



American Association of Hip and Knee Surgeons
Sixteenth Annual Fall Meeting
November 3-5, 2006
Gaylord Texan Resort, Dallas, Texas

Goals and Objectives

The AAHKS 16th Annual Meeting is designed to provide practicing orthopaedic surgeons with state-of-the-art information about the surgical applications and treatment protocols for the diagnosis and management of total hip and knee replacement, and to enhance the care of patients with arthritis and degenerative diseases. Both free paper presentations and interactive symposia will be utilized. The program is designed to meet the seven essentials of the Accreditation Council for Continuing Medical Education, and as a result, program participants will receive the highest quality education and become eligible for a maximum of 13 AMA PRA Category 1 credits.

Upon completion of this activity, participants will 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 and knee joints.
- Determine indications and complications in total hip and knee arthroplasty
- Critique presentations of surgical techniques and demonstrations of treatment options.
- Evaluate the efficacy of new treatment options through evidence-based data

The Scientific Sessions will include the most current research in joint arthroplasty. Clinical papers will focus on:

- MIS Total Joint Arthroplasty and Other Factors Affecting Recovery
- Total Hip Arthroplasty: Bearing Surface Update
- The Difficult Primary THA and Revision THA
- VTE Prophylaxis and Postoperative Rehabilitation after TJA
- Issues Affecting Outcome after TKA
- TKA in the Young and Obese Patient and Choice of Implant
- TKA Failure and Revision

Symposia Topics include:

- Washington Health Policy Update (CMS Reimbursement for THA and TKA)
- The Surgeon – Industry Relationship: Perspectives
- P4P in Orthopaedics: An Overview
- Computer Assisted Surgery: Pros and Cons

AAHKS 16th Annual Meeting Scientific Program

(Times and Topics subject to change.)

Friday, November 3, 2006

8:00-11:00 AM	Board of Directors Meeting	Pecos 1
Noon-9:00 PM	Registration	Grapevine Ballroom Foyer
Noon-9:00 PM	Speaker Ready Room	Fort Worth 1
Noon-5:00 PM	Exhibit/Poster setup	Grapevine Ballroom A-B
	Concurrent sessions:	
1:00-3:00 PM	<i>(Optional Mini-Symposium)</i> Gender Issues in Knee Arthroplasty <i>Sponsored by Zimmer, Inc.</i>	Fort Worth 2
1:00-3:00 PM	<i>(Optional Mini-Symposium)</i> Surgical Coding for Total Joints <i>Presented by Margi Maley, BSN, MS – KarenZupko Associates</i>	Fort Worth 3-4
3:00-5:00 PM	<i>(Optional Mini-Symposium)</i> Curbside Consults in DVT: Case Based Management for the Orthopaedic Patient at Risk (1.5 hour CME) <i>Sponsored by sanofi-aventis, Inc./ Presented by Current Communications Company</i>	Grapevine Ballroom C-D
5:30-8:30 PM	Posters/Exhibits Open	Grapevine Ballroom A-B
5:30-7:30 PM	Welcome Reception (All attendees invited) <i>Sponsored by Stryker</i>	Grapevine Ballroom A-B
7:00-8:00 PM	Hip Problem Case Session <i>MODERATOR: Javad Parvizi, MD Panel: Brian S. Parsley, MD, Carlos J. Lavernia, MD, Joseph C. McCarthy, MD and David Lewallen, MD</i>	Grapevine Ballroom C-D
8:00-9:00 PM	Knee Problem Case Session <i>MODERATOR: Ormonde M. Mahoney, MD Panel: Arlen D. Hanssen, MD, Thomas K. Fehring, MD and Merrill A. Ritter, MD</i>	Grapevine Ballroom C-D
7:00-10:00 PM	Private Board Dinner (invited guests)	Old Hickory Restaurant

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Saturday, November 4, 2006

6:00 AM-6:00 PM	Registration	Grapevine Ballroom Foyer
6:00 AM-6:00 PM	Speaker Ready Room	Fort Worth 1
6:00-7:00 AM	Breakfast Buffet	Grapevine Ballroom A-B
6:00 AM-7:30 PM	Posters/Exhibits Open	Grapevine Ballroom A-B
6:45-7:10 AM	Business Meeting (Active Members only)	Grapevine Ballroom C-D
7:15-7:30 AM	President's Welcome / Brief Report <i>William J. Hozack, MD, Philadelphia, PA</i>	Grapevine Ballroom C-D

The scientific presentations at the AAHKS Annual Meeting will be recorded with Instant Archive™ technology and will be made available to meeting attendees in computer DVD format following the conference. The AAHKS gratefully acknowledges Scios/Traxion World Medical for providing an unrestricted educational grant to sponsor the Instant Archive recording.

SESSION ONE

MIS TOTAL JOINT ARTHROPLASTY AND OTHER FACTORS AFFECTING RECOVERY

7:30-8:30 AM	<i>MODERATORS: Jay R. Lieberman, MD and B. Sonny Bal, MD</i>
7:30 AM	No Benefit of the Two-Incision Technique Over Mini-Poster THA: A Comprehensive Gait Analysis and Strength Testing Study
Paper #1	<i>Mark W. Pagnano, MD, Rochester, MN</i>
7:36AM	Discussion
7:40 AM	Early Failure of UniCompartmental Knee Arthroplasty
Paper #2	<i>E. Marc Mariani, MD, Salt Lake City, UT</i>
7:46 AM	Discussion
7:50 AM	Minimal-Incision TKA though Quadriceps-Sparing Approach – A Comparative Study
Paper #3	<i>Wei-Peng Lin, MD, Taipei, Taiwan</i>
7:56 AM	Discussion
8:00 AM	Functional Problems and Treatment Solutions Following THA
Paper #4	<i>Michael A. Mont, MD, Baltimore, MD</i>
8:06 AM	Discussion
8:10 AM	Internet Promotion of MIS and CAOS in TKA by Members of AAHKS
Paper #5	<i>Lucian Warth, BS,* Iowa City, IA</i>
8:16 AM	Discussion
8:20 AM	Post Operative TKR Rehabilitation: A New Method Using Music Video
Paper #6	<i>Thomas G. Ryan, MD,* Kalamazoo, MI</i>
8:26 AM	Discussion

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SESSION TWO**TOTAL HIP ARTHROPLASTY: BEARING SURFACE UPDATE**

- 8:30–9:30 AM *MODERATORS: Arlen D. Hanssen, MD and Stephen J. Incavo, MD**
- 8:30 AM **RSA Comparison of Wear of Highly Cross-linked Polyethylene Against 36mm vs. 28mm Femoral Heads**
Paper #7
Charles R. Bragdon, PhD, Boston, MA*
- 8:36 AM Discussion
- 8:40 AM **Reduction of Osteolysis with Crosslinked Polyethylene at Five Years**
Paper #8
Thomas P. Schmalzried, MD, PhD, Los Angeles, CA*
- 8:46 AM Discussion
- 8:50 AM **Evaluation of the Separation Force for Various Artificial Hip Bearings**
Paper #9
Steven B. Zelicof, MD, PhD, White Plains, NY
- 8:56 AM Discussion
- 9:00 AM **The Incidence And Volume of Osteolysis at a Minimum 5-Year Follow-Up With Highly Crosslinked and Non Crosslinked Polyethylene**
Paper #10
C. Anderson Engh, Jr., MD, Alexandria, VA*
- 9:06 AM Discussion
- 9:10 AM **The Squeaking Hip: An Under-reported Phenomenon of Ceramic-on-Ceramic THA**
Paper #11
Christopher A. Jarrett, MD, New York, NY
- 9:16 AM Discussion
- 9:20 AM **Noisy Ceramic Hip: Is Component Malpositioning the Problem?**
Paper #12
Richard H. Rothman, MD, Philadelphia, PA
- 9:26 AM Discussion
- 9:30 AM **JAMES A. RAND AWARD WINNER**
PRESENTATION OF AWARD: Douglas A. Dennis, MD
A Population-Based Study of Trends in Utilization of Total Hip and Total Knee Arthroplasty
Michael B. Vessely, MD, Lake Oswego, OR*
- 9:36 AM Discussion
- 9:40 AM **LAWRENCE D. DORR AWARD WINNER**
PRESENTATION OF AWARD: Joseph C. McCarthy, MD
A Prospective Randomized Clinical Trial Shows that Two Incision Total Hips Do Not Recover Quicker Than Mini-Posterior Total Hips
Mark W. Pagnano, MD, Rochester, MN
- 9:46 AM Discussion
- 9:50-10:20 AM **Break In the Exhibit Hall** Grapevine Ballroom A-B

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10:20-11:15 AM **WASHINGTON UPDATE: CMS Reimbursement for THA and TKA**
MODERATOR: Brian S. Parsley, MD (Health Policy Committee Chair)
Guest speakers:
Karen Hackett (AAOS CEO)
Robert Jasak, JD (AAOS Senior Regulatory Advisor)
Richard F. Kyle, MD* (AAOS President)

SYMPOSIUM I **PAY FOR PERFORMANCE IN ORTHOPAEDICS: AN OVERVIEW**
11:15-12:15 PM *MODERATOR: Kevin J. Bozic, MD*

The Government Perspective
David S. Nilasena, MD, MSPH, MS (Medical Officer, CMS)
The Private Payer Perspective
Reed V. Tuckson, MD, FACP (VP Clinical Affairs, UnitedHealthcare)
The Patient and Employer Perspective
Jessica Dilorenzo (Bridges to Excellence)

12:15-1:15 PM **LUNCH** Grapevine Ballroom A-B

SESSION THREE **THE DIFFICULT PRIMARY THA AND REVISION THA**

1:15-2:15 PM *MODERATORS: David G. Lewallen, MD and Brian J. McGrory, MD*

1:15 PM **Technique and Results of Cementless Primary THA with Corrective Femoral**
Paper #13 **Osteotomy: Mean 8-Year Results**
David K. DeBoer, MD, Nashville, TN*

1:21 PM Discussion

1:25 PM **Simultaneous vs. Staged Cementless Bilateral Total Hip Arthroplasty:**
Paper #14 **Perioperative Risk Comparison**
Keith R. Berend, MD, New Albany, OH*

1:31 PM Discussion

1:35 PM **THR Requiring Subtrochanteric Osteotomy for Developmental Hip Dysplasia 5 to 14 Year**
Paper #15 **Follow-up with Analysis of Short and Long Term Failure Modes**
Thomas L. Bernasek, MD, Temple Terrace, FL*

1:41 PM Discussion

1:45 PM **Wear Data and Clinical Results for a Compression Molded Monoblocked**
Paper #16 **Elliptical Acetabular Component: 5 – 9 Year Data**
Thomas P. Sculco, MD, New York, NY

1:51 PM Discussion

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- 1:55 PM **Prevalence of Instability in Septic Revision THA**
Paper #17 *J. Bohannon Mason, MD,* Charlotte, NC*
- 2:01 PM Discussion
- 2:05 PM **The Use of Trabecular Metal Implants for Paprosky 3A and 3B Defects**
Paper #18 *Steven H. Weeden, MD,* Fort Worth, TX*
- 2:11 PM Discussion

SYMPOSIUM II THE SURGEON – INDUSTRY RELATIONSHIP: PERSPECTIVES

2:15-3:15 PM MODERATORS: *Joseph C. McCarthy, MD* and Stuart L. Weinstein, MD*

The Industry Perspective

Ned Lipes (*Stryker Executive Vice President*)

The Clinician’s Perspective

Lawrence D. Dorr, MD

The AAOS Perspective

Richard F. Kyle, MD* (AAOS President)

The Legal Perspective

Robert Pristave, JD (*McGuire Woods LLP, Partner*)

3:15-3:45 PM **BREAK in the Exhibit Hall**

Grapevine Ballroom A-B

SESSION FOUR VTE PROPHYLAXIS AND POSTOPERATIVE REHABILITATION AFTER TJA

3:45-4:45 PM MODERATORS: *William J. Robb, III, MD* and Javad Parvizi, MD**

3:45 PM **A Prospective Study of VTE Prophylaxis in THA/TKA using Lovenox:**

Paper #19 **Results and Surgical Site Complications**

R. Stephen J. Burnett, MD, St. Louis, MO

3:51 PM Discussion

3:55 PM **Does Excessive Anticoagulation Predispose the Patient to Periprosthetic Infection?**

Paper #20 *Javad Parvizi, MD,* Philadelphia, PA*

4:01 PM Discussion

4:05 PM **Extended Travel after Hip Replacement Surgery: Is it Safe?**

Paper #21 *Scott T. Ball, MD,* Los Angeles, CA*

4:11 PM Discussion

4:15 PM **Early and Late Manipulations Improve Flexion Following Total Knee Replacement**

Paper #22 *Robert S. Namba, MD, Corona del Mar, CA*

4:21 PM Discussion

4:25 PM **The Role of Anesthesia and The Anesthetist in Reducing the Length of Stay After Primary THA**

Paper #23 *Vijay D. Shetty, MD, Mumbai, Maharashtra, India*

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4:31 PM Discussion
4:35 PM **Controlling Pain after THR and TKR using a Multimodal Protocol with Local Periarticular
Paper #24 Injections: A Prospective, Randomized Study**
Vineet Shah, MD, New York, NY*

4:41 PM Discussion

SESSION FIVE ISSUES AFFECTING OUTCOME AFTER TKA

4:45–5:45 PM *MODERATORS: Terry A. Clyburn, MD* and William J. Maloney, MD**

4:45 PM **Surgical Treatment of Flexion Contractures Following TKA**
Paper #25 *Thomas K. Fehring, MD,* Charlotte, NC*

4:51 PM Discussion

4:55 PM **The Effect of Retropatellar Fat Pad Excision on Patellar Tendon Contrature and
Paper #26 Outcomes after TKR**
John B. Meding, MD, Mooresville, IN

5:01 PM Discussion

5:05 PM **Acquired Patella Baja after TKR May be caused by Patellar Eversion**
Paper #27 *Richard S. Laskin, MD,* New York, NY*

5:11 PM Discussion

5:15 PM **A Prospective Double Blind RCT of Patellar Resurfacing in Bilateral TKA:
Paper #28 A Minimum 10-year Follow-up Study**
Seth Rosenzweig, MD, St. Louis, MO

5:21 PM Discussion

5:25 PM **Looks Good But Feels Bad: Factors that Contribute to Poor Results after TKA**
Paper #29 *David A. Fisher, MD,* Indianapolis, IN*

5:31 PM Discussion

5:35 PM **Is There a Functional Benefit to Obtaining High Flexion after TKR?**
Paper #30 *R. Michael Meneghini, MD,* Indianapolis, IN*

5:41 PM Discussion

5:45–7:30 PM **POSTER RECEPTION** Grapevine Ballroom A-B
(All are welcome)

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Sunday, November 5, 2006

5:30-10:00 AM	Registration	Grapevine Ballroom Foyer
6:00-10:30 AM	Speaker Ready Room	Fort Worth 1
6:00-7:00 AM	Continental Breakfast	Grapevine Ballroom Foyer
6:45-7:00 AM	Research Update <i>William B. Macaulay, MD, Research Committee Chair</i>	Grapevine Ballroom C-D

SESSION SIX

TKA IN THE YOUNG AND OBESE PATIENT AND CHOICE OF IMPLANT

7:00-8:00 AM	<i>MODERATORS: Thomas P. Schmalzried, MD* and Thomas K. Fehring, MD*</i>
7:00 AM	TKA in the Young Patient: Survival in a Community Registry
Paper #31	<i>Clifford Novak, MD, St. Paul, MN</i>
7:06 AM	Discussion
7:10 AM	TKA in Young Patients with Degenerative Arthritis Using a Modern Prosthesis (10-17 year results)
Paper #32	<i>Gavan P. Duffy, MD,* Jacksonville, FL</i>
7:16 AM	Discussion
7:20 AM	The Obesity Epidemic – Its Effect on Total Joint Arthroplasty
Paper #33	<i>Susan Odum, MEd *</i>
7:26 AM	Discussion
7:30 AM	Primary TKA in Morbidly Obese Patients: A 5-14 Year Follow-up
Paper #34	<i>Robert J. Krushell, MD,* Springfield, MA</i>
7:36 AM	Discussion
7:40 AM	Survival of All-Polyethylene Tibial Components in a Community Total Joint Registry
Paper #35	<i>Susan Mehle, BS, St. Paul, MN</i>
7:46 AM	Discussion
7:50 AM	Mobile versus Fixed Bearing TKA: A Randomized, Prospective Study
Paper #36	<i>Ormonde M. Mahoney, MD,* Los Angeles, CA</i>
7:56 AM	Discussion

SYMPOSIUM III

COMPUTER ASSISTED SURGERY: PROS & CONS

8:00-9:00 AM	<i>MODERATOR: Mary I. O'Connor, MD*</i> <i>Panel: William J. Robb, III, MD,* James B. Stiehl, MD, Michael L. Swank, MD,* and Richard L. Wixson, MD</i>
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SESSION SEVEN TKA FAILURE AND REVISION

9:00-10:00 AM MODERATORS: *Carlos J. Lavernia, MD** and *Matthew S. Austin, MD*

9:00 AM **Mechanical Axis Cannot be Restored in Total Knee Arthroplasty**
Paper #37 **With a Fixed Valgus Resection Angle**
Gregory W. Stocks, MD, Houston, TX

9:06 AM Discussion

9:10 AM **The Effect of Polyethylene Sterilization on Wear-Related Failures: A Comparative Study**
Paper #38 **Performed with First- and Second-Generation TKA Systems**
William L. Griffin, MD, Charlotte, NC*

9:16 AM Discussion

9:20 AM **Perioperative Testing for Sepsis in Revision TKA**
Paper #39 *Craig J. Della Valle, MD,* Chicago, IL*

9:26 AM Discussion

9:30 AM **Revision TKA with Modular Cemented Stems: Long-Term Follow-up**
Paper #40 *Tad Mabry, MD, Rochester, MN*

9:36 AM Discussion

9:40 AM **Patient Reported Activity Following Revision TKA**
Paper #41 *Diane Dahm, MD, Rochester, MN*

9:46 AM Discussion

9:50 AM **The Fate of the Unexpected Positive Intraoperative Culture Following Revision TKA**
Paper #42 *Robert L. Barrack, MD, St. Louis, MO*

9:56 AM Discussion

10:00 AM Adjourn

Please return your completed Evaluation Form to the Registration Desk at the end of the Meeting. Thank you for your participation!

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Scientific Presentations

Paper #1

No Benefit of the Two-Incision Technique over Mini-Posterior THA: A Comprehensive Gait Analysis and Strength Testing Study

Mark W. Pagnano, MD, R. Michael Meneghini, MD, Ken Kaufman, MD,
Krista Coleman-Wood, MD, Emily Berg, Arlen D. Hanssen, MD

- Introduction:** 2-incision total hip arthroplasty (THA) advocates have touted that the recovery after that procedure is dramatically quicker than that after other methods of performing THA. Comprehensive gait analysis and strength testing that directly compares the two-incision technique versus another method of THA has not been done in similar groups of patients.
- Methods:** We conducted a prospective randomized clinical trial comparing two-incision THA (fluoroscopically assisted Mears/Berger technique) versus mini-posterior THA. 10 patients in each group underwent comprehensive preoperative and postoperative (8 week and 1 year) gait analysis and strength testing. Gait parameters including step length, velocity, cadence, stride length, and step width were recorded when both walking on level ground and when ascending stair. Strength testing was done with a Biodex machine.
- Results:** A computerized randomization program ensured that both groups were dynamically balanced according to age, gender and body mass index. The mean age of the patients was 66. Both groups showed marked improvements in gait velocity, stride length, and step width at the 8 week postoperative testing. There were no significant differences however between the two groups in regard to the parameters of gait or Biodex strength testing.
- Conclusion:** This comprehensive gait analysis and strength testing study refutes the contention that the two-incision THA technique dramatically improves short term recovery after THA.

Early Failure of UniCompartmental Knee Arthroplasty

E. Marc Mariani, MD, Michael H. Bourne, MD, Richard Jackson, Scott Jackson

Unicompartmental Knee Arthroplasty (UKA) has received increased interest over the past several years. We are reporting the relatively poor results obtained by four surgeons at two centers in carefully selected patients.

Thirty-six patients underwent 39 UKA's from the period of December 2002 to June 2004. All received a Depuy Preservation design with an all poly tibial component. Ages ranged from 38 to 82 (average 61) with an equal distribution of males to females. Pre-op alignment ranged from 9 degrees of varus to 5 degrees of valgus (avg. 1.27 degrees of varus). Post-op alignment ranged from 2 degrees of varus to 7 degrees of valgus (avg. 3.38 degrees of valgus). 36 of the UKA's were performed for unicompartmental osteoarthritis, 1 for traumatic unicompartmental arthritis and 2 for avascular necrosis of the medial femoral condyle. All involved the medial compartment.

