

Arthroscopic Hip Capsular Reconstruction Using Human Dermal Allograft for severe capsular deficiency

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Disclosures

1. Royalties: Smith & Nephew
2. Consulting: Arthrex, Breg

Introduction

- The hip capsule has become increasingly recognized as an important static stabilizer of the hip
- Arthroscopic management of the hip capsule is evolving, with greater emphasis placed on capsular repair/plication*

*Harris et al, *Arthrosc Tech* 2013
Domb, Philippon, Giordano *Arthroscopy* 2013
Domb et al. *Am J Sports Med*, 2013
Thakral, Ochiai *Arthrosc Tech* 2014

Introduction

- Ehlers-Danlos Syndrome and Hyperlaxity Syndrome is being increasingly recognized as a concomitant condition with hip pathology *
- In addition, hip arthroscopy may iatrogenically cause hip capsular deficiency#

*Larson et al *Arthroscopy* 2015
#Trindale et. al, *Arth Tech*, 2015

Case report

- 33 year old female with geneticist confirmed Ehlers-Danlos Syndrome (EDS)
- Three prior hip arthroscopic procedures
 - First 2012- for anterior hip pain with labral repair and cam/pincer FAI osteoplasty
 - Second 2013-labral debridement for feelings of instability and catching in her hip
 - Third 2015-attempted capsular plication (one suture) for microinstability with feelings of the hip “slipping out of joint”

Case report

- Upon presentation, she would have microinstability events at least twice a day, with feelings of subluxation with getting out of bed to stepping off a curb
- She is a law student, and her hip is affecting her ability to concentrate for her studies

Case report

- On Physical examination
 - Pain with hip flexion to 95 degrees (120 degrees left)
 - Internal rotation to 15 degrees (20 degrees left)
 - External rotation to 80 degrees (90 degrees left)
 - Positive apprehension with FABER position
 - Positive anterior impingement test

Case report

- CT scan showed no evidence of dysplasia (CE angle 27 degrees)
- MRI showed a large capsular defect

Case report



MR2
ARTHROGRAM
FOOT
1/5/2015
S
E 20
3 mm
mm
n

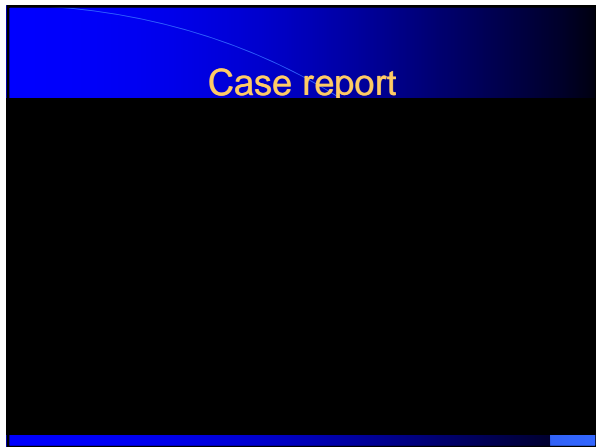
Case report

- Surgical findings:
 - Thin, non-functional labrum
 - Significantly thin capsule with irreparable lateral defect
 - Mild residual CAM FAI distally with functional testing



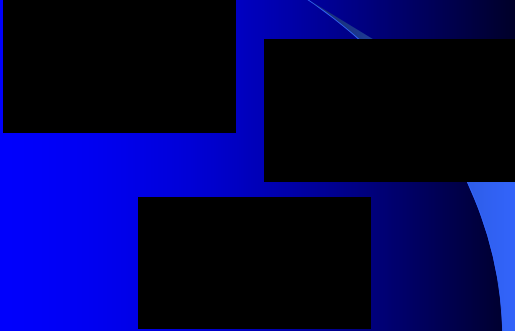








Case report



Discussion

- The capsule of the hip can be an important static stabilizer
- Most cases of capsular deficiency is iatrogenic
- With an irreparable capsular defect, capsular reconstruction is a viable option

Thanks for listening



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Discussion

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- With an irreparable capsular defect, capsular reconstruction is a viable option

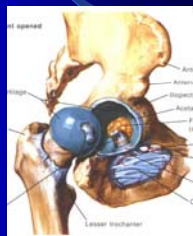
Hip Anatomy

- Hip joint is a synovial ball and socket joint
- Movements allowed are flexion/extension, adduction/abduction, and internal/external rotation
- Compared with shoulder, less mobility and more stability



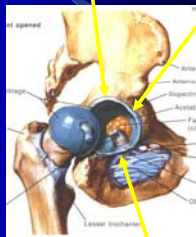
Hip Anatomy

- Tough synovial capsule
- Stability arises from its concentric ball and socket configuration
- Rim of surrounding Type II cartilage—labrum



Hip Anatomy

- Labrum
 - Deepens the dish of the acetabulum
 - Assists with stability of hip in extremes of motion



Hip Anatomy

- Other ligaments that contribute stability:
 - “Y” Ligament of Bigelow (iliofemoral ligament)
 - Pubofemoral ligament
 - Ilioischial ligament




Neurovascular structures

- Femoral nerve, artery, and vein anteriorly
- Sciatic nerve posteriorly
- Both are usually safe



Neurovascular structures

- Lateral femoral cutaneous nerve is nerve at most direct risk of injury (meralgia paresthetica)
- Pudendal nerve is most commonly affected (because of pressure from the post)



Why do hip arthroscopy at all?

