Managing OA of the Knee and Hip: From Injections to Joint Replacement. An evidence based talk

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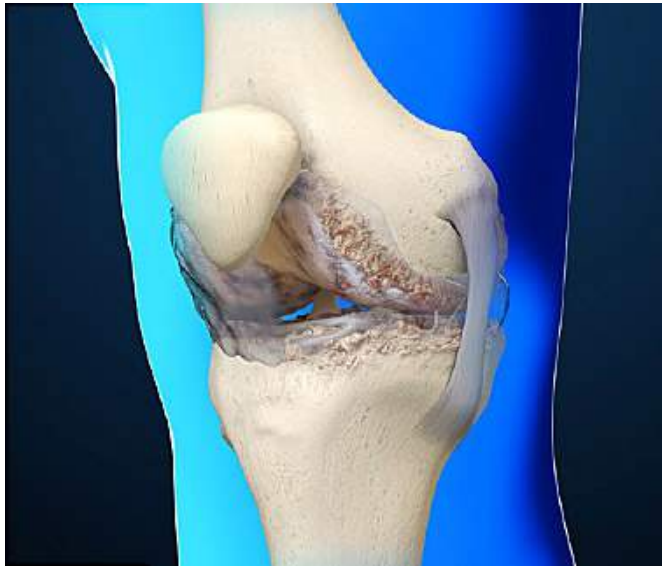
30th Annual Metabolic Bone Disease Society Meeting

Disclosures

- Consultant Zimmer Biomet
- Consultant AIC

Outline

- OA:
  - Types
  - Causes
- Pathophysiology
- Diagnosis
- Treatment (KNEE and then HIP)
  - Non-operative measures
  - Operative measures



Osteoarthritis (OA)

- Osteoarthritis is a non-inflammatory,

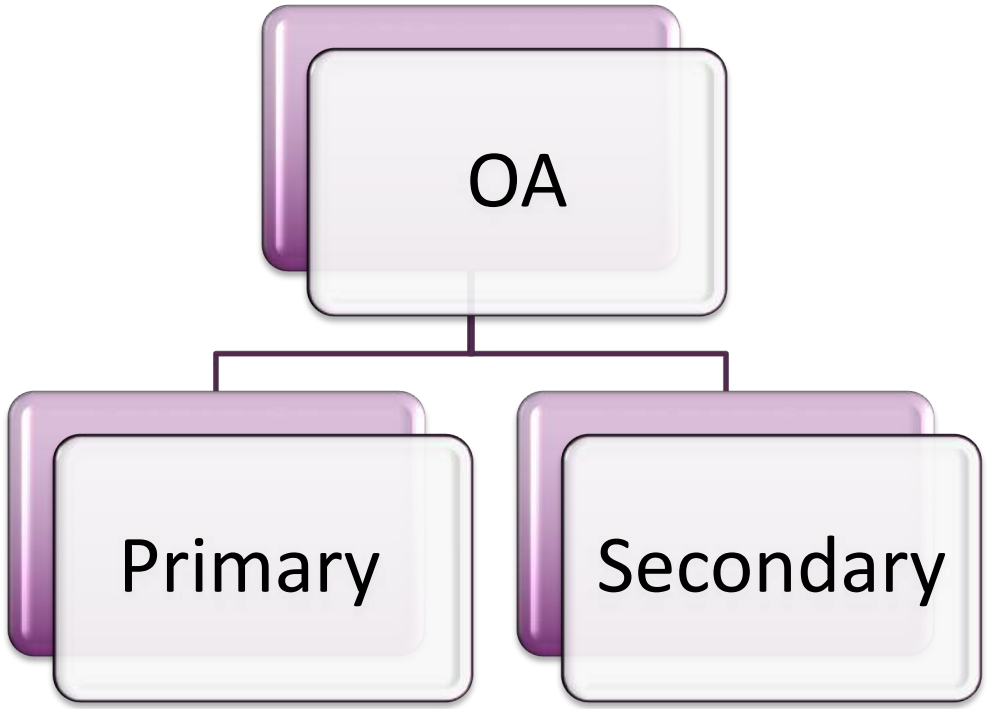
degenerative condition of joints characterized by degeneration of articular cartilage and formation of new bone osteophytes

  - Common in weight-bearing joints such as hip and knee, but can affect any joint

OA Risk Factors

- Hereditary
- Female gender
- Aging
- Obesity (knee)
- Abnormal mechanical loading
  - meniscectomy, instability
- Inherited type II collagen defects
- Joint injury
  - Trauma
  - Infection:
  - Crystalline arthropathy
  - Multiple hemarthroses (hemophillia)

Classification of OA



Primary OA

- More common than secondary OA
- Cause –Unknown
  - Genetic—multifactorial
  - Congenital (alignment issues)
- Common in elderly where there is no previous pathology.
- Its mainly due to wear and tear changes occurring in old ages mainly in weight bearing joints

Secondary OA

- Due to a predisposing cause such as:
- Trauma
- Iatrogenic (previous meniscectomy)
- Infection
- Inflammatory arthritis (RA)
- Crystalline arthropathy
- Congenital hip dysplasia (CDH)
- Deformity
- Obesity
- Other disease: hemophilia, hyperthyroidism, etc.

Pathophysiology

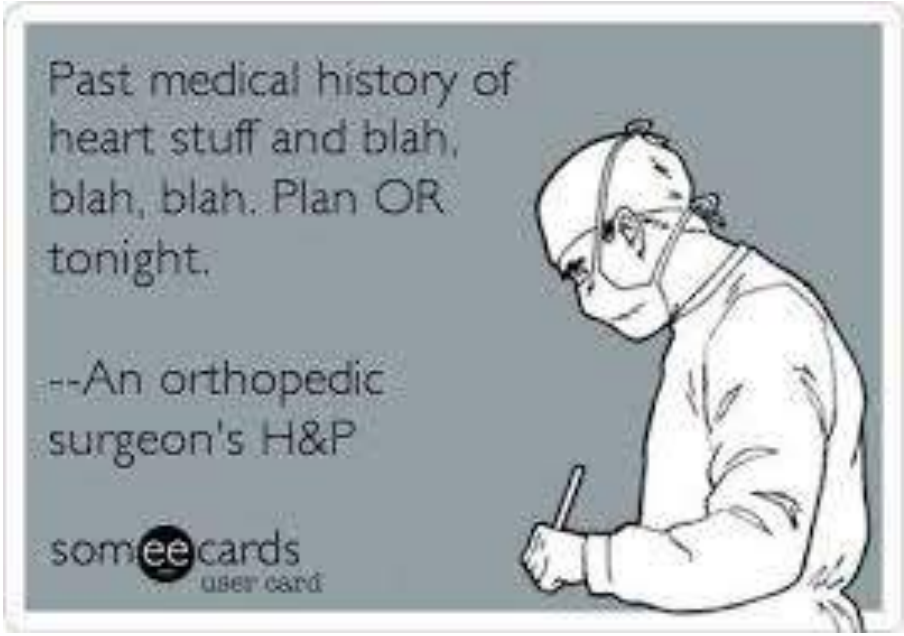
- Cartilage erosion often central/weight bearing areas.
- Fibrillation leads to softening, splitting and fragmentation of the cartilage in both weight bearing & non-weight bearing areas.
- Collagen fibers split with disorganization of the proteoglycan/H20/collagen relationship, which causes further softening and flaking
- These flakes of cartilage may break off and impact the joint surfaces causing locking and inflammation

Pathophysiology

- Interleukin-1 (IL-1) is a potent pro-inflammatory cytokine that, in vitro, is capable of inducing chondrocytes and synovial cells to synthesize Matrix Metallo Proteinases (MMPs).
- These MMPs are the primary enzymes responsible for the degradation of articular cartilage.
- IL-1 suppresses the synthesis of type II collagen and proteoglycans, and inhibits the transforming growth factor-ß stimulated chondrocyte proliferation.

Diagnosis

- So Easy even an orthopod can do it!
  - History
  - Physical Exam
  - Imaging
  - Sorry folks… no labs!



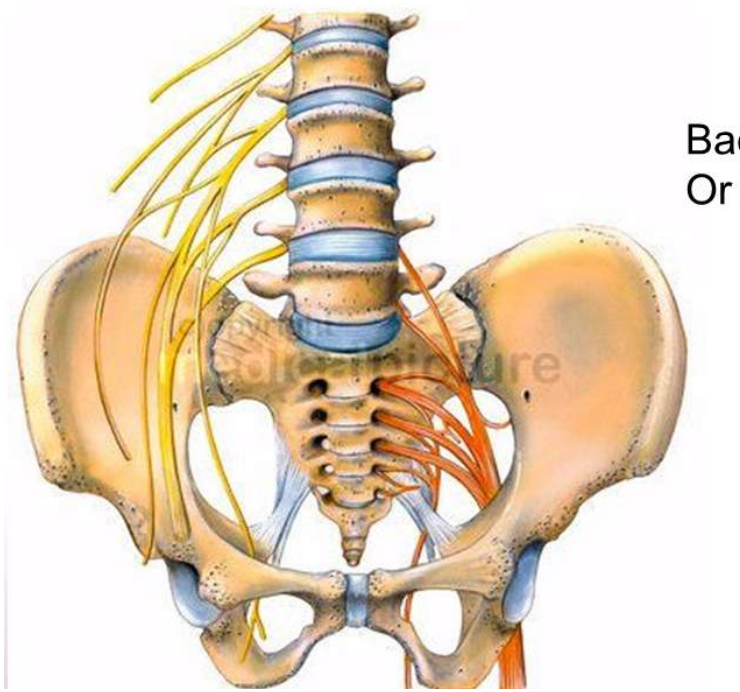
History

- Pain
- Stiffness (often first thing patients notice)
- Deformity (knee)
- Instability (knee)
- Muscle weakness or atrophy
- Joint enlargement
- Crepitus
- Effusion (knee)

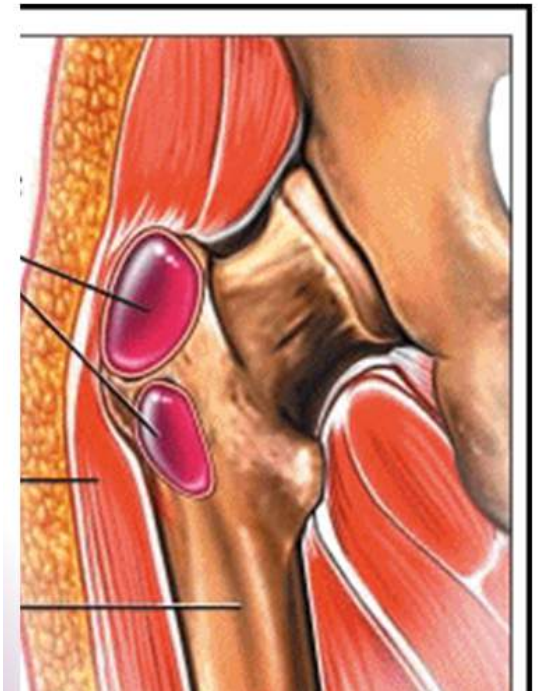
Pearls of OA Wisdom

- Knee OA hurts in the knee
  - Beware the radiating knee pain
- Hip OA hurts in the groin, thigh, and knee!
  - Patients often DO NOT KNOW WHERE THE HIP IS!
  - PCP's may know but not ask?

Pearls (Back Pain)



Pearls (Trochanteric Bursitis)



Pearls (True Hip Pain)

- Don’t think “groin pull” Think hip OA!
- Knee pain… Always consider hip as source!

Physical Exam

- Hip:
  - Antalgic gait (limp)
  - Loss of motion
  - Pain with motion(internal rotation!)
- Knee
  - Antalgic gait
  - Loss of motion
  - Contractures
  - Pain with motion
  - Varus/valgus deformity
  - Joint effusion
  - Enlargement (osteophytes)
  - Crepitus/Patellar grind
  - Popliteal (Baker's) Cyst
  - Pain with hip motion

Imaging

- Radiographs
- MRI

Pearls of Wisdom

Do This…

Not This…!

