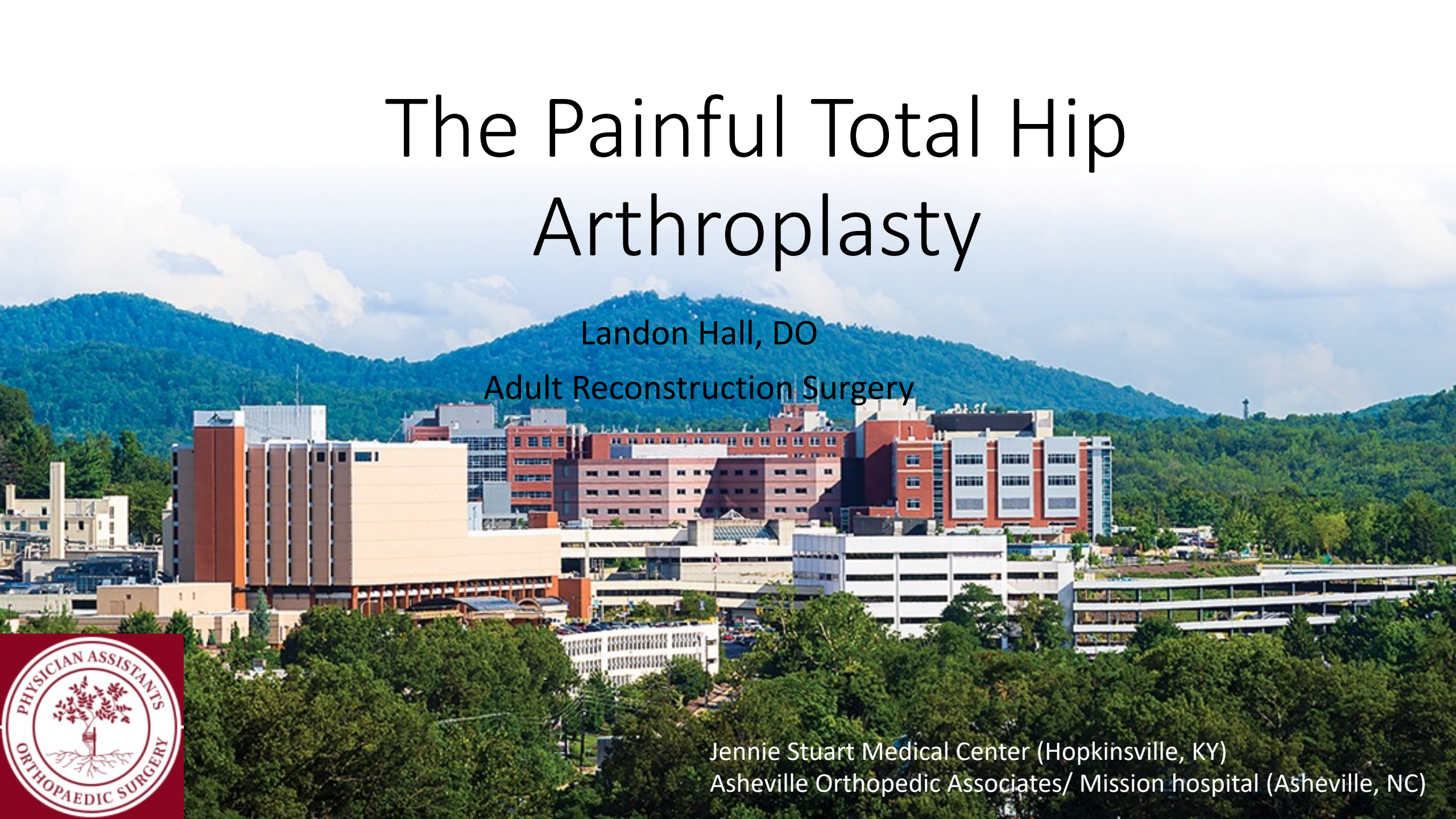
The Painful Total Hip Arthroplasty

Landon Hall, DO

Adult Reconstruction Surgery



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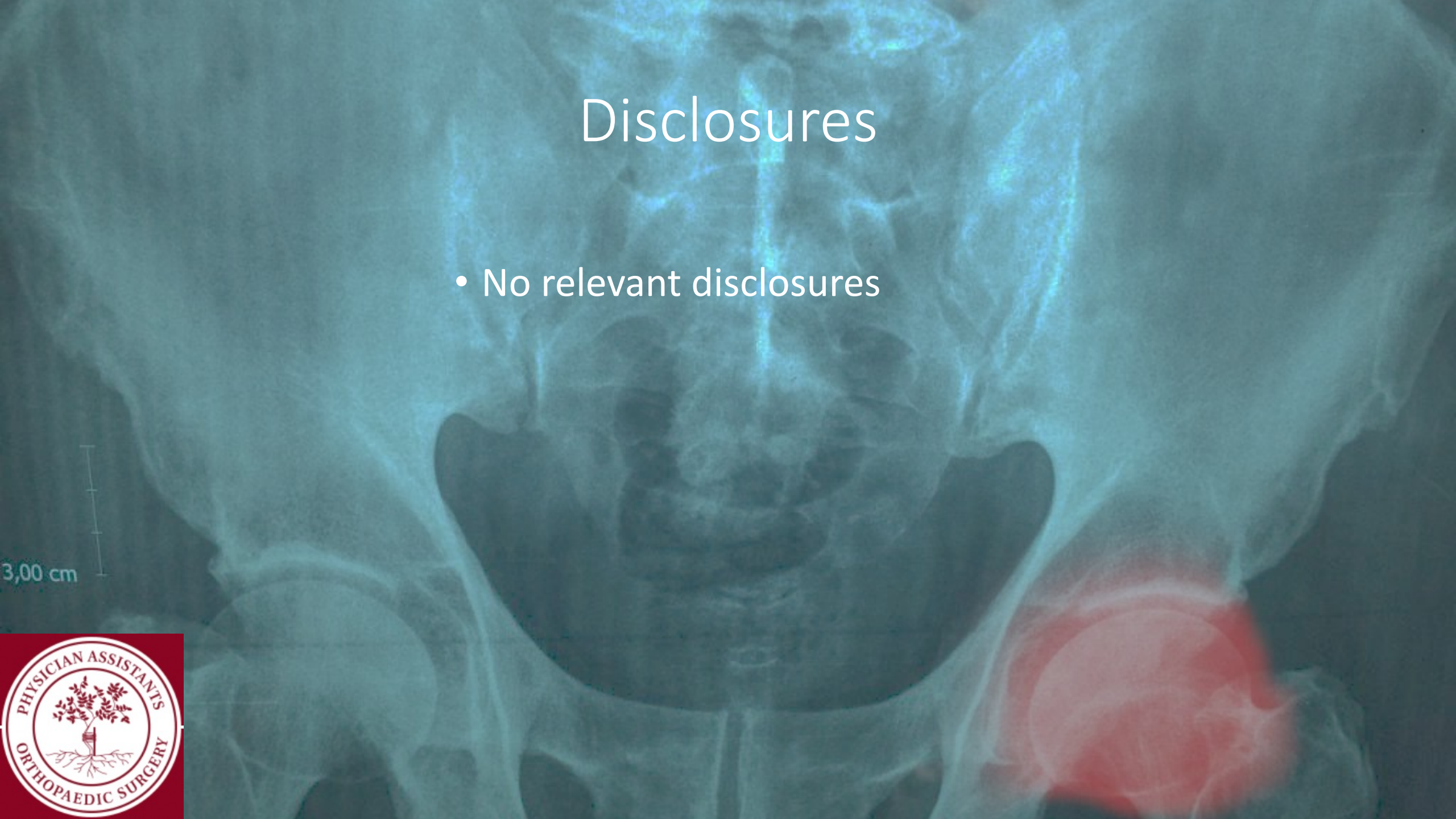
Asheville Orthopedic Associates/ Mission hospital (Asheville, NC)

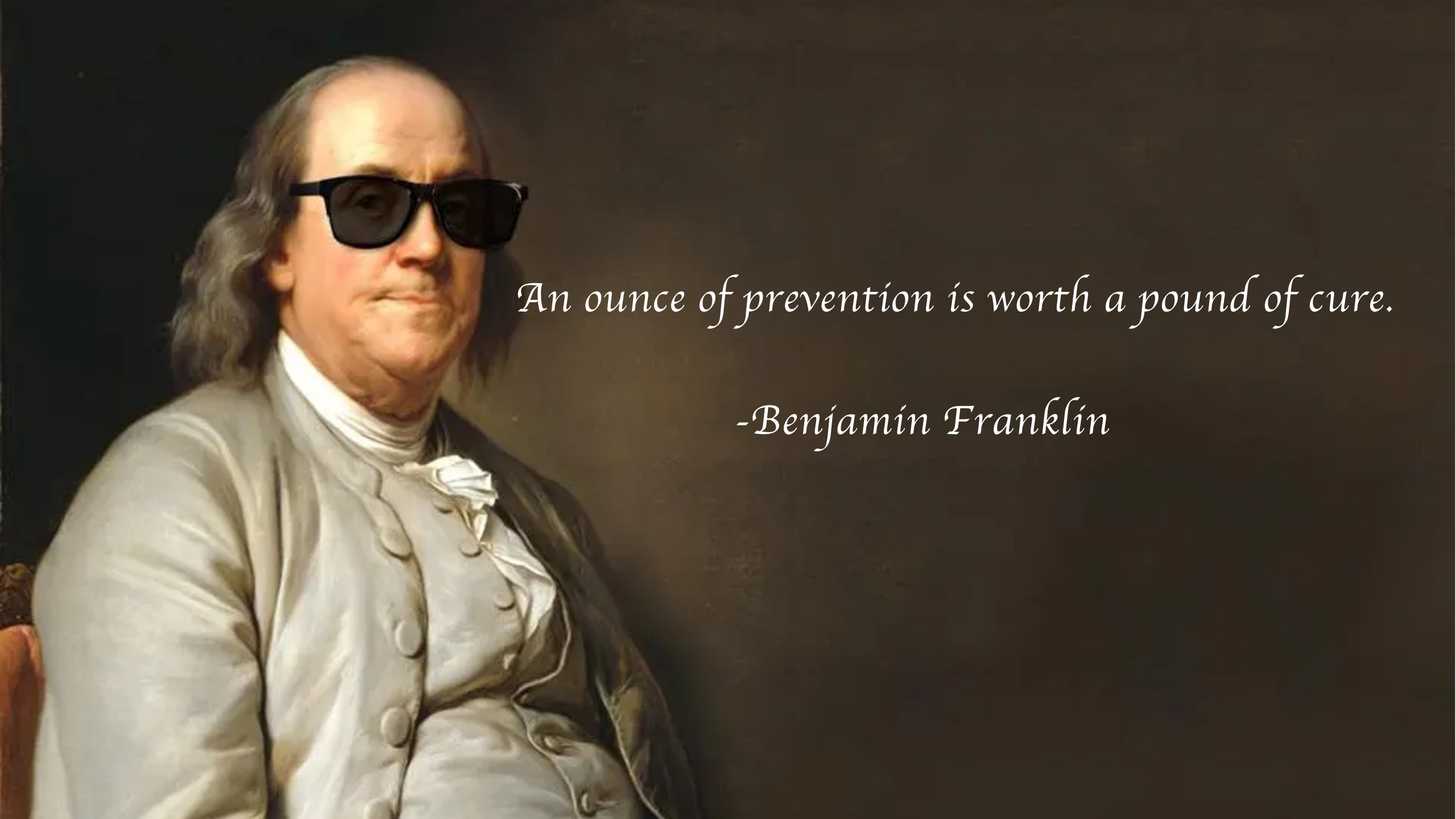
Disclosures

- No relevant disclosures



Objectives

- Identify non intra-articular causes of hip pain
- Identify true intra-articular causes of hip pain
- Identify hip arthritis treatment
- Identify total hip arthroplasty indications and expectations
- Recognize those likely to have a poor surgical outcome
- Recognize what we can do to improve outcomes
- Identify why patients have revisions
- Identify most common causes of total hip pain, work-up and treatment


An ounce of prevention is worth a pound of cure.
-Benjamin Franklin

Hip Pain: Non Intra-Articular Causes

- Greater Trochanteric Pain Syndrome
- Sacroiliitis
- Lumbosacral radiculopathy

(Most common, not including UTIs, pyelonephritis, psychological)

Greater Trochanteric Pain Syndrome (GTPS)

- Trochanteric bursitis: several studies have shown that GTPS is is attributable to tendinopathy of the gluteus medius/minimus with or without existing bursal pathology
- Cause: A result of abnormal hip biomechanics, impingement of gluteal tendons and bursa onto the greater trochanter by the iliotibial band as the hip moves into adduction

3,00 cm

Greater trochanteric pain syndrome: a review of diagnosis and management in general practice

Christopher JB Speers and Gurjit S Bhogal

British Journal of General Practice 2017; 67 (663): 479-480. **DOI:** https://doi.org/10.3399/bjgp17X693041

Greater Trochanteric Pain Syndrome (GTPS)

- More common in women between the ages of 40-60.
- 10-20% of patients presenting with hip pain are diagnosed with GTPS
- Presents as lateral hip pain localized over greater trochanter which is worse with weightbearing activities and side lying at night
- Physical exam can include additional test: Jump Off, Single Leg Stance, FABER, FADER, Ober, and ADD test.

