The American Academy of Orthopaedic Surgeons (AAOS), the American Association of Hip and Knee Surgeons (AAHKS), The Hip Society, and The Knee Society extend sincere appreciation to Exactech, Inc. for their support of this program.

THE FOLLOWING FUNCTIONS ARE SPONSORED BY EXACTECH, INC:

- **FRIDAY EVENING DINNER**
- **SATURDAY MORNING AND AFTERNOON BREAKS**
- **SUNDAY MORNING BREAKS**
POLICIES AND DISCLAIMERS
Policy Regarding The Use Of Human Cadaveric Specimens In AAOS Educational Courses

The value of using cadaveric specimens in AAOS CME courses for the development of surgical skills is too great to abandon their use. However, the risk of transmission of HIV and other bloodborne infectious diseases through these activities may exist. This policy allows all educational course participants to handle cadaveric specimens in the proper setting.

To minimize the possibility of exposure to HIV and other bloodborne infectious diseases, the following procedures must be followed regarding cadaveric specimens and their use at the OLC. These requirements are designed to allow all participants in OLC educational courses to handle cadaveric specimens in a safe, properly equipped environment:

1. Cadavers from which specimens are used must be tested for HIV-Ab. Only specimens from cadavers testing negative for HIV-Ab will be accepted. It is not necessary to document or seek documentation on the medical and social history of individuals used as cadaveric specimens.

Specimens obtained for use in educational courses conducted at the OLC must also be tested for the Hepatitis B virus (HBV). A HBV surface antigen test must be performed on all specimens and all E antigen positive specimens must be rejected for use and discarded. If the specimens do not test positive for HBV surface antigen, then they should be tested for Hepatitis C (HCV) by an antibody test. At this time, no antigen test is available to test HCV.

2. Universal precautions in force for clinical laboratories and the safety standards detailed in the OSHA Regulations on Occupational Exposure to Bloodborne Pathogens must be utilized in dealing with cadaveric specimens (fresh or frozen). The use of fresh or frozen specimens entails greater risk of bloodborne disease transmission than the use of embalmed specimens. For this reason, embalmed specimens are recommended for educational courses utilizing cadaveric specimens conducted at the OLC. The individual(s) responsible for the preparation of the specimens will determine the appropriate embalming process.

3. All participants in educational courses utilizing cadaveric specimens conducted at the OLC must wear safety equipment. Use of this equipment is mandatory; this must be stated in the registration materials for all educational courses conducted at the OLC.

Operators of power saws must use eye protection and a face shield. Because some aerosolization cannot be prevented, the course sponsors must provide adequate site and personal barriers. Use of power saws and drills must be confined to containers or an environment in which aerosolization of dust and fluid particles can be prevented from being inhaled by the operators. Generally, the same personal protective equipment used in surgical procedures should be used in educational courses utilizing cadaveric specimens at the OLC.

4. All protective wear and related disposables, which have been soiled during the course, must be disposed of in designated biohazardous material receptacles. All sharps must be carefully placed into sharps containers at the conclusion of the lab. A biohazardous waste service (under contract with the OLC), will promptly remove these materials from the premises.

5. All course participants are required to sign a waiver of liability before participating in any AAOS course that utilizes cadaveric specimens.

6. A hotel, or similar facility, is an inappropriate setting for surgical skills courses using cadaveric specimens due to the difficulty involved in complying with safety recommendations and requirements. Surgical skills courses utilizing cadaveric specimens are restricted to the OLC or a clinical setting.
General Course Information

Safety Guidelines for Participants in Academy Surgical Skills Sessions Involving Anatomical Specimens

The following guidelines have been developed following consultations with infectious disease authorities and careful review of CDC recommended protective procedures for working with anatomical materials. In order to provide you with a safe working environment, the Academy requires you to follow these precautionary measures when participating in the surgical skills (cadaver) component of this course.

We advise that you regard all anatomical materials as potentially contaminated, and take protective measures as outlined below:

- All participants must wear surgical gowns, gloves, shoe covers, masks and goggles/face shields throughout the entire lab session. These will be provided by AAOS. Each participant will be given a clean gown every day. Your face shield should be used for the duration of the course. Gowns are to be hung on the IV poles, provided at each station, during breaks and lunches. Gloves and shoe covers will be replaced after all breaks and lunches.

- Registrants may observe, assist or perform the procedures under the guidance of the lab instructors provided by the Academy.

- Participants must dispose of all needles, blades and sharp objects in the designated containers located at each station. Lab assistants wearing orange vests will assist you with additional supplies and instrument needs.

- Participants must immediately wash off any anatomical material or blood that may touch their skin. A shower is located in the back south corner of the lab. If a splash occurs please inform your instructor and proceed immediately to the eye wash station at the back of the lab.

- IF A NEEDLE STICK OCCURS, THE FLOOR MANAGER AND LAB COORDINATOR MUST BE CONTACTED IMMEDIATELY. The wound will be cleaned and disinfected. A needle stick form will be filled out and copies of this form along with cadaver information will be made available to the participant.

- At the conclusion of the lab, any outside instrumentation brought to the course will be removed from the work station. Trained technicians will wash and disinfect these instruments. You may pick them up in the prep room on the south side of the lab. It takes approximately 20-30 minutes for the cleaning process.

- All participants must remove and dispose of ALL protective wear in the appropriate infectious waste boxes (RED BAG) before exiting the lab. Gowns and shoe covers are NOT allowed outside the lab area. NO EXCEPTIONS. Please check the floor around your work station for sharps and other contaminated materials.

The Academy will continue to offer sophisticated surgical skills educational opportunities. We need your cooperation to maintain a safe working environment.

February 12, 2002
While it is rare, from time to time, faculty presentations make reference to name-brand products, devices, pharmaceuticals/drugs, or suggest “only one way” to perform a surgical procedure.

In an effort to ensure balance and avoid commercialism, the Academy requests that course faculty use generic terminology in their presentations.

Course Directors are requested to provide commentary and add balance if “name-brands” or “only one way” to perform surgery are included in faculty presentations. Our goal is to avoid commercialism in Academy programs.
Disclaimer and Policy Information

Course Content
The company(ies) providing grants and/or in-kind support for this course were not involved in course planning and did not influence the content of the course in any way.

Disclaimers
The material presented at this course has been made available by the American Academy of Orthopaedic Surgeons for educational purposes only. This material is not intended to represent the only, nor necessarily best, methods or procedures appropriate for the medical situations discussed, but rather is intended to present an approach, view, statement or opinion of the faculty which may be helpful to others who face similar situations.

Faculty are required to disclose whether or not they, or their department, receive something of value from a commercial or other party which relates directly or indirectly to the subject of their presentation. This disclosure is indicated in the course syllabus.

Attendance at courses and surgical skills laboratories does not constitute credentialing.

The AAOS disclaims any and all liability for injury or other damages resulting to any individual attending a course and for all claims which may arise out of the use of the techniques demonstrated therein by such individuals, whether these claims shall be asserted by a physician or any other person.

Some drugs and medical devices demonstrated in Academy courses have FDA clearance for use for specific purposes or for use only in restricted settings. The FDA has stated that it is the responsibility of the physician to determine the FDA status of each drug or device he or she wishes to use in clinical practice, and to use the products with appropriate patient consent and in compliance with applicable law.

Course Policies
Course sessions, food functions, and educational exhibits are for course participants only. We regret that spouses and families are not permitted in these areas.

No reproductions of any kind, including audiotapes and videotapes, may be made of the presentations at Academy CME courses. The Academy reserves all of its rights to such material, and commercial reproduction is specifically prohibited.

To participate in surgical skills courses, you will be required to sign a waiver of liability prior to the course. Academy policy mandates that every individual must wear the protective wear provided by AAOS during the lab sessions in order to participate in this course.

