

Diagnosis and treatment of Femoroacetabular Impingement Syndrome (FAIS) in athletes

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Disclosures

- **None**

Objectives

1. Review current concepts in the treatment of Femoroacetabular impingement syndrome (FAIS)

Outline

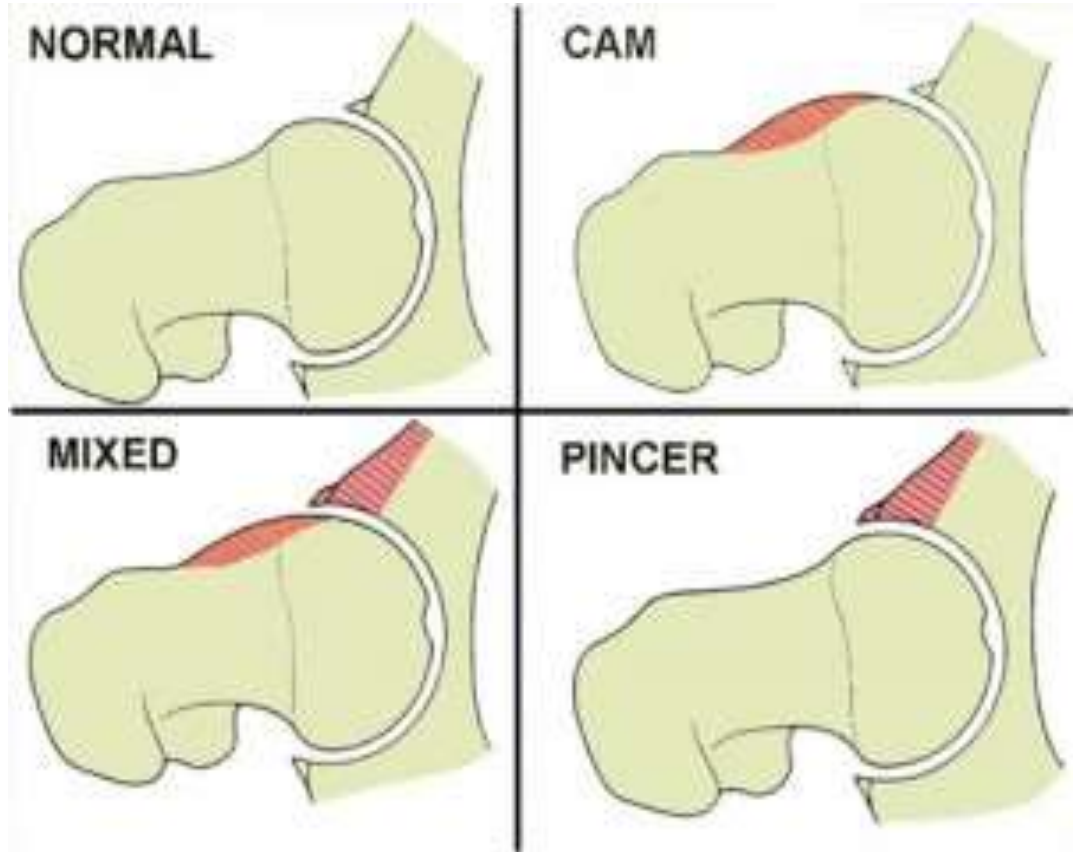
1. Background
2. History and Physical Exam
3. Imaging
4. Hip Arthroscopy
5. Outcomes

FAI - Background

- First popularized by Ganz in 1990s
 - Leads to hip arthritis over many years
- Acetabular morphology is formed around the time of birth
- CAM lesions develop in adolescence
 - Stress response of the growth plate
- Symptomatic FAI significantly affects daily living
 - Higher morbidity than ACL and Rotator Cuff
- Majority of labral tears are asymptomatic
 - Greater than 70% in patient over 40

FAI - Background

- CAM – 70%
- Mixed – 20%
- Pincer – 10%



Clinical Evaluation

- History
 - Physical Examination
 - Plain X-Ray Films
-
- MRI

History

Positives

- Traumatic injury
- Pain in the groin crease
- Unable to squat
- Pain with prolonged sitting
- Severely activity limiting
- Common in young males, middle aged active females

Negatives

- Back or pain in buttocks
- Pain radiating down leg into foot
- Numbness or tingling in leg
- Pain in lateral hip
- Bilateral Symptoms

Physical examination

Intra-articular pathology

- Hip Pain: “C-sign”
- Loss of range of motion:
asymmetric
- Provocative tests
 - FADIR
 - FABER

Other

- Pain localizes to back
- Positive facet loading
- Pain over greater trochanter
- Positive straight leg raise
- Pain with resisted hip flexion
- Pain with FABER in SI joint or
laterally over gluts

Rotational motion

Normal

- 30 deg of internal and 60 deg of external rotation
- Symmetric motion bilaterally

Abnormal

- Asymmetric decrease in rotational motion
- Less internal rotation supine than prone (CAM affect)
- Asymmetric difference in FABER testing

CAM Affect

- CAM Morphology has been shown to decrease passive internal rotation of the hip in flexion
- Global hip motion is also decreased
- Prone ROM is increased compared to supine motion at 90 deg flexion
- Internal rotation significantly improves after CAM resection

Extra-articular Diagnosis

- Genitourinary
- Hernias
- Ovaries and uterus
- SI joint
- Lumbar spine
- Peripheral nerve entrapment
- Core muscle injury
- Osteitis pubis



