THE HIP SOCIETY

The Forty-Third Open (Winter) Meeting of The Hip Society

The Twenty-First Combined Open Meeting of The Hip Society and the American Association of Hip and Knee Surgeons (AAHKS)

Final Scientific Program

Saturday, March 28, 2015
Venetian/Sands EXPO I Room 2001
Las Vegas, Nevada
ANOUNCEMENTS

FUTURE MEETINGS AND CALLS FOR ABSTRACTS

AAOS Annual Meetings

March 1-5, 2016  Orlando, Florida
March 14-18, 2017  San Diego, California

The Hip Society Scientific Awards
Abstracts for the 2015 Hip Society Scientific Awards may be submitted on The Hip Society website (www.hipsoc.org) beginning September 2015. Abstracts are due by December 1, 2015.

AAHKS 25th Annual Meeting

November 5-8, 2015  Sheraton Dallas Hotel, Dallas

Call for Symposium Proposals Covering All Aspects of Arthroplasty and Health Policy
Apply online at www.aahks.org. Submissions are due by May 1, 2015.

Call for Abstracts for Podium and Poster Presentations
Apply online at www.aahks.org by June 2, 2015.

AAHKS 26th Annual Meeting

November 10-13, 2016  Hilton Anatole, Dallas
WELCOME TO THE TWENTY-FIRST COMBINED OPEN MEETING OF THE HIP SOCIETY AND THE AMERICAN ASSOCIATION OF HIP AND KNEE SURGEONS (AAHKS) AT THE 2015 AAOS SPECIALTY DAY

GENERAL INFORMATION

The Mission of The Hip Society:

The Mission of The Hip Society is to advance knowledge of hip disorders, promote evidence-based treatment, and refine surgery of the hip in order to improve the lives of patients.

Meeting Objectives:

The objectives of the Open Meeting of The Hip Society and AAHKS are to provide up-to-date information on the treatment of hip conditions, including non-arthroplasty options, and the latest surgical techniques as well as the current thinking on bearing surfaces. Other objectives address the difficult primary THA and complication management and include an update on revision THA.

CME Accreditation:

This activity has been planned and implemented in accordance with the Essential Areas and Policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint providership of the American Academy of Orthopaedic Surgeons (AAOS) and The Hip Society. The AAOS is accredited by the ACCME to sponsor continuing medical education for physicians.

The American Academy of Orthopaedic Surgeons designates this live activity for a maximum of 7 AMA PRA Category 1 Credits™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

IMPORTANT

☐ Please complete evaluation online at: https://www.surveymonkey.com/s/HSWinterMtg

☐ Please silence all electronic devices while inside the session room.

☐ Please refrain from unauthorized photography and video recording of presentations.

☐ Your registration for, and attendance of, this session gives The Hip Society permission to capture images of session attendees and to use these images for internal and marketing purposes.

This program is streaming LIVE via the Internet to participants around the world.

Live-streaming and recording services are provided by:
## ACKNOWLEDGEMENTS

### PAST PRESIDENTS OF THE HIP SOCIETY

<table>
<thead>
<tr>
<th>Period</th>
<th>President</th>
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<th>President</th>
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<tbody>
<tr>
<td>1968-1969</td>
<td>William H. Harris, MD, D Sc.</td>
<td>2010-2011</td>
<td>Chitranjan S. Ranawat, MD</td>
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<tr>
<td>1969-1970</td>
<td>Frank E. Stinchfield, MD (Deceased)</td>
<td>2011-2012</td>
<td>Adolph V. Lombardi, Jr., MD, FACS</td>
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<tr>
<td>1970-1971</td>
<td>Walter P. Blount, MD (Deceased)</td>
<td>2012-2013</td>
<td>David G. Lewallen, MD</td>
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<tr>
<td>1971-1972</td>
<td>Albert B. Ferguson, Jr., MD (Deceased)</td>
<td>2013-2014</td>
<td>Vincent D. Pellegrini, Jr., MD</td>
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<tr>
<td>1973-1974</td>
<td>Mark B. Coventry, MD (Deceased)</td>
<td>2015-2016</td>
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<td>1974-1975</td>
<td>Emmett M. Lunceford, Jr., MD (Deceased)</td>
<td>2016-2017</td>
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<td>1976-1978</td>
<td>Augusto Sarmiento, MD</td>
<td>2017-2018</td>
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<td>1979-1980</td>
<td>Harlan C. Amstutz, MD</td>
<td>2020-2021</td>
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<td>1980-1981</td>
<td>Philip D. Wilson, Jr., MD</td>
<td>2022-2023</td>
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<td>1981-1982</td>
<td>Richard C. Johnston, MD, MS</td>
<td>2024-2025</td>
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<td>1982-1983</td>
<td>Clement B. Sledge, MD</td>
<td>2026-2027</td>
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<td>1983-1984</td>
<td>Floyd H. Jergesen, MD (Deceased)</td>
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<td>1984-1985</td>
<td>C. McCollister Evarts, MD</td>
<td>2030-2031</td>
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<td>1985-1986</td>
<td>Jorge O. Galante, MD, DMSc.</td>
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<td>1988-1989</td>
<td>Joseph E. Miller, MD (Deceased)</td>
<td>1994-1995</td>
<td>Richard C. Johnston, MD, MS</td>
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<td>1989-1990</td>
<td>Donald E. McCollum, MD (Deceased)</td>
<td>1996-1997</td>
<td>Lawrence D. Dorr, MD</td>
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<td>1996-1997</td>
<td>Dennis K. Collis, MD</td>
<td>2003-2004</td>
<td>William J. Hozack, MD</td>
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<td>1997-1998</td>
<td>Eduardo A. Salvati, MD</td>
<td>2004-2005</td>
<td>Daniel J. Berry, MD</td>
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<td>2000-2001</td>
<td>Leo A. Whiteside, MD</td>
<td>2007-2008</td>
<td>Mary I. O’Connor, MD</td>
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<td>2001-2002</td>
<td>Benjamin E. Bierbaum, MD</td>
<td>2008-2009</td>
<td>Carlos J. Lavernia, MD</td>
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<td>2002-2003</td>
<td>Miguel E. Cabanela, MD</td>
<td>2009-2010</td>
<td>Thomas P. Vail, MD</td>
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<td>2003-2004</td>
<td>Charles A. Engh, Sr., MD</td>
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<td>Thomas K. Fehring, MD</td>
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<td>2004-2005</td>
<td>Richard E. White, MD</td>
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<td>John J. Callaghan, MD</td>
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<td>Lawrence D. Dorr, MD</td>
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<td>Wayne G. Paprosky, MD</td>
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<td>2009-2010</td>
<td>William J. Maloney, III, MD</td>
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<td>1996-1997</td>
<td>Hugh S. Tullos, MD (Deceased)</td>
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<td>1997-1998</td>
<td>Merrill A. Ritter, MD</td>
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<td>1998-1999</td>
<td>Richard H. Rothman, MD, PhD</td>
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<td>1999-2000</td>
<td>James A. Rand, MD</td>
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<td>2000-2001</td>
<td>Richard B. Welch, MD</td>
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<td>William J. Robb, III, MD</td>
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THE HIP SOCIETY EXECUTIVE BOARD  
2014-2015

Paul F. Lachiewicz, MD - President
Daniel J. Berry, MD - 1st Vice President
Harry E. Rubash, MD - 2nd Vice President
Douglas E. Padgett, MD - Secretary
Kevin L. Garvin, MD - Treasurer
Vincent D. Pellegrini, Jr., MD - Immediate Past President
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Michael D. Ries, MD - Chair, Membership Committee
Richard D. Iorio, MD – Chair, Research Committee
Michael E. Berend, MD - Member-At-Large
Adolph V. Lombardi, Jr., MD – Chair, Fellowship & Mentorship Committee (Ex-Officio)

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2014-2015

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Paul E. Beaulé, MD
Kevin J. Bozic, MD, MBA
C. Anderson Engh, MD
Kevin L. Garvin, MD
A. Seth Greenwald, D.Phil. (Oxon)
Paul F. Lachiewicz, MD
Mark W. Pagnano, MD

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C. Lowry Barnes, MD - Treasurer
Thomas K. Fehring - Immediate Past President
Thomas P. Vail, MD - Past President
Members-at-Large: Stefano A. Bini, MD; Rafael J. Sierra, MD; Audrey K. Tsao, MD; Michael P. Bolognesi, MD

AAHKS EDUCATION COMMITTEE  
2014-2015

Craig J. Della Valle, MD - Chair
Bryan D. Springer, MD – Vice Chair
Javad Parvizi, MD – 2014 Program Chair
Gregory G. Polkowski, MD – 2015 Program Chair
Steven J. Incavo, MD – Communications Chair
David F. Dalury, MD – Patient Education Chair
William P. Barrett, MD – Joint Educational Ventures Chair
Jay R. Lieberman, MD – Presidential Line Mentor
Presidental Guest Speaker

Prof. Fares S. Haddad, BSc MD (Res) MCh (Orth) FRCS (Orth) FFSEM

Professor Fares Haddad is a Hip and Knee Reconstruction Orthopaedic at University College London Hospitals. He is Professor of Orthopaedic Surgery and Divisional Clinical Director of Surgical Specialties at UCLH, and Director of the Institute of Sport, Exercise and Health (ISEH) at University College London.

He graduated from the University College London Hospitals with a First Class BSc and MB BS. His basic training in hip and knee surgery and reconstruction started in London on the St Bartholomew’s, Royal Free and Royal National Orthopaedic Hospital rotations and was subsequently enhanced by fellowship training in the United States and Canada including a year in Vancouver. He has been awarded an MD (Res) for his thesis on periprosthetic fractures. He was the gold medallist in the FRCS (Orth) exam and has gained a large number of prizes and prestigious academic awards. He has been an EFORT Travelling Fellow, British Hip Society Travelling Fellow and ABC Travelling Fellow in 2004. He was a Hunterian Professor in 2005.

Professor Haddad’s clinical and research endeavours have centred around hip and knee reconstruction. His interests include joint preservation after trauma and sports injuries, bearing surfaces, implant fixation, periprosthetic infection and outcomes assessment in hip, knee and revision surgery. His broader work also encompasses strategies to preserve and regain musculoskeletal health; he led the musculoskeletal team at the London Olympics 2012, was instrumental in setting up the National Centre for Sport & Exercise Medicine and has recently been awarded International Olympic Committee Centre of Excellence status at ISEH.

He has presented and published widely on key aspects of hip, knee and sports surgery and continues to lead a clinical research group with interests in joint preservation after injury, the genetic influences on bone and tendon, prosthetic design and performance and in particular outcomes measurement after hip / knee injury, degeneration and surgery. He is Editor in Chief of the Bone and Joint Journal, and is on the editorial board of The Journal of Arthroplasty, Annals of the Royal College of Surgeons and Hospital Medicine.
The Hip Society Welcomes
The 2015 Hip Society Rothman-Ranawat Traveling Fellows

Brian M. Curtin, MD
Charlotte, NC

Daniel A. Oakes, MD
Los Angeles, CA

Eoin C. Sheehan, MD
Tullamore, Ireland

Jason CJ Webb, MD
Bristol, England

The deadline to submit applications for the 2015 Hip Society Rothman-Ranawat Traveling Fellowship is August 15, 2015. For more information, visit www.hipsoc.org.
THE 2015 JOHN CHARNLEY AWARD

The Use of Patient Reported Outcome Measures to Predict Clinically Meaningful Improvement after THA

Presenter: Kevin J. Bozic, MD, MBA
Co-Authors: Jonathan L. Berliner, MD; Dane J. Brodke, BA; Vanessa Chan, MPH; and Nelson F. SooHoo, MD

THE 2015 OTTO AUFRANC AWARD

Prevalence of Radiographic Abnormalities in Senior Athletes With Well-Functioning Hips

Presenter: Lucas A. Anderson, MD
Co-Authors: Mike B. Anderson, MSc; Ashley Kapron, PhD; Stephen K Aoki, MD; Jill A. Erickson, PA-C; Jesse Chrastil, MD; Ramon Grijalva, MD; and Christopher Peters, MD

THE 2015 FRANK STINCHFIELD AWARD

Large Heads Do Not Increase Damage at the Head-Neck Taper of Metal-on-Polyethylene Total Hip Arthroplasties

Presenter: Timothy M. Wright, PhD
Co-Authors: Georgios K. Triantafyllopoulos, MD; Marcella E. Elpers, BS; Jayme C. Burket, PhD; Christina I. Esposito, PhD; and Douglas E. Padgett, MD;
Congratulations to presenters of the inaugural Young Investigators Symposium!

**Is Hemoglobin A1c or Perioperative Hyperglycemia Predictive of Periprosthetic Joint Infection or Death Following Primary Total Joint Replacement?**

**Presenter:** Christopher E. Pelt, MD  
**Co-Authors:** Jesse Chrastil, MD; Mike B. Anderson, MSc; Vanessa Stevens, PhD; Rahul Anand, MD; and Christopher L. Peters, MD

**Impact of Lumbar Arthrodesis on Outcomes After Elective Total Hip Arthroplasty**

**Presenter:** Michael P. Bolognesi, MD  
**Co-Authors:** Colin Penrose, BS; Abiram Bala, BA; Richard C. Mather, MD, MBA; David E. Attarian, MD; Samuel S. Wellman, MD; and Thorsten M. Seyler, MD, PhD

**Post-Discharge Mobility Monitoring in Elders: An e-Health Solution**

**Presenter:** Michael J. Taunton, MD  
**Co-Authors:** Joshua A. Spear, BS; Sheridan Cook, BS, and David Cook, MD
AAOS/AAHKS
Total Hip Arthroplasty: From Primary to Revision
June 25 – 26, 2015 ● Rosemont, IL
Douglas E. Padgett, MD, and Scott M. Sporer, MD
Course Directors

Practice the latest techniques for managing difficult acetabular and femoral primary and revision surgery.

Highlights include:
• New, state-of-the-art cadaver lab
• Discuss cases in small groups with faculty

Learn more at the AAOS Resource Center, Academy Hall G.

Register at aaos.org/3342

AAOS/AAHKS/AOSSM/POSNA
Open and Arthroscopic Techniques for Adolescent and Young Adult Hip Preservation/Disorders
July 23 – 25, 2015 ● Rosemont, IL
Christopher M. Larson, MD, and John C. Clohisy, MD
Course Directors

Customize your lab experience! Choose 1 of 3 lab tracks: arthroscopic procedures only, open preservation procedures only, or a combination of both.

Highlights include:
• Choose the lab experience that works best for you!
  • 80% of your course time is spent in the cadaver lab

Learn more at the AAOS Resource Center, Academy Hall G.

Register at aaos.org/3345
Residents - Expand your surgical skills for hip and knee arthroplasty!
Build your surgical skills leading to proficiency at hip and knee arthroplasty in this free interactive skills course designed exclusively for orthopaedic residents! Spend the majority of your time practicing bone cuts, correct ligament balancing for TKA, determining correct cup size for THA, and more. Work on anatomical specimens under the guidance of expert faculty. Panel discussions and faculty-led small group interactions round out your skills lab experience.

Course highlights include:

- Preoperative planning and templating for hip and knee arthroplasty procedures
- The rationale behind and the surgical skills needed to:
  - Monitor and reproduce leg lengths in THA
  - Monitor and improve hip stability during THA
  - Release soft-tissues to obtain appropriate limb and implant alignment during TKA
  - Maximize motion following TKA
- Optional 4-hour lab devoted to surgical tools for arthroplasty

<table>
<thead>
<tr>
<th>Registration Fees</th>
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<tr>
<td>AAOS Resident Member / Orthopaedic Resident / Post-Residency Fellow</td>
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Limited to orthopaedic residents in North American residency programs.