A list of course participants and faculty will be provided to companies that exhibit and provide grants for this course.
FACULTY DISCLOSURE, FDA AND AFFILIATION INFORMATION
Fundamentals of Hip and Knee Arthroplasty for Orthopaedic Residents presented by AAOS/AAHKS/HS/KS (East) - (Product Number 1703074)

Farshad Adib, MD  Faculty (This individual reported nothing to disclose); Submitted on: 10/25/2016

Karl Balch, MD  Faculty (This individual reported nothing to disclose); Submitted on: 04/04/2017

James Andrew Browne, MD  Faculty Submitted on: 04/11/2017
American Journal of Orthopedics: Editorial or governing board
Biocomposites Ltd: Paid consultant
DJ Orthopaedics: IP royalties; Paid consultant
Journal of Arthroplasty: Editorial or governing board
Journal of Bone and Joint Surgery - American: Publishing royalties, financial or material support
OsteoRemedies: Paid consultant
Radlink: Stock or stock Options
Saunders/Mosby-Elsevier: Publishing royalties, financial or material support
Southern Orthopaedic Association: Board or committee member
Virginia Orthopaedic Society: Board or committee member

Nancy Cocalis  Staff (This individual reported nothing to disclose); Submitted on: 04/04/2017

Ronald Emilio Delanois, MD  Director Submitted on: 04/26/2017
cayenne medical: Paid consultant; Paid presenter or speaker
Corin U.S.A.: Paid consultant
Maryland Orthopedic association: Board or committee member

Brian G Evans, MD  Faculty Submitted on: 04/12/2017
Brainlab: Paid presenter or speaker

Gregory Golladay, MD  Co-Director Submitted on: 05/02/2017
American Association of Hip and Knee Surgeons: Board or committee member
Cayenne Medical, Inc: Paid consultant
Editorial Board, Journal of Hip and Knee Surgeons: Board or committee member
Orthosensor: Paid consultant; Research support
Orthosensor, Inc: IP royalties
Orthosensor, Inc.: Paid presenter or speaker; Stock or stock Options
Virginia Orthopaedic Society: Board or committee member

Brian R Hamlin, MD  Faculty Submitted on: 05/04/2017
AAOS: Board or committee member
BodyCAD: Paid consultant
Journal of Arthroplasty, Transfusion: Editorial or governing board
Smith & Nephew: Paid consultant
Fundamentals of Hip and Knee Arthroplasty for Orthopaedic Residents presented by AAOS/AAHKS/HS/KS (East) - (Product Number 1703074)

William A Jiranek, MD Faculty Submitted on: 04/12/2017  
American Association of Hip and Knee Surgeons: Board or committee member  
Cayenne Medical: Paid consultant  
DePuy, A Johnson & Johnson Company: IP royalties; Paid consultant; Research support  
Johnson & Johnson: Stock or stock Options  
Lifenet Health, Inc.: Board or committee member  
Stryker: Research support

Lori Kerwer Staff (This individual reported nothing to disclose); Submitted on: 04/04/2017

Kyle W Lacy, MD, MS Faculty (This individual reported nothing to disclose); Submitted on: 04/05/2017

Dawn Martinez Staff (This individual reported nothing to disclose); Submitted on: 01/04/2017

Susan A McSorley Staff (This individual reported nothing to disclose); Submitted on: 11/18/2016

Ellen Moore Staff (This individual reported nothing to disclose); Submitted on: 04/05/2017

James Nace, DO, PT Faculty Submitted on: 04/12/2017  
Journal of Arthroplasty, Journal of the American Osteopathic Medicine Association, Orthopedic Knowledge Online: Editorial or governing board  
Journal of Knee Surgery: Editorial or governing board  
Stryker: Research support

Ann O'Neill Staff Submitted on: 08/23/2016  
Johnson & Johnson: Stock or stock Options

Michael Lloyd Parks, MD Faculty Submitted on: 02/22/2017  
Orthopaedic Research and Education Foundation: Board or committee member  
Orthopedic Learning Center (OLC): Board or committee member  
Zimmer: Paid consultant; Research support

Nirav K Patel, MD, MS, FRCS (Ortho) Faculty Submitted on: 05/02/2017  
Annals of Orthopaedics, Trauma and Rehabilitation: Editorial or governing board  
Journal of Orthopedic Surgery and Rehabilitation: Editorial or governing board
Public Disclosure Information
for Faculty Members

Fundamentals of Hip and Knee Arthroplasty for Orthopaedic Residents presented by AAOS/AAHKS/HS/KS (East) -
(Product Number 1703074)

Jibanananda Satpathy, MD Faculty (This individual reported nothing to disclose); Submitted on: 04/10/2017

Peter Keyes Sculco, MD Faculty (This individual reported nothing to disclose); Submitted on: 05/07/2017

Ro Simon Staff Submitted on: 11/16/2016
The Association for Bioskills Laboratory Excellence: Board or committee member

Robert S Sterling, MD Faculty Submitted on: 04/04/2017
AAOS: Board or committee member
American Association of Hip and Knee Surgeons: Board or committee member
Journal of Arthroplasty: Editorial or governing board
Journal of Surgical Education: Editorial or governing board
Maryland Orthopaedic Association (BoD): Board or committee member
FDA Clearance Not Applicable
No pharmaceuticals or medical devices will be discussed in this presentation.

- Farshad Adib, MD
- Karl Balch, MD
- Ronald E. Delanois, MD
- Brian R. Hamlin, MD
- Brian G. Evans, MD
- Kyle W. Lacy, MD
- James Nace, DO, PT
- Nirav L. Patel, MD
- Peter K. Sculco, MD
- Jibanananda Satpathy, MD

FDA Clearance: All Pharmaceutical and/or Medical Devices are Cleared For the Use Described

- James A. Browne, MD
- Gregory Golladay, MD
- Michael L. Parks, MD
- Robert S. Sterling, MD

FDA Clearance: All Pharmaceuticals and/or Medical Devices Are NOT Cleared for the Use Described and are Discussed for Off-Label Use

- William A. Jiranek, MD

FDA STATEMENT
Some drugs or medical devices demonstrated at this course may not have been cleared by the FDA or have been cleared by the FDA for specific purposes only. The FDA has stated that it is the responsibility of the physician to determine the FDA clearance status of each drug or medical device he or she wishes to use in clinical practice.

Academy policy provides that “off label” uses of a drug or medical device may be described in the Academy’s CME activities so long as the “off label” use of the drug or medical device is also specifically disclosed (i.e., it must be disclosed that the FDA has not cleared the drug or device for the described purpose). Any drug or medical device is being used “off label” if the described use is not set forth on the product’s approval label.
Dr. Delanois is a board-certified, fellowship-trained orthopedic surgeon who has more than 20 years of experience with complex hip, knee and shoulder reconstructive surgery. He is the division director of the Center for Joint Preservation and Replacement (CJPR) and also the director of the CJPR Fellowship Program. His emphasis is on diagnostic, arthroscopic and joint preserving procedures for the hip, knee and shoulder. He served 24 years in the United States Air Force; for eight years he was the division head of the Adult Reconstructive Service at the Naval Medical Center Portsmouth. Dr. Delanois and his team deliver advanced orthopedic solutions to patients who suffer from a multitude of joint ailments. He has performed thousands of arthroscopic and reconstructive procedures. He is involved with the latest cutting-edge technology that allows the patient to return to a full and active lifestyle in the shortest amount of time.

Dr. Golladay is Associate Professor of Orthopaedic Surgery and Fellowship Director of Adult Reconstruction at VCU Health. He joined the faculty in 2013 after 12 years in private practice in Michigan, following residency training at the University of Michigan and fellowship at MGH. He is Committee Chairman of the Publications Committee of AAHKS and a Board Member of the Virginia Orthopaedic Society. He was a founding member of MARCQI, the Michigan arthroplasty registry. His current research interests include use of nanosensors for quantitative knee balancing and a variety of projects related to quality improvement in TJA. He is pleased to be a part of the Baltimore residents' course for the fourth year and is greatly indebted to the volunteer faculty and the AAOS administrative staff as well as the industry sponsors for their great contributions to this course.
FACULTY

Farshad Adib, MD
University of Maryland Medical Center
Baltimore, MD

Karl Balch, MD
Medical College of Virginia Hospitals
Richmond, VA

James A. Browne, MD
University of Virginia
Charlottesville, VA

Brian G. Evans, MD
Midstar Georgetown University Hospital
Washington, D.C.

