FAI

Pediatric and Adolescent Hip Impingement; Clinical & Radiological

Shalin Shah
Pediatric Orthopedics

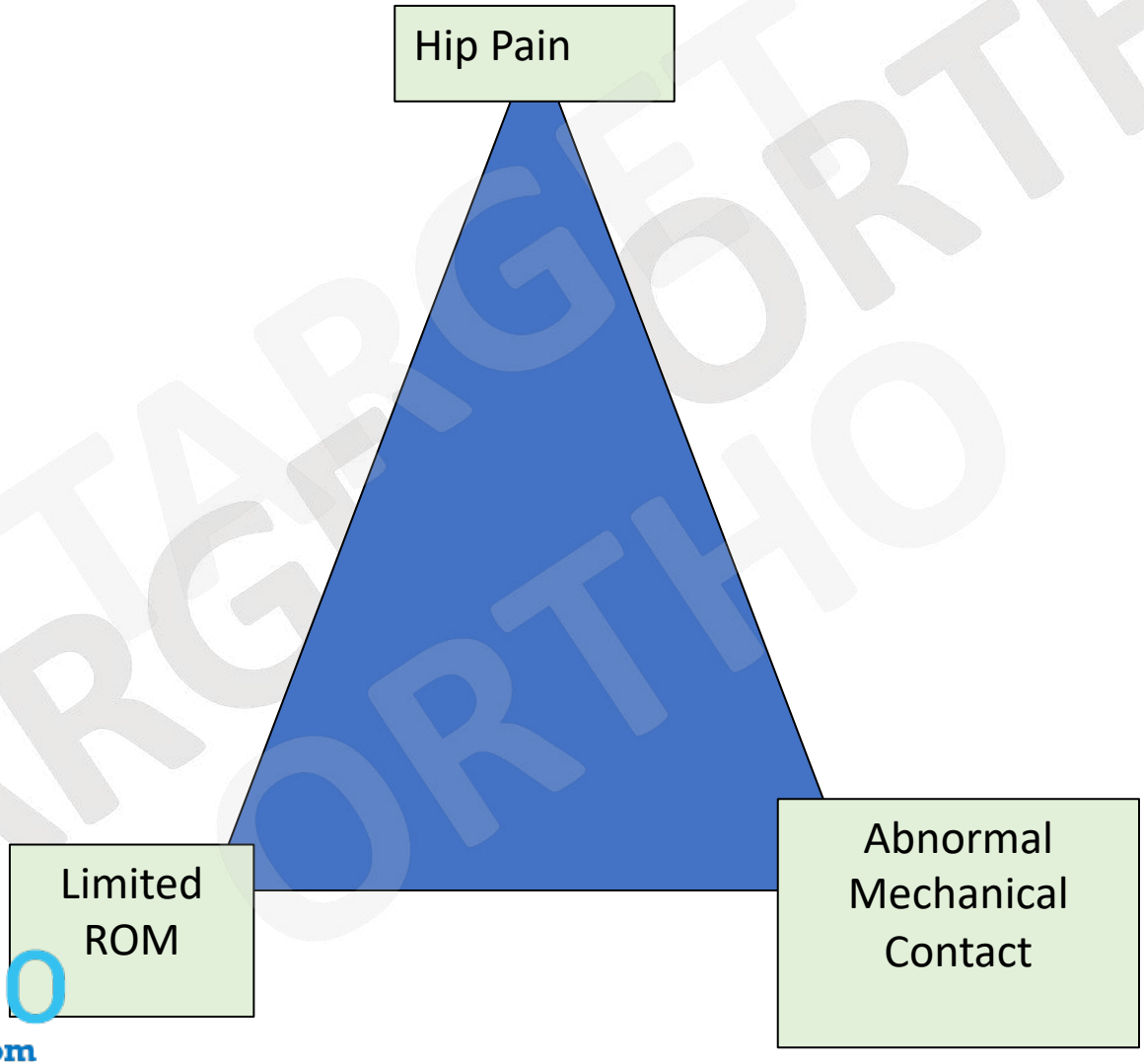
Special thanks

- Dr. Sasha Carsen
- Children's Hospital of eastern Ontario, Ottawa

Agenda

- The Hip and FAI
- The workup and a patient's "flow"
- Hip arthroscopy
- Case examples

FAI Syndrome:



But,

- *There is a high prevalence of morphologic abnormalities found in asymptomatic individuals*

The New York Times

THE ATHLETE'S PAIN

Hip Procedure Grows Popular Despite Doubt

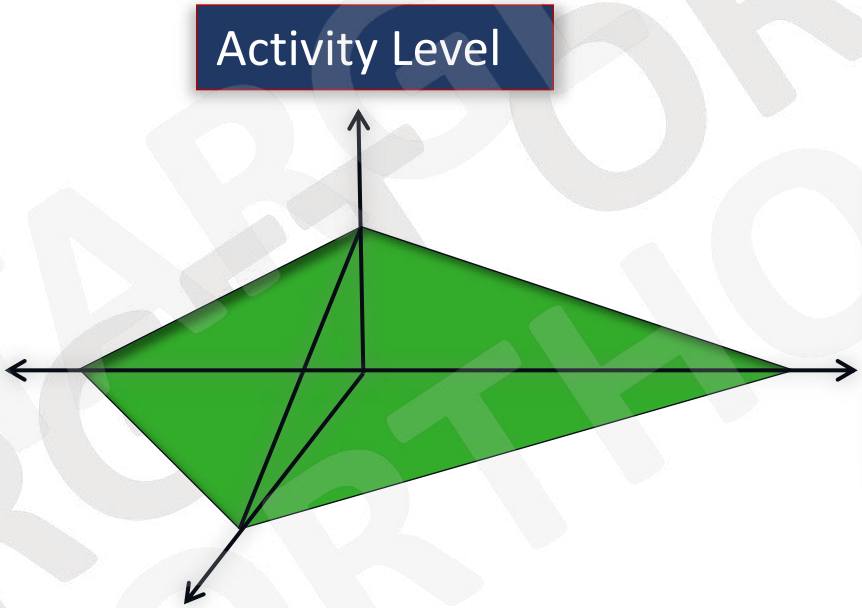
Review | FOCUS ON: Musculoskeletal Imaging | August 23, 2013

Femoroacetabular Impingement: Fact, Fiction, or Fantasy?

Author: David A. Rubin | AUTHOR INFO & AFFILIATIONS

Volume 201, Issue 3 | https://doi.org/10.2214/AJR.13.10913

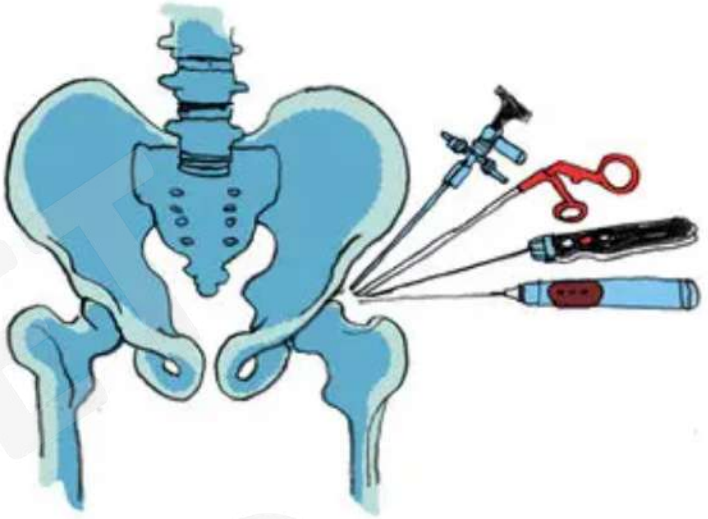
The mechanical environment of the hip

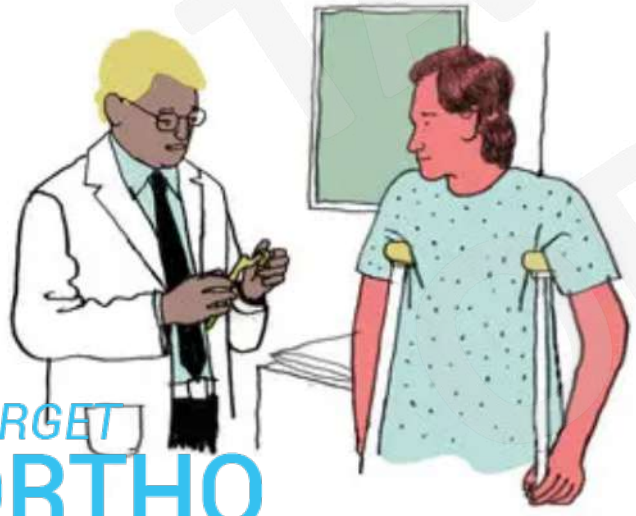


Borrowed from Dr. Millis, BCH

Sports known to be associated with FAI

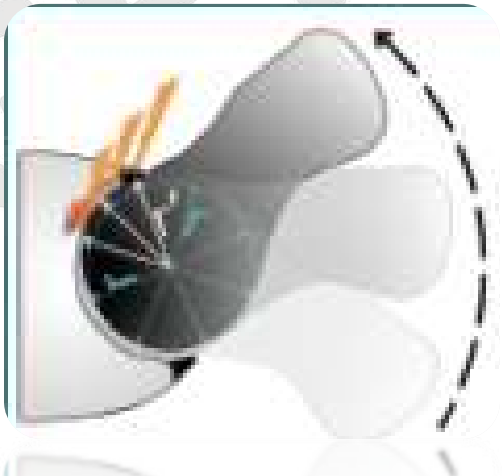
- Hockey
- Football
- High level Gymnasts
- Jumpers
- Runners
- Tennis