American Academy of Orthopaedic Surgeons, American Association of Hip and Knee Surgeons, The Hip Society and The Knee Society thank the following companies for educational grants in support of this program:

**AVID TruCustom & OR Products | Kinamed | Pacira Pharma | Zimmer**

This course is jointly offered by the American Academy of Orthopaedic Surgeons (AAOS), American Association of Hip and Knee Surgeons (AAHKS), The Knee Society and The Hip Society.
## Welcome

*Paul F. Lachiewicz, MD (Chapel Hill, NC)*  
*President of The Hip Society*

### Symposium I: The Problem of Dislocation After Primary and Revision Hip Arthroplasty

**Moderator:** *Daniel J. Berry, MD (Rochester, MN)*

<table>
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<tr>
<th>Time</th>
<th>Presentation</th>
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</table>
| 8:00 am – 8:06 am | **22** Are Hip Precautions Necessary Now?  
*Michael E. Berend, MD (Mooresville, IN)* |
| 8:07 am – 8:13 am | **23** The Role of Big Heads to Prevent and Treat Recurrent Dislocation  
*Harry E. Rubash, MD (Boston, MA)* |
| 8:14 am – 8:20 am | **24** The Role of and Problems with Dual-Mobility Components for Recurrent Dislocation  
*Paul F. Lachiewicz, MD (Chapel Hill, NC)* |
| 8:21 am – 8:27 am | **24** The Role of and Problems with Constrained Liners for Recurrent Dislocation  
*Kevin J. Bozic, MD, MBA (San Francisco, CA)* |
| 8:27 am – 8:42 am | Discussion and Case Presentations |

### Symposium II: Hip Fracture and The Arthroplasty Surgeon

**Moderator:** *Richard Iorio, MD (New York, NY)*

<table>
<thead>
<tr>
<th>Time</th>
<th>Presentation</th>
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| 8:43 am – 8:49 am | **25** Unipolar Prosthesis for Displaced Fractures: Cemented or Uncemented?  
*William B. Macaulay, MD (New York, NY)* |
| 8:50 am – 8:56 am | **30** Total Hip Arthroplasty for All Displaced Fractures  
*Carlos J. Lavernia, MD (Miami, FL)* |
| 8:57 am – 9:03 am | **31** Hip Arthroplasty after Failed Fixation of Femoral Neck and Intertrochanteric Fractures and After Intramedullary Hip Screw  
*Douglas E. Padgett, MD (New York, NY)* |
| 9:04 am – 9:10 am | **33** Total Hip Arthroplasty after Fixation Acetabular Fractures: Techniques and Results  
*Richard W. McCalden, MD (London, ON Canada)* |
| 9:11 am – 9:26 am | Discussion and Case Presentations |
| 9:26 am – 9:41 am | **BREAK** |
# THE KNEE SOCIETY

**KS Page**  
**7:55 am – 7:59 am**  
**WELCOME**  
*Thomas K. Fehring, MD (Charlotte, NC)*  
President of The Knee Society

**8:00 am – 8:07 am**  
24  
**Why Do TKAs Fail?**  
*William J. Maloney, III, MD (Redwood City, CA)*

**8:08 am – 8:47 am**  
**Session I: Ligament Balancing—Video Vignettes**  
*Moderator: James B. Benjamin, MD (Tucson, AZ)*

- **8:08 am – 8:13 am**  
  26  
  **How I Balance the Varus Knee**  
  *Lawrence D. Dorr, MD (Los Angeles, CA)*

- **8:14 am – 8:19 am**  
  26  
  **How I Balance the Valgus Knee**  
  *Chitranjan S. Ranawat, MD (New York, NY)*

- **8:20 am – 8:25 am**  
  27  
  **How I Deal with Flexion Contractures**  
  *Giles R. Scuderi, MD (New York, NY)*

- **8:26 am – 8:31 am**  
  28  
  **How I Balance the PCL**  
  *Richard D. Scott, MD (Boston, MA)*

- **8:32 am – 8:37 am**  
  30  
  **Principles of Gap Balancing**  
  *Thomas K. Fehring, MD (Charlotte, NC)*

- **8:37 am – 8:47 am**  
  **DISCUSSION**

**8:48 am – 9:45 am**  
**Session II: Surgical Technique Controversies—Mini-Debates**  
*Moderator: John J. Callaghan, MD (Iowa City, IA)*

- **8:48 am – 9:03 am**  
  32  
  **Debate 1: Alignment – Kinematic vs. Mechanical Axis**  
  *Mark W. Pagnano, MD (Rochester, MN) vs. Stephen J. Incavo, MD (Houston, TX)*

- **9:04 am – 9:19 am**  
  34  
  **Debate 2: Osteolysis – Conventional vs. AO Polyethylene**  
  *Paul F. Lachiewicz, MD (Chapel Hill, NC) vs. William L. Healy, MD (Newton, MA)*

- **9:20 am – 9:35 am**  
  38  
  **Debate 3: Cementless vs. Cemented TKA**  
  *Arlen D. Hanssen, MD (Rochester, MN) vs. Robert E. Booth, MD (Philadelphia, PA)*

- **9:35 am – 9:45 am**  
  **DISCUSSION**
<table>
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<th>Time</th>
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| 9:42 am – 10:24 am | Symposium III: Primary and Revision Total Hip Arthroplasty: Perioperative Management  
Moderator: Vincent D. Pellegrini, Jr, MD (Charleston, SC) |
| 9:42 am – 9:48 am | Pain Management  
Mark W. Pagnano, MD (Rochester, MN) |
| 9:49 am – 9:55 am | Blood Management  
Thomas P. Vail, MD (San Francisco, CA) |
| 9:56 am – 10:02 am | Thromboembolism Prophylaxis: Routine and High Risk Patients  
Robert L. Barrack, MD (Saint Louis, MO) |
| 10:03 am – 10:09 am | Outpatient Total Hip Surgery - Reality or Fallacy  
Adolph V. Lombardi, Jr., MD, FACS (New Albany, OH) |
| 10:10 am – 10:24 am | Discussion |
| 10:25 am – 10:48 am | PROGRAM HIGHLIGHT: Presidential Guest Speaker  
Introduction: Paul F. Lachiewicz, MD (Chapel Hill, NC)  
Innovation, Decision Making and the Evaluation of Outcomes in Hip Surgery  
Prof. Fares S. Haddad, BSc MCh (Orth) FRCS (Orth) FRCS (Ed) (London, United Kingdom) |
| 10:49 am – 11:31 am | Symposium IV: Perioperative Problems: Primary and Revision  
Moderator: Thomas P. Sculco, MD (New York, NY) |
| 10:49 am – 10:54 am | Fracture of the Acetabulum and Lack of Fixation  
John J. Callaghan, MD (Iowa City, IA) |
| 10:55 pm – 11:01 am | Fracture of the Femur, Proximal and Distal  
Michael H. Huo, MD (Dallas, TX) |
| 11:02 am – 11:08 am | The Leg Length Is Not Correct  
William J. Maloney, III, MD (Redwood City, CA) |
| 11:09 am – 11:15 am | What Do I Do With This Taper Corrosion?  
William L. Griffin, MD (Charlotte, NC) |
| 11:16 am – 11:31 am | Discussion and Case Presentations |
| 11:31 am – 11:54 am | PROGRAM HIGHLIGHT: The Hip Society Scientific Awards  
Moderator: Steven J. MacDonald, MD, FRCSC (London, ON Canada) |
| 11:31 am – 11:38 am | The John Charnley Award  
The Use of Patient Reported Outcome Measures to Predict Clinically Meaningful Improvement after THA  
Kevin Bozic, MD, MBA (San Francisco, CA) |
# Session III: Infection Controversies—Mini-Debates

Moderator: Thomas S. Thornhill, MD

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<th>Time</th>
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<tr>
<td>9:46 am – 9:52 am</td>
<td><strong>The Diagnosis of Infection in TKA</strong></td>
<td>Javad Parvizi, MD, FRCS (Philadelphia, PA)</td>
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<td>9:53 am – 10:08 am</td>
<td><strong>Debate 1:</strong> Antibiotics in Cement – Yes or No?</td>
<td>Steven J. MacDonald, MD, FRCSC (London, ON, Canada) vs. Michael J. Dunbar, MD, FRCSC, PhD (Halifax, NS, Canada)</td>
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<td>10:09 am – 10:29 am</td>
<td><strong>Debate 2:</strong> I&amp;D vs. Two Stage vs. One Stage</td>
<td>Kevin L. Garvin, MD (Omaha, NE) vs. Douglas D. R. Naudie, MD, FRCSC (London, ON, Canada) vs. Prof. Thorsten Gehrke (Hamburg, Germany)</td>
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<tr>
<td>10:29 am – 10:39 am</td>
<td>DISCUSSION</td>
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## Session IV: New Technologies—Mini-Debates

Moderator: C. Lowry Barnes, MD (Little Rock, AR)

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<tr>
<td>10:49 am – 11:01 am</td>
<td><strong>Debate 1:</strong> PSI vs. Standard Instruments</td>
<td>Adolph V. Lombardi, Jr., MD, FACS (New Albany, OH) vs. Robert L. Barrack, MD (St. Louis, MO)</td>
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<tr>
<td>11:02 am – 11:14 am</td>
<td><strong>Debate 2:</strong> UKA vs. TKA in 2015</td>
<td>Jean-Noel Argenson, MD (Marseille, France) vs. Jay R. Lieberman, MD (Los Angeles, CA)</td>
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<tr>
<td>11:15 am – 11:27 am</td>
<td><strong>Debate 3:</strong> Anesthesia – Blocks vs. Intra-Articular Injections</td>
<td>Thomas P. Vail, MD (San Francisco, CA) vs. David F. Dalury, MD (Towson, MD)</td>
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<tr>
<td>11:28 am – 11:34 am</td>
<td><strong>What is New in Navigation</strong></td>
<td>Jess H. Lonner, MD (Philadelphia, PA)</td>
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<tr>
<td>11:35 am – 11:41 am</td>
<td><strong>Blood Management in 2015</strong></td>
<td>Bryan D. Springer, MD (Charlotte, NC)</td>
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<tr>
<td>11:41 am – 11:51 pm</td>
<td>DISCUSSION</td>
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## Session V: Current Economic Issues

Moderator: Kevin J. Bozic, MD, MBA (San Francisco, CA)

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<tbody>
<tr>
<td>12:50 pm – 12:58 pm</td>
<td><strong>How to Start a Bundled Payment Program</strong></td>
<td>Daniel B. Murrey, MD, MPP (CEO, OrthoCarolina, Charlotte, NC)</td>
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| 11:39 am – 11:46 am | **The Frank Stinchfield Award**  
Prevalence of Radiographic Abnormalities in Senior Athletes with Well-Functioning Hips  
*Lucas Anderson, MD (Salt Lake City, UT)* |
| 11:47 am – 11:54 am | **The Otto Aufranc Award**  
Large Heads Do Not Increase Damage at the Head-Neck Taper of Metal-On-Polyethylene Total Hip Arthroplasties  
*Timothy Wright, PhD (New York, NY)* |
| 11:54 am – 12:50 pm   | **LUNCH** |
| 12:50 pm – 1:44 pm | **Symposium V: Revision Total Hip Arthroplasty with Video Vignettes**  
Moderator: *Wayne G. Paprosky, MD, FACS (Winfield, IL)* |
| 12:50 pm – 12:56 pm | **Revision of Failed Metal-Metal Total Hip and Resurfacing**  
*Thomas K. Fehring, MD (Charlotte, NC)* |
| 12:57 pm – 1:03 pm | **Acetabular Revision with Enhanced Surface Coatings**  
*David G. Lewallen, MD (Rochester, MN)* |
| 1:04 pm – 1:10 pm | **Femoral Revision with Monoblock Porous Components**  
*Kevin L. Garvin, MD (Omaha, NE)* |
| 1:11 pm – 1:17 pm | **Femoral Revision with Modular Fluted Components**  
*William J. Hozack, MD (Philadelphia, PA)* |
| 1:18 pm – 1:24 pm | **Femoral Revision with Monoblock Fluted Components**  
*Clive P. Duncan, MD (Vancouver, BC Canada)* |
| 1:24 pm – 1:44 pm | **Discussion and Case Presentations** |
| 1:45 pm – 2:10 pm | **PROGRAM HIGHLIGHT: Symposium VI: Young Investigators Papers**  
Moderator: *Michael D. Ries, MD (Carson City, NV)* |
| 1:45 pm – 1:49 pm | **YI: Paper 1**  
Is Hemoglobin A1c or Perioperative Hyperglycemia Predictive of Periprosthetic Joint Infection or Death Following Primary Total Joint Replacement?  
*Christopher Earl Pelt, MD (Salt Lake City, Utah)* |
| 1:50 pm – 1:54 pm | **YI: Paper 2**  
Impact of Lumbar Arthrodesis on Outcomes After Elective Total Hip Arthroplasty  
*Michael P. Bolognesi, MD (Durham, NC)* |
| 1:55 pm – 1:59 pm | **YI: Paper 3**  
Post-Discharge Mobility Monitoring in Elders: An E-Health Solution  
*Michael J. Taunton, MD (Rochester, MN)* |
12:59 pm – 1:14 pm Debate: Outpatient vs. Inpatient TKA
Keith R. Berend, MD (New Albany, OH) vs. Vincent D. Pellegrini, Jr., MD (Charleston, SC)

1:15 pm – 1:21 pm Risks for Re-Admission
David C. Ayers, MD (Worcester, MA)

1:21 pm – 1:31 pm DISCUSSION

1:32 pm – 1:56 pm Session VI: Peri-Operative Management – How I Do It
Moderator: Daniel J. Berry, MD (Rochester, MN)
Panel: Thomas S. Thornhill, MD (Boston, MA); Mary I. O’Connor, MD (Jacksonville, FL); Ormonde M. Mahoney, MD (Athens, GA); John J. Callaghan, MD (Iowa City, IA)

1:57 pm – 2:19 pm PROGRAM HIGHLIGHT: Session VII: The Young Investigator Symposium
Moderator: Thomas P. Vail, MD (San Francisco, CA) – Incoming President of The Knee Society

“Does Speed Matter? Revision Rates and Functional Outcomes in TKA in Relation to Duration of Surgery”
Simon W. Young, MD, FRACS (North Shore Hospital, Auckland, New Zealand)

“Increased Aseptic Tibial Failures in Patients with a BMI >35 and Well-Aligned Total Knee Arthroplasties”
Matthew P. Abdel, MD (Mayo Clinic, Rochester, MN)

2:20 pm – 2:50 pm Session VIII: “My Worst Case” Competition
Moderator: Aaron G. Rosenberg, MD (Chicago, IL) – 2014 reigning champion

The 2015 Contestants:
1. Aaron A. Hofmann, MD (Salt Lake City, UT)
2. Giles R. Scuderi, MD (New York, NY)
3. Robert T. Trousdale, MD (Rochester, MN)
4. Thomas K. Fehring, MD (Charlotte, NC)

Vote for the 2015 Champion and presentation of The Golden Knee
# Symposium VII: Controversies in Hip Preservation Surgery

Moderator: Michael B. Millis, MD (Boston, MA)