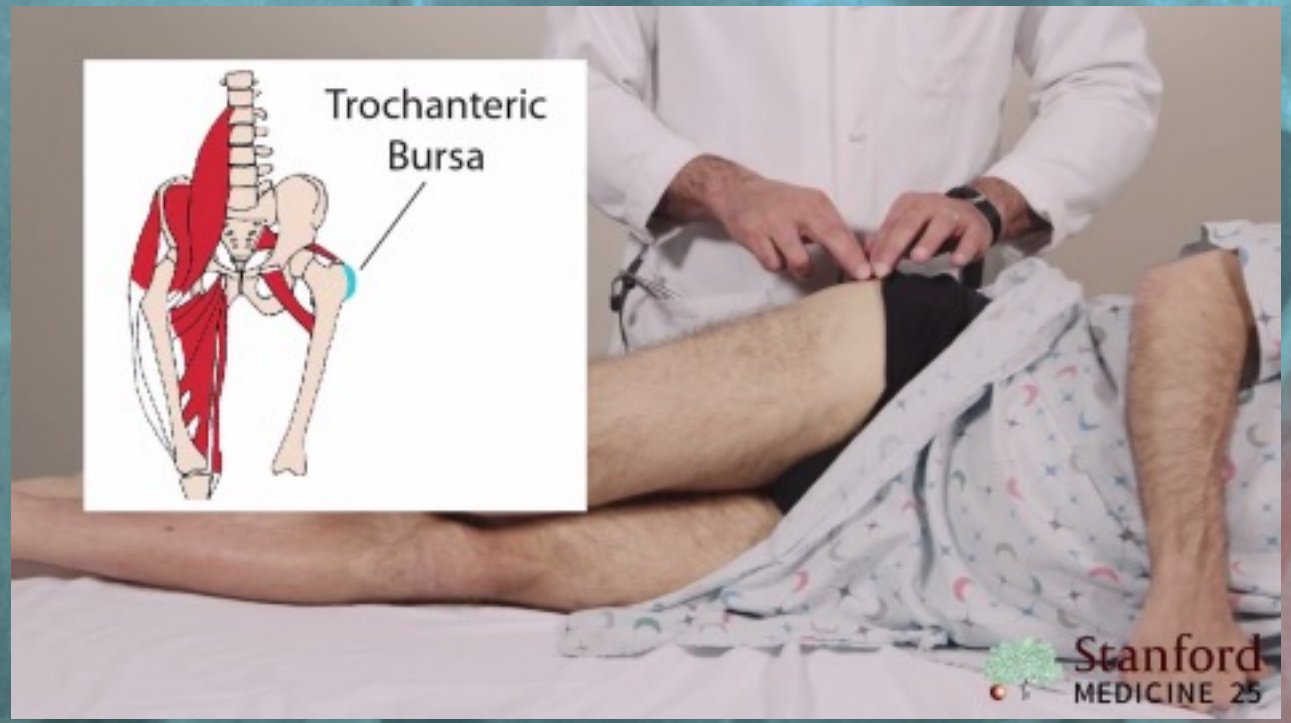
Greater trochanteric pain syndrome: a review of diagnosis and management in general practice

Christopher JB Speers and Gurjit S Bhogal

British Journal of General Practice 2017; 67 (663): 479-480. **DOI:** https://doi.org/10.3399/bjgp17X693041

Greater Trochanteric Pain Syndrome (GTPS)

- Direct Palpation of Greater Trochanter (Jump Sign)



Greater Trochanteric Pain Syndrome (GTPS)

- Single Leg Stance: Pain within 30 seconds of standing on one leg

Greater Trochanteric Pain Syndrome (GTPS)

- GTPS may progress to hip arthritis:
  - A 2021 paper, 11 year prospective study following patients GTPS verse asymptomatic patients
  - 35% of GTPS were diagnosed with hip osteoarthritis verses 0 in asymptomatic control group

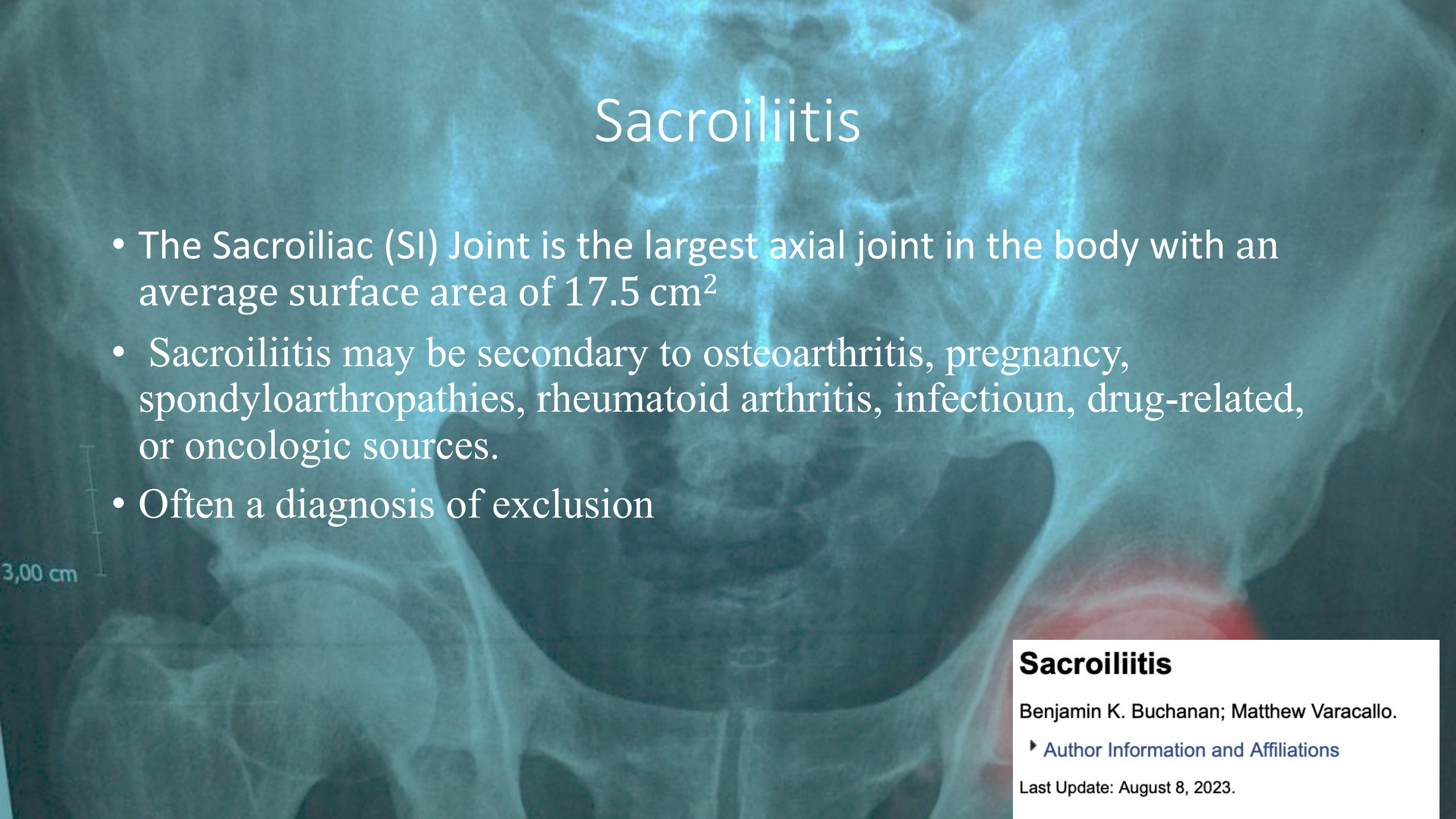
BMC Musculoskelet Disord. 2021; 22: 1048.
Published online 2021 Dec 20. doi: 10.1186/s12891-021-04935-w
PMCID: PMC8691027
PMID: 34930192

The natural history of greater trochanteric pain syndrome: an 11-year follow-up study

Luke Bicket,[1] Julie Cooke,[1,2] Isaac Knott,[4] and Angie Fearon[1,2,3]

Sacroiliitis

- The Sacroiliac (SI) Joint is the largest axial joint in the body with an average surface area of 17.5 cm^2
- Sacroiliitis may be secondary to osteoarthritis, pregnancy, spondyloarthropathies, rheumatoid arthritis, infectioun, drug-related, or oncologic sources.
- Often a diagnosis of exclusion



Sacroiliitis

Benjamin K. Buchanan; Matthew Varacallo.

Author Information and Affiliations

Last Update: August 8, 2023.

Sacroiliitis

- Prevalence is as high as 25% in low back pain patients.
- Pain presentation of Sacroiliitis:
  - Ipsilateral Buttock: 94%
  - Midline lower lumbar area: 74%
  - Radiation to lower extremity: 50%
  - Radiation to groin: 4%

Sacroiliitis

- Provocative Test: Fortin Finger Sign, FABER test, sacral distraction test, iliac compression test, Gaenslen test, Thigh Thrust test, sacral thrust test
  - 3 or more positive provocative tests have a sensitivity of 82%–94% and a specificity of 57%–79% for SI joint pain
  - FABER & Thigh Thrust Test combination is most accurate

Adv Orthop. 2022; 2022: 3283296. PMCID: PMC9812593
Published online 2022 Dec 28. doi: 10.1155/2022/3283296 PMID: 36620475

Sacroiliitis: A Review on Anatomy, Diagnosis, and Treatment

Anderson Lee,✉ Monik Gupta, Kiran Boyinepally, Phillip J. Stokey, and Nabil A. Ebraheim


