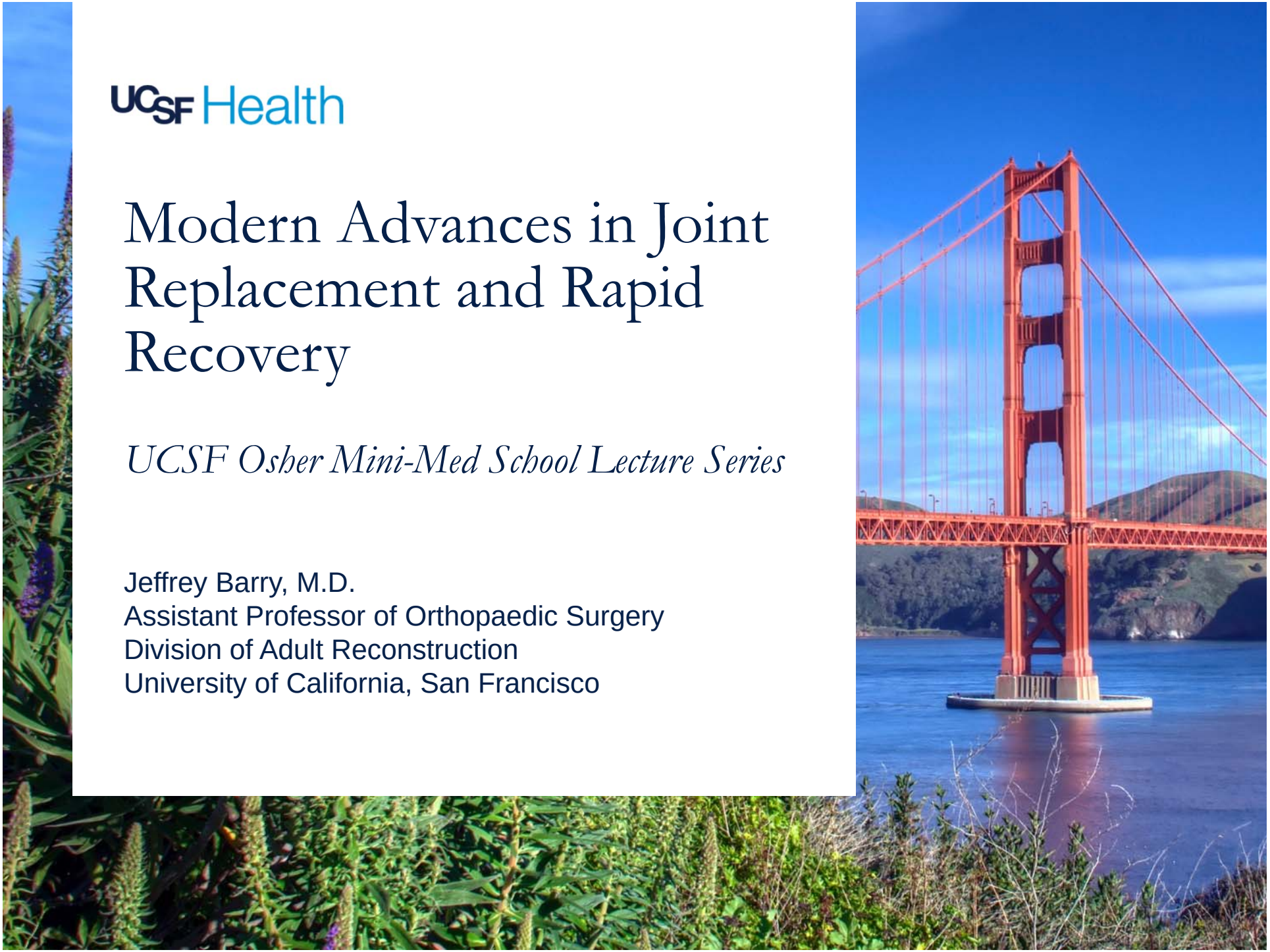


UCSF Health

Modern Advances in Joint Replacement and Rapid Recovery

UCSF Osher Mini-Med School Lecture Series

Jeffrey Barry, M.D.
Assistant Professor of Orthopaedic Surgery
Division of Adult Reconstruction
University of California, San Francisco

Disclosures

- No relevant disclosures to this talk

About Me

- Bay Area Native

Duke UNIVERSITY | PRATT SCHOOL of ENGINEERING

UCSF School of Medicine

OrthoCarolina

UCSF Joint Replacement

- UCSF
  - U Can Stay Forever

Outline

- Burden of Disease and Epidemiology
- The Basics of Hip and Knee Replacement
- What's improving over the last decade
  - Longevity
  - Pain Management
  - Hospital Stay
  - Thromboembolism prophylaxis
  - Risk Reduction

Question

What is the most common inpatient surgery performed in the US?

1. Percutaneous coronary angioplasty
2. Total hip replacement
3. Lumbar Laminectomy
4. Appendectomy
5. Total knee replacement

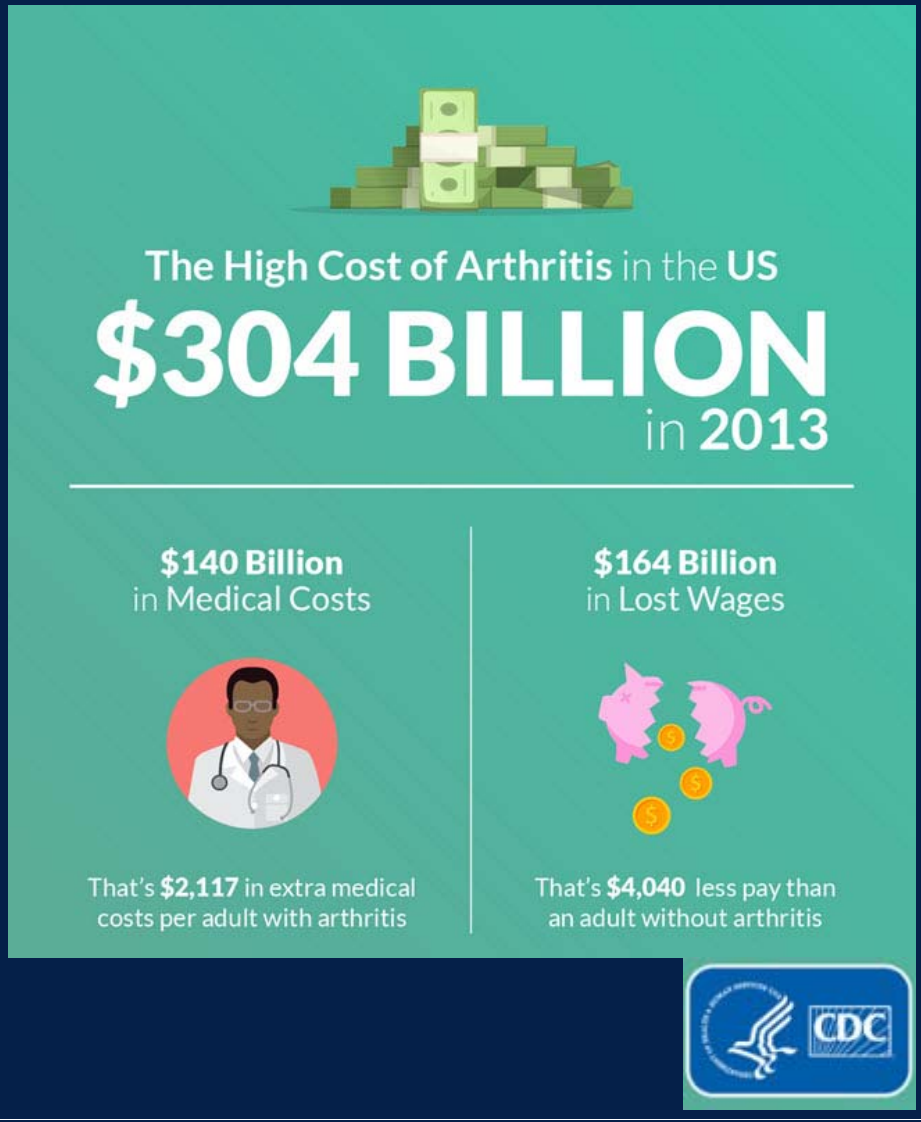
Most Frequent Operating Room Procedures Performed in U.S. Hospitals, 2003-2012

Rank	Procedure
Total stays	
1	Arthroplasty knee
2	Percutaneous coronary angioplasty (PTCA)
3	Laminectomy, excision intervertebral disc
4	Hip replacement, total and partial
5	Spinal fusion
6	Cholecystectomy and common duct exploration
7	Partial excision bone
8	Hysterectomy, abdominal and vaginal
9	Colorectal resection
10	Excision, lysis peritoneal adhesions
11	Appendectomy
12	Treatment, fracture or dislocation of hip and femur
13	Oophorectomy, unilateral and bilateral
14	Coronary artery bypass graft (CABG)
15	Treatment, fracture or dislocation of lower extremity (other than hip or femur)

Notes: Includes only nonmaternal and nonneonatal stays. All-listed operating room procedures were
categories. Procedures designated as Other are not reported.
Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and
Sample (NIS), 2012

Burden of Disease

- Arthritis = most common cause of disability in the US
- 22.7% of adults have doctor-diagnosed arthritis
  - 43.2% of patients with arthritis report activity limitations due to disease



Projections of Primary and Revision Hip and Knee Arthroplasty in the United States from 2005 to 2030

By Steven Kurtz, PhD, Kevin Ong, PhD, Edmund Lau, MS, Fionna Mowat, PhD, and Michael Halpern, MPH, MD, PhD

- By 2030:
  - 3.5 million TKA (673%)
  - 570,000 THA (174%)
- Curve updated 2014 – just as predicted!

