

Current Concepts In The Athlete's Hip

Are we really preserving the joint?

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Disclosures

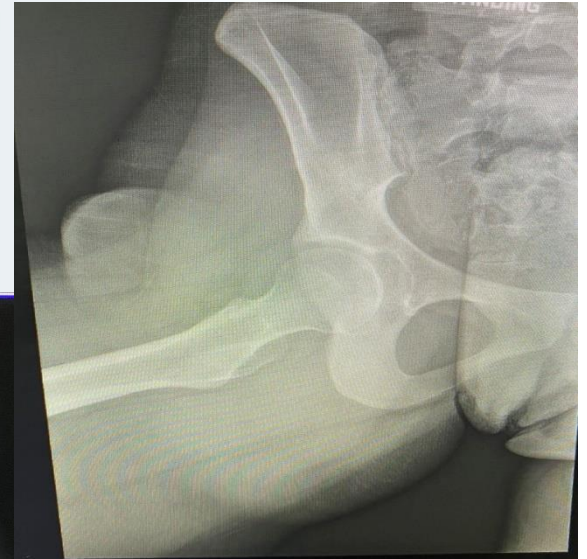
Journal of Arthroscopy: Editorial Board

Case

- 17 y/o Female
- Competitive Dancer
- History of previous bilateral hip arthroscopy 2017. Without resolution of pre-operative pain. Unable to return to sport.
- PE:
- Beighton Score: 9
- + FADIR, - spring back, + Subspine
- Resolution of pain with diagnostic injection. Failed 6 months of rest from sport and PT

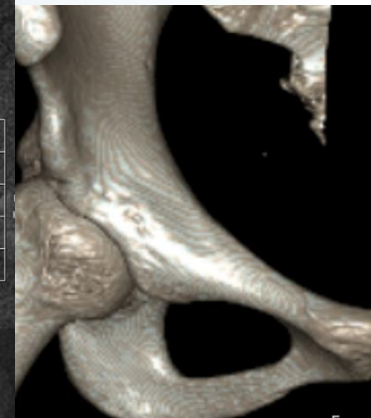
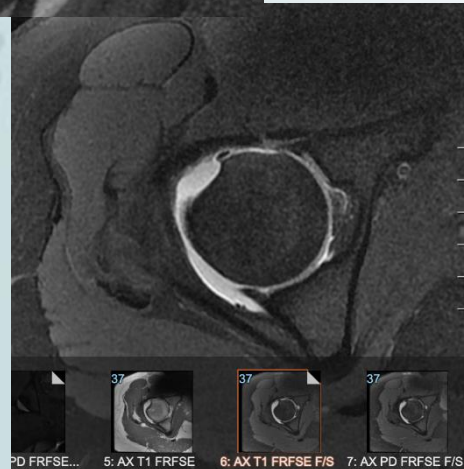
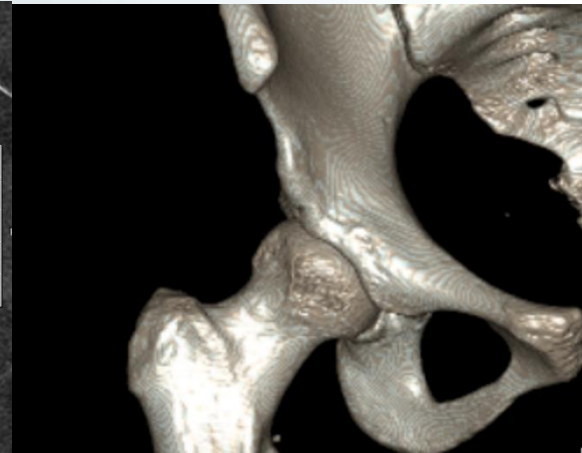
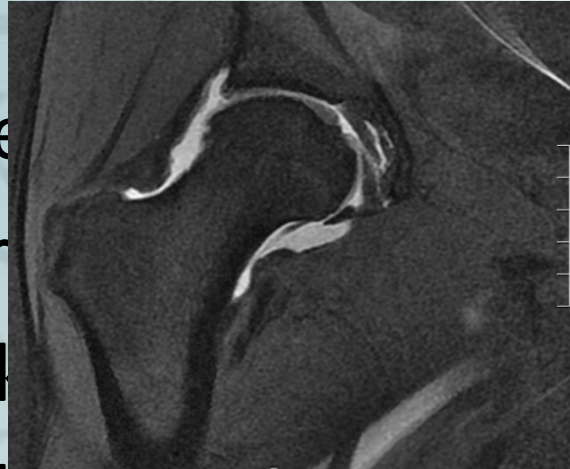
Imaging

- Tonnis 0
- LCEA: 16
- ACEA: 17
- TA: 18



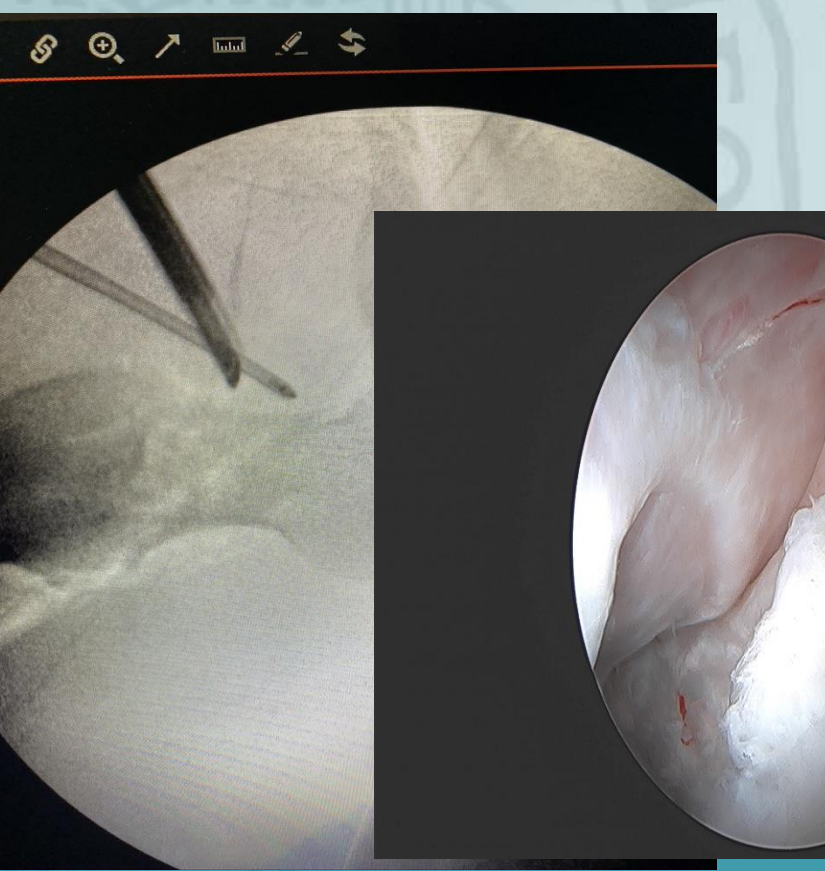
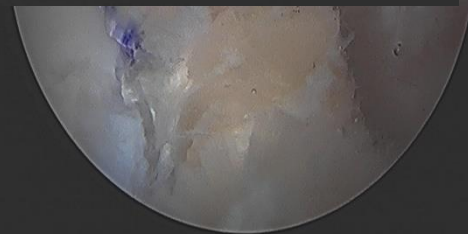
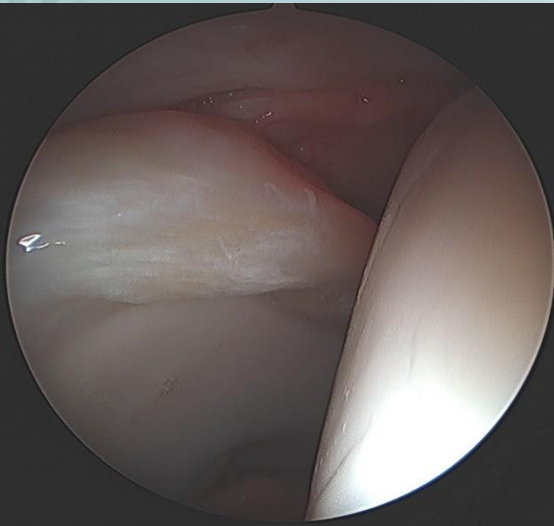
MRI/CT

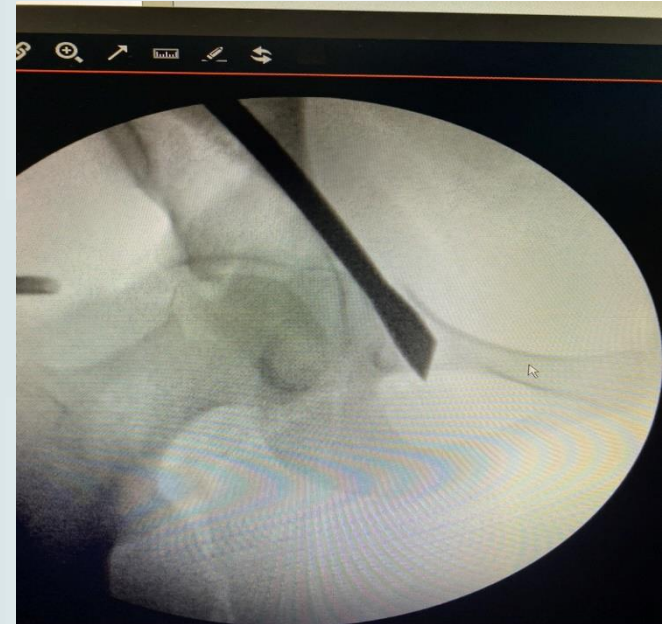
- FNV : 13 de
- Acetabular
 - 1 o'clock
 - 2 o'clock: 9
 - 3 o'clock: 13