Faber/
Patricks/
Figure 4
Sign
Assessment


Thigh
Thrust
Test
Assessment


Gaenslen's
Test
Assessment

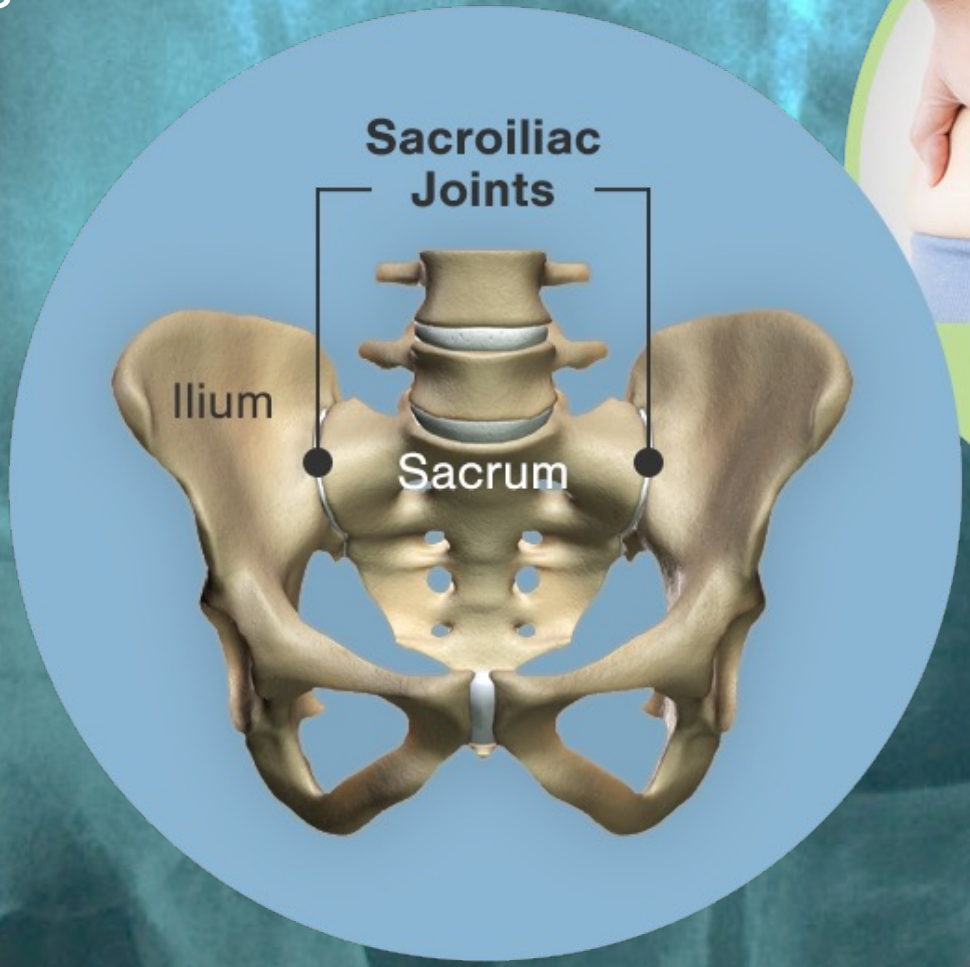

Distraction
Test
Assessment


Compression
Test
Assessment


Sacral
Thrust
Test
Assessment

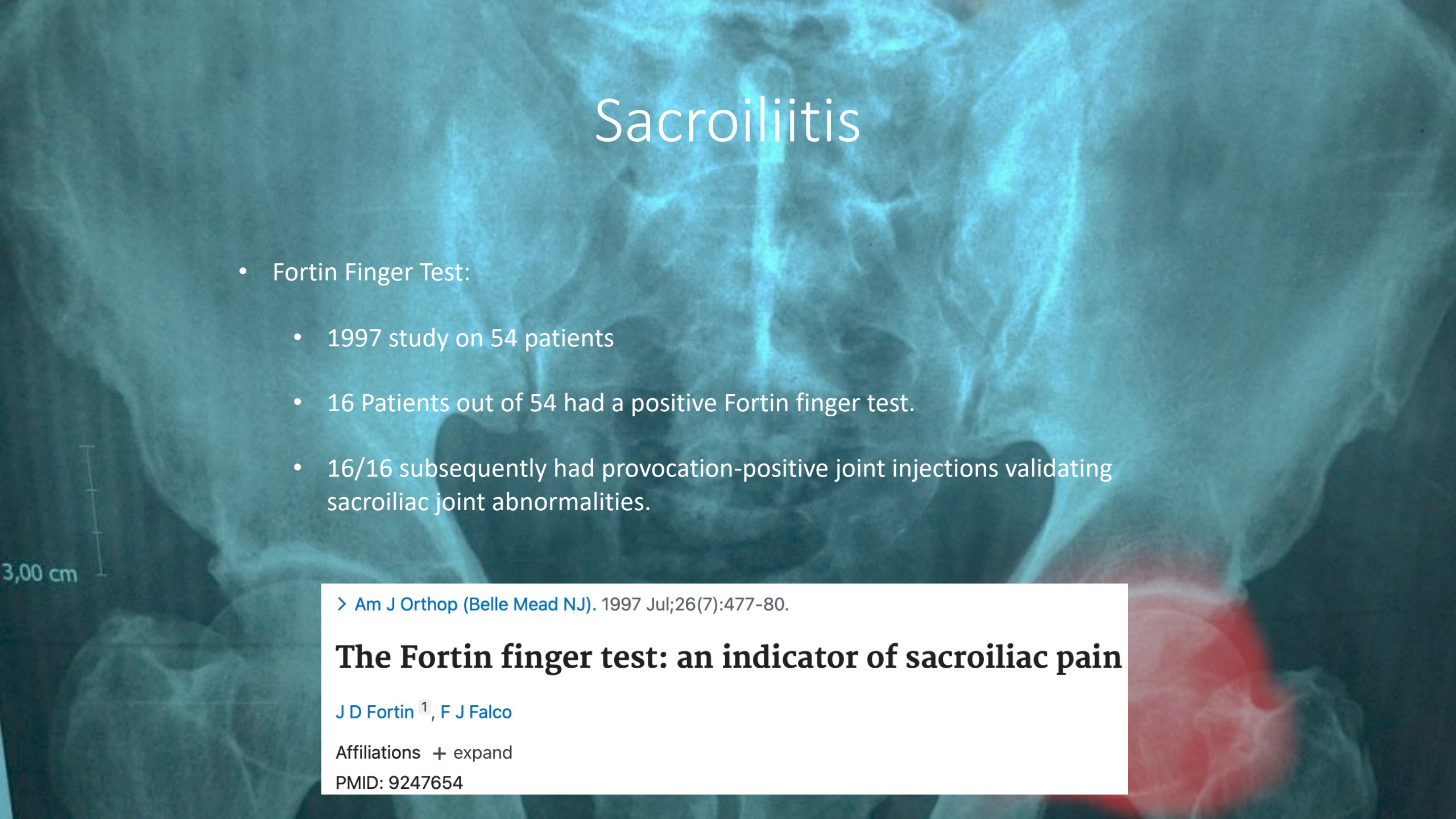
Sacroiliitis

- Fortin Finger Test



Sacroiliitis

- Fortin Finger Test:
  - 1997 study on 54 patients
  - 16 Patients out of 54 had a positive Fortin finger test.
  - 16/16 subsequently had provocation-positive joint injections validating sacroiliac joint abnormalities.



> Am J Orthop (Belle Mead NJ). 1997 Jul;26(7):477-80.

The Fortin finger test: an indicator of sacroiliac pain

J D Fortin [1], F J Falco

Affiliations + expand

PMID: 9247654

Sacroiliitis

- Sacroiliitis may coincide with hip arthritis:
  - 2019 CT images study investigating SI joint degeneration and space in 31 female hip replacement candidates with age matched controls.
  - Hip replacement candidates: Increased SI Joint space narrowing and vacuum phenomena

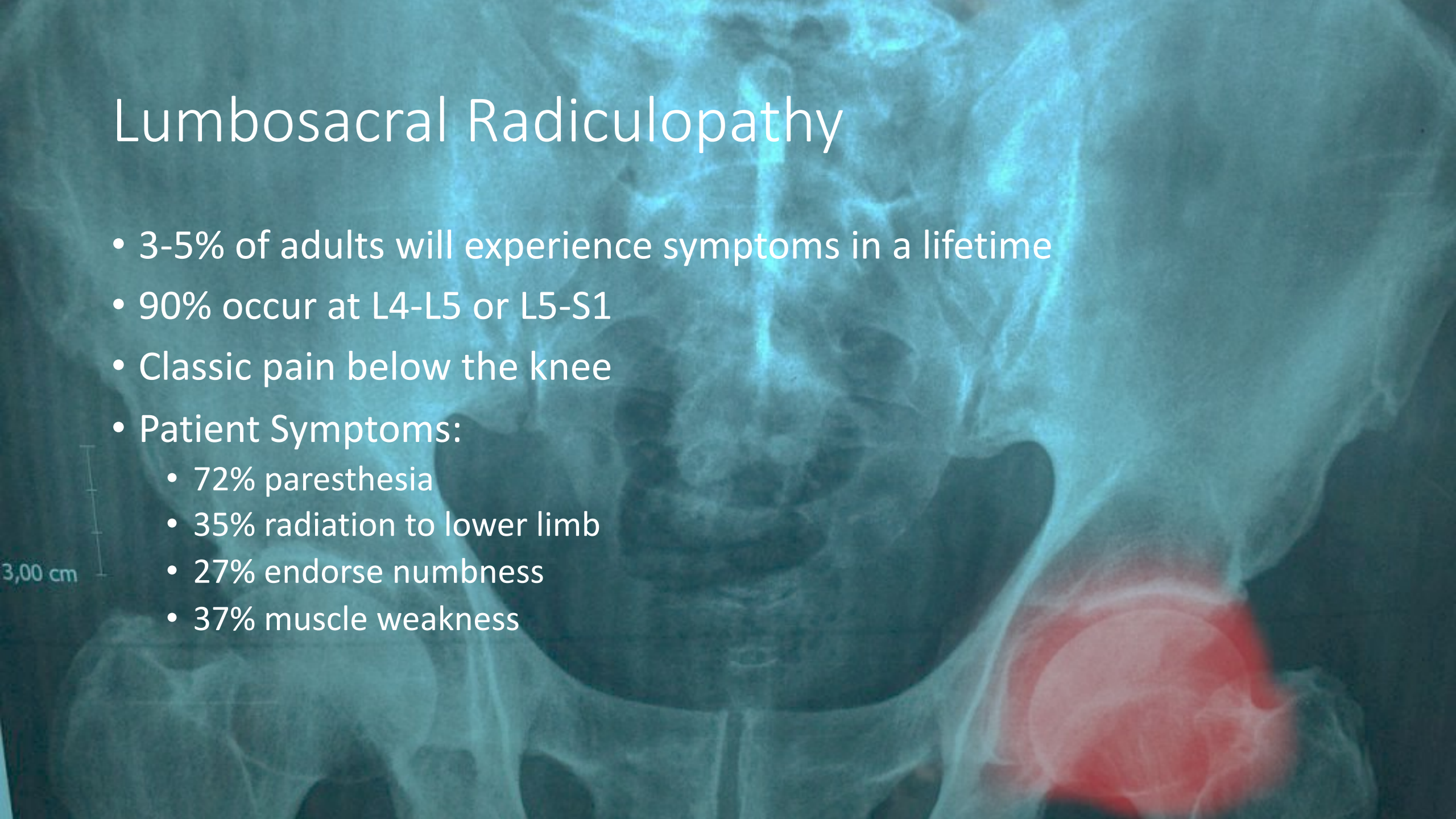
J Belg Soc Radiol. 2019; 103(1): 36.
Published online 2019 May 23. doi: 10.5334/jbsr.1648
PMCID: PMC6534012
PMID: 31149653

Degeneration of the Sacroiliac Joint in Hip Osteoarthritis Patients: A Three-Dimensional Image Analysis

Maki Asada,[1] Daisaku Tokunaga,[2] Yuji Arai,[1] Ryo Oda,[1] Hiroyoshi Fujiwara,[1] Kei Yamada,[3] and Toshikazu Kubo[1]

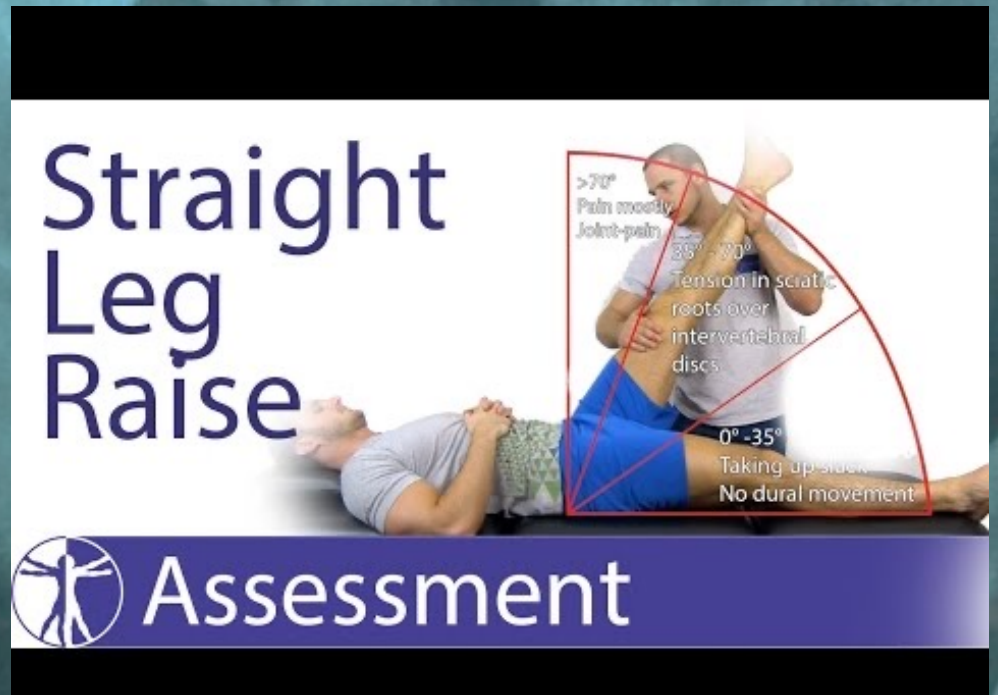
Lumbosacral Radiculopathy

- 3-5% of adults will experience symptoms in a lifetime
- 90% occur at L4-L5 or L5-S1
- Classic pain below the knee
- Patient Symptoms:
  - 72% paresthesia
  - 35% radiation to lower limb
  - 27% endorse numbness
  - 37% muscle weakness



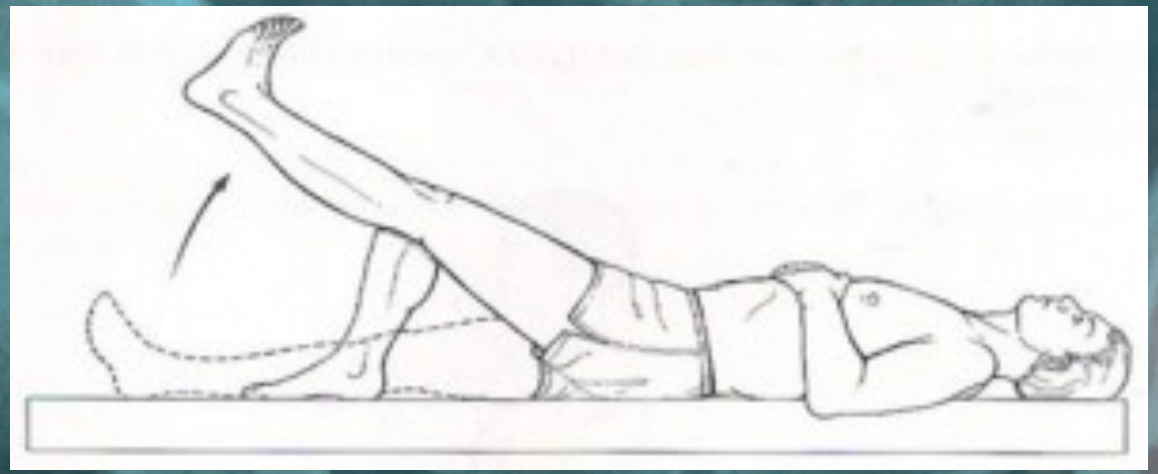
Lumbosacral Radiculopathy Physical Exam

- Straight Leg Raise Test (Lasegue Test):
  - Patient lays supine and provider flexes the hip with the knee in extension
  - Positive if gluteal or leg pain elicited at angle lower than 45 degrees



Lumbosacral Radiculopathy Physical Exam

- Crossed Straight Leg Test (Cross over Lasegue):
  - Patient lays supine and provider flexes the hip with the knee in extension of the unaffected side
  - Positive if gluteal or leg pain elicited at angle lower than 45 degrees of affected side



Lumbosacral Radiculopathy: Hip Spine Syndrome

- 2019 study on progression of spondylolisthesis in hip arthritis patients
  - Approximately 50% of patient with hip osteoarthritis report low back pain
  - Incidence of lumbar spondylolisthesis in patients with hip arthritis is 31-35% (incidence in general population is 5%)
  - WHY? Hip osteoarthritis progresses, lumbar kyphosis occurs, pelvic retroversion and hip joint extension occurs to compensate for anterior shift of gravity, the acetabular roof coverage decreases increasing hip joint forces.