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<th>Time</th>
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<tbody>
<tr>
<td>2:11 pm – 2:17 pm</td>
<td>Defining Success for Joint Preserving Surgery of the Hip</td>
<td>Paul E. Beaulé, MD, FRCSC (Ottawa, ON Canada)</td>
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<tr>
<td>2:18 pm – 2:24 pm</td>
<td>Principles and Pitfalls of Treating Acetabular Dysplasia</td>
<td>Christopher L. Peters, MD (Salt Lake City, UT)</td>
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<tr>
<td>2:25 pm – 2:31 pm</td>
<td>Arthroscopic Management of Impingement: Success and Limitations</td>
<td>Christopher M. Larson, MD (Edina, MN)</td>
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<tr>
<td>2:32 pm – 2:38 pm</td>
<td>What We Have Learned from the ANCHOR Group</td>
<td>John C. Clohisy, MD (Saint Louis, MO)</td>
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<tr>
<td>2:38 pm – 2:53 pm</td>
<td>Discussion and Case Presentations</td>
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<tr>
<td>2:54 pm – 3:00 pm</td>
<td>Highlights of the AAHKS Meeting</td>
<td>Jay R. Lieberman, MD (Los Angeles, CA)</td>
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| 3:01 pm – 3:06 pm | Highlights of the 2014 Hip Society Rothman-Ranawat Traveling Fellowship | Stanislav Y. Bondarenko, MD, PhD (Kharkiv, Ukraine) ...
| 3:07 pm – 3:10 pm | Introduction of the 2015 Hip Society Rothman-Ranawat Traveling Fellows | Adolph V. Lombardi, Jr., MD, FACS (New Albany, OH)                      |
| 3:11 pm – 3:15 pm | Recap of the 2014 British Hip Society Traveling Fellowship          | James A. Browne, MD (Charlottesville, VA) ...
|                |                                                                     | Joshua T. Carothers, MD (Albuquerque, NM)                                 |

**3:15 pm – 3:30 pm** | **BREAK**                                                                 |

**3:31 pm – 4:25 pm** | Symposium VIII: The Problem of Infection after Total Hip Arthroplasty | Moderator: Arlen D. Hanssen, MD (Rochester, MN) |

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<th>Time</th>
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<tr>
<td>3:31 pm – 3:37 pm</td>
<td>State of the Art In Infection Prevention</td>
<td>Javad Parvizi, MD, FRCS (Philadelphia, PA)</td>
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<tr>
<td>3:38 pm – 3:44 pm</td>
<td>The Early Deep Infection: Diagnosis and Treatment</td>
<td>Craig J. Della Valle, MD (Chicago, IL)</td>
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<tr>
<td>2:51 pm – 3:23 pm</td>
<td><strong>PROGRAM HIGHLIGHT:</strong> Session IX: The Knee Society Scientific Awards</td>
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<td><em>Moderator:</em> Clifford W. Colwell, Jr., MD (La Jolla, CA)</td>
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<tr>
<td>2:51 pm – 3:01 pm</td>
<td><strong>The John N. Insall, MD Award</strong></td>
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<td><em>Introduction:</em> Thomas P. Sculco, MD</td>
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<td>“No Functional Benefit After UKA Performed with PSI: Results of a Prospective Controlled Randomized Study”</td>
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<td><em>Presenter:</em> Sébastian Parratte, MD, PhD (Marseille, France)</td>
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<td>3:02 pm – 3:12 pm</td>
<td><strong>The Chitranjan S. Ranawat, MD Award</strong></td>
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<td><em>Introduction:</em> Chitranjan S. Ranawat, MD</td>
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<td>“Running Subcuticular Closure Enables the Most Robust Perfusion Following TKA: A Randomized Clinical Trial with LA-ICGA”</td>
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<td><em>Presenter:</em> Cody C. Wyles, BS (Rochester, MN)</td>
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<td>3:13 pm – 3:23 pm</td>
<td><strong>The Mark Coventry, MD Award</strong></td>
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<td><em>Introduction:</em> Mark W. Pagnano, MD</td>
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<td>“Custom Cutting Guides Do Not Improve Total Knee Arthroplasty Clinical Outcomes at Two Years Follow-Up”</td>
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<td><em>Presenter:</em> Denis Nam, MD (St. Louis, MO)</td>
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<td>3:24 pm – 3:30 pm</td>
<td><strong>PROGRAM HIGHLIGHT:</strong> The Knee Society’s 2015 Lifetime Achievement Award</td>
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<td><em>Introduction:</em> Thomas K. Fehring, MD (Charlotte, NC)</td>
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<td><em>Recipient:</em> Richard D. Scott, MD (Boston, MA)</td>
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<td>3:31 pm – 3:36 pm</td>
<td><strong>Highlights of The John N. Insall, MD Fellowship</strong></td>
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<td><em>W. Norman Scott, MD (New York, NY)</em></td>
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<td>3:36 pm – 3:51 pm</td>
<td><strong>BREAK</strong></td>
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<tr>
<td>3:51 pm – 5:00 pm</td>
<td><strong>Session X: Revision TKA</strong></td>
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<td><em>Moderator:</em> William L. Griffin, MD (Charlotte, NC)</td>
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<td>3:51 pm – 3:58 pm</td>
<td><strong>How To Manage Retained Hardware</strong></td>
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<td><em>Christopher L. Peters, MD (Salt Lake City, UT)</em></td>
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<td>3:59 pm – 4:06 pm</td>
<td><strong>Removal of Components—Video Techniques</strong></td>
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<td><em>William A. Jiranek, MD (Richmond, VA)</em></td>
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<td>4:07 pm – 4:14 pm</td>
<td><strong>Bone Loss Options in Revision TKA</strong></td>
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<td><em>David G. Lewallen, MD (Rochester, MN)</em></td>
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<tr>
<td>4:15 pm – 4:22 pm</td>
<td><strong>Peri-Prosthetic Fractures—What to Do</strong></td>
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<td><em>Donald S. Garbuz, MD, MHSc, FRCS (Vancouver, BC, Canada)</em></td>
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<tr>
<td>4:23 pm – 4:30 pm</td>
<td><strong>Current Options for Extensor Mechanism Reconstruction</strong></td>
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<td><em>Robert T. Trousdale, MD (Rochester, MN)</em></td>
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### Two Stage Revision for Chronic Infection
Scott M. Sporer, MD, MS (Winfield, IL)

### Two-Stage Revision with Hemi-Explanation: Indications and Results
Keith R. Berend, MD (New Albany, OH)

### One Stage Revision for Most Infections: A Good Option?
Prof. Thorsten Gehrke (Hamburg, Germany)

### Discussion

### Symposium IX: "My Worst Case" Competition
Reigning Champion and Moderator: Carlos J. Lavernia, MD (Miami, FL)

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<tr>
<td>4:26 pm – 4:52 pm</td>
<td>The 2015 Contestants: 1. Joseph C. McCarthy, MD (Boston, MA) 2. Steven T. Woolson, MD (Palo Alto, CA) 3. David G. Lewallen, MD (Rochester, MN) 4. Michael D. Ries, MD (Carson City, NV)</td>
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<tr>
<td>4:55 pm – 4:57 pm</td>
<td>Vote for the 2015 Champion and presentation of The Golden Hip</td>
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<td>4:57 pm</td>
<td>ADJOURN</td>
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</table>
4:31 pm – 4:38 pm  88  Treatment of the Unstable TKA  
Aaron G. Rosenberg, MD, FACS (Chicago, IL)

4:40 pm – 4:47 pm  90  When to Use Static vs. Articulating Spacers  
Craig J. Della Valle, MD (Chicago, IL)

4:47 pm – 5:00 pm  DISCUSSION

5:00 pm  ADJOURN
Postoperative restrictions have become ingrained in the postoperative care following total hip arthroplasty (THA). One must ask: Are these protective and providing value therefore reducing dislocations in the early postop period?

Restrictions often include limiting hip flexion to 90°, limiting adduction to the midline, elevated toilet seats and chairs, and sleeping with a pillow between their legs.

Prospective randomized trials of 303 hips, with an anterolateral approach, show no reduction in dislocation rates. In fact in this study removing postop restrictions revealed a more rapid return to work and more rapid return to side sleeping and had higher patient satisfaction. Other studies have shown relaxing restrictions allow more rapid progression to a cane, off a cane, and resolution of limp. It is unclear whether these findings would apply to a posterolateral surgical approach. It has been demonstrated that meticulous posterior capsular repair reduces early dislocation rates from 4.8 to 0.7% respectively. Large femoral heads >36 mm, notably in patients with higher preoperative range of motion, has also demonstrated reduced dislocation rates after THA.

In the future with more rapid recovery expected after THA removal of hip precautions may be a benefit for our patients.

References

In 2001, roughly 5% of all femoral heads used in the United States of America for primary total hip arthroplasty (THA) measured greater than 32mm. In 2012, this percentage increased to 66% with only a mere 8% of heads measuring less than 32mm. [1] This increase in the use of larger femoral heads can be attributed to improved acetabular bearing surface technology which have provided the benefits of larger heads without the previous detrimental effects of wear and osteolysis.

The introduction of highly cross-linked UHMWPE has produced a material with substantially improved wear characteristics and no evidence of osteolysis at a minimum 10-year follow-up. [2, 3] The wear rate is not greatly affected by head sizes, at least up to 40mm, potentially allowing the use of even larger heads. [4, 5] One recent report, however, showed a direct relationship between head size (36-40mm) and volumetric wear rates. [6] Further investigation is required to fully understand large heads and the effects of volumetric wear.

There are several real and perceived benefits to using large femoral heads. Instability remains a common complication in primary THA and accounts for roughly 11% of all causes leading to revision. Not surprisingly, this percentage doubles for those patients undergoing multiple revision operations. [7] These rates remain high despite changes in technique such as the direct lateral approach and meticulous repair of the posterior capsule. Implementation of larger head sizes, however, markedly improves range of motion (ROM) and virtually eliminates component-to-component impingement, thereby reducing the risk of dislocation. [8] Moreover, after impingement, the favorable head-neck ratio increases the jump distance, allowing for increased ROM prior to dislocation. A recent randomized, controlled trial demonstrated a significantly lower incidence of dislocation following primary THA with 36mm heads (0.8%) as compared to 28mm heads (4.4%). [9] This protective benefit holds and appears to potentially be magnified after revision THA. [10]

Large metal-on-metal THA (36-44mm) have been shown to be sources of elevated serum cobalt and chromium ion levels and have been implicated in the formation of adverse local tissue reactions (ALTR) resulting in implant recalls and decrease in popularity. [11, 12] Once thought to be isolated to the articular surfaces, there is increasing evidence that fretting and taper corrosion between the mixed-metal, modular components of the femoral stem can produce similar destructive ions regardless of bearing surface. [13, 14] Although a majority of reported ALTR cases attributed to taper fretting and corrosion have been in 32mm or smaller cobalt-chrome heads, a recent study identified increased fretting and corrosion at the head-neck taper of 28 and 36mm heads and implicated that the larger head imparted an increased torsional moment at the junction resulting in the increased wear. [15] An additional study found that head size alone (26-36mm) was not a predictor of fretting or corrosion, but acted in concert with various factors including taper angle, surface roughness and, importantly, metal alloy combinations. [16] Though the prevalence of this phenomenon is largely unknown, the use of a large, fracture-resistant ceramic head in primary THA may reduce the likelihood of fretting and corrosion while providing the benefits of a larger head. [17-20] Similarly, in revision cases for fretting and corrosion with well-fixed, stable components it is
suggested that the cobalt-chrome head be exchanged for a ceramic head with a titanium sleeve. In this instance, the titanium sleeve minimizes further electrochemical transfer and shields the neck from further damage by the harder ceramic. [21] Nevertheless, the interaction of large ceramic heads and metal stems remains largely unknown prompting the need for more detailed investigation. Additionally, ceramic heads have similar and potentially improved wear characteristics on polyethylene compared to cobalt-chrome. [22, 23]

Larger femoral heads on highly cross-linked UHMWPE are associated with decreased dislocation rates, exceptionally low wear rates and minimal signs of osteolysis at 10-14 years follow-up. Fretting and corrosion may be more prevalent with larger heads limiting the use of cobalt-chrome heads on titanium stems and making the use of ceramic heads a potentially more viable option. Further investigations into the use of large femoral heads in THA with longer follow-up need to be conducted.

References


23. Ranawat, A., M. Meftah, and C. Ranawat, The Performance of Large Ceramic and Metal Heads on Highly Cross-linked Polyethylene is Similar at 5-years Follow-up, in The 2014 Summer Meeting of The Hip Society. 2014.
Dual mobility components provide for an additional articular surface, with the goals of improving range of motion, jump distance, and overall stability of the prosthetic hip joint. A large polyethylene head articulates with a polished metal acetabular component, and an additional smaller metal (or ceramic) head is snap-fit into the large polyethylene. New components have been introduced in North America over the past several years for both primary and revision total hip arthroplasty. Their greatest utility may be to treat recurrent dislocation after primary or revision total hip arthroplasty.

Dual mobility components are an alternative to constrained liners for recurrent dislocation in relatively young patients with an intact abductor mechanism. However, these may also be considered for failure of constrained components, modular exchange, and revision of malpositioned components. These components may also be utilized in revision procedures with a high risk of dislocation, such as revision of failed metal-metal resurfacing or total hip arthroplasty, and second-stage reimplantation for periprosthetic infection. The absence of a functioning abductor mechanism is usually considered to be a contra-indication for dual mobility components.

There is relatively little biomechanical or wear data on dual mobility components. In a 3-D CT scan-cadaver hip model, there was no difference in range of motion between a 36 mm head and one dual mobility component sizes 50-56 mm. In addition, there may be a “3rd articulation” in dual mobility components—the routine impingement of the femoral neck against the polyethylene femoral head at the extremes of motion. Multiple retrospective studies have shown satisfactory results (failure 1-3%) of certain dual mobility components for recurrent dislocation at short-to-medium-term follow-up. Dual mobility devices can dislocate at either the large polyethylene ball-metal shell articulation (closed reduction likely) or at the small metal head-inner polyethylene ball articulation (closed reduction difficult or unlikely). Although postoperative groin pain has not been a complaint after dual mobility components, it has been suggested that iliopsoas tendon impingement may occur frequently. There are also concerns with polyethylene wear and intra-prosthetic dislocation with dual mobility components. Until long-term follow-up data is available for the newer devices, a cautious approach to the use of dual mobility components for recurrent dislocation is recommended.

References

The Role and Problems with Constrained Liners for Recurrent Dislocation

Kevin J. Bozic, MD, MBA

Introduction
Constrained liners are commonly used with variable results for patients with recurrent instability following total hip arthroplasty (THA)\(^1\)\(^-\)\(^3\). A number of unique complications are associated with the use of increased constraint\(^1\)\(^-\)\(^4\). The purpose of this presentation is to discuss the role and problems of constrained liners for recurrent dislocation.

Function and Design
The constrained liner functions by the use of a locking mechanism that locks the femoral head within the acetabular liner\(^2\)\(^,\)\(^3\). Bipolar and tripolar constraint designs are available. Both designs function to transfer force generated from impingement through the liner-shell and shell-bone interface to prevent dislocation\(^2\)\(^,\)\(^3\)\(^,\)\(^5\)\(^-\)\(^7\).

Indications and Results
The use of constrained liners has increased since their introduction in the late 1980s due to reports of high success rates in salvage situations, reproducibility of its results, and high failure rates with the other available treatment options for recurrent instability\(^1\)\(^,\)\(^5\)\(^,\)\(^6\)\(^,\)\(^8\). They are most commonly used for recurrent instability; however, other indications are reported\(^2\)\(^,\)\(^9\)\(^-\)\(^11\).

The results of constrained liners are mixed and less promising when evaluating long-term results and use in patients with recurrent instability. The results of bipolar and tripolar designs are also varied\(^2\)\(^-\)\(^4\)\(^,\)\(^12\). Anderson et al reported a 29% dislocation rate in a series of 21 constrained components at 31 months. When used in patients with recurrent instability, the dislocation rate was 33%\(^1\)\(^3\). Berend et showed similar results in a 10 year follow up of 755 constrained liners\(^4\). Long-term results using the tripolar design are reported by Bremner et al. At an average of 10-year follow up, 4 of the 56 patients (7%) had repeat dislocation. However, 9% of the hips were revised for aseptic loosening and osteolysis\(^1\)\(^4\). Shapiro et al reported similar results with the tripolar design in 85 patients with recurrent instability\(^1\).

Problems of Constrained Liners
The problems associated with the use of constrained liners can be divided into three categories: 1) related to the constrained mechanism including dislocation, head dissociation from the stem, liner dissociation from the acetabular component, and impingement with or without locked ring breakage; 2) related to increased constraint and transfer of force from dislocation to the liner-shell and shell-bone interface, resulting in aseptic loosening, osteolysis, and periprosthetic fracture; and 3) complications not associated with constraint inherent to all hip arthroplasty including infection, venous thromboembolic disease, and fracture\(^3\).

