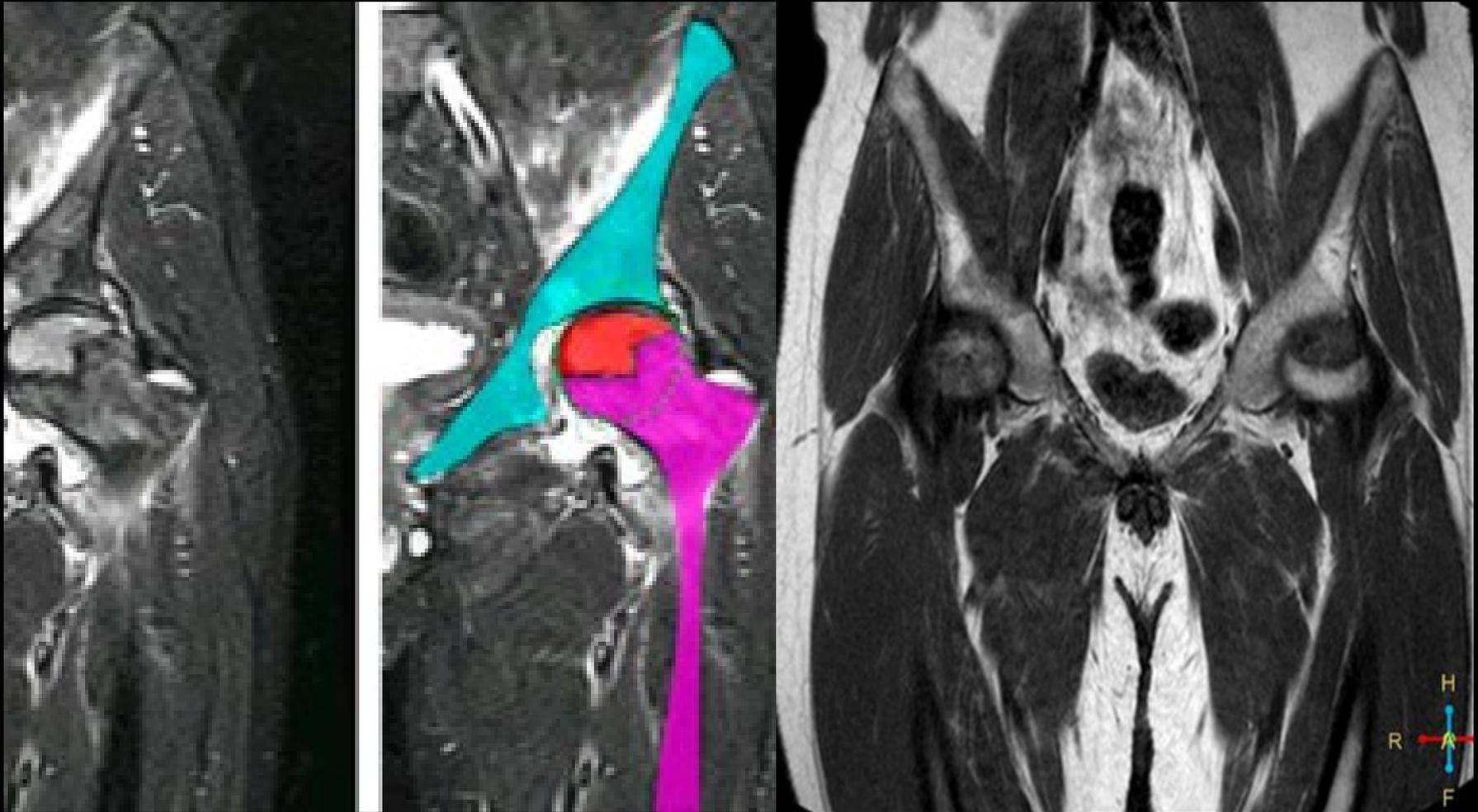


# ***.IMAGING OF THE HIP JOINTS***



***Dr/ABD ALLAH NAZEER. MD.***

## ***Indications for MRI hips***

- > Intra or extra articular abnormality (e.g., loose body)**
- > Slipped femoral capital epiphysis**
- > Tears of the acetabular labrum.**
- > Evaluate integrity of hip cartilage**
- > Degenerative disk disease**
- > Avascular necrosis**
- > Inflammatory arthritis**
- > Traumatic fracture**
- > Pathologic fracture**
- > Stress fracture**
- > Osteoarthritis**
- > Muscle injury**
- > Tendonitis**
- > Myositis**
- > Bursitis**
- > Cellulitis**

# Pelvis anatomy - Normal AP

Hover over image to show findings



## **Pelvis anatomy - Normal AP**

*The 2 hemi-pelvis bones and the sacrum form a bone ring bound posteriorly by the sacroiliac joints and anteriorly by the pubic symphysis*

*Each obturator foramen is also formed by a ring of bone.*



### **Hemi-pelvis anatomy - Normal AP**

*Each hemi-pelvis bone comprises 3 bones - the ilium (white), pubis (orange) and ischium (blue)*

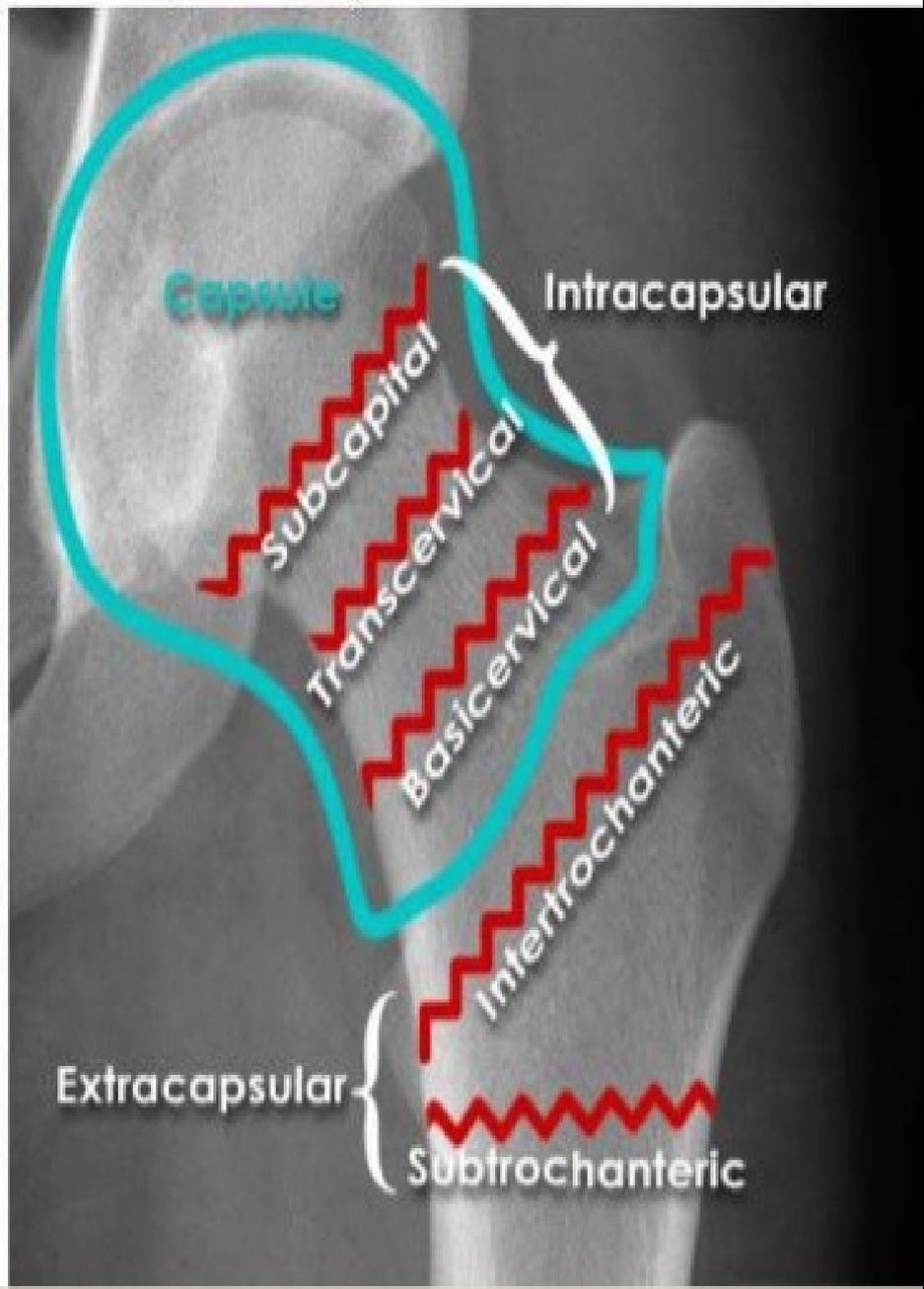
*The 3 bones fuse to form the acetabulum - the pelvic portion of the hip joint*

*ASIS = Anterior Superior Iliac Spine = attachment site for sartorius muscle*

*AIIS = Anterior Inferior Iliac Spine = attachment site for rectus femoris muscle*

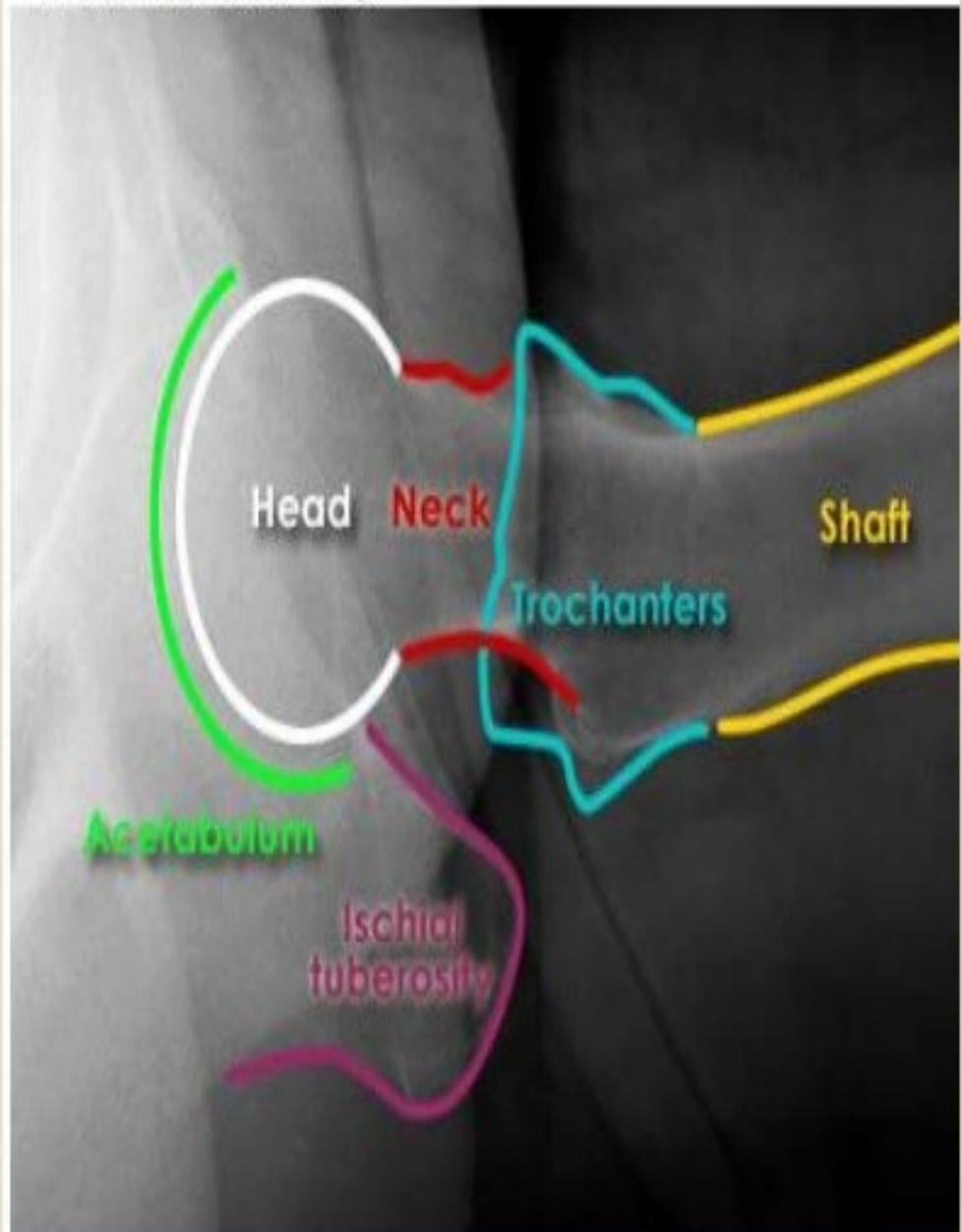
# Intracapsular v extracapsular

Hover over image to show findings



# Hip X-ray anatomy - Normal Lateral

Hover over image to show findings



# How to know the pulse sequence ?!

*Upper Egypt.*

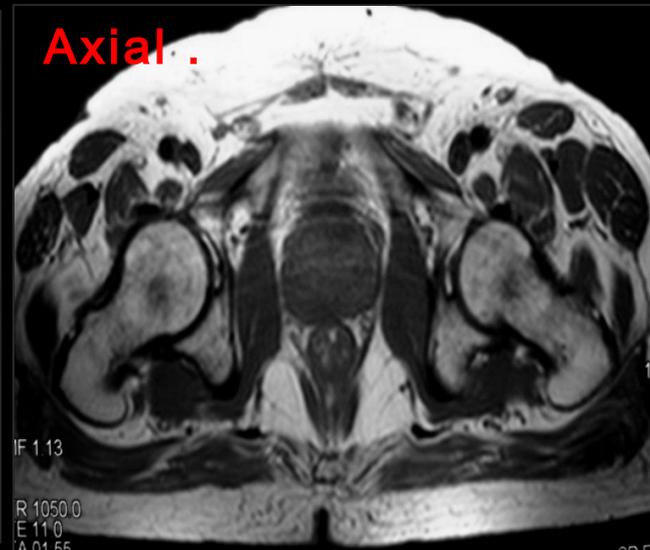
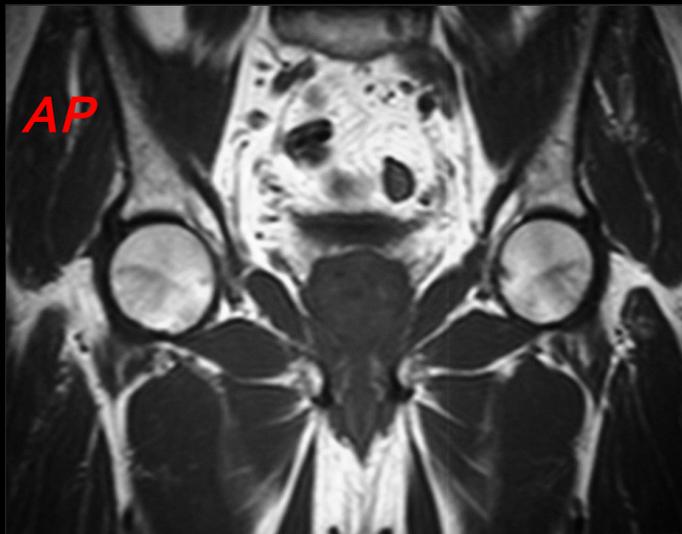
*Lower Egypt.*

All these pulse sequences belong to T2



# *Protocol of examination.*

- ◆ Axial scout
- ◆ Coronal T1, T2 WI & STIR
- ◆ Axial T2 (gradient, T2\*) , axial T1 ?!
- ◆ Sagittal T2 for the diseased hip
- ◆ If contrast is injected [ Axial, Sagittal ,coronal T1 WIs ].



**TABLE 1**

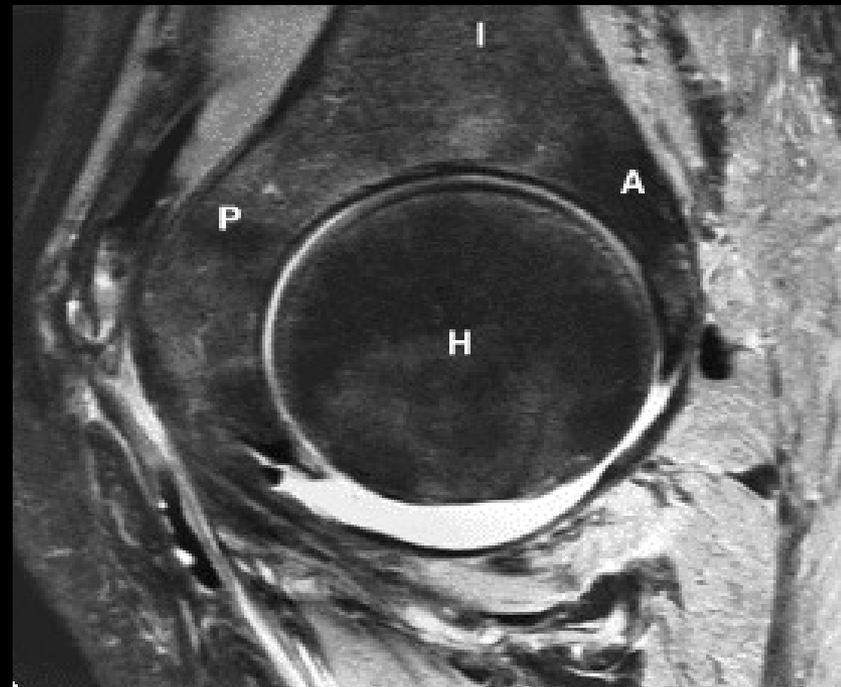
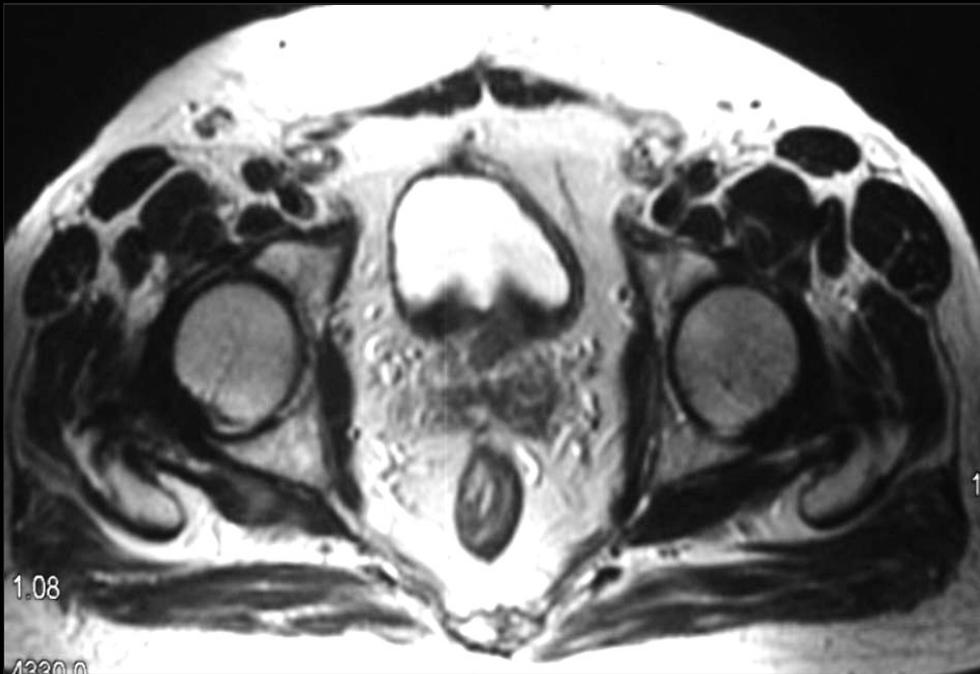
<i>Sequence</i>	<i>FOV</i>	<i>Matrix</i>	<i>NEX</i>	<i>Slice thickness/gap (mm)</i>	<i>TR</i>	<i>TE</i>	<i>TI</i>	<i>Echo train</i>
<i>Coronal STIR</i>	28-36 (both hips)	256 × 192	2 to 3	4 / 1	>2000	20-40	150	8
<i>Coronal T1</i>	28 (both hips)	256 × 256	1 to 2	4 / 1	400-800	minimum	N/A	N/A
<i>Axial T2 fatsat</i>	28 (both hips)	256 × 256	2 to 3	5 / 1	>2000	50-60	N/A	8
<i>Coronal oblique PD</i>	20	256 × 256	1 to 2	4 / 0.5	3000 (max)	25-30	N/A	4
<i>Coronal oblique T2 fatsat</i>	20	256 × 256	2 to 3	4 / 0.5	>2000	50-60	N/A	8
<i>Sagittal T2 fatsat</i>	20-22	256 × 256	2 to 3	4 / 0.5	>2000	50-60	N/A	8
<i>Sagittal PD (optional)</i>	20-22	256 × 256	2 to 3	4 / 0.5	>2000	20-30	N/A	8

***MRI body coil.***



# MR Anatomy.

- ◆ *Ball and socket joint.*
- ◆ *Acetabulum covers 40% of the femoral head.*
- ◆ *A fibrocartilaginous labium ↑ the depth of acetabulum.*
- ◆ *95% of the femoral neck is intraarticular.*



sartorius muscle

rectus femoris muscle

pectineus muscle

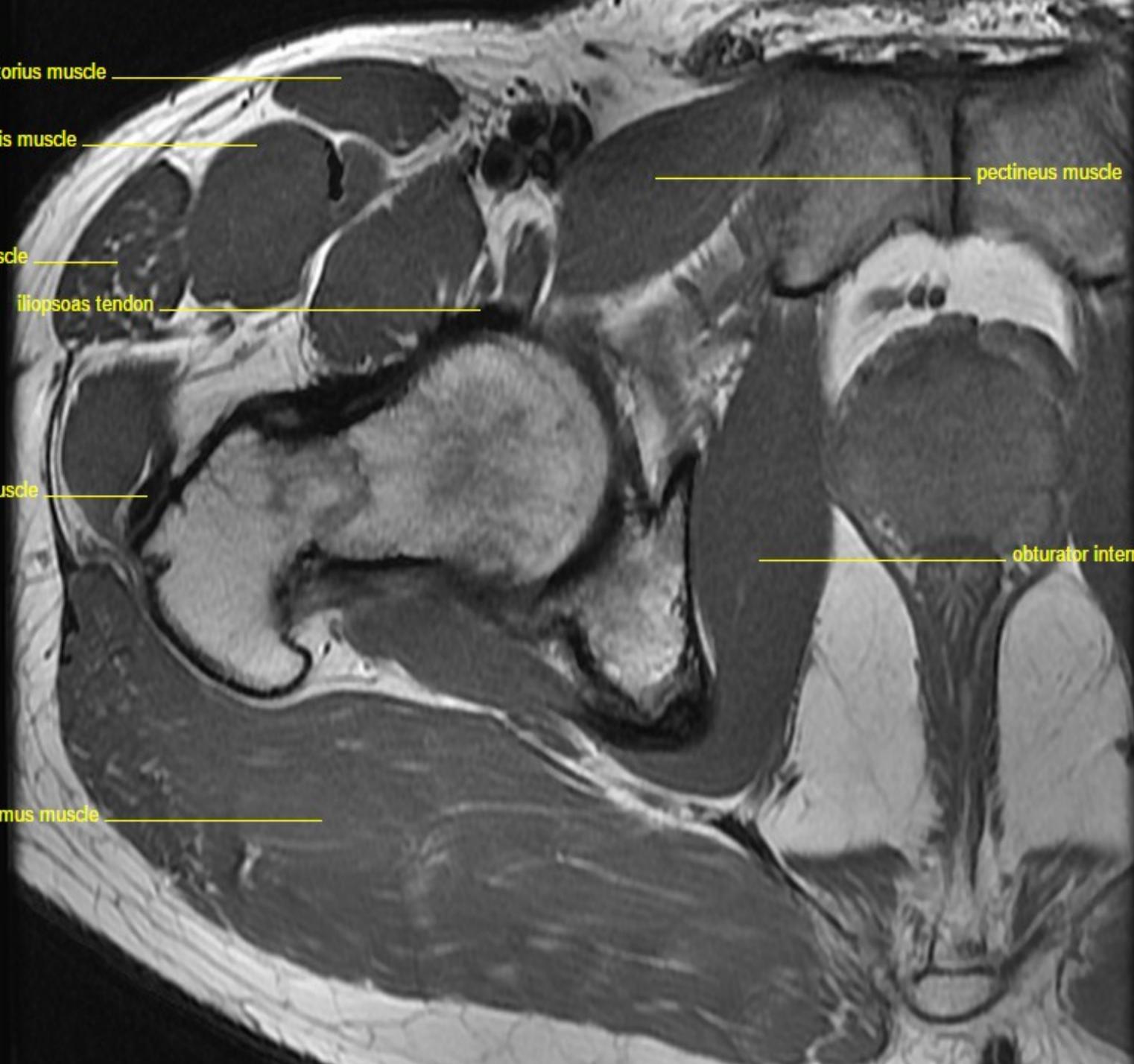
tensor fascia lata muscle

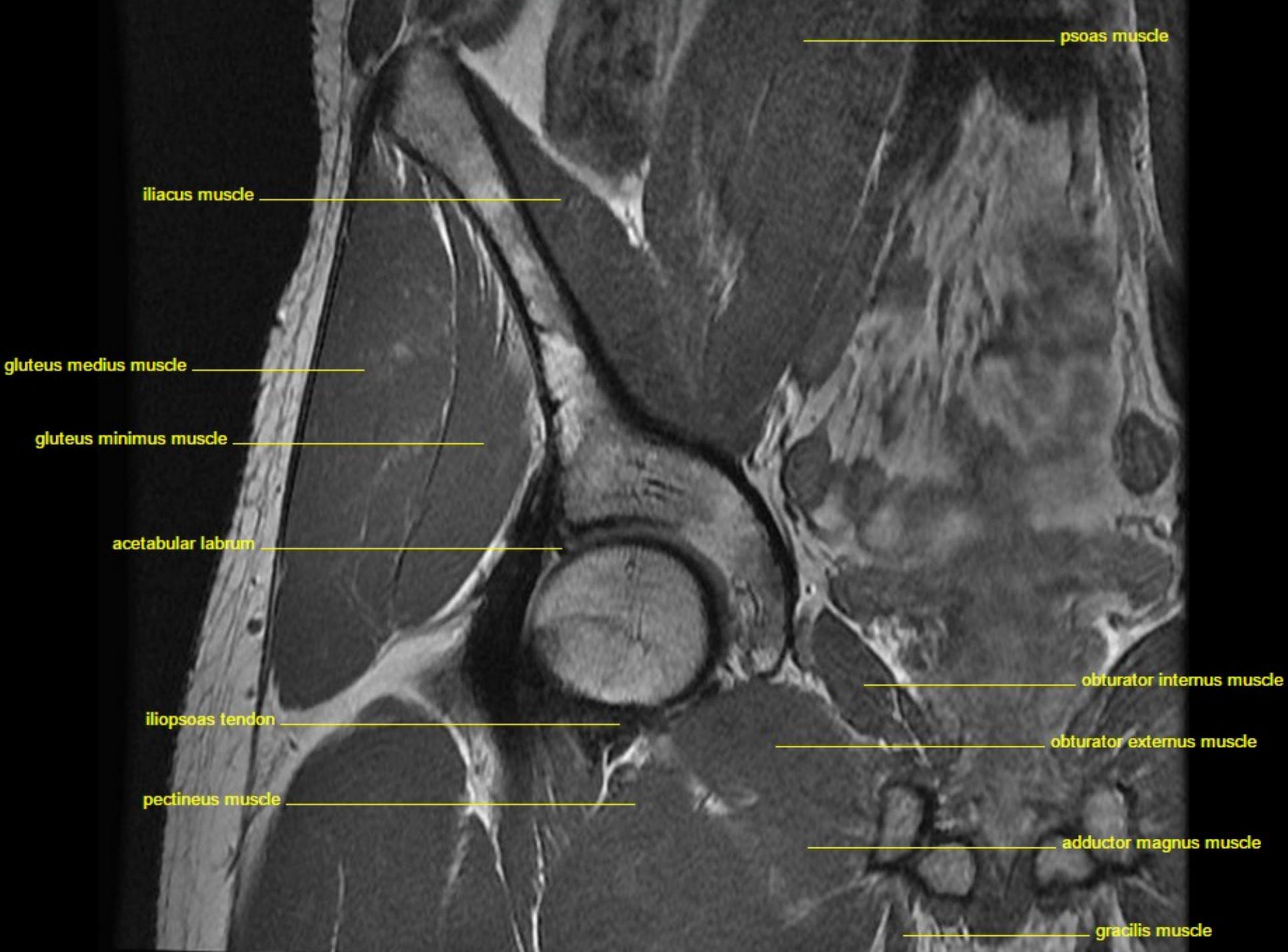
iliopsoas tendon

gluteus minimus muscle

obturator internus muscle

gluteus maximus muscle





psoas muscle

iliacus muscle

gluteus medius muscle

gluteus minimus muscle

acetabular labrum

iliopsoas tendon

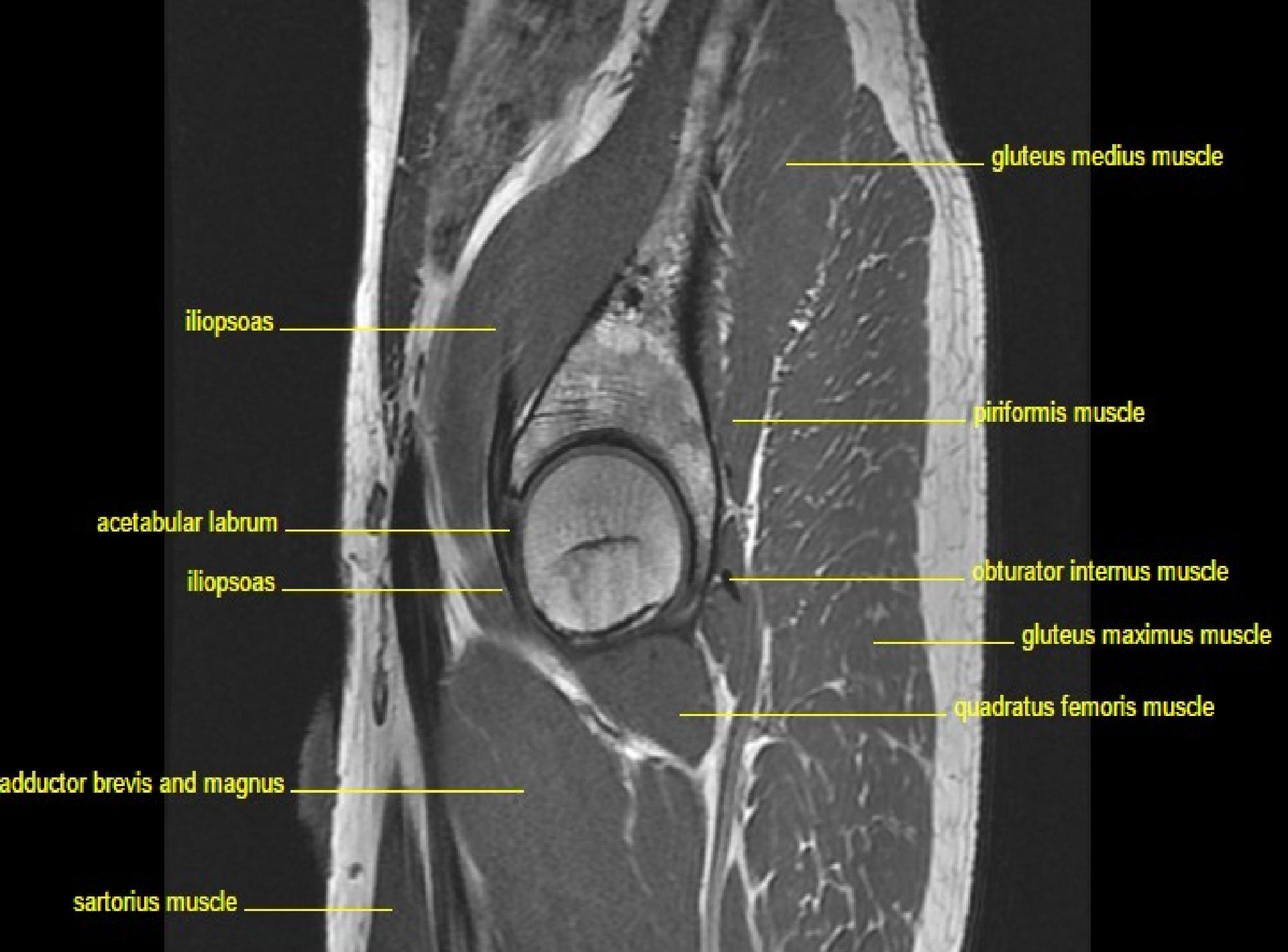
pectineus muscle

obturator internus muscle

obturator externus muscle

adductor magnus muscle

gracilis muscle



gluteus medius muscle

iliopsoas

piriformis muscle

acetabular labrum

iliopsoas

obturator internus muscle

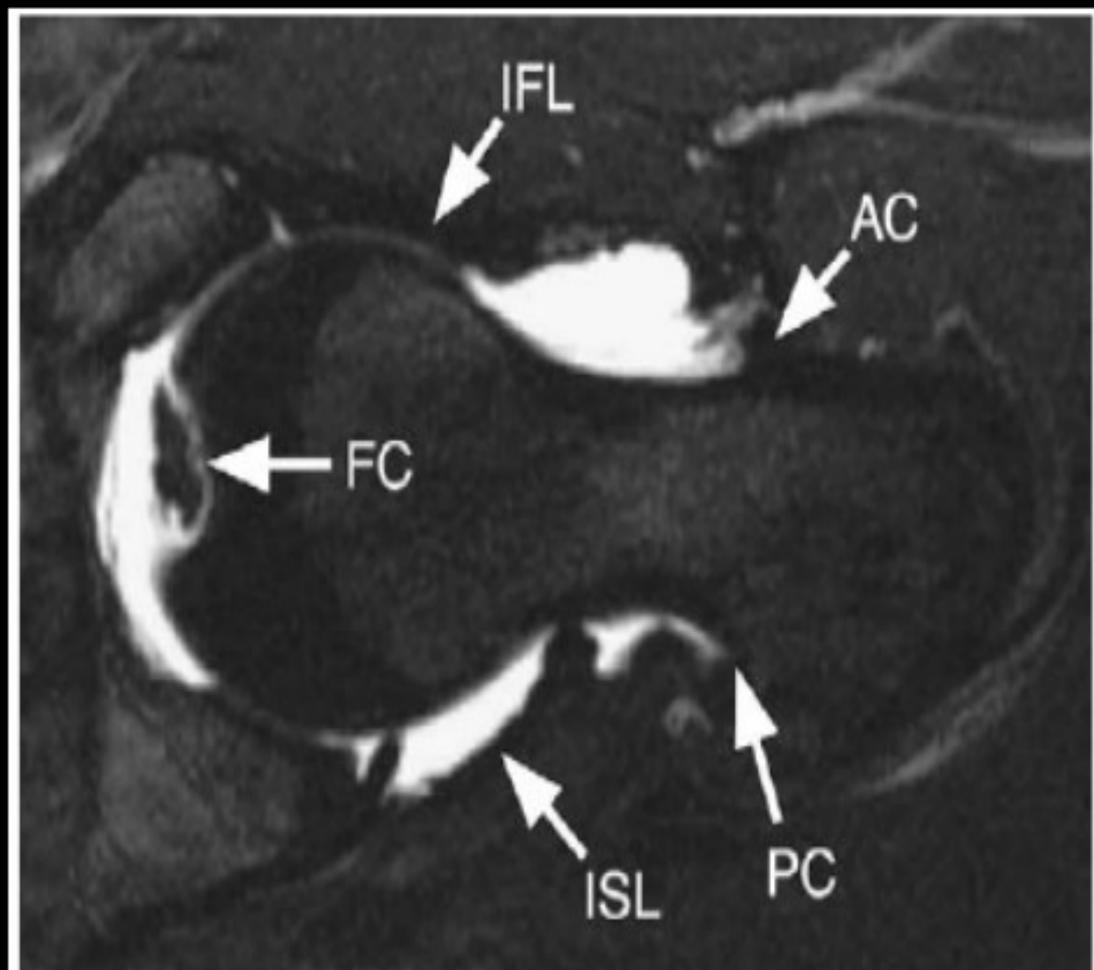
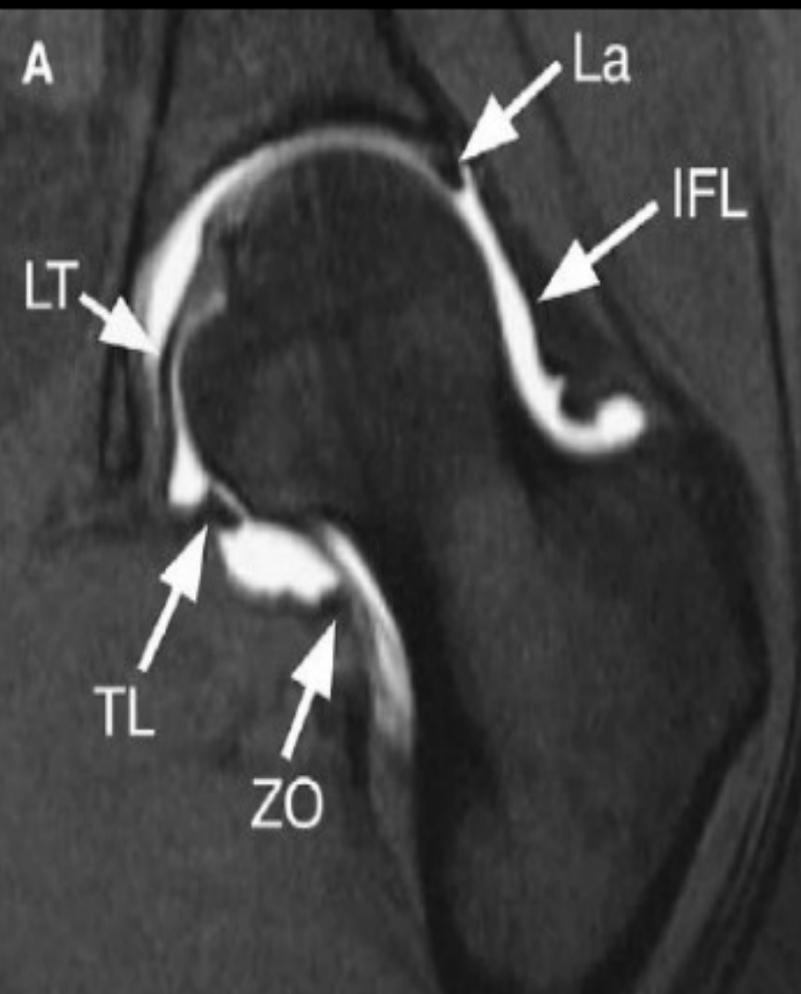
gluteus maximus muscle