Radiographic Studies

3 Views

- Standing AP Pelvis
- 45 degree Dunn Lateral
- False Profile

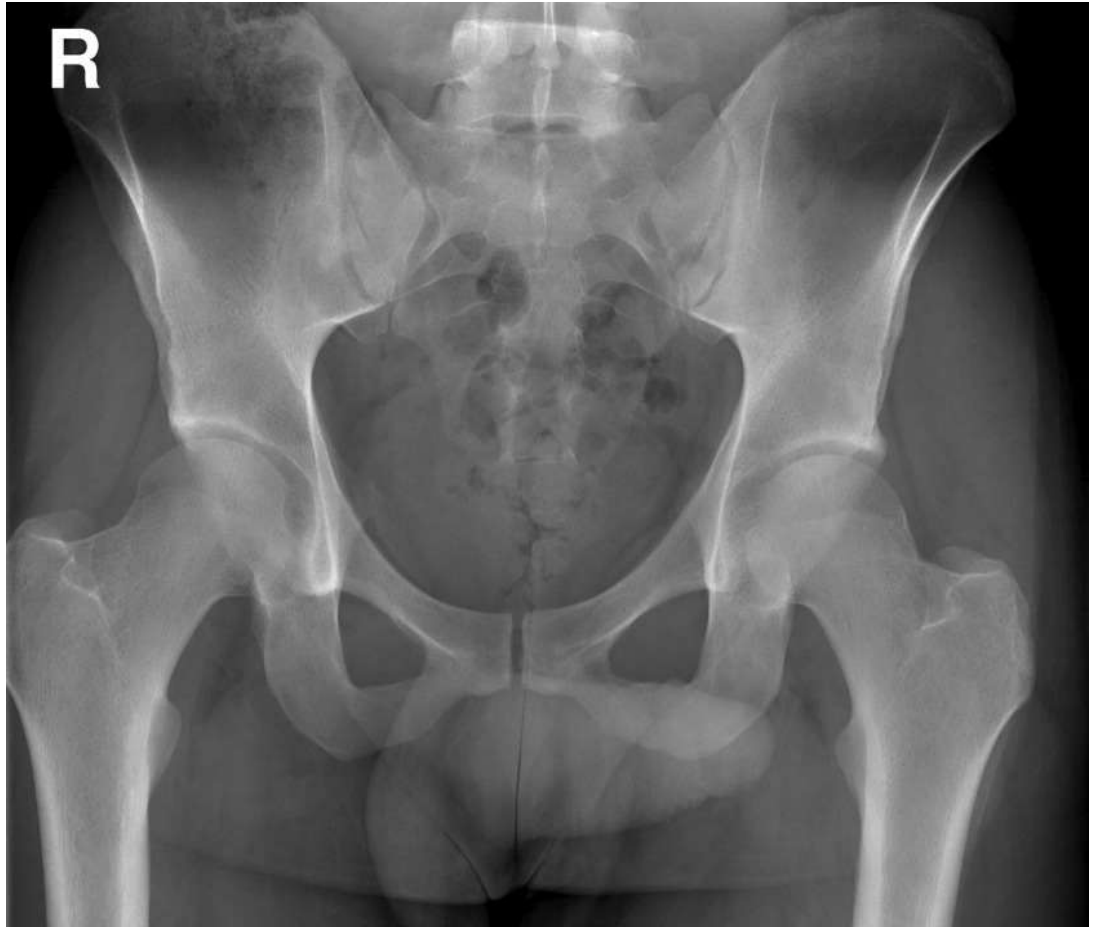
Findings can be subtle

Xrays are rarely “normal”

Radiographic Studies

AP Pelvis

- Rotation and Tilt
- Acetabular coverage
 - CEA
 - Tonnis
 - profunda
- Acetabular version
 - Crossover sign
 - Ischial spine sign
- Arthritis
 - Minimum Joint space
 - Cysts, Spurts
- Femoral anatomy
 - Neck shaft angle
 - Anterior alpha angle



Radiographic Studies

- 45 deg Dunn lateral

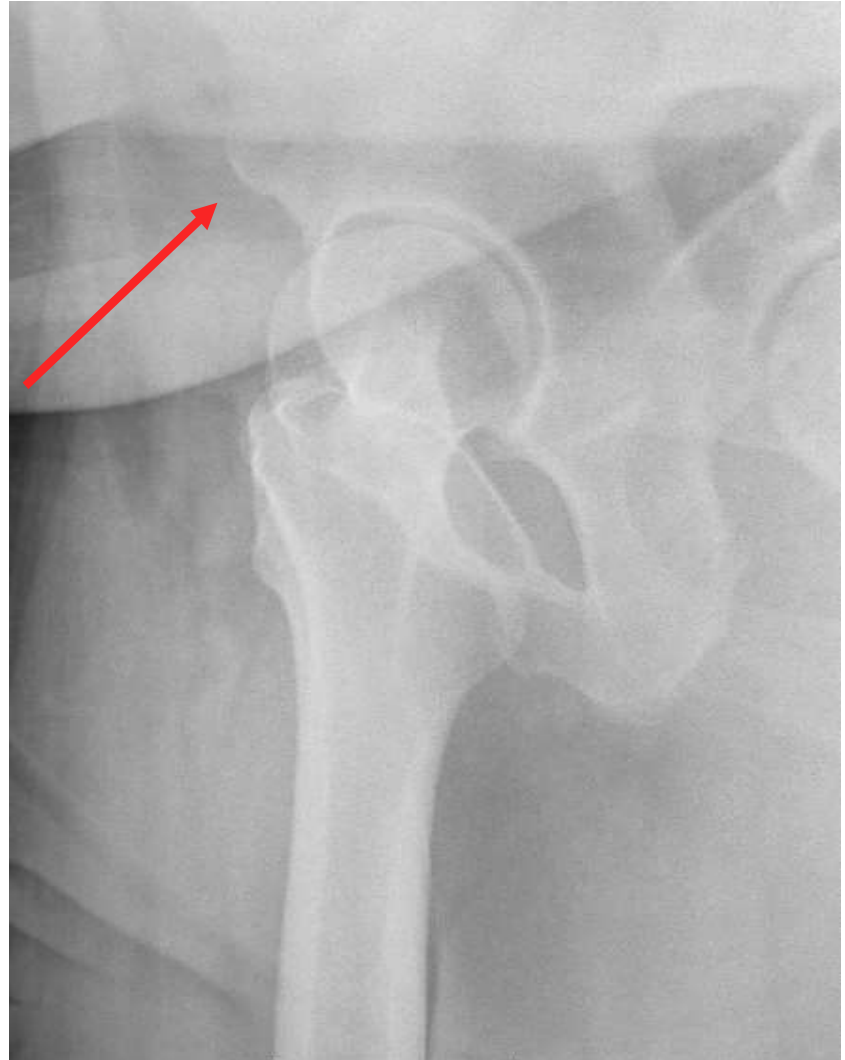
- Alpha Angle
- Impingement cysts
- Sclerosis neck
- Head neck offset



