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Hip Preservation in the Active Adult

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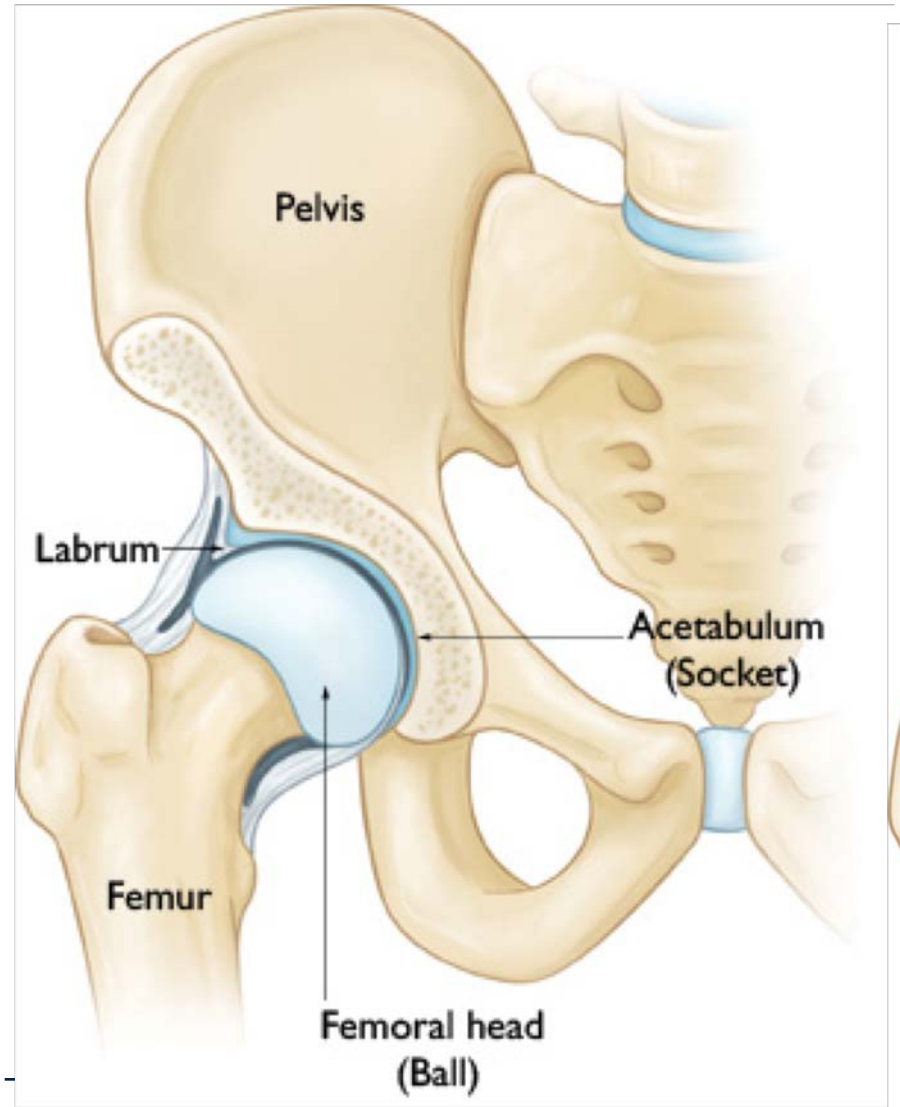
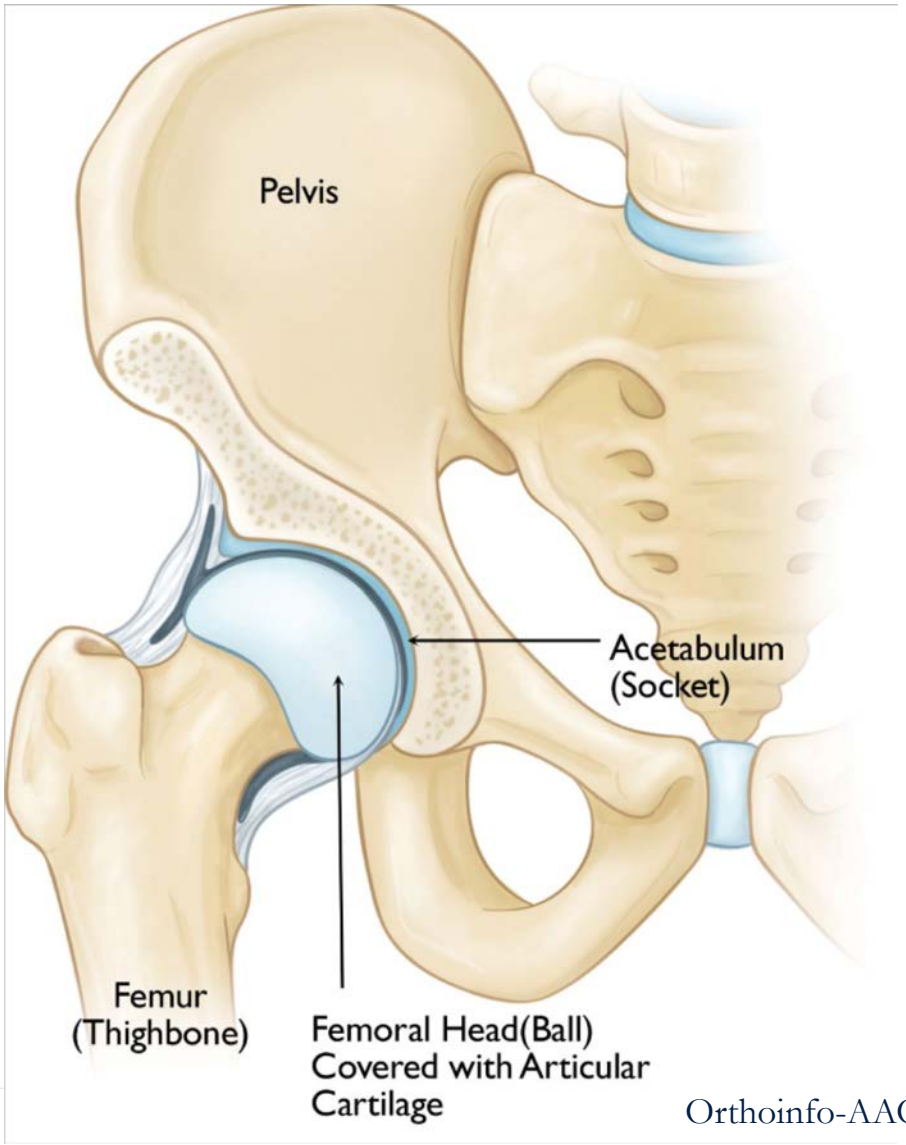
Anatomy





Orthoinfo-AAOS

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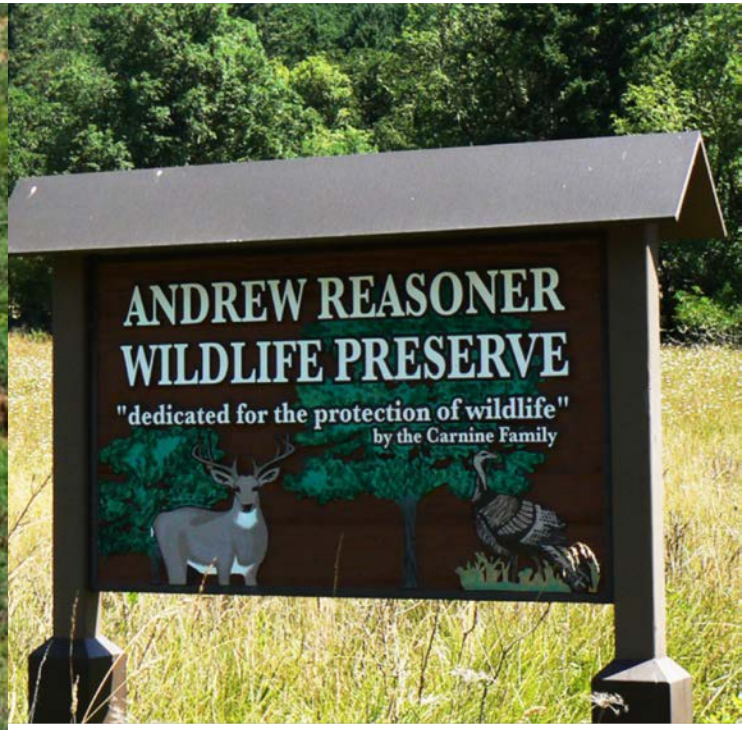
What are we preserving?



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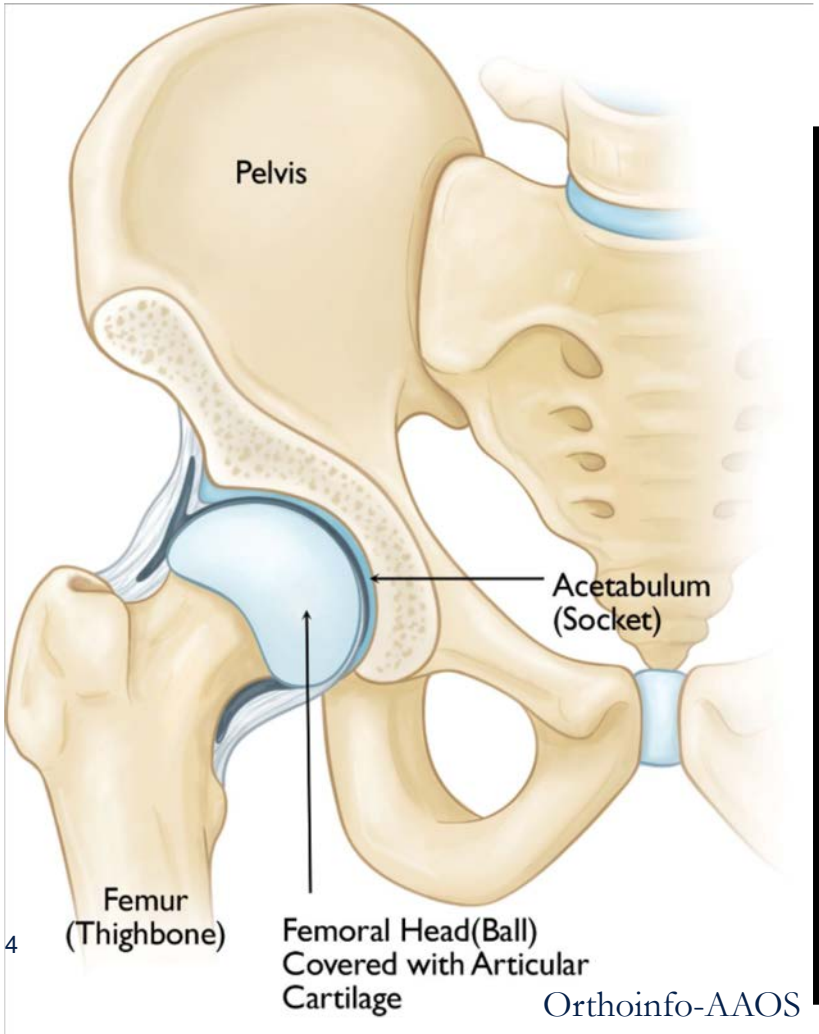
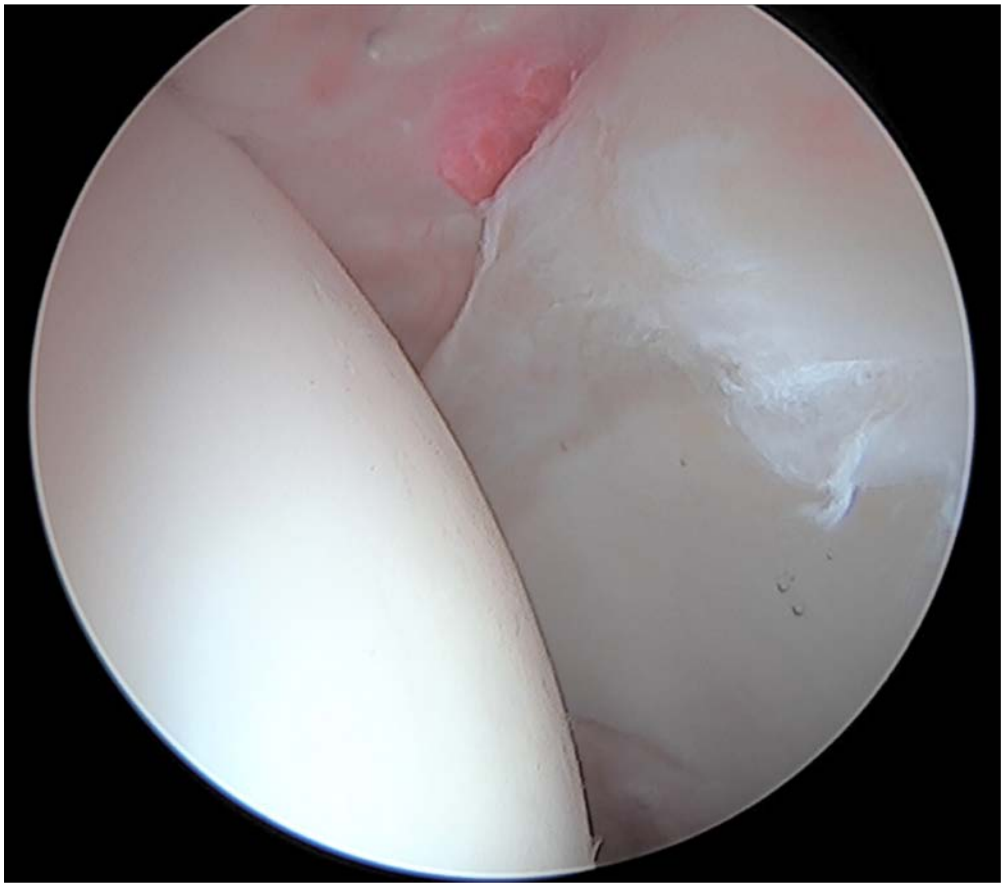
Articular Cartilage

- Smooth, soft cartilage that covers bone inside of joints
- Allows bones to glide over each other with minimal friction