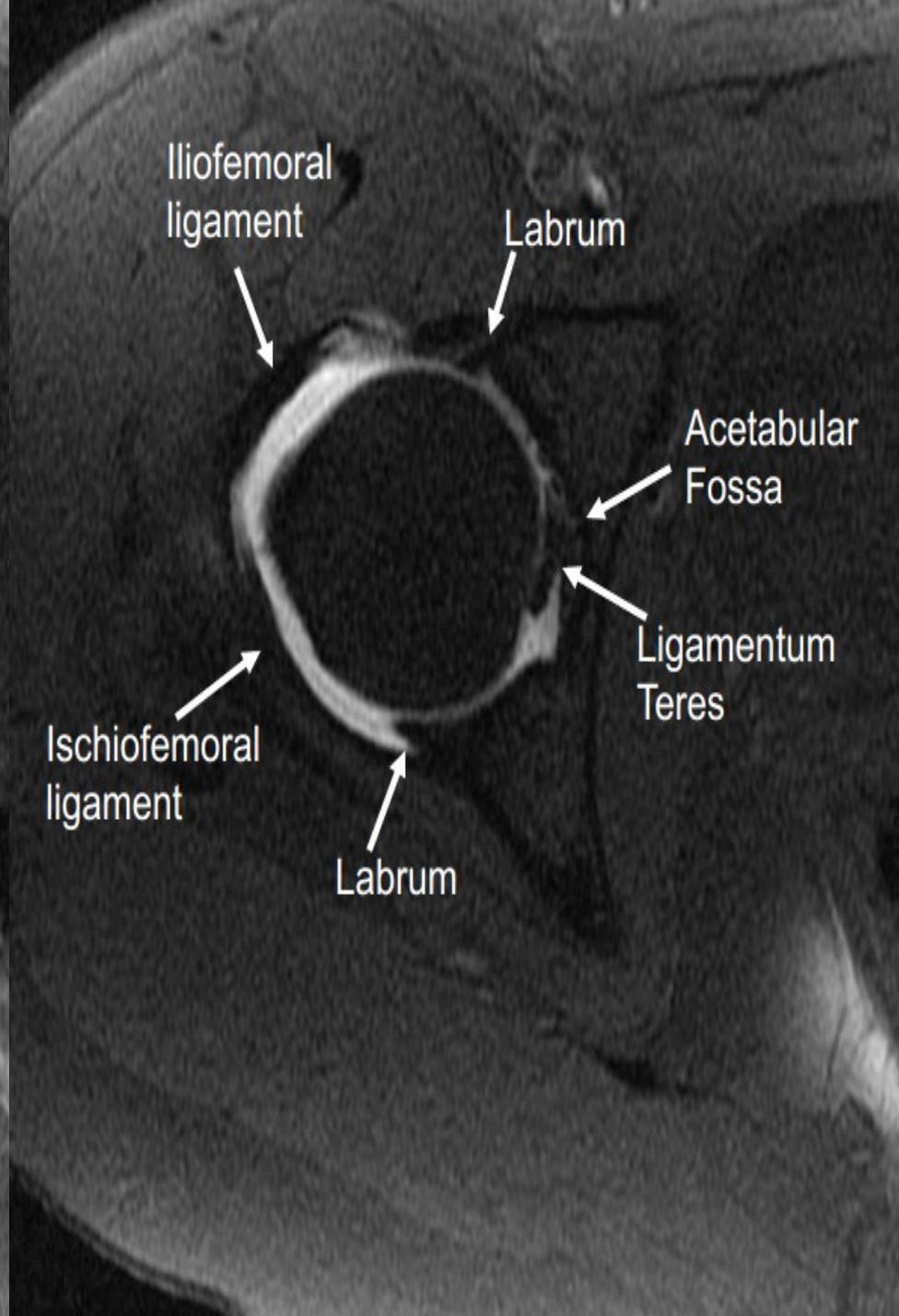
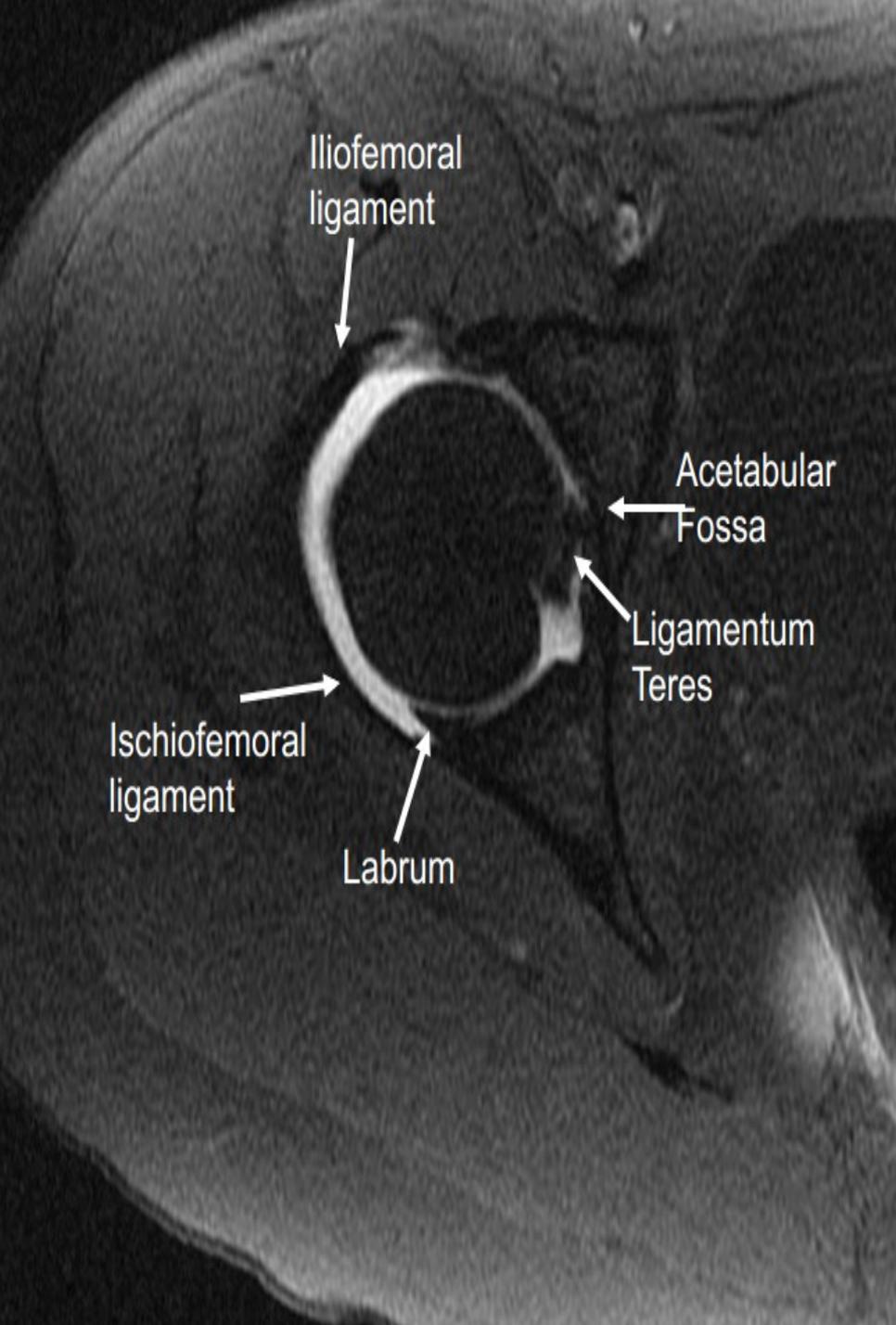
quadratus femoris muscle

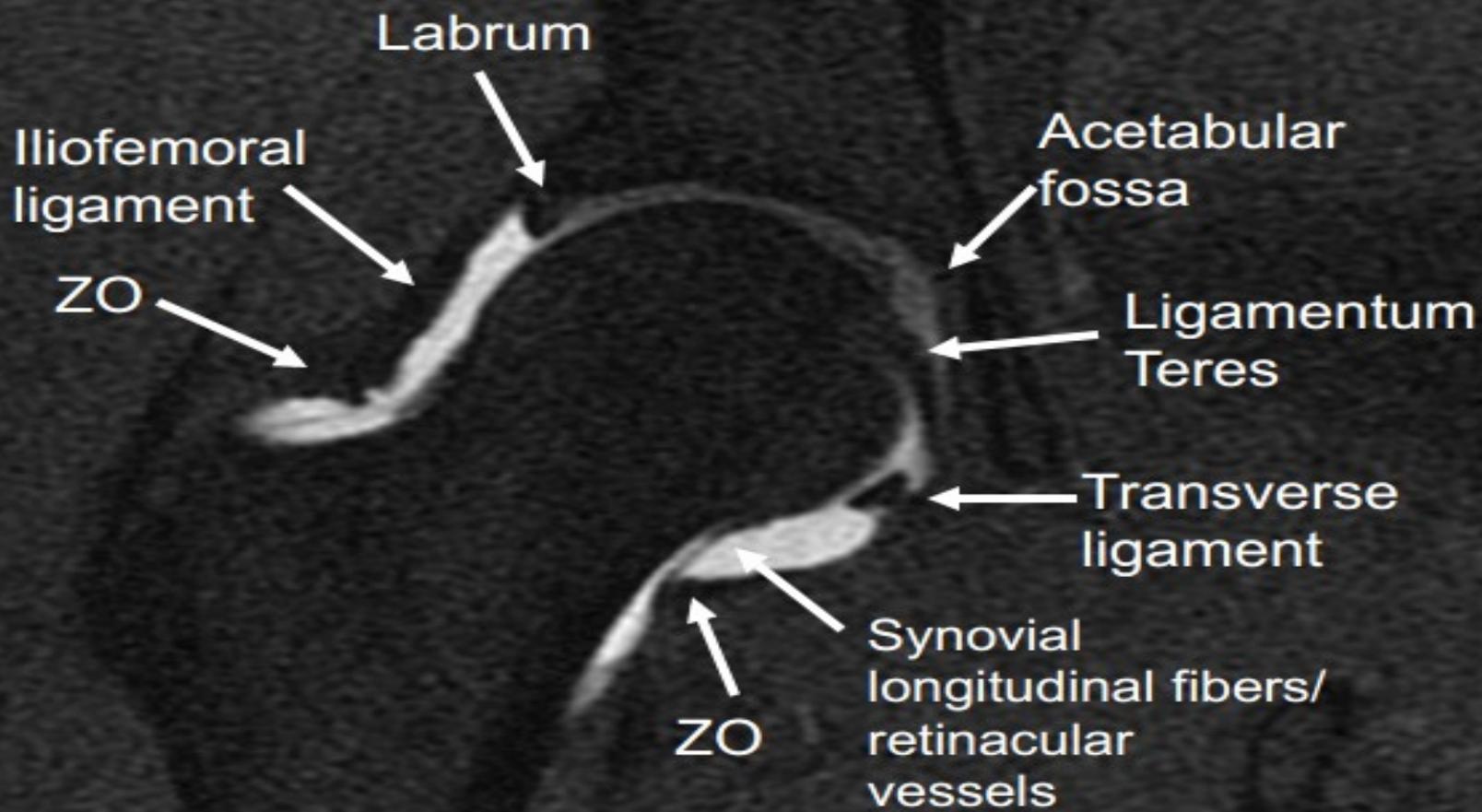
adductor brevis and magnus

sartorius muscle

# Hip Joint: Normal MR Anatomy







# *Items to be evaluated.*

- ◆ *Avascular necrosis.*
- ◆ *Transient osteoporosis.*
- ◆ *Perth's disease.*
- ◆ *Slipped femoral epiphysis.*
- ◆ *Trauma, muscle injury.*
- ◆ *Miscellaneous.*
  - ◆ *Labral tears.*
  - ◆ *Bursitis.*
  - ◆ *Femoro-acetabular impingement.*
  - ◆ *Loose bodies & chondromatosis.*
  - ◆ *Femoral neck anteversion .*

# Avascular necrosis:

## ***Introduction to Avascular necrosis.***

- Known also as osteonecrosis, aseptic necrosis, ischemic necrosis , osteochondritis dissecans.***
- Progressive process involving the compromise of bone vasculature, leading to death of bone and marrow cells and subsequently mechanical failure.***
- Theory for avascular necrosis is increased intra-osseous pressure with resultant osteonecrosis.***
- Estimated 10,000-20,000 new patient diagnosed every year, with male to female ratio as 8: 1.***
- Cause of approximately 10% of hip replacements.***
- Common site are femoral and humeral heads.***

**The antrolateral aspect of the femoral head is the commonest site, but no specific area is protected**

MR sensitive **97%** specific **98%**

### **Causes:**

#### **◆ Traumatic**

◆ (Femoral neck fracture, Dislocation and Minor trauma).

#### **◆ Non-Traumatic**

◆ Chronic corticosteroids administration.

◆ Sickle cell disease

◆ Alcohol use/Cigarette smoking.

◆ Gusher's disease

◆ Radiation

◆ Collagen disease, pancreatitis.

◆ SLE.

◆ HIV.

◆ Osteomyelitis, infection, tumor, metastasis.

# Avascular necrosis of the hip classification

*Dr Ahmed Abd Rabou and Dr Frank Gaillard et al.*

The **Ficat classification** is used for **AVN of the hip**, and uses a combination on plain film, MRI and clinical features

- **stage 0**
  - X-ray : normal
  - MRI : normal
  - clinical symptoms : nil
  
- **stage I**
  - X-ray : normal or minor osteopaenia
  - MRI : oedema
  - bone scan: increased uptake
  - clinical symptoms: pain typically in the groin
  
- **stage II**
  - X-ray : mixed osteopenia &/or sclerosis &/or subchondral cysts, without any subchondral lucency (crescent sign - see below)
  - MRI : geographic defect
  - bone scan : increased uptake
  - clinical symptoms: pain and stiffness
  
- **stage III**
  - X-ray : **crescent sign** & eventual cortical collapse
  - MRI : same as Xray
  - clinical symptoms : pain and stiffness+/- radiation to knee and limp
  
- **stage IV**
  - X-ray : end stage with evidence of secondary degenerative change
  - MRI : same as Xray
  - clinical symptoms : pain and limp

# Mitchell's MRI Staging

## Class

▶ A

▶ B

▶ C

▶ D

▶ T1

▶ Bright

▶ Bright

▶ Intermediate

▶ Dark

▶ T2

▶ Intermediate

▶ Bright

▶ Bright

▶ Dark

▶ Definition

▶ Fat signal

▶ Blood signal

▶ Fluid or edema  
signal

▶ Fibrosis signal

# Radiology- sequential Changes

- Crescent Sign
- Osteoporosis
- Sclerosis
- Cystic changes
- Loss of spherical weight bearing dome
- Partial collapse of head
- Secondary Osteoarthritis

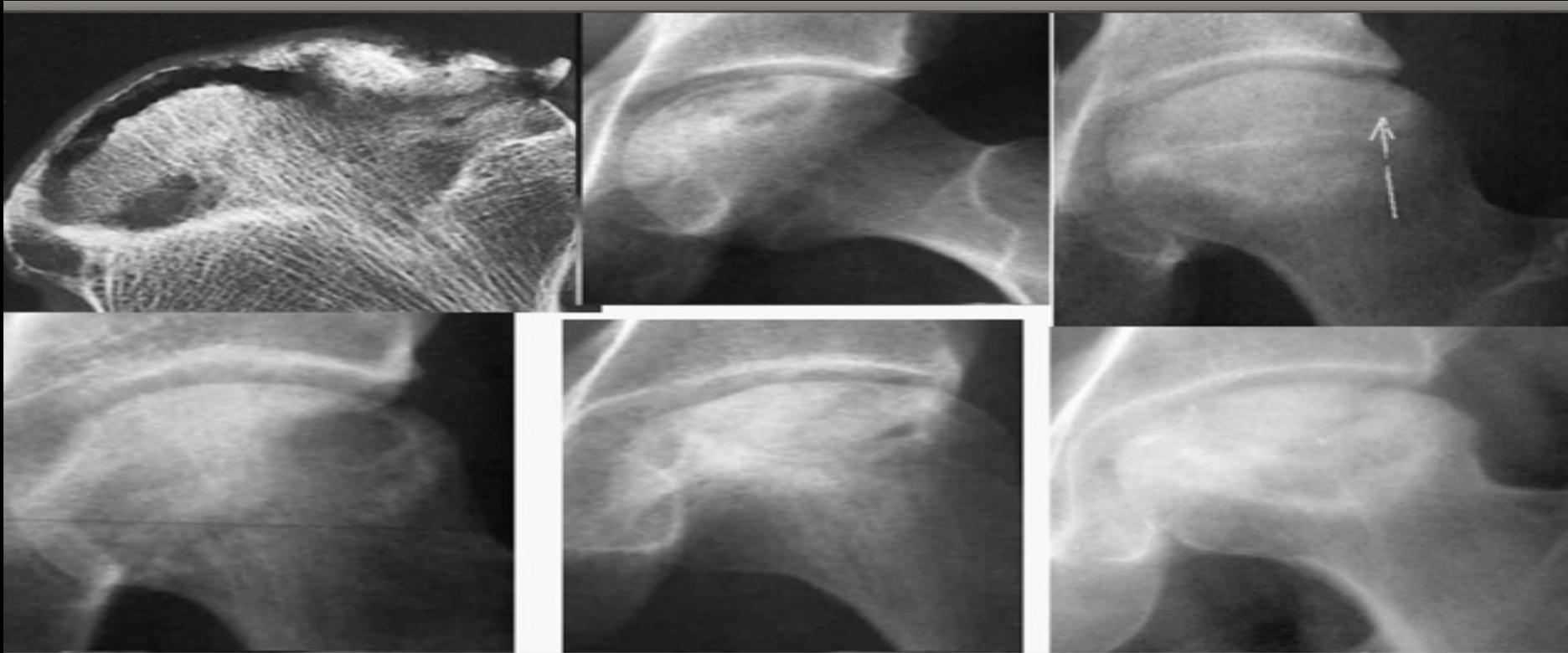
## ***Hip AVN on plain films.***

***Suspected AVN of the femoral head should be evaluated initially by AP and lateral films.***

***Lateral films help to evaluate superior element of femoral head where subchondral abnormality may be seen.***

***Plain films can remain normal months after AVN has begun.***

***Sclerosis,, cysts, joint space narrowing, degenerative changes in the acetabulum.***

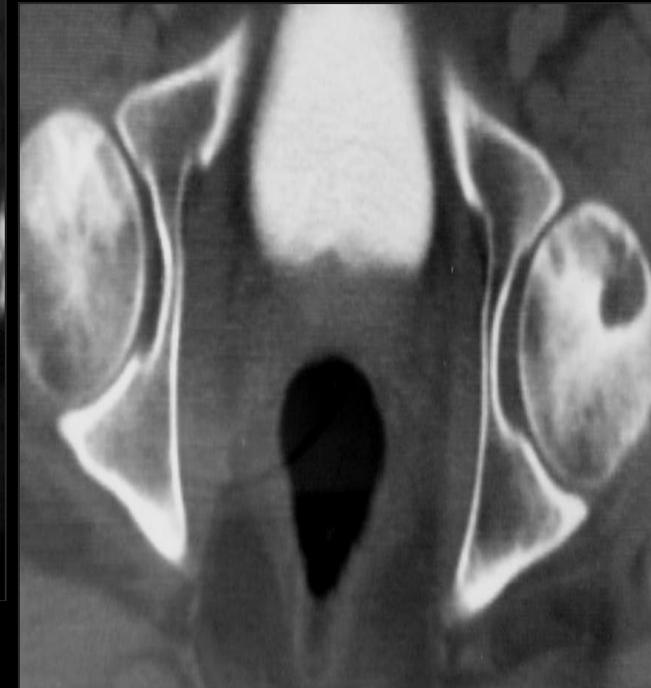
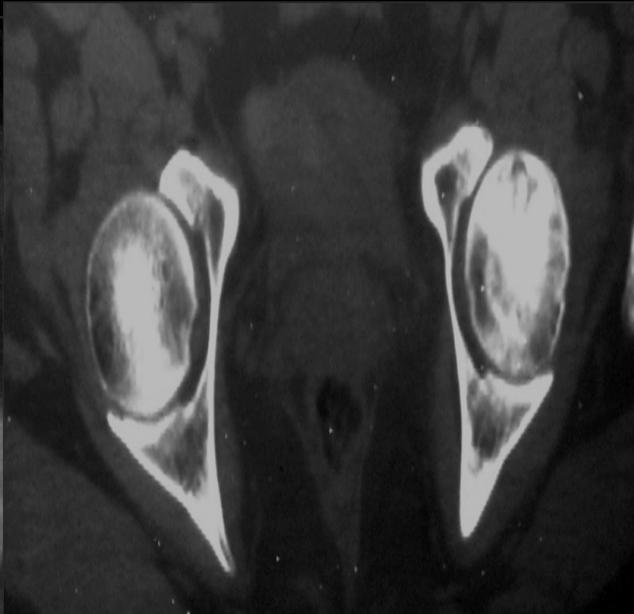


***Avascular necrosis of the right hip grad 111.***



## **Hip AVN on CT:**

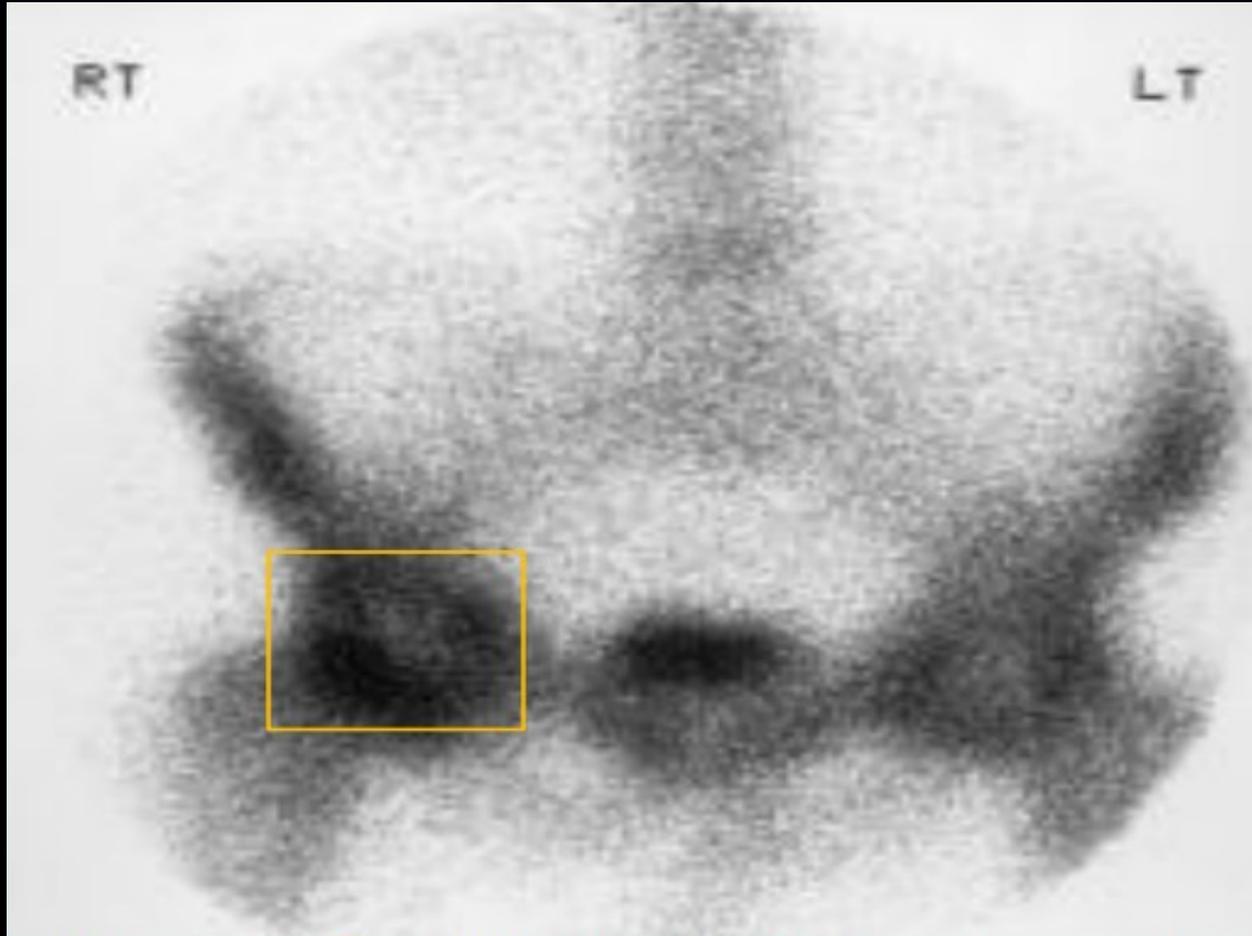
- ◆ *CT scan do not demonstrate early AVN*
- ◆ *Osteoporosis is the first visible sign of AVN on CT.*
- ◆ *Contour irregularities and fissures*
- ◆ *Areas of bone sclerosis .*
- ◆ *Structural collapse*
- ◆ *Osteoarthritic changes*



**Avascular necrosis.**

# ***Hip AVN on Tc-99 Bone Scan.***

***Technetium-99 bone scanning used for patients with suspected disease who have negative radiographs and unilateral symptoms. Increased bone turnover at the bridge between dead and reactive bone. Increased uptake surrounded by a cold area lead to a radiographic donut sign.***



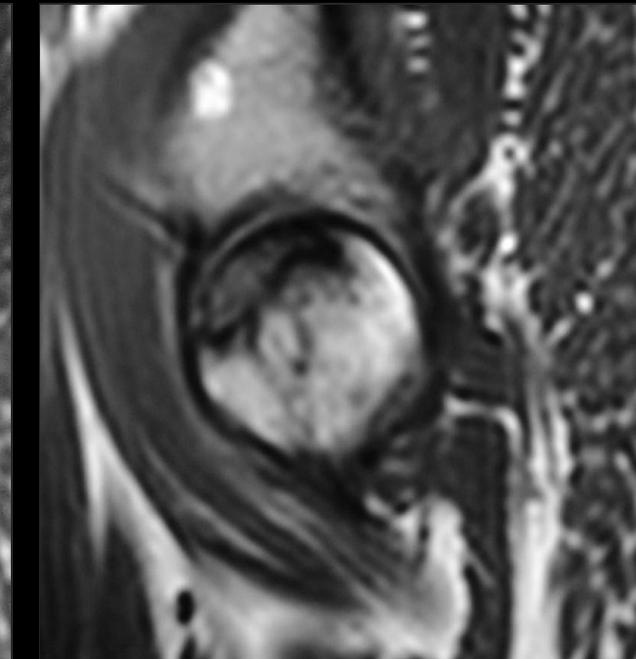
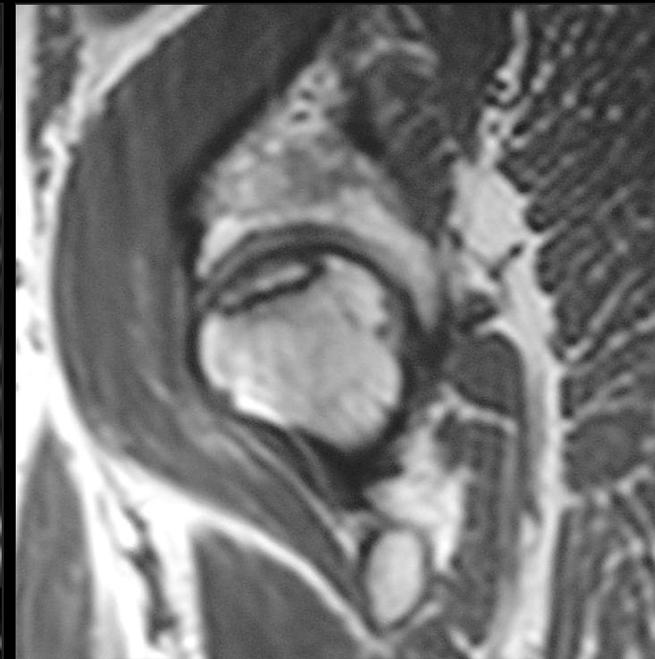
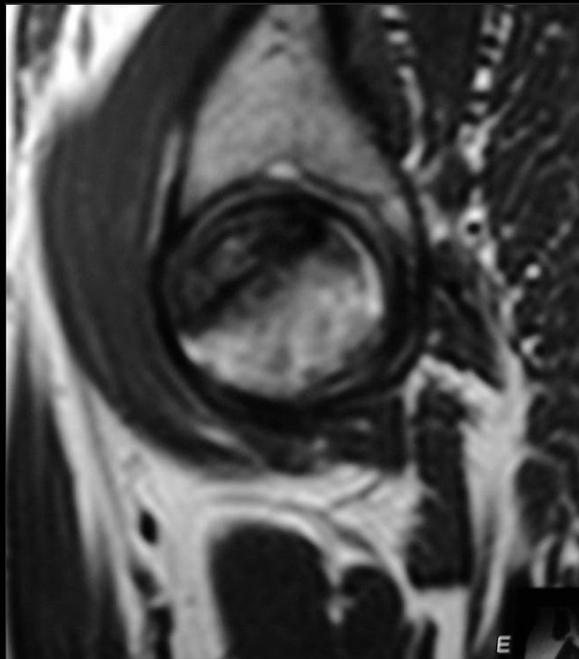
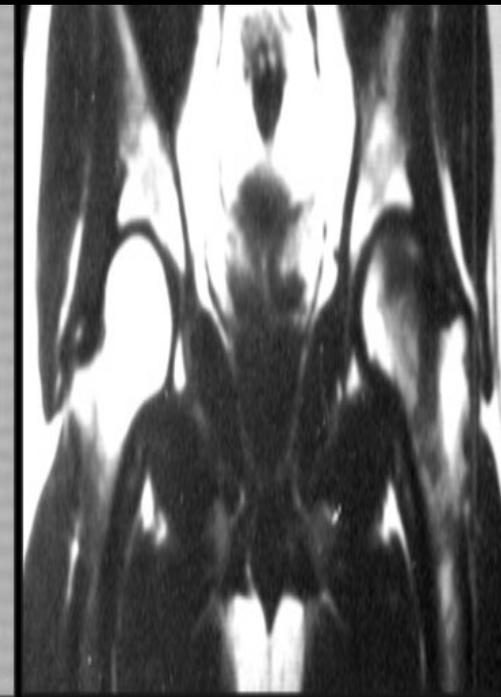
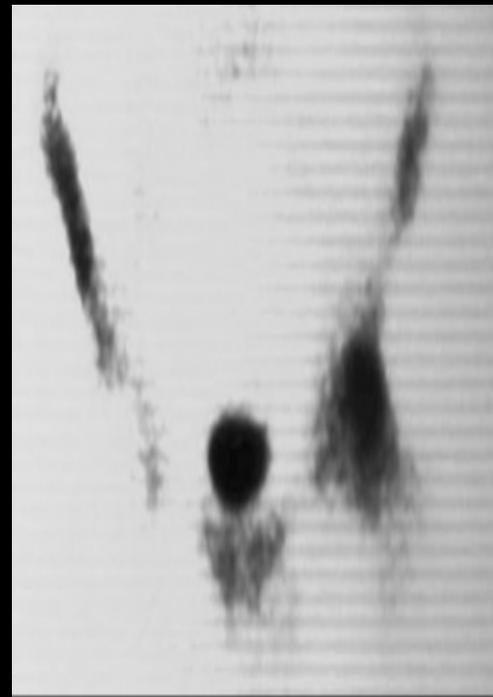
# MRI - Findings

- Bone Marrow edema
- Double Line – Head in Head sign
- Crescent sign
- Collapse
- Joint effusion
- Involvement of acetabulum
- Status of other hip
- Marrow infiltrating disease

# Avascular necrosis.

1-Bone marrow edema.

2-Normal marrow + line



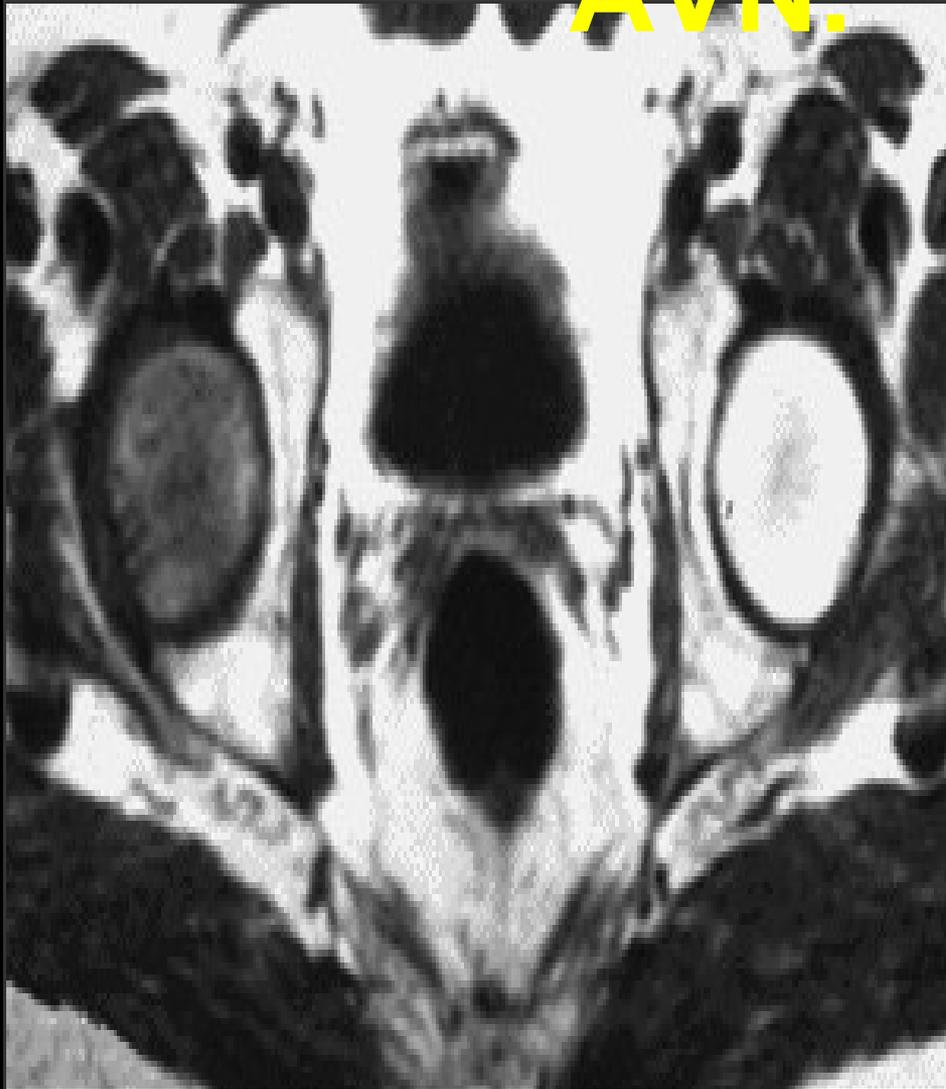


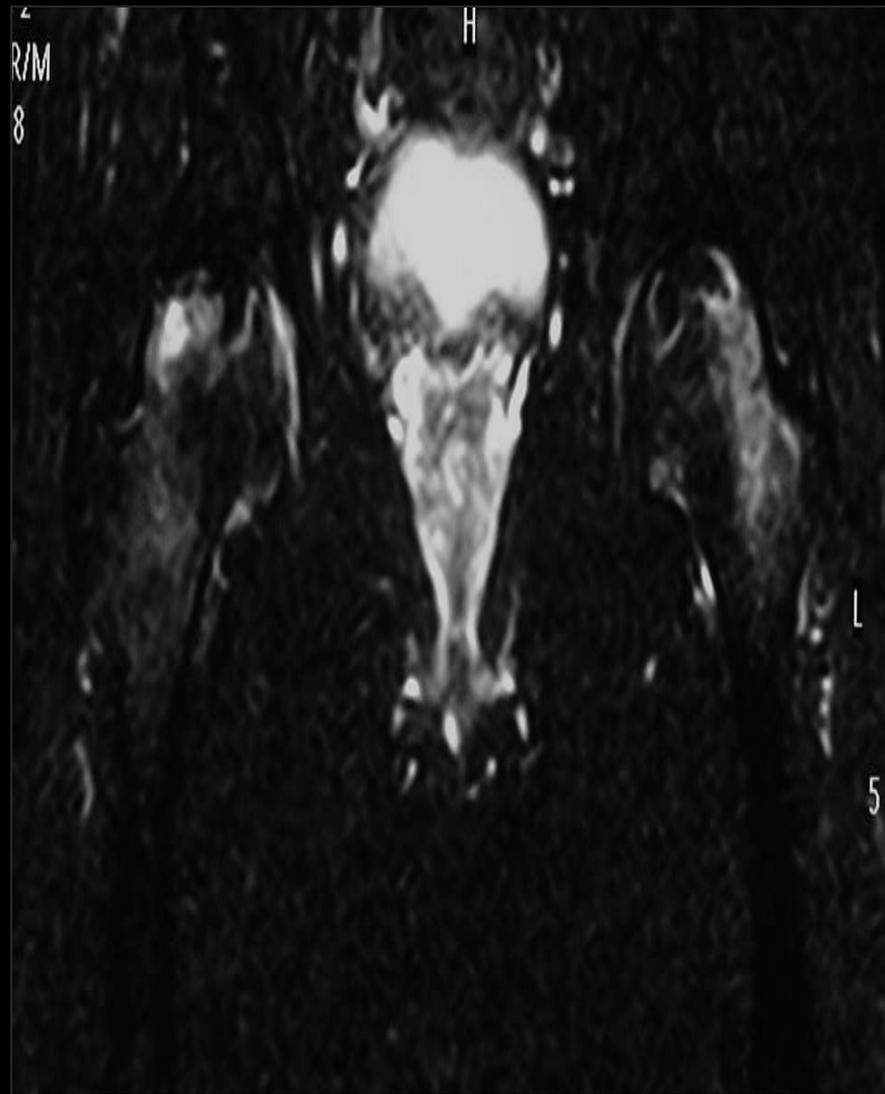
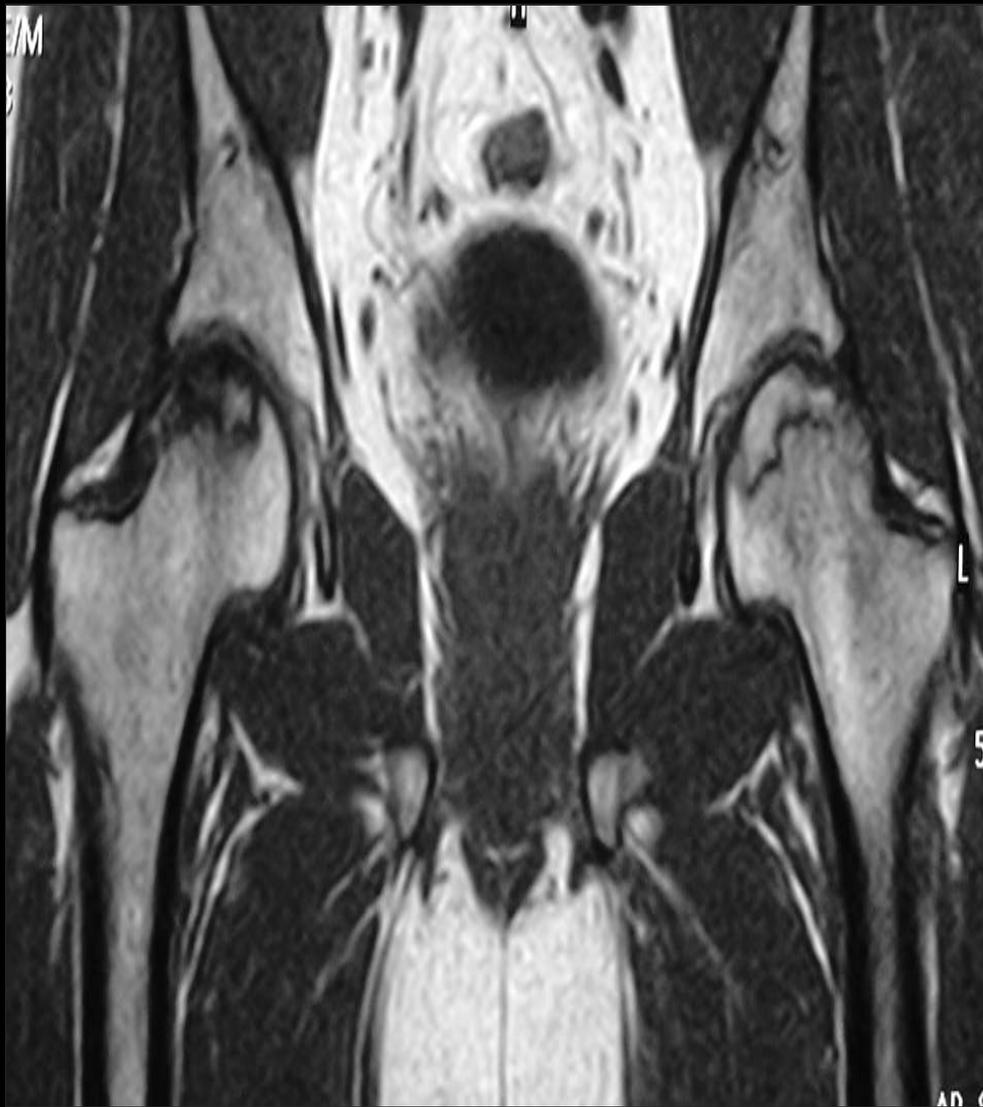
**Stage 1 - Plain radiograph and T1-weighted MRI image of the right hip. There are no abnormal findings in the left image, although there are already some signs of osteonecrosis on the femoral head on the MRI.**

