



# ISAKOS

## NEWSLETTER

**SUMMER 2002**

Volume 6, Issue 1

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## Editor's Note

Roland P. Jakob, M.D., Switzerland, ISAKOS Newsletter Editor



Steve Burkhart has stepped down as Editor of our newsletter as he has become the President of AANA, the Arthroscopy Association of North America. We congratulate him for his successful election and wish him strength and health. We are grateful to him for his active engagement in the work and editing of this important means of communication.

It is a project that brings ISAKOS members together, highlights events and activities, and is also a means of transporting interesting knowledge and innovation to our readers. It informs our members of the society news and allows updates

on new technology, scientific papers and key information of recent scientific meetings.

I am taking over for Steve as a collector and provider of information which seems relevant and which could be welcomed by our members. I am supported by Ronald Selby, MD, from the Communications Committee who is the Associate Editor and by Michele Johnson, Executive Director of ISAKOS, together with the ISAKOS office. We welcome your comments and information for inclusion in the newsletter.

In this issue, we bring some interesting information on recent cartilage work that was presented in June at the ICRS in Toronto and in July at a Cartilage Panel in Davos, Switzerland, to highlight some of the progress in imaging and basic science. Also included is an article on the patellofemoral pain syndrome.

## President's Message

Barry R. Tietjens, F.R.A.C.S., New Zealand, 2001-2003 ISAKOS President



The world is on the move again and I have also been traveling more than usual. To Dallas, Texas, in February for the AAOS where we had a successful full round of Executive Board, Board of Directors and Committee Meetings. We also hosted a lunch for the ISAKOS International Presidents Council. This is an

important initiative for ISAKOS, which brings together leaders of the major Regional Societies including AANA, AOSSM, APOA, APOSSM, ESSKA and SLARD to share ideas and plan collaborative projects. Through this council we can now plan educational activities in between congresses in collaboration with Regional Societies.

I spent most of April traveling around Europe as godfather for the Asia-Pacific Traveling Fellows culminating at the ESSKA Congress in Rome. These exchange traveling fellowships pioneered by AOSSM and ESSKA provide a truly unforgettable opportunity for young surgeons to experience scientific and cultural

exchange. ISAKOS is now looking to expand the traveling fellowship program to involve South America. The ESSKA Congress was an outstanding success and a wonderful opportunity to see many friends from Europe who were at the ISAKOS Congress in Montreux last year.

In May I traveled to Buenos Aires as guest of the Argentine Arthroscopy Association for the Argentina 2002 Congress and Second Congress of SLARD (Latin American Society of Arthroscopy, Knee Surgery and Sports Surgery). This was a very enjoyable meeting with a strong faculty of International and Latin American speakers. SLARD is rapidly growing to engage all the Latin American countries and provides strong support for ISAKOS.

Also in May, ISAKOS completed a thorough study focused on the future activities of the society. Interviews with members and industry leaders were conducted, and I am happy to report that the study showed strong support for the development of ISAKOS projects. Specifically, ISAKOS will be aggressively moving forward with plans to enhance membership benefits and programs by focusing on four key areas: education, technology, partner-

(continued on page 13)

# ISAKOS Welcomes New Members

## ACTIVE MEMBERS

Sergio Aguirre, MD, Chile • Rodolfo Alonso, MD, Argentina • Peter Berton, FRACS, Australia • Paolo Bulgheroni, MD, Italy • Chatenya Chauhan, MB, ChB, United Kingdom • Jorge Civetta, MD, Argentina • Dirk De Clercq, MD, Belgium • Masataka Deie, MD, PhD, Japan • Antonio Delcogliano, MD, Italy • Patrick Djan, MD, France • Aires Duarte Jr., MD, Brazil • Mohamed Elshafie, MD, Egypt • Joao Espregueira-Mendes, MD, PhD, Portugal • Eisaku Fujimoto, MD, Japan • Terry Gemas, MD, USA • Francesco Giron, MD, Italy • Hugo Gonzalez, MD, Chile • Sadfumi Ichinohe, MD, Japan • William Kibler, MD, USA • Jongsoon Kim, South Korea • Jason Koh, MD, USA • Abel Leturia, MD, Argentina • Vladimir Luptak, MD, Slovak Republic • Akira Maeda, MD, PhD, Japan • Mihkel Mardna, MD, Estonia • Robert Marx, MD, MSc, FRCS, USA • Kazutomo Miura, MD, PhD, Japan • Hany Morsy, MD, Egypt • Hirotaka Mutsuzaki, MD, Japan • Norimasa Nakamura, MD, PhD, Japan • Hironori Numazaki, MD, PhD, Japan • Maria Orellana, MD, Argentina • Afzal Osman, FCS(SA)Orth., South Africa • Dirk Petre, MD, Belgium • Rubens Pitangueira, MD, Brazil • Ludvig Pontoh, MD, Indonesia • Sebastian Rosasco, MD, Argentina • David Ruch, MD, USA • Murilo Santos, MD, Brazil • Nilson Severino, MD, Brazil • Joel Smith, MD, Asst Prof., USA • Takashi Soejima, MD, Japan • Odone Sommariva, MD, Argentina • Masaki Sonoda, MD, PhD, Japan • Cristian Stoica, MD, Romania • Takehiko Sugita, MD, PhD, Japan • Toshiaki Takahashi, MD, Japan • Yuji Uchio, MD, PhD, Japan • Andreas Weiler, MD, Germany • Ethan Wiesler, MD, USA • Masayoshi Yagi, MD, PhD, Japan • Haruyasu Yamamoto, MD, PhD, Japan

## ASSOCIATE MEMBERS

Dino Aguilar, MD, Nicaragua • Hassan Ali, MD, Turkey • Ivan Argenzio, MD, Ecuador • Rakesh Arya, MS, India • Gastone Bruno, MD, Italy • Deepak Chaudhary, MS(Ortho), India • Inoue Chiharu, MD, Japan • Philippe Colombet, France • Gerald Cooper, MD, Chile • Manuel Cornejo, MD, Peru • Henry Coudane, MD, France • David Dellaero, MD, USA • Parameswaran Easwaran MBBS, MS(Ortho), D(Ortho), United Kingdom • Oscar Farinas, MD, Spain • Navid Ghalambor, MD, USA • Patrick Greis, MD, USA • Rimtautas Gudas, MD, Lithuania • Michael Hantes, MD, Greece • Keisuke Inoue, MD, Japan • Yu Jiakuo, MD, PhD, Germany • Ivan Jibaja, MD, Peru • Naoki Katayama, MD, Japan • Toshio Kawahara, MD, Japan • Stephane Louisia, MD, France • Giovanni Mancini, MD, Italy • Arturo Maradiaga, MD, USA • Wayne McLwraith, DMV, PhD, USA • Juan Moreno, MD, Venezuela • Ramoroa Morule FCS(Orth), SA, South Africa • Joel Murachovsky, MD, Brazil • Hidetaka Murakami, MD, Japan • Olle Muren, MD, Sweden • Yoshihiro Nagaosa, MD, PhD, Japan • Hideo Oba, MD, Japan • Shigeru Sasaki, MD, Japan • Yoshinori Soda, MD, Japan • Takashi Suzuki, MD, Japan • Jee Tan MBBS, FRCSed, FRCS(GLAS), Singapore • Nino Taricani, MD, Venezuela • Steven Traina, MD, USA • Christopher Vertullo, MBBS, FRACS (Orth) Australia • Roberto Vianello, MD, Italy • Tsz Kau Wong, FRCSed (Ortho), FHKAM (Ortho), China

## FROM THE HOME OFFICE

### Announcements From the ISAKOS Office

#### Update Your Membership Information

ISAKOS Members: Help us keep your information current! Please visit the ISAKOS Web Site at [www.isakos.com](http://www.isakos.com) and check your listing in the online Membership Directory to verify that we have your correct address, telephone numbers and e-mail address. Please notify the ISAKOS Office if any of your information is missing or incorrect.

#### Apply for Membership Today

If you wish to become a member of ISAKOS in order to register for the 2003 ISAKOS Congress as a member, please submit a completed ISAKOS membership application to the ISAKOS Office no later than January 1, 2003. You may download an ISAKOS Membership Application from the ISAKOS Web site or contact the ISAKOS Office directly at [isakos@isakos.com](mailto:isakos@isakos.com).

#### ISAKOS Committee Membership

If you are interested in becoming a member of an ISAKOS Committee for the 2003-2005 Term, please contact the ISAKOS Office by e-mail at [isakos@isakos.com](mailto:isakos@isakos.com) or fax +1 925 314 7922. Please indicate which committees you are interested in becoming a member of. You must be an Active Member in good standing to become an ISAKOS committee member.

#### Have You Paid Your ISAKOS Dues?

Reminder: ISAKOS Members who do not pay their dues, will not receive their subscription to the *Arthroscopy* Journal and will not be able to register as a member for the 2003 ISAKOS Congress.

If you have not done so already, please remit your annual dues payment to the ISAKOS Office. You may fax or mail your payment (VISA, MasterCard, American Express, or a check drawn on a US Bank in US Dollars) directly to the ISAKOS Office.

#### Register Online for the ISAKOS Congress

[www.isakos.com/register](http://www.isakos.com/register)

Now you may register online for the 2003 ISAKOS Congress. Visit the ISAKOS Web site at [www.isakos.com/register](http://www.isakos.com/register), enter your registration information and provide a credit card for payment. You will receive a confirmation of your registration by e-mail or fax.

The deadline to pre-register for the 2003 ISAKOS Congress is February 10, 2003. After February 10, you will be required to register on-site at the meeting in Auckland.

If you prefer to submit your registration by fax or mail, you may download the registration form from the ISAKOS Web site at [www.isakos.com](http://www.isakos.com).