J Orthop. 2019 Jul-Aug; 16(4): 275–279. PMCID: PMC6441715
Published online 2019 Mar 23. doi: 10.1016/j.jor.2019.03.006 PMID: 30976139

The progression of osteoarthritis of the hip increases degenerative lumbar spondylolisthesis and causes the change of spinopelvic alignment

Hideki Warashina,[a,*] Michitaka Kato,[a] Shinji Kitamura,[a] Taiki Kusano,[b] and Yukiharu Hasegawa[c]

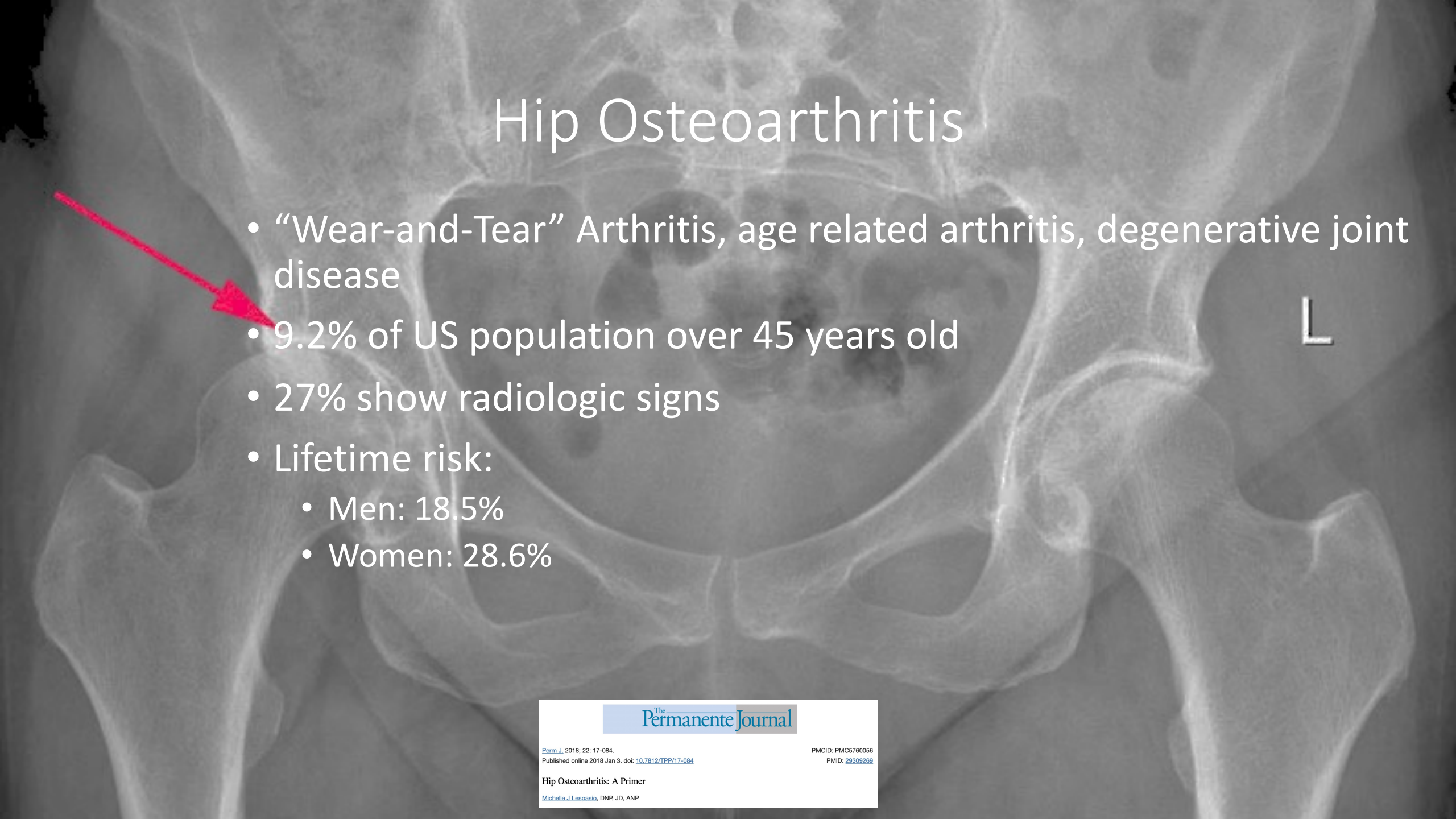
Hip Pain: True Hip Intra-Articular Causes

- Osteoarthritis
- Osteonecrosis/Avascular Necrosis
- Femoral Acetabular Impingement

- Many other causes that overlap or fall within the above
  - (IE: Post traumatic arthritis, labral pathology)

Hip Osteoarthritis

- "Wear-and-Tear" Arthritis, age related arthritis, degenerative joint disease
- 9.2% of US population over 45 years old
- 27% show radiologic signs
- Lifetime risk:
  - Men: 18.5%
  - Women: 28.6%



The Permanente Journal

Perm J. 2018; 22: 17-084.
Published online 2018 Jan 3. doi: 10.7812/TPP/17-084
PMCID: PMC5760056
PMID: 29309269

Hip Osteoarthritis: A Primer

Michelle J Lespasio, DNP, JD, ANP

Hip Osteoarthritis

- Further Risk Factors:
  - Age:
    - > than 60
  - Sex:
    - Men > rate below the age of 50 and Women > rate above the age of 50
  - Genetics:
    - Twin studies have shown 60% attributable risk associated with genetics
  - Obesity:
    - Obesity is the greatest modifiable risk factor for arthritis
    - Patients with a BMI>30 were 6.8 times more likely to develop arthritis
  - Occupation:
    - Heavy manual work and/or employment in farming or the construction industry

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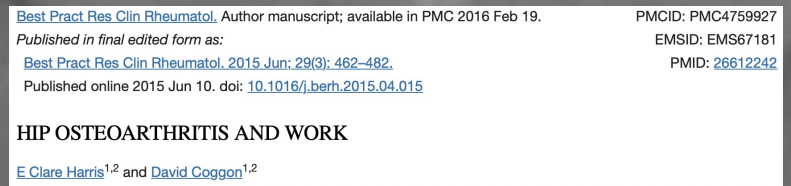
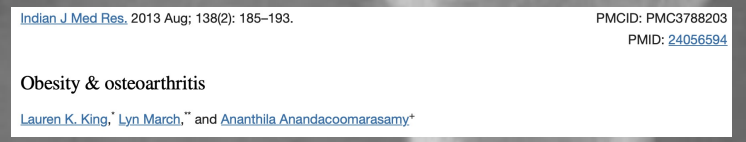




Hip Osteonecrosis/ Avascular Necrosis

- 20,000 to 30,000 new cases in US yearly
- 10% underlying diagnosis of all total hip arthroplasties
- Most commonly in 30-65 year old individuals
  - Mean age at diagnosis is usually < 50
- Lack of blood supply to the femoral head and bone marrow causes death of osteocytes and mesenchymal stem cells

The Permanente Journal

Perm J. 2019; 23: 18-100. PMCID: PMC6380478
Published online 2019 Jan 17. doi: 10.7812/TPP/18-100 PMID: 30939270

Osteonecrosis of the Hip: A Primer

Michelle J Lespasio, DNP, JD, ANP,[✉1] Nipun Sodhi,[2] and Michael A Mont, MD[2]

Hip Osteonecrosis/ Avascular Necrosis

- Traumatic Causes: femoral neck fractures, dislocations, injury of bone marrow (IE: radiation injury, Caisson Disease)
- Atraumatic Causes:
  - Glucocorticoid-Induced:
    - 9-40% of patients receiving long term therapy
    - Single Medrol dose pack: 0.13% risk
  - ETOH Abuse
    - 31% of patients that develop osteonecrosis
  - Sickle Cell Disease
    - 50% of patients develop osteonecrosis by 35
  - Lupus (SLE)
    - 3-30%, higher in those treated with glucocorticoids
  - Less common causes: Antiphospholipid antibodies, Cushing Disease, Leukemia/lymphoma, Crohn Disease, IBS, HIV

The Permanente Journal

Perm J. 2019; 23: 18-100. PMCID: PMC6380478
Published online 2019 Jan 17. doi: 10.7812/TPP/18-100 PMID: 30939270

Osteonecrosis of the Hip: A Primer

Michelle J Lespasio, DNP, JD, ANP,[1] Nipun Sodhi,[2] and Michael A Mont, MD[2]

Femoral Acetabular Impingement (FAI)

- Mechanical impingement from abnormal hip morphology involving the proximal femur and/or acetabulum
  - Cam Deformity: Abnormal bony prominence or "bump" at the junction of the femoral head and neck resulting in an aspherical-shaped head, occurring most commonly along the anterosuperior femoral head-neck area
  - Pincer Deformity: Abnormal bony overhang of the anterolateral acetabular rim resulting in over coverage of the femoral head
  - Combined Deformity: A combination of Cam and Pincer deformity and is the most common in symptomatic patients
- 10-15% of adult population diagnosed with symptomatic FAI

Femoroacetabular Impingement

Ryan J. O'Rourke; Youssef El Bitar.

Author Information and Affiliations

Last Update: June 26, 2023.

Femoral Acetabular Impingement (FAI)

- Increased incidence in of FAI in athletes due to cam deformity formation.
  - High-intensity sport athletes are ten times more likely to have a cam deformity and impingement than age-matched adolescents not participating in high-intensity sports
  - Increased stress along the growth plate of the hip leads to increased stress reaction bone formation resulting in cam deformity and subsequent impingement
  - Prevalence of FAI in symptomatic athletes as high as 55%

Femoroacetabular Impingement

Ryan J. O'Rourke; Youssef El Bitar.

Author Information and Affiliations

Last Update: June 26, 2023.

Femoral Acetabular Impingement (FAI)

- FAI has been identified as a major precursor to osteoarthritis:
  - Up to 90% of hip osteoarthritis patients have subtle FAI bony morphology
  - Denmark Population Study (4,151): FAI in 71% of men and 37% of women with hip arthritis

CFP·MFC
Official Publication of
The College of
Family Physicians of Canada
Link to Publisher's site

Can Fam Physician. 2015 Dec; 61(12): 1055–1060.
PMCID: PMC4677941
PMID: 26668284

Hip Pain: True Hip Intra-Articular Causes

- History:
  - Pain and stiffness that is worse in the morning or after sitting or resting
  - Pain in the groin or thigh that radiates into the buttocks or knee
  - Pain that flares with vigorous activity
  - Stiffness in the hip joint that makes it difficult to walk or bend
  - “Locking” or “sticking” of the joint and a grinding noise (crepitus
  - Decreased range of motion in the hip that affects the ability to walk and may cause a limp

Hip Pain: True Hip Intra-Articular Causes

- Exam:
  - Inspection:
    - Look for obvious misalignments, abnormalities, and record leg length
  - Gait Observation:
    - Focus on the stance and swing phases of the gait, range of motion, and the presence of any limping or antalgic steps
  - Palpation:
    - Lateral hip (Greater Trochanter), Sacroiliac joint, Lumbar spine
  - Range Hip:
    - Decreased active or passive range of motion specifically with flexion past 90° with internal rotation

Hip Pain: True Hip Intra-Articular Causes

- Exam:
  - Special Test:
    - FADIR(flexion, adduction, and internal rotation)
      - Anterior Impingement Test
    - FABER(flexion, abduction, and external rotation)

