ISAKOS

ISAKOS NEWSLETTER 2023 • VOLUME II

Current Perspectives on Arthroscopy, Knee Surgery & Orthopaedic Sports Medicine

UPCOMING Workshops & Courses

isakos.com/collaborations

INTERNATIONAL SOCIETY OF ARTHROSCOPY, KNEE SURGERY & ORTHOPAEDIC SPORTS MEDICINE • 1995 •

INSIDE

in this issue

International Society of Arthroscopy, Knee Surgery and Orthopaedic Sports Medicine

567 Sycamore Valley Road West
Danville, CA 94526–3900 USA
Telephone: +1 925 807–1197
Fax: +1 925 807–1199
Email: isakos@isakos.com

The 2023 Biennial ISAKOS Congress in Boston, USA held in-person, marked the beginning of an exciting new chapter for ISAKOS and the future of knee surgery, arthroscopy, and orthopaedic sports medicine research! There were approximately 2700 attendees with an astounding 85 countries represented. Events included 600+ faculty presentations, 200+ sessions, 450 accepted papers, 60 symposia, and 1000+ accepted e-posters. The surgical demos, debates, and instructional course lectures with plenty of time for Questions & Answers also allowed for interactive and lively discussion regarding cutting-edge research, treatment decisions and surgical timing, as well as technique. If we learned one thing only at the Congress, it is that ZOOM and webinars are good, but there is nothing like being in-person to learn and interact with colleagues!

The Congress also welcomed the new President, Dr. David Parker from Australia, who will lead ISAKOS for the next two years, and many thanks to Dr. Guillermo Arce from Argentina for his extraordinary work as the past-President leading the society out of the pandemic. A big welcome to the 2023–2025 Board of Directors & Committees.

The Society is thrilled to have new *Journal of ISAKOS (JISAKOS)* Editor-in-Chief, Dr. Olufemi Ayeni from Canada, take charge! "Femi", as he is known to many of us, is a highly respected, brilliant scientist and master surgeon who will be replacing *JISAKOS's* first Editor-in-Chief, Dr. Niek van Dijk from the Netherlands. We are all extremely grateful for Dr. van Dijk's incredible service to the *Journal* since inception. He was the first *JISAKOS* Editor-in-Chief starting in 2015 and launched the *Journal* in 2016, working tirelessly since. As a snapshot of Dr. van Dijk's work, *JISAKOS* had 160 loyal reviewers from 34 countries, who completed 323 reviews in just 2022 alone during which time *JISAKOS* published 51 articles from authors in 37 countries. In 2023, we published our first special issue from the Knee: Sports & Preservation Committee, guest edited by Dr. Sachin Ramchandra Tapasvi from India. Eight special issues are in development from eight different committees.

As for me, I am moving as Second Vice President of ISAKOS and we will search for a new Newsletter Editor. The future is bright for ISAKOS! We look forward to seeing you in 2024 at the Second Biennial ISAKOS Knee Arthroplasty Forum in Kyoto, Japan and then again at the 2025 ISAKOS Congress in Munich, Germany!

Robert G. Marx, MD

ISAKOS Newsletter Editor
UNITED STATES

approximately **2700** attendees

85 countries represented

600+ faculty presentations

200+ sessions

450 accepted papers

60 symposia

1000+ accepted e-posters

Thank you for 8 years of service as the ISAKOS Newsletter Editor!

Dr. Marx will continue his ISAKOS leadership journey by serving as ISAKOS 2nd Vice President for the 2023–2025 committee term.

David A. Parker, MBBS, BMedSc, FRACS
AUSTRALIA

A Fantastic Meeting in Boston and Exciting Times Ahead!

It is a great honour to take on the leadership of this wonderful society for the next 2 years. ISAKOS is the leading, and only truly international, society for knee surgery, arthroscopy and orthopaedic sports medicine, and it has always been a privilege to be a part of this organisation, ever since I attended my first meeting in Montreux in 2001. What an exciting initiation to ISAKOS that was!

I am most grateful to my predecessor Guillermo Arce for his tireless work and enthusiasm over the last 2 years as president, and for getting us back on track after the pandemic. He has represented ISAKOS at many international meetings, led many new initiatives, and has set a high standard to follow! I'm off to a good start, having gone straight from Boston to the Canadian Orthopaedic Association meeting in Calgary, followed by the Japanese Sports Orthopaedic Association meeting in the week after Boston. Visiting these meetings around the world helps to strengthen our international relationships.

ISAKOS is all about the people – the members. No other organisation has so many people from so many countries around the world, who willingly give up their time for the advancement of our profession and the benefits for our patients. We all share a passion to come together to share experiences, exchange ideas, and collaborate. We saw this at our recent **Biennial Congress in Boston, with nearly 3,000 people from around the world.** How wonderful it was to be back meeting in-person again!

The last 2 years, under Guillermo's leadership, has seen the reinforcement of our successful programs and the development of many new exciting ones, and the next 2 years promise to see this evolution and successful growth continue.

Education is our core mission, and whilst there are many challenges in maintaining and growing a global education program, if we follow the principles of collaborating rather than competing, and proactively developing new innovative strategies, we can continue to be the leaders, and the most trusted, highest level of independent information in our field.

We will continue to grow and diversify our educational programs, reinforcing our commitment to reach as many regions of the globe as frequently as possible. We are very excited about our 2nd ISAKOS Knee Arthroplasty Forum to be held in Kyoto, Japan, in October 2024. This will be a truly international meeting dedicated to knee arthroplasty, with the innovative engaging program ISAKOS is famous for. We will of course host our next Biennual Congress in the fabulous city of Munich in June 2025 – mark your calendars now for what will undoubtedly be the best ISAKOS meeting yet!

In addition to our main meetings, we will be running several cadaveric teaching labs every year, starting with Aspetar in Qatar in September, followed by labs planned for 2024 in North and South America and Asia-Pacific regions. We of course also will continue our many on-line educational platforms, including Global Link, Webinars, and our highly successful *Journal of ISAKOS*.

We will continue to support research, with a diverse portfolio of grants for our members, particularly focusing on providing support for young researchers and members from countries with limited resources, to provide a head start in developing their research studies. We also have many exciting travelling fellowships our members can apply for.

The recently initiated global travelling fellowship has been a great success and provided wonderful experiences for all who participated.

ISAKOS is a proudly diverse organisation. We have members from 102 countries, and have representation from all regions in leadership and on committees. We have valuable partner societies in all regions, who we work with regularly to reach each region of the globe. We are also striving for continued improvements in age and gender diversity. Social events for young members and women in orthopaedics in Boston were incredibly successful, and for the 2023–2025 term we have the highest ever representation of younger fellows and women in leadership and on committees, and this will be an ongoing focus for our gender diversity and young professionals task forces.

So the future is bright for our organisation and our profession. ISAKOS has a well established infrastructure and is well resourced, and we have an amazing team in the office led by our CEO Sue Reimbold. We have a fantastic Executive Committee and Board of Directors, made up of leaders from around the world. We have strength in our diversity, and we are united by a common bond to advance our profession.

In closing I would like to congratulate Bob Marx on his appointment as second vice president of our organisation. Bob has been actively involved in many committees and leadership roles for ISAKOS for many years, and is an outstanding choice who will no doubt continue to make a valuable contribution on the Presidential line. Amongst many other contributions, Bob has worked tirelessly as the editor of the ISAKOS newsletter for many years, taking it to a new level and maintaining an incredibly high standard. He now plans to step down as newsletter editor to concentrate on his new responsibilities as second VP, and I would like to sincerely thank Bob for his outstanding efforts in leading the newsletter team for many years.

I am honoured to lead ISAKOS for the next 2 years, and look forward to working with you all and visiting as many of you around the world as possible. As mentioned, we all exist for ISAKOS and its members, so please get involved and feel free to reach out with any feedback you have to help improve what we do (president@isakos.com).

2023 VOL. I CORRECTION

Osteo-Core-Plasty: Minimally Invasive Approach for Subchondral Pathologies in Knee Osteoarthritis
https://www.isakos.com/GlobalLink/Newsletter/2023-Volume-1/Osteo-Core-Plasty

Katarzyna Herman, Graeme P. Whyte, Anna Montagna, Leandra Bizzoco, Nogah Shabshin, Dawid Szwedowski, Alberto Gobbi. Osteo-core plasty: minimally invasive approach for subchondral pathologies. *Journal of Cartilage & Joint Preservation*, Volume 3, Issue 1, 2023, 100101, ISSN 2667-2545, https://doi.org/10.1016/j.jcjp.2023.100101.

> **"I am excited by the opportunity to build a great team that will continue to advance *JISAKOS'* momentum in the academic world."**

Olufemi R. Ayeni, MD, PhD, MSc, FRCSC
CANADA
Editor in Chief, *JISAKOS*
chiefeditor@jisakos.com

A Bit About Myself

My name is Olufemi (Femi) Ayeni. I am a Professor and Orthopaedic Surgeon at McMaster University, Canada. I am currently the Academic Chair of the Division of Orthopaedic Surgery at McMaster University, a designated University Scholar, and a Canada Research Chair in Joint Preservation Surgery. My clinical focus is on arthroscopy and sports medicine, and I serve as the Medical Director for Forge FC (Canadian Premier League) and the Hamilton Tiger Cats (Canadian Football League). I am in my 15th year of practice in Canada. My wife Theresa is an ENT surgeon, and we have 4 very active children.

My Experience

I have completed post-graduate training in research methods and have participated in >400 published academic studies and several funded clinical trials. These efforts have involved receiving feedback through a peer-review process, providing me with extensive experience in this area. I have also held several editorial roles during the last 10 years; specifically, I served as the Scientific Editor of the *Canadian Orthopaedic Association Bulletin*, as the Deputy Editor in Chief for the journal *Knee Surgery Sports Traumatology and Arthroscopy*, and as a member of the editorial boards of the *American Journal of Sports Medicine* and the *Journal of Hip Preservation Surgery*, among others.

Why Apply?

