in narcosis. Postoperative, the patients were treated with intensive mobilisation therapy. The results were determined six weeks, three months and twelve months postoperative by the patient’s subjective opinion and by using the Constant Score.

Results:
From 34 operated patients 28 patients (16 women and 12 men) appeared to the re-examination dates. Operation-conditioned complications did not occur. The praeoperative Constant-Score resulted in an average value of 61 (44-73) points. These values improved on the average on 76 (59-88) points six weeks postoperative, 85 (61-96) points three months postoperative and 91 (63-100) points 1 year postoperative. One year after the operation, 14 patients indicated the result as very good, 7 patients as good, 5 patients as satisfying and 2 patients as bad.

Discussion:
The therapy of the frozen shoulder is the subject of a controversial discussion. The described arthroscopic therapy is a complication-poor intervention, which leads to satisfying medium-term results after success lacking of conservative.

Poster #384
REPAIR OF TYPE-2 SLAP LESIONS USING CORKSCREW ANCHORS. A CLINICAL FOLLOW-UP STUDY
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Harry Brownlow, Sydney, AUSTRALIA
Gregory Burrow, Sydney, AUSTRALIA
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Purpose of the study: To make a clinical assessment of patients who had undergone arthroscopic repair of a type-2 SLAP lesion using Corkscrew® anchors.

Materials and methods: 17 consecutive patients who agreed to fill in a pre- and post-operative questionnaire were included in the study. The aetiology was traumatic in 12/17 patients and non-traumatic in 5/17. The time between the onset of the symptoms and the operation was 11 (3-120) months. At the index operation five patients underwent a concomitant acromo-plasty, while 4 patients underwent supplementary anterior labrum fixation using suture anchors. 13/17 (76%) of the patients were physically re-examined by independent observers after a follow-up period of 25 (11-32) months. The questionnaire involved a patient administered assessment of pain and instability using a VAS-scale from 0-10, where 0 indicates full stability and no pain respectively.

Results: At follow-up the Rowe score was 84 (51-98) points and the Constant score was 83 (35-98) points. The Constant score on the non-operated side was 92 (66-100) points, (p=0.01). The external rotation in abduction was 85 (60-110) degrees on the operated side and 90 (80-110) degrees on the non-operated side (n.s.). The strength in abduction was 7.3 (0.8-14.4) kg on the operated side and 8.7 (2.7-15.5) kg on the non-operated side (p=0.01). The pre-operative pain score decreased from 2.5 (0-8) to 0.75 (0-6) at follow-up (n.s). The corresponding values for the pre- and post-operative stability scores were 3.75 (0-8) and 2.25 (0-10) respectively (n.s). Three patients underwent or were scheduled for further surgery during the follow-up period.

Conclusions: Based on the limited number of patients included in the study it seems that the results are satisfactory and that the subjective patient administered evaluations improve after arthroscopic repair of type-2 SLAP lesions using Corkscrew® anchors.
The purpose of this study was to report our experience with an arthroscopic surgery in the treatment of a painful throwing shoulder. The study subjects consisted of patients with painful throwing shoulder and followed up for more than one year after surgery. There were 12 males and 3 females. The age of the patients at operation ranged from 18 to 35 (average 24.2). The follow-up period ranged from 12 months to 52 months (average 310 months). Arthroscopic evaluation consisted of examination of the glenohumeral joint and subacromial space. Treatment consisted of debridement and repair of the rotator cuff, labral tears and subacromial space. The results were evaluated by the SAO Shoulder Sports score system. SAO Shoulder Sports score improved from 49.6 points to 90.2 points. 22 patients revealed undersurface tearing of the rotator cuff. 18 patients had lesions of the subacromial space. 13 patients also had tearing of the posterior labrum. Anterior labrum fraying was noted in all patients. 33 of 41 (80%) athletes evaluated had returned to their preinjury level of throwing, but 8 athletes have changed their positions. Arthroscopic surgery of the rotator cuff, labral lesions, and subacromial lesions are reasonable options for baseball players with symptomatic stable shoulders who wish to return to sports.

Poster #386
THE SURGICAL OUTCOME OF THE ARTHROSCOPIC TREATMENT FOR AN OVERHEAD ATHLETIC INJURIES
KOTAKE Toshiro I), YAMAKAWA Tomoyuki I), NAKAGAWA Yasuaki2), NAKamura Takasi2),
1) Department of Orthopaedic Surgery, Mitsubishi Kyoto Hospital
2) Department of Orthopaedic Surgery, Faculty of Medicine, Kyoto University

The purpose of this study was to report our experience with an arthroscopic surgery in the treatment of a painful shoulder. The study subjects consisted of patients with painful shoulder of overhead athlete and followed up for more than one year after surgery. There were 12 males and 3 females. The age of the patients at operation ranged from 18 to 35 (average 24.2). The follow-up period ranged from 12 months to 52 months (average 310 months). Arthroscopic evaluation consisted of examination of the glenohumeral joint and subacromial space. Treatment consisted of debridement and repair of the rotator cuff, labral tears and subacromial space. The results were evaluated by the SAO Shoulder Sports score system. SAO Shoulder Sports score improved from 49.6 points to 90.2 points. 22 patients revealed undersurface tearing of the rotator cuff. 18 patients had lesions of the subacromial space. 13 patients also had tearing of the posterior labrum. Anterior labrum fraying was noted in all patients. 33 of 41 (80%) athletes evaluated had returned to their preinjury level of throwing, but 8 athletes have changed their positions. Arthroscopic surgery of the rotator cuff, labral lesions, and subacromial lesions are reasonable options for baseball players with symptomatic stable shoulders who wish to return to sports.
there were more reports on this condition. In the reviewed series, the majority of the ganglion cysts were reported to be communicated with the shoulder joint, either through a labral tear (e.g., SLAP lesion) or a capsular defect. Different kinds of surgeries were performed for this condition ranging from open decompensation to all arthroscopic technique. None of the studies has reported on the spontaneous dissolution of ganglion cyst following arthroscopic stabilisation of a SLAP lesion. We reported a case of supraglenoid cyst compressing the suprascapular nerve with a SLAP lesion. He was a 37-year-old construction site worker who had right shoulder pain after an injury 4 months prior to presentation. Physical examination showed isolated infraspinatus wasting and weakness together with preservation of supraspinatus power and function. Speed test and O’Brien test were positive. MRI arthrogram showed a SLAP lesion with supraglenoid cyst that was communicating with the glenohumeral joint through the SLAP lesion. There was no rotator cuff tear. We performed shoulder arthroscopic repair of the type 2 SLAP lesion using Fastak suture anchors. We did not particular put the scope or any instrument into the cyst to decompress it. Postoperatively, he followed standard rehabilitation programme for SLAP repair. There was good pain relief. The power of the infraspinatus returned to grade 5. He again engaged in heavy manual work. Follow-up MRI arthrogram showed dissolution of the ganglion cyst. In this case, we showed that by repairing the SLAP lesion itself could cause dissolution of the supraglenoid cyst with good clinical suprascapular nerve recovery. Direct drainage or decompression of the ganglion cyst might not be necessary, if the cyst was associated with a SLAP lesion.

Conclusion:
1. Ganglion cyst causing suprascapular nerve entrapment can happen in work-related injury.
2. MRI arthrogram is important in diagnosis and the planning of treatment.
3. Suggested treatment strategy following literature review- a. Cyst with a SLAP lesion : stabilisation will lead to spontaneous dissolution, decompensation may not be necessary.
b. Cyst without a SLAP lesion, but with a communication with the glenohumeral joint: arthroscopic decompensation through labral or capsular defects.
c. Without SLAP lesion and no communication as shown on MRI arthrogram: direct endoscopic drainage or open drainage +/- release of superior transverse ligament.

Poster #389
ROTOR CUFF REPAIR USING A SCREW AND WASHER TECHNIQUE: ANALYSIS OF OUTCOME AT ONE YEAR FOLLOW-UP.
Cary R. Muz, Aurora, CO, USA, Presenter
James P Tasto, San Diego, CA, USA
William J Ciccone II, Colorado Springs, CO, USA
San Diego Sports Medicine and Orthopedic Center, San Diego, CA, USA

Purpose: To report the results of our first twenty patients who underwent repair of a rotator cuff tear using a new bioabsorbable screw and washer fixation device at minimum one year follow-up.

Methods: Twenty patients (16 male: 4 female) underwent a rotator cuff repair utilizing a bioabsorbable screw and washer (Bionx, Biocuff). The patients averaged 14 months follow-up (range 12-38 mos). The average age of the patients was 56 years (range 43-70 years). Workmen’s compensation cases were excluded from this series. The patients were rated pre-operatively with both a UCLA score and a SF-36 score for outcome assessment. Radiographs were obtained at six months to assess for osteolysis or a persistent screw tract. At six months post-op the patients were again rated with a UCLA score and SF-36 assessment.

Results: At one year follow-up, no patient reported any adverse reaction to the implant. Post-op UCLA scores increased from an average of 16(range 9-22) pre-op to 32(range 23-35) (p<0.0001). SF-36 scores showed a statistically significant increase in physical function scores (p<0.005), physical role function scores (p<0.007), and bodily pain scores (p<0.0001). One patient developed mild adhesive capsulitis post-operatively but resolved. Two patients had persistent screw tracts without osteolysis on their six month radiographs. No patient developed foreign body impingement. Continued follow-up for more than twelve months demonstrate no change in the results, in fact, some patients continue to show improvement long term.

Conclusions: The new bioabsorbable screw and washer is a safe and effective alternative to traditional methods for the fixation of the rotator cuff to bone. In addition, there seem to be no long term disadvantages over these methods in patients objective and subjective outcomes. This construct may have superior biomechanical properties versus currently available fixation methods.

Poster #390
POSTERIOR SHOULDER PAIN IN THROWING ATHLETES WITH BENNETT LESION
Siltae Nishiyama, Osaka, JAPAN, Presenter
Minoru Yoneda, Osaka, JAPAN
Kenji Hayashi, Osaka, JAPAN
Masanori Obata, Osaka, JAPAN
Sunao Fukushima, Osaka, JAPAN
Osaka Kosei-Nenkin Hospital, Osaka, JAPAN

PURPOSE: Bennett lesions are often observed in long-term throwing athletes and are usually non-symptomatic, suggesting that there may be physiological ossifications. However, this lesion can sometimes become painful and disturb an athlete’s throwing ability. We have been treating symptomatic Bennett lesions arthroscopically according to our criteria. As the reason why some lesions become symptomatic is still unknown, we investigated the factors inducing the pain on Bennett lesion.

METHOD: Twenty-four baseball players with Bennett lesion, who underwent arthroscopic operation, were examined. According to our criteria, painful lesions in 11 players were resected, and non-symptomatic ossifications in the other 11 players were left untreated and studied as control. Range of motion and joint laxity in bilateral shoulders under general anesthesia and arthroscopic findings were retrospectively studied.

RESULTS: We defined more than 10 degrees loss of internal rotation at 90-degrees abduction in injured shoulder compared with uninjured side as posterior capsular tightness. Though posterior capsular tightness was seen in 8 of 11 shoulders with non-symptomatic ossification, it was seen in only 4 of 13 shoulders with uninjured side as posterior capsular tightness. Though range of motion and joint laxity in bilateral shoulders under general anesthesia and arthroscopic findings were retrospectively studied.

CONCLUSION: While it was difficult to detect any intraoperative findings specific to painful lesions, deficiency of posterior
joint tightness regardless of the formation of ossification appears to relate to their symptom. So, careful preoperative diagnosis should be done.

SIGNIFICANCE: We clarified the character of Bennett lesion, which induce throwing pain.