Feel Better. Do More.

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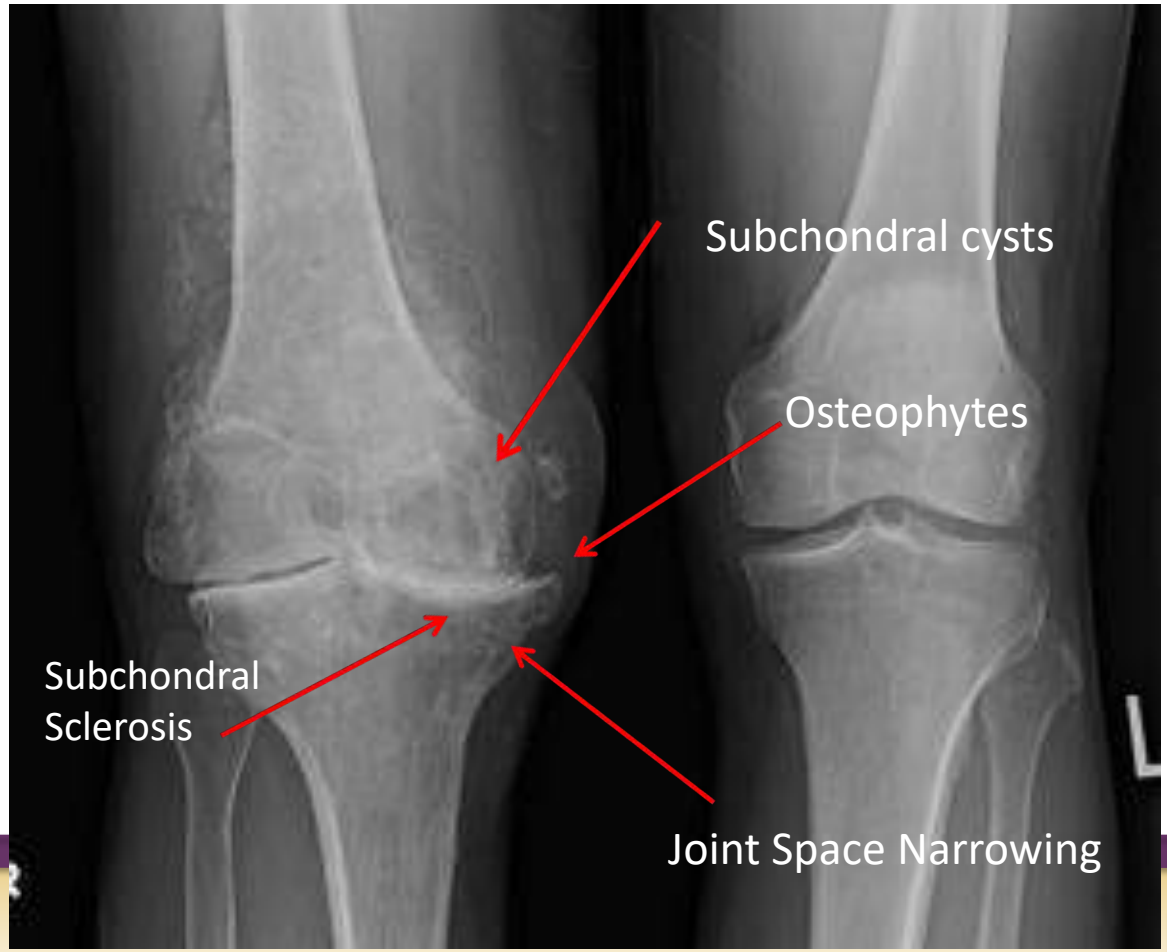
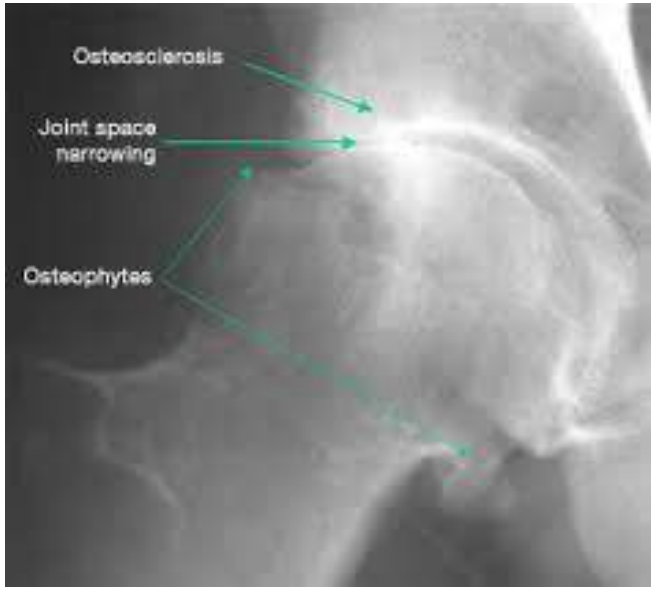
Radiographs (WEIGHT BEARING!)

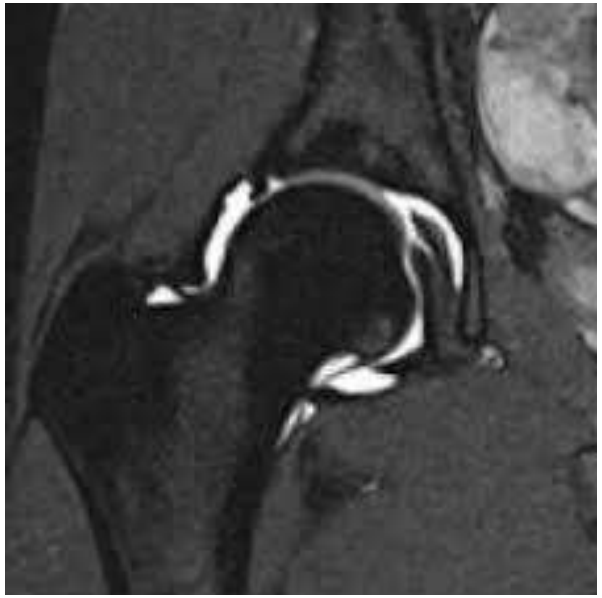


Pearls of Wisdom

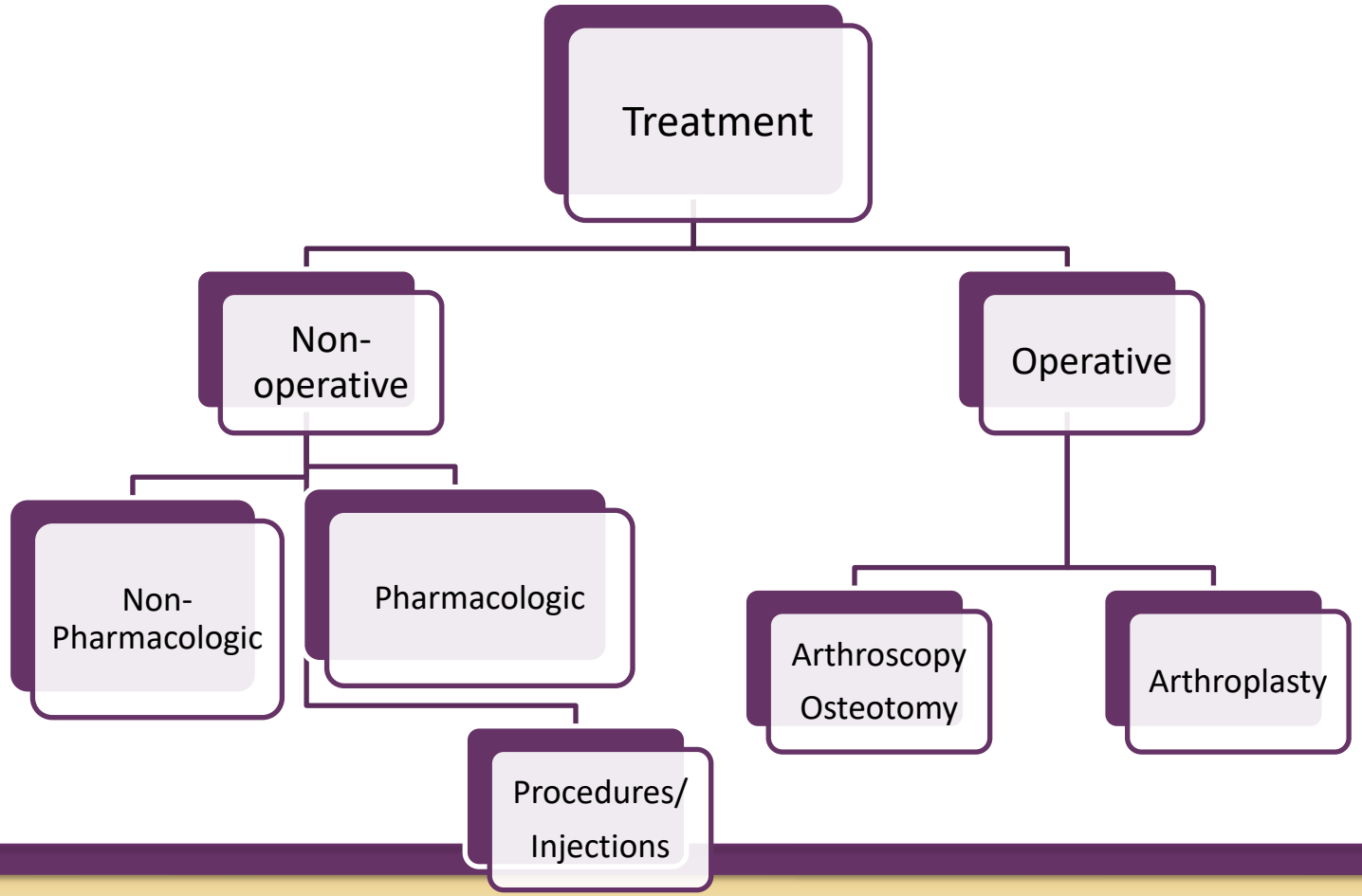
Do This…



Not This…



Evidence-Based Treatment



The basis of the evidence

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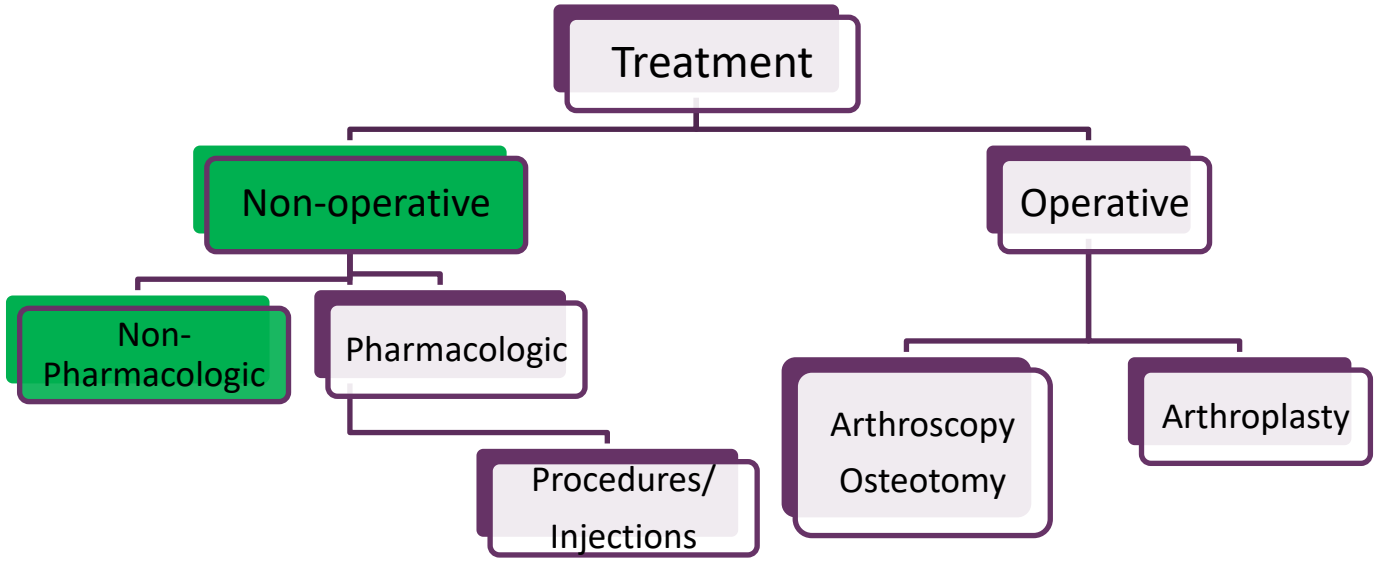
TREATMENT OF OSTEOARTHRITIS OF THE KNEE