Of the 39 UKA's, 15 (38%) failed at 9-12 months postoperative. All the failures were secondary to loosening of the femoral component. No correlation to failure was found between pre-op angle, post-op angle, amount of correction obtained, posterior slope of the tibia or gender of the patient. The average age of those that failed was 52 compared to 63 for those that did not fail. All fifteen failures were revised to a conventional total knee arthroplasty.

Despite the recent enthusiasm for UKA, our experience of a 38% revision rate at one year is cause for concern. These results have lead all four surgeons to no longer offer our patients this procedure with this device.

Scientific Presentations

Paper #3

Minimal-Incision Total Knee Arthroplasty Through Quadriceps-Sparing Approach – A Comparative Study

Wei-Peng Lin, MD, Jinn Lin, Shun-Min Chang, Lih-Ching Horng, Ching-Chuan Jiang

- Background:** Minimal-incision total knee arthroplasty (TKA) has gained attention in recent years. Our study was conducted to compare radiographic alignment and functional outcomes with two approaches to minimal-incision TKA: the mini-medial parapatellar (MP) approach with downsized front-cutting instruments and the quadriceps-sparing (QS) approach with side-cutting instruments.
- Methods:** In this prospective comparative study, 60 patients (80 knees) with primary osteoarthritis were randomly assigned to receive MP or QS TKA. Radiographic alignment, surgical time, postoperative pain (scores on the visual analog scale), functional outcomes (Hospital for Special Surgery knee scores), and patient satisfaction were assessed. Isokinetic peak muscle torque was measured 2 months after surgery.
- Results:** Postoperative alignment of the femoral component alignment was significantly less valgus and postoperative alignment of the tibial component was significantly more varus with the QS approach than with the MP approach. There were 3 outliers (a 4-degree-or-greater deviation than the target alignment) in the femoral components and 1 outlier in the tibial component with the QS approach. The overall postoperative hip-knee-ankle axis was more varus and surgical time was longer with QS TKA than with MP TKA. Postoperative pain, functional outcomes, and patient satisfaction were comparable. Isokinetic peak muscle torque did not differ between the techniques.
- Conclusions:** We demonstrated a relatively varus mechanical axis after minimal-incision TKA with the QS approach and side-cutting instruments. Postoperative pain and short-term isokinetic peak muscle torque did not differ between the approaches.

Functional Problems and Treatment Solutions Following Total Hip Arthroplasty

Anil Bhawe, **Michael A. Mont, MD**, Thorsten M. Seyler, MD, David R. Marker, Ronald E. Delanois, MD

The success of total hip arthroplasties (THA) in terms of patient satisfaction, improved function and reduced pain has been well documented. Cases of patient dissatisfaction are often linked to complications due to comorbidities, radiographic loosening, and poor prosthesis alignment; however, a small number of patients are still reporting functional problems without any obvious causes. The purpose of this study was to elucidate some of the abnormalities which may lead to biomechanical dysfunction following THA and to assess the efficacy of physical therapeutic modalities which have been specifically customized for this patient population. Seventy-eight THA patients complained of poor functional capabilities following THA. Physical examination, videotape analysis, 3-dimensional gait studies, and isokinetic strength assessment indicated gait abnormalities associated with muscle weakness (57), muscle tightness (32), limb-length differences (11), and/or two-dimensional biomechanical malalignment of the leg (10). All patients were placed on individualized treatment protocols that included physical therapy, electrical stimulation, shoe lifts, orthoses, intramuscular botulinum toxin A and intra-articular corticosteroid injections. At final follow-up of 63 months (range, 24 to 200 months), seventy-three (94%) patients had a good to excellent clinical outcomes. Five patients were recalcitrant to both invasive and non-invasive conservative measures and were considered clinical failures. Overall, the mean Harris Hip score improved to 94 points (range, 65 to 100 points) and patient satisfaction averaged 8.7 out of 10 possible points (range, 2 to 10 points). The excellent clinical results from this study suggest that thorough clinical assessment and 3-dimensional gait studies are valuable tools in identifying biomechanical abnormalities in patients with functional problems after THA. A standardized diagnostic algorithm to understand these underlying dysfunctions in patients who demonstrate no radiographic abnormalities facilitates the development of customized rehabilitation modalities and improves clinical outcome.

Key Words: hip arthroplasty, functional problems, biomechanical abnormalities, physical therapy, rehabilitation, outcome

Scientific Presentations

Paper #5

Internet Promotion of MIS and CAOS in TKA by Members of AAHKS

John J. Callaghan, MD, **Lucian C. Warth, BS**, Steve S. Liu, MD, Gregg R. Klein, MD, William L. Hozack, MD

- Introduction:** Minimally Invasive (MIS) and Computer Assisted Orthopaedic (CAOS) surgical options in Total Knee Arthroplasty (TKA) have recently prompted increased discussion despite there being few controlled studies evaluating the efficacy and safety of these options. One of the responsibilities of the members of a specialty society such as AAHKS (American Association of Hip and Knee Surgeons) is to disseminate accurate information concerning the procedures they perform. The study addresses the question “What is the level of promotion of MIS and CAOS TKA through the internet sites of AAHKS members?”
- Methods:** Commonly used search engines Google, Yahoo, and Excite were used to search for websites related to active members of the AAHKS. Physician’s name and permutations thereof were used as keywords to conduct the search. For each surgeon, all web sites found were browsed and evaluated for MIS and CAOS TKA information. Both direct (Surgeon/Private Practice) and indirect (Institution/Hospital) information from the sites were evaluated.
- Results:** Active AAHKS physicians were found to have 727 total websites. 8.4% and 12.7% of these sites made indirect and direct reference to MIS TKA, respectively. Claims such as quicker recovery and less pain were suggested by 8.4% and 8.0% of these sites, respectively, without reference to any peer review reports. In contrast, MIS specific TKA risks were presented by only 4.7% and 3.2% of sites, respectively. CAOS TKA was discussed in 4.3% and 5.6% of these sites, respectively.
- Discussion:** While our findings confirm that MIS and CAOS TKA are not commonly promoted via the internet by members of the AAHKS, MIS and CAOS TKA are often associated with these surgeons via institutional websites or hospital affiliations. It is important to note that from a patient perspective, MIS and CAOS information which is indirectly associated with a surgeon may be mistaken as an endorsement of the procedure without a clear statement of position on the part of the surgeon.

Post Operative Total Knee Replacement Rehabilitation: A New Method Using Music Video

Thomas G. Ryan, MD, Blake Ohlson, Ryan Adams

- Introduction:** Postoperative rehabilitation protocols following total knee replacement vary considerably among surgeons. Previous reports have shown the usefulness of music exercise videos for cardiovascular rehabilitation and general fitness. The authors created a music exercise video for use in the postoperative period following total knee replacement.
- Methods:** A prospective study was done whereby 45 patients undergoing 51 primary total knee replacements were randomized to a control (25) or video (26) group. All procedures were done by the senior author. All patients were evaluated at postoperative week 1,2,4,6, and 8 by a blinded examiner who generated Knee Society scores. Patients also completed a satisfaction questionnaire and the 8 week cost of rehabilitation was documented.
- Results:** Significant improvements were noted in patient's assessment of understanding, confidence, and overall satisfaction when using the video ($p<0.05$). Average return to usual activities was 34 days in the control and 14 days in the video group ($p< 0.0001$). Knee Society knee and function scores were improved for the video group and were statistically significant for the 6 and 8 week scores ($p<0.05$). The therapy costs averaged \$2,602.00 in the control and \$287.00 in the video ($p<0.0001$). No complications were reported while using the video.
- Discussion:** Use of the music video as a supplement to the rehabilitation program following total knee replacement is recommended due to improved patient satisfaction, earlier return to activities, and improved knee scores. These are achieved at a substantial cost savings which benefits both patients and society.

Scientific Presentations

Paper #7

RSA Comparison of Wear of Highly Cross-linked Polyethylene Against 36mm vs. 28mm Femoral Heads

Charles Bragdon, PhD, Meredith Greene, Andrew Freiberg, MD, Murali Jasty, MD, Harry Rubash, MD, Dennis Burke, MD, William Harris, MD, Henrik Malchau, MD

- Introduction:** Historically, the greater stability and increased range of motion afforded by the use of large diameter femoral heads in THR was countermanded by the increase in wear in conventional polyethylene. However, in vitro wear studies of highly cross-linked polyethylene suggested the possible return to the use of larger diameter femoral heads. This study aimed to use radiostereometric analysis to compare clinical femoral head penetration of 28 vs. 36mm heads into highly cross-linked polyethylene.
- Methods:** Thirty hips were evaluated in an RSA study using highly cross-linked polyethylene (Longevity™, Zimmer Inc.) against either 28 or 36 mm diameter CoCr femoral heads.
- Results:** At three year follow-up there was no significant difference in the total average femoral head penetration, including both creep and wear, between the two groups. Importantly, after bedding-in about 0.075mm, there was no further significant increase in the amount of femoral head penetration with either head size between years one and three. There were no radiographic signs of lysis or radiolucencies at three year follow-up.
- Conclusion:** Using RSA, the most precise method of measuring femoral head penetration, there was no difference in the penetration of the 36 vs. 28mm femoral heads at 3 years into electron beam irradiated highly cross-linked polyethylene and there was no significant increase in penetration and therefore no measurable wear of the polyethylene after the bedding in period.

Reduction of Osteolysis with Crosslinked Polyethylene at Five Years

Rudi Bitsch, MD, Christian Heisel, MD, Scott B. Bal, MD, Mylene dela Rosa, **Thomas P. Schmalzried, MD**

- Introduction:** Marathon™ crosslinked polyethylene (PE) has demonstrated low wear in short-term studies that approached the reduction predicted by wear simulators. With longer follow-up, wear rate can be more accurately determined and radiographs can be assessed for osteolysis.
- Methods:** 32 patients received a crosslinked PE liner (Marathon™, DePuy, Warsaw, IN) and 24 hips a conventional PE insert (Enduron™, DePuy, Warsaw, IN). True wear rates were measured on radiographs using a linear regression analysis of data generated with a validated computer-assisted technique. Patient activity was assessed by a computerized two-dimensional accelerometer worn on the ankle (Stepwatch, Cyma, Seattle, WA). Five year radiographs were assessed for osteolysis by three different orthopaedic surgeons.
- Results:** The mean follow up time was 5.3 years (range: 3.9-7.0 years). Marathon™ PE had a volumetric wear rate of 15.9 mm³/year (range: 0.3-84.3 mm³/year, SD = 19.9 mm³/year) and 9.5 mm³/million cycles (range: 0.1-23.0 mm³/million cycles, SD = 6.1 mm³/million cycles). The group with Enduron™ PE had a mean volumetric wear rate of 59.2 mm³/year (range: 5.6-259.0 mm³/year, SD = 55.6 mm³/year) and 29.1 mm³/million cycles (range: 2.2-70.9 mm³/million cycles, SD = 15.5 mm³/million cycles). Volumetric wear rate in the Marathon™ group was 73% lower than in the Enduron™ group (p=0.001). 8 of 24 hips with Enduron™ liners had unanimously developed osteolysis. Osteolysis was unanimously not apparent radiographically in any of the 32 hips with Marathon™.
- Conclusions:** Up to 7 years *in vivo*, Marathon™ crosslinked polyethylene demonstrates a 73% relative reduction in volumetric wear rate which approaches the reduction predicted by wear simulations. More importantly, however, is the absence of radiographically apparent osteolysis. Concerns of an increased risk of osteolysis due to smaller particles from crosslinked polyethylene are assuaged by this experience.

Paper #9

Evaluation of the Separation Force for Various Artificial Hip Bearings

Steven B. Zelicof, M.D., Ph. D., J. David Blaha, M.D., Satya Nambu, M.S., Michael Carroll, B.S.

- Introduction:** Separation of the hip joint following THR has been documented using video fluoroscopy during various activities such as gait and abduction type movements. It has been proposed that larger diameter bearings provide greater inherent joint stability than smaller ones. Additionally, large diameter bearings tend to develop a fluid film between the surfaces which may induce a “suction” effect due to surface tension that may keep the bearing surfaces in contact during periods of unloading or light distractive motion.
- Methods:** Mechanical testing was conducted to quantify the force required to separate hip bearings of various sizes and materials. 28mm metal-polyethylene, 28mm and 36mm ceramic-ceramic, and 28mm, 36mm, 44mm, and 54mm metal-metal bearings were used for this testing. The bearings were subjected to a compressive force of 200N and then axially rotated +/- 20 degrees simulating the swing phase of gait. The bearings were then separated at a rate of 25mm/second and the force was recorded.
- Results:** Metal-metal and ceramic-ceramic bearings exhibited an increase in separation force with increasing size. Material effects were observed with the 28mm and 36mm ceramic-ceramic bearings exhibiting higher separation forces in comparison to metal-metal and metal-polyethylene bearings of similar size. The force required to separate the 54mm metal-metal bearings was approximately 3X and 4X higher than for the 28mm metal-metal and metal-polyethylene bearings respectively. The 36mm ceramic-ceramic bearings had the highest separation force followed by 54mm metal-metal bearings.
- Conclusions:** Large diameter metal-metal bearings demonstrated higher separation forces when compared to smaller metal-polyethylene and metal-metal couples.

The Incidence And Volume Of Osteolysis At A Minimum 5-Year Follow-Up With Highly Crosslinked And Non Crosslinked Polyethylene

Serena Leung, Adam Stepniewski, MD, **C Anderson Engh, Jr, MD**, Charles Engh, Sr, MD

- Introduction:** In both laboratory and clinical studies, crosslinked polyethylene has shown decreased wear rates, but the effect on osteolysis still needs to be examined. This study sought to determine if the incidence and volume of osteolysis decreased with use of a crosslinked polyethylene. CT was used in this study since it more accurately measures volume than radiographs and can detect small lesions, making it useful for the early detection of osteolysis.
- Materials and Methods:** 230 hips were randomized to a Marathon crosslinked (Depuy) or Enduron non crosslinked (Depuy) 4-mm lateralized polyethylene between 1999 and 2000 in an IRB-approved prospective study separate from this study. 76 study hips received a computed tomography (CT) scan as part of routine clinical follow-up. CT scans were analyzed using a validated post-processing software package (Muscular-Skeleton Analysis Software) that allowed a blinded observer to define osteolysis and determine osteolysis volume.
- Results:** The average length of follow-up was 6.1 ± 0.4 years. 36 hips had a Marathon polyethylene and 40 had an Enduron polyethylene. There were 12 (30.0%) Enduron and 6 (16.7%) Marathon cases with at least one osteolytic lesion. There was no significant difference ($p = 0.19$) in the incidence of osteolysis between the two groups. The average lesion volume for Enduron cases was 7.0 ± 6.7 cm³, which was significantly larger ($p = 0.001$) than the average lesion volume for Marathon cases of 1.2 ± 0.7 cm³.
- Discussion:** At this short follow-up interval, Marathon crosslinked polyethylene has shown to have a decreased volume of osteolysis over Enduron non crosslinked polyethylene. Longer follow-up is necessary to determine if Marathon crosslinked polyethylene will continue to demonstrate the encouraging improved wear and osteolysis characteristics found in both the literature and the current study.

Scientific Presentations

Paper #11

The Squeaking Hip: An Under-reported Phenomenon of Ceramic-on-Ceramic Total Hip Arthroplasty

Christopher A. Jarrett, MD, Amar Ranawat, MD, Matteo Bruzzone, MD,
Jose Rodriguez, MD, Chitranjan Ranawat, MD

- Introduction:** Early reports of ceramic-on-ceramic total hip arthroplasty have demonstrated excellent clinical and radiographic results without catastrophic failures as were associated with earlier designs. The finding of squeaking and other noise has been documented.
- Methods:** Between March 2003 and May 2005, three surgeons performed 159 ceramic-on-ceramic total hip arthroplasties in 143 patients. A control group of 60 hips (48 patients) with a metal-on-polyethylene bearing was matched to the ceramic group for comparison. A detailed radiographic analysis was performed.
- Results:** The incidences of noises and squeaks in the ceramic group were 20% (31 patients) and 7% (10 patients) respectively. There were no squeaks in the control group, though other noises were present in 4 %. Squeaking was reproduced during mid range motion while load bearing as in a simulated stair climb. Cup position and ante-version could not be correlated with squeaking. Squeaking was not associated with pain in any patient. Average HSS scores improved from 19.8 to 38.4 out of 40. There were 3 dislocations (1.9%), one of which squeaked and was revised for recurrent dislocation. There were no other re-operations.
- Conclusion:** The squeaking hip is a peculiar phenomenon unique to hard-on-hard bearing surfaces. This is the first prospective study to report the incidence of noises and squeaks. The immediate and long term implications of squeaking and noises have yet to be studied fully.

Noisy Ceramic Hip: Is Component Malpositioning the Problem?

Camilo Restrepo, MD, Javad Parvizi MD, James Purtill, MD, Peter Sharkey, MD,
William Hozack, MD, **Richard Rothman, MD**

- Introduction:** Noisy/squeaking ceramic on ceramic (COC) bearing surface is a recently recognized problem associated with THA. Multiple theories for etiology of this complication have been proposed. Some investigators implicate acetabular component malpositioning as the main potential cause. The intention of this case-controlled study was to evaluate acetabular component positioning in patients with squeaking and non-squeaking COC THA.
- Materials and Methods:** Noise (squeaking) has occurred in 30 out of 1056 (2.7%) patients undergoing COC THA at our institution. These patients were strictly matched, in a 1 to 2 ratio, with non-squeaking COC hips. The matching criteria included age, gender, BMI, surgeon, date of surgery, prosthesis type, femoral head size, and acetabular liner size. Radiographic evaluation to determine the position of the acetabular component was performed using OrthoView® (Southampton Hampshire, UK) software. CT scan to assess component positioning was also used in the squeaker cohort, but because of ethical and financial reasons CT scan in the control group could not be performed.
- Results:** There was no statistically significant difference in the mean cup inclination ($p=0.27$) or cup version ($p= 0.69$) between squeaker and non-squeaker hips. Further, the software was accurate in measuring the position of the acetabular component as the mean values obtained with the CT scan for cup version and inclination did not differ from radiographic measurements significantly.
- Conclusion:** The main etiology of squeaking COC THA remains elusive at the present time. Although component malpositioning and impingement could potentially be an important contributing factor, the latter cannot be the sole reason for noisy ceramic hips based on the findings of this study. Further investigations to elucidate the etiology of this undesirable complication is warranted.

James A. Rand Award Paper

A Population-Based Study of Trends in Utilization of Total Hip and Total Knee Arthroplasty

Michael Vessely, MD, W. Scott Harmsen, Cathy Schleck, Lee Joseph Melton III, MD,
Robert Kurland, MD, Daniel Berry, MD

- Introduction:** Information on THA/TKA utilization mostly has come from examining Medicare recipients. We hypothesized study of THA/TKA in the whole community can more precisely identify trends in utilization, and provide better estimation of national need for THA/TKA.
- Methods:** An NIH-funded database was used to identify all residents of a single US county who had a primary THA or TKA between 1969 and 2003. This database provides unique capability for population-based studies due to a medical records linkage system with details of medical care provided to residents since the early 1900s. Poisson regression analysis was used to assess age, gender, and time period effects on crude THA/TKA incidence rates. Adjusted incidence rates were standardized to the age and gender distribution of the 2000 US population.
- Results:** Age- and gender-adjusted incidence rates per 100,000 person-years increased over time: from 62 in 1969-75 to 96 in 2000-03 for THA (55% increase), and from 29 in 1971-75 to 157 in 2000-03 for TKA (>500% increase). There was a higher utilization rate for women for both procedures over the study period (78 THA and 101 TKA per 100,000 person-years) than men (69 THA and 86 TKA per 100k p-y) (THA $p=0.01$, TKA $p<0.001$). Incidence rates increased with increasing patient age for both THA/TKA except for patients over 80. The largest percentage increase over the study period was in patients under 50. There was a significant increase in the proportion of THA/TKA performed for the diagnosis of osteoarthritis, from 61% of THAs in 1969-75 to 89% in 2000-03, and from 51% of TKAs in 1971-75 to 92% in 2000-03 ($p<0.001$). Using these age- and gender-adjusted rates for THA/TKA for the time period 2000-03 in this county, the entire US population would have been projected to have 276,424 THA and 452,932 TKA performed in 2002 compared to national estimates (NHDS/NCHS) of 193,000 and 381,000 respectively.
- Discussion:** In a single US county, where access to THA and TKA have been widely available during the study period, utilization rate of TKA has increased steadily while the THA rate has increased more slowly. The most rapid increase was in patients under 50 for both THA/TKA. To our knowledge this is the only study of THA/TKA utilization in the US of an entire community since the introduction of both procedures. These population-based data allow national estimates of probable need for THA and TKA. Based on these data the probable need for THA/TKA exceeds Federal agency (NHDS/NCHS) projections.