Poster #391
ARTHROSCOPIC ACROMIOPLASTY AND ROTATOR CUFF REPAIR USING ANCHORS THROUGH A MINI OPEN APPROACH

Pericles P. Papadopoulos, Thessaloniki, GREECE, Presenter
Ioannis Christoforides, Athens, GREECE
Dimitrios Karataglis, Thessaloniki, GREECE
Ippocratis Hatzofos, Thessaloniki, GREECE
Ilias Fotiadis, Thessaloniki, GREECE
John Pournaras, Thessaloniki, GREECE
G. Papaniolou Hospital, Thessaloniki, GREECE

Purpose: Evaluation of the results of arthroscopic subacromial decompression and rotator cuff repair using anchors through a mini-open approach.

Material and methods: 25 shoulders in 24 patients were evaluated for operative outcome using the Constant Score. 11 patients were male and 13 female. Average age at operation was 48.6 years (38-77 years). Follow-up ranged 12 to 26 months (average 15.5 months). Tears were classified according to size: 10 were small-medium (<3cm), 12 were large (3-5cm) and 3 were massive (>5cm). Arthroscopic subacromial decompression was performed in all patients prior to rotator cuff repair using bone anchors through a mini-open approach. The coracoacromial ligament was preserved in all cases.

Results: The average Constant Score improved from 38.5 preoperatively to 79.2 post-operatively. 13 results were evaluated as excellent, 11 as good and 1 as fair; no poor results were recorded. One patient developed superficial infection which was treated successfully with surgical debridement and antibiotics.

Conclusions: The results of our study suggest that arthroscopic subacromial decompression combined with rotator-cuff repair using bone anchors through a mini-open approach with preservation of the coracoacromial ligament is a good option for patients with rotator-cuff tear, especially when these are large or massive.

Poster #392
FOLLOW-UP AFTER SHOULDER STABILIZATION PROCEDURES – A COMPARISON OF PATIENT SELF-ASSESSMENT AND CLINICAL EXAMINATION

Hans-Georg Pieper, Essen, GERMANY, Presenter
Rene Tibussek, Essen, GERMANY
Nicole Alexandra Hunger, Essen, GERMANY

Introduction
Quality control has become an important part of any surgical procedure for medical as well as legal reasons. However, it is difficult to get a high follow-up rate on clinical examinations because many patients do not like to take the time to return for them repeatedly, especially if they are satisfied with the result of the operation.

Methods

In order to compare the results of a follow-up by patient self-assessment and clinical examination, a printed questionnaire was designed to get information on pain, function, strength, and degree of activity exhibited in daily life, which are needed for the Constant Score, the UCLA Score, and the Rowe Score. This questionnaire was sent to and returned by 100 patients between 1 and 11 years after surgical treatment of shoulder instability. The same patients were examined clinically >2 weeks after they had returned the questionnaire. The scores resulting from the self-assessment of the patient by questionnaire and those gained by clinical examination and questioning of the patient were compared.

Results
There was no statistically significant difference between the scores accumulated in the questionnaires and those resulting from the clinical examination. The questionnaires exhibited a tendency towards a slightly lower score primarily as concerns the assessment of strength, but this difference was not statistically significant either.

Conclusions
It seems reliable to carry out follow-up studies based on questionnaires since their results are reasonably similar to those of clinical examinations. Thus higher follow-up rates at lower cost can be achieved.
position of other recognizable intraarticular landmarks, including the bare area and biceps tendon. The results indicate that the interval between the supraspinatus and the infraspinatus tendons is estimated at 6.3 mm anterior to the origin of the bare area with a standard deviation of .82. The width of the insertion is one centimeter.

Knowledge of these relationships will enable the arthroscopist to correctly return the supraspinatus and infraspinatus to their correct insertion points on the humeral head when performing arthroscopic rotator cuff repair. This results in better post-operative function with correct anchor placement.

**Poster #395**

**EARLY RESULTS OF THIRD-GENERATION HUMERAL PROSTHETIC REPLACEMENT**

Robert Allen Sellards, New Orleans, LA, USA, Presenter
Anthony Romeo, Chicago, IL, USA
Rush Presbyterian St. Luke’s Medical Center, Chicago, IL, USA

**INTRODUCTION:** Shoulder replacement can predictably improve patient comfort and passive range of motion. First and second generation designs fail to consistently match the three-dimensional anatomy of the proximal humerus. A third generation humeral prosthesis adapts to the patient’s normal anatomy which should result in better motion and function than a non-anatomic replacement. The purpose of this study is to report the early results of third-generation humeral prosthetic replacement.

**METHOD:** A prospective outcome study was organized with patient evaluation performed preoperatively and after surgery at 3 months, 6 months, 1 year, then annually. Diagnoses included osteoarthritis, rheumatoid arthritis, avascular necrosis (AVN), cuff tear arthropathy, post-traumatic arthritis, and fractures.

**RESULTS:** The average follow-up for all patients was 10 months (3 to 36 months). The analysis included pain scores, Simple Shoulder Test, ASES score, Constant score, range of motion, strength, and patient satisfaction. Patients with osteoarthritis and AVN had the greatest increase in ROM. The non-adjusted Constant score and ASES scores improved significantly with the greatest increase noted in patients with osteoarthritis and AVN. Patients with cuff tear arthropathy and rheumatoid arthritis demonstrated limited improvements in active motion and function. Of those that had glenoid replacements, the majority had radiolucent lines with hall being partial. There were some complications, including infection, glenoid revision, and subscapularis rupture.

**CONCLUSION:** Anatomic third-generation shoulder prostheses can alleviate pain, provide improved passive motion, active motion, and function. With an intact rotator cuff the active motion and function of the shoulder will approach age-adjusted norms.

**Poster #396**

**COMPARISON OF THE LOAD TO FAILURE OF A CANNULATED TACK (SURETAC II) AND A SUTURE ANCHOR (MITEK) IN ROTATOR CUFF REPAIR**

Graham Tylerleighb-Strong, Edinburgh, UK, Presenter
Antony Miniaci, Toronto, CANADA
Alan Hirahara, Sacramento, CA, USA
Sports Medicine Programme, University of Toronto, Toronto, CANADA

**Aim:** The load to failure of cannulated tacks (SureTac II) and cuff suture anchors (Mitek) were compared in the direction of pull of the rotator cuff tendons rather than straight out in simulated rotator cuff repairs.

**Materials & Methods:** Rotator cuff lesions were created and repairs performed at the insertion of the supraspinatus tendon of matched dissected humeral heads of 11 cadavers using 2 SureTac devices spaced 1 cm apart on one side and 2 Mitek anchors spaced 1 cm apart on the opposite. The humerii were then mounted in an Instron Test System with the supraspinatus tendons clamped and pulled along their longitudinal axis. The structures were cyclically loaded for 200 cycles at 1 Hz at 30N to assess compliance and then pulled to failure using a preload of 10N and a constant loading rate of 8.5 mm/sec to assess for mode and load to failure.

**Results:** There was an increase in compliance in both groups by the 200th cycle but no statistical difference between groups. The mean load to failure in the SureTac group 247.2N (+/-68.1) and the Mitek group 215.9 (+/-69.8) was not statistically significant (p=0.213). The SureTac group failed by pull-out in 6 and tendon “comb” through in 5, the Mitek group by pull-out in 2, suture “pull” through in 3 and suture failure in 6.

**Discussion:** Although the failure mode of the devices differed, the ultimate load to failure did not. Previous concerns about the load to failure of tacks in rotator cuff repairs were not confirmed in this study.

**Conclusion:** At time zero tack fixation for rotator cuff tears is comparable to that of cuff suture anchors.

**Poster #397**

**ALL ARTHROSCOPIC VERSUS MINI OPEN REPAIR IN THE MANAGEMENT OF COMPLETE TEARS OF THE ROTATOR CUFF**

Stephen C. Wefer, Sacramento, CA, USA, Presenter
Rosana Sager, Sacramento, CA, USA
Sacramento Knee and Sports Medicine, Sacramento, CA, USA

Small series have shown all arthroscopic repair feasible, however, comparative series to demonstrate these reports’ assertions that these procedures provide improvement in perioperative morbidity or outcomes are limited. Presented here is a prospective report to compare all arthroscopic repairs with mini-open rotator cuff repairs by a single surgeon. From 1/91 to 3/99 770 patients were taken to surgery for rotator cuff repair; 490 had moderate or large tears or other diagnoses and were excluded, leaving 280 patients for review. 126 chose an all-arthroscopic repair versus 154 with an open repair. Follow-up averaged 36.3 months for the arthroscopic and 47.8 for open with a minimum of two years. Age, gender, associated findings at surgery, and duration of surgery were not significantly different between the two groups. Perioperative morbidity was significantly decreased with all arthroscopic repair, allowing 98% to be performed outpatient versus 38% (p<0.01) and significantly less narcotic use. Recovery of motion was not significantly different at any time of follow-up. There were two manipulation and four reoperations for failed repair in the open group (4%). Four patients had loose anchors early in the arthroscopic group, this complication ceased early using second-generation anchors. Three failed repairs presented with a total reoperation rate of 4.76% (p=n.s). Final outcomes as measured by ASES, UCLA and SST scores were not different. All arthroscopic repair is shown to offer a significant reduction in perioperative morbidity over mini open repair. Final outcomes are not changed, and early complications indicate a steep learning curve.
MINI OPEN SUB PECTORAL BICEPS TENODESIS FOR MANAGEMENT OF RUPTURES OF THE LING HEAD OF THE BICEPS

Stephen C Weber, Sacramento, CA, USA, Presenter
Sacramento Knee and Sports Medicine, Sacramento, CA, USA

Recent articles have emphasized the role of the biceps as a significant pain generator in the shoulder. Treatment of these lesions however has varied widely. Open tenodesis is felt to restores strength and cosmesis but has considerable morbidity. Arthroscopic tenotomy is simple but can result in significant deformity and weakness postoperatively. Arthroscopic tenodesis techniques have been described, but many are technically challenging, and some require transhumeral drilling, placing the axillary nerve at risk. Mini open biceps tenodesis using a subpectoral approach was presented as a technical note in 1993, offering simple, technically easy subcutaneous access to the retracted biceps through a 2 centimeter incision. This series reviews long term follow-up of 81 patients treated over a 10 year period, with a mean follow-up of 6.71 years. 56 were male, with the remainder female. Intraarticular pathology was corrected arthroscopically, partial tears were tenonomized arthroscopically and allowed to retract. With the patient lateral, the arm is released from traction and abducted and externally rotated. A two centimeter mid axillary incision is made, and blunt dissection carried down to the distal bicipital groove inferior to the pectoralis major tendon. The retracted tendon is then fixed to the distal bicipital groove using a unicortical screw and washer. No complications occurred. One patient was non-compliant postoperatively, and reruptured the tendon; all other patients rated their arms as cosmetically normal. All procedures were done outpatient. Post operative UCLA scores averaged 31.4. Mini open biceps tenotomy is shown to have acceptable long term outcome in the management of lesions of the biceps. More complex arthroscopic techniques may significantly increase difficulty, cost, and risk without additional benefit.

ALL ARTHROSCOPIC VERSUS MINI OPEN REPAIR OF PARTIAL THICKNESS ROTATOR CUFF TEARS: THE SAFETY OF COMPLETING THE TEAR

Stephen C Weber, Sacramento, CA, USA, Presenter
Sacramento Knee and Sports Medicine, Sacramento, CA, USA

Open repair of significant partial thickness rotator cuff tears has been shown to offer superior results over debridement and acromioplasty. The increased popularity of all arthroscopic repair for full thickness tears was felt to apply to repair of partial thickness tears as well. Controversy exists over the best technique of repair of articular side defects, with some surgeons attempting to repair through the remaining attached tendon, and other completing the tear. 62 patients were identified with greater than 50% tears and followed prospectively over a six year period with two year minimum follow-up. 33 patients underwent all arthroscopic repair done by completing the tear from the bursal side and then repairing with suture anchors and were compared to 29 patient managed with mini open technique. Follow-up averaged 31.4 months for the arthroscopic and 41 months for open. Perioperative morbidity was significantly different between groups, with no patients admitted in the arthroscopic group, and 48% admitted in the open group. Outcomes were similar (UCLA scores 30.67 arthroscopic 29.84 open p=N.S.) Arthroscopic repair of partial thickness tears offers significant improvement in morbidity over mini open repair, with similar outcomes. Completing the articular side tears allows a technically easier repair, and also allows advancement of healthy tendon over the attachment site. Concerns over completing the tear in this situation appear unfounded.