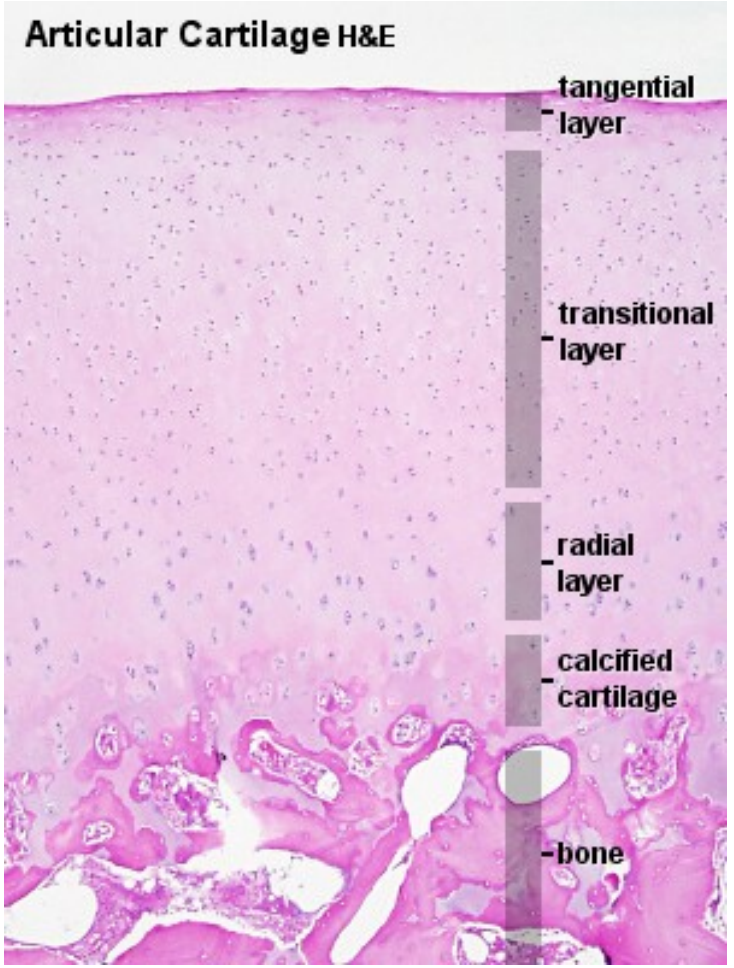




Orthoinfo-AAOS

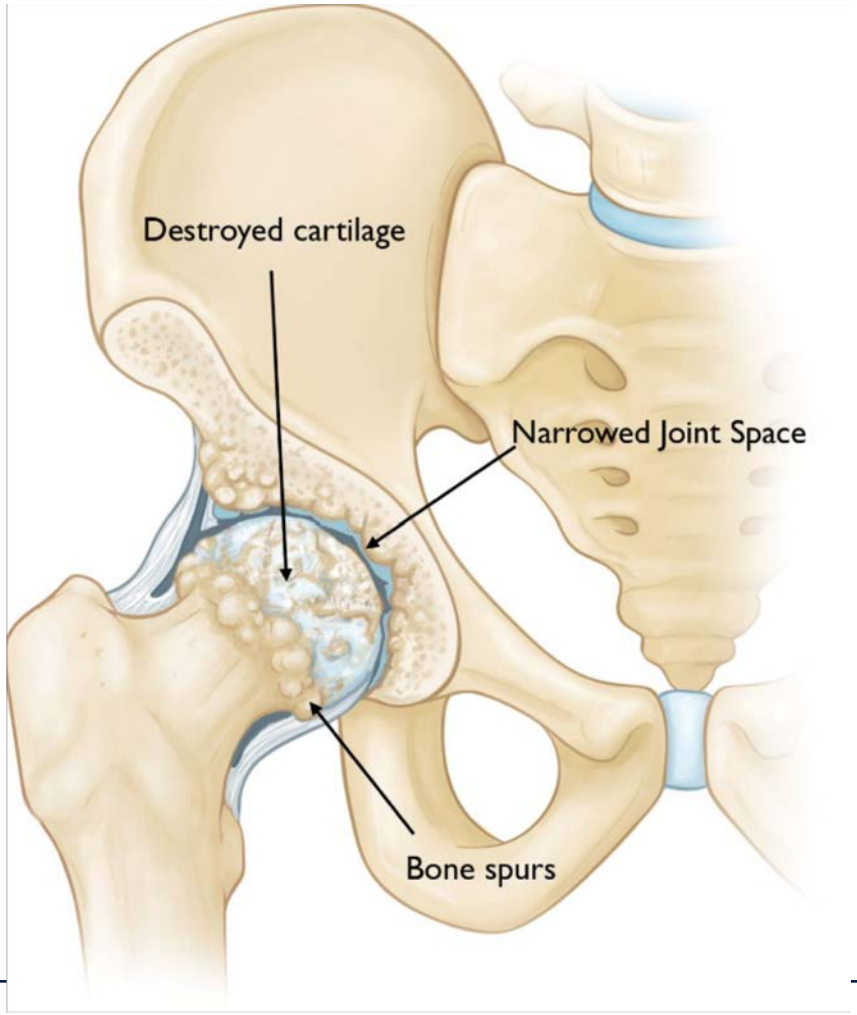
Articular Cartilage

- Articular cartilage
  - Super smooth
  - No nerve endings
  - Few cells
- No nerve endings=does not sense early damage
- Few cells=cannot regenerate



What are we preserving the hip from?

- Arthritis
  - Cartilage degeneration/ destruction
  - Loss of cartilage results in bone on bone contact inside of joints



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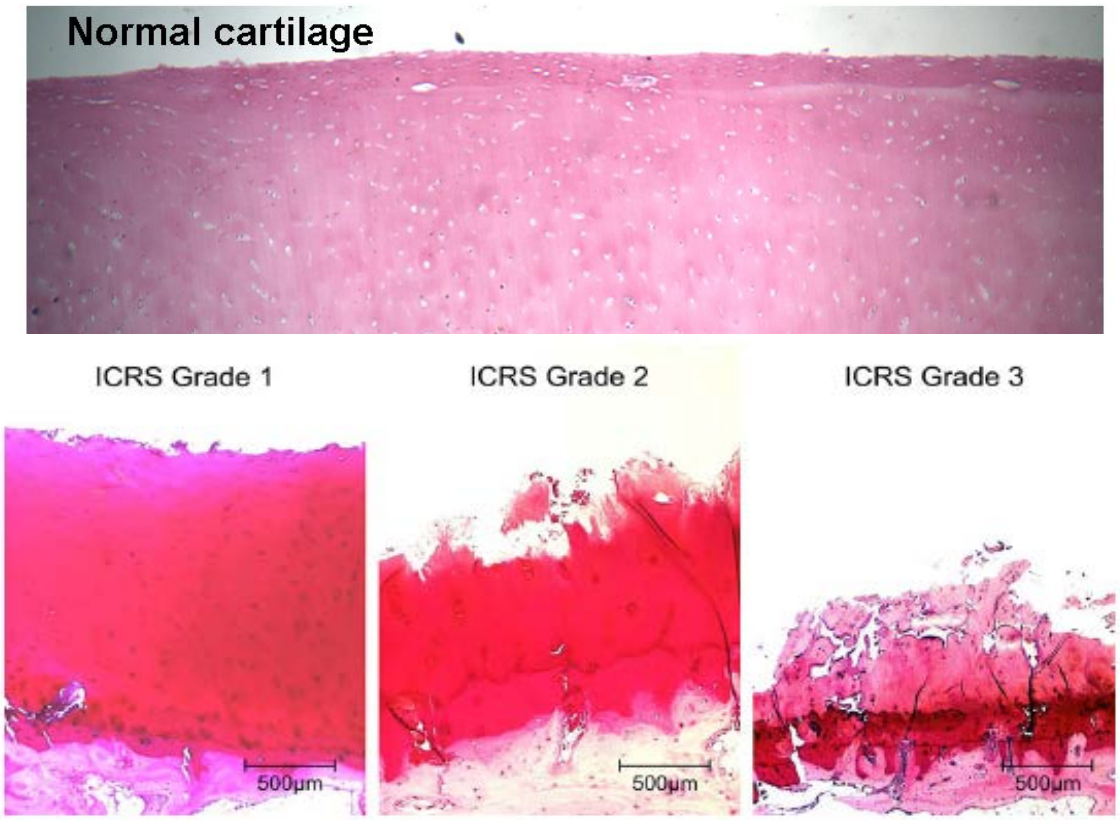
Understanding Arthritis

- **Osteoarthritis**
  - Destruction of articular cartilage resulting in pain, deformity, and disability
- Multi-factorial causes for cartilage degeneration (most common)
  - Age
  - Weight
  - Genetic
  - Activity level/overuse
- Specific causes for cartilage destruction (less common)
  - Inflammatory arthritis
  - Post-traumatic arthritis
  - Avascular necrosis/osteonecrosis

Understanding Arthritis

- Osteoarthritis: The destruction of the articular cartilage resulting in pain, deformity, and disability

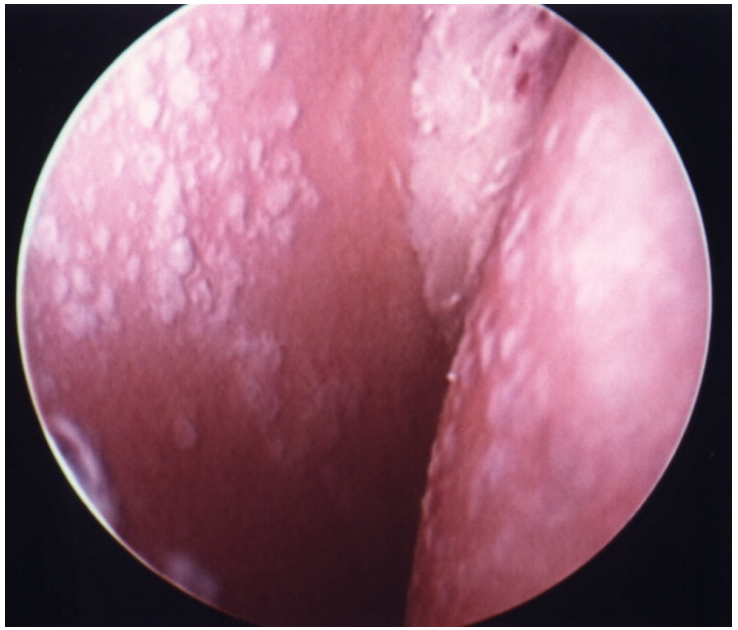


http://www.med.nyu.edu/medicine/labs/abramsonlab/basic-arth-research.html

Understanding Arthritis

- Osteoarthritis: The destruction of the articular cartilage resulting in pain, deformity, and disability

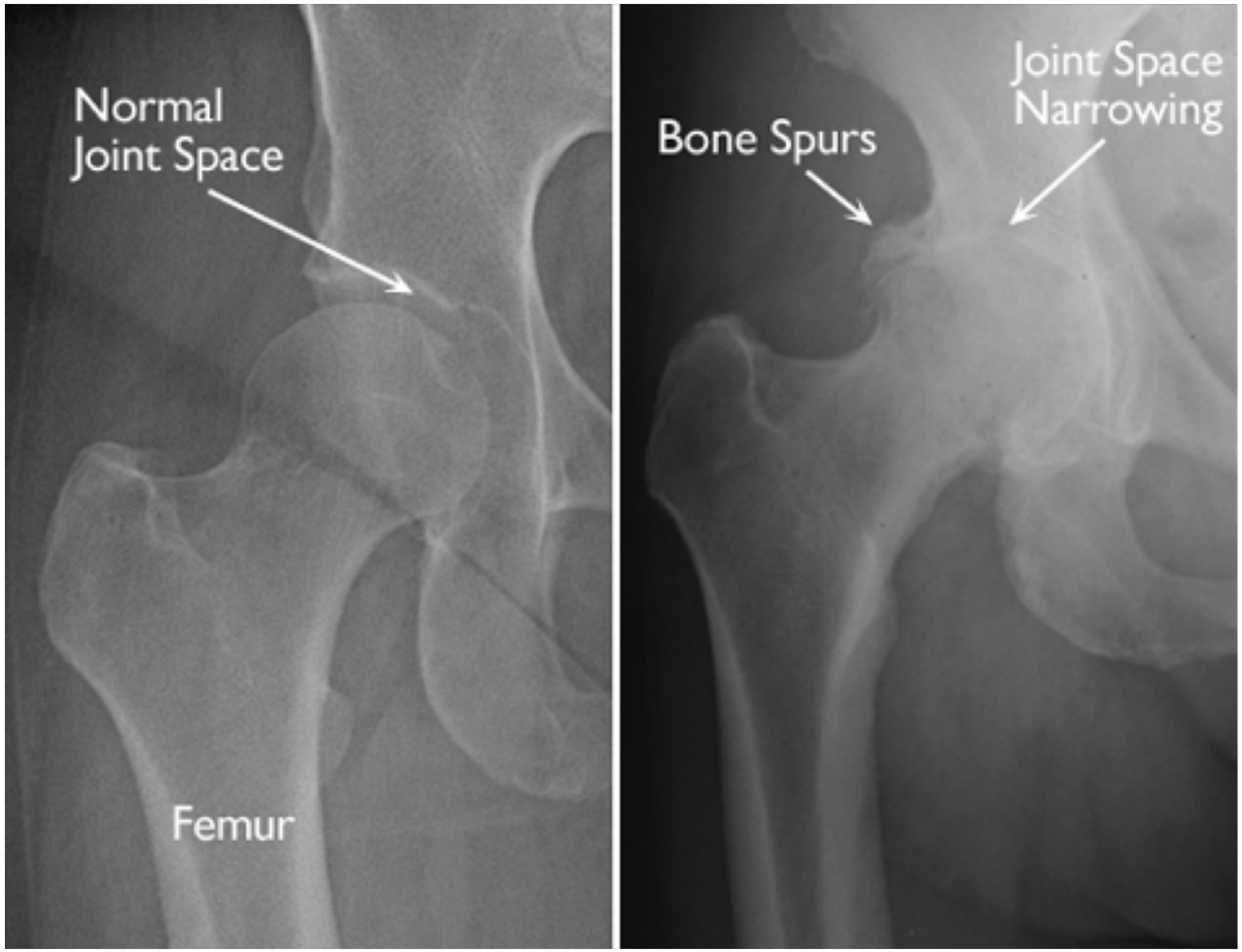
Moderate focal arthritis



Severe arthritis (bone on bone)

Radiographic Findings

- AP Pelvis
  - Joint space narrowing
  - Subchondral sclerosis
  - Osteophytes



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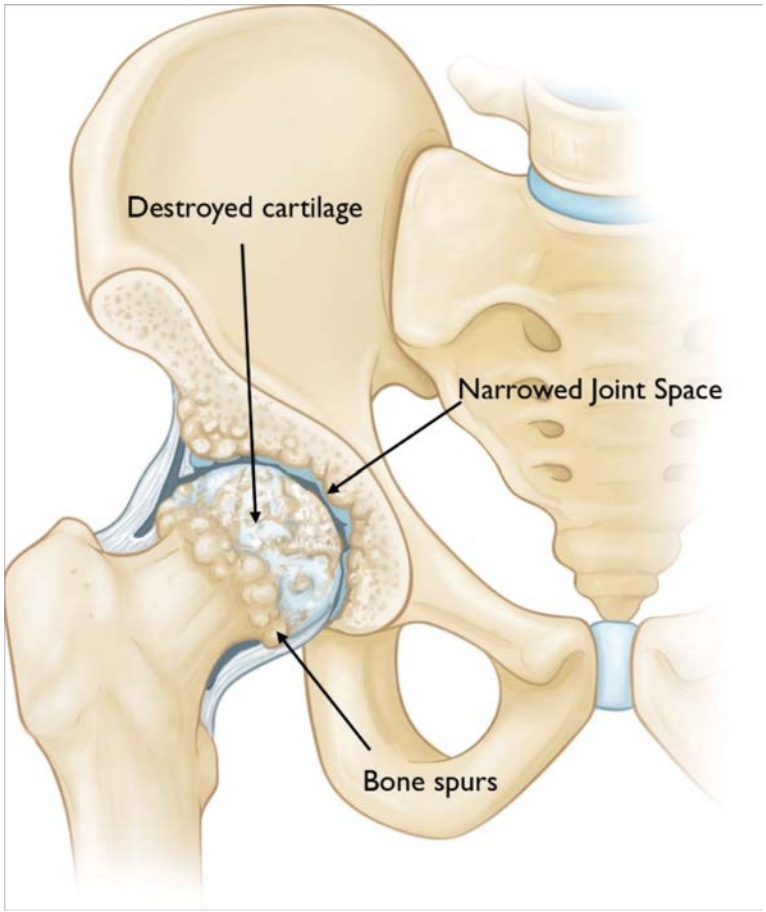
End-Stage Arthritis

- Occurs from complete loss of articular cartilage
- Bone on bone
- Loss of range of motion
- Significant pain with movement and weightbearing



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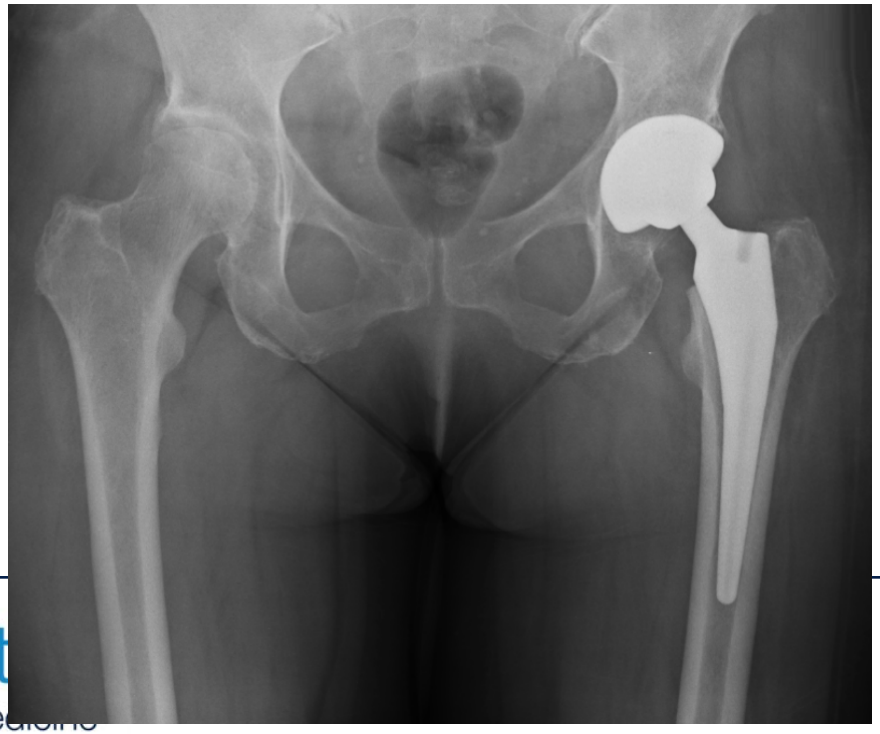
Treatment for arthritis