#### Include Your Educational CD-ROM in the ISAKOS Multimedia Center

ISAKOS is establishing an educational library of instructional CD-Roms and DVDs for use by its members. We would like to include your CD-ROM or DVD in the ISAKOS Multimedia Center at the 4th Biennial ISAKOS Congress in Auckland, New Zealand. Please send your CDs to the ISAKOS Office, 145 Town & Country Drive, Suite 106, Danville, CA 94526-3963, USA. Please be advised the CDs will not be returned to you after the congress.

### Keep Your Member Information Current!

ISAKOS Members: Help us keep your information current! Please visit the ISAKOS Web site at [www.isakos.com](http://www.isakos.com) and check your listing in the online Membership Directory to verify we have your correct address, telephone numbers and e-mail address. Please notify the ISAKOS office if any of your information is missing or incorrect.

## Join ISAKOS in Auckland

Join ISAKOS in Auckland, host of the Fourth Biennial ISAKOS Congress. Rain forests, parks, cafés and harbors surround the "City of Sails," the host of the 2003 America's Cup.

The ISAKOS Congress will be held near the center of town, within walking distance of most area hotels, the downtown shopping district, and, of course, the waterfront. Congress attendees are sure to enjoy the Pacific breezes, fresh seafood, world-class wines and wealth of outdoor activities. Golf courses here are affordable and in abundance; hiking is accessible; museums are numerous. Auckland is safe, warm and friendly. ISAKOS attendees are going to want to return again and again!

Take this opportunity to travel to a far-away land and enjoy the international exuberance of an ISAKOS Congress. It will be well worth your time.

### Congress Sponsors

ISAKOS thanks the following companies for their generous donations to the ISAKOS Congress. Their sponsorships have made the Congress more affordable and accessible to our attendees. It would be impossible to have an international congress without their support.

### PLATINUM SPONSORS



#### Linvatec

Linvatec Corporation, a leading manufacturer of arthroscopic instrumentation, medical imaging, and power surgical equipment, offers a diverse line of products critical to the orthopaedic/arthroscopic surgeon.

### Smith+Nephew

#### Smith & Nephew, Inc., Endoscopy Division

A global leader within arthroscopy and an innovator in endoscopic surgery, Smith & Nephew, Endoscopy Division, designs, develops and manufactures endoscopic surgical instrumentation and techniques with the goal of reducing trauma and pain to the patient, reducing cost to the healthcare system, and providing better outcomes for surgeons.

### GOLD SPONSORS



#### Mitek Worldwide

### SILVER SPONSORS

- Arthrex Inc.
- Arthrotek
- Stryker Endoscopy

### Congress Award Programs

#### John Joyce Award

*Sponsored by Smith & Nephew, Inc., Endoscopy Division*

#### Smith+Nephew

Cash award of US\$1,500 awarded for the best arthroscopy paper read during the scientific program in Auckland. All arthroscopy papers presented at the 2003 ISAKOS Congress are automatically considered for this award. Second and Third Place awards of US\$750 are also granted.

#### Richard B. Caspari Award

*Sponsored by Mitek Worldwide*



Beginning at the 2003 ISAKOS Congress in Auckland, New Zealand, a monetary prize in honor of Richard B. Caspari, MD, will be awarded to the best upper extremity paper read at the scientific program of the congress.

A panel composed of members of the ISAKOS Upper Extremity Committee will select the prize-winning paper. The winner will be announced in Auckland at the Awards Ceremony and a US \$2,000 honorarium will be awarded. A Second Place prize of US\$1,000 is also granted.

#### Achilles Orthopaedic Sports Medicine Research Award

*Sponsored by Aircast, Inc.*



US\$3,000 honorarium is awarded to researcher(s) who have performed the most outstanding clinical or laboratory research in the field of orthopaedic sports medicine.

## Live Surgical Demonstrations

ISAKOS is offering a series of live surgical demonstrations on cadavers, free to all attendees. All demonstrations will be interpreted to Spanish.

### Monday, March 10

13:30 -14:15

#### ACL Fixation

*Don Johnson, MD, Canada*

Sponsored by Linvatec

### Tuesday, March 11

11:15-12:00

#### Arthroscopic Rotator Cuff Repair Including Use of Electroblade

*James Esch, MD, USA*

Sponsored by Smith & Nephew, Inc., Endoscopy Division

13:30-14:15

#### Shoulder Arthroscopy

*Anthony Romeo, MD, USA*

Sponsored by Arthrex

### Wednesday, March 12

11:15-12:00

#### ACL Technique for Aggressive Rehabilitation Using DLSTG Graft and Patellar Tendon Demonstration

*Stephen Howell, MD, USA,*

*and Pier Paolo Mariani, MD, Italy*

Sponsored by Arthrotek

13:30 -14:15

#### Tibia & Femur Osteotomy

*Giancarlo Puddu, MD, Italy*

Sponsored by Arthrex

### Thursday, March 13

11:15-12:00

#### Total Knee Replacement

*Prof. Johan Bellemans, Belgium*

Sponsored by Smith & Nephew Orthopaedics

13:30 -14:15

#### Comprehensive Arthroscopic Approach for Treating Articular Cartilage and Meniscal Tear

*Moises Cohen, MD, Brazil, and David*

*Diduch, MD, USA*

Sponsored by Mitek Worldwide

### Albert Trillat Young Investigator's Award



Sponsored by Arthrotek and

Orthopaedics Today International

US\$3,000 honorarium awarded to a young researcher who has done outstanding clinical or laboratory research contributing to the understanding, care, or prevention of injuries to the knee. All applicants must be under 40 years old at the time of the 2003 Congress, March 10-14, 2003.

### Simultaneous Interpretation to Spanish

All presentations held in the two concurrent general session rooms will be interpreted to Spanish, free of charge to all attendees.

### Special Events in Auckland

#### Welcome Reception at the Town Hall



This grand, festive affair is a highlight of the congress, offering music, hors d'oeuvres and cocktails to all attendees.

Attendance is included with the cost of registration. Dress is business casual, and guests are welcome, free of charge!

Date: Monday, March 10  
Time: 18:30 - 21:00  
Cost: Included in registration  
Guests are welcome  
Location: Town Hall, across the plaza from the Aotea Centre

#### Poster, New Member and Exhibit Reception

Join congress attendees and exhibitors as ISAKOS officially welcomes its newest members. This relaxed wine and cheese reception will be held in the foyers of the convention center, amidst the exhibits and electronic posters.

Date: Wednesday, March 12  
Time: 18:00 - 19:30  
Cost: Included in registration  
Location: Exhibit Hall in the Aotea Centre

#### Farewell Banquet at the Hyatt

Sponsored by Smith & Nephew, Inc., Endoscopy Division



Commemorate the conclusion of another successful ISAKOS Congress in true Pacific style at the ISAKOS Gala Dinner on

Thursday, March 13. Celebrate in a magical tropical setting, dine on fresh Pacific Rim cuisine, and enjoy the vibrant atmosphere and entertainment. We promise the perfect finish to your New Zealand experience. Hotel transfers begin at 18:00.

Date: Thursday, March 13  
Time: 18:30 - 23:00  
Cost: US\$80 per person  
Location: Hyatt Regency

#### Day Tours

Special tours have been designed specifically for ISAKOS attendees and are available for an additional charge. Please see the Preliminary Program and the Day Tours Registration Form for a full description of all tours that are available. Register online for tours and hotel accommodations at [www.isakos.com](http://www.isakos.com).

## Hands-on Workshops

Monday through Thursday, 12:00 to 13:30, Carlton Hotel  
Free to all registered attendees

Spend the lunch hour learning the latest surgical techniques with a variety of cutting-edge instrumentation and models! Join us each day for 90 minutes of hands-on practice.

- Knot-Tying Techniques
- Meniscus Repair with Suture and Implants
- ACL & PCL Reconstruction
- Shoulder Stabilization
- Rotator Cuff Repair

ISAKOS thanks the following companies for their support of the workshops with educational grants: ArthroCare; Bionx Implants; Linvatec; Smith & Nephew, Endoscopy Division; and Stryker Endoscopy.



## Update on ISAKOS-Approved Course Knee Cadaveric Training Course, Gleneagles Hospital, Singapore

**T**welve participants from India, Sri Lanka, Thailand, Malaysia and Singapore were present at the 1st Knee Cadaveric Training Course held at the Gleneagles Hospital in Singapore on March 16-17, 2002. Dr. Charles Brown, ISAKOS Active Member, was the chief

instructor. Members of the Singapore Orthopaedic Association presented CME lectures on the evening preceding the course. The course was well received by the participants and faculty, and all attendees are looking forward to future courses.