THE GLENOLABRUM INJURY OF THE SHOULDER: MRI AN MR ARTHROGRAPHY WITH ARTHROSCOPIC CORRELATION

Kazuhito Yamaguchi, Sasebo, JAPAN, Presenter
Hiroyuki Kitahara, Sasebo, JAPAN
Eichiror Asou, Sasebo, JAPAN
Nagasaki Rosai Hospital, Sasebo, JAPAN

(PURPOSE) The purpose of this study was to know the correlation of MRI and MR arthrography findings and arthroscopic findings of glenoid labrum injury of shoulder

(MATERIALS AND METHOD) Twenty six patients 16-49 years old who had either signs and symptoms of shoulder pain or instability were evaluated in this study. Each patient underwent MR imaging and MR arthrography before surgery. Two senior radiologists analyzed the type of labrum injury and the area of injury. The type of injury were detachment, defect, and fraying or degeneration. The results of MRI and MR arthrography and arthroscopic findings were compared and scored. All data were calculated by the difference of MRI findings and arthroscopic findings as follows. Rank 1: 0-1 hour difference; Rank 2: 1-2 hour difference; Rank 3: 2-3 hours difference; Rank 4: over 3 hours difference.

(RESULTS AND DISCUSSION) The results of all type of labrum injury area were Rank 1: 3 cases; Rank 2: 5 cases; Rank 3: 7 cases, Rank 4: 12 cases. More false positive cases were seen in anterosuperior part of labrum than other areas. Labrum injury in anterosuperior part was difficult to be diagnosed by MRI and MR arthrography.

THE IMPORTANCE OF THE INJECTED VOLUME OF CORTICOSTEROIDS AND XYLOCAINE IN THE TREATMENT OF SUBACROMIAL IMPINGEMENT SYNDROME

Christos K Yiannakopoulos, Athens, GREECE, Presenter
Emmanuel Antoniogiannakis, Athens-Chologares, GREECE
Kostas Karlaftis, Athens, GREECE
Georgios Anastasios Babalis, N. Iraklio Attikis, GREECE
Christos Karabalis, Athens, GREECE
Christos Thananas, Athens, GREECE
401 General Army Hospital, Athens, GREECE

The purpose of this study was to evaluate the significance of the volume of injected corticosteroid and xylocaine in the treatment of subacromial impingement syndrome (SIS). The study was conducted between 1/1/2000 and 1/12/2001 and included 21 patients with SIS without the presence of other pathologic lesions. The patients were separated randomly into 2 groups following the positive clinical examination and the positive impingement test. Group A included 11 patients (6 males, 5 female of mean age 52.4 years) and group B included 10 patients (4 males, 7 females of mean age 57.6 years). In group A 12 mg of betamethasone (2 ml) and 1 ml xylocaine 2% have been injected, in contrast to group B where 12 mg betamethasone (2 ml) and 8 ml xylocaine 2% have been injected. The improvement of pain and function was evaluated at a mean of 5.7 months (4-12 months). The results have been statistically evaluated using the t-test and the chi square test. The improvement in group B was more significant than in group A in terms of improvement of the functional results and relieving of the

• The FDA has not cleared the drug and/or medical device for the use described in this presentation (i.e., the drug or medical device is being discussed for an “off-label” use).
Poster #402
ISOLATED RUPTURE OF THE SUBSCAPULARIS TENDON DURING THROWING MOTION
Gen-issa Yoshihara, Otsu, JAPAN, Presenter
Yoishitaaka Matsusue, Otsu, JAPAN
Mototsuna Marufuami, Otsu, JAPAN
Katsuhiko Hori, Otsu, JAPAN
Department of Orthopaedic Surgery, Shiga University, Otsu, JAPAN

Chronic partial tears of the subscapularis tendon in patients with baseball players are frequently described, while the acute complete ruptures of this tendon are quite rare. We report the case of a 50 years old amateur baseball player who suddenly injured his right shoulder during throwing. He drunk beer heavily before playing baseball. The subscapularis muscle is highly active during acceleration phase of throwing motion. We guess that autonomous muscular violence under the influence of drink cause subscapularis tendon rupture.

Poster #403
ISOKINETIC PROFILE AND SUGGESTION FOR THE RECOVERY OF THROWING SHOULDER INJURIES OF HIGH SCHOOL BASEBALL PLAYERS
Toskiniro Yoshiimatsu, Tokyo, JAPAN, Presenter
Shunichi Yoshimatsu, Nagano, JAPAN
Keisuke Masima, Tokyo, JAPAN
Kazumasa Fukushima, Tokyo, JAPAN
Akiyoshi Saito, Tokyo, JAPAN
Keinosuke Ryu, Tokyo, JAPAN
Dept. of Orthop. Surg., Nihon University School of M, Tokyo, JAPAN

Results
Returning to pitching was found to be highly possible when the patients corrected of the imbalance of internal and external rotational strengths and their concentric isokinetic endurance strength was above 80 measured by the concentric endurance strength test.

Conclusion
Correction of the imbalance of internal and external rotational strengths and the improvement of endurance strength are considered to be necessary to judge the appropriate time for returning to pitching.

Poster #404
SUBACROMIAL ARTHROSCOPIC DECOMPRESSION OF THE SHOULDER WITH THE CASPARI TECHNIQUE. LONG-TERM FOLLOW-UP
Benigno Ch Zenteno, Mexico DF, MEXICO, Presenter
Sergio Martinez, Chihuahua, MEXICO
Nicolas Zarur, Mexico City, MEXICO
Cima Hospital, Chihuahua, MEXICO

Twenty patients were followed for a mean of 3 years, range 14 months to 6 years, with diagnosis of impingement syndrome according to neer criteria, and failed conservative treatment for a long period of time. All operated by one surgeon with the technique described by Richard B. Caspasi. The age of the patients varied from 22 to 72, with a mean of 49.3 years. The surgical mean time was 1.13 hrs. The aggregated injuries were:6 complete injuries of these tendons. Inferior clavicular osteophytes, two. Parcial lesions of the biceps tendon one. And arthritis of the acromioclavicular joint one. We had no complications. The patients were evaluated with the UCLA shoulder parameters. Of the patients 85% resulted in good and excellent numbers. Pain was a parameter that improved from 2.3 to 3 postoperatively with the UCLA classification. With the results mentioned above, we advise the utilization of this technique, as a simple
procedure, safe, effective and the results will not deteriorate with time.

Poster #439
INTEREST OF ARTHROSCOPY IN THE DIAGNOSIS AND THE TREATMENT OF A PAINFUL SHOULDER ARTHROPLASTY
Kempf Jean-François, Strasbourg, FRANCE, Presenter
Torga Spak Roger, Strasbourg, FRANCE
Lefèvre Yves, Strasbourg, FRANCE
Lano Jerome, Strasbourg, FRANCE
Bonnomet Françoise, Strasbourg, FRANCE
Service d’Orthopedie Hopital de Hautepierre, Strasbourg, FRANCE

Hemi or total shoulder arthroplasties (TSA) bring in a regular way an excellent analgesic and functional result. Some of these shoulders remain nevertheless painful and/or stiff and the cause of this unsatisfactory result is difficult to establish. We wanted to estimate the interest diagnostic and therapeutics of the arthroscopy in this context.

Of 1994 to 2000, 12 patients had an arthroscopy of the shoulder because of persevering pain. It was 11 times about a hÉmiarthroplastie and once about a TSA. The initial diagnosis was in 6 cases an osteoarthritis, in 3 cases a fracture of the upper part of the humerus, in 2 cases an osteonecrosis and in 1 case an allograft for tumor. The revision of the patients contained a Constant score (CS), a radiological evaluation (9 arthro-CT scan). Gestures were 5 arthrolysis, 5 tenotomies of the long head of Biceps (LHB), 2 removal of a fragment of cement. In 3 cases, an additional opened surgery was realized. 1 implantation of a glenoid component for a painful hemiarthroplasty, tablation of a fragment of cement and 1 rotator cuff repair.

The interval between the prosthesis and the arthroscopy was on average of 28 months (6-96). The average follow-up was of 19 months (6-72 months). Globally, all the patients were improved, the CS increased from 25 points to 43 points and the adjusted CS from 32% to 55%. 6 tenotomies of the LHB were realized, 5 times for an isolated pathology of the LHB and it is in that case that the results were the best, increasing the CS from 28 points to 48 points. 5 arthroscopic releases were performed for stiffness with less good results (pre-op CS: 23 points, post-op CS: 39 points) because there was every time an important wear of the glenoid. For 3 patients, arthroscopy allowed a surgical indication: 1 implantation of a glenoid component, 1 ablation of a fragment of cement and 1 rotator cuff repair.

Conclusions:
• Arthroscopy of a shoulder arthroplasty remaining painful is useful for the diagnosis and for the treatment.
• Hemiarthroplasties are more often painful than TSA.
• The most effective gesture is the tenotomy of a pathological LHB in an isolated way.
• The arthrolysis of a painful and stiff shoulder arthroplasty is less effective because of the associated glenoid wear.
• The rarer indications are the ablation of foreign body or associated rotator cuff disease.

Poster #449
OUTCOME OF MINI-OPEN SALVAGE OF TECHNICALLY UNSUCCESSFUL ARTHROSCOPIC ROTATOR CUFF REPAIR
Seung-Kyu Oh, Seoul, SOUTH KOREA
Irvin Oh, Seoul, KOREA
Samsung Medical Center, Seoul, SOUTH KOREA

Purpose: The purpose of this study was to compare outcomes between arthroscopic repair of medium and large rotator cuff tears to mini-open repair of similar tears in which arthroscopic repair was technically unsuccessful.

Methods: We evaluated 76 patients, who were treated for full-thickness rotator cuff tears either by all-arthroscopic (42 patients) or mini-open salvage of technically unsuccessful arthroscopic repair (34 patients). Patients who had acromioclavicular arthritis, subscapularis tear, or instability were excluded. There were 39 males and 37 females with mean age of 56 years (range, 42 to 75 years). Preoperative values including shoulder scores, tear size (arthroscopic group, 23 medium and 19 large tears; mini-open salvage group, 21 medium and 13 large tears) or patients’ activity were similar in both groups. The mini-open salvage procedure was performed after arthroscopic acromioplasty, margin convergence when necessary and suture anchor insertion. At a mean follow-up of 39 months (range, 24 to 64 months), the results of both groups were compared with regard to the University of California Los Angeles and American Shoulder and Elbow Surgeons shoulder rating scales.

Results: Shoulder scores improved in all ratings in both groups (p<0.05). Overall, sixty-six patients showed excellent or good and ten patients showed fair or poor scores by the University of California Los Angeles scale. Seventy-two patients satisfactorily returned to prior activity and four showed unsatisfactory returns. The range of motion, strength, and patient satisfaction were improved postoperatively. There were no difference in shoulder scores, pain, and activity return between the arthroscopic and mini-open salvage groups (p>0.05). However, Patients with larger size tear showed lower shoulder scores and less predictive recovery of the strength and function (p<0.05). Postoperative pain was not different with respect to the size of the tear (p=0.251).

Conclusion: Arthroscopic repair of medium and large full-thickness rotator cuff tears had an equal outcome to technically unsuccessful arthroscopic repairs, which were salvaged by conversion to a mini-open repair technique. Surgical outcome depended on the size of the tear, rather than the method of repair.