# .Stage I versus transient osteoporosis

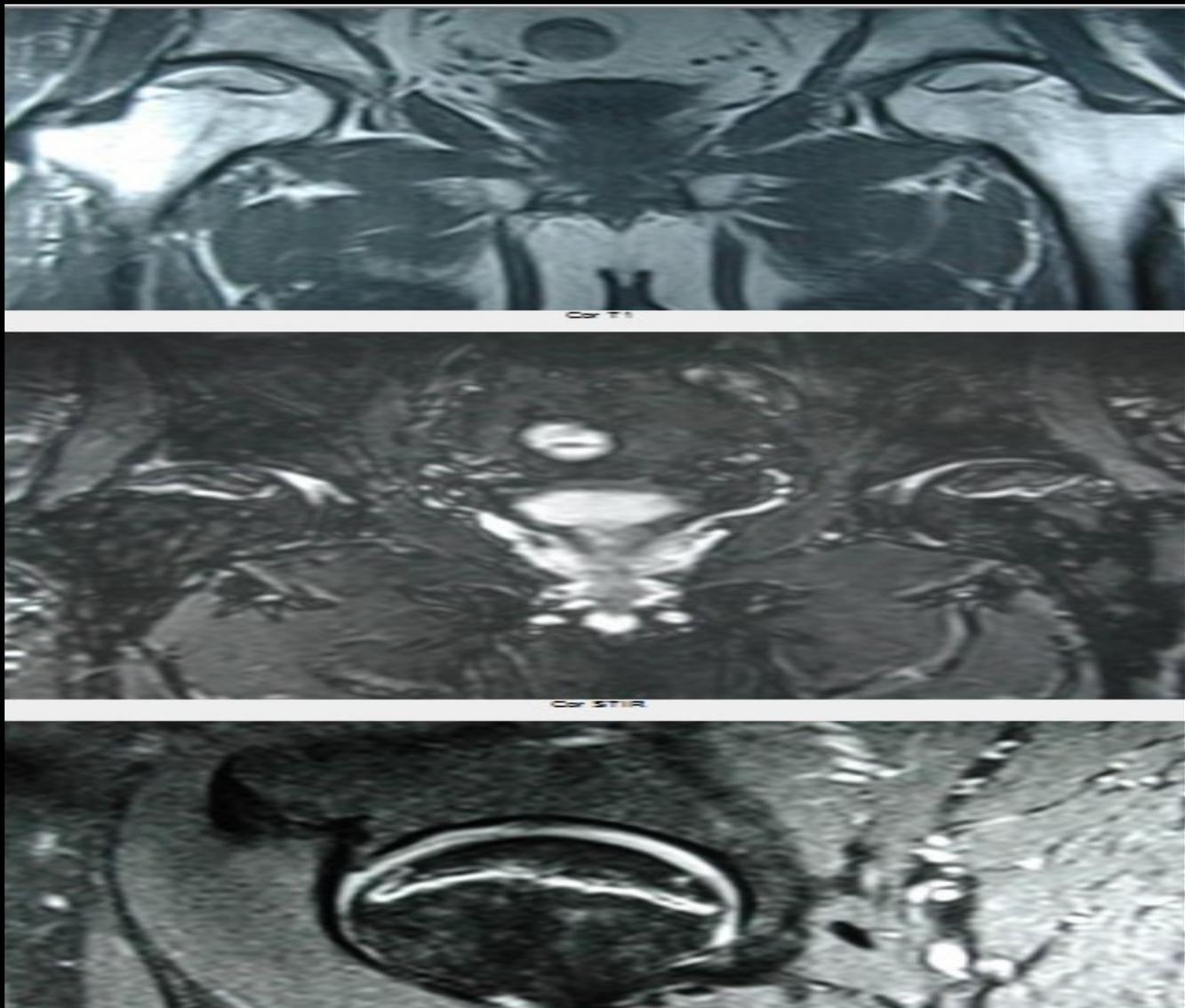


# Stage 1 AVN.





**:] Stage 11** The line is composed of two layers [ **double line sign**  
Inner layer of hyperemic granulation tissue and an outer layer of osteoblastic activity

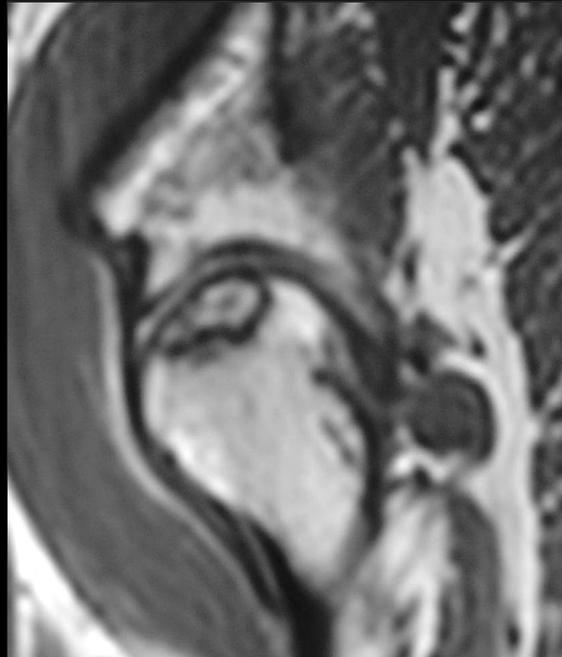
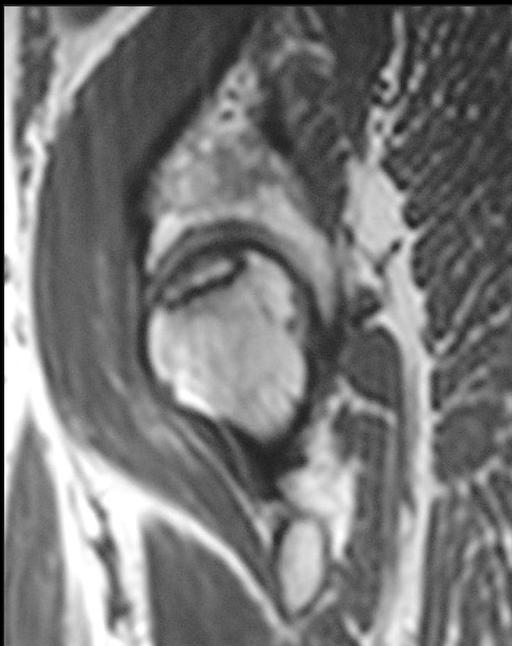
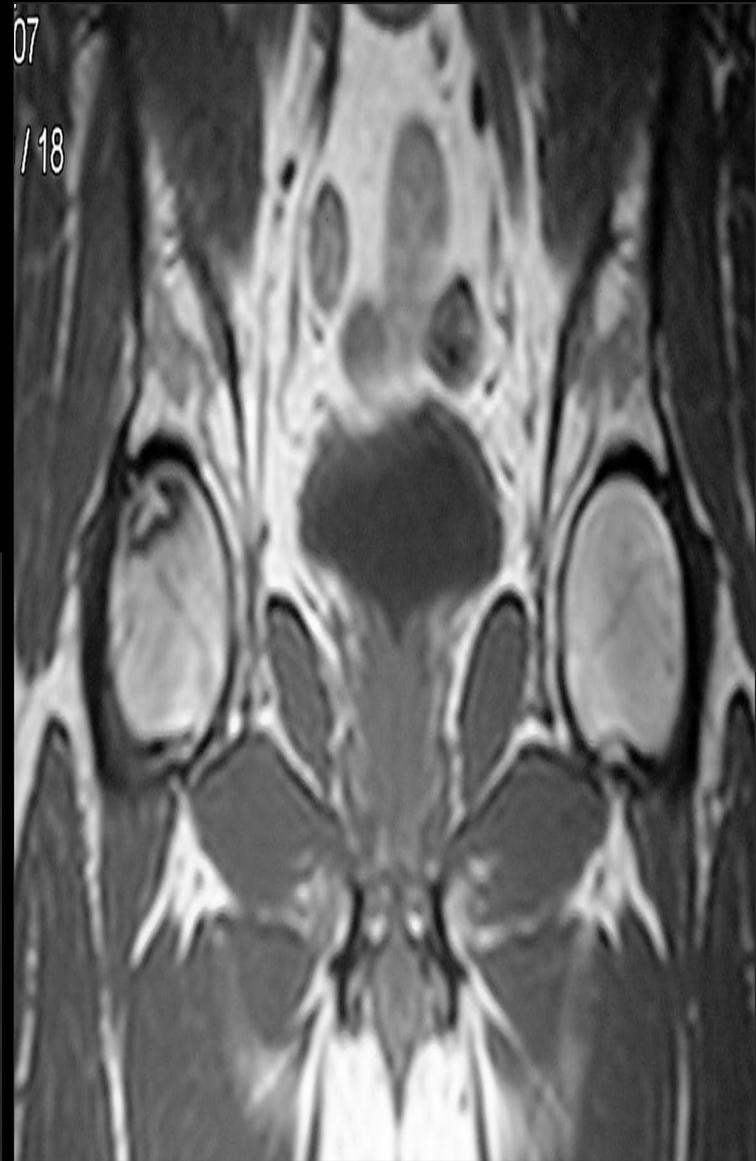
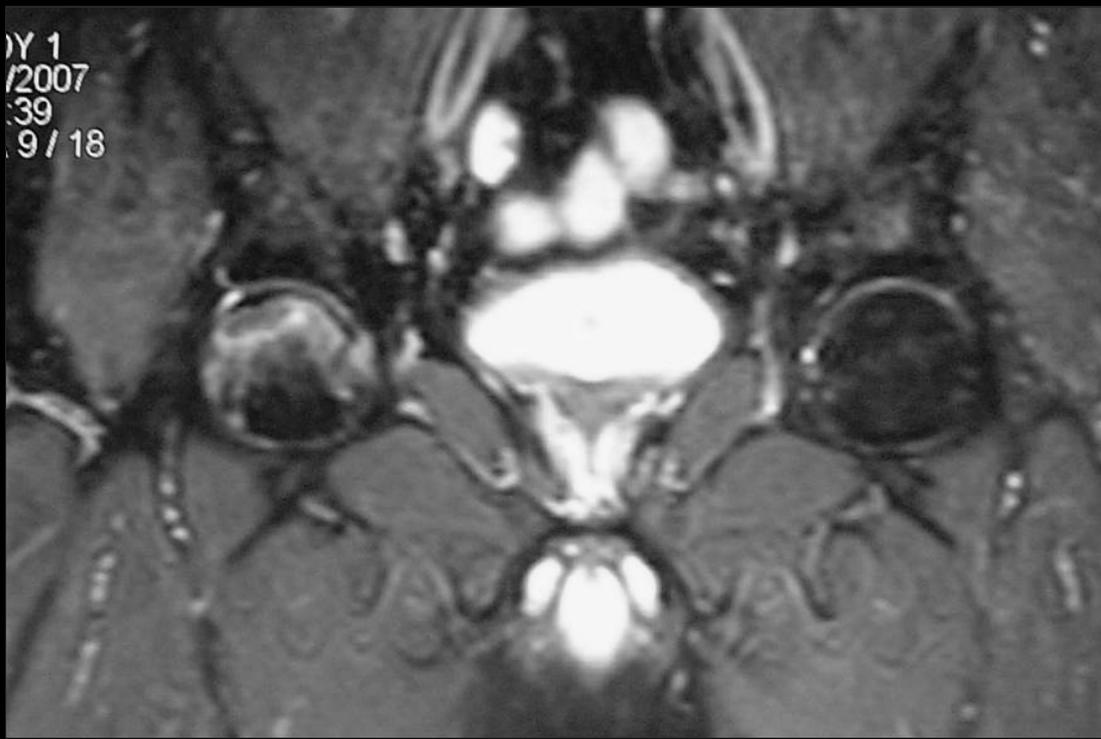


:] **Stage 11**. The line is composed of two layers [ **double line sign**  
Inner layer of hyperemic granulation tissue and an outer layer of osteoblastic activity

# Stage 11



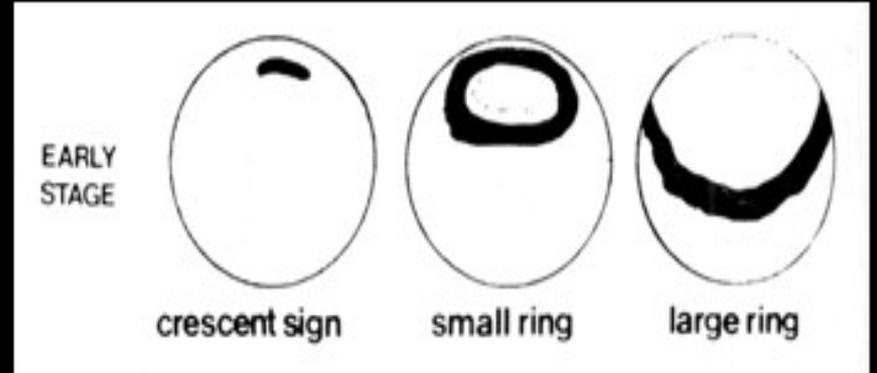
# Stage 11



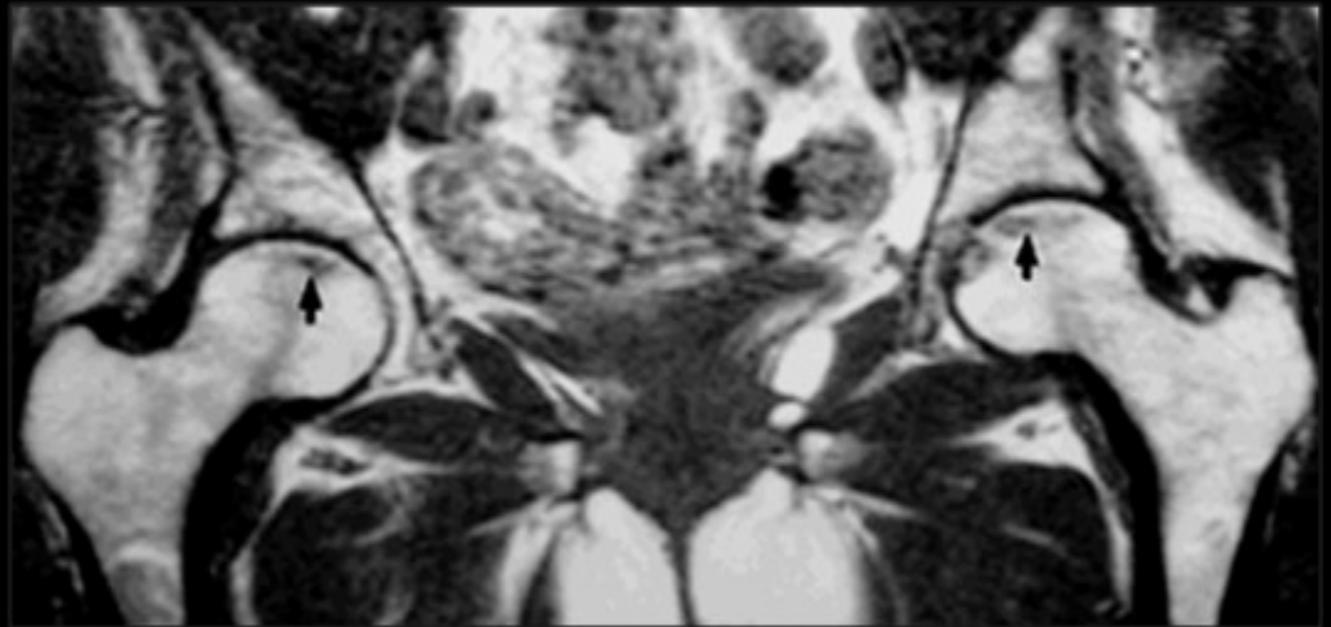
## Stage 11



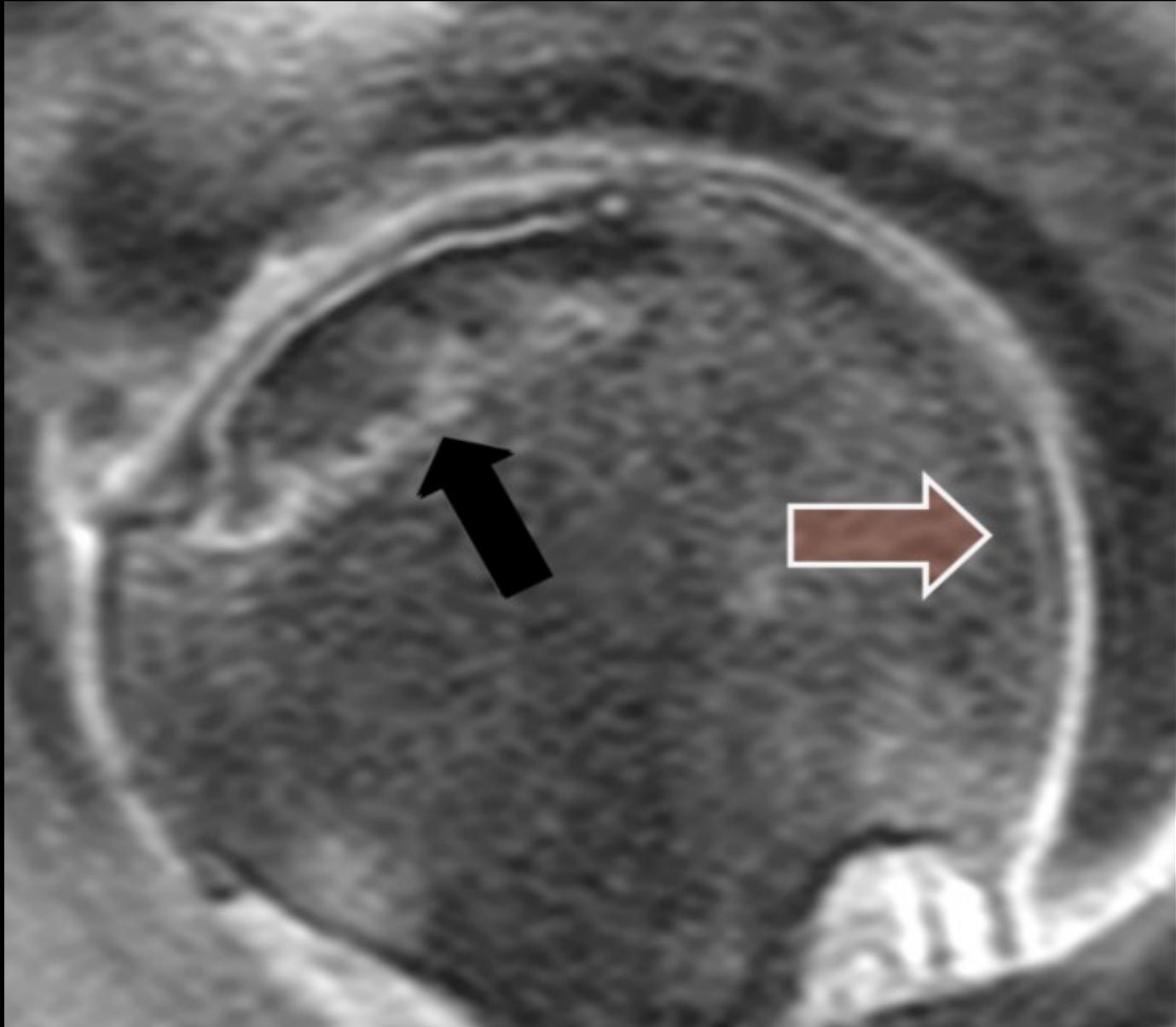
- ◆ *The size and location of the lesion will affect the prognosis.*
- ◆ *Lesions < 25% of the weight bearing area of the femoral head responds well to core decompression*
- ◆ *Medially and centrally located lesions have better prognosis*
- ◆ *Contrast injection may be used to assess bone viability ?!!*



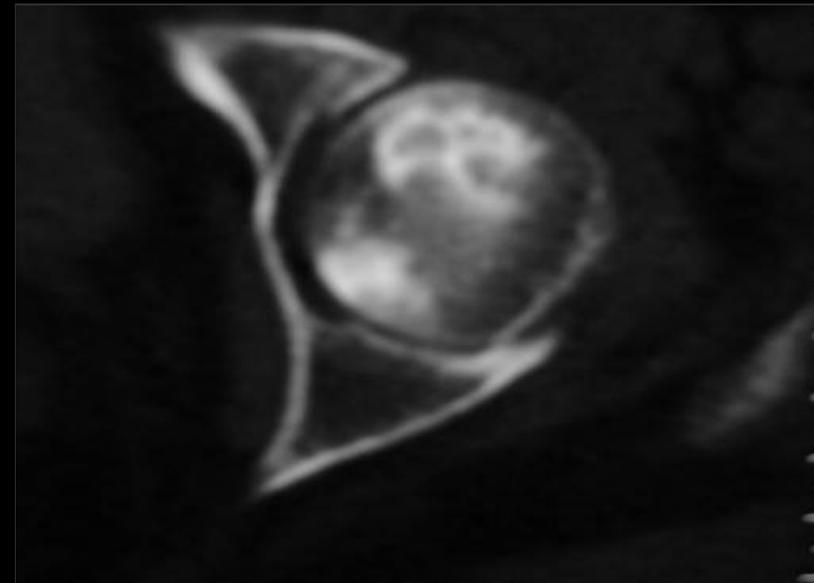
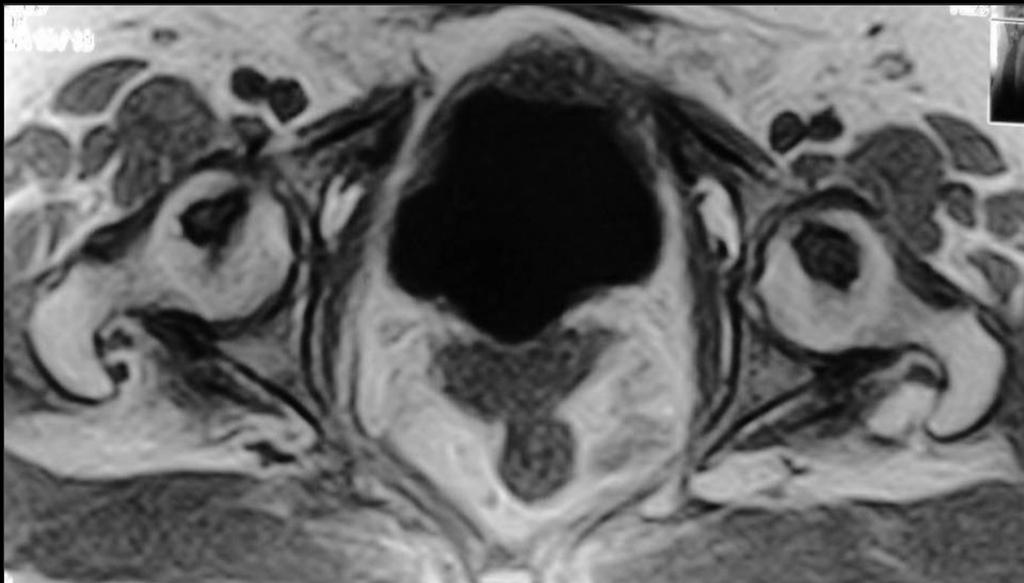
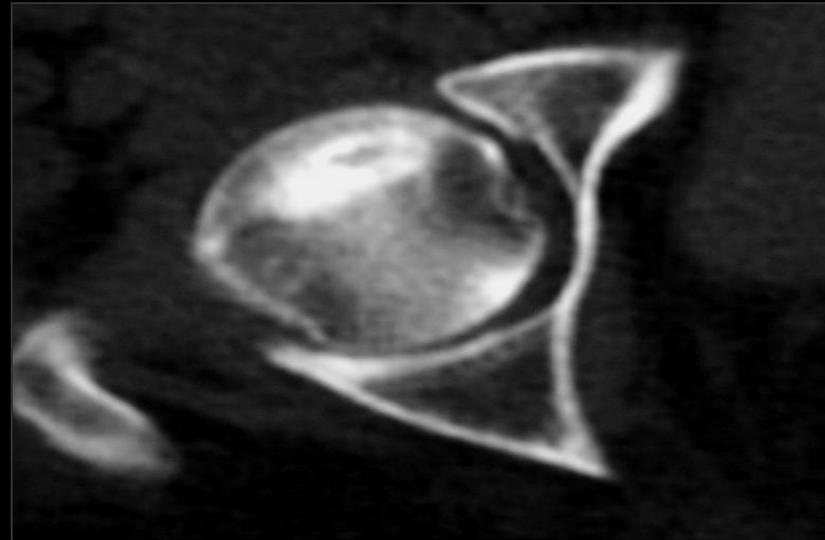
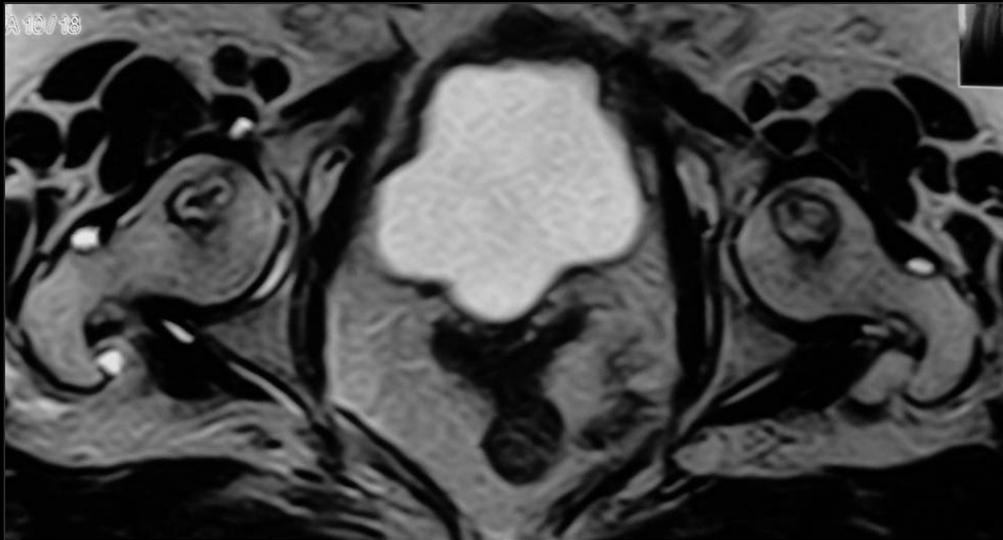
**Stage 11**



# Stage 11.



# Stage 111

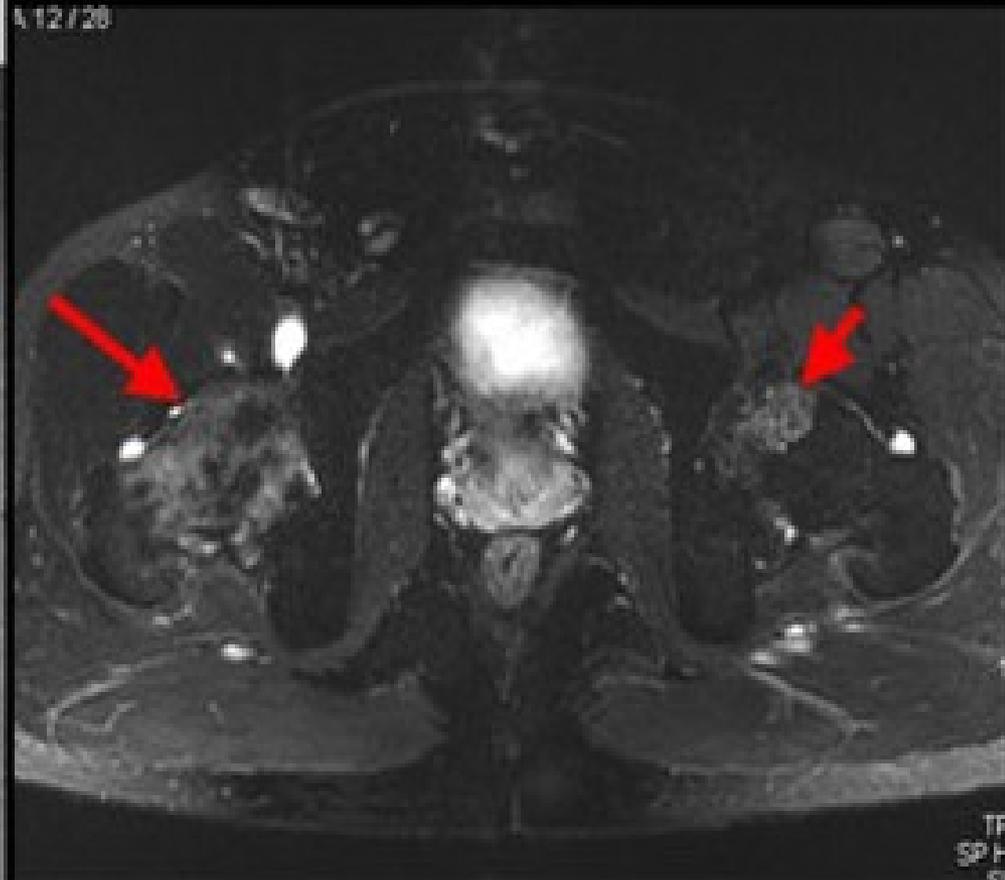


# Stage 11 and 111



# Avascular Necrosis - Hip

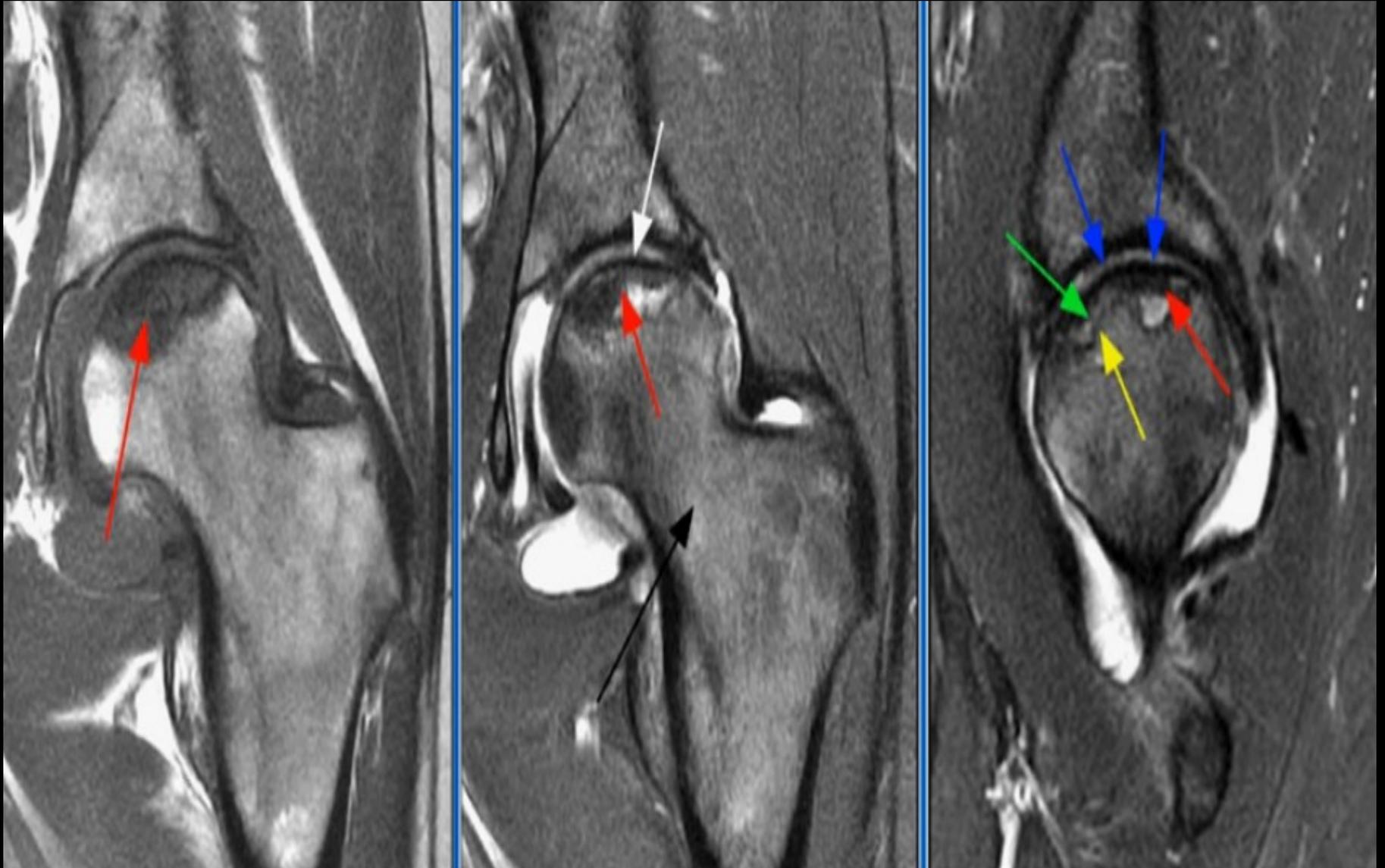
## Stage 111



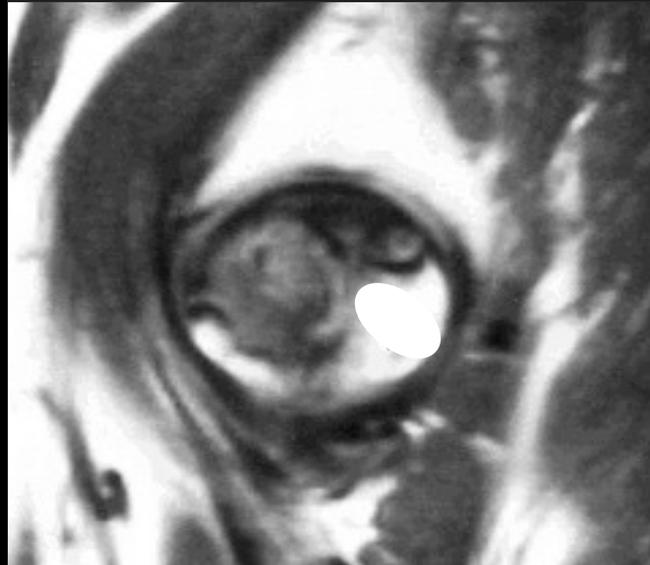
# Stage 111.



# Stage III



# Stage III





***Grade 111 AVN with Global loss of sphericity in FHO.***

# Stage IV.



Stage III



Stage I



# Osteoarthritis

## Stage IV



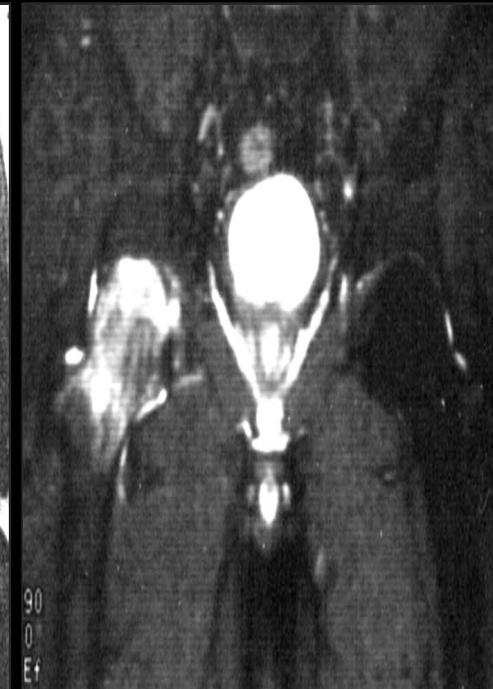
# Transient osteoporosis.