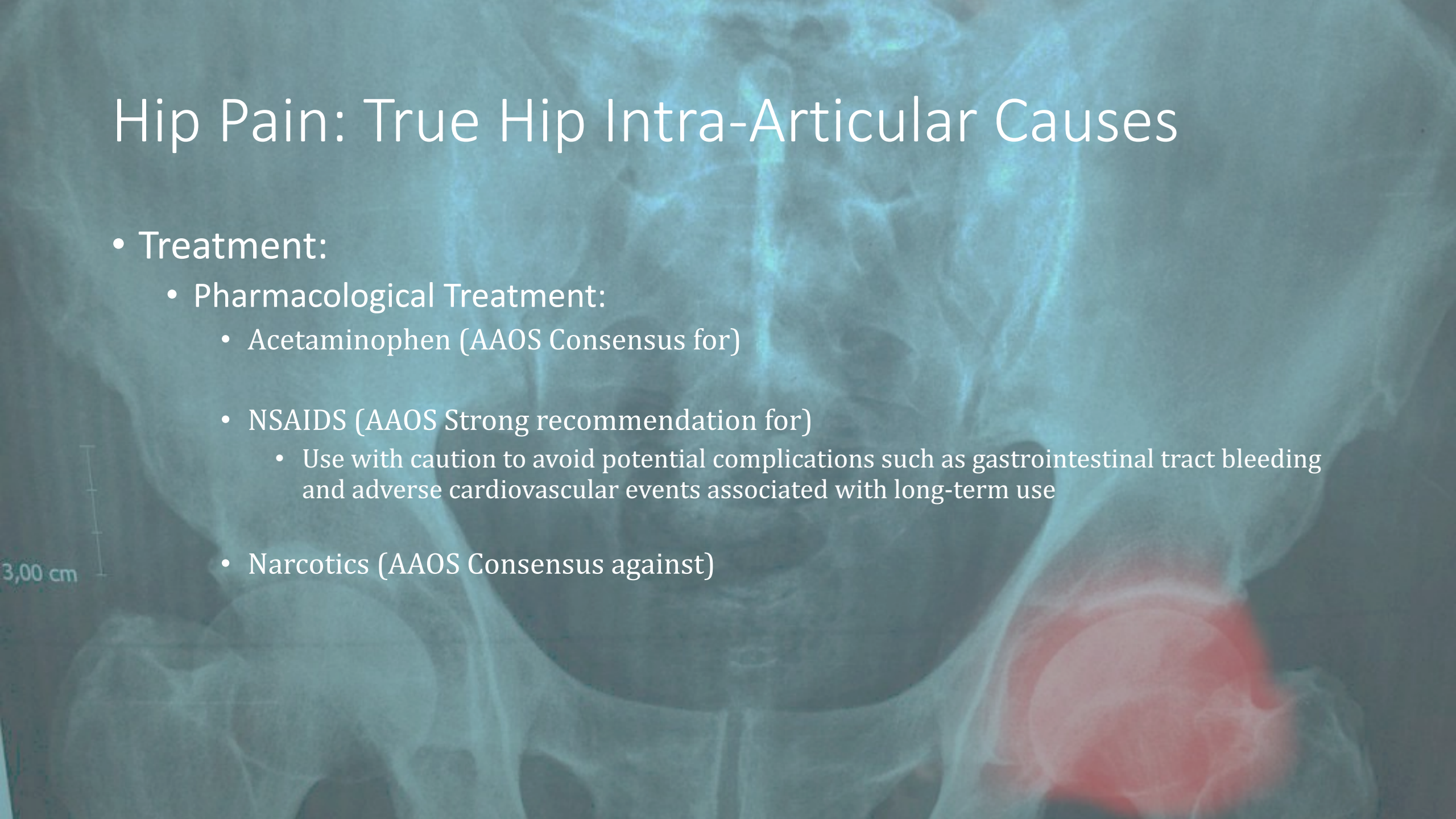
    - These tests have high sensitivity, specificity, and positive predictive values for identifying intra-articular causes of hip pain

Hip Pain: True Hip Intra-Articular Causes

- Treatment:
  - Nonpharmacological Treatment:
    - Exercise:
      - Exercise programs that do not involve high-impact activities are associated with pain reduction
      - Avoiding activities requiring hip twisting or high impact (Golf, Jogging)
    - Physical Therapy (AAOS Moderate Recommendation For)
      - Strengthening and improved joint mobility has been found beneficial in early arthritis
    - Weight Reduction:
      - 1 extra pound is equivalent to 6 across the hip
    - Assistive Devices:
      - Walking sticks, canes, and other devices should be considered as adjuncts to core treatments

Hip Pain: True Hip Intra-Articular Causes

- Treatment:
  - Pharmacological Treatment:
    - Acetaminophen (AAOS Consensus for)
    - NSAIDS (AAOS Strong recommendation for)
      - Use with caution to avoid potential complications such as gastrointestinal tract bleeding and adverse cardiovascular events associated with long-term use
    - Narcotics (AAOS Consensus against)



Hip Pain: True Hip Intra-Articular Causes

- Treatment:
  - Intra-articular injections:
    - Hyaluronic Acid (AAOS strong recommendation against)
    - Corticosteroid (AAOS moderate recommendation for)
    - Platelet-Rich-Plasma
  - A great diagnostic tool in addition to treatment:
    - 2010 study: 204 patient received an injection, 152 positive results, 86 underwent total hip with good results
      - 100% Specificity and Positive predictor value
      - 0 false positives: Patients that had positive response to injection and negative response to total hip replacement (worst case scenario)

Hip Pain: True Hip Intra-Articular Causes

- Treatment:
  - Intra-articular injections: corticosteroids
    - Must wait at least 3 month prior to total hip arthroplasty after injection
    - Multiple injections increases risk of prosthetic joint infection (2.0% vs 6.6%)
    - Higher risk with methylprednisolone and betamethasone vs triamcinolone or dexamethasone

Indications for a Total Hip Arthroplasty

- Patient's quality of life is severely affected by pain or functional impairment
- Conservative therapies are insufficiently effective
- Visible and/or progressive radiological changes demonstrating morphological joint damage
- Other possible causes have been rule out or effectively treated

(Positive response to hip intra-articular injection at least 3 months prior to planned surgical date)

Expectations for a Total Hip Arthroplasty

- 1997 study including 180 total hip patients surveyed 2-3 years after surgery on expectations
  - 89% of patients were satisfied with surgery
  - 7% expected an increase in nonessential activities
  - Lower rates of satisfaction in patients who had:
    - A better preoperative condition
    - Expected improvement in nonessential activities
    - Reported worse postoperative condition
  - Patients who expected to feel normal again or lose the stigma of disability were most satisfied at 96%

Expectations for a Total Hip Arthroplasty

- 2020 10 year survey on expectations fulfillment in 346 patients
  - Approximately two out of every five patients who considered themselves unfulfilled at early follow-up went on to experience late fulfilment
    - 5%-10% of previously fulfilled patients reported poor fulfilment at late follow-up
  - Poorly met expectation fulfilment at late follow-up was highest for:
    - Ability to put on shoes and socks
    - Sexual activity
    - Remove need for walking aid
    - Eliminate need for medications
    - Improved stair climbing ability

Arch Orthop Trauma Surg. 2020; 140(7): 963–971. PMCID: PMC7295723
Published online 2020 Apr 1. doi: 10.1007/s00402-020-03430-6 PMID: 32239326

Patient expectation fulfilment following total hip arthroplasty: a 10-year follow-up study

Liam Z. Yapp,[1,2] Nicholas D. Clement,[1] Deborah J. Macdonald,[1,2] Colin R. Howie,[1] and Chloe E. H. Scott[1,2]

Total Hip Arthroplasty: Who Has A Bad Outcome?

- Up to 23% of patients develop pain after total hip arthroplasty (THA) (2023 systematic review including 54 papers)
  - Risk Factors:
    - Obesity: worse pain outcomes or increased opioid use after THA (9/13 studies)
    - Pain and Opiate use: worse preoperative pain and and higher opiate use was a significant predictor of pain or persistent opioid use after THA (16/20 studies)
    - Sex: Females have a higher risk of continued pain and opiate use after THA (9/11 studies)
    - Radiographic Severity of Arthritis: More severe arthritis on X-ray had improved pain outcomes (3/4 studies)
    - Comorbidities: negative association between medical or psychological comorbidities and postoperative pain (17/18 studies)

Arthroplasty. 2023; 5: 19. PMCID: PMC10069042
Published online 2023 Apr 3. doi: 10.1186/s42836-023-00172-9 PMID: 37009894

Risk factors for pain after total hip arthroplasty: a systematic review

Bo Zhang, Sandesh Rao, Kevin L. Mekkawy,✉ Rafa Rahman, Anzar Sarfraz, Lauren Hollifield, Nick Runge, and Julius K. Oni

Total Hip Arthroplasty: Who Has A Bad Outcome?

- Allergies: 2016 retrospective study on 144 THA patients and 302 TKA patients comparing outcomes and allergies
  - 273 reported at least 1 allergy (0-33 range)
    - Penicillin was the most reported allergy
  - Patients reporting at least 1 allergy had significant lower postoperative SF-36 (health quality of life) score compared to those who reported no allergy (51.3 vs 49.4)

J Arthroplasty. 2016 Dec;31(12):2746-2749. doi: 10.1016/j.arth.2016.07.040. Epub 2016 Aug 10.

Patient-Reported Allergies Predict Worse Outcomes After Hip and Knee Arthroplasty: Results From a Prospective Cohort Study

Jesse E Otero [1], Christopher M Graves [1], Yubo Gao [1], Tyler S Olson [1], Christopher C Dickinson [2], Rhonda J Chalus [2], David A Vittetoe [2], Devon D Goetz [2], John J Callaghan [1]

Affiliations + expand

PMID: 27600302 DOI: 10.1016/j.arth.2016.07.040

Total Hip Arthroplasty: What can we control?

- Femoral Head Size/ Duel Mobility:
  - 2022 retrospective review of 3,568 hips comparing duel mobility constructs, femoral heads <32mm and >36mm
    - >36mm heads had the highest dislocation rate
    - Required Iliopsoas injections: <32mm 0.9%, >36mm 0.4%, Duel mobility: 0%,
    - Required > 3 months of physical therapy: < 32mm: 32.5%, >36mm: 14.5%, Duel mobility: 10.1%,
  - Take away: Larger head size and duel mobility use may not be as important of a factor in causing groin pain/ iliopsoas tendinitis as previously thought

Total Hip Arthroplasty: What can we control?

- Cup size:
  - 2014 study of 237 total hips comparing groin pain to size change from native femoral head to cup size
    - Median change was 2mm
    - >6 mm change was significantly associated with groin pain
  - Take away: be cognizant of femoral head to cup size change with goal of < 6mm

J Arthroplasty. 2014 Apr;29(4):753-6. doi: 10.1016/j.arth.2013.07.001. Epub 2013 Aug 6.

Oversized cups as a major risk factor of postoperative pain after total hip arthroplasty

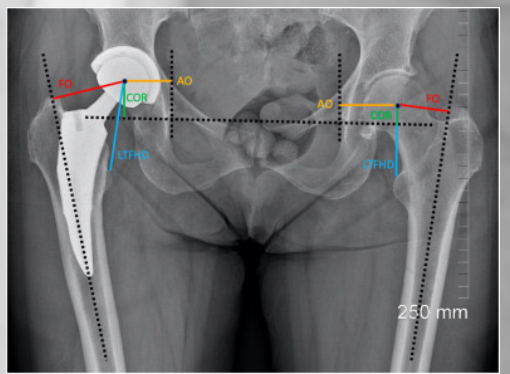
Guillaume A Odri [1], Giovany B Padiolleau [1], François T Gouin [1]

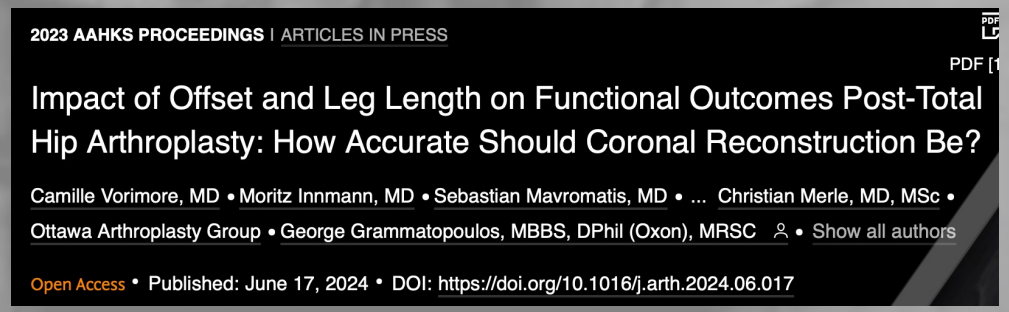
Affiliations + expand

PMID: 23927907 DOI: 10.1016/j.arth.2013.07.001

Total Hip Arthroplasty: What can we control?

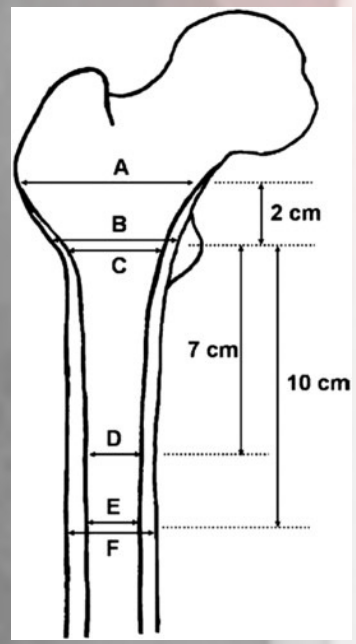
- Offset and leg length discrepancy:
  - 2024 prospective, multicenter, consecutive cohort study of 500 patients treated with primary THA without robotics or navigation
  - Femoral offset increased by 3 ± 6 mm
  - Acetabular offset decreased by 2 ± 4 mm
  - Global offset and leg length centered on 0 ± 2.5 mm had the best Oxford Hip Scores
    - Only 10% achieved this
  - A larger femoral offset compensating for reduced acetabular offset had inferior hip scores
- Take Away: Accuracy matters: goal of offset and leg length should be ± 2.5 mm (consider technology)





Total Hip Arthroplasty: What can we control?

- Femoral stem characteristics:
  - 2015 study including 196 total hip replacement patients
    - Increased distal-third canal fill ratio and a lower canal calcar ratio trended towards a higher incidence of thigh pain
    - Decreased mid-third canal fill ratio was associated with increased severity of thigh pain (P=.04).



- Take Away: Consider doing your own templates and have multiple stem options (No one size fits all/ beware of Dorr A femurs)

J Arthroplasty. 2015 Mar;30(3):495-501. doi: 10.1016/j.arth.2014.10.005. Epub 2014 Oct 8.

Radiographic parameters associated with pain following total hip and surface arthroplasty

Denis Nam [1], Timothy J Sauber [2], Toby Barrack [1], Staci R Johnson [1], Peter J Brooks [3], Ryan M Nunley [1]

Affiliations + expand

PMID: 25456636 DOI: 10.1016/j.arth.2014.10.005

Total Hip Arthroplasty: What can we control?