Poster #406
EXPOSURE OF THE ADOLESCENT PORCINE SPINE TO MECHANICAL FLEXION-COMPRESSION AND EXTENSION-COMPRESSION.
Adal Baranto, Göteborg, SWEDEN, Presenter
Lars Ekstrom, Göteborg, SWEDEN
Mikael Hellstrom, Göteborg, SWEDEN
Olof Lundin, Göteborg, SWEDEN
Stern Holm, Göteborg, SWEDEN
Leif Sward, Göteborg, SWEDEN
Sahlgrenska University Hospital, Department of Orth., Göteborg, SWEDEN

Study Design. Experimental, exposing functional spinal units (FSU) from adolescent porcine to controlled mechanical flexion-compression and extension-compression to failure. The biomechanical, radiological, magnetic resonance imaging and histological characteristics are described.
Objectives. To try to explain the mechanism behind traumatic displacement of the ring apophysis, disc degeneration and end plate injuries found in adolescent athletes by investigating the patterns of injury seen in FSU:s from adolescent porcine lumbar spine exposed to traumatic flexion-compression and extension-compression forces.

Summary of Background Data. Several studies of the adolescent spine exposed to trauma have shown injuries affecting the growth zone, in contrast to adults where the vertebral body is the weakest part. In athletes with high loads on the spine a high frequency of abnormalities in the vertebral discs, vertebral bodies, end plates and ring apophyses has been demonstrated. The aetiology of these abnormalities is however, still a controversial issue.

Methods. Eight functional lumbar spinal units (vertebra-disc-vertebra) obtained from 4 adolescent male pigs were exposed to flexion-compression and another 8 FSU:s from 4 adolescent pigs were exposed to extension-compression forces to failure. All FSU:s were examined with plain radiography and magnetic resonance imaging before and after flexion/extension compression loading. After failure, the units were sagittally sawed into 3-4 mm slices, photographed and prepared for histological examination.

Results. In all FSU:s exposed to flexion-compression there were identical traumatic avulsion fractures seen in the growth zone posteriorly and similar injuries were seen in the extension-compression units anteriorly. There were no changes in the discs. The avulsion fractures were not seen on plain radiographs but were detected on magnetic resonance images and confirmed on macroscopic, microscopic and histological examination. The flexion and extension angles at failure varied between 12° and 19°. The ultimate force at failure for all FSU:s varied between 1607 N and 3138 N.

Conclusions. The weakest part of the lumbar spine in adolescent pigs, when compressed in flexion or extension, is the growth zone. This may explain the high frequency of disc degeneration and persisting ring apophyses seen in the spine of young athletes.

Poster #407
SURGICAL TREATMENT OF ATHLETES SPINAL DISEASES
Marcelo Wajchenberg, Sao Paulo-SP, BRAZIL
Moises Cohen, Sao Paulo, BRAZIL, Presenter
Eduardo B Paquetas, Sao Paulo, BRAZIL
Francisco Prado Santos, Sao Paulo, BRAZIL
Skeila Jean McNeill Ingram, Sao Paulo, BRAZIL
Luciano Miller Rodrigues, Sao Paulo, BRAZIL
Paulo Satiro Souza, Sao Paulo, BRAZIL
Jose Carlos Meirelles, Sao Paulo, BRAZIL
Valdeci Manuel Oliveira, Sao Paulo, BRAZIL
UNIFESP/EPM, Sao Paulo, BRAZIL

The indication to perform a surgical treatment in patients with pathology in the spine varies according to the patient's symptomatology without specific rules to its application. This fact is also observed in athletes but other variables must be considered such as the capacity to practice competitive physical activity after the surgery. In this study, 84 patients were assisted during one year (from October 1999 to September 2000), of which 8 surgically treated. The diseases treated were: lumbar disc herniation in 4 patients, spondylolisthesis in 1 patient, chondroma in the cervical region in 1 patient, osteoid osteom in lumbar spine in 1 patient and fracture-luxation of the thoracic spinal column in 1 patient. All the patients returned to their physical activities but one athlete who did not complete the postoperative recovery period. The purpose of this study was to evaluate and discuss the pathologies treated on these patients, the indication of the proposed treatment and its relationship with the patient's sports activity.

Poster #408
ACUTE INJURY OF AN INTERVERTEBRAL DISC IN AN ELITE TENNIS PLAYER
Lof Svard, Goteborg, SWEDEN
Mikael Hellstrom, Goteborg, SWEDEN
Bjorn Rydevik, Goteborg, SWEDEN
Olof Lundin, Goteborg, SWEDEN, Presenter
Department of Orthopaedics and Radiology, Sahlgren, Goteborg, SWEDEN

Study Design. A case report.

Objectives. To present a previously undescribed rare case of intra-discal haematoma due to acute trauma in an elite tennis player with a literature review injury patterns.

Summary of Background Data. Several studies have demonstrated a high frequency of radiological changes in the spine of athletes, especially in sports with high loads on the back. In addition signs of disc degeneration without disc herniation have frequently been found in MRI studies of the spine of athletes. The aetiology to these abnormalities is however obscure. It has also been shown that radiological abnormalities of the spine in young athletes are correlated to back pain, which was not found among former athletes where progressive disc degeneration with time was the only factor that correlated with back pain.

Methods. In October 2000 an elite male tennis player experienced pain in the right buttock after a backhand stroke. He was treated due to hip problems and started to play 2 weeks later. After a few games a backhand stroke again resulted in intense pain projected in the os coccyx region. At examination there was no neurological disturbances and the LasÈgues test was negative. At palpation over the spinal processes (Springing test) of L1-L2 the patient experienced intense pain over the upper lumbar region, a pain with the same distribution as described above.

Results. MRI in November 2000 showed an injured L1-L2 disc with fluid inside the disc with a signal similar to blood. Another three MRI examinations have been performed in the five to eight weeks interval where a healing process has been recognized with gradually increasing signal intensity in the nucleus pulposus.

Conclusions. It may be concluded that MRI is sensitive in diagnosing acute intradiscal injuries and that the healing process can be followed.

Poster #409
PSOAS RUPTURE WITHOUT A PREDISPOSING FACTOR. A CASE REPORT
Kaya Memiso glu, Kocaeli, TURKEY
Baris Kurtoguz, Kocaeli, TURKEY
Gur Akansel, Kocaeli, TURKEY
Sefa Muezzinoglu, Kocaeli, TURKEY, Presenter
Kocaeli University School of Medicine Dept of Orth, Izmit, TURKEY

Iliopsoas rupture is always a complication of anticoagulation therapy, hemophilia, infection or very rarely following posterior spinal decompression. We report a isolated psoas muscle rup-
In a thirty-one-year-old patient, a history of diabetes developed five years before first visit to our hospital, and it was under medical treatment by diagnosis of diabetes. After 47-73 years of age, the right coxalgia appeared and it had grown more severe. Although the anti-inflammatory drug medication was performed, sharp hip pain did not decrease. The right hip joint had pain on active motion and range of motion was restricted. With the plain X-rays view, narrowing of joint space, and enthesopathy were showed. Storage of joint liquid was revealed by MRI. We confirmed remarkable synovitis at the time of arthroscopic examination and arthroscopic synovectomy was performed. Coxalgia was mitigated shortly after the operation. Until now, after five years post operatively, recurrence has not occurred.

Significance: Although the open surgical treatment of synovectomy etc. is required for the hip joint which does not respond to the medical treatment, arthroscopic surgery succeeded in pain relief. This method is effective as minimum invasive surgery for the psoriatic arthritis.

**Poster #410**

**PSORIATRIC ARTHRITIS OF HIP JOINT.**

Takashi Ono, Nakakoma-gun, JAPAN, Presenter

Kotakiho Iida, Nakakoma-gun, JAPAN

Yasukiro Yamamoto, Nakakoma-gun, JAPAN

Satoshi Ochiai, Yamanashi, JAPAN

Yamanashi Medical University, 1110 Tamahomati Simokatou, JAPAN

Purpose: To report a case of psoriatic arthritis of hip joint who can be decreased the pain by arthroscopic synovectomy of the hip joint.

Case report: 38 year male. Chief complain: right coxalgia. Eczema of the whole body developed five years before first visit of our hospital, and it was under medical treatment by diagnosis of psoriasis. After time of 37 years-old the right coxalgia appeared and it had grown more severe. Although the anti-inflammation drug medication was performed, sharp hip pain did not decrease. The right hip joint had pain on active motion and range of motion was restricted. With the plain X-rays view, narrowing of joint space, and enthesopathy were showed. Storage of joint liquid was revealed by MRI. We confirmed remarkable synovitis at the time of arthroscopic examination and arthroscopic synovectomy was performed. Coxalgia was mitigated shortly after the operation. Until now, after five years post operatively, recurrence has not occurred.

Significance: Although the open surgical treatment of synovectomy etc. is required for the hip joint which does not respond to the medical treatment, arthroscopic surgery succeeded in pain relief. This method is effective as minimum invasive surgery for the psoriatic arthritis.

**Poster #411**

**A TECHNIQUE FOR ARTHROSCOPIC REMOVAL OF A BULLET FROM THE ACETABULUM**

Steven B Singleton, Fort Worth, TX, USA, Presenter

Harris Methodist Hospital, Fort Worth, TX, USA

Arthroscopy of the hip offers minimally invasive access to the hip joint compared to standard open arthroscopy. The authors describe an arthroscopically-assisted technique for the removal of a bullet lodged in the acetabulum of a young patient.

**INTRODUCTION**

Hipp arthroscopy was first described by Berman in 1931, but has been popularized only recently. Currently, arthroscopy of the hip is used for the diagnosis and treatment of multiple disorders about this joint. Proponents of hip arthroscopy assert that the indications for this procedure continue to evolve. Previous reports have demonstrated the use of arthroscopy for bullet removal from the femoral head and hip joint. The authors report a new, previously undescribed, method for removing a bullet lodged in the acetabulum.

**CASE REPORT**

A 38-year-old male presented with a bullet lodged in the right acetabulum. After perforating the descending colon, the missile had traversed the pelvis and became lodged within a non-displaced acetabular fracture. He underwent arthroscopic I&D of the joint and extraction of the missile. The missile was engaged in a longitudinal fashion using a 3.2 mm threaded-tipped guide pin through the nondisplaced acetabulum fracture. The threaded pin advanced easily into the tip of the missile, and when the pin was firmly seated, the bullet was then simply pulled out through the fracture line via the anterior hip portal. At one year follow up, this patient’s acetabulum fracture had healed, and he was ambulating without pain or crepitation. He has had no evidence of hip sepsis or lead intoxication.

Preop x-rays and CT scans, intraoperative fluorescent images, and postop radiographs detail this report. Excellent intraoperative arthroscopy photos also accompany the report.

**DISCUSSION**

There are a number of existing reports detailing different techniques on arthroscopic bullet removal from the hip and femoral head. Few detail removal of missiles or foreign bodies from the acetabulum, and we were unable to locate any that describe this method of extraction. This case is illustrative of several pertinent topics for contaminated foreign bodies located adjacent to large joints: 1) the potential for joint infection; 2) the potential for lead intoxication; and 3) the potential for complications with arthroscopy following acute acetabulum fracture.

**Poster #412**

**ARTHROSCOPIC ACETABULAR LABRAL REPAIR**

Akihiro Tsuchiya, Ichikawa, JAPAN, Presenter

Yoshitada Harada, Chiba, JAPAN

Isao Abe, Chiba, JAPAN

Hiroyuki Saegusa, Funabashi, JAPAN

Hideo Shiratsuchi, Funabashi, JAPAN

Kouji Michinaga, Funabashi, JAPAN

Funabashi Orthopedic Hospital, Funabashi, JAPAN

[Purpose] Two cases of arthroscopic acetabular labral repair are reported. The purpose of this study is to introduce our arthroscopic technique of repairing torn acetabular labrum and to evaluate the results of this procedure.