Radiographic Studies

- Anterior CEA
- Sub-spine impingement

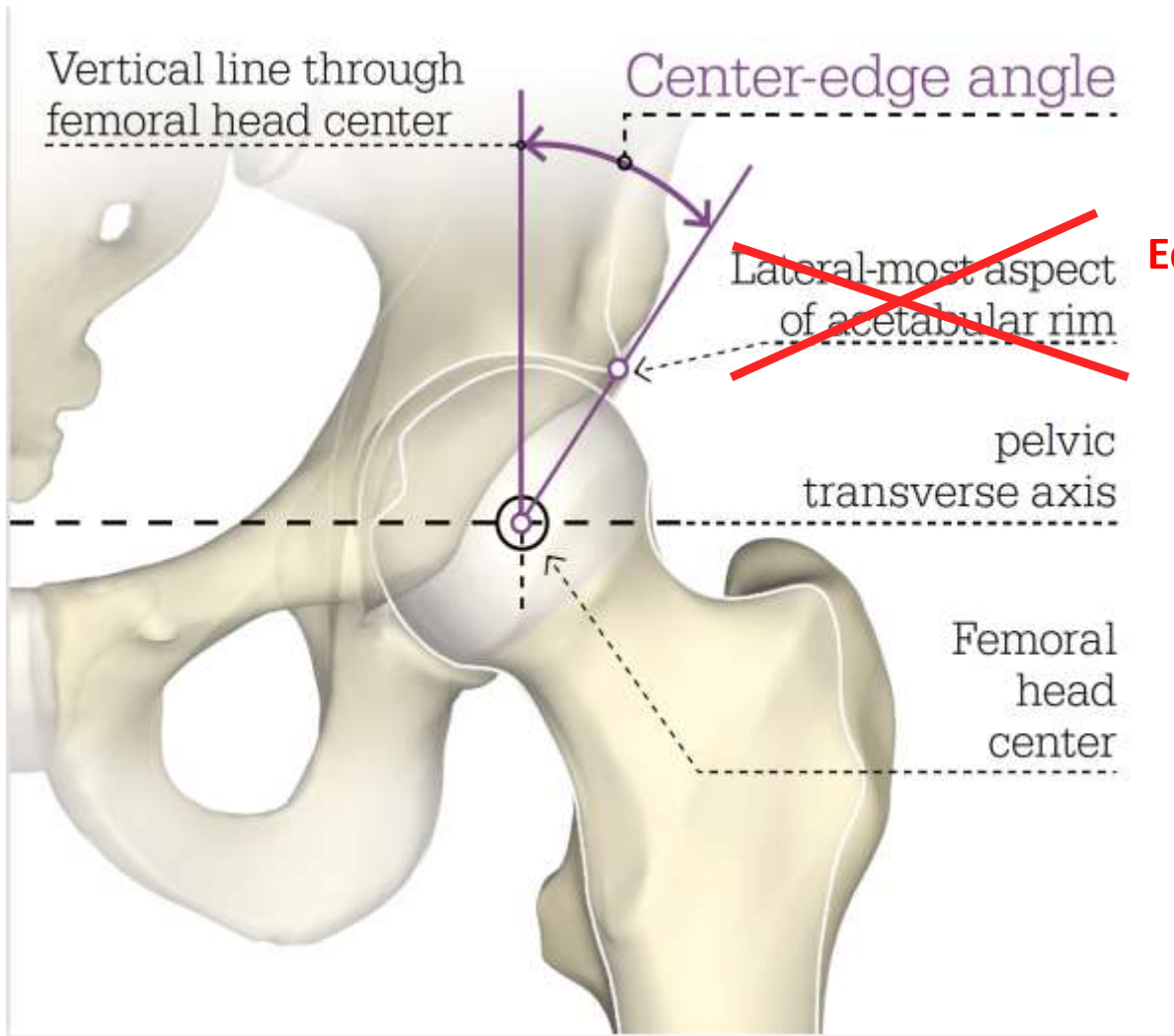
- False Profile



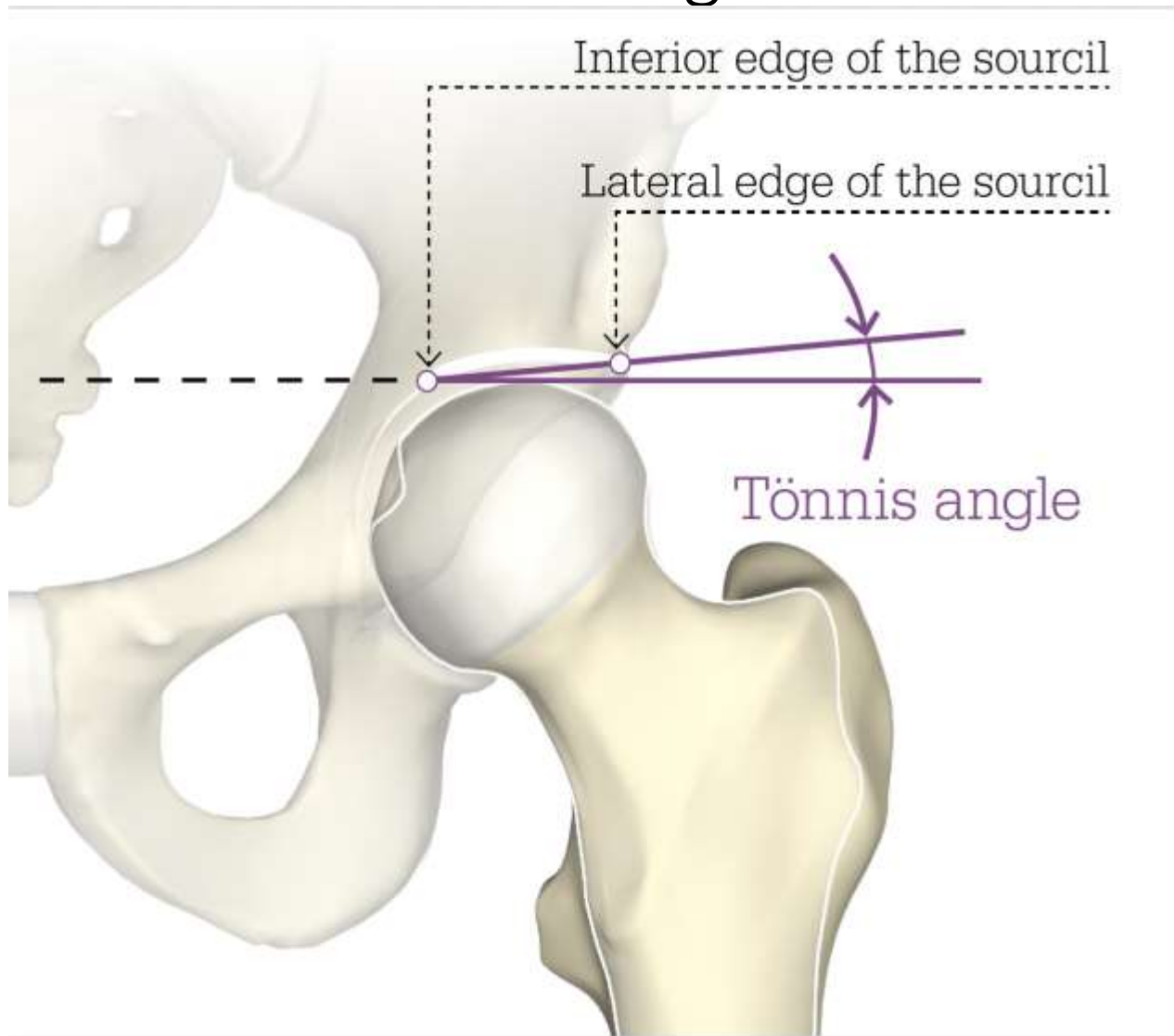
Radiographic Measurements of the Hip

- Lateral Center Edge Angle
- Anterior Center Edge Angle
- Tonnis Angle
- Lateral Alpha Angle
- Anterior Alpha Angle
- Femoral Head Neck Offset
- Transverse axis distance
- Minimum Joint Space Distance