- Minimally invasive surgery
- Quicker recovery
- Preserves normal hip anatomy
- Avoids patient limitations associated with total hip replacements
- Allows access to spaces that are more difficult to gain through open techniques

Indications

- Loose bodies in the hip joint
- **LABRAL TEARS**
- Snapping Hip
- Synovial chondromatosis
- Adhesive capsulitis
- Deep gluteal pain syndrome
- Ruptured ligamentum teres
- Hip sepsis
- **FEMOROACETABULAR IMPINGEMENT SYNDROME (FAI)**
- **Gluteus medius/minimus tears**
- **Greater trochanteric pain syndrome**

Contra-indications

- Ankylosis of the joint
- Poor bone quality
- Open wounds or sores
- Systemic infection
- Severe obesity (?)


Patient Selection

- As with any surgery, the key to a good outcome is choosing patients who will likely get better with the intervention!
- “We may not make you better, but we can surely make you different”

LOOSE BODIES

Loose bodies


- Classic bullet in the hip
- Excellent results with arthroscopic management
- Can be technically challenging



Arthroscopy: The Journal of Arthroscopic and Related Surgery, Vol 19, No 9 (November), 2003: E76

Loose bodies

- Obviously, loose bodies from chondral sources are far more common



Arthroscopy: The Journal of Arthroscopic and Related Surgery, Vol 19, No 9 (November), 2003: E76

LABRAL TEARS OF THE HIP

Labral Tears

- Hip labral tears are the equivalent of meniscal tears in the knee
- Symptoms include catching and locking
- Pain is usually in the groin, but can radiate posteriorly or down the thigh

Labral Tears

- Pain with rising from a seated position
- Pain with twisting activities
- Pain getting in and out of cars
- Pain with sexual activity

Validated Outcome Studies


- HOS-Sport
- Modified HHS
- NAHS
- MHOT 14 or MHOT 33

Physical Examination

- Range of motion
- Lumbar nerve stretch tests
- Greater trochanteric tenderness


Physical Examination

- McCarthy test
 - Supine positioning. Flexion of hip, with external rotation and extension.



Physical Examination

- Anterior impingement test
 - Supine positioning. Forced flexion, adduction, and internal rotation.



Physical Examination

- Twist test
 - Done standing. Patient faces the examiner, with knees bent to 30 degrees. Patient “windshield wipers” knees back and forth. Patient will then repeat with standing on one leg, then the other, with the examiner holding patients’ hands for balance only.