[Material and method] In the supine position on a traction table, three portals, anterior, anterolateral and lateral, are inserted in the patient. The arthroscope is inserted into the anterior portal and other working instruments are inserted into the anterolateral and lateral portals. The torn acetabular labrum was repaired similarly to a torn labrum of the shoulder which is by use of an anchor system. The anchors were placed in the acetabulum and torn labra were sutured to the acetabulum by the inside-out technique arthroscopically. Two female cases were performed by our technique. The patient age at operation was 44 and 21, respectively. The second case was a judo player. Mild dysplasia acetabuli were revealed on X-ray in both cases. Symptoms were pain around the hip joint in daily

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*The FDA has not cleared the drug and/or medical device for the use described in this presentation (i.e., the drug or medical device is being discussed for an “off-label” use).*
life and during sports. Follow-up was 43 months and 13 months, respectively.

[Results] Postoperative swelling around the external genitalia was observed in one case, but improved naturally after several days without any complications. Pain around the hip joint disappeared after surgery in both cases. The second case was able to return to judo without any limitations.

[Conclusion] This is a first presentation of arthroscopic repair of torn acetabular labrum. We were able to obtain good results in these two cases. Acetabular labral tear, especially ones which are detached from the acetabulum should be repaired arthroscopically.

Poster #413
SNAPPING HIP CAUSED BY JOINT CARTILAGE AVULSION – A CASE REPORT
Yasuhiro Yamamoto, Nakakoma-gun, JAPAN, Presenter
Takashi Seto, Nakakoma-gun, JAPAN
Takashi Ono, Nakakoma-gun, JAPAN
Yoshiki Hamaeda, Nakakoma-gun, JAPAN
Maiko Suma, JAPAN
Yamanashi Medical University, Nakakoma-gun, JAPAN

Purpose: To report snapping hip caused by joint cartilage avulsion. Case report: 24-year male. Chief complaint: right coxaalgia. He received conservative treatment for Perthes disease in childhood. Six months before initial visiting of our hospital, sharp pain developed with click when he extended, with external rotation, his right hip joint from the full flexed position. Plain X-ray showed oval deformity of the femoral head without bone cyst or sclerosis in the weight bearing area. CT detected impingement of the anterior femoral head on the anterior acetabular rim without bony lesion. MRI revealed no intraarticular lesion. At the time of arthroscopic examination, flap-like avulsion of the cartilage of the femoral head was recognized and it was shaved. A day after the operation, sharp pain and click disappeared.

Significance: Osteoarthritis, osteochondritis dissecans, and labral tear were reported as the cause of pain in the hip after Perthes disease in childhood. Only 4 cases of hip pain with impingement of the anterior femoral head on the anterior acetabular rim after Perthes disease were reported by Snow, et al. in 1993. On the other hand, although labral tear and loose body are recognized as the cause of intraarticular snapping hip, detached joint cartilage were unrecognized. This pathology should be recognized as the one of the cause of both coxalgia after Perthes disease and intraarticular snapping hip.

Sports Medicine

Poster #414
THE OUTCOME AND FINDINGS OF ARTHROSCOPIC SURGERY IN SWIMMER’S SHOULDER
Klaus Baek, Charlottenlund, DENMARK, Presenter
Christoffer Brusíj, Copenhagen S, DENMARK
Hans Viggo Johansen, rmitus, DENMARK
Peter Faunoe, Aabybro, DENMARK
Department of Orthopaedic Surgery, Aalborg Hospital, Copenhagen, DENMARK

Purpose: Among swimmers, shoulder pain is the most common injury. “Swimmer’s shoulder” can be examined and treated arthroscopically. There are only few previous studies on this subject. The purpose of this study was to evaluate findings and outcome of arthroscopic surgery in elite swimmers with shoulder pain resistant to rehabilitation.

Methods and materials: A retrospective analysis of 18 swimmers who underwent shoulder arthroscopy was undertaken. The median age was 18 years. The duration of symptoms before operation was median 23 months. Patient records were reviewed with respect to findings at preoperative clinical examination and arthroscopical findings. Telephone interviews were conducted in order to evaluate the functional outcome of the operation. Out of 18 people, 16 (89%) answered.

Results: Eleven (61%) exhibited labral pathology. Three swimmers had signs of posterior superior impingement (PSI), 2 had combined PSI and subacromial impingement, and 6 had labral tears, of which 2 had a SLAP lesion and 1 an incomplete Bankart. Three exhibited subacromial impingement alone, 2 had inflammation of the long head of the biceps tendon, and 1 had diffuse synovitis. In one shoulder no pathological findings were seen. Seven (44%) returned to the same level without pain, and two (12.5%) to the same level with moderate pain. Of 7 swimmers who had ceased activity, 6 (38%) stopped due to shoulder problems.

Conclusion: Only 56 percent return to competitive swimming at preinjury level after arthroscopic surgery of the shoulder. The most common finding in a swimmer's shoulder is labral pathology. This may be an indication of wear of the stabilizing structures in association with multidirectional hyperlaxity.

Poster #415
PERCUTANEOUS VS. OPEN SURGICAL ACHILLES TENDON REPAIR
Andrej Cretnik, Celje, SLOVENIA, Presenter
Milos Kesanovic, Celje, SLOVENIA
Aleksander Frank, Maribor, SLOVENIA
Teaching Hospital, Maribor, SLOVENIA

237 consecutive patients with a closed acute rupture of the Achilles tendon were included in the multicentre study. There were 132 prospectively followed patients in the first hospital, where all the patients were operated on with the percutaneous suturing under local anaesthesia and 105 patients in the second hospital where all the patients were treated with the open operative repair under general or spinal anesthesia. Functional outcome and the complication rate were assessed with the follow-up of minimally two years.

The results showed significantly more major complications in the group of open operative repair in comparison with the group of percutaneous repair (12.4% versus 4.5%)(p=0.03), particularly necrosis (5.6% versus 0%)(p=0.019), as well as greater total number of the complications (23% versus 11%)(p=0.013). There were slightly more reruptures (3.7% versus 2.8%) and suralis nerve disturbances (4.5% versus 2.8%) in the group of percutaneous repair with no statistical significance. Functional score assessment showed no statistical significance with good result in 91% patients in the group of percutaneous repair and in 88% patients in the group of open operative repair. Patients in the group of open operative repair had finally significantly greater thickness of the operated Achilles tendon (p=0.0005) and greater loss of dorsiflexion of the ankle (p=0.003). Patients in the group of percutaneous repair were more satisfied in their subjective assessment (p=0.024). The average costs in the group of percutaneous repair were about one third of those in the group of open operative repair.
The results of the study support the choice of percutaneous suturing under local anesthesia as the method of comparable functional results to the open repair with lower rate of complications and lower costs.

Poster #416
NEW SPORTS BANDAGE FOR ANKLE SUPPORT – ITS CLINICAL APPLICATION AND FUNCTIONAL RESULTS
Toru Fukabayashi, Tokyo, JAPAN, Presenter
Koiti Wakayoshi, Nara, JAPAN
Shinya Miyakawa, Ishikawa, JAPAN
Takanobu Aoyagi, Tokyo, JAPAN
Takashi Miura, Tokyo, JAPAN
Nobu Hiwatari, Tokyo, JAPAN
The University of Tsukuba and Nara Education, Tsukuba and Nara, JAPAN

Purpose: There are certain complaints that conventional sports bandages have not enough fixation strength. To increase the stability of the unstable ankle joint we developed new type bandages, which are much stiffer and more durable than the conventional ones. The objective of this study is to analyze the effectiveness of these bandages from the point of durability, endurance ability, and sports performance.

Method:
- Stability and comfortability
Six male collage soccer players who had the experiences of ankle sprains were used for this study. Their ankles were stabilized with conventional bandage, new bandage, and taping. Stress X-rays were taken with Telos-SE before fixation, immediately after fixation, and after thirty minutes soccer practice. Tilting angles of talus were measured, and statistically analyzed. Subjective evaluation of the fit feeling was also checked.
- Running economy
Endurance tests were performed with treadmill to seven male collage athletes. VO2 and HR were monitored until the exhaustion. Running pitch and stride were measured from the video photography. The running economy (REco) was evaluated from these points.

Results: New sports bandages showed better stability, durability, and subjective feeling than the conventional ones. As far as the REco they showed no remarkable change.

Conclusion and Significance: This study demonstrated the advantage of the new sports bandages. They may prevent the ankle sprain more effectively without decreasing sports performances.

Poster #417
ROFECOXIB IN THE TREATMENT OF PAINFUL KNEE JOINT IN ICE-HOCKEY PLAYERS
Milan Handl, Prague, CZECH REPUBLIC, Presenter
Orthopaedic Clinic, University Hospital Motol, Prague, CZECH REPUBLIC

Summary:
The knee pain after the hit, concussion and sprain is very common at ice-hockey players in the high season. If no serious injury has been diagnosed the question of early ability to play occurs. Author evaluated 2 parallel groups of total 37 players treated for the knee pain by rofecoxib or paracetamol in 2001 - 2002. The evaluation was based on clinical tests. In both groups the early ability to full load was observed and compared. The results show a positive effect of rofecoxib in early full-sports activity.

Purpose
Standard NSAIDs have a potential risk of causing GIT disease. Despite this they are used in the treatment of sports injuries. The aim of the study was to evaluate the effect and safety of a selective inhibitor COX-2 rofecoxib (with reduced risk of PUB) used as pain-killer in the knee difficulties.

Methods
Two groups of patients - high-level icehockey players (age 16 to 38 yrs) were treated for the painful knee (sprain, chondropathy, chronic effusion, early OA). The treatment period was 1 week since pain has been announced. No severe knee injury requesting a rest was included in the study. The first group (21 pts) used rofecoxib 25 mg daily, the other one (16 pts) used paracetamol 500 mg daily. In both groups the therapy was finished after 7 days. The clinical testing were performed on 1, 3 and 7 day. Early onset of pain-relief (in 2 hours) longterm effect of a single dose (1 day) and full effect (total pain relief) after 1 week dose were observed.

Results
Rofecoxib group appear early onset after 2 hours with long term effect for the whole day. After one week therapy most of the pain has gone. In paracetamol group there were shorter periods of the pain-killer effect. One dose was not sufficient as pain-killer in all cases. Paracetamol did not bring full recovery in most cases. No GIT complications were observed in both groups.

Table
<table>
<thead>
<tr>
<th>Group</th>
<th>No of pts</th>
<th>Pain relief %</th>
<th>Longterm %</th>
<th>Full effect %</th>
<th>GIT %</th>
</tr>
</thead>
<tbody>
<tr>
<td>G 1</td>
<td>rofecoxib 21</td>
<td>80,9 - 90,5</td>
<td>95,3</td>
<td>95,3</td>
<td>0</td>
</tr>
<tr>
<td>G 2</td>
<td>paracetamol 16</td>
<td>43,8 - 62,5</td>
<td>25</td>
<td>50</td>
<td>0</td>
</tr>
</tbody>
</table>

Discussion
The effective pain-killer can usually solve the reason of intraarticular knee derangement. NSAID have potential risk of other complication. The proper way of combination of both effects is being searched among COX-2 inhibitors.

Conclusion:
The early possible outcome as an effective pain-killer among drugs available on the market is discussed. Use of COX-2 inhibitors seems to be an adequate way in the effective treatment of knee pain when the reduced risk of GIT complication as well as sufficient effect of pain relief is demanded.

Poster #418
SMARTNAIL – A BIODEGRADABLE NAIL FOR TREATMENT OF OSTEOCHONDRAL LESIONS
Gert Kristensen, Aalborg, DENMARK, Presenter
Preben Lass, Aalborg, DENMARK
Steen Olesen, Aalborg, DENMARK
Aalborg Hospital, Dept. of Orthopaedic Surgery O, Aalborg, DENMARK

Introduction
Osteochondral fractures with a big cartilage component and a small bony component are difficult to fix properly. With Smartnail you can adress and fix these fractures from the chondral side.