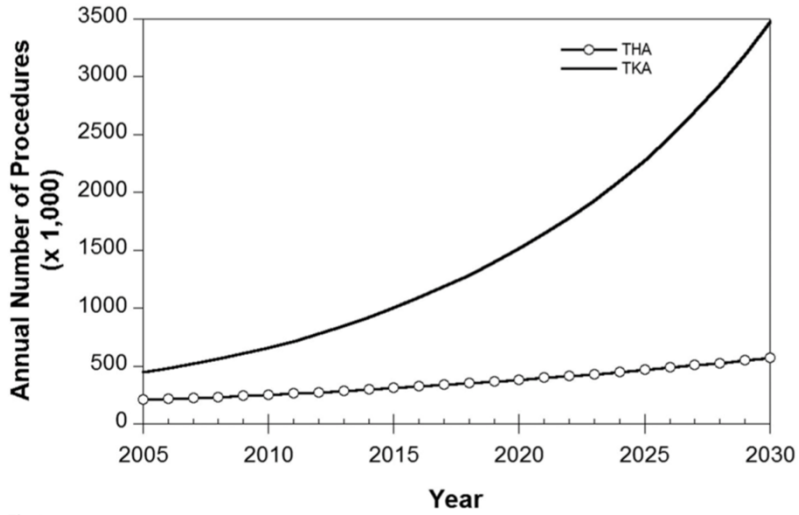


Fig. 1

The projected number of primary total hip arthroplasty (THA) and total knee arthroplasty (TKA) procedures in the United States from 2005 to 2030.

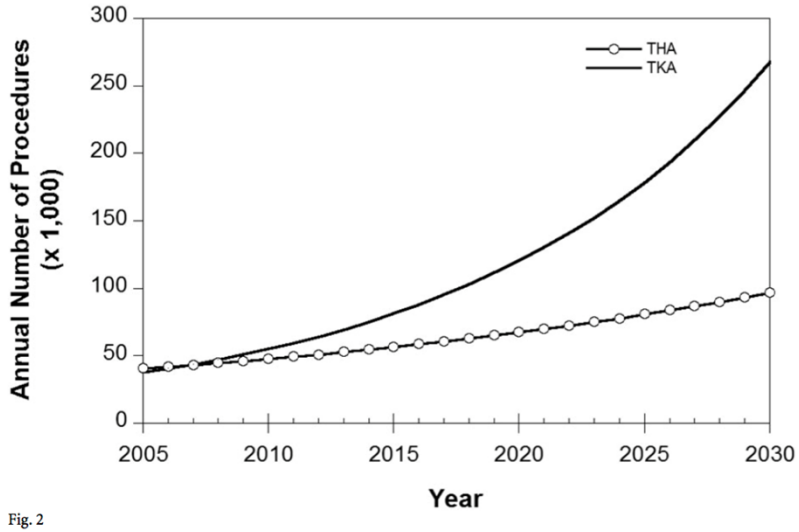


Fig. 2

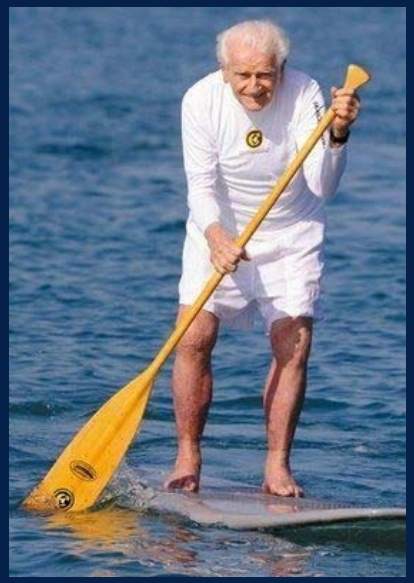
The projected number of revision total hip arthroplasty (THA) and total knee arthroplasty (TKA) procedures in the United States from 2005 to 2030.

J Bone Joint Surg Am. 2007;89:780-5 • doi:10.2106/JBJS.F.00222

UCSF Health

Causes of Increased Utilization

- Aging Population
- Patients receiving arthroplasty at a younger age
  - Improvements in technology
  - Obesity



Future Young Patient Demand for Primary and Revision Joint Replacement

National Projections from 2010 to 2030

Steven M. Kurtz PhD, Edmund Lau MS, Kevin Ong PhD, Ke Zhao MA, MS, Michael Kelly MD, Kevin J. Bozic MD, MBA

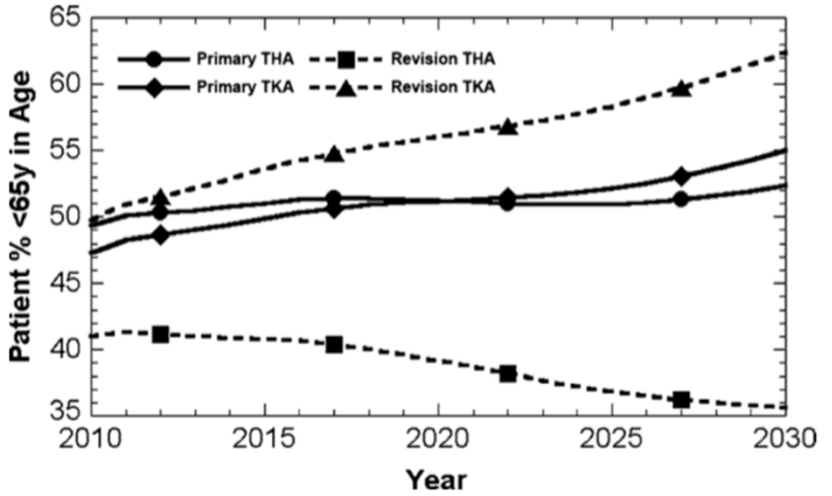


Fig. 1 The projected relative proportion of the younger patient population (< 65 y) for primary and revision total joint replacement between 2010 and 2030 is shown.

Clin Orthop Relat Res (2009) 467:2606–2612

Why Replace a Joint?

Arthritis

arthro – joint

itis – inflammation

What is Arthritis – Disease of Cartilage

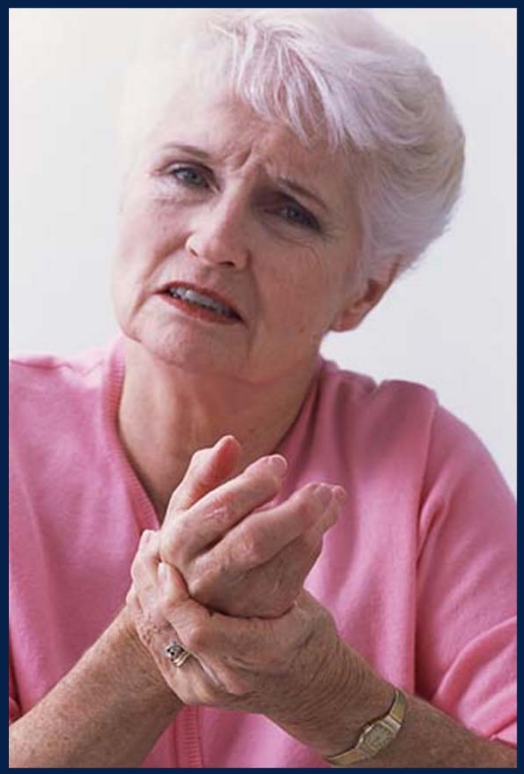
- Cartilage Degeneration
  - Pain
  - Limp
  - Swelling
  - Loss of range of motion
  - Eventual deformity

UCSF Health

Arthritis → Affects on Your Life

- Quality of Life
- Independence
- Movement, Walking, Exercise
- Self-image
- Self-esteem
- Family Life
- Sleep

- Everything and Everybody



Causes of Arthritis

- Osteoarthritis - “wear and tear”
- Inflammatory arthritis
- Trauma, old fractures
- Infection
- Osteonecrosis - “lack of oxygen to the bone”
- Childhood/ developmental disease

Diagnosis

- Clinical Symptoms + Radiographic
- Radiographs – Standing or Weight bearing!
- MRI is RARELY needed!!!
  - Expensive
  - Brings in other issues
  - Unnecessary treatment
  - Unnecessary explanations

