Modes of Failure in Revision Hip and Knee Replacement

Park Jin Soo

Background

- Total joint replacement is one of the most commonly performed and successful operations in orthopaedics as defined by *clinical outcomes* and *implant survivorship**

* TWENTY-FIVE-YEAR SURVIVORSHIP OF TWO THOUSAND CONSECUTIVE PRIMARY CHARNLEY TOTAL HIP REPLACEMENTS

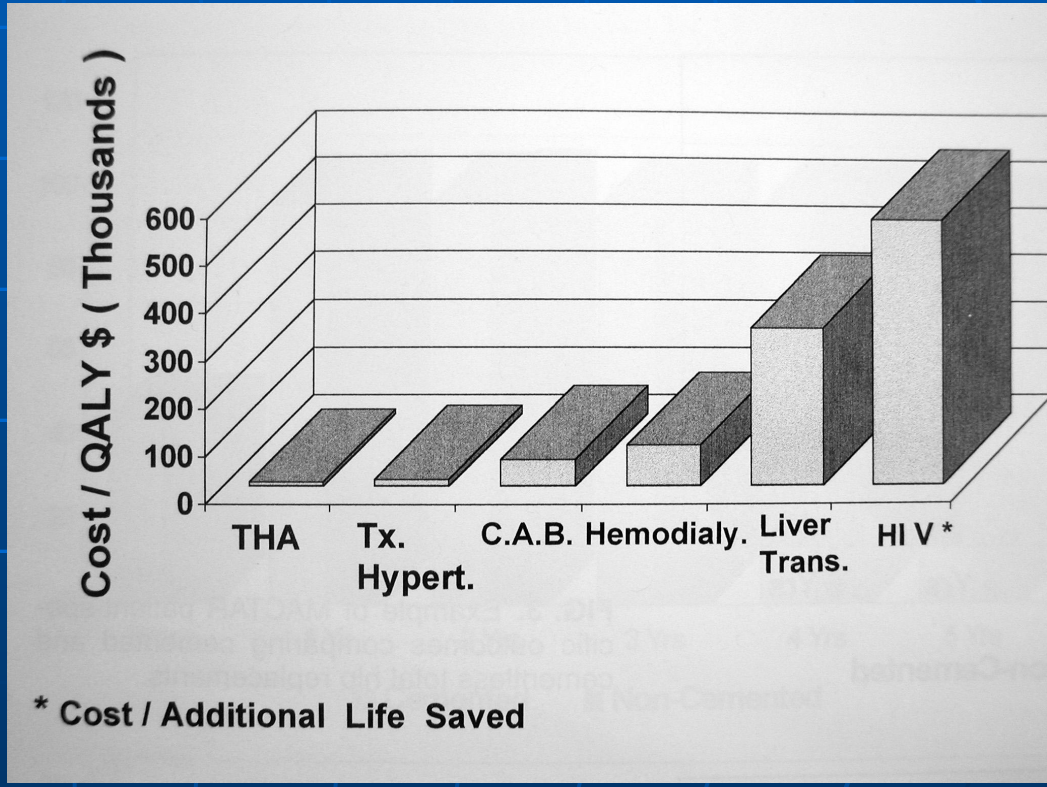
FACTORS AFFECTING SURVIVORSHIP OF ACETABULAR AND FEMORAL COMPONENTS

BY DANIEL J. BERRY, MD, W. SCOTT HARMSEN, MS, MIGUEL E. CABANELA, MD, AND BERNARD F. MORREY, MD

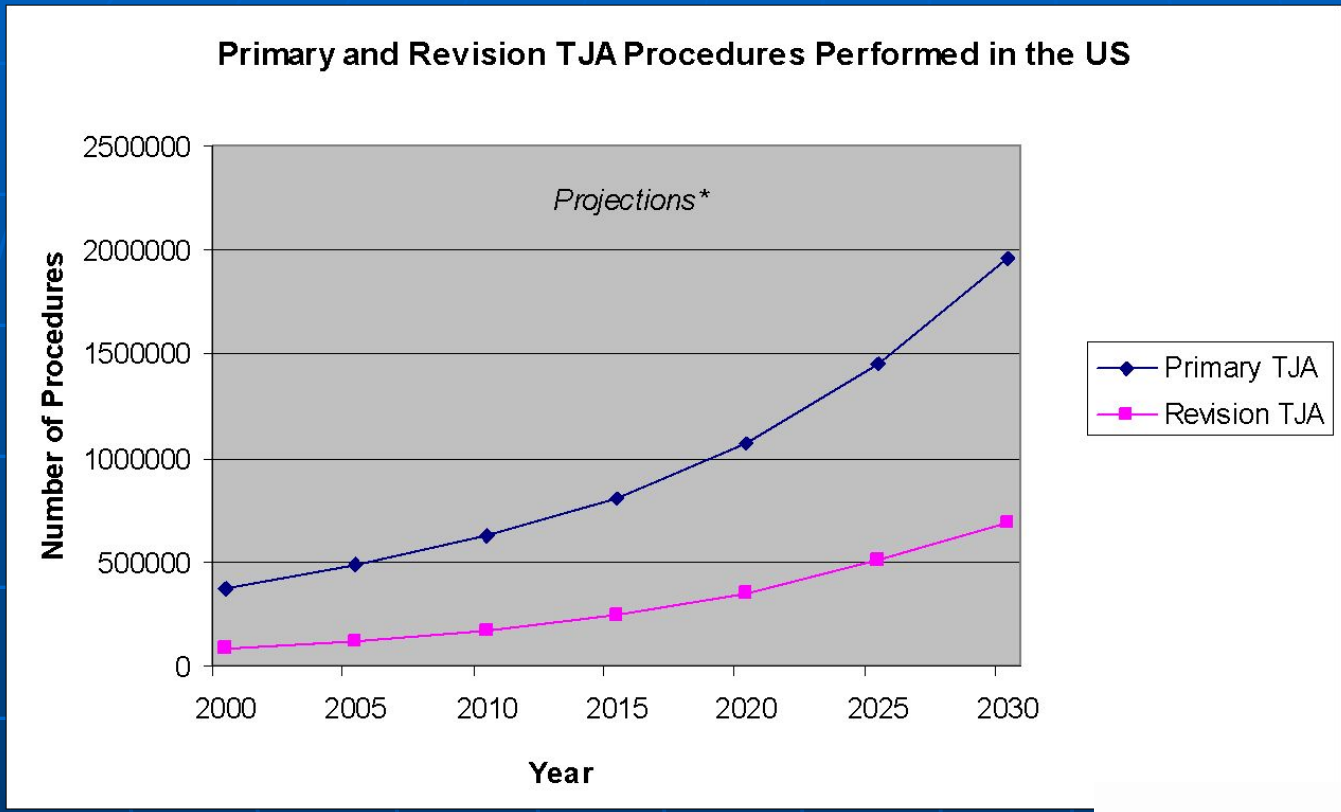
Investigation performed at the Department of Orthopedic Surgery, Mayo Clinic, Rochester, Minnesota

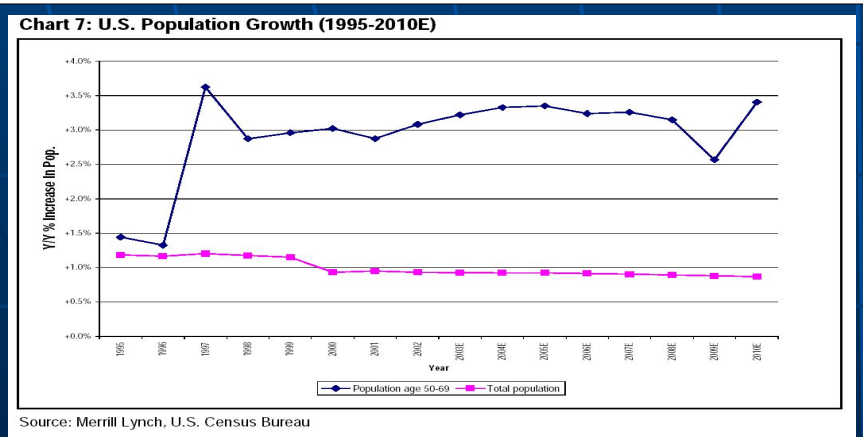
Background

- Total joint replacement (TJR) is one of the most cost-effective procedures in all of medicine.