I applied for the EIC role because I have always admired the mission of *JISAKOS* and the organization's dedication to excellence in peer review, evidence-based principles, and open access to allow for a global reach. The exciting trajectory of the journal during the tenure of Niek van Dijk, with indexing of the journal in multiple databases and the journal's first impact factor, are among the factors that compelled me to apply for this position. I also believe that my prior editorial experience and career interests have prepared me well for this role, and it simply feels like the right time for me to truly contribute to *JISAKOS* at an editorial level.

What I am Most Excited About

I am excited by the opportunity to build a great team that will continue to advance *JISAKOS'* momentum in the academic world. I am also hopeful that by aligning all of our editorial interests and talents, we will continue to propel this journal forward as one of the leading sources of information in sports medicine. Specifically, I have a keen interest in developing a program to enable authors from low to middle-income nations to contribute their experiences to the journal. Furthermore, the opportunity to broaden our social media activities to distill the journal's content and drive principles of evidence-based medicine forward within the journal will be key focal points. More details will be revealed soon, but this opportunity to continue to develop inclusive excellence is certainly very exciting for me.

ISAKOS CONGRESS 2025

MUNICH GERMANY

June 8–11

SAVE THE DATE

Abstract submission will open

February 1, 2024

Neues Rathaus Marienplatz Muenchen, © München Tourismus, Vittorio Sciosia

#ISAKOS2025

THANK YOU TO ALL

FOR HELPING MAKE THE CONGRESS IN BOSTON A SUCCESS!

ISAKOS WELCOMES
THE 2023 – 2025 ISAKOS BOARD OF DIRECTORS

EXECUTIVE COMMITTEE

David A. Parker, MBBS, BMedSc, FRACS AUSTRALIA, President

João Duarte Espregueira-Mendes, MD, PhD PORTUGAL, First Vice President

Robert G. Marx, MD UNITED STATES, Second Vice President

Mark G. Clatworthy, FRACS NEW ZEALAND, Treasurer

Laurie A. Hiemstra, MD, PhD, FRCSC CANADA, Assistant Treasurer

David H. Figueroa, MD CHILE, Secretary

Sebastien Lustig, MD, PhD FRANCE, Assistant Secretary

Pieter D'Hooghe, MD, PhD QATAR, Consultant

Volker Musahl, MD UNITED STATES, Consultant

Norimasa Nakamura, MD, PhD JAPAN, Consultant

Sachin Ramchandra Tapasvi, MBBS, MS, DNB, FRCS INDIA, Consultant

Guillermo Arce, MD ARGENTINA, Past President

MEMBERS-AT-LARGE

Nobuo Adachi, MD, PhD JAPAN

K. Fredrik Almqvist, MD, PhD UNITED ARAB EMIRATES

Elizabeth A. Arendt, MD UNITED STATES

Gian Luigi Canata, MD ITALY

Camila Cohen Kaleka, PhD BRAZIL

Myles R. J. Coolican, FRACS AUSTRALIA

Alberto Gobbi, MD, FRACS ITALY

Rodrigo Maestu, MD ARGENTINA

Shuichi Matsuda, MD, PhD JAPAN

Seth L. Sherman, MD UNITED STATES

Maria Tuca, MD CHILE

Andy Williams, MBBS, FRCS(Orth), FFSEM(UK) UNITED KINGDOM

WELCOME THE 2023

ISAKOS HONORARY MEMBERS

Mitsuo Ochi, MD, PhD
JAPAN

Marc R. Safran, MD, Prof.
UNITED STATES

THE INAUGURAL FREDDIE FU LIFETIME ACHIEVEMENT AWARD

Sponsored by Smith & Nephew

HONOUR THE WORK

A Tribute to Freddie Fu

Recipient & Honor Lecturer
John Bartlett, AM MB BS, FRACS, FAOA
AUSTRALIA

In honor of renowned orthopaedic surgeon, ISAKOS Past President and inspirational leader, the Freddie Fu Lifetime Achievement Award is the highest pinnacle of honor bestowed by ISAKOS—established to recognize an ISAKOS Member for their distinguished service to the Society, plus their significant contributions to the field(s) of arthroscopy, knee surgery and orthopaedic sports medicine.

"A brilliant choice for the first Freddie Fu award.

Freddie and John were great friends.

John, like Freddie, has had a truly global perspective with friends in every region in our ISAKOS family.

John is especially committed to helping colleagues in developing countries in the Asia-Pacific region."

Barry R. Tietjens, FRACS
Aukland, NEW ZEALAND
ISAKOS President 2001–2003

ISAKOS CONGRESS 2023

Boston
Massachusetts
June 18 – June 21

THANK YOU

TO THE 2021 – 2023 ISAKOS PROGRAM COMMITTEE

Mark G. Clatworthy, FRACS NEW ZEALAND, Chair

Alan Getgood, MD, FRCS(Tr&Orth), DipSEM CANADA, Deputy Chair

Elizabeth A. Arendt, MD UNITED STATES

Olufemi R. Ayeni, MD, PhD, MSc, FRCSC CANADA

John Bartlett, AM MB BS, FRACS, FAOA AUSTRALIA

John A. Bergfeld, MD UNITED STATES

Leendert Blankevoort, PhD NETHERLANDS

Emmanouil V. Brilakis, MD, MSc, PhD GREECE

Emilio Calvo, MD, PhD, MBA SPAIN

Gian Luigi Canata, MD ITALY

Myles R. J. Coolican, FRACS AUSTRALIA

Pieter D'Hooghe, MD, PhD QATAR

Giovanni Di Giacomo, MD ITALY

Julian A. Feller, FRACS, FAOrthA AUSTRALIA

Margaret W. M. Fok, FRCSEd(Ortho), MBChB HONG KONG

Brett A. Fritsch, MBBS, BSc(Med), FRACS, FAOrthA AUSTRALIA

Alberto Gobbi, MD, FRACS ITALY

Joshua D Harris, MD UNITED STATES

Iftach Hetsroni, MD, Associate Prof. ISRAEL

Laurie A. Hiemstra, MD, PhD, FRCSC CANADA

MaCalus V. Hogan, MD, MBA UNITED STATES

Mark R. Hutchinson, MD, FACSM, FAANA, FAAOS, Prof. UNITED STATES

José F. Huylebroek, MD BELGIUM

Jon Karlsson, MD, PhD, Prof. SWEDEN

Vikas Khanduja, PhD, MA(Cantab), MBBS, MSc, FRCS, FRCS(Orth) UNITED KINGDOM

Jason L. Koh, MD, MBA UNITED STATES

Elizaveta Kon, MD, Prof. ITALY

Aaron J. Krych, MD UNITED STATES

Ryosuke Kuroda, MD, PhD JAPAN

John G. Lane, MD UNITED STATES

Daphne Ling, PhD, MPH TAIWAN

Sebastien Lustig, MD, PhD FRANCE

Robert G. Marx, MD UNITED STATES

Augustus D. Mazzocca, MS, MD UNITED STATES

Mary K. Mulcahey, MD UNITED STATES

Toshiyasu Nakamura, MD, PhD JAPAN

Luigi A. Pederzini, MD ITALY

Gary G. Poehling, MD UNITED STATES

Andrew James Price, DPhil, FRCS(Orth) UNITED KINGDOM

Elvire Servien, MD, PhD, Prof. FRANCE

Kevin P. Shea, MD UNITED STATES

Seth L. Sherman, MD UNITED STATES

Daniel A. Slullitel, MD, Prof. ARGENTINA

Robert A. Stanton, MD UNITED STATES

Sachin Ramchandra Tapasvi, MBBS, MS, DNB, FRCS INDIA

C. Niek van Dijk, MD, PhD NETHERLANDS

Daniel C. Wascher, MD UNITED STATES

Masahito Yoshida, MD, PhD JAPAN

Volker Musahl, MD UNITED STATES, Past Chair

ISAKOS WOULD LIKE TO THANK
THE FOLLOWING SPONSORS FOR THEIR SUPPORT

PLATINUM

enovis™

Smith+Nephew

GOLD

Arthrex®

ConMed

SILVER

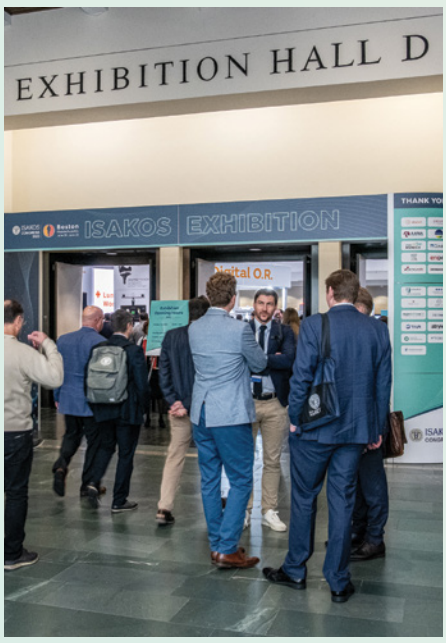
ANIKA

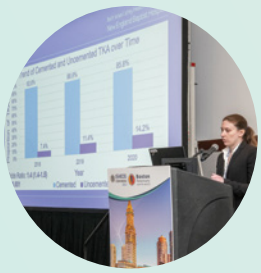
DePuy Synthes
THE ORTHOPAEDICS COMPANY OF Johnson & Johnson

STORZ
KARL STORZ — ENDOSKOPE

ZIMMER BIOMET
Moving You Forward.™

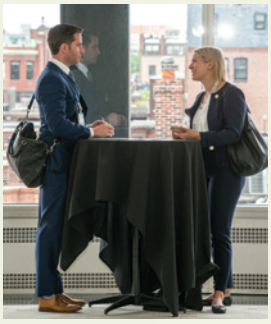
GREAT TO BE BACK TOGETHER IN PERSON!

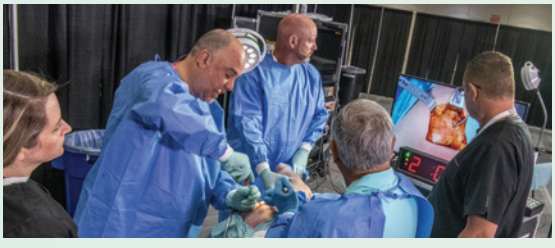




ISAKOS CONGRESS 2023

Boston
Massachusetts
June 18–June 21





WELCOME RECEPTION

The ISAKOS Congress Welcome Reception was a festive occasion, welcoming all Congress participants and their guests to Boston!