Conclusions
Constrained liners are a viable option in treating patients with recurrent dislocation following THA and as a result of their design, are associated with unique complications.
References

Despite a movement touting the use of total hip arthroplasty in the treatment of displaced femoral neck fractures, due to real concerns about dislocation, hemiarthroplasty remains the preferred treatment (in the hands of certain surgeons at certain institutions) for a subset of the elderly who suffer displaced femoral neck fractures. The balance of the literature on the subject suggests that unipolar (as opposed to bipolar) hemiarthroplasty is more cost effective and should be the preferred construct.

A case will be made that far too many cementless femoral stems (as part of an arthroplasty construct in an osteopenic patient) are being used in the United States and around the world. Periprosthetic hip fractures are a significant public health issue and this problem is growing as our population ages.

Let us not forget that cement is an option for fixation of the femoral component; this is especially appropriate to keep in mind in the treatment of osteoporotic patients who have already demonstrated unsteadiness of gait and a propensity for falling.
Total Hip Arthroplasty for All Displaced Fractures
Carlos J. Lavernia, MD

Performing a total hip arthroplasty (THA) in face of displaced femoral neck fracture continues to be controversial. Although perioperative complications are higher in some series, the long term outcomes are clearly superior with a THA.

Recent publications have demonstrated that total hip arthroplasty has better functional outcomes and less reoperations when performed by an experienced hip surgeon. Chammout et al. [1] in a randomized controlled trial with a long term follow-up (17 years) in which subjects were randomly assigned to either THA (n=43) or internal fixation (n=57) showed that 9% of patients in the THA group and 39% in the internal fixation group had undergone a major reoperation. The overall reoperation rate was 23% in the THA group and 53% in the internal fixation group (relative risk, 0.44). Further, the Harris hip score was higher in the THA group, with a mean difference of 14.7 points (p<0.001) during the study period. There was no difference in mortality between the two groups.

Likewise, Johansson [2] in a minimum 15 year follow-up study of a previously reported randomized trial showed that for lucid patients the internal fixation failure rate was 55% and it was 5% for THA. In a review of the American Board of Orthopaedic Surgery database, Miller et al., [4] from 1999 to 2011, found that the use of THA increased over time (0.7% of fractures in 1999, 7.7% in 2011, p<0.001) while the use of hemiarthroplasty (67.1% in 1999, 63.1% in 2011, p=0.020) and internal fixation (32.2% in 1999, 29.2% in 2011, p=0.064) declined slightly. The proportion of patients younger than 65 years managed with THA increased from 1.4% to 13.1% (p<0.001). The published literature clearly demonstrates the superiority of a THA when compared to ORIF for displaced femoral neck fractures. [3]

References


Total Hip Arthroplasty following Failed Osteosynthesis of Femoral Neck and Intertrochanteric Fractures

Douglas E. Padgett, MD

Introduction

Patient survival is increasing following treatment proximal femur fractures. Conversion arthroplasty is often necessary either due to loss/failure of fixation or the later development of post-traumatic arthritis. This talk will focus on the features of conversion arthroplasty. Specifically, the goal of this talk:

1. Identify issues related to uniqueness of these cases.
2. Suggest treatment strategies to improve outcome

General Features: When deciding upon conversion arthroplasty, surgeons must recognize:

a. Location of prior incision: compatible with your plan?
b. Location and presence of prior hardware: need to remove or not?
c. Always think about infection! (data from Parvizi et al)
d. THE BONES:
   i. United? yes or no
   ii. Continuous? yes or no
   iii. Deformed? yes or no
   i. Traditional landmarks may be altered
   ii. Consider femur first technique if version is unclear

Prior ORIF Femur

1. Hardware removal
   a. Get the right tools
   b. Know the type of screw, plate, or nail
   c. Modern nails may have distal screw interlock!!!
2. Subcapital fractures:
   a. Exposure: dislocate-relocate-remove hardware then dislocate!
   b. If unable to remove screws/nail, may perform neck osteotomy around fixation device and then remove device retrograde!
   c. Socket fixation: typically cementless but bone porotic > use of supplemental screws
   d. Fixation options on femoral side: either cement or cementless
   e. Cementing:
      i. May plug fixation holes with bone
   f. Most standard stems work:
      i. Length and offset not an issue
3. Intertrochanteric fractures:
   a. A little more complicated:
      i. Loss of height may necessitate calcar enhancing stem
      ii. Malunion: modular stems can be an asset!
   b. The emerging problem of intramedullary hip screws:
      i. Union rates high (although cutout still occurs)
      ii. The problem is the trochanter:
         1. Trochanteric non-union/fracture
2. Huge hole through the abductors! May affect abductor strength.

iii. Sclerotic endosteum may influence stem orientation.

Results

Most studies demonstrate reasonable success with conversion arthroplasty following failed ORIF for femoral neck fractures.

Results of conversion arthroplasty for failed osteosynthesis for intertrochanteric fractures is largely influenced by fracture type (stable vs unstable) and method of fixation. The results of conversion of a fracture treated with a sliding hip screw appear to be uniformly successful. However, conversion arthroplasty previously treated with an intramedullary nail have a higher complication rate (41%) as well as higher rates of persistent limp and lower hip scores.

References

2. Haidukewych et al. THR p failed IT fractures. JBJS 2003
Total Hip Arthroplasty after Fixation of Acetabular Fractures: Techniques and Results
Richard W. McCalden, MD, MPhil (Edin), FRCSC

Total hip replacement (THA) following open reduction internal fixation (ORIF) of an acetabular fracture can be a very challenging reconstruction. This is related to a number of specific problems following the ORIF of acetabular fractures including: difficult exposure due to soft tissue scarring and heterotopic ossification, retained hardware, bone defects coupled with poor bone quality leading to the decreased potential for osseous ingrowth, the presence of infection, muscle weakness, and sciatic nerve injury. Therefore, treating these injuries is problematic and has a significantly higher complication rate, particularly for infection and aseptic loosening of the acetabulum.

Preoperative planning is essential to a successful THA and includes ruling out infection, careful consideration of the surgical exposure and the necessary tools to deal with retained hardware. In addition, a number of strategies may be required to deal with large bony defects and/or poor bone quality and may require specific implants designed to enhance osseous ingrowth\(^1\).

As a result, the reported results of THA following ORIF have consistently been inferior to the results of patients treated for non-traumatic osteoarthritis\(^2\). In general, the outcome and functional scores have been consistently lower while the revision rate is significantly higher in all reported studies to date. Along with infection, the biggest challenge has been the premature failure of the acetabular component due to aseptic loosening. However, similar to revision THR surgery, porous metal acetabular implants have been used to address this problem. As yet, there is no long-term evidence to support this although the short to mid-term results are promising.

In summary, while the treatment of post-traumatic OA following failed ORIF acetabulum is challenging, good results can be obtained with careful preoperative planning and surgical technique. However, there still remains a role for the non-operative treatment of acetabular fractures, particularly in the elderly with poor bone quality or minimal fracture displacement, where late THA can be performed successfully, often with less complexity, in the event of secondary degeneration. Furthermore, in those patients who present with specific acetabular fracture patterns that are likely to fail (eg. severely comminuted posterior wall fracture with impaction and/or concomitant femoral head fracture), one can consider acute THA, although this requires the surgeon to be familiar with the principles of both complex THA and ORIF of the acetabulum.

References

The entirety of the patient experience after contemporary total knee and total hip replacements in 2015 is markedly different from that encountered by patients just a decade ago. Ten years ago most patients were treated in a traditional sick-patient model of care and because they were assumed to require substantial hospital intervention, many cumbersome & costly interventions (e.g. indwelling urinary catheters, patient-controlled-analgesic pumps, autologous blood transfusion, continuous passive motion machines) were a routine part of the early postoperative experience. Today the paradigm has shifted to a well-patient model with a working assumption that once a patient has been medically optimized for surgery then the intervention itself, hip or knee replacement, will not typically create a sick-patient. Instead it is expected that most patients can be treated safely & more effectively with less intensive hospital intervention. While as orthopedic surgeons we are enamored with the latest surgical techniques or interesting technologies most busy surgeons recognize that advances in perioperative pain management, blood management, and early-mobilization therapy protocols account for the greatest share of improvements in patient experience over the past decade.

One can think pragmatically to get ahead and stay ahead of 3 predictable physiologic disturbances that adversely impact rapid recovery after knee and hip replacement: fluid/blood loss; pain; and nausea. The modern orthopedic surgeon and his/her care team needs a simple strategy to pro-actively, not reflexively, manage each of those 3 predictable impediments to early recovery. Those surgical teams that routinely get ahead and stay ahead in each of those areas will routinely witness faster recovery, lower costs and greater patient satisfaction and that is clearly a win for patient and surgeon alike.

Effective pain management improves patient satisfaction, decreases hospital stay, and facilitates discharge to home. Today’s emphasis is on a multi-modal strategy that minimizes the use of opioids. Most protocols use preop medications including an NSAID, acetaminophen, an oral opioid and some include gabapentin. Regional anesthesia is typically preferred over general. Both peripheral nerve blocks and periarticular local anesthetic cocktail injections have proved as effective adjuncts in decreasing early postoperative pain. Postoperative oral medications delivered on a schedule, not just as needed, often include acetaminophen, an NSAID and some included gabapentin. Oral and parenteral opioids are reserved for breakthrough pain.

Perioperative management of blood in total hip arthroplasty has undergone nothing short of a major transformation over the past decade due to management across the episode of care. This transformation from routine use of allogeneic blood, to auto-donation, and finally to the present era of limited transfusions of any type is linked to planning ahead with evaluation, hemoglobin testing, and education prior to surgery, refinement of surgical techniques focused on limiting injury to soft tissues, the use of anti-fibrinolytic drugs, and changes in philosophy regarding the appropriate clinical scenario for a transfusion trigger.

In 2002, 75% of my arthroplasty patients predonated blood. In that era, a mean of 1.47 units were donated, 0.95 units were transfused, and still 27% of patients received allogeneic blood. Those numbers indicated that the process of predonation was inefficient, and did not eliminate the need for allogeneic blood.

Subsequent research by Sproul at UCSF delineated that our patient’s ability to walk 10, 50, and 100 feet following primary total hip or knee surgery was faster when they had higher preoperative Hgb and postop Hgb (p=0.003). Likewise, shorter length of stay in the hospital was correlated with higher preoperative Hgb, and postop Hgb (p=0.0009).

This observation, in conjunction with literature associating transfusion with risk of infection and other transfusion related complications led to implementation of additional measures including the use of finger stick testing in the clinic at the time of surgical scheduling, anti-fibrinolytic medications (tranexamic acid 10mg/kg IV dosed once at the start of surgery and again at the time of wound closure), and lower transfusion triggers based upon clinical indicators rather than Hgb, has led to a reduction in transfusion rates to 8% for all total hip patients and 5% for total knee patients with 0% pre-donation.
**Introduction**

Venous thromboembolic events (VTE) remain one of the most common complications following total hip arthroplasty (THA). Orthopaedic surgeons now have greater flexibility regarding the use of various VTE prophylaxis regimens, yet controversy remains regarding which is optimal. The purpose of this study was to present our institution’s experience with use of a risk stratification protocol in which “routine” risk patients receive a mobile compression device (MCD) in conjunction with aspirin and “high” risk patients receive warfarin for thromboprophylaxis.

**Methods**

This was a prospective, IRB-approved study of patients undergoing primary THA, revision THA, and surface replacement arthroplasty (SRA) at a single institution. Patients were considered “high” risk if they met any of the following criteria: > 70 years of age, history of DVT, active cancer, hypercoaguable state, body mass index ≥ 40kg/m², family history of VTE, or prolonged immobility at the surgeon’s discretion. If none of these criteria were met, patients were stratified to the “routine” risk protocol.

All patients received mobile pneumatic compression devices (MCDs) applied to the contralateral lower extremity intraoperatively prior to the procedure. “Routine” risk patients received MCDs for 10 days along with enteric-coated aspirin (325mg twice daily) for 6 weeks postoperatively. “High” risk patients received MCDs for the duration of their inpatient stay, with warfarin therapy for 4 weeks postoperatively targeting an international normalized ratio between 1.8 and 2.2.

Any postoperative VTE event, readmission, wound, bleeding, or medical complication within 6 months postoperatively was recorded.

**Results**

From April of 2010 to October of 2014, 1859 hip arthroplasty patients were prospectively enrolled (1403 routine, 456 high risk). Patients in the routine risk cohort were younger than in the high risk cohort (55.5 ± 12.0 years versus 65.1 ± 12.1 years, p<0.0001).

The cumulative rate of VTE events was 0.7% in the routine risk cohort versus 0% in the high risk cohort within 4-6 weeks postoperatively (p=0.2), and 0.7% versus 1.0% within 6 months postoperatively (p=0.5). Patients in the routine risk cohort had a lower rate of major bleeding complications (0.5% versus 1.8%, p=0.02), wound complications (0.2% versus 1.0%, p=0.03), incisional drainage greater than 7 days (4.7% vs. 10.8%, p<0.001), and readmission rate within 6 months (10.0% versus 13.9%, p=0.03) versus the high risk cohort.

**Conclusion**

This study demonstrates a risk stratification protocol including the use of MCDs with aspirin in routine risk patients is non-inferior in the prevention of VTE and superior to the use of warfarin with regards to bleeding complications and readmission rate following hip arthroplasty.
Outpatient Total Hip Surgery: Reality or Fallacy?

Adolph V. Lombardi, Jr., MD, FACS

Perhaps the single most important outcome from the minimally invasive movement has been an enhanced understanding of the multi-modal approach to pain management of patients undergoing arthroplasty. Enhancement of our perioperative pain management protocols has resulted in accelerated rehabilitation.

The anesthesia staff is a key element of the care team, with the anesthesiologist visiting the patient in the preoperative holding area. At our facility, the majority of patients undergoing total joint arthroplasty are treated with a single-shot spinal anesthetic consisting of a combination of bupivacaine and morphine sulfate injection. The bupivacaine affords the immediate perioperative anesthetic while the morphine sulfate injection results in sustained analgesia for a period of 12 to 24 hours. We utilize intra-articular injections delivered directly into the soft tissue of the hip. Our current intra-articular injection is 20 mL 1.3% bupivacaine liposome suspension, 25mL 0.5% bupivacaine, and 0.5 mL 1:1000 epinephrine. In patients with a normal renal function, 30mg of ketorolac is added. The injection is administered throughout all of the soft tissues in and around the joint. Administration of tranexamic acid has been shown to safely reduce perioperative blood loss. Prophylactic antiemetics are administered in the form of dexamethasone, ondansetron and a scopolamine transdermal patch. The use of this perioperative anesthesia provides effective pain relief without motor blockade. Patients without any significant cardiovascular history are given celecoxib preoperatively, which is continued for approximately two weeks postoperatively. Immediately postoperative, acetaminophen and steroidal dexamethasone are administered intravenously.

Today, total hip arthroplasty can be performed safely as outpatient procedures by implementing surgical and protocol refinements. Understanding and addressing, safely, the reasons that surgeons and patients believe they “need” a hospital admission is the cornerstone to outpatient arthroplasty. The less efficiently run hospital in-patient setting demands over-treatment of each patient to fit him or her into the mold of inpatient surgery. Patient satisfaction is very high in the outpatient setting. Patients can recover in their own home with reduced inpatient services and by utilizing outpatient physical therapy. The surgeon efficiently controls the local environment, and thus the overall patient experience and satisfaction are improved in the outpatient setting.