- Summary:
  - Increasing femoral head size/ utilizing duel mobility does not necessarily lead to increased groin pain
  - Be cognizant of native femoral head to cup size change (Goal of < 6 mm)
  - Accuracy matters: goal of offset and leg length should be ± 2.5 mm (consider technology)
  - Consider doing your own templates and have multiple stem options (No one size fits all/ beware of Dorr A femurs)

Total Hip Arthroplasty: Why Do Revisions Occur?

- 2022 retrospective database review included 79,205 THA cases and 1,433 revisions with identified etiology.
  - Revisions within 6 months:
    - 41.8% femur fracture, 25.7% Dislocation, 12.9% Joint Infection
  - Revisions 6 month to 1 year:
    - 32.2% Joint infection, 20.5% Aseptic Loosening, 20.0% Dislocation
  - Revisions 1 to 5 years:
    - 31.9% Aseptic Loosening, 19.4% Dislocation, 17.5% Joint Infection

Total Hip Arthroplasty: Break It Down

- Painful Total Hips:
  - 2019 study on 201 unexplained painful total hip arthroplasties 6 months out from surgery and final diagnosis (excluded known infections:11, fractures:2, and dislocations:12)

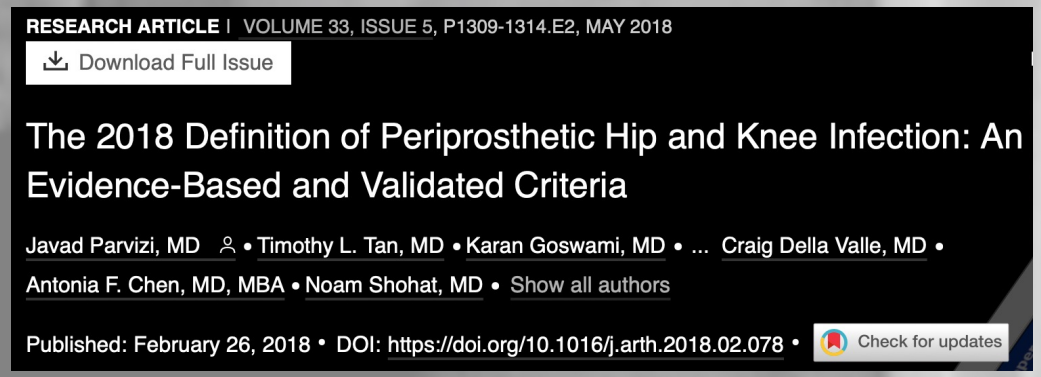
- Periarticular pain: 26.4%
- Projected pain: 24.4%
- Low back pain: 22.4%
- Trochanteric bursitis: 19.9%
- Polyethylene wear: 19.9%
- Loosening: 10.0%
  (Femoral 8, cup 12)
- Material problems 8.5%
- Trunnionosis: 6.5%
- No diagnosis: 3.4%
- Infection: 3.0%
- Iliopsoas tendinitis: 2.4%
- Abductor deficiency: 2.4%
- Metallosis: 2.0%
- Instability without dislocation: 1.5%
- Leg length discrepancy: 1.5%
- Knee arthritis: 1.4%
- Heterotopic ossification: 0.9%
- Fracture: 1.0%
(1 greater trochanter, 1 ilio-ischiopubic ramus)

Total Hip Arthroplasty: Work It Up

- Infection: 3%

Total Hip Arthroplasty: Infection

- Exam: Pain, warmth, erythema, sinus tract, drainage/dehiscence
- Imaging: Radiographs, advanced imaging has limited value
- Labs: Sedimentation rate (ESR), C-Reactive Protein (CRP), Aspiration
  - IL-6, alpha defensin, leukocyte esterase, d-dimer
  - 2018 MSIS Criteria
- Population: Obesity, tobacco use, rheumatoid arthritis, diabetes, immunosuppression, malignancy
- 1-2% of joint replacements



Total Hip Arthroplasty: Infection

- 2018 MSIS Criteria

Major criteria (at least one of the following)	Decision
Two positive cultures of the same organism	Infected
Sinus tract with evidence of communication to the joint or visualization of the prosthesis	

Preoperative Diagnosis	Minor Criteria	Score	Decision
Serum	Elevated CRP *or* D-Dimer	2	≥6 Infected 2-5 Possibly Infected [a] 0-1 Not Infected
Serum	Elevated ESR	1	
Synovial	Elevated synovial *WBC count or LE*	3	
Synovial	Positive alpha-defensin	3	
Synovial	Elevated synovial PMN (%)	2	
Synovial	Elevated synovial CRP	1	

Intraoperative Diagnosis	Inconclusive pre-op score *or* dry tap [a]	Score	Decision
	Preoperative score	-	≥6 Infected 4-5 Inconclusive [b] ≤3 Not Infected
	Positive histology	3	
	Positive purulence	3	
	Single positive culture	2	

Marker	Chronic (>90 d)	Acute (<90 d)
Serum CRP (mg/dL)	1.0	10
Serum D-dimer (ng/mL)	860	860[a]
Serum ESR (mm/h)	30	-
Synovial WBC count (cells/µL)	3000	10,000
Synovial PMN (%)	80	90
Synovial CRP (mg/L)	6.9[a]	6.9
Synovial alpha-defensin (signal-to-cutoff ratio)	1.0	1.0

Total Hip Arthroplasty: Infection

- Treatment:
  - Chronic suppressive antibiotics
  - DAIR (Debridement Antibiotics Implant Retention)
  - DAPRI (Debridement Antibiotic Pearls Retention of Implants)
  - 1.5 stage antibiotic spacer (Long term/ forever spacer)
  - 2 stage antibiotic spacer

Total Hip Arthroplasty: Work It Up

- Periarticular pain in 53 (26.4%)
  - 40 cases of trochanteric bursitis
  - 5 of abductor deficiency
  - 5 of iliopsoas tendinitis
  - 1 of ischial tuberosity tendinitis
  - 2 of heterotopic ossification

Total Hip Arthroplasty: Trochanteric Bursitis

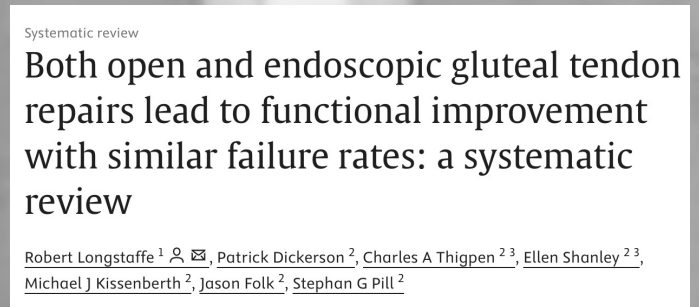
- Exam: Jump Sign, Single Leg Stance, Ober test
- Imaging: Radiographs, MRI or US can be useful in conservative treatment failures
- Population: More common in females
- 2021 retrospective review of 33,761 total hip patients
  - 1.70% (573/33,761) had lateral trochanteric pain
  - 16.6% were treated with physical therapy, home exercises, or oral medications
  - 83.4% were treated with corticosteroid injection (CSI)
    - 63.6% achieved clinical improvement with 1 injection
    - 20.5% with 2 CSIs
    - 5.44% with 3 CSIs

Total Hip Arthroplasty: Abductor Deficiency

- Exam: Jump Sign, Single Leg Stance, Trendelenburg Gait, Abductor strength testing
- Imaging: Radiographs, Metal Subtraction MRI, US (user dependent)
- Population: preoperative tears masked by hip pathology, failed repair of the abductors after anterolateral approach, tear that develops postoperatively
- No good conservative treatment study: NSAIDs, physical therapy, corticosteroids injections

Total Hip Arthroplasty: Abductor Deficiency

- Surgical Treatment:
  - Open vs Arthroscopic Abductor Repair:
    - 2021 systematic review of 22 studies and 611 hips:
      - 70% resolution of gait deviation
      - Average 1 grade improvement in abductor strength
      - Complication rate: open 7.8%, arthroscopic 0.7%
      - Retear: open 4.1%, arthroscopic 3.4%
  - Gluteus Maximus Transfer:
    - 2024 systematic review of 10 studies and 125 hips:
      - Significant improvement in Modified Harris Hip Score and Visual Analog Score
      - No improvement in strength and 33% residual Trendelenburg gait
      - Complication rate of 5.6%


Systematic review

Both open and endoscopic gluteal tendon repairs lead to functional improvement with similar failure rates: a systematic review

Robert Longstaffe [1], Patrick Dickerson [2], Charles A Thigpen [2 3], Ellen Shanley [2 3], Michael J Kissenberth [2], Jason Folk [2], Stephan G Pill [2]


SYSTEMATIC REVIEW AND META-ANALYSIS | VOLUME 39, ISSUE 4, P1117-1124.E1, APRIL 2024 Download Full Issue PDF [78

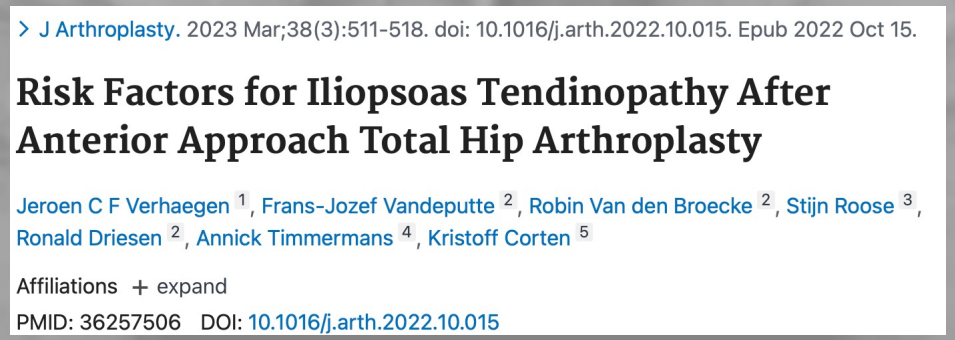
Gluteus Maximus Transfer for Irreparable Hip Abductor Deficiency: A Systematic Review and Meta-Analysis

Bryant M. Song, MD • Paul M. Inclan, MD • Andrew W. Kuhn, MD • Benjamin M. Stronach, MS, MD • Cecilia Pascual-Garrido, MD, PhD

Published: October 22, 2023 • DOI: https://doi.org/10.1016/j.arth.2023.10.036 • Check for updates

Total Hip Arthroplasty: Iliopsoas Tendinitis

- Exam: pain with deep anterior palpation, painless PROM with painful AROM, pain with resisted hip flexion
- Imaging: Radiographs (Cross Table lateral: cup prominence or retroversion), US useful in unclear cases and can show tendon displaced anteromedial by hardware, MRI limited secondary to artifact
- Population: acetabular prominence or malpositioned cup, excessive offset or limb length discrepancy > 1 cm
- Conservative treatment: NSAIDs, physical therapy, activity avoidance, injections



> J Arthroplasty. 2023 Mar;38(3):511-518. doi: 10.1016/j.arth.2022.10.015. Epub 2022 Oct 15.

Risk Factors for Iliopsoas Tendinopathy After Anterior Approach Total Hip Arthroplasty

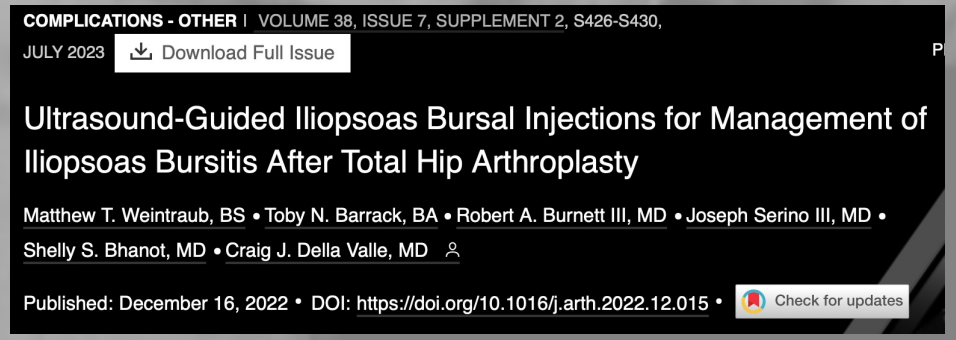
Jeroen C F Verhaegen [1], Frans-Jozef Vandeputte [2], Robin Van den Broecke [2], Stijn Roose [3], Ronald Driesen [2], Annick Timmermans [4], Kristoff Corten [5]

Affiliations + expand

PMID: 36257506 DOI: 10.1016/j.arth.2022.10.015

Total Hip Arthroplasty: Iliopsoas Tendinitis

- Iliopsoas Injection:
  - 2022 retrospective review of 42 total hip patients who received an ultrasound guided steroid injection
    - 22 patients had no cup overhang and received injection
      - 81.2% patients had no pain after 1st injection
    - 20 patients had anterior cup overhang
      - 5 underwent revision with complete resolution of symptoms
      - 15 nonrevised patients had continued pain at follow-up
  - Patients without acetabular cup overhang have higher rate of success with injections



Total Hip Arthroplasty: Iliopsoas Tendinitis

- Surgical Treatment: Iliopsoas Tenotomy/ Acetabular Revision
  - 2019 systematic review including 11 studies with 280 hips diagnosed with iliopsoas tendonitis after total hip replacement
    - Iliopsoas tenotomy:
      - Improved hip scores compared to acetabular revisions
      - Superior postoperative functional outcomes and lower overall rate of complications
  - Iliopsoas tenotomy should be considered 2nd line of treatment with revision arthroplasty reserved for recalcitrant cases

J Arthroplasty. 2019 Sep;34(9):2184-2191. doi: 10.1016/j.arth.2019.04.067. Epub 2019 May 8.