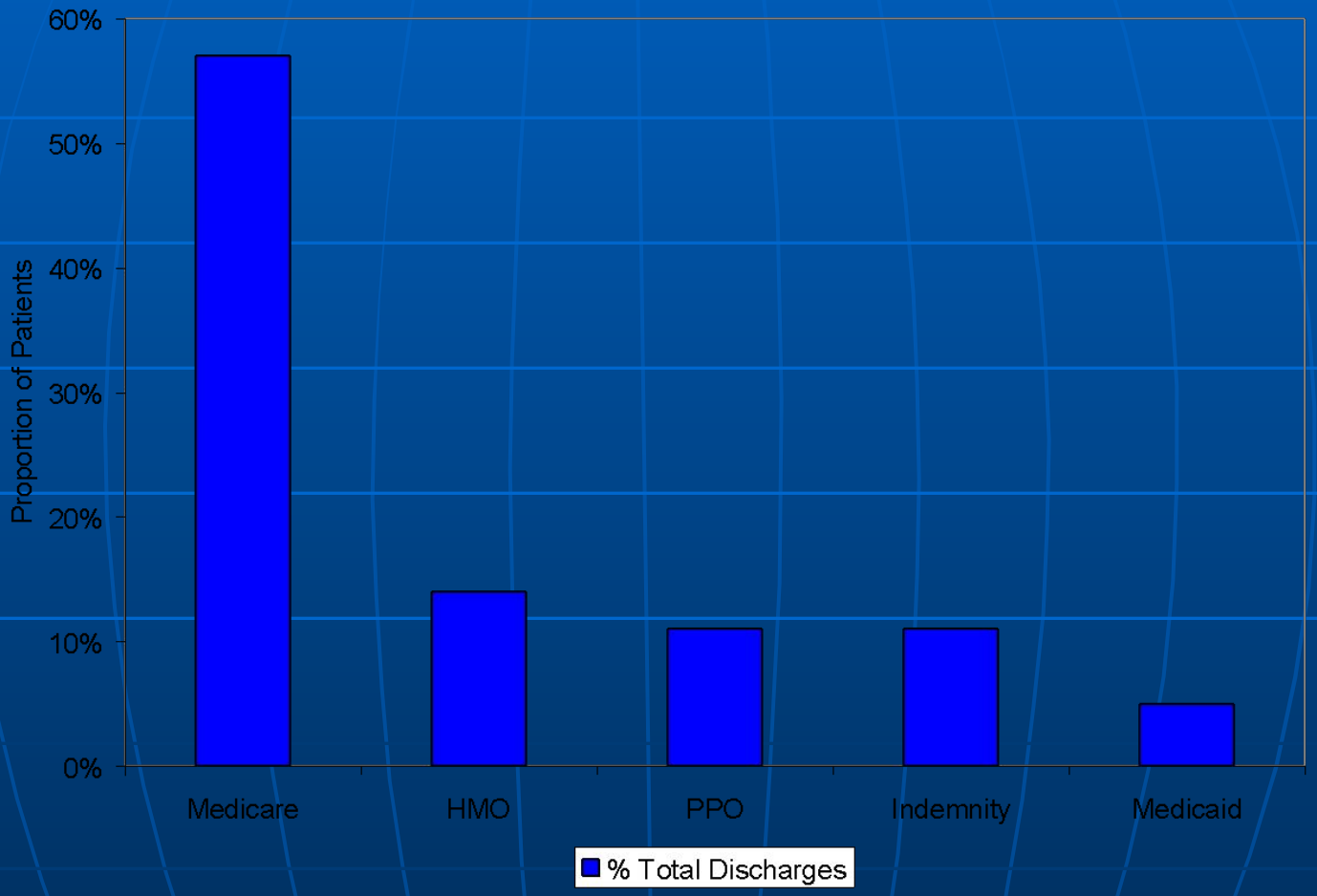


TJA Volume Estimates



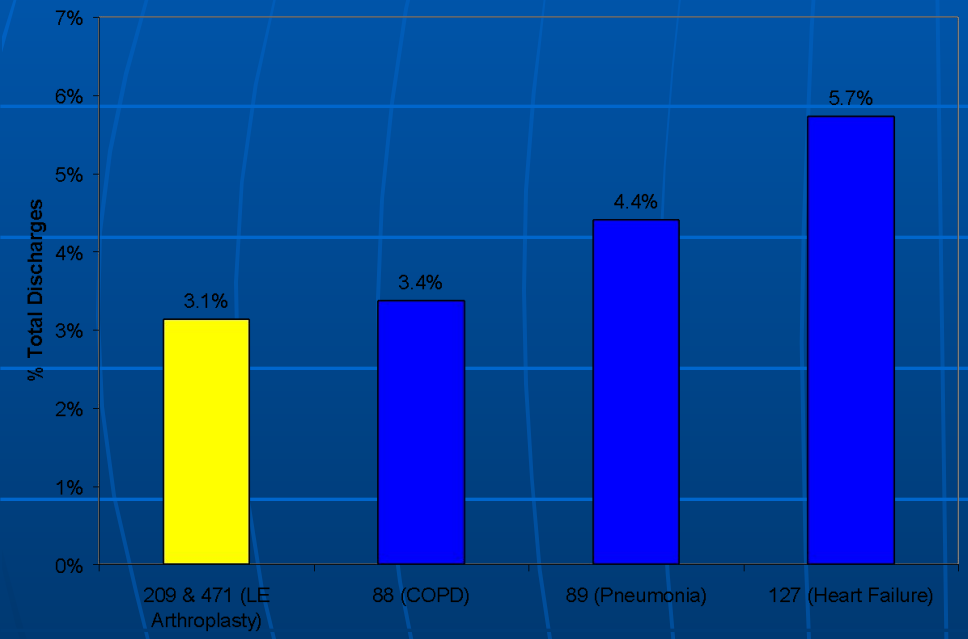


U.S. TJR Payer Mix

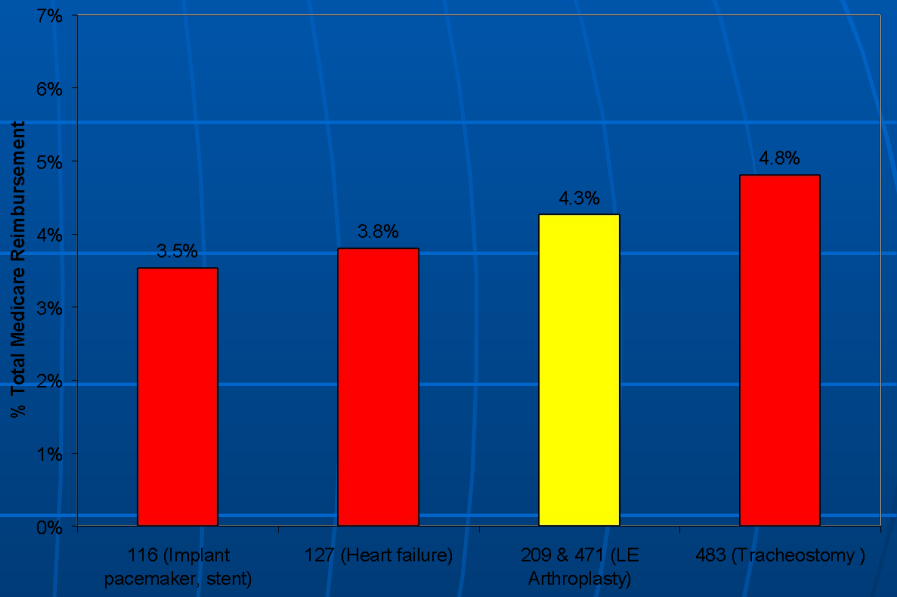


Source: AHRQ, HCUPnet, 2002 Nationwide Inpatient Sample, http://hcup.ahrq.gov/HCUPnet.asp, site accessed on July 26, 2004. Total Hip Replacement is sum of ICD9-CM Procedure Codes 81.51 and 81.53. 81.51 Total Hip Replacement, 81.53 Revise Hip Replacement. NIS data is collected for calendar years (January – December). Routine discharge is discharge to home only. Discharge to another institution includes discharge to SNF and IRF.

DRG 209/471: 1998-2002



% of Medicare Discharges



% of Medicare Inpatient Charges

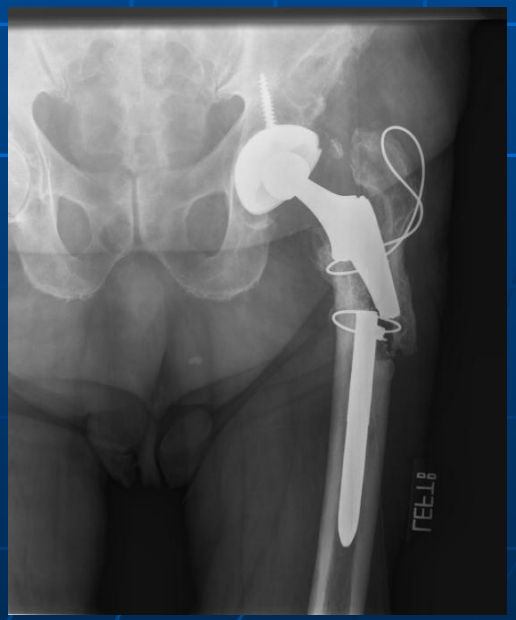
TJR Failure

- Despite the success achieved with most primary TJR procedures, factors related to *implant longevity* and a younger, *more active patient population* have led to a steady increase in the number of *failed TJR's*

Problem with Current ICD-9-CM Diagnosis Codes

- Currently, all failed TJR's are coded as either:
  - ***996.4*** *Mechanical complication of an internal orthopedic device, implant, or graft*:
  - Mechanical complications involving external fixation device using internal screw(s), pin(s), or other methods of fixation; grafts of bone, cartilage, muscle, or tendon; internal fixation device such as nail, plate, rod, etc.

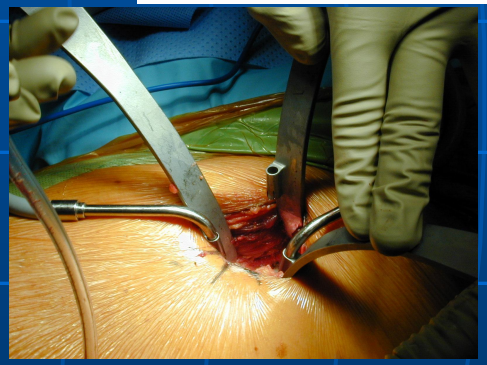
  - ***996.6*** Infection and inflammatory reaction due to internal joint prosthesis



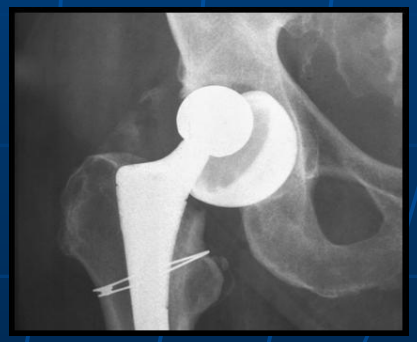
Problem with Current ICD-9-CM Diagnosis Codes

- New technologies and surgical techniques are constantly being introduced into the marketplace

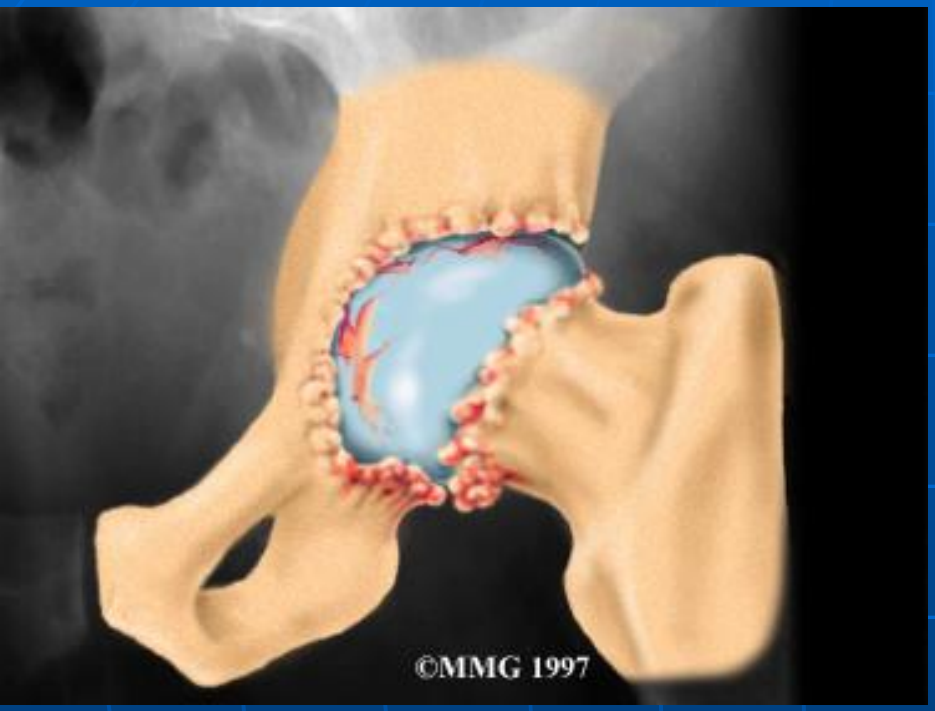
- Despite careful laboratory testing, a certain percentage of new technologies are associated with higher rates of clinical failure

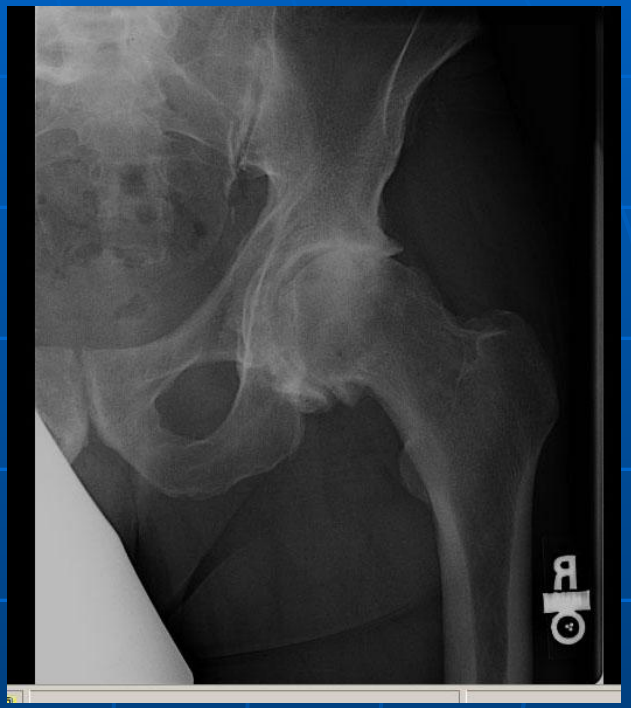


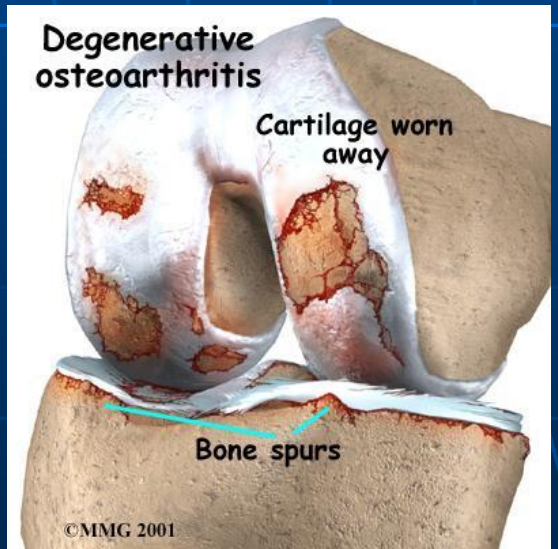
- Current ICD-9-CM Diagnosis codes *limit our ability to track clinical outcomes and complications* related to *new techniques and technologies in TJR*