## Free Instructional Course Lectures in Auckland

Instructional Course Lectures (ICLs) will be held Tuesday, March 11, through Friday, March 14, from 07:00-08:30. Instructional course lectures will be free of charge to all attendees. Attendees should register in advance for each course using the Congress Registration Form located in the Preliminary Program. *Please Note: There will be no interpretation to Spanish in any of these sessions.*

### Tuesday, March 11, 2003, 07:00-08:30

#### ICL #01: Basic Science and Clinical Use of Cell Therapy in Articular Cartilage Repair

Chair: Lars Peterson, MD  
Faculty: Scott Gillogly, MD, Bert Mandelbaum, MD, Anders Lindahl, Wayne Gersoff and Carl Winalski

#### ICL #02: Computers in Clinical Practice

Chair: Don Johnson, MD  
Faculty: Vladimir Bobic, MD, Nicola Maffulli, MD, MS, PhD, FRCS and Ronald Selby, MD

#### ICL #03: Issues in ACL Surgery

Chair: Peter Fowler, MD, FRCS  
Faculty: Charles Brown, Jr., MD, Burt Klos and Philippe Neyret, MD

#### ICL #04: Current Concepts in Posterolateral Instability of the Knee

Chair: Robert F. LaPrade, MD  
Faculty: Lars Engebretsen, MD, PhD, Steinar Johansen, MD and Fred Wentorf, MS

#### ICL #05: Clavicle Fractures and Dislocations

Chair: Ulrich Bosch, MD  
Faculty: Eugene Wolf, MD

### Wednesday, March 12, 2003, 07:00-08:30

#### ICL #06: Sports Specific Outcomes in ACL Surgery

Chair: Jose Huylebroek, MD  
Faculty: Suzanne Werner, Stephen Howell, Lars Engebretsen and Jean-Claude Imbert

#### ICL #07: Emerging Technologies in Knee Surgery

Chair: Masahiro Kurosaka, MD

#### ICL #08: Arthroscopic Evaluation and Treatment of Rotator Cuff Injuries

Chair: Stephen Snyder, MD  
Faculty: Stephen Burkhart, MD, James Esch, MD and Alessandro Castagna, MD

#### ICL #09: Arthroscopic Management of Intra Articular Fractures of the Knee

Chair: M. Nedim Doral, MD  
Faculty: W. Jaap Willems, MD, Phillip Lobenhoffer, MD, Freddie Fu, MD and David McAllister, MD

#### ICL #10: Management of the Post Meniscectomy Knee and Decision Making

Chair: Giancarlo Puddu, MD  
Faculty: Christopher Harner, MD, Annunziato Amendola, MD and Philippe Neyret, MD

### Thursday, March 13, 2003, 07:00-08:30

#### ICL #11: Total Knee Arthroplasty – New Perspectives on Design

Chair: Paolo Aglietti, MD  
Faculty: David Barrett, MD, Timothy Wright, PhD, Michael Kelly, MD, Kelly Vince, MD, Johan Bellemans, William Walsh, MD and Mark Pagnano, MD

#### ICL #12: Tendon Injuries in Football (Soccer)

Chair: Alberto Pienovi, MD  
Faculty: Ramon Cugat, MD and Sergio Montenegro, MD

#### ICL #13: Knee Meniscus Repair

Chair: Dieter Kohn, MD  
Faculty: Andrew Amis, DSc, Romain Seil, MD, Uffe Joergensen and K. Donald Shelbourne, MD

#### ICL #14: Complex Issues in ACL Reconstruction

Chair: Kai-Ming Chan, MD  
Faculty: Freddie Fu, MD, Savio Woo, PhD, DSc, James Lam, FRCS and Hsiao-Li Ma, MD

#### ICL #15: Elbow Arthroscopy (Ligament Injuries and Tendinopathy)

Chair: Luigi Pederzini, MD  
Faculty: Gary Poehling, MD and Gregory Bain, FRACS

### Friday, March 14, 2003, 07:00-08:30

#### ICL #16: New Frontiers in Shoulder Arthroscopy

Chair: W. Jaap Willems, MD  
Faculty: Stephen Burkhart, MD, Ben Kibler, MD, George Lajtai, MD, Anthony Miniaci, MD, FRCS and Joe De Beer, MD

#### ICL #17: Knee OCD

Chair: Lars Engebretsen, MD, PhD  
Faculty: Anthony Miniaci, MD, FRCS, Lars Peterson, MD, PhD, Jon Karlsson, MD, PhD and Andre Frank, MD

#### ICL #18: Hip Arthroscopy (Osteochondromatosis)

Chair: J.W. Thomas Byrd, MD  
Faculty: James Glick, MD, Michael Dienst, MD and Romain Seil, MD

#### ICL #19: Stress Fractures

Chair: Gideon Mann, MD  
Faculty: Aharon Finestone, MD, Sakari Orava, MD, PhD, Peter Brukner, MD and Charles Milgrom, MD, PhD

#### ICL #20: Allografts in Knee Surgery

Chair: Stephen Howell, MD  
Faculty: Dieter Kohn, MD; Konsei Shino, MD; David Caborn, MD

## ISAKOS Committees Prepare for 2003 Congress

### Sports Medicine Committee

*Annunziato Amendola, M.D., USA, Chairman*

The Sports Medicine Committee met in Dallas and is working on several projects, including a monograph and defined committee direction. As these projects near completion, we continue to develop long-term plans for the future.

Working with other solicited experts in the field, the committee will complete a monograph entitled "Tendinopathies: Evolving Strategies in Evaluation and Treatment" in time for the Auckland congress.

The committee is also preparing a clear "Terms of Reference" to define the committee role and direction.

The committee feels there is great potential for multi-center collaboration in a variety of areas, particularly in injury prevention and high-risk sports factors. The committee continues to evaluate and discuss its plans for action in these areas.

### Scientific Committee

*Alexandra Kirkley, M.D., F.R.C.S., Canada, Chairwoman*

The ISAKOS Scientific Committee continues our work on the clinical trial syllabus design. This syllabus will be a publication that includes a series of individual articles, each of which will address the main methodologic issues for performing a clinical trial in orthopaedic surgery. The articles will be user-friendly, providing practical points for consideration in designing and implementing a clinical trial. The design of this syllabus will be prepared for the meeting in Auckland.

At this point, all articles are on schedule: we expect to publish a first draft in September. Gradually, the group plans to add more sophisticated topics in clinical trial design. This will occur as the level of science in the organization changes, commensurate with implementation of these new skills.

Two additional projects are in the data collection phase. These projects will provide strong evidence for recommendations on which outcome tools to use in specific patient populations.

Ultimately the goal of this committee is to make ISAKOS a leader in methodologically rigorous clinical research. Each of these projects is part of the overall plan for reaching this goal.

### Education Committee

*W. Jaap Willems, M.D., Netherlands, Chairman*

The Education Committee has applied much of its energies to the update and maintenance of the ISAKOS-Approved Teaching Center Program and the development of the Auckland congress. As the Education Committee also looks forward, we have reviewed the possibility of future traveling fellowships and traveling team "on the spot" teaching courses.

We recently updated the teaching centers list. We asked all of our approved centers to give detailed information about their activities and outline the number of hosted visitors. Those who supplied us with this data maintained their "ISAKOS-Approved" status. The committee used this information exchange as a means to evaluate the centers, but also to establish more contact with the active centers. It is important for the Education Committee to stay informed on the developments of the centers and their teaching programs, thereby enabling us to effectively distribute data to all interested parties.

During the next congress in Auckland there will be a good number of educational activities that have been organized by the Program Committee in cooperation with the Education Committee. We think that the New Zealand Congress will reach a level even higher than the congress in Montreux.

When the committee meets in Auckland, we will review the need and opportunities for the initiation of traveling fellowships. The committee is working on the conditions on which we can organize these in the future.

The committee will also consider another possible project: sending specialized teams to countries where there is still a lack of proper training in arthroscopic surgery and sports medicine. Before the next ISAKOS Congress, we would like to hear from members where there is a need for this "on the spot" training. The committee would like, for example, to send a team of surgeons, specialized in several areas of arthroscopic surgery, to a specific country or center to deliver practical and theoretical courses.

The Education Committee heartily welcomes any comments on any of our activities.

### Arthroscopy Committee

*Andre Frank, M.D., France, Chairman*

The Arthroscopy Committee continues to work on the following projects:

- Terminology and Classification. Development of texts concerning the shoulder and knee are in the final stages.
- Multicenter Studies. B. Jakobsen and N. Van Dijk are continuing their work on "Arthroscopy and Jumpers Knee" and will present their results in Auckland.
- We have finished the database for the multicenter study concerning "revision arthroscopy of the knee after meniscectomy" and hope to put it on the Web. If you would like to join this study, please contact Dr. Frank via e-mail ([frank@sofarthro.com](mailto:frank@sofarthro.com)).

### Info for Multicenter Study:

1. Painful meniscectomized knee: Revision Arthroscopy
  - a. Director: P.Djian (France)
  - b. Participants: Every ISAKOS member willing to join the study and accepting the protocol.
  - c. Results: 2005 ISAKOS Congress
  - d. Database programmed in File maker Pro and 4thD (PC and Mac)
  - e. Objective:
    - A prospective study to evaluate etiology of failures after arthroscopic meniscectomy and to determine the best indication and delay for a revision arthroscopy.
    - Imaging findings: Which imaging?
    - When should we propose revision? Which clinical and imaging criteria?
    - Arthroscopic findings: comparison between first and revision arthroscopy. Correlation between anatomical findings, imaging and symptoms.

### Upper Extremity Committee

*Stephen S. Burkhart, MD, USA, Chairman*

The Upper Extremity Committee of ISAKOS has several projects under way. Dr. Philippe Hardy is setting up a study involving neurovascular complications of upper extremity arthroscopy. Reporting will be confidential via an Internet site.

# ISAKOS Committee Meeting Schedules

## 2003 AAOS Annual Meeting Hilton Garden Inn, New Orleans, Louisiana, USA

### **Tuesday, February 4** (Room TBA)

18:00 - 22:00 Executive Board & Dinner

### **Wednesday, February 5** (Room TBA)

08:00 – 10:00 Strategic Planning Committee  
10:15 – 12:00 Finance Committee  
12:00 – 13:30 International Presidents' Council Lunch (by invitation only)  
(AANA, AOSSM, ESSKA, SLARD, APOSSM & ISAKOS)  
14:00 – 16:00 Board of Directors

No other committees are scheduled to meet at the AAOS Annual Meeting in New Orleans in February, as they will all be meeting at the ISAKOS Congress in March.