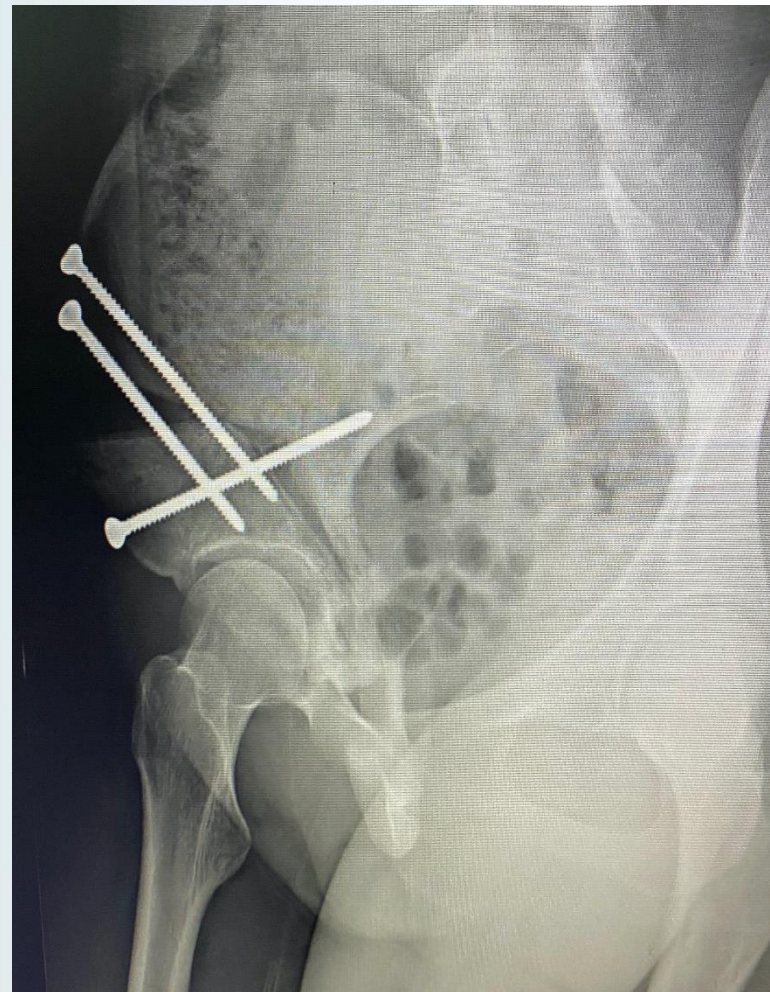
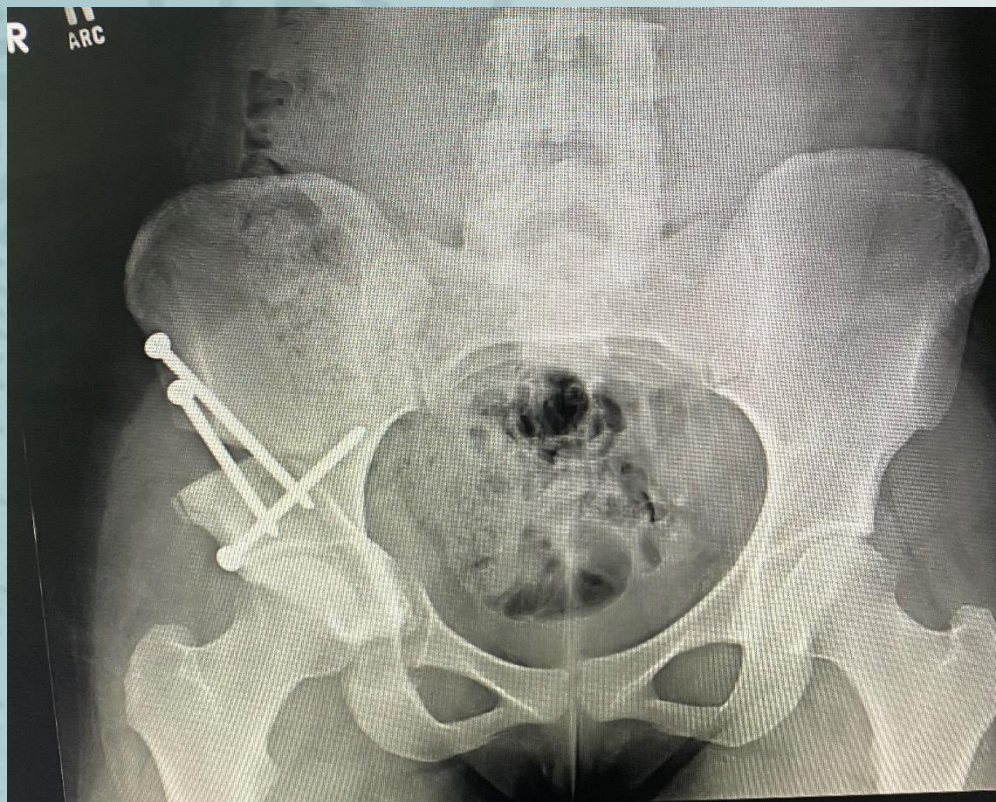


How to treat this patient?

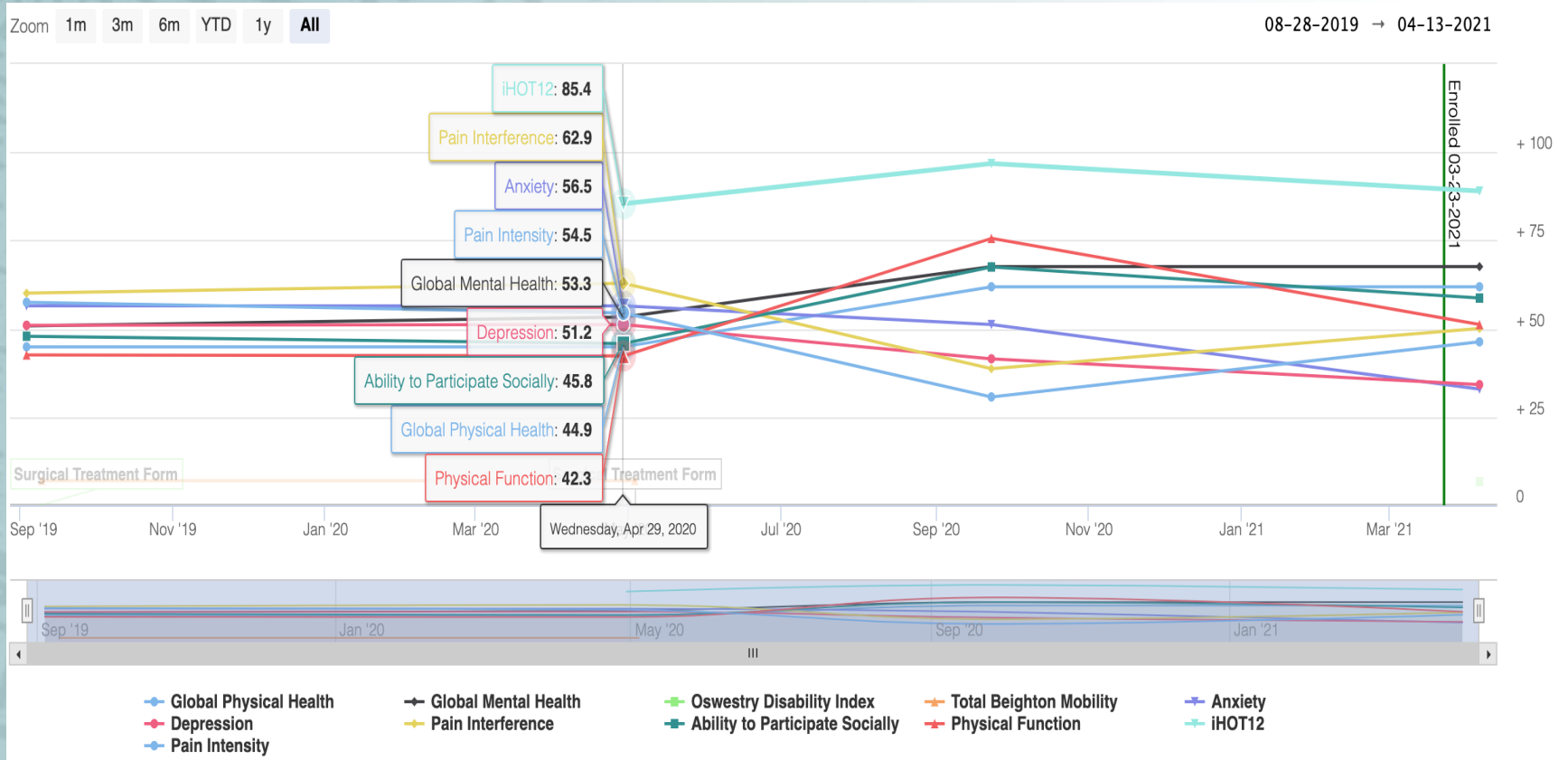
- What do we know?
- What can we resolve?
- What can't we change?





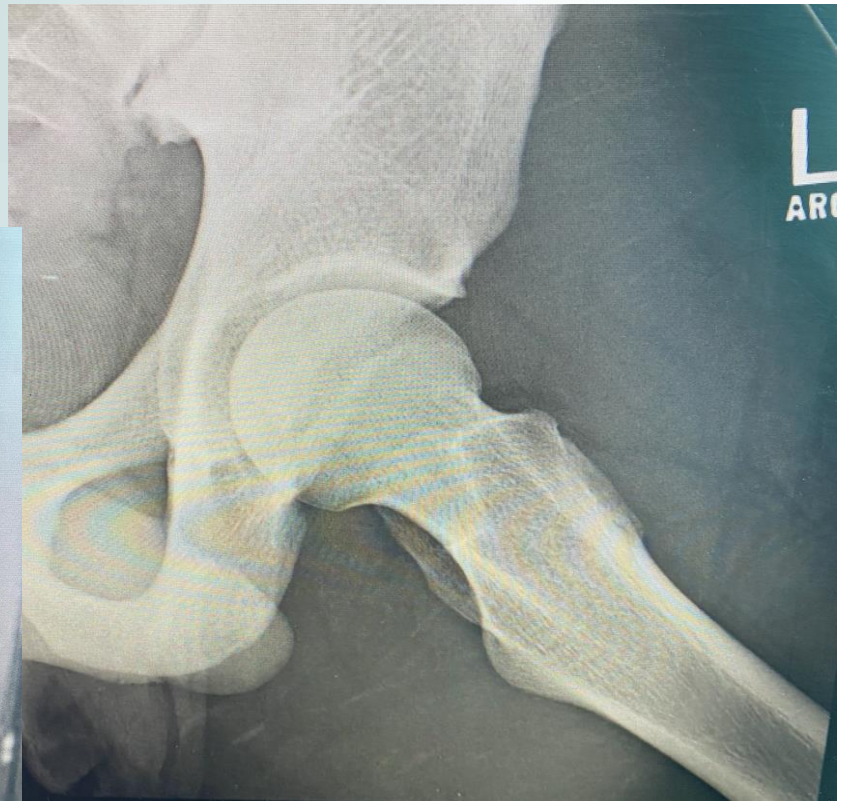


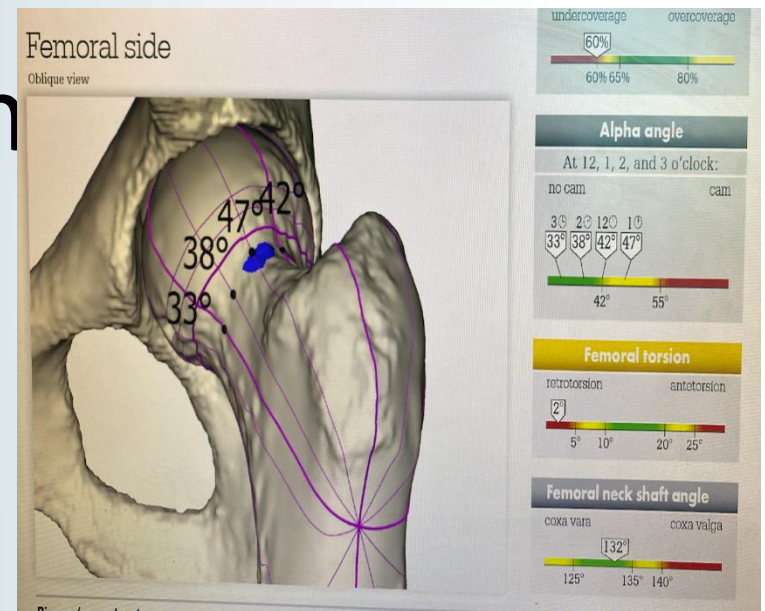
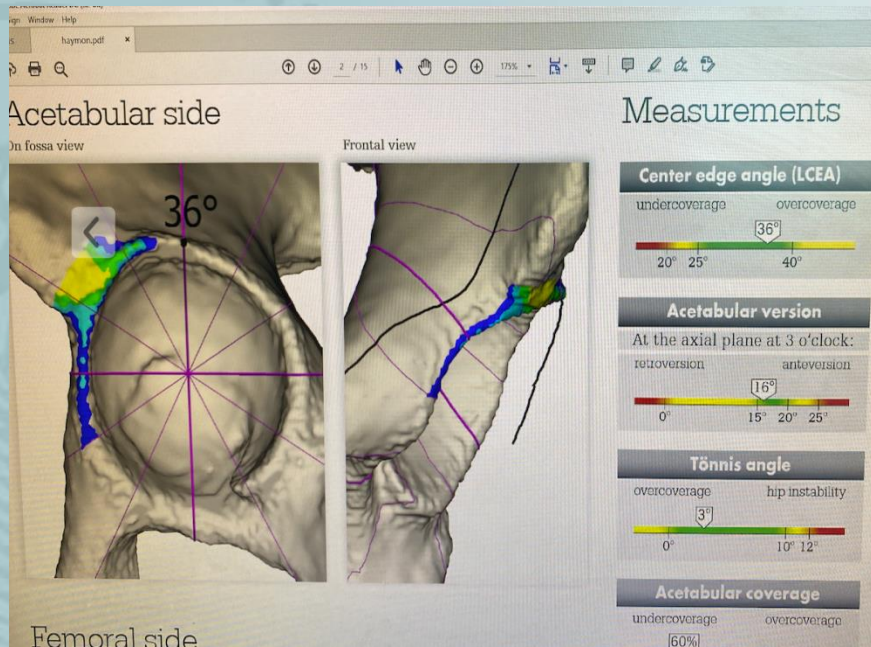
Outcome?