- No method to regrow cartilage currently
- Hip replacement works well for end stage arthritis
- But in young patients early replacement leads to early wear and risk of revision surgery/complications



Inflammatory Arthritis

- Body's immune system becomes overactive and attacks healthy cells
  - Can cause destruction of multiple joints as well as organs, skin, eyes, heart
- Age >35
- Most common forms
  - Rheumatoid arthritis
  - Systemic lupus erythematosus
- Medicinal treatment is available
  - Oral steroids
  - Immuno-modulating drugs
  - Prevention of cartilage loss

Healthy hip joint Rheumatoid arthritis

Post-traumatic Arthritis

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Post-Traumatic Arthritis

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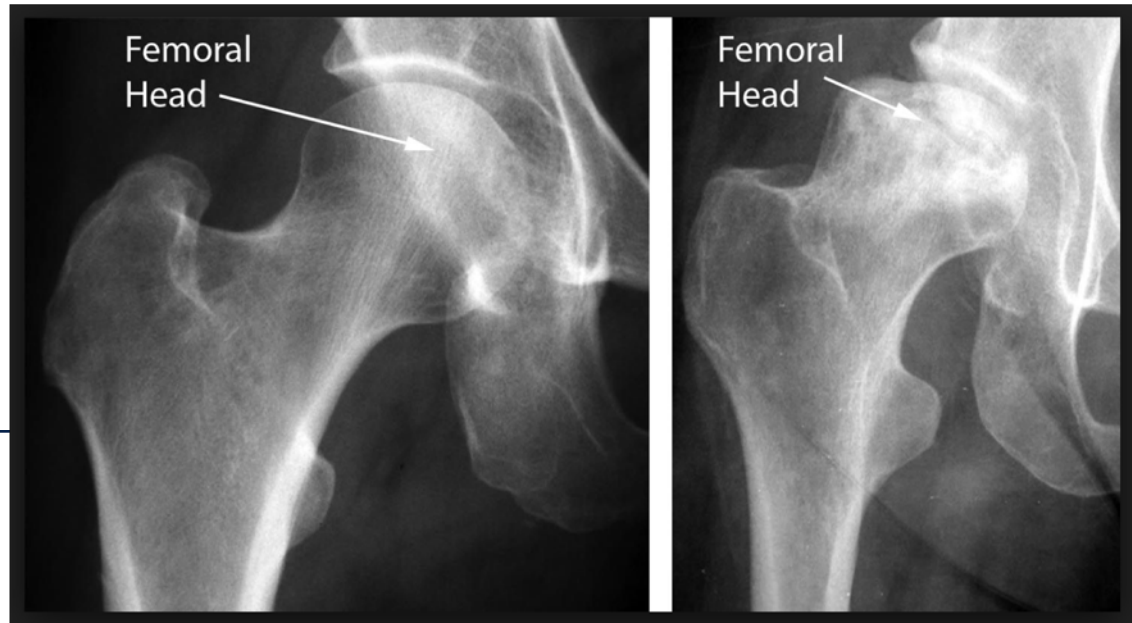
Avascular necrosis (AVN) of the hip

- Interruption of blood supply to femoral head causes cell death (osteonecrosis)
- Ages 20-50
- Causes-
  - Trauma (femoral neck fracture)
  - Medications (Steroids, chemo)
  - Systemic (HIV, Hep C)
  - Social (Alcohol abuse)
  - Idiopathic



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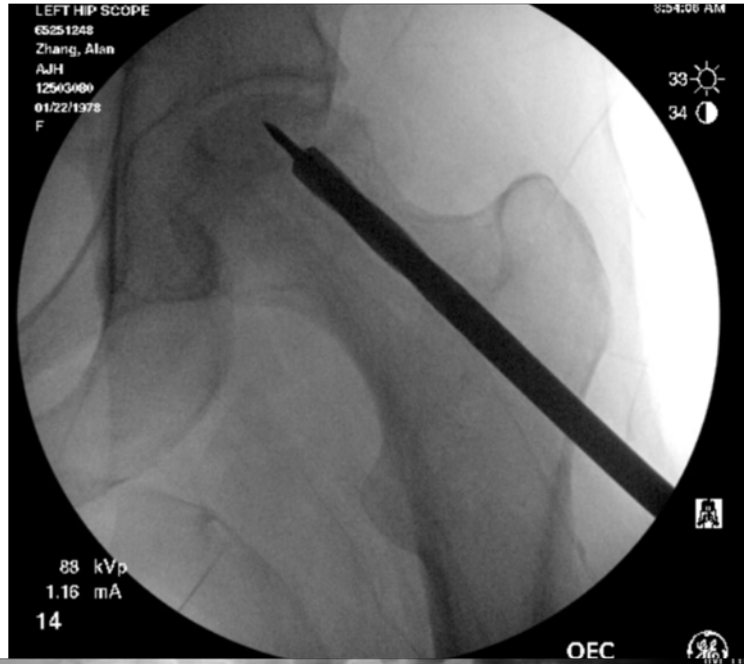
Treatment

- Pre-collapse of femoral head
  - Core decompression
  - Bone grafting
  - Up to 70% success rate for preservation
- Post-collapse
  - Replacement



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Target Population for Hip Preservation

- Arthritis typically develops in the older population (>55 years old) with gradual onset
- Is it possible to prevent arthritis from occurring in certain high-risk individuals?
  - Especially in young active patients

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Causes for Early Arthritis

- In patients with end-stage arthritis under age 50
- 9% due to post-traumatic arthritis
- 29% due to avascular necrosis (osteonecrosis)
- 48% due to osteoarthritis from structural abnormalities of the hip
  - Femoroacetabular impingement (FAI) or dysplasia

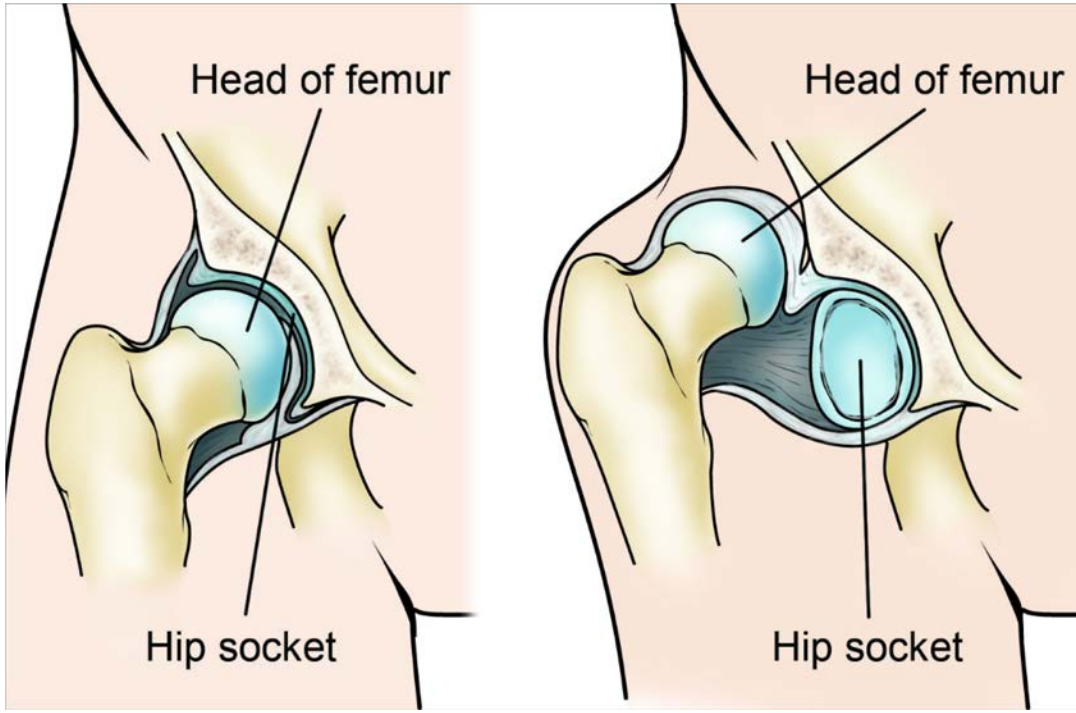
Clohisy et al JBJS 2011

Hip Preservation in the Young Active Population

- 2 major structural abnormalities of the hip (FAI and dysplasia) lead to early hip arthritis in the young active population
  - FAI- 15-30% of population
  - Hip dysplasia- 1-5% of population
- Hip replacement surgery should be avoided in young patients due to risk for breakdown over time and need for revision
- Therefore prevention of worsening cartilage damage is a major focus

Hip Dysplasia

- Congenital structural abnormality of the hip
  - Deficient coverage of femoral head
- Can be diagnosed at birth (severe cases)
  - Associated with breech delivery
  - Family history
- Milder forms asymptomatic until adulthood



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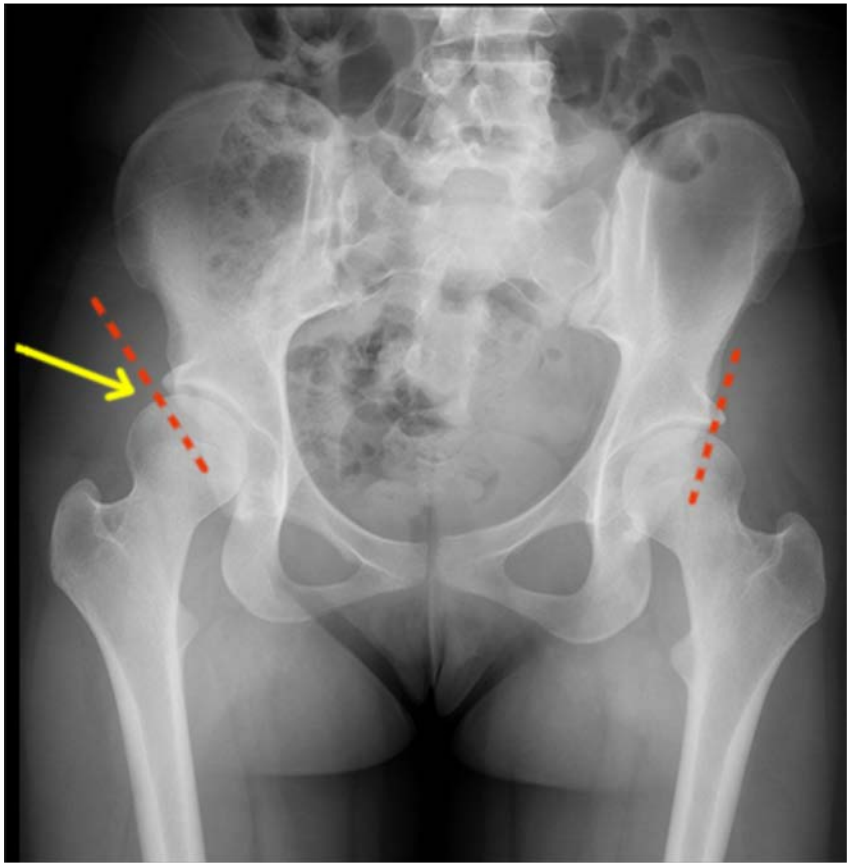
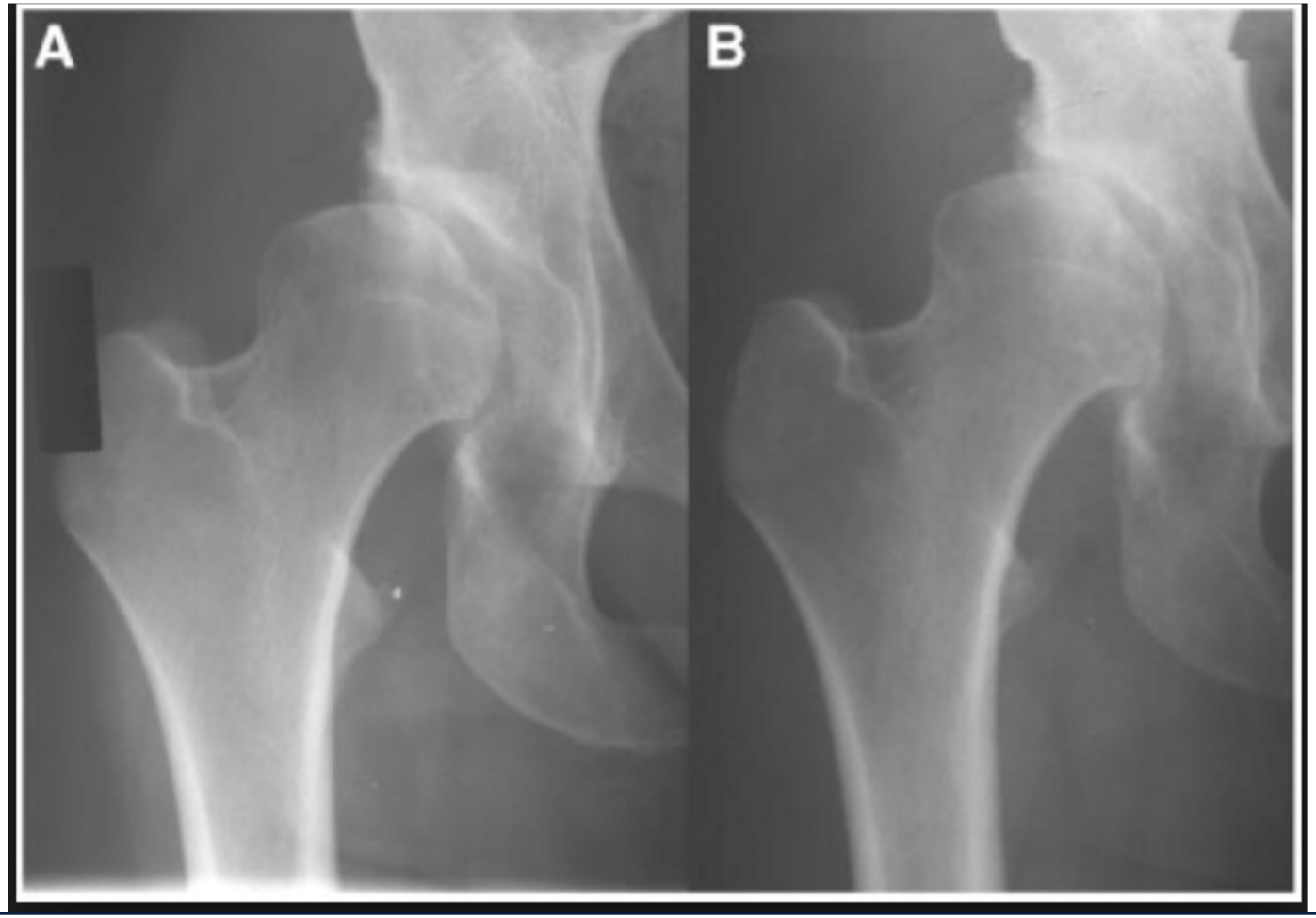
Hip Dysplasia



- More common in females 85% vs males 15%

Hip Dysplasia and Arthritis



Hip Dysplasia Treatment

- Peri-acetabular osteotomy

Complications after PAO

2018 Bernese Hip Symposium

Are Complications After the Bernese Periacetabular Osteotomy Associated With Subsequent Outcomes Scores?