A Prospective Randomized Clinical Trial Shows that Two Incision Total Hips Do Not Recover Quicker Than Mini-Posterior Total Hips

Mark Pagnano, MD, James Leone, MD, Arlen Hanssen, MD, Robert Trousdale, MD, Emily Berg

- Introduction:** Proponents of 2-incision total hip arthroplasty (THA) have claimed that the recovery after that procedure is dramatically quicker than that after other methods of performing THA. To date however there is no data that directly compares 2-incision THA to another method of THA in similar groups of patients using the same advanced anesthetic and rehabilitation protocol.
- Methods:** We conducted a prospective randomized clinical trial comparing two-incision THA (Mears/Berger technique) versus mini-posterior THA. This study was designed to ensure adequate power to detect even small (5 day) differences in the measures of early functional recovery. A computerized randomization process dynamically balanced the groups based on age, gender, race, and body mass index. Early function was determined by a milestone diary. SF-12 scores were done preoperatively and at 2 month and 1 year followup. All THAs were done by a surgeon experienced in both techniques.
- Results:** 72 patients with a mean age of 66 (40-85) were enrolled and this included 20 males and 16 females in each group. The mean BMI was 29.5 (21-46). The mean time to discontinue ambulatory aids, to return to normal daily activities, and to climb stairs was shorter for the mini-posterior patients than for the two-incision patients. The mean time to discontinue narcotics was shorter for the two-incision patients.
- Conclusion:** This prospective randomized trial dispels the notion that the two-incision THA technique dramatically improves short term recovery after THA, instead it was the mini-posterior patients who had the quicker recovery in most categories measured.

Scientific Presentations

Paper #13

Technique and Results of Cementless Primary THA with Corrective Femoral Osteotomy: Mean 8-Year Results

David DeBoer, MD, Michael Christie, MD, Craig Morrison, MD, Martha Brinson

- Introduction:** Proximal femoral anatomy distorted by congenital deformity or trauma may be difficult to address with most off-the-shelf components. This paper describes the surgical technique and reports the mid-term results of corrective osteotomy (shortening, derotational, angulation, or a combination) performed concurrently with primary total hip arthroplasty (THA) with implantation of a proximally porous-coated, modular component.
- Methods:** The first fifty consecutive corrective osteotomies with implantation of the S-ROM femoral component (DePuy Orthopaedics) were retrospectively reviewed. The underlying diagnoses included developmental dysplasia in 23 hips, posttraumatic arthritis in seven hips, Paget's disease in 2 hips, and Perthes' disease in 4 hips. In most cases, after preparation of the femur for implantation, a uniplanar osteotomy to correct length or deformity was performed. A "timing mark" etched on the femur aids in re-alignment of the femoral portions. The proximal and distal sections were then re-approximated, and the stem is seated. In most, but not all cases, prophylactic cerclage cables are added to prevent fracture during final implant seating.
- Results:** Forty-one hips were available for review at mean 8 years follow-up. (range, 4 – 15 years). Radiographically, all osteotomies united. There have been 2 revisions for sepsis. No stem is radiographically loose. Clinically, Harris hip scores averaged 92 points.
- Discussion and Conclusion:** Corrective osteotomy can be performed with this implant because of the torsional stability provided by the distal flutes. Additionally, this stem is proximally porous-coated, providing long-term stability through bone ingrowth. This relatively simple technique is effective for correction of deformity and provides excellent results at mid-term.

Simultaneous vs. Staged Cementless Bilateral Total Hip Arthroplasty: Perioperative Risk Comparison

Keith Berend, MD, Adolph Lombardi, MD, Joanne Adams

For patients presenting with bilateral end-stage degenerative hip disease, the decision to perform arthroplasties simultaneously under a single anesthetic or staged remains controversial. Factors influencing staging include patient and physician preferences, co-morbidities, and symmetry of disease progression. A consecutive series of 277 patients undergoing primary cementless bilateral THA in lateral decubitus position is retrospectively reviewed to compare perioperative risks in simultaneous versus staged procedures. Procedures were performed simultaneously in 167 patients and staged in 110 at an average 8.1 months apart. Preoperative clinical scores were similar between groups; however, staged patients were significantly older (57 vs. 52-years-old; $p < 0.0001$), and more likely to be Charnley class C (38% vs. 14%; $p = 0.0000$) and female (57% vs. 40%; $p = 0.0051$). Cumulative single day blood loss and total blood units transfused per patient were significantly higher in simultaneous patients (479 vs. 240mL; $p < 0.0001$ and 0.8 vs. 0.4 units; $p = 0.0004$) while cumulative length of stay was lower (3.9 vs. 5.6 days; $p < 0.0001$). Inpatient adverse events per admission were more common in the simultaneous group (71.3% vs. 42.3%; $p = 0.0000$). Fewer simultaneous patients met physical therapy goals by discharge (53.3% vs. 79.5%; $p = 0.0000$), more required discharge to a rehabilitation facility (40.7% vs. 18.6%; $p = 0.0000$), and more required subsequent hip surgery (3.9% vs. 0.5%; $p = 0.0116$), predominately related to wound problems and dislocation. While accomplishing two hip reconstructions under a single anesthetic provides shorter cumulative length of stay, closer examination of perioperative risks demonstrates that staged procedures done in the lateral decubitus position may be safer for the patient.

Paper #15

Total Hip Replacement Requiring Subtrochanteric Osteotomy for Developmental Hip Dysplasia 5 to 14 Year Follow Up with Analysis of Short and Long Term Failure Modes

Thomas L. Bernasek, MD, Kenneth Gustke, George Haidukewich, Jennifer Stahl

THA in twenty consecutive DDH patients requiring femoral osteotomy for soft tissue decompression and impingement prevention was reviewed at an average 8.2yr(5-14) followup. All osteotomies were transfixed by the SROM hip stem. Interval Harris hip scores(HHS) and radiographs were performed. Kaplan-Meier survivorship analysis was performed using revision as an endpoint. 20 patients(23 hips) averaged age 43years(17-67): BMI 26.4(21-33); femoral anteversion 56 degrees(15-90). Crowe classification: type I-4, type II-3, type III-5, and type IV-10. Osteotomy resection averaged 32 mm(0-70mm), average acetabular size was 47 mm (40-55). Average pre to post-operative HHS was 42-82. All osteotomies healed (one demonstrated persistent asymptomatic lateral radiolucency). Significant difference between pre and post-operative range of motion for extension ($p=0.0074$), flexion ($p=0.003$) and abduction ($p=0.0012$) was noted. Improvement of adduction, internal rotation, and external rotation was not significant. 17.4% (4/23) required revision at an average of 4 years (range 1-8 years) postoperatively. Survivorship was 74.9% at 14 years. Failure modes included polywear osteolysis in 3 (13%), acetabular loosening (manufacturer recall) in 1 hip (4%). Dislocation occurred in 4 hips (17.4%), treatment: closed reduction in two and open in two(avg. time to dislocation 9.5 months{0.6-36}). Two hips (8.6%) with complete acetabular radiolucencies, and six hips (26.1%) with eccentric polyethylene wear (mean 3.4 mm) and two (33%) with osteolysis are under observation.

Conclusion: Femoral osteotomy heals predictably. Small acetabular components are routinely required predisposing to polyethylene wear, osteolysis and failure suggesting the need for improved polyethylene or alternate bearing use.

Wear Data And Clinical Results For A Compression Molded Monoblock Elliptical Acetabular Component: 5 – 9 Year Data

John Anderson, MD, David Mayman, MD, Edwin Su, MD, **Thomas Sculco, MD**

Polyethylene wear rates correlate with osteolysis. Modular acetabular components may fail due to backside polyethylene wear or liner/shell dissociation. A monoblock acetabular component avoids these problems and we report its mid-term results

221 primary total hip arthroplasties with a titanium monoblock, elliptical acetabular component by one surgeon were followed for minimum 5 years (Range 5-9 years). X-rays were scanned and digitized and examined for osteolysis. Wear rates were determined using the Martell hip analysis software.

No acetabular components were revised for polyethylene wear or dissociation, acetabular osteolysis, or loosening. Average yearly wear rate was 0.079mm (range 0 to 0.51mm.) Mid term results with this monoblock design demonstrate excellent survival and absence of osteolysis.

Key Words: Monoblock; Acetabular Cup; Polyethylene Wear; Osteolysis; Backside Wear

Scientific Presentations

Paper #17

Prevalence of Instability in Septic Revision THA

Thomas K. Fehring, MD; Susan M. Odum, MEd; Steven G. Struble, MD;
Keith Fehring; William L. Griffin, MD; **J. Bohannon Mason, MD**

- Introduction:** Hip instability is a common postoperative complication that is disturbing to surgeon and patient alike. The prevalence of dislocation in aseptic revision THA exceeds that of primary surgery. The increased dissection required in revision surgery is a significant contributing factor in this difference. Two-stage reimplantation with its concomitant shortening of the limb requires even more extensive dissection. We have noted an increased prevalence of postoperative instability following two-stage reimplantation despite appropriately placed components. The purpose of this study was to define the prevalence of postoperative hip instability following two-stage reimplantation and to develop strategies to minimize this risk.
- Methods:** A joint registry review of 1280 revision THA identified 111 patients (114 hips) who underwent two-stage reimplantation. 56 patients (57 hips) were alive at the time of data collection. The prevalence of dislocation was documented and potential risk factors were analyzed. A radiographic analysis of acetabular component position was performed.
- Results:** Of the 57 knees undergoing two stage reimplantation, 14 (24.6%) dislocated, six of whom required revision. 6 of 14 had a trochanteric nonunion. The average abductor angle for the dislocators was 39.9° compared to 37.8° for nondislocators. No significant differences were noted with regards to head size, cup size, liner type, or leg length.
- Discussion:** This instability rate following two-stage reimplantation is clearly unacceptable. Strategies to minimize this complication must be undertaken. The use of interim articulating spacers, postoperative bracing, large head technology, or constrained liners are treatment methods that should be considered in this group of patients.

The Use of Trabecular Metal Implants for Paprosky 3A and 3B Defects

Steven Weeden, MD, Robert Schmidt, MD

- Introduction:** In hip revision complex defects difficult to reconstruct. Reports suggest that traditional porous implants and cages may fail in more severe bone defects. The author has published a higher failure rate of traditional implants in type 3 defects. This study rereports the early success of TM implants in this difficult reconstruction.
- Methods:** A review of 43 revisions with a minimum of 24 month follow-up were evaluated. The average follow-up was 2.8 yrs (2–4). Only patients with Paprosky 3A and 3B defects were included in the study. No patients were lost to follow-up and two patients have died at the latest review.
- Results:** There were 33 type 3A defects and 10 type 3B. Modular augments were utilized in 26 cases in an attempt to support the trabecular metal shell. At early follow-up only one component has loosened or required revision surgery (a Type 3A defect that had recurrent infection). All implants are stable (97% success rate). The scores (D'Aubigne and Postel) improved from 4.3 to 9.2 points after revision.
- Conclusions:** Severe defects remain a challenge. Cages and traditional implants have worked well in less severe defects. However, over time and as the defect is more severe, traditional implants may fail. The biologic nature of TM and the ability to add augments may change the way more severe (3A - 3B) defects are reconstructed. The authors are encouraged by the early results of this newer technology. In contrast to a cage, trabecular implants provide a surface for bone and tissue growth.

Paper #19

A Prospective Study of VTE Prophylaxis in THA/TKA using Lovenox: Results and Surgical Site Complications

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RA Shively MD, SA Givens RN, RL Barrack MD

- Background:** Low-molecular-weight heparins provide effective VTE prophylaxis in THA/TKA. Wound problems using these agents have created concerns for surgeons. The purpose of this study is to report on the efficacy/complications using Lovenox in THA/TKA patients, with prospective surgical site monitoring.
- Methods:** 290 consecutive THA/TKA patients were prospectively entered into a clinical anticoagulation trial (non-pharmaceutical sponsored). Exclusion criteria included patients that had a high risk history for VTE(ACCP guidelines). In 234 THA/TKA, a 10-day course of Lovenox was used for postoperative VTE prophylaxis. Patients were followed to 6-months. Symptomatic DVT/PE, hospital readmission, H.I.T. return to O.R. for surgical site complications, wound drainage (duration and quality), injection site problems, satisfaction, and relation of preoperative demographics to complications were analyzed.
- Results:** Symptomatic DVT/PE occurred in 9(3.8%) and 3(1.3%-all nonfatal) patients. H.I.T. occurred in 3(1.3%) cases. Surgical site complications included 11(4.7%) readmissions, 8(3.4%) return to O.R. for wound I&D, 12(5.1%) prolonged hospitalization (wound drainage), 8(3.4%) injection site complications. Wound drainage occurred for 4-7 days in 9.3%, and >7 days (range, 8-27 days) in 9.3%, with >7days predictive of readmission and wound reoperation ($p<0.001$). There was no significant relationship between reoperation or VTE with: age, gender, primary/revision surgery, or THA/TKA. Increased BMI > 35 was predictive of prolonged wound drainage using Lovenox ($p<0.05$). Ninety percent of patients were satisfied/very satisfied with the outpatient injection therapy. Return to the O.R. for wound complications occurred 3 times more frequently with the use of Lovenox than in a previous cohort of 705 patients at our institution that received warfarin (1.2% local wound complications) for VTE prophylaxis.
- Conclusions:** The use of a 10-day course of LMWH for VTE prophylaxis in THA/TKA was associated with wound complications previously underreported. Surgical site complications requiring readmission or re-operation should be considered 'major' complications when reporting the results and guidelines of future recommendations and studies of VTE prophylaxis in THA/TKA.

Does Excessive Anticoagulation Predispose The Patient To Periprosthetic Infection?

Javad Parvizi, MD, Elie Ghanem, MD Peter Sharkey, MD, Richard Rothman, MD, William Hozack, MD

- Introduction:** Periprosthetic infection (PPI) remains one of most challenging complications of joint replacement. A number of predisposing risk factors for PPI have been identified. The aim of this study is to determine whether postoperative hematoma formation, wound drainage, and excess anticoagulation are predisposing factors for PPI.
- Methods:** We conducted a 2 to 1 case-control study to determine risk factors for PPI including postoperative INR. 78 cases without prior history of PPI underwent revision for septic failure. The control group consisted of 156 patients who underwent revision procedure for aseptic failure and were followed up for the same period. The two groups were strictly matched for age, sex, surgeon, type of prosthesis, and date of implantation. The anticoagulation protocol was the same throughout the study period. Patient co-morbidities, preoperative medications, intraoperative factors, and postoperative factors were collected and compared between the two groups using univariate and multivariate analysis.
- Results:** Among the 78 infected cases, 26 patients had developed wound drainage and 11 patients had incisional hematoma necessitating surgical evacuation following the primary procedure. The postoperative INR was higher among the group of patients who later developed PPI. There was only one patient from the control group who developed hematoma and another had post-operative wound drainage. The development of hematoma ($p < 0.001$), wound drainage ($p < 0.001$), or both ($p < 0.001$) was significantly higher in the infected group as compared to the control group respectively.
- Conclusion:** Postoperative hematoma formation and wound drainage are potential risk factors for development of PPI. Cautious anticoagulation to prevent hematoma formation and/or wound drainage is critical to prevent this devastating complication. Aggressive surgical management of persistent wound drainage and wound hematoma needs to be investigated.

Scientific Presentations

Paper #21

Extended Travel After Hip Replacement Surgery: Is It Safe?

Scott T. Ball, MD, Piya Pinsornsak, MD, Mylene dela Rosa, Harlan Amstutz, MD, Thomas Schmalzried, MD

- Introduction:** Increasing numbers of patients are travelling to centers of excellence for surgical procedures. Hip replacement and extended travel are each recognized as risk factors for venous thromboembolism (VTE). The purpose of this study is to assess the safety of extended travel after hip replacement surgery.
- Methods:** All patients received either low molecular weight heparin (LMWH) or warfarin for VTE prophylaxis and thigh-high compression stockings. Patients travelling less than 200 miles were excluded. Data was collected using a mail survey, selected telephone interviews and chart review. Minimum follow-up was 3 months. The primary endpoints were symptomatic deep vein thrombosis (DVT), pulmonary embolus (PE), or death.
- Results:** 502 patients with an average age of 51 years (14 – 89 years) travelled an average 1,319 miles (200 – 8,000 miles) at an average of 6.5 days after surgery (2 – 46 days). 372 patients (74%) travelled by airplane, 127 (25%) by car and 3 by train. No bleeding complications were identified. There were no deaths and no PE's. 3 DVT's (0.6%) were identified; one in a patient who travelled by plane and 2 in patients who travelled by car. All 3 patients who developed DVT had warfarin prophylaxis. Of the 104 patients who had continuous travel of more than 6 hours, none developed symptoms of DVT.
- Discussion:** With chemical VTE prophylaxis, extended travel within 6 weeks of hip replacement surgery is associated with a low rate of symptomatic DVT, with no known PE's and no deaths. There was no difference in VTE risk by mode or distance of travel.

Early and Late Manipulations Improve Flexion Following Total Knee Replacement

Robert S. Namba, MD, Maria Inacio

Manipulation under anesthesia (MUA) has previously been considered an option only in the early postoperative period following TKA. The efficacy of early and late MUA was evaluated.

A retrospective analysis utilizing a total joint registry identified TKA patients, over a four year period, who subsequently underwent an MUA. 102 (52.3%) underwent MUA within 90 days (early), 93 (47.7%) underwent MUA more than 90 days (late) after TKR. There were no significant differences between the demographics of the two groups.

Average pain (10 point scale), satisfaction (10 point scale), flexion (degrees), and extension (degrees) were recorded before and after MUA. Non-parametric techniques were used to analyze the results.

Flexion was significantly improved after MUA for both groups. Flexion increased from 68.4 degrees (± 17.2) to 101.4 degrees (± 16.15), $p < 0.001$ in the early group. The late group increased flexion from 81.0 (± 13.3) to 98.03 (± 18.0), $p < 0.001$. Pain significantly decreased in both groups. Extension improved significantly from 7.15 (+ 10.1) to 2.50 (+ 4.98) in the early MUA group, but did not improve with late MUA.

Treatment options for stiffness following TKR are manipulation, arthroscopic release, open surgical release, and revision surgery. Manipulation is a non-invasive treatment which has been previously advocated only in the early postoperative period. Our study reveals that both early and late MUA can improve knee flexion. Only early MUA significantly improved flexion contractures.

Scientific Presentations

Paper #23

The Role of Anesthesia and The Anesthetist in Reducing the Length of Stay After Primary Total Hip Arthroplasty

Vijay Shetty, MD, Sarah Vowlar, Richard Villar

- Introduction:** There has been very little work on the influence of anesthetic technique and the anesthetist concerned on the post-operative length of hospital stay following primary total hip replacement (THR). We wished to study these two factors, as well as the effect of age and body mass index (BMI), on the length of hospital stay.
- Methods:** We studied 121 consecutive THRs in 109 patients. All procedures were performed by the same surgeon using the same approach, the same prosthetic design and the same physiotherapy protocol. Patients received either general anesthesia alone (50 THRs) or a combination of general and local anesthesia (lumbar plexus block; 71 THRs) from three separate anesthetists. The mean age at the time of operation was 66.5 years (33 to 88). The influence of anesthetist, anesthetic technique, age of the patient and BMI on length of stay after primary THR was assessed separately.
- Results:** Our analysis showed that the length of hospital stay was greatly influenced by the anesthetic technique used, those patients who received a lumbar plexus block having a shorter median length of hospital stay (3 days) than those who received general anesthesia alone (5 days; $p < 0.0001$). The age of the patient was also critical ($p = 0.003$) as was the anesthetist concerned ($p = 0.01$). BMI was unimportant.
- Conclusions:** For those surgeons who believe that a reduction in the length of hospital stay after primary THR is a worthwhile objective, we have one over-riding observation - the anesthetic technique used is critical.

Controlling Pain After Total Hip And Knee Replacement Using A Multimodal Protocol With Local Periarticular Injections: A Prospective, Randomized Study

Hari Parvataneni, MD, **Vineet Shah, MD**, Amar Ranawat, MD, JoAnne Weiskopf,
Holly Howard, Naida Cole, Chitranjan Ranawat, MD

- Introduction:** The purpose of this study is to describe a multimodal pain protocol including a novel periarticular injection and to evaluate its effects on pain control, narcotic consumption, and recovery of function after total joint replacement.
- Methods:** An IRB-approved prospective randomized study was conducted to compare different perioperative pain management protocols. For THR, patients were randomized to either the PCA or the periarticular injection group and for TKR, patients were randomized to the PCA plus femoral nerve block (FNB) or the periarticular injection group. 105 patients (56 hips and 49 knees) were enrolled. All patients received a comprehensive protocol including perioperative analgesics, anti-inflammatories, patient education, and advanced rehabilitation. The injection consists of a local proprietary mixture of five medications with different mechanisms of action. Pain, recovery of functional milestones, and overall satisfaction were assessed.
- Results:** Patients in the hip injection group demonstrated significantly lower average pain scores (3.8 vs 5.77 on POD # 1; $p=0.0067$). Narcotic use and associated side effects were significantly lower and straight leg raise and overall satisfaction were significantly higher (52% vs 15% and 9.2/10 vs 6.7/10 respectively). Average pain scores and overall patient satisfaction were comparable between the knee injection group and the PCA + FNB group. However, the injection group demonstrated lower narcotic usage and side effects and increased ability to straight leg raise (63% vs 21%).
- Discussion and Conclusion:** Periarticular injection with a multimodal protocol was shown to decrease pain and improve functional recovery compared to conventional pain control modalities.