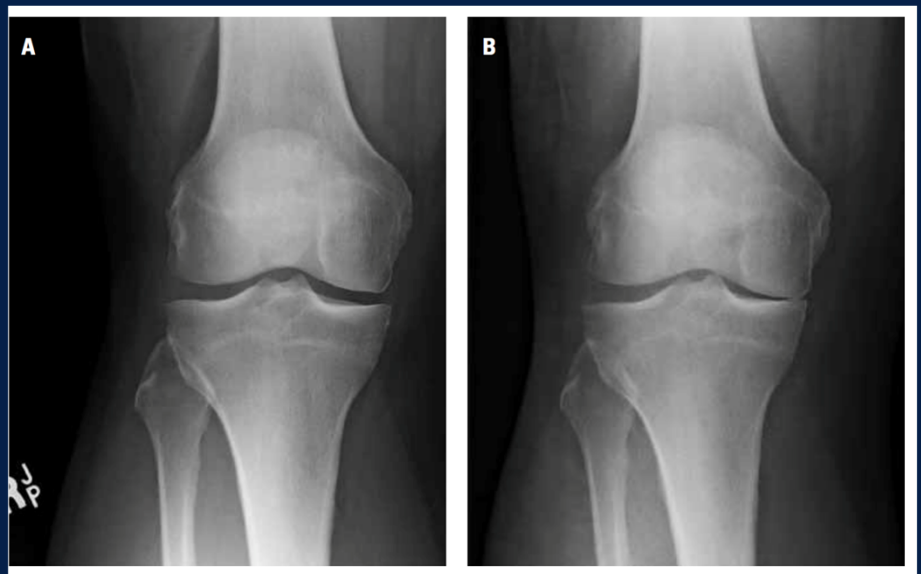
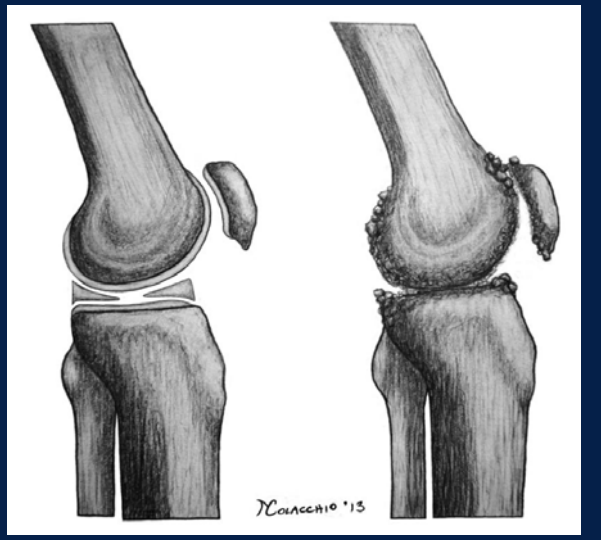


Figure. Two anteroposterior radiographs of the same knee. The non-weight-bearing radiograph (A) shows minimal medial joint space loss, while the weight-bearing radiograph (B) reveals significant loss.