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Magee-Woman Hospital
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William A. Jiranek, MD
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Glen Allen VA

Peter K. Sculco, MD
Hospital For Special Surgery
Brooklyn, NY

Robert S. Sterling, MD
John Hopkins University SOM
Baltimore, MD
CME, OBJECTIVES, AND PROGRAM
Fundamentals of Hip and Knee Arthroplasty for Orthopaedic Residents presented by AAOS/AAHKS/The Hip Society/The Knee Society (Baltimore) #3074

Program Objectives:

At the conclusion of this course, learners should be able to:

- Identify the surgical anatomy as it relates to arthroplasty of the hip and knee
- Combine clinical and radiographic information in pre-operative templating of hip and knee Arthroplasty
- Practice exposure of the hip and knee with a variety of approaches
- Formulate strategies for intraoperative decision-making for releasing contractures, maximizing motion and retaining stability of the Arthroplasty
- Manage and avoid postoperative complications following arthroplasty
SCHEDULE

FRIDAY, May 19

BUSES WILL DEPART THE HOTEL AT 3:45-4:00 PM FOR VISTA LAB. PLEASE BE IN THE LOBBY BETWEEN 3:30-3:45 PM. THERE WILL NOT BE ADDITIONAL TRANSPORTATION AVAILABLE AFTER THE BUSES LEAVE.

4:30 pm  Registration and Dinner *(Registration Foyer)*

5:00  Welcome and Course Overview *(Lecture Room)*
Ronald E. Delanois, MD and Gregory Golladay, MD

TOTAL HIP REPLACEMENT
Moderator: Brian G. Evan, MD

5:05  Small Group Case Discussion THA (Basic Principles)
Basic Osteoarthritis
Rheumatoid Arthritis
Osteonecrosis
Discussion Leaders: Drs. Delanois, Golladay, Adib, Balch, Browne, Evans, Hamlin, Jiranek, Lacy, Nace, Parks, Patel, Satpathy, Sculco, Sterling

5:45  Preoperative THA Planning and Templating
Peter K. Sculco, MD

6:00  THA Stem Femoral Design: Fitting the Anatomy
James A. Browne, MD

6:15  Hip Template Session
Session Leaders: Karl Balch, MD
Session Instructors Drs. Delanois, Golladay, Adib, Browne, Evans, Hamlin, Jiranek, Lacy, Nace, Parks, Patel, Satpathy, Sculco, Sterling

7:30  Course Adjourn

7:30  Buses Depart for Hotel
**SATURDAY, MAY 20**

**BUSES WILL DEPART THE HOTEL AT 6:15 AM FOR VISTA LAB. PLEASE BE IN THE LOBBY BETWEEN 6:00-6:15 AM. THERE WILL NOT BE ADDITIONAL TRANSPORTATION AVAILABLE AFTER THE BUSES LEAVE.**

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
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| 7:00 am| Lab Orientation *(Lecture Room)*  
*Ronald E. Delanois, MD and Gregory Golladay, MD* |
| 7:10 am| Surgical Anatomy of the Hip  
*Nirav K. Patel, MD, MS, FRCS* |
| 7:20   | **INTERACTIVE PRE-RECORDED DEMONSTRATION**  
Posterior Approach Hip  
*Robert S. Sterling, MD* |
| 7:30   | **INTERACTIVE PRE-RECORDED DEMONSTRATION**  
Direct Anterior Hip  
*James Nace, DO, PT* |
| 7:40   | **INTERACTIVE PRE-RECORDED DEMONSTRATION**  
Direct Lateral Hip  
*Ronald E. Delanois, MD* |
| 7:50   | Surgical Approaches: A Critique/Faculty Debate  
Moderator: *Gregory Golladay, MD*  
Panelists: *Drs. Delanois, Adib, Balch, Browne, Evans, Hamlin, Jiranek, Lacy, Nace, Parks, Patel, Satpathy, Sculco, Sterling* |
| 8:00   | **HANDS-ON SURGICAL SKILLS LAB (LAB)**  
Surgical Approaches  
Acetabular Preparation  
Lab Leader: *Ronald E. Delanois, MD and Gregory Golladay, MD*  
Lab Instructors: *Drs. Delanois, Golladay, Adib, Balch, Browne, Evans, Hamlin, Jiranek, Lacy, Nace, Parks, Patel, Satpathy, Sculco, Sterling* |
| 10:00  | Refreshment Break/Exhibits *(Lecture Room)* |
10:15  **Small Group Case Discussions THA (Lecture Room)**  
DDH  
Post Traumatic Arthritis Hardware and Deformity  
Childhood Hip Disease  
Evaluation and Treatment of TJA Infection  
Discussion Moderator: Robert S. Sterling, MD  
Discussion Leaders: Drs. Delanois, Golladay, Adib, Balch, Browne, Evans, Hamlin, Jiranek, Lacy, Nace, Parks, Patel, Satpathy, Sculco, Sterling

11:30 Lunch and Panel Discussion

1:00 pm  **HANDS-ON SURGICAL SKILLS LAB (LAB)**  
Femoral Components  
Anatomic Dissection of Hip Specimen  
Lab Leader: Ronald E. Delanois, MD and Gregory Golladay, MD  
Lab Instructors: Drs. Delanois, Golladay, Adib, Balch, Browne, Evans, Hamlin, Jiranek, Lacy, Nace, Parks, Patel, Satpathy, Sculco, Sterling

2:30 Refreshment Break/Exhibits

**TOTAL KNEE REPLACEMENT (Lecture Room)**  
Moderator: James Nace, DO, PT

2:45 Basic Principles of TKA  
Michael L. Parks, MD

3:00  **Small Group Case Discussion TKA (Lecture Room)**  
Indications: Non-Operative Treatment and Preop Considerations  
Limb Alignment and Deformity  
Soft Tissue Balance and Ligament Releases  
Patella Tracking and Resurfacing  
Discussion Moderator: William A. Jiranek, MD  
Discussion Leaders: Drs. Delanois, Golladay, Adib, Balch, Browne, Evans, Hamlin, Jiranek, Lacy, Nace, Parks, Patel, Satpathy, Sculco, Sterling

4:00 Panel Discussion: Perioperative Pain Management  
Multimodal analgesia  
Periarticular injections  
Regional / peripheral anesthesia  
Moderator: Brian R. Hamlin, MD  
Panel: Drs. Delanois, Golladay, Adib, Balch, Browne, Evans, Jiranek, Lacy, Nace, Parks, Patel, Satpathy, Sculco, Sterling
4:30  Unicompartmental Knee Arthroplasty: Rationale and Indications
  Jibananda Satpathy, MD

4:45  Unicompartmental Knee Replacement: Technical and Surgical Principles
  Farshad Adib, MD

5:00  Course Adjourns

5:00  Buses Depart for Hotel
SUNDAY, MAY 21

BUSES WILL DEPART THE HOTEL AT 6:15 AM FOR VISTA LAB. PLEASE BE IN THE LOBBY BETWEEN 6:00-6:15 AM. THERE WILL NOT BE ADDITIONAL TRANSPORTATION AVAILABLE AFTER THE BUSES LEAVE.