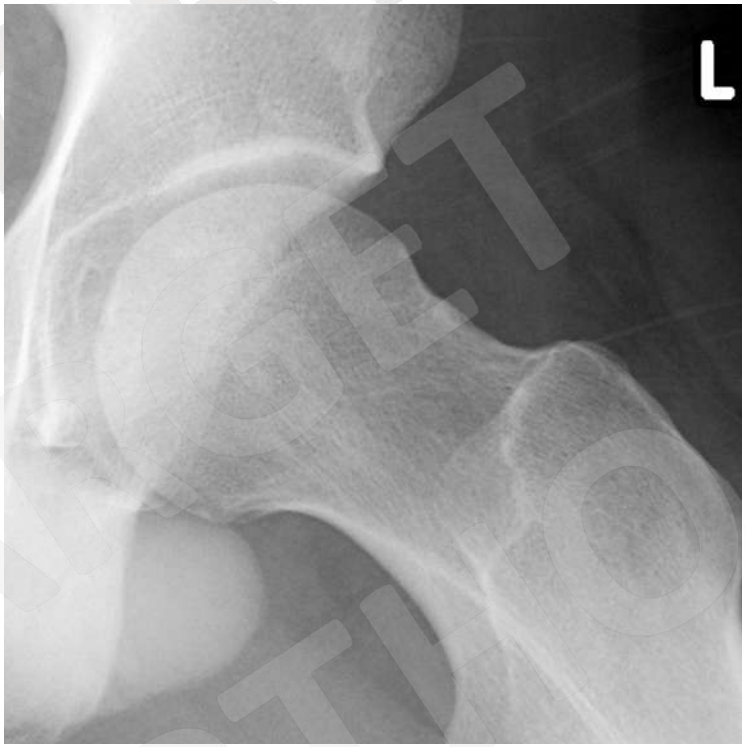
Impingement

- FAI is a *process* rather than *disease*
  - Repetitive “collisions” between femur and acetabular rim
    - Morphologic alterations femur and/or acetabulum
    - Extremes of hip motion/activity



Pfirrmann CW et al. Radiology 2008;249(1):236-241

Impingement

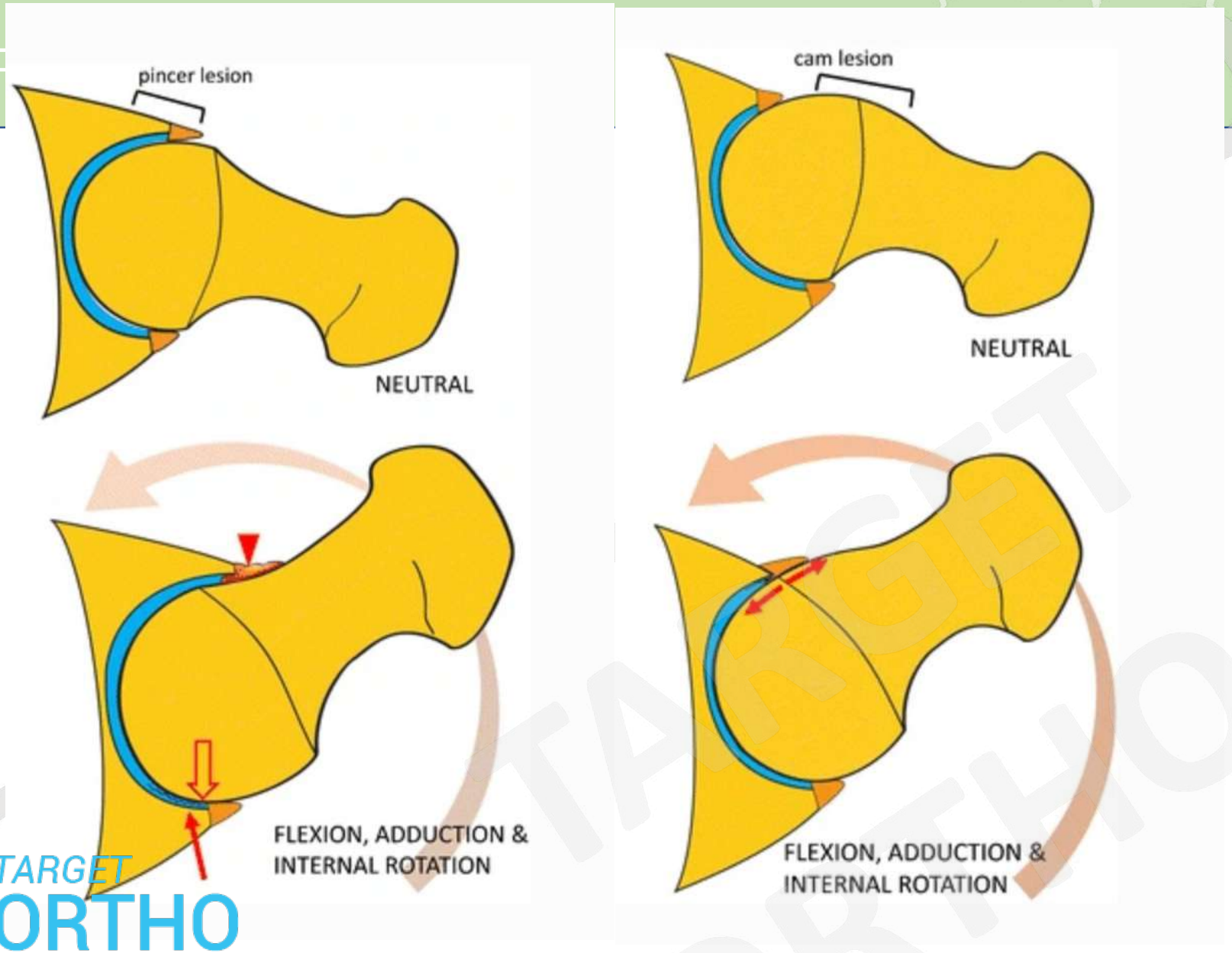


"It seems clear that either osteoarthritis of the hip does not exist as a primary disease entity or if it does, is extraordinarily rare."

-William H. Harris

Femoroacetabular Impingement: FAI

- Abnl abutment between femur and acetabulum
- Cam, Pincer, **Mixed (m/c)**
- Leads to early OA
- Sym common during flexion and internal rotation of hip
- Patients usually young and active



Femoroacetabular Impingement

- **Conditions that can be associated with FAI**
  - DDH
  - SCFE
  - LCP
  - Post-traumatic deformity
  - Acetabular retroversion
  - Other developmental anomalies

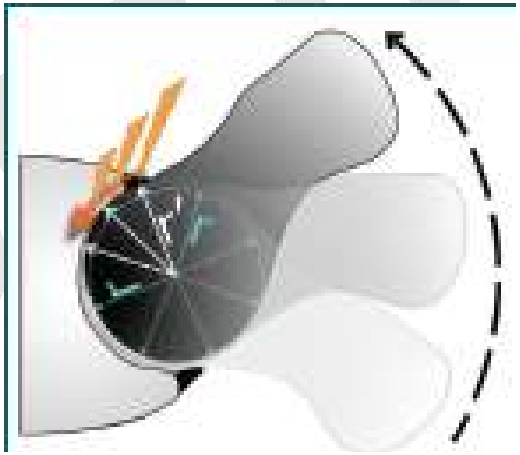
Femoroacetabular impingement

- Radiographs often normal

- **Subtle features:**
  - Bony prominences of anterolateral femoral head/neck junction
  - Reduced femoral head/neck offset
  - Synovial herniation pits
  - Os acetabuli
  - Ossification of acetabular rim
  - Acetabular retroversion

Femoracetabular Impingement- Cam type

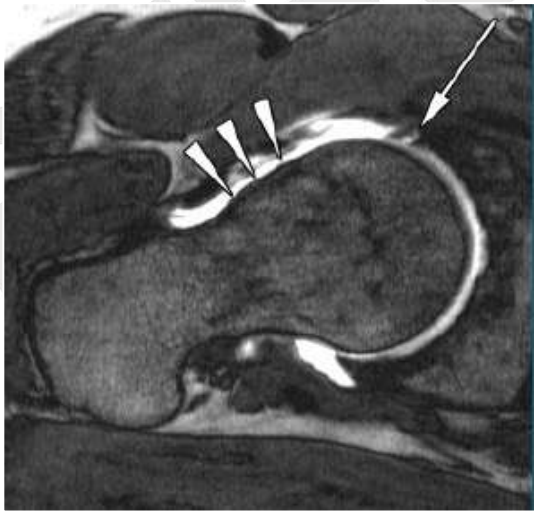
- Caused by aspherical shape of femoral head
- Extension of bone and cartilage onto the femoral neck



- Causes friction with acetabular cartilage in flexion and internal rotation which leads to cartilage delamination

Cam Impingement

- Nonspherical femoral head
- Young, athletic men
- Femoral, dysplastic bump
  - Secondary to physeal growth disturbance
  - Abnl incorporation of physeal growth center

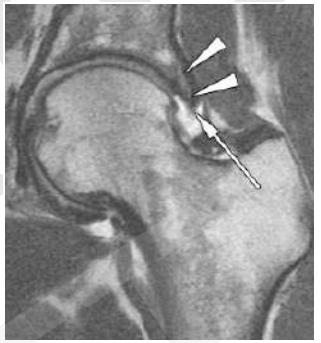


The Cam-type Deformity of the Proximal Femur Arises in Childhood in Response to Vigorous Sporting Activity

K. A. Siebenrock, MD,[1] F. Ferner, MD,[1] P. C. Noble, MD, PhD,[2] R. F. Santore, MD, PhD,[3] S. Werlen, MD,[4] and T. C. Mamisch, MD[1]

Pincer Impingement

- Acetabular over-coverage
  - Coxa profunda
  - Acetabular retroversion



Hip Pain D/D

Trauma

- MSK Trauma
- Overuse

  (Athletic Pubalgia)