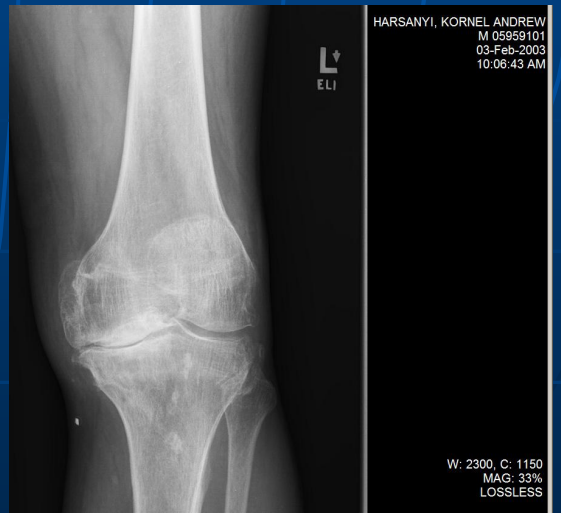


TJA: Indications









Arthritis—Background

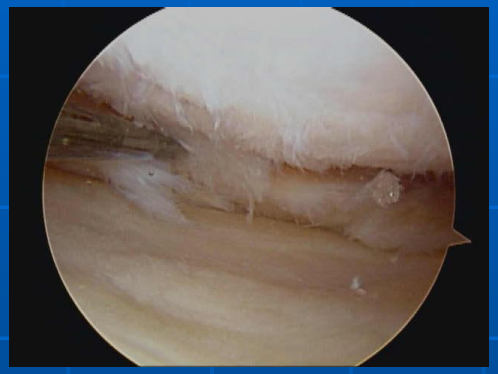
- Arthritis is the second most common chronic condition in the US (sinusitis is first)
  - Most common among elderly
- 20-30% of people over age 70 suffer from osteoarthritis (OA) of the hip
- Arthritis affects over 32 million people in the US
- Total costs associated with arthritis are over $82B/year, including hospital and drug costs, nursing home costs, and lost productivity and work

Treatment Options: Non-operative

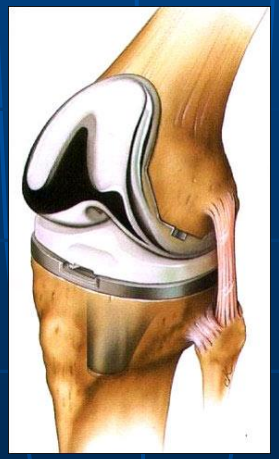
- Activity Modification
- Weight Loss
- Cane/walker
- Physical Therapy
- Medications:
  - NSAIDs
  - COX-2 Inhibitors
  - Nutritional supplements
- Injections:
  - Corticosteroid
  - Viscosupplementation

Surgical Treatment Options

- Joint preserving operations
  - Arthroscopy
  - Cartilage transplantation
  - Osteotomy



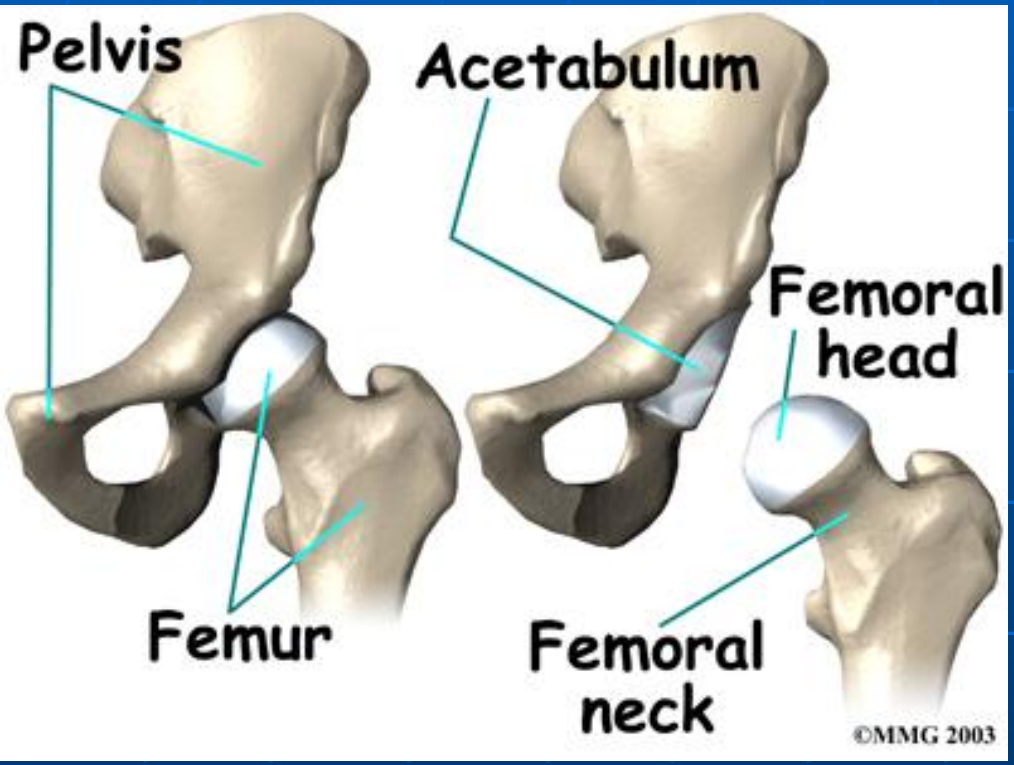
- Arthroplasty Options:
  - Hemiarthroplasty
  - Resurfacing arthroplasty
  - **Total joint arthroplasty**

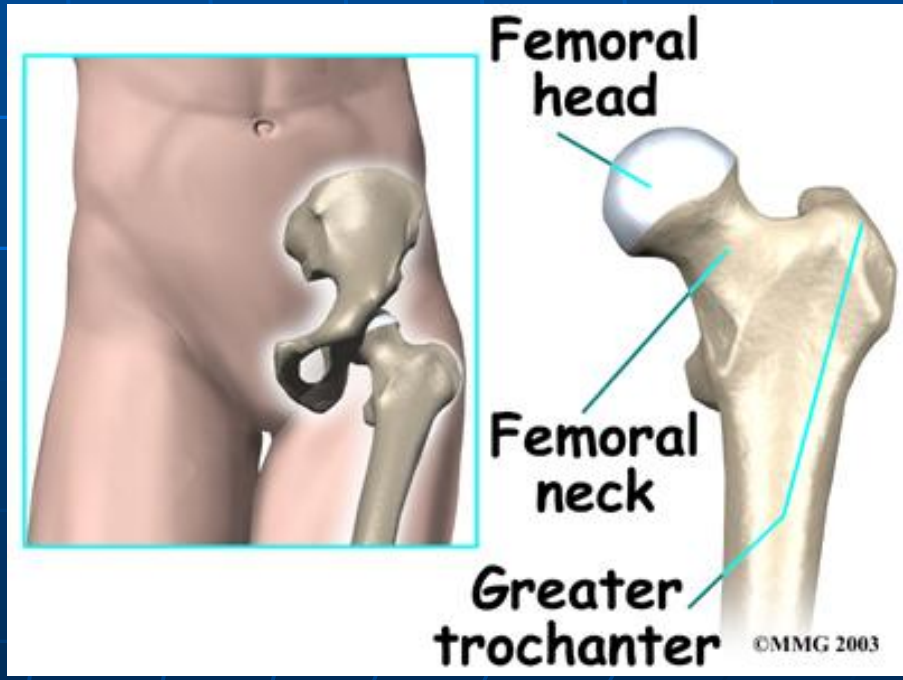


Goals of Joint Replacement Surgery

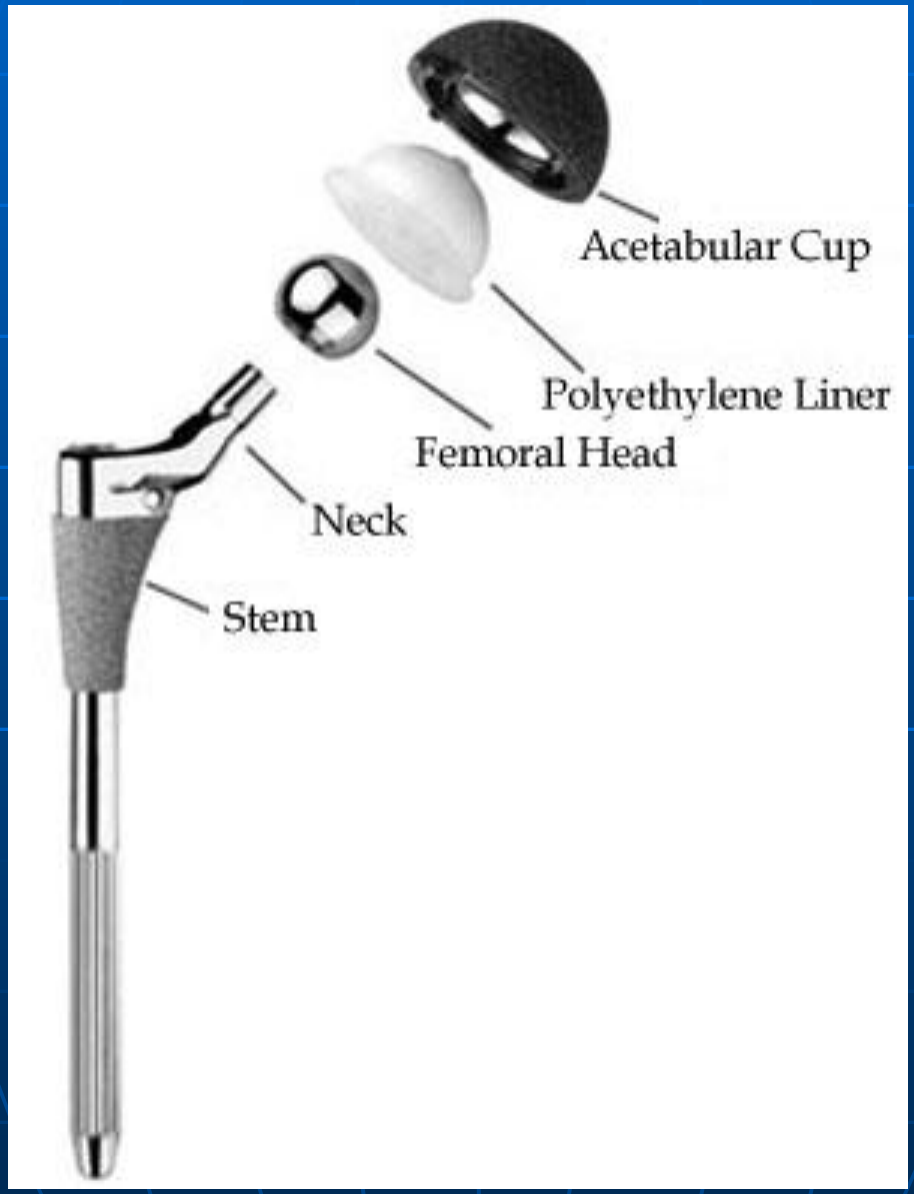
- ***Relieve pain!!!***
- Restore function, mobility

Anatomy—Hip


Pelvis
Acetabulum
Femoral head
Femur
Femoral neck
©MMG 2003


Femoral head
Femoral neck
Greater trochanter
©MMG 2003

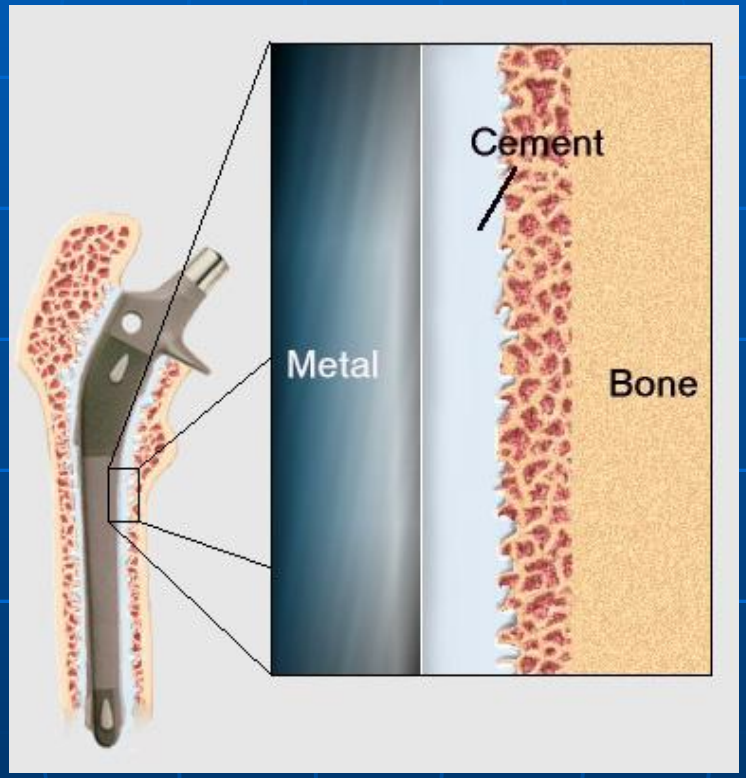
THA Implants



Implant Choice

<u>Cemented</u>:

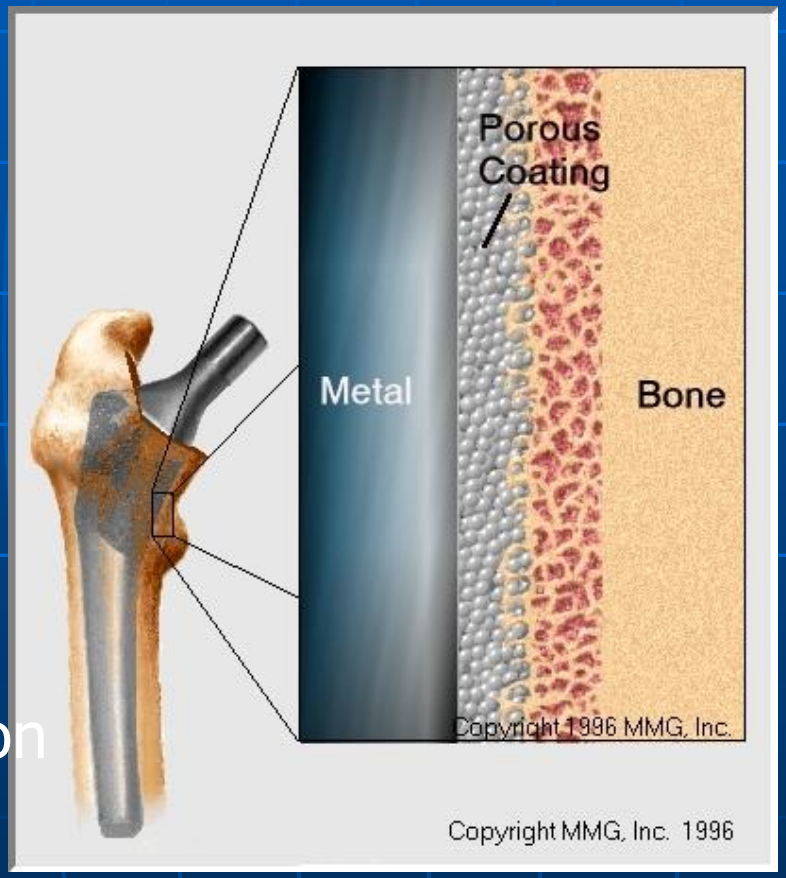
- Elderly (>65)
- Low demand
- Better early fixation
- ? late loosening



Implant Choice

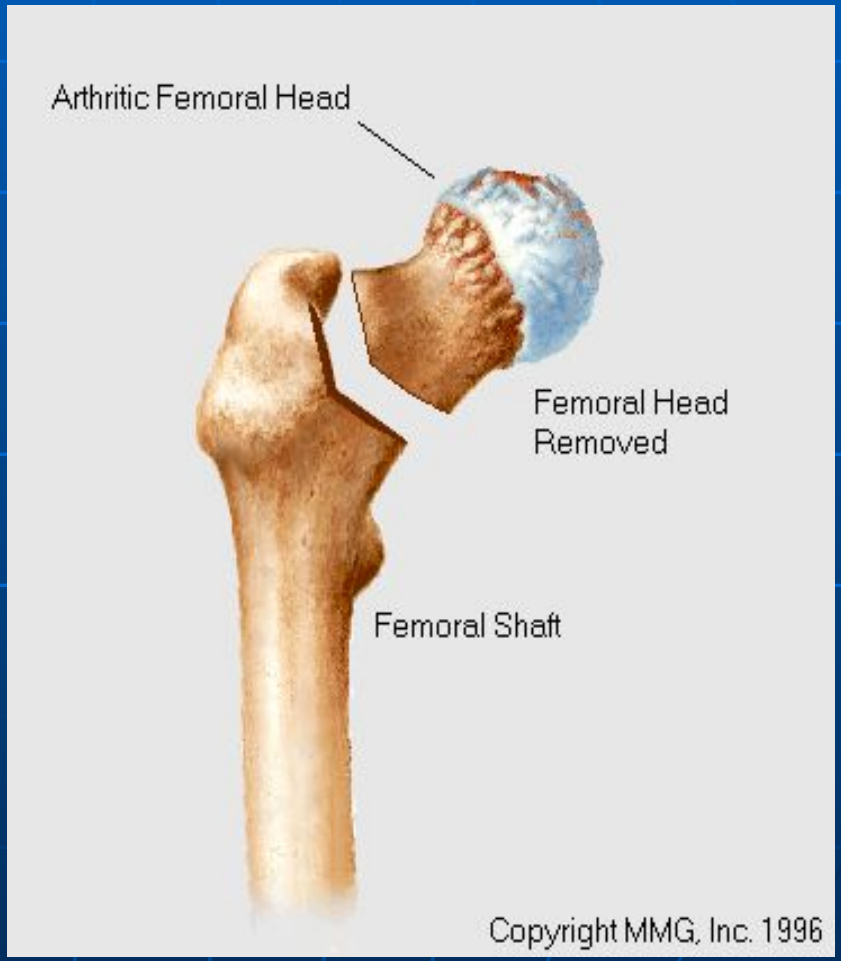
<u>Cementless</u>:

- Younger
- More active
- Protected weight-bearing first 6 weeks
- ? Better long-term fixation