Material and method
2 cases of osteochondral fractures of the talus, 2 cases of osteochondral fractures of patella after patella dislocations, 2 cases of ACL-avulsion from the tibial eminence, one case of radial head fracture and one case with avulsion fracture of the proximal phalanx of the great toe - all repaired with Smartnails are presented.

Results
Poster #419
ENDOSCOPIC TREATMENT OF OSGOOD-SCHLATTER’S DISEASE
Gert Kristensen, Aalborg, DENMARK, Presenter
Aalborg Hospital, Dept. of Orthopaedic Surgery O, Aalborg, DENMARK

Introduction
Osgood-Schlatter’s disease rarely needs operation, but when it does open surgery has been recommended. This paper describes an endoscopic technique with good results and without complications.

Material and method
14 patients, age 22.4 years (range 14-35) all with failed conservative treatment and all with X-ray changes were operated with endoscopic technique via standard anterolateral and anteromedial portals. Procedures done were removal of ossicles in the tendon, resection of scar tissue in the infrapatellar bursa and removal of bony prominence of tibial tubercle – alone or in combination.

Results
11 out of 14 patients returned to the same sport within 3 months postop. 2 patients between 3 and 6 months. 1 patient developed patellar tendonitis after a symptomfree period. Median operating time was 35 min. (25-45). No complications were observed.

Conclusion
Endoscopic treatment of Osgood-Schlatter’s disease is a simple and safe procedure allowing patients to return to sport very fast.

Poster #420
THE RELATIONSHIP BETWEEN BONE BRUISE IN MRI AND ASSOCIATED INJURIES AFTER KNEE JOINT TRAUMA
Hee-Soo Kyung, Daegu, KOREA, Presenter
Joo-Chul Ilk, Taegu, SOUTH KOREA
Jun-Young Yeo, Taegu, SOUTH KOREA
Department of Orthopaedic Surgery, Kyungpook Natio, Taegu, SOUTH KOREA

Purpose
The purpose is to analyze the relationship between bone bruise in MRI and associated injuries after the knee joint trauma.

Materials and Methods: Total 50 cases were reviewed, divided into two groups according to initial trauma energy. High-energy group (group I), such as traffic accident was 13 cases, low-energy group (group II), such as sports trauma was 37 cases. The type of the lesion was used the classification by Costa-Paz. The site of lesion was analyzed according to femoral/tibial, medial/lateral and anterior/middle/posterior site respectively. Associated injuries were confirmed by physical examination, radiograph, MRI and arthroscopy.

Results
In group I there was a various distribution of the bone bruise in the knee joint according to mechanism of injury. The bone bruise with ACL injury was 38% only and the most frequent type was Costa-Paz type I (52.6%). In group II more frequent locations were the middle portion of the lateral femoral condyle and the posterior portion of the lateral tibial condyle. Bone bruise associated with ACL injury, was upto 56.8% and the frequent type were Costa-Paz type II (48%), in order type (42%). As a result, in the high-energy injury the bone bruise had a various location in both condyle and less frequently associated injury, but in the low-energy injury there was particularly frequent location of bone bruise, associated injury and type.

Conclusion: We could assess the associated injury by analysis of the location and type of bone bruise, especially in the low-energy injury, e.g. sports injury. But further study will be necessary with more case analysis.

Poster #421
MUSCULOSKELETAL INJURIES IN TRACK AND FIELD: A TWO-YEAR FOLLOW-UP OF COMPETITIVE ATHLETES.
Cristiano Laurino, Sao Paulo, BRAZIL, Presenter
Rogerio Takahashi, Sao Paulo, BRAZIL
Patricia Ventres, Sao Paulo, BRAZIL
Rene Jorge Abdalha, Sao Paulo, BRAZIL
Moises Cohen, Sao Paulo, BRAZIL
Centro de Trauma-Ortopedia do Esporte, Universid, Sao Paulo, BRAZIL

Behavior of lesions among Track and Field athletes was evaluated in this study, during a period of 2 years (season of 1998 and 1999). Forty-six track and field athletes, of which 31 male (67.4%) and 15 (32.6%) were evaluated and followed-up, in the State of Sao Paulo. Incident and characteristics of lesions in relation to training, tournament, sports modality, level of performance, category (by age range) and individual characteristics were studied. Forty-one athletes (89.1%) presented 107 lesions, 29 (93.5%) were males and 12 (80.0%) females. A mean of 1.3 lesion/athlete/year was observed. Fifty-one (47.7%) severe lesions and 56 (52.3%) chronic lesions were found. Lower limbs were involved in 86.0% of the lesions and the most common affected areas were: thigh (31.8%) and knee (19.6%). Tournaments caused 83.2% of the lesions. No statistical significant difference between the athlete’s level of performance or category and appearance of lesions among the studied groups was observed.

Poster #422
SKATEBOARD INJURIES
Cristiano Laurino, Sao Paulo, BRAZIL, Presenter
Luis Henrique Vitoria, Sao Paulo, BRAZIL
Giovanna Cocco Parisse, Sao Paulo, BRAZIL
Moises Cohen, Sao Paulo, BRAZIL
Rene Jorge Abdalha, Sao Paulo, BRAZIL
Centro de Trauma-Ortopedia do Esporte, Universid, Sao Paulo, BRAZIL

This study evaluated 148 athletes, 135 (91.2%) were males and 13 (8.8%) females, 68 (45.9%) amateurs and 80 (54.1%) skateboarding professionals. The mean age was 22 years. Presence and characteristics of lesions caused by sports practice during training and tournaments were evaluated in this study. The number of reported lesions was 526. Amateurs presented 40.7% of the lesions while professionals 59.3%. Among all the lesions, 63.1% occurred due to the nonattendance of safety equipment. The most affected areas were: foot and ankle (27.5%), hands (20.3%) and spine (19.6%). Tournaments caused 83.2% of the lesions. No statistical significant difference between the athlete’s level of performance or category and appearance of lesions among the studied groups was observed.

Poster #423
MALE PELVIC STRADDLE-TYPED STRESS FRACTURE
Hao-Chin Liao, Changhua, TAIWAN, Presenter
Stress fracture is not an uncommon injury in sports medicine clinics. It often occurs in joggers, runners, and recruits. It frequently involves the metatarsals, tibia, fibula, os calcis, and femoral neck. Pelvic stress fracture contributes a low incidence (1.25%) of all runners’ stress fractures. Stress fractures of the pubic rami are even fewer. There is only one case report of female involving all four of the pubic rami in English literature. We present a male straddle-typed stress fracture and possible mechanism discussed.

Poster #424
SURGICAL MANAGEMENT OF TENNIS ELBOW: A COMPARATIVE STUDY OF TWO TECHNIQUES
Nicola Maffulli, Stoke on Trent, UNITED KINGDOM, Presenter
D Debashis, Stoke on Trent, ENGLAND
Keele University, Stoke on Trent, ENGLAND

Background To ascertain whether there were any differences in the outcome of release of the common extensor origin and release of the common extensor origin and drilling of the lateral epicondyle in the management of recalcitrant tennis elbow.

Methods 111 patients (125 elbows; 40 males, median age: 47 years; 71 females, median age: 45 years) entered the study. The minimum follow up period was two years (average follow up: 52.8 months). Patients were reviewed at two and six or eight weeks, and three and six months after surgery. If a complication ensued, or if a patient did not report improvements, they were followed up for at least one year post-operatively. Two years after the recruitment period had ended, telephone interviews were performed. We used a 1 to 10 scale when enquiring about pain, both pre-operative and post-operative, with 1 as the best score and 10 the worst. We also determined patient satisfaction, grip strength, and elbow function.

Results 75% of patients had excellent or good results, with 73% of them being satisfied with the results of surgery. There was no statistical significance in the outcome of the two procedures (Chi square, p = 0.488). There were no statistically significant differences between the two procedures regarding pain, satisfaction, elbow function, and grip strength.

Conclusions Release of the common extensor origin at the elbow is a relatively simple operation, and produces reliable long term relief of tennis elbow pain in at least 70% of patients.

Poster #425
INCOMPLETE TEARS OF THE ANTERIOR CRUCIATE LIGAMENT
Nicola Maffulli, Stoke on Trent, UNITED KINGDOM, Presenter
W J Leach, Stoke on Trent, ENGLAND
Keele University, Stoke on Trent, ENGLAND

Background To report the long term outcome of patients with a partial tear of the anterior cruciate ligament (ACL).

Methods We reviewed 26 of 31 athletes who had a diagnosis of acute, incomplete tear of the anterior cruciate ligament (ACL) between November 1986 and December 1991. All patients had arthroscopy and examination under anaesthesia within 8 weeks of acute knee injury, and were included in the study if there were still ACL fibres remaining which resisted anterior tibial translation. We excluded patients with associated major ligamentous lesions. Patients were reviewed by a combination of questionnaire and clinical examination at a mean of 38 months after the index injury (range 18 to 66).

Results At review, 20 patients (77%) had developed some symptoms of knee instability. The number of patients with a positive Lachman’s test had increased from 17 to 18, and those with a positive pivot shift had increased from 9 to 13. Seven patients (27%) had undergone ACL reconstruction, 7 other patients (27%) had been unable to return to sport, and 6 patients (23%) continued to participate in sport, but at a reduced level. Only 6 patients (23%) were able to continue in sport at their pre-injury level without reconstructive surgery. Patients with a tear of the anteromedial bundle of the ACL were more likely to have signs of instability at review and to require ACL reconstructive surgery than patients with a tear mainly affecting the posterolateral bundle.

Conclusions Partial lesions of the ACL, especially when involving the AM bundle, should not be regarded as benign injuries. They often result in symptomatic instability necessitating intra-articular reconstruction of the ACL, and, in the long run, in marked decrease in the level of sports participation.

Poster #426
CLINICAL AND FUNCTIONAL RESULTS OF OPEN OPERATIVE REPAIR FOR ACHILLES TENDON RUPTURE IN A NON-SPECIALIST SURGICAL UNIT: A LONG-TERM OUTCOME STUDY
Nicola Maffulli, Stoke on Trent, UNITED KINGDOM, Presenter
A Coats, Aberdeen, SCOTLAND
A MacGregor, J Gibson, Stoke on Trent, ENGLAND
Keele University, Stoke on Trent, ENGLAND

Background To ascertain whether there were any differences in the outcome of release of the common extensor origin and release of the common extensor origin and drilling of the lateral epicondyle in the management of recalcitrant tennis elbow.

Methods 111 patients (125 elbows; 40 males, median age: 47 years; 71 females, median age: 45 years) entered the study. The minimum follow up period was two years (average follow up: 52.8 months). Patients were reviewed at two and six or eight weeks, and three and six months after surgery. If a complication ensued, or if a patient did not report improvements, they were followed up for at least one year post-operatively. Two years after the recruitment period had ended, telephone interviews were performed. We used a 1 to 10 scale when enquiring about pain, both pre-operative and post-operative, with 1 as the best score and 10 the worst. We also determined patient satisfaction, grip strength, and elbow function.

Results 75% of patients had excellent or good results, with 73% of them being satisfied with the results of surgery. There was no statistical significance in the outcome of the two procedures (Chi square, p = 0.488). There were no statistically significant differences between the two procedures regarding pain, satisfaction, elbow function, and grip strength.

Conclusions Release of the common extensor origin at the elbow is a relatively simple operation, and produces reliable long term relief of tennis elbow pain in at least 70% of patients.