Developmental

- Perthes
- SCFE
- DDH

Infection

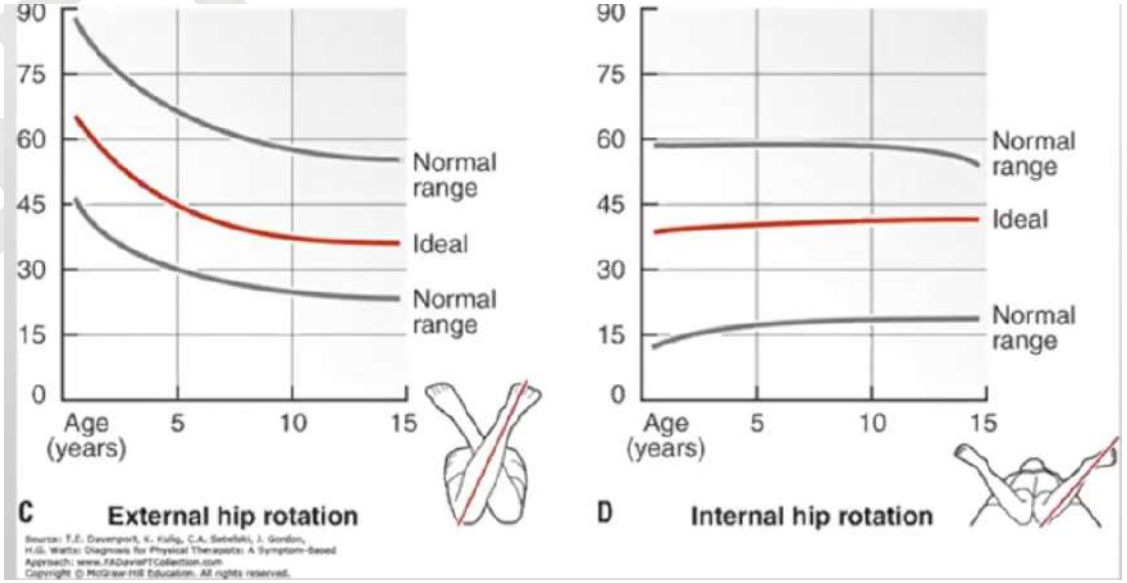
- Septic arthritis
- Osteomyelitis

Hip Pain D/D

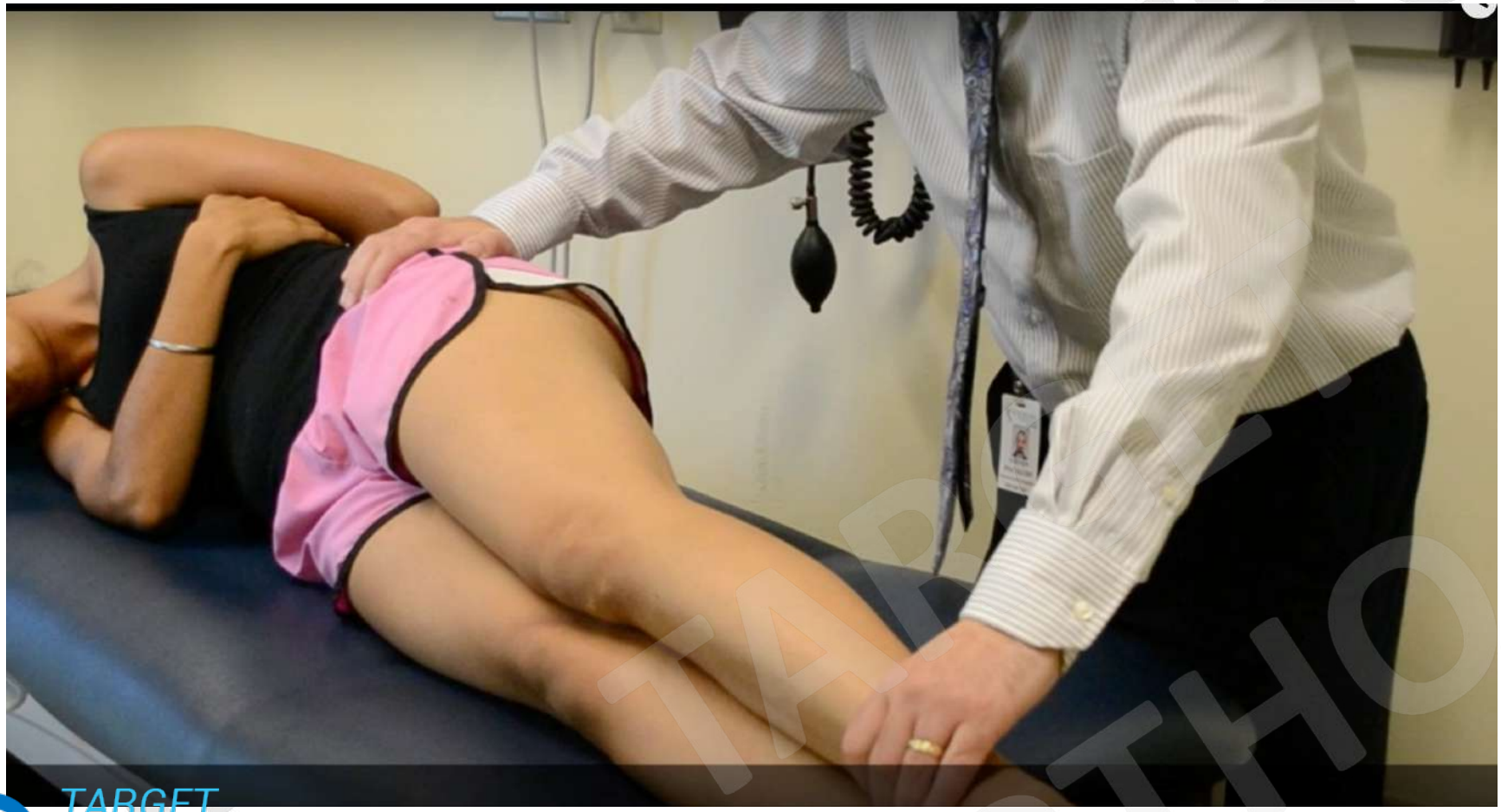
Trauma	Developmental	Infection
• Mechanism • Onset • Pain score • Wt Bearing • Relieving Factor • Physiotherapy	• Perinatal history • Family history • When Noticed • Pain +/- • ROM Limitations	• Fever • NICU Admission • Sx for SA • Sinus etc

Hip range

- Ext- Fle. 20-120
- Abd-Add 50-30
- IR-ER Range

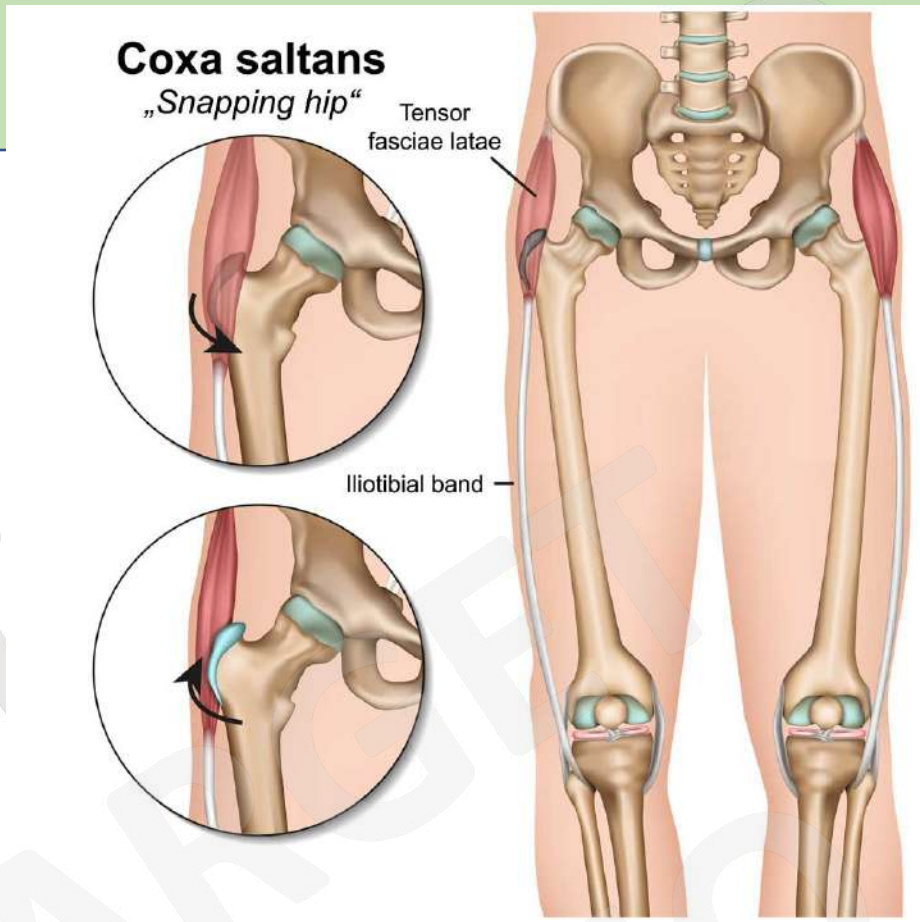


Ober Test



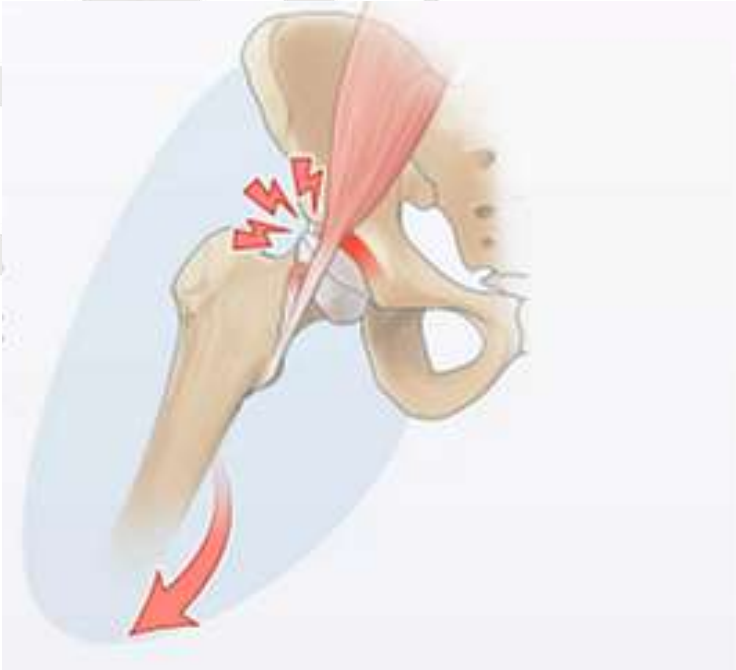
Coxa Saltans externa

- Snapping hip
- Snap outside
- Cause by tight muscle rubbing



Coxa saltans interna

- Snapping hip
- Snap inside
- Cause by rubbing of iliopsoas over lesser trochanter.



Stinchfield Test

Ely Test

Hamstring tightness 90-90

FADIR Test

Normal Pelvis AP View?