EVIDENCE-BASED GUIDELINE
2ND EDITION

Adopted by the American Academy of Orthopaedic Surgeons
Board of Directors
May 18, 2013

Knee Treatment



Knee: Non-pharmacologic treatment

- Self management (exercise, PT, neuromuscular education)
- Rest/activity modification
- Assistive device (cane, walker)
- Weight loss
- Acupuncture
- TENS
- Manipulation(massage, chiropractic, myofascial release)
- Unloader bracing
- Shoe wedges (orthotics)
- Glucosamine/Chondroitin
- Psychosocial support

Knee: Non-operative: Non-Pharmacologic

- Recommended:
  - Low Impact Exercise (AAOS strong evidence)
  - Weight loss (moderate evidence)
- Cannot recommend:
  - Glucosamine and Chondroitin (strong evidence)
  - Acupuncture (strong evidence)
  - Shoe wedges (moderate evidence)
  - TENS (strong evidence)
- Inconclusive:
  - Physical (manual therapy)
  - Unloader bracing

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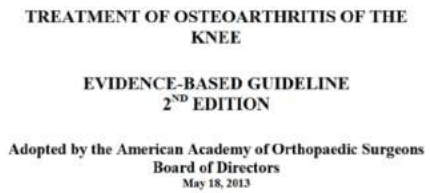
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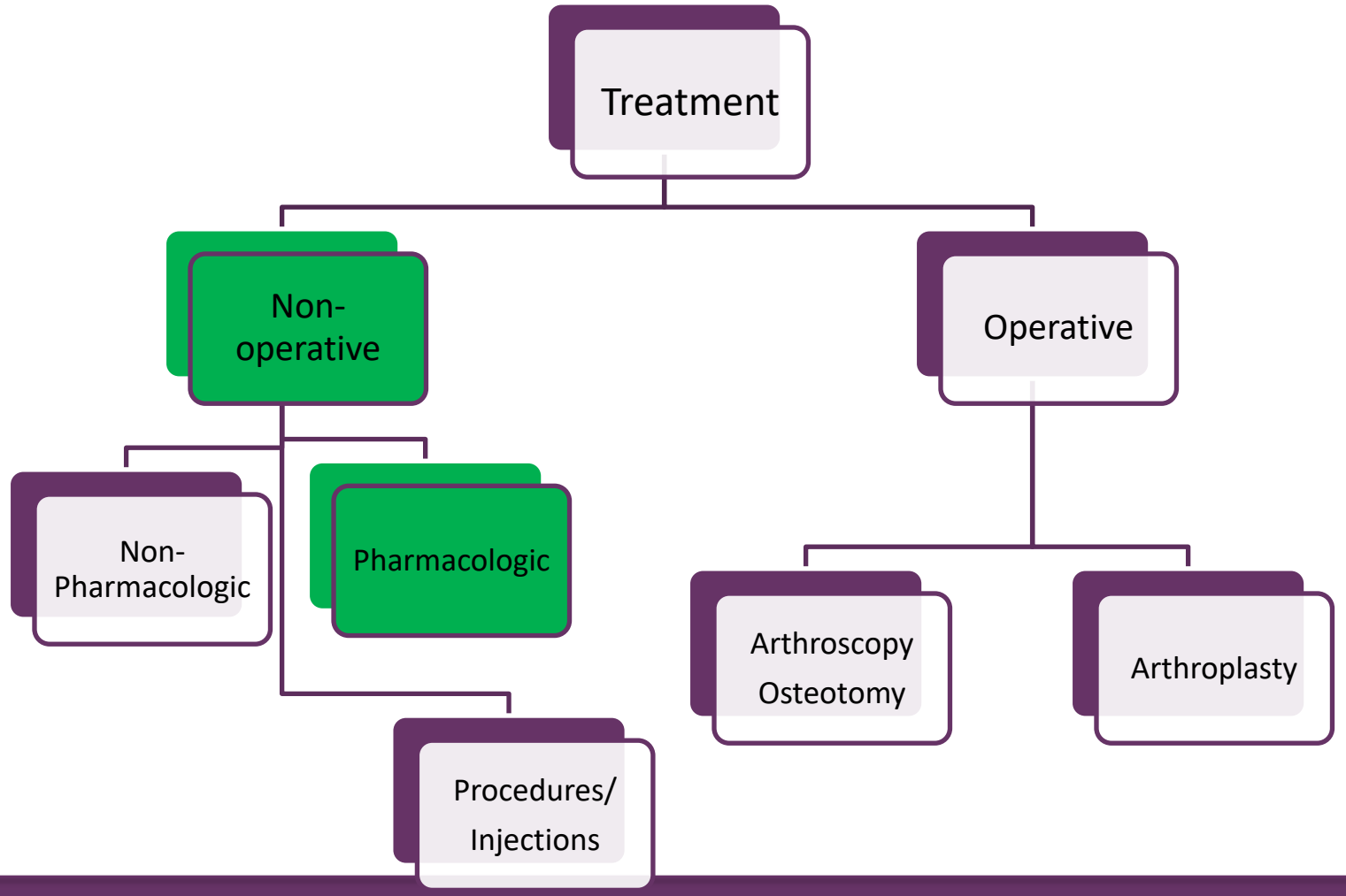
Other Non-Pharmacologic treatments

- Not Covered by AAOS guidelines (common sense?):
  - Rest (activity modification)
  - Assistive device (cane, walker)
  - Psychosocial support

Knee Treatment



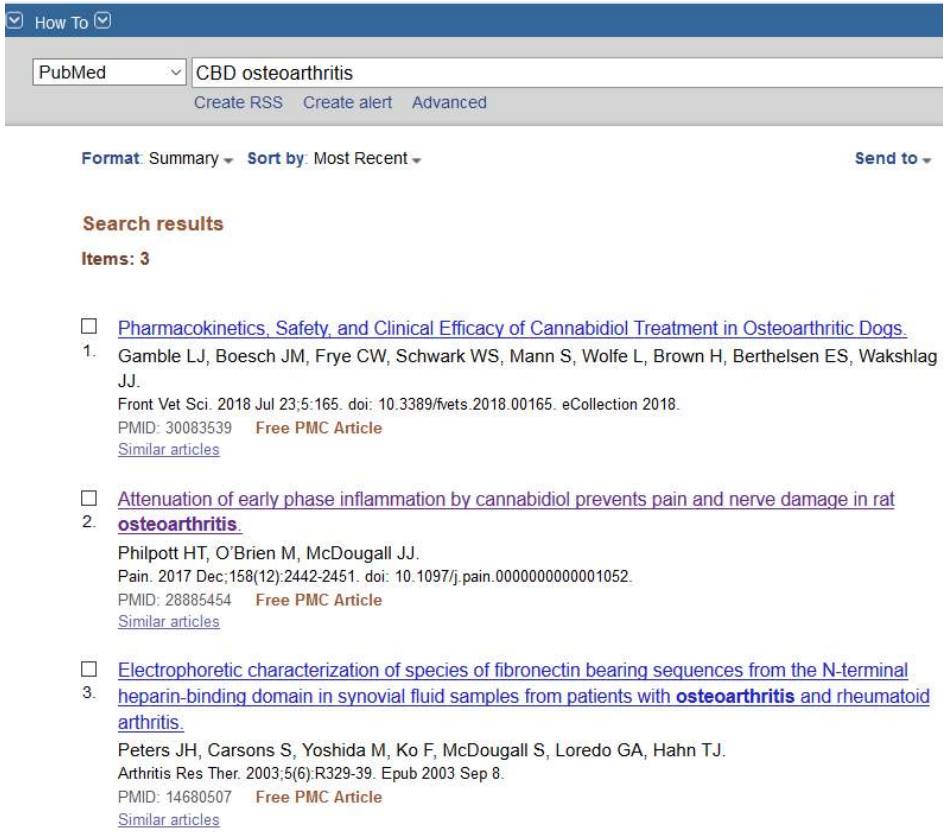
Knee: Non-operative Pharmacologic

- NSAIDs (oral or topical)
- Acetaminophen
- Tramadol
- Opioids
- Pain patches
- CBD creams

Knee: Non-operative: Pharmacologic

- Recommend:
  - NSAIDS
    - Oral or topical (strong evidence)
    - (Tramadol?)
- Inconclusive
  - (acetaminophen?)
  - pain patches
  - (opioids!)

How about Cannabidiol (CBD)?


How To

PubMed CBD osteoarthritis

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1. Pharmacokinetics, Safety, and Clinical Efficacy of Cannabidiol Treatment in Osteoarthritic Dogs.
Gamble LJ, Boesch JM, Frye CW, Schwark WS, Mann S, Wolfe L, Brown H, Berthelsen ES, Wakshlag JJ.
Front Vet Sci. 2018 Jul 23;5:165. doi: 10.3389/fvets.2018.00165. eCollection 2018.
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2. Attenuation of early phase inflammation by cannabidiol prevents pain and nerve damage in rat **osteoarthritis**.
Philpott HT, O'Brien M, McDougall JJ.
Pain. 2017 Dec;158(12):2442-2451. doi: 10.1097/j.pain.0000000000001052.
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3. Electrophoretic characterization of species of fibronectin bearing sequences from the N-terminal heparin-binding domain in synovial fluid samples from patients with **osteoarthritis** and rheumatoid arthritis.
Peters JH, Carsons S, Yoshida M, Ko F, McDougall S, Loredo GA, Hahn TJ.
Arthritis Res Ther. 2003;5(6):R329-39. Epub 2003 Sep 8.
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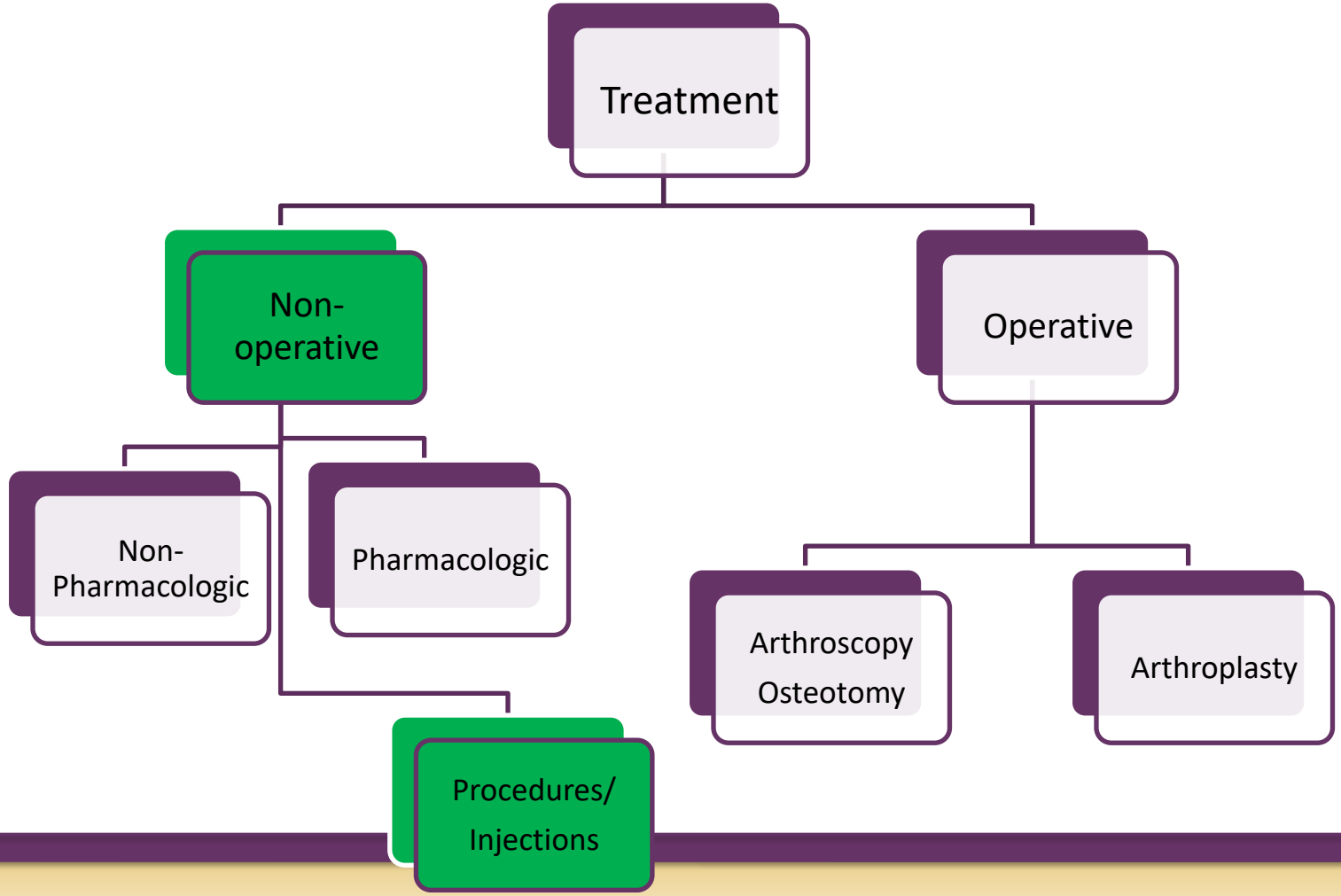
Knee Treatment