## 2003 ISAKOS Congress Carlton Hotel, Auckland, New Zealand

### **Saturday, March 8** (Room TBA)

13:00 – 14:00 Membership  
14:00 – 15:00 Site Selection  
15:00 – 16:00 Finance  
16:00 – 18:00 Executive Board

### **Sunday, March 9** (Rooms TBA)

09:30 – 10:00 Bylaws  
10:00 – 11:00 Upper Extremity  
11:15 – 12:15 Communications  
12:15 – 13:00 Newsletter Editorial Board  
10:00 – 11:00 Orthopaedic Sports Medicine  
11:15 – 12:15 Education  
12:30 – 13:30 Knee  
08:00 – 09:45 Program  
10:00 – 11:00 Arthroscopy  
11:15 – 12:15 Scientific  
13:30 – 15:30 Board of Directors  
16:00 – 18:30 ISAKOS Strategic Planning Forum  
(all committee chairs and committee members to attend)

### **Thursday, March 13** (Room TBA)

15:00 – 17:00 Committee on Committees

### **Friday, March 14** (Room TBA)

10:30 – 12:30 New Board of Directors and Committee  
Chairs Meeting (2003-2005) with Lunch

The committee is in the process of selecting 5 finalist papers for the first Richard Caspari Award for the best upper extremity paper submitted to the ISAKOS 2003 meeting.

Dr. Stephen Burkhart has completed an ISAKOS-sponsored cadaver study on neurovascular anatomy-at-risk in shoulder arthroscopy. The results will be presented as a part of an instructional course at the congress in Auckland.

### **Communications Committee**

*Donald H. Johnson, M.D., Canada, Chairman*

The ISAKOS Communications Committee has organized an online discussion group, or "e-mail list serve," via Orthogate for ISAKOS members to join. This program will allow ISAKOS members to share clinical information on arthroscopy, knee surgery and orthopaedic sports medicine. There is no cost to join, as this is a free member benefit to all ISAKOS members!

To join the list and receive emails, send an e-mail to [isakos-subscribe@orthogate.com](mailto:isakos-subscribe@orthogate.com), stating you wish to join the ISAKOS mailing list. Once you have subscribed, you may send your questions to [isakos@orthogate.com](mailto:isakos@orthogate.com) for discussion. This email address will reach all ISAKOS subscribers.

You may attach photos, x-rays, etc. Keep the file size to less than 200KB. Please make sure you block out the patient's name on x-rays and maintain confidentiality with any clinical photos.

To reply to THE INDIVIDUAL who sent the message, JUST HIT "REPLY."

To reply to ALL the members, HIT "REPLY TO ALL." (This is the best choice, allowing everyone to benefit from the discussion).

### **Membership Committee**

*Moises Cohen, M.D., Brazil, Chairman*

ISAKOS membership is on the rise. The membership committee is in the process of sending 3,500 membership invitations to Latin American and South American surgeons. We hope to eventually send to surgeons in all regions to promote ISAKOS membership.

## Program Committee

John Bartlett, Australia, Chairman

Approximately 1,000 abstracts were submitted for the 2003 ISAKOS Congress in Auckland! The Preliminary Program will be available in early September and will include:

- Over 210 Podium Presentations – To include 5 John J. Joyce Award presenta-

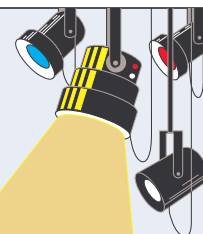
tions and 5 Richard Caspari Award presentations.

- 22 Symposia
- 3 "How I Do" Lectures
- 7 Live Surgical Demonstrations
- 20 Instructional Course Lectures
- 7 Invited Lectures
- 2 Debates
- Hands-on Workshops

Please don't wait to make your airplane, hotel and meeting reservations. We know that this is going to be a tremendous congress, building on the enthusiasm and strength of Montreux. Watch the ISAKOS Web site for updated meeting information as the congress draws near.

# Spotlight on Teaching Centers:

## C.O.R.E. Hospital do Coração, São Paulo, Brazil



### Teaching Center Courses

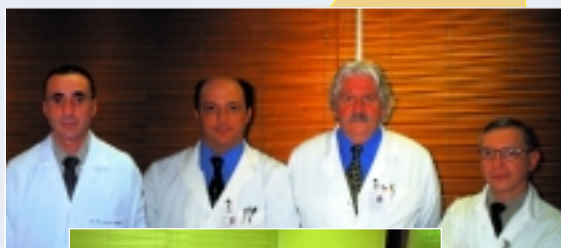
The C.O.R.E. Hospital do Coração in São Paulo, Brazil holds several courses per year. These include Sports Medicine Courses, such as physiotherapy applied to sports lesions, arthroscopic advanced techniques, knee replacement and workshops in our Learning Center. The Center periodically organizes joint activities with other Scientific Centers, sponsored by the Brazilian Knee Society. These joint activities offer a forum where the participants may discuss clinical cases. Twice a year, a guest physician spends two or three days performing surgery, giving lectures and sharing knowledge.

### Organization

The Center has four main activities: Clinical Practice, Surgical Training, Advanced Rehabilitation Techniques and Learning Center.

- **Clinical Practice:**  
The fellows work with four doctors focusing on knee and arthroscopic surgery, shoulder and sports medicine. The center has an average of 200 patients a week including new and returning ones.
- **Surgical Training:**  
The fellows follow the four doctors during the surgical practice, having a chance to observe and discuss surgical techniques. The average number of surgeries is 30 per week, including arthroscopy, ligament surgery, knee joint replacement and shoulder procedures.
- **Advanced Rehabilitation Techniques:**  
In our Rehabilitation Center the fellows have a chance to observe advanced techniques, which include Isokynetics Tests, Proprioception Evaluation, Training and routine KT-1000 tests. The Fellows follow our rehabilitation protocols for each kind of procedure.
- **Learning Center:**  
The center's objective is to increase knowledge and improvement of surgical technique. We have a Training Lab with models (Knee, Shoulder, Ankle, etc.) to allow skill enhancement. The center promotes workshops and courses, there is a library, Internet and data bank available for lectures, and finally, once a week clinical sessions with all the staff discussing papers, clinical reports and special lectures.

For more information on this center, please contact:



C.O.R.E. Hospital do Coração  
Rua Desembargador Eliseu Guilherme, 2º Andar  
São Paulo 123-167 BRAZIL  
Tel: +55 11 3887 6611, ext. 4200  
Fax: +55 11 3887 6611  
E-mail: [cecocore@terra.com.br](mailto:cecocore@terra.com.br)  
Web: [www.core.med.br](http://www.core.med.br)



### Strategic Planning Committee

Gary G. Poehling, MD, USA, *Chairman*

The Strategic Planning Committee is planning a strategic planning forum for all committee members one day prior to the start of the congress in New Zealand. We plan to have all segments of the organization represented to discuss issues that are critical to the continued success of our organiza-

tion. These issues include relationships with regional and continental organizations, methods of cost-effective educational programs for our membership, mentorship and traveling fellow programs and journal issues. We expect this to generate lively discussion and excellent material to guide the leadership into the future.

### Bylaws Committee

Per A. Renstrom, MD, PhD, Sweden, *Chairman*

The Bylaws Committee of ISAKOS met in February 2002 in Dallas, Texas, and recommended amendments to the ISAKOS Bylaws. PLEASE VISIT THE ISAKOS WEB SITE [WWW.ISAKOS.COM](http://WWW.ISAKOS.COM) TO REVIEW THE CURRENT BYLAWS.

The proposals for change shall be pre-

## Spotlight on Teaching Centers: Orthopaedic Learning Centre, Shatin, Hong Kong

Officially opened on April 26, 1991, the Orthopaedic Learning Centre has organized over 60 educational programs for orthopaedic surgeons, nurses and allied health personnel in the past three years. More than 2,400 participants have attended our courses. The professional enhancement courses organized in our centre are focused on orthopaedic fields such as the Comprehensive Bioskill course for Fracture Fixations, International Bone Research Instructional Course and Hands-on Workshop, Asia Shoulder Arthroscopic Workshop, Workshop on Trauma Management with cast application and workshop on posterior Lumbar Endoscopic Surgery. Most of our courses are accredited by local and international official entities including The Hong Kong College of Orthopaedic Surgeons, Hospital Authority Continuous Nursing Education and National Association of Orthopaedic Nurses.

Our Orthopaedic Learning Centre was established as an innovative and comprehensive training centre. It is the first of its kind in Hong Kong and Asia to provide the facilities and expertise in training for orthopaedic surgeons.

Equipped with the latest information technology, together with the state-of-the-art Bioskill laboratory, our Orthopaedic Learning Centre highlights the following:

- Hands-on Bioskill training for the orthopaedic surgeons and nurses specializing in trauma surgery, joint replacement surgery, arthroscopic surgery, hand and microsurgery, spinal surgery, pediatric surgery and other essential orthopaedic procedures.
- With the optic-fibre connection in our operating room, the surgeon in training can observe and assimilate the live surgery experience.
- The provision of telemedicine opens the opportunity for orthopaedic learning to be linked with and delivered to the other international centres.
- The extensive Intranet and Internet provide the ultimate source of information in the orthopaedic information superhighway and help establish a comprehensive resource center in orthopaedics and traumatology.

The Orthopaedic Learning Centre is a ground-breaking venture to promote team building, interactive self-motivated learning and assimilation of advanced technology to clinical practice.



For more information on this center, please contact:

Orthopaedic Learning Centre  
1/F Li Ka Shing Specialist Clinic  
North Wings, Prince of Wales Hospital  
Shatin, HONG KONG  
Tel: +852 2632 3483  
Fax: +852 2647 7432  
E-mail: [olc@cuhk.edu.hk](mailto:olc@cuhk.edu.hk)  
Web: [www.olc-cuhk.org](http://www.olc-cuhk.org)

sented at the first Business Meeting of the 2003 Congress in Auckland, New Zealand. The proposals for change will then be voted upon at the second Business Meeting.