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Fig. 8

Clohisy et al

Dunn Views

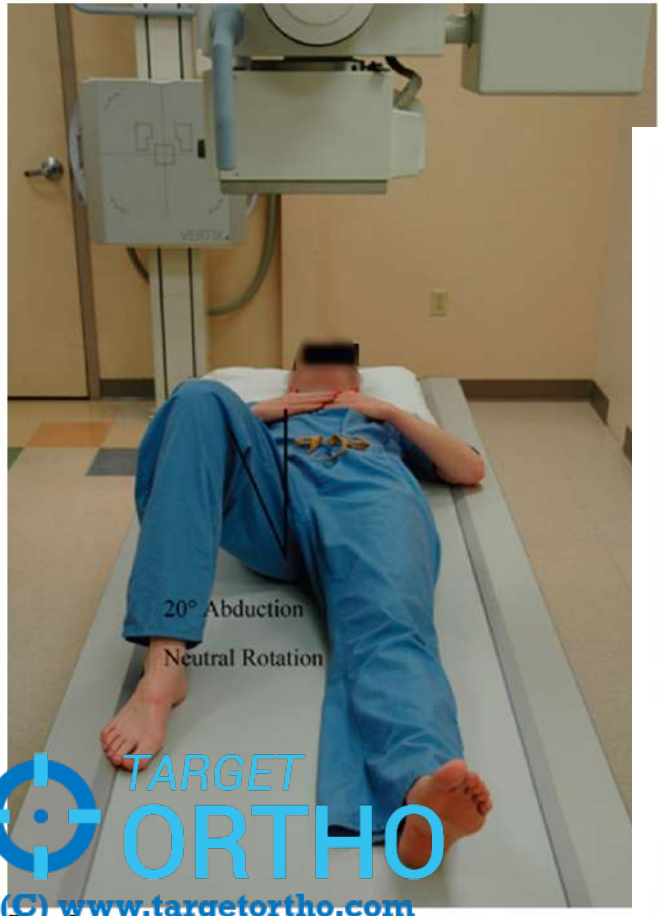
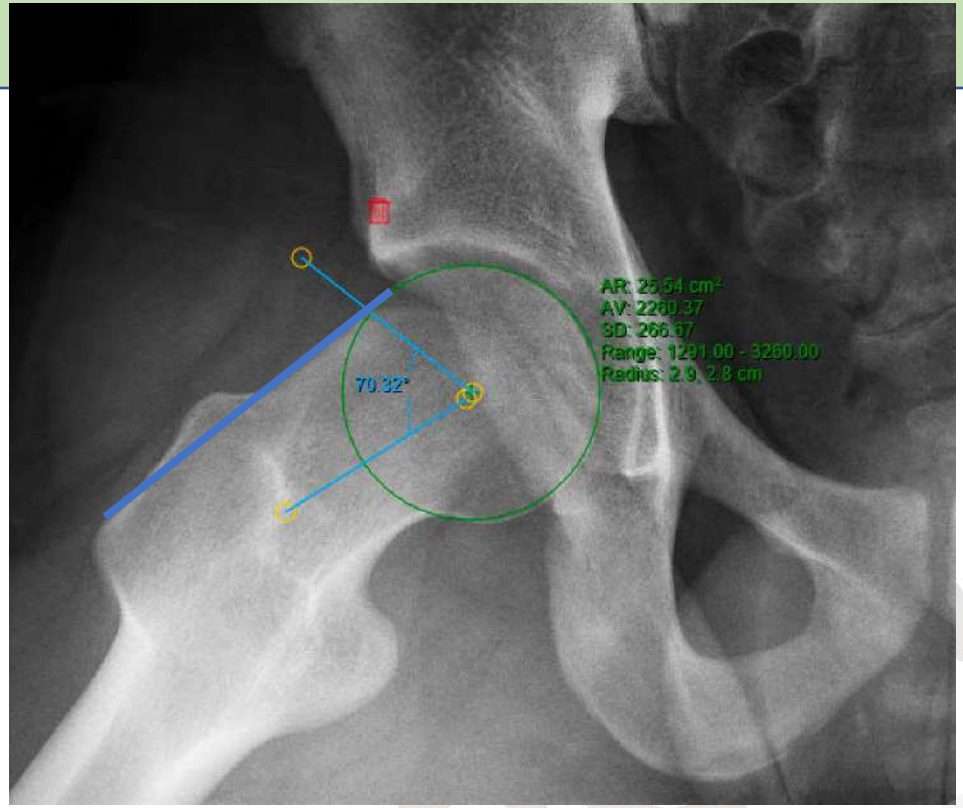
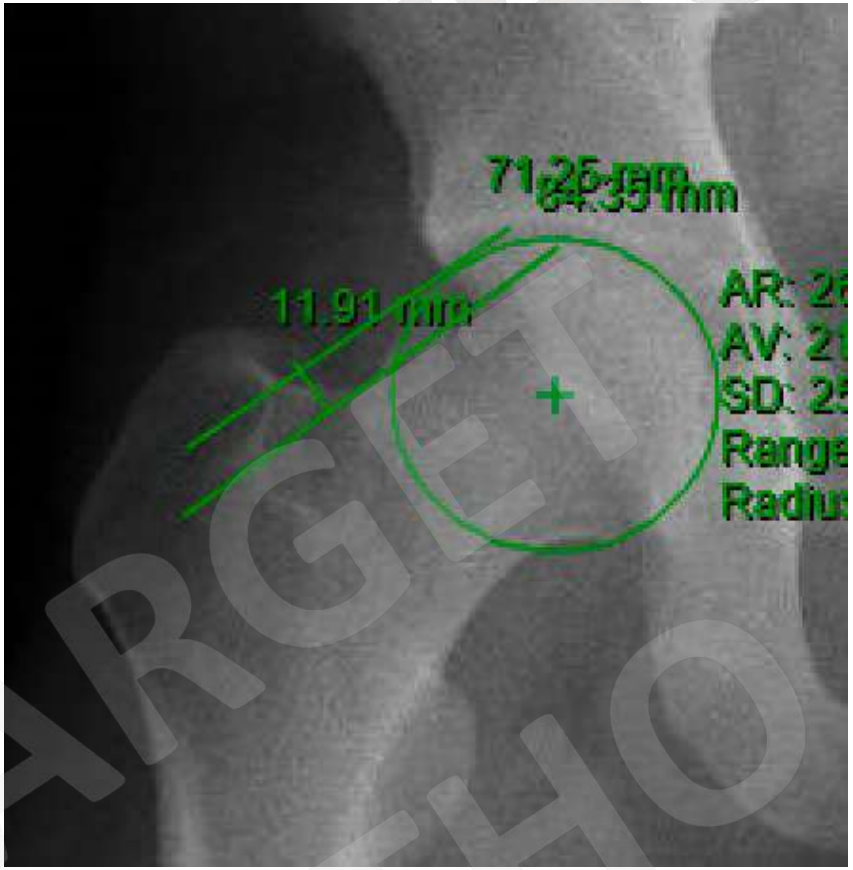