Twist test



Twist Test

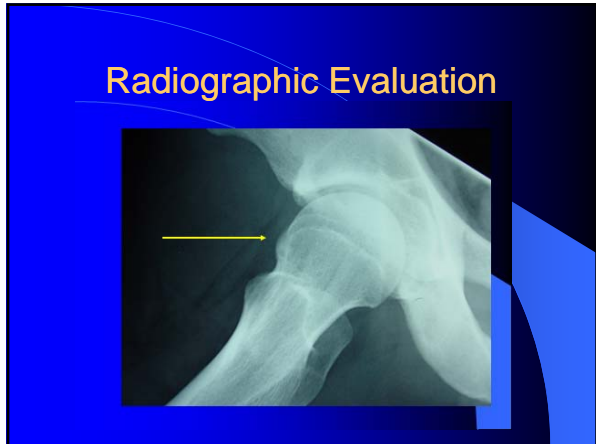


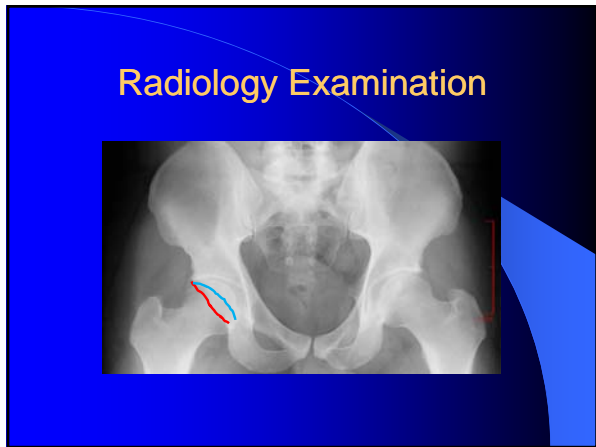


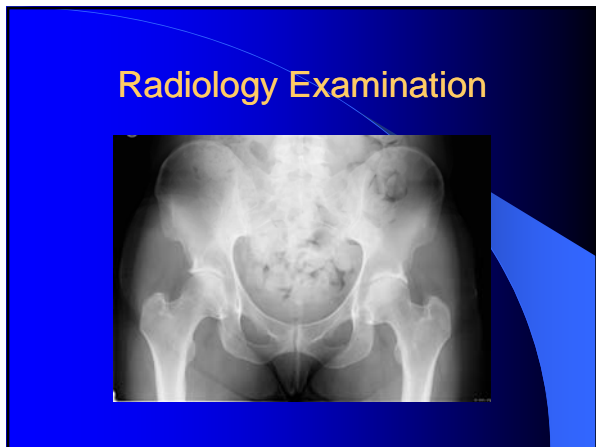


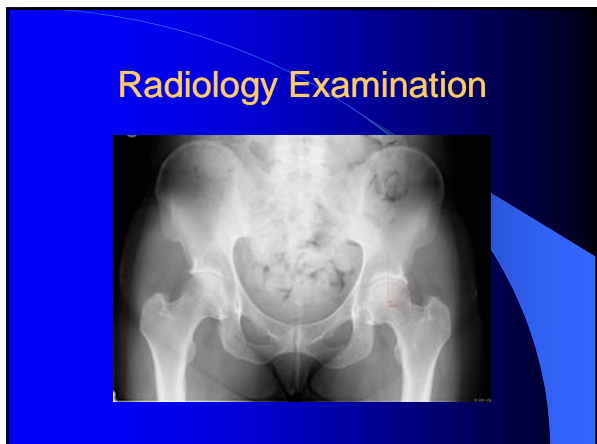
Radiology Examination

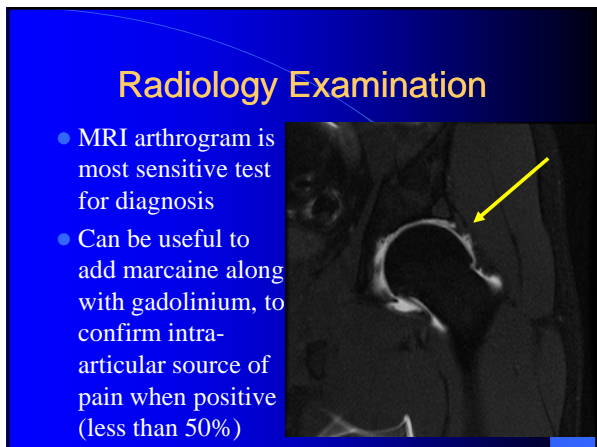
- Plain radiographs can be very helpful
- CAM FAI best seen on lateral X-ray
- Pincer FAI best defined on an AP pelvis X-ray












NOT ALL SNAPS IN THE HIP ARE FROM LABRAL TEARS

Snapping hip

- Most snapping hips are asymptomatic and do not require treatment
- In rare instances, the snapping causes pain
- Must differentiate between internal (iliopsoas tendon snapping over the hip) and external (iliotibial band snapping over the greater trochanter) and intra-articular (from an unstable labral tear or loose body)

Snapping hip

- Internal snapping hip can be addressed through arthroscopic iliopsoas release



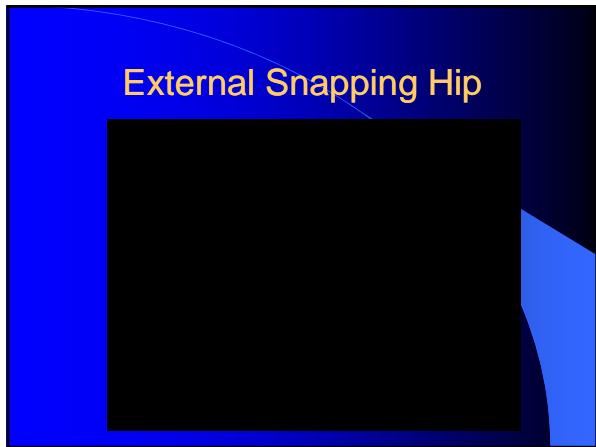
Snapping hip

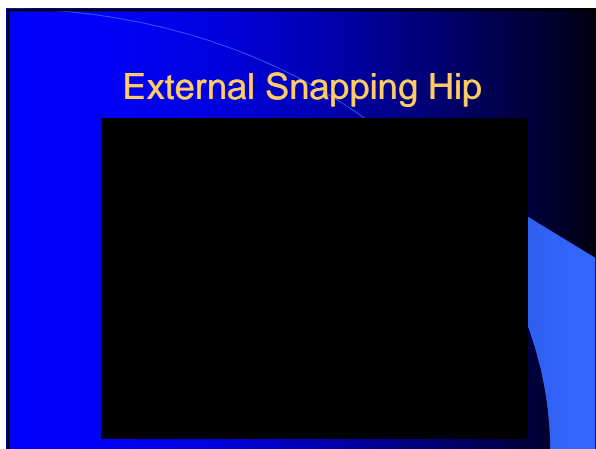
- External snapping hip can be addressed through arthroscopic iliotibial band release



Ilizaliturri et al. Arthroscopy 2006; 505-510.

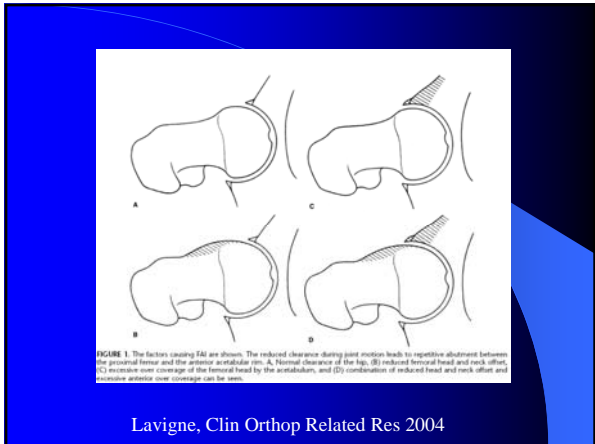






FEMOROACETABULAR IMPINGEMENT SYNDROME

- ## Femoroacetabular Impingement
- Concept introduced by Murray (a)
 - Popularized by Ganz (b)
 - Two types: Pincer and cam
 - Some experimental evidence that this is involved in the final common pathway to the development of hip arthritis
- (a) Murray, RO, Br J Radiol 1965; 38; 810-824.
(b) Ganz et al., Clin Orthop 2003; 417; 112-120.