EXHIBITS

ISAKOS thanks the ISAKOS Congress Exhibitors for their continued support of our mission of education and improved patient care.

LUNCH TIME SESSIONS

Lunch Time Lectures and Workshops were also sponsored by various companies and provided up-to-the-minute information on various techniques with lectures and hands-on workshops.

PRESIDENTIAL MEDALLION PRESENTATION

Dr. Guillermo Arce of Argentina, ISAKOS President 2021–2023, passed the Presidential Medallion to Dr. David Parker, ISAKOS President 2023–2025.

HONORARY MEMBERS

ISAKOS congratulates two new Honorary Members: Dr. Mitsuo Ochi of Japan and Dr. Marc Safran from the United States.

PRESIDENTIAL GUEST LECTURERS

ISAKOS would like to thank Judo Olympian, Paula Pareto, MD, for presenting "When the 'Impossible' Becomes Possible."

MEET THE EXPERTS

The up-close discussion with world renowned experts was extremely popular with the attendees.

VIRTUAL REALITY CHALLENGE

ISAKOS would like to thank Smith & Nephew and CONMED for their sponsorship of the inaugural VR Challenge.

WOMEN OF ISAKOS RECEPTION

The ISAKOS Gender & Diversity Task Force hosted the first Women of ISAKOS Reception at the ISAKOS Congress! This forum allowed female members and attendees to network with leadership and build and renew relationships. Thank you to the 60+ attendees!

YOUNG PROFESSIONALS & FIRST TIME ATTENDEE SOCIAL

The ISAKOS Young Professionals Task Force hosted the inaugural Young Professionals & First-Time Attendee Social. This new event kicked off the Congress on Sunday morning and gave attendees the chance to network with the ISAKOS leadership and other international peers. It was a great event to learn more about ISAKOS and how to get involved.

ISAKOS CONGRESS 2023 | Boston Massachusetts June 18–June 21

THANK YOU TO ALL

FOR HELPING MAKE THE CONGRESS IN BOSTON A SUCCESS!

The Internal Joint Stabilization System for Elbow Lesions

Angelo De Crescenzo, MD
Ente Ecclesiastico Ospedale "F. Miulli"
Acquaviva delle Fonti
Bari, ITALY

Andrea Celli, MD
Shoulder and Elbow Unit
Hesperia Hospital
Modena, ITALY

Jorge L. Orbay, MD
Miami Hand & Upper Extremity Institute
Miami, FL, USA

Luigi A. Pederzini, MD
Nuovo Ospedale di Sassuolo
Modena, ITALY

Introduction

The Modena elbow course, led by Dr. Pederzini and Dr. Celli, with Dr. Orbay as a special guest, was held on December 3, 2022. This course focused on elbow instability resulting from acute and chronic lesions, and, more specifically, on the use of the Internal Joint Stabilizer (IJS) to temporarily stabilize the elbow while allowing early motion and protecting bone and ligamentous healing.

Etiopathogenesis and Risk Factors

The elbow is a joint with a high inherent stability that is ensured by congruent articular surfaces and strong collateral ligaments. After acute fracture-dislocations or the reconstructive surgical treatment of chronic injuries, residual joint instability can occur. Despite the fixation of osseous and soft-tissue constraints, concentric reduction may not be maintained within a reasonable range of motion, preventing early motion recovery.

As a consequence, prolonged immobilization with splints or an orthosis is usually considered as a means of achieving secondary stability. In more severe scenarios, static reduction requires additional surgical stabilization with use of transarticular pins or static external fixators. In such cases, joint stability is pursued at the expense of motion, leading to progressive stiffness. The use of a hinged external fixator to achieve both stability and early motion has been associated with inconsistent results[1], with some reports describing a high rate of pin-track problems such as infection and mobilization despite successful restoration of range of motion[1,2]. Such complications have stemmed from the intrinsic biomechanical drawbacks of the device. For example, the long lever arm of the external frame makes the recreation of a correct axis of rotation extremely complex to recreate. In addition, the distance between the ulnar and humeral pins can provide substantial flexibility and can restrict joint motion rather than facilitate it. As a result, recurrent instability has been found in as many as 30% of cases[2].

To address these issues, an internal hinge was developed by an idea of Orbay and Mijiraes, who first proposed an internal device achieved crafting intraoperatively a Steinmann pin[3]. The Internal Joint Stabilizer (IJS) is a completely internal device that is designed to stabilize the joint, allow early motion, and protect bone and ligamentous healing. Reducing the distance of the device to the joint and its lever arm allows a more accurate recreation of the axis of motion and helps to avoid the severe pin-site complications that have been associated with hinged external fixation. Moreover, an internal device is less cumbersome and heavy for the patient. Since its approval by the Food and Drug Administration in 2016, the IJS has demonstrated consistent and successful results, with similar recovery of motion, decreased rates of complications and recurrent instability when compared to the hinged external fixators[2,3].

Device Description and Surgical Treatment

The IJS consists of a smooth axis pin for humeral purchase with frictionless motion; this pin is secured through a connecting arm to a plate that is firmly fixed to the dorsal ulnar surface with three screws (Fig. 1).

01 The IJS consists of a smooth axis pin for humeral purchase and frictionless motion. This pin is secured through a connecting arm to a plate that is firmly fixed to the dorsal ulnar surface with three screws.

With the patient in the supine position, the procedure is performed through a posterior global approach, a lateral approach, or a combined medial and lateral approach. In the setting of acute trauma, any fractures are initially addressed and then ligaments repaired or reconstructed. Capsular and osseous release combined with bone and ligamentous reconstruction are performed in patients with chronic elbow disease. Then, elbow stability is assessed throughout the range of motion, with residual instability considered to be an indication for temporary stabilization with the IJS. As a matter of fact, the likely need for temporary and additional stabilization with the IJS is generally considered at the beginning of surgery as the center of rotation on the lateral capitellum should be left free for the axis pin rather than for an anchor for the lateral ulnar collateral ligament repair. With use of fluoroscopy and the system's aiming guide, the K-wire is placed, starting from the center of rotation on the lateral capitellum to the humeral insertion point of medial collateral ligament, with care being taken not to violate the medial cortex in order to avoid ulnar nerve injury. Then, the K-wire is measured and drilled with use of the 2.7-mm cannulated drill. The K-wire is thereafter removed, and the axial pin is inserted.

The lateral collateral ligament is generally repaired with a transosseous technique or with all-suture anchor placed immediately posteriorly and proximally to the axial pin. The limbs of both sutures are whipstitched through the ligament but are tied down only after the IJS placement is completed.

Once the humeral portion of the procedure is complete, the proximal ulna is approached for baseplate positioning. The overlying soft tissue is cleared from the bone surface, and the baseplate is temporarily positioned and fixed, with the first screw being placed through the oblong hole and aiming distally to the coronoid process. Application of the first screw through the center sliding slot makes it possible to correct the position of the plate before definitive fixation is achieved. After image intensifier assessment, the proximal and distal screws are positioned, with care being taken to avoid both the ulnohumeral and proximal radioulnar joints. At this stage, the axis pin is tightened to the connecting rod, and, only after fluoroscopic and clinical checks of concentric reduction, both the proximal and distal screws on the connecting rod are secured. Adjusting the connecting rod and boom in this way allows the device to be tailored to the patient, with accommodation for anatomic variations. The stability is again confirmed, and the excessive length of connecting bar is trimmed. Finally, stitches on the lateral collateral ligament are tied down. Postoperatively, patients are mobilized on the first postoperative day.

Surgical Tips

- To have enough room for the aiming guide, an anterior capsular release may be needed.
- When using the aiming guide to find the axis of joint rotation, choose the biggest size without crossing the medial lip of the trochlea. The more medially that the trochlea is grasped by the guide, the more accurate the recreation of the axis of rotation will be.
- When tightening the connecting rod, place the elbow in flexion with the hand towards the patient's face.
- Once the axis pin and connecting rod are tightened, check the full range of motion. If some degree of extension stiffness is observed, an impingement of the connecting arm with bone prominence can occur at the lateral epicondyle. In that case, bone excision and flattening are warranted.

Advantages and Disadvantages

Advantages

- The primary benefit of the IJS is that it can overcome the severe and consistent biomechanical downsides and complications associated with hinged external fixation. The shorter lever arm allows for easier recreation of the axis of rotation and less flexibility of the hinge.
- Even though, as an internal device, the IJS can be prominent and provide some aesthetic discomfort, it is generally less cumbersome than an external frame.
- Patients with severe associated disease such as drug or tobacco abuse, brain injury, or psychiatric conditions can tolerate an internal device more easily than an external fixator.

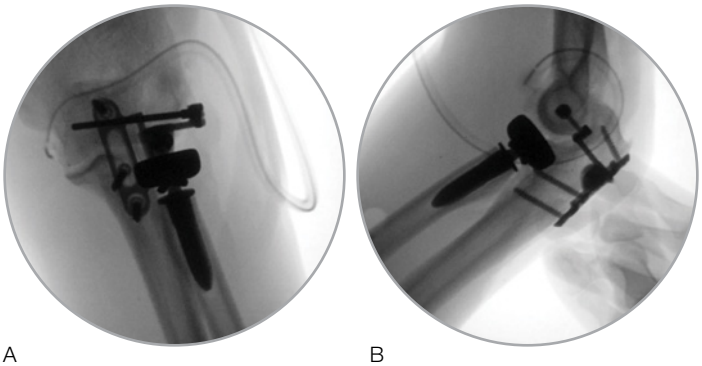
Disadvantages

- The primary drawback of the internal stabilizer is the need for a second surgical procedure for its removal. Even though a smaller skin incision is required for the IJS, patients may complain about it and must be advised that a second surgery will be required for implant removal.
- Severe elbow injuries associated with large soft-tissue damage prevent the use of an internal device.