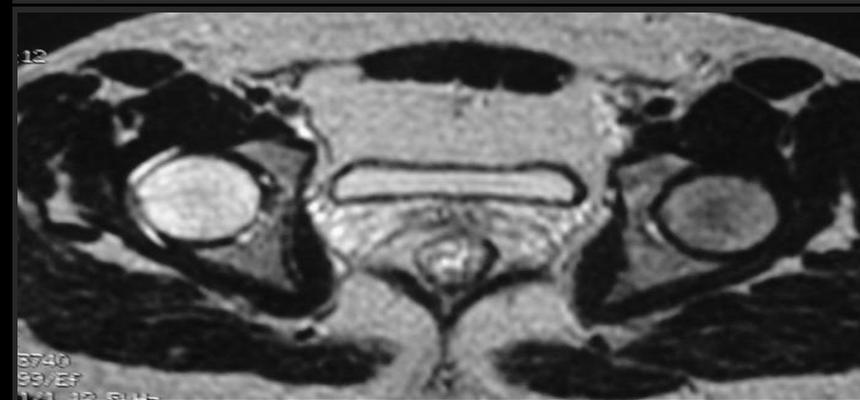
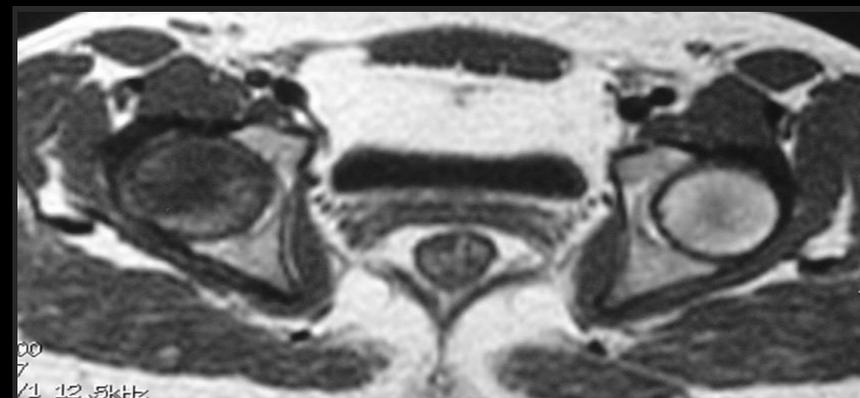
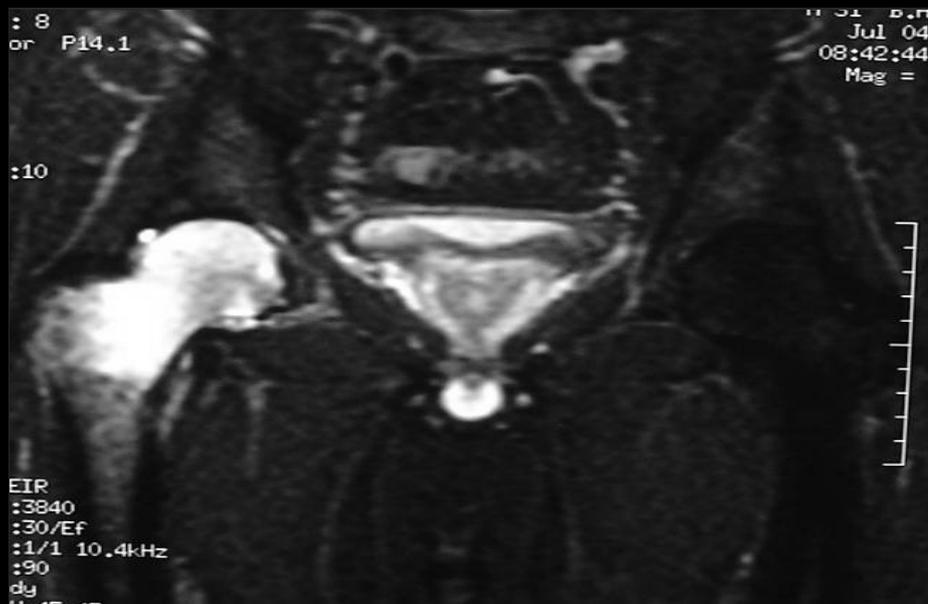
- ◆ *Unknown etiology*
- ◆ *Middle aged over weight males*
- ◆ *Male : female= 3:1*
- ◆ *Usually unilateral [**left hip in females**]*
- ◆ *Resolves spontaneously in 6-8 months*
- ◆ *Pain & limp with no history of trauma*



# Transient osteoporosis

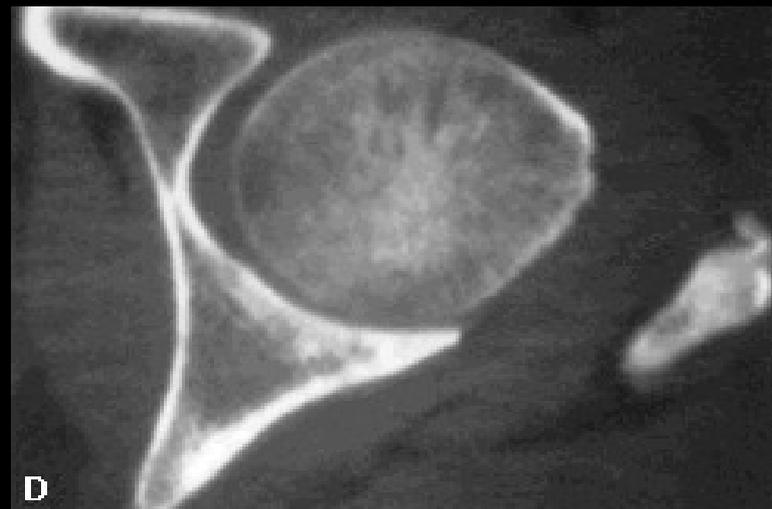
- ➔ *X ray*                      *Normal or ↓ bone density*
- ➔ *Bone scan*                *↑ uptake in the femoral head and neck*
- ➔ *MRI neck*                    *Bone marrow edema in the head and neck*
- ➔ *DD*                            *AVN, bone infarct, stress fracture*  
*Septic arthritis, primary and metastatic tumors*



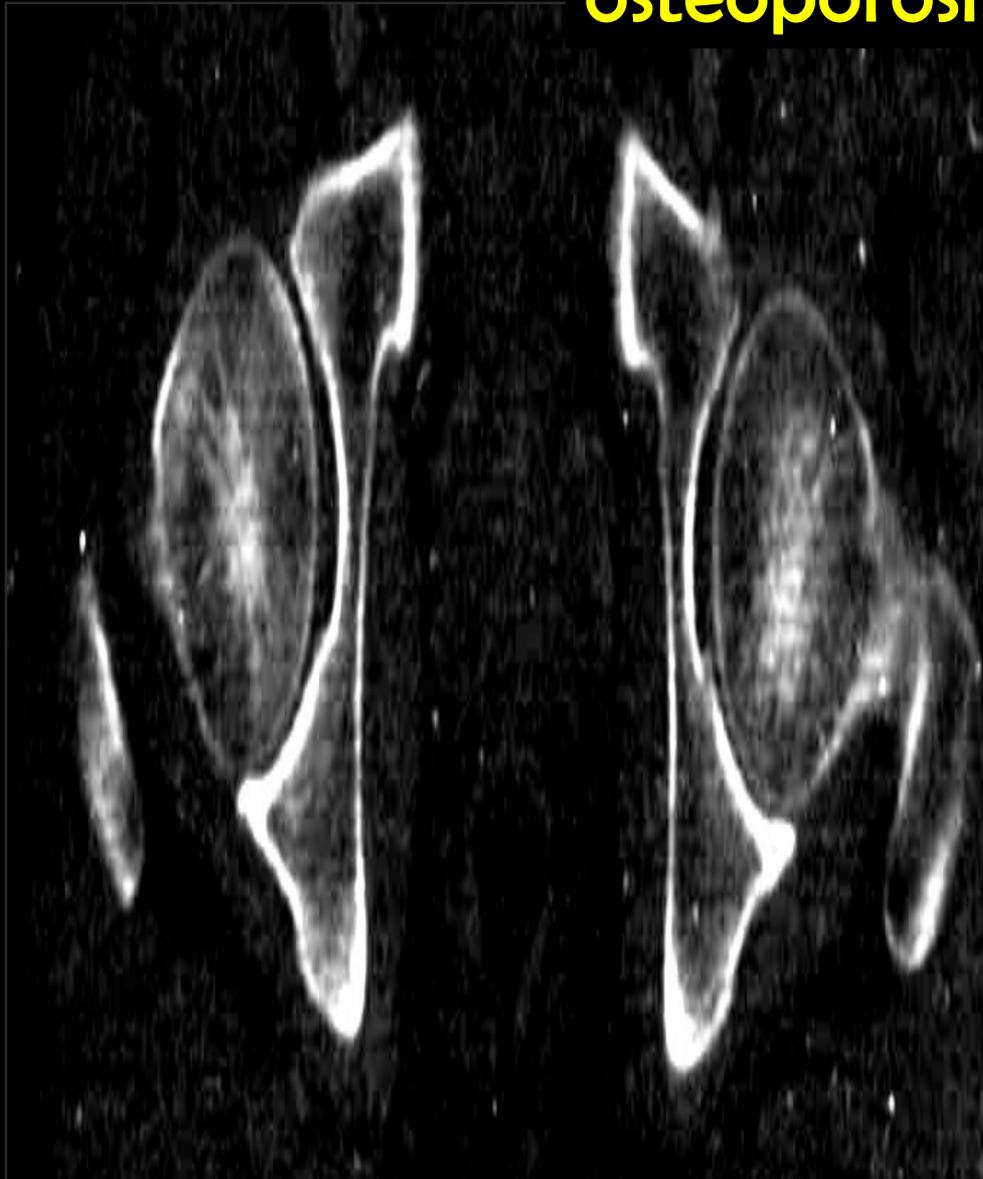


**Transient osteoporosis.**

# Transient osteoporosis



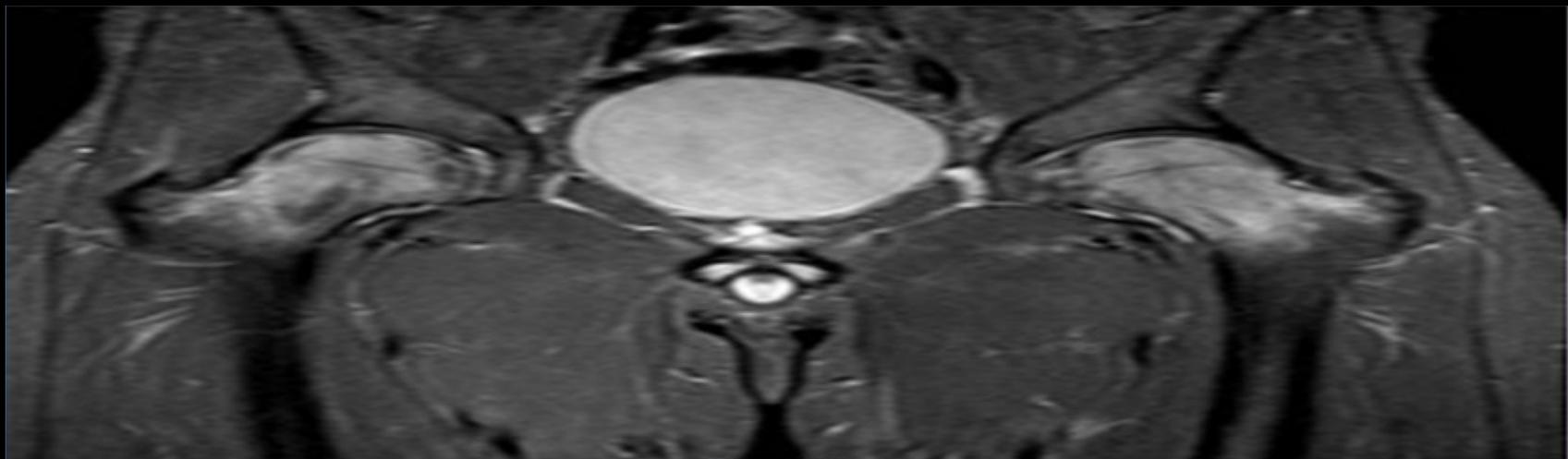
# Transient osteoporosis.



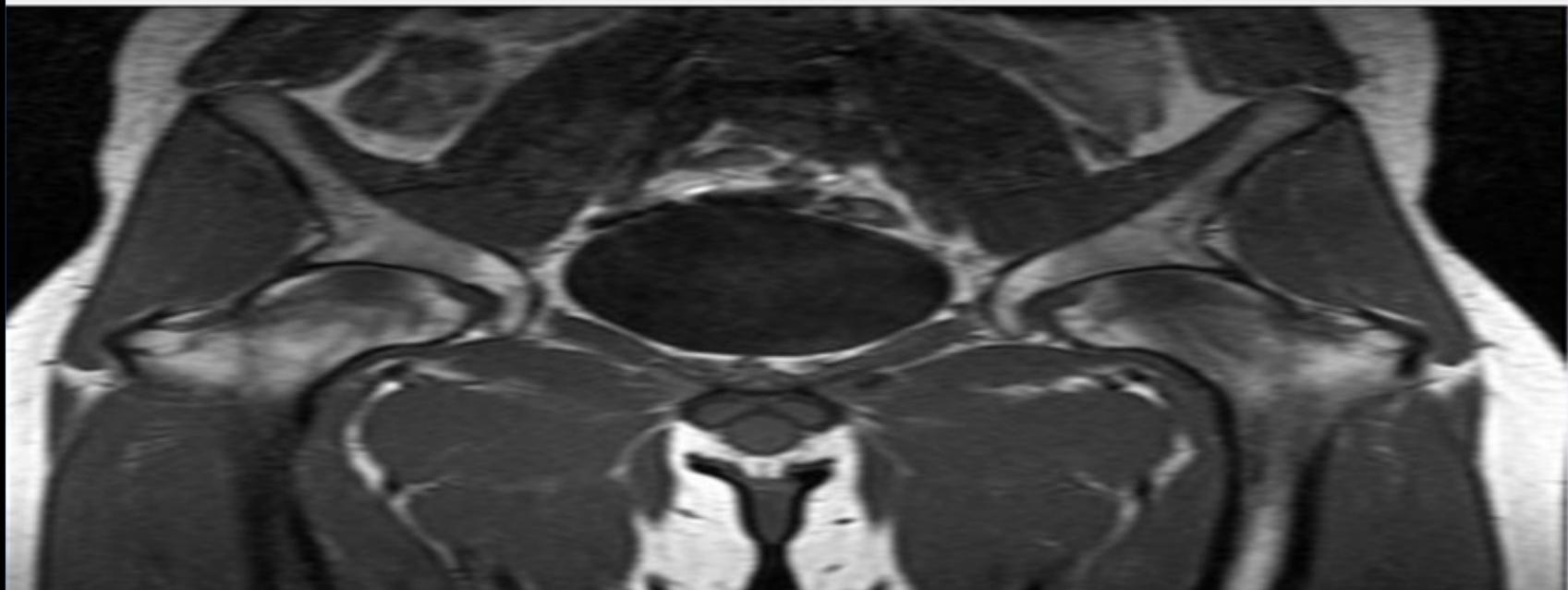
# Transient osteoporosis.



# Bilateral Transient osteoporosis.



Cor STIR





Transient osteoporosis 7/9/99.

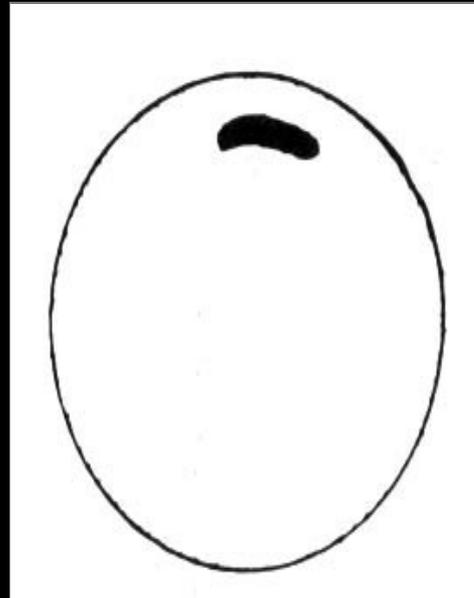
9/12/99

# Transient osteoporosis with follow up.

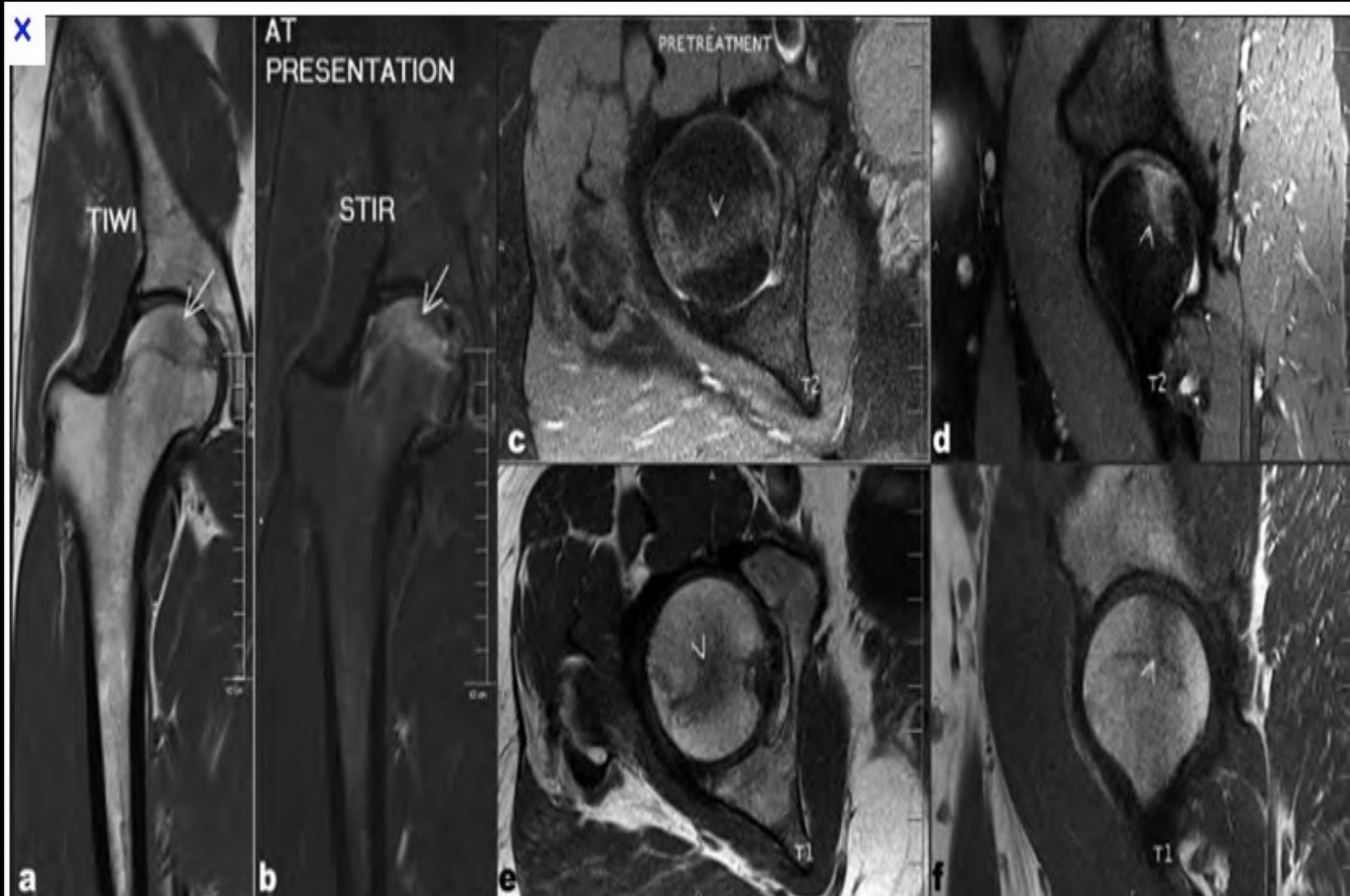


# **Subchondral fracture.**

- ◆ *In young may be a stress fracture*
- ◆ *In elderly may be the squeal of osteoporosis*
- ◆ *Leads to extensive marrow edema which may progress to femoral head collapse and secondary OA*
- ◆ **DD** include AVN , TOH .
- ◆ *MR shows a hypo intense line*

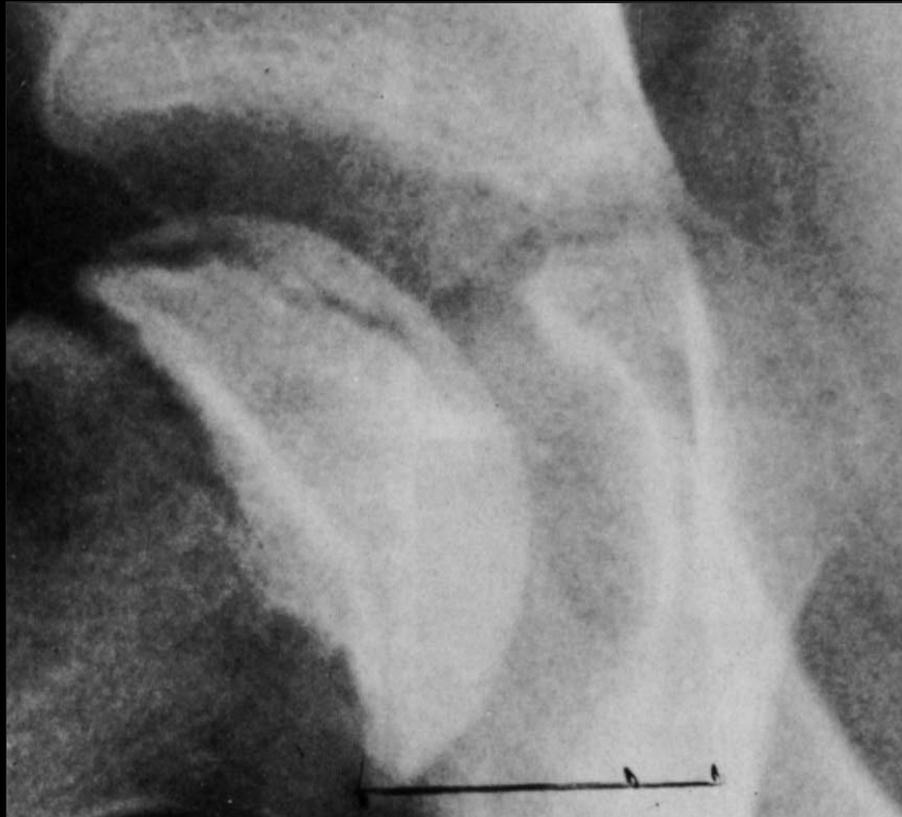


# Subchondral fracture



# Legg- Calve- Perthes diseases

- ◆ *Avascular necrosis of the bony femoral epiphysis*
- ◆ *Unknown etiology*
- ◆ *Children 4-9 years old*                      *boys: girls= 4:1*
- ◆ *Children with knee pain must be examined for hip pathology*



# Legg- Calve- Perthes diseases.

## Stages

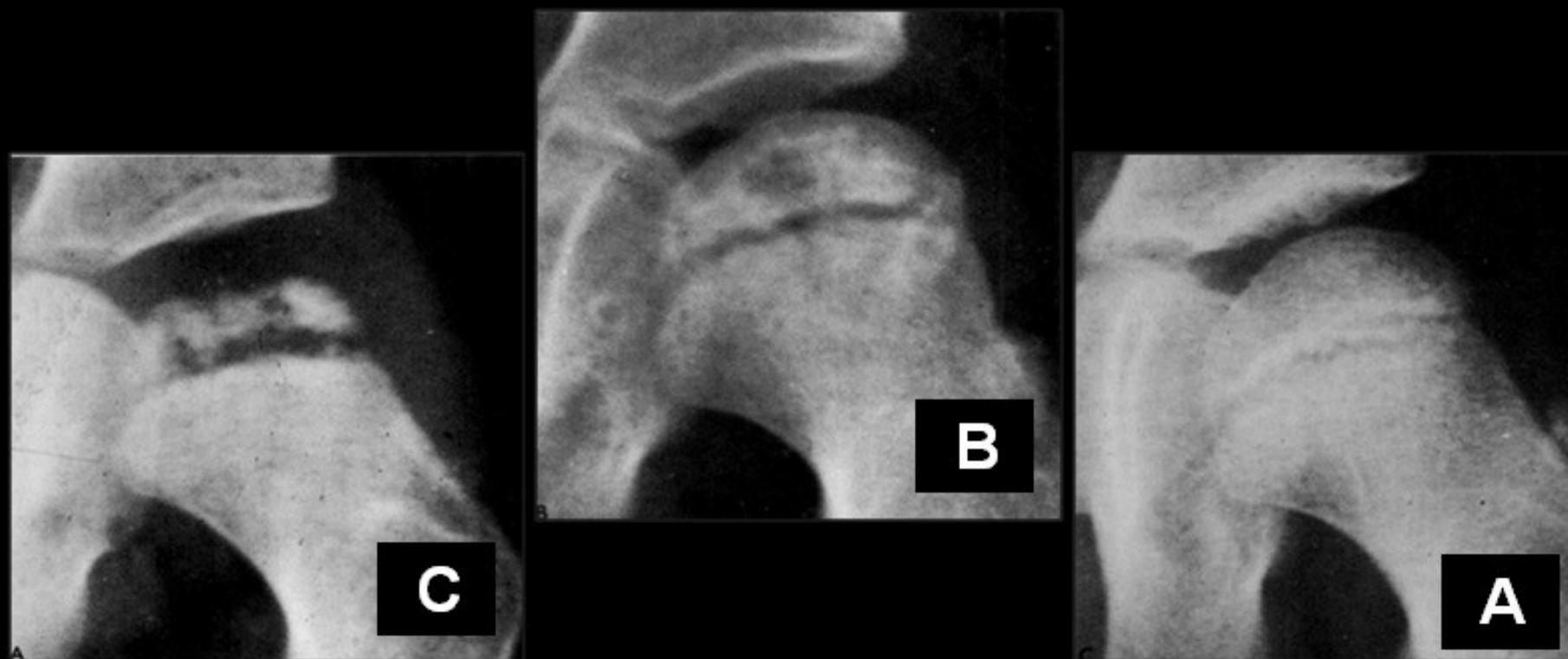
- I Anterior aspect of the epiphysis.
- II Anterior aspect of the epiphysis + metaphyseal reaction.
- III All of the epiphysis+ metaphyseal reaction.
- IV Flattening and collapse.



## Legg-Calve-Perthes diseases



## Legg- Calve- Perthes diseases



Reconstitution of the femoral head over 3 ½ years

# Early stage I : Fracture with gas



01-2000

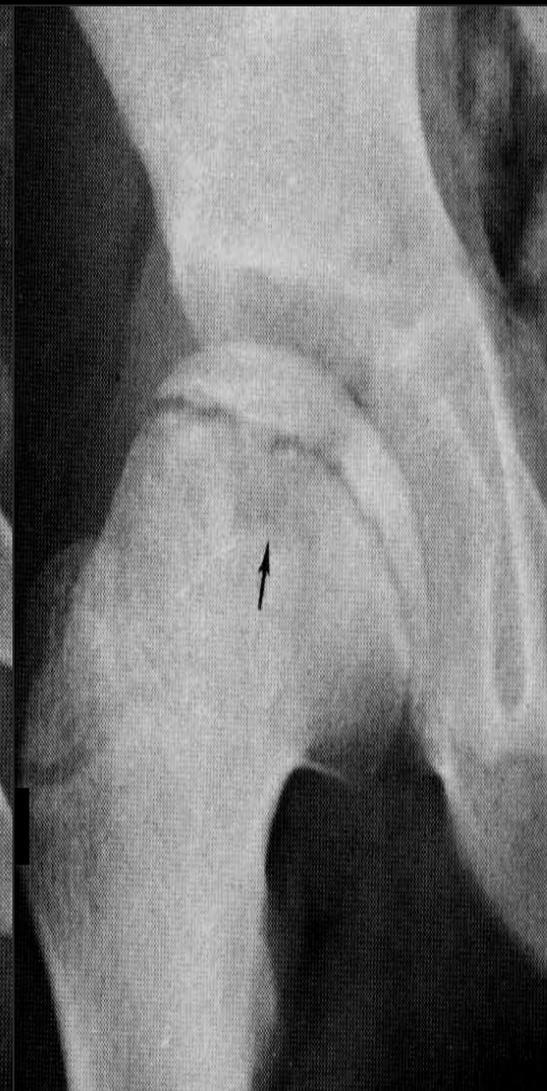
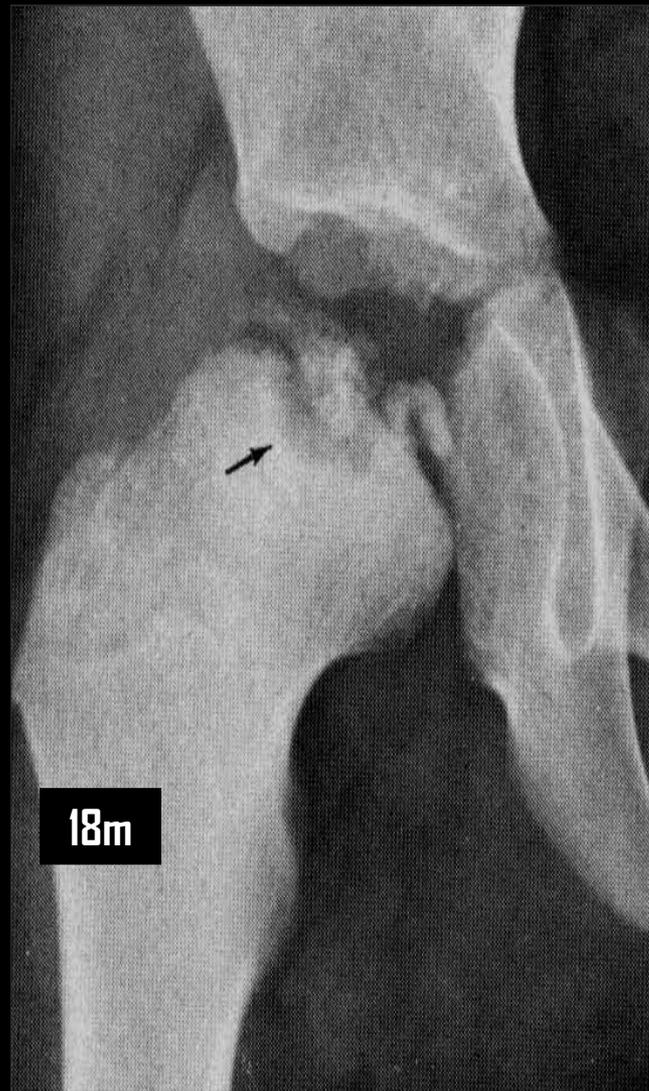


09-07-200



**Stage 11:**





***Healed epiphyseal changes + residual metaphyseal changes***

# Legg- Calve- Perthes diseases

## MR value

- ◆ Morphology and signal characteristics of femoral epiphysis
- ◆ Normal epiphysis shows bright signal in T1 (Fat marrow)
- ◆ Intra articular effusion



# Legg-Calve-Perthes diseases stage 11

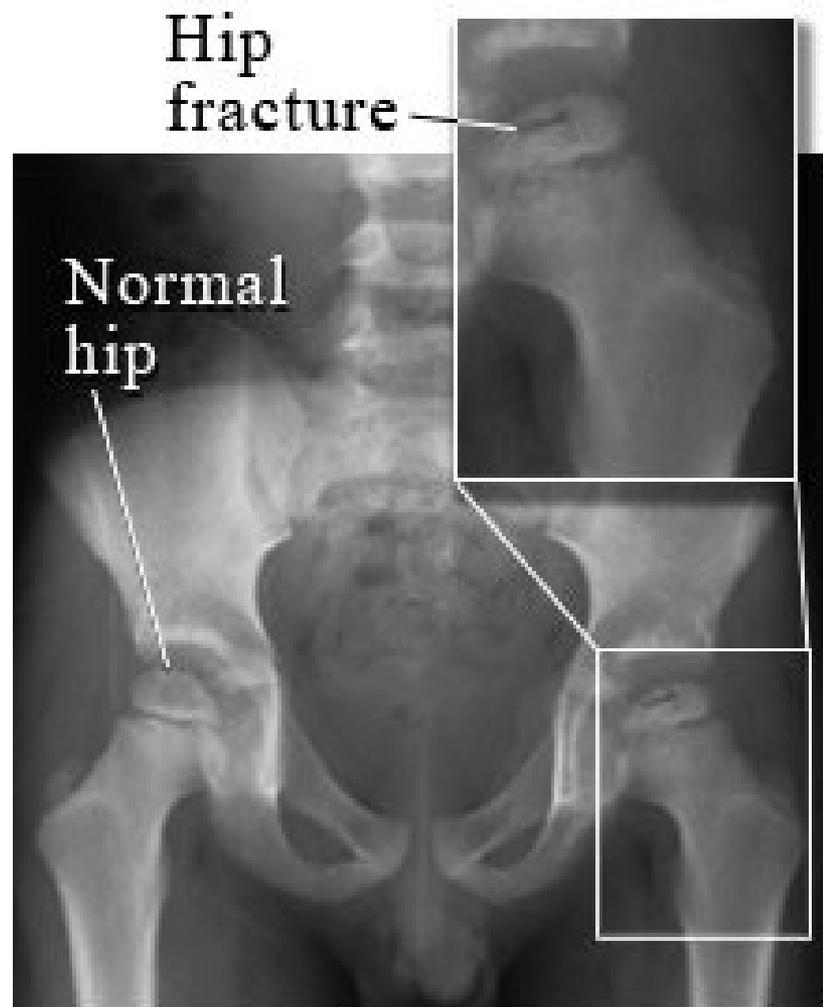


Figure 1

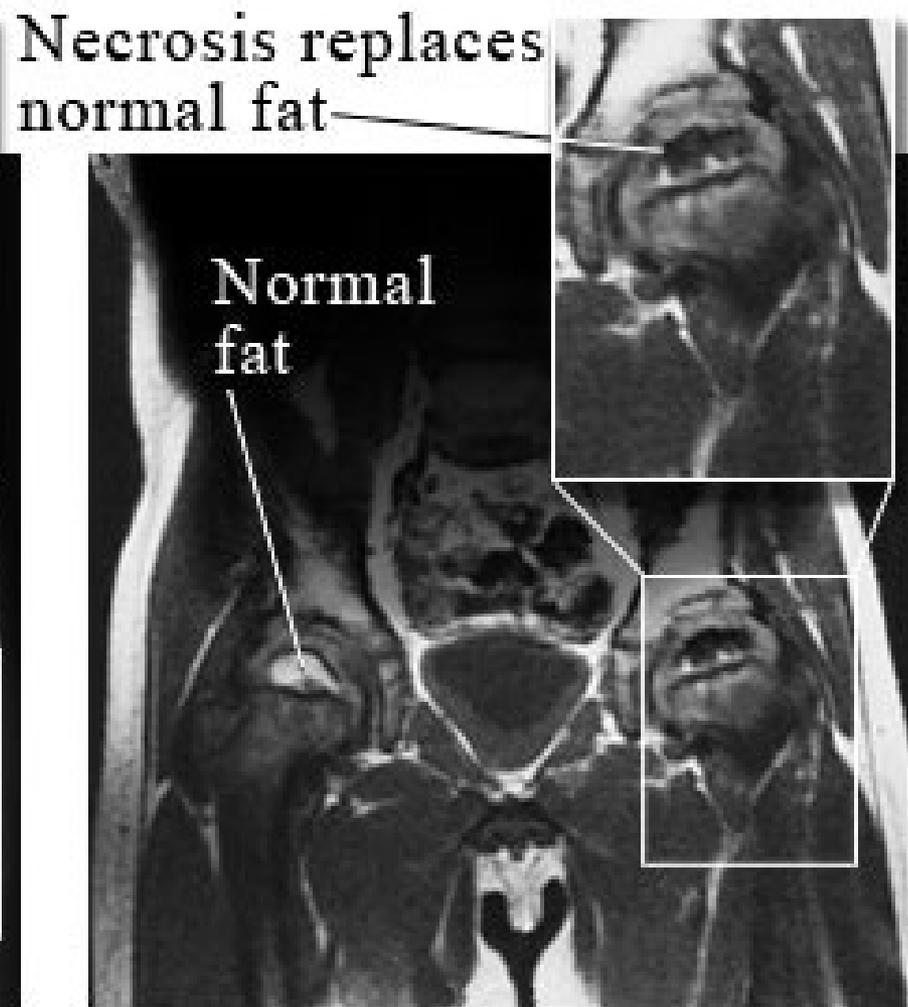
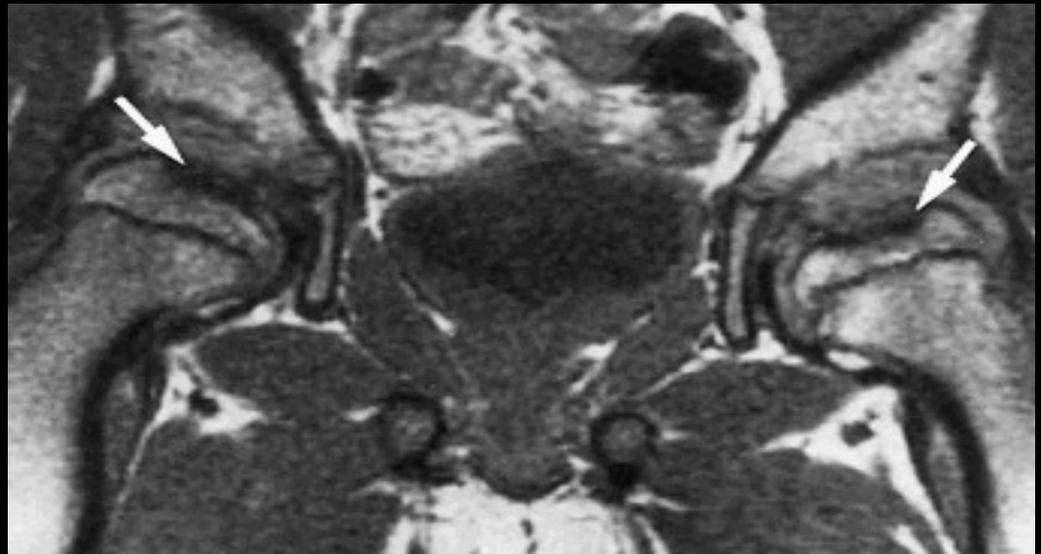


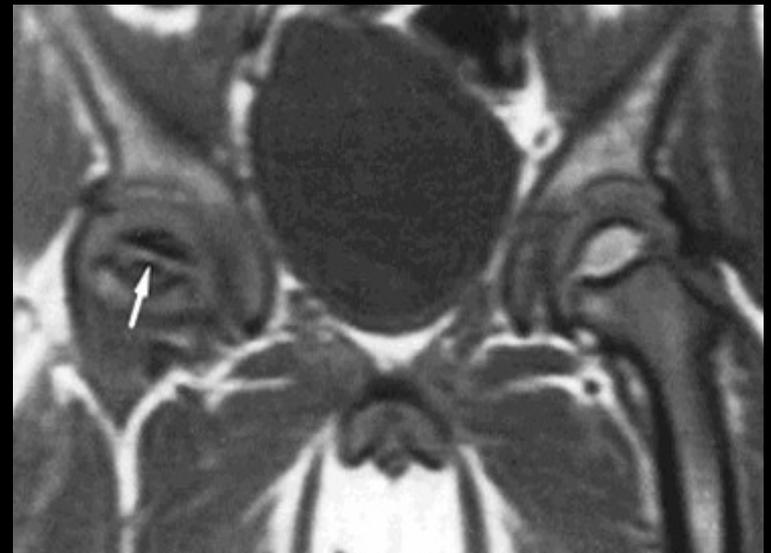
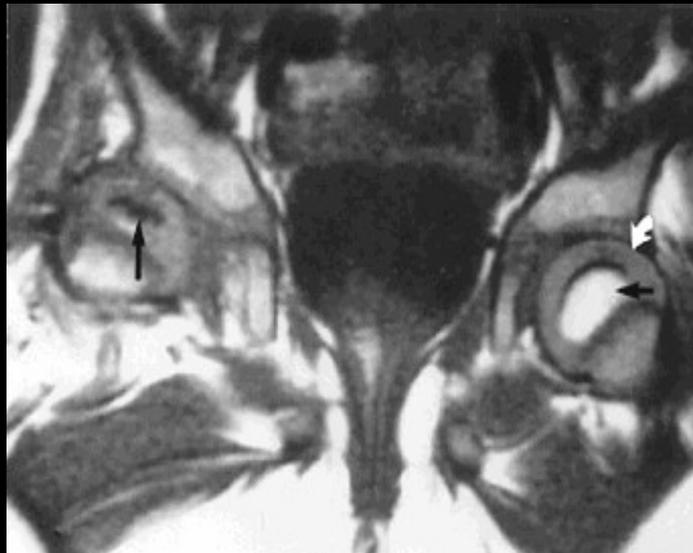
Figure 2

Stage 1, Anterior aspect  
of the epiphysis



**IV**

Flattening and  
collapse



**Spectrum of Perth's disease.**

# ***Slipped Capital Femoral epiphysis.***

***Disorder of the proximal femoral physis that leads to slippage of the epiphysis relative to the femoral neck as a result of physis fracture.***

## ***Epidemiology***

### ***incidence***

***most common disorder affecting adolescent hips, found in 10 per 100,000***

### ***demographics***

***more common in***

***obese children (single greatest risk factor)***

***males (male to female ratio is 3:2)***

***African Americans***

***Pacific islanders***

***during period of rapid growth***

### ***location***

***left hip is more common***

***bilateral in 17 to 50%***

### ***risk factors***

***femoral retroversion***

***obesity (single greatest risk factor for SCFE)***

***history of previous radiation therapy to the femoral head region***

# ***Classification:***

## ***Loder classification***

***Stable***

***Unstable, practically defined as when the patient is unable to ambulate even with crutches***

***Temporal***

***Acute***

***Chronic***

***Acute-on-chronic***

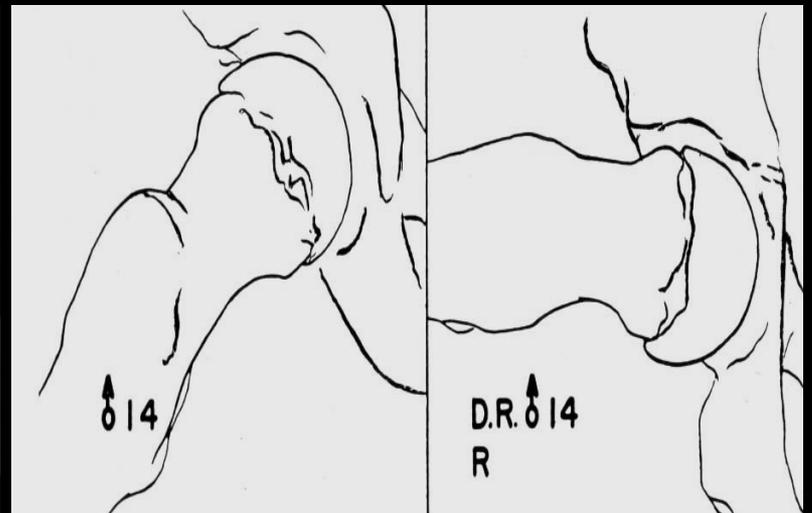
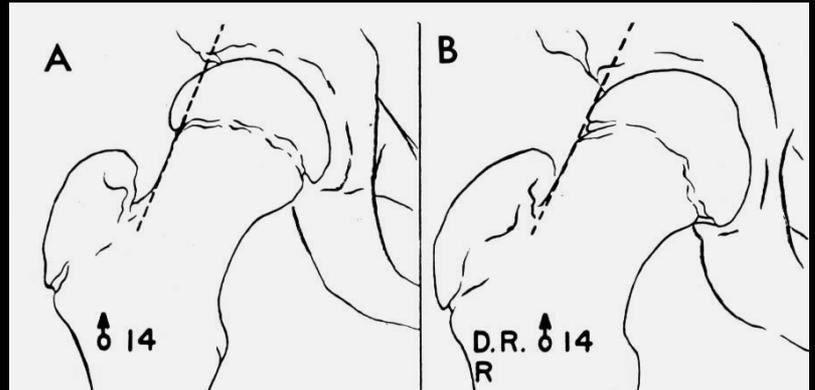
## ***Radiological***