Outcomes of Nonoperative Management, Iliopsoas Tenotomy, and Revision Arthroplasty for Iliopsoas Impingement after Total Hip Arthroplasty: A Systematic Review

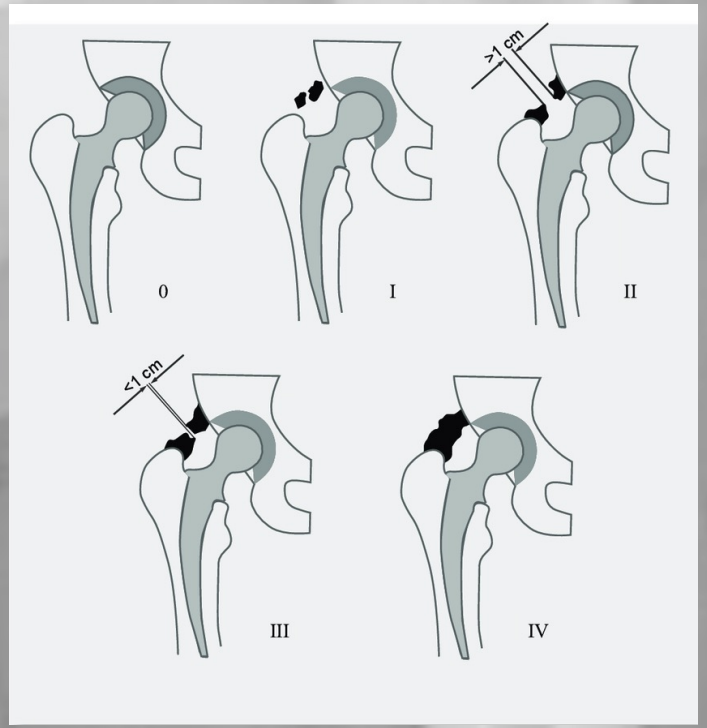
Jacob Shapira [1], Sarah L Chen [1], Natalia M Wojnowski [1], Ajay C Lall [1], Philip J Rosinsky [1], David R Maldonado [1], Benjamin G Domb [1]

Affiliations + expand

PMID: 31147246 DOI: 10.1016/j.arth.2019.04.067

Total Hip Arthroplasty: Heterotopic Ossification (HO)

- Exam: Limited joint mobility
- Imaging: Radiographs (Booker Classification), Bone Scan (Early dx)
- Population: male gender, preexisting ossifications, and ankylosing spondylitis, possible approach
- Prevention: NSAIDs, ASA, radiation



J Orthop Surg Res. 2022; 17: 147. PMCID: PMC8898402
Published online 2022 Mar 5. doi: 10.1186/s13018-022-02959-z PMID: 35248082

Heterotopic ossification after total hip arthroplasty: When is development completed?

Roland E. Willburger, Friederike Brinkhoff, Jan Nottenkämper, Jan Krapp, and Stella Oberberg

Total Hip Arthroplasty: Heterotopic Ossification (HO)

- HO Progression:
  - 2022 prospective study of 75 total hip patients comparing HO at 3 months, 1,3,5, and 10 years
    - Patients who received appropriate prophylaxis developed less HO and when it did occur the extent was less
    - 9 patients had booker stage increase from 1 to 3 years with no further progression at 5 or 10 years

J Orthop Surg Res. 2022; 17: 147. PMCID: PMC8898402
Published online 2022 Mar 5. doi: 10.1186/s13018-022-02959-z PMID: 35248082

Heterotopic ossification after total hip arthroplasty: When is development completed?

Roland E. Willburger, Friederike Brinkhoff, Jan Nottenkämper, Jan Krapp, and Stella Oberberg

Total Hip Arthroplasty: Heterotopic Ossification (HO)

- Surgery: Wide resection with or without revision arthroplasty
  - 2023 systematic review of 7 studies of 46 patients with Booker Grade 3 or 4
    - At 14.8 month follow-up range of motion was improved but relief of pain was inconsistent
    - Prophylaxis with irradiation prevented recurrence
    - Overall there is insufficient quality data on surgical treatment

Total Hip Arthroplasty: Work It Up

- Projected pain in 49 (24.4%):
  - 45 cases of back pain with or without neuropathy
  - 3 of knee osteoarthritis
  - 1 of metabolic neuropathy

Total Hip Arthroplasty: Back Pain

- Exam: Straight leg raise, crossed straight leg raise, pain below the knee
- Imaging: Lumbar radiographs, Lumbar MRI
- Population: History of low back pain, Osteonecrosis with decreased cup inclination
  - 2010 prospective questionnaire of 344 total hip patients:
    - Preoperative: 170 patients reported low back pain, 174 reported no low back pain
    - Postoperative:
      - 66% low back pain patients reported resolved pain
      - 20% without low back developed low back pain at 1 year

Clin Orthop Relat Res. 2010 May; 468(5): 1325–1330. PMCID: PMC2853644
Published online 2010 Feb 3. doi: 10.1007/s11999-010-1236-5 PMID: 20127429

Back Pain and Total Hip Arthroplasty: A Prospective Natural History Study

Javad Parvizi, MD,✉ Aidin E. Pour, MD, Alan Hillibrand, MD, Grigory Goldberg, MD, Peter F. Sharkey, MD, and Richard H. Rothman, MD, PhD

Total Hip Arthroplasty: Work It Up

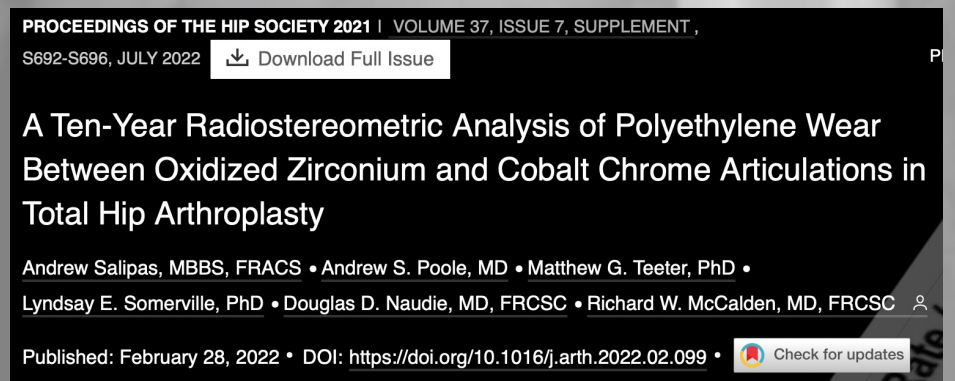
- Polyethylene wear in 40 (19.9%)
- Loosening in 20 (10.0%)
  - 8 of the femoral component and 12 of the cup
- material problems in 17 (8.5%)
  - 13 of trunnionosis and 4 of metallosis in metal-on-metal implants

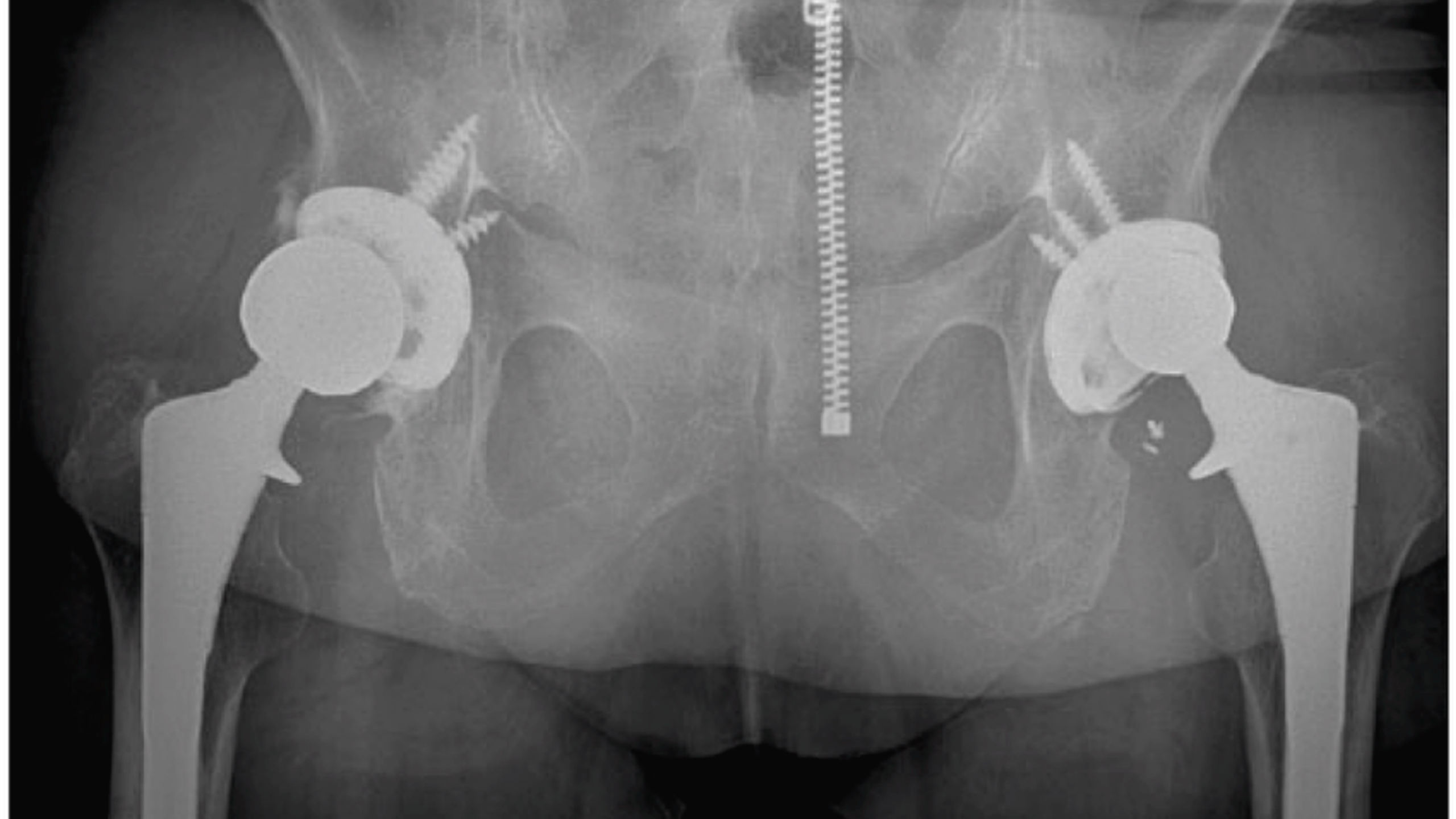
Total Hip Arthroplasty: Polyethylene Wear

- 2022 systematic review including 14 studies and 1,175 total hips patients comparing highly cross linked polyethylene (HXL) vs conventional polyethylene (CP) with 10 year follow-up:
  - Osteolysis: HXL 14%, CP 25%
  - Excessive wear: HXL 8%, CP 33%
  - Revision surgery due to wear: HXL 3%, CP 20%
- Highly cross linked polyethylene dramatically reduce the rate of polyethylene related revision

- 2022 study of radiostereometric analysis of 10 year wear between oxidized zirconium and cobalt chrome femoral heads found no significant difference