The changes are indicated below:

### 1. Update Emeritus Description:

Page 2 (d). Senior (Emeritus) Members. **Emeritus Members. Any member 65 years of age or older not practicing in the field of arthroscopy, knee surgery and orthopaedic sports medicine may become an Emeritus member and may become inactive by request, or may remain active ...** Any active or associate member upon reaching the age of 65 years may become a senior member and may become inactive by request, or remain active if he or she continues to meet all the requirements for active membership. Senior members shall not be entitled to vote at meetings of the Society, nor shall they be obligated to pay dues to the Society. Senior members shall not be eligible to hold elected office in the Society.

It was suggested by the Bylaws Committee to delete the underlined portion and insert the text in bold.

### 2. Clarify Journal Inclusion in Membership Dues:

Page 3: Article 8 - Dues; Section 8.01 The Board of Directors shall establish the annual dues for each category of membership within the Society. Upon payment of full Society dues, the member shall receive a subscription to the Journal for the following year. **Subscription to the Journal is included in membership. Only members of the Arthroscopy Association of North America (AANA), as the Journal is also a part of the AANA dues obligation, may choose to waive the Journal portion of their membership dues.** Annual dues shall become effective at the beginning of January of the calendar year following their establishment and shall remain in effect for each succeeding year unless and until changed by the Board.

It was suggested by the Bylaws Committee to insert the text in bold.

## ISAKOS DEVELOPMENT PROGRAM

*Education. Technology. Partnership. Infrastructure.*

With a growing track record of success and a unique opportunity to advance arthroscopy, knee surgery and orthopaedic sports medicine in our increasingly global world, the ISAKOS Board is looking to the future.

ISAKOS will better serve members and positively shape our fields by partnering with regional societies and industry leaders, strengthening our infrastructure, harnessing advanced technology and providing more numerous and more effective educational opportunities around the world.

To lead this charge we will be initiating the ISAKOS Development Program over the next year. Our Development Program will increase revenue annually and provide funding necessary to meet the needs of our international membership. It will be comprised of three ongoing components:

#### Annual Fund

Support society operations! Each year members will be asked to consider a cash gift to ISAKOS to support continuing operations. This gift would be in addition to membership dues and would be tax-deductible as allowed by local laws. We hope you will consider ISAKOS in your annual charitable giving and will be sending more information as the program gets up and running.

#### Special Events

Networking! Networking! Networking! ISAKOS special events will be social opportunities to meet and mingle with colleagues while lending financial support to the society. Ideas include raffles and sports outings and will likely take place at biennial congresses or regional workshops, as they are implemented.

#### Deferred/ Planned Gifts

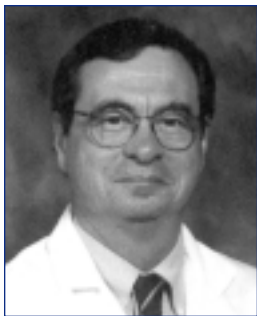
If liquid assets are tied up but you want to donate to ISAKOS, consider making a planned gift to the society through bequests, annuities, trusts, life insurance, appreciated property and more. Planned gifts will strengthen ISAKOS' long-term financial future!

We hope you will consider supporting one or more components of the ISAKOS Development Program as it progresses. To build a strong organization we need your help!

As the program gets under way, we will gladly share more details with you. In the interim, please call the ISAKOS Office at +1 925-314-7920 or email [isakos@isakos.com](mailto:isakos@isakos.com) for more information.

# Aging, Osteoarthritis and the Limitations of Cartilage Repair

James Martin and Joseph A. Buckwalter, Iowa City, Iowa, USA



Joseph A. Buckwalter

After age 40, the incidence of the joint degeneration responsible for osteoarthritis increases with every passing decade. At the same time, the efficacy of articular cartilage repair decreases; in

particular, the clinical success of replacing damaged articular cartilage with perichondrial or articular cartilage grafts and of stimulating articular cartilage repair by drilling the articular surface declines after age 50. Furthermore, the risk of developing joint degeneration following a joint injury increases significantly after age 50. The reasons for the age-related changes in the incidence of joint degeneration and the results of joint surface repair have not been well explained.

It is known that as articular cartilage ages, superficial fibrillation develops, the tensile strength and stiffness of the superficial zone decreases, aggrecan molecules become shorter and more irregular, and proteoglycan aggregates become smaller. Older articular cartilage chondrocytes synthesize smaller and less uniform aggrecans and less functional link proteins, and their mitotic and synthetic activity decreases as does their responsiveness to anabolic growth factors. In a recently reported study (D'Lima et al. Effect of age and osteoarthritis on glycosaminoglycan synthesis. 4th International Cartilage Repair Symposium. 2002. Toronto, Canada), chondrocytes from humans over age 50 showed a greater decrease in proteoglycan synthesis following mechanical injury and after exposure to interleukin-1 than chondrocytes from humans less than age 35. Taken together, these observations led us to hypothesize that cell senescence, progressive deterioration of cell function after skeletal maturity due to alternations in the cell genome or energy metabolism, is responsible for an age-related decrease in the ability of human chondrocytes to maintain and restore articular cartilage.

To test this hypothesis, we measured cell senescence markers ( $\beta$ -galactosidase expression, mitotic activity and telomere length) in human articular cartilage chondrocytes from 27 donors ranging in age from 1 to 87 years. We also assessed mitochondrial DNA, membrane potential and numerical density. To determine if aging changes in human chondrocytes are reversible, we transfected human articular cartilage chondrocytes with the human telomerase gene (hTERT) and human papilloma virus oncogenes (E6 and E7).

We found that expression of the senescence marker,  $\beta$ -galactosidase, increased with age ( $R = .84$ ,  $P = .00001$ ) while mitotic activity and telomere length declined ( $R = -.77$ ,  $P = .001$  and  $R = -.71$ ,  $P = .0004$  respectively). Decreasing telomere length was strongly correlated with increasing expression of  $\beta$ -galactosidase and decreasing mitotic activity. Telomeres, the sequences of base pairs at the ends of human chromosomes, are necessary for DNA replication. In addition, telomeres may have important roles in maintaining normal gene expression. In *in vitro* studies, as the number of cell divisions increased, human chondrocyte mitochondrial DNA was degraded, mitochondrial membrane potential was lost and the number of mitochondria per cell decreased. Transfection of human articular cartilage chondrocytes from a 47-year-old donor with hTERT and P6P7 created a cell

line that has now completed more than 300 population doublings as compared with an upper limit of 20 population doublings for normal chondrocytes from this patient. Telomere length increased in cells transduced with hTERT.

These findings help explain the age-related declines in chondrocyte synthetic and mitotic activity and responses to anabolic cytokines and the increased suppression of proteoglycan synthesis by mechanical injury and interleukin-1 in older chondrocytes. They also suggest that *in vivo* chondrocyte senescence contributes to the age-related increase in the incidence of the joint degeneration responsible for osteoarthritis and the decreased efficacy of cartilage repair in older patients. If progressive chondrocyte senescence occurs *in vivo*, it will be important to consider the age of the patient in developing methods of restoring biological articular surfaces. The creation of immortal cell lines with increased telomere lengths suggests the progression of human chondrocytes toward senescence is not inevitable, but considerable work must be done to determine if delaying chondrocyte senescence will be of clinical value. New efforts to prevent the development and progression of osteoarthritis and to improve cartilage repair for middle-aged and older people may include strategies that slow the progression of chondrocyte senescence or replace senescent cells.

## In Memoriam

### LORDEN TRICKEY (1920-2002)

ISAKOS Members who knew Lorden Trickey will be saddened to hear he died recently. Lorden was an early member of ISK and a past President of the British Association for Surgery of the Knee.

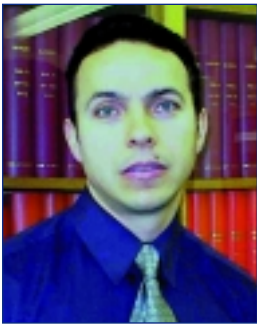
John Ireland has informed ISAKOS a celebration of the life and work of Lorden Trickey (1920-2002), will take place at the Teaching Centre, Royal National Orthopaedic Hospital, Stanmore, on

Wednesday, October 9, 2002, at noon. RSVP to:

Mrs. Joanne Harbinson  
The Sir Herbert Seddon Teaching Centre  
Royal National Orthopaedic Hospital  
Brockley Hill, Stanmore  
Middx. HA7 4LP UNITED KINGDOM  
Fax: +44 208 954 9132  
E-mail: [jharbinson@rnoh.nhs.uk](mailto:jharbinson@rnoh.nhs.uk)

## Patellofemoral Pain Syndrome

Nezar Tumia, MBChB, FRCS, United Kingdom, and Nicola Maffulli, MD, MS, PhD, FRCS(Orth), United Kingdom



Nezar Tumia, MBChB, FRCS

Patellofemoral pain syndrome (PFPS) is a common complaint in young adults, especially in females and active individuals. The incidence in the general population is as high as 25% of adolescent and young adults, and even higher among athletes. The term anterior knee pain includes all pain-related problems of the anterior aspect of the knee, and covers terms such as chondromalacia patella, patellofemoral arthralgia, patellar pain, patellar pain syndrome, and patellofemoral pain. Exclusion of other intra-articular pathology is essential, including patellar tendinopathy, peripatellar bursitis, the plica syndrome, Sinding Larsen's and Osgood Schlatter's lesions.