Fig. 5-B

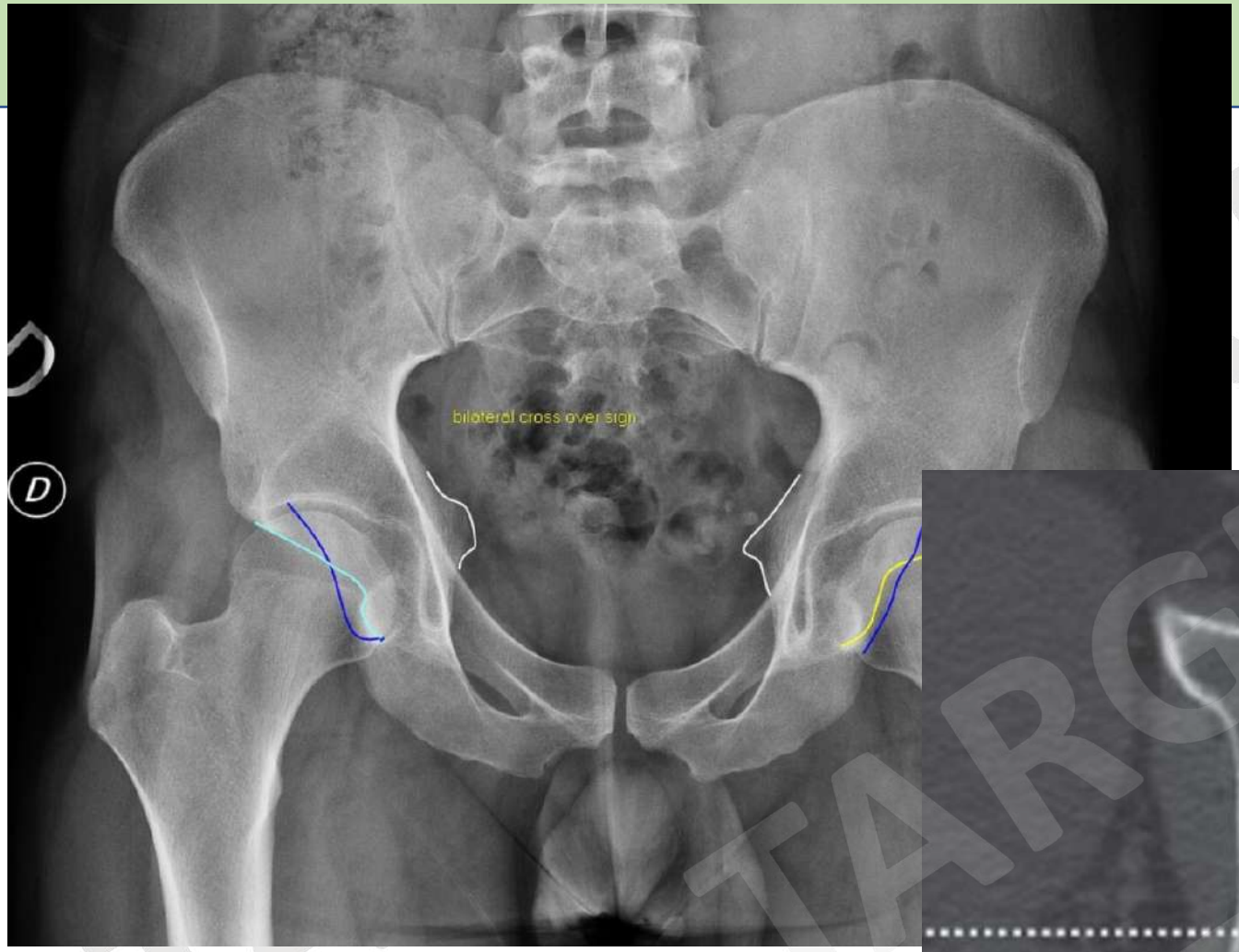
Fig. 5-A

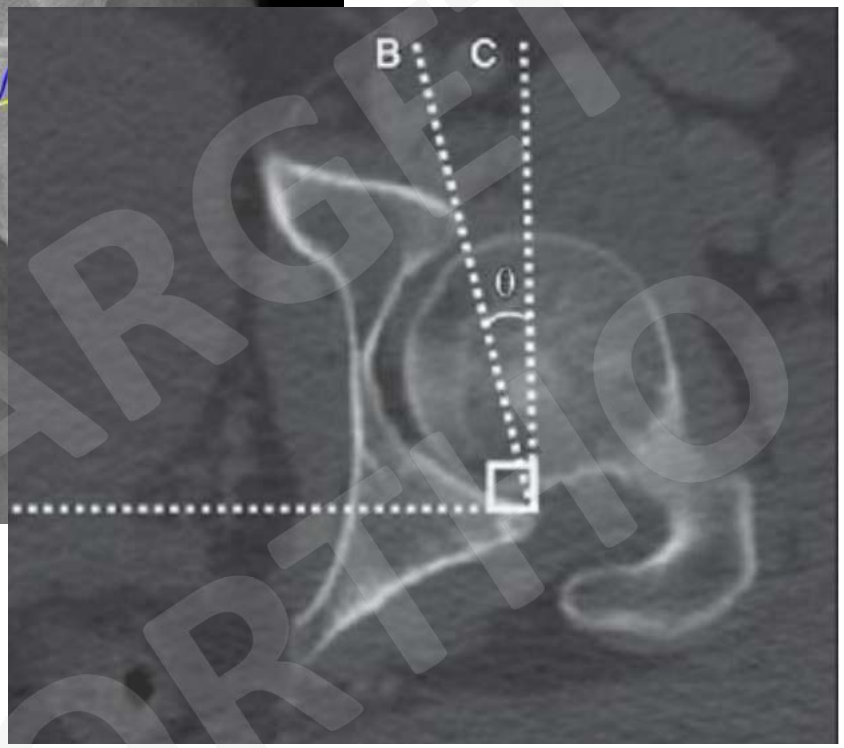


Normal Alpha 50-55



Normal offset >0.17





The Typical Workup…

- Activity – Pain – Referral
  - Not uncommon to have seen 2-3
- History & Physical exam
- **XRs!**
  - **AP Pelvis, Dunn Laterals, False Profiles**
    - **LCEA, Alpha, Shenton's, Retroversion signs, Offset**
- MRI
  - Less need for MR-A today
  - Arguable if patients need MRI if other positive findings…
- Not clear??
  - MR-A, CT, Injection
- CT – 3D for Pre-op planning (PRN)

So, you're gonna have an operation…

- Hip Arthroscopy

vs

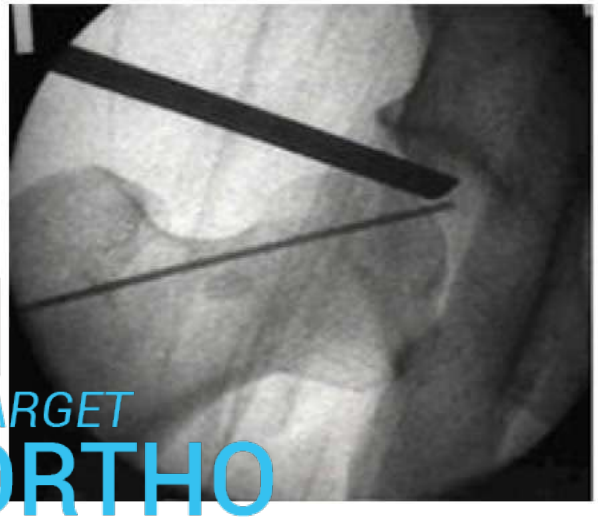
- Open Surgery
  - PAO
  - Surgical Dislocation
  - Extra-articular osteotomy

Hip Arthroscopy

- Allows for both a more minimally invasive (and significantly lower risk) procedure as well as a more complete and anatomic view of the hip joint

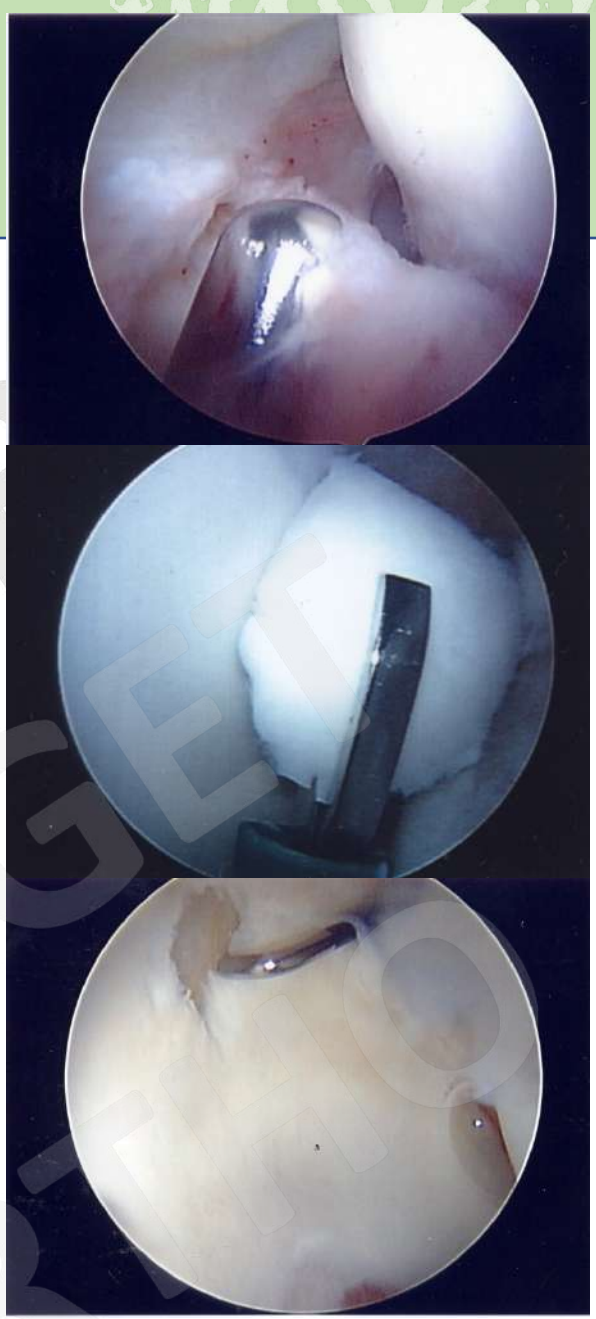
Requires a Team

- Primary care / Sports Med / Physio
- Radiology (pre- , intra-, and post-op)
- Orthopaedics

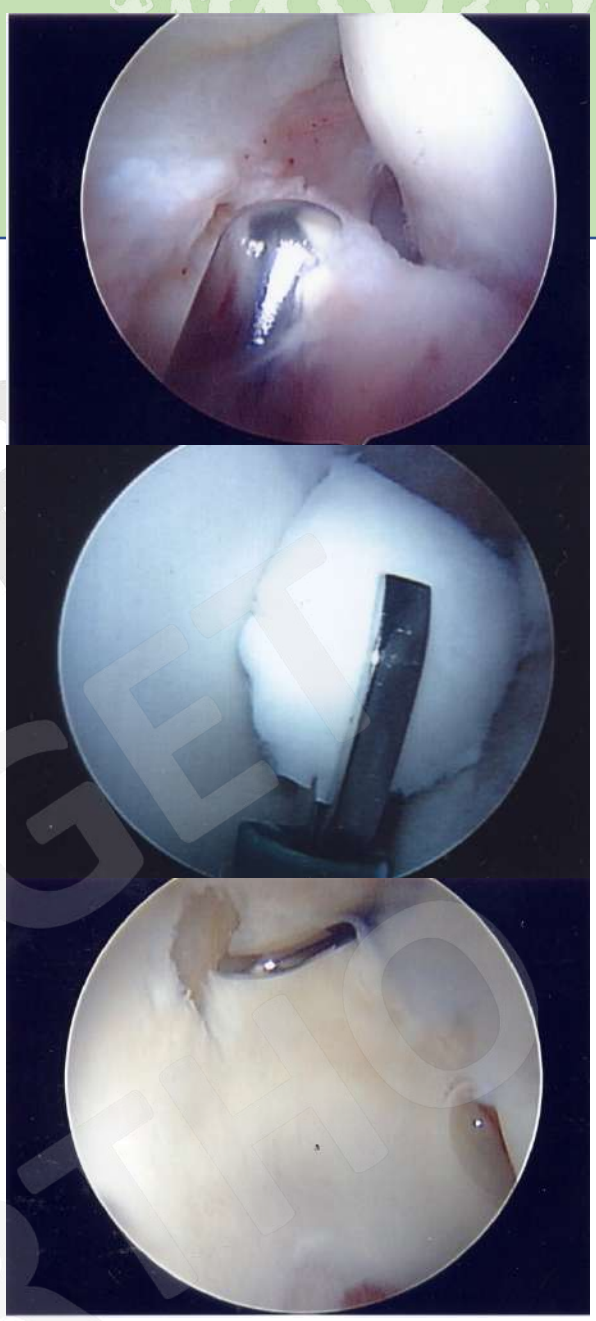


Hip Arthroscopy

- Indications
  - Labral Tears
  - FAI
  - Loose Bodies
  - Other:
    - Dysplasia / Deformity
    - SCFE
    - Synovial Disease
    - Septic Arthritis
    - Chondral Injury
    - Osteochondritis Dissecans
    - Osteoarthritis
    - Osteonecrosis
    - Ligamentum Teres Tears
    - Snapping Hip