***Grade I = 0-33% slippage***

***Grade II = 34-50% slippage***

***Grade III = >50% slippage***

# Slipped capital femoral epiphysis.



Normal capital femoral epiphysis



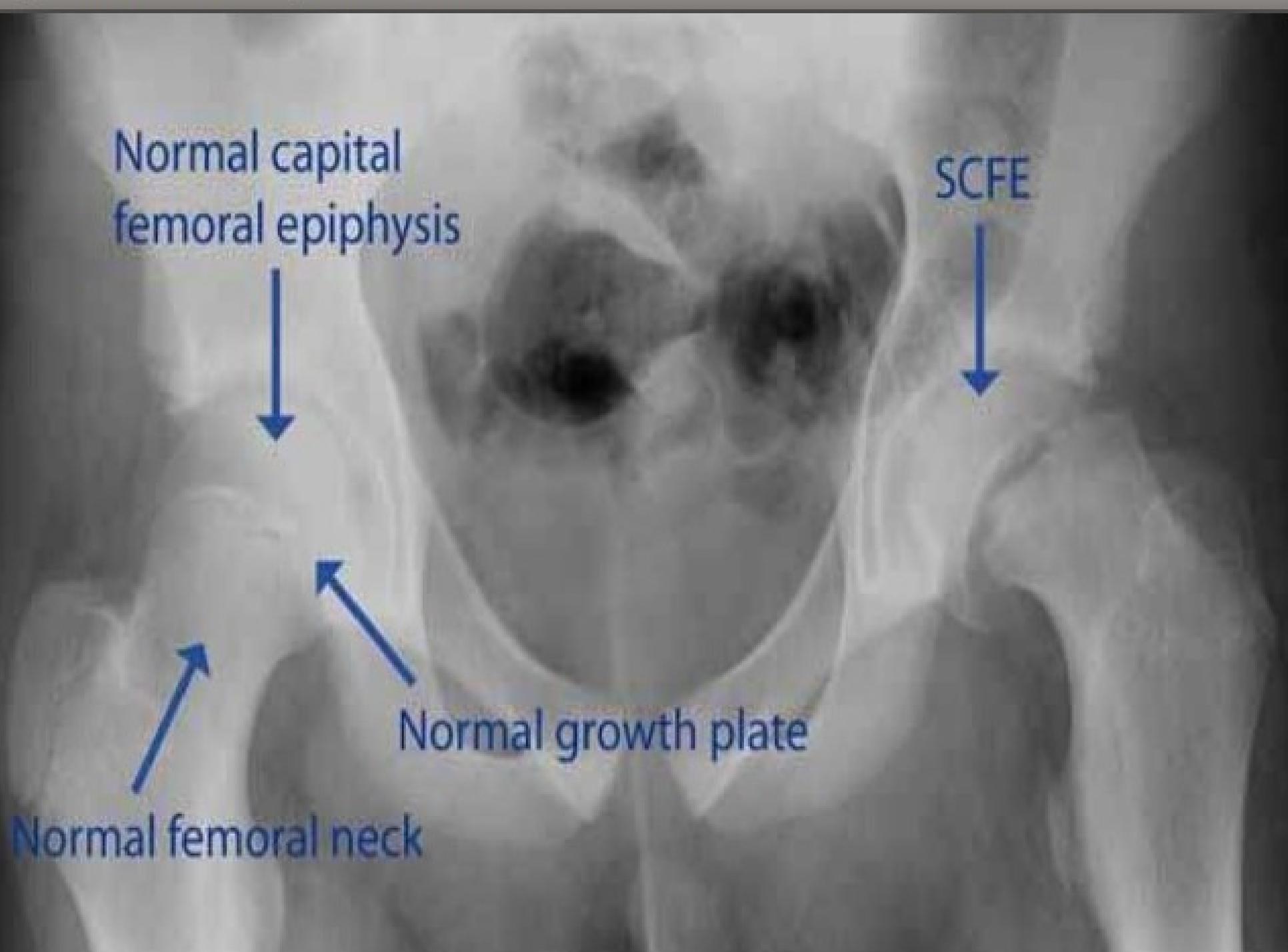
SCFE



Normal growth plate



Normal femoral neck



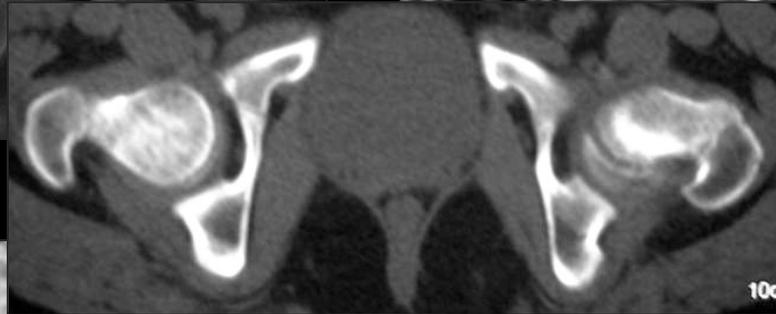
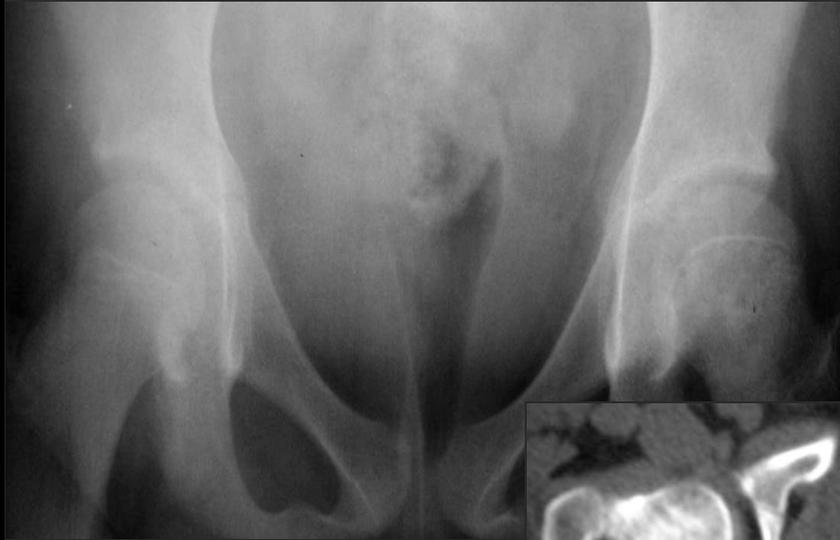


A.P. VIEW—  
Posterior ,inferior,  
And medial  
translation of  
epiphyses



LATERAL VIEW—to  
measure lateral  
epiphyseal shaft  
angle

# Slipped capital femoral epiphysis.



**Slipped femoral epiphysis with normal marrow signal.**



**Developmental dysplasia of the hip (DDH)** denotes aberrant development of the hip joint and results from an abnormal relationship of the femoral head to the acetabulum. There is a clear female predominance, and it usually occurs from ligamentous laxity and abnormal position in utero. Therefore, it is more common with oligohydramniotic pregnancies. This article describes the commonly used radiographic measurements and lines involved in DDH.

### **Epidemiology**

The reported incidence varies between 1.5 and 20 per 1000 births, with the majority (60-80%) of abnormal hips resolving spontaneously within 2-8 weeks (so-called immature hip).

### **Risk factors include :**

female gender (M:F ratio ~1:8)

family history

breech presentation

oligohydramnios

metatarsus adductus

**Plain radiograph:** Assessment is looking for symmetry and defining the relationship of the proximal femur to the developing pelvis. The ossification of the superior femoral epiphyses should be symmetric. Delay of ossification is a sign of DDH.

**Hilgenreiner line:** Hilgenreiner line is drawn horizontally through the superior aspect of both triradiate cartilages. It should be horizontal but is mainly used as a reference for Perkin line and measurement of the acetabular angle.

**Perkin line:** Perkin line is drawn perpendicular to Hilgenreiner line, intersecting the lateral most aspect of the acetabular roof. The upper femoral epiphysis should be seen in the inferomedial quadrant (i.e. below Hilgenreiner line, and medial to Perkin line)

**Acetabular angle:** The acetabular angle is formed by the intersection between a line drawn tangential to the acetabular roof and Hilgenreiner line, forming an acute angle. It should be approximately 30 degrees at birth and progressively reduce with the maturation of the joint.

**Shenton line:** Shenton line is drawn along the inferior border of the superior pubic ramus and should continue laterally along the inferomedial aspect of the proximal femur as a smooth line. If there is a superolateral migration of the proximal femur due to DDH then this line will be discontinuous.



Perkin's line

Vertical, through the lateral aspect of the acetabular roof

*F. Geithard  
2007*



Hilgenreiner's and Perkin's line

*F. Geithard  
2007*



### Shenton's line

Smooth line along inferior border of superior pubic ramus and inferomedial femoral neck

*F Gaillard  
2008*



### Acetabular angle

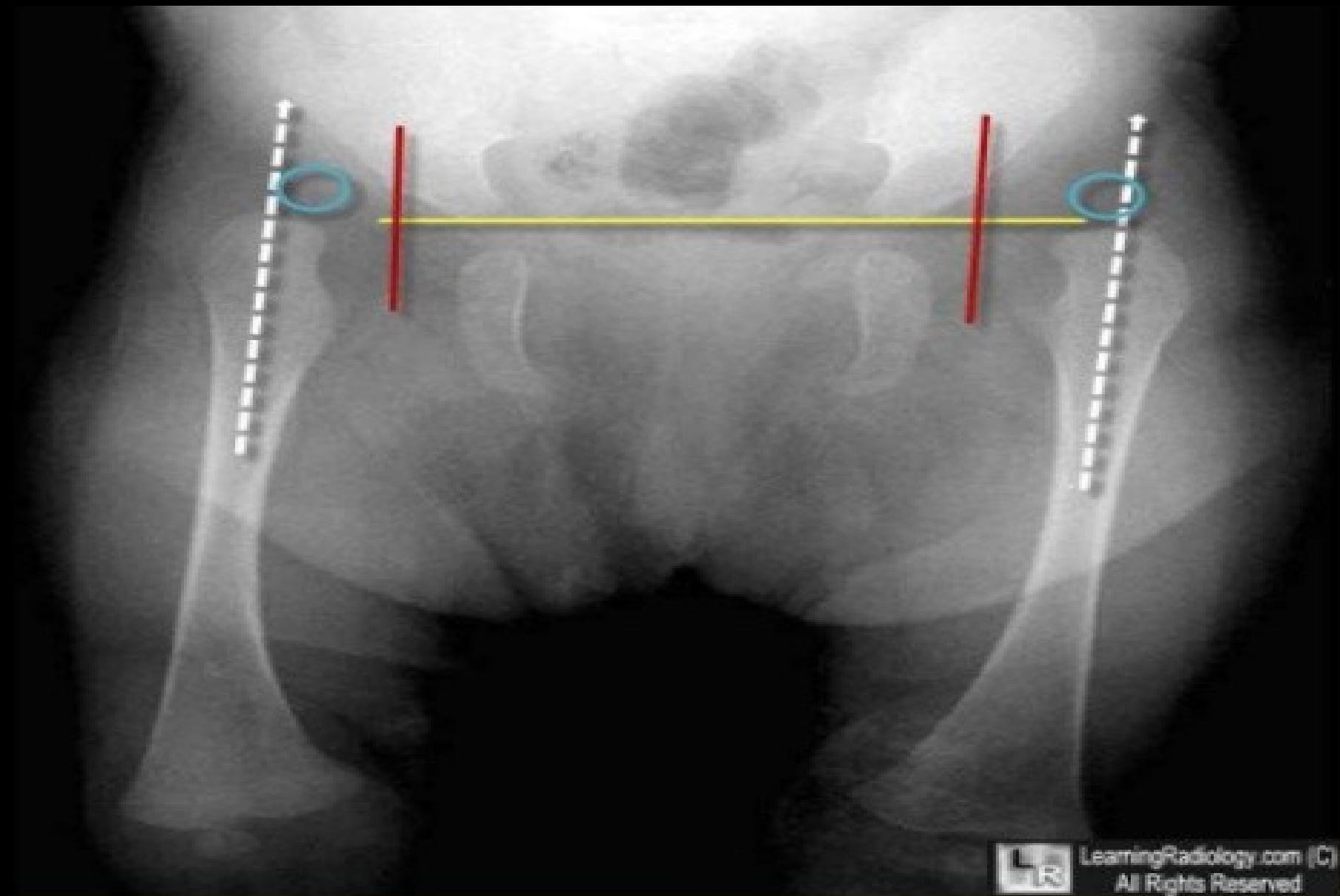
< 28° at birth, progressively reduces with age

*F Gaillard  
2008*

Normal Hip

Dislocated Hip





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***Bilateral Hip Dislocation.***



*T1-weighted images with fat saturation show superimposed bony acetabular index angle (I) and cartilaginous acetabular index angle (J). Bony acetabular index measures 39.6°, which is fairly concordant with 34° acetabular angle measured on radiographs. Hypertrophic acetabular cartilage contributes to 15° cartilaginous acetabular index, which is still abnormal but relatively closer to normal range (mean cartilaginous acetabular index in 2-year-old is  $8.2 \pm 1.9$  [40]) compared with measured bony acetabular index. This examination served as guide for further orthopedic management. Compared with radiographs, femoral head appears more concentrically located in acetabulum. Surgeon subsequently elected to treat more conservatively.*

# Inverted superior labrum

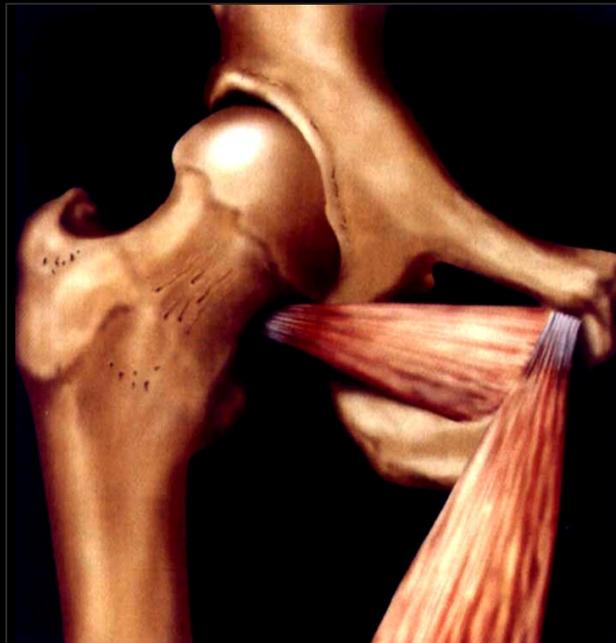




# Inverted superior labrum

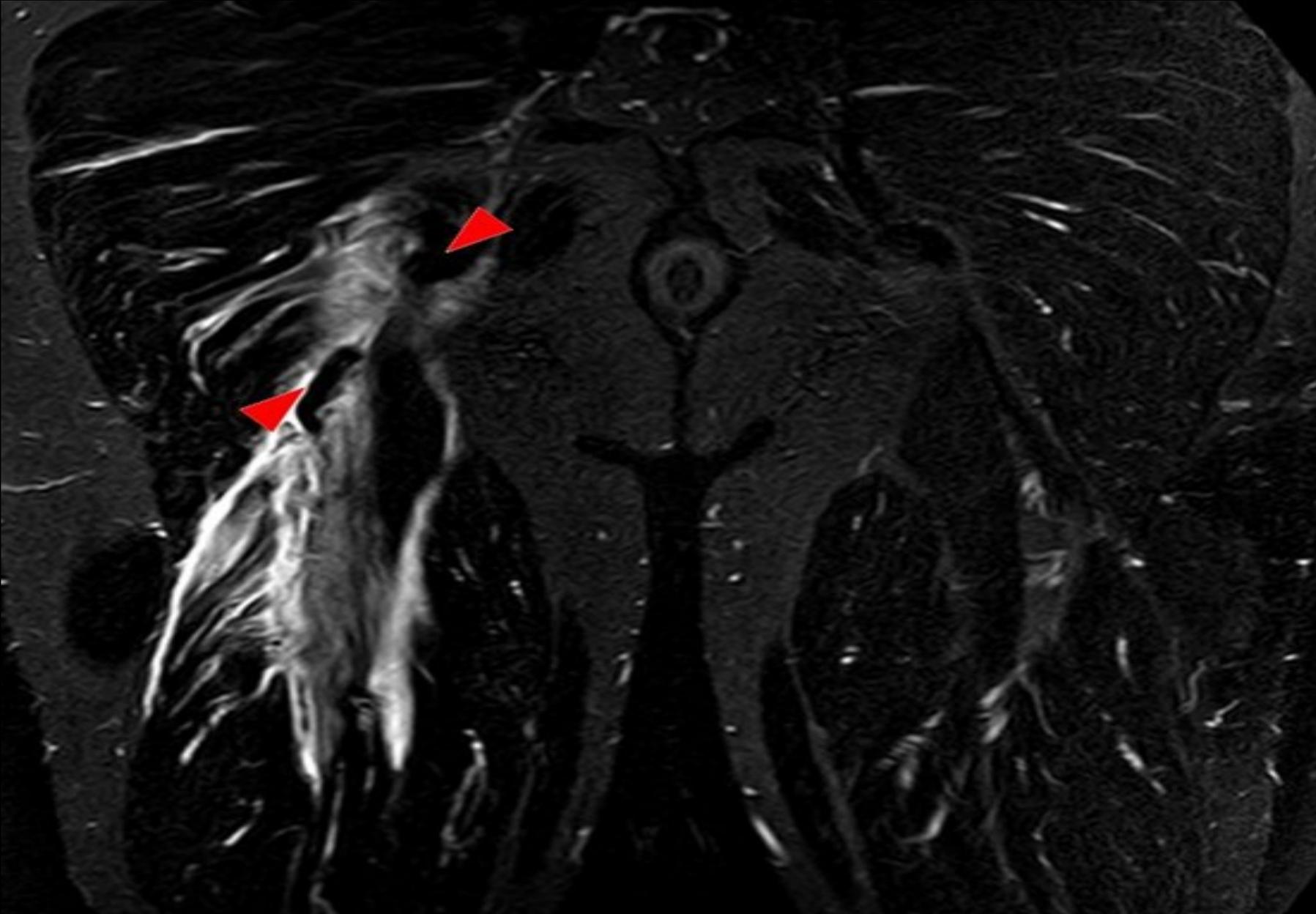
# Muscle sprains

- I Muscle **edema** with preserved morphology
- II Disruption of up to 50% of muscle fibers with **Subacute blood** at the site of tear
- III Complete muscle tear  $\pm$  retraction and **atrophy**  
[ best seen in axial images with comparison to normal side]

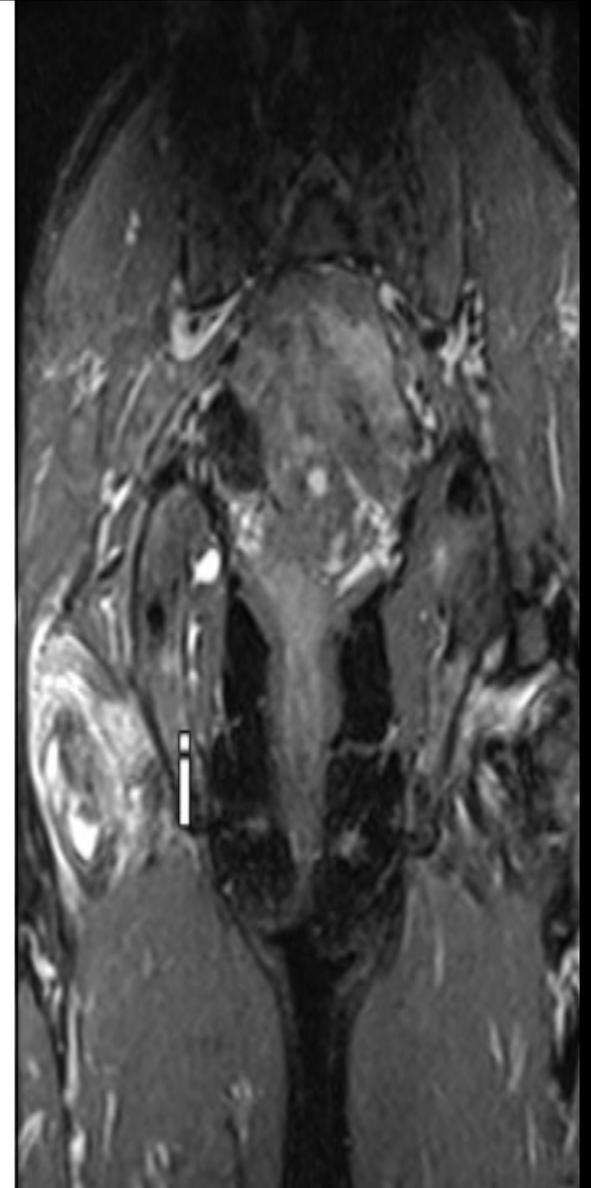


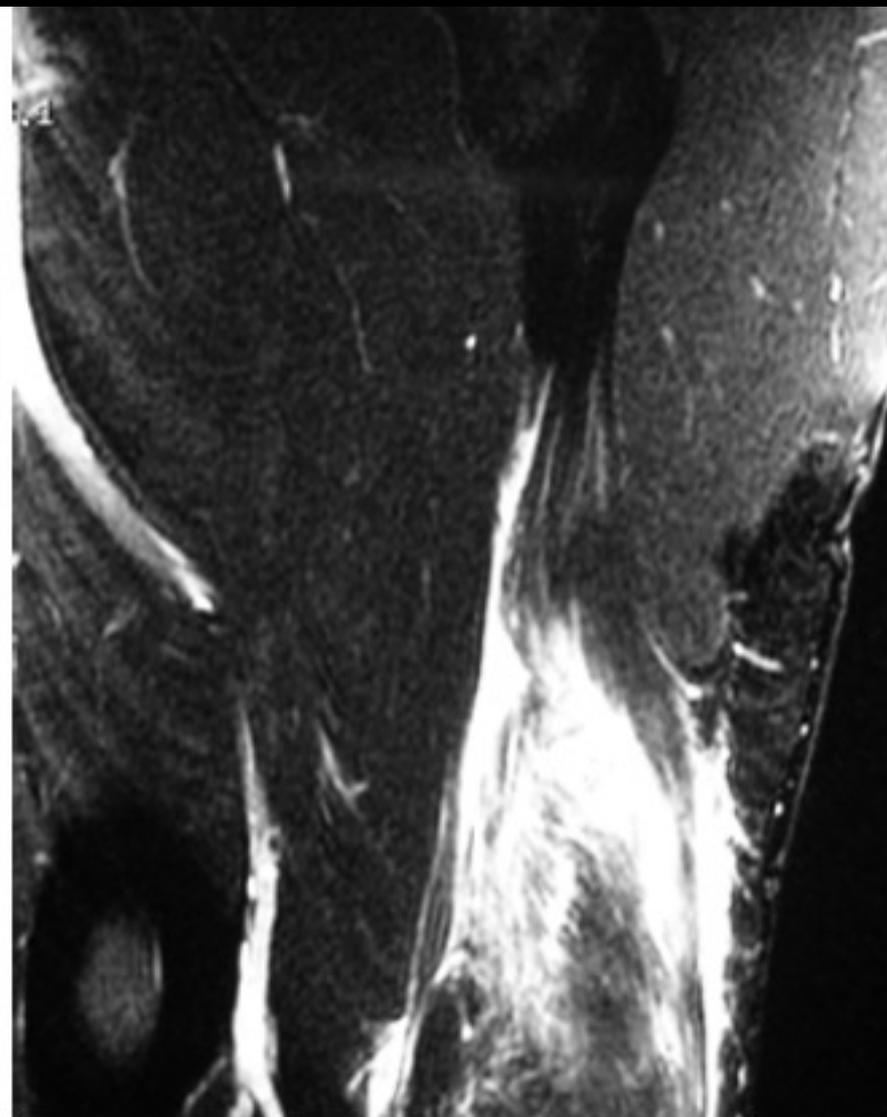
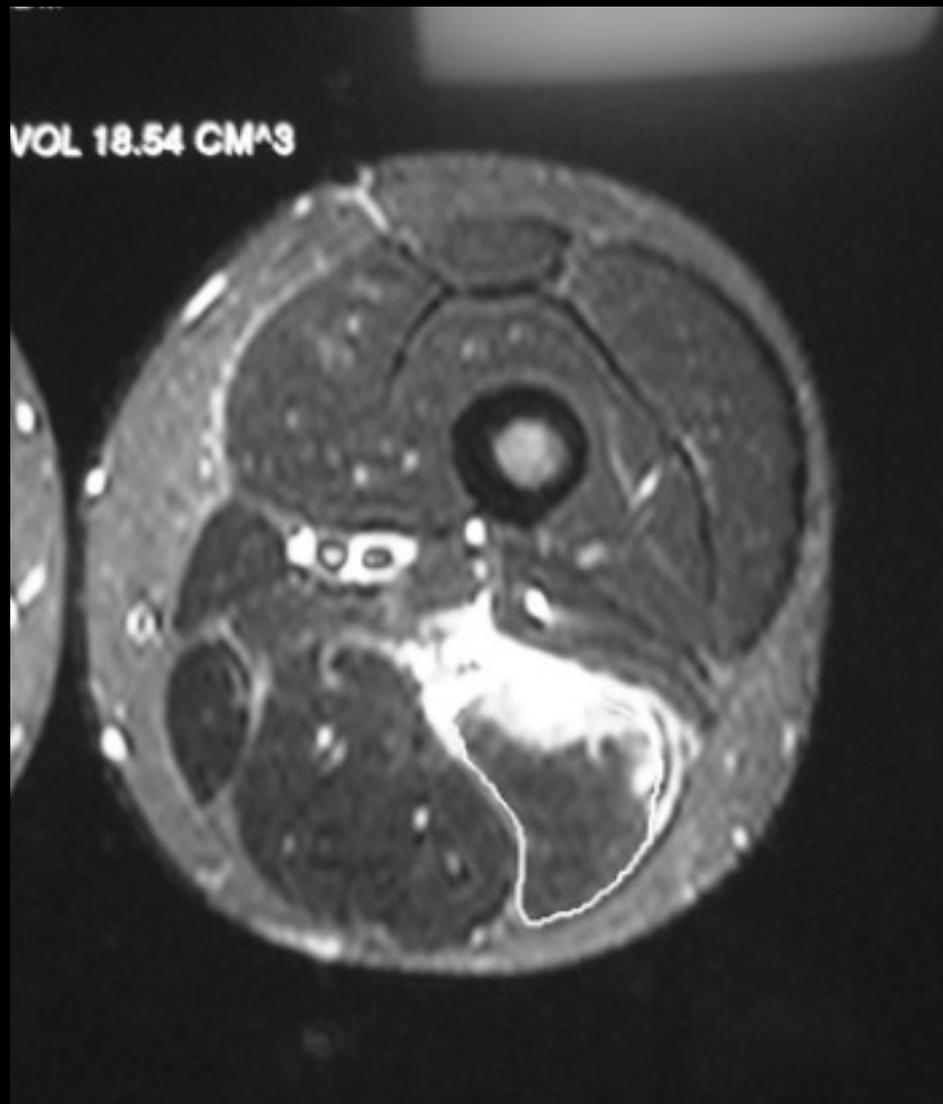
Grade I muscle sprain of the obturator externus and adductor longus

Coronal STIR images show tear at the hamstring muscles at ischial tuberosity.



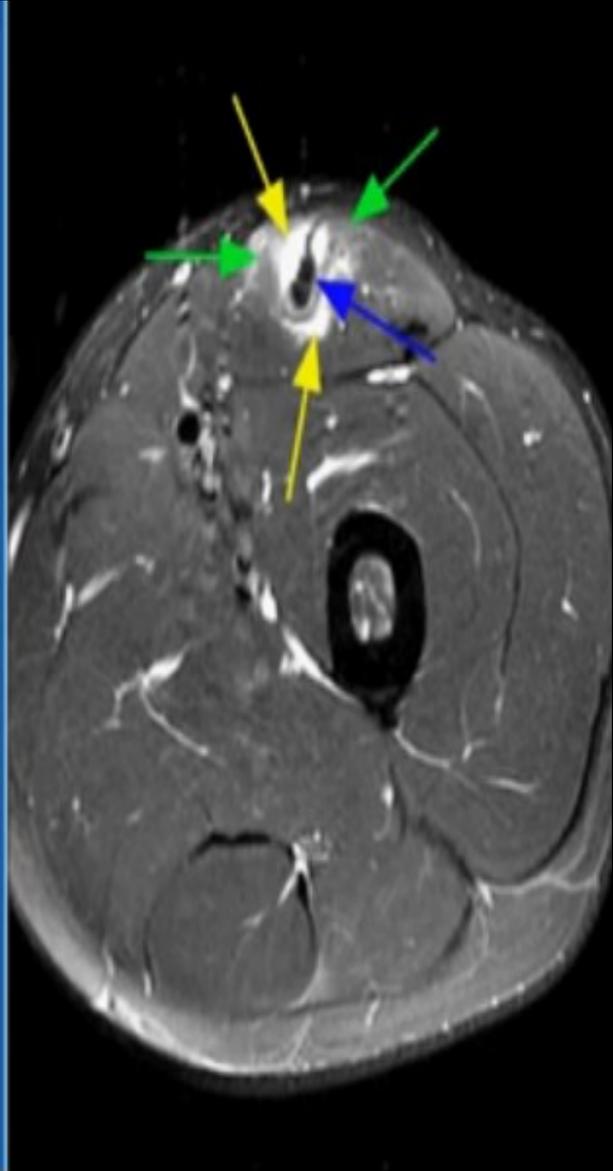
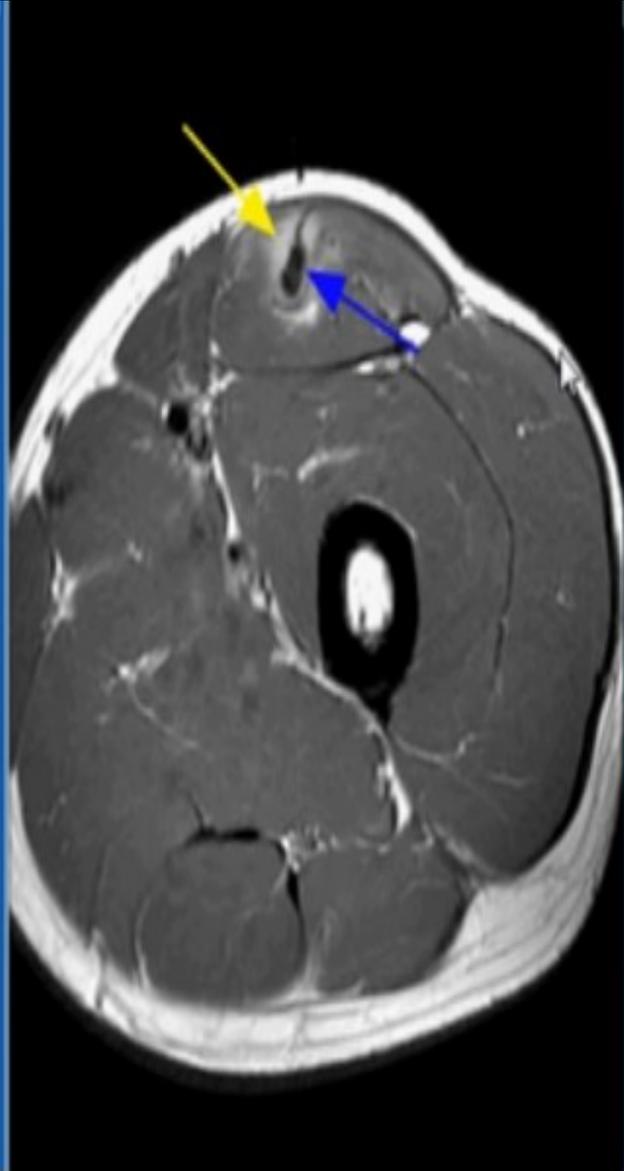
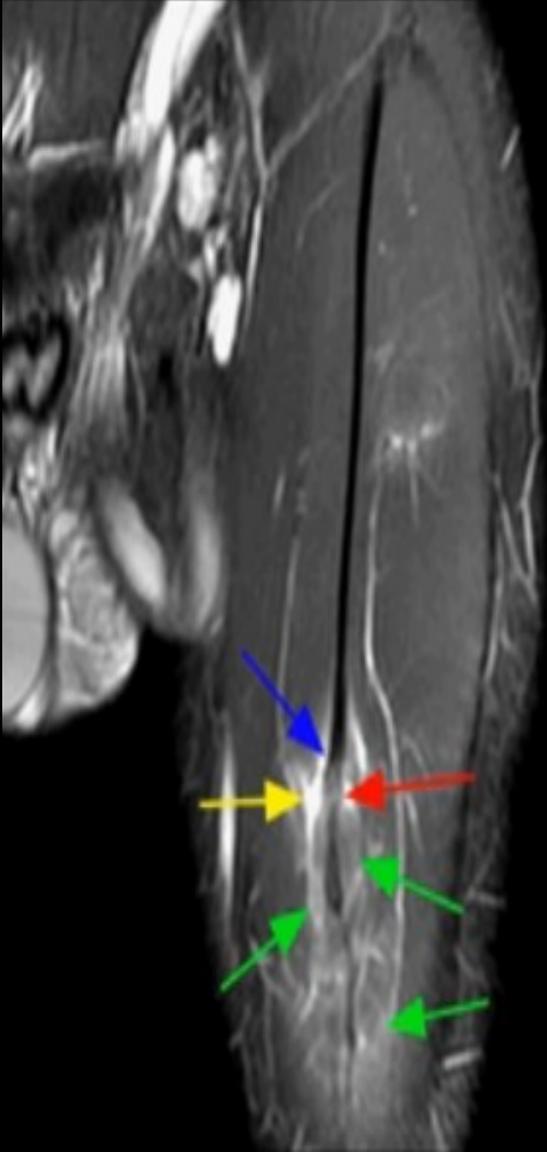
# Complete rupture of the quadrates femoris tendon.



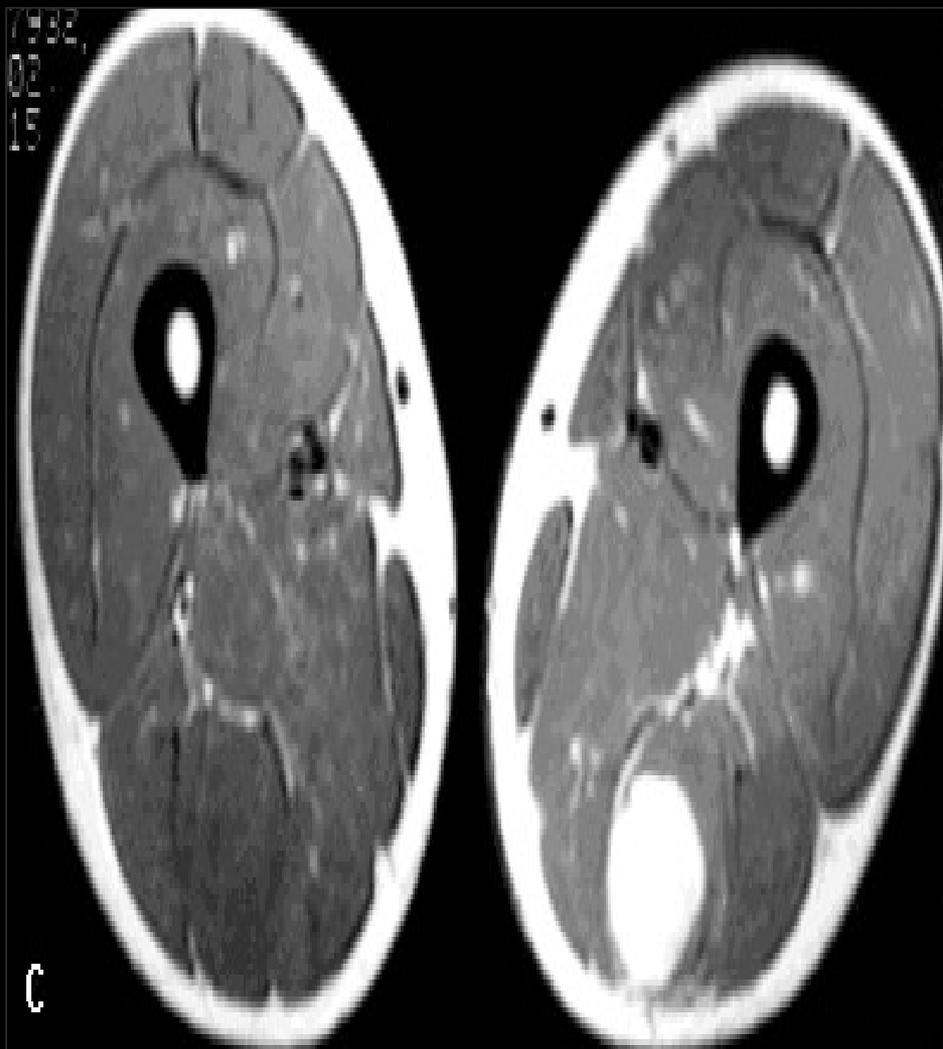


**Figure 2. MRI images showing proximal biceps femoris musculo-tendinous injury.**

**Head rectus femoris head muscle and deep tendon injury.**



# Grade II tear of semitendinosus muscle



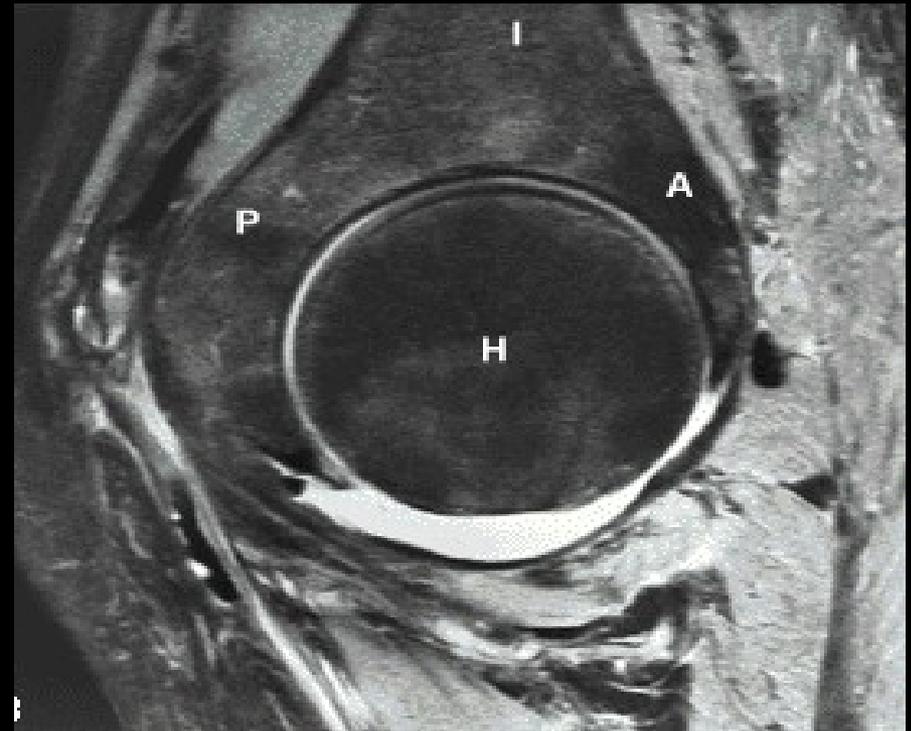
# *MR arthrogram.*

- ◆ Labral abnormalities.
- ◆ Loose bodies.
- ◆ Osteochondral lesions.