Diagnosis

- Clinical symptoms overlap greatly with labral tears, and FAI co-exists with labral tears
- Diagnosis may be made on plain film or MRI
 - Be sure that the radiologist reading the MRI has experience with the diagnosis

Diagnosis

- Pain with sitting
- Pain with rising from a seated position
- Pain with twisting activities
- Pain getting in and out of cars
- Pain with sexual activity

Diagnosis

- Patients will often have a characteristic “slouch” with affected hip extended, because flexion hurts
 - Sitting closer to the edge of the seat
 - Listing toward unaffected side
 - Affected foot is farther forward
 - Leg is externally rotated

Diagnosis

- Impingement test-flexion and internal rotation increases pain
- Limitation of flexion and especially internal rotation
- “Twist test”

FAI “Slouch”



FAI

- Open treatment has been gold standard
 - Requires an open arthrotomy with dislocation of the femoral head (a)
 - Recently, this condition is being treated by arthroscopic osteoplasty of the femoral head, acetabulum, or both
- (a) Parvizi et al, JAAOS, 2007.

Hip Arthroscopy

- Set up can be either in supine position or on the patient's side (I prefer supine)



Hip Arthroscopy

- Use a well padded peroneal post to limit pudendal nerve palsy and apply traction in line with hip joint



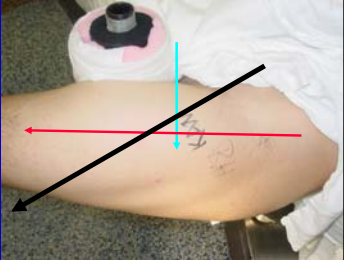
Hip Arthroscopy

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Hip Arthroscopy

- Use a well padded peroneal post to limit pudendal nerve palsy and apply traction in line with hip joint

A photograph of a patient's leg from the side. A black line indicates the direction of traction along the hip joint. A red arrow points to the peroneal post, and a blue vertical line indicates the position of the post. The patient is lying on a white surface.


Hip Arthroscopy

- Pad the heels and use web roll as well to take pressure off the heels

A photograph showing a white heel pad and a web roll being held by a hand. The heel pad is a rectangular piece of white material, and the web roll is a roll of white material.

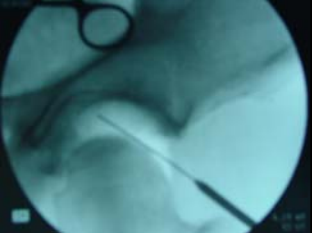
Hip Arthroscopy

- Try to get at least 8 mm of distraction
- I do this BEFORE prepping and draping, so that I know I will be able to start in the central compartment

An arthroscopic view of the hip joint, showing the femoral head and acetabulum. A surgical instrument is visible in the joint.


Hip Arthroscopy

- Tip: Mark the amount of traction necessary with a piece of tape. Then YOU do not have to be the one putting the traction up, and you can be confident that the staff is not over-distracting the hip.




Hip Arthroscopy

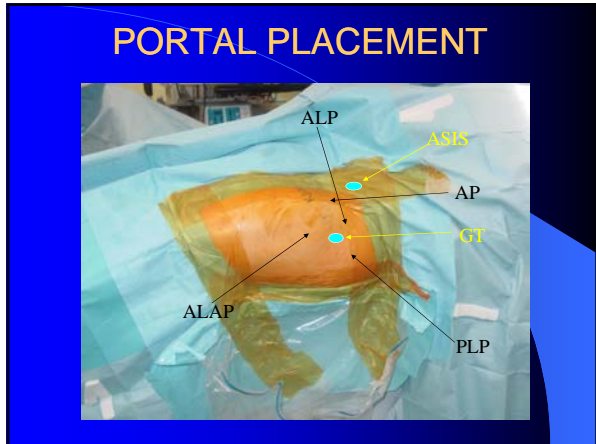
- Metal cannulas
- Slotted cannula
- Nitinol guide wire
- Spinal needle
- Straight snap
- Probe