The Internal Joint Stabilization System for Elbow

Indications

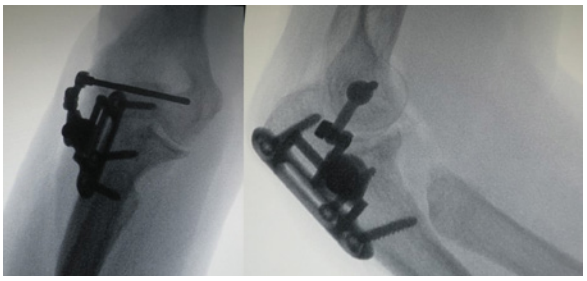
To date, the indications for the use of the IJS are still somewhat unclear and are largely dependent on surgeon preference. Even though elbow instability can result from several conditions, published reports have indicated that the terrible triad injury is the most frequent indication[2,3]. Defined as the combination of elbow dislocation, radial head fracture, and coronoid fracture, the terrible triad is associated with a remarkable rate of complications (Figs. 2A and 2B).



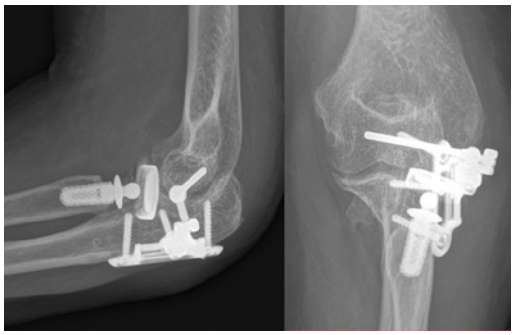
A B

02 Radiographs of the elbow in a patient with an acute elbow dislocation associated with radial head and coronoid fractures and an LCL lesion.

Recurrent instability and stiffness are the most concerning complications, usually requiring revision surgery (Figs. 3 and 4).



03 Radiographs of the elbow in a patient with chronic elbow instability at the site of a previous radial resection.



04 Radiograph of the elbow in a patient with chronic stiffness at the site of a previous radial head replacement.

Coronoid fractures have a major impact on joint stability, and therefore careful assessment and reconstruction are mandatory. A large, unrepaired fracture involving >50% of the coronoid is a relative contraindication to the use of the IJS because the device is ineffective for counteracting the substantial posterior dislocation. In contrast, a medially-placed internal device can overcome this relative contraindication. In patients with a coronoid process fracture, especially one extending into the medial coronoid, an internal device with a lateral connecting arm is supposed to be in an unfavorable condition[4]. A recent biomechanical study demonstrated the efficacy of a medial internal device to maintain elbow stability in a coronoid-deficient elbow, and this benefit has been shown in the clinical setting as well[4,5]. Thus, the IJS, applied on the lateral side of the elbow, withstands the distraction forces that would lengthen the lateral ligaments under varus stress. Conversely, a device placed on the medial side of the joint would better withstand a tenuous fracture fixation acting as a strut against a medial collapse in a varus posteromedial instability[5].

In addition to the specific elbow injury, other factors can play a substantial role in the decision-making process. If an external frame needs to be tolerated by the patients, the IJS can be more easily accepted even by complex patients, being an internal device. Patients with a cerebral insult or impaired cognitive function, elderly patients, and patients who abuse alcohol, drugs, or tobacco are usually unwilling to perform regular pin site care, tolerate an external frame, or return for regular follow-up. In such cases, a completely internal stabilizer avoids these situations, with a corresponding reduction in the rate of complications.

Implant Removal

The need for a second surgical procedure for implant removal remains the main drawback of the IJS. The manufacturer recommends performing this procedure at approximately 6-8 weeks after the index procedure, an interval that is considered to be adequate for fracture and soft-tissue healing to maintain concentric elbow reduction and to avoid implant failure or bone damage over time. However, most authors have reported safe delayed removal at 3-4 months after the index procedure, suggesting that the IJS device is well tolerated by patients. In that extended time-frame, complete tissue-healing and a better definition of the sequelae of the injury can be achieved. Thus, the second surgery for IJS removal can also be used to perform adjunct procedures as needed, such as capsular release or heterotopic ossification excision. The longer the period from index surgery to implant removal, the more lasting the recovered arc of motion will be; in addition, the longer period allows soft-tissue or bone constraints to be removed as well. As a matter of fact, device removal can be even indefinitely delayed in selected patients without implant-related symptoms or radiographic complications.

Different reports show a remarkable rate of patients lost to follow-up suggesting the potential longstanding tolerance for the internal device. This can help to reduce the chance of potential and irreversible complications in patients who are lost to follow-up because of complex conditions (e.g., psychological disease) or an unwillingness to respect the follow-up schedule.

Conclusion

The IJS represents an effective and reliable option for temporary stabilization when the elbow remains unstable after fracture and ligament fixation. By allowing free joint motion while maintaining concentric reduction, this fully internal device protects bone and soft-tissue healing after complex reconstruction and avoids concerning complications associated with external fixation.

References

1. Cheung EV, O'Driscoll SW, Morrey BF. (2008). Complications of hinged external fixators of the elbow. *J Shoulder Elbow Surg*;17:447-453. https://doi.org/10.1016/j.jse.2007.10.006. **2.** Orbay JL, Ring D, Kachooei AR, Santiago-Figueroa J, Bolano L, Pirela-Cruz M, et al. (2017). Multicenter trial of an internal joint stabilizer for the elbow. *J Shoulder Elbow Surg*;26:125-132. https://doi.org/10.1016/j.jse.2016.09.023. **3.** Orbay JL, Mijares MR. (2014). The management of elbow instability using an internal joint stabilizer: preliminary results. *Clin Orthop Relat Res*;472:2049-2060. https://doi.org/10.1007/s11999-014-3646-2. **4.** Reiter BD, Lorentz S, Hillin CD, Foster T, Hoyer RW. (2021). Internal joint stabilizer for varus posteromedial rotatory instability of the elbow. *J Shoulder Elbow Surg*;30:1774-1779. https://doi.org/10.1016/j.jse.2020.12.008. **5.** Sheth MM, Price MB, Mitchell S. (2021). Novel Use of a Medially Applied Internal Joint Stabilizer for Recurrent Elbow Instability After a Terrible Triad. *JBJS Case Connect*;11. https://doi.org/10.2106/JBJS.CC.20.00725

MCL Anatomy, Biomechanics, and Surgery: Appreciation of the Deep MCL is Long Overdue

Andy Williams, MB, BS, FRCS (Orth), FFSEM (UK)
Fortius Clinic
London, UK

Simon Ball, MA, FRCS (Tr & Orth)
Fortius Clinic
London, UK

Kyle Borque, MD
Houston Methodist Hospital
Houston, TX, USA

Professor Andrew Amis
Imperial College
London, UK

Introduction

The medial collateral ligament (MCL) is the most commonly injured knee ligament. The MCL complex has a large surface area and good blood supply with excellent healing potential following injury, meaning that many injuries can be managed nonoperatively. However, there is growing recognition that not all MCL injuries are benign and that not all MCL lesions should be treated nonoperatively[1].

Anatomy and Biomechanics

The MCL complex is an arrangement of three structures within separate layers of tissue: layer 1 includes the deep investing fascia; layer 2 includes the superficial MCL (sMCL); and layer 3 includes the capsule, the deep MCL (dMCL), and the posterior oblique ligament (POL)/posteromedial capsule (PMC).

The dMCL has until recently been regarded as a capsular thickening in the region immediately deep to the superficial MCL. However, recent work has suggested that the dMCL has an inverted fan-like structure and attaches to the femur distal and posterior to the femoral attachment of the sMCL. The fibers pass anterodistally and have a broad tibial insertion close to the joint line. These fibers are well aligned to resist anterior translation of the medial tibia and external rotation. This is not a new finding: Werner Müller described this anatomical concept in his seminal work Das Knie in 1982 and pointed out that the fibers of the dMCL align with those of the ACL[2].

While there is unanimous agreement that the sMCL is the primary restraint to valgus load throughout the range of motion, the function of the other structures remains controversial. The POL/PMC is tight in extension but immediately slackens with flexion. It has a role in resisting valgus rotation in extension and tibial internal rotation. Most surgical reconstruction techniques have previously aimed to restore the function of the sMCL and POL/PMC. It is surprising that the POL is included given its limited role. The only logical indications from adding a POL component are in cases of posteromedial rotatory instability, which is uncommon, and excess hyperextension in cases of MCL injury.

Conversely, it is strange that the dMCL is ignored in most surgical techniques. While it was previously thought that the sMCL was responsible for resisting tibial external rotation, new studies have suggested that the dMCL is the primary restraint to tibial external rotation from 0° to 30° of flexion. This accounts for the occurrence of an unusual isolated dMCL lesion that is most commonly seen in professional soccer players. It is also recognized that, because of its role in resisting external rotation, the proximal dMCL is very commonly injured when the ACL is ruptured, even in cases that were previously thought to be an “isolated” ACL rupture[3]. If adequate healing is not achieved, persistent laxity can result in anteromedial rotatory instability, which in turn increases the risk of ACL graft failure. Therefore, there is a need to appreciate all structures including those in the collateral ligament complexes damaged in ACL injury and to have surgical techniques that enable stability to be achieved in all injured structures, including, if needed, the MCL complex.

An Unusual Lesion

While injuries involving both the sMCL and dMCL following a combination of valgus and external rotation are more common, isolated tears of the dMCL do occur. This unusual injury predominantly affects soccer players and is a result of pure external rotation.

Isolated dMCL tears often are initially thought to be minor MCL tears, and a player’s early recovery appears to be rapid.

Unfortunately, some patients develop persistent pain at the femoral attachment site of the dMCL. While a player can run in a straight line and kick hard "off the laces," they are unable to "bend" a ball through the air because of sharp pain when the ball is impacted against the distal medial foot. There is little to no valgus laxity because the sMCL is intact, but some patients do have an excess of external rotation (a positive dial test for anteromedial rotation). With the knee flexed 20° over the examiner's knee, rapid external rotation will reproduce pain. Around 75% of patients have a classic MRI scan with edema seen in the meniscofemoral part of the dMCL. Those cases that do not resolve and have persistent pain require surgery.