Paper #25

Surgical Treatment of Flexion Contractures Following TKA

Thomas K. Fehring, MD, Susan M. Odum, MEd; William L. Griffin, MD
Thomas H. McCoy, MD; John L. Masonis, MD; Bryan D. Springer, MD

- Introduction:** Flexion contractures following total knee arthroplasty are not uncommon. The majority of minor flexion contractures stretch out with time or are of little clinical significance. Occasionally, significant (greater than 15 degree) flexion contractures are a source of persistent anterior knee pain and altered gait mechanics. The purpose of this study was to evaluate the efficacy of surgical treatment for painful postoperative flexion contractures.
- Methods:** A Joint Registry review of 819 revision knees identified 19 patients treated surgically for symptomatic flexion contractures > 15° following primary arthroplasty. Preoperative Knee Society scores were compared to postoperative scores. Pain and range of motion values were analyzed separately. A radiographic analysis was also performed to determine joint line position.
- Results:** The average preoperative Knee Society score was 16.7 and the average postoperative Knee Society score was 78.8 (p=.003). Flexion contractures preoperatively ranged from 15-80°, average 33.7°. Postoperatively, residual flexion contractures ranged from 0-20°, average 5.0°. Eleven of the sixteen patients had postoperative flexion contractures of 5 degrees or less.
- Discussion:** The surgical treatment of postoperative flexion contractures has not been previously described. With conservative management most minor flexion contractures resolve with time, however, some remain significant and symptomatic. Significantly symptomatic flexion contractures can be managed successfully by revision surgery. Strategies to prevent this complication at primary surgery must be understood.

The Effect of Retropatellar Fat Pad Excision on Patellar Tendon Contracture and Outcomes after Total Knee Replacement

John Meding, MD, R. Michael Meneghini, MD, Jeffery L. Pierson, MD,
Michael E. Berend, MD, Kenneth E. Davis, MD, Merrill A. Ritter, MD

- Introduction:** The effect of excising the retro-patellar fat pad during total knee replacement (TKR) has been debated and has not been clearly established.
- Methods:** A retrospective review of 1055 primary TKRs performed in 1997-1998 was performed. Surgical records were reviewed to determine whether the retro-patellar fat pad was excised or retained. Clinical and radiographic evaluation was performed pre- and post-operatively. Regression analysis was performed to determine the effect of excising the fat pad on patellar tendon contracture (as indicated by the Insall-Salvati Ratio), range of motion (ROM), Knee Society Score (KSS), and stair, function and pain scores.
- Results:** The retropatellar fat pad was preserved in 770 (73%) of the 1055 TKRs, while the remaining 285 knees (27%) underwent fat pad excision. Fat pad excision had no significant effect on the Insall-Salvati Ratio ($p=0.4599$) or the incidence of postoperative patella infera ($p=0.4889$). There was no significant effect upon ROM ($p=0.7361$), KSS ($p=0.7247$), stairs ($p=0.1174$) or function scores ($p=0.6786$). Fat pad excision was associated with a 1.9 times probability of experiencing postoperative knee pain than those with fat pad preservation ($p=0.0005$).
- Conclusions:** Excision of the retropatellar fat pad during total knee replacement does not have an effect on patellar tendon length or the majority of functional outcomes including range-of-motion and the ability to climb stairs. However, this investigation reveals that patients who undergo fat pad excision during TKR are nearly twice as likely to experience postoperative pain.

Paper #27

Acquired Patella Baja after Total Knee Arthroplasty may be caused by Patellar Eversion

Richard Laskin, MD, Markus Floren, MD, Jack Davis

- Background:** Acquired patella baja occurs after many orthopaedic procedures including TKA, with prevalences between 30% - 60%. The inferior position of the patella leads to alterations in the joint mechanics, reduction of range of motion, anterior knee pain, and can cause increased wear of the tibial and patellar polyethylene. Our aim was to evaluate the prevalence of patella baja after TKA and to assess whether this was affected by displacing rather than everting the patella.
- Methods:** Postoperative changes in patella height were measured on serial radiographs of 74 TKA implanted without patella eversion (group 1) and 57 TKA implanted with patella eversion (group 2). Pre- and postoperative Knee Society Scores, operative data, radiographic data, and complications were compared.
- Results:** With a cut-off level of 5% shortening, the prevalence was 12% (9 knees) in group 1 and 37% (21 knees) in group 2 ($p=0.001$). With the 10% cut-off level the prevalences were 5% (4 knees) in group 1, and 14% (8 knees) in group2 ($p=0.1$). The presence of patella baja was related to reduced flexion and increased pain at follow up examinations.
- Conclusion:** Our study has suggested that the prevalence of acquired patella baja can be reduced significantly by avoiding patellar eversion during knee replacement.

A Prospective Double Blind RCT of Patellar Resurfacing in Bilateral TKA: A Minimum 10-year Follow-up Study

R. Burnett, MD, K.P. McCarthy, MD, J.L Boone, MD, **Seth Rosenzweig, MD**, Robert L. Barrack, MD

- Background:** Patella resurfacing in TKA remains controversial. This study compares the long-term clinical outcome in TKA patients undergoing bilateral TKA's with one patella resurfaced(R) and the other side nonresurfaced (NR).
- Methods:** Thirty-two patients (64 knees) underwent primary bilateral single-stage TKA for knee OA. All patients received the same CR TKA. Patients were randomized to NR/R of the patella for the first TKA, and the second knee received the opposite treatment. Both patient and examiner were blinded at follow-up. Evaluations included the Knee Society Score, patellofemoral specific patient questionnaire, patient satisfaction, anterior knee pain scores, radiographs, complications. All living patients were followed to a minimum of 10-years (range, 120-146 months).
- Results:** There were no significant differences between the knees treated with NR/R with regard to range of motion, KSCRS (Total, Pain, Function scores), satisfaction, revision rates, anterior knee pain (presence/severity). In the NR group, Total Knee Scores improved from 90 to 148 points, and in the R group from 86 to 146 points. Thirty-seven percent of patients preferred the R knee, 22% the NR knee, and 41% had no preference. Two patients (7.4%) in the NR group and 1 patient (3.5%) in the R group required revision for a PF-related complication. Overall revision rates were 11%-R and 7.4%-NR
- Conclusions:** Ten-year follow-up in bilateral TKA patients reveals equivalent results for resurfaced and nonresurfaced patellae in TKA with regards to ROM, KSCRS, pain and function, PF symptoms, revision rates. Nearly 2/3 (63%) of patients either preferred the unresurfaced knee or had no preference.

Scientific Presentations

Paper #29

Looks Good but Feels Bad: Factors that Contribute to Poor Results after Total Knee Arthroplasty

David A. Fisher, MD, Brian Dierckman, MD, Melanie Watts, MD

- Introduction:** The purpose of this study was to evaluate patient factors that might contribute to a poor result after total knee arthroplasty.
- Methods:** Out of 1024 primary total knee arthroplasties performed between 1998 and 2004, 71 knees (6.9%) were identified at 1 yr follow up as having a poor result due to either stiffness (less than 90 degrees of motion) or pain. All surgeries were performed by the same surgeon, with similar knee implants and rehabilitation protocols. Radiographs demonstrated satisfactory alignment and fixation in all cases. There were no infections in the group, no instability, or other obvious causes for a poor result. This group was compared to a matched control group of 148 non-painful or stiff TKA, with similar range of motion preoperatively. Logistic regression analysis was performed to compare age, sex, BMI, comorbidities, previous surgeries, preoperative narcotic use, tobacco or alcohol use, work status, insurance status, and any history of depression.
- Results:** Factors that were significantly associated with a stiff or painful outcome included female sex, higher BMI, previous knee surgery, patients on disability, diabetes mellitus, pulmonary disease, and depression. Factors that did not seem to influence TKA outcomes included alcohol or tobacco history, preoperative narcotic use, or other comorbidities.
- Discussion:** Certain patient specific factors may predispose to poor outcomes after TKA. Patients with these factors may benefit from preoperative counseling, improved perioperative management programs, or other forms of treatment.

Is There a Functional Benefit to Obtaining High Flexion After Total Knee Replacement?

R. Michael Meneghini, MD, Jeffery Pierson, Michael E. Berend, MD,
Kenneth E. Davis, Merrill A. Ritter, MD

- Introduction:** There is recent emphasis on developing implant systems that are designed to accommodate extremely high degrees of knee flexion after total knee replacement (TKR). However, clinical evidence is lacking to support the true functional benefit of high flexion in patients after TKR.
- Methods:** A retrospective review of 511 total knee replacements in 370 patients was performed. The mean patient age was 67.7 years (range, 34 to 95) at time of surgery and the mean body-mass-index was 33.0 (range, 17.9 to 57.4). The mean follow-up was 3.7 years (range, 2 to 8 years). Regression analysis was performed to determine the effect of obtaining high flexion (greater than 125 degrees) on Knee Society Scores (KSS), and stair, function and pain scores.
- Results:** 340 of 511 TKRs (66.5%) obtained ROM greater than 115 degrees and 63 (12.3%) TKRs obtained high flexion greater than 125 degrees. There was no difference between the patients who obtained greater than 115 degrees and those who obtained high flexion greater than 125 degrees in Knee Society Scores ($p=0.34$), function scores ($p=.57$), and the use of support for ambulation ($p=.16$). Patients with greater than 125 degrees of flexion are 1.56 times more likely to demonstrate optimal stair function ($p=0.02$).
- Conclusion:** Obtaining high flexion greater than 125 degrees after TKR does not offer a benefit in terms of overall knee function. However, obtaining such a high degree of flexion does improve the patient's ability to climb stairs optimally.

Paper #31

Total Knee Arthroplasty in the Young Patient: Survival in a Community Registry

Terence J. Goe, MD, **Clifford Novak, MD**, Wenjun Ma, MD, MS, Kathleen Killeen, MOT, Susan Mehle, BS

Introduction: Operative options for the young patient with an arthritic knee remain controversial. This study reports the results of a prospectively followed cohort of patients 55 years old or less who underwent total knee arthroplasty (TKA) in a community joint registry over a 14 year period.

Materials and Methods: From September 1991 through December 2005, 1047 TKAs of three predominant designs were implanted in patients age 55 years or less by 48 surgeons in five hospitals associated with our community joint registry. The mean age for this cohort was 49.8 years, and 62.8% (657/1047) of the patients were female. The diagnosis was osteoarthritis (OA) in 93% (977/1047). 1.4% (15/1047) of the patients died with their prosthesis intact.

Results: There were a total of 73 revisions performed, 5.6% (37/653) in females and 9.2% (36/394) in males. Primary reasons for revision included aseptic loosening in 31.5% (23/73), wear and osteolysis in 19.2% (14/73), and infection in 12.3% (9/73).

Cumulative revision rate (CRR) varied by surgical time period, with TKAs performed before 1996 having a higher CRR than those performed between 1996 and 2005 (29.6% vs. 12.3%; p-value = 0.08). When comparing implant types, cemented TKAs performed best, with a CRR of 15.5%, compared to 32.3% in unicompartmental knee (UKA) patients and 34.1% in cementless designs (p <0.01). Males had a higher CRR than females, 31.9% compared to 20.6% (p = 0.07). Cemented implants had a survival rate of 84.5% at 14.3 years. After adjusting for implant type and gender, there was no difference in CRR based on diagnosis (OA vs. other) or age group (\leq 40 yo, 41-45, 46-50, 51-55), or between cruciate-retaining and substituting designs.

Discussion: There was acceptable survival of cemented TKA implants in a younger population at 14 years in this community registry. TKAs implanted before 1996 failed at a higher rate than those implanted after 1996. Cementless designs, UKAs, and male gender increased revision risk independently.

TKA In Young Patients With Degenerative Arthritis Using A Modern Prosthesis (10-17 Year Results)

Gavan P. Duffy, MD, Amy Crowder, MD, Daniel Berry, MD

- Introduction:** We report the 10- to 15-year results of Total Knee Arthroplasty using the PFC Knee System in young patients with degenerative arthritis.
- Methods and Materials:** 52 Consecutive Total Knee Arthroplasties were performed using the PFC Knee System in 42 patients who were 55 years of age or younger at time of surgery. Patients were followed until death or for a minimum of 10 years, with average follow-up of 12 years (range 10-15 years). No knees were lost to follow-up. All pre-operative diagnoses were degenerative arthritis.
- Results:** The knee function score improved from 34 points pre-operatively to 86 points post-operatively. Pain scores improved from 36 points to 92 points post-operatively. At an average of 12 years of follow-up (range 10 -15 years) there were 8 revisions. There were 2 revisions prior to 10 years, one for sepsis, and one for instability. There were 6 revisions between 10 and 15 years, all associated with polyethylene wear and osteolysis. Implant survival was estimated to be 96% at 10 years and 86% at 15 years follow-up.
- Conclusion:** In a young group of patients with degenerative arthritis good ten-year results were obtained with this implant, however, polyethylene wear and osteolysis after 10 years led to a survival of 86% at 15 years.
- Summary:** 52 TKAs in patients with DJD at 15 years had a survival of 86% using the PFC prosthesis.

Paper #33

The Obesity Epidemic – Its Effect on Total Joint Arthroplasty

Thomas K. Fehring, MD, **Susan M. Odum, MEd**, William L. Griffin, MD,
J. Bohannon Mason, MD, Bryan D. Springer, MD

- Introduction:** Obesity has reached epidemic proportions in the United States. Resource use has increased exponentially in dealing with the obese total joint patient. Increased complications, operative times and hospital stays have been documented while the increased physical stress and injury to health professionals remains unstudied. This study sought to determine if the BMI for joint replacement patients has increased with time and if reimbursement has kept pace with the growing size of the patient cohort.
- Methods:** The BMI for 1,434 total joint patients presenting during four distinct time periods was studied. The years 1990, 1995, 2000 and 2005 were analyzed. The mean BMI for each period was compared. The percentage of patients who were normal, overweight, obese, or morbidly obese was compared. Additionally, the reimbursement for hospitals and physicians during each time period was documented and compared to the prevalence of obesity.
- Results:** The mean BMI increased significantly from 27.8 in 1990 to 31.3 in 2005 ($p < .0001$). The percentage of obese patients ($BMI > 30$) in 1990 was 30.4% and increased significantly ($p < 0.0001$) to 52.1% in 2005. In contrast, the percentage of normal patients in 1990 was 26% and decreased significantly ($p < .0001$) reaching a low of 10% in 2005. The percentage of obese patients ($BMI 30-39$) in 1990 was 25% and increased significantly ($p < .0001$) to 39% in 2005. While hospital reimbursement increased, physician reimbursement changed inversely.
- Conclusion:** Obese joint replacement patients have increased significantly since 1990. Implant designers should be cognizant of the expanding patient profile. Physician reimbursement for treating obese patients should be reevaluated.

Primary Total Knee Arthroplasty in Morbidly Obese Patients: A 5-14 Year Follow-up

Robert J. Krushell, MD, Richard Fingerroth

- Introduction:** This study reports the results of TKA in morbidly obese (MO) patients with 5 to 14 year follow-up versus a case-controlled group of non-obese patients.
- Methods:** Our research database was used to identify 39 patients who underwent TKA between 1992 and 1999 who were morbidly obese (BMI>40) and a case-controlled non-obese (BMI<30) comparison group.
- Results:** There were two revisions (1 tibial loosening, 1 polyethylene wear) in the MO group and no revisions in the comparison group. Combined knee/function score means improved from 61 preoperatively to 136 at final follow-up for the MO group. In the companion group, mean scores went from 72 to 158. In the MO group 8 knees had minor wound complications treated conservatively without sequelae. There were no wound problems in the comparison group. In the MO group there was one knee with poor femoral and tibial radiolucency scores and an additional patient with a 1.5 cm osteolytic tibial lesion. In the comparison group there were no knees with poor scores.
- Discussion:** Although we found a higher rate of minor wound complications, sub-optimal alignment, and late revision (5%) in comparison to a case-controlled group of non-obese patients, overall the problems in morbidly obese patients have been relatively few thus far. The substantial improvement in scores and high rate of patient satisfaction (85%) suggests that TKA should continue to be offered to morbidly obese patients. Techniques that can increase the accuracy of alignment may be especially useful in this group of patients.

Scientific Presentations

Paper #35

Survival of All-Polyethylene Tibial Components in a Community Total Joint Registry

Terence J. Gieo, M.D., **Susan Mehle, B.S.**, Wenjun Ma, M.D., M.S., Kathleen Killeen, MOT

- Introduction:** The advantages of monoblock design and lower cost have prompted renewed interest in the all-polyethylene tibia (APT) in total knee arthroplasty (TKA). This study reports the results of a prospectively followed cohort of APT TKAs performed in a community total joint registry over a 14 year period.
- Materials and Methods:** Since 1991, 442 TKAs utilizing an APT component were implanted by 12 surgeons in 4 hospitals associated with a community registry. One of three designs was used in over 98% of cases. The mean age of the patient population was 77 years. Osteoarthritis was the primary diagnosis in 97%, and 78% were female. 93 patients died with their prosthesis intact.
- Results:** Two revisions were performed on this population; one for aseptic loosening and one for periprosthetic fracture. One additional revision has been performed outside the registry. Twenty-three patients were lost to followup despite office chart review, repeated phone calls, and three separate internet search protocols. Kaplan-Meier survival analysis revealed 99.4 % survival at 14.3 years with revision for any reason as the endpoint. With aseptic loosening or wear as the revision reason, survival is 99.7% at 14.3 years.
- Discussion:** TKA with one of the 3 contemporary congruent APT designs used in this registry performed extremely well in this population. Savings for this group (compared to a metal-backed component) was estimated at \$729/case. If all patients over the age of 75 years in our registry had received an APT, the estimated savings for the implant alone would have been \$1.03 M.

Mobile versus Fixed Bearing Total Knee Arthroplasty: A Randomized, Prospective Study

Scott T. Ball, MD, Yong In, MD, Mylene dela Rosa, **Ormonde Mahoney, MD**, Thomas Schmalzried, MD

- Introduction:** Controversy continues over the relative risks and benefits of mobile bearing total knee arthroplasty (TKA). The purpose of the current study was to compare outcomes and complications in patients treated with the same total knee prosthesis with the only variable being a fixed or a mobile tibial bearing.
- Methods:** Under the auspices of an FDA-approved IDE trial, 100 knees in 74 patients were enrolled into a prospective, randomized, single-blind clinical trial by two surgeons at different institutions. 85 knees in 62 patients were available with a minimum follow-up of 2 years. 38 knees received a fixed bearing (FB), posterior-stabilized TKA and 47 knees received the mobile bearing (MB) version. All components were fixed with cement and all patellae were resurfaced. Patients were assessed at 7 weeks, 6 months, one year, and two years postoperatively.
- Results:** There were no significant differences in the demographics of the randomized patients. At two-year follow-up, there were no significant differences between the groups in Knee Society clinical score, SF-12 score, or range of motion. However, the score of the stair climbing component of the Knee Society function score was significantly higher in the MB group (47.0 to 40.8, $p=0.001$). Consequently, the MB group had a higher Knee Society functional score than fixed bearing group (93.7 to 85.8, $p=0.017$). The improved stair climbing ability associated with MB knees was demonstrated in patients operated on by each surgeon independently. There was no significant difference noted in complication rates between FB and MB knees and specifically, there were no bearing dislocations or subluxations in MB knees.
- Discussion:** With this TKA prosthesis, patients with MB knees demonstrated improved stair climbing compared to those with FB knees. This functional difference has not been previously reported and should be considered in prosthesis selection.