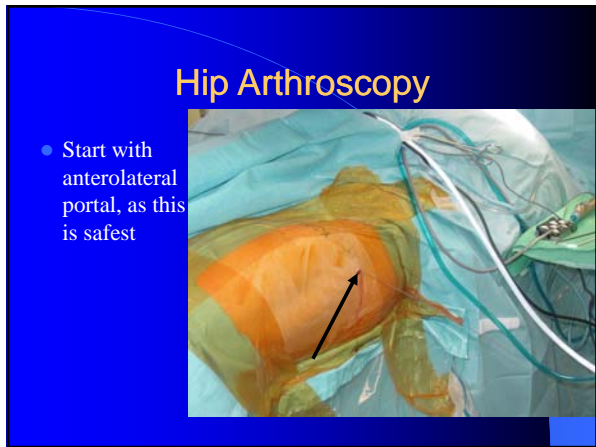


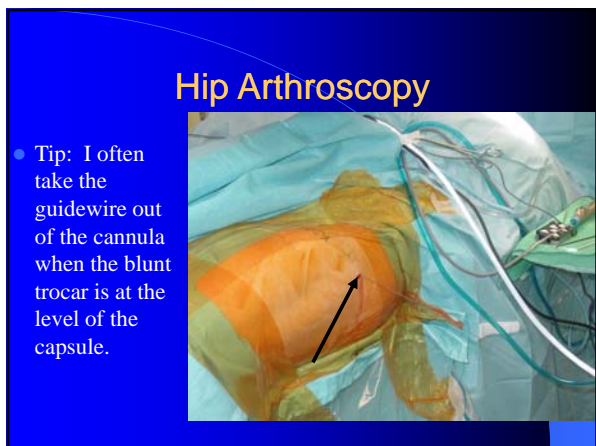
Hip Arthroscopy

- Can use a Mayo stand to hold the instruments and arthroscopy equipment
- I always use radiofrequency to improve visualization and perform capsulotomy



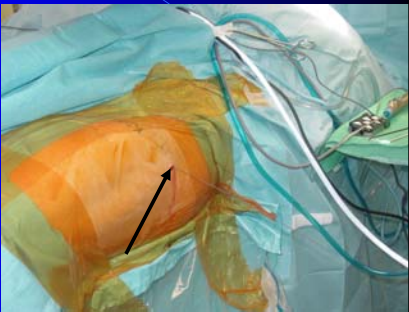







Hip Arthroscopy

- On the off chance that the guidewire is penetrating the labrum, the trocar won't follow that path and instead push the labrum superiorly.




Hip Arthroscopy

- Then do anterior portal under direct visualization
- Use a straight clamp to spread away branches of lateral femoral cutaneous nerve



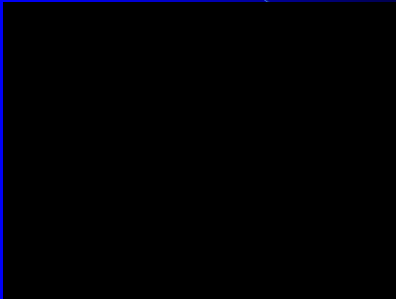
Hip Arthroscopy

- Peripheral compartment arthroscopy done with the hip out of traction and flexed to relax the anterior capsule

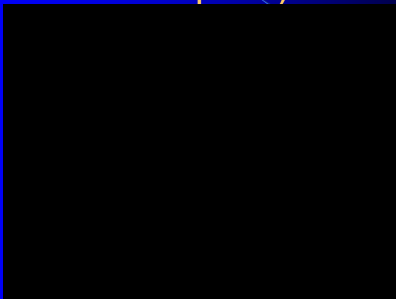


Diagnostic Hip Arthroscopy
Videos

Hip Arthroscopy video (getting in)



Hip Arthroscopy video (checking
other portal)



Hip Arthroscopy video (diagnostic central compartment)



Hip Arthroscopy video (diagnostic peripheral compartment)



Labral Tears

- 8 runners had increasing hip pain without overt trauma
- All 8 had labral tears in the anterosuperior quadrant
- 3 of 8 had associated chondromalacia of acetabulum
- Runner's Hip?

Guanche and Sikka, Arthroscopy, 2005.

Labral Tears

- 5 female patients post-delivery had symptomatic hip labral tears
- All had epidural analgesia
- All five arthroscopically confirmed and improved with arthroscopy

Ochiai and Guanche, poster, AANA National Meeting, 2008

Labral Tears

- Arthroscopic management can be either debridement alone or suture to bone fixation
- While some post-traumatic labral tears can be effectively treated with debridement alone, suture fixation may be preferable

Labral Tears

- Labral re-fixation is commonly performed in the setting of FAI osteoplasty

Labral Tears

Should we be fixing these tears at all?

Labral Tears

- Success rate for arthroscopic debridement is between 68-82% (a,b)
- Results are poorer with associated acetabular cartilage damage

(a) Farjo et al., Arthroscopy, 1999
(b) Byrd, Jones, Arthroscopy, 2000

Role of the Labrum

- Maintains hydrostatic lubrication
- Maintains negative pressure of hip joint, increasing hip stability
- Possibly contributes to load distribution across hip joint

Role of the Labrum

- Contact stresses are up to 92% higher when labrum removed
- Cartilage layers of hip compress 40% faster
- Increased motion of femur relative to acetabulum

Ferguson, J Biomech 2000.

Role of the Labrum

- Low permeability of labrum resists flow of fluid across hip
- Circumferential stiffness reinforces the rim of the acetabulum

Ferguson and Ganz J Biomech 2001.

Vascularity of the Labrum

- Capsular (peripheral) portion has much more vascularity than articular side of labrum (analogous to meniscus)

Kelly et al, Arthroscopy, 2005.

Healing Potential of the Labrum

- Bovine model
- Detached labral tears healed via fibrovascular repair or direct bone to labrum reattachment

Philippon et al, Arthroscopy, 2007.