### Etiology of PFPS

Although patellofemoral pain is frequently encountered in the sports injury clinic, its etiology is still not well understood. There is no single factor causing PFPS, but it may represent the result of numerous pathophysiological processes. Various authors have cited both extrinsic and intrinsic parameters as etiological factors.<sup>1</sup>

Three major contributing factors are classically considered as increasing the risk of developing PFPS:

### Lower Extremity Malalignment

Malalignment of the lower extremity in patients with PFPS includes: femoral neck anteversion, genu valgum, knee hyperextension, increased quadriceps (Q) angle, tibia vara, hyperpronation of the forefoot, and leg length discrepancy. The term "malalignment" should be used judiciously, as a large part of the normal population falls into a category generally classified as having "malalignment."

Patellar tracking abnormalities have been described as a major cause of patellar pain, although some studies showed no difference in imaging between the patient's more and less symptomatic knee.<sup>2</sup> Patellar malalign-

ment has three different patterns: subluxation without tilt, subluxation with tilt, and tilting without subluxation (Figure 1). Various limits of normality have been reported, but none have been shown unequivocally to be a significant factor in the etiology of PFPS. Patella alta has been described as a possible contributing factor.

### Quadriceps muscle imbalance

Reduced strength and shortened reflex response time of the vastus medialis obliquus (VMO) has been found in patients with PFPS.<sup>3</sup> An abnormal relationship in the activation pattern of the VMO and vastus lateralis (VL) can alter the dynamics of the patellofemoral joint (PFJ).

Decreased quadriceps muscle flexibility creates high patellofemoral stresses during sporting or daily life activities, and therefore predisposes to PFPS.

### Increased physical activity

Patients with anterior knee pain are more involved in competitive sports than their age-matched controls, and pain is associated with increased physical activity. The stimulus to develop PFPS may be increased physical activity and overload instead of malalignment of the PFJ.

### Symptoms

The most common symptoms in patients with PFPS are anterior knee pain, crepitus, giving way, and catching, with occasional stiffness and swelling. Crepitus is not always present in patients with PFPS and can be present without pain or other symptoms. Swelling is mild, intermittent and rare. Strength deficit of the knee extensor muscles are common in patients with PFPS.

### Management

PFPS should be managed initially conservatively. There are many treatment regimens in use, and this is due to a lack of scientific evidence and evidence-based protocols. The most frequently recommended management regimen is rehabilitation.

In general, a rehabilitation program should include: (i) symptomatic control; (ii) a progressive resistance program of isometric

quadriceps and iso-inertial hamstrings exercises; (iii) a graduated running program; and (iv) a maintenance program.

Isometric training (open kinetic chain exercises) for patients with moderate PFPS, and a soft brace for those with symptoms that are more serious is recommended.<sup>5</sup> Eccentric isokinetic (closed kinetic chain exercises)



Nicola Maffulli, MD, MS, PhD, FRCS

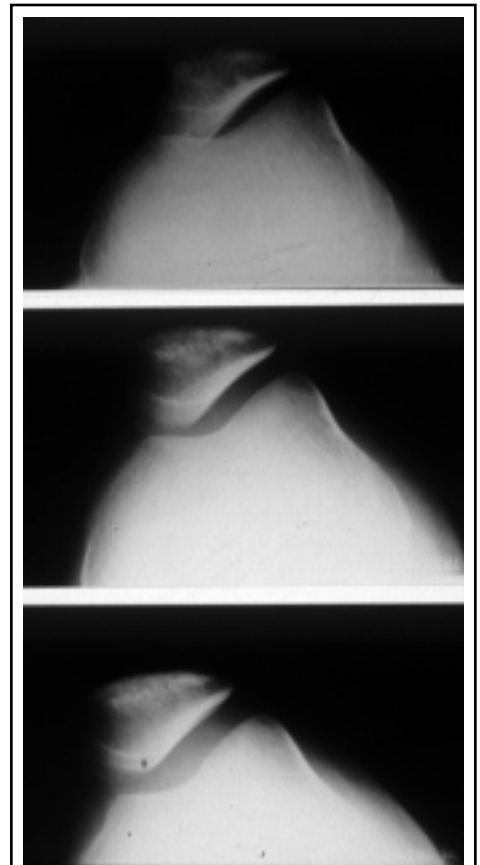


Figure 1: Skyline view of the patella at 30°, 60° and 90° of knee flexion, showing progressive lateral subluxation of the patella, due to weakness of the vastus medialis obliquus.

exercises are currently in fashion, but closed kinetic chain exercises are only a little more effective than open kinetic chain exercises in reducing pain and increasing functionality.<sup>3</sup>

Training might induce increased diffusion of nutrients to the articular cartilage through cyclical loading and unloading the PFJ, and improved nutrition to surrounding joint structures and muscles with increased vascularity.<sup>5</sup> Thus, training programs may produce beneficial effects on the PFJ, as adaptive changes can be seen in muscles, tendons, ligaments and the cartilage after regularly repeated, slowly progressing, non-strenuous rehabilitation. The increased physical activity after treatment may contribute to further improvements in symptoms and muscle function seen in the longer term.

### Patellar Taping

Taping for patellar malalignment has now reached widespread acceptance. In the appropriate hands, and with the right technique, patellar taping has been successful.<sup>6</sup> However, patellar taping does not improve the EMG activity ratio between the VMO and the VL muscles. Some authors suggest that there are no advantages in adding taping to a well-planned rehabilitation program.

### Surgery

Surgery is aimed at correcting malalignment (realignment procedures), or other abnormalities of the knee extensor mechanism when the conservative treatment fails. Numerous surgical procedures have been described for the treatment of patients with PFPS when non-operative management has failed. These include:

- Lateral release: Its main indications are: (i) abnormally high lateral patellar compression with tenderness and tightness of the lateral retinaculum, and lateral patellar tilt; (ii) degenerative disease of the patellofemoral joint with lateral patellar tilt; and (iii) persistent patellofemoral pain associated with a lateral traction osteophyte

at the insertion of the lateral retinaculum into the patella. The procedure is not recommended for pre-pubertal patients.

- Proximal realignment: It is indicated in patients who: (i) are skeletally immature and have a history of recurrent dislocations; (ii) have an increased congruence angle with patellofemoral pain; and (iii) have dysplastic femoral trochlea and poor medial patellar support of the VMO muscle, with recurrent patellar subluxations or dislocations. Satisfaction is normally high, but these procedures are now rarely used in isolation.
- Distal realignment: These procedures are most often used in patients with recurrent patellar subluxation or dislocation, and less for patellofemoral pain. The indications are (i) persistent patellofemoral pain combined with excessive patellar tilt or subluxation or increased congruence angle; (ii) lateral patellar degenerative joint disease with increased Q angle; and (iii) failed lateral release procedure, especially in patients with significant lateral tilt or subluxation. Transfer of the tibial tubercle is contra-indicated in skeletally immature patients, given the high risk of development of genu recurvatum in this age group. Satisfaction is high, but long-term results are unclear.
- Elevation of the tibial tubercle: Marked decrease of patellofemoral compression forces is produced by elevation of the tibial tubercle of 1.2 to 2.5 cm. The main indication for this procedure is with moderate degeneration joint disease of the PFJ that is unresponsive to conservative management. This procedure is now rarely used for the treatment of PFPS.
- Anteromedial tibial tubercle transfer and elevation: The procedure is indicated in patients with malalignment, increased Q angle and mild-to-moderate PFJ osteoarthritis.
- Articular cartilage procedures: These procedures include open or arthroscopic

patellar shaving, local excision of defects with drilling of the sub-chondral bone, facetectomy and transplantation of autologous chondrocytes. The major benefit of arthroscopic interventions might well be the dilution effect with wash out of the debris from the knee joint.

- Patellectomy: Excision of the patella should be considered the last resort to treat patellofemoral diseases, as it may result in a considerable decrease in functional ability.

### Conclusion

Standardized information and reduced and modified physical activity levels will suffice in most PFPS patients with mild symptoms. Excessive physical exercise and avoidance of prolonged sitting with knees flexed seem to be most effective. Rehabilitation should progress gradually and the success of a management regime depends on adjusting the exercises of the rehabilitation program to the patient's symptoms and needs.

### References

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6. Ernst GP, Kawaguchi J, Saliba E. Effect of patellar taping on knee kinetics of patients with patellofemoral pain syndrome. *J Orthop Sports Phys Ther* 1999; 29: 661-667.

### President's Message

(continued from page 1)

ship and infrastructure. I am excited about the opportunities in our path and will be sharing more information as plans develop.

In October I shall be in Singapore for the 7th Meeting of the Knee and Sports Medicine

Section APOA and 3rd Meeting of the Asia-Pacific Orthopaedic Society for Sports Medicine (APOSSM).

Preparations for the 2003 Congress in Auckland are progressing well after a record response to the Call for Abstracts. John Bartlett and the ISAKOS Program Committee

have reviewed approximately 1,000 abstracts to select the abstracts for podium and e-poster presentation. The preliminary program will be mailed out in September. Remember the 2003 Congress will be held March 10-14, which is earlier than usual to coincide with Auckland's best weather.