**The FDA has not cleared the medical device(s) for the use described in this presentation
(Stryker: Scorpio Rotating Platform TKR)**

Mechanical Axis Cannot be Restored in Total Knee Arthroplasty with a Fixed Distal Valgus Resection Angle

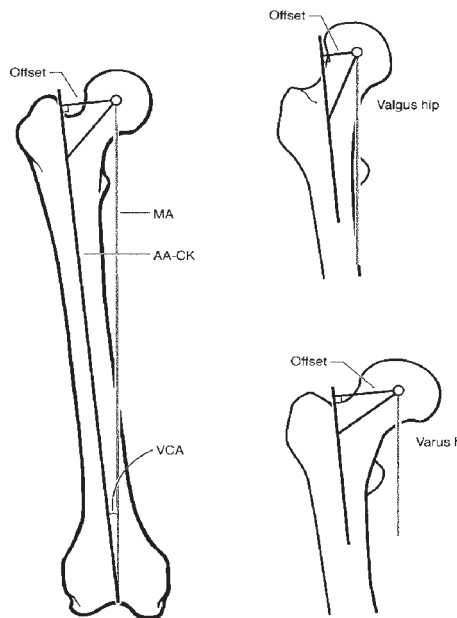
Nikolaos V. Bardakos, MD, Akin Cil, Brandon Thompson, Gregory W. Stocks, MD

Should most knees undergoing TKA be cut with a distal resection angle of 5° or 6°? By retrospectively reviewing long-leg alignment (LLA) radiographs, we sought to determine the variability in valgus cut angle (VCA), and the individual patient variables that affect the VCA necessary to restore the mechanical axis (MA).

The LLA radiographs of 174 extremities in patients undergoing TKA were measured to determine the VCA of the distal femur necessary to restore the MA. The offset and neck-shaft-angle (NSA) of the ipsilateral hip was also measured.

The VCA averaged $5.6^\circ \pm 1.0^\circ$ with a range of 2° to 9° . With the three different methods of defining the anatomic axis of the femur, 30 to 51% of patients required a VCA of $< 5^\circ$ or $> 6^\circ$. Men required a 0.6° larger VCA than women ($p = 0.001$). A negative correlation was found between VCA and NSA ($r = -0.422, p < 0.005$). A strong positive correlation was found between VCA and hip offset ($r = 0.919, p < 0.005$). VCA did not correlate with patient height ($p = 0.312$).

Arbitrary choice of a VCA of 5° or 6° may contribute to inaccuracy in restoring the MA in at least 30% of patients. The offset and NSA of the ipsilateral hip exert a strong effect on the VCA necessary to restore the MA. Patients with coxa valga (and / or reduced hip offset) generally require a VCA $< 5^\circ$. Patients with coxa vara (and / or increased hip offset) generally require a VCA $> 6^\circ$.



The Effect of Polyethylene Sterilization on Wear Related Failures: A Comparative Study Performed with First- and Second-Generation TKA Systems

William L. Griffin, MD, Thomas K. Fehring, MD, Donald L. Pomeroy, MD,
Thomas Gruen, MS, Jeffrey A. Murphy, MS

- Introduction:** This study compared the rate of wear related failure between two large series of total knees using identical modular tibial trays and polyethylene inserts sterilized by different methods.
- Materials and Methods:** 1479 PFC Sigma prostheses with a minimum 5 year f/u (av- 7.3yrs) were assessed by an independent radiologist for osteolysis or loosening. These results were compared with our previously published study on wear-related failures in 1287 first generation PFC modular total knees followed for a minimum of 5 years (av- 7.8yrs). In the previous study, the polyethylene inserts were sterilized by gamma irradiation in air. The second generation PFC Sigma design used polyethylene sterilized and packaged in an oxygen free environment. Using identical criteria for both study groups, wear related failure was defined as 1.) osteolysis $>$ or $=$ to 100 mm² or 2.) revision of the implant due to osteolysis, polyethylene wear and/or effusion.
- Results:** With a minimum 5-year follow-up, the second generation PFC Sigma design had a wear related failure rate of 0.7% (11/1479) compared to 7.3% (94/1287) with the first generation PFC. The Kaplan-Meier survivorship was 97.0% at 10 years in the current study compared to 87.7% at 10 years in the previous study. Patient age was the only variable that statistically correlated with wear-related failure in the current study, whereas, in the original PFC study with gamma-in-air polyethylene, shelf age of the polyethylene insert was the most significant variable.
- Discussion:** This study demonstrates improvement in mid-term TKA survivorship with improved manufacturing of polyethylene implants.

Paper #39

Perioperative Testing For Sepsis in Revision Total Knee Arthroplasty

Craig Della Valle, MD, Scott Sporer, MD, Richard Berger, MD, Aaron Rosenberg, MD,
Joshua Jacobs, MD, Wayne Paprosky, MD

- Introduction** While there are multiple tests available for determining the presence of infection at the site of a total knee arthroplasty (TKA), few studies have applied a consistent algorithm to determine the utility of the various tests available. The purpose of this study was to evaluate the utility of commonly available tests for determining periprosthetic infection.
- Methods** One hundred five consecutive knees were evaluated by a single surgeon for the presence of infection and underwent reoperation. All patients were evaluated using a consistent algorithm with the following considered as consistent with infection; ESR>30mm/hr, CRP >10mg/dl, synovial fluid cell count >3,000, synovial fluid polymorphonuclear (PMN) differential >65% and frozen section >10PMN per high-powered field. Sensitivity, specificity, negative predictive value (NPV), positive predictive value (PPV) and accuracy were determined. Cases were considered infected if two of the following three criteria were met: positive intra-operative cultures, gross purulence was found at the time of reoperation or positive histopathology.
- Results** Eleven cases were excluded (four had a draining sinus, no fluid was obtained from the aspiration in three, the aspirated fluid could not be analyzed in two and incomplete data was present in two) leaving 94 knees with full data for evaluation. Forty-one cases were judged to be infected. The synovial fluid cell count had the highest sensitivity (100%), specificity (98%), PPV (97.6%), NPV (100%) and accuracy (98.9%).
- Discussion** Synovial fluid cell count is the most useful perioperative testing modality for determining the presence of periprosthetic sepsis at the site of a TKA.

Revision Total Knee Arthroplasty with Modular Cemented Stems: Long-Term Followup

Tad Mabry, MD, Michael Vessely, MD, W. Scott Harmsen, MD, Daniel Berry, MD

- Purpose:** To evaluate the results of revision total knee arthroplasty (TKA) using modular, fully cemented femoral and tibial stems.
- Methods:** From 1989 to 1994, 73 knees in 72 consecutive patients (mean age 73 years) requiring surgery for an aseptic, failed primary TKA were treated at one institution with posterior stabilized revision TKA of one design using modular, fully cemented femoral and tibial stems. The indications for revision were aseptic loosening (45 knees), polyethylene wear (13 knees), tibiofemoral instability (7 knees), metal-backed patella failure (6 knees), or other (2 knees). Patients were followed until death, revision, or removal of components. Three patients (3 knees) died or were lost to follow-up within 2 years. The median follow-up of living, unrevised patients was 10.2 years.
- Results:** Five knees had both femoral and tibial components re-revised for aseptic loosening of the tibia, femur, or both. One knee was re-revised for patellar loosening and tibial polyethylene wear. The mean time to re-revision was 7.4 years. Three other patients had reoperations: two for deep infection and one for late periprosthetic fracture. Five and 10 year implant survivorship free of revision for aseptic failure were 97% and 91%, respectively. The effects of patients' age, gender, BMI, underlying diagnosis, and use of bone grafts, metal augments, or antibiotic cement were analyzed and none had a statistically significant effect on survivorship.
- Discussion:** These data provide the first long-term follow-up information on revision TKA with modular components with fully cemented stems. Survivorship was comparable to early series of non-modular cemented stems and similar to recent shorter term follow-up series of modular uncemented stems.

Scientific Presentations

Paper #41

Patient Reported Activity Following Revision Total Knee Arthroplasty

Diane Dahm, MD, Sunni Barnes, MD, Jeffrey Harrington, MD Daniel Berry, MD

- Introduction/
Purpose:** The purpose of this study was to determine the functional and athletic activities that patients were able to return to following revision TKA, and to compare these results to those following primary TKA in a similar group of patients.
- Methods:** We identified 373 consecutive patients who underwent revision TKA between 1995 and 2000. These patients were surveyed regarding clinical outcome and activity level. Additionally, patients were queried about participation in 40 different athletic activities. Modified Knee Society pain and function scores, and UCLA activity-level ratings were calculated. These were compared to results from an identical survey sent to 1630 patients undergoing primary TKA during the same time period.
- Results:** 244 patients responded (65%). Average age at revision TKA was 68 (31-86). Average follow up was 5.7 years (3-9). Average UCLA activity level rating was 6.8. Average Knee Society function score was 61. Satisfaction with activity level following revision TKA was 75%. 85 patients (35%) responded that their activities were limited by other joints. Patients over 70 years had lower UCLA scores and lower Knee Society function scores ($p < 0.001$) but no difference in self-assessment of activity level vs. peers ($p = 0.9$) than those under 70. When compared to results following primary TKA, patients with revision TKA had significantly lower Knee Society pain and function scores ($p < 0.0001$) and lower self-assessment of activity level vs. peers ($p = 0.0002$) but no significant difference in UCLA scores ($p = 0.08$). Patients most commonly reported participating in low-impact activities such as walking (medium pace: 67%), stationary biking (41%), swimming (25%) and dancing (20%). However, 34 patients (14%) reported participating in heavy manual labor or sports deemed “not recommended” by Knee Society published guidelines.
- Conclusion:** This is the largest study to date documenting patient-reported activity level following revision TKA. Activity levels by UCLA score remain relatively high following revision TKA, despite lower Knee Society pain and function scores when compared to those following primary TKA.

The Fate of the Unexpected Positive Intraoperative Culture Following Revision Total Knee Arthroplasty

Ajay Aggarwal, MD; R. Stephen J. Burnett, MD, FRCS(C); John C. Clohisy, MD; Elie Ghanem, MD;
Meredith Warner, MD; Javad Parvizi, MD; **Robert L. Barrack, MD**

- Introduction:** A study was undertaken to determine the incidence of unexpected positive intraoperative cultures (PIOC) at the time of revision total knee arthroplasty (TKA) and the subsequent results of selective treatment of patients in this clinical scenario.
- Materials and Methods:** Eight hundred and eighty-nine TKA's were performed during a seven year period at two total joint referral centers. One hundred and ninety-seven were classified as infected and six hundred and ninety-two were classified as not infected based on established clinical and laboratory criteria and treated with revision TKA.
- Results:** Of the knees classified as not infected, a PIOC occurred after revision TKA in thirty-seven of six hundred and ninety-two (5.3 %) cases. Of PIOC in this group, twenty-eight of thirty-seven (76%) were classified as false positive based upon the absence of any other evidence of infection and growth in broth only or growth quantified as rare on solid media and no further treatment was administered. Nine of thirty-seven (24%) were classified as possible occult infections based on other laboratory evidence of possible infection and growth on solid media quantified as more than rare or more than one positive culture. These patients were treated with six weeks of intravenous antibiotics alone. The twenty-eight patients with unexpected PIOC were followed clinically for a minimum of two years (range 2-8 years) during which time no patient developed clinical signs of infection or underwent further surgery.
- Conclusion:** A PIOC in the absence of any other evidence of infection immediately following TKA revision surgery should not be taken as definitive evidence of infection and frequently does not require further treatment.

NOTES

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* indicates something of value has been received from a commercial company or institution

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Radiographic Narrowing Of The Lateral Compartment At 10 To 18 Years After Medial Unicondylar Arthroplasty: Has The Role Of Knee Alignment Been Overstated?

Matthew B. Collier, MS, Thomas H. Eickmann, MD,
Kevin K. Anbari, MD, Gerard A. Engh, MD

- Introduction:** Limited data has been reported on radiographic narrowing of the lateral tibiofemoral compartment after medial unicondylar arthroplasty (Weale AE *et al.*, Hernigou P *et al.*, Khan OH *et al.*).
- Methods:** 107 unicompartmental arthroplasties were implanted 1985-1995 and had 10-18 years of radiographic follow-up. The lateral compartment joint space width was measured from weightbearing anteroposterior radiographs made during postoperative year one and at the most recent examination. Postoperative year one hip-knee-ankle angle, postoperative year one lateral compartment joint space width, tibial implant thickness, polyethylene shelf age, gender, weight, and age were examined as risk factors for narrowing.
- Results:** Lateral compartment narrowing was limited (mean±SD: 0.04±0.14 mm/year). Narrowing correlated weakly with hip-knee-ankle angle (0.010 mm/year more narrowing with each 1° valgus increase, p=0.04). Knees placed in 0.0° to 5.5° hip-knee-ankle valgus had 0.06±0.13 mm/year narrowing (0.30-0.20 mm/year: 8 knees, 0.20-0.10 mm/year: 7 knees, <0.10 mm/year: 30 knees). Knees placed in hip-knee-ankle varus (up to 6.5°) had 0.02±0.15 mm/year mean narrowing (0.65-0.30 mm/year: 5 knees, 0.30-0.10 mm/year: 3 knees, <0.10 mm/year: 54 knees).
- Eighty-six of 107 (80%) knees showed <25% narrowing (versus year 1 measurement); 10/107 had 25-50% narrowing; 6/107 displayed 50-75% narrowing; 5/107 had >75% narrowing. No studied factor was significantly associated with an outcome of >25%, >50%, or >75% narrowing. Seven of 11 knees with >50% narrowing had initially had a varus postoperative hip-knee-ankle angle.
- Discussion:** Lateral compartment narrowing was rare. Postoperative coronal plane knee alignment only slightly influenced narrowing and offered no prognostic value as to which knees showed >25% (or more) narrowing at 10 to 18 postoperative years. Other factors (collateral or flexion-extension gap imbalance, meniscal degeneration) may better explain why medial unicondylar knees occasionally show lateral compartment narrowing during (or before) this interval.

Poster Presentations

Poster #2

Early Hospital Discharge After 2-Incision MIS THA: A Randomized, Prospective, Inpatient-Blinded Study.

R. Michael Meneghini, MD, Jeffery L. Pierson, MD

- Introduction:** Reports of early hospital discharge after minimally invasive total hip arthroplasty have recently emerged and created considerable controversy. Most have confounding variables and therefore, the effect of surgical approach on early hospital discharge after THA has not been established.
- Methods:** 17 consecutive hips in 16 patients were randomized to THA through one of three surgical approaches (two-incision, mini-posterior and mini-anterolateral). The mean patient age was 53 years (range, 38 to 74) with an average BMI of 26 (range, 21 to 30). Patients received identical preoperative teaching and expectations of discharge the day following surgery. All patients received identical perioperative anesthesia, pain protocol and rapid rehabilitation protocol. Patients were blinded to the surgical approach until discharge. Blinding was achieved with peri-incisional local anesthetic. Patients randomized to a single-incision approach received anesthetic injected at the anterior site of a two-incision approach and a phantom dressing. Hospital staff and therapists were blinded to avoid additional bias and patients were discharged when objective criteria were met. The operative dressing was not removed until discharge.
- Results:** 14 of 17 THAs met physical therapy criteria for discharge by AM the day following surgery and were discharged home. One patient (two-incision) remained in the hospital two additional days for hypoxia that resolved uneventfully and two patients (two-incision and mini-posterior) remained an additional day for anxiety related to early discharge.
- Conclusions:** The results of this study, designed with adherence to the scientific method and avoidance of confounding variables, demonstrate that surgical approach has no effect on early hospital discharge after THA.

Management Of The Retroverted Acetabulum: Hip Preserving Surgical Options

Christopher L. Peters, MD, Jill A. Erickson

- Introduction:** The optimum treatment for the young adult patient with femoro-acetabular impingement (FAI) due predominately to acetabular retroversion is currently unknown. Anteversion-producing periacetabular osteotomy (PAO) with or without femoral head-neck osteochondroplasty and surgical dislocation and debridement (SDD) of the femoral head-neck junction and the anterior acetabular rim have been utilized without clear evidence of superiority. We have utilized both of these treatments in patients with acetabular retroversion and present our clinical experience.
- Methods:** Thirty-eight patients (43 hips, 5 bilateral) had preoperative acetabular retroversion and clinically significant FAI diagnosed with exam, plain radiographs, MR-arthrography and 3D CT-arthrography. Twenty-eight PAOs and fifteen SDDs were performed in these patients. The decision to perform PAO rather than SDD was based on the preoperative condition of the articular cartilage. In the five patients with bilateral retroversion, four had staged PAOs, one patient had staged SDDs. The average follow-up was 38 months. The average age was 26 years (range 15-44). The average height was 67 inches, average weight was 160 pounds.
- Results:** Mean Harris Hip score improved from 52 to 90 for the PAO group and 72 to 91 for the SDD group. There was one failure with infection followed by conversion to total hip in one patient with spastic cerebral palsy from the PAO group. There was one failure requiring conversion to total hip due to severe articular cartilage delamination from the SDD group. There were no other major complications.
- Discussion:** Our rationale of treating acetabular retroversion in younger patients with intact articular cartilage with PAO, and patients with evidence of compromised articular cartilage with SDD appears sound, based on the low rate of failure and improved clinical outcomes in these patients. The decision regarding the best surgical management of the retroverted acetabulum remains difficult and depends on a thorough consideration of hip morphology and degree of articular cartilage damage.

Poster Presentations

Poster #4

Infection-Specific Biomarkers in the Synovial Fluid

Carl Deirmengian, MD, Abdul Tarabishy, MD, Marco Caicedo, MD, Nadim Halleb, MD, Joshua Jacobs, MD, Craig Della Valle, MD, Jess Lonner, MD, Robert Booth, MD

- Introduction:** In a previous genomic study, analyzing the gene expression of synovial fluid leukocytes from TKA infection, we identified a target list of infection biomarkers. The purpose of this study is to test three of these biomarkers for infection with immunoassay.
- Methods:** 70 synovial fluid samples were prospectively collected at the time of total joint arthroplasty (TJA). 12 samples were from native joints at the time of TJA (controls), 14 samples were from TJA being treated for clear evidence of infection (infections), and 44 samples were from revision TJA (unknowns). Pertinent labs were collected including CRP, ESR, cell counts, and pathology. This study tested three biomarkers: interleukin-1-beta (cytokine); SKALP (antimicrobial peptide), and SLPI (antimicrobial peptide). Protein levels were measured in the synovial fluid by standard, commercially available immunoassay.
- Results:** All twelve control samples had <10pg/ml IL1B and <1300pg/ml SKALP. All 14 infections had IL1B levels >50pg/ml (ave.5038pg/ml); 13 of 14 infections had SKALP levels above 1300pg/ml (ave. 2340pg/ml). Of the 44 revision TJA, only 9 had elevated IL1B and SKALP levels, and 7 of these cases had soft signs of infection such as broth only positive cultures. The SLPI protein was not a useful biomarker.
- Discussion:** Based on information from genechip studies, we have identified infection specific biomarkers in the synovial fluid with rapid, inexpensive immunoassay. It appears that these biomarkers will help identify cases of occult infection; specific examples are presented. Future studies will test additional biomarkers and assess sensitivity and specificity in a larger population of patients.

Total Knee Arthroplasty in Valgus Knees using A Lateral Approach

Nikolaos Bardakos, MD, Akin Cil, Michael Conditt, Brian Parsley, MD

We investigated the results of the use of the lateral approach in knees with fixed valgus deformity undergoing total knee arthroplasty (TKA) and compared them with the more commonly used midvastus approach at a minimum 2 years' follow-up. 55 valgus knees in 48 patients underwent TKA via a lateral approach. 25 knees in 24 patients formed our control (midvastus) group. Clinical and radiographic Knee Society scores were measured pre-operatively, at 2-3 months post-op and at latest follow-up. Only 3 (5.5%) knees of the study group required a constrained prosthesis. In terms of post-operative scores, a significant ($p=0.003$) difference in favor of the midvastus group was present for the early functional score only. In 7 (29.2%) of the control group, a lateral retinacular release was required. The lateral approach allows for the use of minimally constrained implants and provides excellent results and optimal patellar tracking, without the need for lateral retinacular release, in the valgus knee undergoing TKA.

Poster Presentations

Poster #6

Wear Rate Using a Cross-linked Polyethylene Liner vs. Conventional Polyethylene Liner in Patients Undergoing Primary Total Hip Arthroplasty

Arthur Malkani, MD, Ryan Krupp, MD, Dale Baker, Rama Ramakrishnan

- Introduction:** Purpose of this study was to compare wear rate of cross-linked polyethylene liners to conventional polyethylene liners at average five-year follow up.
- Methods:** 49 total hip arthroplasties in 48 patients using a cross-linked polyethylene liner were reviewed. Conventional polyethylene group consisted of 30 patients. 28 mm chrome cobalt head was utilized in all cases using Martell's software to determine head penetration rate.
- Results:** Mean head penetration rate in the cross-linked polyethylene group was 0.027 mm/year (0.0019-0.15). Mean head penetration rate for the conventional polyethylene group was 0.15 mm/year (0.009-0.46). Cross-linked polyethylene group demonstrated 82% reduction in wear compared to conventional polyethylene group, $p < 0.0001$. There were no catastrophic failures of the polyethylene liners in either group at latest follow up.
- Discussion:** At average follow up of 5 years, the cross-linked polyethylene group demonstrated a statistically significant reduction (82%) in head penetration rate compared to the conventional polyethylene group.