Labral Repair

- During FAI open surgery, the labrum is detached, acetabular osteoplasty performed, and rim re-attached
- Faster recovery and superior outcomes with labral fixation as opposed to resection

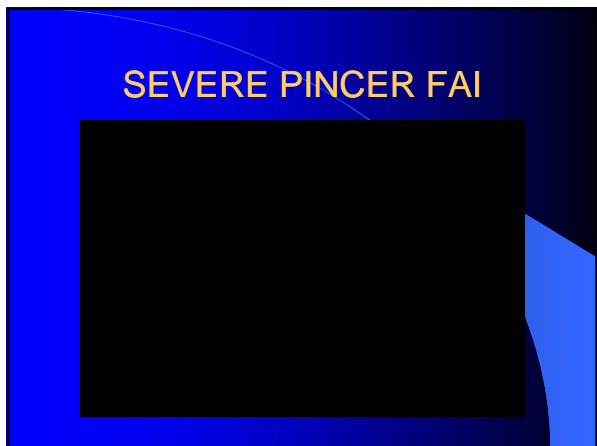
Espinoza et al, JBJS 2006.

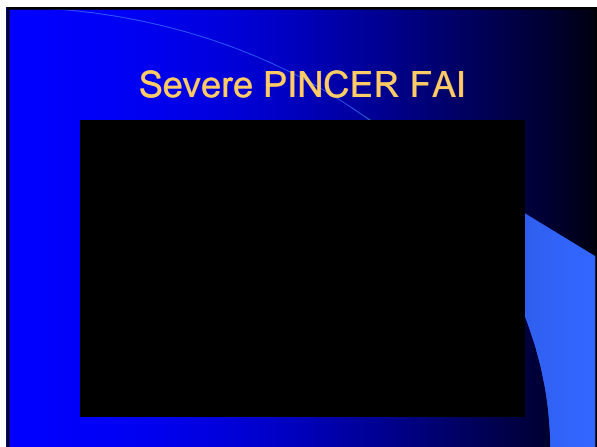
LABRUM REPAIR VIDEO

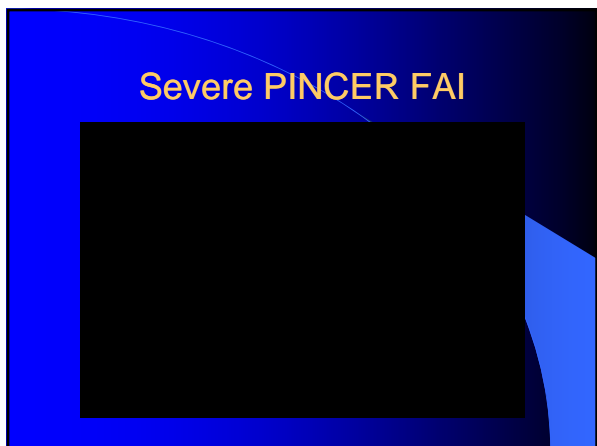




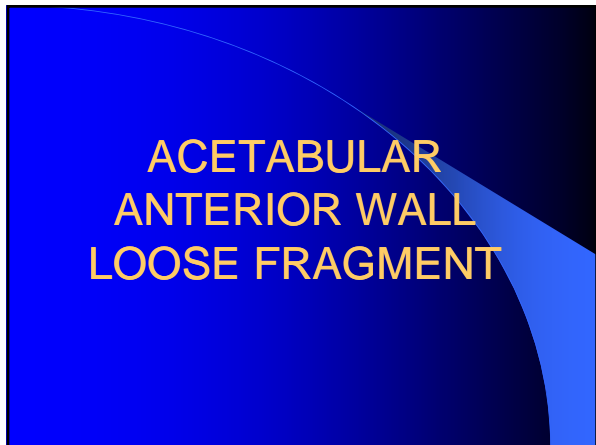




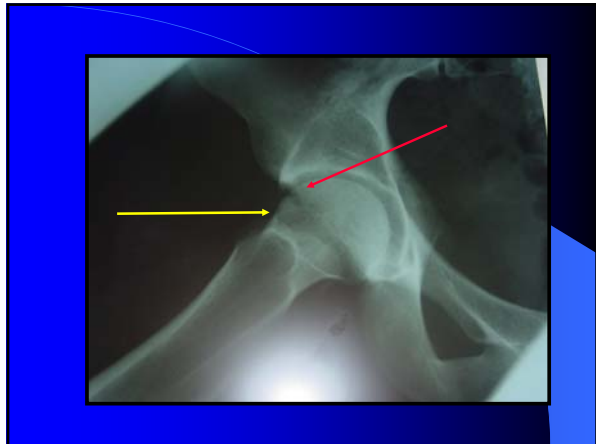


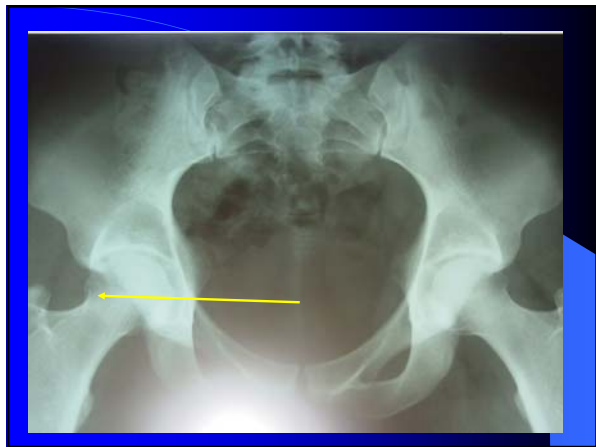















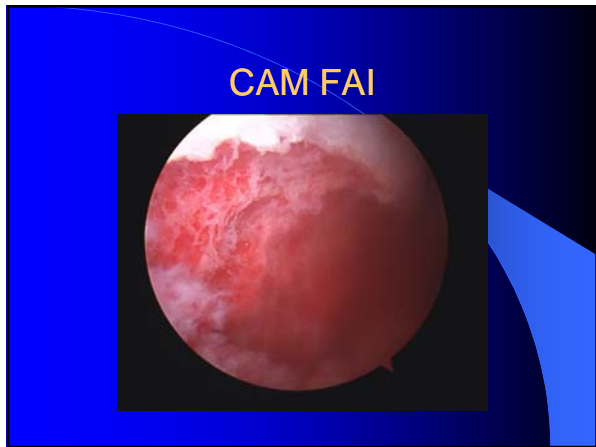