PRINCIPLES OF TOTAL KNEE REPLACEMENT (Lecture Room)
7:00 am  PRE-RECORDED VIDEO DEMONSTRATION
Gap Balancing and Measured Resections
Video by James I. Huddleston, III, MD
Moderator: Kyle W. Lacy, MD, MS

7:30  HANDS-ON SKILLS LAB (LAB)
Surgical Exposures
Primary Total Knee
Lab Leader: Ronald E. Delanois, MD
Lab Instructors: Drs. Delanois, Golladay, Adib, Balch, Browne, Evans, Hamlin, Jiranek, Lacy, Nace, Parks, Patel, Satpathy, Sculco, Sterling

OPTIONAL LAB: Knee Templating
Lab Leaders: Gregory Golladay, MD
Lab Instructors: Drs. Delanois, Golladay, Adib, Balch, Browne, Evans, Hamlin, Jiranek, Lacy, Nace, Parks, Patel, Satpathy, Sculco, Sterling

9:30  Small Group Case Discussions (Lecture Room)
Severe Valgus
Extra-Articular Deformity
Previous Hardware
Obesity
Discussion Moderator: James A. Browne, MD
Discussion Leaders: Drs. Delanois, Golladay, Adib, Balch, Browne, Evans, Hamlin, Jiranek, Lacy, Nace, Parks, Patel, Satpathy, Sculco, Sterling

10:30  Panel Discussion: Perioperative Care of the Arthroplasty Patient
Blood Conservation/TXA
DVT Prophylaxis
Physical Therapy
CPM, Cryo Therapy
Risk Optimization
Moderator: Brian G. Evans, MD
Panelists: Drs. Delanois, Golladay, Adib, Balch, Browne, Evans, Hamlin, Jiranek, Lacy, Nace, Parks, Patel, Satpathy, Sculco, Sterling
11:15  Lunch/Exhibits (Registration Foyer/Lecture Room)
Symposium: TKA Complication Avoidance and Management
Wound Closure
Intra-Operative MCL Disruption
Extensor Mechanism Disruption
Moderator: Peter K. Sculco, MD
Panelists: Drs. Delanois, Golladay, Adib, Balch, Browne, Evans, Hamlin, Jiranek, Lacy, Nace, Parks, Patel, Satpathy, Sculco, Sterling

12:30 pm  HANDS-ON SKILLS LAB (LAB)
Advanced and Extensible Exposures
Complete Knee Dissection
Lab Leaders: Ronald E. Delanois, MD and Gregory Golladay, MD
Lab Instructors: Drs. Delanois, Golladay, Adib, Balch, Browne, Evans, Hamlin, Jiranek, Lacy, Nace, Parks, Patel, Satpathy, Sculco, Sterling

3:00  Course Adjourns

BUSES MAY BE AVAILABLE TO THE AIRPORT, PLEASE SEE RO SIMON ONSITE AT THE COURSE.
FRIDAY
Goal of THA

- Durable component fixation
- Stability
- Leg length equalization
- Offset restoration

Preoperative Plan

Key Features of the physical exam
- Abductor function (intact? Questionable?)
- Soft tissue envelope around hip
  - Previous incisions, pannus, skin lesions (psoriatic patch)
- Periarticular contractures
- Pelvic obliquity
- Scoliosis
- Leg length discrepancy (functional)
Steps to Templating

• Measure Leg length difference (LLD)
  – Tear drop to lesser trochanter

• Position acetabular component
  – Cup size 6mm or less femoral head diameter
  – Position along subchondral bone
  – Inferior aspect of cup at teardrop

• Determine center of rotation (COR) of femoral head
• Measure LTC bilaterally
• Size femoral component with 0 head ideally at femoral COR and determine whether standard or high offset is required
  • Measure neck cut from lesser trochanter

Case 1

Things to consider in the OR
1.) how thick is medial wall?
2.) Expected lateral cup uncoverage
3.) Amount and location of osteophyte removal
4.) Acetabular bone quality
5.) Femoral bone quality
Case 2

Pre-Op Plan

1.) Physical Exam Findings
   - Flexion contracture
   - Functional leg length discrepancy
   - External rotation contracture

2.) Expected Operative Findings
   - Consider making incision slightly more posterior
   - Thick medial wall for reaming
   - Large inferior osteophyte

Case 2
Case 5: Reduced Offset Post-op

Thank you!
THA Stem Femoral Design: Fitting the Anatomy

James A. Browne, MD
Associate Professor
Head of Adult Reconstruction
Baltimore Resident Hip and Knee Arthroplasty Course 2017

Femoral Stem Design

- Excellent long term survivorship can be obtained with a number of designs
- Cementless fixation is most common in North America
- Stems differ in geometry and how they obtain initial fixation
- Cemented stems are commonly used in Europe

Requirements for Bone Ingrowth

1. Live host bone (ie. not irradiated)
2. Appropriate material
   - Metal porosity should be 40-80%
     Too much: surface shears off
     Too little: bone doesn’t grow in
   - Pores 50 to 150 microns deep
   - Gaps < 50 microns
3. No motion
   - > 150 microns: fibrous ingrowth
   - Gross motion: fibrous encapsulation
   - Importance of press-fit technique

Remember that “press fit” is a technique (and not an implant design)!

Ongrowth versus Ingrowth

- Ingrowth: multiple surfaces (fiber mesh, sintered beads, porous metals)
- Ongrowth: grit blasting or plasma spraying

Hydroxyapatite

- Plasma sprayed onto implant (or over porous coating)
- Osteoconductive
- Interface strength can be a concern
- Optimal thickness is around 50 µm
- Clinical studies have failed to show a difference

Disclosure

- Consulting: DJO Surgical, Biocomposites, OsteoRemedies
- IP/Royalties: DJO Surgical
- Stock Options: Radlink

My full disclosure can be found on the AAOS website as part of the AAOS Orthopaedic Disclosure Program (http://www7.aaos.org/education/disclosure/search)
**Stem Designs**

- **Single Wedge (“Blade”)**
  - Flat and thin
  - Engage bone medial to lateral
  - Rotational stability due to broad flat shape
  - Proximal ingrowth surface
  - Collarless
  - Broach only

- **Double Wedge (Fit and Fill)**
  - Cortical contact in two planes: AP and ML
  - Metaphyseal filling
  - Proximal ingrowth surface, may be ongrowth distally
  - May have spines to engage distally
  - Ream and broach preparation

- **Single Versus Double Taper**

- **Spines, Flutes, Slots**
  - Reduce modulus of elasticity
  - Flutes may provide rotational stability

- **Conical Stems**
  - Long, consistent conical taper
  - Fins provide rotational stability
  - Ream only (cone within a cone)
  - Provides freedom in controlling version
  - Basis for revision stems
Tapered Stems
- Long, consistent taper
- Three point fixation

Three Point Fixation
- Anteriorly in midportion
- Posterior proximally and distally

Fully Porous Cylindrical Stems
- Engage cortical bone in the diaphysis
- Proximal collar transfers forces to calcar (enhances stability?)
- Distal reaming and proximal broaching
- Large diameter CoCr stems associated with thigh pain
- Can bypass compromised metaphysis

Modular Stems
- Separate components for metaphysis and diaphysis with independent preparation
- Combination of proximal and distal fixation
- Diaphyseal reaming with proximal machining
- Uncouple version from fixation

Modular Neck Stems
- Allow for greater control of version and offset
- Fallen out of favor due to concerns about corrosion and breakage

Short Bone Conserving Stems
- High prevalence of malalignment, subsidence, and fractures have been reported in a subset of designs
Dorr Classification

Khanuja et al, JBJS 2011

Dorr A: Beware the Blade Stem

Deformities

Deformities

Template! And Get Lateral!
Don’t Forget Cement!

• Lower fracture risk in osteoporotic patients
• Dorr C bone
• Deformity
• Hemiarthroplasties

Cuts the fracture risk by an order of magnitude!

Cemented Femur Design

• Avoid flexible materials (titanium) - less bending stress on cement mantle
• Avoid sharp edges
• Compress cement
• Precoat or roughened: higher rates of failure and osteolysis - causes cement/bone interface to preferentially fail

Thanks

jamesbrowne@virginia.edu
What is Templating?