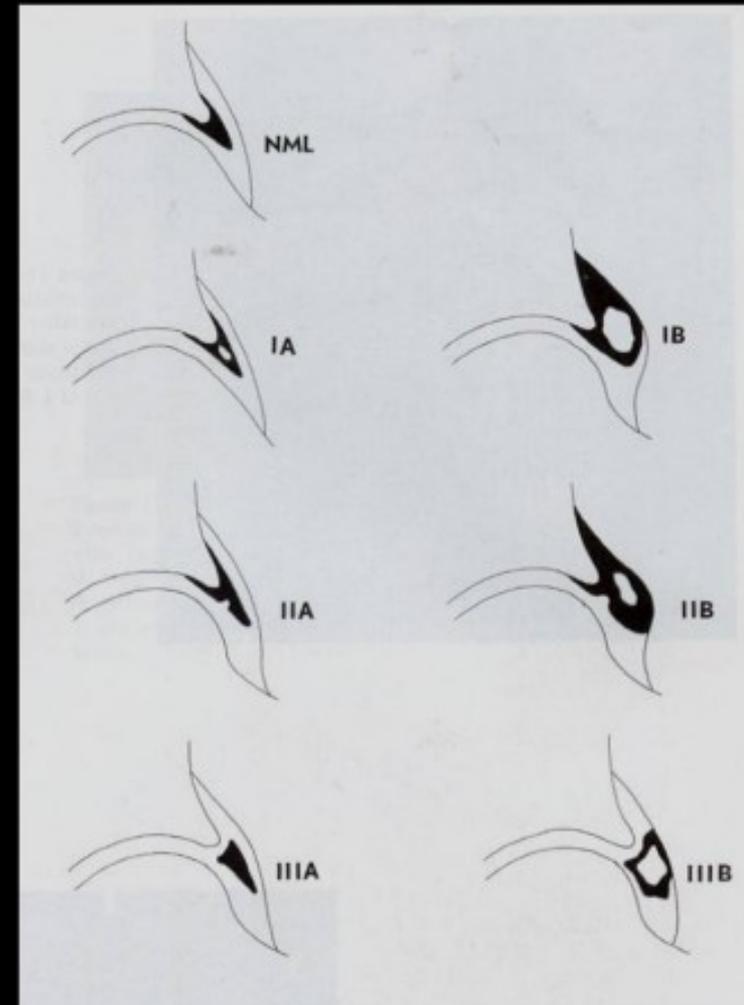
# Labral tears

- ◆ *Normal labrum is a triangular low signal structure at the superior and inferior acetabular margins.*
- ◆ *Surface coil*
- ◆ *MR arthrogram.*
- ◆ *Labral tears are part of femoro-acetabular impingement and can occur*
- ◆ *due to trauma or secondary to degeneration.*



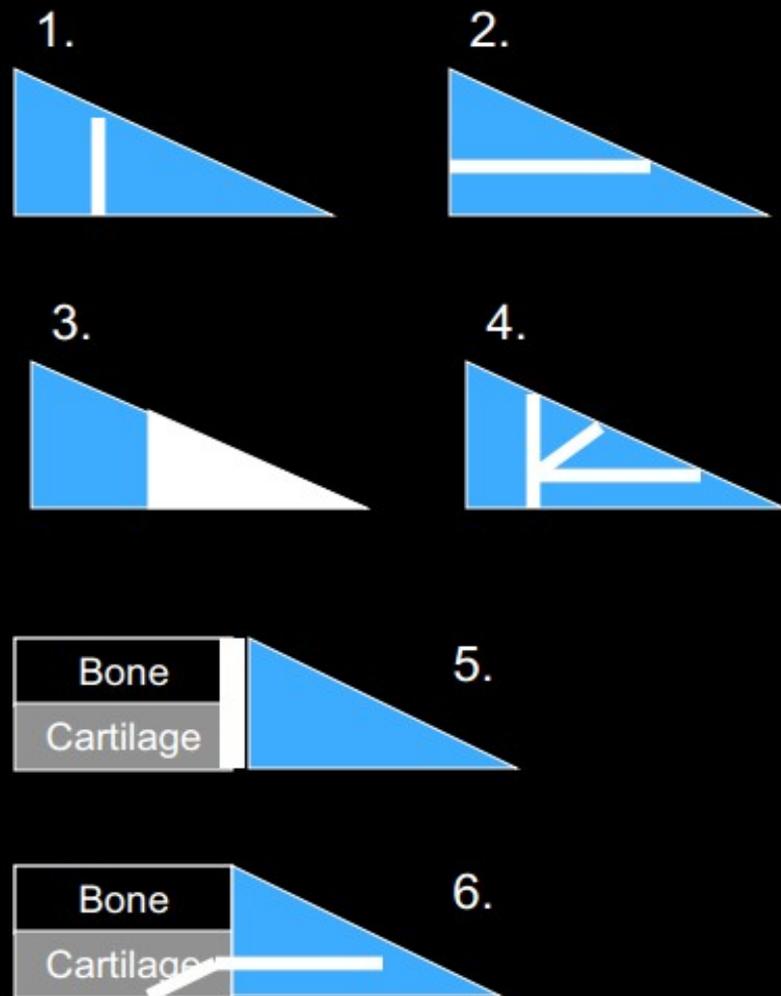
# Labral Tears Classification

- Arthroscopic classification by Lage<sup>27</sup>
  - Radial flap
  - Radial fibrillated
  - Longitudinal peripheral
  - Unstable
- Initial MR Imaging classification by Czerny et al<sup>28</sup>
  - I. Intralabral signal
  - II. Contrast extends into labrum
  - III. Labral detachment
- BUT, these 2 systems do not correlate well with ea other<sup>25</sup>



# Resnick's MR Classification of Labral Tears

- Use sagittal plane for location of tear
- Coronal plane (cross reference to other planes) for type of tear
- **Types:**
  1. Longitudinal vertical
  2. Longitudinal horizontal
  3. Radial
  4. Complex
  5. Labral detachment
    - From bone or articular cartilage
  6. Acetabulolabral articular destruction (ALAD)



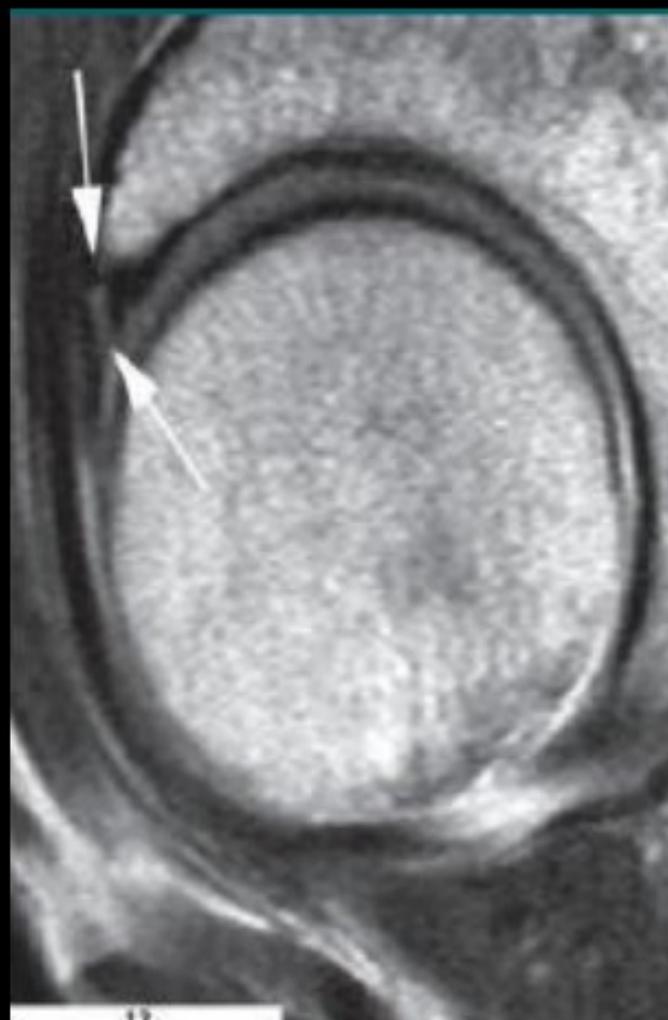
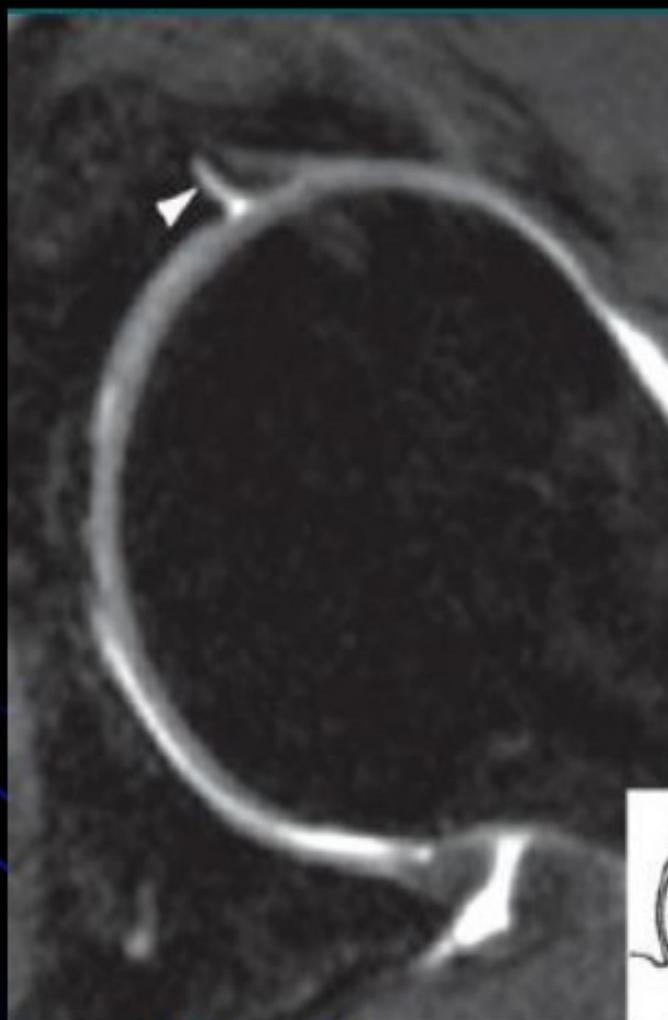
MR Arthrogram: Coronal T1 FS

Axial T1 FS

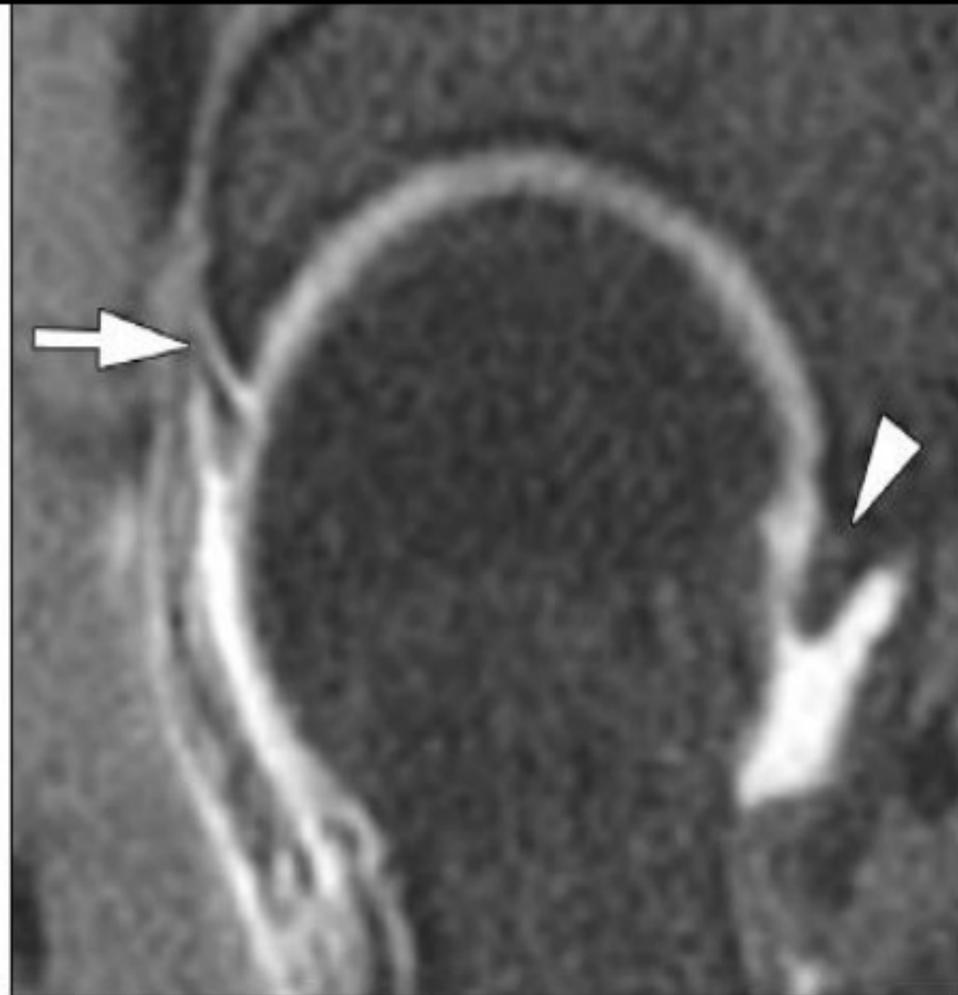
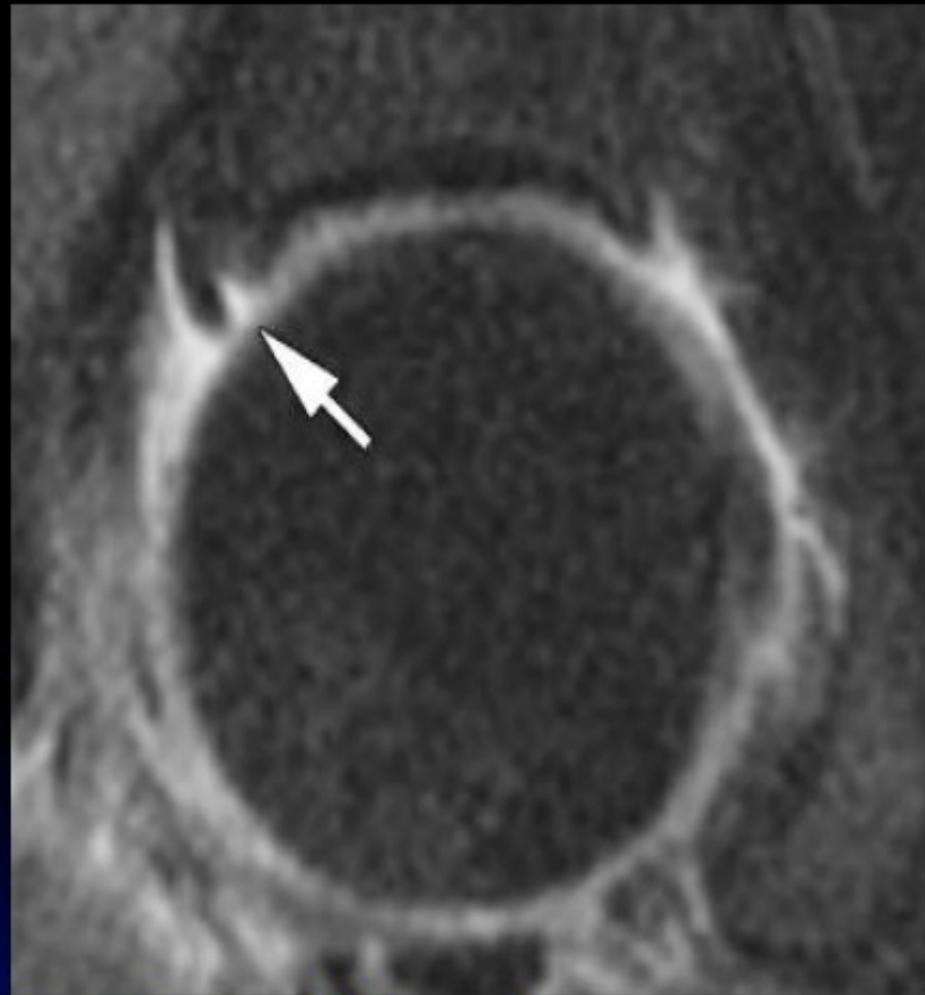


Anterosuperior Labral Tear

# 68 yo woman with anterosuperior labral tear



38 yo male with avulsion of  
anterosuperior labrum

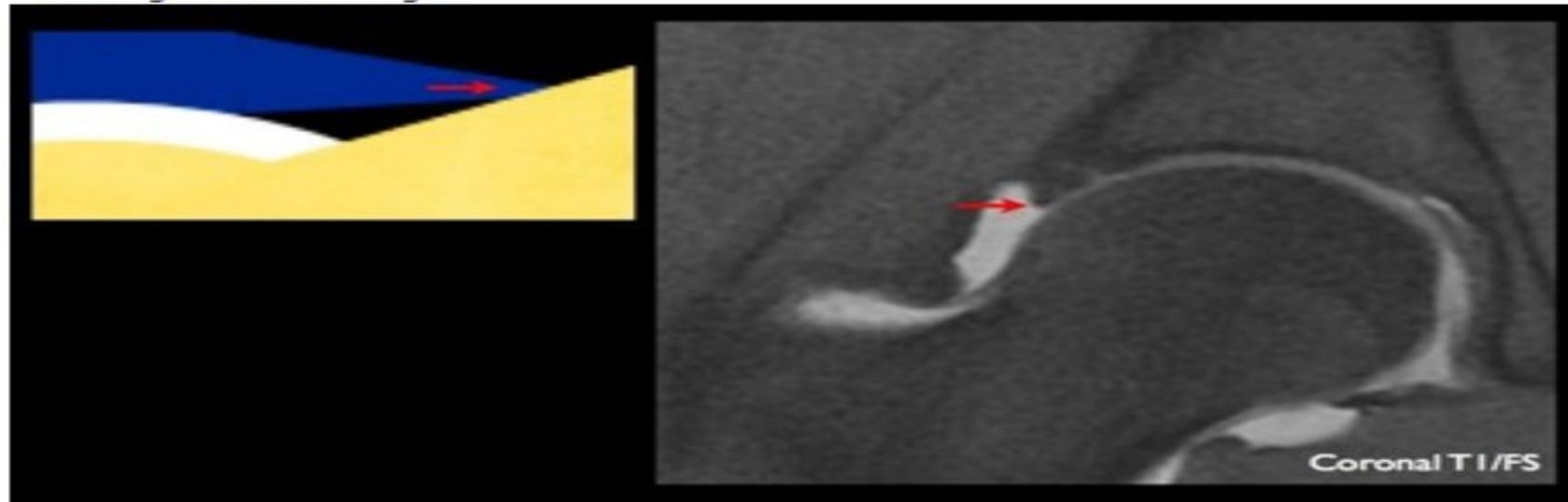


# Labral Tears: Paralabral Cyst

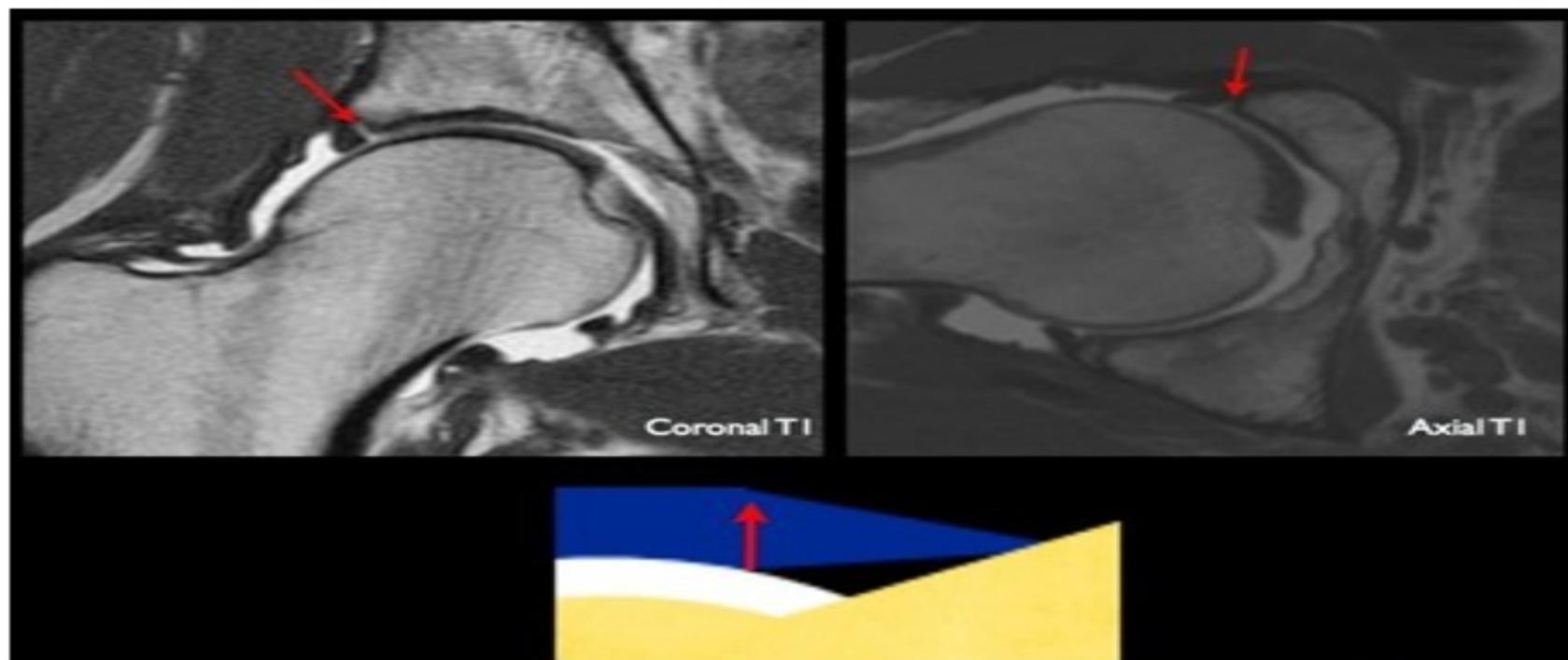


38 yo female with right hip pain for 7 yrs, no trauma

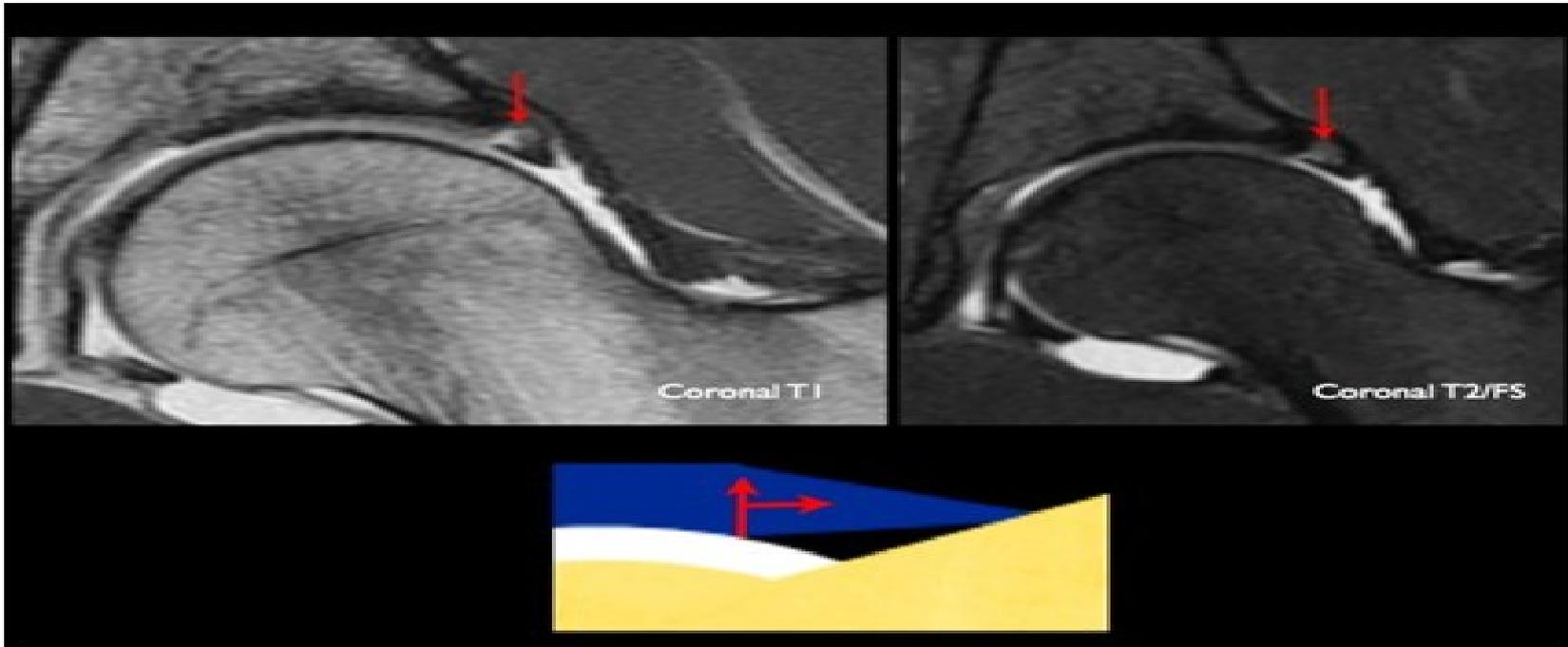
- wearing of the free edge



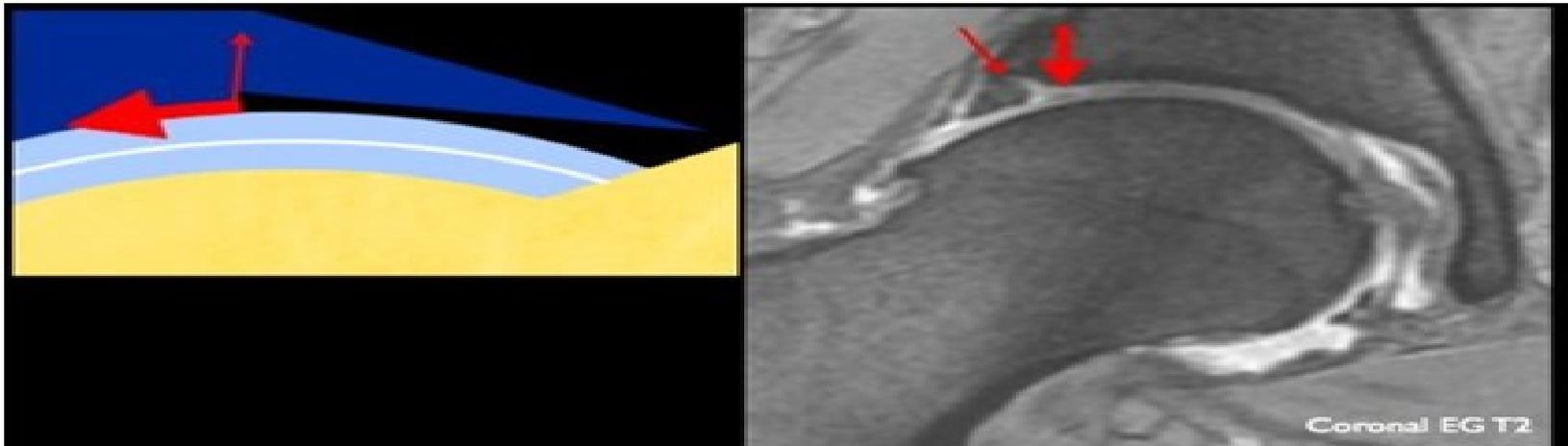
- partial or complete tear

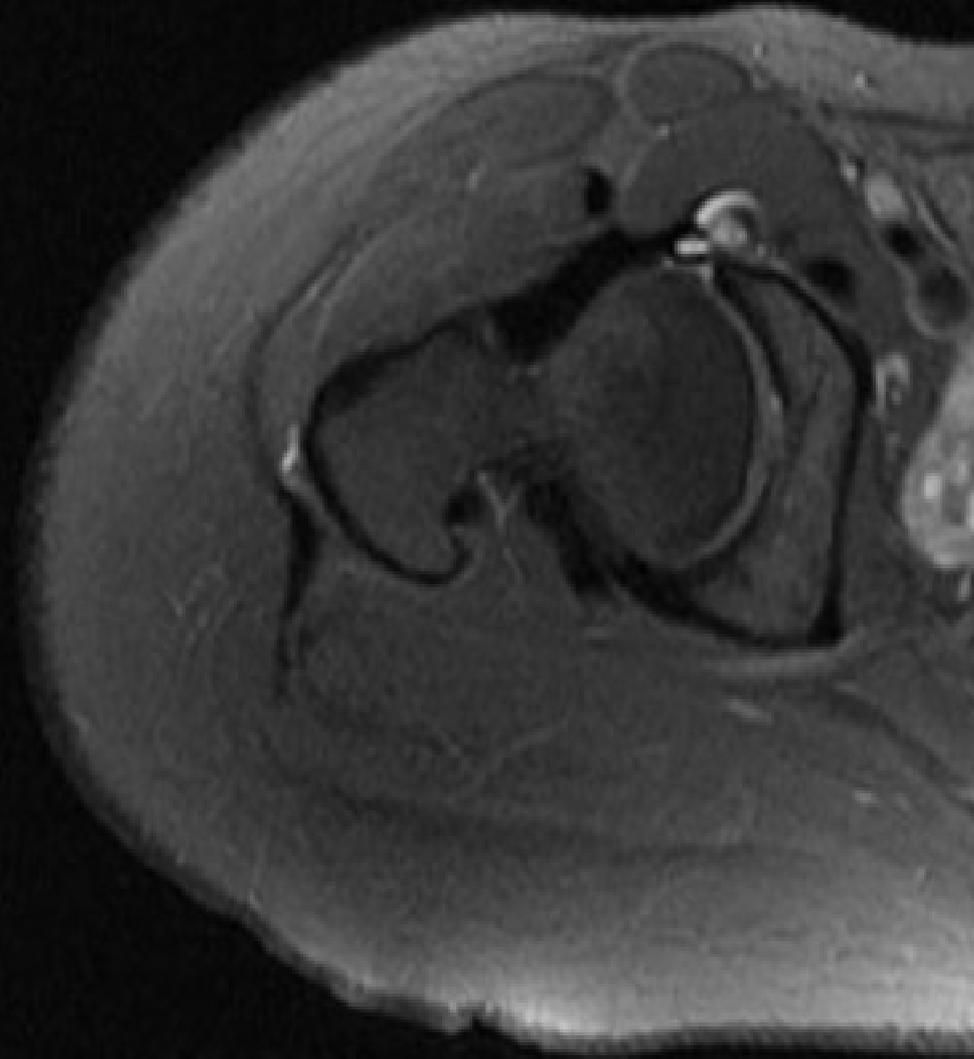


- complex tear which can lead to instability

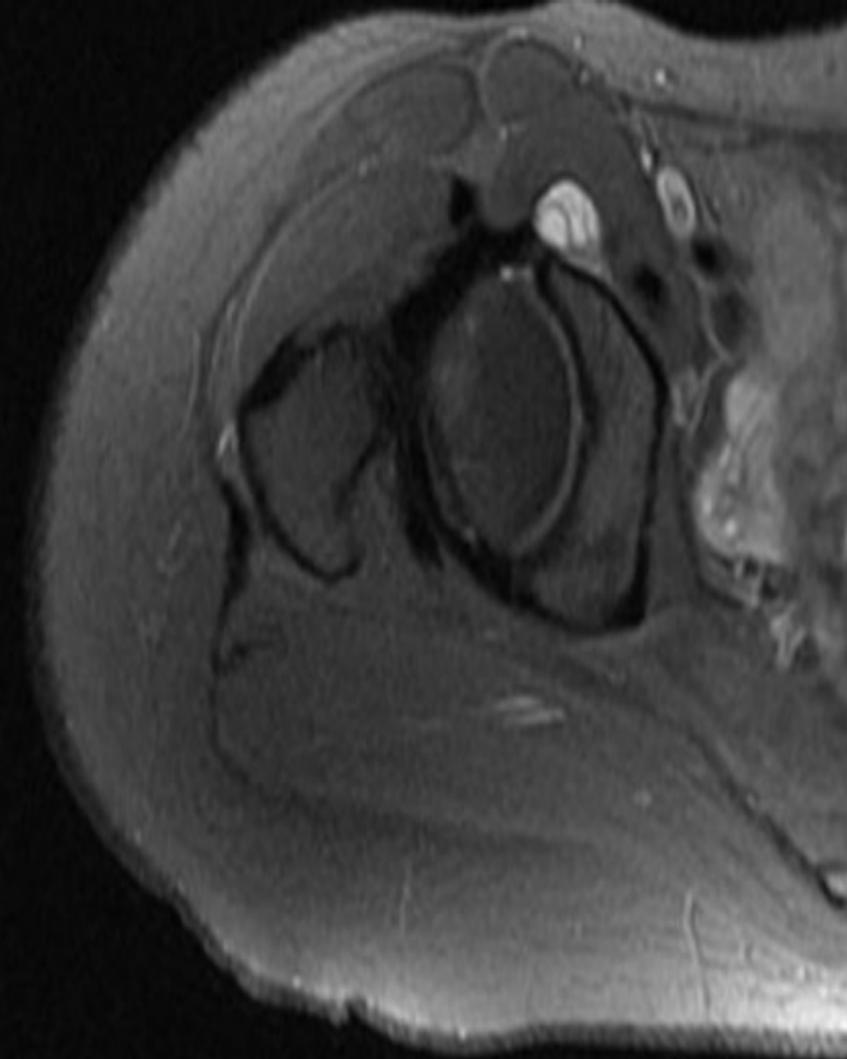


In cam-types femoroacetabular impingement, labral tears are often associated with acetabular cartilage delamination lesions. Those lesions appear hyperintense on T2-weighted sequences at the deep side of the cartilage (thick red arrows).



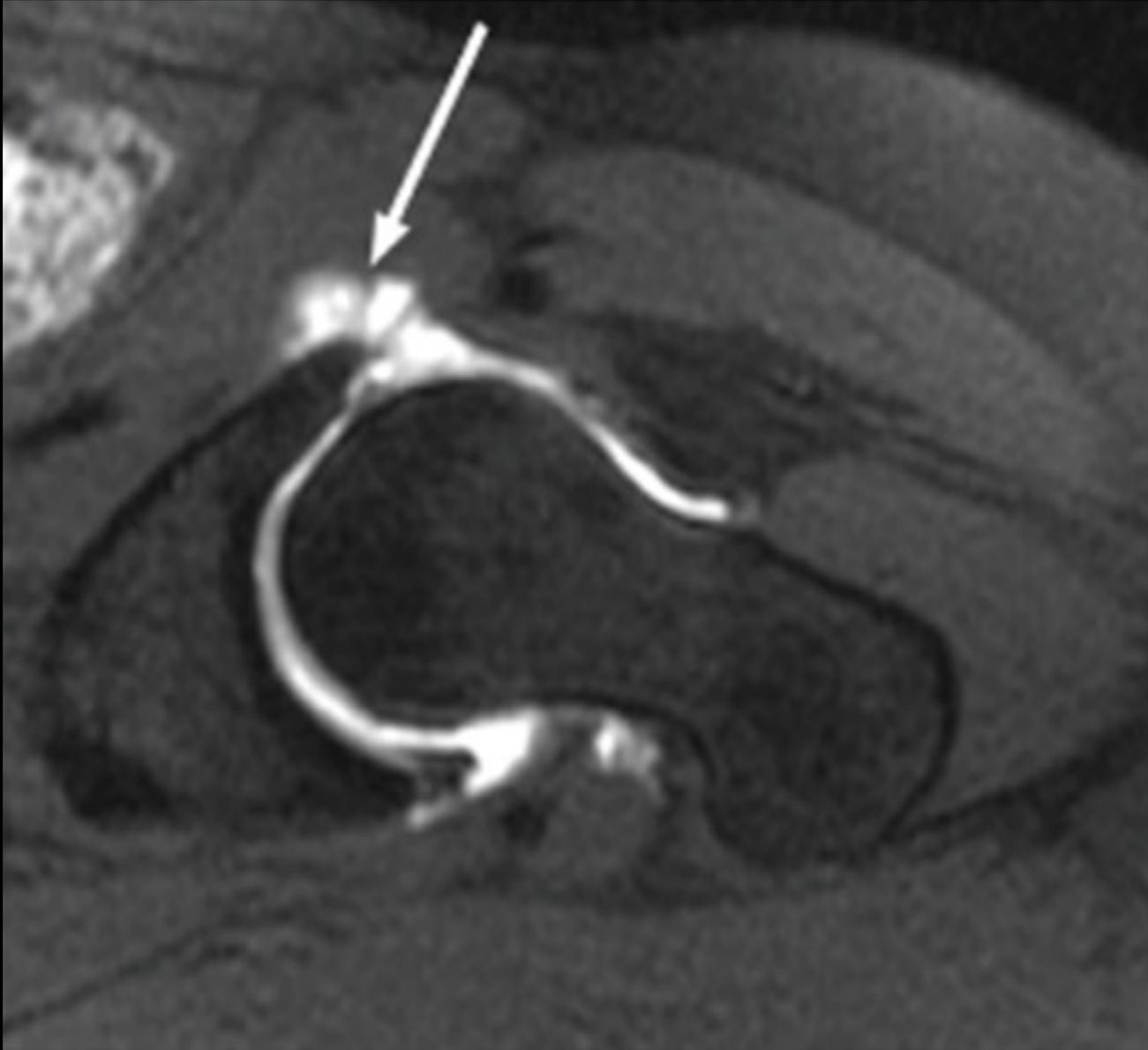


Axial PD fat sat  
well defined lobulated septate paralabral cyst with full thickness anterior labral tear at right

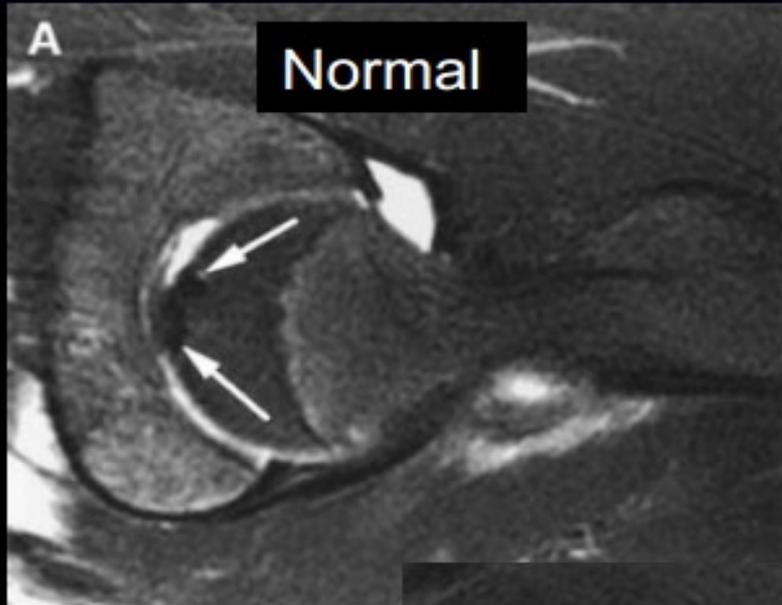


Axial PD fat sat  
well defined lobulated septate paralabral cyst with full thickness anterior labral tear at right hip joint

**MR arthrogram of the left hip showing anterior paralabral cyst(arrow) and a complex degenerative tear of the anterior labrum**