At surgery, the dMCL is seen to be either completely avulsed from the femur or injured just distal to the femoral attachment. In both patterns, there is lack of healing. Freshening of the lesion and simple repair with the knee in neutral rotation and 30° of flexion followed by double breasting of the sMCL over the dMCL repair leads to excellent results. The return-to-play time is approximately 12-16 weeks.

Anteromedial Rotatory Instability

The concept of anterolateral rotatory instability has been popularized again recently, leading to a resurgence of lateral extra-articular procedures to de-stress an ACL graft. Similarly, the phenomenon of anteromedial rotatory instability (AMRI) has been rather ignored. In 1968, Slocum and Larson highlighted the impact of damage to the medial ligament complex as well as the posterior medial meniscus in failing to resist anterior translation of the medial tibia when combined with ACL insufficiency. In 1990, Shapiro et al. measured ACL tension with 10 Nm of external rotation torque applied to the knee. With the MCL intact, this produced average of 55 N ACL tension, but with the MCL cut, this value increased to 135 N. While the risk of overstressing the ACL reconstruction in a patient with MCL insufficiency is obvious, there is no consistent approach to dealing with combined ACL and MCL injuries. Furthermore, clinical assessment of MCL laxity focuses on valgus laxity, while axial rotation is frequently ignored. The dial test has gained popularity for the assessment of posterolateral rotatory instability, but it can also be positive in knees with excessive anteromedial rotation. Clinical studies have confirmed that unaddressed medial laxity is associated with an increased risk of ACL graft failure. In one study, unaddressed MCL laxity was associated with a 17-fold increase in the rate of ACL graft re-rupture.

MCL Surgery

While the majority of MCL injuries, whether isolated or combined with other ligament injuries, can be treated satisfactorily with nonoperative means, there are clear scenarios in which surgical intervention is advised.

In cases involving chronic laxity causing instability despite rehabilitation, there is clearly a need for surgery as there is no healing potential.

In the acute phase, there is healing potential, and therefore the decision to operate is more difficult. Surgery should be considered when adequate healing is not expected. We suggest surgery in cases of excess valgus laxity of the knee in full extension; grade-3 laxity at 30°; a positive dial test for anteromedial rotation; a tibial sided injury with a 'Stener' lesion or an in-folding of the ligament into the joint; and in cases combined with ACL rupture, a positive Slocum test (i.e., persistence of the anterior drawer to test laxity despite external rotation) and/or grade 2 MCL laxity in athletes.

Compared to the criteria for adding anterolateral procedures to ACL reconstruction in which decisions can be somewhat arbitrary, as there is very little guidance from clinical examination apart from a big/explosive pivot shift, the indications for MCL surgery described above are clear cut. This should allow MCL surgery to be undertaken only when appropriate and that unnecessary operative intervention, with its inherent risk of complications, can be minimized.

Surgical Techniques

Many procedures have been described for MCL reconstruction. Most address the POL and sMCL but ignore the dMCL. It seems particularly strange that, when addressing anteromedial rotatory instability resulting from injuries involving the ACL and the medial structures, the POL is even considered at all. The POL passes in the opposite direction to the ACL, as opposed to the dMCL, which runs parallel to the ACL[2]!

In acute cases that require surgery, repair of the damaged structures is desirable. Restoration of natural anatomy is superior to reconstruction alone as it allows normal function of the soft-tissue elements of the MCL and is more likely to restore proprioceptive feedback from the ligament complex. While simple suture repair of the acutely injured soft tissues may be sufficient on its own, we believe in the concept of protecting the acute repair with reconstructive surgery in most cases, in keeping with the experience with acute posterolateral 'corner' surgery. The exception is a complete MCL avulsion from the tibia or femur, which can be fixed back strongly.

MCL Anatomy, Biomechanics, and Surgery: Appreciation of the Deep MCL is Long Overdue

There is also the philosophical consideration of whether reconstructions of knee ligaments even allow normal ligament function at all. It is impossible to reproduce the soft-tissue components of the native MCL complex with use of available grafts, and, because of the potential for fixation problems, we believe that the main role of an MCL reconstruction is to simply protect soft-tissue repairs, which actually restore the native anatomy, rather than the reconstruction reproducing anatomy. In acute cases, direct anatomic repair is possible, but in chronic cases, our practice is to restore anatomy with use of layer-by-layer dissection and then to use suture techniques (effectively like 'capsular shifts' in shoulder surgery) to re-tension the sMCL and dMCL to normal. In these repairs, suture-tying is performed with the knee in 30° and neutral rotation. If the posteromedial capsule/POL is attenuated, simple suture techniques to plicate these tissues, with the sutures being tied close to extension, produce very good results given the vascularity and hence healing potential of the tissues concerned. A POL reconstruction is rarely required. Our indications of it are the unusual cases of excess hyperextension related to posteromedial deficiency or posteromedial rotatory instability when combined with a PCL injury. As the role of reconstruction is to simply protect the anatomic restoration, once the anatomic structures have healed, the reconstruction is redundant by 6-12 weeks from surgery.

Reconstruction Techniques

Most reconstruction techniques involve the use of soft-tissue grafts to reproduce the sMCL and the POL. Recent studies from Imperial College and München have shown that the isometric fibers of the sMCL attach onto the center of the medial epicondyle on the femur[4]. Many popular MCL techniques involve the attachment of an sMCL graft posterior to the epicondyle, but this is non-isometric, resulting in tightening of the graft close to extension. In the natural state, a long sMCL is advantageous as the length of the fibers allows for the dissipation of force, thereby reducing the risk of rupture. However, in situations in which the reconstruction simply functions to protect soft-tissue repairs, the longer the soft-tissue graft used, the more elongation that will occur. sMCL grafts are especially prone to stretching out, probably due to valgus and external rotation loading during the stance phase of gait. This is exacerbated by the reduced neuromuscular control following injury/surgery. In addition, a long graft needs fixation far distal to the joint line, where bone quality is less good for graft fixation. Also in this position implants and grafts can irritate the medial hamstring tendons.

In order to reproduce a proximal as well as distal tibial attachment of the sMCL graft, some techniques involve the use of a suture anchor close to the joint line. If this anchor provides sound fixation, then it is questionable whether it is necessary to have graft distal to this point.

New approaches to MCL reconstruction have been developed on the basis of the recently described anatomical and biomechanical concepts described above. The techniques include consideration of the dMCL and sMCL but not the POL when treating anteromedial rotatory instability associated with ACL deficiency. In one technique, hamstring tendons are split and then flattened out to produce a construct with a limb for the dMCL and sMCL.

Cadaveric studies have compared reconstruction techniques with a dMCL component with the popular contemporary techniques without. The key findings are that:

1. Techniques without a dMCL component do not control exteral rotation, nor AMRI in ACL deficient knees.
2. POL constructs are only of relevance in resisting internal rotation close to extension and are unnecessary in most cases requiring MCL reconstruction.
3. sMCL grafts should be attached on the femur to the center of the medial epicondyle, and resist valgus but not external rotation towards extension.

For many years, one of us (AW) has performed a short isometric single-strand reconstruction technique, with the proximal graft attached to the center of the medial femoral epicondyle and the distal end attached 2 cm distal to the joint line[5]. Scrupulous attention to producing isometry of the graft is essential; this isometry can be achieved by placing two guide-wires, connected with suture, before deciding on the final positioning of the graft on the femur and tibia. The advantages of this method are that (1) the short graft will stretch less than a longer one; and (2) the site of proximal tibial attachment is proximal to the pes anserinus, thereby avoiding soft-tissue irritation and having better quality bone for graft fixation than more distal fixation allows. In addition, a short graft provides rotational restraint. This technique was recently shown to be effective in the laboratory setting when compared to various other techniques.

While there has been understandable resistance to using synthetic grafts as a result of the problems associated with their use in the context of ACL reconstruction, there are clear advantages of them in the extra-articular situation. Apart from avoiding autograft harvest, these grafts are less likely to stretch and are amenable to strong fixation. We have used extra-articular synthetic grafts for many years without encountering the complications associated with intra-articular use and good clinical results.

We do not support the current promotion of percutaneous procedures for MCL reconstruction. The grafts are passed deep to the skin in a "blind" fashion between a proximal and distal 'stab' incision. Such procedures can lead to injuries of the infrapatellar branch of the saphenous nerve and neuroma formation, and of course they do not allow for the anatomic repair of tissues. In addition, the risk of anisometric graft placement is higher which results in permanent loss of motion and/or graft failure.

Conclusion

The MCL is the most commonly injured ligament in the knee, and while the majority of injuries can correctly be treated nonoperatively, a substantial minority require operative treatment. In the context of ACL reconstruction, multiple studies confirm unaddressed MCL laxity is associated with increased failure of ACL grafts. Improved understanding of the MCL means careful clinical and radiological evaluation can identify patients needing surgery. Application of the basic science considerations above allows more appropriate reconstructive surgery and repair techniques which will likely improve the outcomes of MCL reconstruction and also reduce the risk of ACL graft re-rupture.

Cadaveric studies at Imperial College were generously funded by support from Smith & Nephew.

References

1. Williams A, Becker R, Amis A. The medial collateral ligament: The neglected ligament. *Knee Surgery, Sport Traumatol Arthrosc*, 2020;28:3698–9. https://doi.org/10.1007/s00167-020-06116-z. **2.** Müller W, Muspach R, Morscher E. Das Knie: Form, Funktion und ligamentäre Wiederherstellungschirurgie. Berlin Heidelberg: Springer; 1982. **3.** Willinger L, Balendra G, Pai V, Lee J, Mitchell A, Jones M, et al. High incidence of superficial and deep medial collateral ligament injuries in 'isolated' anterior cruciate ligament ruptures: a long overlooked injury. *Knee Surgery, Sport Traumatol Arthrosc,* 2021. https://doi.org/10.1007/s00167-021-06514-x. **4.** Willinger L, Shinohara S, Athwal KK, Ball S, Williams A, Amis AA. Length-change patterns of the medial collateral ligament and posterior oblique ligament in relation to their function and surgery. *Knee Surg Sport Traumatol Arthrosc,* 2020;28:3720–32. https://doi.org/10.1007/s00167-020-06050-0. **5.** Borque KA, Ball S, Sij E, Amis AA, Laughlin MS, Jones M, et al. A "Short isometric construct" reconstruction technique for the medial collateral ligament of the knee. *Arthrosc Tech,* 2023. https://doi.org/10.1016/j.eats.2022.10.005.