- Looking at imaging to plan the surgery for joint replacement.
- Helps plan what implants to use
- Helps plan sizing for the implants
- Gives you an idea what to expect.

Why Template?

- Reduce surgical time.
- Plan for appropriate implants / sizing in the community.
- Plan cuts, slope, augments, constraint, bone graft, etc...
- Help restore hip center, offset, and leg length in hips.
- Helps identify intra-op problems or deviations.

Knee Templating

3 Main Goals of Knee Templating

- 1. Calculate critical angles and measurements
- 2. Sizing of components on lateral image
- 3. Ensure appropriate size on AP imaging (no overhang/underhang)
Standard Radiographs:

- Need standardized Radiographs for templating.
  - Can supplement with Merchant/Sunrise, Full length views, obliques, CT scan, Bone scan, MRI.

Measurements:

- Note varus / valgus
- Tibfem angle used to eval coronal deformity.
- Distal femoral cut = femoral resection angle = Difference Mech axis and anatomic axis.
  - Some people just cut 5 degrees every time.
- AP XR used to evaluate M-L osteophytes / defects.
- Lateral used to eval posterior phytes, evaluate slope, patellar height, and erosive defects.

Measuring Slope:

- Allows you to predict tibia slope cut.
- Nml slope 5-15.
- Restore native slope in CR, Less slope in PS to prevent post impingement.

Size Templating for TKA

- A-P diameter of femur and tibia on lateral most important for dictating size.
- Anterior flange should align with anterior femoral cortex.
- Restore posterior condylar offset.
Size Templating for TKA

- Check the sizes from your lateral templating on AP to make sure there is not overhang or undersizing on the AP.

- Main role of AP image is to cross check the M-L sizing from your lateral templating.

Lets Practice!

First Tibia for sizing.

Overhang!
3 Main Goals of Hip Templating

1. Calculate leg length discrepancy and plan offset.
2. Sizing and placement of cup first.
3. Sizing and placement of stem next.

Standard Radiographs:

- Need standardized Radiographs for templating.
  - Can supplement with full length, frog-lat, cross fire lateral, Judet, Inlet-outlet, CT scan, MRI/MARS.
  - Using lateral to template helps avoid pitfalls.

Measurements

- Leg Length Discrepancy
- Predicted cup version.
Acetabular Templating: 40 +/- 10

- Will affect leg length, offset, joint forces.

Sizing and Placement of Cup

- Medial border of cup should approximate the ilioischial line and lie close to the teardrop

Templating Femoral Component

- Next place femoral component.
- Size for good M-L fit.
- Look at fit against cortex.
- Red Dots will determine planned length and offset

Decreased Offset  
Increased Offset  
Increased Length  
Decreased Length
Let’s Practice!

Most common hip errors!

- Excessive Lengthening ~3.5mm
- Incomplete medialization cup
- Offset discrepancy
Thanks for your Attention

Now You Try It!

• Opportunity to use the software to practice templating.
• Faculty will walk around and assist groups.
• Remember TKA: Template sizing on lateral, Anterior flange on anterior cortex, restore posterior condylar offset. Check AP for M-L sizing.
• Remember THA: Template Cup first, medialize to tear drop, femoral component size to M-L and adjust offset and lengthening.
SATURDAY
Objectives
1. Review relevant and important structures as it relates to surgical approaches to the hip
2. Understand the potential complications associated with these anatomic structures
3. Review/discuss figures of hip anatomy

Outline
- Posterior
- Anterolateral – Watson-Jones
- Direct lateral – Hardinge
- Direct anterior – Smith-Petersen

Basics
- ‘Coxa’
- Ball and socket (diarthrodial) articulation
- Synovial
- Stability is primarily based on bony architecture
  – Soft tissue
Pelvic ossification
- Appear in-utero
- Ilium, ischium and pubis fuse 7-9 years
- Triradiate cartilage fuses 20-25 years

Femoral ossification
- Femoral head appears 4-6 months
- Fuse 14-18 years

‘Vinegar cup’
Posterior Approach

AKA Moore or Southern approach

Blood supply

Nerve supply

Posterior Approach: KEY POINTS

- **No internervous plane:** gluteus maximus split (inferior gluteal n.)

- **Dangers**
  - *Sciatic n.* - can be damaged by excessive retraction or stretching of the nerve during leg lengthening procedures
  - *Medial femoral circumflex arterial brs.* - forms the cruciate anastomosis within quadratus femoris and can bleed
  - *Inferior gluteal a.* - under the piriformis, branches inevitably split with gluteus maximus
Posterior Approach

• Incision:
  - 10-15cm curved, just posterior to GT
  - 50% above/below GT

Anterolateral Approach
AKA Watson-Jones approach
Watson-Jones Approach: KEY POINTS

- No true internervous plane: TFL and glut med (sup glut n.)

- Dangers
  - Superior gluteal n. - injured by developing a plane up to the muscle origins on the ilium as SGN enters TFL
  - Superior gluteal a. - branches of the SGA cross the interval between TFL and gluteus medius and should be ligated
  - Femoral n. - most lateral structure in femoral triangle and can be injured by excessive medial retraction/retractors
  - Femoral a./v., profunda femoris a. - at risk from incorrectly placed retractors that pierce iliopsoas

Watson-Jones Approach

- Incision:
  - 2.5cm posterior and distal to ASIS
  - Centered over GT, 5cm distal
Direct Lateral Approach

AKA Hardinge or Transgluteal approach

Direct Lateral Approach: KEY POINTS

- **No true internervous plane**: split gluteus medius (sup glut N.) and vastus lateralis (femoral N.)

- **Dangers**
  - **Superior gluteal N.** – runs between gluteus medius and minimus 3-5cm proximal to GT, limit proximal gluteal split
  - **Femoral N.** - most lateral structure in neurovascular bundle of anterior thigh, keep retractors on bone

Direct Lateral Approach

- **Incision**:
  - Centered over GT
  - 5cm proximal to GT
  - Approximately 50% above/below GT
Direct Anterior Approach
AKA Smith-Petersen approach

Anterior Approach : KEY POINTS

• Internervous plane:
  – sartorius (femoral n.) and TFL (superior gluteal n.)
  – rectus femoris (femoral n.) and gluteus medius (superior gluteal n.)

• Dangers:
  – Lateral femoral cutaneous a. - retract medially during superficial dissection
  – Ascending branch of lateral femoral circumflex a. - found below deep fascia on medial side of TFL
  – Femoral n. and femoral a. - can be at risk if the dissection is out of plane or with excessive retraction

Direct Anterior Approach

• Incision:
  – 1cm distal and 1cm lateral to ASIS
  – 8-10cm towards lateral patella

Anteriorly adipose tissue
Posteriorly small vessels
Incise fascia over the TFL
Approach the deep layers from within the sheath
– Minimizes the risk of lateral femoral cutaneous n. injury

Capsular release
Short external rotator release

Be careful with the TFL
Retractor/manipulation/levering can damage muscle
Avoid by releasing fascia

Conclusion
Know your anatomy!
– Intervals and planes
– Dangers

Multiple approaches, each may be effectively used
Once overcome “learning curve” outcomes are similar between approaches
It is not the approach, it is the exposure and surgery!

Thank You
Direct Anterior Learning Curve
IT is better from the Front!