Poster #427
LOCAL FLAP COVERAGE FOR SOFT TISSUE DEFECTS FOLLOW
Nicola Maffulli, Stoke on Trent, UNITED KINGDOM, Presenter
S M Kumta, Stoke on Trent, ENGLAND
Keele University, Stoke on Trent, ENGLAND

Background To report the long term outcome of patients with a partial tear of the anterior cruciate ligament (ACL).

Methods We reviewed 26 of 31 athletes who had a diagnosis of acute, incomplete tear of the anterior cruciate ligament (ACL) between November 1986 and December 1991. All patients had arthroscopy and examination under anaesthesia within 8 weeks of acute knee injury, and were included in the study if there were still ACL fibres remaining which resisted anterior tibial translation. We excluded patients with associated major ligamentous lesions. Patients were reviewed by a combination of questionnaire and clinical examination at a mean of 38 months after the index injury (range 18 to 66).

Results At review, 20 patients (77%) had developed some symptoms of knee instability. The number of patients with a positive Lachman’s test had increased from 17 to 18, and those with a positive pivot shift had increased from 9 to 13. Seven patients (27%) had undergone ACL reconstruction, 7 other patients (27%) had been unable to return to sport, and 6 patients (23%) continued to participate in sport, but at a reduced level. Only 6 patients (23%) were able to continue in sport at their pre-injury level without reconstructive surgery. Patients with a tear of the anteromedial bundle of the ACL were more likely to have signs of instability at review and to require ACL reconstructive surgery than patients with a tear mainly affecting the posterolateral bundle.

Conclusions Partial lesions of the ACL, especially when involving the AM bundle, should not be regarded as benign injuries. They often result in symptomatic instability necessitating intra-articular reconstruction of the ACL, and, in the long run, in marked decrease in the level of sports participation.
Posters

Poster #428
RUPTURED ACHILLES TENDONS SHOW INCREASED LECTIN STAINABILITY
Nicola Maffulli, Stoke on Trent, UNITED KINGDOM, Presenter
S W Waterston, Aberdeen, SCOTLAND
S W B Ewen, Aberdeen, SCOTLAND
School of Post Graduate Medicine, Keele University, Stoke on Trent, ENGLAND

Purpose To ascertain whetherlectins could be a useful tool for investigation of the extracellular matrix of degenerated and normal tendons.

Methods Haematoxylin-eosin stained slides were assessed blindly using a semi-quantitative grading scale for fibre structure, fibre arrangement, rounding of the nuclei, regional variations in cellularity; increased vascularity; decreased collagen stainability; hyalination; glycosaminoglycan, with a pathology score giving up to three marks per each of the above variables, with 0 being normal, and 3 being maximally abnormal. For lectin staining with Aleuria aurantia, Canavalia ensiformis, Galanthus nivalis, Phaseolus vulgaris, Arachis hypogaea, Sambucus nigra, Triticum vulgaris, assessment of staining on a scale from 0 (no staining) to 5 (strong staining) was performed blindly.

Results The mean pathology sum-score of ruptured tendons (n = 14, average age 46.5 years, range 29-61) was significantly higher than the mean pathology score of the control tendons of Achilles tendons from individuals with no known tendon pathology (n = 16, average age 62.5 years, range 49-73) (pathology score: 18.5 ± 3.2 vs 6.1 ± 2.3). Four of the seven lectins used exhibited significantly positive results.

Conclusions Ruptured tendons are histologically significantly more degenerated than control tendons. Ruptured tendons show different lectin staining properties than non-ruptured ones. This difference may result from post-translational changes in the extracellular matrix producing alterations in the biochemistry of the tendon which MIGHT INTERFERE WITH THE INTERACTION WITH THE LATERAL SUGAR RESIDUES OF THE COLLAGEN MOLECULES, OR CAUSE STERIC BLOCKADE.

Poster #430
LONG TERM OUTCOME OF MACINTOSH RECONSTRUCTION OF CHRONIC ANTERIOR CRUCIATE LIGAMENT INSUFFICIENCY USING FASCIA LATA
Nicola Maffulli, Stoke on Trent, UNITED KINGDOM, Presenter
D R Johnston, Aberdeen, SCOTLAND
A Baker
R Christian
T R Scotland, Stoke on Trent, ENGLAND
Keele University, Stoke on Trent, ENGLAND

We assessed the long-term outcome of the MacIntosh lateral-substitution over-the-top anterior cruciate ligament (ACL) reconstruction in 82 patients (84 knees) at an average follow up of 9.8 years. Patients were evaluated with subjective questionnaires and by clinical and radiographic examination. Using the Lysholm score, 17 knees were rated excellent, thirty-five good, 19 fair, and 13 poor. The pivot shift test was negative in 74 patients. Thirty knee radiographs were evaluated. The mean Hospital for Special Surgery ACL radiographic score was 20.9. There was a non-significant association between the radiographic score and the Lysholm score, and between a worsening radiographic score and increasing time from injury. The MacIntosh lateral-substitution over-the-top ACL reconstruction shows comparable results with previously published long-term studies.

Poster #431
THE STUDY OF EFFECT OF VERBASCOSIDE ON OXIDATIVE STRESS IN MUSCLES DURING IMMOBILIZATION AND REMOBILIZATION IN RABBITS
Liu Mingju, HK, CHINA, Presenter
Li lingxiang, HK, CHINA
Qin Ling, Shatin NT, HONG KONG
Lee Kwongan, HK, CHINA
Chan Kaiming, Hong Kong, CHINA
The Chinese University of Hong Kong, HK, CHINA

Immobilization is one of the most common clinical procedures for fractures on bones or ruptures of ligaments as well as...
degenerative diseases of joints, it also frequently applied for injuries in sports. However, it is well known that immobilization results in dysfunction of the limb and obvious atrophy of affected muscle. Moreover, recovery from muscle atrophy is very slow. Recent study suggested that enhanced oxidative stress occurred during the recovery from atrophic muscle, which might aggravate muscle damage. In this study we evaluated the effect of Verbascoside, a purified extract of Chinese medicine, in reducing oxidative stress induced by immobilization. Male adult New Zealand White rabbits were divided into three groups: Control, Verbascoside and Placebo groups. After 3 weeks one hindlimb in the casts, the rabbits of Verbascoside and Placebo groups attended remobilization treatment for 7 days. Five hours after the last remobilization training, the gastronemius muscles from all animals were harvested. The levels of thiobarbituric acid-reactive substance (TBARS) and reduced glutathione (GSH) were measured. The data showed that the level of TBARS was increased significantly, while the level of GSH was decreased significantly (P<0.05). Compared with Placebo group, significant decreased TBARS and increased GSH were observed in Verbascoside group (P<0.05). The results indicated remobilization enhanced oxidative stress. Verbascoside could attenuate effectively increased oxidative stress during remobilization.

Poster #432
FIVE CASES WITH ATLANTAL FRACTURE BY SUMO WRESTLING
Yasuake Morimoto, Tokyo, JAPAN, Presenter
Akiyoshi Saito, Tokyo, JAPAN
Toshihiko Yoshimatsa, Tokyo, JAPAN
Takanori Horiguchi, Tokyo, JAPAN
Kensuke Sato, Funabashi, JAPAN
Koh Hoteya, Chiyoda-ku, JAPAN
Tatsuyuki Okita, Chiyoda-ku, JAPAN
Department of Orthopaedic Surgery Nihon University, Chiyoda-ku, JAPAN

[Discussion] Position of the neck at the time of injury varied among the five patients. Since bursting fractures of the atlas are caused by displacement eccentric to the nerves, patients are less likely to develop neurological symptoms. None of the five patients displayed neurological symptoms. As far as the diagnosis of atlantal fracture is concerned, CT is useful since plain radiography may miss these fractures.

The reason for the higher prevalence of atlantal fractures among sumo wrestlers could be the inherent nature of the sport. In other words, no weight classes exist in sumo wrestling; sumo wrestlers do not wear protective gear; and in most bouts, sumo wrestlers collide with each other and push the opponent’s head and neck region. As sumo wrestling is a very old and traditional sport, a tendency exists among sumo wrestlers to ignore cervical pain, and a certain percentage of sumo wrestlers with neck pain might unknowingly possess atlantal fractures.

[Conclusions] We presented the cases of five patients with atlantal fracture caused by sumo wrestling. Although the stability of the atlantal axis has improved somewhat, bone fusion has not yet been achieved in any of the patients.

Poster #433
ADOLESCENT FEMALES AND MALES DIFFER IN THE PERCEIVED IMPORTANCE OF STATIC HAMSTRING STRETCHING
John Nyland, Louisville, KY, USA, Presenter
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Purpose: The hamstring muscles are dynamic biarticular agonists that protect the ACL during jump landings and running directional changes. Nonimpaired musculotendinous extensibility is an essential component of hamstring muscle group function. Increasing our understanding of the perceived relevance athletes place on hamstring stretching should increase our ability to achieve program adherence. This study evaluated the opinions and practices of adolescent females and males in regard to static hamstring stretching.

Materials and Methods: One hundred twenty five nonimpaired athletes (64 males, 61 females) from two high schools participated in this study. Males participated in football, basketball, soccer, track and field, or wrestling. Females participated in basketball, soccer, track and field or gymnastics. Data were collected during pre-athletic participation physical exams. Active hamstring musculotendinous extensibility was measured using a handheld goniometer with subjects positioned in supine at 90 deg hip flexion. Subjects responded to written questions about the number of hamstring stretching repetitions and stretch duration that they commonly performed prior to athletic participation. Subjects also completed a 3 question, 10 cm visual analogue scale survey (end range descriptors 1 = not important, 10 = very important) of perceived hamstring stretching importance to injury prevention, athletic performance, and to their coach.

Results: As expected females displayed greater active hamstring musculotendinous extensibility than males (-13 +/- 13 deg knee extension vs. -23 +/- 13 deg knee extension, p > 0.0001). Groups were similar for hamstring stretch repetition (females = 3.1 +/- 2 repetitions vs. males = 3.8 +/- 5 repetitions), and duration (females = 16 +/- 7 sec vs. males = 18 +/- 12 sec). Rating differences did not exist between males (8.8 +/- 1.4 cm) and females (8.6 +/- 1.7 cm) for the perceived importance of hamstring stretching to injury prevention (p > 0.05). Males rated hamstring stretching to be more important to athletic performance than females (8.9 +/- 1.2 cm vs. 8.3 +/- 1.4 cm, p = 0.009). Males rated hamstring stretching to be more important to their coach than females (8.5 +/- 1.6 cm vs. 7.6 +/- 2.2 cm, p = 0.001).
Conclusions and Significance: Although differences were not observed regarding the importance of hamstring stretching to injury prevention, males rated hamstring stretching to be more important to both athletic performance and to their coaches than females. Reduced perceptions of the importance of hamstring stretching to athletic performance and to their coach among female athletes may be associated with the tendency of females to display increased joint laxity and a more erect, capsuloligamentous dependent postural habitus during athletic maneuvers. Modified hamstring stretching activities performed in functionally relevant postures may improve musculotendinous extensibility among females without increasing knee cap-it function. These modifications may also help reinforce postural behavior changes toward a greater reliance on musculotendinous dependent postures.

Poster #434
MUSCLE ACTIVITY DURING DASH SHOWN BY 18F-FDG PET.
Masahiro Ohnuma, Sendai, IAPAN, Presenter
Takafumi Sugita, Sendai, IAPAN
Tomomaru Kawamata, Sendai, IAPAN
Koshi N Kishimoto, Sendai, IAPAN
Akihito Tomiya, Sendai, IAPAN
Masatoshi Itô, Sendai, IAPAN
Keiichiro Yamauchi, Sendai, IAPAN
Shoichi Kodakun, Sendai, IAPAN
Hisashi Rikimaru, Sendai, IAPAN
Department of Orthopaedic Surgery, Tohoku University, Sendai, Japan

Muscle activity during running at full speed was evaluated using 18F-FDG PET and compared with that of a control group. Muscle activity indexes included SUVs at the anterior thigh, posterior thigh, anterior leg, and posterior leg. In the dash group, the mean SUVs of the anterior thigh, posterior thigh, anterior leg, and posterior leg were 0.48, 0.45, 0.46, and 0.46, respectively. In the dash group, the mean SUVs of the anterior thigh, posterior thigh, anterior leg, and posterior leg were 0.77, 0.83, 0.62, and 0.62, respectively. FDG accumulation in the posterior thigh in the dash group was significantly higher than in the control group (p<0.03). It was observed from our investigation that the posterior thigh muscles were especially activated when running at full speed.