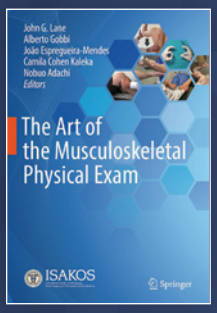
2023 ISAKOS PUBLICATIONS

Free Access for ISAKOS Members

35+

Books AVAILABLE

$4000+ value, FREE for members!

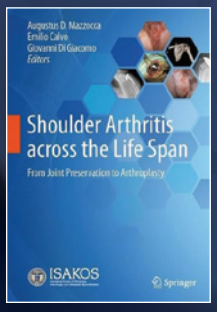


The Art of the Musculoskeletal Physical Exam – AVAILABLE NOW!

J. Lane, A. Gobbi, J. Espregueira-Mendes, C. Kaleka Cohen, N. Adachi

Sideline Management in Sports

S. Piedade, M. Hutchinson, D. Parker, J. Espregueira-Mendes, P. Neyret



Shoulder Arthritis across the Life Span: From Joint Preservation to Arthroplasty

E. Calvo, G. Di Giovanni, A. Mazzocca

isakos.com/books

CALL FOR PAPERS

JISAKOS received its first Journal Impact Factor – 1.6!

JISAKOS is Open Access

The *Journal of ISAKOS* accepts submissions across a wide range of article types, including original articles and state of the art, systematic, current concept reviews, and case reports.

Interested in Becoming a Reviewer?

Log in to isakos.com/myisakos and select your preference in myAccount.

jisakos.org

Single Row vs. Double Row Rotator Cuff Repair: Have We Settled the Debate?

Andrew B. Harris, MD
The Johns Hopkins University
Baltimore, MD
UNITED STATES

Edward McFarland, MD
The Johns Hopkins University
Baltimore, MD
UNITED STATES

Stephen Weber, MD
The Johns Hopkins University
Baltimore, MD
UNITED STATES

Introduction

The debate between Single Row (SR) and Double Row (DR) rotator cuff repair has been a topic of intense interest for many years and an abundance of studies have been performed on this topic. While many great debates in medicine eventually declare a victor, the battle between SR and DR repair has been longstanding without a closing bell. Despite numerous biomechanical studies demonstrating that DR repair provides improved stability and load transfer compared to SR, the comparison of these two repair techniques in clinical studies has produced seemingly mixed results.

Many prospective controlled studies and retrospective analyses have been conducted on the topic of SR vs. DR rotator cuff repair, but discussion still remains regarding the most appropriate suture configuration for rotator cuff repair. The issue is further confused by the studies showing that the results may depend more on the number of sutures than the number of anchors or rows of the construct. Given the large number of high-quality studies, we hope to highlight the recent meta-analyses which have shed some light on this topic, as this may provide us with the most up to date overview of the literature as a whole. Our goal with this discussion is to be brief yet informative regarding this important and nuanced topic.

The more recent meta-analyses reviewed include a 2014 paper by Millet et al., a 2015 study by Hein et al., and a 2016 study by Spiegl et al. While the primary focus of this debate is on clinical outcomes and retear rates, cost is another factor that varies between constructs and should be considered especially in resource-limited healthcare systems and will also be discussed.

Clinical Outcomes

In 2014, Millet et al. performed a systematic review and meta-analysis of Level 1 randomized clinical trials which examined SR vs. DR rotator cuff repair. Among a total of 7 studies, there was no statistically significant difference in clinical outcomes between the SR and DR repair, as measured by ASES, UCLA, and Constant scores. Overall, their results suggested that the comparison of SR and DR repairs in tears of all sizes may not be sufficient to detect differences in clinical outcomes[1]. In studies that have separately examined tears >3 cm, however, consistent differences appear across high quality studies. For example, improved ASES scores, Constant scores and strength have all been demonstrated with DR repair in patients with initial tear size >3 cm. We believe this point of contention has led to much of the earlier debate regarding SR vs. DR rotator cuff repair. As earlier studies tended to examine all patients as a homogeneous group, later studies have consistently identified 3 cm as the inflection point at which DR constructs tend to provide clinically significant benefit.

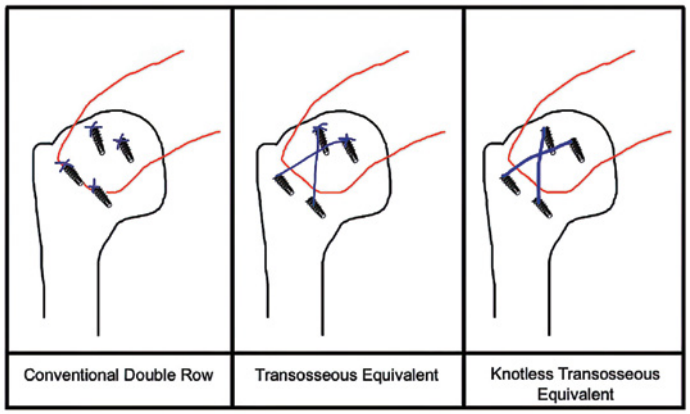
The most comprehensive analysis of the literature in the past 10 years may possibly be the "summary of meta-analyses" by Spiegl et al. in 2016, however, and this study was equivocal regarding the clinically significant benefit of DR vs. SR. In their study, the authors aggregated 8 separate meta-analyses, which included a total of 13 primary studies (many studies were included in multiple meta-analyses)[2]. Exactly half (4/8) of these meta-analyses demonstrated no difference in clinical outcomes between SR and DR, while the other half (4/8 studies) showed higher UCLA and ASES scores in patients with DR repair[2]. All meta-analyses were generally medium quality using the Quality of Reporting of Meta-Analyses (QUORUM) score. If one accepts this penultimate systematic review as the best and most current accumulation of the evidence, the debate is neck-and-neck. But we believe the equivocal nature of this study (compared to earlier studies which have shown a benefit of DR in >3 cm tears) is due to looking at all studies in aggregate for the primary outcomes. Regardless, we feel that the study by Spiegl et al. is an important contribution to our overall understanding of this topic and highlights the importance of separating tears by size.

Retear Rates

The current classification system for rotator cuff tears combined is based on a combination of studies that have used different metrics (tear size as measured in centimeters vs. the number of torn tendons), which can lead to imperfect and mixed results. In addition, the distinction between type 1 retears (retear at the tendon-bone interface) and type 2 retears (medial cuff failure) is important given the decreased ability to successfully repair type 2 retears. Standardized classification of tear size and type among studies would improve the accuracy of future studies, though the most consistent metric is separating tears by <3 cm or ≥3 cm. Similar to the results of studies reporting clinical outcomes, it is apparent that size of tear is an important variable when considering retear rates of SR and DR repair and must be considered when discussing these studies.

In a 2015 meta-analysis by Hein et al., the authors performed a comprehensive overview of studies which examine retear rates between SR and DR repair, and we believe this overview highlights the important and recent literature on this topic very well[3]. In addition to SR and DR, the authors also defined a separate DR technique of suture bridge (SB) as DR repair with crossed mattress sutures[3]. Given this separation, their review included primarily Level III and IV studies with 32 studies total. There was no difference in overall retear rates between DR and SB when studies were examined in aggregate; however, their analysis also demonstrated that both DR and SB have lower retear rates than SR in tears 1-3 cm, <3 cm, >3 cm, >5 cm, and when aggregating all tear sizes but not when looking at tears between 3-5 cm only[3]. Although this latter finding of no benefit for 3-5 cm tears seems counterintuitive, it could suggest that the analysis was underpowered in this specific size range, as most studies examined a single size cutoff.

Although secondary to the main event of SR vs. DR repair, it is also important to mention studies which examine transosseous/transosseous equivalent (TO/TOE) repair which is a similar but distinct entity from DR repair (Figure 1).

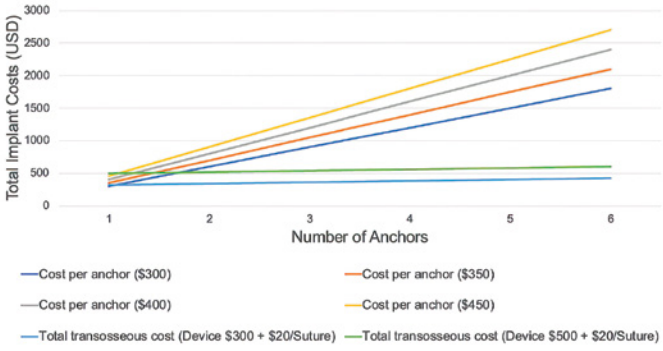


01 Traditional Suture Configurations for Rotator Cuff Repair.

The increased proportion of type 2 retears in TO/TOE repair has been confirmed consistently and is well-supported. For example, Jeong et al., in a 2018 study of 415 patients who were managed with SR or TOE repair, reported a significantly higher rate of retear following SR repairs of large tears (28.6% for the SR group, compared with 4.5% for the TOE group); and also found that the majority (78%) of failures following SR repairs were type 1 retears, whereas the majority (64%) of failures following TOE repairs were type 2 retears[2]. Bedeir et al., in a 2018 systematic review of 14 high-quality studies, reported that type 2 failures represented 62% of all failures after TOE repairs, compared with 24% of all failures following SR repairs[4].