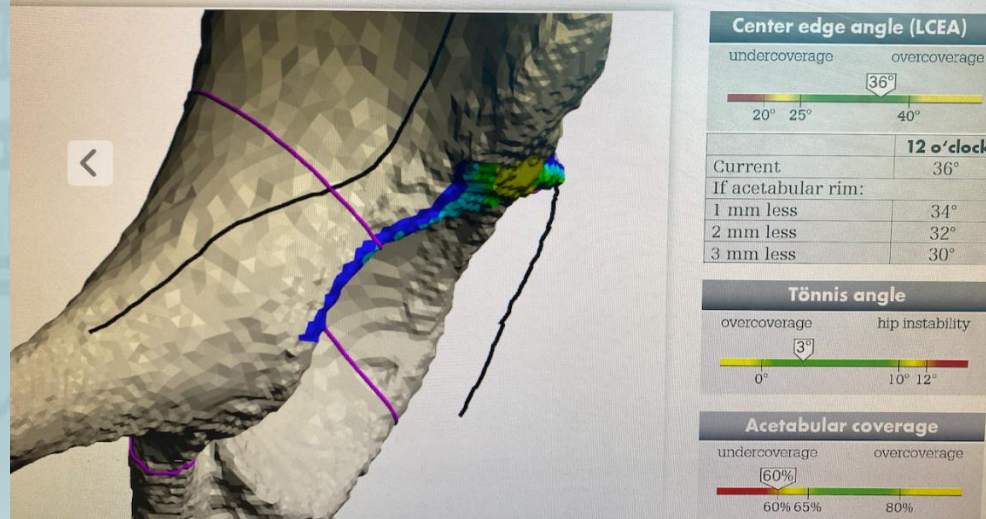
Case 2

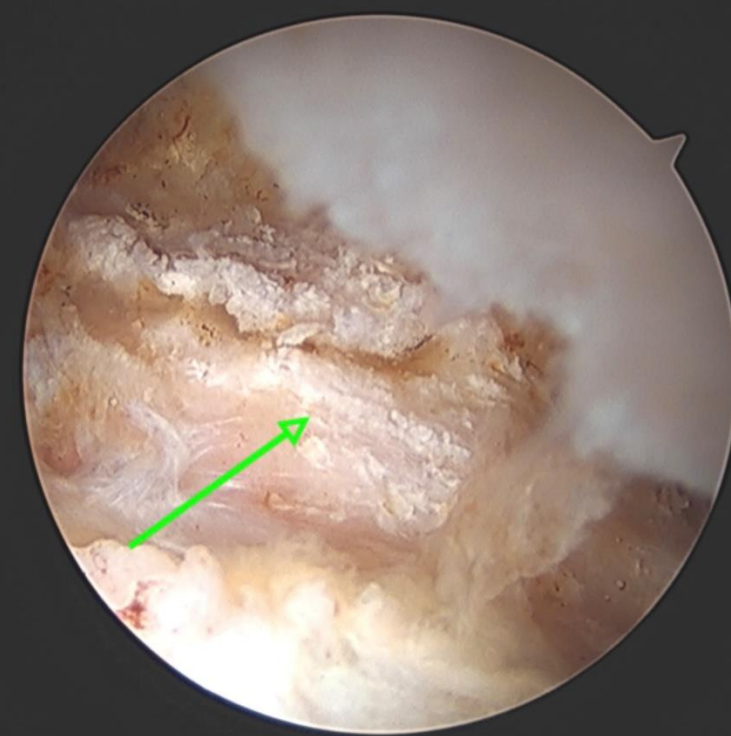
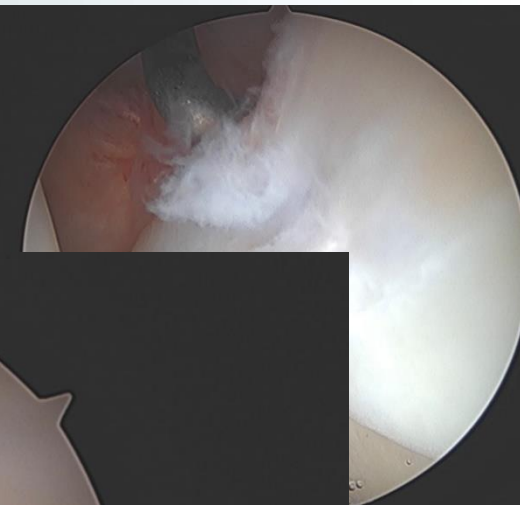
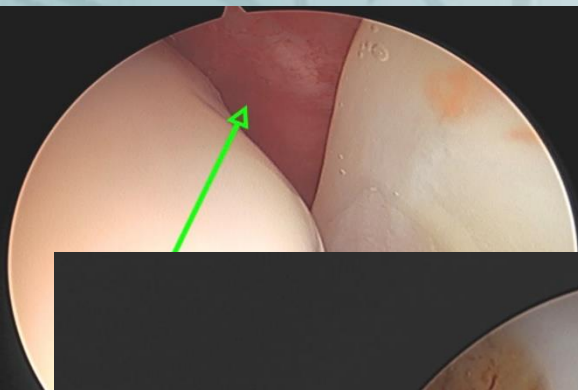
- 19 y/o Male
- Football
- Defensive Back at Arizona, Division I
- 10 months of chronic left hip pain
- Failed: PT, Shut down, Injection
- Presented for 2nd Opinion





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





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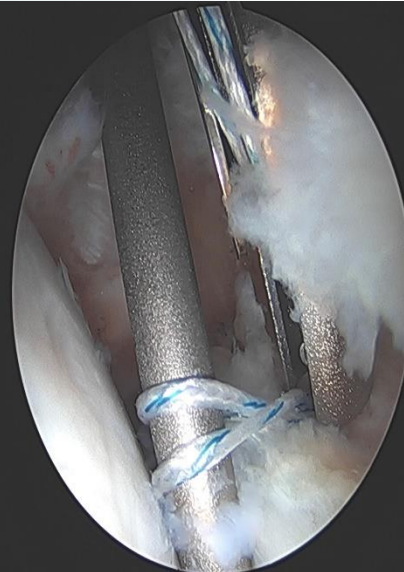
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PINCER

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ACETABULOPLASTY

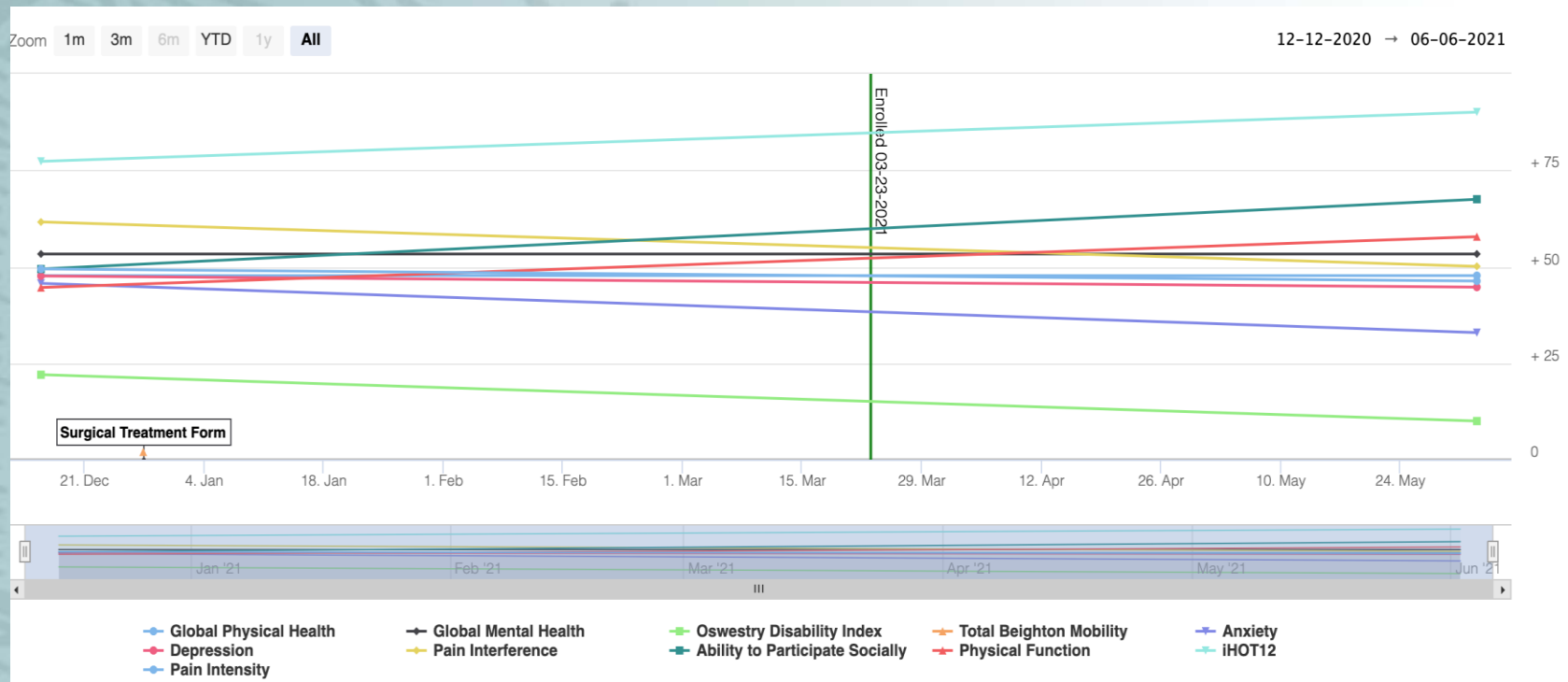


LABRAL REPAIR



FEMORAL NECK OSTEOPLASTY

How Did He Do?



Why the concern?