Poster #435
ANALYSIS OF POOR CONDITION IN J-LEAGUE PROFESSIONAL FOOTBALL PLAYERS
Minoru Shiraiishi, Toyota, JAPAN, Presenter
Zdenko Verdenik, Toyota, JAPAN
Nagoya Grampus Eight Clinic, Toyota, Japan

Objective:
To prevent injury and improve condition is very important to achieve good results in professional sports. But the previous epidemiologic study did not clarified daily conditioning problems in detail on that situation players can continue playing but not show full performance. This study was designed to analyze poor condition and discuss how to improve condition of the professional football players in Japan (I-League).

Materials and Methods:
Poor condition was assessed for 31 professional football players (average 25.0 years; range 18-35) in Nagoya Grampus Eight Football Club (NGE) in 1999 season. Condition data were obtained daily by one full-time team doctor who performed medical examination every pre- and post-training. The criteria of poor condition include; 1) injury (trauma or disorder) needed some treatment by the team’s medical department, 2) can continue normal training for some days after injury occurred, 3) performance level down. Poor condition was grouped into Recover Group (RG; poor condition can continue training to the last) and Deteriorate Group (DG; poor condition must stop training halfway). The statistical procedures were performed using Stat View (SAS Institute, Inc., North Carolina). The level of significance was 5%.

Results:
A total of 72 poor condition injuries (RG; 52 cases, DG; 20 cases) and 89 immediately training stop injuries occurred through one season. The average injury rate of poor condition per 1000 training hours per player was; 11.7 cases during game, 4.2 cases during camp, and 1.7 cases during training. About 70% of the poor condition injuries were involving lower extremities (ankle, 18%; knee, 11%; thigh, 11%; foot, 10%). Of both groups, many injuries occurred during game (RG; 48%, DG; 55%) and through non-contact mechanism (RG; 54%, DG; 60%). In Deteriorate Group, average 5.9 times of trainings could be continued from occurrence to discontinuance. Many injuries were caused by intrinsic factors; muscular problems (RG; 29%, DG; 40%), past injuries and inadequate rehabilitation (RG; 25%, DG; 35%) or by extrinsic factors; inappropriate training (RG; 31%, DG; 30%), overuse (RG; 25%, DG; 20%), as well as by foul plays (RG; 29%, DG; 25%). In the Deteriorate Group, spine, thigh, lower leg, and foot injuries were more frequent than Recover Group. Muscular problems, past injuries and inadequate rehabilitation, and body mechanics such as malalignment influenced more strongly in the Deteriorate Group than Recover Group.

Discussion and Conclusion:
This study revealed that muscular problems, previous injuries, and body mechanics of players, inadequate rehabilitation of team physicians, and unsuitable training program of coaches are the main deteriorate factors of player’s condition. Needless to say about better medical support, we must make efforts in various fields to improve player’s condition. 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 (self-conditioning), and to do fair play are most important strategy to get better condition.

Poster #436
MECHANICAL PROPERTIES OF SUTURE EYELET – SUTURE INTERACTIONS
Andrew Perry, Randwick, AUSTRALIA
Adam M Butler, Randwick, AUSTRALIA
Danny Acton, Randwick, AUSTRALIA
Richard Evans, Randwick, AUSTRALIA
Peter Hughes, Randwick, AUSTRALIA
Jerome Goldberg, Randwick, AUSTRALIA
Warwick JM Bruce, Randwick, AUSTRALIA
David Sonnabend, Chatswood, AUSTRALIA
Ronald Mark Gillies, Randwick, AUSTRALIA
William R Walsh, Randwick, AUSTRALIA, Presenter
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Introduction: Suture anchor and suture are commonly combined to repair tendon-bone interfaces. Traditionally, standard braided sutures, such as Ethibond, have been used based on historical use in intrasosseous repairs. The mechanical proper-
ties of the suture alone may play an important role in intraoperative failure during repair. This study evaluated the in-vitro failure strength of a new polyethylene based suture material (Fibrewire, Arthrex) compared to #2 Ethibond over the eyelet of a standard suture anchor.

Methods: The tensile strength of suture over an eyelet of a Mitek SuperAnchor was performed using an MTS Bionix Testing Machine. The anchor was fixed in a testing jig and 7 tests performed using #2 Ethibond (Ethicon) or #2 Fibrewire (Arthrex). Uniaxial tension was applied at 100 mm per minute and load versus displacement continuously recorded. The ultimate load, displacement at the ultimate load and stiffness were determined for all samples. Data was analysed using an unpaired Student's t-test using SPSS.

Results: Failure for all samples occurred at the eyelet suture interface for all samples. Differences between #2 Fibrewire and #2 Ethibond in the current study were highly significant (p<0.001). The ultimate strength (360 N vs. 193 N) and stiffness (63.4 N/mm vs. 10.2 N/mm) of the Fibrewire were superior to Ethibond. The displacement at the ultimate load for Fibrewire was less than Ethibond (6.7 mm vs. 18.1 mm).

Discussion: Intraoperative failure of suture when using a suture anchor can present a problem. The tensile strength of the suture is one parameter that contributes to the overall biomechanical properties. Many other factors (i.e. tendon and bone quality, knot etc.) also play an important role. When evaluated over the suture anchor eyelet, Fibrewire provided a much stronger and stiffer construct compared to Ethibond.

Poster #450
SURGICAL TREATMENT Tibial EMINENCE OF A SHANK BONE IN YOUNG SPORTSMEN

Vitaly F. Kuksov, Samara, RUSSIA, Presenter
Pirogov City Hospital, Samara, RUSSIA

The choice of rational treatment is the basic. At displaced Salter-Harris types II-III fractures the surgical treatment is shown. During 1994-2001 years surgical treatment was provided to 39 patients with cleavage fractures tibial eminence of a shank bone /I type - 28 patients,II type - 11 patients/Age of patients from 9 till 14 years Artrotomia knee joint Careful revision of it.Open osteosynthesis tibial eminence by Kirshner wires with lavsan lasher;it was carried out through the subchondral. The long term results of treatment are studied in all 39 patients at the period for 2 years till 5 years after operation X-rayanatomic and functional results are good and excellent.The fragment adhesion in full, full congruence of joint surface.The full volume of movements.The stable knee joint is presented.The sport forecast favorable - patients continue to go in sports section. At cleavage fractures tibial eminence of a shank bone /II type-III types in young sportsmen only surgical treatment is used,so favorable forecasts speak about it.

Poster #451
THE CLINICAL DIAGNOSIS OF ACHILLES TENDINOPATHY WITH TENDINOSIS

Nicola Maffulli, Stoke on Trent, UNITED KINGDOM, Presenter
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John B King, London, UNITED KINGDOM
V Teita
G Capasso, Stoke on Trent, ENGLAND
R Regine
Keele University, Stoke on Trent, ENGLAND

Objective To evaluate sensitivity, specificity, reproducibility and predictive value of palpation, of the painful arc sign, and of the ‘Royal London Hospital test’ in 10 patients with Achilles tendinopathy, and in 14 asymptomatic subjects.

Design Test-retest study.

Setting University teaching hospital

Participants Ten male athletes on the waiting list for exploration of one of their Achilles tendons for tendinopathy of the main body of the tendon attended a special clinic. Each was invited to bring at least one athletes of the same sex in the same discipline aged within two years of themselves, with no history and no symptoms of AT. A total of 14 controls were thus recruited.

Main outcome measures Pain and tenderness following performance of palpation, the painful arc sign, and the ‘Royal London Hospital test’. Results There were no statistically significant differences at the 5% level among the effects of investigator or between morning and afternoon measurements for any of the three measurement methods. There was no evidence of a difference of the three assessment methods (p > 0.05). When the three methods were combined, the overall sensitivity was 0.586 (CI 0.469 - 0.741) and the overall specificity was 0.833 (CI 0.758 - 0.889).

Conclusions In patients with tendinopathy of the Achilles tendon with a tender area of intratendinous swelling which moves with the tendon and whose tenderness significantly decreases or disappears when the tendon is put under tension, a clinical diagnosis of tendinopathy can be formulated, with a high positive predictive chance that the tendon will show ultrasonographic and histological features of tendinopathy.

Poster #455
PREVALENCE OF ORTHOPAEDIC INJURIES AMONG 160 BRAZILIAN COMPETITIVE TENNIS PLAYERS

Rogerio Teixeira Da Silva, Perdizes, BRAZIL, Presenter
Moises Cohen, Sao Paulo, BRAZIL
Marcelo Matsumoto, Sao Paulo, BRAZIL
Center for Sports Medicine, Sao Paulo, BRAZIL

One hundred and sixty competitive tennis players from Sao Paulo, Brazil were retrospectively studied. Of these, 64 (40%) were females and 96 males (60%). Ages ranged from 9 to 78 years with a mean of 27.6 years. The overall incidence was 0.15 lesions per athlete per year of sports practice and 0.06 lesions per athlete per year of competition. Two hundred and forty-four lesions were reported by 122 athletes (38 athletes did not refer any lesions), leading to an index of 1.53 lesions per athlete in our population of tennis players. Regarding the affected part of the body, the major lesion reported was muscle injury (58 athletes - 23.8%), followed by foot and ankle injury (48 athletes - 16.8%). The most reported specific injuries were tennis elbow (38 athletes - 15.6%) and elbow injury (41 athletes - 16.8%). The mean time of absence from the tennis courts, after the injuries was 39 days and the majority of the athletes returned after 7 to 28 days (90 athletes - 36.9%). The younger players (up to the age of 16 years) reported a low incidence of lesions. Regarding tennis elbow, a direct relationship between the higher incidence of lesions and more years of tennis practice was observed.
Poster #456

"THE GLASS KNEE" – A NEW METHOD OF ANATOMIC PREPARATION AND PRESERVATION OF HUMAN JOINTS.
Scott F. Dye, San Francisco, CA, USA, Presenter

Objective:
Viewing the complex extra-articular anatomy of the knee through standard methods of preparation and dissection requires destruction of the more superficial layers to view the deeper ones. The purpose of this study is to report a new method of anatomic preparation and preservation (developed in the field of vertebrate biology/paleontology) which results in the muscles and other tissues becoming transparent - allowing visualization of deeper structures without extensive dissection.

Materials and Methods:
Adult and embryonic (24 week) human knees were prepared using the following method: fixation of specimens in a 10% formalin solution for 3 days. They were then washed in distilled H2O for 3 days. The specimens were then skinned and transferred to decreasing changes of ethyl alcohol, from 95% to 15%. They were then transferred to distilled H2O for 3 hours. The specimens were then placed in a solution of saturated aqueous sodium borate solution with 1 gram of trypsin /30 ml of solution for 3 weeks. They were then transferred to 0.5 grams of KOH solution for 24 hours. They were then transferred through 0.5% KOH - glycerin series (3:1, 1:1, 1:3) and ultimately to pure glycerin.

Results:
The human knees prepared in this study show striking and exquisite details of extra-articular anatomy while remaining completely mobile and fully preserved.

Conclusion:
This method of anatomic preparation and preservation of the human knee provides a novel technique to understand three-dimensional relationships of musculoskeletal macrostructures. This method can be easily applied to other human joints and musculoskeletal systems with probable similar benefits in anatomic understanding.
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