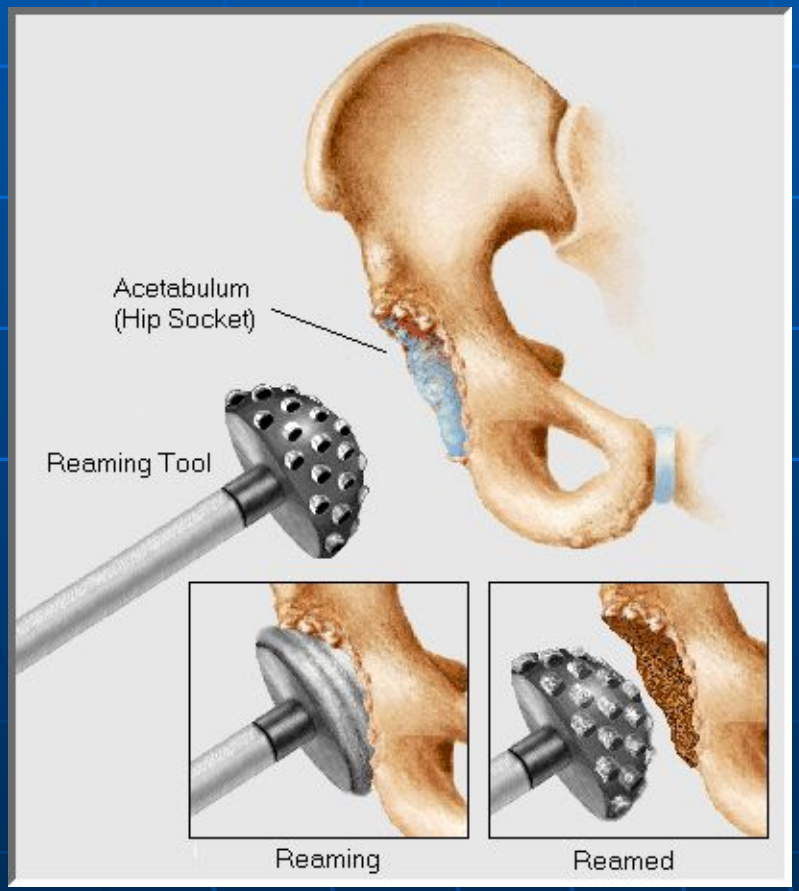
Technique: Total Hip Replacement

- Femoral neck resection

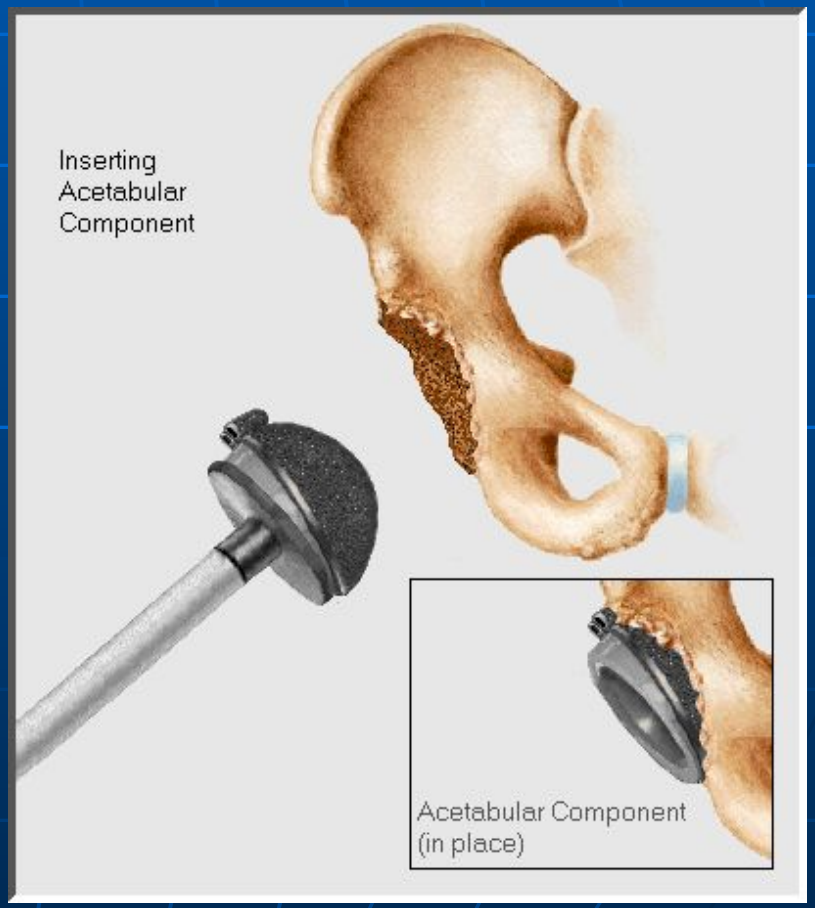


Technique: Total Hip Replacement

- Acetabular reaming

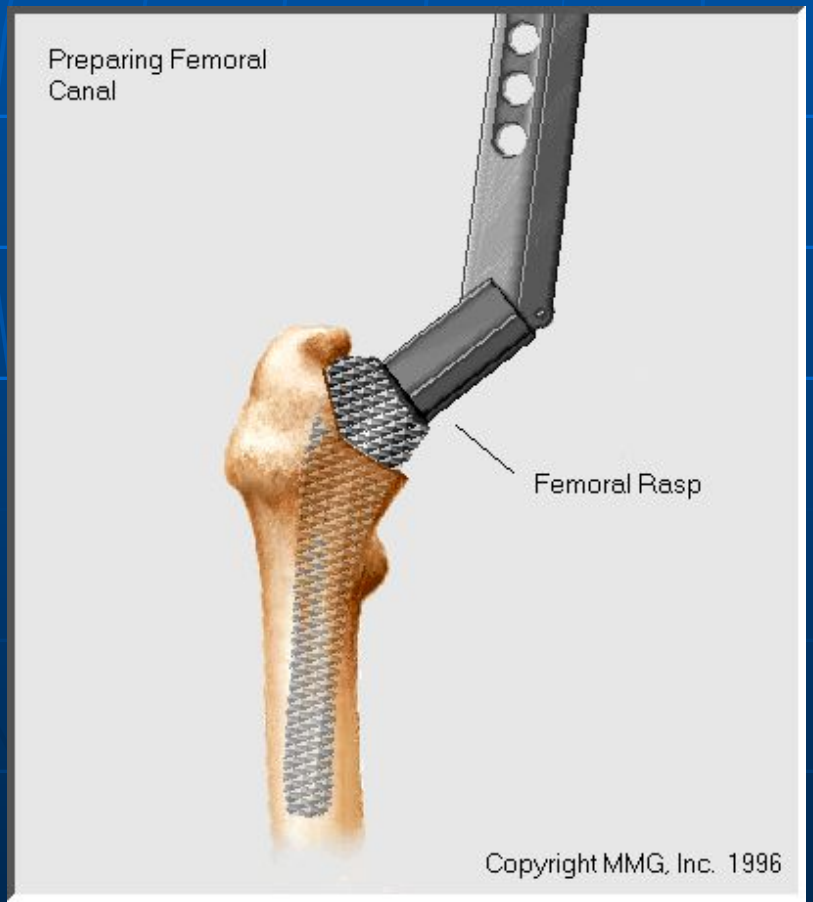


- Insertion of acetabular component

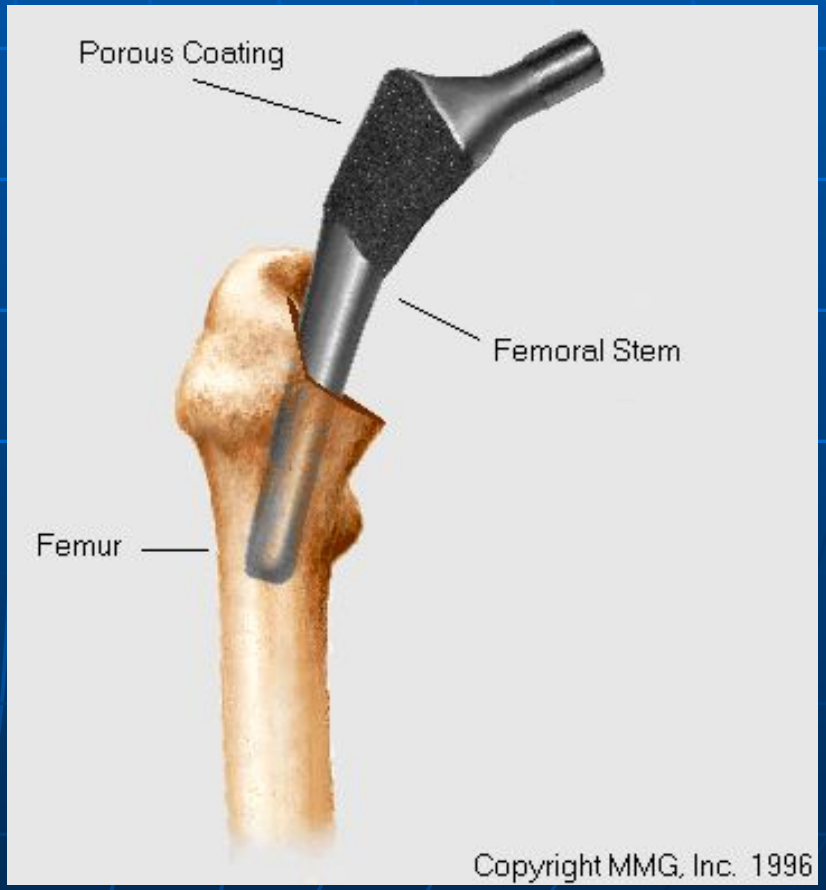


Technique: Total Hip Replacement

- Reaming/broaching of femoral component

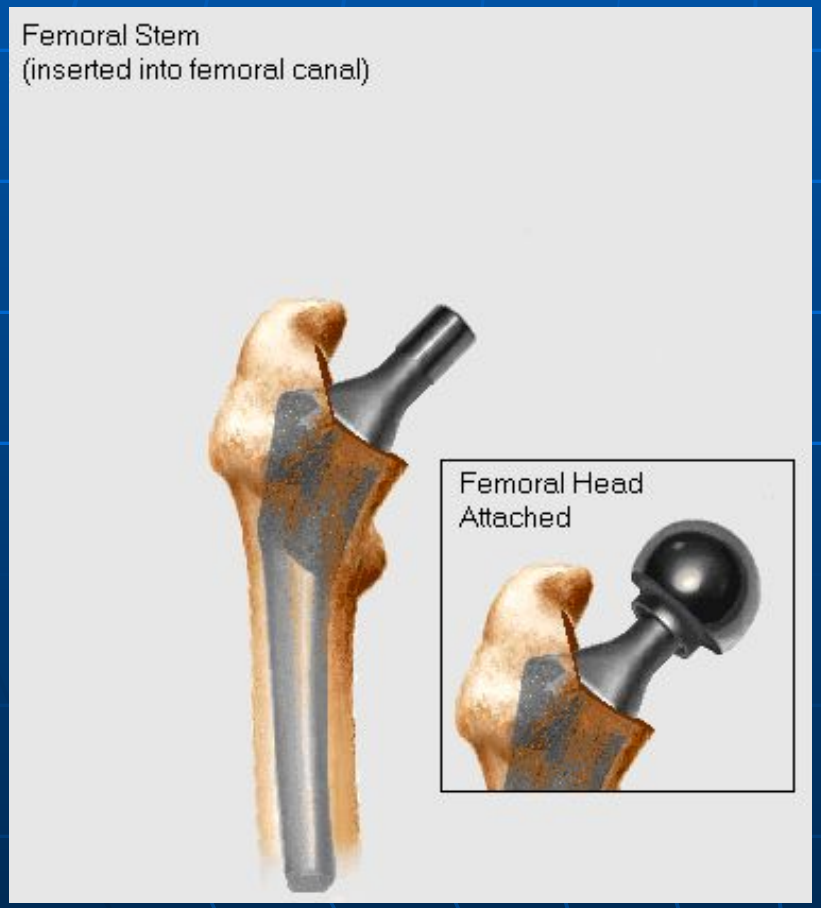


- Insertion of femoral component

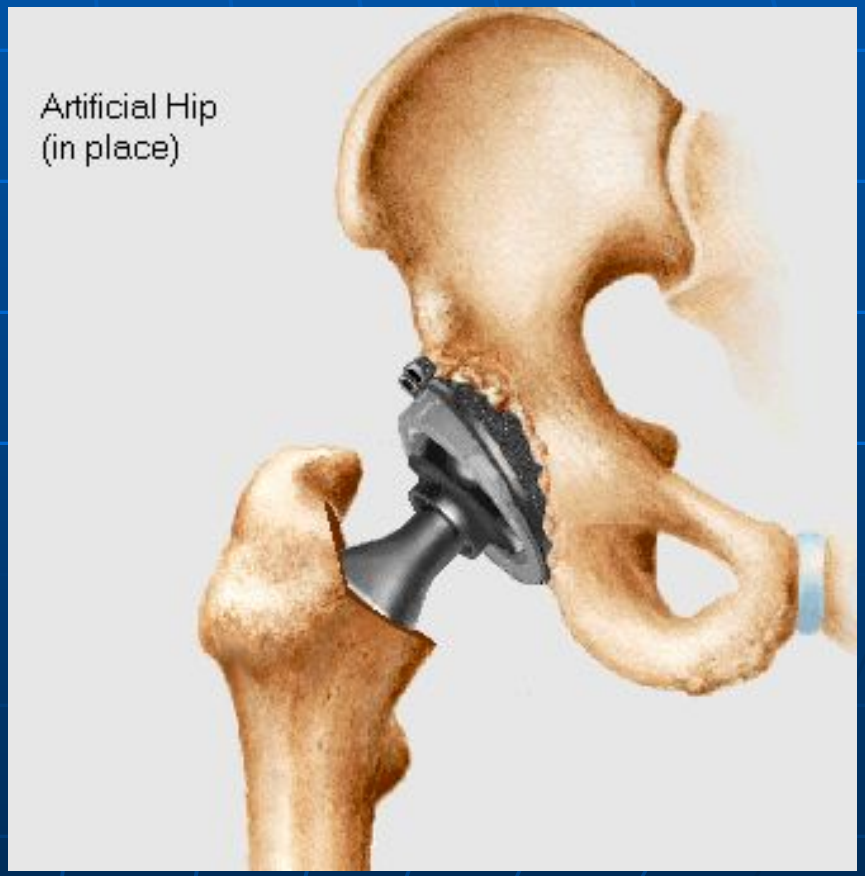


Technique: Total Hip Replacement