- Femoral Neck Shaft Angle
- Femoral Head Un-coverage Percentage
- Crossover Sign
- Coxa Profunda
- Acetabular Protrosio

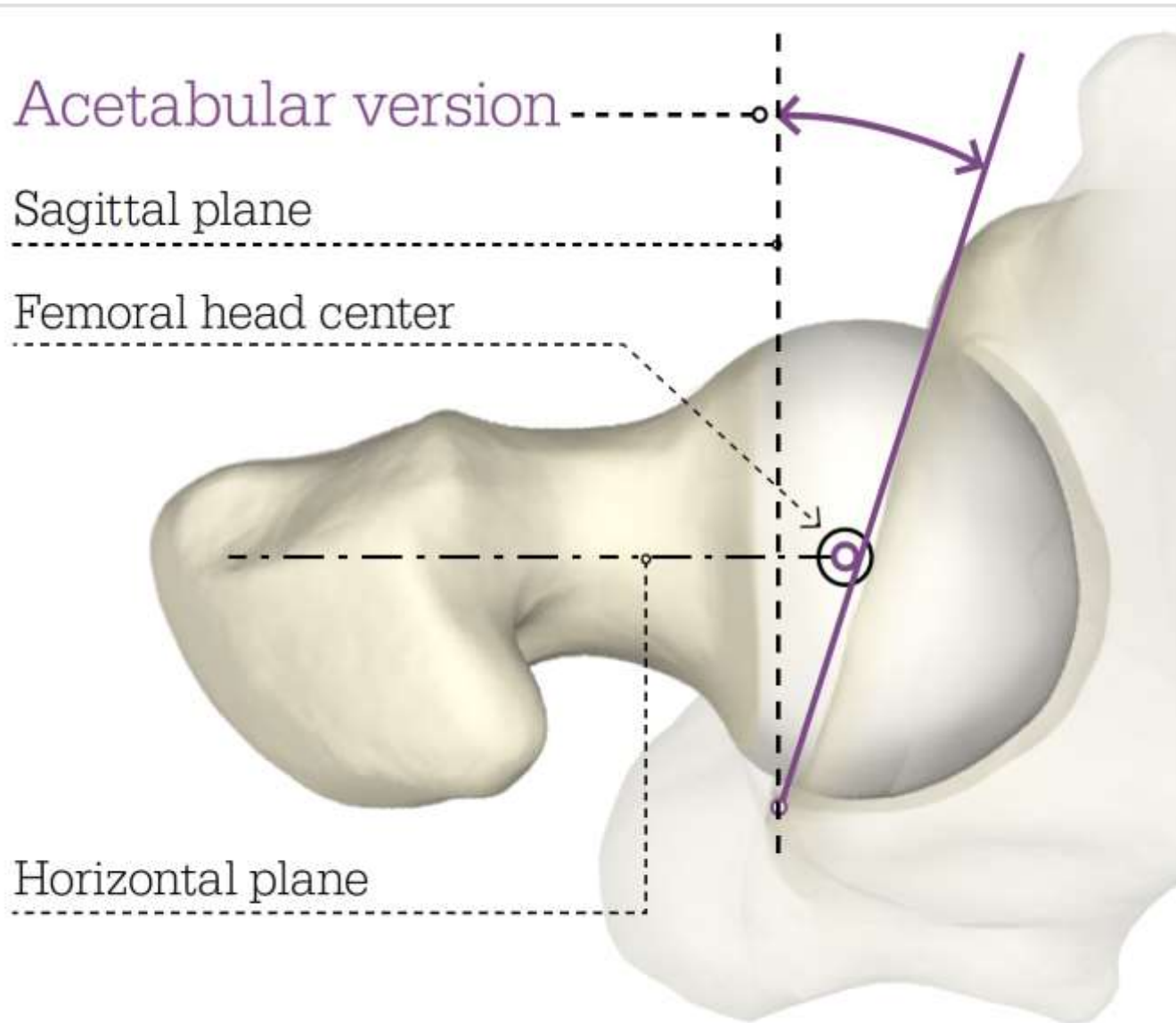
Center Edge Angle



Acetabular Index: Tönnis Angle



Acetabulum Version

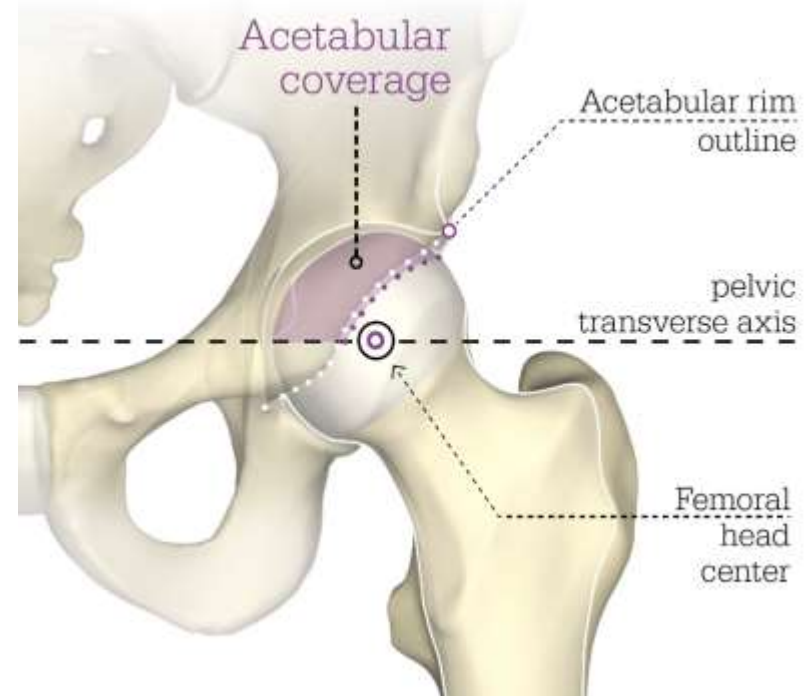


Acetabular Coverage

Percentage area of the superior half of the femoral head that is covered by the Acetabulum