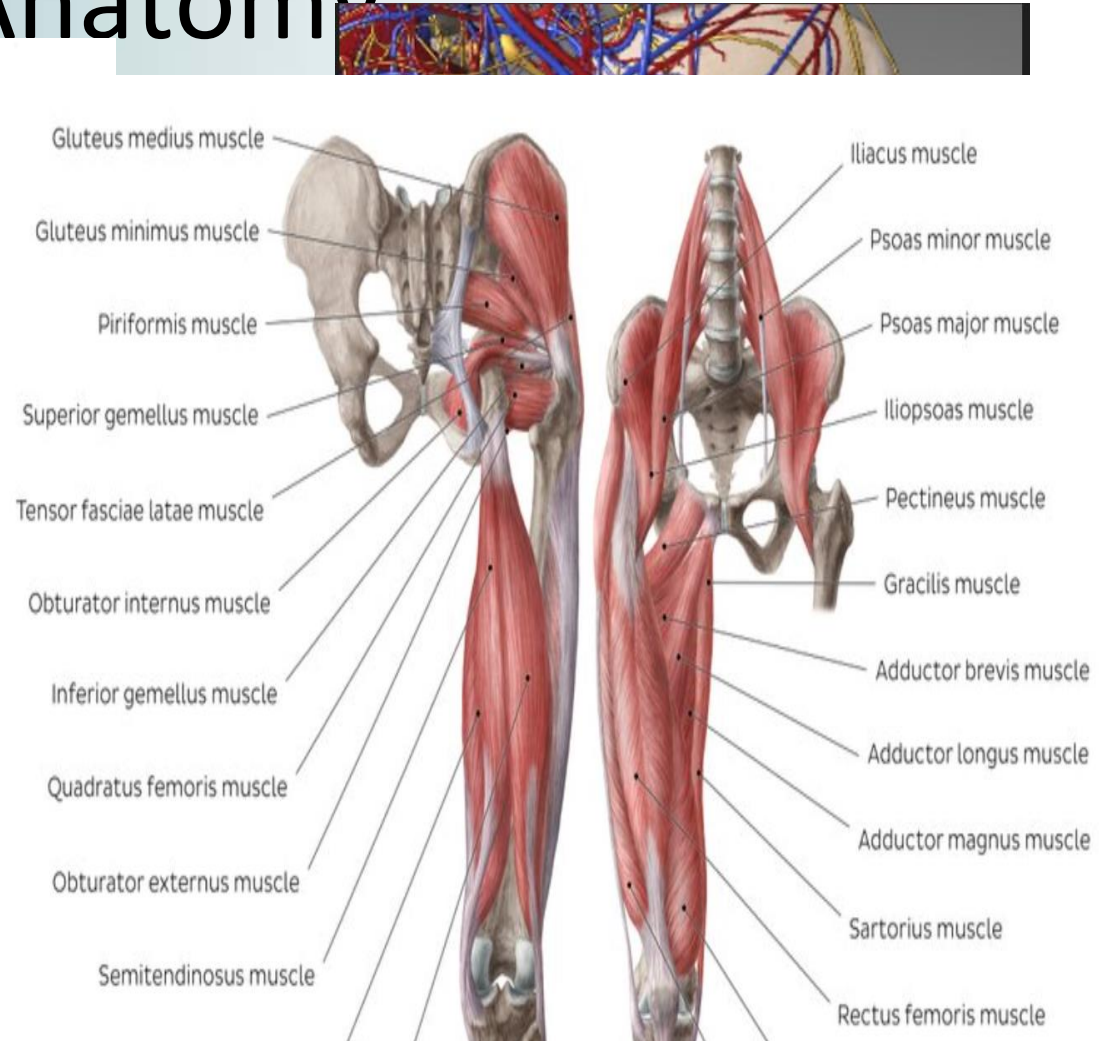
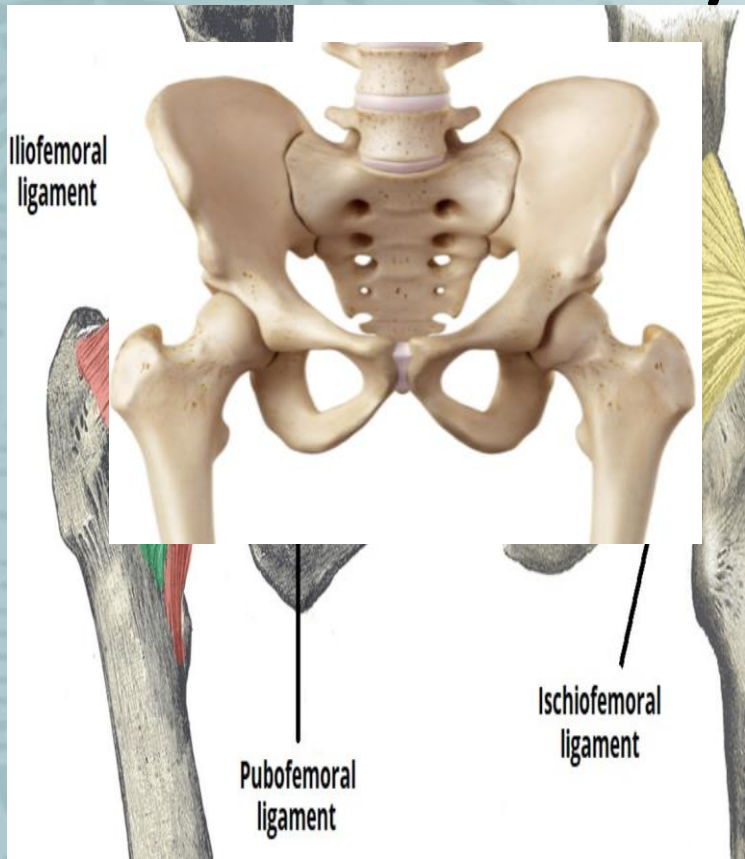
Importance

- Athletes engage in supra-physiologic ranges of motion
- Growing evidence that symptomatic Impingement leads to intra-articular damage and early-onset osteoarthritis
- Untreated Dysplasia
 - Symptoms usually do not manifest until adulthood
- Increased awareness leading to recognition in pediatric and adolescent population
- Goal is to preserve native hip and potentially decrease the incidence of symptoms, and return to play

Objectives

- Anatomy and Pathophysiology
- Femoral Acetabular Impingement (FAI) syndrome
- Current Concepts in Management
- Outcomes and Return to Sports (RTS)
- Dysplasia
- Treatment options
- Long term and RTS Outcomes

Anatomy





Femoral Acetabular Impingement

Femoral Acetabular Impingement

.Definition: descriptive diagnosis by a combination of clinical signs, symptoms and pathology

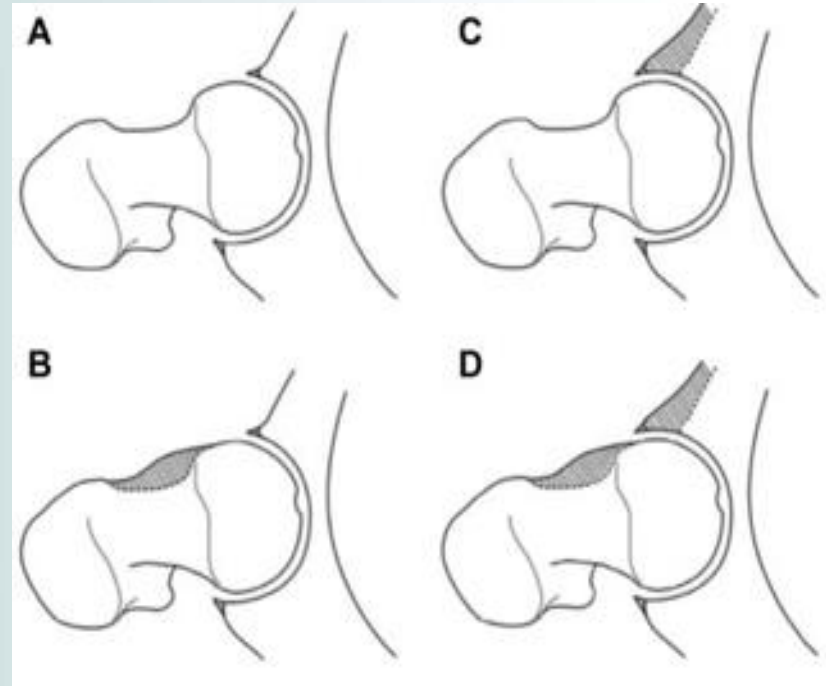
- Pathologic contact between femoral head and acetabulum due to abnormal femoral head-neck junction (cam) and/or excessive anterolateral coverage of head (pincer)

- 3 specific mechanisms

- cam
- pincer
- Mixed

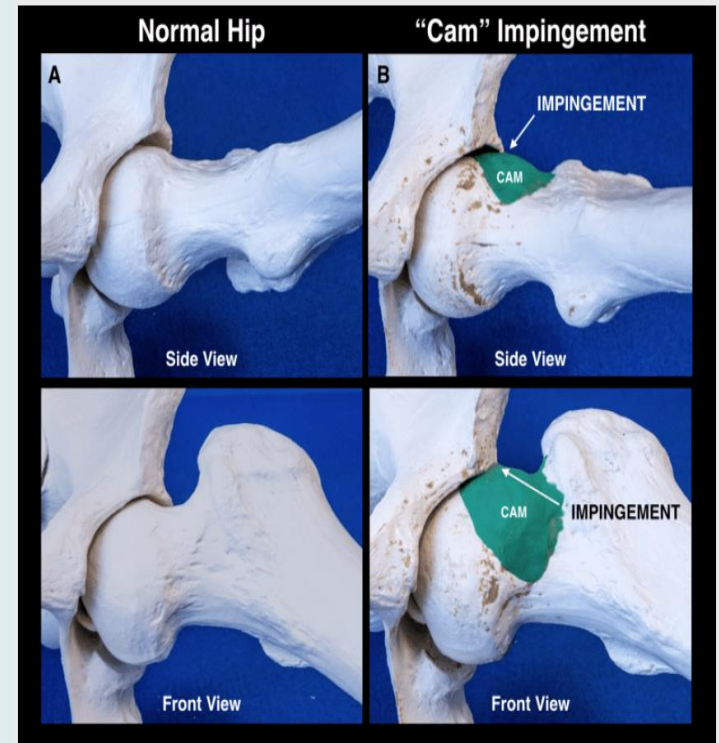
- Bimodal distribution

- middle average 43 y/o 2:1 males
- Younger average 20y/o 3:1 male

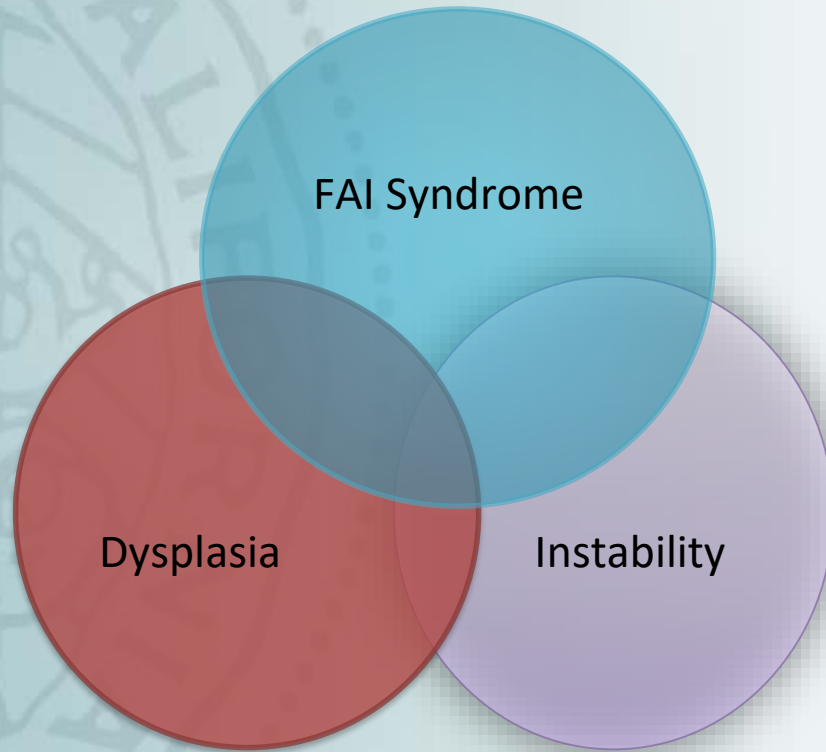


Impingement Development

- • Abnormal contact between the femur and acetabulum
- Little evidence of genetic link
- • Increased incidence in athletes with repetitive end ROM
- • cam lesion starts to develop as early 13-16 years old during physeal closure



What's New???