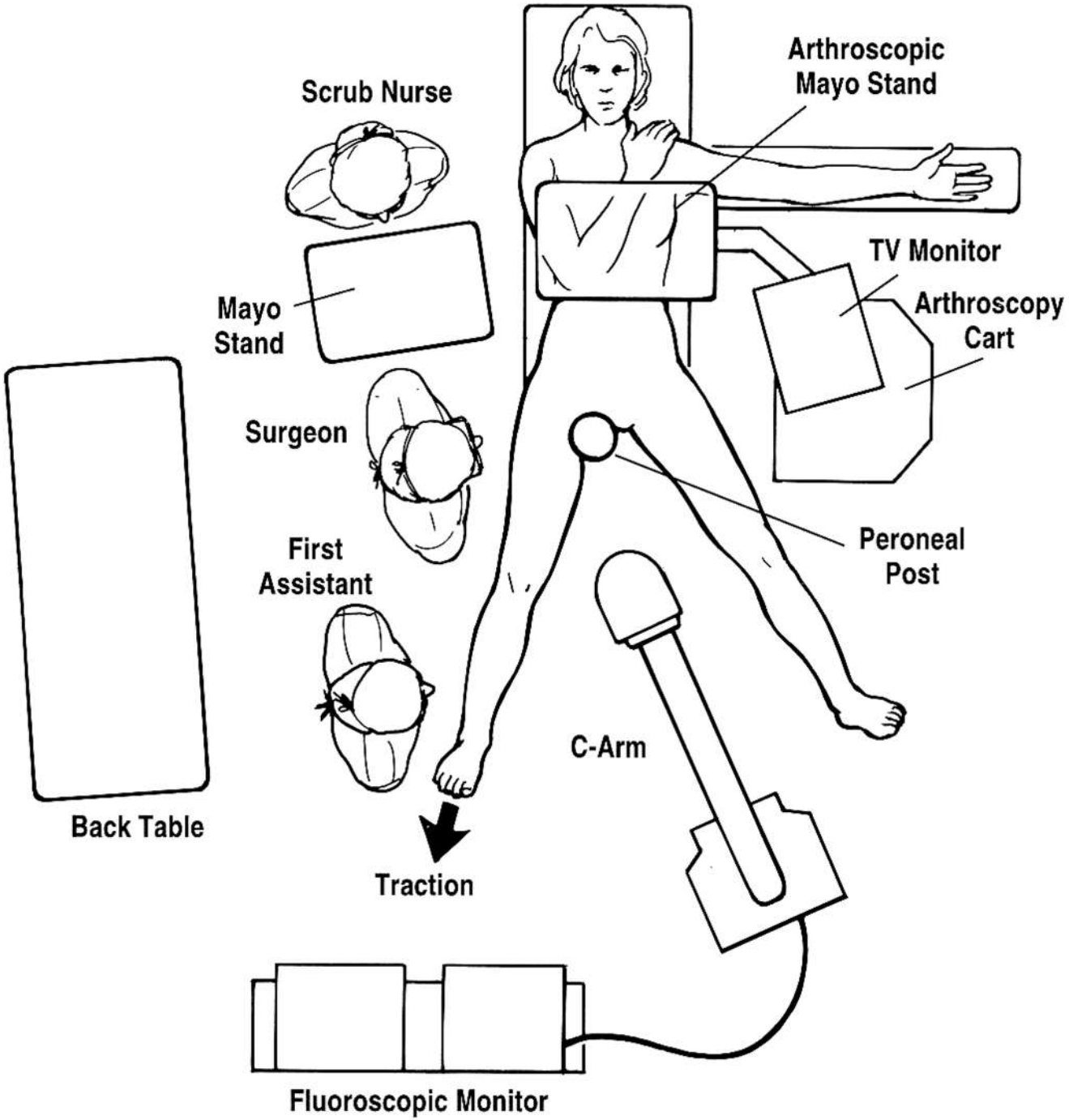


Hip Arthroscopy in Children & Adolescents



- Kocher MS, Kim YJ, Millis MB, Mandiga R, Siparsky P, Micheli LJ, Kasser JR.
  - J Pediatr Orthop 2005: 25(5):680-6
  - 54 hip arthroscopies in 42 pts
    - 15.2 yrs old (5.9 – 18.9)
    - Follow-Up: 17.4 months (12-26)
  - Idications
    - Isolated Labral Tear (30), Perthes (8), DDH s/p PAO (8), JRA/ Arthritis (3), SED (2), AVN (1), SCFE (1), Osteochondral Fx (1)
  - Results
    - HHS: 53.1 ⇒ 82.9
    - 83% patients improved
    - Complications: Transient Pudendal Nerve Palsy (6%), Recurrent Labral Tear (7%)

Setup



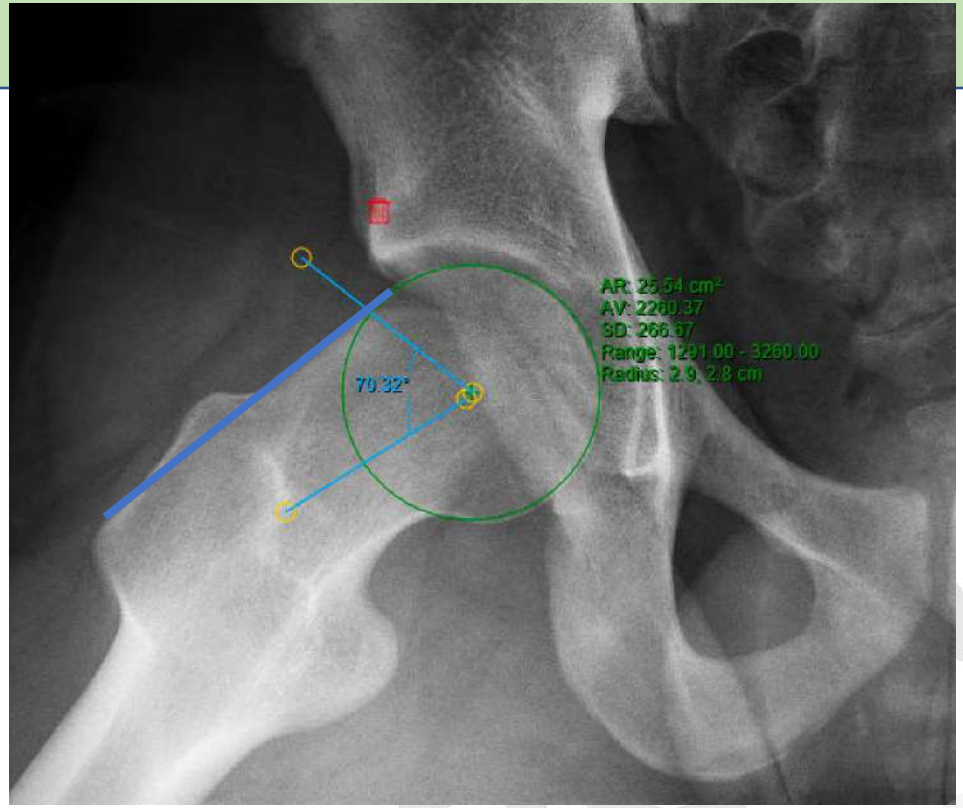
Intra-op

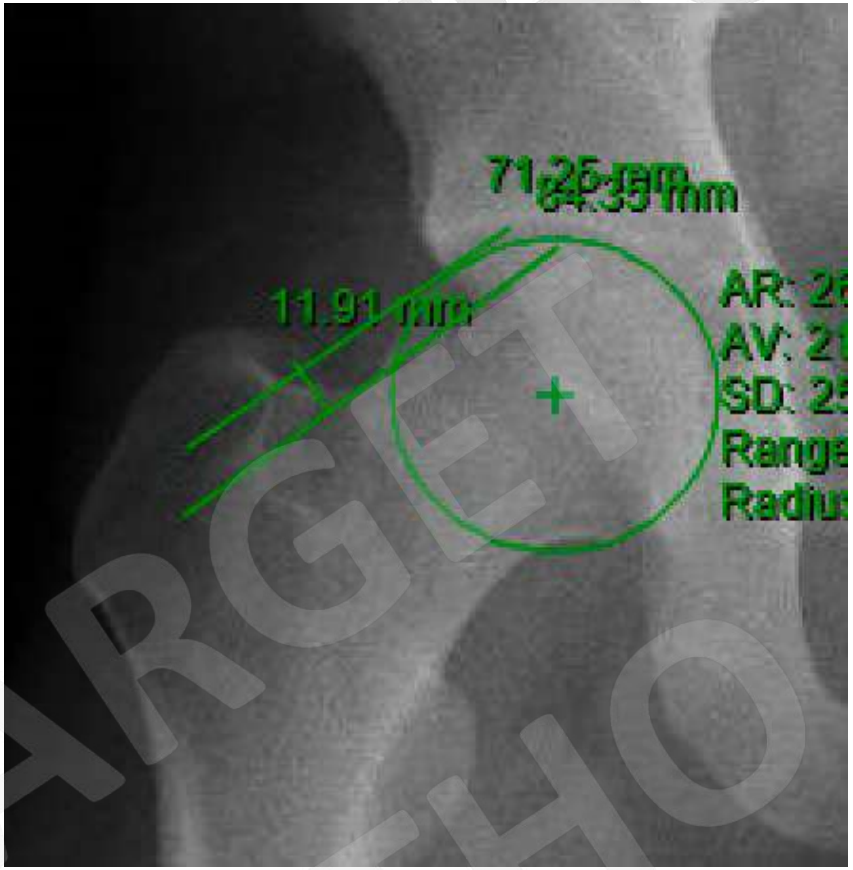
- Fluoro:
  - **Integral to Seldinger-type safe introduction into the joint**
  - **Integral to Acetabuloplasty**
  - **Integral to the head-neck osteochondroplasty**
  - *** Shows Impingment pre-, intra-, and post-op**
- The scope is 70deg, gives a ‘fish-eye’ type view. Easy to miss the forest for the trees….