## New MRI Techniques for Imaging Cartilage

Deborah Burstein, PhD, Boston, Massachusetts, USA, and Martha Gray, PhD, Cambridge, Massachusetts, USA



Deborah Burstein, PhD

**M**agnetic resonance imaging (MRI) is increasingly an important component in the evaluation and diagnosis of musculoskeletal disorders. Its current utility and further potential in this regard is

largely due to its ability to image all of the tissues in the joint and the versatility of anatomic, functional and biochemical information available through MRI techniques. Standard MRI techniques are currently used widely in practice to delineate morphologic abnormalities. New MRI techniques are being developed for improved morphologic analysis as well as functional and biochemical information. Here we will review the MRI techniques on the horizon, focusing on those that are closest to being directly applied in both basic and clinical studies. While we focus here on cartilage imaging, we hasten to emphasize that the opportunity for examining the whole joint exists. In the long run, these techniques should improve our ability to understand the healthy joint and the disease process, provide earlier diagnostic capabilities, and evaluate therapeutic interventions. With these capabilities, we can more effectively establish strategies to maintain joint health and, if needed, to intervene at a very early stage of degeneration.

### Basics of MRI, Part I

We begin with an overview of the basics of MRI to provide the reader with a sense of what is measured and how an MR measurement is made. MRI is possible because nuclei with an odd number of protons and/or an odd number of neutrons possess net magnetic moments. Fortunately, the most abundant nucleus in biological systems is the hydrogen nucleus (which in MR vernacular is referred to as a proton because hydrogen contains a single proton), making water

and fat observable by MRI. In all of the methods we will discuss here (and virtually all of the MR imaging done clinically), it is the hydrogen (proton) nuclei being measured – indeed the term MRI has come to be synonymous with the term proton-MRI (while MR of another nucleus xyz is referred to as xyz-MRI or MR spectroscopy).

The first step in the MRI experiment is to obtain a sample with these nuclei, either a person, an animal, an excised tissue sample, a cell suspension, or a model system such as an agar gel.

The second step in the MRI experiment is to place these nuclei in a magnetic field. There are several magnet designs available for musculoskeletal applications. The first is the standard whole body magnet. These are typically 1.5 Tesla magnets, with bores large enough for the entire torso. The second type of magnet is an extremity system. These are typically lower field (below 1 Tesla), although 1 and 1.5 Tesla units are becoming available. The extremity systems have smaller bores to accommodate the joints of the extremities and are thus easier to site and are lower cost. The third general type of system is the basic research magnet, which tends to be higher field (between 7 and 11 Tesla) and smaller bore (9 to 40 cm), and can accommodate animals and excised tissue samples.

When the sample is in the magnetic field, the magnetic moments tend to reorient so that they are rotating about the direction of the field (analogous to a toy top precessing around the direction of gravity). The frequency of rotation is proportional to the magnetic field strength, a feature that is exploited to obtain an image (see below). The alignment of the magnetic moments results in a net magnetic moment that will be detected. The higher the magnetic field, the more moments will align, yielding a higher signal to noise and thus the possibility for improved spatial resolution for a given imaging time. This is the motivation for going to higher magnetic field strength magnets.

In order to detect the net magnetic moment, a “receiver coil” is needed. This receiver coil can be a large coil to fit around the entire torso or a smaller coil placed

around the joint or sample of interest. Since the noise in the image is in large part due to this coil, it is desirable to have it as small as possible, and thus local coils are generally used for musculoskeletal applications.

With this receiver coil, we can detect that the magnetic moments are in the sample. (The specifics of how this is done is given in short below.) However, we need to know where the moments are in order to obtain an image. We do this through the use of magnetic field gradient coils. These are coils that produce small gradients (variations in space) in the main magnetic field. (Note that the noise heard during MR imaging is due to these gradients turning on and off, causing vibrations within the magnet bore.) Since the frequency of rotation of the magnetic moments is proportional to the magnetic field strength, by detecting the frequency of rotation we can determine where the magnetic moments (water) are, and we are ready for the first level of MR imaging. Note that these gradients can be produced in any arbitrary direction, and thus the localization of water can be made within any plane. Although we will not go into details here, numerous techniques are available for obtaining two-dimensional and three-dimensional images by turning the gradients on and off in different directions while acquiring the signal.

So, the upshot is that proton MRI uses large magnetic fields to align some of the protons in the hydrogen nucleus. The image is created by detecting the net magnetic moments and determining their positions within the sample by detecting the frequency of rotation within the small applied gradient magnetic field. Spatial resolution is limited by noise and is generally improved with higher field strengths and smaller detector coils.

### Applications of MRI, Part I: The Organ Level

The most obvious use of imaging is to visualize joint morphology: What is the shape of the joint, how thick is the cartilage, what is the volume of cartilage? These questions are addressed by looking at a “multi-

slice" data set of the joint – that is, looking at a set of sequential images yielding an approximate three-dimensional image of the joint, or by acquiring the signals directly as a three-dimensional data set. Many studies have been done examining variations in cartilage thickness and volume with physiologic interventions and disease. As one example, a recent study demonstrated that patellar cartilage volume changes were measurable after various exercise regimes such as knee bends<sup>1,2</sup>, while differences due to long-term physical activity were not found<sup>3</sup>. The ability to image the knee in different directions in real time allows one to monitor the motion of joint structures relative to one another<sup>4,5</sup>.

Assessment of parameters such as cartilage thickness, curvature, volume and motion tracking might aid in the understanding of the factors that contribute to cartilage degeneration with physical and physiological factors, and thus what lifestyle and/or motion factors might be protective of the joint. The ability to measure changes in cartilage morphology with acute exercise may provide a possible means for future "physiologic stress tests" of cartilage, i.e., the normal, and hence abnormal, range of response of cartilage to physical stress on the joint, with the possibility for early intervention if this response is abnormal. While much work needs to be done to further optimize the techniques and define normal and abnormal behavior, the payoff might be great.

### **Basics of MRI, Part II**

As part of the MRI experiment, we disturb the equilibrium of the magnetic moments rotating around the main magnetic field. This is done by transmitting a second magnetic field at the same frequency of the rotations of the nuclei (i.e., a radiofrequency field). This is done through the use of the coil used as a receiver coil discussed earlier.

After the equilibrium is disturbed, the radiofrequency field is turned off. The return to equilibrium of the magnetic moments is strongly affected by molecular interactions. This is critically important; as this interaction tells us about the molecular surroundings of the nuclei of interest. In the case here, the interactions are those between the water molecules and the macromolecules of the cartilage matrix.

In order to "view" this interaction, we monitor the return to equilibrium of the magnetic moments after the radiofrequency perturbation. Two time constants are used to characterize this process, namely T1 and T2. We can set our experimental parameters to detect the magnetization at some point along the return to equilibrium (or, equivalently, at some specific time after the perturbation is turned off); in particular in MR vernacular, we set the recovery time TR (which probes the T1 relaxation process) and the echo time TE (which probes T2).

Water has a very long T1 and T2 (on the order of 3000 ms). Cartilage has a much lower T1 (approximately 1000 ms) and T2 (approximately 50 ms). T1 and T2 values for meniscus are approximately 500 and 10 ms. The much faster relaxation times in tissue are due to the interactions between the magnetic moments of the tissue water and the macromolecules in its vicinity. The large differences between T1 and T2 are reflective of the fact that different types of molecular interactions affect the two processes.

The large differences in T1 and T2 of different tissues are used to differentiate one tissue from another in the morphologic images described above by setting TR and TE appropriately. However, one can also look at more subtle variations of these relaxation parameters within a given tissue to investigate molecular effects within that tissue:

### **Applications of MRI, Part II: The Tissue Level**

Although the specifics may be debated, it is well-accepted that the collagen in adult cartilage has a characteristic preferred orientation that varies with tissue depth, with the most superficial zone being oriented tangential to the articular surface and the deepest zone being oriented perpendicular to the bone. This tissue ultrastructure changes with cartilage degeneration and thus provides a potentially important objective for MR imaging. Since the magnetic moments need to realign themselves with the main magnetic field, and since they need to interact with macromolecules in order to do this, one can intuitively see that the degree of orientation of the macromolecules relative to the main magnetic field will affect the efficiency of relaxation, in this case T2 in particular. Therefore, in a "T2 weighted" image (one

where TE is at a value where equilibrium has not yet been reached), there is contrast between regions of differing relaxation rates that essentially reveals difference in collagen orientation.

Using this technique, clear orientation effects of the collagen molecules have been demonstrated in high resolution studies of excised samples<sup>6,8</sup>. In clinical studies, the striations are not resolved; however, the different zones of the cartilage take on different intensities depending on how the cartilage is oriented relative to the magnetic field. While care must be taken in the interpretation of such images given the numerous types of interactions that affect T2 (see below), further studies might enable one to evaluate where the cartilage architectural structure is disrupted.

### **Basics of MRI, Part III**

Exogenous agents can also influence the T1/T2 relaxation. (Because these agents effectively change the image intensity in the final image they are referred to as contrast agents.) MR contrast agents are macromolecules which provide strong local magnetic moments for increased T1/T2 relaxation interactions. The effects can be sufficiently strong that T1 and T2 relaxation are dominated by the contrast agent, so that an MR image reveals the spatial localization (and concentration) of contrast agent. These agents are most commonly used to help distinguish tissue interfaces (e.g., between synovial fluid and cartilage) but can also be designed and used as a probe for macromolecular constituents.

### **Applications of MRI, Part III: The Biochemical Level**

Cartilage is composed of water, collagen, proteoglycans (glycosaminoglycans) and cells. Each of the constituents of water, collagen, and GAG have been investigated in vitro and in vivo MRI studies. The cellular component has been in general ignored since cells comprise < 10% of tissue volume.

One can image directly the amount of water (hydration) in the cartilage. This is done by quantifying the magnitude of the net magnetization vector, and then using calibration to a known phantom (a tube of water) to quantify the water content. For example, the variation of hydration from the

bone to articular surface of cartilage can be mapped out.<sup>9</sup> Increased hydration is thought to be an early indicator of disease. While in principle disease-related changes could be observed by MRI, the changes are relatively small (less than 5%), and care must be taken in the measurements.