Functional Improvement of Articulating Spacers vs. Static Spacers in Infected TKA

Mark S. Freeman, MD, **Thomas K. Fehring, MD**, William L. Griffin, MD, J. Bohannon Mason, MD,
Bryan D. Springer, MD, Susan M. Odum, MEd

- Introduction:** Two-stage reimplantation remains the gold standard. However, controversy exists concerning which type of spacer is the most appropriate. The purpose of this study was to determine if articulating spacers improve function compared to static spacers.
- Methods:** A review of 633 revision total knees identified 76 living patients who underwent two stage reimplantation with interim spacers. 28 patients treated with static spacers and 48 treated with articulating spacers were available for comparison.
- Results:** The prevalence of recurrent infection was 18.4% in the static group and 9.2% in the articulating group ($p=.12$). The median Knee Society pain score was not significantly different ($p=.7$) However, the Knee Society functional score was significantly ($p=.05$) better in the articulating group (65.6) compared to the static group (42.5).
- Discussion:** The use of articulating spacers improves functional results following 2-stage reimplantation. Due to the functional limitations of static spacers, their use in two-stage reimplantation for periprosthetic sepsis should be reevaluated.

Poster Presentations

Poster #8

Is Cementless Acetabular Fixation An Improvement In THR Performed In Younger Patients?

John Callaghan, MD, **Matthew Teusink, BA**, Jonathan Donigan, MD, Lucian Warth, BS, Steve Liu, MD, Jason Sullivan, BS Devon Goetz, MD, David Vittetoe, MD, Richard Johnston, MD

- Introduction:** Especially in the young patient, cemented acetabular fixation in the THA construct has had limited long-term durability. For this reason, the two senior authors began using cementless acetabular components in 1986. The authors address the question “Is the durability of cementless acetabular fixation greater than cemented fixation in younger patients (age 50 and under) at 10 to 18 year follow-up?”
- Methods:** Between 1986 and 1995, 145 consecutive non-selected hip replacements were performed by two surgeons in patients under the age of 50 using a cementless acetabular component. The patients were prospectively followed for 10 to 18 years. Hips were evaluated for need for revision, clinical success (WOMAC Score), radiographic loosening, osteolysis, and acetabular component wear. These results were compared to the senior surgeon’s cemented acetabular results in this age group (67 patients, 89 hips), at comparable follow-up (minimum 15 years).
- Results:** Only 1 hip was lost to follow-up, leaving 144 hips available for analysis. At final follow-up, 3 acetabular components were revised for aseptic loosening and associated osteolysis, and an additional 9 components were revised for osteolysis without loosening. An additional 11 components required revision of the acetabular liner without replacement of the shell (8 for wear and osteolysis, and 3 for dislocation). Including the components revised for loosening, only 3 components were radiographically loose. Osteolysis occurred around 14% of acetabular components and the average radiographic linear wear rate was 0.188 mm per year. At this interval of follow-up, the revision rate for aseptic acetabular loosening was 2.5% for cementless fixation compared to 15% for the senior surgeon’s results with cemented fixation in this age population.
- Discussion:** Cementless acetabular fixation is more durable than cemented acetabular fixation in patients under age 50 at this interval of follow-up (2.5% loose vs 15% loose). Acetabular polyethylene wear and osteolysis are the long term problems and the reoperation prevalence was higher for the cementless acetabular component (23%) versus the cemented component (15%)! Hopefully, using acetabular shells with better locking mechanisms and extensively crosslinked polyethylene sterilized in an inert environment, the wear and osteolysis rates will be reduced.

Revision Total Knee Arthroplasty: The Patient's Perspective

Robert L. Barrack, MD, Corey Burak, MD, John C. Clohisy, MD, Thomas McClure, MD,
Javad Parvizi, MD, Peter F. Sharkey, MD

- Introduction:** A study was undertaken to assess the revision patients' level of satisfaction, understanding of the reason for failure, and expectations for longevity of their revision TKA.
- Materials and Methods:** A consecutive series of revision knee arthroplasty cases from three referral centers during the previous five years formed the study group. Patients were contacted independently by an experienced medical interviewer and rated their degree of satisfaction with the original arthroplasty, the revision arthroplasty, their assessment of why the failure occurred and expectation for longevity of the revision procedure. A member of the surgical team then reviewed the operative report, clinical record, and radiographs to determine the diagnosis at revision, procedure performed, and the etiology for the failure.
- Results:** During the time period of the study, 408 revision procedures were performed of which 238 surveys were successfully completed (58%) Patient satisfaction with the primary procedure was directly related to the time to revision with those revised less than 10 years expressing a high degree of dissatisfaction. The majority of patients (74%) expect their revision to last longer than their primary regardless of the revision diagnosis or how long the primary procedure lasted prior to revision. The surgeon's assessment of the reason for failure agreed with the patient's assessment in less than one-third of cases.
- Conclusion:** Though the majority of revision TKA patients are satisfied with the results of their revision procedure, most do not agree with their surgeon as to why the original arthroplasty failed and most have unrealistic expectations regarding how long their revision procedure will last.

Poster Presentations

Poster #10

Modular Polyethylene Exchange for Wear and Osteolysis in PFC Total Knees

William L. Griffin, MD, David Dalury, MD, Ormonde Mahoney, MD, Richard Scott, MD, Bryan Springer, MD, John Chiavetta, MD, Thomas Fehring, MD, Susan Odum, MEd

- Introduction:** Wear and osteolysis have been successfully treated by modular polyethylene exchange in revision hip surgery. Similar reports regarding revision total knee arthroplasty have discouraged modular exchange. The purpose of this study was to evaluate the results of polyethylene exchange for wear and osteolysis in a single total knee design.
- Methods:** Between January 1999 and May 2003, 56 patients from four centers were revised for polyethylene wear and/or osteolysis with isolated polyethylene exchange. The index polyethylene was gamma irradiated in air. The replacement poly was sterilized and packaged in an oxygen free environment. Accessible osteolytic lesions were grafted or cemented. Radiographs were evaluated for osteolysis progression and loosening. Knee Society Scores were documented.
- Results:** At an average 36 months follow-up, there were 6 (11%) failures. Five components were re-revised for aseptic loosening four due to lysis and one for infection. No other patients developed radiographic evidence of loosening. Pre and post-operative radiographs were available for 52 patients. Osteolytic lesions showed no progression in 51 patients (98%) and improved in 1 patient (2%). Average Knee Society clinical scores improved from 75 to 93.
- Discussion:** With short term follow-up we found an 89% success rate with this procedure. We are cautiously optimistic about the results of modular exchange with an improved polyethylene in total knee arthroplasty. However, additional follow-up is required to determine if the decreased morbidity of modular polyethylene exchange is better than full component revision for osteolysis and wear

The Impact of Direct to Consumer Advertising on Physician Attitudes and Behavior in Orthopaedic Surgery

Kevin J. Bozic, MD, Amanda Smith, Sanjo Adeoye, MD, Sanaz Hariri, MD,
John Gourville, Harry E. Rubash, MD

- Background:** Direct-to-consumer advertising (DTCA) has emerged as an influential factor in healthcare delivery in the United States. Previous reports on DTCA have focused exclusively on prescription drugs. The purpose of this study was to evaluate the attitudes and behaviour of hip and knee surgeons towards DTCA, and to assess its impact on health services resource utilization, quality of care, and the doctor-patient relationship.
- Methods:** A 36-question survey was sent to 737 orthopaedic surgeons with experience in hip and knee replacement surgery. Respondents were asked questions regarding their opinions of and experiences with DTCA, including the frequency of DTCA-related patient requests and its influence on their practice and patient interactions. The extent and direction of association between surgeon demographic characteristics and survey responses were measured using appropriate statistical methods.
- Results:** The survey response rate was 49%. Over 98% of respondents had experience with patients who had been exposed to DTCA, with 77% indicating experience with patients who were confused or misinformed about the appropriate treatment option for their condition as a result of exposure to DTCA. A majority of respondents reported feeling pressured to use a particular surgical technique, approach, or specific type of implant based on a patient request (53%) and that DTCA had an overall negative impact on their practice and their interaction with patients (74%). Opinions regarding DTCA were influenced by surgeon training and demographics.
- Conclusions:** DTCA has the potential to enhance patient education efforts, improve the efficiency of doctor-patient interactions, and encourage treatment compliance among patients with arthritis of the hip and knee. However, the majority of physicians surveyed believe the information contained in DTCA is inaccurate and misleading, which could have a detrimental effect on the quality and efficiency of orthopaedic care delivery and the doctor-patient relationship. Further study is needed to better delineate the risks and benefits associated with DTCA in orthopaedics.

Poster Presentations

Poster #12

Implant Sizing and Female Gender in Total Knee Arthroplasty: Differences between US Manufacturers

Wayne M. Goldstein, MD, **Alexander C. Gordon, MD**,
Jill Jaspersen Branson, RN, BSN

- Introduction:** The introduction of total knee replacements designed specifically for women, suggests that currently available implants may not fit optimally in these patients.
- Methods:** We compared differences between the medial-lateral (M/L) and anterior-posterior (A/P) dimensions of femoral components available from five orthopaedic manufacturers. We also determined the most common femoral and tibial sizes used in our practice on 2,001 consecutive female and 1,650 male knees between 7/19/1996 and 6/1/2006.
- Results:** The most common femoral components used in our female patients were PFC Sigma sizes 3 (M/L=66mm, A/P=61.7mm) and 4 (M/L=71, A/P=65.6mm) (41% each). The A/P dimensions of the Nex-Gen CR implants that corresponded to our most common female sizes were 6mm larger in the M/L measurement. The other femurs with the corresponding A/P diameter were within 1-2mm of the PFC Sigma.
- Discussion:** There is variability between manufacturers M/L size of femoral components in commonly used sizes that may have implications on appropriate fit in female patients.

Minimally Invasive Unicompartmental Knee Arthroplasty: A Comparison of All-polyethylene and Metal-backed Tibial Components

David Fisher, MD, Jeff Almand, MD, David Dalury, MD,
Ricardo Gonzales, MD, Melanie Watts

- Purpose:** This study compares the results of unicompartmental knee arthroplasty with all polyethylene and metal backed tibial implants.
- Methods:** This is a comparative prospective analysis of 142 all-polyethelene and 88 metal-backed tibial unicompartmental knees(UKA) implanted with the same minimally invasive technique. These knees were then compared with 75 metal backed UKA performed through a traditional arthrotomy. The three groups were similar in demographics and knee pathology. Knee scores, range of motion, radiographic analysis, and complications were assessed preoperatively and at 6 weeks, 1, and 3 years postop.
- Results:** While all 3 groups showed significant improvement in knee pain and function scores, the metal backed implants had better knee scores ($p=.037$) and pain scores ($p=.024$) at 1 year but were equal at 3 years. The minimally invasive UKA had better range of motion at 3 years ($p=.026$). Postoperative limb alignment and implant position were similar for the 3 groups. At 1 and 3 years, the incidence of radiolucent zones beneath the tibial implant was higher with all polyethylene implants ($p=.052$), but did not correlate with pain or function ($p=.919$). Complications and reoperations were more frequent in knees with all polyethylene tibial components.
- Conclusion:** While satisfactory UKA results can be obtained with all polyethylene or metal backed tibial implants, better clinical and radiographic results may be obtained with metal backed components.

Poster Presentations

Poster #14

Acetabular Revision Using a Cementless Protrusio Shell: Clinical and Radiographic Analysis at Mid-Term Follow-up.

Thomas Blumenfeld, MD, William Barger, MD

- Introduction:** A common finding in acetabular revision surgery is loss of medial cavitory or segmental bone stock. A cementless protrusio shell that has 6 mm of lateral augmentation is useful in restoring the joint center while at the same time increasing implant to host bone contact. To date no clinical information is available for this component. This study was undertaken to evaluate both implant survivorship and the radiographic ability to restore the joint center.
- Methods:** Using a computerized database 142 acetabular revisions using the Arthropor™ DP+6 revision acetabular component (Joint Medical Products/Depuy Johnson & Johnson, Warsaw, IN) were identified. The patients were operated on from 1991 to 2000. The clinical and radiographic records were reviewed. All patients were followed bi-annually.
- Results:** Implant survivorship is 98% at average 7 year follow-up (range, 5-14 years). Initial radiographic migration of >2mm with subsequent stabilization occurred in 18% of the revisions. There were frequent minor Zone 3 radiolucencies. The joint center was restored to within 5 mm of the contralateral hip in 85% of the revisions. The Harris Hip Score improved in all patients. There have been 9 re-operations: 2 for aseptic acetabular loosening, 1 for deep infection, 2 for femoral revision and 4 head/liner exchanges for recurrent dislocations. The dislocation incidence is 7.8%.
- Discussion:** At mid-term follow-up the survivorship results are excellent, equal to outcomes for revisions using hemispherical shells. With the ability to restore the anatomic joint center in the majority of cases continued use of this component in cases of medial cavitory or segmental defects appears warranted.

Effect of Femoral Head Size and Abductor Mechanism on Dislocation Rate after Revision Total Hip Arthroplasty

Peter Kung, MD, Michael Ries, MD

- Introduction:** Dislocation is a common complication after revision total hip arthroplasty (THA), particularly if the abductor mechanism is deficient. Use of a large femoral head may reduce the incidence of dislocation. However, it is not clear if the large femoral head is effective in controlling dislocation when the abductor mechanism is deficient.
- Methods:** 218 consecutive patients who underwent revision THA were separated into four groups. Group 1 (162 patients) had an intact abductor mechanism and 28mm femoral head. Group 2 (21 patients) had an absent abductor mechanism (trochanteric non union or complete segmental proximal femoral bone loss) and 28 mm femoral head. Group 3 (27 patients) had an intact abductor mechanism and 36mm femoral head. Group 4 (8 patients) had an absent abductor mechanism and 36mm femoral head.
- Results:** The rate of dislocation was 11.7 % for Group 1, 38% for Group 2, 0% for Group 3, and 37.5% for Group 4. Although greater head diameter was associated with a lower dislocation rate, the presence of abductors had a more significant effect (Group 1 vs. Group 2, $p = .001$; Group 3 vs. Group 4, $p = .007$).
- Discussion:** Our results indicate that a 36mm head is associated with a lower dislocation rate after revision THA than a 28mm head. However, the integrity of the abductor mechanism has a more significant effect on dislocation rate than head size. Use of a large diameter head does not appear to reduce the rate of dislocation if the abductor mechanism is absent.

Poster Presentations

Poster #16

Elevation of Serum Cobalt and Chromium Levels in Patients with Metal-On-Metal Resurfacing Hip Prostheses: A 3 Year Follow-up

D. Gordon Allan, MD, B. Parsley, MD, Brad Dyrstad,
Rita Trammell, MD, Joseph C. Milbrandt, MD

This prospective study was designed to monitor serum cobalt (Co) and chromium (Cr) levels in patients following hip resurfacing with the Cormet 2000 device. Serum samples were obtained from subjects at 6 months, 1, 2, and 3 years after surgery. Co/Cr levels were determined by high-resolution inductively coupled plasma mass spectrometry. The study group consisted of 20 males and 15 females with a mean age of 51 years (range 33-66). Levels following device implantation were increased at all follow-up time points when compared to controls. Peak levels were observed at 1 year with the elevations at 3 years trending down, but this decrease was not statistically significant. Long term elevations of serum Co/Cr levels following implantation with the Cormet 2000, as well as other hip resurfacing devices, are of concern and will require additional studies to assess the potential long term health risks of these levels in

Alumina-on-Alumina Bearings in Total Hip Arthroplasty: Clinical Results, Osteolysis, Breakage, and Noise

William N. Capello, MD, James A. D'Antonio, MD, Michael T. Manley, MD

- Introduction:** This prospective, randomized, multicenter FDA study aims to demonstrate efficacy and safety of an alumina-on-alumina bearing system compared to the standard metal-on-polyethylene in total hip arthroplasty.
- Methods:** Patients were randomly assigned to one of three experimental conditions: porous-coated cup with alumina-on-alumina; arc-deposited hydroxyapatite-coated cup with alumina-on-alumina; or porous-coated cup with metal-on-polyethylene bearing surface. A fourth non-randomized group using a modified arc-deposited cup with a preassembled titanium insert was added after original study enrolment was closed. All patients received a hydroxyapatite-coated stem. Demographics of the 452 patients (475 hips) are: 66% male, mean age 53 years, 82% OA, and mean follow-up of 5.6 years.
- Results:** Clinically, 94% of hips have no or slight pain only; 98% no or mild limp; and 96.9 mean Harris Hip Score at four-year minimum follow-up. Four hips have undergone revision for sepsis (three both components, one cup only). Four additional stems have been revised (two post-periprosthetic fracture, one painful leg length discrepancy, and one aseptic loosening at 4.5 years). Radiographically, scalloping in zones 1 or 7 is seen in 2/346 (0.9%) hips with alumina-on-alumina bearings compared to 22/92 (24.4%) metal-on-polyethylene controls. ($p < 0.001$) There have been no fractured alumina inserts or heads, and five hips with alumina-on-alumina bearings reported transient squeaking sounds.
- Discussion:** Alumina-on-alumina bearings have shown excellent clinical results with significantly less proximal osteolysis than metal-on-polyethylene controls. Issues of head/liner fracture and noise have been minimal in this study as well as in the nearly 100,000 ceramic bearings in the U.S. today.

Poster Presentations

Poster #18

The Pre-screening H&P in Elective Total Joint Replacement

E. Michael Keating, MD, **John B. Meding, MD**, Phillip M. Faris, MD, Michael E. Berend, MD,
Robert A. Malinzak, MD, Merrill A. Ritter, MD

- Purpose:** To determine the benefits of the pre-operative H&P in elective total joint replacement.
- Methods:** During 2002 and 2003, 1,805 patients underwent a complete medical H&P in the same hospital-based pre-screening program prior to elective total joint arthroplasty. All peri-operative medical morbidities and mortality was prospectively recorded. Operations included TKR (58%), THR (40%) and TSR (2%). 60% of patients were male. Age averaged 67 years.
- Results:** New diagnoses established as a result of this pre-screening program included CAD (0.2%), CHF (0.6%), valvular heart disease (3.2%), cardiac dysrhythmia (4.3%), COPD (14%), cancer (8.6%), HTN (56%), GI disorder (36.4%), diabetes mellitus (5%), and UTI (3%). Forty-five patients (2.5%) were deemed unacceptable surgical candidates. Patients identified with an increases risk of peri-operative MI or CHF were those with a pre-operative diagnosis of valvular heart disease ($p=0.0077$), CHF ($p=0.0093$), and diabetes mellitus ($p=0.0187$). Notably, the peri-operative incidence death (0.2%) was not statistically different between those patients with or without these established diagnoses.
- Discussion:** This study not only emphasizes the importance of the medical pre-screen relative to elective total joint replacement but also demonstrates the persistent problem of obtaining primary health care delivery even in a major metropolitan area. In spite of the number of new diagnoses established as a result of the medical pre-screen, surgery was eventually performed in over 97% of cases.

Surgical Treatment of Flexion Contractures Following TKA

Thomas Fehring, MD, Susan Odum, William Griffin, MD, Thomas McCoy, MD,
John Masonis, MD, Bryan Springer, MD

- Introduction:** Flexion contractures following total knee arthroplasty are not uncommon. The majority of minor flexion contractures stretch out with time or are of little clinical significance. Occasionally significant (greater than 15 degree) flexion contractures are a source of persistent anterior knee pain and altered gait mechanics. The purpose of this study was to evaluate the efficacy of surgical treatment for painful postoperative flexion contractures.
- Methods:** A Joint Registry review of 819 revision knees identified 16 patients treated surgically for symptomatic flexion contractures > 15° following primary arthroplasty. Preoperative Knee Society scores were compared to postoperative scores. Pain and range of motion values were analyzed separately. A radiographic analysis was also performed to determine joint line position.
- Results:** The average preoperative Knee Society score was 24.7 and the average postoperative Knee Society score was 72.3 (p=.03). The average pain score was 8.6 preoperatively and 38.3 postoperatively (p=.01). Flexion contractures preoperatively ranged from 15-80°, average 32.9°. Postoperatively, residual flexion contractures ranged from 0-20°, average 5.8°. Nine of the sixteen patients had postoperative flexion contractures of 5 degrees or less. Pre-revision, five of sixteen patients had radiographic evidence of under-resection of the distal femur, the remaining eleven patients had F/E gap imbalance clinically.
- Discussion:** The surgical treatment of postoperative flexion contractures has not been previously described. With conservative management most minor flexion contractures resolve with time, however, some remain significant and symptomatic. Significantly symptomatic flexion contractures can be managed successfully by revision surgery. Strategies to prevent this complication at primary surgery must be understood.