Cost

The final aspect of rotator cuff repair technique to take into account is cost. While cost is always important to consider, this factor may be less important in the decision-making depending on the location of a surgeon's practice. In some situations, cost may even be restrictive to the point that the cheapest repair techniques may be the only ones that are considered. Without surprise, the cost of rotator cuff repair is primarily driven by the cost of implants. Given that SR and TO repairs require fewer (or no) implants as compared with DR and TOE repairs, it is not surprising that SR and TO constructs are more cost-friendly. Black et al., in the most recent high-quality study available (2016), evaluated 178 DR/TOE repairs and found that cost increased incrementally from $813 (USD) in small tears to $1,507 for massive tears[5]. This can be depicted graphically using the summative amounts for theoretical anchors costing $300, $350, $400, $450, and TO devices costing $300 and $500, respectively (Figure 2).



02 Graphical Representation of Incremental Implant Costs for Rotator Cuff Repair Using Anchors versus a Transosseous Device and Sutures.

Of note, this graphical representation highlights the incremental cost of suture anchors but nearly static cost of true TO repair. Thus, we believe that cost should be incorporated into the clinical decision-making when appropriate, particularly for patients who may have rotator cuff tears that are not substantially larger or smaller than 3 cm and/or in practice environments where cost is extremely restrictive or implant options are substantially limited.

Single Row vs. Double Row Rotator Cuff Repair: Have We Settled the Debate?

In the United States, for example, where the cost of the implants is bundled into the facility reimbursement, the cost of DR techniques may exceed the reimbursement for the surgical procedure in a surgery center or other bundled payment environment.

Conclusions

Has the debate between the superiority of SR vs. DR been settled? In a way, yes, several aspects of this timeless debate have what we believe to be a consistent answer in the literature. DR repair is believed to produce better results in terms of repair integrity, particularly for tears >3 cm. While differences in clinical outcomes are less clear between SR and DR, the most recent meta-analyses suggest that improvements in outcomes are significant also only for tears >3 cm. TO/TOE does not seem to confer a significant advantage in clinical outcomes or retear rates compared to DR; however, the primary advantages of TO/TOE compared to DR is a decrease in type 2 tears and decreased cost. While tear pattern and cost of repair are crucial factors in selecting repair technique, the surgeon should also consider each patient's tendon healing ability and functional goals. Continued study of this topic will continue to be important, especially as techniques advance even further and additional factors like biologic grafts and autologous bone marrow inevitably complicate the comparisons of pure traditional techniques even further.

References

1. Millett, Peter J., MD, MSc, Warth RJ, MD, Dornan GJ, MSc, Lee JT, MD, Spiegl UJ, MD. 2014. Clinical and structural outcomes after arthroscopic single-row versus double-row rotator cuff repair: A systematic review and meta-analysis of level I randomized clinical trials. *Journal of Shoulder and Elbow Surgery* 23: 586-597. **2**. Spiegl UJ, Euler SA, Millett PJ, Hepp P. 2016. Summary of meta-analyses dealing with single-row versus double-row repair techniques for rotator cuff tears. *The Open Orthopaedics Journal* 10: 330-338. **3**. Hein J, MD, Reilly JM, MS, Chae J, MD, Maerz T, PhD, Anderson K, MD. 2015. Retear rates after arthroscopic single-row, double-row, and suture bridge rotator cuff repair at a minimum of 1 year of imaging follow-up: A systematic review. *Arthroscopy* 31: 2274-2281. **4**. Bedeir YH, Schumaier AP, Abu-Sheasha G, Grawe BM. 2019. Type 2 retear after arthroscopic single-row, double-row and suture bridge rotator cuff repair: A systematic review. *Eur J Orthop Surg Traumatol* 29: 373-382. **5**. Black EM, MD, Austin LS, MD, Narzikul A, BA, et al. 2016. Comparison of implant cost and surgical time in arthroscopic transosseous and transosseous equivalent rotator cuff repair. *Journal of Shoulder and Elbow Surgery* 25: 1449-1456.

Please note: ISAKOS Newsletter Current Perspectives are not peer-reviewed articles. For peer-reviewed articles, please visit the *Journal of ISAKOS* at jisakos.com.

ISAKOS KNEE ARTHROPLASTY FORUM

KYOTO, JAPAN 2024

OCTOBER 31 – NOVEMBER 1

Join Us

As the world's only truly global knee society, ISAKOS is proud to once again host an international meeting dedicated entirely to Knee Arthroplasty.

Through symposia, debates, surgical demonstrations and interactive case-based discussion, world-renowned experts will offer insights into clinical challenges and research advancements.

Featuring an Innovative and Interactive Meeting Format

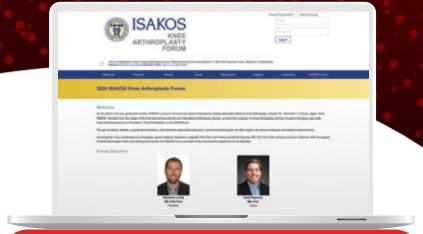
- Controversial Topics
- New Technology
- Debates
- Consensus

Cutting-edge, international knowledge you can take home!

Forum Directors

Sebastien Lustig, MD, PhD, Prof.
FRANCE

Shuichi Matsuda, MD, PhD
JAPAN



isakos.com/IKAF2024

Gender-Based Health Care Inequities in Orthopaedics

María Loreto Figueroa Berrios, MD
Clinic Alemana De Santiago
Universidad Del Desarrollo
CHILE

Laurie A. Hiemstra, MD, PhD, FRCSC
Banff Sport Medicine
University of Calgary
CANADA

"The state in which everyone has the opportunity to attain their full health potential and no one is disadvantaged from achieving this potential because of social position or other socially determined circumstances"

(National Academies of Sciences, Engineering and Medicine)

Introduction

Gender disparities within the medical system lead to significant differences in the treatment received by men and women. Sex and gender influence various aspects of medical care, including the allocation and speed of treatment, the type of interventions offered, and the availability of funding. Research indicates that men generally have greater access to medical and surgical interventions than women. Women are less likely to receive certain treatments and interventions such as lipid-lowering medication, kidney dialysis, admission to an intensive care unit, referral to major trauma centers, and renal or liver transplantation. Female patients also experience underdiagnosis of chest pain, are less likely to receive aspirin or nitroglycerin when having chest pain, and are less likely to be treated with cardiac catheterization or defibrillation.

Why are there gender disparities in medical treatment and what are the underlying causes? The medical decisions made by doctors and surgeons are heavily influenced by their knowledge and training. Regrettably, medical education and training have been biased for centuries, centering on men as the default norm. Consequently, the research that informs our clinical decisions relies on data and scales from studies predominantly conducted on male subjects, with results and recommendations applied to women without adequate consideration.

This broad application of gender-biased research perpetuates the reality of "a world designed for men," in which the medical system is primarily designed to meet male needs[1]. It was not until 1993 that the National Institutes of Health made it mandatory for female patients to be included in their funded clinical trials. To deliver high-quality, effective, and equitable care to our patients, it is imperative that we adopt a sex and gender lens in our medical practice, understanding that the unique needs and experiences of each patient are intimately tied to their health outcomes.

Health Care Inequity in Orthopaedics

Despite the seemingly neutral nature of the appendicular skeleton, orthopaedics, as a medical specialty, would be expected to be shielded from these biases. Unfortunately, this assumption does not hold true, as there is a significant gender gap in orthopaedic patient care. This discrepancy is evident in the treatment of male and female patients with musculoskeletal conditions spanning various subspecialties within orthopaedics. Outside of the obvious ethical and moral considerations, gender and racial disparities emphasize that all orthopaedic patients are not receiving equitable and optimal levels of care.

Gender disparities have been examined most commonly in knee osteoarthritis (OA), with women accounting for 60% of the cases and experiencing more functional disability than men. Despite these differences, women are 4 times less likely than men to be referred to an orthopaedic surgeon for consideration of a total knee arthroplasty. Even when women manage to see an orthopaedic surgeon, they are 22 times less likely than men to be offered a knee replacement[2]. Similar barriers occur for women with hip, ankle, shoulder, wrist, and back conditions. Women are less likely than men to have consulted their primary care provider, to have been referred to specialist care, to have consulted with an orthopaedic surgeon, or to be on a waiting list for surgery. Therefore, if and when they do undergo surgery, they have higher pain and disability scores and worse function in comparison with men, which, in turn, leads to poorer clinical outcomes. Biases persist in the trauma setting, where women who experience major trauma are given lower priority than men. They are less likely to be transferred to a major trauma center, to be evaluated with a CT scan, or to be offered surgical fixation of fractures. Even in the management of musculoskeletal conditions such as tendinopathy or nerve compression, men are more likely to be offered aggressive management options such as injections or surgery.

Exploring the Causes of Health Inequity

The medical system is steeped in history and tradition, which has tragically embedded within it the systematic discrimination against women and other under-represented groups. The gender health equity gap can be traced to our patriarchal society, in which men hold the power and occupy the leadership positions.

Substantial progress from this model has resulted in many countries achieving gender parity in medical school positions. However, orthopaedic surgery has struggled to reduce the gender gap and remains one of the most male-dominated surgical specialties[3]. The barriers that women face in orthopaedic surgery predominantly stem from the male culture that is pervasive throughout the specialty[4]. Despite serving a diverse population, the orthopaedic surgery profession lacks diversity. The importance of diversity lies in its ability to bring forth varied perspectives, ideas, and innovative solutions. Applying this principle to orthopaedics, a diverse group of surgeons would be expected to understand their patients better and to provide superior care[5]. Likewise, patients who feel understood by their surgeon are more invested in their recovery and have better outcomes. This discrepancy is most apparent for gender but holds true for all other under-represented groups, becoming even more substantial when intersectionality is present.

Gender stereotypes can impact how patients communicate their symptoms to health care providers and how those symptoms are interpreted. Women are more likely to be caregivers at home and are more likely to perform the majority of the housekeeping duties in addition to being in the workforce. Traditional perceptions depict men as strong and stoic, whereas women are often considered weak and emotional. This belief creates a paradox in which women, burdened by societal pressures and cultural expectations, may downplay the extent and severity of their pain and disability. However, when they report their pain, they are often labeled as "emotional" or "over-reactive." Despite these labels, studies have shown that women are more likely to label lower functional ability as acceptable and are more willing to live with more disability than men. The interaction of higher pain sensitivity and hesitance to report symptoms, combined with misinterpretation by physicians, may contribute to female patients being offered surgery later in the course of their disease. Surgery performed in patients with more pain and lower function leads to poorer postoperative outcomes. It is crucial for surgeons to understand these existing gender stereotypes as well as the psychosocial economic realities of each patient in order to appropriately assess and treat their patients.