An outpatient arthroplasty program involves multiple individuals and specialized protocols for preoperative, perioperative, and postoperative care. These include patient selection and education, anesthesia and analgesia, and minimally invasive surgical techniques. In an outpatient environment the surgeon actually spends more time with the patients and family in a friendly environment. Patients feel safe and well cared for, and are highly satisfied with their arthroplasty experience. The singular focus on the patient and avoidance of over-treatment will become the standard of care for total hip replacement in much the same way as other procedures once deemed “inpatient” surgeries.

Innovation, Decision Making and the Evaluation of Outcomes in Hip Surgery
Prof. Fares S Haddad, BSc MD (Res) MCh (Orth) FRCS (Orth) FFSEM

Hip surgery has been at the forefront of surgical innovation for the last three decades and seen tremendous progress and remarkable outcomes in terms of function and quality of life for our patients.

This presentation will consider some of the lessons learnt through the introduction of recent innovations, and will in particular focus on how we need to look at evidence, understand it, analyse it and apply it in the modern world.

The population that we treat as hip surgeons has changed dramatically. Our patients are younger, more active and have high aspirations and expectations. We therefore need to carefully consider how we evaluate their pathology, how we address their functional needs, and how we plan to meet their expectations. There has been an evolution in the ways in which we assess their outcomes, starting with surgeon-derived scoring systems which are still in place, and now evolving towards patient-derived health-related quality of life measures and joint specific outcomes. When considering innovation, however, it is important to discriminate in an even finer way within well-defined populations - I will describe techniques that we have used using functional-based measures to differentiate for higher activity patients whose demands may be greater.

The success or failure of a procedure will depend partly on the surgeon, partly on the implant chosen and partly on the patient. It is critical when considering outcomes to optimise each of these areas and have means of evaluating them effectively. The next generation of hip surgeons will need to evaluate outcomes in a very sophisticated way and be able to capture clear metrics, not just for their own sakes, but also for the sake of their patients and to meet the demands of healthcare commissioners. They will want to continue to innovate but will need to balance that with having appropriate data and will need to evidence their decision-making more than ever. It will also become particularly difficult to change practice without clear forethought and data to support such a change.

There is also a new problem that has been incompletely addressed. This relates to the dramatic increase in the information that is available both to patients, but also to their carers and to commissioners. It is therefore difficult for the clinician to dissect good data from poor or misleading data. Even within the realms of high-level studies and registry outputs, there are weaknesses that must not be underestimated. Ultimately the outputs of our studies and our desire to achieve the best possible results for our patients needs to be balanced in appropriate decision making that will guide us to perform the best possible intervention for each individual patient. Those decisions can be extremely difficult, and we need to empower our colleagues to facilitate that process.
Fracture of the Acetabulum and Lack of Fixation

John J. Callaghan, MD

Intraoperative Acetabular Fractures

The introduction of press fit stabilization (underreaming of acetabulum in relationship to size of component) increased the incidence of intraoperative acetabular fractures. Cadaver studies demonstrated 26% acetabular fractures if 2 mm under-ream and 93% acetabular fractures if 4 mm under-ream (Kim et al). When fractures occurred, they occurred in the greater sciatic notch through the posterior column. Substantial impaction was required to advance the acetabular component into the underreamed acetabulum (approximately 2000 N). Even with substantial impaction, medial gaps were documented in-vitro. Shortly after this publication, Sharkey et al reported 13 cases of intraoperative fractures. All were related to acetabular component insertion. 9/13 were recognized intra-operatively. Intraoperative cases were treated with screw augmentation. 2 cases required revision.

Haidukewych et al have reported on the occurrence and treatment of intraoperative fractures during preparing for and inserting cementless acetabular component. In their series, it occurred in 0.04% of cases (21/7121). All fractures united. Elliptical mono-block cups had a significantly higher rate than elliptical modular cups and hemispherical modular cups.

My approach is the following. Suspect when component lies medial to the position where the trial component was situated. Palpate the posterior column for crack or step off. If component questionably stable, remove component and explore column and rim. If non-displaced posterior crack, I use multi-hole cup and try to place screws through the cup above and below the fracture and limit weight bearing. If the fracture is displaced, I plate the posterior column and use multi-hole acetabular component. There are several algorithms for the treatment of periprosthetic acetabular fractures including Helfet et al (Instructional Course Lecture 2004, AAOS).

Intraoperative Over Reaming of the Acetabulum

This is usually not a problem with over reaming, but inadvertant online reaming or inadequate under reaming to place a secure acetabular component. After positioning component, if not totally stable, check to assure there are no acetabular cracks present. If acetabulum appears online reamed, simply add screws to augment fixation. If a no hole cup has been utilized, the surgeon will need to switch to a multi-hole component. Remember, in the beginning, 25 years ago, all cups were reamed online, screws were used to augment fixation and results at 20 years demonstrated < 2% loosening. Hence, if this is the problem, use of a multi-hole cup if a no hole cup has been placed may be the solution. If one thinks over reaming has been performed and there are no acetabular cracks, place trial liner and if this is the case, will need to see if larger trial liner is stable, and if so, use a larger component. Any questionable cases like this, even if one usually does not routinely use screws, I would recommend using them in this scenario.
References


Periprosthetic Femur Fracture in Total Hip Arthroplasty

Michael H. Huo, MD

The volume of total hip arthroplasty (THA) is expected to reach nearly 1 million per year by 2030. Epidemiology estimates indicate that >2.5 million living Americans have a THA. The prevalence of periprosthetic femur fracture around a THA is on the rise. The fracture can occur intraoperatively or after surgery. Significant challenges and resource utilization are involved in the clinical management of these fractures. The outcome of the patients with this complication has not been uniformly successful. Bhattacharyya et al. reported 11% mortality within the first years in 106 patients. They compared the data to a group of 309 patients with fragility hip fractures (mortality rate= 16.5%), and 311 primary THAs (mortality rate= 2.9%). One interesting finding was that the mortality rate was higher for those patients with ORIF (mortality rate= 33%) than for those patients who underwent revision THA for their periprosthetic fracture. (mortality= 12%) (p<0.03)

Classification

There are multiple systems reported in the literature. The Vancouver system has been the most commonly cited, and has the most clinical utility in formulating management strategies.

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<tr>
<th>Fracture</th>
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<tr>
<td>A: not involving stem</td>
<td>Greater trochanter</td>
<td>Lesser trochanter</td>
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<tr>
<td>B: around the stem</td>
<td>B1: stable stem</td>
<td>B2: loose stem</td>
<td>B3: loose stem and poor bone stock</td>
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<tr>
<td>C: distal to the stem</td>
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Treatment Options

The treatment should be specific for each particular fracture pattern, and for each particular patient profile. The general principles include:

**Type A:** fixation of the greater trochanter or the medial calcar as to maintain the abductor mechanism integrity, and to prevent stem fixation failure.

**Type B:**

**B1:** ORIF using various techniques either solely or in combination of wires, cables, plates, allograft struts. Moore et al. reported on a systematic review on the reported results of ORIF from 37 studies including 682 fractures. The union rate was not different with or without the use of strut allograft (90.7% without vs 91.5% with). The time to union (4.4 vs 6.6 months) and infection rates (3.8% vs 8.3%) were higher in the cases done with strut allograft. They also did not find any difference with locking vs non-locking plate devices. Biomechanical testing has consistently demonstrated stronger fixation construct using plate vs using cables alone. Moreover, plate plus a medial strut allograft provided the most stiff condition under torsional load.
B2: These require revision of the stem plus addressing the fracture. Most surgeons have reported using long-stem implant for distal fixation, supplemented by cables, wires, plate, with or without strut allograft. Cementless fixation is preferred. The most commonly used stem designs include: extensively-coated with cylindrical geometry, and the fluted-tapered stems. Monobloc or modular designs can be used dependent upon the specific requirements for each individual patient. Supplementation with strut allograft may be necessary in selected cases. The proper management of the greater trochanter/extensor mechanism is critical to reduce dislocation risks.

B3: These are technically challenging as there is either poor quality or insufficient quantity of bone. Similar techniques used for major bone deficiencies associated with femoral revisions can be utilized. Allograft-prosthetic composite and proximal femoral replacement are two of the options.

Type C: These can be treated by ORIF or by indirect reduction and limited incision technique (LISS).

Outcome

Springer et al. reported on revision THA for 118 periprosthetic femur fractures. Survival was 90% at 5 years, and 79.2% at 10 years. Lindahl et al. reported on 321 fractures over a 2-year period in the Swedish Joint Registry. The survival rate was poor: 74.8% at 66-month. Fuchtmeyer et al. reported on 121 patients. The one-year mortality rate was 13.2%. Even more importantly, the implant failure rate was 16.5% within the first year. Colman et al. reported on 97 fractures treated at one institution over 11 years. Three treatments methods were utilized: ORIF (57), revision THA (19), and proximal femoral replacement (21). There was no statistically significant difference in the mortality rate among the 3 groups. Implant survival at 5-year interval was less successful (p=0.03) in the proximal femoral replacement group in contrast to the other two groups.

Conclusion

Periprosthetic femur fracture is a complex and difficult problem to manage. Treatment options must be formulated based upon the fracture type, stem fixation status, and each individual patient profile.

References

Outcome

- Fuchtmeyer B, Galler M, Muller F: Mid-term results of 121 periprosthetic femur fractures: increased failure and mortality within but not after one postoperative year. J Arthroplasty (electronic ahead of print)

Fixation

General

The Leg Length is Not Correct
William J. Maloney MD

Leg length inequality is a common source patient dissatisfaction. The history and physical examination are important in determining the leg length differences and counseling the patient on the possibility of post-operative leg length inequality.

Physical Examination
True leg length – ASIS to medial malleolus
Apparent leg length – Umbilicus to medial malleolus, apparent leg length measurements are significantly influenced by pelvic obliquity

Pelvic obliquity can result in a significant apparent leg length when the true leg differences are minimal. There are three common causes of pelvic obliquity. A hip abduction contracture leads to an apparent long leg on the affected side. In this situation, the patient may report feeling the leg is long when the true leg length measurements show the affected side is short. A hip adduction contracture leads to an apparent short leg on the affected side. In this situation, the apparent leg length differences and the true leg length differences are additive. In both cases, the hip arthroplasty will correct the contracture and apparent leg discrepancy. A pelvic obliquity can also be secondary to a spinal deformity that incorporates the pelvis. Hip surgery will not significantly impact an obliquity secondary to spinal deformity. It is not advisable to try and adjust the leg length by shortening or lengthening the leg at surgery. Counseling the patient preoperatively is advisable as the apparent leg length discrepancy will persist.

Pre-operative Planning
The goal of pre-operative planning is to develop a plan to restore hip center, offset and leg length. Templating, using either acetate templates or a computerized templating system, determines the level of the femoral neck osteotomy and femoral component size that will achieve the above goals.

Intra-operative Assessment
The goal at surgery is to execute the preoperative plan. As it relates to leg lengths, I still to begin by measuring the osteotomy level using the lesser trochanter as the landmark. A trial reduction is performed to assure hip stability and re-assess leg lengths. As another check, I measure the vertical height of the bone removed and compare it to the vertical height of the components implanted. For the socket, the vertical height can be calculated by subtracting the ID from the OD and dividing by two. As an example, a 54mm socket with a 32 mm head will add 11 mm to the vertical height. For the femoral component, I have the manufacture prepare a chart for vertical height from base of the neck to top of the head for each head neck option.
If you are performing a complex reconstruction or have any concerns about leg length, an intra-operative x-ray should be taken.

**Post-operative Assessment**

Ideally, a significant leg length discrepancy is identified intra-operatively and corrected. If a recovery x-ray identifies a significant discrepancy, the patient should be examined. If there is a concern that the discrepancy may present a clinical problem, consideration should be given to taking the patient back to the operating room immediately and correct the discrepancy.

The most common reason for a perceived leg length discrepancy post-operatively is tight abductors leading to a pelvic obliquity and an apparent long leg on the operated side. This can be accentuated by a relatively minor increase in true leg lengths and is often associated with an increase in offset compared to preoperative offset. This can be addressed with therapy to stretch the abductors and ITB. This typically resolves in 6 to 12 weeks.

Relatively small leg length discrepancies can be addressed with a shoe lift placed inside the shoe. Lifts greater than one cm typically have to be added to the sole.

Although uncommon, significant leg length discrepancies may require revision surgery.
Modular heads, necks, and stems allow for intra-operative optimization of offset, anteversion, leg lengths, and soft tissue tension. However, modularity comes with a cost. All modular junctions are subject to interface motion which can lead to mechanically assisted crevice corrosion. Fretting and the metal debris generated from trunnion corrosion can cause adverse local tissue reactions (ALTR) as seen with metal on metal bearings and occasionally implant fracture.

Implant retrievals and FEA studies have identified a number of mechanical factors associated with fretting and corrosion. Taper angle, taper diameter, surface area and finish, neck length, and mixed alloys (Ti and CoCr) can all affect the amount of corrosion. Increasing head size, evaluated in several studies, did not correlate with the development of trunnionosis.

Dual modular stems with CoCr necks and Ti stems are subject to loads that can exceed the elastic limits of the Ti stems and have led to ALTR, high revision rates, and subsequent implant recalls from two manufacturers.

The incidence of trunnionosis at the modular head-neck junction in a metal-on-poly THA is relatively rare, making the diagnosis difficult. It is more commonly seen in dual modular stems at the neck-stem junction and in cases of metallosis with metal-metal bearings at the head-neck trunnion.

Evaluation of these patients requires a high index of suspicion in a painful MOP THA. If MOP patients have even mildly elevated Co and Cr ion levels, then a cross sectional study such as a MARS-MRI is indicated to help identify ALTR.

Isolated head-neck trunnionosis can be successfully treated with exchange of the CoCr metal head to a ceramic head with a Ti sleeve. For recalled dual modularity stems with revision rates ranging from 25-48%, stem revision is recommended. There is insufficient data on all of the dual modular stems to make definitive recommendations.

Further study will help to better delineate who is at risk for trunnionosis and which patients are better treated with stem revision vs head exchange.

References


The Use of Patient Reported Outcome Measures to Predict Clinically Meaningful Improvement after THA

Jonathan L. Berliner, MD; Dane J. Brodke, BA; Vanessa Chan, MPH; Nelson F. SooHoo, MD; and Kevin J. Bozic, MD, MBA

Background
Despite the overall effectiveness of total hip arthroplasty (THA), a subset of patients experience suboptimal postoperative results with respect to satisfaction, physical function, and quality of life.

Question/Purpose
The purpose of this study is to use preoperative patient reported outcome measure (PROM) scores to predict which patients are most likely to experience a change in functional outcome greater than the minimal clinically important difference (MCID).

Methods
We used a retrospective cohort study design to evaluate preoperative and 1-year postoperative SF12v2 and WOMAC scores from 537 patients who underwent primary unilateral THA. MCIDs were calculated using a distribution-based method. A receiver operating characteristic (ROC) analysis was used to calculate threshold values and area under the curve (AUC). The effect of preoperative SF12v2 MCS scores on functional threshold values was determined using multivariate logistic regression.

Results
MCID values for WOMAC and SF12v2 PCS were 9.1 and 4.6, respectively. Threshold values for WOMAC and PCS were a maximum of 51.0 (AUC .74, p<.001) and 32.5 (AUC .62, p<.001), respectively. Multivariate analysis accounting for preoperative MCS increased WOMAC and PCS threshold AUCs to .77 (p=.003) and .69 (p<.001), respectively. Multivariate analysis also demonstrated a linear relationship such that each 10-point decrease in preoperative MCS score resulted in a 6-point decrease in both WOMAC and PCS threshold values.

Conclusions
We identified PROM threshold values that predict clinically meaningful improvements in functional outcome following THA. Patients with preoperative WOMAC or SF12v2 PCS scores above the functional score thresholds have a diminishing probability of experiencing clinically meaningful improvements after THA. Lower preoperative MCS scores decrease the likelihood of achieving a clinically meaningful improvement in function after THA. The results of this study may be used to facilitate discussion between physicians and patients regarding the expected benefit after THA and to support the development of patient-based informed decision-making programs.