BC MEDICAL JOURNAL VOL. 58 NO. 9, NOVEMBER 2016

UCSF Health

Knee Arthritis

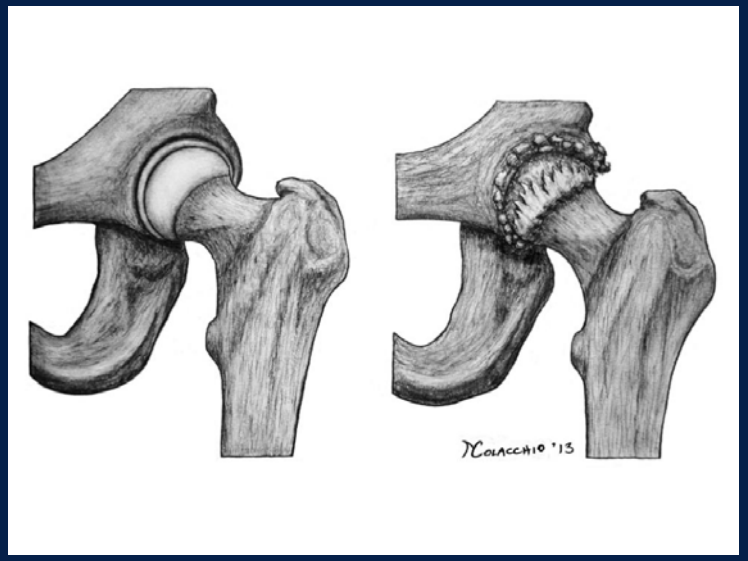


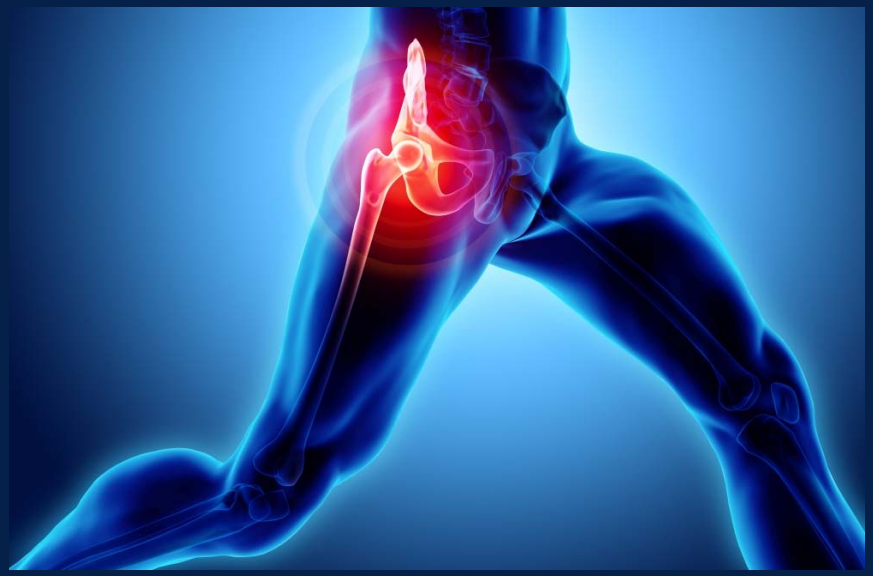
- Radiographs
- Clinical

UCSF Health

Hip Arthritis

- X-ray

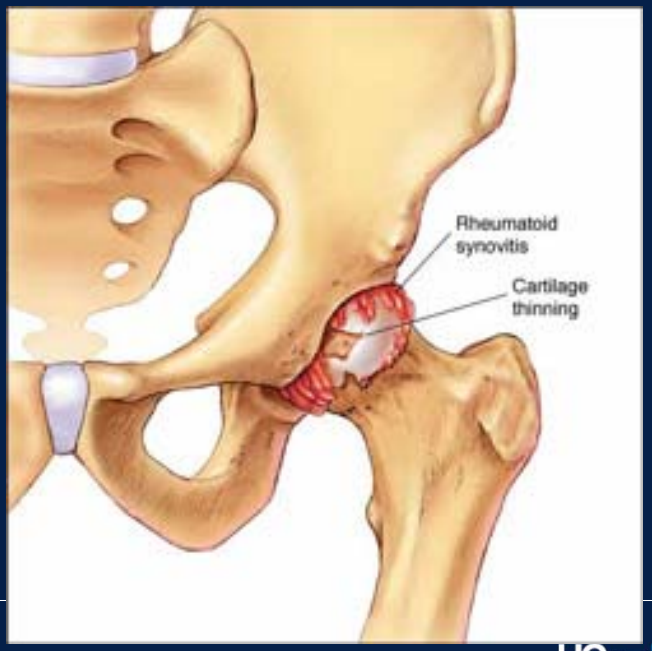




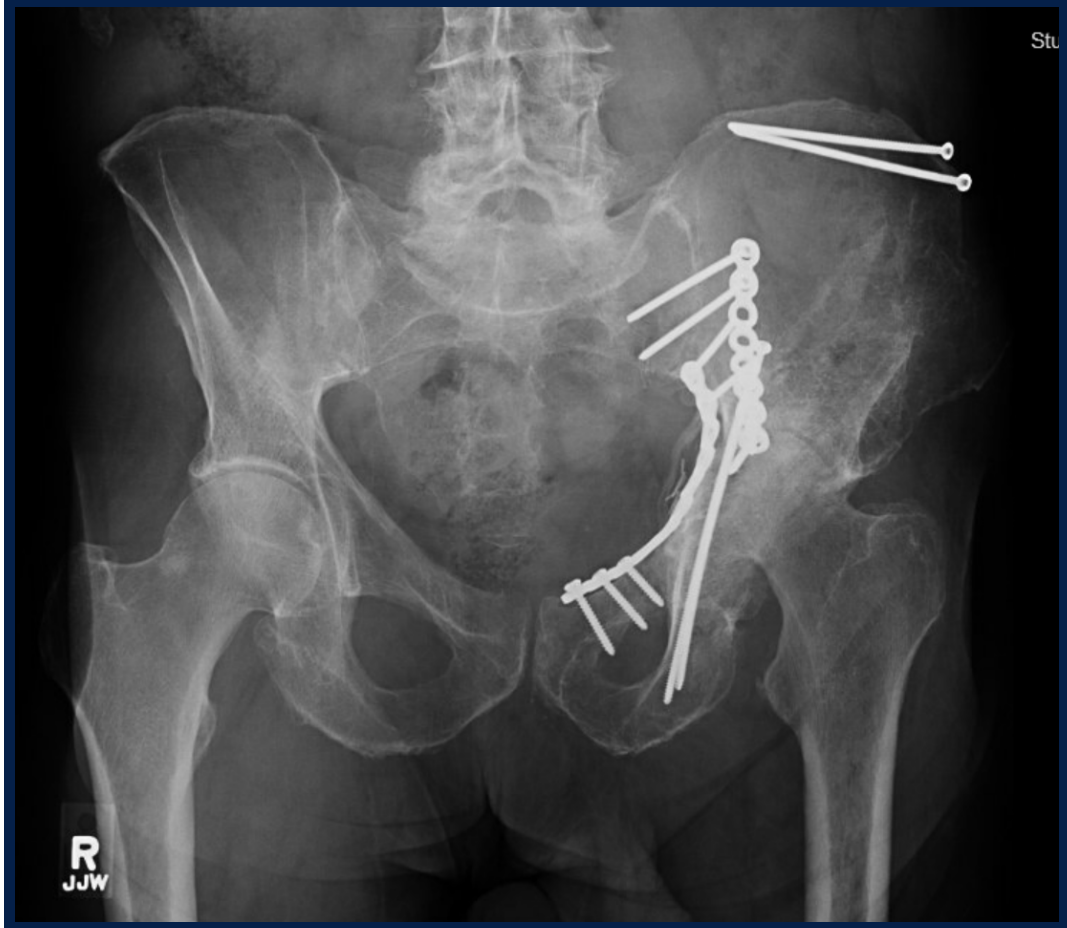
- Clinical

Inflammatory Arthritis

- Autoimmune
- Higher risk population
- Medication advances have vastly decreased the incidence of symptomatic disease over the past decade

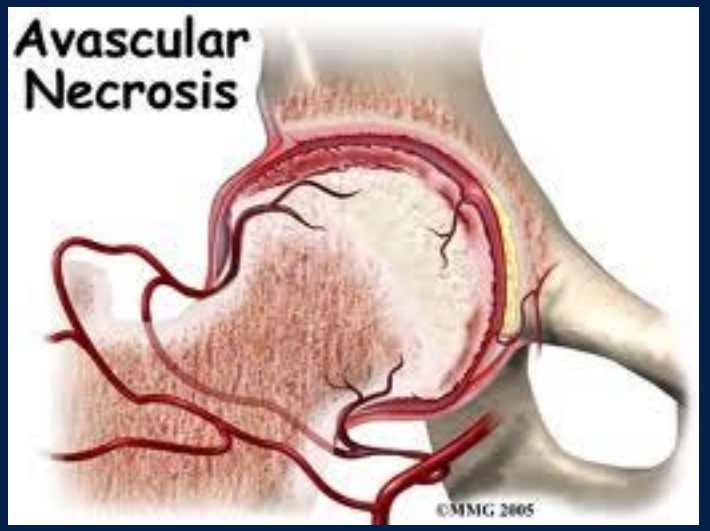


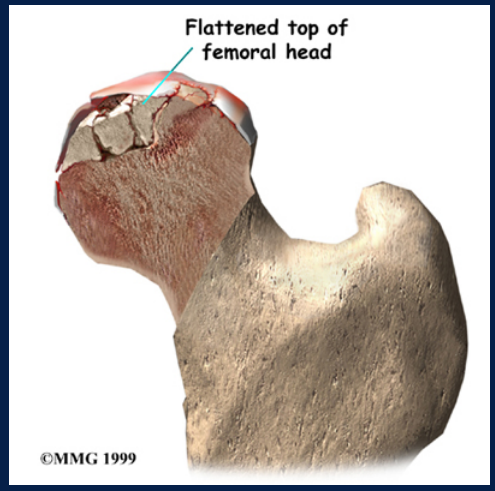
Prior Trauma



Osteonecrosis (Avascular Necrosis)

- Steroids
- HIV/HAART
- Alcohol
- Scuba Divers
- Sickle Cell Anemia





Childhood Hip Disease

- Developmental Dysplasia
  - Spectrum of Disease

Arthritis → Non-Operative Treatment

- Acetaminophen
- NSAID's
- Weight Loss
- Exercise
- Gait Aids
- Physical Therapy
- Bracing
- Glucosamine/Chondroitin Sulfate
- Corticosteroid Injections
- Viscosupplementation

What Surgeries Do I Perform?

- Knee arthro**plasty** – Total Knee Replacement
  - Primary/ Revision
  - Also partial knee replacements

- Hip arthro**plasty** – Total Hip Replacement
  - Primary/ Revision
  - Also partial hip replacements (hemiarthroplasty)

- Not Hip/Knee arthro**scopy** – Usually Sports medicine

What is Arthroplasty

- “Arthro”- joint
- “plasty”- reconstruction

- Replacement of the diseased joint surface w/ a prosthesis (metal, plastic, ceramic)

High-Impact Intervention

The operation of the century: total hip replacement

Ian D Learmonth, Claire Young, Cecil Rorabeck

Lancet 2007; 370: 1508–19

Intermediate and Long-Term Quality of Life After Total Knee Replacement

A Systematic Review and Meta-Analysis

Leonard Shan, MBBS, BMedSci, Bernard Shan, Arnold Suzuki, MBBS, Fred Nouh, MBBS, and Akshat Saxena, MBBS, MS

Investigation performed at the University of Melbourne, Victoria, Australia

Background: Total knee replacement is a highly successful and frequently performed operation. Technical outcomes of surgery are excellent, with favorable early postoperative health-related quality of life. This study reviews intermediate and long-term quality of life after surgery.

Methods: A systematic review and meta-analysis of all studies published from January 2000 onward was performed to evaluate health-related quality of life after primary total knee replacement for osteoarthritis in patients with at least three years of follow-up. Key outcomes were postoperative quality of life, function, and satisfaction compared with the preoperative status. Strict inclusion and exclusion criteria were applied. Quality appraisal and data tabulation were performed with use of predefined criteria. Data were synthesized by narrative review and random-effects meta-analysis utilizing standardized mean differences. Heterogeneity was assessed with the tau^2 and I^2 statistics.

Results: Nineteen studies were included in the review. Intermediate and long-term postoperative quality of life was superior to the preoperative level in qualitative and quantitative analyses. The pooled effect in combined WOMAC (Western Ontario and McMaster Universities Osteoarthritis Index) and KSS (Knee Society Score) outcomes was a marked improvement from baseline with respect to the total score (2.17; 95% CI [confidence interval], 1.13 to 3.22; $p < 0.0001$) and the pain (1.72; 95% CI, 0.97 to 2.46; $p < 0.00001$) and function (1.26; 95% CI, 0.87 to 1.64; $p < 0.00001$) domains. Most patients were satisfied with the surgery and derived substantial benefits for daily functional activities. Tau^2 (0.20 to 1.10) and I^2 (90% to 98%) values implied significant clinical and statistical heterogeneity.

Conclusions: Total knee replacement confers significant intermediate and long-term benefits with respect to both disease-specific and generic health-related quality of life, especially pain and function, leading to positive patient satisfaction. Recommendations for necessary future studies are provided.

Level of Evidence: Therapeutic Level II. See Instructions for Authors for a complete description of levels of evidence.

J Bone Joint Surg Am. 2015;97:156-68 • http://dx.doi.org/10.2106/JBJS.M.00372

Review

Total hip replacement: a systematic review and meta-analysis on mid-term quality of life

L. Shan †, B. Shan ‡, D. Graham §, A. Saxena §*

† *Melbourne Medical School, The University of Melbourne, Victoria, Australia*
‡ *Faculty of Medicine, Nursing and Health Sciences, Monash University, Victoria, Australia*
§ *Department of Orthopaedic Surgery, The Wollongong Hospital, Wollongong, New South Wales, Australia*

ARTICLE INFO

Article history:
Received 16 March 2013
Accepted 2 December 2013

Keywords:
Orthopaedic surgery
Total hip replacement
Total hip arthroplasty
Osteoarthritis
Mid-term
Quality of life