Joel Wells MD, MPH, Perry Schoenecker MD, Jeff Petrie MD, Kayla Thomason BS, Charles W. Goss PhD, John C. Clohisy MD

- 66/154 hips had complication (43%)
- 10% with major complication (infection, nerve injury, revision surgery)

Outcomes after PAO

J Am Acad Orthop Surg. 2018 Nov 14. doi: 10.5435/JAAOS-D-17-00810. [Epub ahead of print]

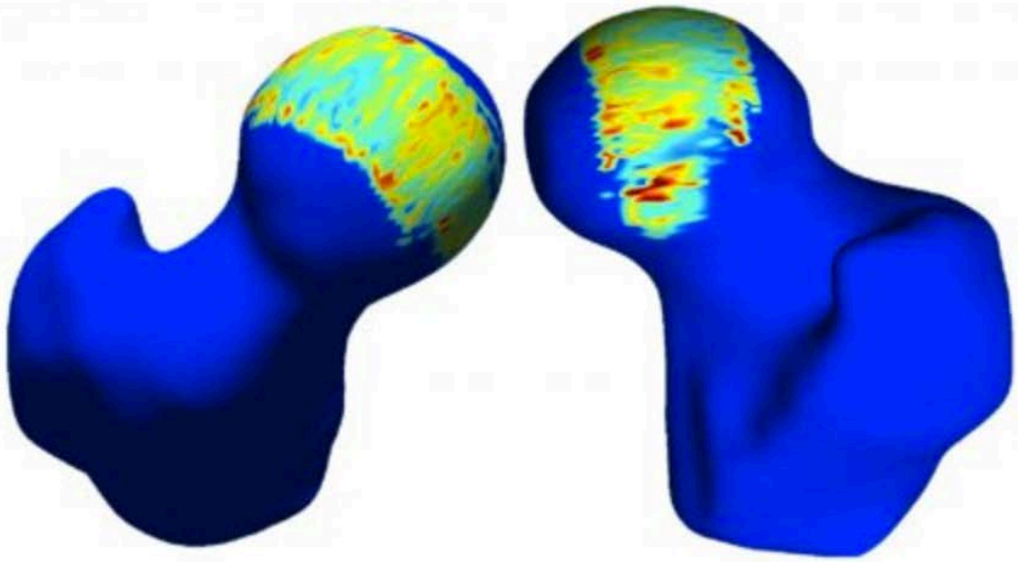
Ten- and 20-year Survivorship of the Hip After Periacetabular Osteotomy for Acetabular Dysplasia.

Ziran N[1], Varcadipane J, Kadri O, Ussef N, Kanim L, Foster A, Matta J.

- 302 cases
- 10 year and 20 year = 86% and 60% survivorship
- 14% and 40% convert to total hip replacement at 10 and 20 years after PAO, respectively
- Age over 50= greater risk for converting to THA (63% at 10 years)

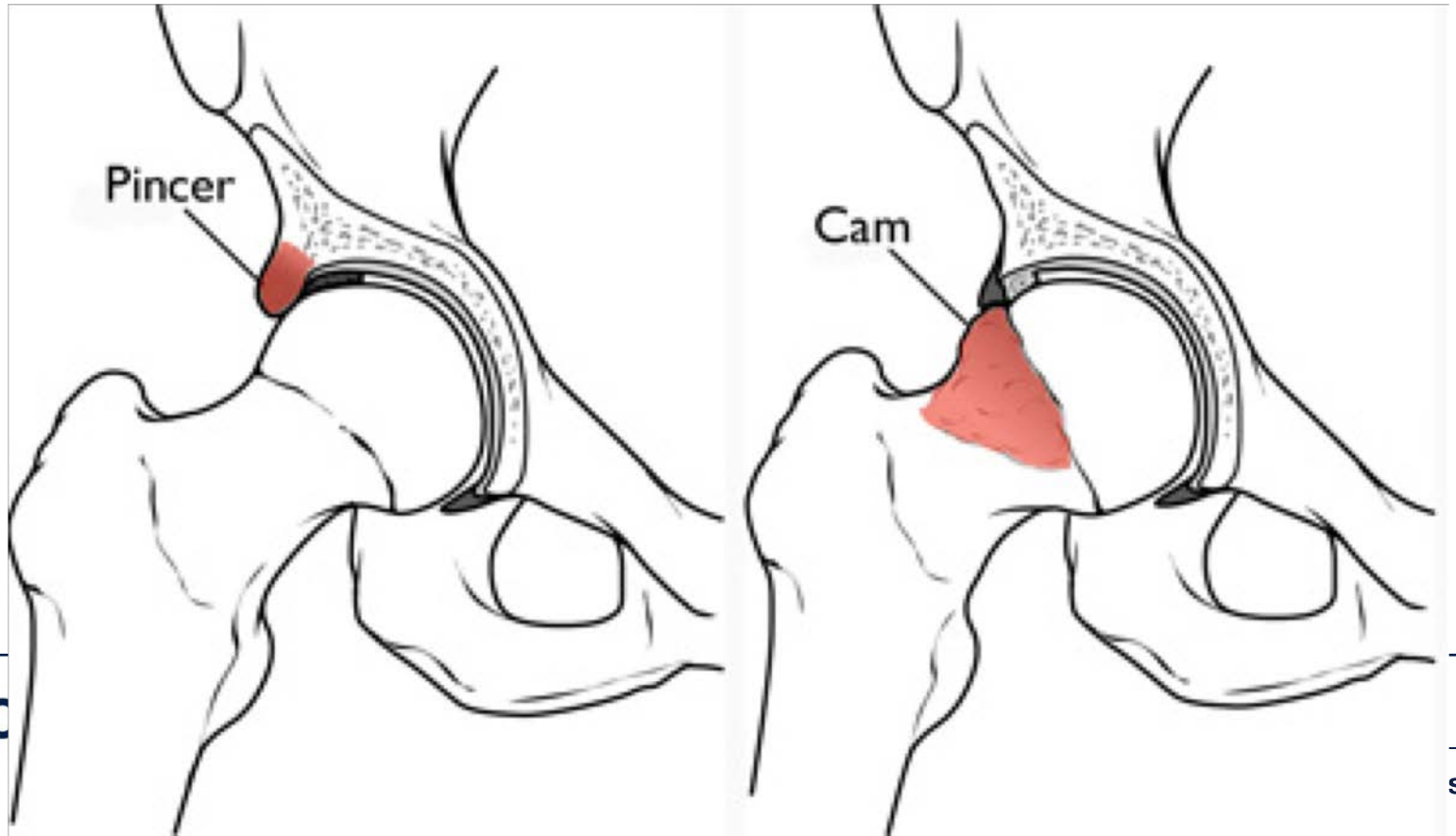
Hip Dysplasia Treatment

- Further studies are needed to investigate treatment methods for dysplasia to lower complication rates, improve patient outcomes and preserve native cartilage



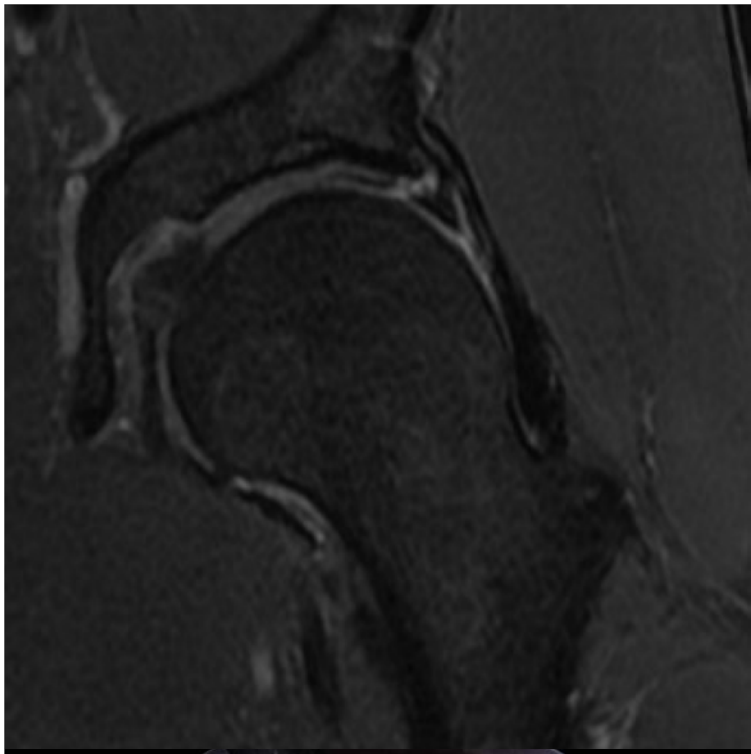
FAI- Femoroacetabular Impingement

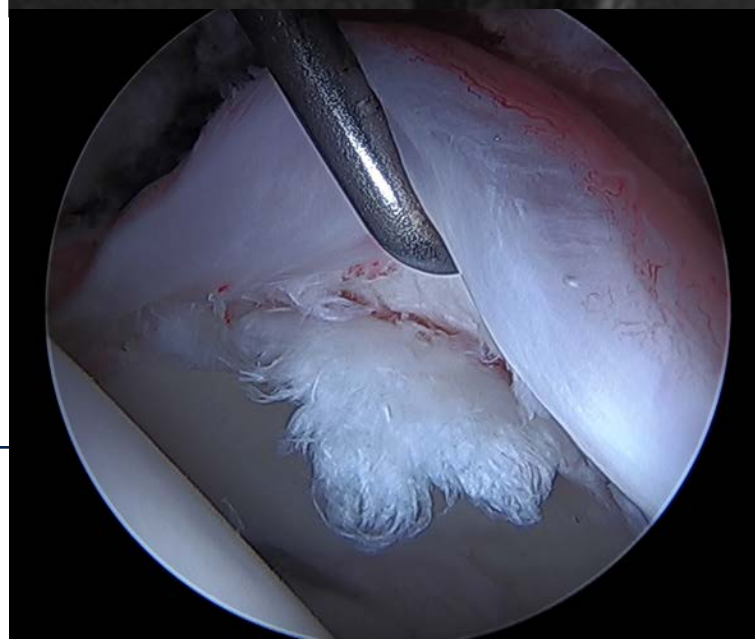
- Abnormal bony anatomy that forms during skeletal development
- Extra bone growth can cause increased friction (impingement) that leads to cartilage and labral injury



Labral Tears

- Hip Labrum
  - Protective ring of fibrocartilage
  - Maintains suction seal of hip
  - Helps stability
- Labral tears common in FAI
  - >90% of FAI patients have labral and/or cartilage injuries (Beaule et al CORR 2012)
  - Can cause pain and mechanical symptoms
  - Labrum may be symptomatic before cartilage





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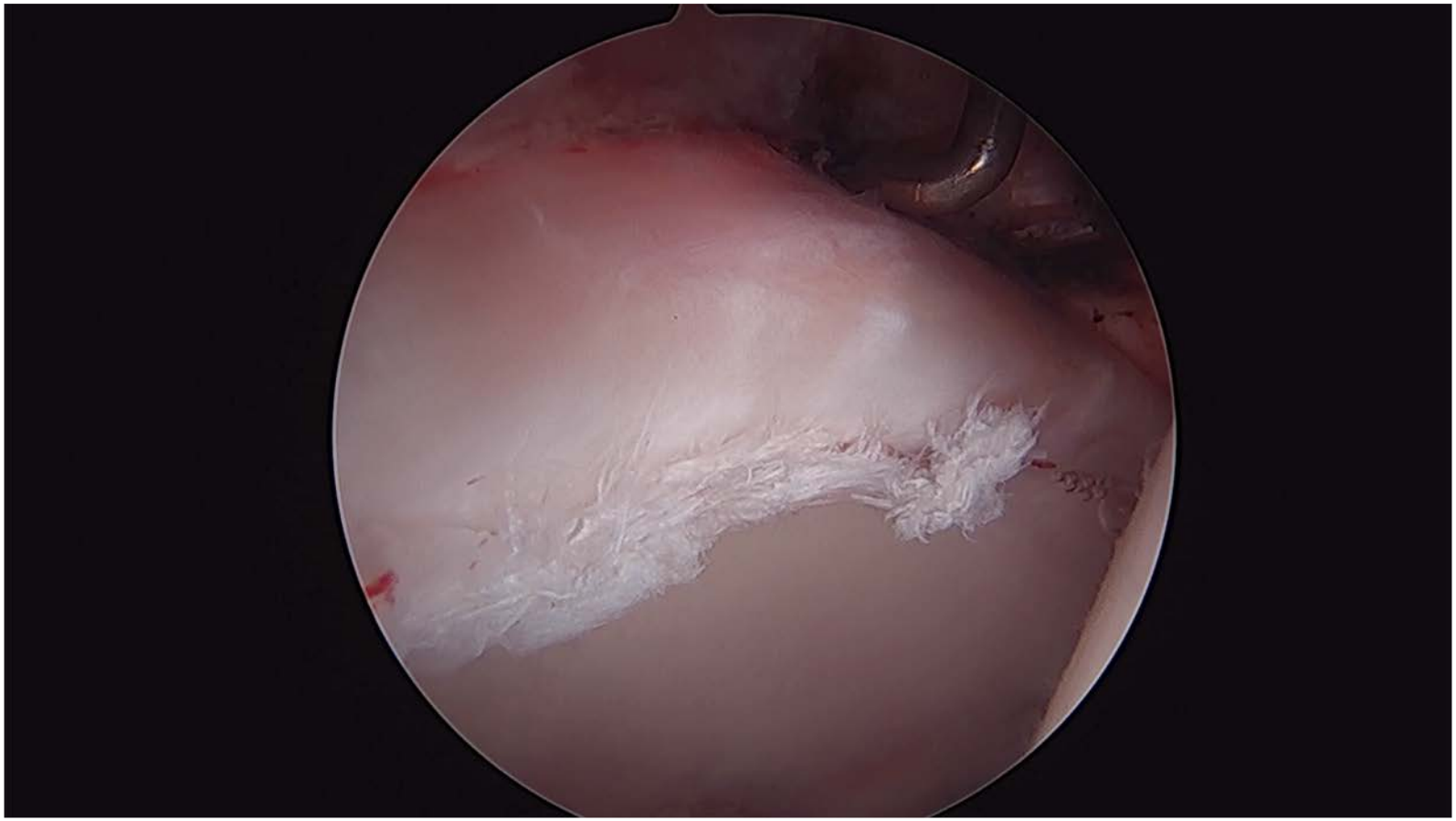
Cartilage injury with full-thickness labral tear in 18 year-old



Burden of FAI in U.S. Population

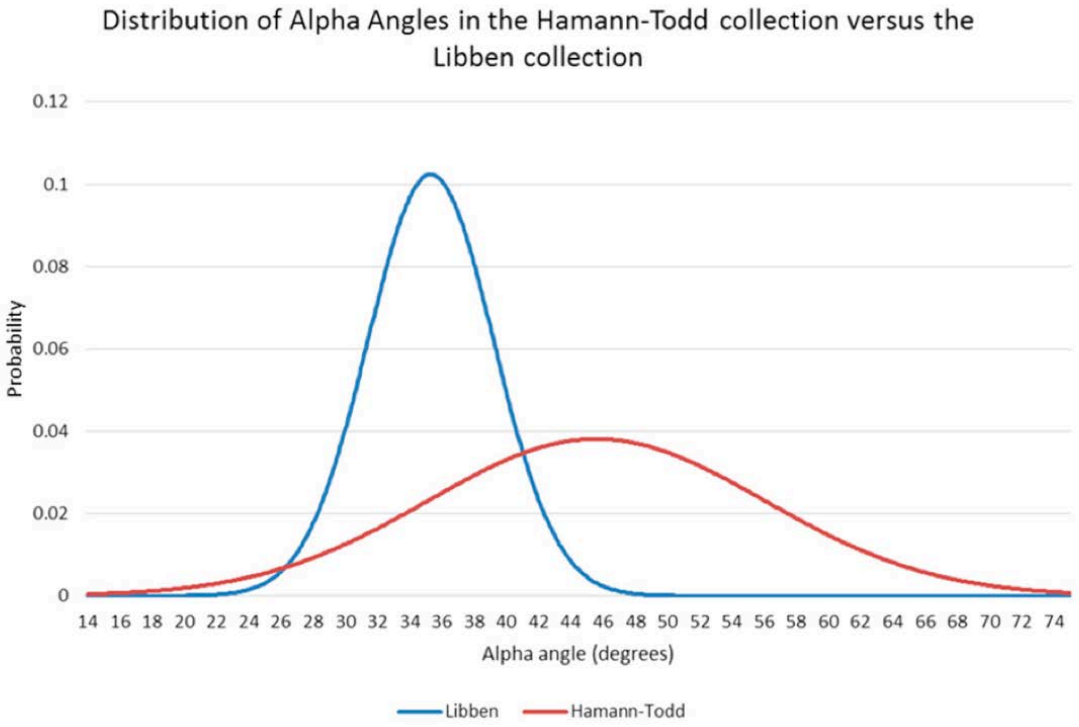
- 15-30% of general population with radiographic FAI
- 78% have bilateral radiographic lesions (Beaule et al JBJS 2009)
  - Cam more common in males, pincer in females
- 25% of FAI patients have bilateral surgery
- Disease of modern humans