Less than 65% → undercoverage (instability)

More than 80% → impingement



Femoral side

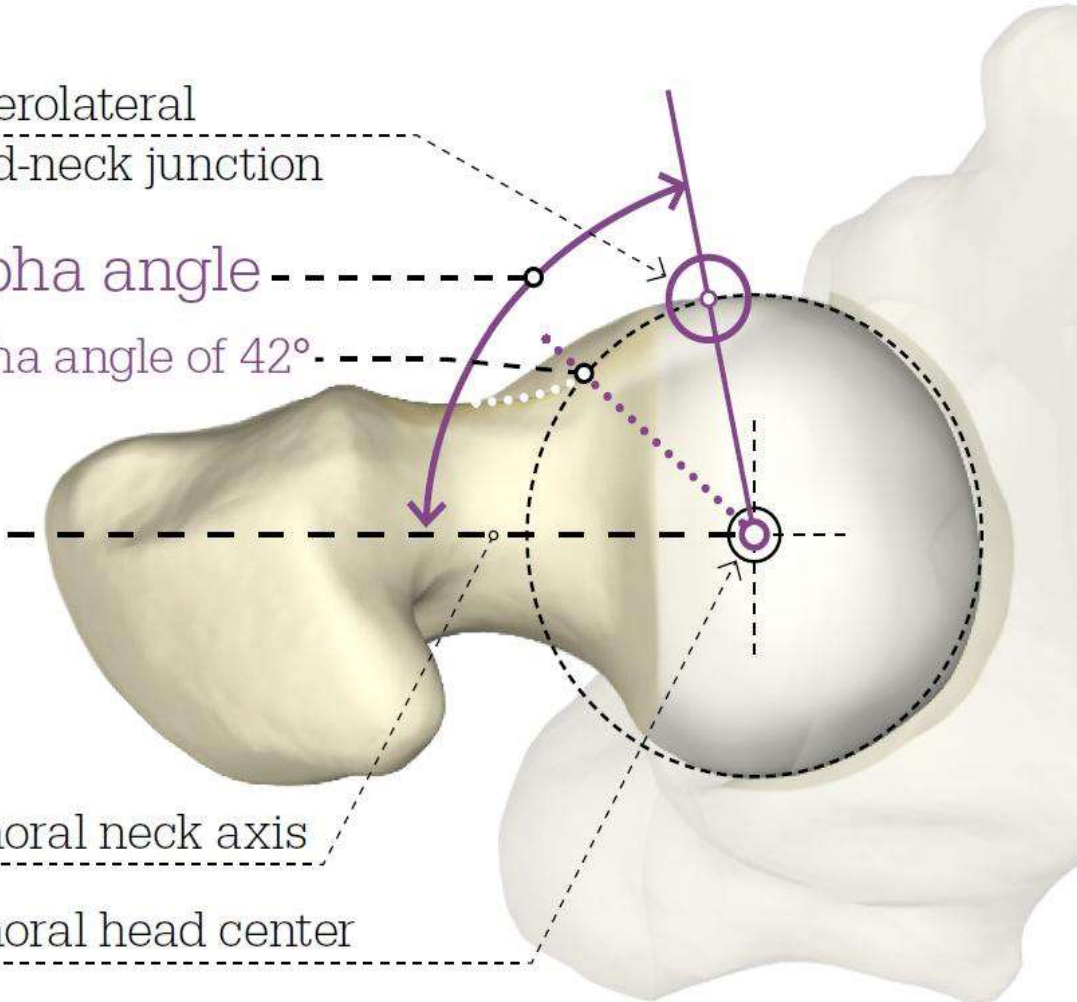
Anterolateral
head-neck junction

Alpha angle

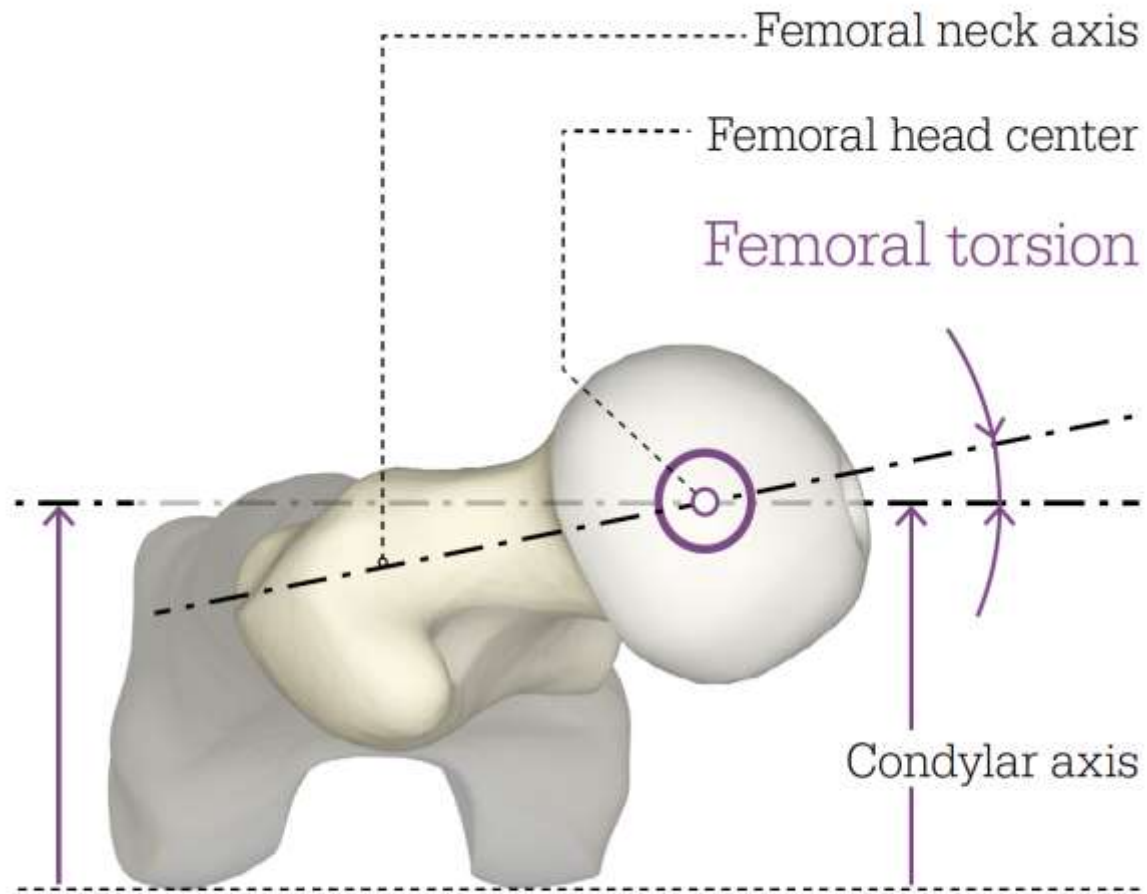
Alpha angle of 42°

Femoral neck axis

Femoral head center



Femoral Version/Torsion



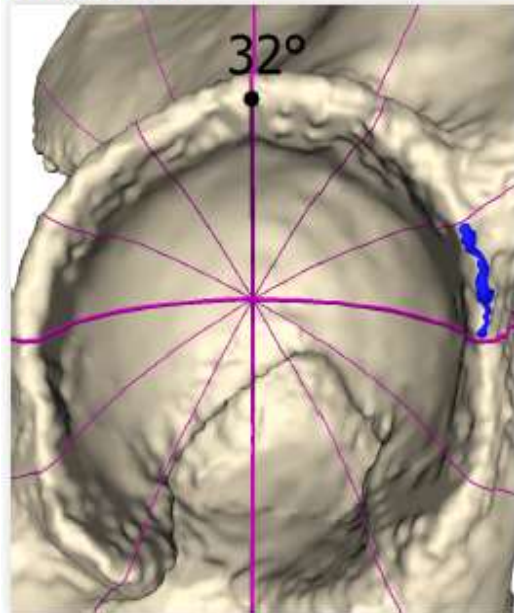
Femoral Version/Torsion Considerations

- Femoral antetorsion of 10-20° is considered normal
- Greater than 25° → hip instability
- Less than 5° anteversion → magnify the CAM effect
 - Distal CAM impingement

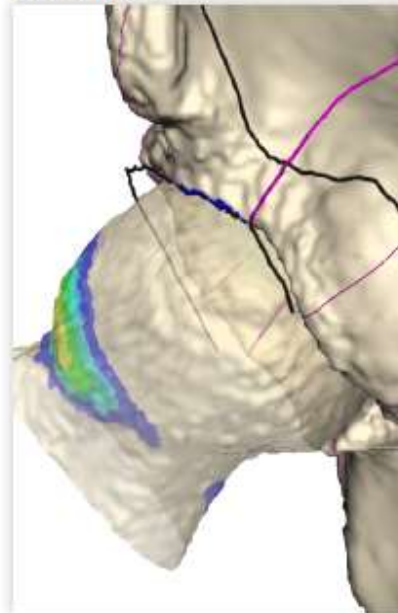
Putting it all together - Hip map