Prevalence of FAI?

Arthroscopy. 2015 Jan 28. pii: S0749-8063(14)00968-2. doi: 10.1016/j.arthro.2014.11.042. [Epub ahead of print]

Prevalence of Femoroacetabular Impingement Imaging Findings in Asymptomatic Volunteers: A Systematic Review.

Frank JM¹, Harris JD², Erickson BJ², Slikker W 3rd², Bush-Joseph CA², Salata MJ², Nho SJ².

- Systematic Review of 2114 asymptomatic hips
- 57 % male
- 43 % female
- Mean age 25
- cam/pincer defined by X-ray
- Overall prevalence of cam lesion 37%
 - 54% of all athletes
- Pincer Lesion 67%
- Pinpoints need for Subjective/Clinical exam and correlation of radiographs

Physical Exam

Hip pain characteristics

- ‘C’ sign
- Groin
- Worse with:
 - start-up activities*
 - prolonged sitting (chair or car)*
 - prolonged activity or sports*
 - uphill, putting on shoes/socks,*
 - getting in and out of car*
- Can be ATYPICAL!
- Mechanism – nonspecific
- Associated symptoms
 - Mechanical symptoms : catching or locking
 - Instability
 - Stiffness



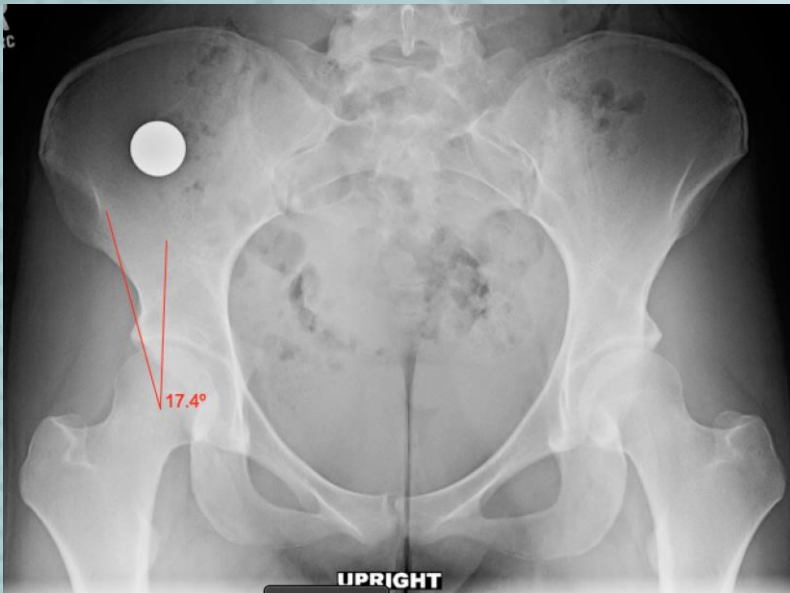
Combining results from hip impingement and range of motion tests can increase diagnostic accuracy in patients with FAI syndrome

- 81 patients with 2 observers. Looking at accuracy of PE tests.

Results: Anterior impingement test (AIMT), FADIR test and FABER test showed kappa values above 0.6. All passive hip ROM, except extension, had kappa values above 0.4. AIMT and FADIR showed the highest sensitivity, i.e., 80%, with a specificity of 26% and 25%, respectively. Passive hip ROM in internal rotation with neutral hip position had a sensitivity of 29% and a specificity of 94%.

Conclusion: The AIMT, FADIR and FABER tests were reliable between two experienced raters, while results from different raters for hip ROM should be interpreted with caution. The AIMT and FADIR test can only be used to rule out patients with FAI syndrome, while evaluation of ROM in internal rotation with neutral position may be more suitable to rule in patients with FAI syndrome.

Imaging



- First Line in making good decisions
- Standard Series:
 - Standing AP Pelvis
 - Coccyx centered on pubis and 1-2 cm superior
 - False Profile View
 - Modified Dunn Lateral
- LCEA
 - <18-20 - Dysplasia
 - 20-25 - Boarderline
 - >25 - “Normal”



Advanced Imaging

- Non-contrast 3.0T MRI for all unless prior surgery

MRI Arthrogram

- (70-90% effective) (*MRI will always show a labral tear if arthritis is present on plain XR*)

- *Technical proficiency varies*
- *Wide variation in interpretation skills*

- *Labral tears commonly asymptomatic*

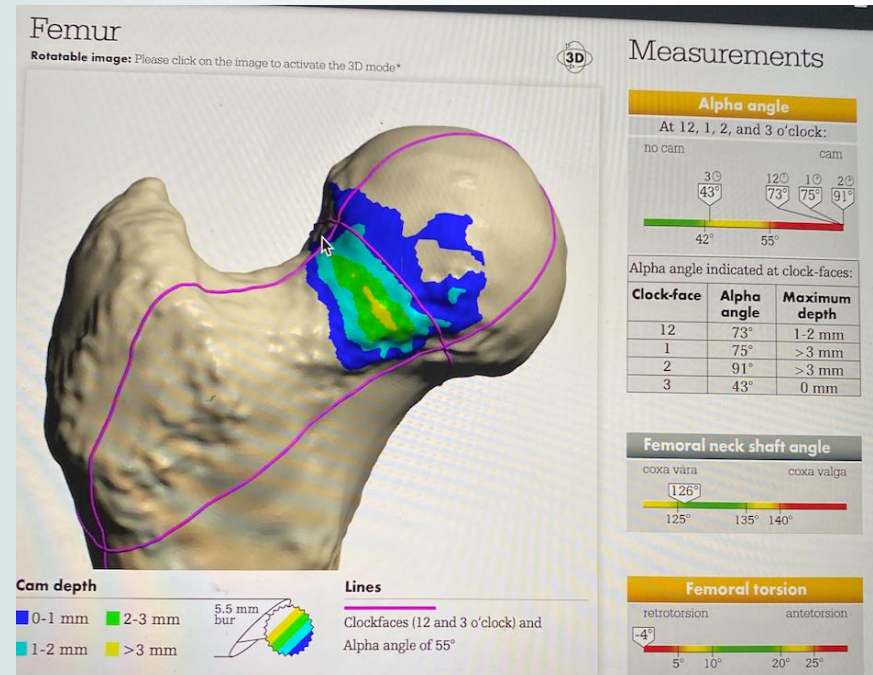
- Philippon – 67% teenage athletes (AOSSM 2012)

- Parvisi- 41% asymptomatic hips (CORR 2019)



3D Analysis and Version

- Obtained on ALL patients for Arthroscopy or Osteotomy
- Helpful in analyzing the femoral head and acetabular morphology, as well as location of labral tears
- Guides treatment using hip arthroscopy



Preoperative Three-dimensional CT Predicts Intraoperative Findings in Hip Arthroscopy

Benton E. Heyworth MD, Mark M. Dolan MD,
Joseph T. Nguyen MPH, Neal C. Chen MD,
Bryan T. Kelly MD

New Terminology - Warwick Agreement

Femoroacetabular Impingement Syndrome

Reference: The 2016 Warwick Agreement by DR Griffin et al. BJSM 2016

Designed by @YLMsPortScience

DEFINITION

FAI syndrome is a motion-related clinical disorder of the hip with a triad of symptoms, clinical signs, and imaging findings. It represents a symptomatic premature contact between the proximal femur and the acetabulum



DIAGNOSIS

FAI SYNDROME = **SYMPTOMS** + **CLINICAL SIGNS** + **DIAGNOSTIC IMAGING**

SYMPTOMS

- 1 Motion or position related hip or groin pain
- 2 Sometimes back, buttock or thigh pain
- 3 Sometimes clicking, catching, locking, stiffness, restricted range of motion or giving way



CLINICAL SIGNS

- 1 Hip impingement tests should reproduce the patients symptoms
- 2 Often there is limited range of motion



Non-operative Treatment Correcting Neuromuscular Imbalances

Nonoperative Treatment

Control the inflammation first

•My approach – Three Pillars:

1. Control the inflammation

•Oral NSAID or Corticosteroid injection

2. Stop aggravating activities for 4 weeks

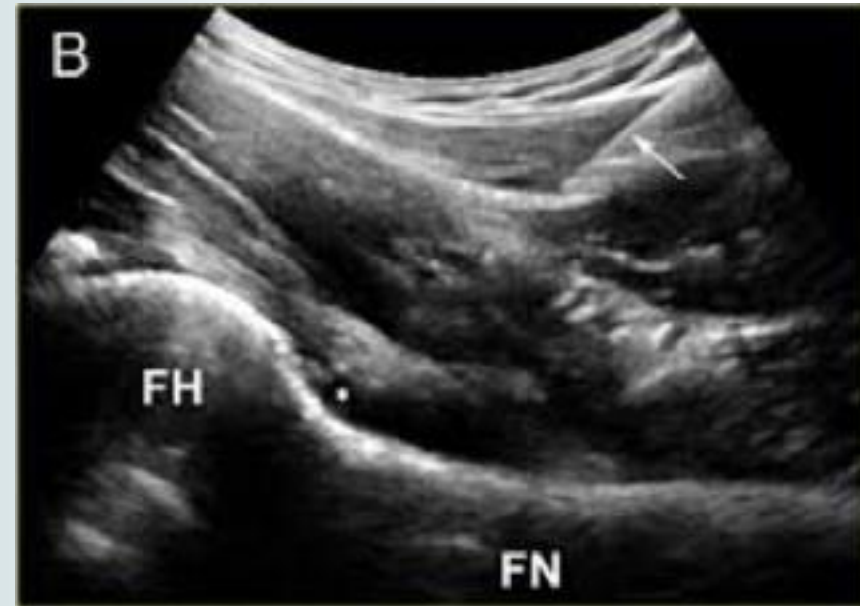
3. Start PT one week after anti-inflammatory treatment

•All prior to MRI unless concern for stress fracture



Injectons

- Confirm the Pathology
- Intra-articular injection of **local anesthetic (Ropivacaine)** +/- corticosteroid
- Positive Test
 - 90% accuracy of determining intra-articular etiology of hip pain
- Patients with intra-articular pathology have improved outcomes with arthroscopy
- Selective Injections
 - Trochanteric, SI joint, Spine



Who is likely to succeed without surgery?

Non-operative

- Gross muscular imbalances
- Mild bony deformities
- Psoas tendonitis

Surgical

- Athletes whose sport requires end-range motion
- Large bony deformities
 - Classic pistol grip cam
 - Large crossover

Nonoperative Management of Femoroacetabular Impingement: A Prospective Study.