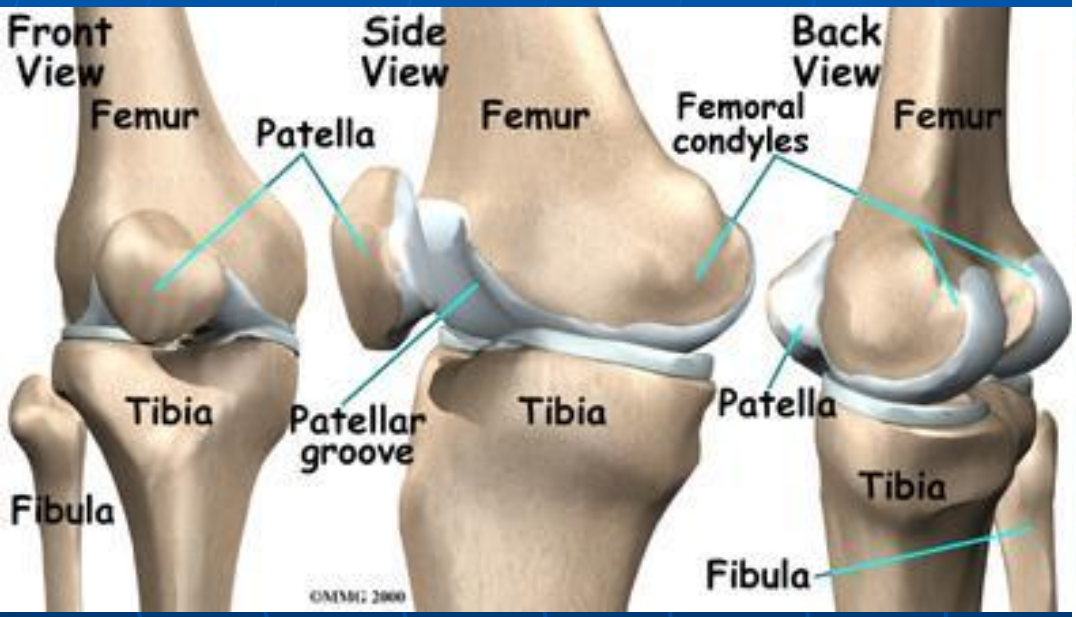
- Femoral head impaction

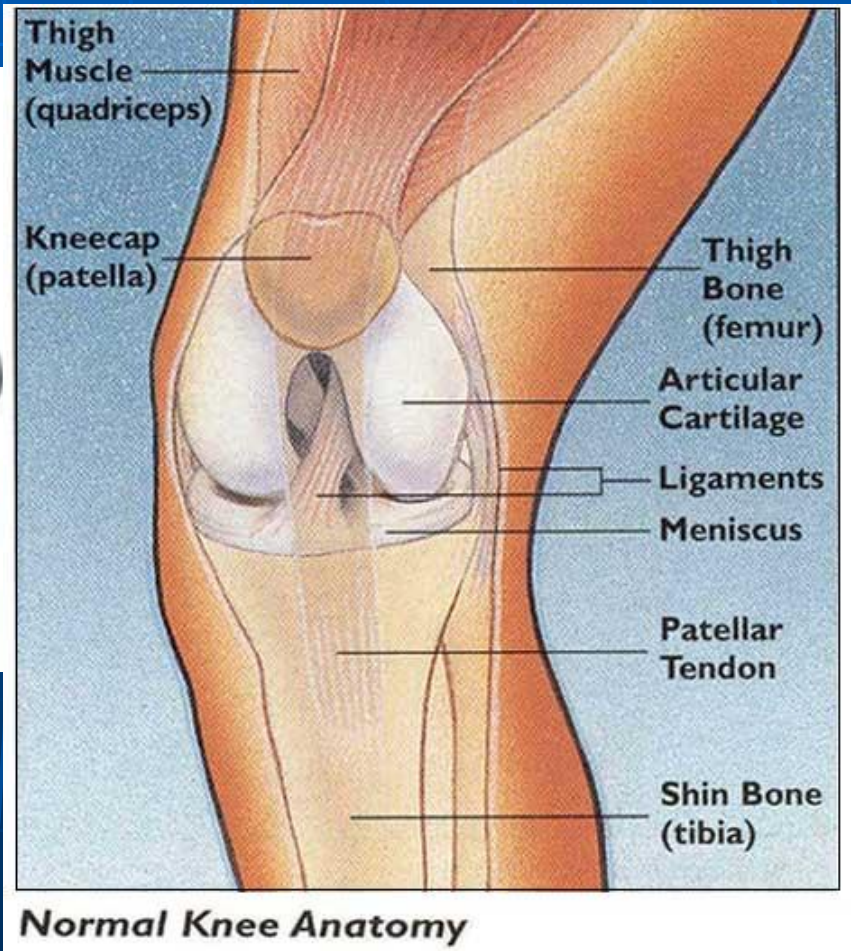


- Final implant



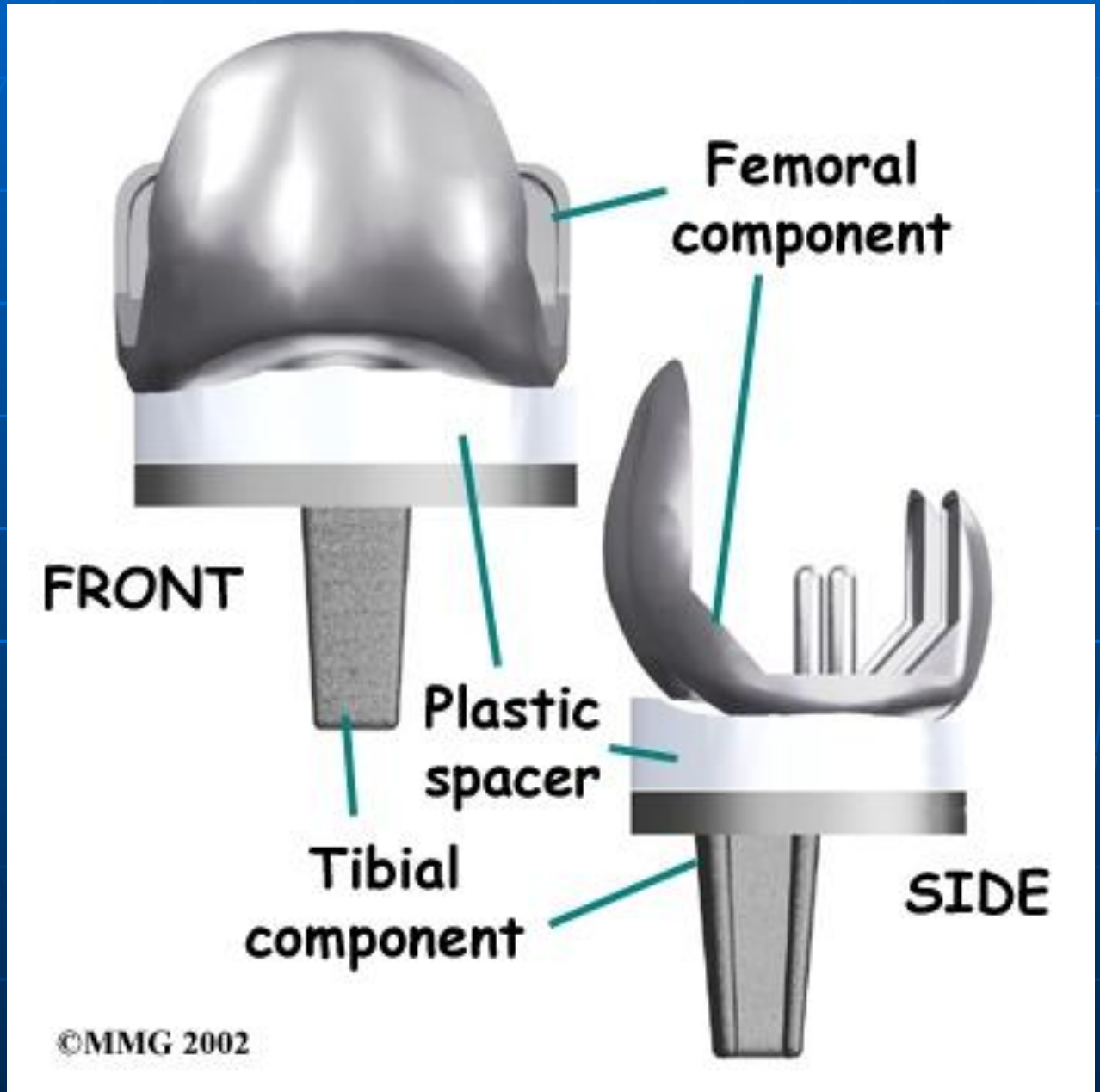
Anatomy—Knee





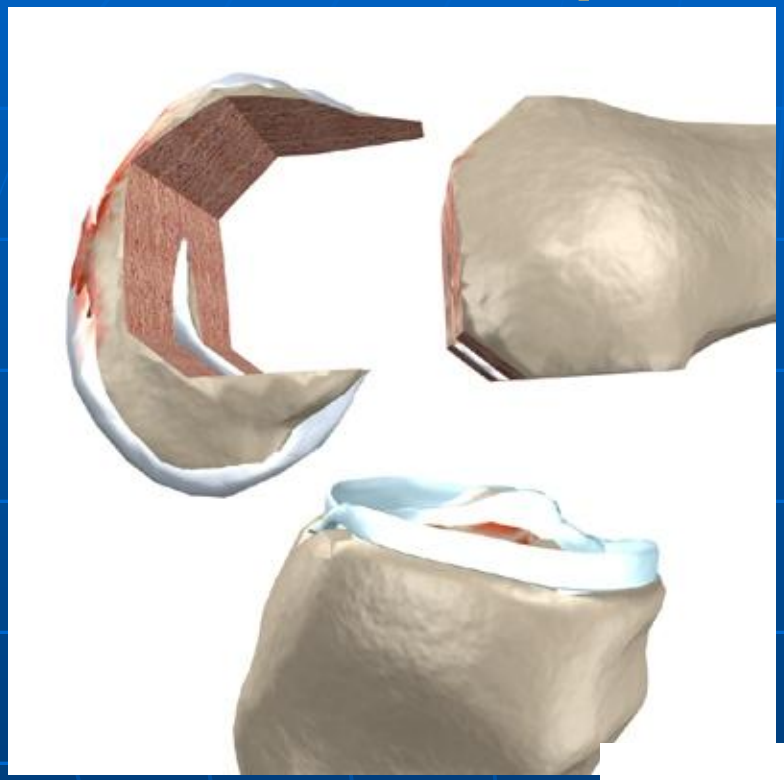
Normal Knee Anatomy

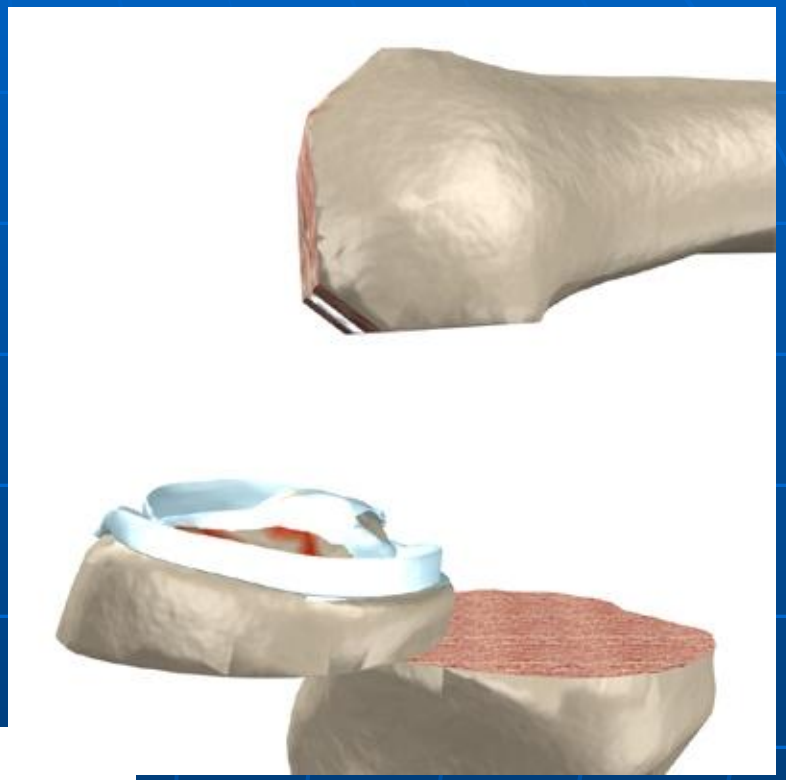
Knee Replacement—Implants



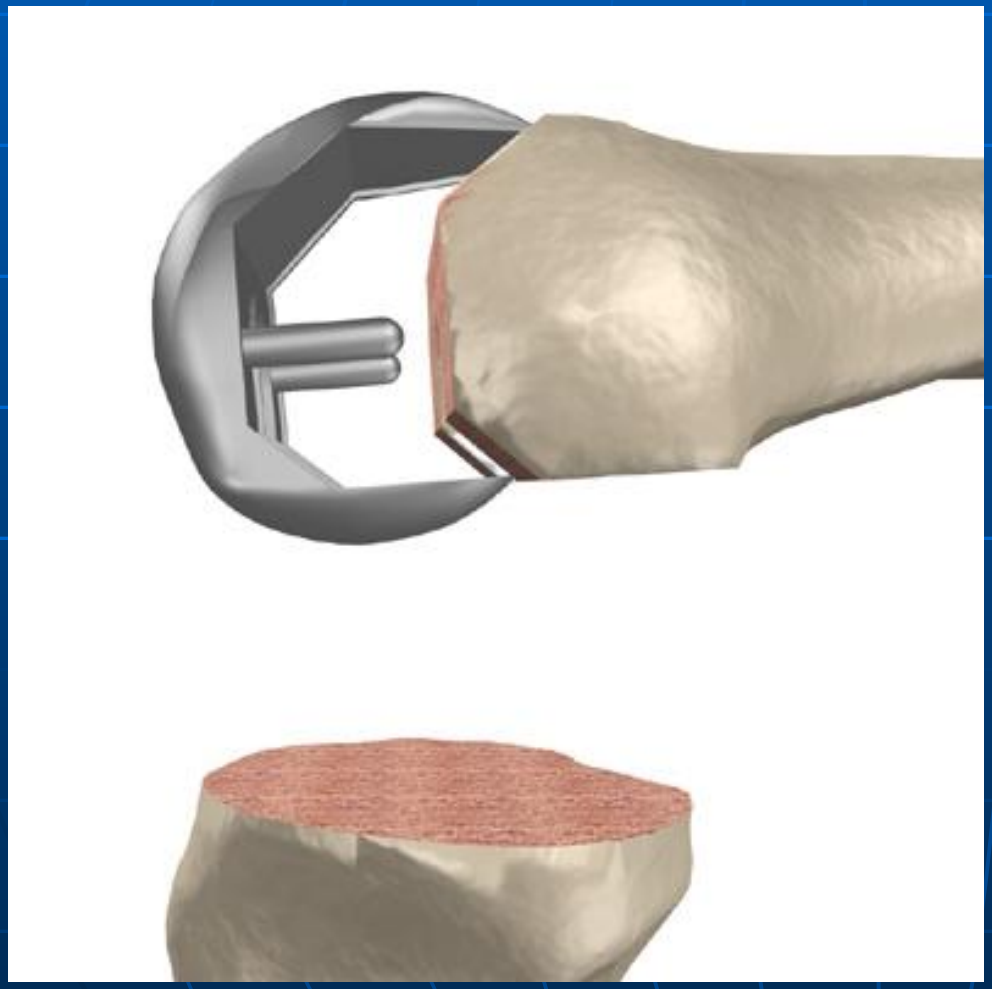
Patellar component

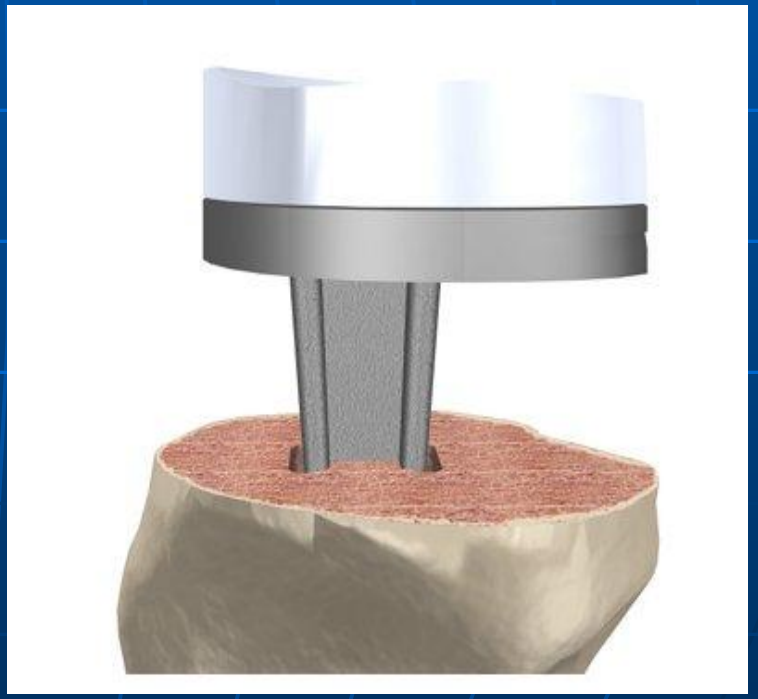
Knee Replacement—Bone Cuts



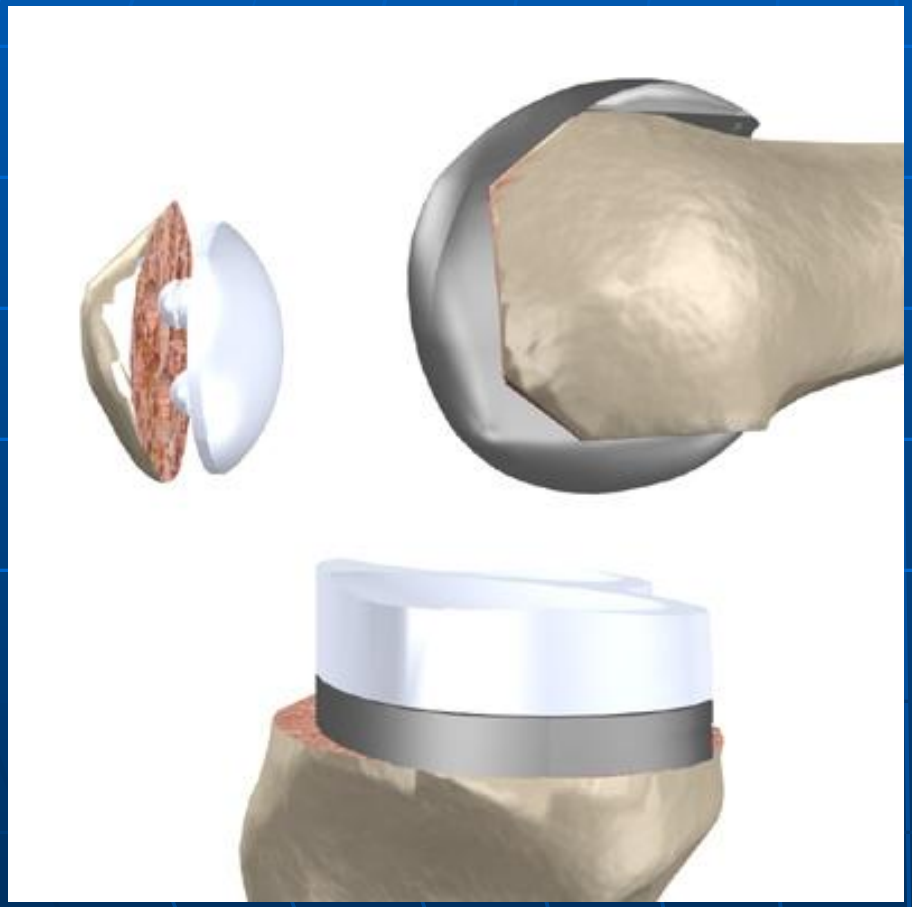


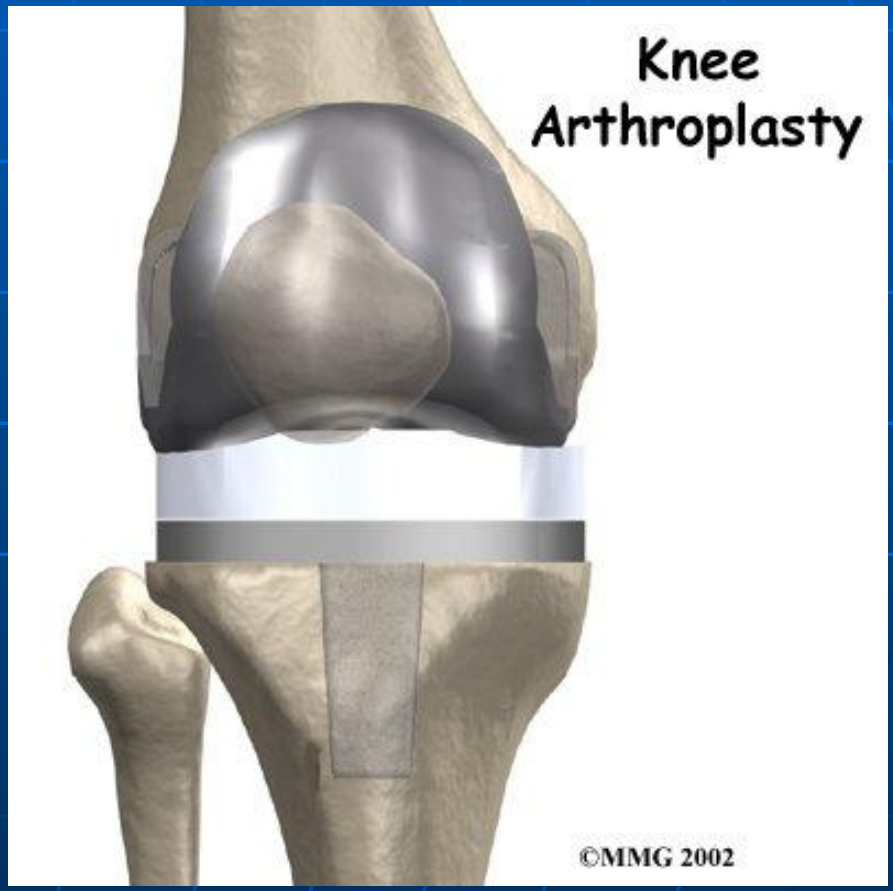