CAM IMPINGEMENT

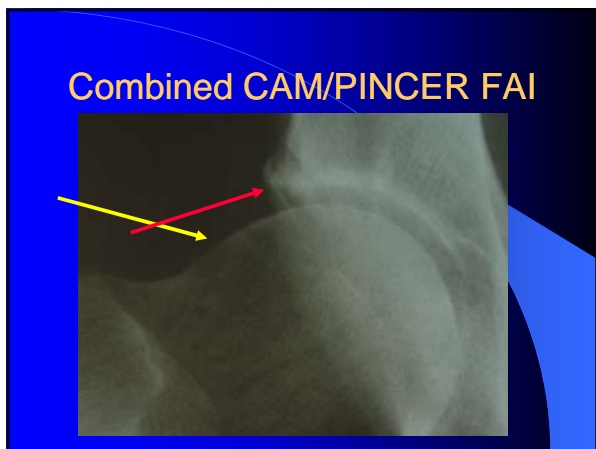
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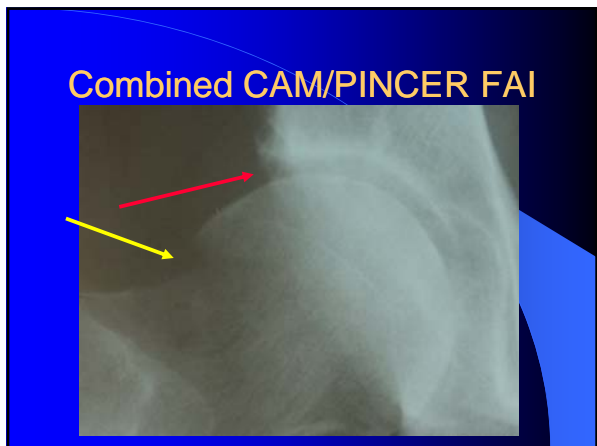




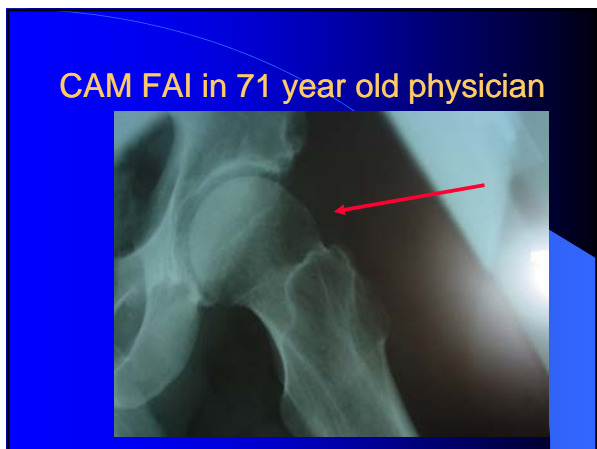












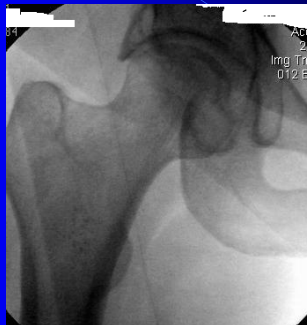
CAM FAI in 71 year old physician

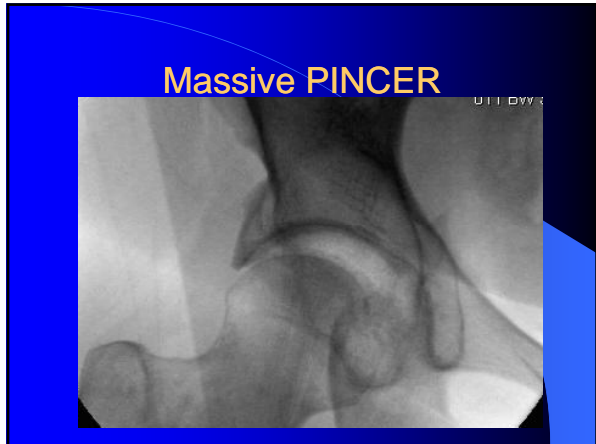


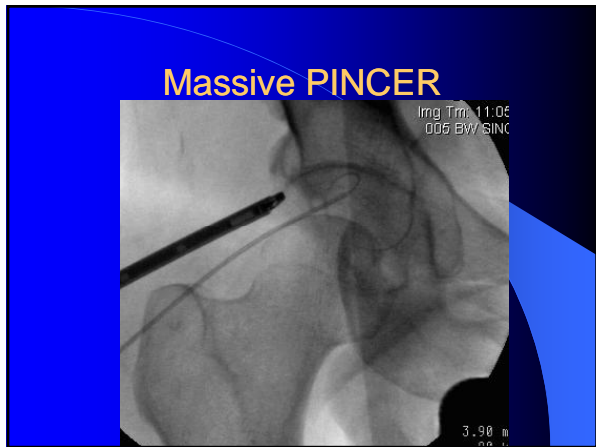
Massive Pincer

- Pincer can be from solely anterolateral overhang of the acetabulum (retroversion)
- It can also be from coxa profunda
 - 37 year old female
 - Profound hip pain
 - Already in pain management