Gender stereotypes are not limited to personal attributes but also extend to occupational roles. For example, consider the scenario in which a male welder and a female homemaker are compared regarding the likelihood of requiring a knee arthroplasty. The male welder is seen as needing to support his family and having a physical job and therefore needs to have his symptoms addressed. The female homemaker is not working, is overstating her pain, and should be able to manage. The unpaid work that women do to support families is not recognized as valuable or physical, and the urgency to address their symptoms is minimized. Such judgments are influenced by societal biases that historically ascribe different values to traditionally male and female occupations.

Please note: ISAKOS Newsletter Current Perspectives are not peer-reviewed articles. For peer-reviewed articles, please visit the *Journal of ISAKOS* at jisakos.com.

Gender-Based Health Care Inequities in Orthopaedics

These biases and stereotypes within our medical system have extended to medical research. Clinical decisions are based on research performed almost solely on men. A lack of gender-specific research has led to women being treated as merely "smaller men," not as a distinct patient group with different anatomy, physiology, and psychosocial realities. When gender-specific data are available, factors that may confound the results must be taken into consideration. For example, a study may show that women have poorer results than men after patellofemoral stabilization, leading to a hesitancy to offer surgery to women. However, women with patellofemoral instability have more pathoanatomic risk factors than men, so it may not be specifically gender that is causing the unequal recovery. Furthermore, the patient-reported outcome measures that we use to measure clinical success are also inherently biased as they have been largely tested and validated on the default male. Gender-specific normative data demonstrate variability, with numerous patient-reported outcome measures revealing a 3- to 8-point variance (on a 100–point scale) between male and female uninjured subjects. Yet, when evaluating postoperative results, an 8-point difference in outcomes between men and women is considered statistically significant. This conclusion suggests that women's postoperative recovery is comparatively less favorable than that of men without considering the baseline disparities in the outcome measure. Similarly, confounding factors to outcomes such as return to sport exist for women. The timing of the many sport medicine injuries and procedures is during the typical child-bearing years for women. Changes in life circumstances may confound their answers and reasons for not returning to sport. These examples highlight that merely reporting results for women and men separately, although important, is not the only factor leading to gender-related health research disparities.

Suggested Solutions

According to the World Economic Forum, it will take 132 years to achieve global gender equity. Intentional and focused efforts are required to expedite progress and overcome the barriers that impede women from attaining equity. Within the field of medicine, it is crucial to acknowledge and address biases and privileges related to gender among both health care providers and patients.

A critical step in this process is addressing the gender gap within orthopaedic surgery. Why are there so few women in orthopaedics? Could a hidden curriculum be steering them away from the specialty? Can women not imagine doing orthopaedics because they see so few female mentors leading the way? Is it true that girls just do not like power tools? To achieve equity, we need to understand and eliminate the barriers that women encounter when training, entering, and leading the orthopaedic profession.

Only when orthopaedic surgeons better reflect the diversity of their patient population can we ensure that patients receive the highest-quality care.

No longer do we have the traditional scenario of a surgeon working long hours with a spouse at home caring for the family. We need to reframe our medical system and take specific steps to address other biases in orthopaedic surgery that affect women disproportionately—for example, by assessing the timing of rounds, facilitating locum opportunities, promoting job sharing, providing protected leave for pregnancy and parenting, and facilitating non-punitive mental health care for practitioners. These changes will improve quality of life for both men and women in orthopaedics.

Another necessary step forward involves reframing our approach to patient care and acknowledging that our current medical system has been constructed on a gender-biased model. These biases are incorporated in the data and research studies on which we base clinical decisions. Therefore, research must incorporate considerations of gender-based differences for the design and conduct of clinical trials. Sex-specific analysis of data is essential, and the outcome measures that are utilized in clinical trials must undergo critical examination to ensure that they are also free from gender bias. By actively dismantling the systems that perpetuate existing biases, a more equitable and inclusive environment can be created for our patients and for our profession.

Bibliography

1. Criado Perez C. Invisible Women - Data Bias in a World Designed for Men. New York, USA: Abrams Press; 2019. **2.** Borkhoff CM, Hawker GA, Kreder HJ, Glazier RH, Mahomed NN, Wright JG. The effect of patients' sex on physicians' recommendations for total knee arthroplasty. *CMAJ*. 2008;178(6):681-7. **3.** Green J, Chye V, Hiemstra L, Fellander-Tsai L, Incoll I, Weber K, et al. Diversity: Women in orthopaedic surgery - a perspective from the International Orthopaedic Diversity Alliance. *Journal Of Trauma and Orthopaedics.* 2020;8(1):44-51. **4.** Hiemstra LA, Kerslake S, Clark M, Temple-Oberle C, Boynton E. Experiences of Canadian Female Orthopaedic Surgeons in the Workplace: Defining the Barriers to Gender Equity. *J Bone Joint Surg Am*. 2022;104(16):1455-61. **5.** Wright MA, Murthi AM, Aleem A, Zmistowski B. Patient Disparities and Provider Diversity in Orthopaedic Surgery: A Complex Relationship. *J Am Acad Orthop Surg*. 2023;31(3):132-9.

Detailed references available on request

Financial Disclosures

MLFB–nothing to disclose

LAH–nothing related to this content

- Consultant, research support, speakers bureau with Smith&Nephew, Conmed, Sanofi-Aventis, Pendopharm, Precision OS
- Stock options–Precision OS

Please note: ISAKOS Newsletter Current Perspectives are not peer-reviewed articles. For peer-reviewed articles, please visit the *Journal of ISAKOS* at jisakos.com.

ISAKOS | GIANTS in Orthopaedic Sports Medicine

Giants in Orthopaedic Sports Medicine

Each episode features an up-close interview with incredible legends of ISAKOS.

View the latest interviews with Drs. Barry Tietjens from New Zealand and Laurie Hiemstra from Canada.

Videos are available on Global Link and podcast versions are also available wherever you get your podcasts.

isakos.com/GlobalLink/Giants-in-Ortho

ISAKOS Global Connection

Education, Research and Collaboration

DONATE TO ISAKOS

Ways to Give:

- ISAKOS Annual Fund
- ISAKOS Godfather Initiative
- Corporate Giving

"The commitment to **state-of-the-art excellence** stands as one of the distinctive hallmarks that sets ISAKOS apart from others in the field. ISAKOS deserves commendation for its remarkable endeavors in not only **promoting education** but also in providing tools and resources to **empower young investigators**, particularly those hailing from developing nations.

Thank you, ISAKOS!"

Prasad Soraganvi, MBBS, MS, DNB, MRCS, SICOT-dip
INDIA

Thanks to Our Industry Partners for Their Educational Grant Support

Smith+Nephew

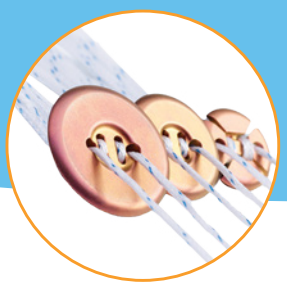
DJO GLOBAL

isakos.com/SupportISAKOS

UltraTRAC◊ QUAD

ACL Reconstruction Technique

The Technique features the QUADTRAC◊ System, the first integrated guide-system for minimally invasive quadriceps tendon graft harvesting.[1] The system provides direct graft visualization while enabling a controlled and reproducible technique to optimize harvest.[2-4] The graft is easily prepared with five needle passes[9] and fixated with the all adjustable versatility of the ultra-strong*[5-8] ULTRABUTTON Device Family. Learn more at **smith-nephew.com**.



ULTRABUTTON◊ QUAD
Adjustable Fixation Device

ULTRABUTTON◊ TIB
Adjustable Fixation Device

QUADTRAC◊
Quadriceps Tendon Harvest Guide System

Scan to watch the technique

*As demonstrated in bench top testing

References **1.** Smith+Nephew 2022. QUADTRAC Validation. 15011575 Rev A. **2.** Smith+Nephew 2022. QUADTRAC Marketing Claims. Internal Report. 15011572 Rev A. **3.** Smith+Nephew 2022.TRAC-Cutter Push-Pull Cut Force DV Protocol. Internal Report. 15011552 Rev A. **4.** Smith+Nephew 2022.QUAD-Cutter Force to Cut Design Verification. Internal Report. 15011559 Rev A. **5.** Arthrocare Corporation 2016. Test Report: ULTRABUTTON competitor comparison 69889-01 C. **6.** Ahmad SS, et al. Adjustable loop ACL suspension devices. *Knee Surg Sports Traumatol Arthrosc.* 2018;26(5):1392-1398. **7**. Shelburne KB, et al. Pattern of ACL force in normal walking. *J Biomech.* 2004;37(6):797-805. **8.** Smith+Nephew 2022. Comp, UBX Cyclic and Repair Strength Testing 15012185 Rev A. **9.** Smith+Nephew 2022. User Evaluation, UBX Competitive Device Comparison 15012018 Rev A.

Smith & Nephew, Inc. 150 Minuteman Road Andover, MA 01810, www.smith-nephew.com, US Customer Service: +1 800 343 5717 ◊Trademark of Smith+Nephew.

aossm™ In partnership with ISAKOS

SURGICAL SKILLS

MASTERS COURSE: OSTEOTOMIES AROUND THE KNEE

EVIDENCE-BASED TECHNIQUES FROM AROUND THE WORLD

OCTOBER 6-7, 2023

OLC EDUCATION & CONFERENCE CENTER | ROSEMONT, IL

COURSE CHAIRS

Elizabeth A. Arendt, MD
University of Minnesota

Alan M. Getgood, MD FRCS
Fowler Kennedy Sports Medicine Clinic

Robert F. LaPrade, MD, PhD
Twin Cities Orthopaedics