Poster Presentations

Poster #20

Publication Rates of Scientific Presentations at the American Association of Hip and Knee Surgeons (AAHKS) Annual Meetings from 1996 to 2001

Eric Lloyd, BA, MS, Jeffrey Geller, MD, Richard Iorio, MD, Richard Yoon,
Michael Huo, MD, William Macaulay, MD

- Introduction:** National orthopaedic subspecialty meetings are a research forum where large volumes of investigations are presented after a peer-reviewed selection process. The objective of this investigation was to determine the publication rate of the scientific presentations at the American Association of Hip and Knee Surgeons (AAHKS) annual meetings from 1996 to 2001.
- Methods:** A Pubmed search was performed on 292 podium abstracts from the AAHKS annual meetings from 1996 to 2001, using both author names and important text words from the title and abstract. Two independent sources validated matching results between abstract and publication. Any discrepancy was deferred to the senior author for a final decision.
- Results:** From 1996 to 2001, 168 of 292 (58%) podium abstracts presented at AAHKS meetings were published. The average time to publication was 21.7 months (± 14.7). The most common journals in which the presented abstracts were published included: Clinical Orthopaedics and Related Research (32%), Journal of Bone and Joint Surgery (29%), and Journal of Arthroplasty (28%). Together, these three journals constituted 89% of the sources in which AAHKS abstracts were published.
- Discussion:** The 58% publication rate for AAHKS ranks as one of the highest for all orthopaedic specialty meetings. This rate validates the selection process, which includes passing numerous review boards, and represents the high quality of research presented at AAHKS. In conclusion, AAHKS meetings are an excellent source for scientific information as reflected by the exceptional publication rate in peer-reviewed reference journals.

No IRB-code because it does not involve patient information

A Randomized Clinical Trial of Mobile-Bearing and Fixed-Bearing (All-Poly Tibia) Cruciate Substituting TKA Designs

Terence Gioe, MD, Neil Johnson, MD

- Introduction:** Mobile-bearing total knee arthroplasty proponents cite potential advantages of diminished backside wear and improved range of motion and/or function, but these advantages have not been demonstrated in prospective comparison. We conducted a randomized prospective clinical trial to compare a mobile-bearing and fixed-bearing cruciate-substituting TKA of the same design.
- Materials and Methods:** Patients 60 years of age or older were prospectively randomized to receive either a cruciate substituting Depuy Sigma® rotating platform (RP) design or fixed-bearing design with an all-polyethylene tibia (APT). The monoblock APT was selected to test a long-term hypothesis regarding nonarticular surface wear in TKA. There were no significant demographic differences between the groups (mean age=72.7; mean ASA score=3; mean BMI= 32.3). Routine clinical and radiographic followup included Knee Society scores (KSS), WOMAC, and SF-36 outcome measures.
- Results:** A total of 180 TKAs in 167 patients (68 AP/112 RP) had at least two-year (mean 39.3 mo) followup. There was no significant difference in preoperative ROM, KSS clinical or functional scores, WOMAC scores, or radiographic measures between the groups. Although there was significant improvement for both groups, there was no significant difference ($p < .05$) in mean postoperative ROM (111° AP/108° RP), mean KSS clinical scores (91 AP/ 90.5 RP), mean KSS function scores (56.5 AP/ 60.6 RP), or mean KSS pain scores (45.4 AP/45.4 RP) at this followup point. There were seven revisions; four for infection (2 AP/2 RP), one for fracture (RP), one for instability (RP), and one aseptic loosening (RP). No patient was lost to followup.
- Discussion:** Both designs functioned equivalently at early followup. There was no significant clinical advantage of the RP design over an APT design in this patient group, and the RP design was more costly (\$1875).

Poster Presentations

Poster #22

Reduction in Early Dislocation Rate with Large Diameter Femoral Heads in Primary Total Hip Arthroplasty

Christopher L. Peters, MD, Jeffrey Jackson, MD, Jill A. Erickson

- Introduction:** Dislocation following total hip arthroplasty (THA) remains a major problem with an estimated rate of 1-10%. Large diameter femoral heads theoretically can reduce dislocation risk, but this has not been confirmed by clinical studies. We performed two studies to investigate the relationship between large diameter femoral heads and postoperative dislocation. The first, we compared dislocation rates in 296 patients who underwent primary THA using either a 28mm or a 38mm head. The second study examined the rate of dislocation in a large series of primary THA with 38-56mm MOM femoral heads.
- Methods:** Study #1: surgeries were performed 1995-2004. 136 patients underwent primary THA with a 38mm, MOM bearing surface via a posterior approach, average follow-up was 28 months (range 18-36). 160 patients underwent primary THA with a 28mm head and either a metal-on-plastic (92%) or MOM bearing (8%) via a Hardinge approach. Average follow-up was 52 months (range 32-106). Study #2: 469 large diameter MOM THA were performed 2001-2004. All procedures were performed via posterior approach with average 36 month follow-up (range 24-46).
- Results:** Study #1: There were no postoperative dislocations (0/136, 0%) in the patients with 38 mm femoral heads. The HHS improved from 58 to 98 ($p < 0.01$) One patient had a post-operative infection and required debridement. Four patients (4/160, 2.5%) with 28 mm heads experienced one or more postoperative dislocations ($p = 0.12$). The HHS improved from 48 to 90 ($p < 0.01$) The four dislocations occurred in patients who underwent Hardinge approaches with metal-on-plastic components; all dislocations were anterior. Study #2: 99% of femoral components and 98.7% of acetabular components remain in place. There were 3 femoral revisions for acute subsidence and 5 acetabular revisions for aseptic loosening (4) and for impingement (1). There were 2 postoperative dislocations (2/469, 0.004%). Average HHS improved from 48-96 ($p < 0.01$).
- Discussion:** There is limited information regarding the effect of larger head sizes on the rate of dislocation. From the first study, our results indicate that the rate of dislocation in primary THA with a 38mm MOM prosthesis via a posterior approach is the same or better than the rate of dislocation with a 28mm articulation via a Hardinge approach with similar improvement in HHS. The results of the second study indicate that MOM THA with femoral head sizes 38-56mm is associated with an extremely low dislocation rate (0.004%) at short-term follow-up.

Do Preoperative Antibiotics Decrease Intraoperative Culture Yield?

Elie Ghanem, MD, Jesse Richman, James Purtill, MD,
Peter Sharkey, MD, Javad Parvizi, MD

- Introduction:** Intraoperative tissue culture remains the “gold standard” in diagnosing periprosthetic infection (PPI). However, an organism is not always cultured and this has been attributed to the fact that preoperative antibiotics were administered. This study intends to examine if preoperative antibiotics prevent isolation of intraoperative organisms.
- Methods:** 91 total joint arthroplasty patients diagnosed with PPI during (1999-2005) and who had positive aspiration culture were included in the study. All intravenous antibiotics that were given to the patient within seven days of surgery were documented. The total number of positive intraoperative fluid and tissue samples of patients who did and did not receive antibiotics was calculated. Susceptibility of the organism(s) to antibiotics was determined by antibiogram of the preoperative and intraoperative culture.
- Results:** 60 out of 91 patients received preoperative antibiotics within seven days of surgery. Antibiotics prevented isolation of an intraoperative organism in 6 out of the 60 (10%) cases. All of the 31 patients who did not receive any preoperative antibiotics had positive intraoperative cultures. Chi-square analysis revealed no significant difference between giving preoperative antibiotics within 7 days and isolating an intraoperative organism ($p=0.068$). Giving antibiotics that specifically targets the culprit organism did not significantly affect the fluid ($p=0.585$) or tissue culture yield ($p=0.152$) either.
- Conclusion:** Our study demonstrated that giving preoperative antibiotics can prevent isolation of intraoperative organisms in 10% of cases. This is not statistically or clinically significant in patients with positive aspiration cultures because the organism is known beforehand. However, it is clinically and medicolegally relevant to withhold antibiotics in patients with negative aspiration cultures since the postoperative treatment antibiotic is tailored according to the organism cultured.

Poster Presentations

Poster #24

Mobile-bearing vs. Fixed-bearing TKA: Results with a cruciate-retaining knee system

Thomas Bernasek, MD, Jennifer Stahl, George Haidukewich, MD

This retrospective study compared 2-5yr results of fixed-bearing(n=115) and mobile-bearing(n=147) TKA. Knee Society score(KSS), passive ROM, functional ROM, and radiographs were reviewed. **Fixed-bearing:** (50M, 65F), averages: age 63(42-71), F/U 4 years(2-5), BMI 32(26-39), post-operative KSS pain 96(85-100), function 79(60-100). Average PROM: 117 degrees(90-125) and average functional ROM: 98 degrees(40-120). Xrays: 15(13%) with incomplete radiolucent lines(11 non-progressive, 4 progressive). **Mobile-bearing:** (80 F, 67 M), averages: age 61(45-78), F/U 3.2yrs(2-5), BMI 31(23-38), post-operative KSS pain 93(86-100), function 76(70-100). Average PROM 120o(85-130) and functional ROM 100o (50-120). X-rays: 18(12.2%) radiolucencies, all non-progressive. No revisions in either group. No significant difference in PROM(p=.076), functional ROM(p=.456) KSS(p=.581), or non-progressive radiolucencies(p=0.495). Fixed-bearing had a higher number of progressive radiolucencies(p=0.023).

Conclusion:

We saw no significant difference in functional outcomes or ROM. Fixed-bearing progressive radiolucencies warrant observation. Passive to functional ROM correlation was 0.88 fixed-bearing, 0.82 mobile-bearing. Both designs demonstrated satisfactory knee scores during this follow-up period.

Isolated Tibial Component Revision with Femoral Component Retention: Defect Management and Clinical Outcome

Michael Berend, MD, Merrill Ritter, MD, John Meding, MD, Phil Faris, MD, Michael Keating, MD,
Rob Malinzak, MD, Michael Meneghini, MD, Jeff Pierson, MD, Andrew Pierce, MD

- Introduction:** Isolated modular polyethylene bearing exchange has met with limited midterm results. Non-modular implants have decreased polyethylene wear but may require complete component revision for aseptic loosening. The purpose of this study is to report the intraoperative findings and clinical outcome for a consecutive series of isolated non-modular tibial component revisions, which has not been previously reported.
- Methods:** A consecutive series of 8598 total knee arthroplasties were done in 5535 patients from 1983 to 2004. 56 knees (0.65%) underwent isolated tibial component revision (24 metal backed-MB, 32 all polyethylene-AP) from 1988 until 2006.
- Results:** The mean time to failure for MB knees was 3.2 years and AP knees 3.0 years. Following revision the mean f/u time for AP cohort was 7.0 years and MB cohort 2.7 years. In the AP group 69% of the knees were revised with a standard metal backed tibial component and for the MB group 70% required a long stemmed prosthesis. Screws and cement were utilized for the majority of defects. No all polyethylene revision required a tibial component augment. Two knees (4%) required reoperation; one for periprosthetic femoral fracture; one for postero-lateral instability. None of the revised tibial components underwent revision for loosening. Pain scores improved from 19 to 42 points and KSS improved from 62 to 87 points following revision.
- Conclusions:** Revision of non-modular tibial components has acceptable component survivorship of 98% at mid term follow-up in contrast to reported failure rates of 25-27% for modular polyethylene exchange. Defects differ between loose all polyethylene and non-modular metal backed tibial components with screws and cement and long stems with augments being the most common techniques utilized for revision of these cohorts respectively. The retained femoral components and revised tibial components demonstrated excellent survivorship and fixation with no subsequent revisions for aseptic loosening.

Poster Presentations

Poster #26

Cementless Acetabular Reconstruction in Primary Total Hip Arthroplasty: Evaluation at a Minimum of Twenty Years

Craig J. Della Valle, MD, Nate Mesko, BA, Laura Quigley, RN, Richard A. Berger, MD,
Aaron G. Rosenberg, MD, Joshua J. Jacobs, MD, Jorge O. Galante, MD

Methods: Two hundred four primary THA's were performed with a porous acetabular component inserted with screws (HG-1, Zimmer). The mean age at the time of surgery was 52 years. At 20 years, 71 patients died and 4 were lost to follow-up.

Results: The mean preoperative Harris hip score of 52 improved to 89 ($p < 0.01$). Nine well-fixed cups were revised (4 for osteolysis, 3 for infection, 1 for instability and 1 incidentally at femoral revision) and 2 were revised for loosening. An additional 17 hips required reoperation for wear of the liner or osteolysis. Four cups were radiographically loose. Kaplan-Meier survivorship at 20 years was 94% (revision for loosening or radiographic loosening) and 86% with an endpoint of reoperation for a problem related to the component. Osteolysis was identified in 38 hips (18.6%).

Discussion: Cementless acetabular reconstruction provides durable component fixation at 20 years with the majority of reoperations related to wear.

Mid-term Follow-up Comparison of a Metal Backed and All-Polyethylene Tibia with Identical Topography.

David Dalury, MD, Donald Pomeroy, MD, Richardo Gonzales, MD, Thomas Gruen, Jeffrey Murphy, Mary Jo Adams, Janene Empson

- Introduction:** This study compared the mid-term results of an all-polyethylene (AP) with a metal backed modular tibial component (MB) with identical surface geometries. This is a retrospective, matched subset of patients evaluated by an independent radiographer.
- Methods:** We compared 74 patients (88 knees) with an AP tibia to a matched cohort with a MB tibia. Average age was 73.6 years, average follow-up was 7.5 years. Knees were evaluated for radiolucencies, osteolysis, complications, survivorship and KSS.
- Results:** There were no significant differences in the KSS between the two groups. X-ray review showed lower instances of osteolysis and radiolucencies in the AP compared to the MB group. These differences however, were not significant.
- Conclusion:** At mid-term follow-up the AP group was comparable or superior to the MB group in a matched cohort. This, in addition to an approximately \$2000 cost savings, makes the AP tibia an attractive option for TKR.

Poster Presentations

Poster #28

In Vivo Wear Of Large Femoral Heads On Highly Cross-Linked Polyethylene

Paul Beaulé, MD, Brad Apsey, MD, John Martell, MD,
Edward Ebramzadeh, MD, Harlan Amstutz, MD

- Introduction:** Highly cross-linked polyethylene has been shown in hip simulator studies to reduce wear by 80% to 90%. In vivo studies have shown a similar reduction in wear for femoral head sizes up to 32 mm. This study evaluated the in vivo wear of a highly cross-linked polyethylene against femoral head sizes larger than 32mm.
- Methods:** Volumetric and linear wear rates were measured in two groups of patients with a median femoral head size of 40mm with use of a validated computer-assisted technique (Hip Analysis Suite Version 7.0). 13 hips received a highly cross-linked polyethylene liner (Longevity, Zimmer) and 13 hips received a gamma radiated in air (conventional) polyethylene liner (PSR, Depuy).
- Results:** With a mean follow-up of 2.64 years, the highly cross-linked polyethylene had mean volumetric and linear wear rates of $117.5 \pm 103.8 \text{ mm}^3$ and $0.15 \pm 0.10 \text{ mm}$ per year, respectively. With a mean follow-up of 4.5 years, the conventional polyethylene liners had mean volumetric and linear wear rates of $375.7 \pm 153.8 \text{ mm}^3$ and $0.36 \pm 0.16 \text{ mm}$ per year, respectively. The volumetric and linear wear rates were 69% ($p < 0.0009$) and 58% ($p < 0.0007$) lower, respectively, in the group with the highly cross-linked polyethylene liner.
- Discussion:** This study showed a clinically significant reduction in wear of highly cross-linked polyethylene when compared to conventional polyethylene for femoral head sizes larger than 32mm. Although our results have demonstrated the significant improvement in wear resistance of the highly cross-linked polyethylene, an increasing head size still appears to increase the wear rate.

Surgical Treatment of Early Wound Complications Following Primary Total Knee Arthroplasty

Daniel D. Galat, MD, Scott C. McGovern, MD, Arlen D. Hanssen, MD,
Henry D. Clarke, MD

- Introduction:** Wound healing problems are a known complication after primary total knee arthroplasty (TKA). However, the rate and sequelae of early wound complications that require surgical treatment following primary TKA are largely unknown.
- Methods:** Between 1981 and 2004, 17,790 primary total knee arthroplasties were performed at our institution. Sixty-seven knees were identified as having early wound complications, necessitating surgical treatment within thirty days of index arthroplasty. Wound complications included dehiscence, skin edge necrosis, superficial infections, delayed healing, or persistent drainage. All cases of deep infection below the fascia were excluded. Surgical treatment included debridement, skin edge excision, primary closure or delayed primary closure.
- Results:** The rate of return to surgery within thirty days for surgical treatment of superficial wound complications was 0.38%. For knees with early surgical treatment of wound complications, the two year cumulative probabilities of undergoing major subsequent surgery (component resection, muscle flap or amputation) or developing deep infection were 9.3% (95% confidence interval 1.9-16.7%) and 8.6% (95% confidence interval 1.1-15.6%), respectively. In contrast, among knees without early surgical intervention for wound complications, the two year cumulative probabilities were 0.6% (confidence interval 0.5-0.7%) and 0.8% (confidence interval 0.6 -0.9%), respectively (p <0.001 for both outcomes).
- Discussion:** Patients requiring early surgical intervention for wound healing problems after primary TKA are at significantly increased risk for developing further complications including deep infection, and/or undergoing major subsequent surgery, including resection arthroplasty, amputation or muscle flap coverage. These results emphasize the importance of obtaining primary wound healing after TKA.

Poster Presentations

Poster #30

Outcome of Total Hip Arthroplasty Using Extensively Porous-Coated Components at 20-year Follow-up

Philip J. Belmont, MD, Sarah E. Beykirch, BS, **Robert H. Hopper, Jr, PhD**, William G. Hamilton, MD, C. Anderson Engh, Jr, MD, Charles A. Engh, MD

Porous-coated total hip arthroplasty (THA) components were introduced with the hope that they would achieve durable biologic fixation. Between October 1982 and December 1984, we performed 223 THAs among 215 patients using the Anatomic Medullary Locking stem and TriSpine cup (DePuy). The mean age at surgery in this consecutive, unselected series was 55 ± 15 years (range 16 to 87 years). Ninety-one patients (93 THAs) with less than 20-year follow-up are now deceased. The mean follow-up for the 130 remaining THAs is 21.1 ± 2.4 years. Forty-seven THAs have required component revisions. In 22 cases, the first revision was limited to a liner exchange for polyethylene wear or osteolysis. Three stems have been revised for aseptic loosening. Owing to the high incidence of wear-related revisions, Kaplan-Meier survivorship at 20-year follow-up, using component revision for any reason as an endpoint, was $75 \pm 7\%$ (95% confidence intervals). In contrast, survivorship using stem revision for any reason as an endpoint was $98 \pm 2\%$ at 20-year follow-up. Survivorship of the porous-coated shell, using cup revision for any reason as an endpoint, was $86 \pm 5\%$ at 20 years. Despite revisions for wear-related complications in this relatively young patient population, the fixation achieved with these extensively porous-coated components remained durable through 20-year follow-up.

Analysis Of Contact Stress At The Post-Cam Mechanism In Posterior Stabilized Total Knee Arthroplasty

Shuichi Matsuda, MD, Yukio Akasaki, MD, Hiromasa Miura, MD, Hidehiko Higaki,
Ken Okazaki, MD, Hideki Mizu-uchi, MD, Yukihide Iwamoto

- Introduction:** This study evaluated contact area and stress of the post-cam mechanism in posterior stabilized total knee arthroplasty.
- Methods:** Five posterior-stabilized prostheses, the TRAC, Alpina, PFC sigma RPF, Scorpio NRG, and NexGen LPS Flex, were examined. A compressive posterior load of 500N was applied parallel to the joint surface with or without lift-off motion at 90, 120, and 150° of flexion.
- Results:** The TRAC and Alpina exhibited the largest contact area at 90°, which decreased with flexion. The PFC sigma RPF had the largest contact area at 150°. The Scorpio NRG and NexGen units had smaller contact area than the others. Contact stress tended to be inversely proportional to contact area. Lifting of the femoral component increased the contact stress of the TRAC and Alpina designs.
- Discussion:** Recent modifications of post-cam designs have increased the contact area, however, none of these prostheses exhibited constant low contact stress throughout flexion.

Poster Presentations

Poster #32

Cobalt and Chromium Ion Levels in Patients with Metal on Metal Hip Resurfacing Prostheses

Paul Kim, MD FRCSC, Heather Hrushowy, Anna Conway,
Paul Beaulé, MD, Michael Dunbar, MD

Sixty patients with a metal on metal hip resurfacing were enrolled in a prospective trial to assess serum, erythrocyte and urine cobalt and chromium ion levels. At one year, median serum cobalt levels were 1.2 ug/l and median serum chromium levels were 2.3 ug/l. The median levels at two years were 1.3 ug/l for cobalt and 3.3 ug/l for chromium. At one year, median erythrocyte cobalt levels were 1.0 ug/l and median erythrocyte chromium levels were 1.3 ug/l. The median erythrocyte levels at 2 years were 0.9 ug/l for cobalt and 0.9 ug/l for chromium. Resurfacing arthroplasty is associated with an elevation of cobalt and chromium ions. There is a strong correlation between serum and erythrocyte cobalt levels but a poor correlation between serum and erythrocyte chromium levels. This emphasizes the need for a standardized method of ion assessment and reporting following any metal on metal hip arthroplasty.