James Nace, DO, MPT
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The Rubin Institute for Advanced Orthopedics Sinai Hospital
Assistant Professor Orthopedic Surgery PCOM
AAOS/AAHKS Fundamentals of Hip and Knee Arthroplasty
May 20, 2017

Objectives
1. Understand the potential complications, disadvantages, and advantages associated with the direct anterior approach
2. Become familiar with operative techniques of the direct anterior approach
3. Review video of the direct anterior approach

Reasons to consider the DA
• Muscle Sparing approach
  – Does Not violate the gluteus muscles

Disclosures
Institutional support from Stryker
Peer Reviewer:
2. Osteopathic Medicine Association
3. Orthopedic Knowledge Online
4. Journal of Knee Surgery

2010 AAHKS Survey
• Percentage of surgeons using DA-doubling each year
  – 2008—5%
  – 2009—9%
  – 2010—16%
  – 2017 >=50% Specialty day AAOS

Reasons to consider the DA
• Muscle Sparing approach
  – Doesn’t violate the gluteus muscles

Comparison of Minimally Invasive Direct Anterior Versus Posterior Total Hip Arthroplasty Based on Inflammation and Muscle Damage Markers
Patrick F. Bergin, MD1; Jason D. Doppelt, MD2; Curtis J. Kephart, MD3; Michael T. Benke, MD3; James H. Graeter, MD4; Andrew S. Holmes, MD5; Hana Haleem-Smith, BS5; Rocky S. Trunk, PhD6; Anthony S. Unger, MD7
J. Bone Joint Surg. AM., Aug 2011; 93 (15); 1392-1398
Direct Anterior Results

<table>
<thead>
<tr>
<th>Author (year)</th>
<th>Patients (hips)</th>
<th>Comparison group</th>
<th>Follow-up</th>
<th>Outcomes</th>
<th>Specialized Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goebel et al. (2011)</td>
<td>100 (100 hips)</td>
<td>Transgluteal</td>
<td>1 year</td>
<td>Less post-operative pain, shorter length of stay</td>
<td>No</td>
</tr>
<tr>
<td>Bremer et al. (2011)</td>
<td>25 (25 hips)</td>
<td>Transgluteal</td>
<td>1 year</td>
<td>Less soft tissue damage</td>
<td>Fx table</td>
</tr>
<tr>
<td>Woolson et al. (2009)</td>
<td>231 (247 hips)</td>
<td>Lateral</td>
<td>0.5 to 20 months</td>
<td>91% free of major complications</td>
<td>Fx table</td>
</tr>
<tr>
<td>Maffiuletti et al. (2009)</td>
<td>17 (17 hips)</td>
<td>Posterior</td>
<td>Mean 6 months</td>
<td>Less stiffness in Anterior group. Similar pain, gait, for at 6 months</td>
<td>No</td>
</tr>
<tr>
<td>Alecci et al. (2010)</td>
<td>221 (221 hips)</td>
<td>Lateral</td>
<td>3 months</td>
<td>Lower blood loss, length of stay, and postoperative pain</td>
<td>No</td>
</tr>
<tr>
<td>Mayr et al. (2009)</td>
<td>16 (16 hips)</td>
<td>3 months</td>
<td>Superior foot analysis between 6-12 weeks</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Restrepo et al. (2010)</td>
<td>100 hips</td>
<td>Lateral</td>
<td>2 years</td>
<td>Higher HHS and higher daily activity scores in DA group at 2 years, no dif. at 2 years</td>
<td>No</td>
</tr>
<tr>
<td>Jewett et al (2011)</td>
<td>800 no</td>
<td>2 years</td>
<td>Intraop fx/perf early on, wound healing problems prevalent</td>
<td>Fx table</td>
<td></td>
</tr>
<tr>
<td>Bhandari et al. (2009)</td>
<td>1152 (1277 hips)</td>
<td>No</td>
<td>3 to 36 months</td>
<td>97.3% survivorship</td>
<td>Fx table</td>
</tr>
<tr>
<td>Matta et al. (2005)</td>
<td>437 (494 hips)</td>
<td>No</td>
<td>Minimum 3 months</td>
<td>No revision due to dislocations</td>
<td>Fx table</td>
</tr>
</tbody>
</table>

Reasons to consider the DA

• Improved Short Term Outcomes
  - Anterior Approach
    - Improved early function
    - Increased stability
    - Proximity
    - Quicker rehab
    - Less rescue meds
    - Improved gait

• More difficult
• Not a new procedure, but a new way

Our Learning Curve - 1st 50 pts

<table>
<thead>
<tr>
<th>Complication</th>
<th>Incidence (case number)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Femoral Perforations</td>
<td>2</td>
</tr>
<tr>
<td>Trochanteric Fracture</td>
<td>1</td>
</tr>
<tr>
<td>Calcar Fracture</td>
<td>0</td>
</tr>
<tr>
<td>Over-reamed Anterior Wall</td>
<td>1</td>
</tr>
<tr>
<td>TFL Injury &gt;50%</td>
<td>1</td>
</tr>
<tr>
<td>Hematoma</td>
<td>1</td>
</tr>
<tr>
<td>Case of Numbness &gt;6 wks</td>
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<tr>
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</tr>
<tr>
<td>Dislocations</td>
<td>0</td>
</tr>
<tr>
<td>Post-operative Subsidence</td>
<td>1</td>
</tr>
</tbody>
</table>
Cortical Perforation

Learning Curve

- Blood Loss
  - Cases 55 to 70 = mean 614ml (range, 300 to 1400)
  - Cases 70 to 100 = mean 480ml (range, 300 to 800)

- Surgical Time
  - Cases 55 to 75 = mean 159 minutes
  - Cases 75 to 100 = mean 117 minutes

Be Prepared

“Fortune favors the prepared mind”
- Louis Pasteur

Patient Selection

- Choose routine cases
- Thin patients are ideal
  - Avoid the pannus
  - Muscular and obese
- Template-look at soft tissue!
- BMI < 32.5
- Valgus neck
  - Avoid short coxa vara, overhanging troc

Increased Complications in Obese Patients Undergoing Direct Anterior Total Hip Arthroplasty

- Obese (BMI >30) pts w/ DA approach
  - 8.8 times increase in major wound Cx
  - 3.6 times increase in minor wound Cx
  - Significant increases:
    - operative time
    - use of narcotics
    - use of assistive devices, and length of stay

Patient Positioning

- Supine, with or without table
- Fluoro assisted
  - For confirmation
- Computer Nav
Approach
• Incision centered along TFL
• Palpate the interval anteriorly

Intermuscular Approach
• Incise fascia over the TFL
• Approach the deep layers from within the sheath
  avoids LFCN injury

Approach
• Retractors around the superior and inferior neck
  stretch the vessels
• Cauterize and release the fascia distally

Approach
• Anteriorly adipose
• Posteriorly small vessels

Intermuscular Approach
• Ascending branch of lateral circumflex artery
  – Between rectus and gluteus medius
  – Beneath fascia

Capsulectomy vs. Capsulotomy
• Perform a high capsulotomy to retract inferior flap
• Release the iliofemoral ligament along the neck
Neck Resection

- Very difficult to dislocate the hip
- In situ neck osteotomy
  - “Napkin ring”- double osteotomy
  - Single osteotomy and corkscrew on power

Acetabular Exposure

- Inferior capsule
- Orientation
  - Identify TAL
  - Bony landmarks

Acetabular Preparation

- Ream direct visualization
  - +/- Offset reamer
    - Fluoro check

Acetabular Preparation

- Tendency towards anteversion-lower hand

Acetabular Prep Video

Fluoro
**Femoral Exposure**
- Difficult part of the case

**Femoral Position**
- Externally rotate, extend and adduct
- Same maneuver w/ or w/o special table
  - Mayo stand for nonop leg

**Femoral Position**
*Retractors support your exposure- do not lever

**Femoral Exposure**
- Releases allow for translation

**Capsule&Piriformis**

**Releases**
- Capsular release
  - Carried out with a bovie
  - View the medial aspect of the trochanter
- Piriformis and obturator internus as needed
- Preserve obt. ext.