Non-operative: Procedural

- Corticosteroid injections
- Hyaluronic acid injections
- Needle Lavage
- Prolotherapy
- PRP
- Stem cells

Non-operative: Procedural

- Inconclusive:
  - Corticosteroids
  - PRP, growth factors

- Cannot Recommend:
  - Hyaluronic acid (strong evidence)
  - Joint lavage (prolotherapy?) (moderate evidence)

Stem Cells?

- Tremendous interest
  - Patients
  - Practitioners
  - Media
- Tremendous Cost
  - Patients
- Tremendous Profits
  - Practitioners
- Tremendously POOR evidence

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Research News

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SHARE

Stem cell centers on the rise, claim high efficacy for treatment of knee osteoarthritis despite lack of evidence

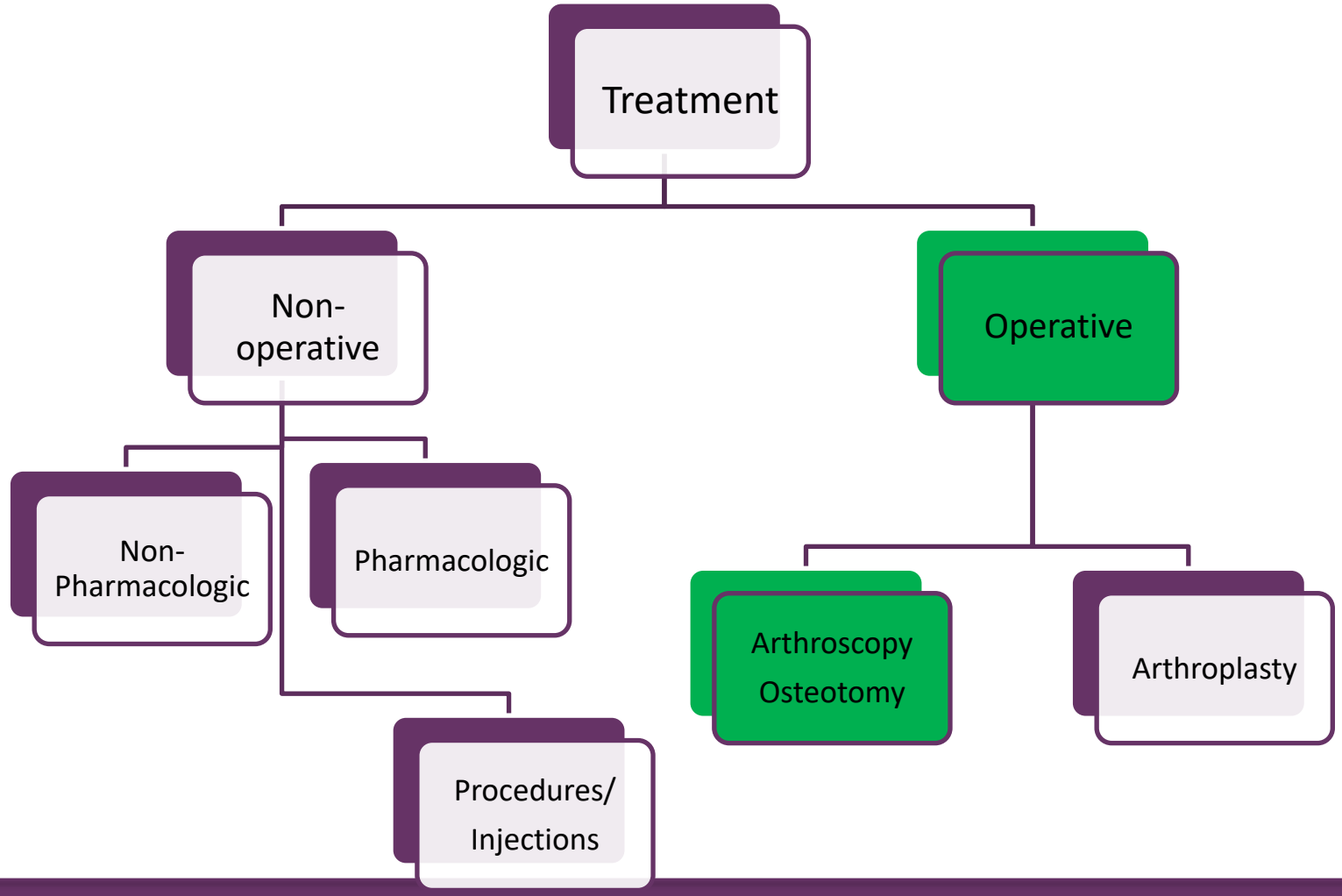
High treatment price may be greater than cost for total knee arthroplasty

NEW ORLEANS, La. (March 6, 2018)–Even with a lack of peer-reviewed evidence, the number of centers advertising stem cell therapies for osteoarthritis (OA) of the knee are increasing in the United States. These centers claim an 80 percent success rate, according to research presented this week at the 2018 Annual Meeting of the American Academy of Orthopaedic Surgeons (AAOS). Of the 65 centers that provided pricing information to treat OA of the knee, the cost ranged from $1,150 to $12,000, with an average of $5,000 per injection

"Our role as orthopaedic surgeons is to provide accurate, credible information on treatment options to our patients," said George Muschler, MD, Professor of Orthopaedic Surgery and Director at the Regenerative Medicine Laboratory at Cleveland Clinic. "Recent systematic reviews of cellular therapies for the treatment of knee OA (over 400 papers screened) have found poor levels of evidence for the efficacy of these treatments to date. Current evidence does not justify the rapid rate of growth for these therapies."

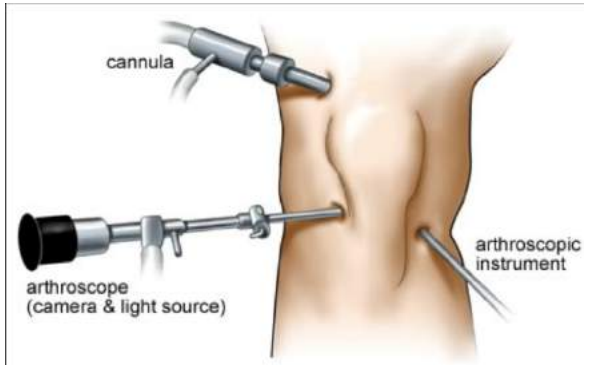
Osteoarthritis affects more than 27 million Americans[i] and an estimated 9.9 million adults suffer from OA the knee.[ii] Risk factors include age, genetics, being overweight, and repetitive knee bending or heavy lifting.[ii] Women have an increased risk of osteoarthritis of the knee as they age.[ii] OA of the knee causes joint pain, stiffness and makes movement difficult.[ii]

Knee Treatment



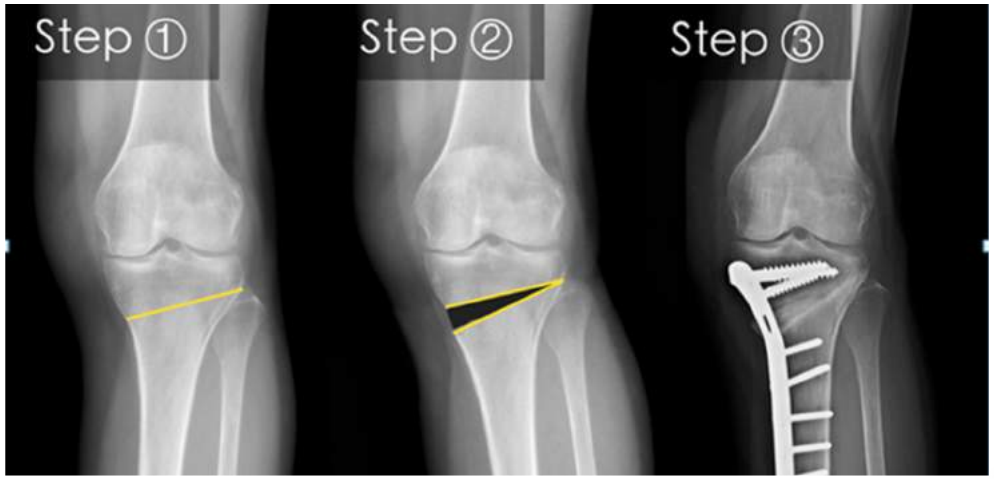
Operative Treatment Knee

- Cannot Recommend
  - Arthroscopy (strong evidence)
  - Interpositional arthroplasty (consensus)



Operative Treatment

- Consider:
  - Proximal tibial osteotomy (Limited evidence)
    - Appropriate for the very young
    - Milder OA
  - Very painful
  - Limited expectations



Operative Treatment of knee OA

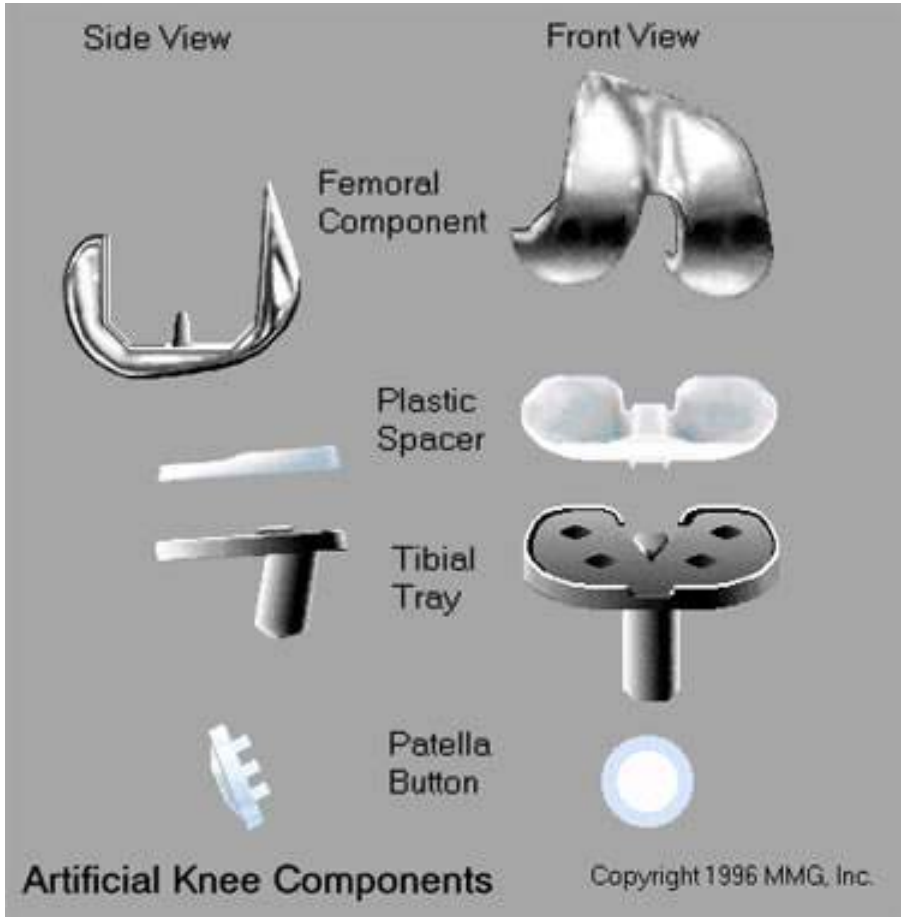
- Total knee arthroplasty
- Unicompartmental knee arthroplasty