The FDA has not cleared the medical device(s) for the use described in this presentation (Wright Medical Technology: Conserve Plus Resurfacing Hip)

Survival of Hip and Knee Arthroplasty in US Using Medicare Data

Edmund Lau, Steve Kurtz, MD, Kevin Ong, MD

A Survivorship of hip and knee arthroplasty has been investigated for the Scandinavian population with the aid of implants registries [1-2]. This study examines the use of Medicare data to evaluate survival of hip and knee implants. The 5% sample of Medicare claims from 1997 to 2004 was examined for hip and knee arthroplasty claims. Medicare beneficiary ID was used to follow patients longitudinally between primary and revision surgery. During the 8-year study period, 30,600 and 62,882 primary total hip or knee replacements, respectively, were extracted. We further excluded patients with traumatic fractures, bone cancer, HMO enrollees, and those who did not receive both Part A and B coverage. Survivorship was assessed by the Kaplan-Meier and Cox regression methods. Overall, the KM estimate showed that after 8 years since the primary surgery, 93.6% of THA and 96.2% of TKA remained revision-free among the elderly Medicare population. Men had a significantly higher risk of knee revision than women, but no significant gender difference among hip revision. Older patients had a reduced risk of revision as compared with younger patients. This study demonstrated the feasibility of Medicare data as a source of hip and knee implant survival. However, Medicare data is lacking in certain critical information such as the reasons for revision, the design of implants, nor bearing materials employed. These deficiencies could be addressed with a formal US registry and more specific, mandated reporting requirements. The study also identified some interesting and significant differences in prosthesis outcome that warrant further investigation.

References: [1] Malchau et al., CORR, Vol. 441, 2005; [2] Espehaug et al., Acta Orthop, Vol. 77, 2006;

Poster Presentations

Poster #34

Treatment of Severe Acetabular Deficiency Using Modular Trabecular Metal Components

Wayne Paprosky, MD, Scott Sporer, MD

- Introduction:** Acetabular fixation in patients requiring revision total hip arthroplasty who have a non-supportive superior dome and proximal migration of the acetabular component (Paprosky Type III A defect) or who have a non-supportive anterior and posterior column with proximal/medial migration of the acetabular component (Paprosky Type III B defect) cannot be achieved reliably with the use of a hemispherical porous coated component alone. Pelvic discontinuity is frequently encountered in patients with severe acetabular bone loss. Treatment of the discontinuity is dependent upon the remaining host bone, potential for healing of the discontinuity and potential for biologic ingrowth of acetabular components. If healing potential for the discontinuity does not exist, the discontinuity should be bridged and treated with distraction utilizing trabecular metal components with augments.
- Materials and Methods:** 26 patients who had an acetabular reconstruction with the use of a tantalum acetabular component along with a tantalum augment for a Type IIIA or Type IIIB defect between January 2002 and December 2003 were followed annually with clinical and radiographic evaluations. As of the latest follow-up, one patient had died and one person was lost to follow-up. Twenty-four patients with an average age of 61 at the time of the index surgery were evaluated at an average 1.9 years post-op (range 1-3 years). 16 patients had a Type III A acetabular defect while 8 patients had a Type III B acetabular defect.
- Results:** One acetabular component in a Type III A defect required revision due to aseptic loosening. Radiographically, all of the remaining components except one were stable and showed evidence of bone ingrowth. Harris hip scores improved from an average of 34 pre-op to an average 94 at latest follow-up.
- Discussion:** Acetabular revision in Type III A and Type III B defects utilizing tantalum acetabular components along with a tantalum augment show good results at short term follow-up.

Survival Analysis of a Second Generation Contemporary Modular Total Knee Replacement: A Large Multi-center 10-Year Study

Martin Roche, MD, William Barrett, MD, J. Bohannon Mason, MD, Kent Boese, MD, Wayne Goldstein, MD, Jeffrey Murphy, MD

The purpose of this study was to evaluate the mid-term survival results and report on the failures of a second-generation total condylar prosthesis (P.F.C.â Sigmaâ). Compared to its predecessor (P.F.C.â), geometric changes in the femoral component and new sterilization and packaging methods were incorporated into the Sigma system.

A consecutive series of 1970 prostheses were implanted in 1512 patients (920 females and 592 males) between June 1996 and December 1997 at eight sites. The average age of the patients at the time of surgery was 69.7 years (range 31–93 years), 80.1% were PCL retaining, and 96.1% had a diagnosis of OA. Five year post-operative follow-up was available for 1479 cases with a mean of 7.3 years. Kaplan-Meier survival estimates were utilized.

There were 40 revisions for the following reasons: infection (17), osteolysis/poly wear (6), pain (4), instability (4), component loosening (4), bone fracture (3), component malposition (1), and patella tendon rupture (1). The 10-year survivorship estimate was 95.6% (95% C.I.: 93.5-97.6%). Excluding infections the 10-year survivorship estimate was 97.2% (95% C.I.: 95.4 -99.1%). Results were similar for: males and females (97.8% and 96.9% respectively; $p=0.96$); and cruciate retaining and substituting (97.9% and 98.4% respectively, $p=0.37$). However, young patients (<55 years) had poorer survivorship compared to older patients: (96.8% and 98.1% respectively, $p=0.01$).

These mid-term results of the P.F.C. Sigma are similar, if not superior, to those of the first generation P.F.C., however, longer-term follow-up studies are recommended.

Poster Presentations

Poster #36

Back pain and Total Hip arthroplasty: A Prospective Natural History Study

Aidin Eslam Pour, MD, **Javad Parvizi, MD**, Grigory Goldberg, MD,
Peter F. Sharkey, MD, Richard H. Rothman, MD

- Introduction:** This prospective study sought to determine the correlation between low back pain- as identified by patients- before and after THA.
- Methods:** Patients undergoing THA were administered questionnaire containing diagrams on which the patient could draw out the site of their pain preoperatively and postoperatively. The results were reviewed in detail by a hip surgeon, a spine surgeon, and a neurologist.
- Results:** A total of 344 patients were enrolled. 139 patients out of 344 patients (40.4%) had no back pain before and after THA. 170 patients (49.4%) had LBP before surgery which resolved in 63 patients (37%) after THA. 35 patients developed LBP after THA from whom 22 patients were known to have spine pathology.
- Discussion:** Hip and spine arthritis often co-exist. Majority of patients with 'back' pain experience a resolution of their pain following THA. Patients with true LBP may benefit from evaluation of their spine prior to THA.

Screw Fixation of Cementless Acetabular Cups in the Deficient Acetabulum

Marco Bosselmann, Jerry Alexander, **Philip Noble, PhD**, Justin Noel,
Richard Santore, MD, Kenneth Mathis, MD

- Introduction:** Screws are electively used to augment press-fit fixation of modular acetabular shells, particularly when inadequate press-fit fixation is observed intraoperatively. This study examined the effect of dome screws on micromotion and spin-out of press-fit cups in the normal and rim-deficient acetabulum.
- Materials and Methods:** Plasma-sprayed titanium shells were implanted (1mm press-fit) in three groups of 6 identical surrogate models of the acetabulum. Two groups were reamed to 2mm and 4mm less than a full hemisphere to simulate mildly and severely deficient circumferential rim coverage, while the third group, reamed to a full hemisphere, acted as a control. Each cup was cyclically edge-loaded to failure (200 micron slip) with a ramped incremental load (max 1000N). Shell-bone micromotion was monitored with displacement transducers. All experiments were repeated with one and then two dome screws augmenting press-fit fixation.
- Results:** Without dome screws, cup fixation strength was 58% of hemispherical controls in the mildly deficient acetabulum and only 38% in the severely deficient specimens ($193\pm 56\text{N}$ vs. $126\pm 32\text{N}$ vs. $334\pm 71\text{N}$). However, in the mildly deficient group, augmentation with one dome screw increased the resistance to interface motion to 243% of the control value ($810\pm 264\text{N}$), but had minimal effect in the severely deficient cases (38% of control; $127\pm 63\text{N}$). Use of two dome screws increased fixation in the mild group by an additional 18% ($952\pm 118\text{N}$; 285% of controls), but had no supplemental effect on cup stability in the severely deficient specimens ($129.0\pm 38.4\text{N}$; 39%).
- Conclusions:** This study suggests that use of dome screws to augment fixation of cementless cups is highly effective in cases where the rim-deficiency is mild. In cases of severe rim-deficiency, however, addition of screws adds nothing to the press fit achieved without screws. Furthermore, this study suggests that circumferential loss of the bony rim has profound effects on shell fixation, with or without screws.

Poster Presentations

Poster #38

The AAHKS Evidence Based Medicine Committee: Background, Resources, and Charges

Adolph Yates, MD and Brian McGrory, MD on behalf of the AAHKS EBM Committee

Evidence Based Medicine (EBM) is the practice of formulating best care plans for patients based on the systematic analysis of that evidence in the scientific literature that meets pre-determined levels of quality. Many tools have been developed to determine what data is appropriate for inclusion in such meta-analyses as well as how to pull out of such review meaningful guidance for practice (clinical guidelines). Externally developed guidelines and assessments already influence the practicing surgeon; Pay for Performance criteria represent one example of guidelines that ideally are formulated by those within the specialty effected by contribution of the most meaningful and persuasive evidence. This makes an EBM committee a vital part of AAHKS.

The AAHKS EBM Committee is presenting this poster to: 1.) Review the background of the committee; 2.) Outline current resources that are available through AAHKS in the field of EBM; And; 4.) Review the charges given to this committee at the 2006 summer leadership retreat. These charges include education of the membership in EBM nomenclature and process, financial support of a group of members who wish to become EBM experts, ensuring AAHKS participation in AAOS EBM activities pertaining to hip and knee arthroplasty, support for the American Joint Replacement Registry, and overseeing position statements from AAHKS.

AAHKS Research Committee: Medical Malpractice and Related Concerns Among Arthroplasty Surgeons

Sonny Bal MD, Sally York MN, RNC, Jennifer Robbennolt PhD JD, Ashish Upadhyay, MD,
Brian McGrory MD, Steven Teeny MD

Introduction: To investigate how medicolegal litigation and related concerns have affected arthroplasty surgeons, a survey was developed by the Research and Legal Committees of the AAHKS. Outcome data were analyzed to obtain the findings reported here.

Methods: Survey research was conducted according to Dillman's Tailored Design Method, a highly detailed methodology that can obtain >50% response rate from surveys of professional associations. A four-stage mixed mode survey of all AAHKS active members (n=749) was performed during April 2006, consisting of sequential introduction of a pre-notice, actual questionnaire, reminder, and repeat reminder with replacement questionnaire over a period of three weeks. No personal identifying data were gathered.

Results: 422 out of 749 members returned questionnaires for a response rate of 56.3%, and a 95% confidence level with a $\pm 5\%$ sampling error in representing the entire AAHKS membership, calculated from Dillman's survey sample size formula. Responses were entered in SPSS 12.0 for analysis after removing any duplicates, and then coded for data entry.

Demographics: 308(72%) of respondents were in private practice and 76(18%) were in academic practice, and the rest were in other practice settings. 321(79%) members were in group practices with two or more physicians. 245(59%) had completed an arthroplasty fellowship, and 464(89%) performed >100 total joint procedures per year. 325(78%) of respondents had been named as a defendant in at least one lawsuit alleging medical malpractice.

Communication of Adverse Events: 389(90%) of members always or frequently disclosed information about an adverse medical event to their patients, with an explanation. About the same proportion reported expressing sympathy for the adverse event, but fewer (n= 267; 64%) frequently or always apologized for an adverse outcome. 103(24%) believed that a physician apology for an adverse event increased the risk of a lawsuit; 226(54%) believed that it would decrease the risk of a lawsuit. The most common barriers to physician apology were the risk of implied guilt, and the fear of litigation. Still, the majority of respondents believed that physician apology is beneficial in improving relations with the patient and family, and demonstrating empathy, honesty, and integrity.

(continued)

Poster Presentations

Poster #39 (continued)

Outcomes: 298(69%) of lawsuits were dismissed or settled out of court. Settlement of litigation was most commonly motivated by the need to avoid the time and stress related to a civil trial, and to a judicial system that appears to promote settlement. Only 20% of respondents felt that the judicial process was fair, and 41% were dissatisfied or very dissatisfied with the outcome of out of court settlement.

Other Concerns: Alternative dispute resolution forums most favored by respondents were mediation, arbitration, expert panel of judges, and peer review committees. 310(75%) of respondents believed that peer expert witness testimony contributed to an increase in medical malpractice litigation; 241(58%) reported having testified as experts themselves. Nerve injury after arthroplasty and limb length discrepancy were the most common causes for medical malpractice lawsuits in the survey.

Discussion:

The medicolegal concerns of arthroplasty surgeons are relevant since the majority of them have been named as a defendant in litigation, or have testified as experts themselves. Educational and informational programs targeted in these areas are therefore very relevant.

Survey data show that surgeons express empathy and share information following an adverse outcome, but that fear of litigation may preclude genuine apologies and communication with affected patients. Surgeons perceive the judicial process of resolving disputes related to adverse events as unfair, and are dissatisfied with settlement outcomes. These data suggest that legislative efforts to remove barriers to physician apology may be helpful.

Even though the majority of medicolegal litigation ends in settlement or dismissal, surgeons were not satisfied with the judicial process. Alternative dispute resolution forums may therefore offer attractive avenues to resolve adverse surgical outcomes. The value of the present data is in identifying potential targets for surgeon education and awareness, encouraging behaviors known to reduce the incidence of medical malpractice claims, and identifying alternative dispute resolution forums for the adjudication of medical malpractice claims.

On-site Registration Hours

Friday, November 3	Noon – 9:00 pm
Saturday, November 4	6:00 AM – 6:00 pm
Sunday, November 5	5:30 – 10:00 am

All on-site registrants must provide payment (cash, credit card or check) at time of registration.

CME Credit

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 American Association of Hip and Knee Surgeons. The American Academy of Orthopaedic Surgeons is accredited by the ACCME to sponsor continuing medical education for physicians. The American Academy of Orthopaedic Surgeons designates this continuing medical education activity for a maximum of 13 *AMA PRA Category 1 Credits*[™]. Physicians should only claim credit commensurate with the extent of their participation in the activity.

Disclaimer

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Additional Information

Financial Disclosure

Each participant in the Annual Meeting has been asked to disclose if he or she has a financial interest or other relationship with a commercial company related directly or indirectly with the AAHKS Meeting to the subject of their presentation.

The American Association of Hip and Knee Surgeons has identified the options to disclose as follows:

- A. Research or institutional support has been received;
- B. Miscellaneous non-income support (e.g., equipment or services), commercially derived honoraria, or other non-research related funding (e.g., paid travel);
- C. Royalties
- D. Stock or stock options
- E. Consultant or employee
- F. Volunteer board, officer or relevant committee position; Non-paid editor; or ownership by you or your institution of publication, website or other product aimed at the orthopaedic surgeon market.

If a participant has received something of value from a commercial company, an asterisk will appear next to their name in the Program outline. The AAHKS 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 Annual Meeting.

MODERATOR	RELATIONSHIP DISCLOSED	PAPER PRESENTER	RELATIONSHIP DISCLOSED
Jay Lieberman, MD	none reported	Mark W. Pagnano, MD	a – Inova
B. Sonny Bal, MD	none	E. Marc Mariani, MD	none
Arlen D. Hanssen, MD	none	Wei-PingLin, MD	none
Steven J. Incavo, MD	a,e – Stryker Orthopaedics, c – Exactech, Innomed	Michael A. Mont, MD	none
Kevin J. Bozic, MD	none	Lucian Warth, BS	a,c,e – DePuy
Brian S. Parsley, MD	none reported	Thomas G. Ryan, MD	f
David G. Lewallen, MD	a,b,c – Zimmer, b – DePuy a Johnson & Johnson, f	Charles R. Bragdon, MD	a,c – Zimmer, Inc.
Brian J. McGrory, MD	none	Thomas P Schmalzried, MD	a,c,e – Stryker
William J. Robb, III, MD	a,e – BrainLAB, Smith and Nephew	Steven B. Zelicof, MD, PhD	none
Javad Parvizi, MD	a – Stryker Orthopaedics	C.Anderson Engh, Jr., MD	a – Inova Health Care Services, c,e – DePuy, a Johnson & Johnson Company, d – Johnson and Johnson
Terry A. Clyburn, MD	a – Biomet, d – Wright Medical	Christopher A. Jarrett, MD	none reported
William Maloney, III, MD	a-DePuy, Zimmer, Medtromcs, c-Zimmer, Wright Medical	Richard H. Rothman, MD	none reported
Thomas P. Schmalzried, MD	a,c,e – Stryker	Michael B. Vessely, MD	a – DePuy
Thomas K. Fehring, MD	a,c,e – DePuy a Johnson & Johnson Company	Mark W. Pagnano, MD	a – Inova
Mary I. O'Connor, MD	a, c – DePuy, c – Zimmer	David K. DeBoer, MD	a – DePuy
Carlos J. Lavernia, MD	a,c,e – Zimmer	Keith R. Berend, MD	a,b,d,e – Biomet f – JBJS, CORR, JOA, Orthopaedics
Matthew S. Austin, MD	none	Thomas L. Bernasek, MD	a,c,e – DePuy, a Johnson & Johnson Company
William Macaulay, MD	none	Thomas P. Sculco, MD	none
James B. Stiehl, MD	none	J. Bohannon Mason, MD	a – DePuy, a Johnson & Johnson Company
Douglas Dennis, MD	none	Steven H. Weeden, MD	a,e – Zimmer
Michael Swank, MD	a, e – DePuy, e- BrainLAB	R. Stephen J. Burnett, MD	none
Joseph McCarthy, MD	a,e – Stryker Orthopedics, Arthrex, Innomed, e – United Health Care	Javad Parvizi, MD	a – Stryker Orthopaedics
Stuart Weinstein, MD	none reported	Scott T. Ball, MD	none reported

Additional Information

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 Thomas K. Fehring, MD

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 Diane L. Dahm, MD
 Robert L. Barrack, MD
 Richard Kyle, MD

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 Richard Wixson, MD
 Craig Della Valle, MD

EDUCATION COMMITTEE

Peter Sharkey, MD
 Thomas Schmalzried, MD
 Thomas Fehring, MD
 Kevin Bozic, MD

 Arlen Hanssen, MD
 Michael Berend, MD (ad hoc)

RELATIONSHIP DISCLOSED

none
 none reported
 a,e – Stryker, DePuy
 a,c,e – DePuy a Johnson & Johnson Company
 a,e – Biomet
 c,e – Smith & Nephew
 none reported
 a,e – DePuy
 a,e – Zimmer
 none
 c – DePuy Orthopaedics
 a - DePuy
 a,b,e – Stryker Orthopaedics
 none
 a,c,e – Stryker
 none
 a,b,c,d,e – DePuy a Johnson & Johnson Company
 none
 none
 none
 c – DePuy, Zimmer, Encore, Millennium Medical Technologies
 f – Team Ortho, MORE, Twin Cities Ortho Education Assn, Mlps. Med. Research Foundation
 none reported
 none reported
 a,b,e – Zimmer

RELATIONSHIP DISCLOSED

c,e – Stryker, c – Stelkast, Inc.
 a,b,c – DePuy, a,b,c,e – Stryker
 a,c,e – DePuy, f – JRI, COSMA
 a – OREF, e – United Health Group
 none
 a,c,e – Biomet

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 Christopher Peters, MD
 Carl Deirmengian, MD
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 Wayne Paprosky, MD
 Martin Roche, MD
 Javad Parvizi, MD
 Brian McGrory, MD
 Sonny Bal, MD
 David Dalury, MD
 Phillip Noble, PhD
 Matthew Teusink, MD

RELATIONSHIP DISCLOSED

a – Inova
 a – Zimmer
 none
 none reported
 a,e – DePuy a Johnson & Johnson Company
 e – Stryker
 a,c,e – DePuy
 a,c,e – DePuy
 none
 a,b,c,d,e – DePuy
 a – OREF
 none
 a,e – DePuy
 a,e – DePuy, a Johnson & Johnson
 e – Smith & Nephew
 a – Corin USA
 none reported
 a,e – Biomet
 a,c,e – DePuy
 none reported
 a – DePuy
 none
 none
 a,c,e – DePuy
 none reported
 a,b,e – Zimmer, b – Orthobiotech
 a – Wright Medical, Los Angeles Ortho Hosp. Foundation
 b,c – Wright Medical
 none
 a – Inova
 none
 a,e – Wright Medical
 none
 none reported
 e – DePuy
 a – Stryker
 none reported
 none reported
 a – DePuy
 a,c,e – Plus Orthopaedics
 none reported