- Beware of recalls



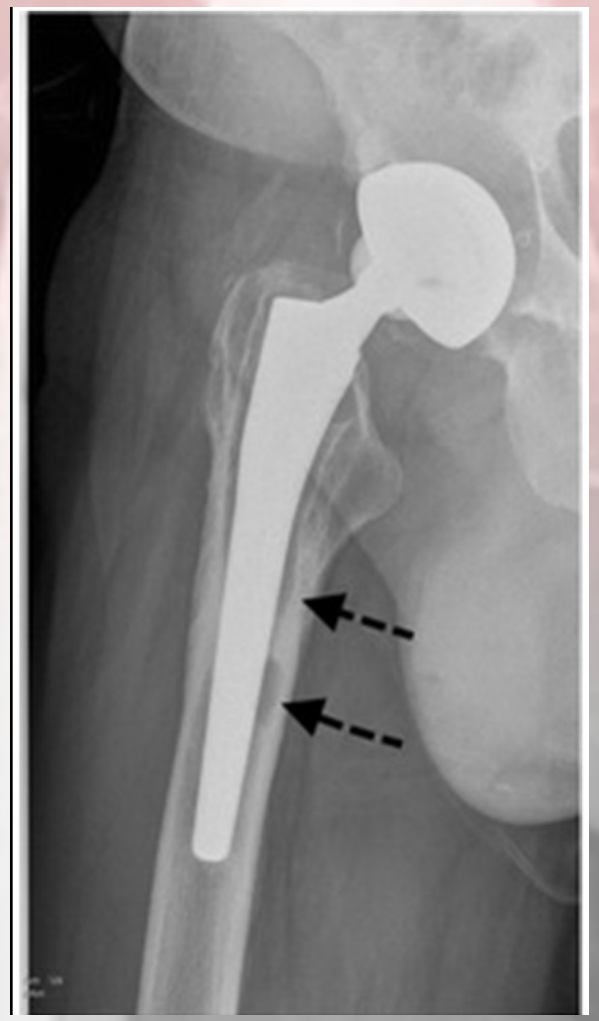


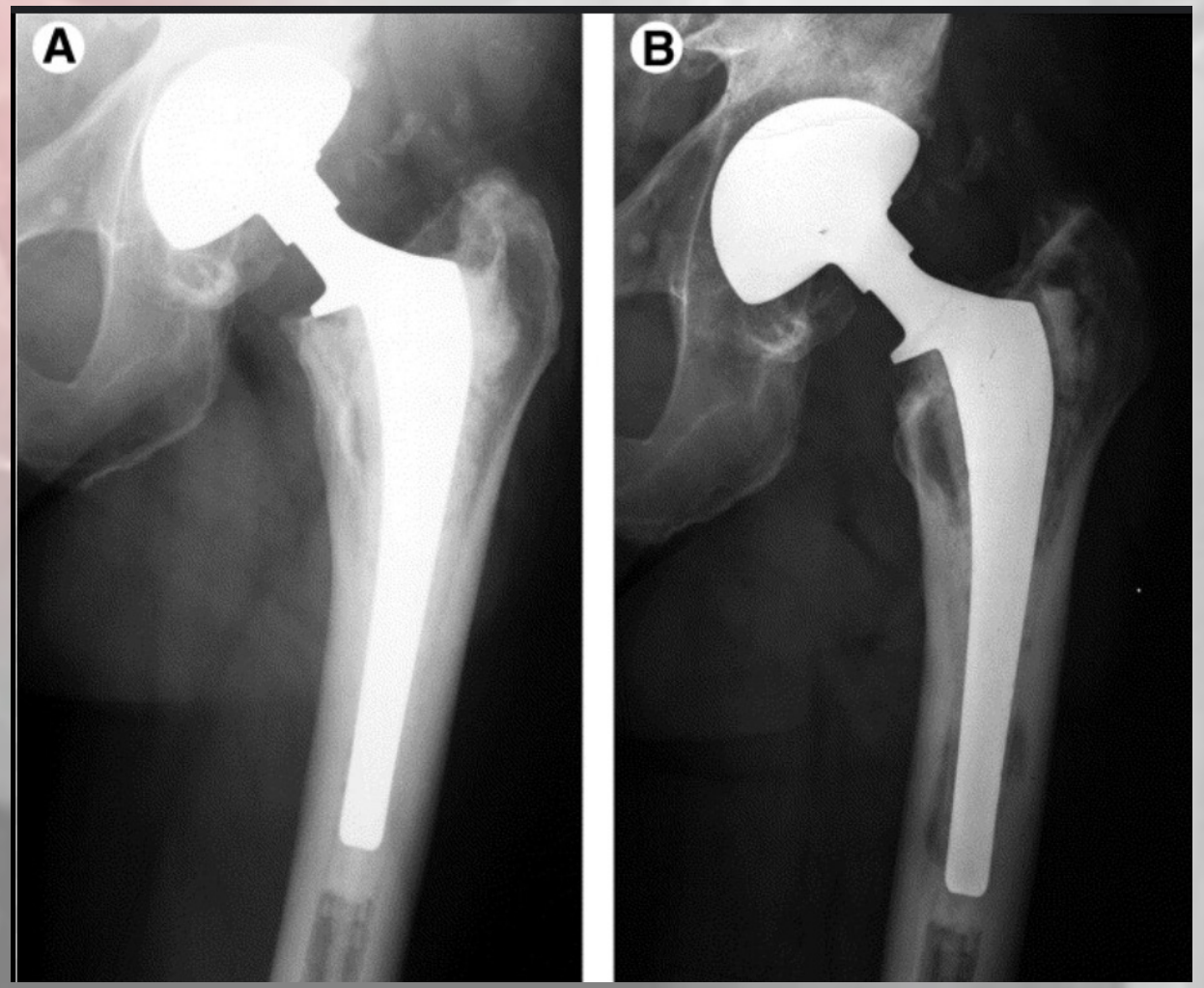
Total Hip Arthroplasty: Aseptic Loosening

- Exam: Start up pain, impaired gait/ pain with weight bearing, painful range of motion
- Imaging: serial radiographs (Vertical migration of 1.5mm/y over 1st 2 years: 100% sensitivity)
  - Subtraction arthrography, nuclear arthrography, bone scan, Fludeoxyglucose Positron Emission Tomography (FDG-PET-highest sensitivity and specificity), DEXA scan
  - MRI (MARS, TMAR): increased circumferential signal intensity at the implant-bone interface surrounded by a halo of decreased signal intensity is highly suggestive of loosening
- Labs: Cell Count: < 2500 WBCs and > 10% lymphocytes (If neither present then < 5% chance of aseptic loosening)
- Population: obesity, osteoporosis, smoking

Total Hip Arthroplasty: Aseptic Loosening

- Causes of loosening:
  - Inadequate initial fixation
  - Mechanical loss of fixation over time
  - Biologic loss of fixation caused by particulate-induced osteolysis around the implant
- Treatment: Revision Arthroplasty




A
B

Total Hip Arthroplasty: Material Problem

- Metallosis: accumulation and deposition of metallic particles secondary to abnormal wear from prosthetic implants
  - Adverse local tissue reaction (ALTR), Aseptic lymphocyte-dominated vasculitis-associated lesions (ALVAL): Ions and particles shed from implants can lead to local inflammation of surrounding tissue
    - Rare systemic manifestations may occur in various organ systems.

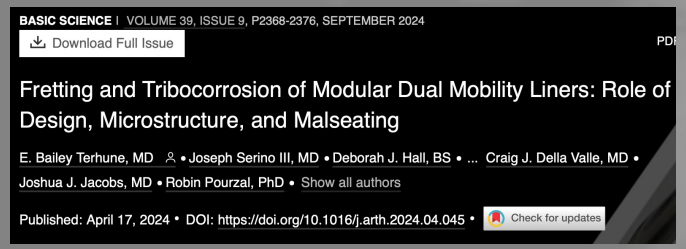
Regen Eng Transl Med. Author manuscript; available in PMC 2022 May 6.
PMCID: PMC9075182
Published in final edited form as:
NIHMSID: NIHMS1744587
Regen Eng Transl Med. 2021 Sep; 7(3): 247–261.
PMID: 35530571
Published online 2021 Jul 29. doi: 10.1007/s40883-021-00222-1

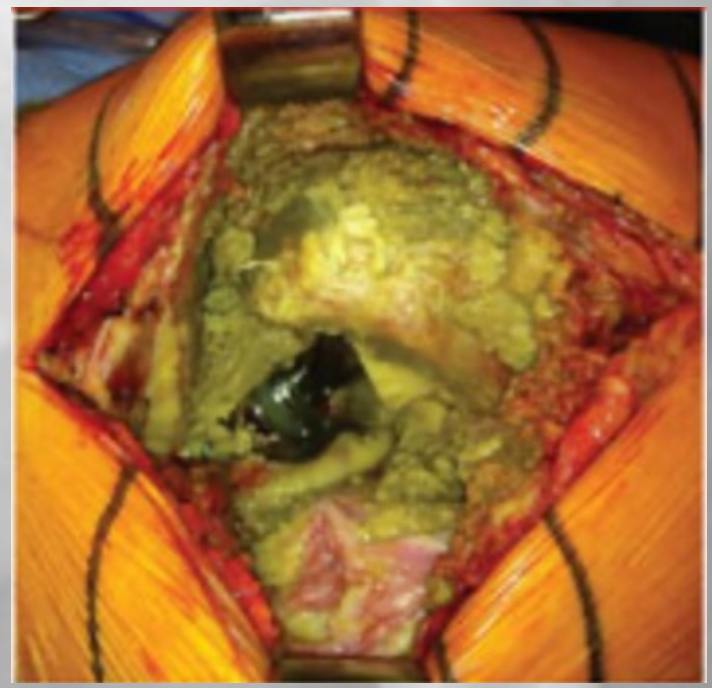
The Mechanism of Metallosis After Total Hip Arthroplasty

Chinedu C. Ude,[1,2,3] Caldon J. Esdaille,[1,2,3,4] Kenneth S. Ogueri,[1,2,7,8] Kan Ho-Man,[1,2,3] Samuel J. Laurencin,[3] Lakshmi S. Nair,[1,2,3,5,6,7] and Cato T. Laurencin[1,2,3,5,6,7,8,9,10]

Total Hip Arthroplasty: Material Problem

- Exam: pain, swelling, skin discoloration, restricted range of motion, and audible crepitus or creaking on weight bearing of the affected joint
- Labs:
  - Metal Ions: 7 parts per billion (ppb) for cobalt or chromium ions cut off for treatment
  - Cell Count: manual cell count necessary- fibrinous debris from metal-on-metal reactions will falsely elevate automated cell counts
- Imaging: Plain radiographs (bubble sign), CT, MRI (MARS), US
- Population: MoM hips (large heads on THA, small heads on resurfacing, a low femoral offset and an acetabular angle greater than 45°), Duel Mobility hips (designs)





CASE REPORTS | VOLUME 18, ISSUE 1, P110-112, JANUARY 2003

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The bubble signA new radiographic sign in total hip arthroplasty

Edwin P. Su, MD • Peter W. Callander, MD • Eduardo A. Salvati, MD

DOI: https://doi.org/10.1054/arth.2003.50007

Total Hip Arthroplasty: Material Problems

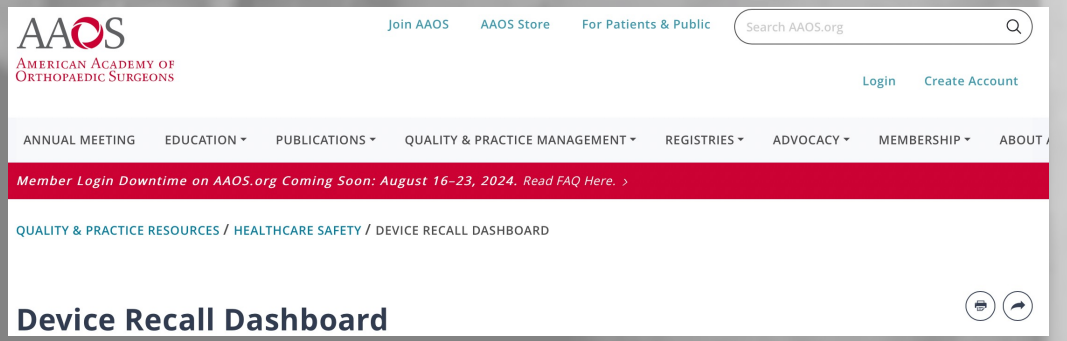
- **Trunnionosis**: taper corrosion, a process of wear caused by mechanical corrosion, occurring at the head-neck or neck-stem interfaces in modular non–metal-on-metal total hip implants
- Factors: > femoral heads, stem designs (narrower neck, smaller taper, less rigidity), Assembly force (4000 newtons), taper cleanliness
- Population: 2% of all THA patients can be affected and reports have demonstrated an incidence ranging from 0.7% to 3% of all THA revisions
- Labs: metal ions (Co/Cr ratio), cell count: >4350 WBC and >85% polymorphonuclear (more likely infection)
- Imaging: Plain radiographs (bubble sign), CT, MRI (MARS), US
- Surgery: Revision Arthroplasty
  - Intraoperative Complication are as high as 6%
  - 13.5% rerevisions at 1.2 years (32% infection, 24% instability, 24% loosening)

Total Hip Arthroplasty: Material Problems

Total Hip Arthroplasty: Recall

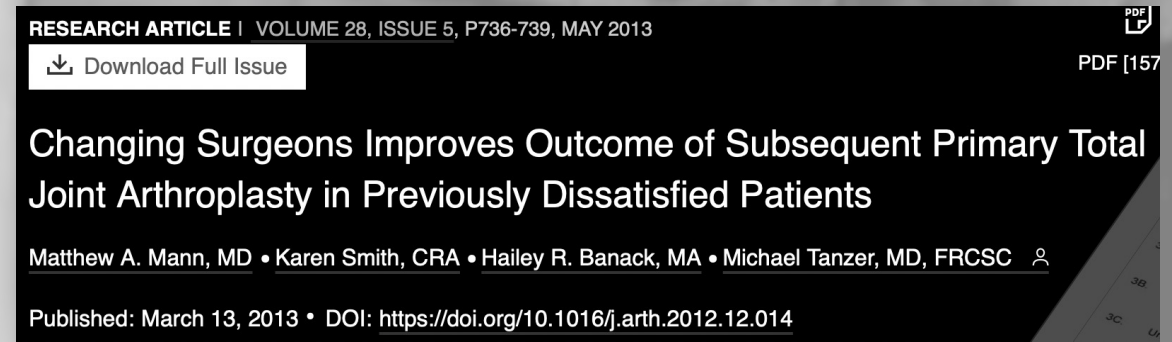
- 2023 study on FDA database query of orthopedic devices approved between 2008 and 2018
  - 19.4% hip and 20.3% knee devices were recalled
  - Hazard of recall for hip and knee devices over 10 years: 24%
  - Most common causes of recall were process control (29.6%) and device design (26.3%)

- Never be the first in orthopedics and never be the last



Total Hip Arthroplasty: 2nd Opinion

- Do not be afraid to get a second opinion
- 2013 study on patients dissatisfied with their previous total joint and changed providers for subsequent total joint:
  - Majority were dissatisfied with surgeon-patient interaction
  - 100% of the patients had decreased pain, improved function and were satisfied with their result.



The End