Operative Treatment:
Total Knee Replacement

- “Total Knee Arthroplasty”
- Has been around since 1960’s
- One of the most successful operations in all of medicine
- Knee “resurfacing” is more appropriate term
- The damaged cartilage surface is removed and resurfaced with metal caps with a plastic spacer in between

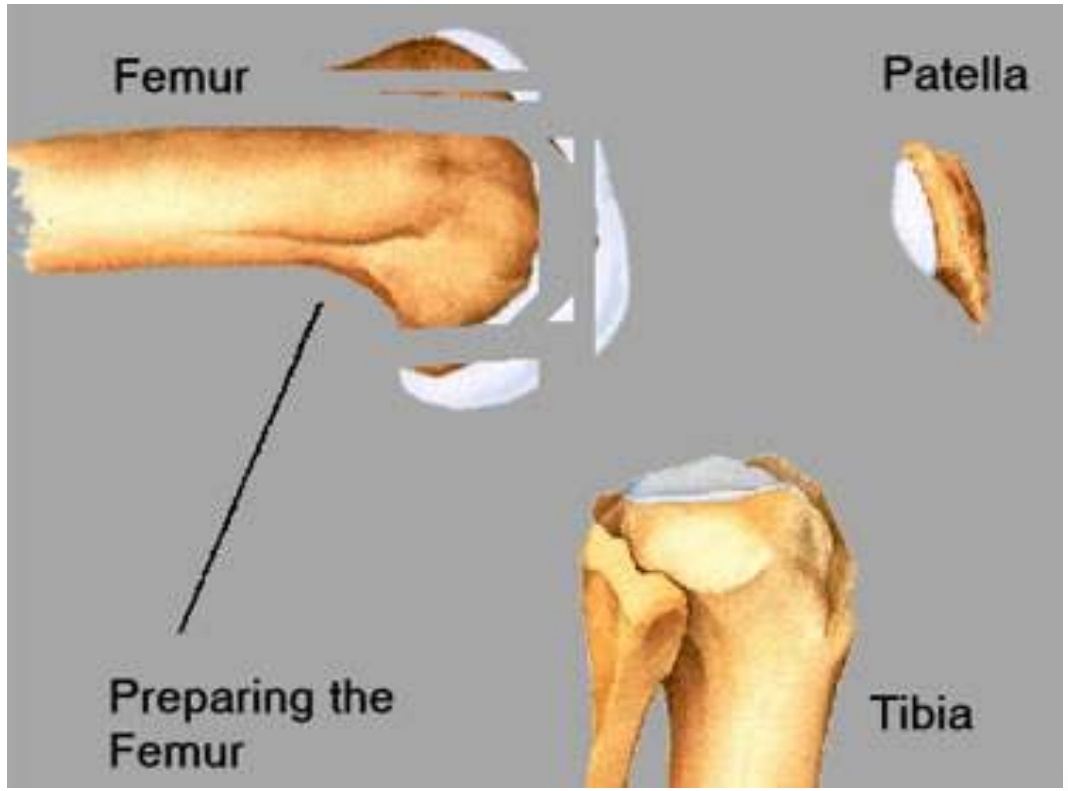

"See? The idiots put my danged knee replacement in backward!"

The Procedure



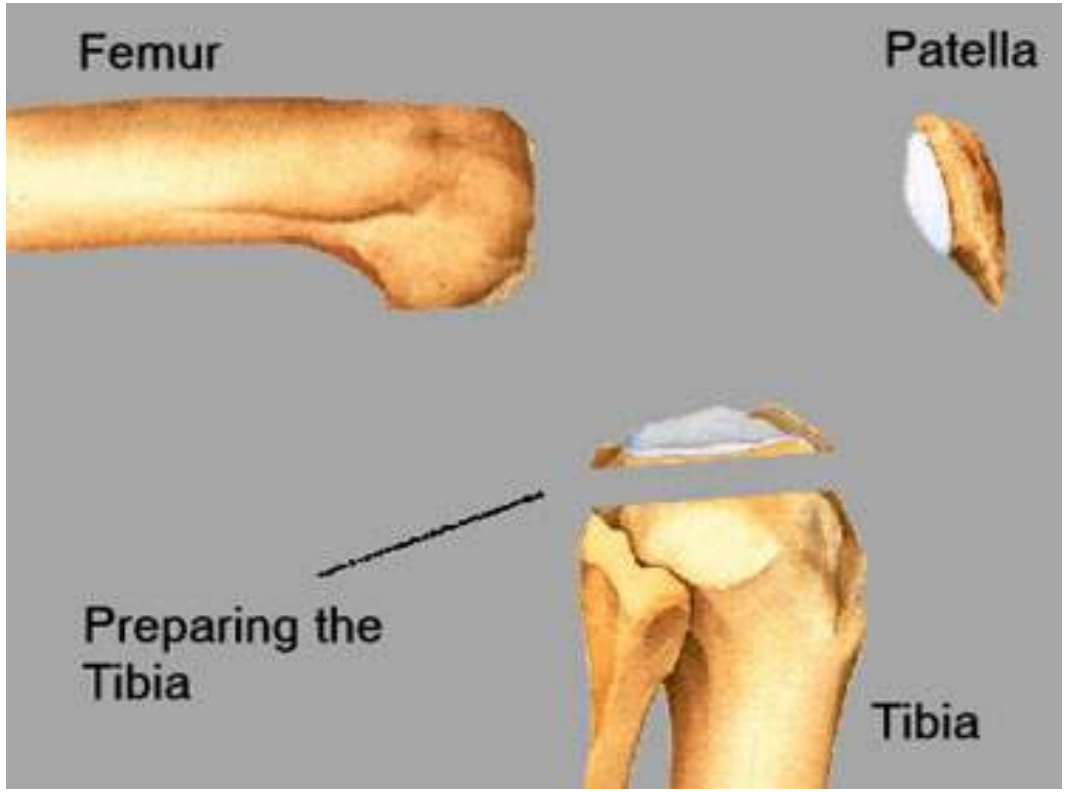
The Procedure

- Step 1: Remove damaged cartilage from the femur



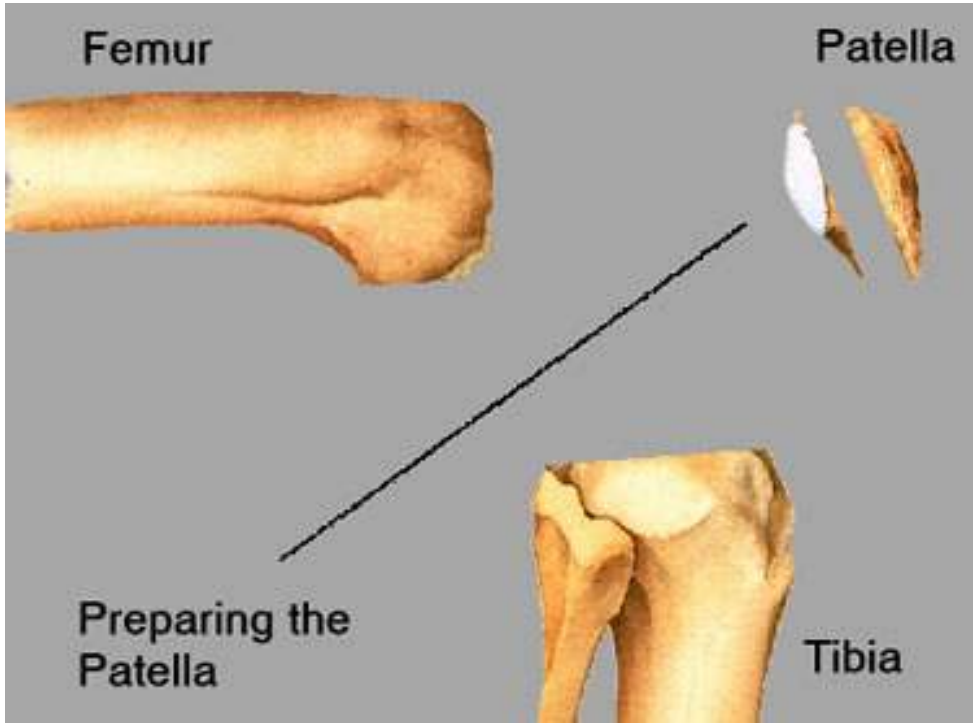
The Procedure

- Step 2: Remove damaged cartilage from the Tibia



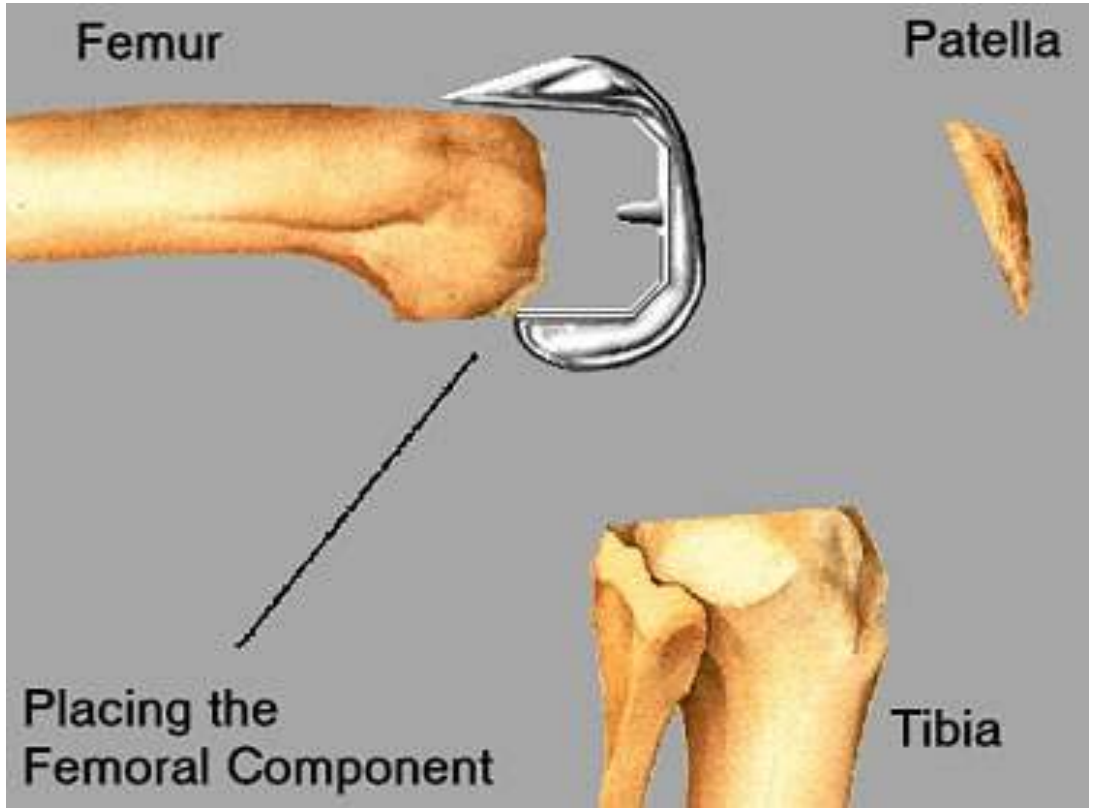
The Procedure

- Step 3: Remove Damaged cartilage from the Patella (knee cap)