# Ligamentum Teres Tears

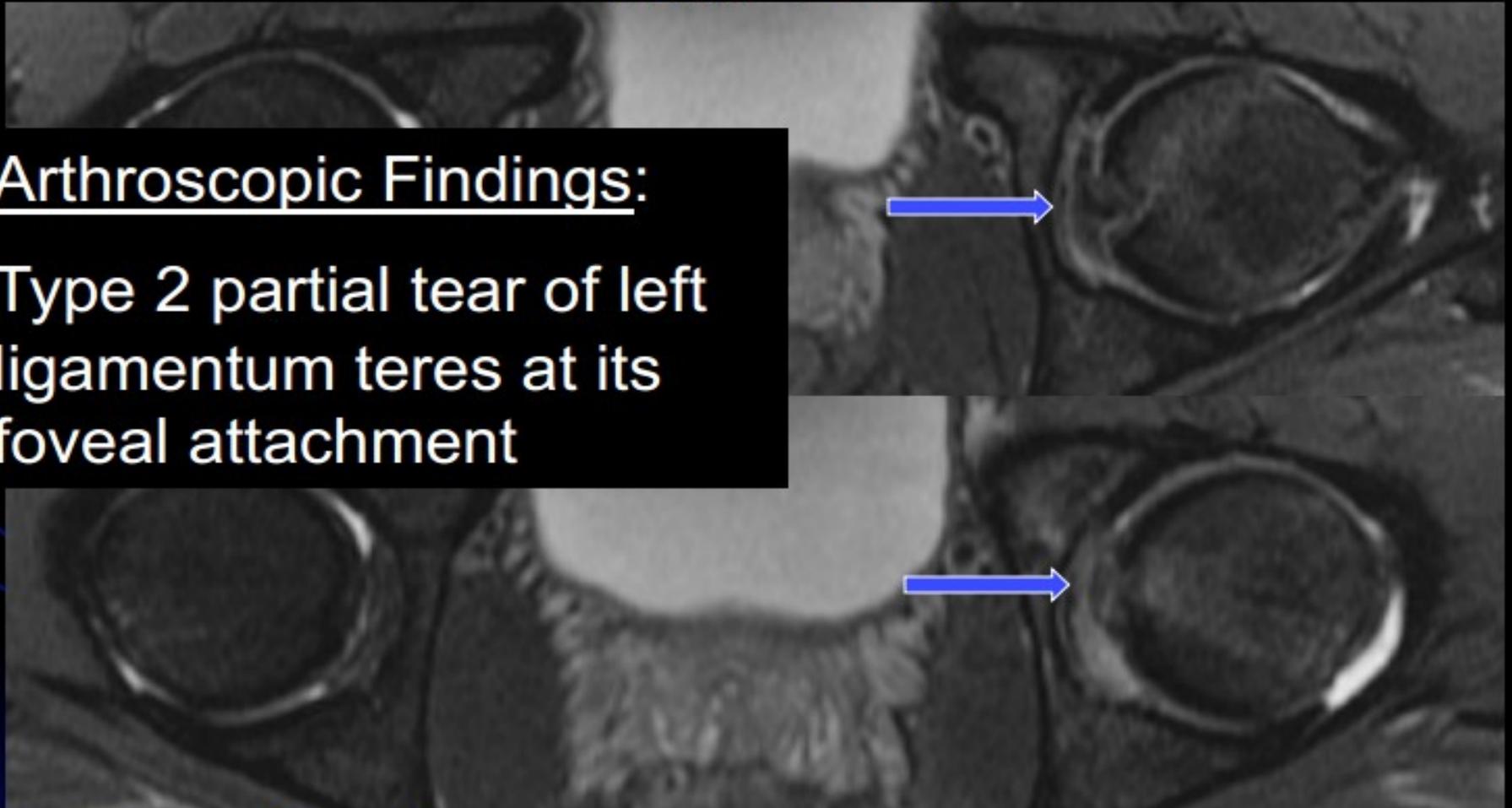


# 24 yo professional soccer player with left hip pain

Axial T2 FS

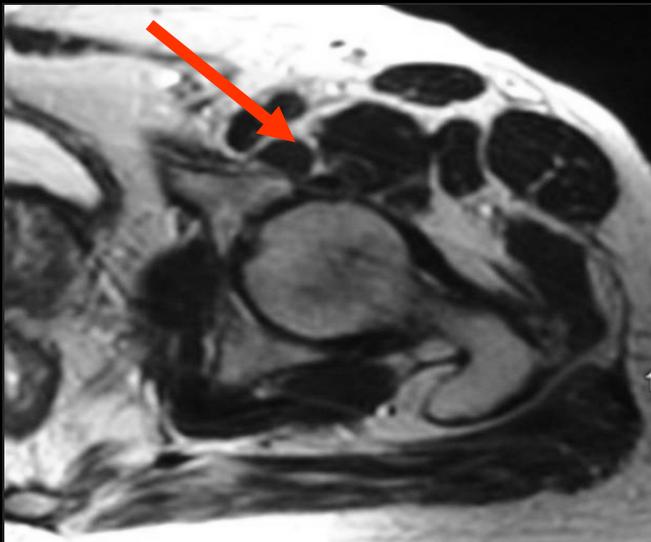
## Arthroscopic Findings:

Type 2 partial tear of left  
ligamentum teres at its  
foveal attachment



# Bursitis.

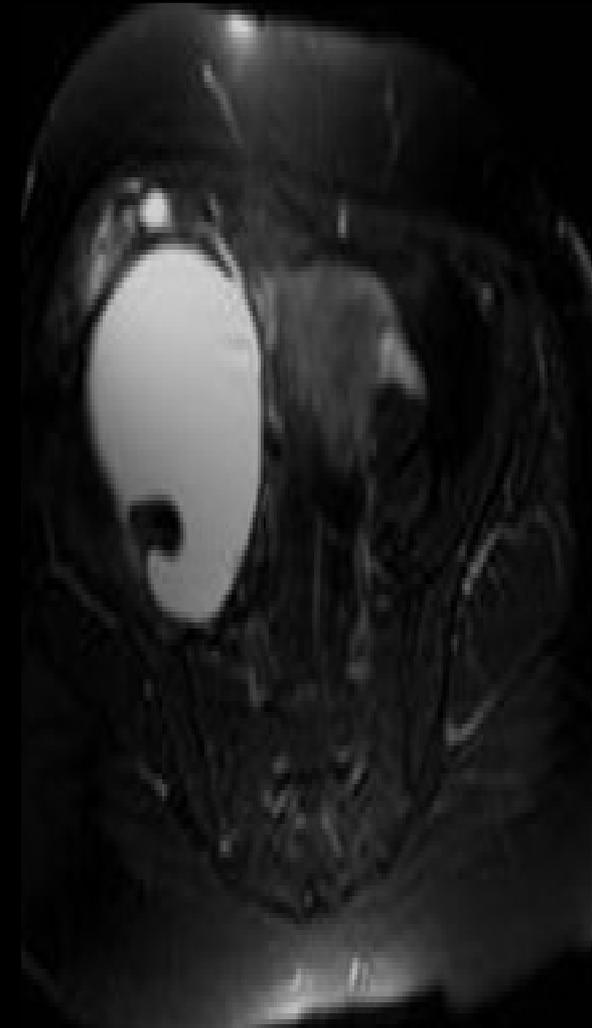
- ◆ *Bursae are sacs of synovial tissue*
- ◆ *Prevent friction between bones and soft tissues.*
- ◆ *15-20 Bursae around the hip joint*
- ◆ ***Trochanteric***
- ◆ ***Ishcheo-gluteal***
- ◆ ***Iliopsoas*** : *the largest in the body*
- ◆ *10% - 15% communicate with the joint*



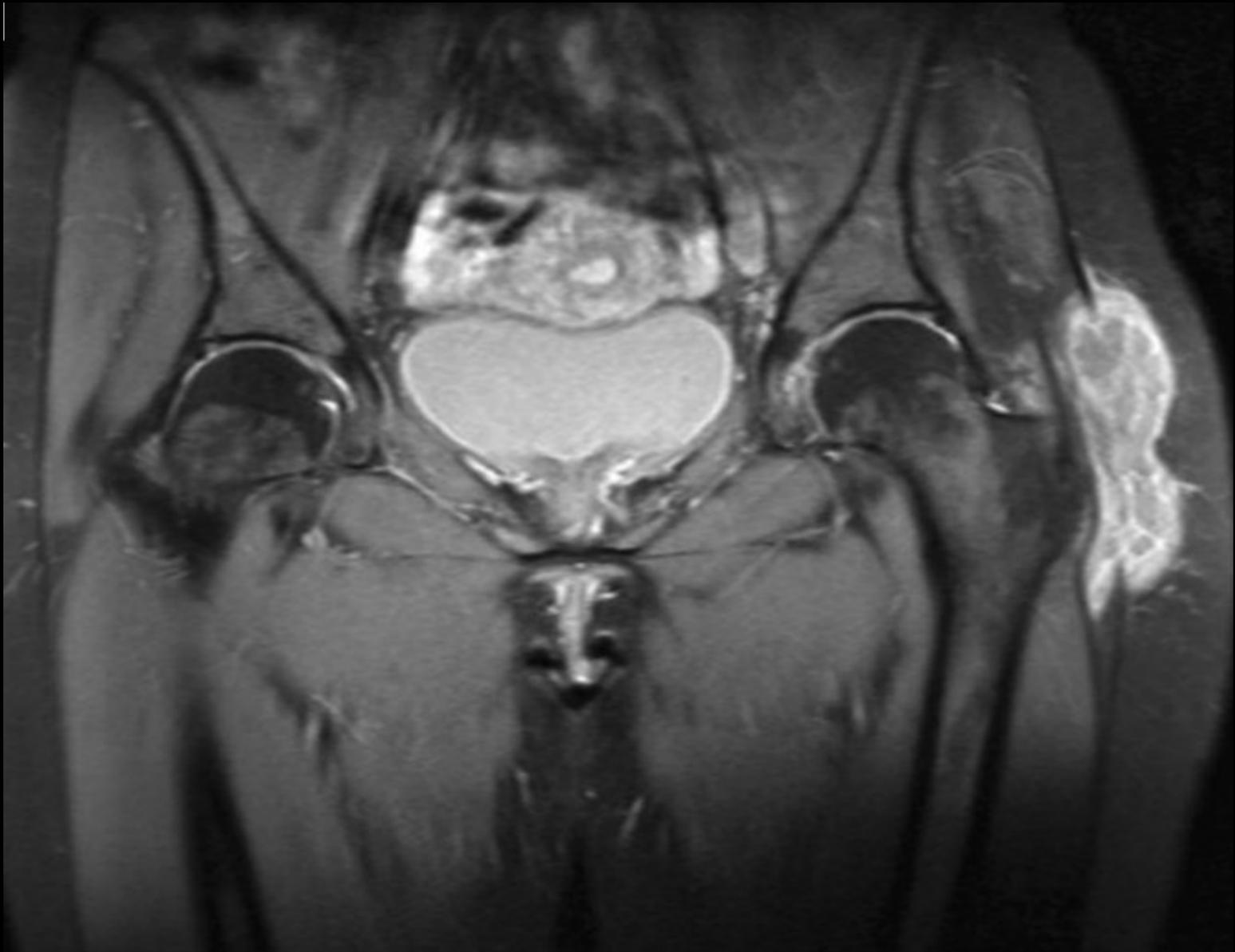
# Sagittal and coronal STIR images show Iliopsoas bursitis.



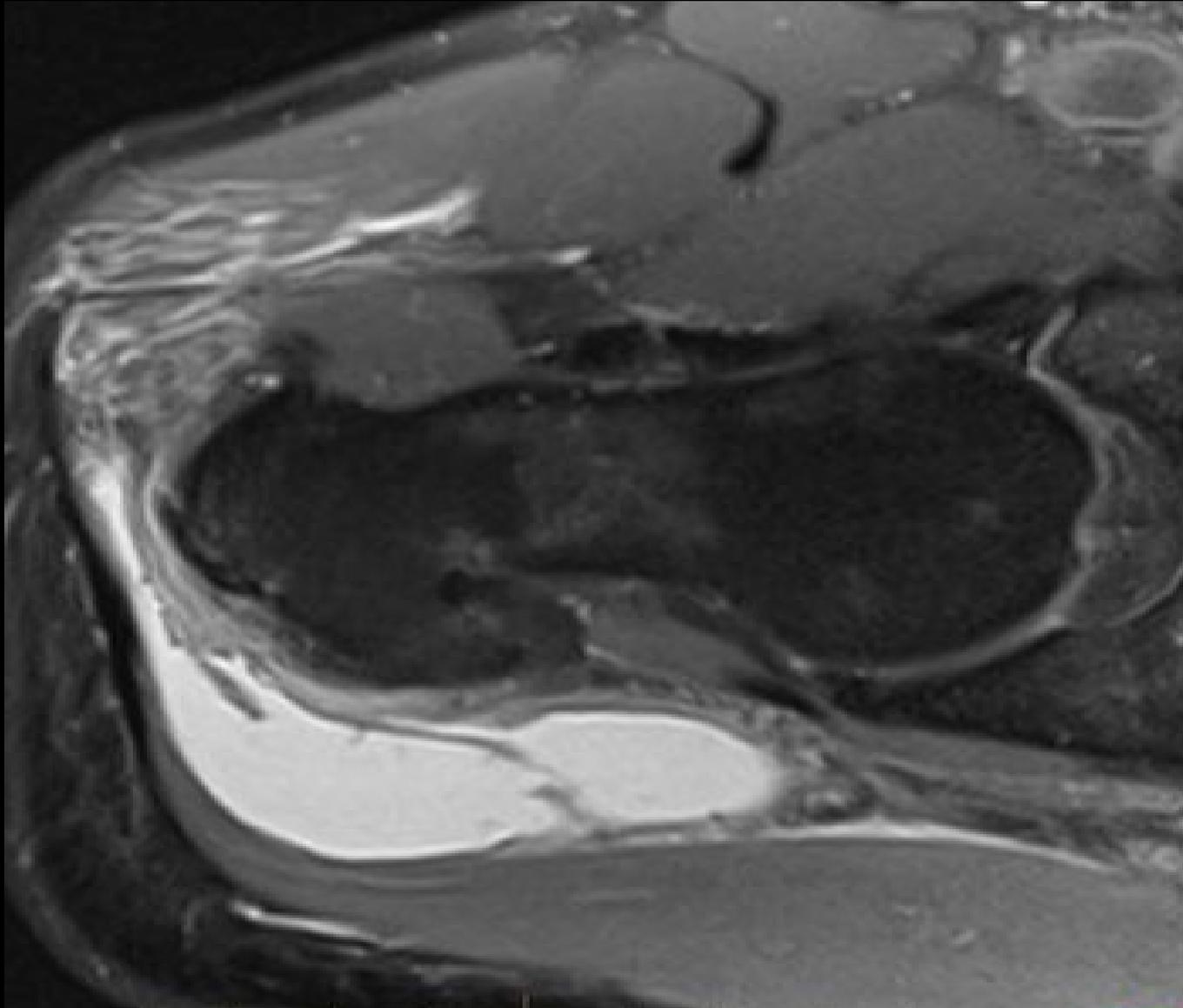
**AXIAL CT Scan and axial STIR MRI images show iliopsoas bursitis**



**Coronal STIR images show left greater trochanter bursa.**



**Axial images show left greater trochanteric bursa.**



# **Femoro-acetabular impingement (FAI)**

**Refers to a clinical syndrome of painful, limited hip motion resulting from certain types of underlying morphological abnormalities in the femoral head/neck region and/or surrounding acetabulum. FAI can lead to early degenerative disease.**

## **Epidemiology**

**Pincer impingement** is more common in middle-aged women, occurring at an average age of 40 years, and can occur with various disorders. It is essentially an over-coverage of the femoral head by the acetabulum

**Cam impingement** is more common in young men, occurring at an average age of 32 years . It refers to a bony protrusion, mostly located at the anterosuperior aspect of the femoral head-neck junction

**Combined:** mixture of the two occurring together.

## **Causes of Cam Lesions**

### **Idiopathic**

### **Developmental**

**Nonspherical femoral head**

**Coxa vara**

### **Traumatic**

**Malunited femoral neck fracture**

**Post-traumatic retroversion of the femoral head**

**Childhood orthopedic condition**

**Perth's disease**

**Slipped capital femoral epiphysis (SCFE)**

### **Iatrogenic**

**Femoral osteotomy**

## **Causes of Pincer Lesions**

### **Idiopathic**

### **Developmental**

**Retroverted acetabulum**

**Coxa profunda**

**Os acetabuli**

**Protrusio acetabuli**

**Chronic residual dysplasia of the acetabulum**

### **Traumatic**

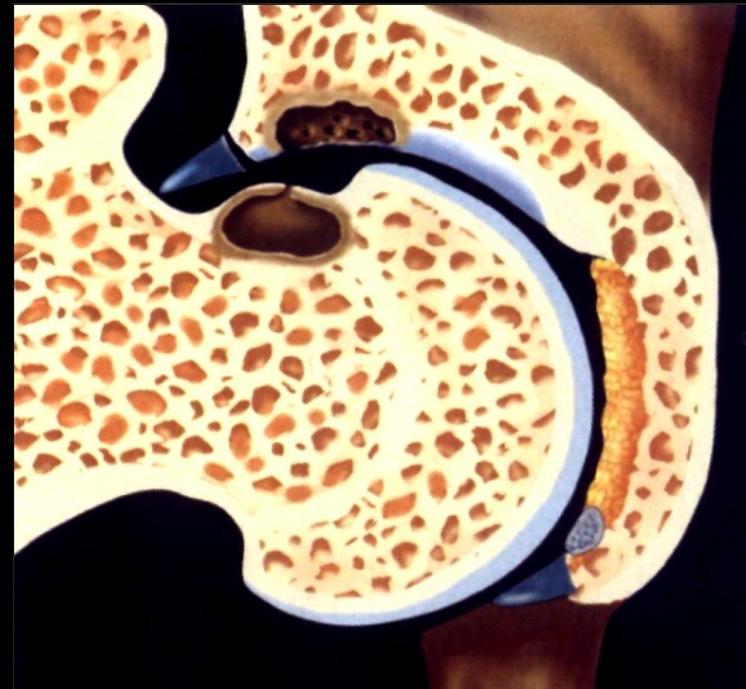
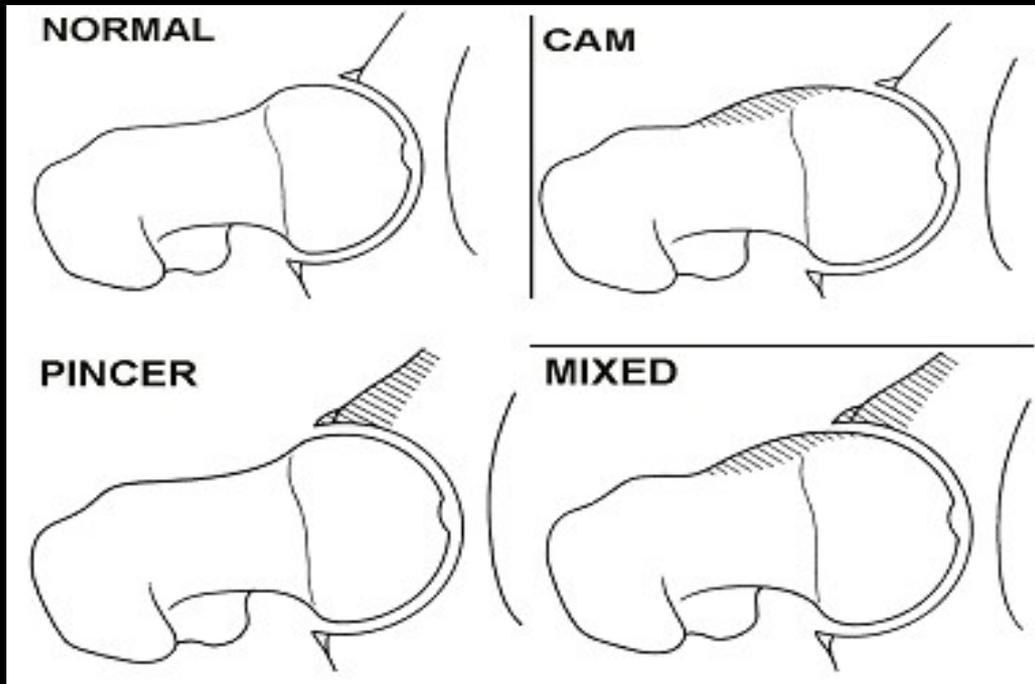
**Post-traumatic deformity of the acetabulum**

### **Iatrogenic**

**Overcorrection of retroversion in dysplastic hips**

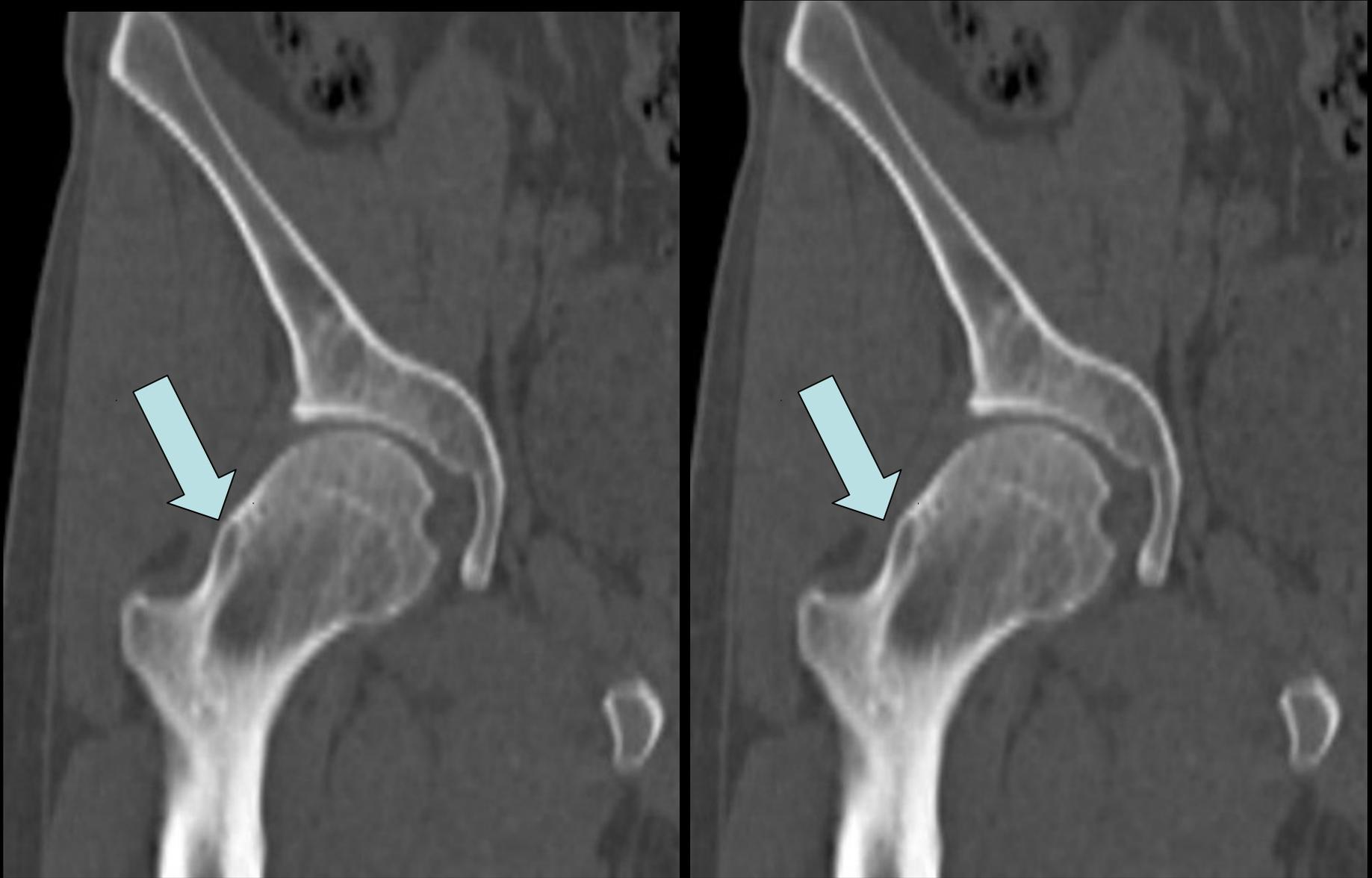
# Femro - acetabular impingement

- ◆ *Micro trauma from impingement of the femoral head against the acetabulum*
- ◆ *Abnormal signal of the acetabular rim and femoral head*
- ◆ *Labral tears and cartilage degeneration are seen*
- ◆ *Clinically recurrent attacks of severe hip and groin pain*
- ◆ *Pain increases by flexion and internal rotation and weight bearing*

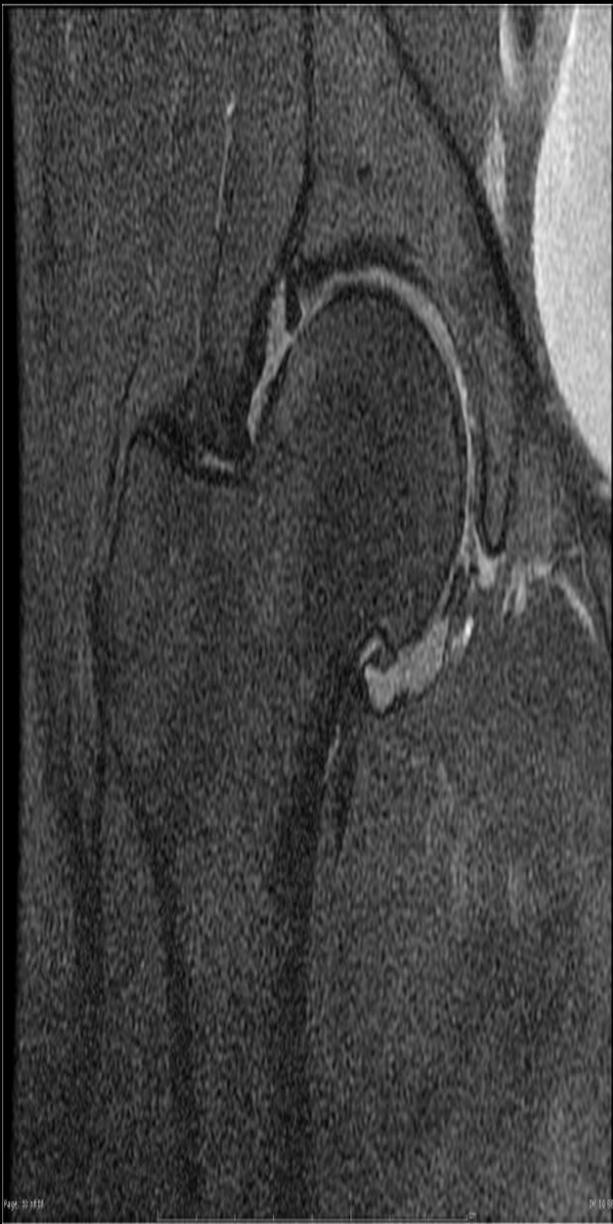




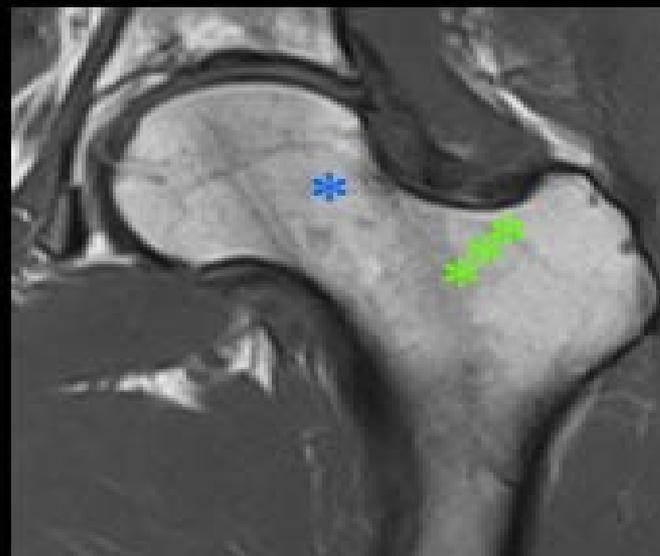
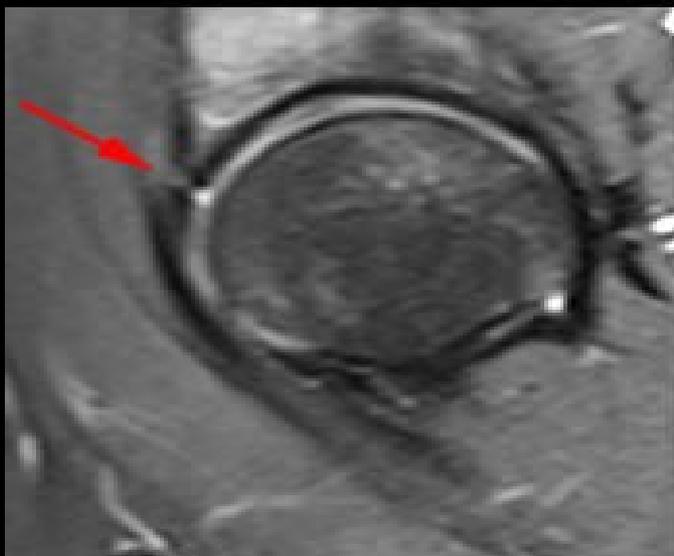
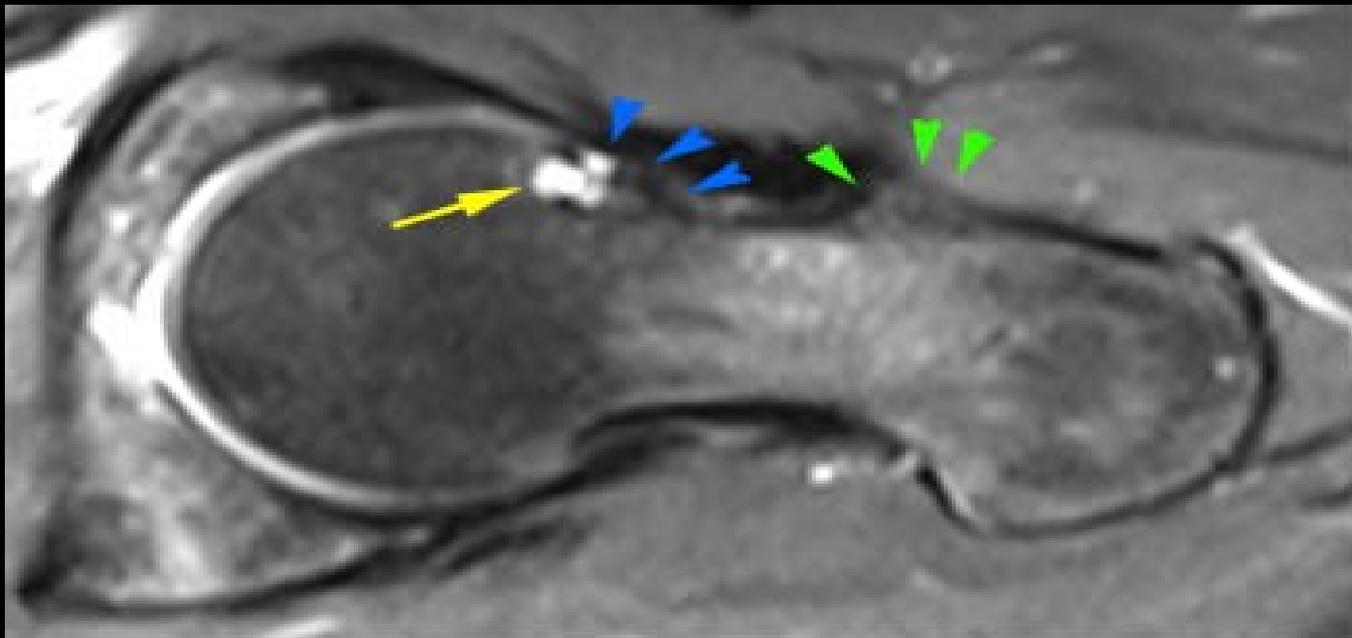
***Plain x-ray of the hip showing bony bump (cam lesion) at the base of the ball.***



***Cam type of femoro-acetabular impingement.***



***Cam type of femoro-acetabular impingement.***



***Femoral head-neck junction bump (cam-type FAI)***

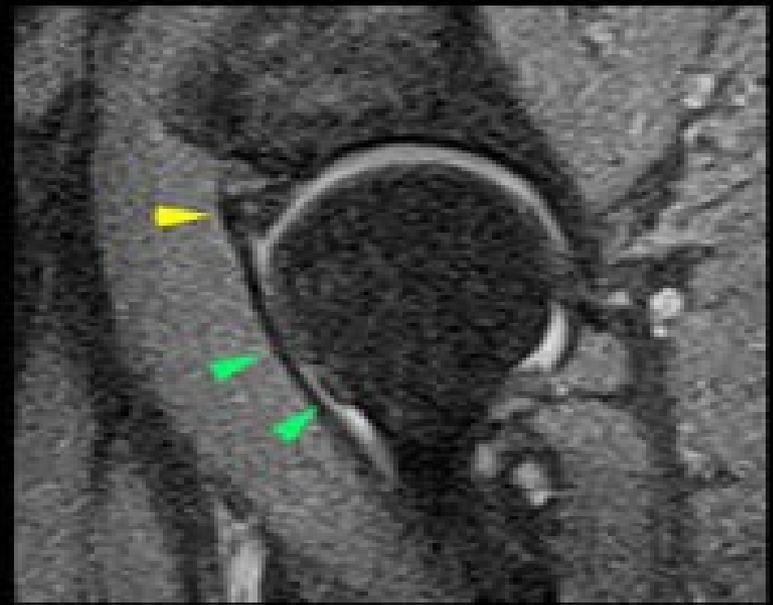
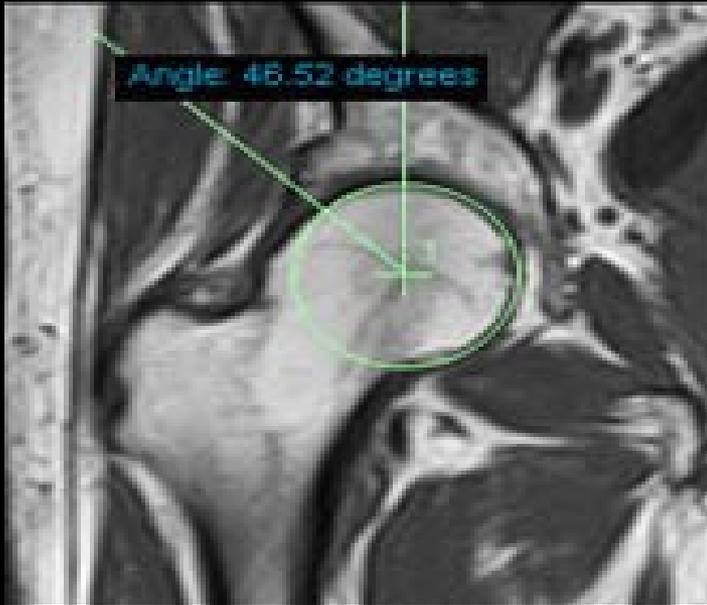




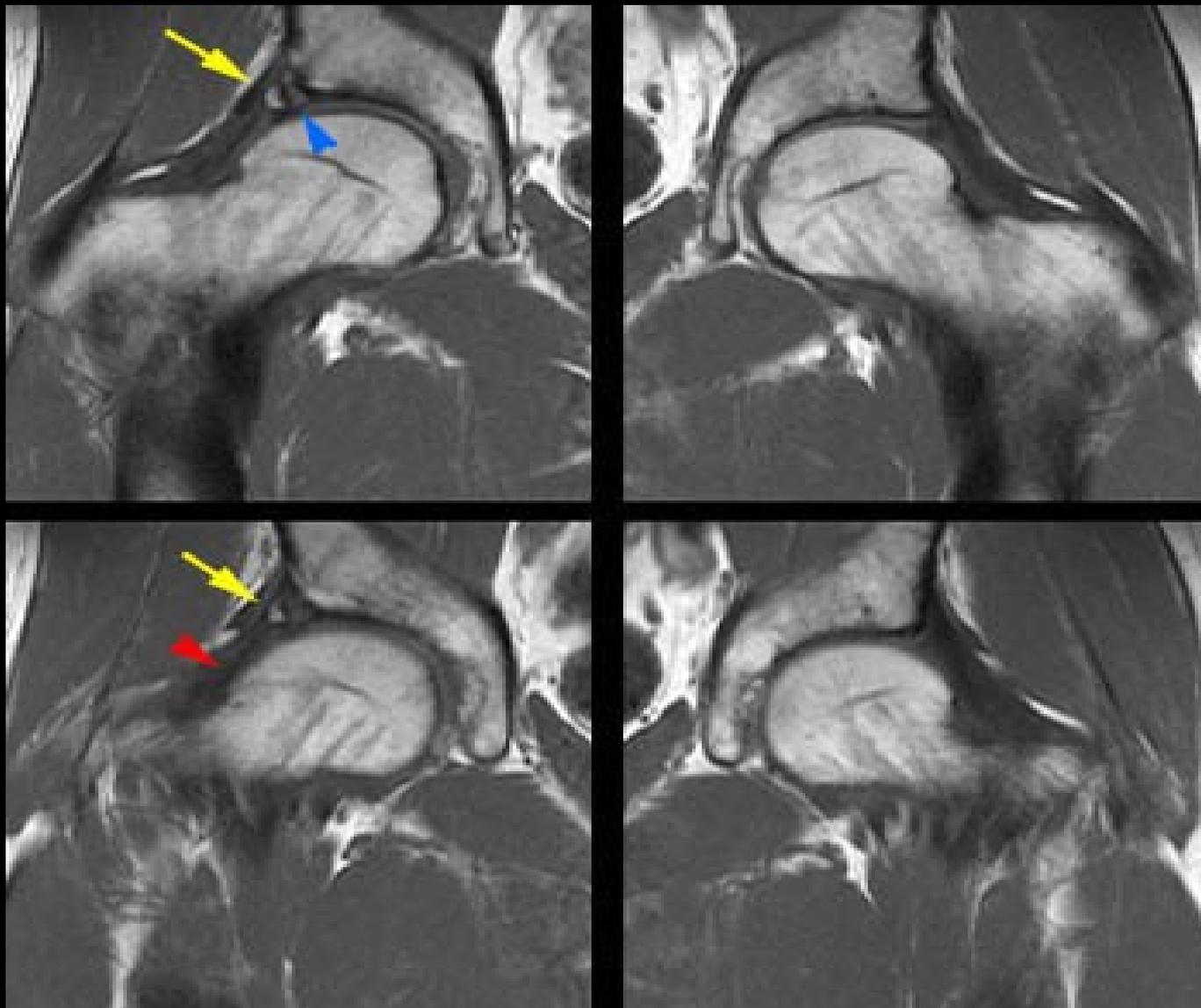
***Overcoverage of the femoral head from labral ossification and irregular hypertrophy, causing pincer-type FAI.***