**Femoral Preparation**
- Remove retained neck
- Enter the canal bluntly
  - Place the first broach without impaction
  - Orient yourself to femoral position
  - Avoid breaching posteriorly

*If difficult check with fluoroscopy*
**Femoral Exposure**
- Broaching technique: medial to lateral

**Femoral Prep Video**

**Femoral Preparation**
- Femoral version – align with posterior cortex
  - Reference the epicondyles.
- Avoid an undersized femoral component (there is a tendency to go small)

**Trial Reduction**
- Perform a trial reduction with the final broach
- Assess leg length, component size and position

**Femoral Implantation**
- Don’t let down your guard
  - Soft tissues push into anteversion
  - Inserter may hit trochanter
  - Offset inserter or by hand

**Femoral Preparation**
- Be careful with the TFL
  - Retractor manipulation and levering can damage muscle
- Avoid by releasing fascia
**Anterior approach in THA improves outcomes.**

- Multimodal pain, rapid rehab protocol, and direct anterior approach has lead to decreased LOS, quicker recovery/return to unassisted ambulation
- Reduced soft tissue damage, pain, and risk of dislocation with early elimination of hip precautions
  - No Resisted hip flexion and hip precautions for 6 weeks.
- Less muscle damage and earlier return to function
- Increased blood loss early on
  - Now using TXA +/- bipolar sealant cautery
- There is a learning curve

**A Prospective Randomized Clinical Trial in THA - Comparing Early Results Between DAA and Posterior Approach.**

- No difference between DAA (n = 35) and PA (n = 37)
  - 10-meter walk test, EuroQoL, and radiographic analyses.
- Subgroup analysis for surgeon 1 identified that the DAA group
  - Shorter stay, less postop opiate, and smaller wounds.
  - BUT increased OR time, higher blood loss, weaker hip flexion @2, 6 weeks.
  - 83% incidence of lateral femoral cutaneous nerve neuropraxia @ 12 wks
- No neuropraxias occurred in the PA group.
- Approach for THA should be based on patient factors, surgeon preference, and experience

**A comparison between the direct anterior and posterior approaches for total hip arthroplasty-the role of an ‘Enhanced Recovery’ pathway**

- No difference in clinical outcomes between DAA and posterior approach
- Significantly higher rate of periprosthetic femoral fractures-even in experienced hands.

**Conclusion:**

- Once overcome “learning curve” outcomes are similar between approaches at 1 year.
- Rise in popularity of DA
- Recent literature-results debatable
- Fluoro
- It is not the approach, it is the surgery!

**Thank You**
References


Total Knee Arthroplasty. How to do a Great TKR

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Weill Medical School of Cornell University
New York, New York

Disclosures

• ZimmerBlomet, Consultant
• OREF Board of Trustees
• OLC Board of Directors
• NYSSOS Board of Directors

Incision

• Midline longitudinal skin incision
  - Incorporate previous incisions, if necessary
• MIS
  - Short medial arthrotomy
  - Midline longitudinal preferred but can be midvastus

Exposure

• Subperiosteal medial tibial dissection
• Small excision anterior femoral synovium
• Fat pad excision
• Osteophyte removal

Proximal Tibial Resection

• Extramedullary guide
• Perpendicular to long axis of tibia
• Check resection depth
• Assess resection

Distal Femur Preparation

• IM Alignment Rod
• Anterior Rough Cut Device
• Set along epicondylar axis, Whiteside line and Posterior femoral condyles
• Make resection, avoid anterior notching
**Distal Femoral Valgus Resection**

- Set distal cutting guide 4 degrees of valgus (3 degree error permits a 1 to 7 degree acceptable range)
- Choice of optional proximal resection 5 mm proximal to standard for flexion contracture
- Sometimes necessary to run saw twice to get a smooth surface cut

**Size the Femur**

- Go usually to lower size if between sizes
- Account for femoral posterior condyle bone loss in valgus knees
  - If gauge is very close to bigger size, try it first to preserve bone.
  - Can always resect more later.

**Femoral Chamfer and Fixation Hole Preparation**

- Set guide with Anterior reference
- Adjust mediolateral position
- Anterior and posterior condylar resections
- Anterior and Posterior Chamfers
- Central Notch Chamfer
- Medial and Lateral fixation holes

**Remove menisci, cruciates and osteophytes to prepare gaps**

**Gap assessment with blocks**

**BALANCING THE VARUS KNEE**

- Items for consideration:
  - Fixed versus flexible
  - Tightness:
    - Flexion
    - Extension or both!
  - Osteophytes tighten MCL
  - Bone Loss medially
  - Subluxation and or effect upon rotation
**Varus Ligament balancing**

**Valgus Ligament balancing**

1. Release ITB off Gerdy’s tubercle
2. Stepped cut release of ITB and posterior Arcuate ligament complex
3. Lateral Osteophytes
4. Lastly LCL off Femoral condyle (Lateral flexion instability)
5. Try to preserve popliteus tendon to preserve lateral instability in flexion

**RELEASES IN THE VALGUS KNEE**

- Minimal medial dissection / release
- Tibial resection:
  - The larger the deformity the less tibial resection required

**RELEASING IN THE VALGUS KNEE**

- Laminar spreader is the best device
- Pie-crusting of the posterolateral capsule and arcuate complex
- Leave the popliteus intact if possible.
  - Can result in flexion instability
- Ranawat Release

**Soft Tissue Balancing**

Which structures can be released to increase the lateral space:
- **PCL**: Flexion and Ext Gap
- **IT Band**: Extension Gap
- **LCL**: Extension & Flexion Gap
- **Popliteus**: Flexion Gap

*Definition ofSoft Tissue Balancing by Amar and Chit Ranawat et al, JBJS 2005*
**Peroneal Nerve**

"The mean nerve to bone distance was 1.49 cm (0.91-2.18 cm). These results suggest that the peroneal nerve is adequately protected at the posterolateral corner of the knee but that the “pie crust” release should be performed carefully."

**Soft Tissue Balancing**

**The Flexion Contracted Knee**

- Remove Osteophytes
- Possible -2mm addition distal resection
- Release Posterior Capsule
- Try Not to Downsize - Increases flexion gap

**Excision of notch bone and chamfer**

**Tibial Preparation**

- Check tibial tubercle
- Posterior tibial cortex
- Ankle mortise
- Try to avoid line to line fitting to prevent soft tissue pinching and impingement postoperatively
Trial Reduction
Must have clear space between lateral femoral condyle and lateral tibial plateau to avoid medial rotation of the tibial component.

Final Osteophyte Removal

Patellar preparation
Measure before and after dimension. Remove what you will replace. With thin patellae, conserve at least 12 – 14 mm bone to prevent stress fracture. Resection done free hand or by cutting guide.

Check Patellar tracking
No touch technique.
Lateral Retinacular Release with preservation of superlateral geniculate artery.

Final Implantation with Cement

Closure of wound
- Tranexamic Acid
  - 3 grams Topical
- Closure of arthrotomy
- Release tourniquet after arthrotomy closure
- Staples for skin closure
  - Possible subcuticular monocril with Glue and Aquacel dressing in certain circumstances.