The Antiquity of the C

A Comparison of Proximal Femoral Morphology E

Allison R. Moats, BS, Raghav Badrinath, BS, Linda B. Spurlo

Investigation performed at the Department of Anthropology, School of Biomedi



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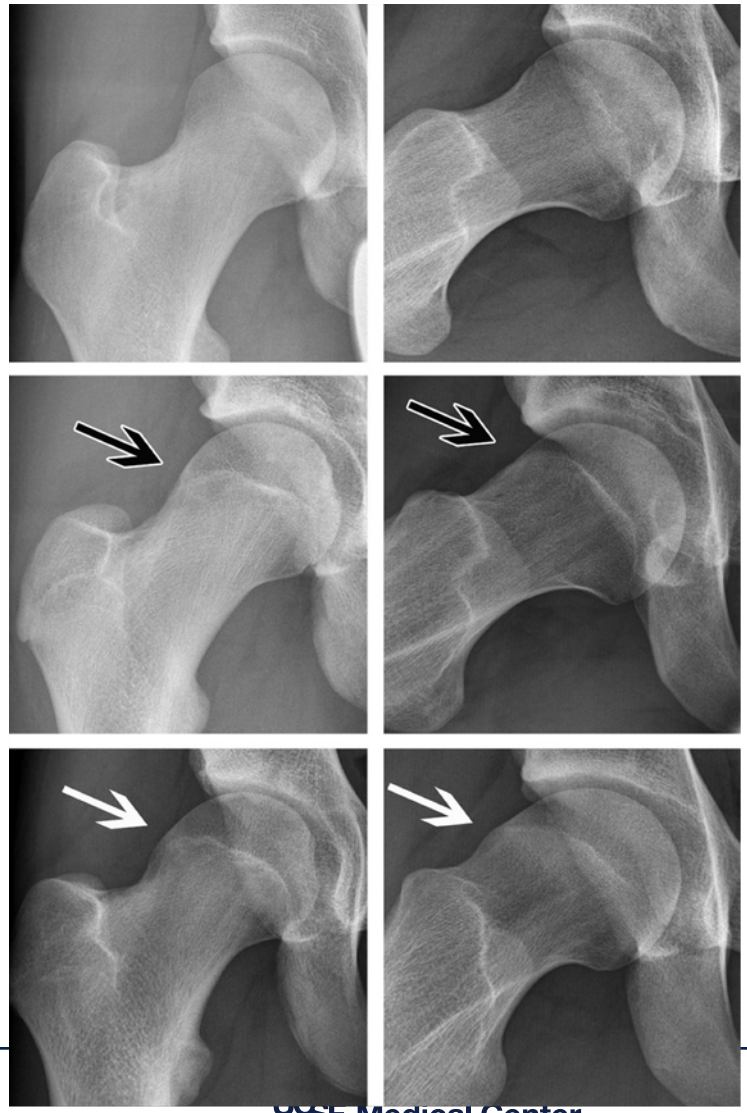
Prevalence of FAI in Athletes

- Football- **90%** of players at NFL Combine (2009-2010) had at least 1 sign of FAI on xrays
- Hockey- **75%** of Elite Youth Hockey players in Colorado had Cam lesion on MRI
- Soccer- **72%** of male and **50%** of female elite soccer players (MLS, US national team) had radiographic FAI

FAI Acquired During Skeletal Maturation in Athletes

- Agricola et al AJSM 2014
  - 63 pre-professional soccer players in Netherlands
  - Baseline Xray at age 12 showed 2% with Cam
  - F/u xrays 2 years later showed 18% with Cam
- Similar studies have shown this trend in high-level youth basketball and hockey players



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FAI and Arthritis

- Patients <50 years old with hip arthritis
- 48% due to FAI/dysplasia, 29% AVN, 9% trauma

Hip Arthritis After Sports

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Patient Signs and Symptoms for FAI

- Pain with hip flexion activities
- Prolonged sitting pain
- Pain in a c-shaped band or in groin
- Pain with standing from sitting position
- Pain with sports/running/activities

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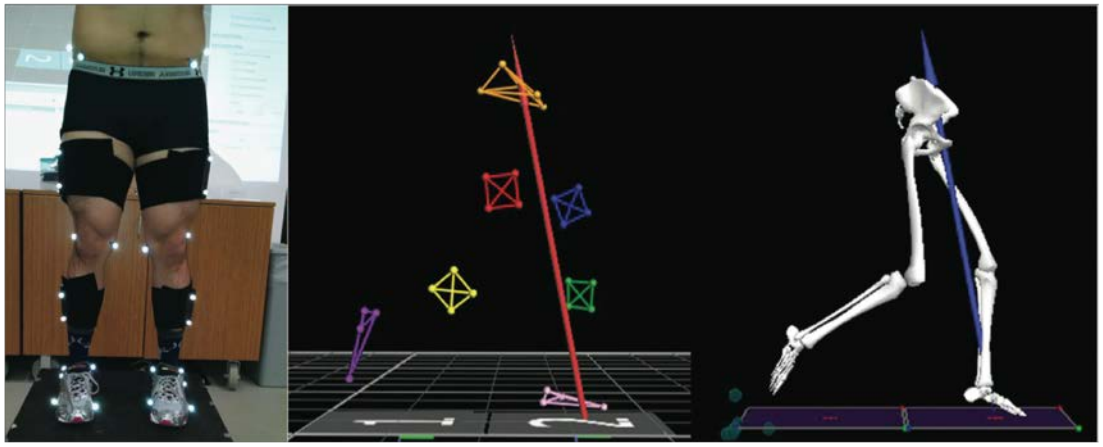
Byrd et al AJSM 2014

Physical Exam



- Asses ambulation
  - Antalgic gait
    - Arthritis/acute injury
  - FAI gait
    - Loss of peak hip extension
- Range of Motion (ROM)
  - Arthritis= global loss of ROM over time
  - FAI= decreased ROM especially internal rotation since early adulthood

Flexion ADduction Internal Rotation

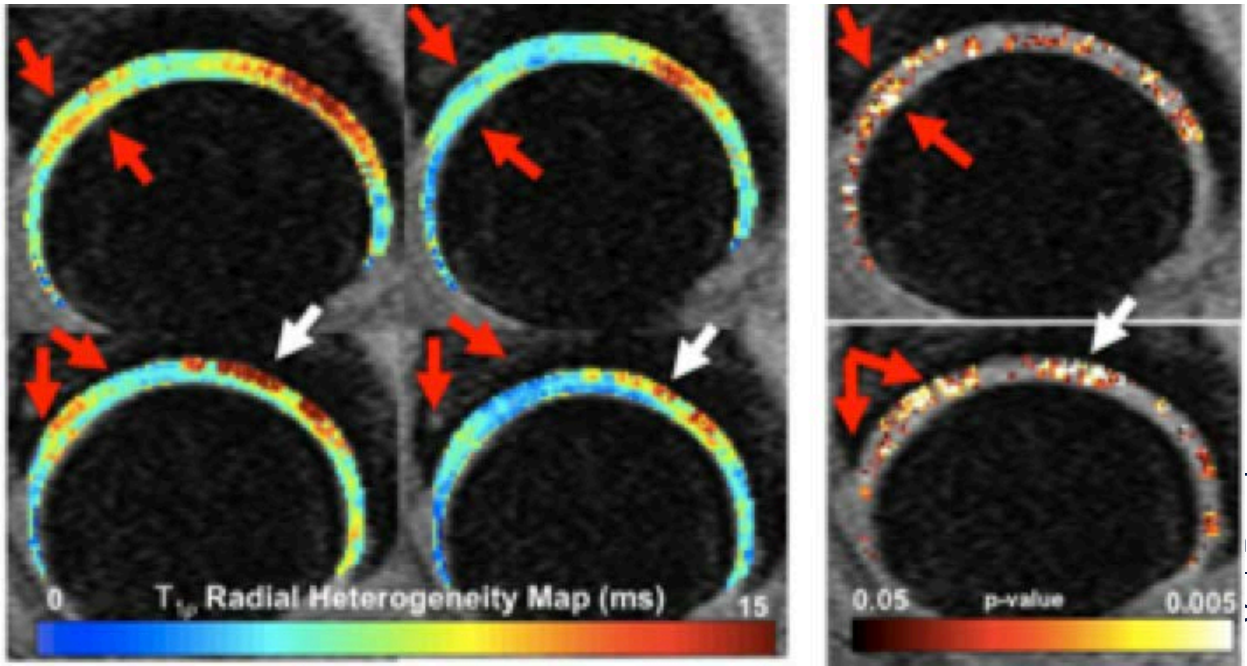
Cartilage/Labral Injury Prevention?

- 1st step to prevention of irreversible damage is timely diagnosis
- Early cartilage delamination is very difficult to detect on MRI

J Orthop Res. 2018 Mar;36(3):971-978. doi: 10.1002/jor.23667. Epub 2017 Aug 21.

A novel mr-based method for detection of cartilage delamination in femoroacetabular impingement patients.

Samaan MA[1], Pedoia V[1], Zhang AL[2], Gallo MC[1], Link TM[1], Souza RB[1,3], Majumdar S[1].



Early Detection Allows for Early Treatment

PM R. 2013 May;5(5):418-26. doi: 10.1016/j.pmrj.2013.02.005. Epub 2013 Feb 16.

Nonoperative treatment for femoroacetabular impingement: a systematic review of the literature.

Wall PD[1], Fernandez M, Griffin DR, Foster NE.

- 1st line treatment
  - Activity Modification
  - Anti-inflammatory medication (NSAIDs)
    - Ibuprofen 600mg every 6 hours or Naproxen 500mg every 12 hours
  - Ice
  - Physical therapy

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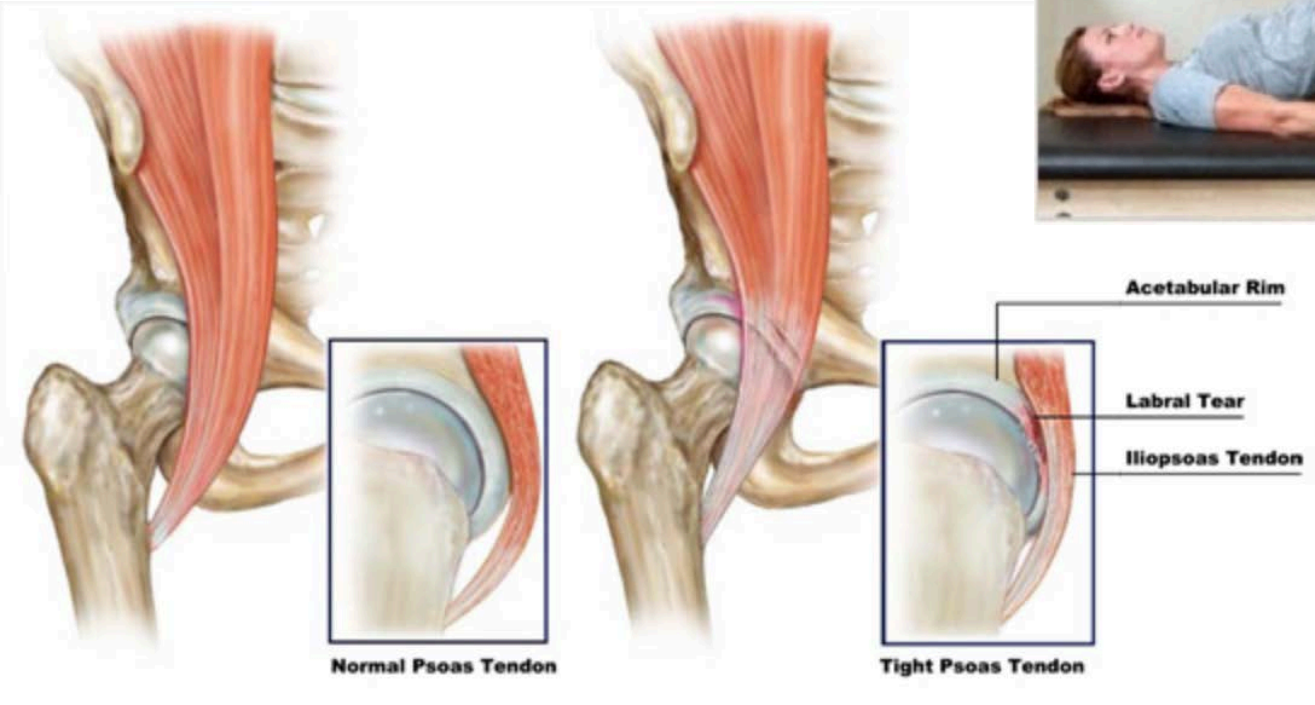
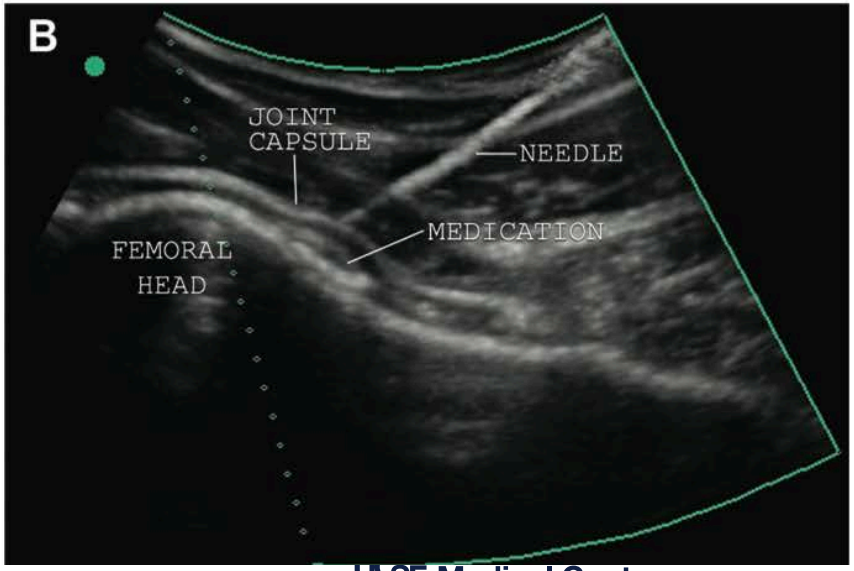
PT Protocol