As discussed above, the orientation of the collagen fibrils impacts the T2 relaxation parameter. T2 is also affected by the absolute amount of collagen and the molecular structure of the collagen molecule. (On a molecular level, any macromolecule will impact T2 relaxation characteristics of tissue. However, since collagen is the most abundant macromolecule in cartilage, it is believed that the collagen is the main determinant of T2 relaxation in cartilage.)

Changes with aging, and focal T2 defects in cartilage have been demonstrated in several studies.<sup>10-11</sup> These data suggest that focal changes in T2, denoting damage to the cartilage matrix, can be followed with physiologic and pathologic events. For example, the progression of T2 lesions post-meniscectomy<sup>11</sup> might be useful for evaluating the efficacy of different surgical interventions on long-term joint health and disease.

As noted above, the spatial distribution of a contrast agent can be measured directly through its effects on T1 and T2. In cases where the distribution of a contrast agent is dependent on a specific macromolecule, the contrast agent can serve as surrogate measure for that macromolecule. This principle has been used to measure cartilage glycosaminoglycan.

One of the most common MRI contrast agents is Magnevist (Berlex, NJ), or Gd-DTPA<sup>2-</sup>, the important characteristic of this agent for purposes here being that it has a negative charge. Glycosaminoglycans (GAG; part of the proteoglycans) on cartilage also have a net negative charge due to abundant carboxyl and sulfate groups. Therefore, if GdDTPA is allowed time to penetrate into cartilage, one can see intuitively that it will be distributed in higher concentration in areas of cartilage that are low in the negatively charged GAG, and be relatively excluded from regions rich in negatively charged GAG. In fact, one can quantify the GAG con-

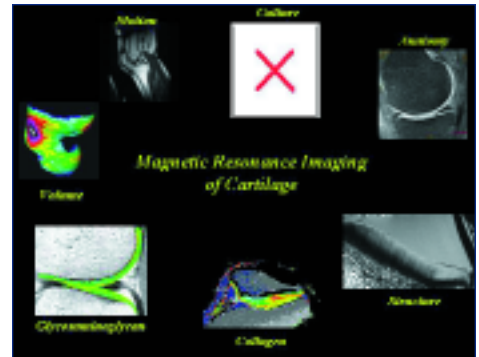
centration by determining the distribution of the GdDTPA. This technique is referred to as delayed Gadolinium Enhanced MRI of Cartilage (dGEMRIC).

The dGEMRIC technique has been applied in both basic science and clinical studies which have demonstrated that GAG determinations based on dGEMRIC track those of biochemistry and histology.<sup>12-13</sup> Clinical studies have demonstrated that dGEMRIC images show "lesions" in cartilage which are not observable in the presence of the nonionic contrast agent ProHance (Bracco Diagnostics, NJ),<sup>14</sup> further validating that the dGEMRIC image corresponds to the distribution of the negatively charged GAG molecules. Variations have been seen in the dGEMRIC index in different knee compartments,<sup>15</sup> and in lesions in patients with osteoarthritis.<sup>16</sup>

With these baseline studies in hand, several pilot clinical studies have been initiated. In trials of autologous chondrocyte implants, the dGEMRIC images of the implants have normalized to the values of the surrounding native cartilage after six months post-op.<sup>17</sup> Another pilot study has demonstrated medial to lateral differences in the dGEMRIC index,<sup>15</sup> and another has demonstrated differences in volunteers who have exercised on a regular basis versus sedentary individuals.<sup>18</sup> A larger study of patients with hip dysplasia revealed a strong correlation between the dGEMRIC index and pain (measured by WOMAC), as well as the dGEMRIC index and the severity of dysplasia, while the standard radiologic parameter of joint space narrowing did not show these correlations.<sup>19</sup>

Combined, these techniques for monitoring the biochemical composition of cartilage appear to be sensitive to native disease-induced differences. With longer-term monitoring we stand to gain enormous insights into temporal and spatial evolution of cartilage degeneration.

The ability to obtain maps of the biochemical composition of cartilage may also enable a noninvasive means of determining its mechanical properties. Some work has begun to examine the relationship between local mechanical properties and MR metrics,



with good correlations noted between dGEMRIC and site-matched indentation stiffness measurements.<sup>20-21</sup>

#### Applications of MRI: The Joint

As mentioned above, MRI has the advantage that the various tissues in the joint are observable by MRI. Studies are now beginning to be designed to better understand the interactions between cartilage, bone, ligament and meniscus.<sup>22</sup> For example, a recent study has correlated changes in cartilage thickness with changes in bone architecture.<sup>23</sup> As the MRI techniques become faster and more widely available, more of these studies will be enabled.

#### Summary

In summary, with the new techniques in MRI we are beginning to realize the opportunity to evaluate and follow the anatomic, biochemical and biomechanical properties of cartilage and other joint tissues. While these techniques have yet to be put into routine clinical practice, this may be possible within a few years with continued development and with added insight from pilot clinical studies. It is reasonable to predict that we are on the leading edge of a paradigm shift, where rather than focusing on the late stage of disease with palliative therapy, we can better understand under what conditions the joint can maintain its health, recognize early degenerative changes and intervene (with lifestyle changes and/or pharmacologic/surgical therapies).

*References are available upon request from the author.*



# The Outcome of Untreated Isolated Traumatic Articular Cartilage Defects of the Knee

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K. Donald Shelbourne, MD

## Introduction

Articular cartilage damage has been reported in 23% of acute ACL injuries and 54% of chronically ACL lax knees. Because the purpose of surgery is to reconstruct the ACL, the chondral lesion is

usually an incidental finding. It is not known if any of the numerous treatments that have been recommended for chondral defects alters the natural history of the untreated lesion. We sought to determine what effect, if any, the presence of an isolated articular cartilage defect observed at the time of ACL reconstruction would have on the radiographic, subjective and objective results after surgery, if no intervention was performed on the cartilage lesion itself, thus allowing the natural history of the chondral defect to emerge.

## Methods

From 1987 to 1999, 2770 ACL reconstructions were performed, of which 125 patients had an articular cartilage defect of Outerbridge grade 3 or 4 but had both menisci intact.

The mean defect size was 167 mm<sup>2</sup> (range, 50 to 600 mm<sup>2</sup>; DEF group). Postoperative rehabilitation was not altered because of the chondral defect, and patients were allowed full weightbearing and full range of motion as able. A matched control group of patients based on sex and surgery age was found from the database, and all patients in the control group had no chondral defects or meniscus tears (CONT group). Patients were evaluated after surgery at 1, 2, 5 years and every 5 years thereafter using the IKDC criteria, modified Noyes subjective questionnaire, and radiographs.

## Results

Subjective follow-up was obtained at greater than 2 years after surgery for 101 patients (mean time, 8.7 years after surgery). Objective evaluation was available for 52

patients (mean time, 6.3 years). Patients in the lateral control group had statistically significantly higher subjective scores than the patients in the lateral defect group (Table 1). Overall, 77% of the DEF group and 87% of the CONT group had subjective scores  $\geq$  90 points. There was no statistical significant correlation between larger defect size and lower subjective scores ( $P=0.2543$ ).

At least 79% of patients in both groups returned to competitive athletics involving jumping, twisting, and pivoting sports at the high school, college or professional level.

## Conclusion

This study reveals the natural history of isolated chondral defects of the knee. Statistical analysis found a difference between the DEF and CONT groups, however an average of 93 points for the lateral group and 94 points in the medial group indicates that most patients have very few symptoms. The radiographic ratings did not show a statistical difference. It is possible that the statistical difference found with the subjective scores is an indication of a degenerative process that may appear on radiographs at a later date.

Most lesions found during ACL reconstruction are incidental findings, and it is difficult to know which defects need treatment. Many of the lesions are of a size that many physicians would choose to perform an articular cartilage repair procedure that involves a slow rehabilitation program that restricts weight bearing.

The results of this study showed that the size of the lesion had no correlation to the subjective scores after surgery; therefore larger

**Table 1. Subjective scores.**

Compartment	DEF group Mean $\pm$ SD	CONT group Mean $\pm$ SD	P-value
Medial (N=48)	94.0 $\pm$ 7.1	95.2 $\pm$ 6.7	0.0451
Lateral (N=53)	92.8 $\pm$ 8.4	95.9 $\pm$ 6.5	0.0047

The distribution of IKDC radiographic ratings was not statistically significantly different between groups (Tables 2 and 3).

**Table 2. IKDC Radiographic rating – Medial compartment (P=0.0863)**

Group	Normal N (%)	Nearly Normal N (%)	Abnormal N (%)
Medial	18 (72)	6 (24)	1 (4)
Control	20 (80)	1 (4)	4 (16)

**Table 3. IKDC Radiographic rating – Lateral compartment (P=0.5007)**

Group	Normal N (%)	Nearly Normal N (%)	Abnormal N (%)
Lateral	20 (74)	6 (22)	1 (4)
Control	23 (85)	4 (15)	0 (0)

lesions did not cause greater symptoms than smaller lesions. The rehabilitation programs recommended after articular cartilage repair procedures involve non-weightbearing for 6 to 8 weeks, which severely affects the patient's lifestyle whether he or she is a young athletic individual, a person who works in an office, or a mother or father who takes care of small children. Non-weightbearing also causes muscle atrophy and may be harmful to healing of the articular cartilage.

It is important to consider the results of articular cartilage procedures and the difficulty of the rehabilitation and whether the treatment significantly improves the natural history of the injury.

In this study, patients achieved good results in that stability was achieved, strength returned to normal levels, patients were able to return to athletics and subjective scores were at least 90 points for 77% of patients at 8 years follow-up. This study current study provides a baseline of information that can be used to compare the results of articular cartilage procedures.

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