***Femoro acetabular impingement-mixed type.***

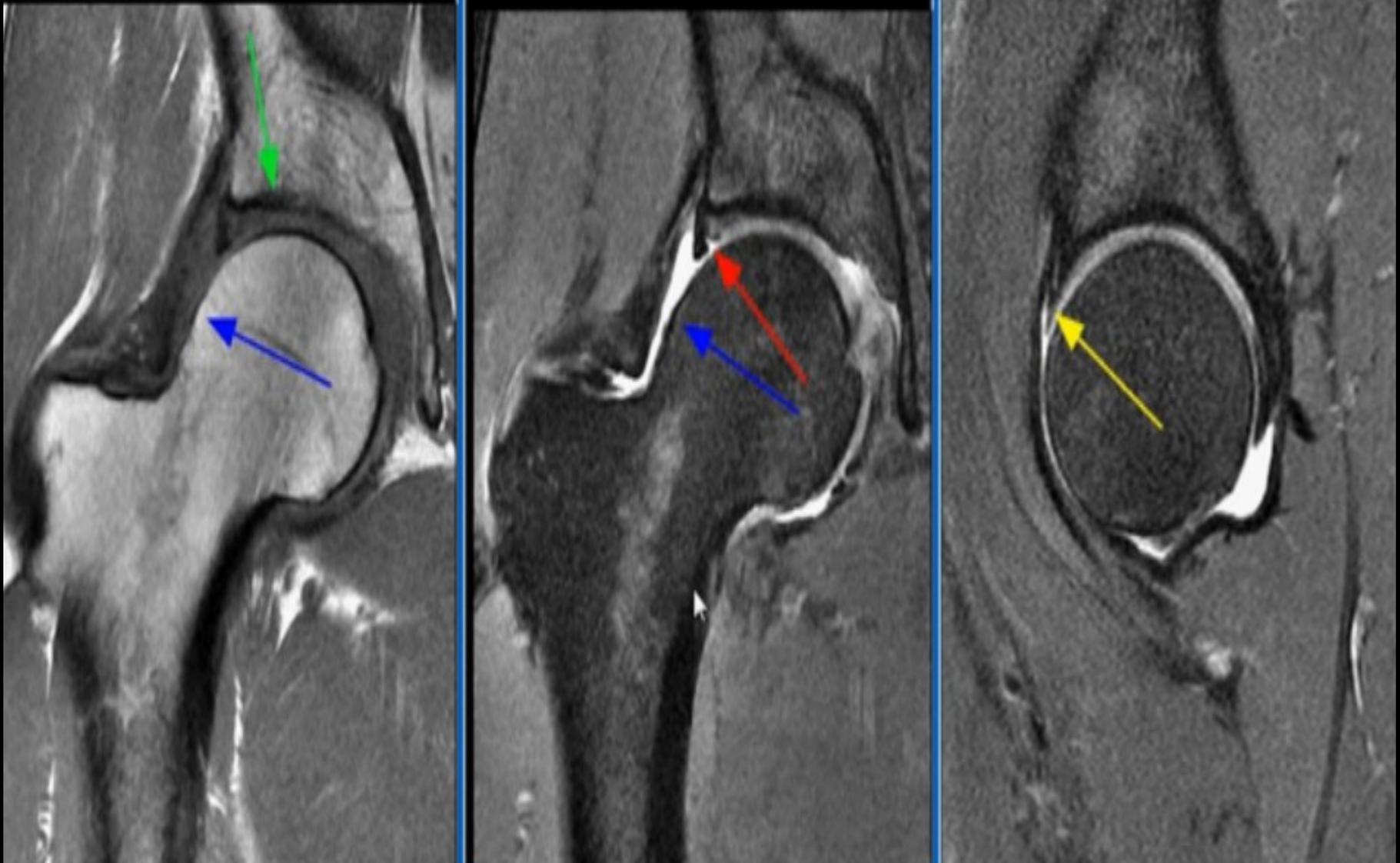


***Os acetabuli and mixed-type FAI.***

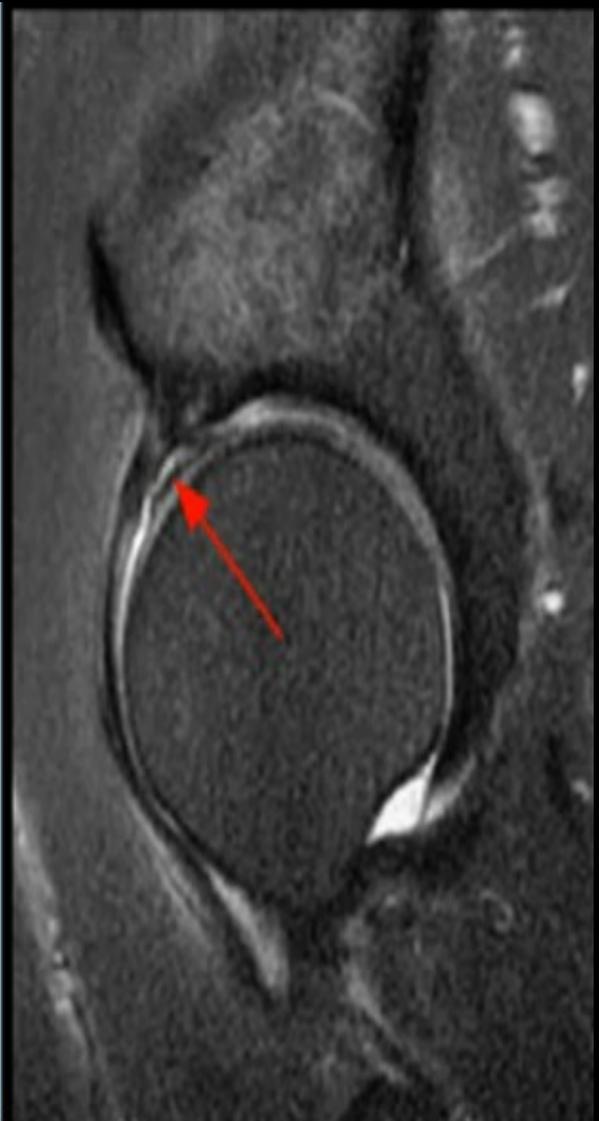
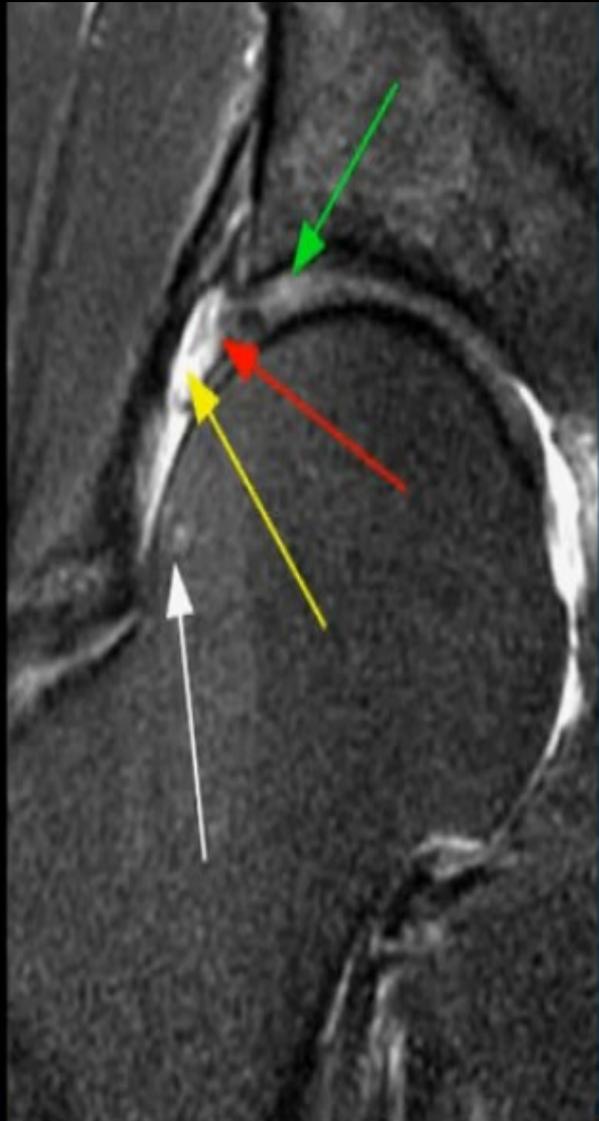
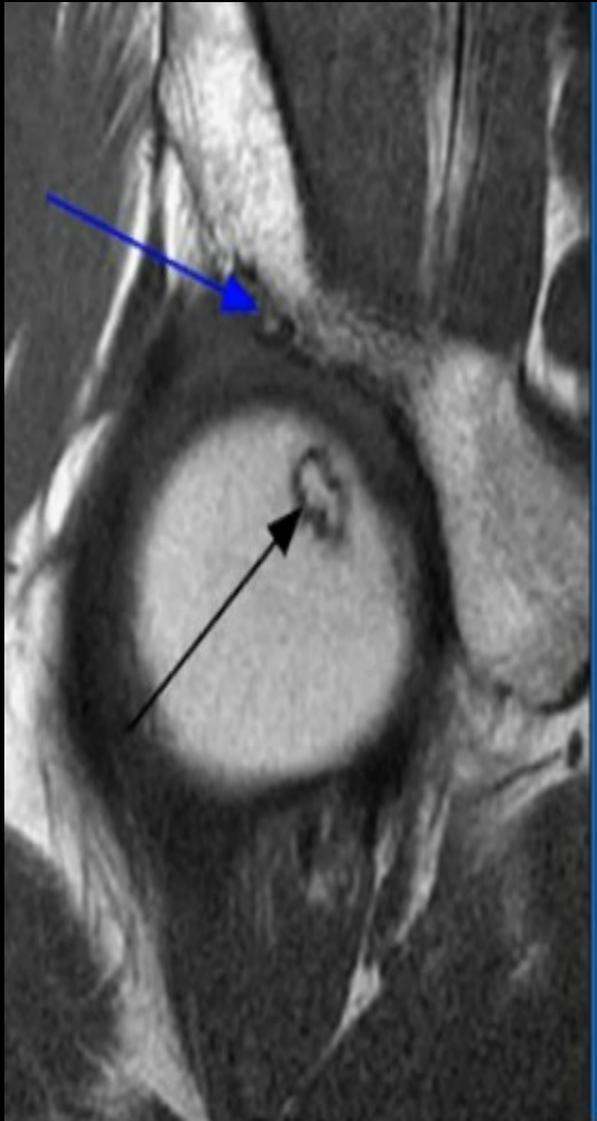


***Unilateral os acetabuli and a spherical femoral head, suggestive of mixed type FAI.***

# .Femro - acetabular impingement

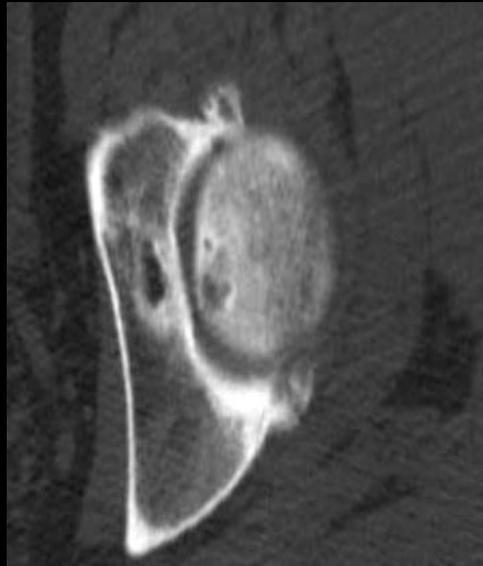


# .Femro - acetabular impingement with avascular head necrosis

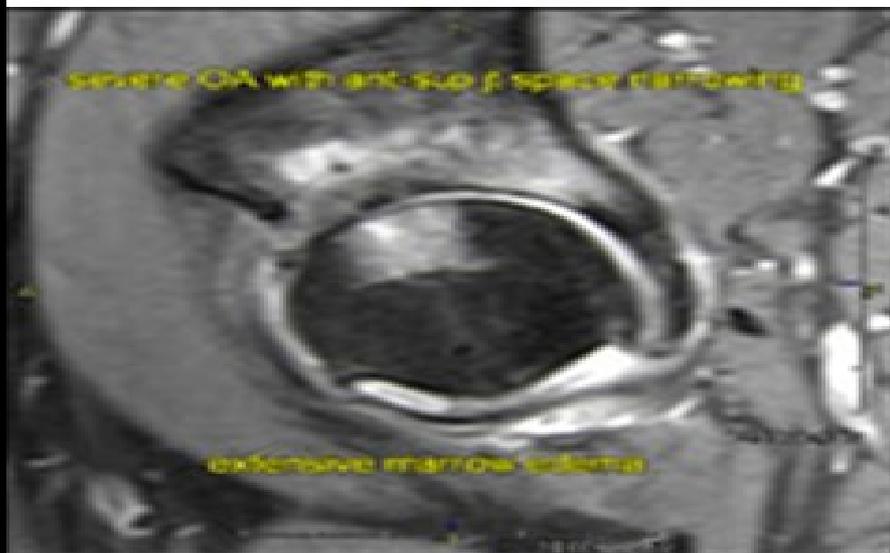


# Effusion, osteoarthritis.

- ◆ *Narrowing of the superior joint space*
- ◆ *Suprolateral migration of the femur*
- ◆ *Osteophytic lipping*
- ◆ *Subchondral sclerosis*
- ◆ *Subarticular pseudo cysts*
- ◆ *Effusion*
- ◆ *Vacuum phenomena*



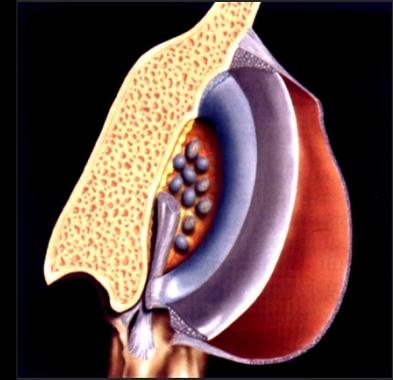
***Osteoarthritis, pseudo-cyst changes, bone marrow edema, synovial proliferation, loose body and effusion.***



# Loose bodies

## Etiology

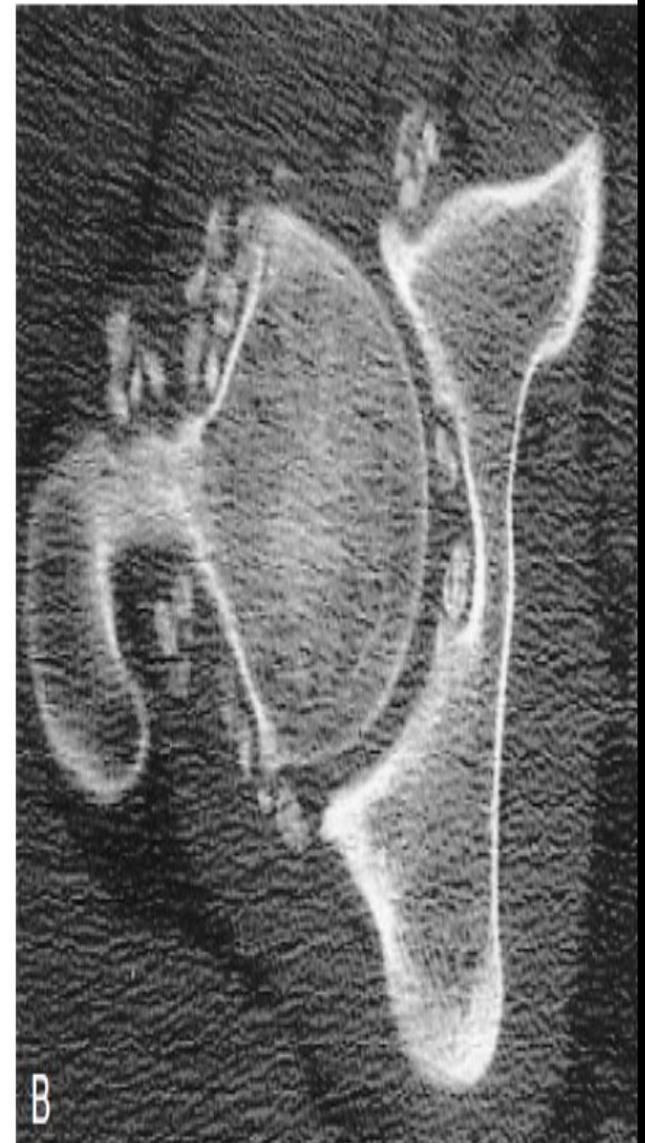
- ◆ Trauma
- ◆ Osteoarthritis
- ◆ PVNS
- ◆ AVN
- ◆ Synovial chondromatosis
- ◆ Arthritis [ gout , septic , rheumatoid.



# Loose bodies/ osteochondromatosis.

## Clinical

- ◆ Pain
- ◆ Locking
- ◆ Clicking
- ◆ Snapping



# Synovial osteochondromatosis.

*Metaplasia of subsynovial soft tissues*

*cartilage formation*

*]Affects any joint [ knee , hip , elbow*

*Age incidence 40 years M : F = 2 : 1*

## Findings

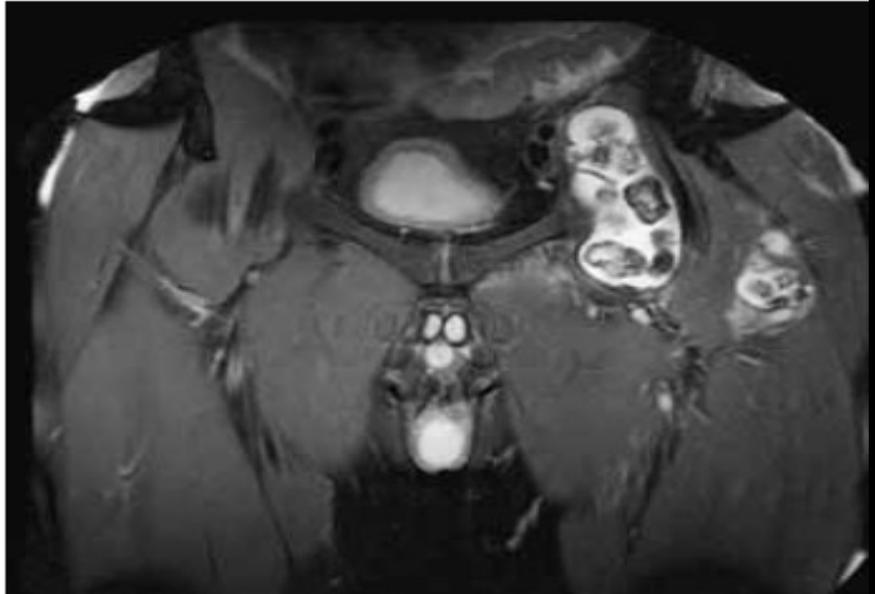
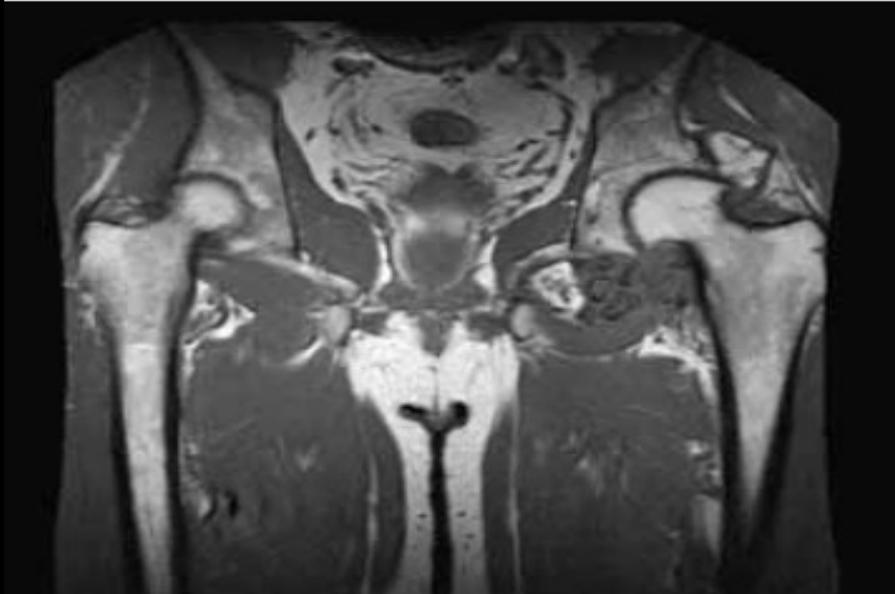
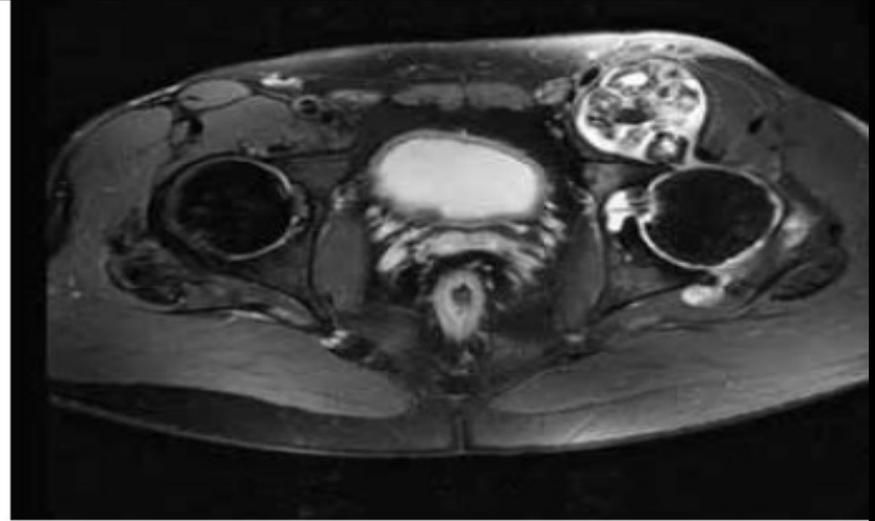
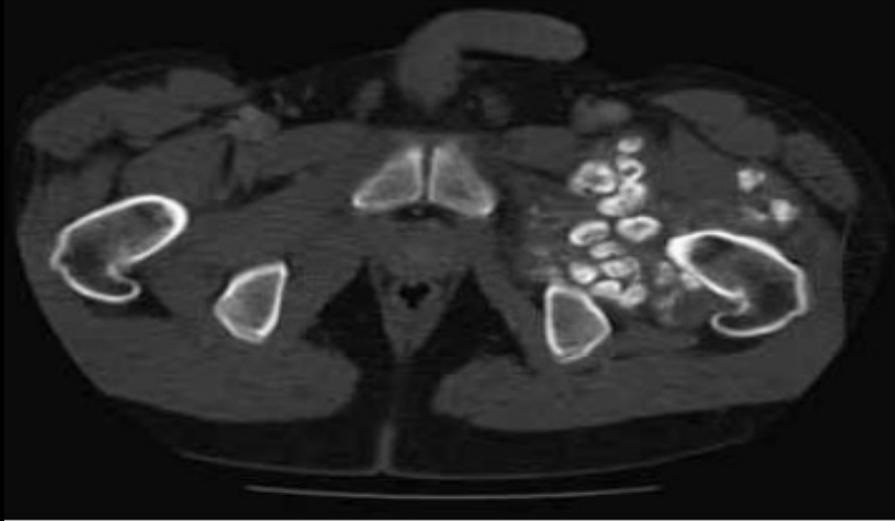
- ◆ *Widening of the joint space*
- ◆ *Bone erosions*
- ◆ *Intra articular loose bodies*
- ◆ *Secondary osteoarthritis changes*



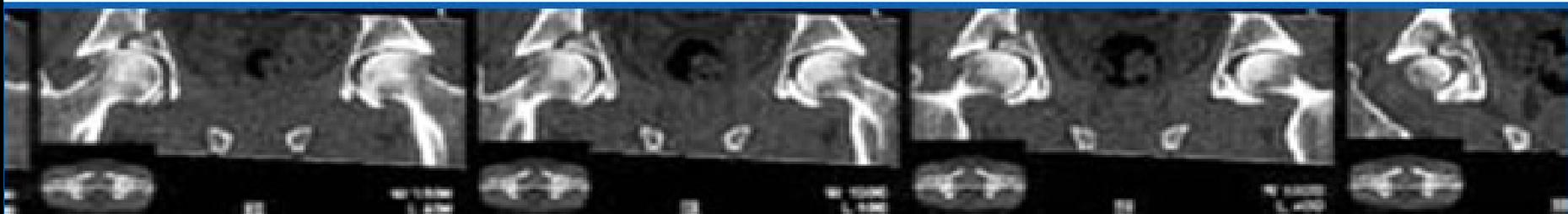
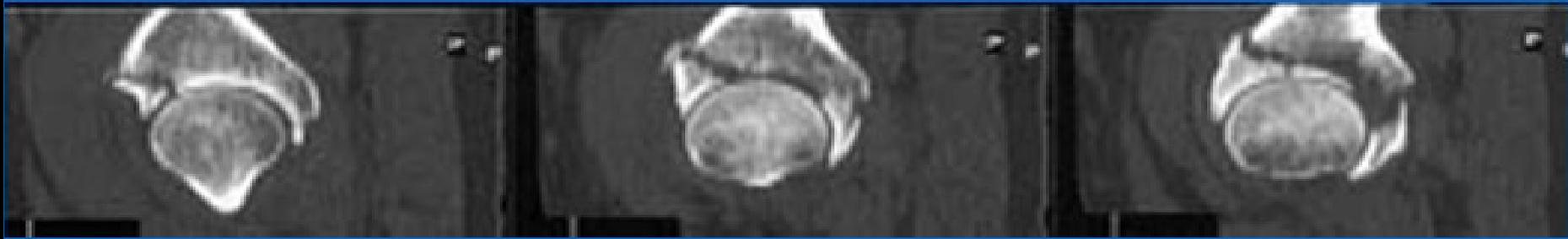
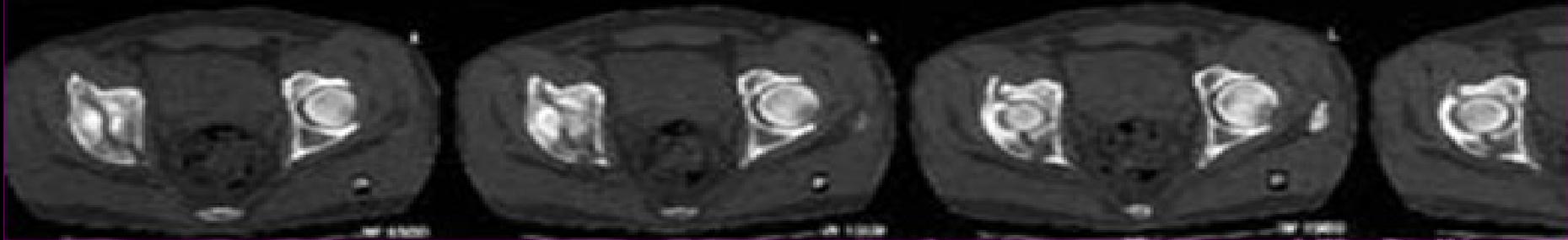
# Synovial osteochondromatosis.



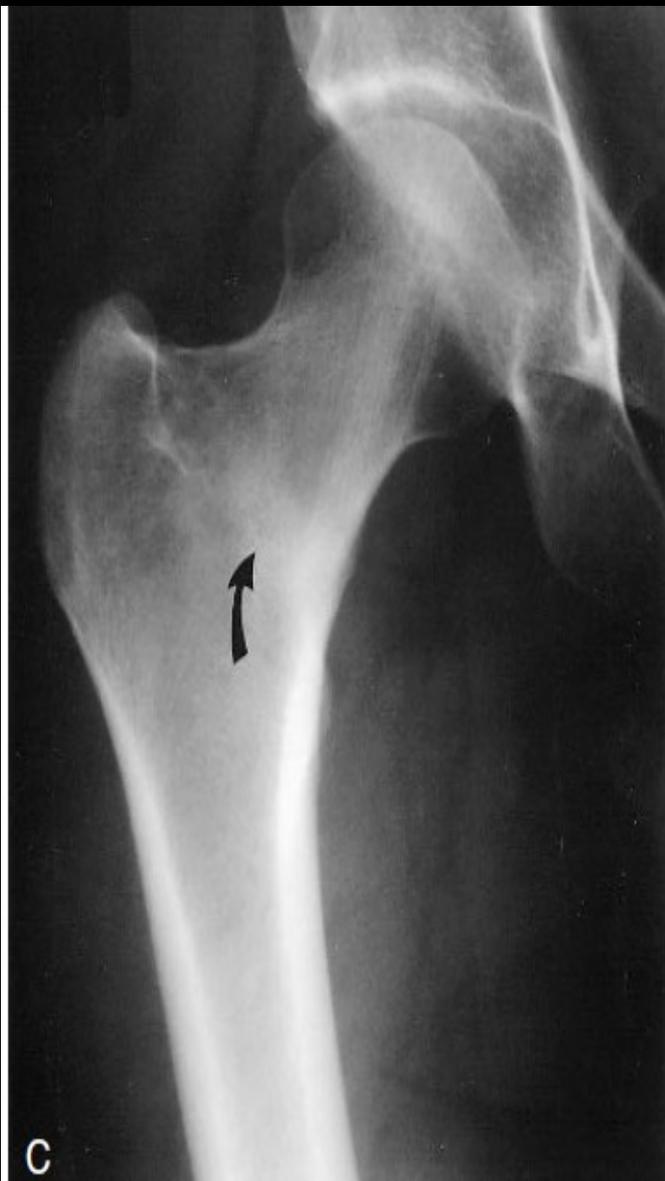
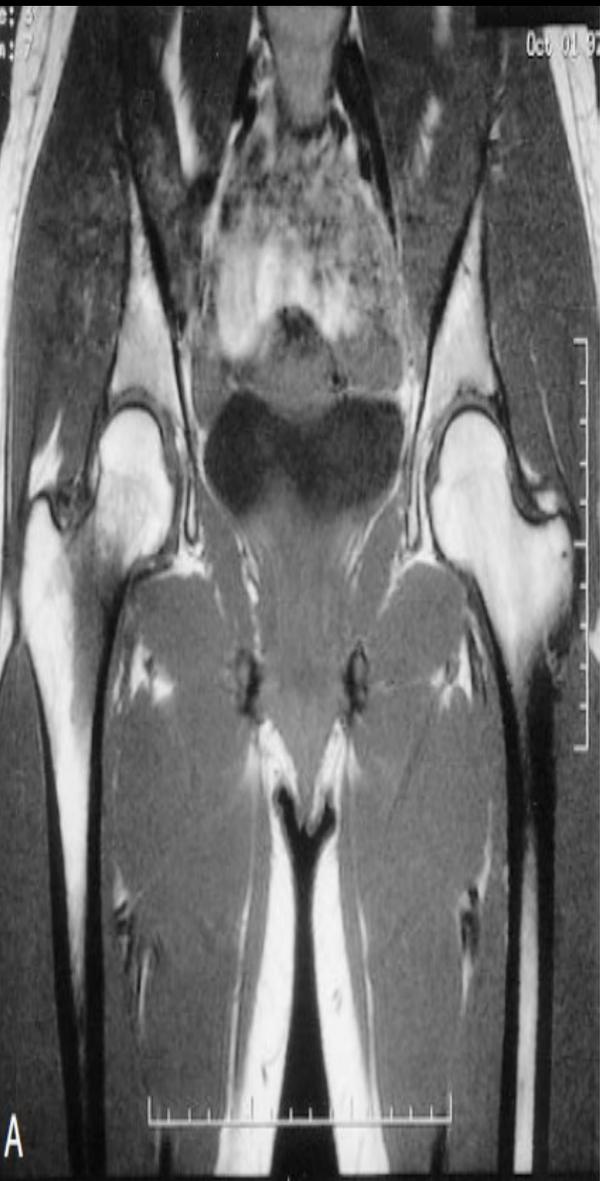
# Synovial osteochondromatosis



# .Types of acetabular of fracture



# Stress fracture of the femoral neck



## Femoral neck fracture with AVN



## ***Femoral neck anteversion***

***refers to the orientation of the femoral neck in relation to the femoral condyles at the level of the knee. In most cases, the femoral neck is oriented anteriorly as compared to the femoral condyles.***

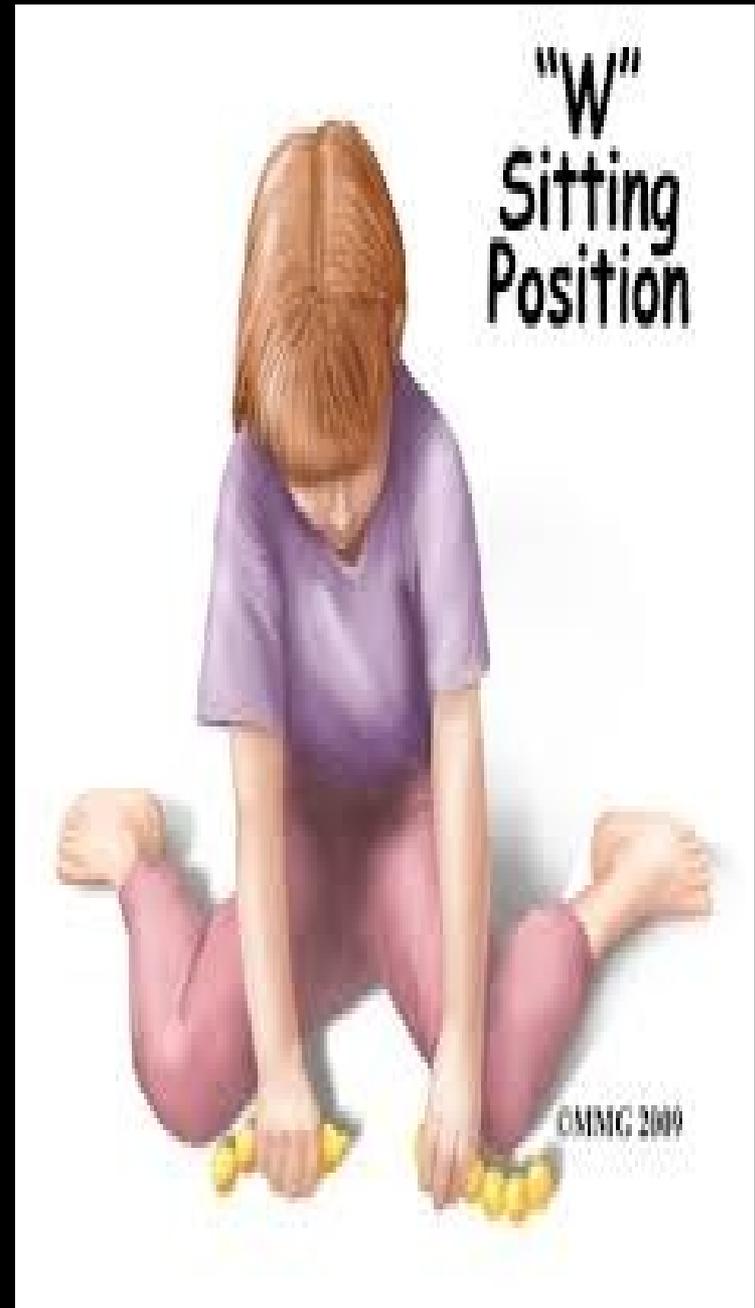
***Femoral anteversion averages between 30-40° at birth, and between 8-14° in adults.***

### ***Symptoms***

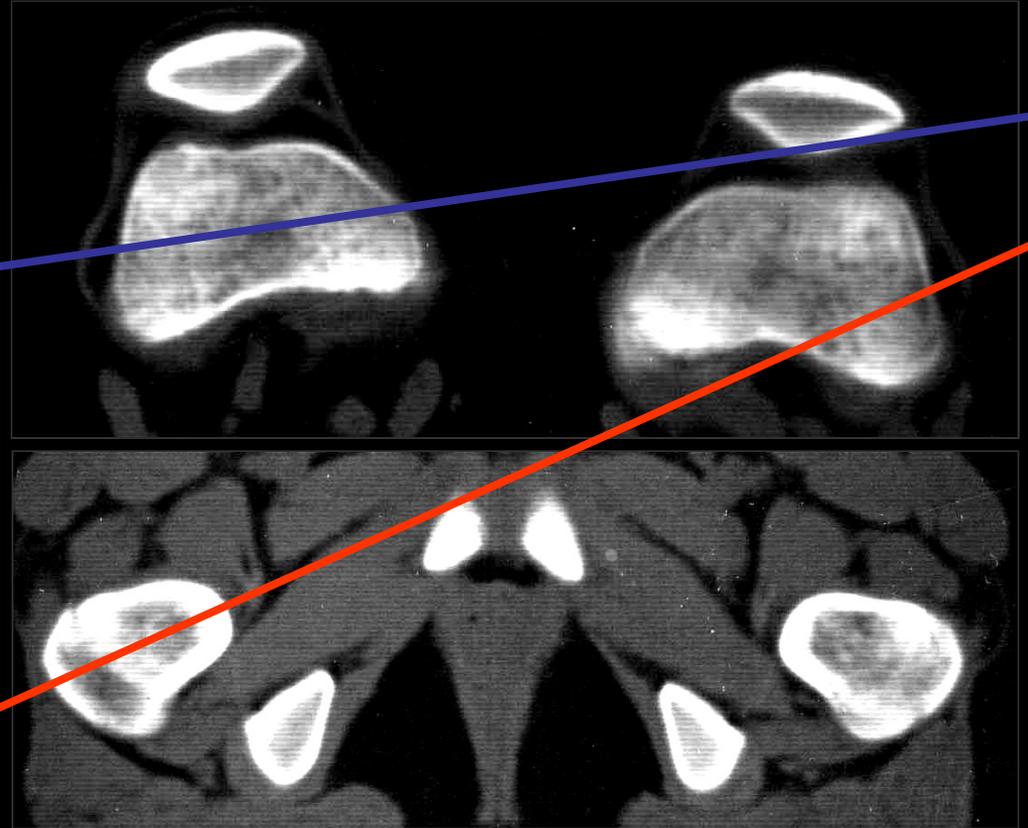
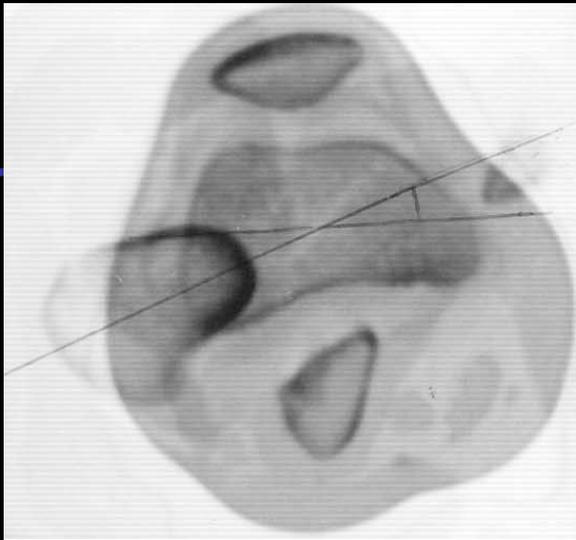
***Parents complain of an intoeing gait in early childhood.***

***Child classically sits in the W position. knee pain when associated with tibial torsion***

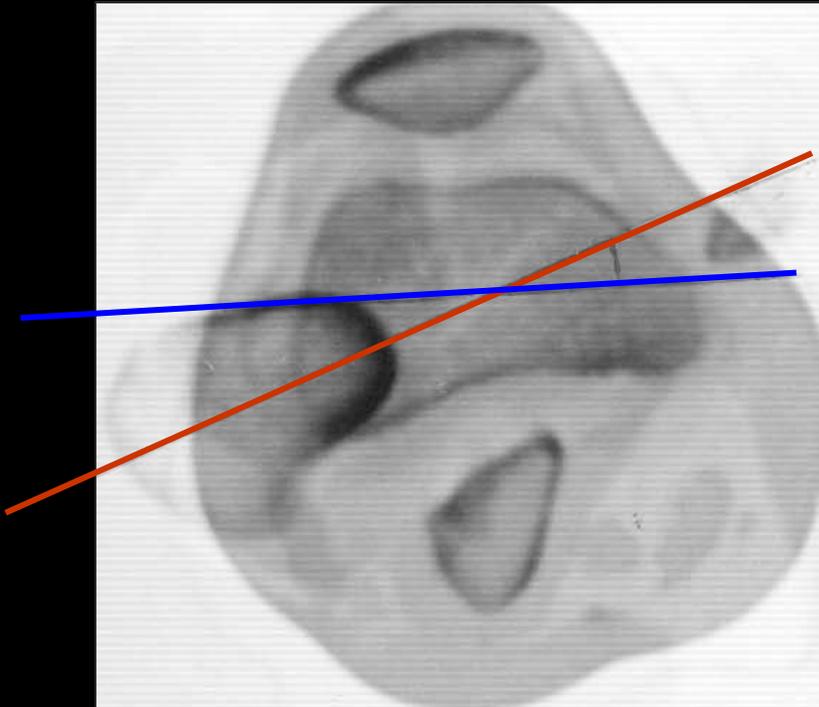
***Awkward running style when extreme in an older child occasional functional limitations in sports and activities of daily living can occur difficulty with tripping during walking or running activities.***



# Femoral neck anteversion angle.



# Femoral neck anteversion angle.



◆ 0-1 Y	= 30 – 50°
◆ 2 Y	= 30°
◆ 3 -5 Y	= 25°
◆ 6- 12 Y	= 20°
◆ 12- 15 Y	= 17°
◆ 16-20 Y	= 11°
◆ 20 Y	= 8°

THANK YOU!