Massive Pincer











Methods

- From January 2008 to December 2011, eight patients were identified with a CE angle greater than 45 degrees




Methods

- All patients had failed attempt at central compartment first arthroscopy
- Peripheral compartment first arthroscopy, with initial rim resection and possible CAM osteoplasty
- Gentle traction was applied to avoid iatrogenic femoral head injury during rim resection
- Then, central compartment arthroscopy performed




Results

- Seven females, one male
- Average age 39.6 years (range 29-46)
- Average Pre-op CE angle 51 degrees
– range 46-56 degrees
- Average Post-op CE angle 36.5 degrees
– range 32-41 degrees



Results

- No post-operative dislocations
- No gross scuffing of articular cartilage noted
- One transient pudendal neuralgia, requiring pudendal nerve injection



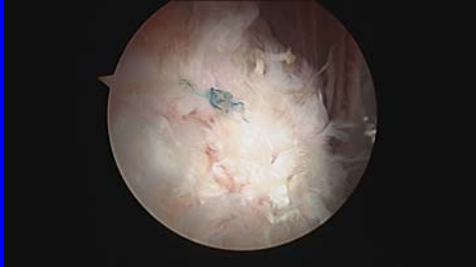
Greater Trochanteric Pain Syndrome

- Greater trochanteric pain syndrome (greater trochanteric bursitis) is a common problem in runners
- Usual treatment is IT band stretching and core/gluteal strengthening, followed by judicious use of cortisone injections
- Sometimes, patients are recalcitrant to multiple injections and courses of physical therapy

Greater Trochanteric Pain Syndrome

- In some cases, the patient has a full/high grade partial tearing of the insertion of the gluteus medius and/or minimus
- Analogous to rotator cuff tear of the hip

Greater Trochanteric Pain Syndrome



Results

- Beck reported on 19 hips that underwent OPEN FAI surgery with dislocation of the hip
 - 13 hips had good to excellent results at about 5 year follow-up
 - 5 hips went on to subsequent total hip replacement

Beck et al., *Clin Orthop Relat Res* 2004

Results

- Sampson reported on 158 patients with FAI
 - All underwent ARTHROSCOPIC FAI surgery
 - Most patients had 50% pain relief by three months
 - 95% pain relief by one year

Sampson, T. *ICL* 2006; 55: 337-46.

Results

- Philippon reports on 112 consecutive cases of arthroscopic FAI surgery
 - Mean age 40.6 years
 - 23 cam osteoplasties
 - 3 pincer osteoplasties
 - 86 combined cam/pincer osteoplasties

Phillippon et al. *JBJS-Br.* 2009;91-B: 16-23.

Results

- Philippon reports on 112 consecutive cases of arthroscopic FAI surgery
 - Modified Harris Hip Score improved from 58 to 84.3
 - Non-Arthritic Hip Score improved from 66 to 81
 - Median patient satisfaction was 9 out of 10

Phillippon et al. *JBJS-Br.* 2009;91-B: 16-23.

Results

- Larson reported a consecutive series of FAI osteoplasties, first 36 treated with labral debridement and second 39 treated with repair
 - Modified Harris Hip scores were superior for refixation group (94.3 vs. 88.9)
 - Good to excellent results 89.7% in repair group vs. 66.7% in debridement group

Larson, Giveans, *Arthroscopy* 2009; 25(4): 369-76.

Results

- Voos reported on 10 patients with arthroscopic gluteus medius repair
 - All 10 had pain resolution
 - 9/10 had near normal gluteal strength

Am J Sports Med. 2009;37:743-747.

Conclusions

- Hip arthroscopy is an effective tool for the diagnosis and treatment of multiple hip pathologies
- The procedure is relatively safe, and the recovery time rivals shoulder arthroscopy.
- Must have proper indications for the procedure.

Conclusions

- Hip arthroscopy, more than shoulder or especially knee, is evolving
- Intermediate term studies are favoring labral repair vs. debridement
- NO LONG TERM STUDIES OF ARTHROSCOPIC FAI RESULTS
- SHORT AND INTERMEDIATE TERM RESULTS SHOW GOOD RESULTS

Final Thoughts

- The best arthroscopic procedures (shoulder, knee, or hip) are the ones that mimic or improve on open techniques
- Hip arthroscopy, as shoulder and knee have done, is moving in this direction as well

Conclusions

- Hip arthroscopy is an effective tool for the diagnosis and treatment of multiple hip pathologies
- The procedure is relatively safe, and the recovery time rivals shoulder arthroscopy.
- Must have proper indications for the procedure.



Thanks for listening



Orthopaedic Surgery & Sports Medicine

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