SUMMARY

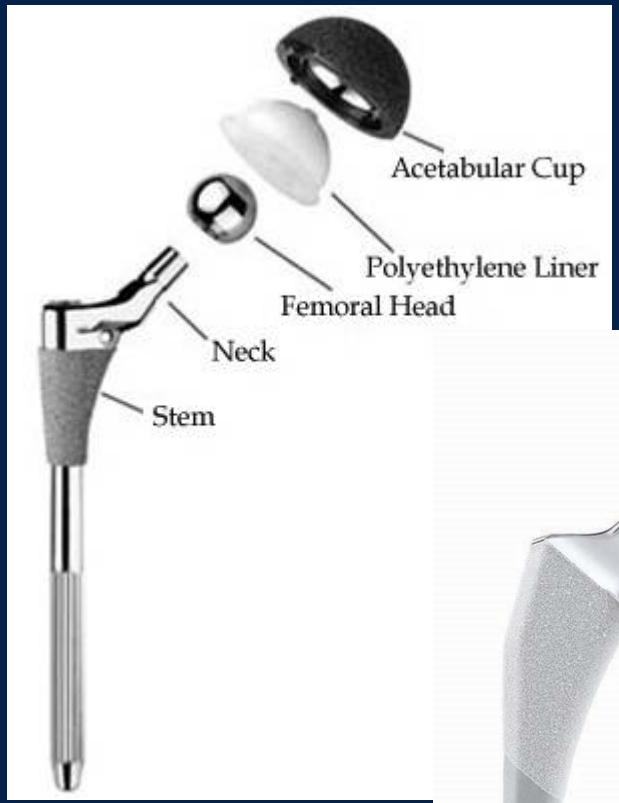
Objective: Total hip replacement (THR) is one of the most successful and frequently performed operations worldwide. Health-related quality of life (HRQOL) is a key outcome measure of surgery. We investigated mid-term HRQOL after THR in patients with osteoarthritis (OA).
Design: A systematic review of clinical studies published after January 2000 was performed using strict eligibility criteria. Quality appraisal and data tabulation were performed using pre-determined forms. Data were synthesised by narrative review and random-effects meta-analysis using standardised response means. Tau^2 and I^2 values and Funnel plots were analysed.
Results: 20 studies were included. Mid-term post-operative HRQOL is superior compared to pre-operative status on qualitative and quantitative analysis. Pooled response means of total Harris Hip Score (HHS) ($P < 0.00001$) and combined pain ($P = 0.00001$) and physical function ($P < 0.00001$) domains of Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) and HHS improved markedly up to 7 years. Medical Outcomes Survey Short Form 36 shows physical functioning (PF) ($P < 0.00001$), bodily pain (BP) ($P < 0.00001$), role physical ($P = 0.001$), role emotional ($P = 0.04$), and social functioning (SF) ($P = 0.03$) were improved up to 7 years. General health (GH) ($P = 0.29$), mental health (MH) ($P = 0.43$), and vitality ($P = 0.17$) was similar. HRQOL is at least as good as reference populations in the first few years and subsequently plateaus or declines. Patient satisfaction and functional status was favourable. There was significant heterogeneity amongst all studies, but publication bias was low in pooled analysis.
Conclusion: THR confers significant mid-term HRQOL benefits across a broad range of health domains. Further studies based on consistent guidelines provided in this review are required.

Osteoarthritis and Cartilage 22 (2014) 389–406

UCSF Health

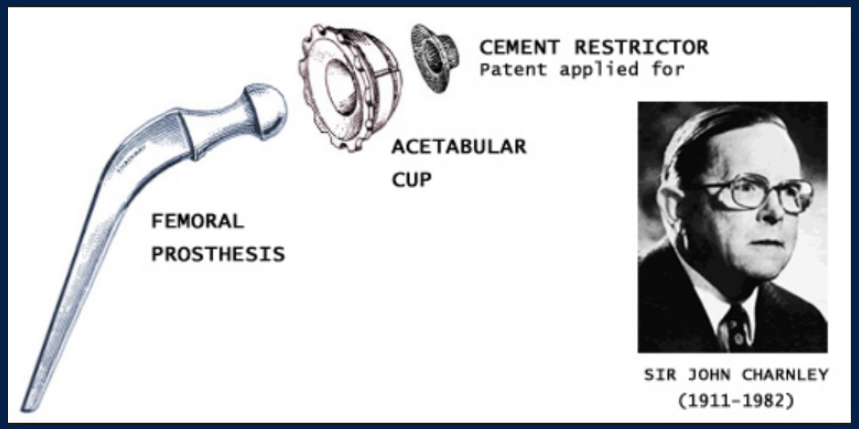
Total Hip Arthroplasty (THA)

- Components
  - Acetabulum (aka socket, shell, or cup) - Titanium
  - Acetabular liner- PE vs CoCr vs ceramic
  - Femoral head - CoCr vs ceramic
  - Femur (aka stem) - Titanium
- Fixation:
  - cementless >> cemented, hybrid
  - porous metals



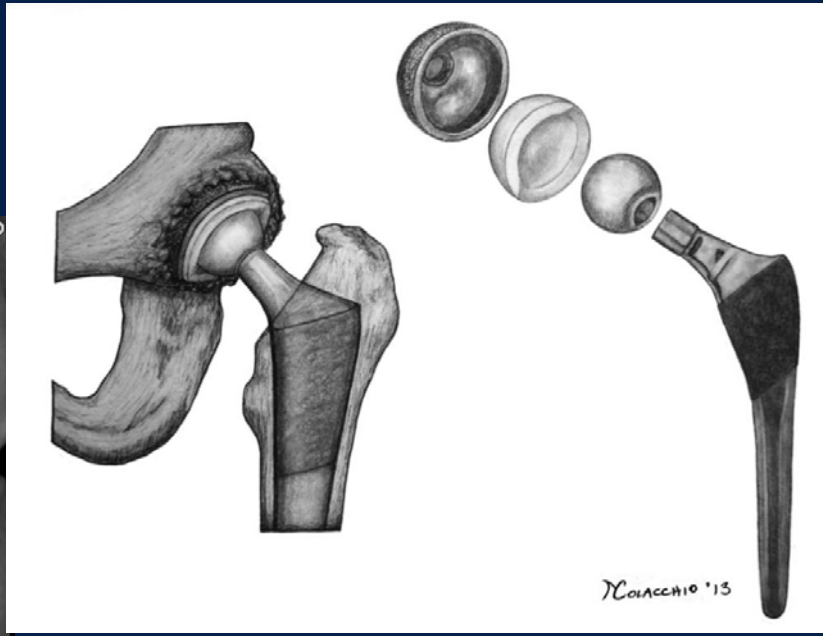
John Charnley – The Godfather of Hip Replacement

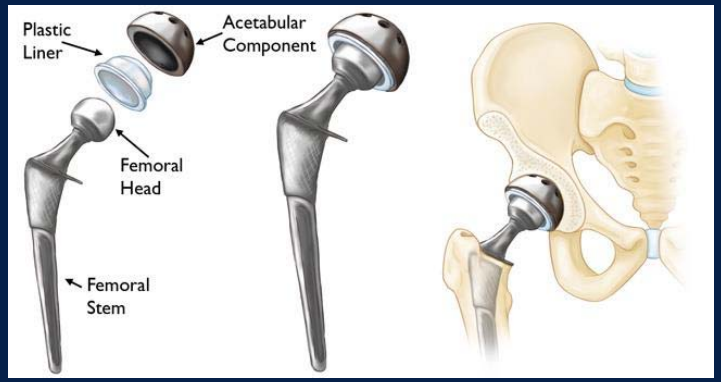
Charnley Low Friction Arthroplasty



Modern THA

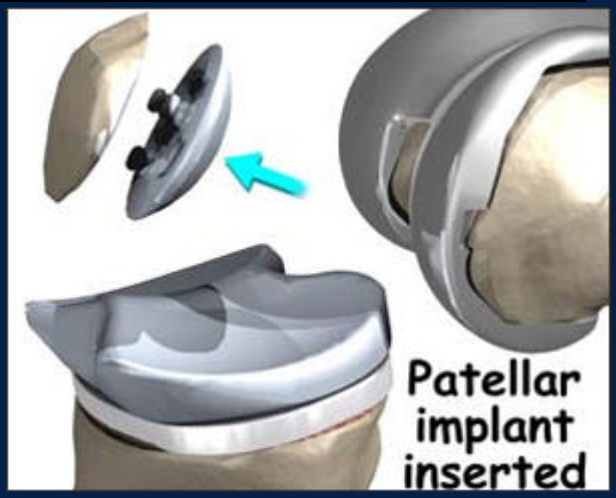

Desc: XR HIP WITH P
R
LTR



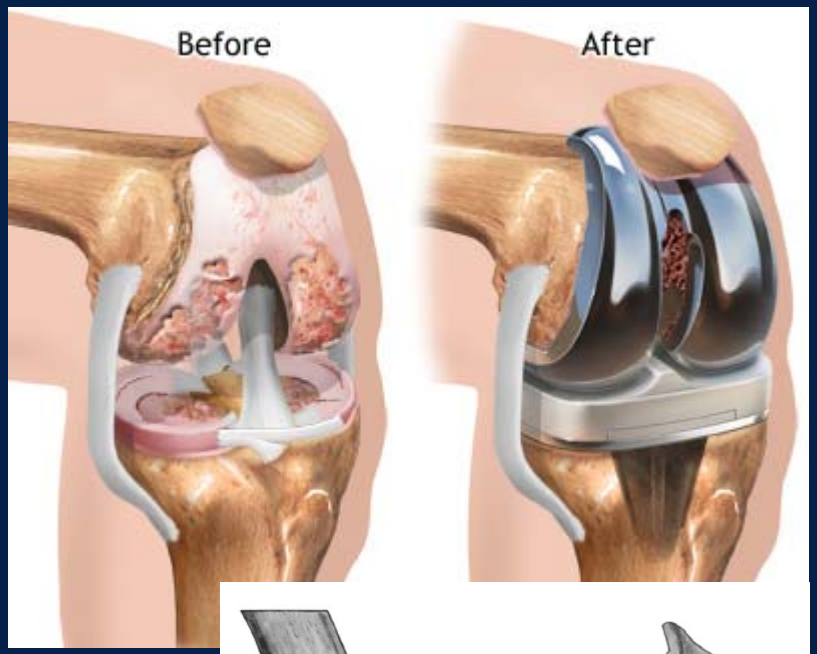

Plastic Liner
Acetabular Component
Femoral Head
Femoral Stem

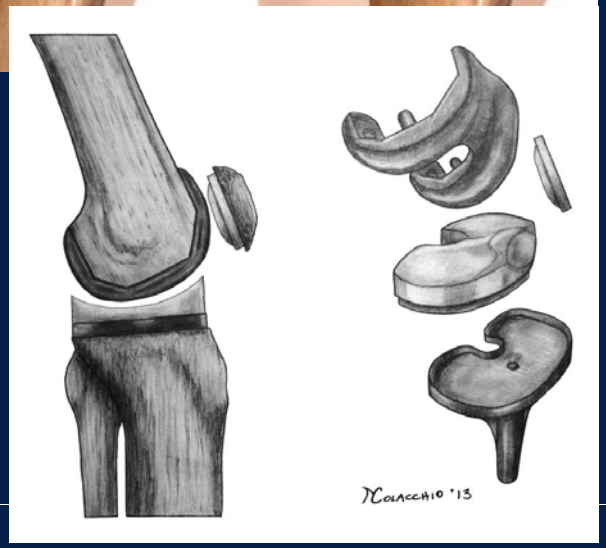
Total Knee Arthroplasty (TKA)