Level of Evidence: Prognostic Level III.
The Frank Stinchfield Award

Prevalence of Radiographic Abnormalities in Senior Athletes With Well-Functioning Hips

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Background
It is not known whether morphological abnormalities of the hip are compatible with life-long hip function and avoidance of osteoarthritis (OA). Our purpose was to investigate the prevalence of radiographic findings consistent with femoroacetabular impingement (FAI) and dysplasia (DDH) in senior athletes with well-functioning hips.

Questions/ Purposes
1) What is the prevalence of FAI and DDH in senior athletes with well functioning hips?
2) Are there radiographic findings of FAI and DDH that correlate with osteoarthritis?
3) What is the relationship between radiographic measures of hip pathomorphology and activity history (type and intensity of activity from teen years to present)?

Methods
547 individuals (55% men, 45% women), average age 67-years-old (range 50 to 91; SD 8 years) gave consent and participated in this IRB approved prospective cross-sectional study of senior athletes. 1081 native hips (534 bilateral and 13 unilateral), were independently evaluated for radiographic signs of FAI and DDH to assess prevalence of FAI, DDH and OA. Hips that had undergone arthroplasty or fracture surgery were excluded.

Results
9% of hips (n=99) had radiographic evidence for dysplasia; 3% (n=28) had a LCEA that was <20° and 8% (n=89) had an AI that was >10°. 82% of hips had radiographic evidence of FAI; 67% had isolated cam, 8% isolated pincer impingement, and 24% of hips had mixed FAI. OA was present in 17% of hips; 93% of hips with OA also had radiographic FAI and 10% DDH. Hips with OA were more likely to have radiographic evidence of FAI (OR=3.7). However, 80% of the hips with findings of FAI had no evidence of OA despite the athletes’ 24 age and lifelong activity levels. Our data suggests an increased risk of FAI in athletes that participated in competitive sporting events during early adult years (OR 1.49, 95% CI 1.04 – 2.11, p=0.020). Additionally, lifetime participation in competitive sports resulted in an increased risk of OA (OR 1.75, 95% CI 1.14 – 2.69, p=0.007).

Conclusions
While the data suggests that senior athletes with FAI are at a greater risk for having radiographic evidence of OA, a substantial portion did not. Although FAI and dysplasia have historically been associated with development of early OA, this study suggests that there may be other factors, such as genetics and cartilage type, which may play a joint preserving role despite presence of pathomorphology in this series of high functioning senior athletes.

Level of Evidence: Prospective Observational (prognostic) Study: Level II. See Instruction to Authors for a complete description of levels of evidence.
The Otto Aufranc Award

Large Heads Do Not Increase Damage at the Head-Neck Taper of Metal-on-Polyethylene Total Hip Arthroplasties

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Background
Fretting and corrosion at head-neck junctions of THAs have been associated with adverse local tissue reactions in patients with both metal-on-polyethylene (MOP) and metal-on-metal (MOM) prostheses. Femoral head size contributes to the severity of fretting and corrosion in large diameter MOM THAs, but its impact on such damage in MOP THAs remains unknown.

Questions/Purposes
We determined the effect of implant factors and length of implantation (LOI) on fretting and corrosion in head-neck junctions of MOP THAs, and examined differences in damage distribution among different taper/trunnion regions.

Patients and Methods
The severity of fretting/corrosion on surfaces of head tapers and stem trunnions was visually examined in 154 retrieved MOP THAs. Fretting and corrosion damage were subjectively graded, and their relations to head size, alloy combinations, taper/trunnion design, LOI, and location were investigated.

Results
Fretting and corrosion were not affected by head size, though taper/trunnion design affected taper fretting and corrosion and trunnion fretting. Head taper fretting (observed in 73% of heads) increased with LOI, but head taper corrosion (noted in 93% of heads) was not affected by LOI. Trunnion fretting (observed in 86% of stems) was more severe in mixed alloy combinations and with increased LOI, and was more severe proximally. Trunnion corrosion (noted in 72% of stems) was also location dependent with greater corrosion distally.

Conclusions
Fretting and corrosion are regular occurrences in MOP THAs, but neither damage type was related to femoral head size. Conversely, taper design, LOI, and alloy combination significantly affected the severity of both fretting and corrosion.

Clinical Relevance
The observation of trunnion corrosion seen in metal on polyethylene bearings has been implicated to be a function of larger diameter heads. Our data suggest that larger femoral heads may be used without concern for increased damage at the modular junction of MOP THAs.
Metal on metal total hip arthroplasty gained popularity as issues of polyethylene wear, late instability, and osteolysis became apparent with the use of metal on polyethylene bearings. The attractiveness of lower volumetric wear rates and improved stability with the use of larger head sizes caused many US surgeons to change their implant preference. By 2006, it was estimated that nearly one-third of all primary total hips completed in the United States were metal on metal bearing surfaces; and in patients less than 65 years of age, nearly 42% of the primary total hip arthroplasties were metal on metal bearings.

The initial laboratory testing of metal on metal bearings was promising; however expanded clinical data provided in national joint registries have shown a two to threefold increase in MoM failure compared to non-MoM bearings in total hip arthroplasty. With the advent of adverse local tissue reaction (ALTR), and the large number of patients with MoM total hip implants in service, a systematic approach to monitoring these patients is important.

When evaluating a patient with a painful MoM THA, it is important to rule out all other causes of a painful total hip before attributing the problem to the bearing. Once these other possibilities have been ruled out, then the metal on metal bearing can be considered as the source of pain.

When determining which metal on metal total hip needs revision, it is best to risk stratify each patient. Kwon et al categorized patients into low, medium, or high-risk patients based on a number of factors. These include pain, abductor weakness, mechanical symptoms, component position, component type, metal ion levels, and cross sectional imaging findings (MARS MRI). Any one of these may put a patient at risk, but none of them alone should be used to make the decision for revision.

Some unique modes of failure for MoM implants are femoral neck fractures in resurfacing procedures, early loosening of monoblock acetabular implants and ALTR’s, or metallosis in MoM implants. Combining these modes of failure account for the higher rate of revision for MoM hip arthroplasties.

The results of revision surgery for failed MoM implants show a high rate of complications. Stryker et al. looked at complication rates following revision of monoblock MoM total hip arthroplasties and found 18/114 (16%) revisions required a second procedure. The most common complications they encountered were aseptic loosening (6%), deep infection (6%), dislocation (4%), and acetabular fracture (3%).

Once the decision for surgery has been made, preoperative planning is essential. Evaluating the patient’s abductor strength is key prior to surgery. If there are any signs of weakness regardless of cause, a constrained implant should be available. The majority of MoM revisions deal with the acetabular component. Devices such as a cup extraction system as well as acetabular gouges should be readily available. Manufacturer specific instrumentation to remove the femoral component should be present as well if the femoral implant appears loose or malrotated.

In a routine revision, a porous metal acetabular component should be used, as ingrowth is commonly a problem when revising a MoM implant. Like all acetabular component revision, conservative reaming should be used. If bony necrosis is noted, reaming should continue until viable bleeding bone is encountered. If there are any concerns regarding acetabular fixation or bone vascularity, the patient should be kept touchdown weight bearing for 6-8 weeks. Recon plates should also be available as ex-
traction fractures or unrecognized preop fractures are common. A cup cage system and conventional cages should be available for patients whose bony deficiency is severe. An additional option for severe bone loss is a custom triflange implant; which has the ability to span severe acetabular defects.

Due to the poor track record of monoblock cups, they should be revised regardless of their position. Some surgeons have chosen to place dual mobility polyethylene cups while retaining the existing metal shell. Currently we cannot endorse this technique, as objective data is not available. When revising a modular MoM acetabular component, it is important to know the specific implant’s track record. Those with a successful history may be more amenable to liner exchange.

References

Acetabular Revision with Enhanced Surface Coatings

David G. Lewallen, MD
Femoral Revision THA with Monoblock Porous Components

Kevin L. Garvin, MD

The success of femoral revision requires the use of the correct femoral component for the bony defect. Patients with minimal bone loss of the metaphysis or diaphysis (Paprosky I or II) are managed successfully with most revision-type implants. Metaphyseal bone loss that extends to the diaphysis but preserves sufficient bone (Type IIIA, 4-5 cm of the diaphysis) for a “scratch-fit” of the implant can be successfully managed with an extensively coated stem. As reported by several authors, the results using this technique have been at 90% or better for survival without revision for any reason (up to 20 years). For patients who have more severe loss of metadiaphyseal bone (Paprosky Type IIIb or Type IV) tapered fluted modular titanium stems or mega prostheses are indicated.

A few points that the surgeon should consider are first, the number or percent of femoral revisions that a surgeon can manage successfully utilizing a nonmodular stem. A recent report by Brown et al included 1124 femoral revisions treated between 1999 and 2010. Only 135 (12%) required a tapered fluted modular titanium stem and the stem was used because of bone loss, poor bone quality, leg length discrepancy, difficulty adjusting the femoral version, proximal femoral remodeling, and an ectatic medullary canal. The authors reported on 70 of these patients (Type IIIb, Type IV) and the majority had good results. The second point for consideration is the surgeon’s experience using an extensively coated stem. Surgeons who perform revisions must be familiar using extensively coated stems as well as modular tapered stems, yet the frequency of use of these modular tapered stems has resulted in surgeons having less experience using extensively coated stems. March et al reminds us of the utility of the nonmodular stems in a recent report. The authors studied a small number of patients followed for eight years (2-14 yrs) who were managed successfully despite severe bone loss (Type IIIb, Type IV). The study highlights that some patients with severe bone loss can be managed successfully with nonmodular stems. The third point for consideration is the cost difference of the extensively coated monoblock femoral component compared to the tapered fluted modular titanium stem. Surgeons should consider cost when choosing what is best for the patient. As innovative materials and devices are introduced, the surgeon may be confronted with new challenges. The tapered fluted modular stems have been associated with fractures at the stem junction. Fortunately, many of the problems with modular stems have been successfully addressed.

In summary, femoral revision with an extensively coated monoblock porous component is a successful surgery for the majority of patients. The implants are effective, relatively easy to use, and less costly than the modular counterparts. Periprosthetic fracture, stem subsidence, and hip dislocation are the most common complications associated with monoblock stems and the surgeon must be diligent to help minimize these complications.

References


Modern modular revision stems employ tapered conical distal stems designed for immediate axial and rotational stability with subsequent osseo-integration of the stem. Modular proximal segments allow the surgeon to achieve bone contact proximally with eventual ingrowth that protects the modular junction. The independent sizing of the proximal body and distal stem allows for each portion to obtain intimate bony contact and gives the surgeon the ability precisely control the femoral head center of rotation, offset, version, leg length, and overall stability.

The most important advantage of modular revision stems is versatility - managing ALL levels of femoral bone loss (present before revision or created during revision). The surgeon quickly gains familiarity with the techniques and instruments for preparation and implantation and subsequently masters its use for all variety of situations. This allows the operating room staff to become comfortable with the instrumentation and components. This ability to use the stem in a variety of bone loss situations eliminates intra-operative shuffle (changes in the surgical plan resulting in more instruments being opened), as bone loss can be significantly underestimated preoperatively or may change intra-operatively. Furthermore, distal fixation can be obtained simply and reliably.

The most critical advantage is the ability to separate completely the critical task of fixation from other important tasks of restoring offset, leg length, and stability. Once fixation is secured, the surgeon can concentrate on hip stability and on optimization of hip mechanics (leg length and offset). This allows the surgeon to maximize patient functionality postoperatively. Additionally, the surgeon can control the diameter of the proximal body to ensure proper bony apposition, especially if an extended trochanteric osteotomy was made to obtain femoral exposure. Distal preparation of the femur for insertion of the tapered conical stem requires experience, and bone quality varies from case to case. It is very common for the implant to find its secure position within the femur at a slightly lower level than the reamer or trial. It seems common sense therefore to insert the conical stem implant first prior to any final determination of the proximal body size and neck length. Small differences in stem seating create very difficult solutions if the stem and body are inserted as one unit.

The most under-appreciated advantage is the straightforward instrumentation that makes the operation easier for the staff and the surgeon, while enhancing the operating room efficiency and reducing cost.
Also, although the implant itself may result in more cost, most modular systems allow for a decrease in inventory requirements, which make up the cost differential.

Potential disadvantages of modular revision stems include modular junction fracture, which can happen if the junction itself is not protected by bone. Ensuring proximal bone support can minimize this problem. Once porous ingrowth occurs proximally, the risk of junction fracture is eliminated. Even NON-modular stems fracture when proximal bone support is missing.

Modular junction corrosion is a theoretical issue only, since both components are titanium. The likely risk of corrosion is from using a cobalt chromium femoral head on the titanium femoral component neck trunion.


High survival of modular tapered stems for proximal femoral bone defects at 5 to 10 years  CORR 471: 454-462, 2013

Reproducible fixation with a tapered, fluted, modular titanium stem in revision hip arthroplasty at 8-15 years follow-up  JOA 29: 214-218, 2014
Femoral Revision with Monoblock Tapered Fluted Titanium Components

Nemandra A. Sandiford, MRCS; Nelson V. Greidanus, MD, MPH, FRCSC; Donald S. Garbuz, MD; Bassam A. Masri, MD, FRCSC; Clive P. Duncan, MD

There is increasing enthusiasm for the use of tapered fluted titanium stems in North America. This is based on objective measurement of patient satisfaction, improved retention of proximal bone stock, ease of use, versatility, and reduced risk of insertional fracture. Our outcome studies and others support these findings. Fracture of the stem at the junction remains a concern when modular designs are chosen, especially if the patient is obese, very active, has a small femoral canal (smaller stem diameter), or there is poor proximal support by bone.

We do not yet have medium term studies of the newer designs with updated junction fatigue strength on which to base a renewed confidence that this problem has been successfully addressed when measured out to 10 years.

We introduced the use of monoblock tapered titanium stems at our centre in 2010 in an effort to bypass the potential drawbacks of modular designs. The existing literature, from Europe and elsewhere, was encouraging. It was our expectation that the nonmodular design would satisfy our needs in 25 to 50% of cases. In fact it has become our revision stem of choice; now used in greater than 90% of cases. We now reserve the modular designs for cases of greater than usual difficulty, such as the Paprosky 4 femur, and some cases of Vancouver type B3 fracture.

Our recent study of 103 consecutive cases, with a minimum follow up of 2 years, has revealed no significant difference in outcome when compared with our previously published results with modular designs. It supports the conclusions made at other centres.

References


3. Van Houwelingen AP, Duncan CP, Masri BA, Greidanus NV, Garbuz DS: High Survival of Modular Tapered Stems for Proximal Femoral Bone Defects at 5 to 10 Years Follow up.; Clin Orthop Relat Res. 2013 Feb;471(2) 454-62


Is Hemoglobin A1c or Perioperative Hyperglycemia Predictive of Periprosthetic Joint Infection or Death Following Primary Total Joint Replacement?

Jesse Chrastil, MD; Mike B. Anderson, MSc; Vanessa Stevens, PhD; Rahul Anand, MD; Christopher L. Peters, MD; and Christopher E. Pelt, MD

**Purpose:** Our primary objective was to determine whether HbA1c and perioperative hyperglycemia were associated with an increased risk of PJI and if there was a cutoff value associated with that risk.

**Methods:** This retrospective cohort study was performed using the Department of Veterans Affairs Informatics and Computing Infrastructure (VINCI). Patients were included if they were ≥ 18 years of age, diagnosed with diabetes mellitus prior to undergoing primary total joint arthroplasty (TJA), and had HbA1c levels available (day -180 to day +7). Perioperative (±7 days) blood glucose levels were also obtained, as were patient characteristics. ICD-9 procedure codes (81.51 and 81.54) were used to identify patients that underwent TJA between 2001 and 2011 with a minimum two-year followup. 17,614 patients met the inclusion criteria. Patients were excluded if they had more than one primary TJA identified or had a diagnosis of malignant neoplasms, osteomyelitis, other bone infections, femoral neck fractures or superficial wounds. This resulted in a final cohort of 13,272 distinct patients. Infections within two years of the index surgery were identified using ICD-9 diagnostic code 996.66.