Perioperative Care
- Epidural Anesthesia for 2 days and Saphenous Nerve Block
- CPM 6 hrs/day with plexipulse foot pumps
- Twice Daily Physiotherapy
- Coumadin prophylaxis INR 1.6-1.8
- Autologous Blood Transfusion if < 8.0
Rationale: UKA
- Attractive alternative to osteotomy and TKA
- First arthroplasty for young and last for elderly
- More retained native bone
- Retained ligaments
- Smaller incision and less pain
- Earlier return to function with better ROM
- Easy conversion to TKA with similar outcomes
- 10 yr survival over 90% and 20 yr survival over 80%

Case Discussion
- 47 yr. old active healthy construction worker
- BMI 36
- Anterior and medial knee pain
- Denies instability
- 0-120 degree ROM
- No FFD, Varus of 11 degrees

Indications for Medial UKA
- Classic indications - AMOA and AVN
- Kozin and Scott Criteria
  - Age less than 60
  - Body weight more than 181 lb
  - Inflammatory arthritis
  - ACL deficiency
  - Uncorrectable Anatomic varus more than 5
  - Valgus of more than 10
  - FFD of more than 5 degree
Case discussion

- 44 yr f with hx of gastric bypass, BMI 35
- Stomach ulcer and obesity
- Complains of knee giving way
- Clinically valgus knee
- Tender laterally as well as retropatellar area
- 0-90 degree ROM
- Valgus is fixed, 7 degrees
- Normal hip exam

Indications for Lateral UKA

- Isolated lateral arthrosis
- Intact knee ligaments
- Passively Correctible valgus

Contraindications

- Fixed valgus more than 10 degrees
- Knee ROM less than 90
- FTOC more than 15
- Pennington et al. JSS 2006
- Sah et al. JBJS 2008
**Fixed Varus/Valgus deformity**

- Numbers vary
- Upto 15 degree of correctible Varus/valgus
- 10 degree of fixed valgus and 5 degree of fixed varus

**Expanded Indications : Age**

- Population less than 60 yrs included
- Comparable outcomes compared to over 60
  - Dalury et al J Knee Surg 2013
  - Tabor et al J Sug ortho adv 2005
  - Bishwas et al JOA 2014
- 10 yr survivorship 93.5% and 15 yrs 86.3%
  - Heyse et al Knee 2012
- Age is not a contraindication for UKA

**Obesity**

- Controversial
- Favorable results have been shown
  - Tabor et al J Sug ortho adv 2005
  - Plate et al Knee surg, Traumatol sports arthrosc 2015
  - Aufray et al Knee 2013
  - Ding et al Knee Surg 2012
- Some studies show twice revision rate
  - Seow et al Jbi 2016
- Tibial loosening most common reason for failure
- Caution with FB UKA
- Similar outcome have been shown in mobile bearing UKA, obese vs nonobese

**Failed HTO**

- 10 yr survivorship of 66%
  - Rees et al JBJS 2001
- Progression of OA/Persistant pain most common reason for failure
- Corrected malalignment leads to overload in lateral compartment

**ACL Deficiency**

- Absolute contraindication if not repaired for mobile bearing
- Relative contraindication for FB UKA
  - AMOA
  - Anterior zone of contact
  - No functional instability
Patellofemoral disease

- Relative contraindication
- Well tolerated for up to Grade III medial disease
- No adverse outcome with FTCL in Oxford study
  - Beard et al. JBJS 2007
- TKA is preferable for lateral facet disease with FTCL

Contraindications for PFJ

- More than KL Grade 1 OA in tibiofemoral area
- Less than grade IV chondromalacia; PF
- Uncorrectable deformity
- FFD more than 10
- ROM less than 110
- CRPS
- Inadequate prior conservative treatment
- Obesity is a relative contraindication

Chondrocalcinosis

- No adverse outcome
- Histological chondrocalcinosis has slightly inferior 10 yr survival (86% vs 96%)

Indications for PFJ

- Grade IV chondromalacia/arthrosis, isolated
- Isolated post traumatic OA, PF
- Trochlear dysplasia with secondary OA

Conclusions

- UKA is equally successful as TKA with proper patient selection
- History, physical exam and imaging are critical in patient selection
- Age, activity level, chondrocalcinosis, site of pain or medial Patellofemoral disease is not a contraindication for UKA
- Obesity and lateral PF disease is a relative contraindication and higher failure rate has been reported specially with FB UKA

Conclusion

- ACL deficiency is an absolute contraindication for mobile bearing UKA
- In functionally stable knee with AMOA, fixed bearing UKA has shown comparable results
- Malalignment must be corrected at the same time or prior to PF arthroplasty
- Conversion of failed UKA to TKA behaves like a simple primary TKA with comparable results
UKA

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April 2017

No conflict of interest
Reviewer of Journal of Arthroplasty

%5 UKA

- How to avoid complication
- Plan B

- The concept behind unicompartmental knee arthroplasty is the replacement of only the damaged part of the knee and the preservation of as much normal tissue and bone as possible, to allow the restoration of normal kinematics.

- 1- UKA is more technically demanding (limited approach)
- 2- Converting a unicompartmental knee arthroplasty to a total knee arthroplasty is somewhat more difficult than a primary
- Then try to Avoid the complication.
- Avoid Undercorrection or overcorrection
• Robotic-assisted surgical procedures with the use of the XXXXXX lead to improved accuracy of implant positioning compared with conventional unicompartmental knee arthroplasty surgical techniques.

• Careful patient selection is critical for unicompartmental knee arthroplasty if reliable results are to be achieved.

• The arthritis should be predominantly confined to a single compartment.

• Medial compartment osteoarthritis is usually on the anteromedial aspect of the tibial plateau, and lateral compartment osteoarthritis is typically on the femoral side.

• How?

• No significant degenerative changes in the other (medial, lateral, or patellofemoral) compartments should be present, and both cruciate ligaments should be intact.

• Absence of the anterior cruciate is a contraindication, but

Preop planning

• May obtain full-length lower extremity AP/Lat x-ray

Anatomical/Mechanical axis of tibia

• With absent deformity, tibia mechanical and anatomic axis are coincident.
Anatomical axis of femur

• Angle measured between femoral anatomic axis and mechanical axis is called the valgus cut angle

• Normally angle is 5-7 degrees valgus

• Stress x-ray
• MRI

• Malalignment of the limb should be passively correctable to neutral and not beyond.

• This usually is possible in patients with a varus deformity less than 15° or a valgus deformity less than 20°.

• The deformity of the knee should be only mild; therefore, a flexion contracture should be less than 15°.

• Unicompartmental knee arthroplasty with excision of osteophytes in the notch cannot correct moderately severe flexion contractures.

• A history of trauma should alert the surgeon to the possibility of a remote fracture or articular or ligamentous damage.

• A history of pain in multiple joints should draw attention to the possibility of inflammatory arthritis.

• The physical examination is crucial for appropriate patient selection for unicompartmental knee arthroplasty

• The integrity of the ACL, the mechanical alignment and range of motion of the knee, and collateral stability must be assessed.
• optimal tibiofemoral alignment following unicompartmental arthroplasty has yet to be determined.

• Extremes of overcorrection and undercorrection are undesirable.

• Overcorrection may result in medial or lateral subluxation and increased loading of the unreplaced compartment (medial or lateral). Undercorrection causes varus or valgus alignment of the leg and can potentially overload the implant.[26]

• Most surgeons advocate undercorrection of the mechanical axis by 2-3° to avoid overloading the normal compartment.

• Medial and lateral soft-tissue releases are contraindicated, because knees requiring these have too much preoperative deformity for unicompartmental knee arthroplasty.
• Angular correction is usually obtained with removal of peripheral osteophytes that tent the capsule and the collateral ligaments

• A sandbag or other bump is affixed to the table to help maintain flexion of the knee.
• The leg is draped free, and it is helpful to place a mark or ball of tape over the anterior superior iliac spine or the femoral head.

• Different techniques
• 1- tibial cut first
• 2- distal femur cut first
Scenario 1

- In both flexion and extension, the joint space is too tight to insert the 8mm Flexion/Extension Gap Spacer,
- Then more tibial bone must be removed
2

• Both flexion and extension the joint space is too loose,

, insert progressively thicker Flexion/Extension Gap Spacers and repeat the gap checking.

3

• If tight in extension and acceptable in flexion,

• 1- Recut proximal tibia with less tibial slope

• 2- Recut 1mm – 2mm of distal femur

• After any adjustment of the flexion and/or extension gap is made, use the Flexion/Extension Gap Spacers to recheck the gaps.

• Always recheck
Take home message

1- Patient selection: History and physical exam, Hips to ankles x-ray, stress test, Expectation
2- Know your Gap balancing, Patience
3- DO NOT try a system for the first time on a patient