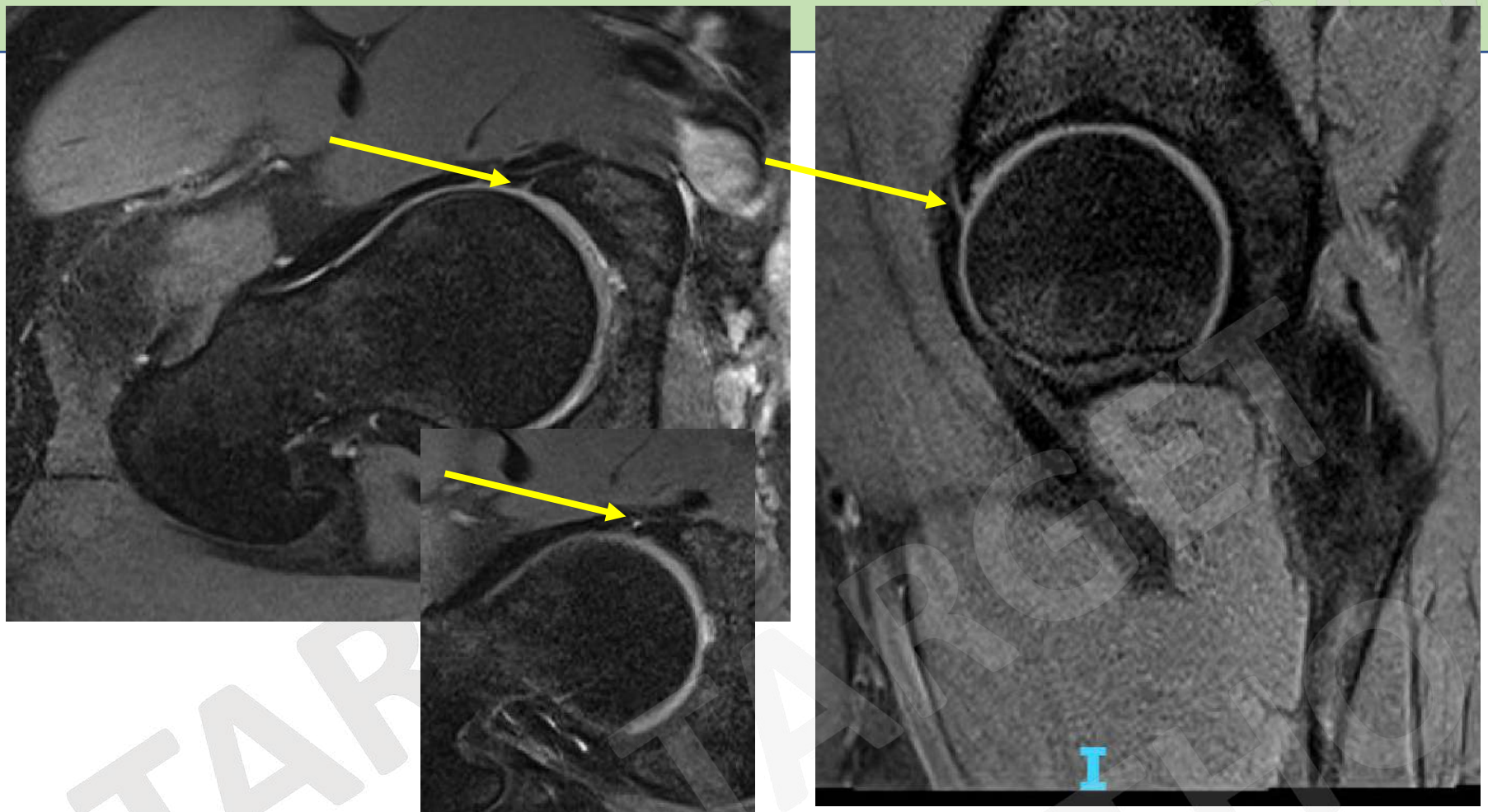
Case

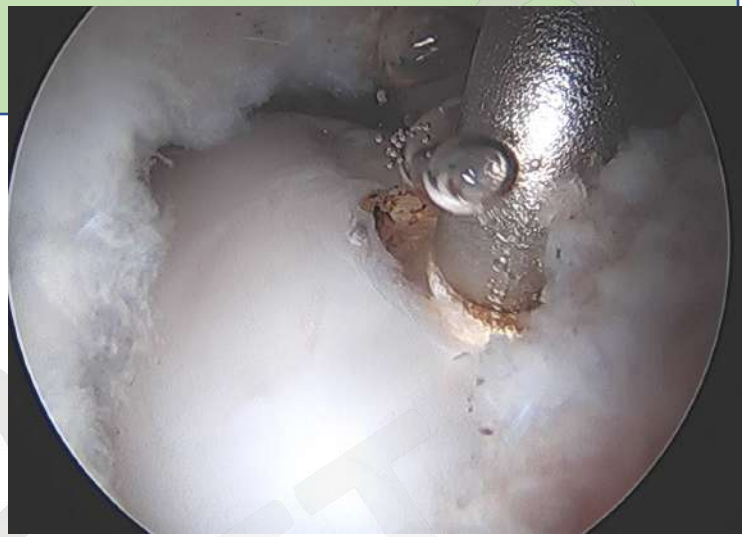
- 18yo F
- Hockey Goalie – High level
- Groin Pain
- Failed >1.5yrs PT, mods, etc.

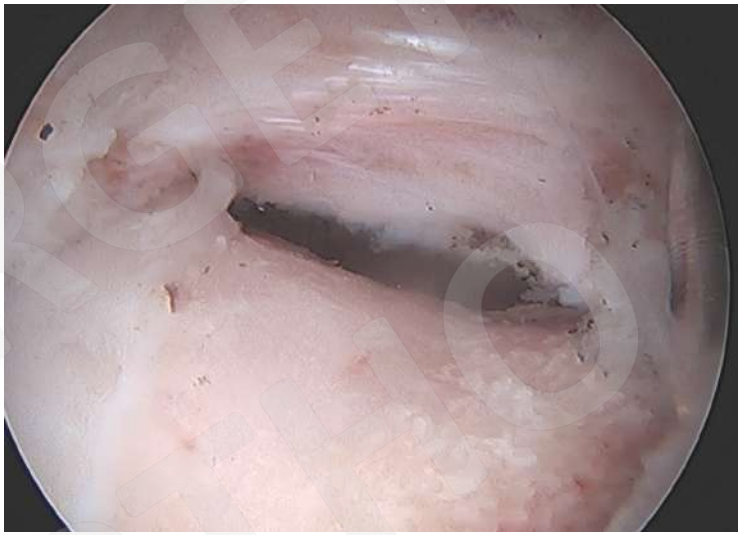
18yF,





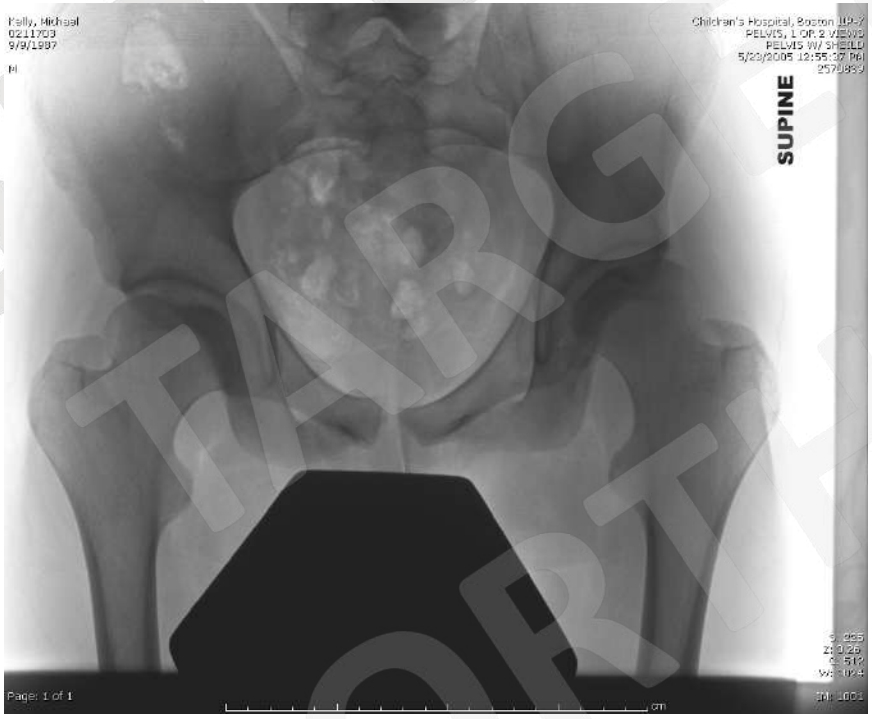






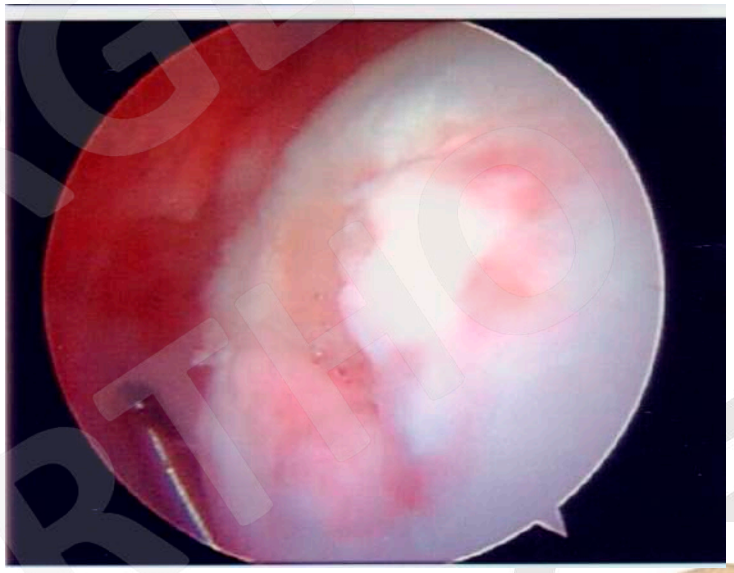
Case Study

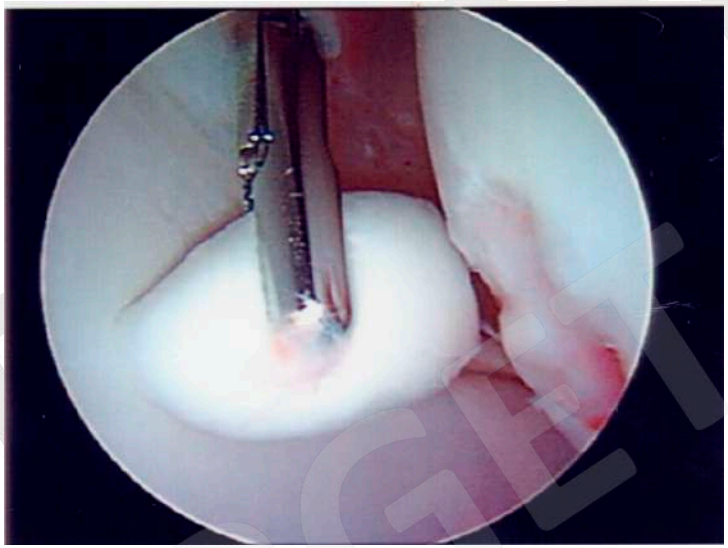
- 16 yo male with spondyloepiphyseal dysplasia with right hip pain
- Radiograph showed coxa magna and dysplasia
- MRI showed large chondral flap and small loose bodies
- Arthroscopic debridement of flap and removal of loose bodies