Pennock AT^{1,2,3}, Bomar JD¹, Johnson KP^{1,2}, Randich K^{1,2}, Upasani VV^{1,3}.

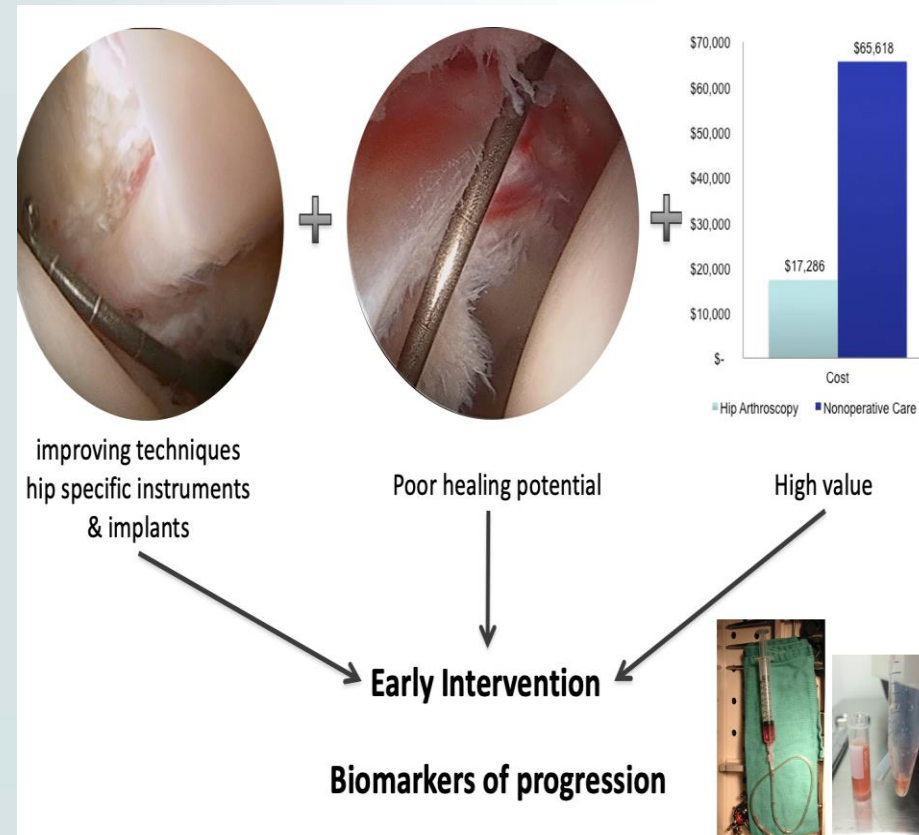
- Non-operative FAI syndrome study
- Prospective Level 2
- 76 hips (mean age 15.4 yrs)
- Followed for mean 26.8 months
- 65 (70%) hips managed with rest, PT and activity modification alone
- 11 (12%) required a steroid injection without surgery
- 17 (18%) required Arthroscopy

82% returned to activity with non-op management!!!



Socio Economic Impact

- Cost of impaired access higher than overutilization
- Value of joint preservation in young patients
- Shifting the economic analysis frame
 - From cost effective to cost saving
 - MSK care as important societal investments



Ideal Patient for Hip Preservation Surgery

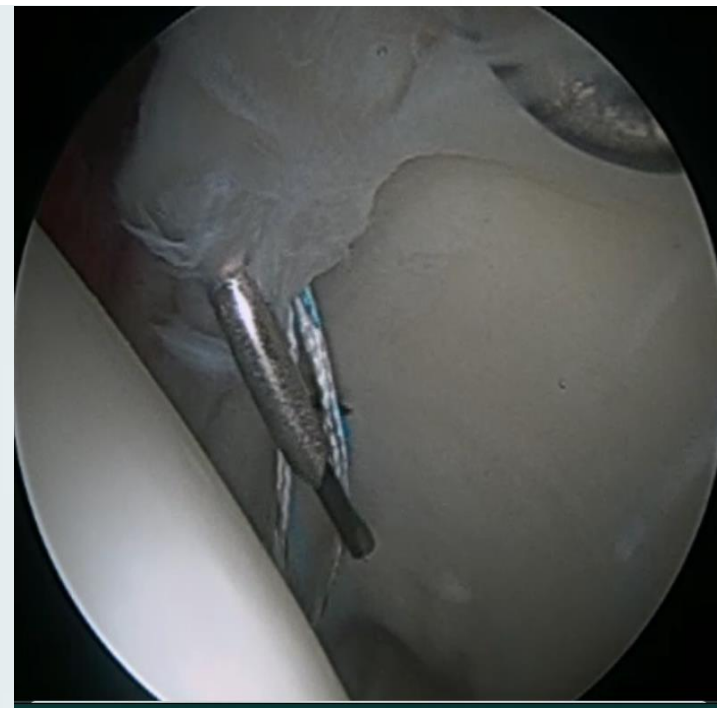
- Age 13-45 years
- Non-obese
- Confirm hip joint is source of pathology
- Minimal degenerative joint disease (joint space and Beck Grade)
- Ability and resources for postop rehab
- **Predictors of poor outcome:**
 - degenerative disease
 - Age

Hip arthroscopy versus best conservative care for the treatment of femoroacetabular impingement syndrome (UK FASHIoN): a multicentre randomised controlled trial

e

[Damian R Griffin](#), Prof, MPhil,^{a,b,*} [Edward J Dickenson](#), MBChB,^{a,b} [Peter D H Wall](#), PhD,^{a,b} [Felix Achana](#), PhD,^a [Jenny L Donovan](#), Prof, PhD,^c [James Griffin](#), MSc,^a [Rachel Hobson](#), BA,^a [Charles E Hutchinson](#), Prof, MD,^{a,b} [Marcus Jepson](#), PhD,^c [Nick R Parsons](#), PhD,^a [Stavros Petrou](#), Prof, PhD,^a [Alba Realpe](#), PhD,^{a,c} [Joanna Smith](#),^b [Nadine E Foster](#), Prof, DPhil,^d and FASHIoN Study Group, on behalf of the UK

- RCT level 1 study
- 348 enrollees
- 171 Hip Arthroscopy, 177 Personalized physical therapy
- Followed for 12 months, outcome measures iHOT-33
- PT group iHOT 35 - 49
- Hip Arthroscopy group 39-58
- Both met MCID with treatment
- Arthroscopy group fared better at 12 months.



Hip Arthroscopy

- Iatrogenic groin related complications are a concern in hip arthroscopy
 - Pudendal Nerve Injury 1.8-13%
 - Most iatrogenic nerve injuries have been reported to resolve by 9 months
 - Reported cases of permanent nerve damage from the perineal post



Traction – Risks & Complications		
Portal Access	Position / Traction	Others
<ul style="list-style-type: none">neurovascularlabrumcartilage	<ul style="list-style-type: none">soft tissuesnervesinsuffic. distractionloss of distraction	<ul style="list-style-type: none">swellingbleeding

Achieving Post-Free Distraction in Hip Arthroscopy With a Pink Pad Patient Positioning Device Using Standard Hip Distraction Tables

Robert C. Kollmorgen, D.O., Thomas Ellis, M.D., B.
Joshua D. Harris, M.D.

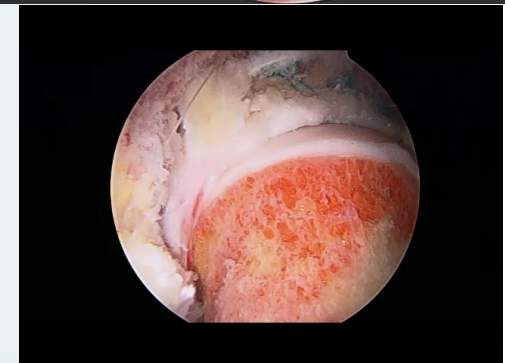
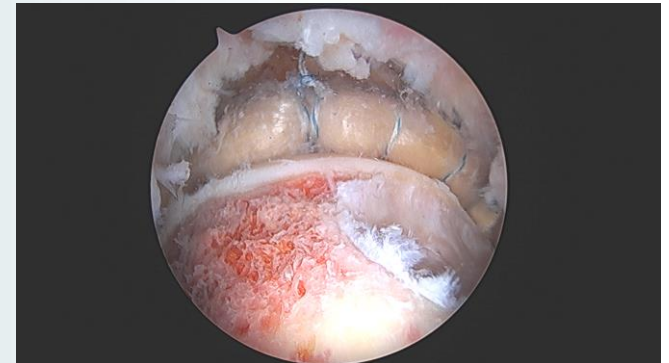
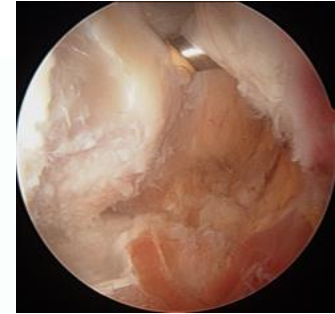
- Post
- mar
- surg
- 30
- rev
- ac
- No
- to l
- per



In Search of the Spherical Femoroplasty: Cam Overresection Leads to Inferior Functional Scores Before and After Revision Hip Arthroscopic Surgery.

Mansor Y^{1,2}, Perets I^{1,3}, Close MR¹, Mu BH¹, Domb BG^{1,4}.

- 130 hips June 2010-June 2014
- 3 Groups OR (15.4%), UR (12.3%), and Neutral (72.3%)
- Mean F/u 39 months
- mHHS scores lower in the OR vs UR group (66 vs 81)
- Conclusion:
 - Cam over resection by more than 5% on modified Dunn predicts inferior outcomes
 - OR >5% yields inferior outcomes after revision hip arthroscopy



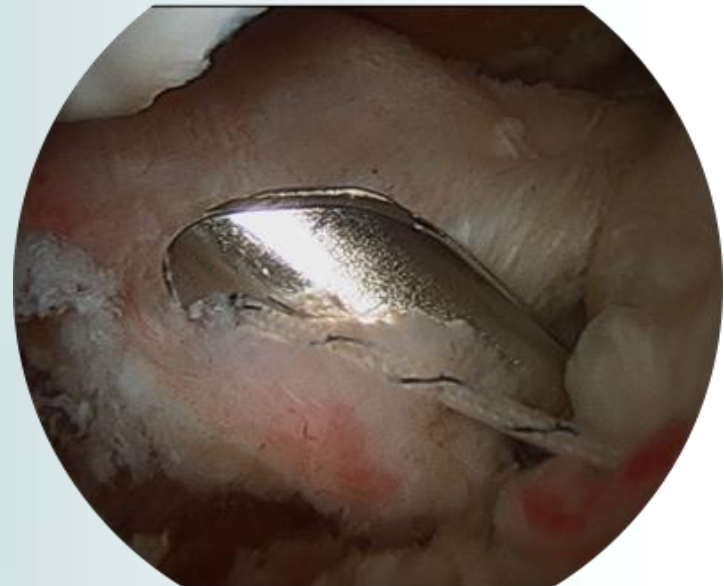
The Capsule

Arthroscopy. 2018 Jan;34(1):303-318. doi: 10.1016/j.arthro.2017.06.030. Epub 2017 Aug 31.

Should the Capsule Be Repaired or Plicated After Hip Arthroscopy for Labral Tears Associated With Femoroacetabular Impingement or Instability? A Systematic Review.

Ortiz-Declet V¹, Mu B¹, Chen AW¹, Litrenta J¹, Perets I¹, Yuen LC¹, Domb BG².