1. Gluteus Strengthening
2. Core Strengthening
3. ROM
4. Iliopsoas Stretching



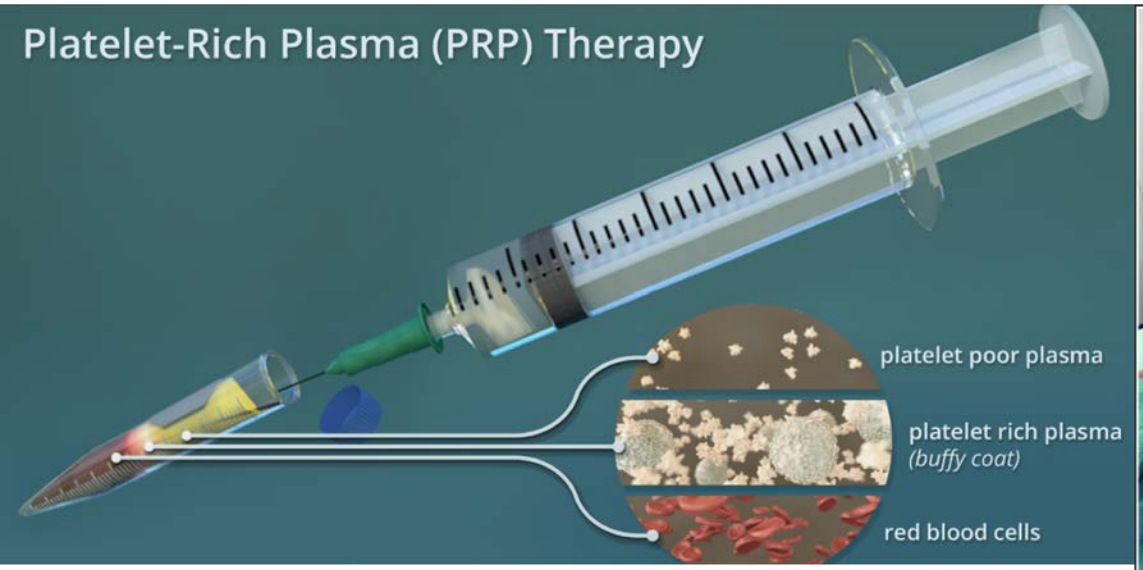
Injections

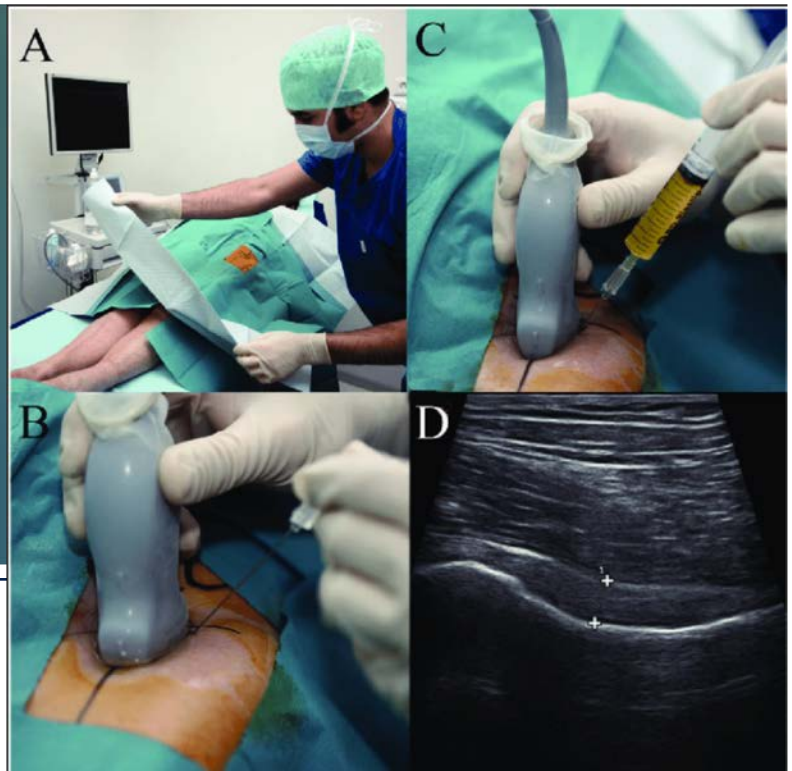
- Cortisone injection under ultrasound or xray is gold-standard
  - Helps with pain/symptoms
  - Lasts 2 weeks to 2 months on average
  - No detrimental effects when used wisely



Alternative Injections

- Platelet-Rich Plama (PRP)
- Will not cause bone shape to change
- No current evidence on efficacy of PRP in the hip





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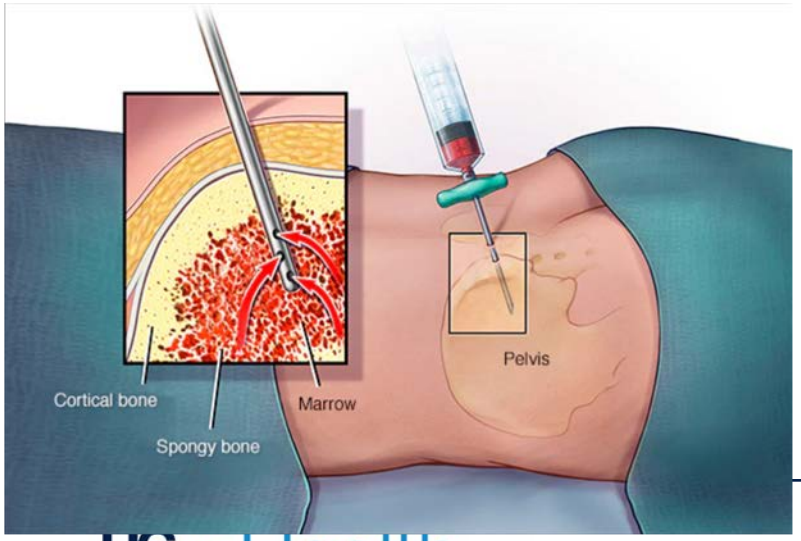
Stem cell Injections

- Allogenic stem cells from placental tissue
  - Unsafe
- Bone marrow aspirate
  - Safer
  - No evidence on efficacy



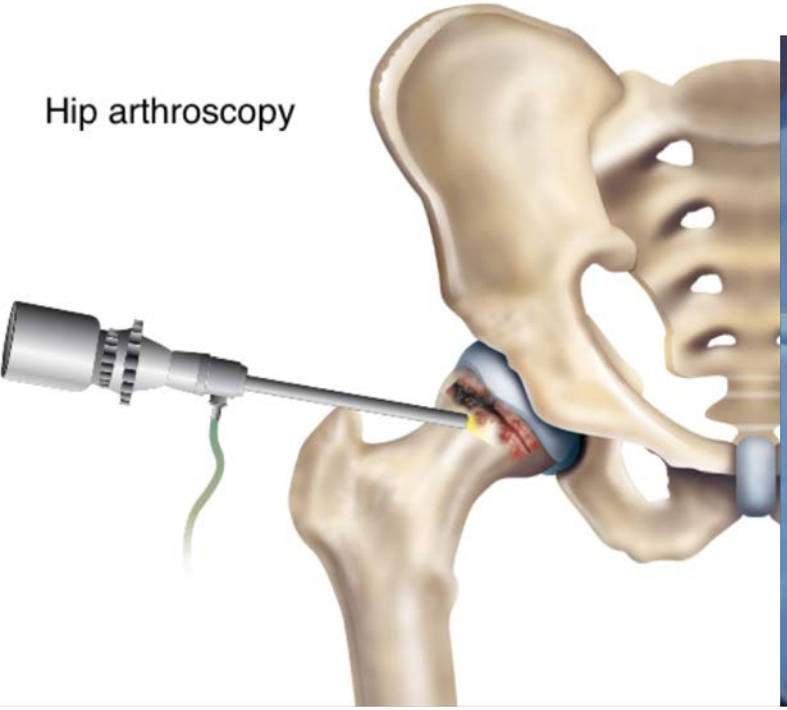
The New York Times

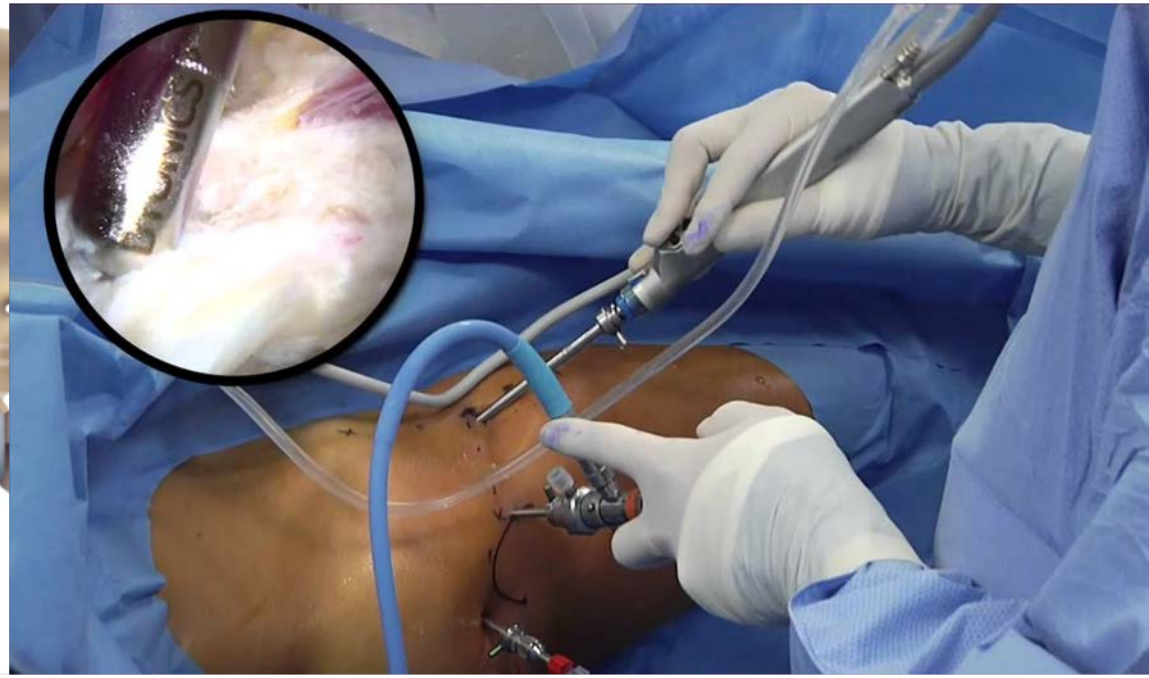
12 People Hospitalized With Infections From Stem Cell Shots

Dr. Scott Gottlieb, the F.D.A. commissioner. Federal regulators are cracking down on clinics offering stem cell injections, warning that the treatments can be unsafe.

Surgical Treatment

- If conservative treatment fails-
- Hip Arthroscopy is a surgical option





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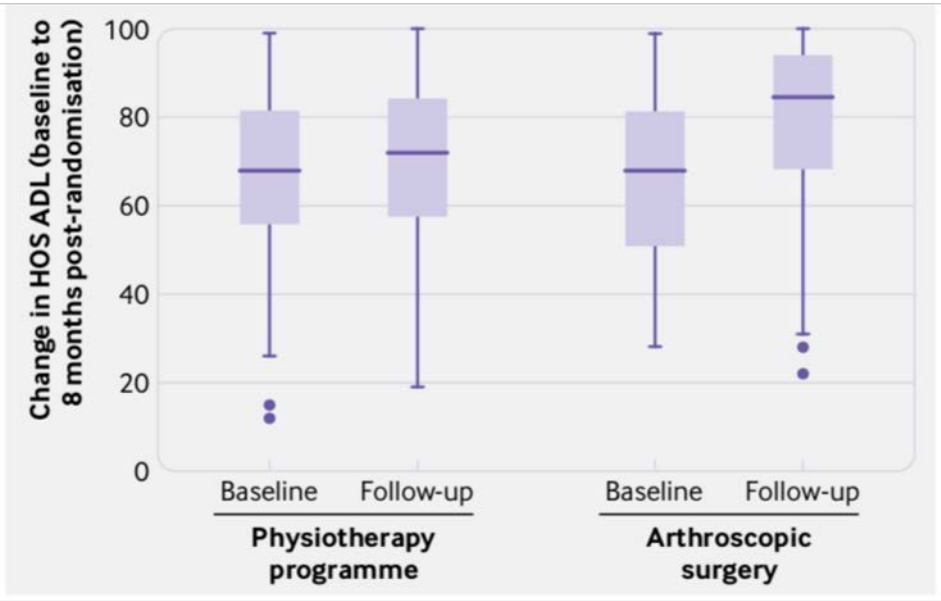
Surgery vs PT

Arthroscopic hip surgery compared with physiotherapy and activity modification for the treatment of symptomatic femoroacetabular impingement: multicentre randomised controlled trial

Antony J R Palmer,[1] Vandana Ayyar Gupta,[1] Scott Fernquest,[1] Ines Rombach,[2] Susan J Dutton,[2] Ramy Mansour,[3] Simon Wood,[3] Vikas Khanduja,[4] Tom C B Pollard,[5] Andrew W McCaskie,[6] Karen L Barker,[1] Tony J M D Andrade,[5] Andrew J Carr,[1] David J Beard,[1,7] Sion Glyn-Jones,[1] on behalf of the FAIT Study Group

- Randomized controlled trial of PT vs hip arthroscopy surgery for FAI in UK (FAIT trial 2019)
- At 8 months after treatment
- Pts who had surgery had significantly better outcomes scores (10 pts) than pts who had PT and activity modification



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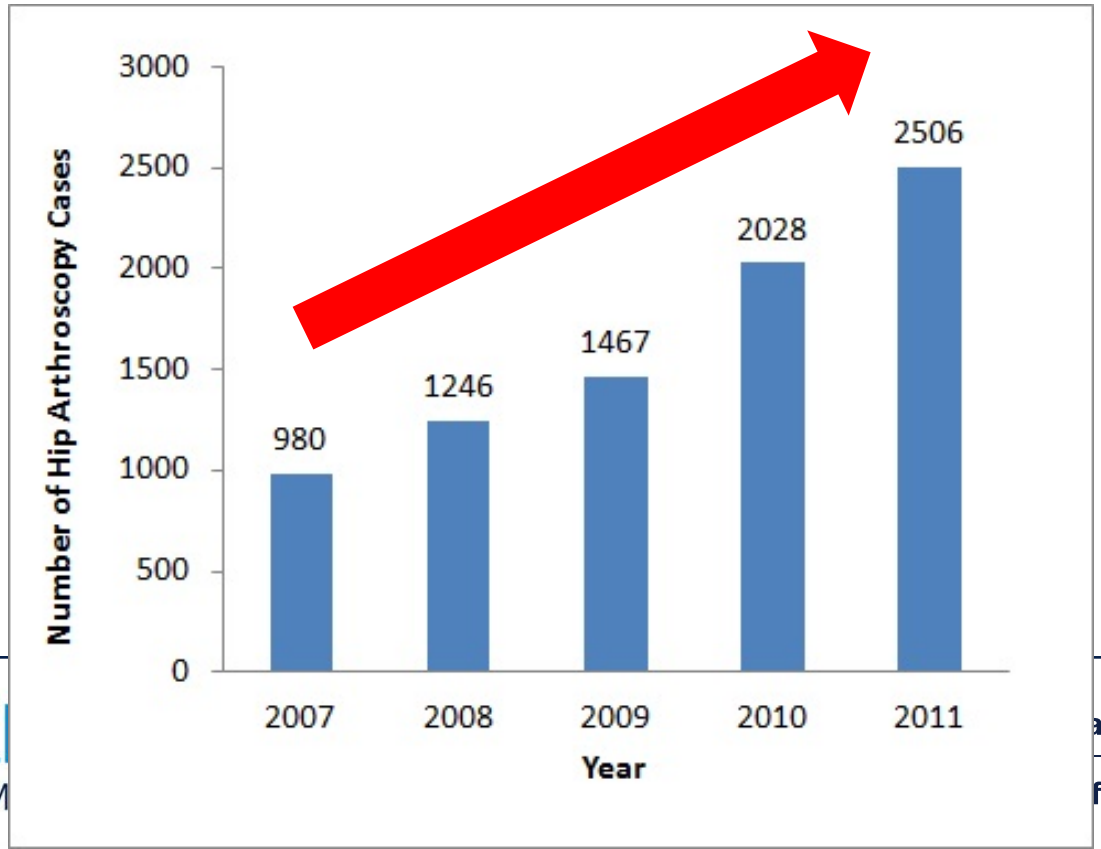
Age-Related Trends in Hip Arthroscopy: A Large Cross-Sectional Analysis

David C. Sing, B.S., Brian T. Feeley, M.D., Bobby Tay, M.D., Thomas P. Vail, M.D., and Alan L. Zhang, M.D.