MRI

Arthroscopy

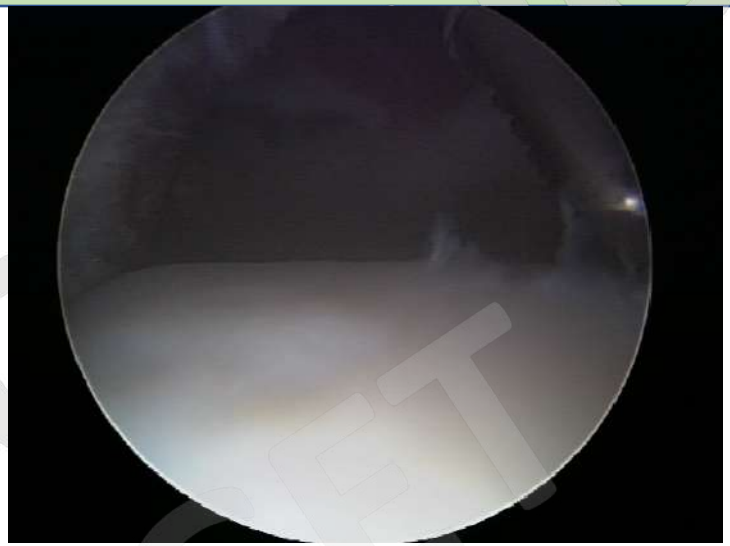




FAI in Adolescents

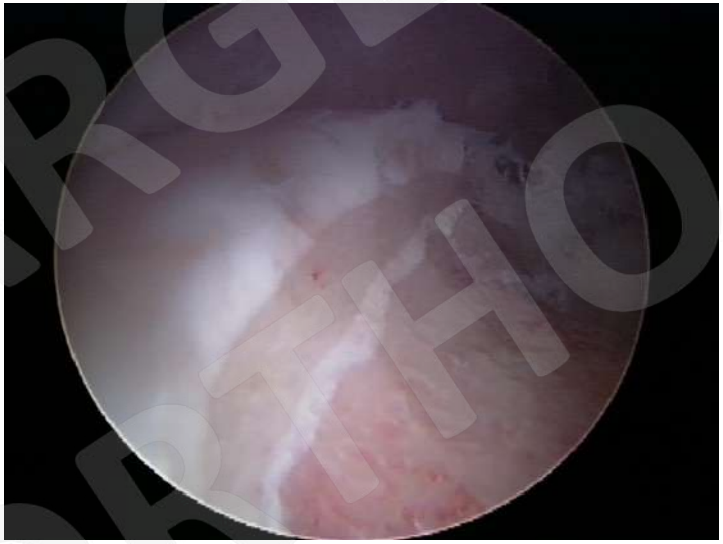
Cam Impingement

Proximal Femoral Physis



Pincer Impingement

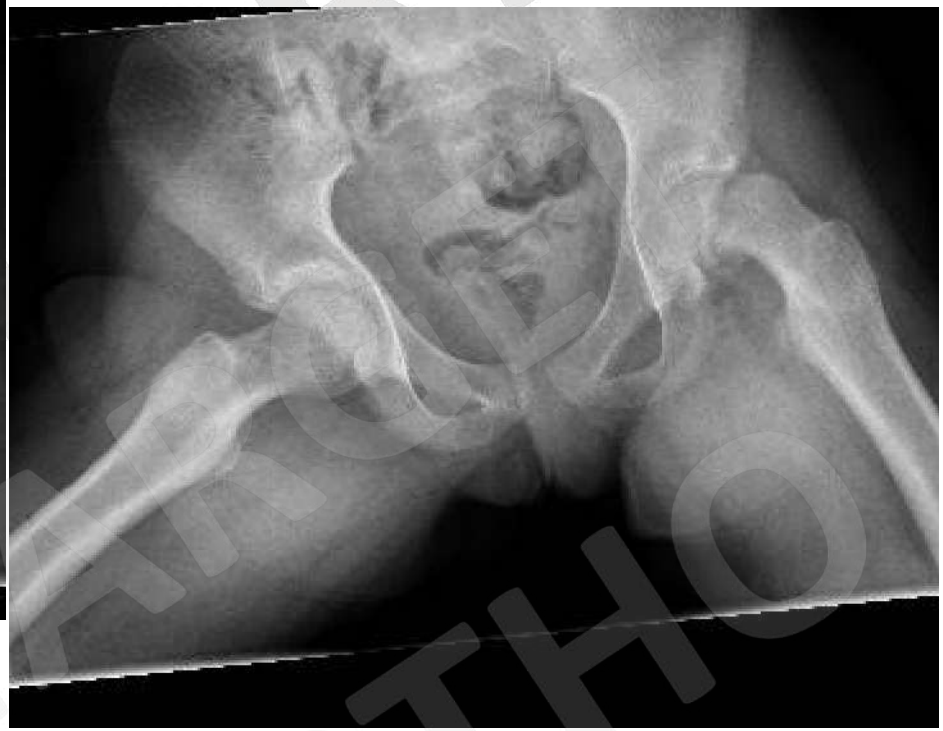
Triradiate Cartilage

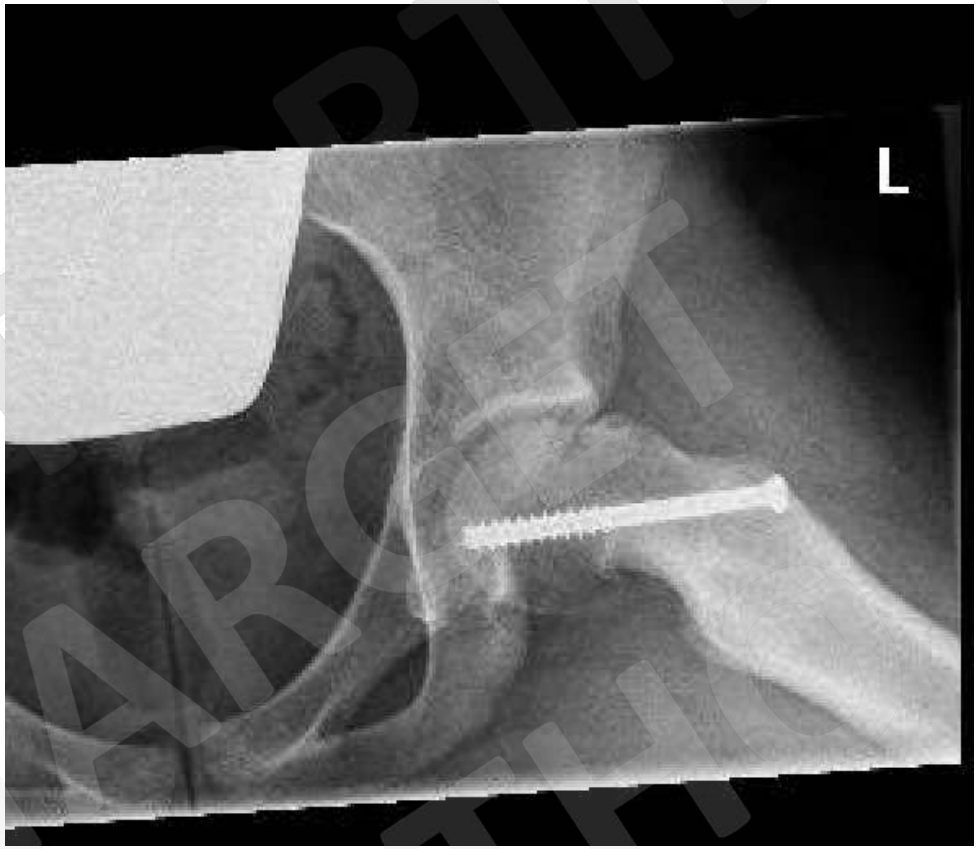


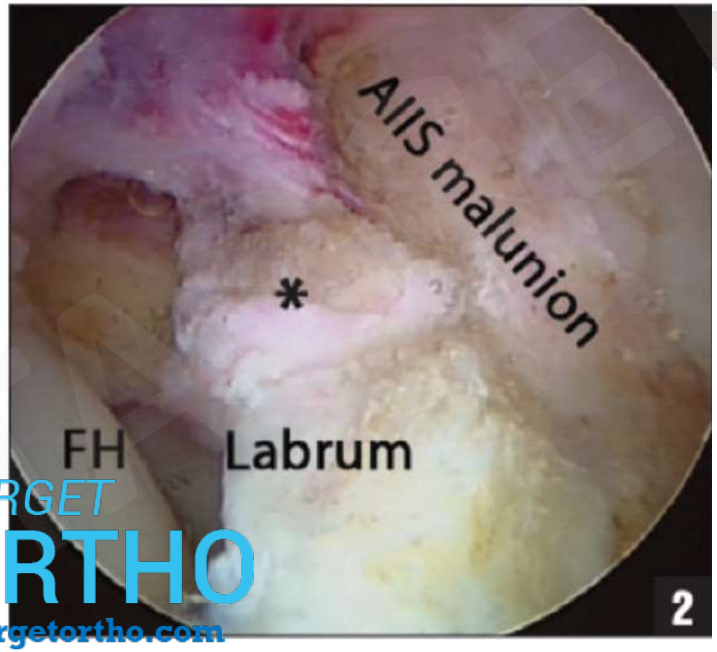
Hip Preservation

- Coordinated and integrated diagnosis and care
  - Community, Pediatric, Adolescent, young Adult care at non-op and operative sides
- Improvements and innovation in Hip Imaging
- Leadership and Multi-Centre role in the world of pediatric hip conditions and treatment
- Clinical Research
- Ongoing measurement of outcomes, and outcome research

19Y F,







Future of Hip Arthroscopy in Young Adults & Peds

- *Ideal group for labral repair and prevention of arthritic changes*
- Addressing the underlying Morphology
- Young, active kids most at risk, best outcomes
- Huge opportunities for future research & outcomes studies

Thank you!