**Results:** The incidence of PJI was 2.5% (328/13,272) in this diabetic cohort. The median perioperative HbA1c was 6.6% (IQR 1.3). While 38% of patients (n=5,035) had a perioperative HbA1c ≥ 7%, these patients did not show an increased risk of infection (HR 0.86, 95% CI 0.68 – 1.1, p=0.23) compared to HbA1c <7%. There was, however, an increased risk of death (HR 1.3, 95% CI 1.08 – 1.56, p=0.01) in patients with an HbA1c ≥ 7%. Further, preoperative glucose levels were associated with both an increased risk of infection (HR 1.44, 95% CI 1.10 – 1.89, p=0.008) and death (HR 1.37, 95% CI 1.1 – 1.7, p=0.004), with an optimal cutoff of 194 mg/dL. HbA1c was correlated with maximum preoperative glucose (r=0.4, p<0.001), average perioperative glucose (r=0.44, p<0.001), and maximum postoperative glucose (r=0.39, p<0.001).

**Conclusions:** HbA1c was not associated with PJI in diabetic patients undergoing TJA. Preoperative hyperglycemia was associated with an increased incidence of PJI with an optimal cutoff value of 194 mg/dL. HbA1c ≥7% was associated with increased mortality within 2 years of surgery. HbA1c remains a test that may help the surgeon predict overall risk of complications, including death, following TJA, but does not appear to be a direct marker that predicts PJI.

**Significance:** Clinicians may need to focus efforts in the tight control of glucose levels immediately before and after TJA to decrease the risk of PJI.
Impact of Lumbar Arthrodesis on Outcomes After Elective Total Hip Arthroplasty

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Purpose: Malpositioning of the acetabular cup has been associated with major complications including dislocation, edge loading, stripe wear and squeaking. Anteversion is determined by pelvic orientation; flexion of the pelvis increases anteversion, extension decreases anteversion of the acetabulum. The degree of pelvic movement is determined by lumbar spine sagittal balance and it is well established that lumbar arthrodesis procedures influence spinal and pelvic parameters including sagittal balance. The purpose of this study is to determine the impact of prior lumbar arthrodesis and revision lumbar arthrodesis on complications after primary elective THA.

Methods: A database review using the entire Medicare sample within the PearlDiver database was performed using International Classification of Diseases, 9th Edition (ICD-9) codes. The search identified 14,439 patients who underwent primary elective THA after prior lumbar arthrodesis and 1,157 patients who underwent primary elective THA after prior revision lumbar arthrodesis. A search for patients who underwent elective primary THA without prior history of lumbar or revision lumbar fusion yielded 749,403 patients who served as a control. Incidence (IN), odds ratios (ORs) and their respective 95% confidence intervals (CIs) for 30-day, 90-day and overall complications were calculated.

Results: The following complications reached statistical significance for THA after primary lumbar arthrodesis: bleeding (IN 9.7%, OR 2.334, p<0.001, CI 2.207-2.469), dislocation (IN 5.6%, OR 1.947, p<0.001, CI 1.811-2.093), infection (IN 3.6%, OR 1.986, p<0.001, CI 1.845-2.139), mechanical complication (IN 0.7%, OR 1.417, p=0.001, CI 1.162-1.727), mechanical loosening (IN 2.3%, OR 1.736, p<0.001, CI 1.555-1.938), other mechanical complication (IN 2.1%, OR 2.128, p<0.001, CI 1.897-2.387), DVT/PE (IN 8.4%, OR 1.504, p<0.001, CI 1.417-1.596), acute renal failure (IN 22%, OR 1.199, p<0.001, CI 1.152-1.247), heart failure (IN 17.6%, OR 1.049, p=0.029, CI 1.005-1.096), periprosthetic fracture (IN 1.6%, OR 1.449, p<0.001, CI 1.270-1.654), and prosthetic-related complication (IN 30%, OR 1.846, p<0.001, CI 1.781-1.914). Higher complications rates were observed for patients who had revision lumbar arthrodesis: bleeding (IN 12.4%, OR 3.063, p<0.001, CI 2.570-3.651), dislocation (IN 9.7%, OR 3.544, p<0.001, CI 2.915-4.308), infection (IN 5%, OR 3.321, p<0.001, CI 2.714-4.063), mechanical complication (IN 6.9%, OR 14.938, p<0.001, CI 11.876-18.790), mechanical loosening (IN 3.2%, OR 2.414, p<0.001, CI 1.739-3.352), other mechanical complication (IN 3.5%, OR 3.564, p<0.001, CI 2.607-4.871), DVT/PE (IN 10.7%, OR 1.959, p<0.001, CI 1.626-2.361), acute renal failure (IN 25.5%, OR 1.456, p<0.001, CI 1.276-1.662), heart failure (IN 20%, OR 1.233, p=0.004, CI 1.068-1.425), periprosthetic fracture (IN 2.7%, OR 2.465, p<0.001, CI 1.724-3.524), and prosthetic-related complication (IN 40%, OR 2.878, p<0.001, CI 2.558-3.237).

Conclusion: The results demonstrate that lumbar arthrodesis and revision lumbar arthrodesis negatively impact postoperative complication rates. The particularly increased rates of dislocation, infection, loosening, and prosthesis-related complication in this patient population should alert surgeon to undertake additional measures to decrease complication rates (preoperative radiographic measurement of pelvic orientation in standing and sitting position, cup fixation with screws, cup placement, medical optimization, and altered DVT prophylaxis).

Significance: Surgeons should be aware that prior lumbar arthrodesis and revision lumbar arthrodesis is a risk factor for high postoperative complications rates, both medical and prosthesis-related including dislocation, loosening, and infection.
Post-Discharge Mobility Monitoring in Elders: an e-Health Solution
Michael J. Taunton, MD; Joshua A. Spear, BS; Sheridan Cook, BS, and David Cook, MD

Purpose
Changing reimbursement models and increased focus on functional outcomes increase demands on providers to assure patients do well after hospital discharge. Technology is creating opportunities to fill in the “data gaps” between provider visits. Mobile technologies can provide a nearly continuous data stream from patients to provider. Data acquisition with mobile tools may provide the means to manage surgical recovery after hospitalization. The purpose of this study is to define the trajectory of mobility recovery after hospital discharge following hip surgery in elders.

Methods
This prospective study enrolled 14 patients having hip surgery. Participants were asked to wear a fitbit™ (San Francisco, California) wireless accelerometer for 30 days after hospital discharge. Patients were provided with the devices and trained in their use prior to discharge. The wireless accelerometer is blue-tooth equipped and transmitted data to a computer or mobile device that was configured with the fitbit™ software. The participants’ computer then transmitted subject data to a web-services database that was accessible by investigators.

Results
Over the first two weeks after discharge patients showed gains in mobility from a mean of 300± 432 steps at first measurement following discharge to 1037± 1373 at 1 week and a mean of 2017± 2942 at 2 weeks post-discharge. After about the 11th post-discharge day the increases in mobility began to plateau.

Conclusions
To our knowledge, the use of wireless accelerometry to determine recovery of mobility over 30 days following hospitalization for hip surgery has never been reported. The application of simple consumer technology has the potential to begin to change health care delivery models and is likely to have value beyond surgical recovery. This is especially important as greater attention is given to thinking about patient-centered outcomes, bundled payment and the social importance of maintaining functional status in elders. The advancement of Accountable Care Organizations (ACOs) may rapidly facilitate the integration of such technology-based approaches to care delivery.

Significance
Normative data on mobility recovery may help guide interventions when patients “fall off” normal recovery curves.
Introduction
With the advent of more advanced imaging (i.e. MRI, 3D CT) as well as a better understanding of the pathomechanism of early degenerative arthritis and new surgical techniques such as hip arthroscopy and surgical dislocation, there has been a rapid growth in the indications as well as number of joint preserving procedures of the hip. Despite the successful outcomes of hip preservation surgery, failures do occur leading onto repeat hip preservation, arthroplasty or worsening hip function in 10-20% of patients[1-3]. Although improving clinical results can be done by better patient selection and optimizing of surgical technique the means to achieve to this are not clear. Similar to joint replacements by categorizing failure mechanisms this will enable clinicians and researchers to more effectively develop solutions and/or guide future research. We propose the following three failure modes:

- **Mode I: Organ Failure**: defined as worsening clinical function and/ or an arthroplasty procedure is needed to restore function secondary to disease progression.

- **Mode II: Mis-Diagnosis**: patient requires subsequent joint preserving procedure.

- **Mode III: Mal Correction of joint pathology**: where new or residual deformity is present.

A) Organ Failure:
Magnetic resonance imaging (MRI) is the modality that provides the most comprehensive imaging of the hip, allowing for visualization of anatomy, and detection of pathology, of the various structures including the labrum, cartilage, synovium and bone. The contribution of various joint structures to hip pain and decreased function and their implications in the success of arthroscopic treatment are not known. The purpose of this study was to develop a Whole organ MRI (WORM) score for the hip and determine its correlation with improvement of clinical function one and two years after arthroscopy of the hip.

Forty hips, 39 patients diagnosed with a labral tear and scheduled for hip arthroscopy underwent pre-operative 3T MRI imaging using 2D Proton density fat suppressed (PD-FS) sequence. A semi quantitative scoring system was developed for comprehensive evaluation of the hip joint elements, including cartilage change, bone marrow edema, cysts, osteophytes, synovitis and joint effusion.

Table 1) Reduction to 8 items using spearman correlation (R) with one year WOMAC.

<table>
<thead>
<tr>
<th>Region</th>
<th>Pathology</th>
<th>R</th>
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<tr>
<td>Anterior acetabulum</td>
<td>Bone marrow edema</td>
<td>-0.43</td>
</tr>
<tr>
<td></td>
<td>Osteophytes</td>
<td>-0.38</td>
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<tr>
<td>Supero-lateral acetabulum</td>
<td>Osteophytes</td>
<td>-0.42</td>
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<tr>
<td>Supero- anterior femoral head</td>
<td>Cartilage condition</td>
<td>-0.64</td>
</tr>
<tr>
<td></td>
<td>Size of cartilage damage</td>
<td>-0.42</td>
</tr>
<tr>
<td>Antero-medial femoral head</td>
<td>Bone marrow edema</td>
<td>-0.36</td>
</tr>
<tr>
<td>Postero-medial femoral head</td>
<td>Cartilage condition</td>
<td>-0.42</td>
</tr>
<tr>
<td></td>
<td>Size of cartilage damage</td>
<td>-0.41</td>
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We divided the patients into two groups; group A with low WORM score (WORMS<12) and group B with high WORM score (WORMS=12 or higher). Preoperative the WOMAC is significantly lower in patients with high WORMS than in patients with low WORMS (p-value 0.011). In the follow up after one year and even more after two years, the WOMAC score become similar (p-value 0.230 and 1.000). The WOMAC score improved clinically significant in group B after one (14) and two years (18), but not in group A (both, after one and two years 6 points). By comparing the WOMAC after one and two years to the preoperative baseline a significant improvement can be detected in the patients with a high WORMS (p-value: 0.016 and 0.038) but not in the patients with low WORMS (p-value: 0.534 and 0.646).

B) Mis-Diagnosis
One of the key underlying issues leading to poor clinical outcome and/or early clinical failures despite surgical expertise is having the correct diagnosis. Clohisy et al[4] found that many of the standard radiographic parameters used to diagnose DDH and/or FAI have poor observer reliability. Accordingly, a more clear set of definitions and measurements must be developed to allow for more reliable diagnosis of early hip disease. Methods to improve the reliability of a radiographic evaluation may increase the clinical utility of these parameters[5]. More importantly, it is now clear that within DDH and FAI there are transitional forms where some features of instability and constraint are present in the same hip. This is analogous to acetabular fractures where Letournel after describing his classification system clearly identified those fractures that did not quite fit within one group making their treatment more challenging.[6] Conversely we also seeing this in joint preserving surgery of the hip where such signs as cross-over and coxa profunda are no longer considered synonymous with pincer type FAI.

It is clear that thorough history and comprehensive examination will continue to form the basis of accurate diagnoses but that also more advanced imaging[7] as well as patient specific analysis will provide additional information[8]. The differentiation between intra-articular and extra-articular source of pain is of primary importance, and can be done with Marcaine Hip Block. But further research in the pathomechanism of pre-arthritic hip disease as well as standardization in definitions and/or treatment method will lead to more reliable clinical outcome.

C) Mal-Correction of joint pathology:
A recent paper by Clohisy et al[9] looking at the most common reasons for revision surgery noted that both open and arthroscopic technique were almost equally split in regards to previous surgical approaches. More importantly for both FAI and dysplasia, hip arthroscopy was the most common previous surgical approach at 86% and 64%, respectively with inadequately corrected structural disease as the most common reason for secondary surgery: femoral osteochondroplasty and acetabular reorientation.

For example, patients with labral tears due to underlying DDH may expect to have little to no symptomatic benefit from arthroscopy[10;11]. Conversely, overcorrection with PAO can lead to retroversion which can cause FAI, creating a new problem[12]. There is retroversion present in one sixth of patients with DDH and if not recognised beforehand can be problematic[13].

Head-neck offset deformity may go un-recognised and can cause impingement after PAO[14]. There may be associated chondral damage with dysplasia which can be a cause of poor outcome after PAO and doing a hip arthroscopy to deal with intra-articular pathology at the same time might be more beneficial[2].

In the treatment of FAI, cases of associated retroversion and/or global over coverage, there is still no consensus as to what magnitude of over-coverage should be the threshold for rim trimming or PAO. The extent to which acetabular rim trimming is done is also important because over trimming can cause dysplasia leading to early degeneration of the joint[15].
Similarly there are no clear indications for labral debridement versus repair. It is generally assumed that preservation and repair to keep the labrum intact is preferable to labral debridement or excision[16].

Conclusion
Success of surgical treatment depends on accurate diagnosis with careful selection of the hip preservation procedure most suited to the pathology and also on the expertise of the surgeon. The importance of introducing modes of failure will permit to improve the reliability of our treatments as well as permit effective comparison of surgical techniques in the treatment of pre-arthritic hip disease.

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Principles and Pearls of Treating Acetabular Dysplasia

Christopher L. Peters, MD

Conventional wisdom holds that classic acetabular dysplasia (LCEA < 20, ACEA < 20, AI > 5-10 degrees) leads to increased contact stress in hyaline cartilage at the anterior-superior acetabular rim and subsequent osteoarthritis in a high percentage of cases. More recent evidence based on subject specific finite element analysis indicates that increased contact stress at the chondrolabral junction and subsequent labral damage may more precisely describe the pathomechanics of joint deterioration in acetabular dysplasia [1].

The Bernese periacetabular osteotomy (PAO) has become the preferred method of surgical treatment of developmental dysplasia of the hip (DDH) in adult patients in North America and Europe [2-7]. Factors associated with successful periacetabular osteotomy (PAO) include age less than 35-40 years, low body mass index, maintained hip range of motion, a congruent hip joint, Tonnis grade of osteoarthritis 0-1, and lateral center edge angle of less than 20-25 degrees (LCEA < 20-25 degrees) [8-10]. Recent data supports low complication rates (5.9%) by experienced surgeons. Precise postoperative correction of the acetabular fragment (avoiding under and over-coverage) and avoidance of femoroacetabular impingement are critical to success.

Factors which favor THA in the patient with acetabular dysplasia include age greater than 35-40 years, poor range of motion, more severe osteoarthritis (Tonnis grade of OA 2-3), noncongruent joint on radiographs, subchondral cyst formation, and/or acetabular chondral damage on advanced imaging such as MRI with or without arthrogram or dGEMERIC techniques. Additionally a 20-year follow-up study of the first 75 PAOs performed in Berne revealed 60% survivorship with a positive anterior impingement test (presumably indicating labral pathology) and preoperative grade of osteoarthritis being strong factors associated with failure [11].