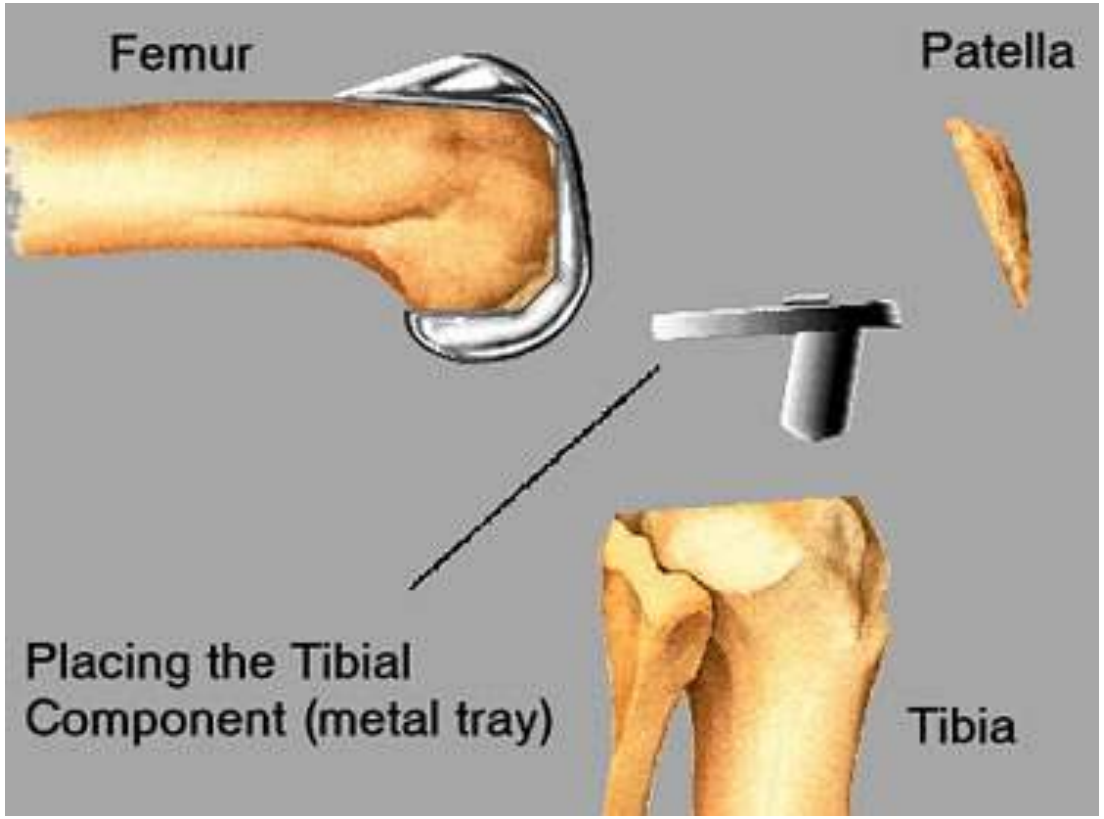
The Procedure

- Step 4: Cap the Femur



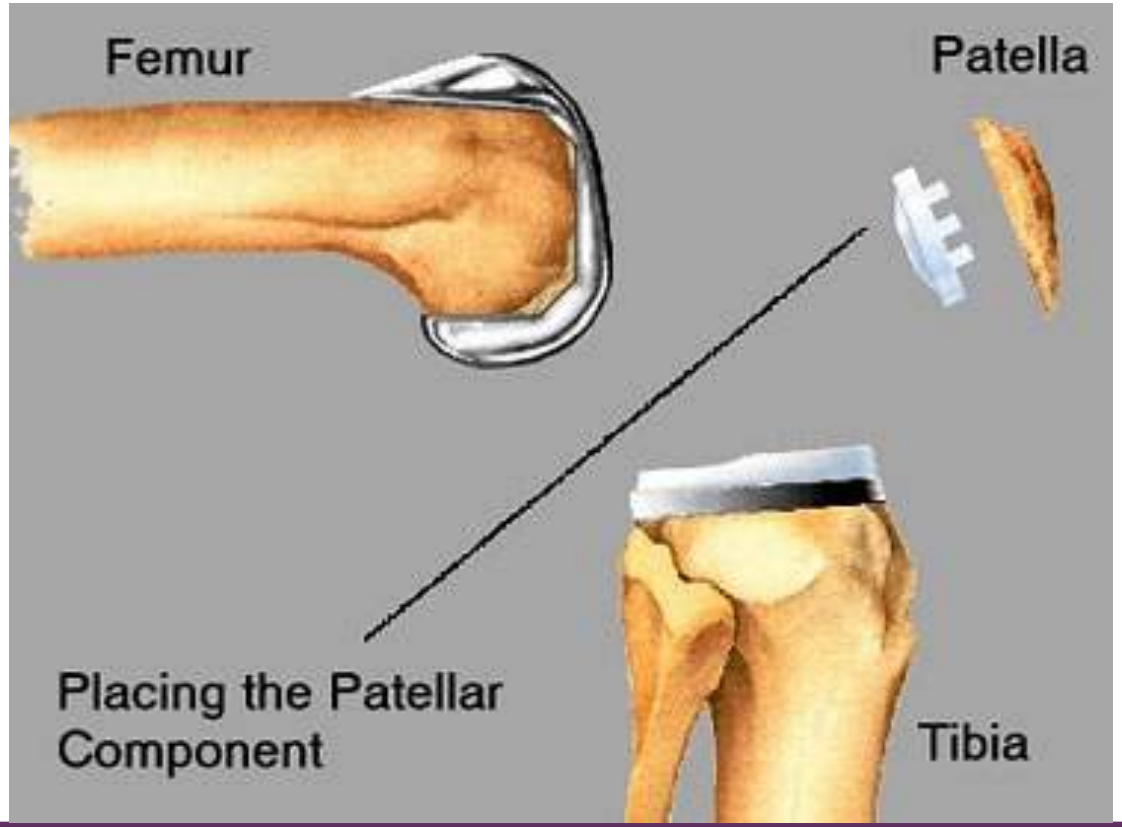
The Procedure

- Step 5: Cap the Tibia



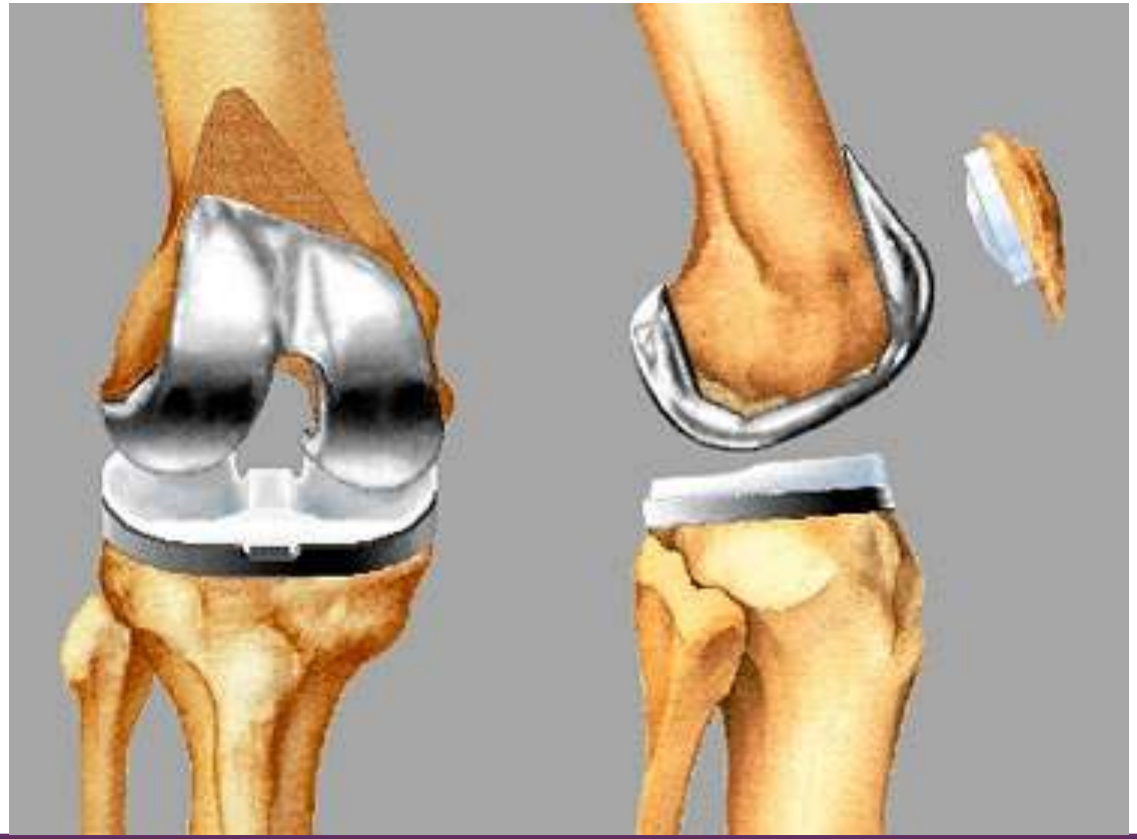
The Procedure

- Step 6: Cap the Patella



The Procedure

- Now you are done



Total Knee Replacement

Before

After

Feel Better. Do More.

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How Long do they Last?

- Howell SM et al. Implant Survival and Function Ten Years After Kinematically Aligned Total Knee Arthroplasty. J Arthroplasty. 2018
  - 98% survivorship at 10 years
- Lachiewicz, P. et al. Fifteen-year survival…modular posterior stabilized knee replacement. A concise follow-up of a previous report. *J Bone Joint Surg Am,* 91(6): 1419-23, 2009.
  - 90.6% of knees doing well at 15 years.
- Abdeen, A et al. Fifteen-year to 19-year follow-up of the Insall-Burstein-1 total knee arthroplasty. *J Arthroplasty,*;25(2):173-8. 25(2): 173-8. 2010
  - 92.4 % of knees doing well at 19 years

Osteoporosis and TKA

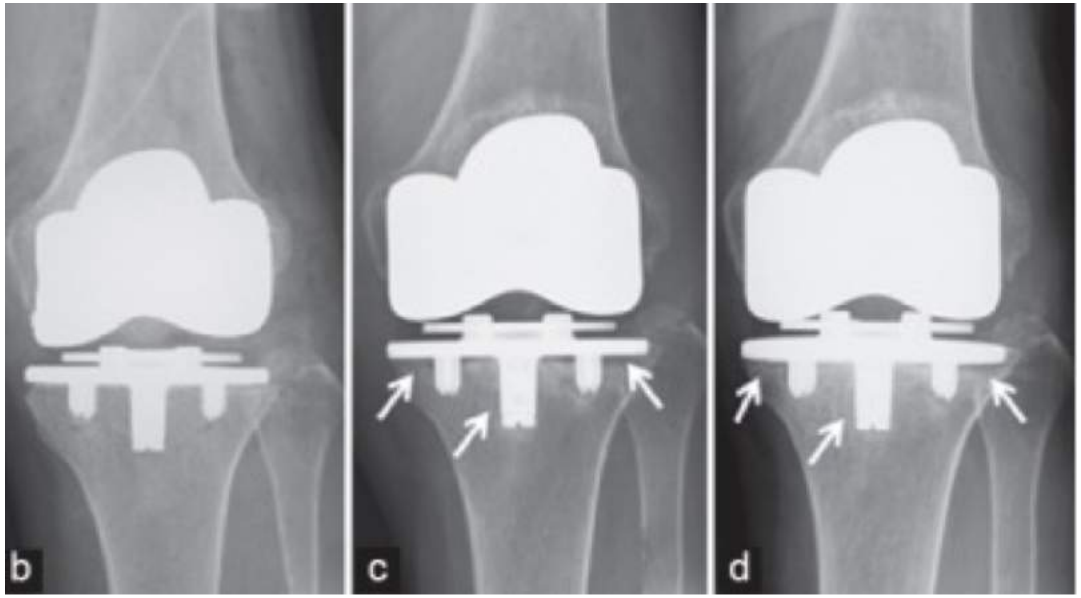
- **Spinarelli** A, et al. Total knee arthroplasty in elderly osteoporotic patients. Aging Clin Exp Res. 2011 Apr;23(2 Suppl):78-80. Review.
- 100 consecutive total knees in osteoprotic patients (mean age 77)
- Summary: outcomes rivaled that of comparable series of non-osteoporotic patients