Knee Replacement—Implants





Knee Replacement—Implants



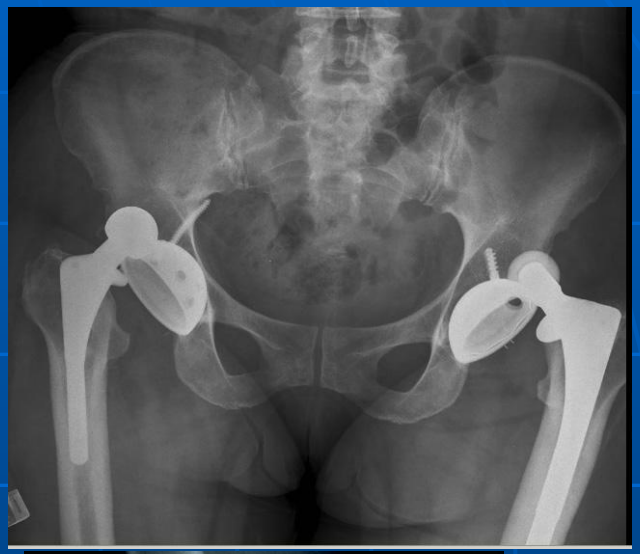


Causes of TJR Failure

- Wear of articular bearing surface
- Aseptic/mechanical loosening
- Osteolysis
- Infection
- Instability
- Peri-prosthetic fracture
- Implant Failure

Timing of TJR Failure

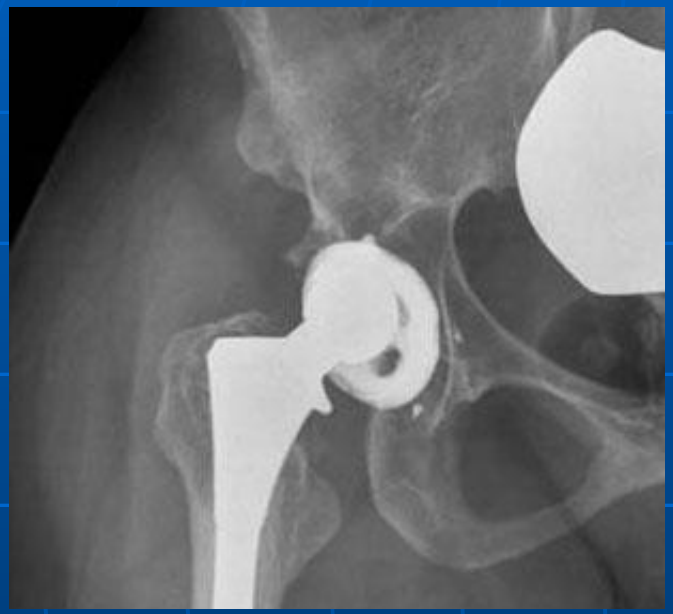
- Early (<10%)
  - *Dislocation*
  - Infection
  - Implant failure
- Late (> 5 yrs post op)
  - *Wear of articular bearing surface*
  - Osteolysis
  - Mechanical loosening
  - Peri-prosthetic fracture