- 3 compartments:
  - medial/ lateral/ patellofemoral
- Components:
  - Femur - CoCr
  - Tibia -Titanium/CoCr
  - Tibial liner (tray/ insert) - PE
  - Patellar component (button) - PE
- Fixation:
  - Cemented > cementless (maybe..)



TKA





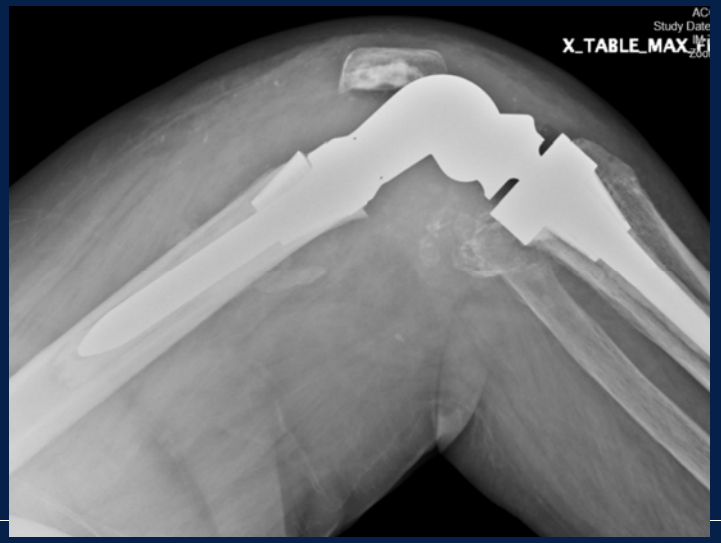
https://medlineplus.gov/ency/article/002974.htm

UCSF Health

Unicompartmental Knee Arthroplasty (UKA)

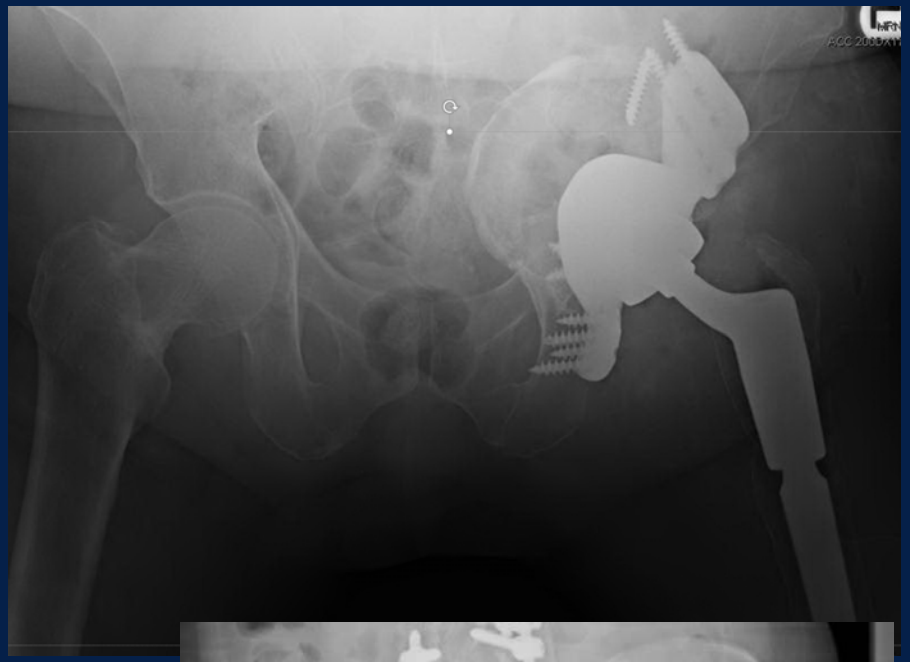
Revision TKA

- Infection
- Loosening
- Fracture
- Instability



Revision THA

- Infection
- Loosening
- Fracture
- Dislocation



When to Choose Total Joint Replacement?

- Failed Non-operative Management
- Pain that Limits Activities of Daily Living
- Bad days outnumber good days
- Unable to enjoy life
- X-ray Evidence of Significant Arthritis

- ***YOU tell ME when it's time***

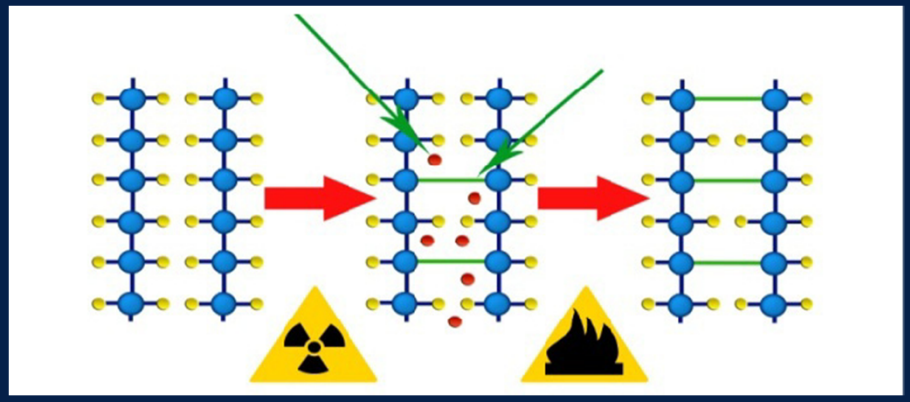
Changes in Arthroplasty

- Longevity
  - Too young for arthroplasty?
    - 50s?
    - 40s?
    - 30?s….
  - Quality of life decision/balance
- Approximately 1% failure rate per year for any reason
- Change in expectations
- Changes in implant technology

https://www.waterskimag.com/features/2015/04/08/joint-replacement-doesnt-have-to-end-your-skiing-life#page-2

Highly Cross Linked Polyethylene

- Previous generations of poly had consistent linear wear rate
  - Many complications of poly wear historically
  - Led to development and impetus for metal on metal (bad results)
- Newer highly crosslinked poly incredibly low wear rates



https://www.researchgate.net/figure/Diagrammatic-representation-of-the-manufacturing-process-of-highly-cross-linked_fig5_221923191

UCSF Health

Changes in Arthroplasty - Safety

- Too Old for Arthroplasty?
  - Quality of life decision
  - No difference in 1-year mortality when age-adjusted for expected mortality rates
  - Frailty and medical co-morbidities play a larger role than age

J Arthroplasty. 2017 Oct 6. pii: S0883-5403(17)30868-9. doi: 10.1016/j.arth.2017.09.060. [Epub ahead of print]

Is Rapid Recovery Hip and Knee Replacements Possible and Safe in the Octogenarian Patient?

Edwards PK[1], Kee JR[1], Mears SC[1], Barnes CL[1].

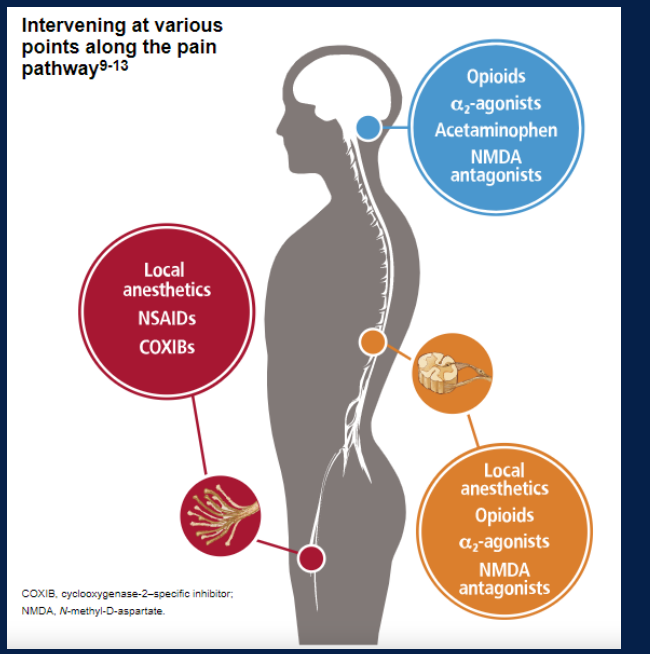
J Arthroplasty. 2015 Aug;30(8):1324-7. doi: 10.1016/j.arth.2015.03.008. Epub 2015 Mar 14.