- 20,484,172 unique orthopedic patients analyzed
- 8,227 hip arthroscopy cases



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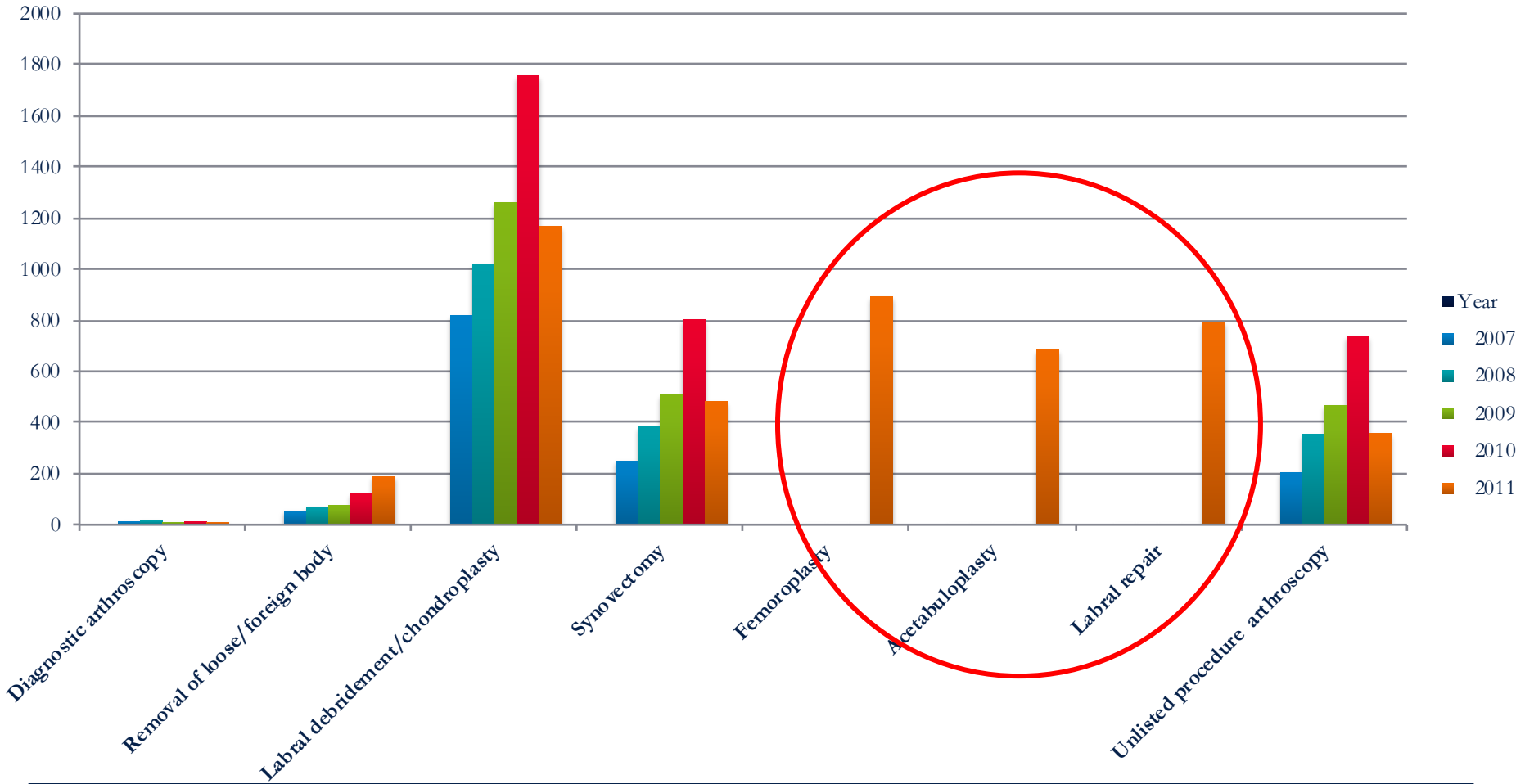
Growth by Procedure



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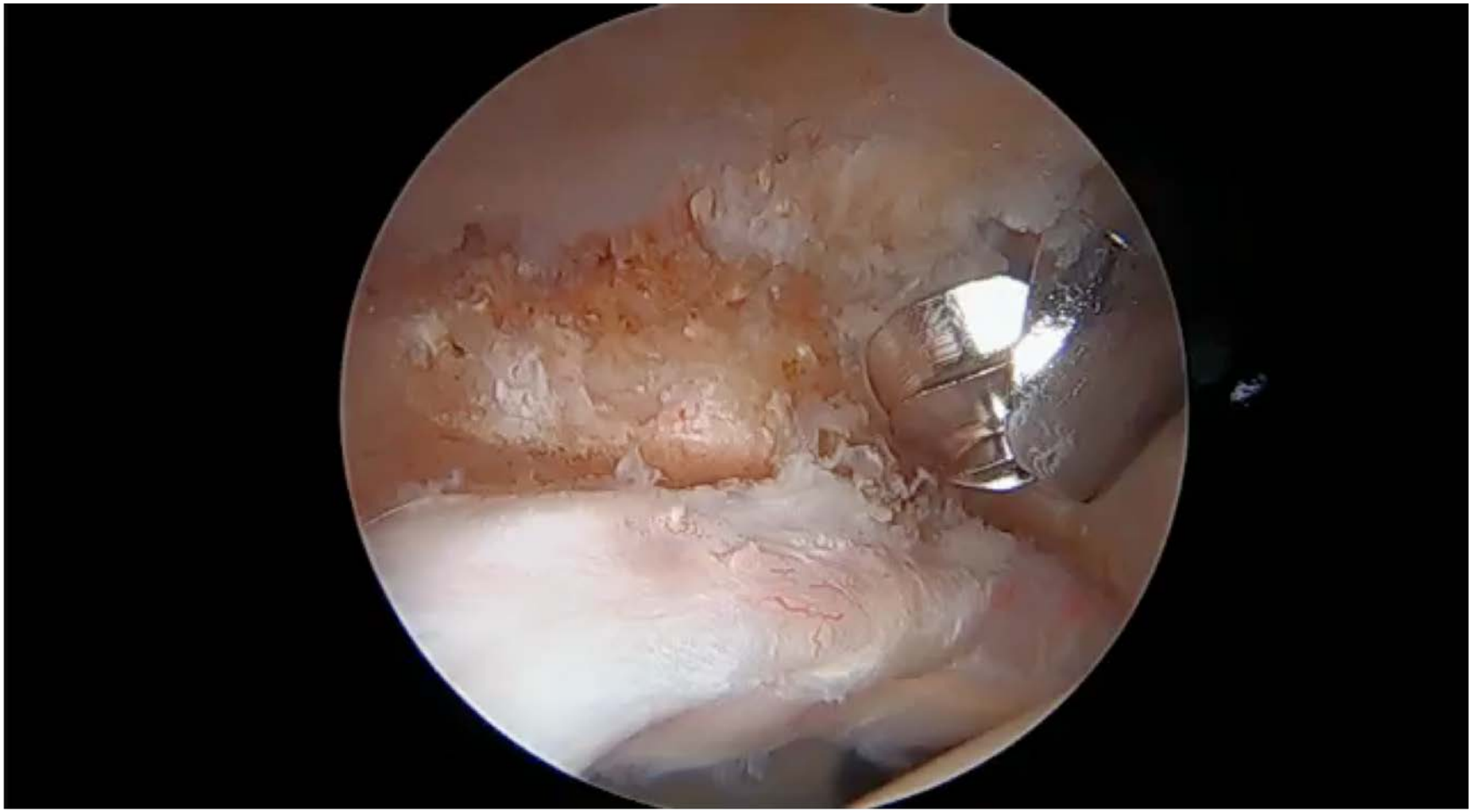
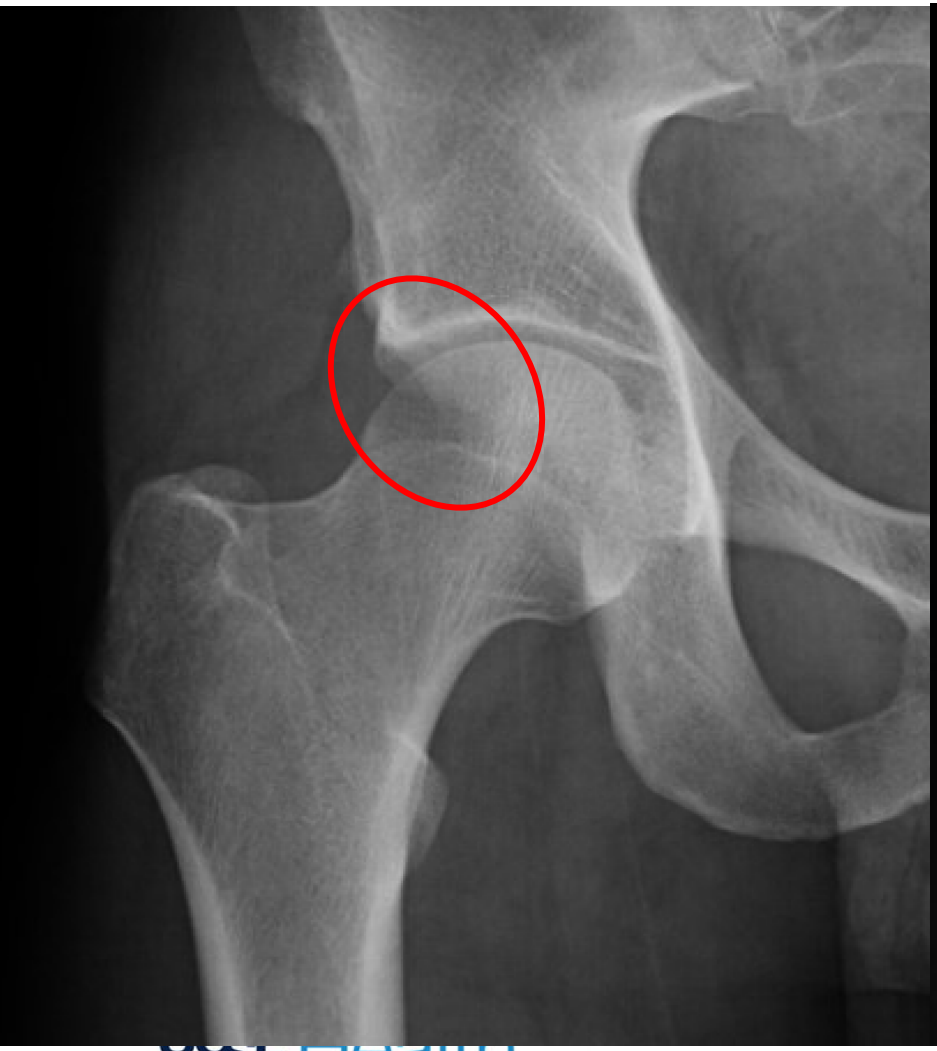
Acetabuloplasty for Pincer Lesion

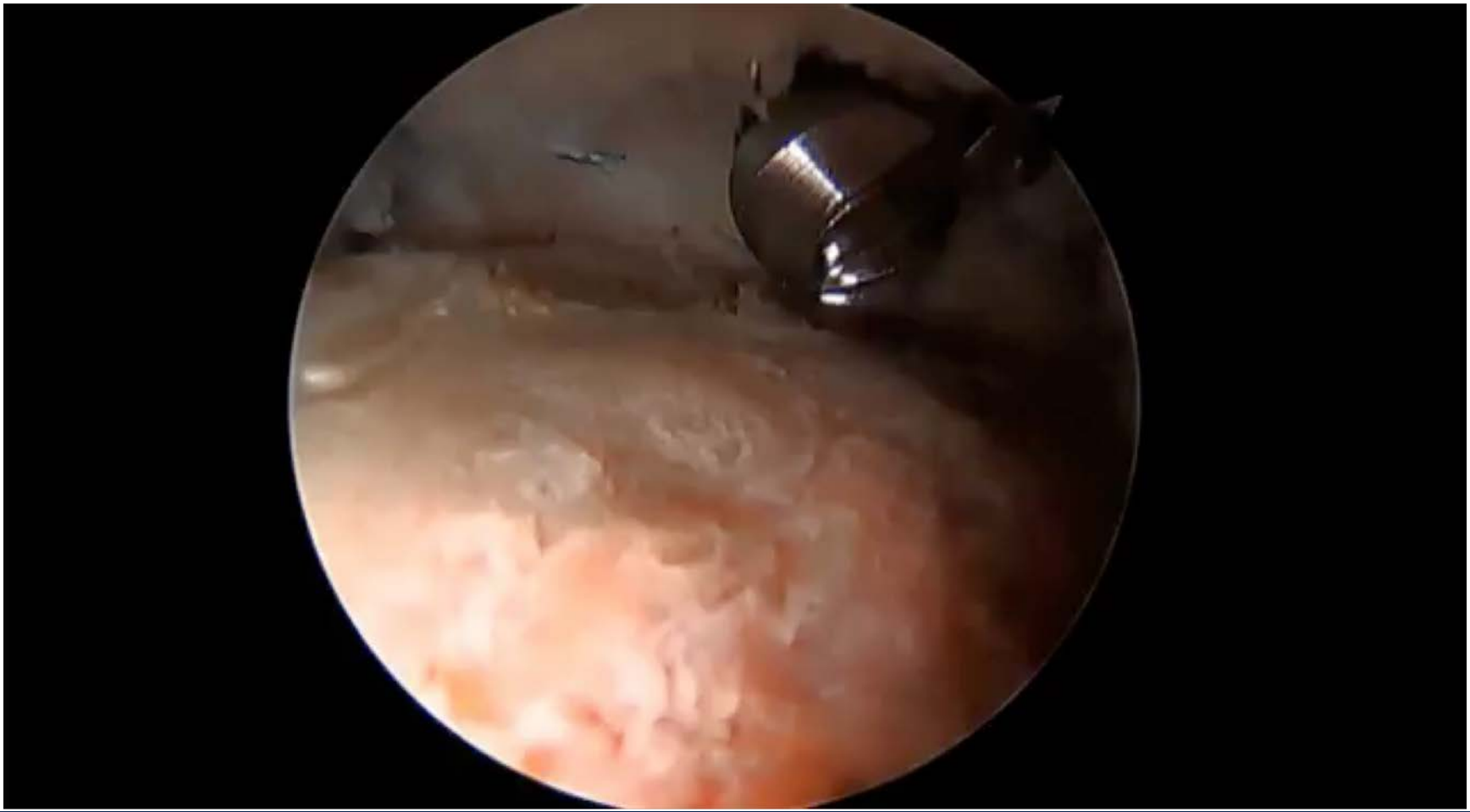


Pincer Pre-Op

Post-Op



Femoroplasty for Cam Lesion



Cam Lesion

After Femoroplasty

Labral Repair

Hip Arthroscopy Outcomes

- Most studies 2-year outcomes

Am J Sports Med. 2016 Jan;44(1):74-82. doi: 10.1177/0363546514562563. Epub 2015 Jan 28.

Does Primary Hip Arthroscopy Result in Improved Clinical Outcomes?: 2-Year Clinical Follow-up on a Mixed Group of 738 Consecutive Primary Hip Arthroscopies Performed at a High-Volume Referral Center.

Gupta A[1], Redmond JM[1], Stake CE[1], Dunne KF[1], Domb BG[2].

- Few 5-year outcomes (Kelly, Philippon, Byrd, Domb)

Am J Sports Med. 2016 Apr;44(4):1062-8. doi: 10.1177/0363546515587719. Epub 2015 Jun 9.

Arthroscopic Versus Open Treatment of Femoroacetabular Impingement: A Systematic Review of Medium- to Long-Term Outcomes.

Nwachukwu BU[1], Rebolledo BJ[2], McCormick F[3], Rosas S[3], Harris JD[4], Kelly BT[5].

- Only Case-series w/ 10-year outcomes (Philippon, Byrd)

J Bone Joint Surg Am. 2017 Jun 21;99(12):997-1004. doi: 10.2106/JBJS.16.01060.

Survivorship and Outcomes 10 Years Following Hip Arthroscopy for Femoroacetabular Impingement: Labral Debridement Compared with Labral Repair.

Menge TJ[1], Briggs KK, Dornan GJ, McNamara SC, Philippon MJ.

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When do patients improve after hip arthroscopy for femoroacetabular impingement?

A prospective cohort analysis.