- Repair versus not?
- SR Level II - IV studies
- Increased outcomes of repair of capsulotomy
- REPAIR any instability, athlete, border line dysplasia, most patients
- Consider no repair in patients with inflammatory disorders



Arthroscopic Labral Treatment in Adolescents: Clinical Outcomes With Minimum 5-Year Follow-up.

Litrenta JM¹, Mu BH², Chen AW³, Perets I⁴, Ortiz-Declet V⁵, Domb BG⁶.

- Repair vs Debridement

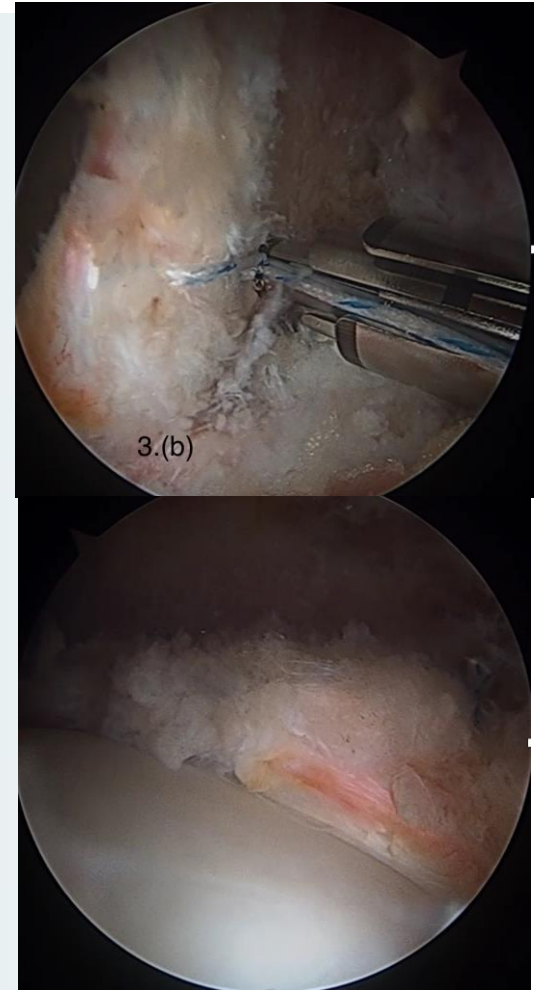
- 44 labral tears in 32 patients

- Average Age 16 years

- 5 year follow up (mHHS, HOS, SSS, NAMS, VAS, Satisfaction)

- 86% repair vs 14% debridement

- Significant improvement at 1 year and lasting at 5 years
- No failures (THA)



Meta-Analysis of the Surgical and Rehabilitative Outcomes of Hip Arthroscopy in Athletes With Femoroacetabular Impingement

Danielle Lovett-Carter ¹, Amritpal S Jawanda, Ailish Hannigan

Clin J Sport Med. 2020 Jul;30(4):404-411. doi: 10.1097/JSM.0000000000000623.

- Level IV SR, 15 studies 823 patients
- 88% of athletes RTS after HA
- 85% returned to same level
- Grade of articular cartilage damage dictated ability to return

> [Arthroscopy](#). 2019 May;35(5):1422-1428. doi: 10.1016/j.arthro.2018.10.153. Epub 2019 Apr 9.

Performance and Return to Sport After Hip Arthroscopy for Femoroacetabular Impingement in Professional Athletes Differs Between Sports

Robert A Jack 2nd ¹, Kyle R Sochacki ¹, Takashi Hirase ¹, Justin W Vickery ¹, Joshua D Harris ²

- RTS for professional athletes
- Defined as play 1 game following HA
- 200 athletes, 172 (86 %) RTS
- NFL, NBA, MLB no difference in RTS
- NHL played fewer years, fewer games and decreased performance following FAI surgery



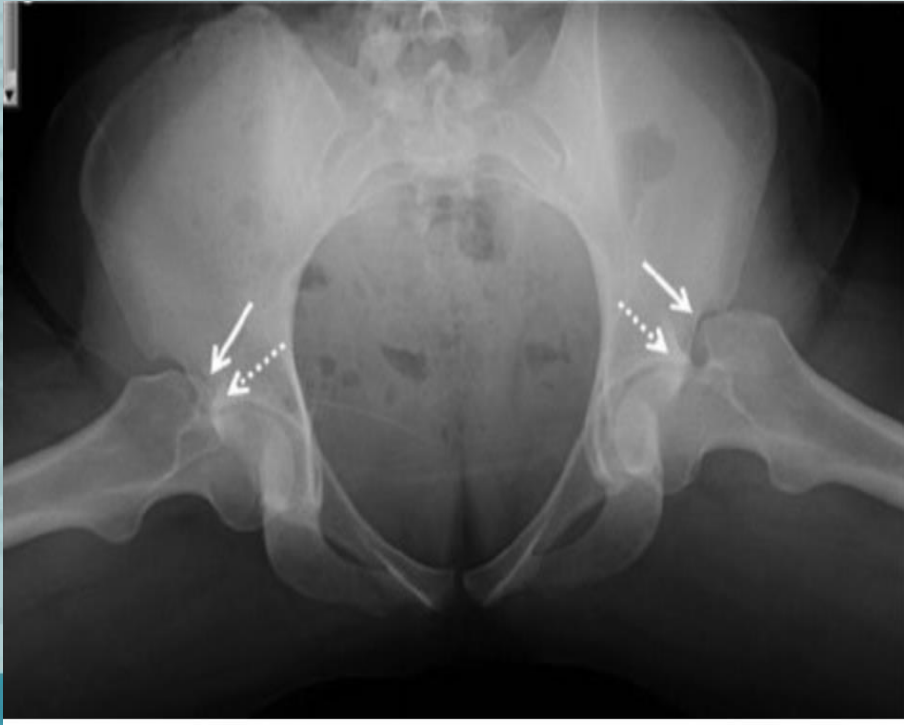
> [Am J Sports Med.](#) 2018 Jun;46(7):1661-1667. doi: 10.1177/0363546518765969.
Epub 2018 May 4.

Midterm Outcomes and Return to Sports Among Athletes Undergoing Hip Arthroscopy

Itay Perets ^{1 2}, Matthew J Craig ^{1 3}, Brian H Mu ¹, David R Maldonado ¹, Jody M Litrenta ⁴, Benjamin G Domb ^{1 5}

- Single surgeon study
- 5 years clinical outcome
- 66 patients
- 37 HS, 20 College, 9 Pro
- All Hip outcome scores improved and maintained at 5 years
- 80% RTS, 71% at Same level

Dysplasia



Pathophysiology

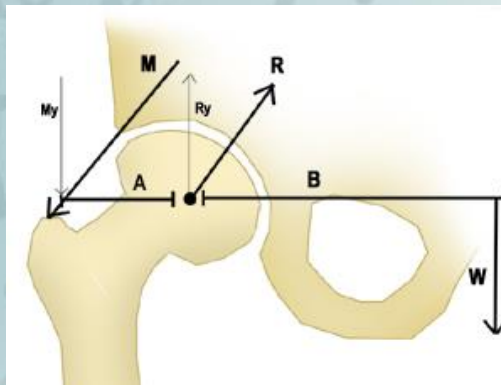
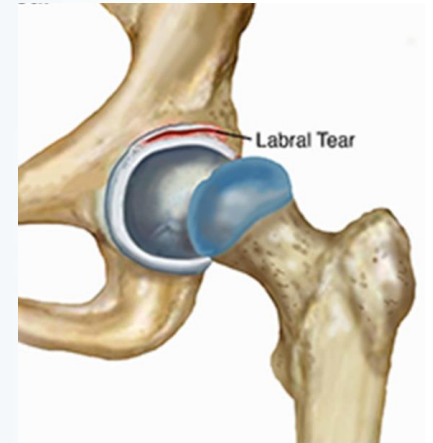
- Shallow acetabulum with accentuated sourcil
- lateralization of hip joint center
- decreased femoral head coverage
- **decreased weight bearing surface**
- •Don't forget, stress=force/**area**, therefore increased force seen at hip joint

$$\text{stress} = \frac{\text{force}}{\text{area}}$$



Pathophysiology

- •Lateralization of the hip joint leads to **increased joint reactive forces**
- –Just 2cm of lateralization causes an increase JRF of 75lbs each step in a 150lb patient
- •Increased loading of the acetabular rim, leads to labrum tears = PAIN!



Pathophysiology

Why does it matter?

–Early onset arthritis

– **The John Charnley Award: Redefining the Natural History of Osteoarthritis in Patients With Hip Dysplasia and Impingement**

– Cody C. Wyles BS, Mark J. Heidenreich MD, Jack Jeng MD, Dirk R. Larson MD, Robert T. Trousdale MD, Rafael J. Sierra MD

•Retrospective review of total joint registry that revealed DDH patients progressed to Tönnis grade 3 OA faster than patients with normal hips

morphology hips. The likelihood of radiographic degeneration was increased in patients with the following findings:
• femoral head lateralization > 8 mm, femoral head extrusion index > 0.20, acetabular depth-to-width index < 0.30, lateral center-edge angle < 25°, and Tönnis angle > 8°.

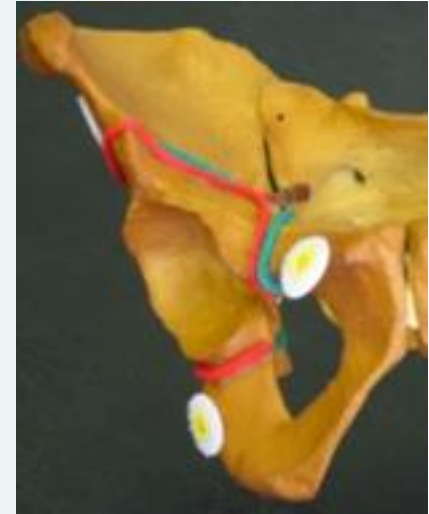
• It causes Pain and Instability

Goals

- Provide containment of an unstable joint
- Correct version
- Correction of Impingement
- Return to Sport

Bernese “GANZ” PAO

- Developed by Dr. Ganz
- Evolution of techniques (Ganz, 1988)
 - Salter: not significant enough correction for older patients
 - LeCoeur: “triple” osteotomy, but more medial than acetabulum, not enough control
 - Hopf: all osteotomies performed through single, Smith-Petersen incision
 - Tonnis/Wagner/Tagawa: more juxtaarticular, avoiding sacropelvic ligaments, more mobility, but still poor anteversion and mediolateral correction

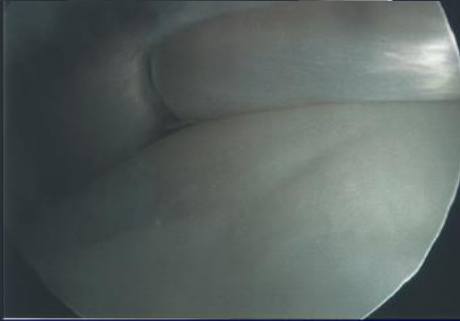
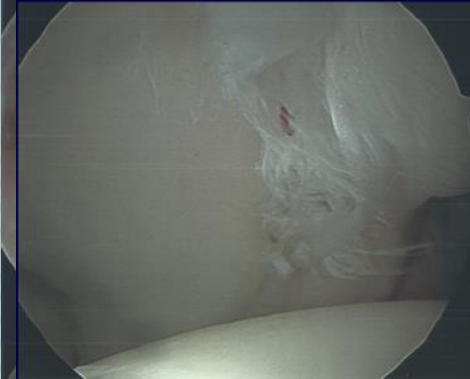