Acetabular rim

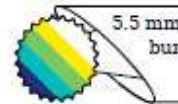
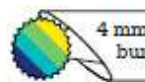
On-fossa view



Frontal view



Pincer depth

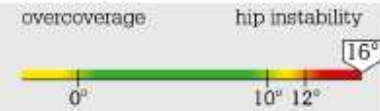


Measurements

Center edge angle (CEA)



Tönnis angle



Lines

Clockfaces

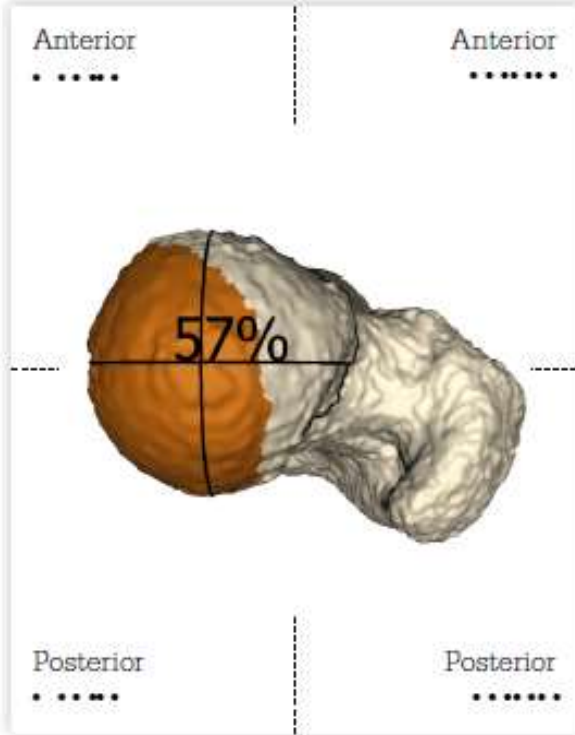
Outerbound of population based 95% CI

Putting it all together - Hip map

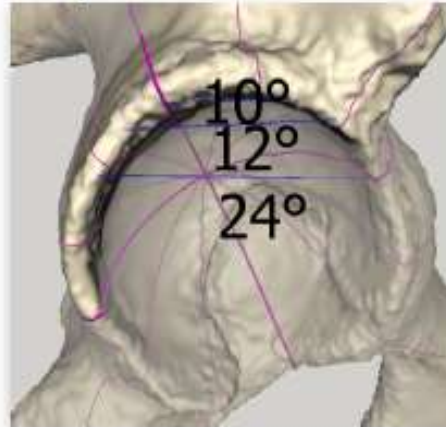
Coverage / version

Measurements

Acetabular surface area is: 5304 mm²



Oblique view



Frontal view



Acetabular version

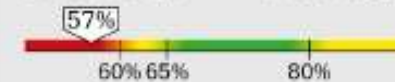
At the axial plane at 3 o'clock:

retroversion anteversion



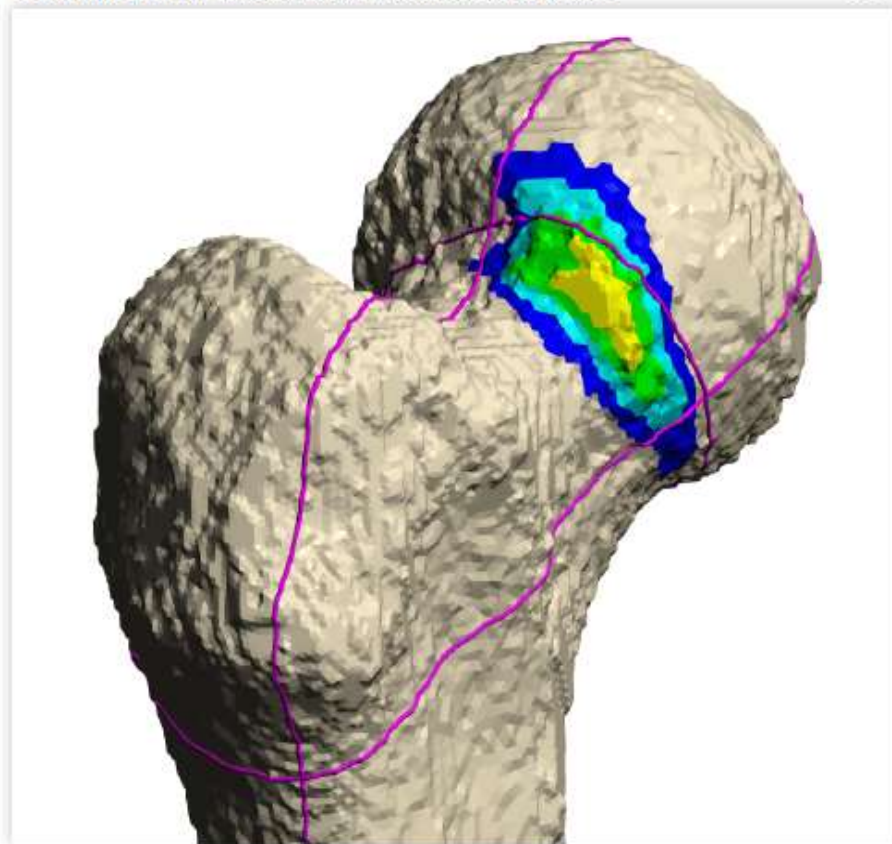
Acetabular coverage

undercoverage overcoverage



Putting it all together Hip map Femur

Rotatable image: Please click on the image to activate the 3D mode*



Cam depth

- 0-1 mm
- 2-3 mm
- 1-2 mm
- >3 mm



potential instability

Measurements

Femoral neck shaft angle

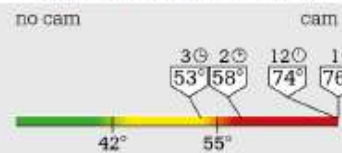


Femoral torsion



Alpha angle

At 12, 1, 2, and 3 o'clock:



Alpha angle indicated at clock-faces:

Clock-face	Alpha angle	Maximum depth
12	74°	0-1 mm
1	76°	>3 mm
2	58°	>3 mm
3	53°	1-2 mm

Lines

Clockfaces indicated at 12 and 3 o'clock.
Alpha angle of 55°

MRI indications

- Failure of non-operative treatment X 6 weeks
 - AVN, cartilage injuries
 - Rule out other pathology
- Limp (stress Fracture)
- Allows injection Test Results (arthrogram)
 - Sometimes required by insurance
 - Diagnostic and Therapeutic

MR Arthrogram Findings

CAM Triad:

- 1) Head-Neck Junction Abnormality
- 2) AnteroSuperior Chondral Abnormality
- 3) AnteroSuperior Labral Tear

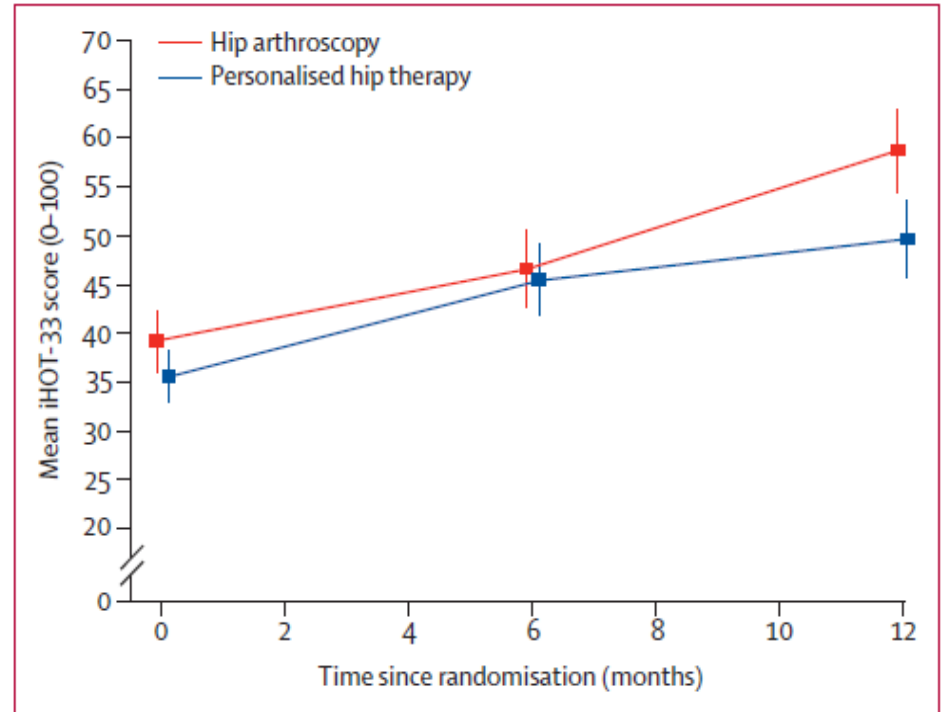


Treatment of FAI

- Non-operative
 - Activity Modification (Deep hip flexion)
 - Physical Therapy – Posterior chain
 - Injections
- Operative Treatment
 - Arthroscopy
 - Open Surgical Dislocation