Are Nonagenarians Too Old For Total Hip Arthroplasty? An Evaluation of Morbidity and Mortality Within a Total Joint Replacement Registry.

Miric A[1], Inacio MC[2], Kelly MP[1], Namba RS[3].

Changes in Arthroplasty – Pain Management

- Multi-modal, non-opiate based regimen
  - Spinal anesthesia
  - Regional nerve blocks/catheters
  - Acetaminophen, celecoxib, gabapentin ATC
- Most patients are off narcotics in a matter of weeks
  - THA patients, 1-2 weeks
  - TKA patients 4-6 weeks
- **<u>Change in expectations…..</u>**
- Surgeons are well aware of the role we play in the opioid crisis

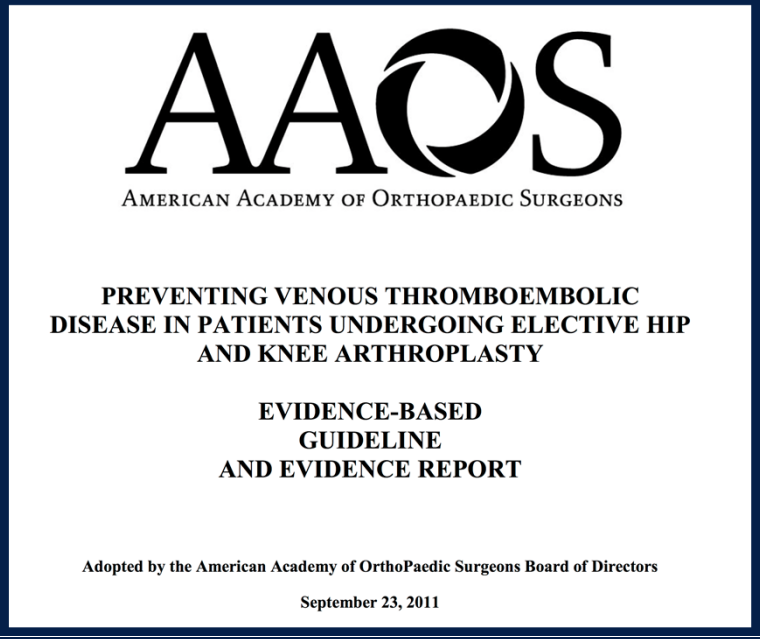


Changes in Arthroplasty – Blood Management

- TXA
- Transfusion rates
  - Primary joint <1%
- No longer pre-donating blood

Changes in Arthroplasty – DVT prophylaxis

- Most patients are on baby Aspirin x4 weeks
  - No increased risk in DVT/PE
  - Decreased wound complications, infection, bleeding events
  - No need for injections/monitoring
  - Lower risk of needing a blood transfusion
- All patients
  - Neuraxial anesthesia
  - Rapid mobilization
  - SCDs



Dental Prophylaxis

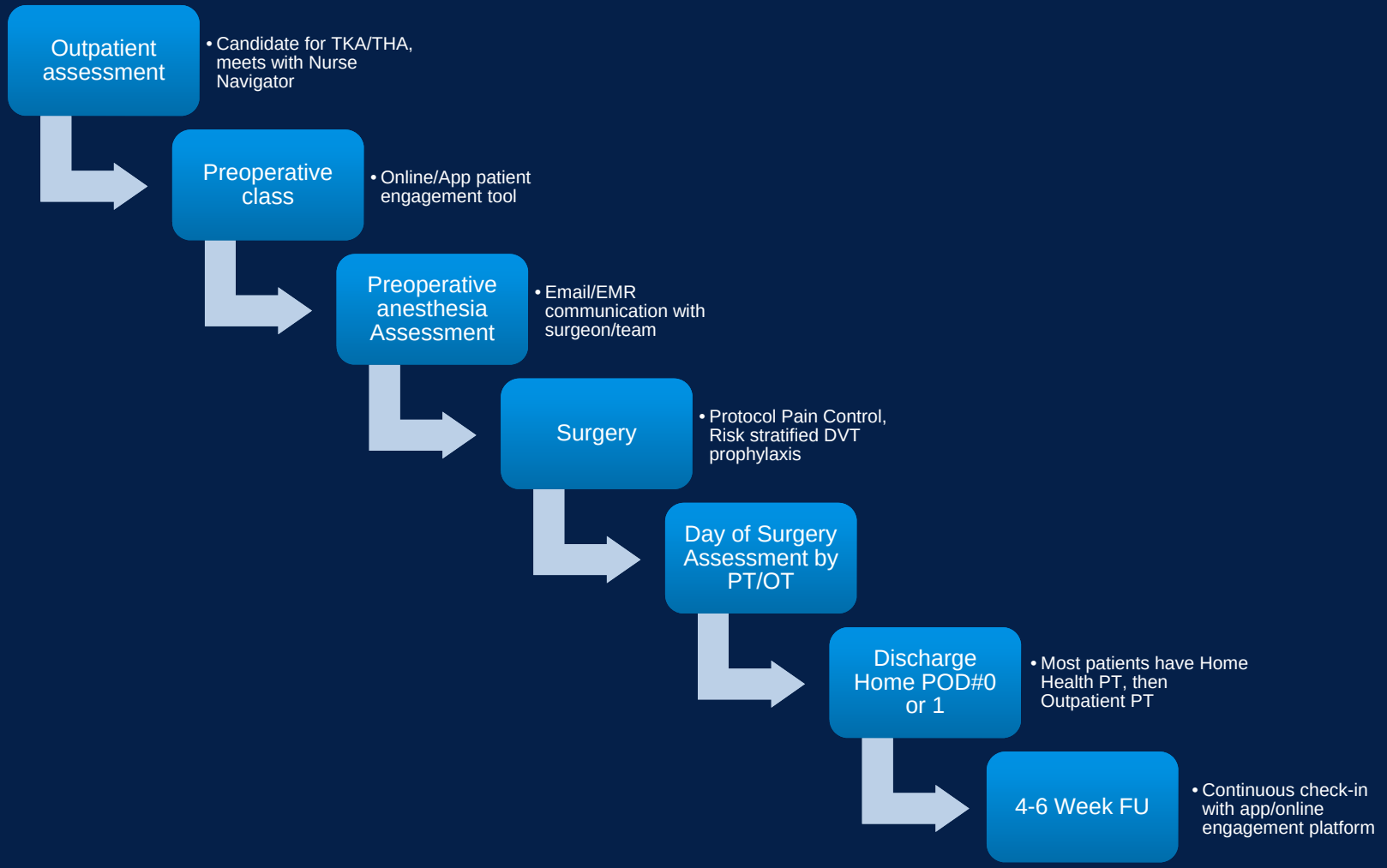
"Doc, do I need antibiotics before I get my teeth cleaned"

Practical Implications and Conclusions. The 2014 Panel made the following clinical recommendation: In general, for patients with prosthetic joint implants, prophylactic antibiotics are not recommended prior to dental procedures to prevent prosthetic joint infection. The practitioner and patient should consider possible clinical circumstances that may suggest the presence of a significant medical risk in providing dental care without antibiotic prophylaxis, as well as the known risks of frequent or widespread antibiotic use. As part of the evidence-based approach to care, this clinical recommendation should be integrated with the practitioner's professional judgment and the patient's needs and preferences.

Changes in Arthroplasty – Hospital Stay and Rapid Recovery

- Outpatient procedures for some patients
- Average one night in the hospital if inpatient
- MOST patients go home (>90%)
- ERAS = “Enhanced Recovery After Surgery”
  - Protocols throughout the episode of care
- There is a large move towards outpatient surgery, including in the Medicare population
  - Removal of TKA from inpatient only list in 2018