“Olson” Modification of Bernese PAO

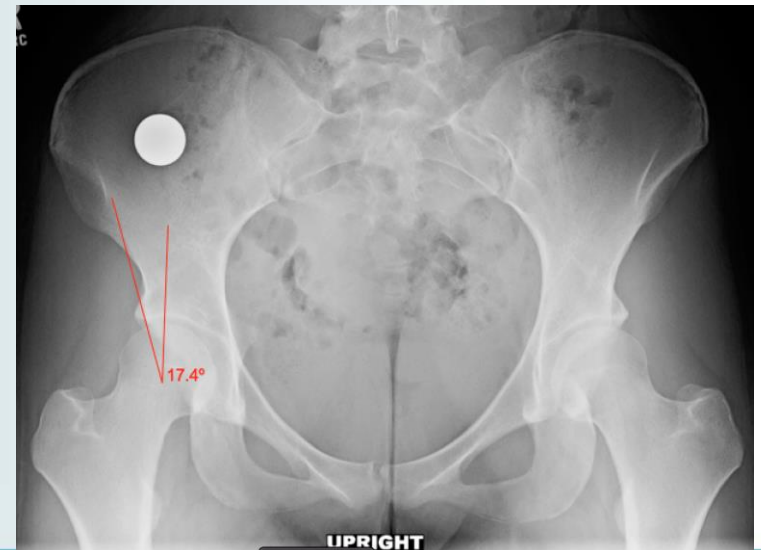
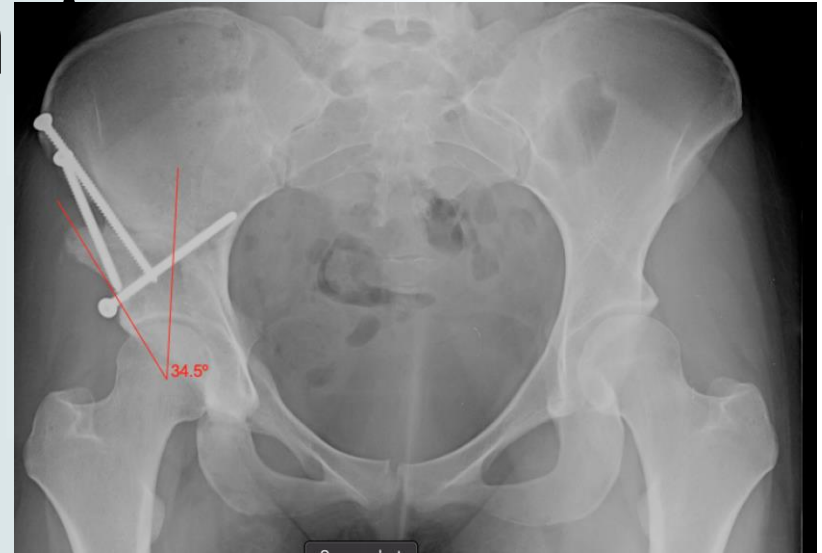
- Starts with Arthroscopy
 - Hip Arthroscopy
 - High incidence of labral pathology, AIIIS prominence, and CAM lesions
 - Rectus sparing single table PAO



Combined
Hip Arthroscopy
and PAO



a



Dysplasia

Am J Sports Med. 2016 Feb;44(2):447-53. doi: 10.1177/0363546515613068. Epub 2015 Nov 30.

Arthroscopic Management of Dysplastic Hip Deformities: Predictors of Success and Failures With Comparison to an Arthroscopic FAI Cohort.

Larson CM¹, Ross JR², Stone RM³, Samuelson KM³, Schelling EF³, Giveans MR³, Bedi A⁴.

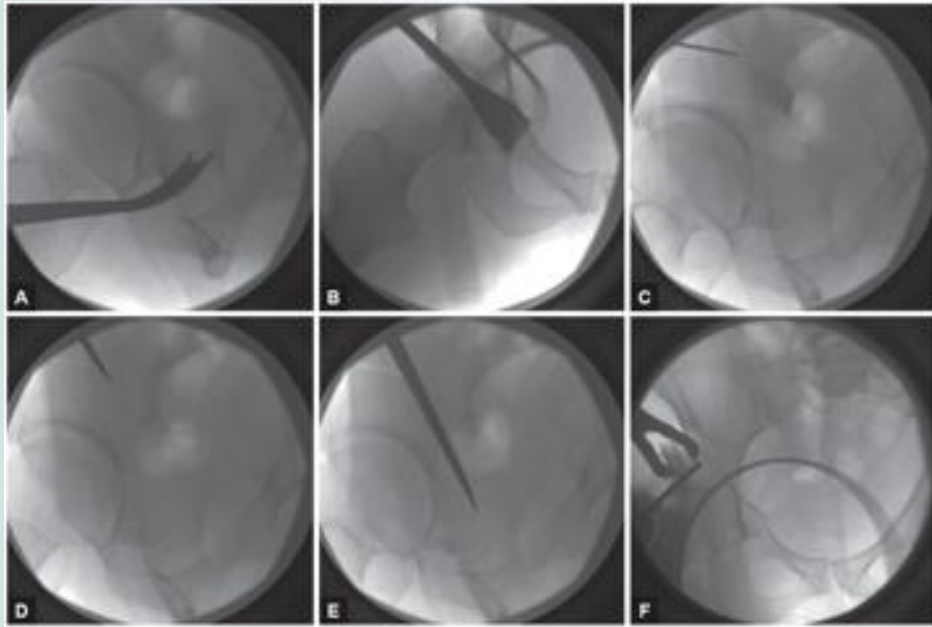
- Proceed with CAUTION!!
- Retrospective Level 3
- 88 dysplastic hips followed for 26 months compared to 231 non-dysplastic FAI
- Dysplastic Group 60% G/E results with 30% failure (mHHS <70, PAO or THA)
- FAI group: 81% G/E results, 10% failure

One-third of Hips After Periacetabular Osteotomy Survive 30 Years With Good Clinical Results, No Progression of Arthritis, or Conversion to THA.

Lerch TD¹, Steppacher SD², Liechti EF¹, Tannast M¹, Siebenrock KA¹.

Group out of Berne First 63 PAOs

- **30% Preserved at 30 years**
- **Failure associated with:**
 - **>Tonnins 2 pre op**
 - **under correction**
 - **post op retroversion**
 - **age >40**
 - **MHHS <70**



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

Ziran N¹, Varcadipane J, Kadri O, Ussef N, Kanim L, Foster A, Matta J.

- 20-year retrospective study
- 302 hips
- Ave age 32
- Follow up 2-27 years
- 10-year survivorship 86%
- 20-year 60%
- Risk of failure: Age > 40, Tonnis 2 hips

Outcomes of Hip Arthroscopy With Concomitant Periacetabular Osteotomy, Minimum 5-Year Follow-Up.

Maldonado DR¹, LaReau JM², Perets I³, Ortiz-Declet V⁴, Laseter JR¹, Lall AC¹, Domb BG⁵.

- 16 patients 5 year follow up
- 13 female; age 12-35
- Tonnis 1 pre op
- No progression of arthritis
- all maintained significant improvement in mHHS, HOS, VAS at 5 years
- Safe and effective



Yes But Do They Return To Snorts?

> [Am J Sports Med.](#) 2016 Jun;44(6):1573-81. doi: 10.1177/0363546516632743. Epub 2016 Mar 11.

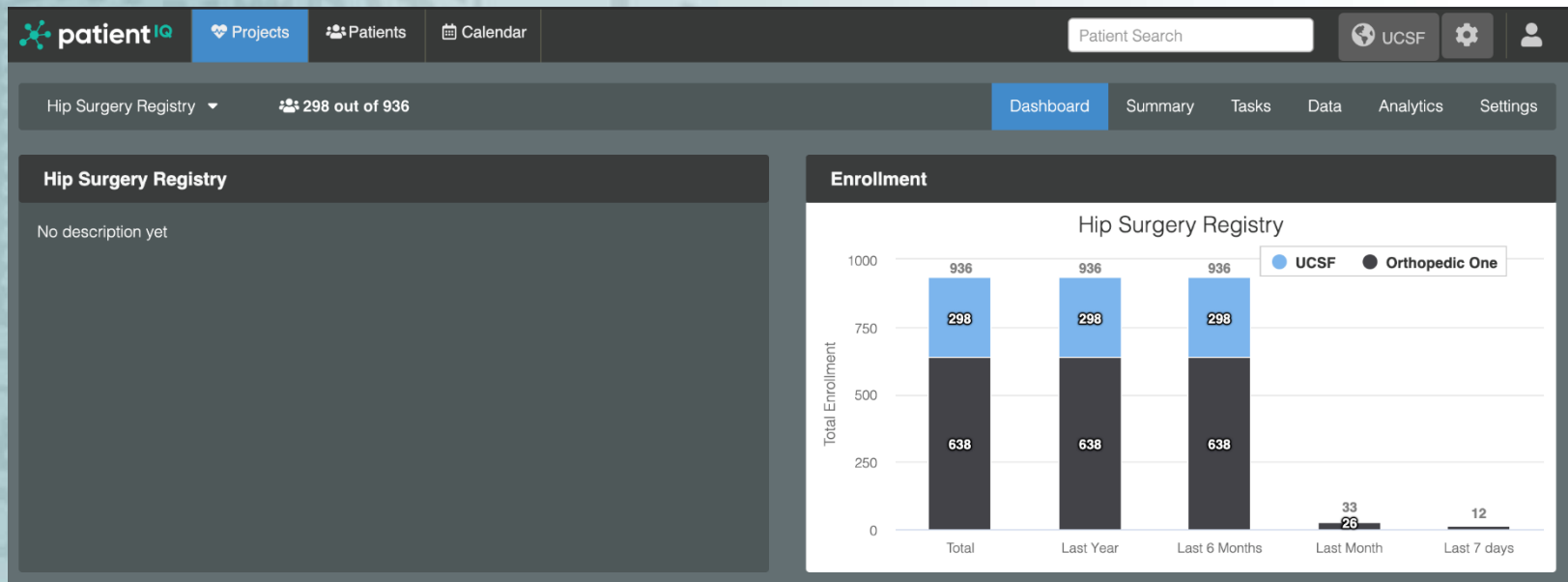
Return to Play After Periacetabular Osteotomy for Treatment of Acetabular Dysplasia in Adolescent and Young Adult Athletes

Benton E Heyworth ¹, Eduardo N Novais ², Kerri Murray ², Gregory Cvetanovich ³,
David Zurakowski ⁴, Michael B Millis ², Young-Jo Kim ²

- Retrospective multicenter database
- 46 Hips in 41 patients at 3 year follow up
- 37 (80%) RTS 9 months post op
- 27 (73%) RTS at same level
- Of those that RTS 85% maintained at 3 years

Current Research

- Multicenter young adult hip registry
- UCSF, Orthopedic One, Houston Methodist, Duke University Medical Center



So, Are we preserving the Hip?

I think so.....

80% of HA RTS at 9 months

80% of PAO RTS at 9 months

Lasting results at 5 years

At 20 yrs 60% of PAO patients preserved with correct indications

Closing

- Patients continue to be complicated
- Surgery requires high skill
- Thoughtful approach
- Athletes Can Improve With Non-surgical Treatments
- Level I evidence of effectiveness of arthroscopy
- HA and PAO are lasting procedures in the properly selected patient
- Future continues to be bright
- Clinical Research is and will be a guide to improved outcomes

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- Thank You !!!
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