Authors: Sergio E. Flores[1], Joseph R. Sheridan[1], Kristina R. Borak[1], Alan L. Zhang MD[1]

- UCSF outcomes-
- 129 patients undergoing hip arthroscopy for FAI at UCSF with 1 and 2 year follow-up
- % of patients achieving MCID (minimal clinically important difference)

PRO Score	1 year post-op	2 year post-op
Sports	84%	96%
Quality of life	88%	94%
Pain	79%	85%

Outcomes in Athletes

- **Byrd et al 2011**
  - 200 athletes with 2 year f/u
  - 90% returned to sport (95% pro, 85% collegiate)
- **Byrd et al 2009**
  - 15 athletes with 10 year f/u
  - 87% success rate
- **Minkara et al 2018**
  - 96% of 1981 patients returned to sports in systematic review

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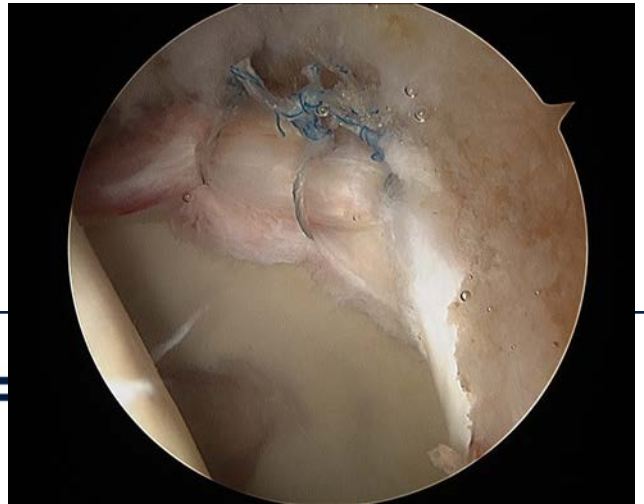
Outcomes for Labral repair vs Debridement

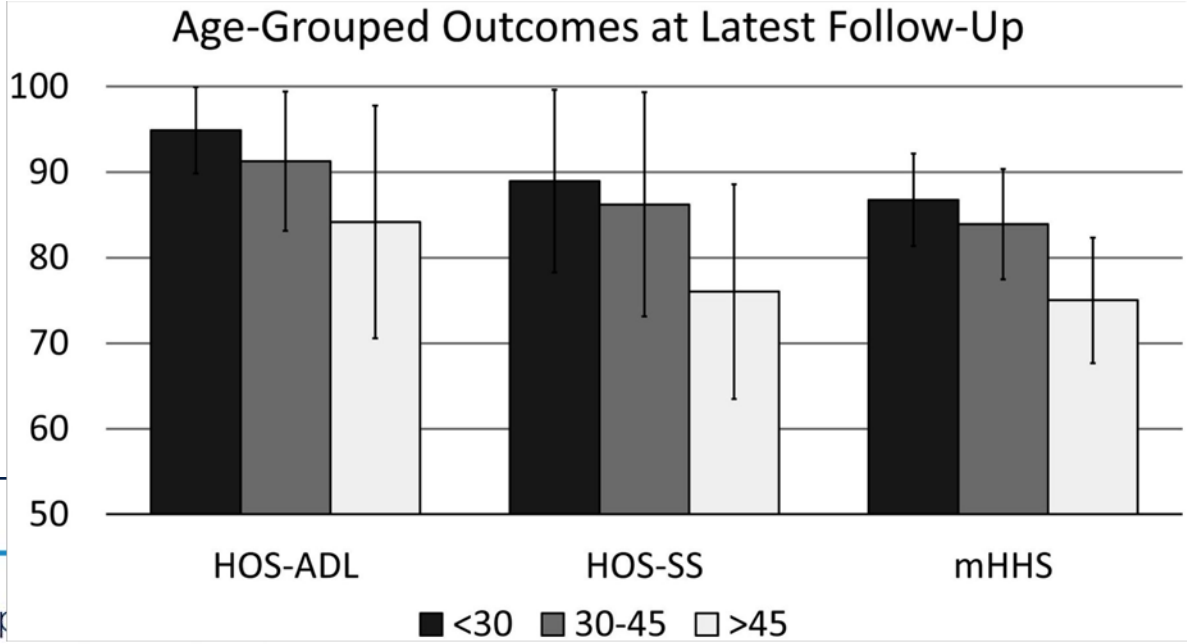
Haddad et al. 2014- JBJS-Br Meta-analysis

- Larson et al: 92% in repair vs. 68% debridement with good or better HHS score
- Philippon et al: higher mHHS improvement with repair
- Schliders et al: mHHS improvement of 33 in repair vs. 26 in debridement
- Espinoza et al: 94% in repair vs. 67% debridement with good or better HHS score



Hip Arthroscopy Outcomes by Age

- 20-30- Best evidence- 85% success with short to mid-term follow-up
- 30-49- Fair evidence- mixed results- better with younger age
- <20- Limited evidence show favorable outcomes
- >50 y/o- Most studies show poor outcomes with high conversion rate to hip arthroplasty



Nho et al
JBJS 2016

Outcomes in Patients >50

- Higher reoperation rate
- Higher complication rate
- Lower rate of PRO improvement after surgery

Arthroscopic Acetabular Labral Debride
Patients Forty-five Years of Age or Old
Minimal Benefit for Pain and Funct

Geoffrey Wilkin, MD, Gerard March, MD, FRCSC, and Paul E. Beaulé, MD, FRCS

Investigation performed at the Division of Orthopaedic Surgery, The Ottawa Hospital, Ottawa, Ontari

Original Article

Hip Arthroscopy for Femoroacetabular Impingement in Patients Aged 50 Years or Older

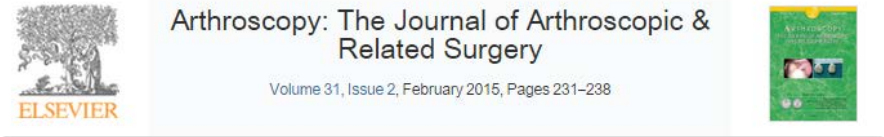
Marc J. Philippon, M.D., Bruno G. Schroder e Souza, M.D., Karen K. Briggs, M.P.H.

Factors Associated With the Failure of Surgical Treatment for Femoroacetabular Impingement

Review of the Literature

Ehsan Saadat,[*†‡] MD, Scott D. Martin,[†‡] MD, Thomas S. Thornhill,[†‡§] MD, Sarah A. Brownlee,[†§] BA, Elena Losina,[†‡§‖] PhD, and Jeffrey N. Katz,[†‡§‖¶#] MD, MSc

Investigation performed at Brigham and Women's Hospital, Boston, Massachusetts



Original Article

Outcomes of Hip Arthroscopy in Patients Aged 50 Years or Older Compared With a Matched-Pair Control of Patients Aged 30 Years or Younger

Benjamin G. Domb, M.D.[a, b, c], Dror Linder, M.D.[a], Zachary Finley, B.S.[a], Itamar B. Botser, M.D.[a], Austin Chen, M.D.[a], Joseph Williamson, B.S.[a], Asheesh Gupta, M.D., M.P.H.[a]

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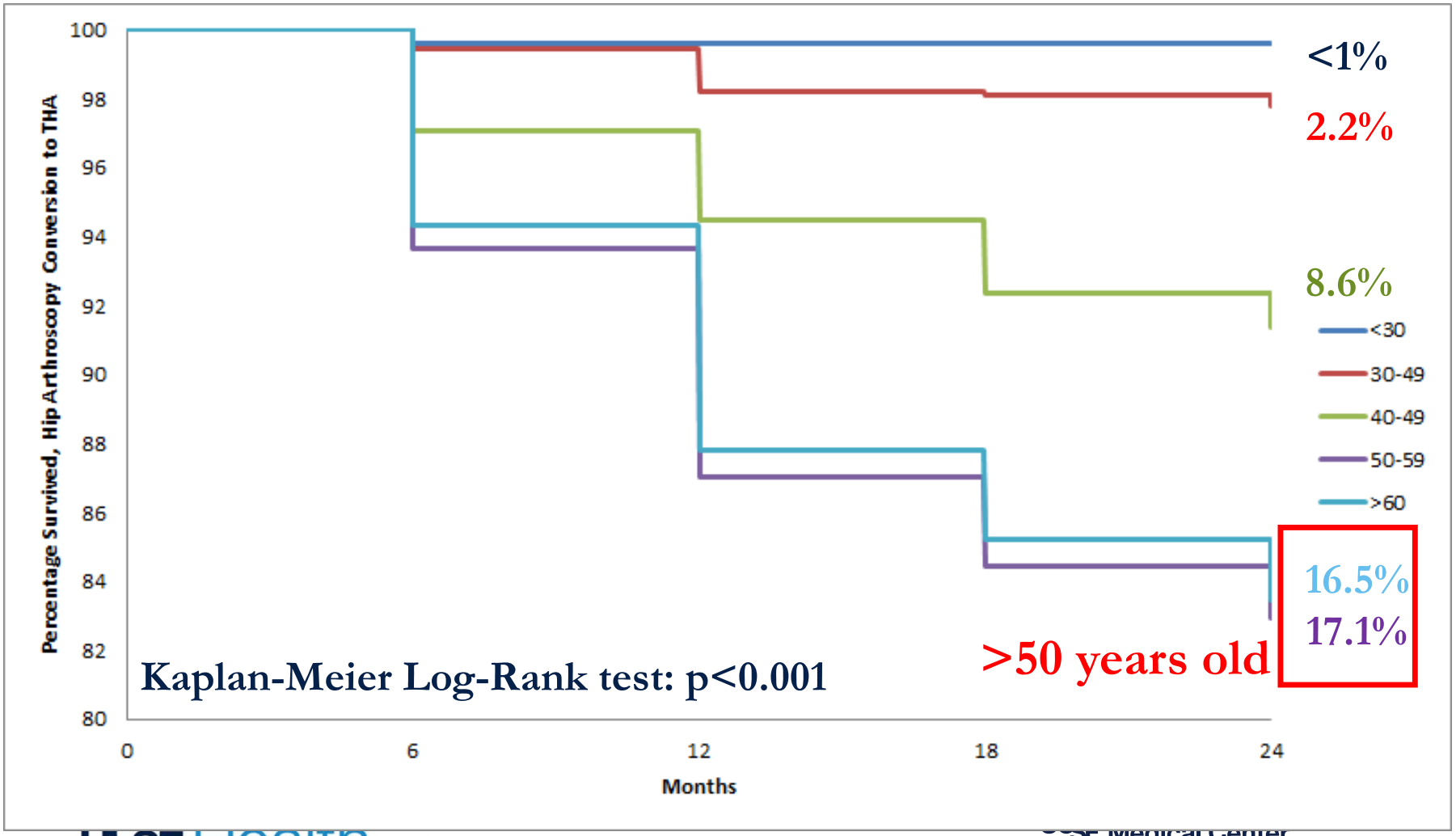
2-year Survival of Hip Scope by Age

Zhang et al 2015



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Outcomes in Setting of Arthritis

Clin Orthop Relat Res. 2013 Aug;471(8):2492-6. doi: 10.1007/s11999-012-2779-4.

Joint space predicts THA after hip arthroscopy in patients 50 years and older.

Philippon MJ[1], Briggs KK, Carlisle JC, Patterson DC.

- <2mm joint space= 80% conversion rate to THA
- *Domb et al:* 17.3% conversion to THA in 52 patients >50
- *Domb et al*: 29% conversion to THA in 1,195 hips with arthritis (Tonnis grade >2 or <2mm joint space)

Osteoarthritis Prevention?

- We know that FAI causes OA
- But does treatment of FAI and labral tears prevent OA?

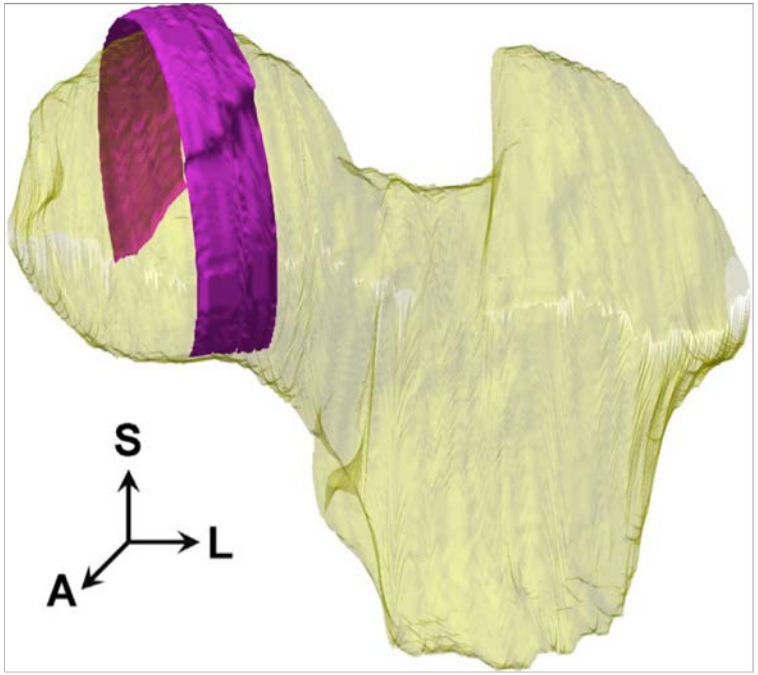
Surgical Correction of Cam Deformity in Association with Femoroacetabular Impingement and Its Impact on the Degenerative Process within the Hip Joint

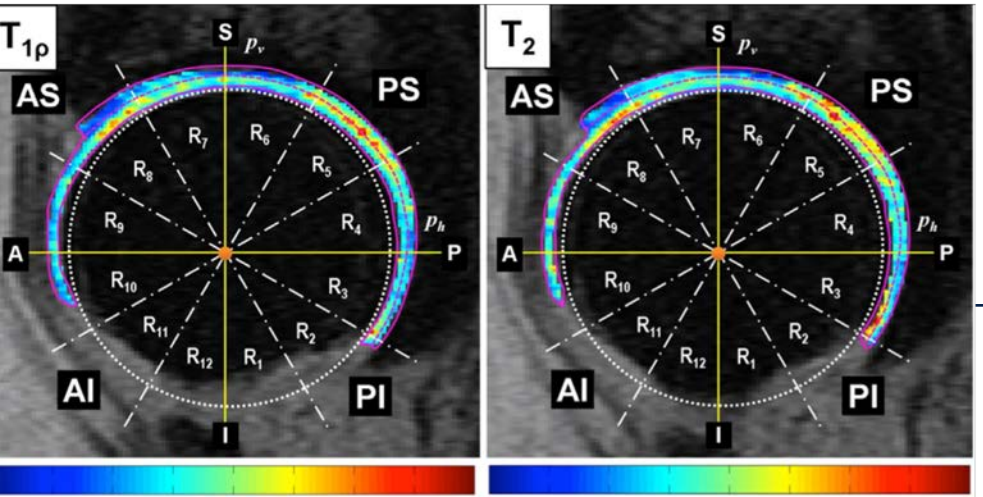
Paul E. Beaulé, MD, FRCSC, Andrew D. Speirs, PhD, Helen Anwander, MD, Gerd Melkus, PhD, Kawan Rakhra, MD, FRCPC, Hanspeter Frei, PhD, and Mario Lamontagne, PhD

Investigation performed at The Ottawa Hospital and University of Ottawa, Ottawa, Ontario, Canada

- 10 pts 2 years s/p FAI Cam correction
- Improved cartilage health and improved clinical outcomes

Future Studies-
Does FAI Surgery Prevent Arthritis?





- $T_{1\rho}$ and T_2 mapping of acetabulum and femoral head performed at UCSF NIH R01
  - QMRI used to monitor natural history of cartilage degeneration in the hip
- AOSSM 2016 YIG- Zhang et al
  - Effects of arthroscopic surgery on cartilage health
  - 35 patients, on-going

Conclusions

1. Preservation of hip articular cartilage is difficult
   - Treatment for end-stage arthritis is with hip replacement surgery
2. In the young active population- FAI and dysplasia are significant risk factors for early arthritis
   - Conservative treatment and activity modification is 1st line
   - Some forms of Injections have unknown effects/risks
3. Hip arthroscopy surgery demonstrates high clinical improvement and return to sports in FAI patients without arthritis
   - It is uncertain if hip arthroscopy surgery can prevent arthritis progression

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Thank you

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