Our Protocol



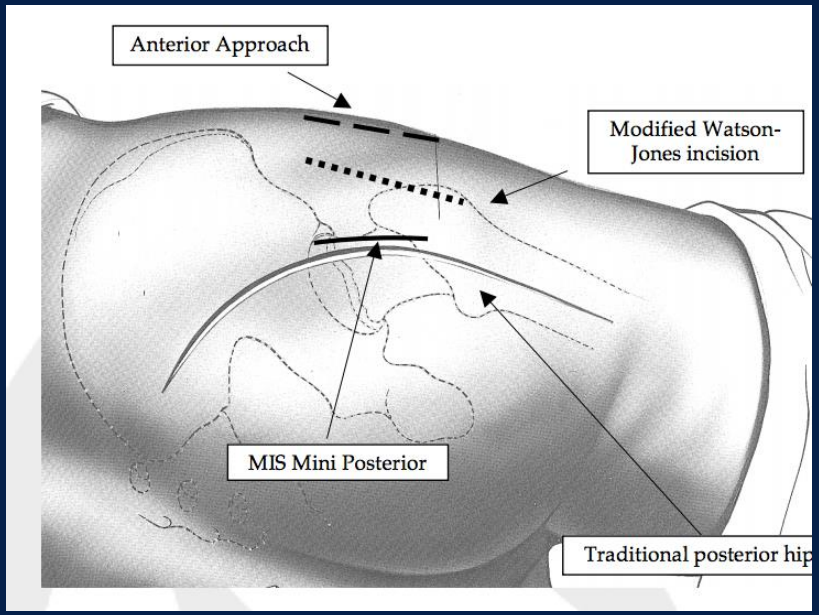
UCSF Health

Changes in Arthroplasty – Risk Reduction

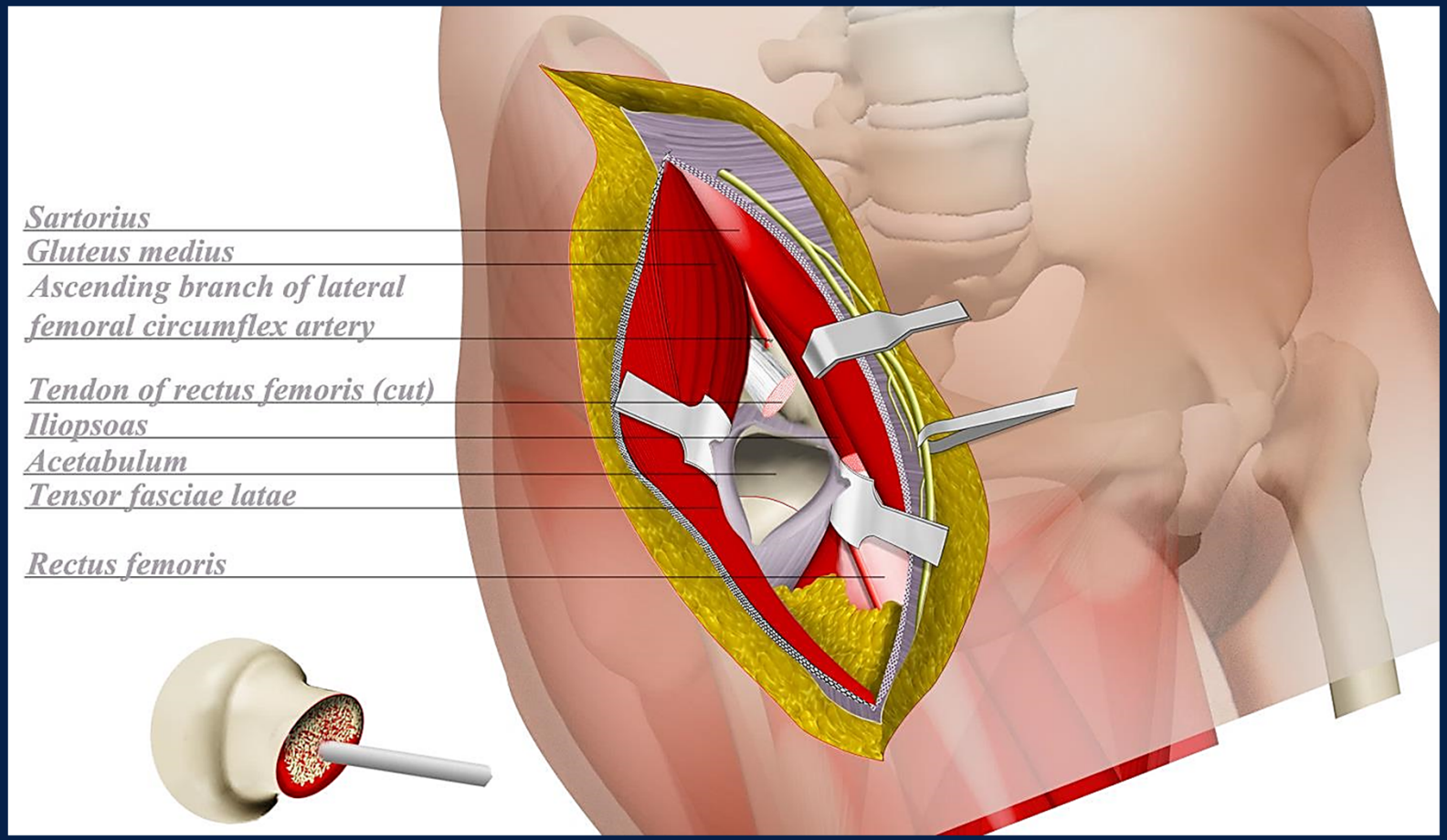
- Diabetes
  - HgBA1c < 8
- Smoking
  - No nicotine
- Obesity
  - BMI < 40
- Chronic Pain
  - Opiates – decrease dose by 50%
- Substance abuse
  - Minimum documented sobriety period

Changes in Arthroplasty – Surgical Technique

- Improvement in techniques
  - Less invasive, soft tissue friendly approaches facilitate rapid recovery
- Mini-posterior approach
- Direct anterior approach



DIRECT ANTERIOR Total Hip Arthroplasty



UCSF Health

DIRECT ANTERIOR Total Hip Arthroplasty

More rapid recovery in first 6 weeks

Less pain early postop

Preserves muscles

Maybe decreased dislocation rate

Learning curve (as any procedure) → select surgeon who has extensive experience and training ("fellowship")

Anterior Approach

Adequate femoral exposure for femoral prep the most difficult portion of the approach

- Reason for majority of complications during “learning curve”

Dislocation position

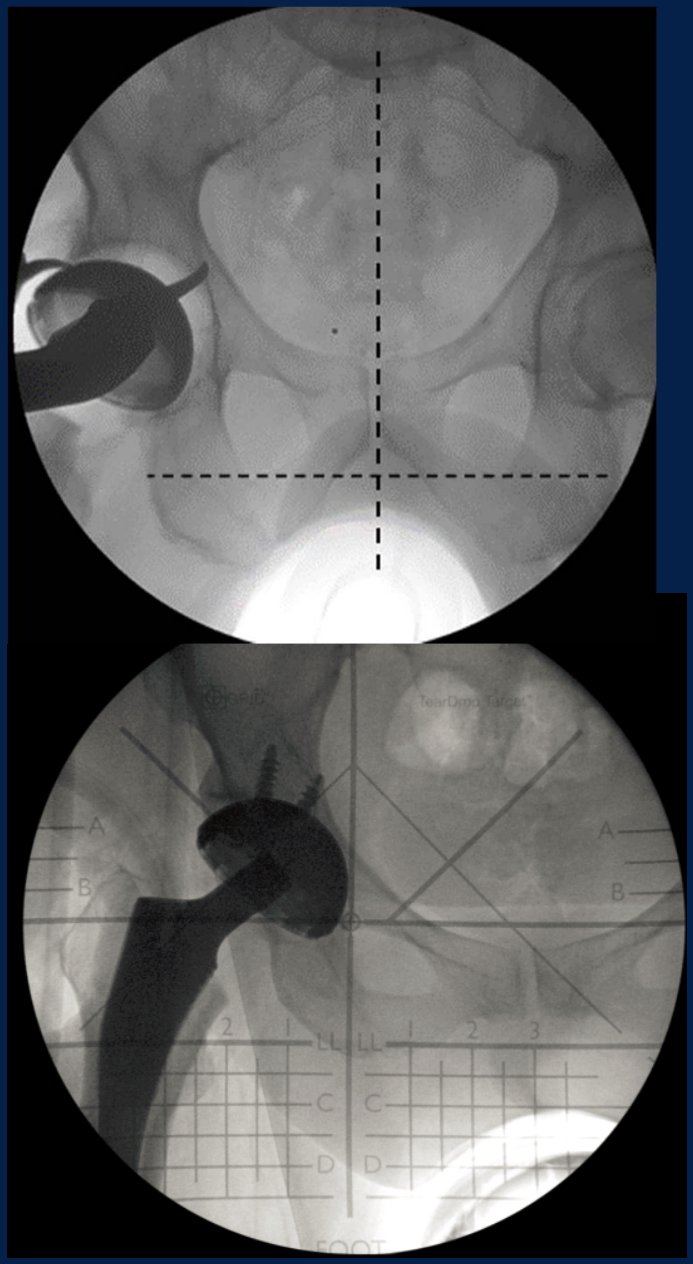
- Hip Extension, ER, Adduction

Perform THA

Supine positioning allows for easy use of fluoroscopy

Assists in cup positioning, leg length determination, offset, femoral sizing and positioning

Shouldn’t be any PACU surprises….



Hip Precautions

Traditionally Posterior hip = posterior precautions

Recent m[illegible] away fro[illegible] with specia[illegible] epairs

Anterior h[illegible] typically no[illegible]

Other Questions/Myths

- Platelet Rich Plasma and Stem Cells for arthritis
- Rejection and Metal Allergies
- Gender Specific Implants
- Minimally Invasive Surgery
- Navigation/Robotics/Computer Assisted

http://www.smartchoicestemcell.com/about-us/cost-and-financing.aspx

UCSF Health

When Bad Things Happen…

- Low Complication rate….but....
- Certain complications are devastating

Conclusions

- Hip and Knee Arthroplasty are rapidly expanding procedures with excellent long term outcomes
- Recovery is becoming significantly easier
- Modifiable risk factor optimization key to success

Thank you!

UCSF Health