Osteoporosis and TKA

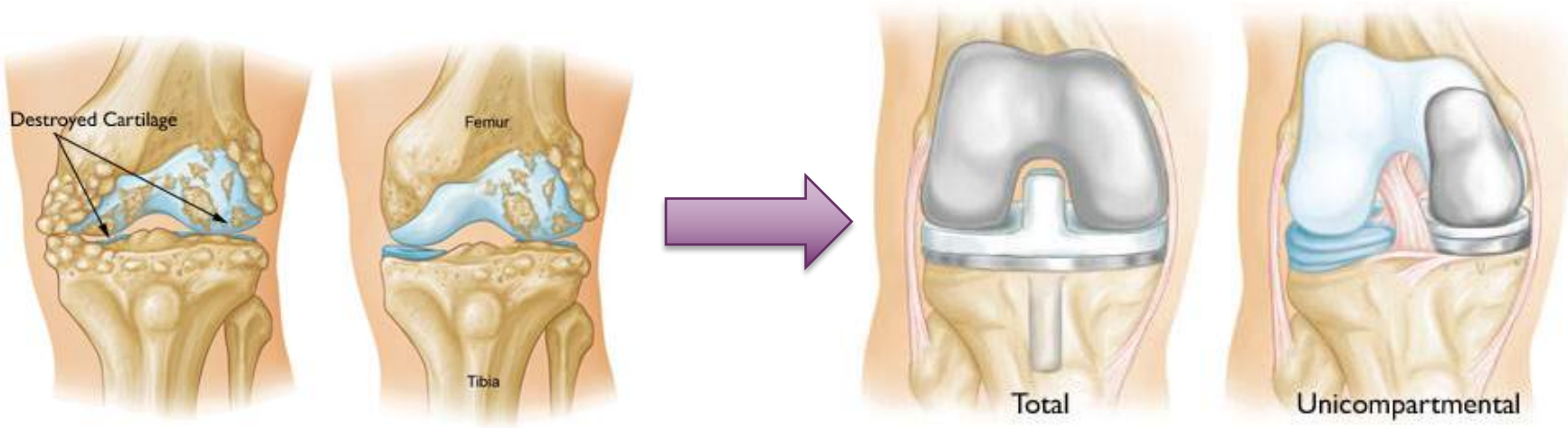
- Suzuki T, et al. Teriparatide Administration Increases Periprosthetic Bone Mineral Density After Total Knee Arthroplasty: A Prospective Study. J Arthroplasty. 2018 Jan;33(1):79-85
  - 22 TKA/osteoporosis patients compared to controls
  - Measured BMD by DEXA at baseline, 6 months and 12 months after knee replacement.
  - Preserved or improved periprosthetic bone quality compared to controls

Teriparatide: Miracle Drug?

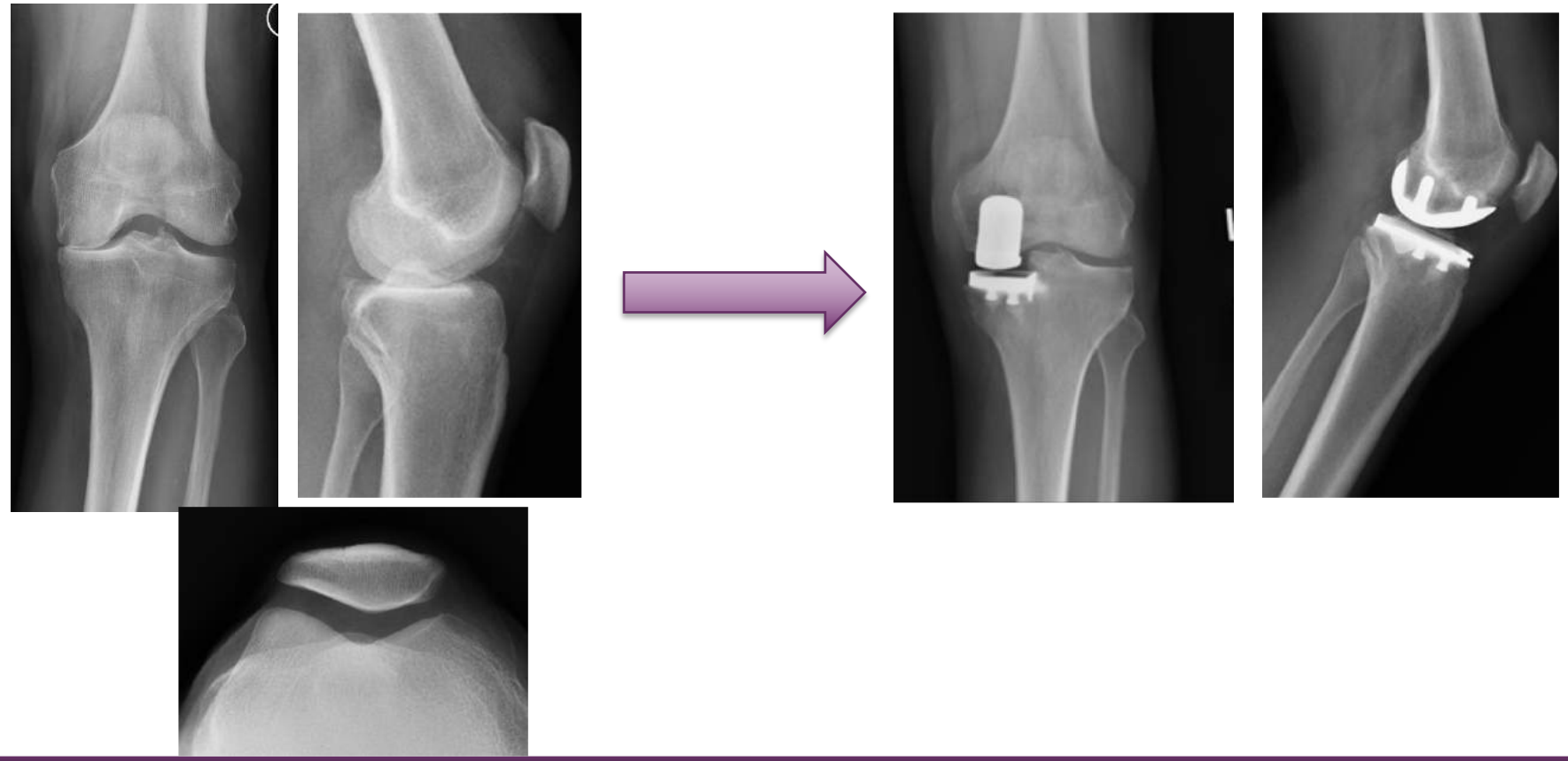
Suzuki T, et al. Teriparatide Treatment Improved Loosening of Cementless Total Knee Arthroplasty: A Case Report. J Orthop Case Rep. 2017 Jan-Feb;7(1):32-35.



Operative Treatment:
Partial Knee Replacement



Partial Knee Replacement
Medial or Lateral Partial:



Partial Knee Replacement
Knee Cap (Patellofemoral)

Partial Knee Replacement

- Advantages:
  - Less invasive surgery
    - Easier, faster recovery
  - Preserves your native bone and ligaments
    - May feel more like your native knee
- Disadvantages
  - May have residual pain in other compartments
  - May develop pain *later* in other compartments

Partial or total solution?

- **A "partial" knee is not a "partial" solution!**
- **Foran**, et al. Long-term survivorship and failure modes of unicompartmental knee arthroplasty. Clin Orthop Relat Res. *102-8;* 2013
  - 93% of knees doing well at 15 years and 90% doing well at 20 years

- **Foran JR**, Sheth NM, Della Valle, CJ. Long Term Patellofemoral Progression. **Textbook Chapter** 21 *Partial Knee Arthroplasty*: Techniques for Optimal Outcomes,). 2012.

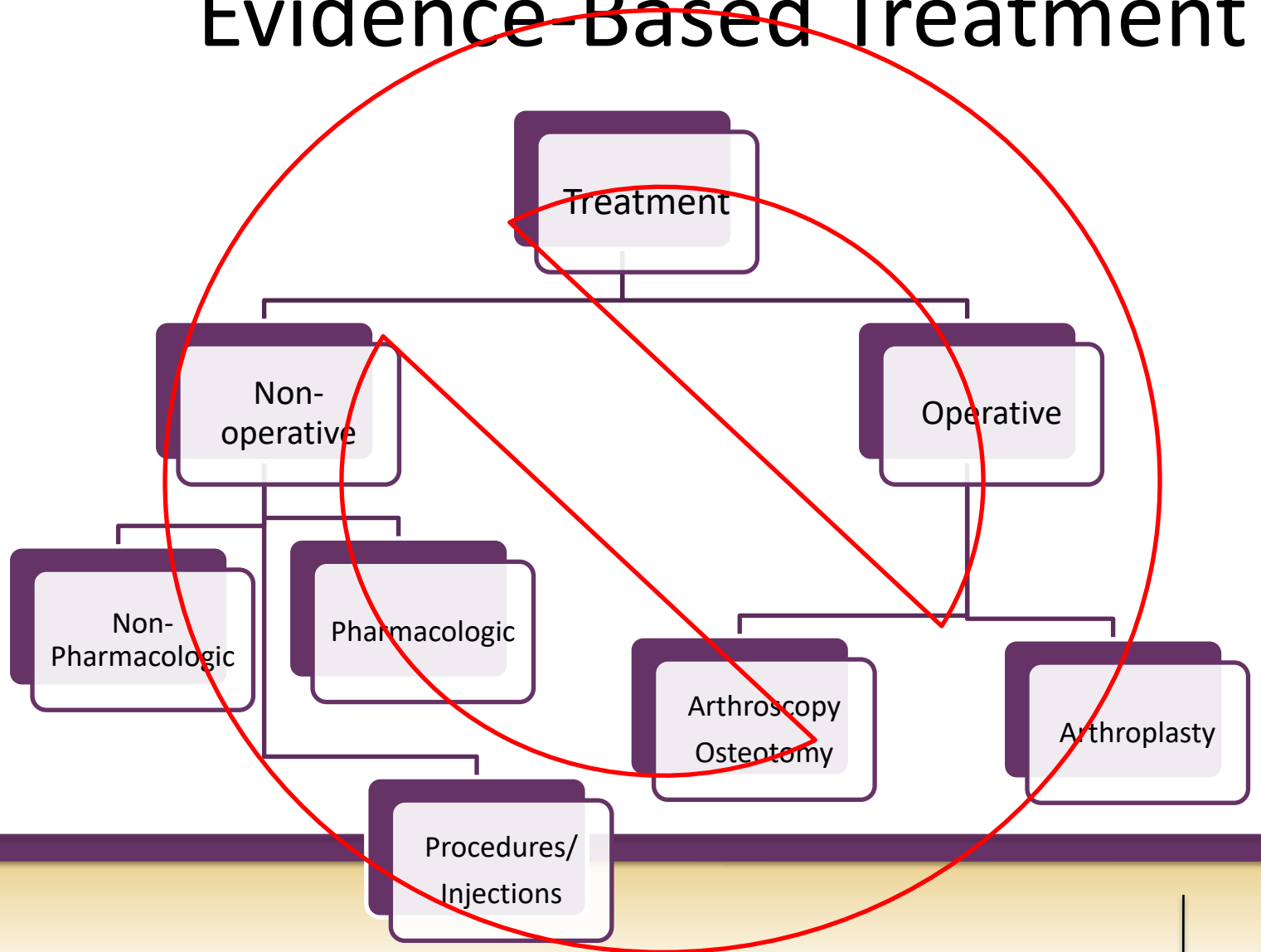
Treatment Hip OA

MANAGEMENT OF OSTEOARTHRITIS OF THE HIP
EVIDENCE-BASED CLINICAL PRACTICE GUIDELINE

Adopted by the American Academy of Orthopaedic Surgeons
Board of Directors
3.13.17