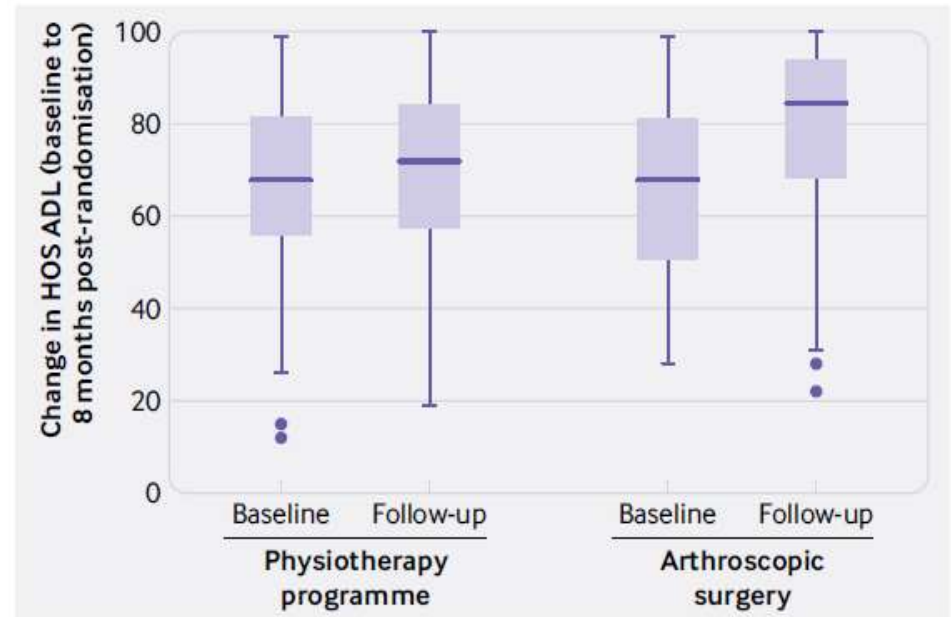
Treatment Comparison – FASHION Trial

- 350 subjects randomized to PT or Hip arthroscopy
 - Primary outcome iHOT-33
- Patients in the arthroscopy group improved significantly more (6-8 points)
- Cost and complications were higher in the arthroscopy group



Treatment Comparisons – FAIT Trial

- 200 subjects randomized to PT or Hip arthroscopy
 - Primary outcome HOS-ADL
- Both groups improved significantly
- Mean score was 10 points higher in arthroscopy group

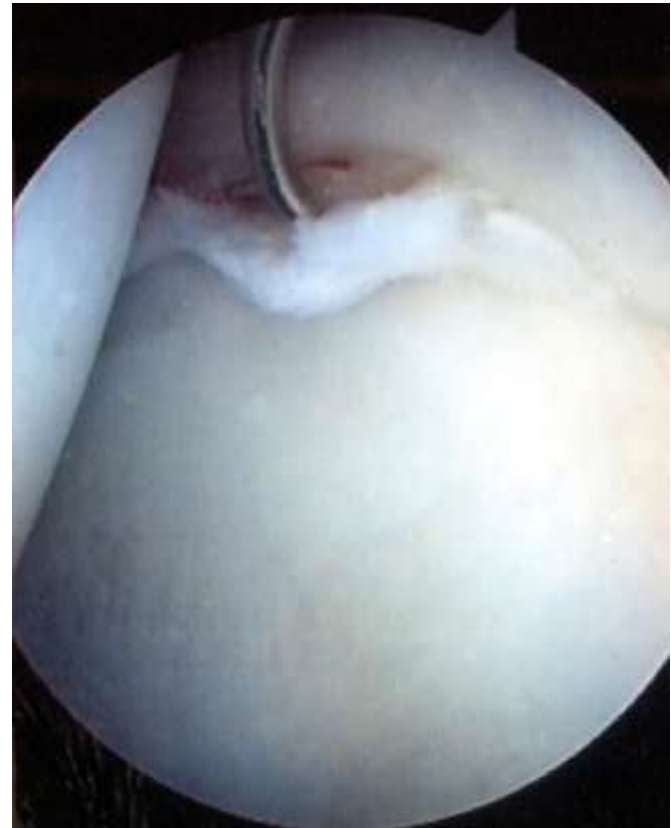


Arthroscopic Intervention

Labral Tear

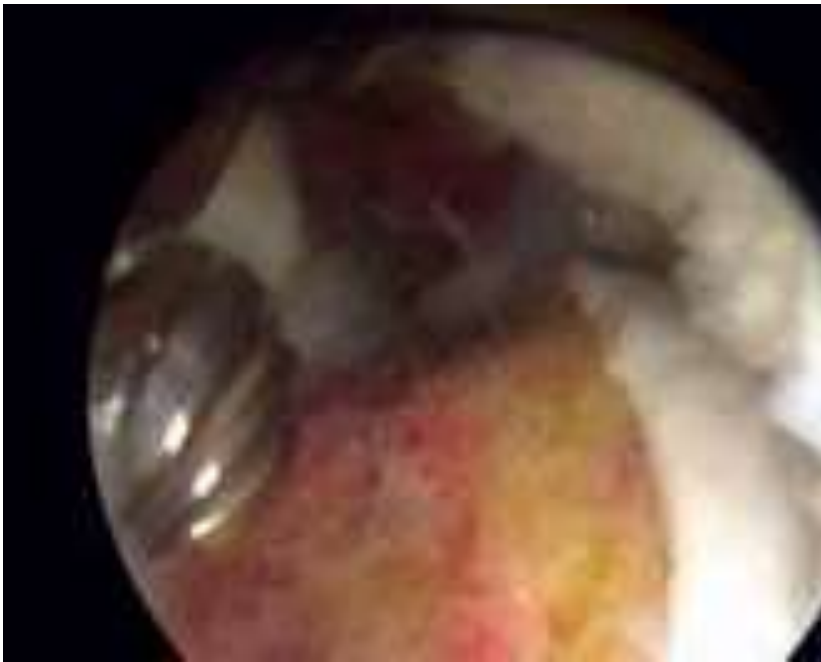


Chondral Injury



Arthroscopic Intervention

Femoral Osteoplasty



Labral Repair



Phase 1 – Protect Joint

0-3 weeks

- Protected weight bearing with crutches and brace
- CPM
- ROM 0-90, 30 int/ext, 30 ab/adduction
- No active open chain hip flexion
- Stationary bike w/out resistance
- Isometrics (quads, gluts)
- Prone hamstring curls
- Manual therapy to focus on TFL, IP

Phase 2 – Return of Function

3-16 weeks

- Wean patients off crutches (aquatic therapy)
- Single leg balance
- Graded increase in joint mobilization
- Scar mobilization
- Elliptical training
- Backward and lateral walking
- Single leg squat
- Planks and side planks
- Single leg bridges
- Weight bearing rotation motion
- Avoid agility drills

Phase 3 – Return to Sport

4-8 months

- Running (alter-G?)
- Cutting/agility
- Sports specific exercises

Outcomes - Athletes

- Recent meta-analysis of 823 athletes
- 88% returned to sport
- 85% returned to pre-injury level

Outcomes - Athletes

- Recent review of return to sport in 200 professional athletes
- 86% returned to sports at an average of 7.1 ± 4.1 months
- NHL players played fewer games and had a performance drop-off after surgery
- No difference in RTS in NFL, MLB, NBA

Summary

- FAIS is a common cause of hip pain in athletes
- 95% of the workup is based upon H&P, exam, and Xrays
- MRA indicated for failure of conservative treatment
 - Consider 3D CT to fully understand pathology
- Good level 1 evidence to support hip arthroscopy
- Return to sport rates are high

Thank you!