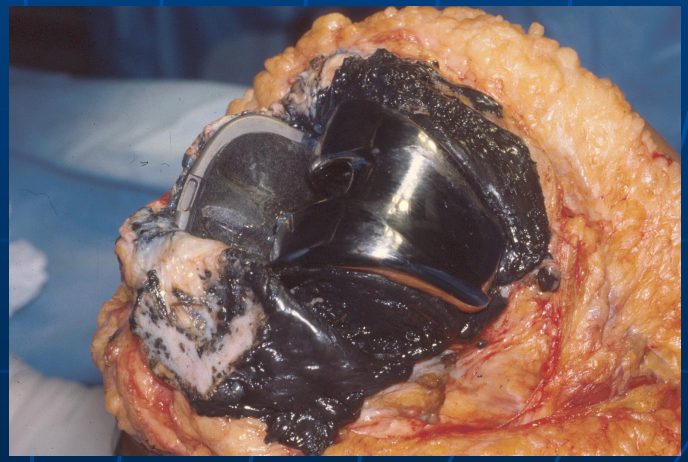


Dislocation/Instability

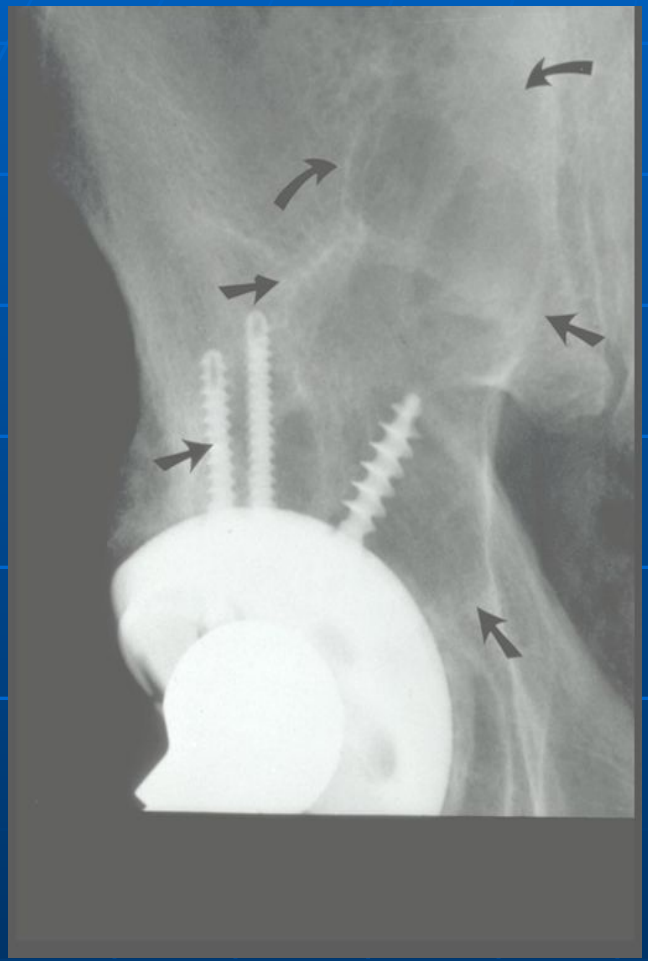
Infection

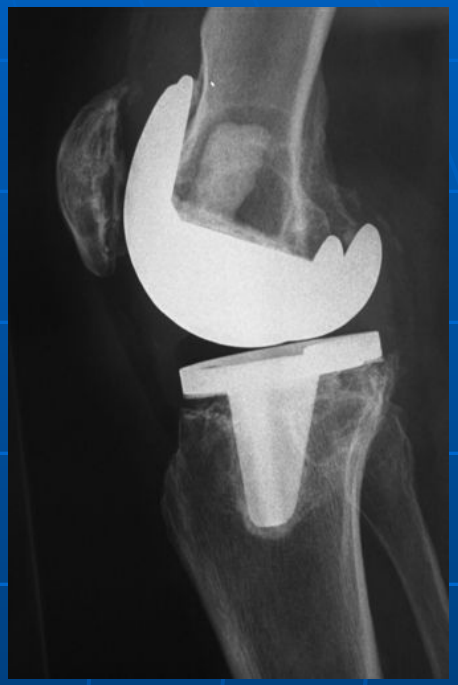
Wear of Articular Bearing Surface

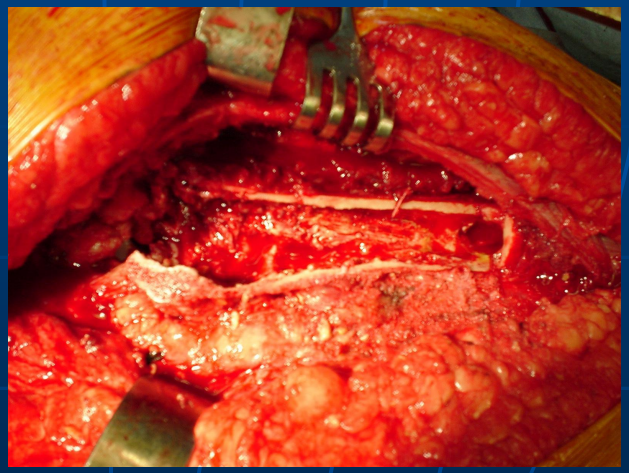




Osteolysis





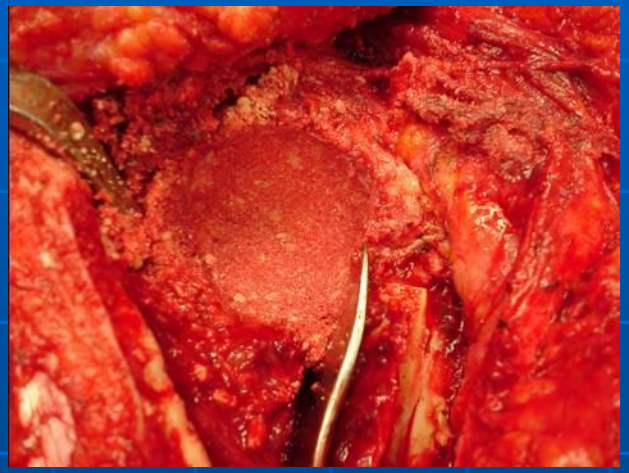


Aseptic/Mechanical Loosening

Peri-Prosthetic Fracture

Implant Failure

Major Osseous Defects



Major Osseous Defects

Benefits of Revised Codes

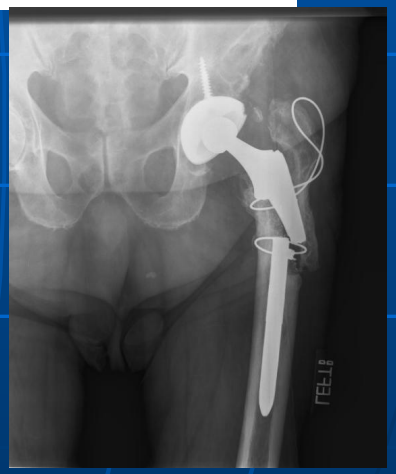
MEDPAR database

- Robust source of data for evaluating clinical outcomes, complication rates, and resource utilization in TJR

- However, current ICD-9 codes do not distinguish between the *type of orthopedic device failure* or the *cause of TJR failure*

ASSOCIATION BETWEEN HOSPITAL AND SURGEON PROCEDURE VOLUME AND OUTCOMES OF TOTAL HIP REPLACEMENT IN THE UNITED STATES MEDICARE POPULATION*

BY JEFFREY N. KATZ, MD, MS, ELENA LOSINA, PHD, JANE BARRETT, MSC, CHARLOTTE B. PHILLIPS, RN, MPH, NIZAR N. MAHOMED, MD, SCD, ROBERT A. LEW, PHD, EDWARD GUADAGNOLI, PHD, WILLIAM H. HARRIS, MD, ROBERT POSS, MD, AND JOHN A. BARON, MD, MPH



Benefits of Revised Codes

- Ability to specify the *cause of implant failure*
- Ability to evaluate *implant-specific TJR failure rates* => refine indications, surgical technique, and implant choice

- Facilitates steady, continuous *quality improvement* by shortening the time span for detection of poor performance of new techniques and technologies

Benefits of Revised Codes

American Joint Replacement Registry(AJRR)

- Goals
  - Accurately define the epidemiology of TJR in the U.S.
  - Identify risk factors for poor outcomes
  - To improve outcomes through continuous feedback to participating centers and surgeons

- ***The success of this project is critically dependent on having revised ICD-9-CM Codes that differentiate between different modes of failure in TJA!!***

Benefits of Revised Codes

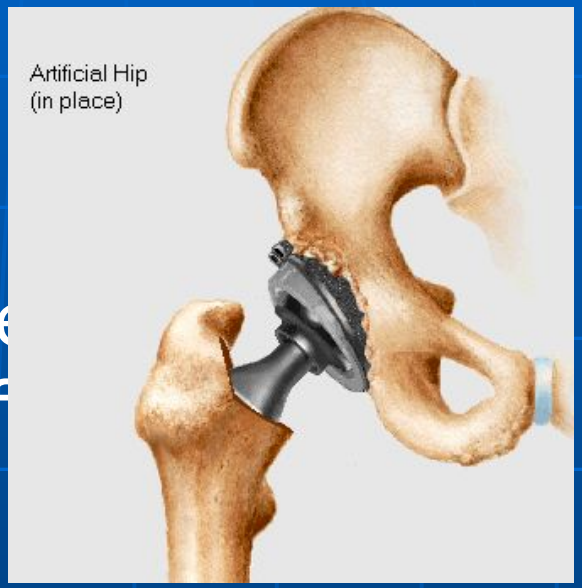

THE SWEDISH TOTAL HIP REPLACEMENT REGISTER

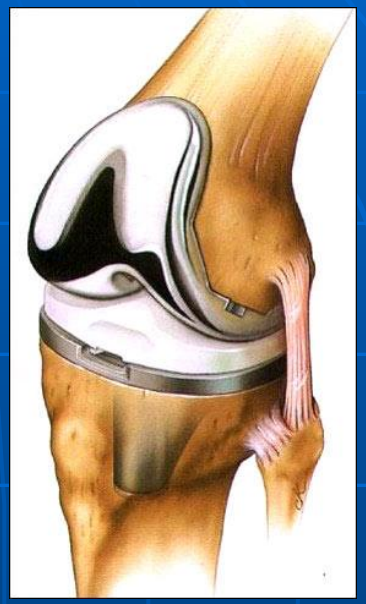
BY HENRIK MALCHAU, MD, PHD, PETER HERBERTS, MD, PHD, THOMAS EISLER, MD, GÖRAN GARELLICK, MD, PHD, AND PETER SÖDERMAN, MD, PHD

- Credited with substantially reducing revision rates through early identification of failures
- Revision rate of 8% (vs. 17% in U.S.)
- Estimated that over 11,000 revisions have been avoided
  - Direct cost savings of $140 million

Summary

- Hip and knee replacement are commonly performe and highly successf operations

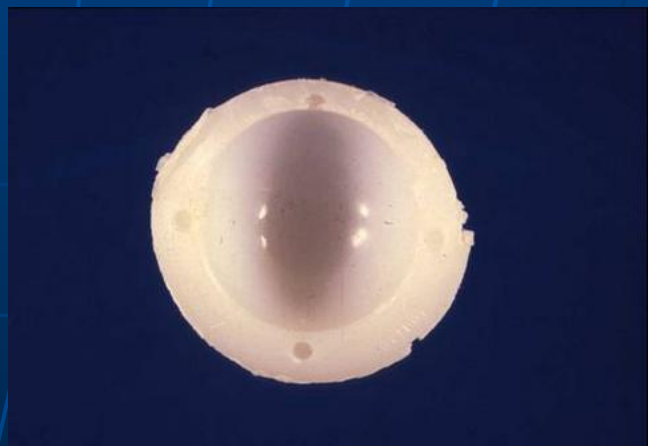




- Most TJR's last 10-15 years or more

Summary

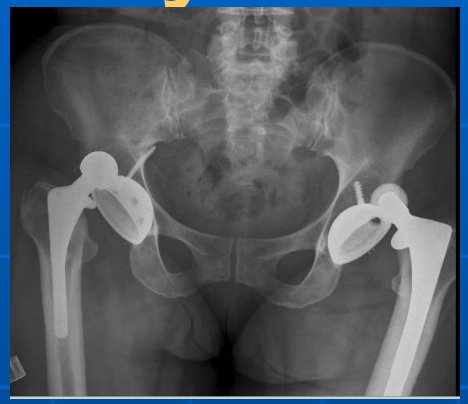
- When failure does occur, the *type and cause of failure* will determine the type of revision joint replacement procedure performed (partial vs. total)

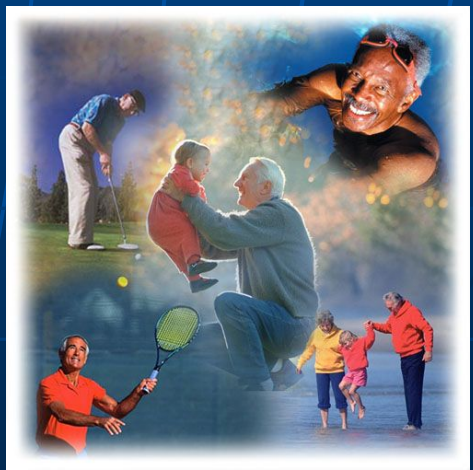


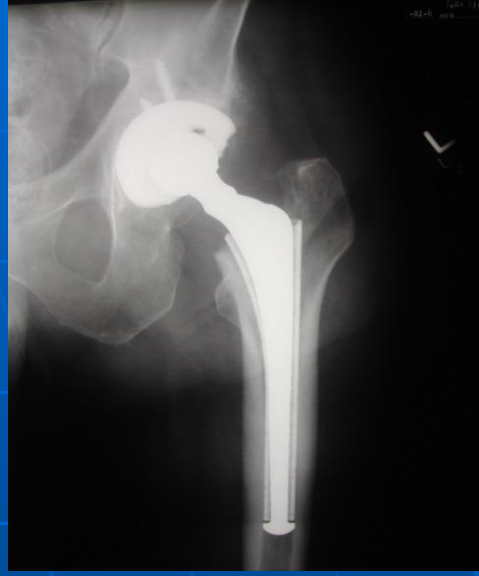
Summary

- Current ICD-9-CM Diagnosis codes do not provide any information regarding the type or cause of implant failure

- Revised codes will benefit patients, providers, and payors by facilitating continuous feedback and improvement in clinical outcomes in TJR







Thank You!!!