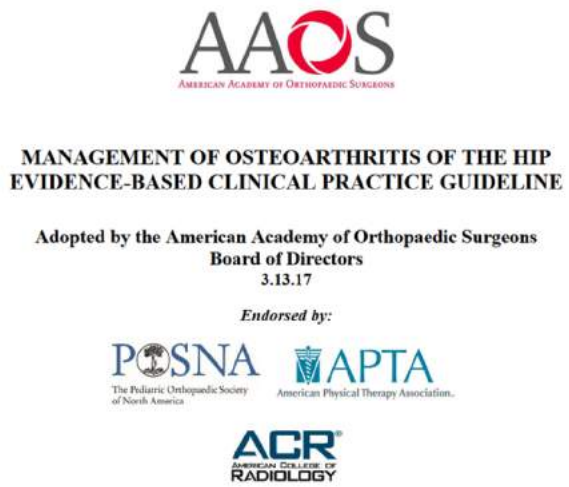
Endorsed by:

Evidence-Based Treatment



Hip: Non-operative:

- Recommended:
  - Weight loss (AAOS moderate evidence)
  - Non-narcotic management (strong)
  - Physical Therapy (Strong)
    - For mild/moderate OA
  - Glucosamine (moderate)
    - Only analyzed 1 of 85 studies!
  - Intraarticular cortisone (strong)
- Not Recommended
  - Hylaruonic acid injections (strong)



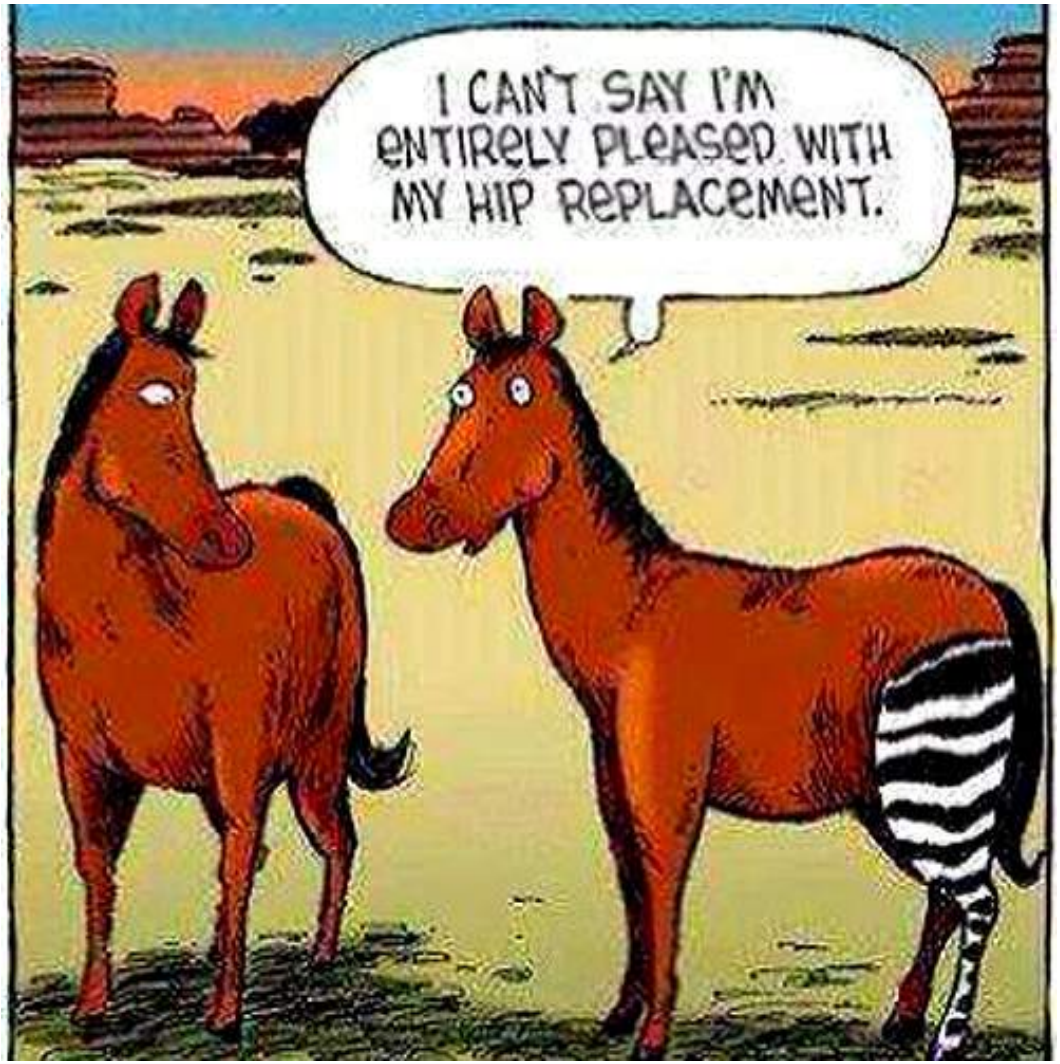
Total Hip Replacement

- Developed in 1960's
- Also one of the most successful operations in all of medicine
- Advances in implant materials and surgical techniques have led to longevity of hip replacements

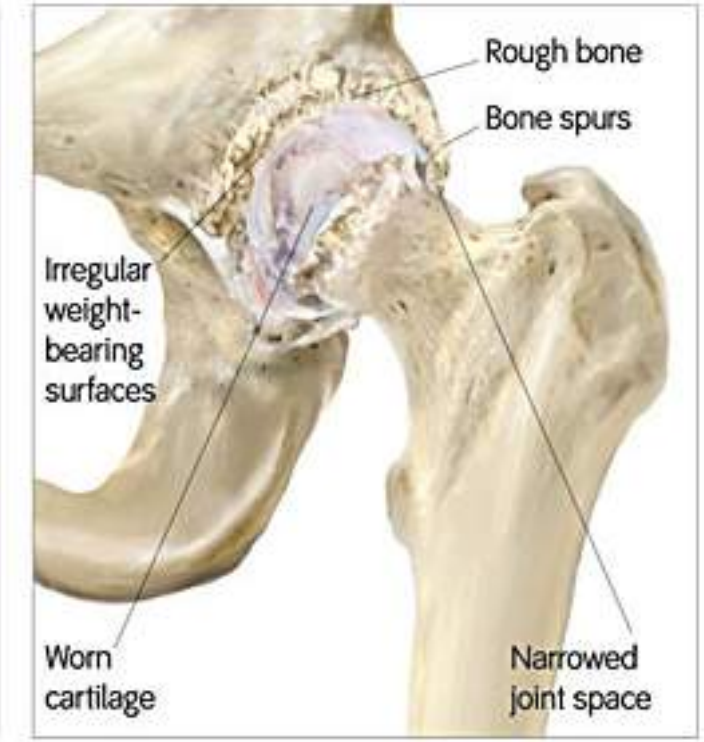
Many Ways to Skin a Cat

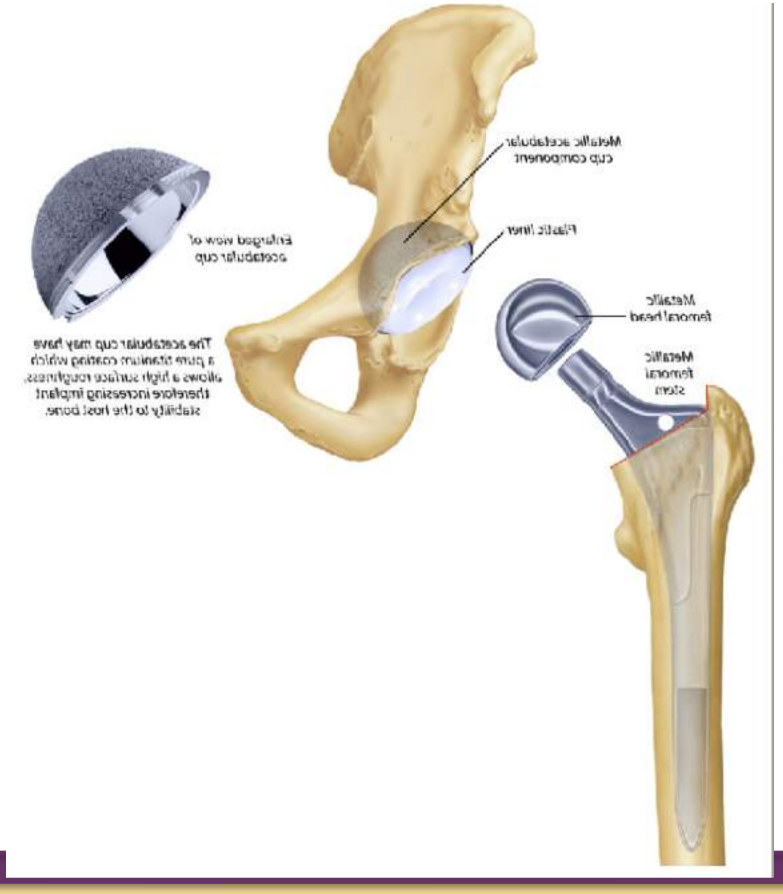
- Anterior
- Anterolateral
- Direct Lateral
- Posterolateral
- Posterior

- Many approaches
- All have pros/cons
- All have been around for a long time
- No clear advantage in the literature


I CAN'T SAY I'M ENTIRELY PLEASED WITH MY HIP REPLACEMENT.

Total hip replacement: before and after





Total Hip Replacement

Before

After

Feel Better. Do More.

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How long Will it Last?
Hips

- Sochart DH, Porter ML. The long-term results of Charnley low-friction arthroplasty in young patients… *J Bone Joint Surg Am*. 1997
  - 81.5% doing well at 25 years!

Vidalain J-P. Twenty-year results of the cementless Corail stem. *International Orthopaedics*. 2011

-modern cementless hip design

-82.5% doing well at 23 years.

(Neither of these long term studies utilize modern materials)

- De Steiger. R Cross-Linked Polyethylene for Total Hip Arthroplasty Markedly Reduces Revision Surgery at 16 Years. J Bone Joint Surg Am. 2018
  - 94% survivorship at 16 years!

Osteoporosis and THA

- Hung, et al. Effects of anti-osteoporosis medications on total hip arthroplasty risks in osteoporotic patients with hip osteoarthritis in Taiwan: a nationwide cohort study. Arch Osteoporos. 2018 Oct 10;13(1):107

- 35,870 patients with hip osteoarthritis and osteoporosis
- 3162 and 1667 respectively treated with bisphosphonates and other non-bisphosphonates AOM respectively
- Outcome: risk of needing THA same in all patients.

A Role for AOM's?

- Nagoya S et al. Restoration of proximal periprosthetic bone loss by denosumab in cementless total hip arthroplasty. Eur J Orthop Surg Traumatol. 2018 May 17.

- Prospective study
- Cementless THA. 10 patients received denosumab versus control
- Findings: up to 7.3% increase in periprosthetic BMD in treatment group

Summary

- OA: progressive degenerative condition
  - Large genetic component
  - Complex pathophysiology
  - Non-operative treatments: perhaps not evidence based
  - Increasing role for metabolic treatments
- Pearls:
  - Weight-bearing radiographs BEFORE MRI!
  - Hip pain: groin, thigh, knee
  - Avoid opioids for chronic treatment
  - Long term survivorship for modern TKA and THA

Thanks!