Hip Arthroscopy and Dysplasia: A Cautionary Note

Recent evidence supports the concept that isolated arthroscopic labral repair or debridement in the setting of acetabular dysplasia is likely to be unsuccessful and may lead to early catastrophic failure of the joint and need for total hip replacement [12-14]. In addition to several cases series illustrating rapid failure, a multicenter report from the ANCHOR group has identified residual acetabular dysplasia as a risk factor for hip arthroscopy failure [15]. Given this compelling data from the literature, it would seem prudent to emphasize acetabular reorientation in the setting of acetabular dysplasia and reserve arthroscopic topic techniques for simultaneous or staged treatment of intraarticular pathology.
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Arthroscopic Management of Impingement: Success and Limitations

Christopher M. Larson, MD

Hip arthroscopy has become a well recognized surgical approach for the management of hip impingement. Hip arthroscopy can manage intra-articular impingement morphologies such as Cam type FAI, various Pincer type Morphologies, as well as associated labral pathology (labral repair / reconstruction) and articular cartilage pathology. Systematic reviews have reported that arthroscopic management of hip impingement has comparable outcomes to mini-open and surgical dislocation with appropriate indications. Extra-articular impingement has been increasingly recognized in the form of trochanteric-pelvic, ischiofemoral, and subspine impingement. Arthroscopy / endoscopy can play a role in the management of symptomatic ischiofemoral and subspine impingement. Hip arthroscopy may also have a role in the management of soft tissue and borderline osseous instability / dysplasia but outcomes are lacking. There are clearly absolute and surgeon specific hip arthroscopy limits. Global acetabular overcoverage and large cam deformities extending beyond the medial and lateral vessels are much more challenging arthroscopic cases. Posterior based femoral sided deformities, medial femoral chondral defects, and trochanteric-pelvic impingement are not readily accessible arthroscopically and require open corrective procedures. In addition, hips with predominately osseous instability (acetabular dysplasia / excessive femoral antetorsion) should be managed with open corrective procedures and arthroscopy alone should be avoided. Hip arthroscopy indications continue to evolve and outcomes research will help to further guide the optimal approaches for patients presenting with hip related disorders.

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What Have We Learned from the ANCHOR Group?
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Hip preservation surgery has rapidly evolved and expanded over the past 15 years. This is due to refined imaging and diagnostic algorithms, improved understanding of pathomechanics, and innovations in surgical technique. Despite substantial advances in this subspecialty area, there is a major need for improved clinical evidence to identify predictors of outcome, guide surgeon and patient decision-making and improve surgical outcomes over time. ANCHOR (Academic Network for Conservational Hip Outcomes Research) was developed as a multi-center clinical research consortium to investigate the diagnostic strategies and treatment outcomes for pre-arthritis hip disease. The study group initially focused on retrospective case series as well as diagnostic reliability studies. After functionality of the study group was achieved, two major prospective longitudinal cohorts were launched. These cohorts included comprehensive data regarding patient demographics, hip pain and function, overall health, quality of life and activity. The ANCHOR FAI-1 cohort includes 1076 patients who underwent surgical treatment for symptomatic FAI and the ANCHOR PAO-1 cohort includes 1444 cases treated with the PAO for symptomatic acetabular dysplasia. These large cohort studies have provided data regarding the clinical epidemiology of these disorders. Early clinical outcome studies have been performed to identify the predictors of surgical treatments. In addition to early clinical outcome studies, the ANCHOR group has focused on complications associated with hip preservation surgery. We have modified and validated a complication grading scheme for hip preservation surgery and applied this grading scheme to the most common hip preservation techniques. These data indicate that both open and arthroscopic hip preservation procedures have an acceptable complication rate with a very low risk for permanent disability after the surgical procedure. Additionally, early clinical outcomes data indicate that contemporary hip preservation procedures are generalizable, have improved over time and are associated with good to excellent clinical outcomes in the majority of patients.
Periprosthetic joint infection (PJI) is becoming the leading cause of failure following total joint arthroplasty (TJA) and several studies have identified independent risk factors for the development of PJI. Despite the debates revolving around some of the identified risk factors, several preventative perioperative strategies are currently commonly in use.

Detailed evaluation of our institutional data and published reports have been performed to identify perioperative strategies that can be used to minimize the risk of developing a PJI.

Strong evidence was found to support preoperative health and nutritional status optimization, the use of prophylactic antibiotics and antibiotic impregnated cement, preoperative skin preparation and the use of disposable draping, shorter operative time, cautious use of anticoagulants and the avoidance of allogeneic blood transfusion. Little or no evidence was found to support the use of laminar flow operating rooms or use of personalized protection suit, double gloving, hair removal, changing blades after skin incision, or addition of antibiotic to the irrigation solution.

Many of the commonly used practices to lower PJI lack strong data to support their use highlighting the need for larger randomized controlled studies. There is, on the other hand, strong support for implementation of simple strategies that could minimize risk of PJI.
The Early Deep Infection: Diagnosis and Treatment
Craig J. Della Valle, MD

Diagnosis of Infection in the Early Post-Operative Period
Diagnosis of PJI can be extremely difficult in the early post-operative period secondary to normal post-operative pain, edema and peri-incisional erythema that make the appearance of the wound and normal cues to diagnosis unreliable. We reviewed 6,033 consecutive primary total hip arthroplasties (THAs) and identified 73 patients (1.2%) who underwent re-operation within the first 6 weeks and had an evaluation for PJI. 36 Patients were classified as infected using MSIS criteria and determined the following optimal cut-off values
- C-Reactive Protein: 93mg/L (normal < 8 mg/L)
- Synovial Fluid WBC count: 12,800 WBC/uL with a differential of 89% PMN

How do I use this in my own practice?
- If there is ANY question regarding the wound appearance, I get a serum CRP. If the CRP is near or > 100mg/L, I aspirate the hip
- If the synovial fluid WBC is > 10,000 and differential is > 90%, the hip is very likely infected. If you are still unsure, you can wait for the culture results

Treatment of Infection in the Early Post-Operative Period
Although the most common treatment for an acute post-operative infection is irrigation and debridement (I+D), the validity of this approach has recently been questioned given a high rate of failure. Alternative options include a 1-stage or a 2-stage exchange. Based on the results of a decision analysis we performed, if the rate of eradication of infection with a 1-stage exchange exceeds 69%, it is the preferred treatment option;
- I+D with a bearing surface change is only preferred if the success rate is > 60%.
- Advantages of a one-stage exchange include
  o Relative ease of cementless component removal early post-operative
  o Greater exposure and access for debridement of the bony surfaces
  o Removal of colonized implants which may harbor bacterial biofilm.

Early experience with 1-Stage Exchange in the early postoperative period following THA
- Multi-center study of 28 Hips; all had cementless components at index arthroplasty and exchanged to cementless implants; 71% implant retention

Based on the published results of an isolated I+D, the decision analysis and the early clinical results of a 1-stage exchange, it seems reasonable to consider a 1-stage exchange for the treatment of the acute infected THA.

References
Two-Stage Revision for Chronic Infection
Scott M. Sporer, MD, MS

Antibiotic Impregnated Cement Spacers

Introduction
A two-stage procedure remains the gold standard for the treatment of chronic periprosthetic joint infection. Multiple spacer options, including various forms or articulating and static spacers exist following component extraction during the first stage. Each treatment modality has potential advantages and disadvantages. Many surgeons choose to add additional antibiotics into the polymethylmethacrylate (PMMA) when making their spacer. However the addition of additional antibiotics into the PMMA is not indicated for use by the FDA and remains an “off label” indication. The elution of an antibiotic from a PMMA spacer is dependent upon the antibiotic dose, the antibiotics chosen, the type of PMMA cement and the geometry of the spacer. Vancomycin and tobramycin are frequently mixed together. Both of these antibiotics remain heat stable and they have been shown to increase the overall elution of Vancomycin when mixed together - “Passive Opportunism”. There are very few studies which compare the multiple antibiotic hips spacers which are available. Attempting to compare treatment outcomes is difficult given the various geometries, antibiotic dosing, infecting organism and definition of cure. The ultimate goal of all antibiotic impregnated spacers is to provide local delivery of antibiotics and promote infection eradication.

Static Antibiotic Spacers

A static antibiotic spacer can be constructed using 1) multiple antibiotic beads placed over suture material or wire or 2) a femoral dowel and an antibiotic puck. Advantages of a static spacer include the potential for increased surface area for elution of antibiotics and the minimization of stress on the surrounding bone. This method is recommended when there is severe acetabular or proximal femoral bone loss. However, static spacers will result in overall femoral shortening and soft tissue contracture and will require the patient to be non-weight bearing until the second stage reimplantation. Additionally, the lack of stress applied to the proximal femur and the acetabulum may result in disuse osteopenia.

Articulating Antibiotic Spacers

There are many methods available to construct an articulating hip spacer. In general, articulating antibiotic spacers should only be used in patients with minor cavitary defects of the acetabulum and proximal femur. They should be avoided in situations of severe acetabular and/or femoral bone loss or in situations when a second stage reimplantation is unlikely.
Self Constructed
Articulating antibiotic spacers can be made using multiple techniques of forming a spacer which resembles a hemiarthroplasty. Frequently, these are constructed using a stem formed with some sort of metal backbone (Rush rod, Ender’s Nail, ) along with a head portion either handmade or formed using a bulb syringe. Advantages of this type of spacer include their relative low cost along with the ability to adjust the length of the stem and head to the patient’s anatomy. Dislocation and fracture have been observed with this method often times attributed to the large head neck ratio and failure to adequately undersize the femoral head by 2-3 mm. This is my preferred method to treat periprosthetic infections when adequate bone is present.

Hip Molds
Articulating spacers can also be constructed intraoperatively using a preformed mold system. These systems allow the surgeon to alter the antibiotics included in the spacer along with the dose similar to a self constructed spacers. However, these mold systems add additional cost to the treatment of an infected hip and no study to date has shown improved outcomes over a self constructed spacer.

Prefabricated
Prefabricated spacers offer the advantage of an off the shelf prosthesis with antibacterial characteristics. These spacers are available in the United States as an FDA approved device for the two stage treatment of infected hip prosthesis. These spacers can minimize operative time and avoid the surface irregularities of a self constructed spacer. However, these spacers remain expensive and are available in limited sizes. Prefabricated spacers also contain a relatively low levels of gentamicin. While surface dimpling of the spacer may promote increased surface area, the clinical effect of this is unknown. Mutimer et al. evaluated the in vivo gentamicin levels have at the time of the second stage reimplantation following the use of a prefabricated knee articulating spacer. The median level was 0.46 mg/L at a median 99 days from the time of implantation. The authors conclude that articulating spacers containing gentamicin provided therapeutic concentrations in the synovial fluid throughout the period of implantation. It is also not known if this data is applicable to the prefabricated hip spacers.
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Two-Stage Revision with Hemi-Explanation: Indications and Results
Keith R. Berend, MD

The common, recommended treatment for infected total hip arthroplasty (THA) is two-staged exchange including removal of all components. However, removal of well-fixed femoral stems can result in bone damage and compromised fixation. We recently reported on an alternative treatment of partial two-stage exchange used in selected cases, in which the well-fixed femoral stem was left and only the acetabular component was removed, the joint space was débrided thoroughly, an antibiotic-laden polymethylmethacrylate spacer was molded either using a bulb-type syringe or, when later available, using disposable silicone molds that incorporate various taper adapter options, and placed in the acetabulum, intravenous antibiotics were administered during the interval, and delayed reimplantation was performed. Indications for using a partial two-stage exchange included those patients whose femoral component was determined to be well-fixed and its removal would result in significant femoral bone loss and compromise of future fixation. Overall we have treated a total of 26 patients (26 hips) with partial two-staged exchange for treatment of infected THA in the presence of a well-fixed stem. Infection has recurred in 3 of 26 patients (11.5%). Two patients, both with prior failure of two-staged treatment of infection, failed secondary to recurrence of infection at an average of 3.3 years. One patient evaluated at 4 months postoperative was noted to have a 7 cm fluid collection in the hip and redness at the incision. Her serum ESR was 87 mm/hr (normal, 0-30 mm/hr) and CRP was 57.2 mg/L (normal, 0.0-9.9 mg/L). Radical débridement was recommended; however, the patient has declined to schedule. At a mean follow-up of 3.6 years (0.3 to 11.2), partial two-staged exchange was successful in 88.5% of patients (23 of 26). Given these results, we believe partial two-stage exchange may represent an acceptable option for patients with infected THA when femoral component removal would result in significant bone loss and compromise of reconstruction. Further study of this technique is required as well as confirmation from other centers. Eradication of periprosthetic joint infection after THA remains an ongoing challenge.

One Stage Revision for Most Infections: A Good Option?

Prof. Thorsten Gehrke

The two-staged approach has become the method of choice for most surgeon’s, with a reported re-infection incidence between 9 % and 20 %. Although advocated as the gold standard, we established and followed a distinct one staged approach in our clinic for over 35 years with success in over 85 % of all our infected THA patients.

As recent reports have shown, the overall results of two-staged approaches at the hip might have even higher complication and lower success rates, as previously reported, especially in MRSA and other resistant infections. In addition, the time before re-implantation can be crucial, as quite high mortality rates have been reported in between stages of reimplantation

Few studies have so far evaluated the one-stage exchange and its techniques in the hip joint. Although many reports are from our own institution, some international experience using this technique exits, with comparable high success rates between 90 % and 75 %, depending on the affecting bacteria and the time of follow up.

The keys to a surgical success include identification of an appropriate patient, bacteria by preoperative aspiration, and antibiotic that can be used locally and systemically. Furthermore the aggressive surgical debridement allows for success rates, comparable to a two-staged procedure.

Besides obvious surgical benefits by eliminating a second major operative procedure, further major advantage arises from the relevantly reduced duration of postoperative systemic antibiotics. This rarely prolongs more than 14 days in our set up, while discharge from hospital can usually be done after 18 days in hospital.
CME Accreditation Statement
This activity has been planned and implemented in accordance with the Essential Areas and policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint sponsorship of the American Academy of Orthopaedic Surgeons and The Hip Society. The American Academy of Orthopaedic Surgeons is accredited by the ACCME to sponsor continuing medical education for physicians.

Credit Hours
The American Academy of Orthopaedic Surgeons designates this live activity for a maximum of 7.0 AMA PRA Category 1 credits™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Goals and Objectives
The objectives of the Open Meeting of The Hip Society are to provide up-to-date information on the treatment of hip problems including arthroplasty and non-arthroplasty options and surgical techniques. Interactive symposia will be utilized.

Upon completion of this program, participants should be able to:
• Update clinical skills and basic knowledge through research findings and biomechanical studies.
• Discuss the various surgical and non-surgical treatments and management of conditions related to the hip joint.
• Determine indications and complications in total hip arthroplasty.
• Critique presentations of surgical techniques and demonstrations of treatment options.
• Evaluate the efficacy of new treatment options through evidence-based data.

FDA Statement
Some pharmaceuticals and/or medical devices at the Specialty Day Meeting have not been cleared by the U.S. Food and Drug Administration (FDA) or have been cleared by the FDA for specific purposes only. The FDA has stated that it is the responsibility of the physician to determine the FDA status of each pharmaceutical and/or medical devices he or she wishes to use in clinical practice.

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Financial Disclosure
Each participant in The Hip Society/AAHKS Meeting has been asked to disclose if he or she has received something of value from a commercial company, which relates directly or indirectly to the subject of their presentation. These responses reflect the answers from a series of questions submitted by all persons participating in the Academy’s overall online Disclosure Program, which is available to all Academy members at www.aaos.org/disclosure. The Hip Society does not view the existence of these disclosed interests or commitments as necessarily implying bias or decreasing the value of the author’s participation in the meeting.

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