The Limping Child

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Normal gait

Stance Phase (weight-bearing phase)

Heel-strike.

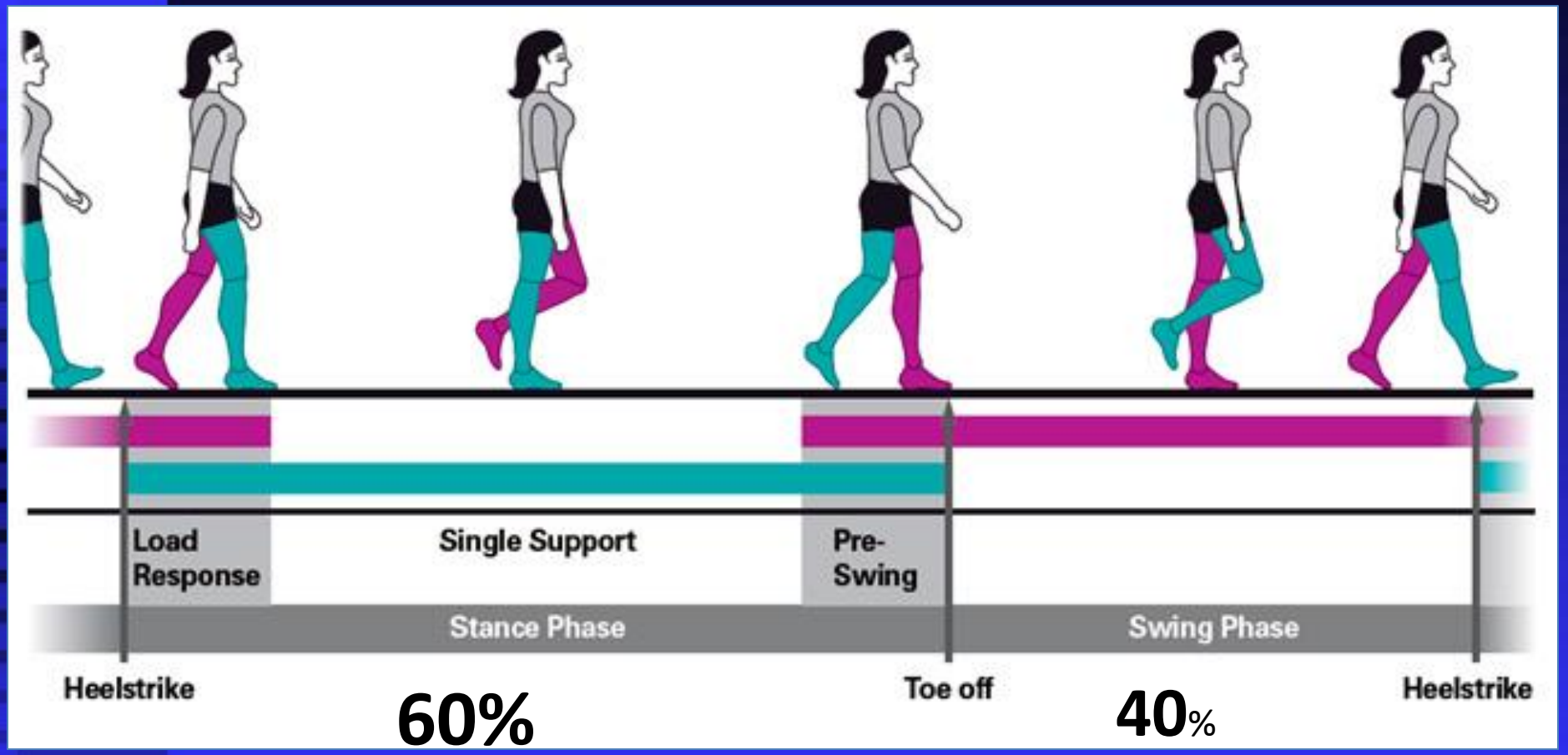
Plantarflexion (foot flat)

Toe-off

Swing Phase

begins with toe-off and ends with the heel-strike.

+forward rotation and tilting of the pelvis,
+stability of the lumbar spine



Fully mature gait is attained by 4 years

1= Antalgic gait (anti-pain)

Less time is spent in stance phase.

2= A Trendelenburg gait

In swing-phase drop of the of the pelvis on the weak side.

3= Waddling gait

Bilateral hip involvement or neurologic disease.

4= Stiff-legged gait

Knee extension and circumduction with pelvic elevation on the affected side.

5-Toe walking

= Habitual = Muscle contractures

= Puncture wound in heel. = LLD.

6- Steppage gait

Failed active dorsiflexion the foot, with exaggerated hip and knee flexion during the swing phase -- NM diseases.

7- **Stooped gait -** pelvic or abdominal pathology

The commonest site

= Hip (34%)
= Knee (19%)
= Leg (18%)
= Spine (fewer than 2%) .

Pain from the spine may be referred to the thigh or the abdomen

Hip pain is referred to the thigh or the knee.

Evaluation of the Child With a Limp

If the right questions are asked a provisional DX can be made in most cases at the primary examination.

= Proper hx and physical exam
= Specific features of the disease
= Proper investigation

50 causes of limping child

Table 1. Differential Diagnosis of Limping in Children

Bone conditions
- Benign neoplasm
  - Osteoblastoma
  - Osteoid osteoma
- Congenital condition
  - Clubfoot
  - Congenitally short femur
  - Developmental dysplasia of the hip
- Developmental condition
  - Legg disease
  - Slipped capital femoral epiphysis
- Infection
  - Osteomyelitis
- Limb length discrepancy
- Malignant neoplasm
  - Ewing sarcoma
  - Leukemia
  - Osteosarcoma
- Osteonecrosis
  - Sickle cell disease
- Overuse injury
  - Osteochondritis dissecans
  - Stress fracture
- Trauma
  - Child abuse
  - Fracture (toddler's fracture)

Intra-abdominal conditions
- Appendicitis
- Neuroblastoma
- Psoas abscess

Intra-articular conditions
- Congenital condition
  - Discoid lateral meniscus
- Hemarthrosis
  - Hemophilia
  - Trauma
- Infection
  - Gonorrhea
  - Lyme disease
  - Septic arthritis
- Inflammation
  - Acute rheumatic fever
  - Juvenile rheumatoid arthritis
  - Reactive arthritis
  - Systemic lupus erythematosus
  - Transient synovitis
- Trauma
  - Intra-articular injury

Neuromuscular conditions
- Cerebral palsy
- Meningitis
- Muscular dystrophy
- Myelomeningocele

Soft tissue conditions
- Congenital condition
  - Idiopathic tight Achilles tendon
- Infection
  - Cellulitis
  - Pyomyositis or viral myositis
  - Soft tissue abscess
- Overuse injury
  - Chondromalacia patellae
  - Jumper's knee
  - Osgood-Schlatter disease
  - Sever disease
- Trauma
  - Child abuse
  - Foreign body
  - Sprains and strains

Spinal conditions
- Diskitis
- Spinal cord tumors
- Vertebral osteomyelitis

Causes as any pathology

= Musculoskeletal Trauma
= Inflammation
= Infection
= Developmental or Congenital
= Neoplasm
= Autoimmune
= Osteochondrosis
= Neurological

Musculoskeletal Trauma

Physeal Fracture

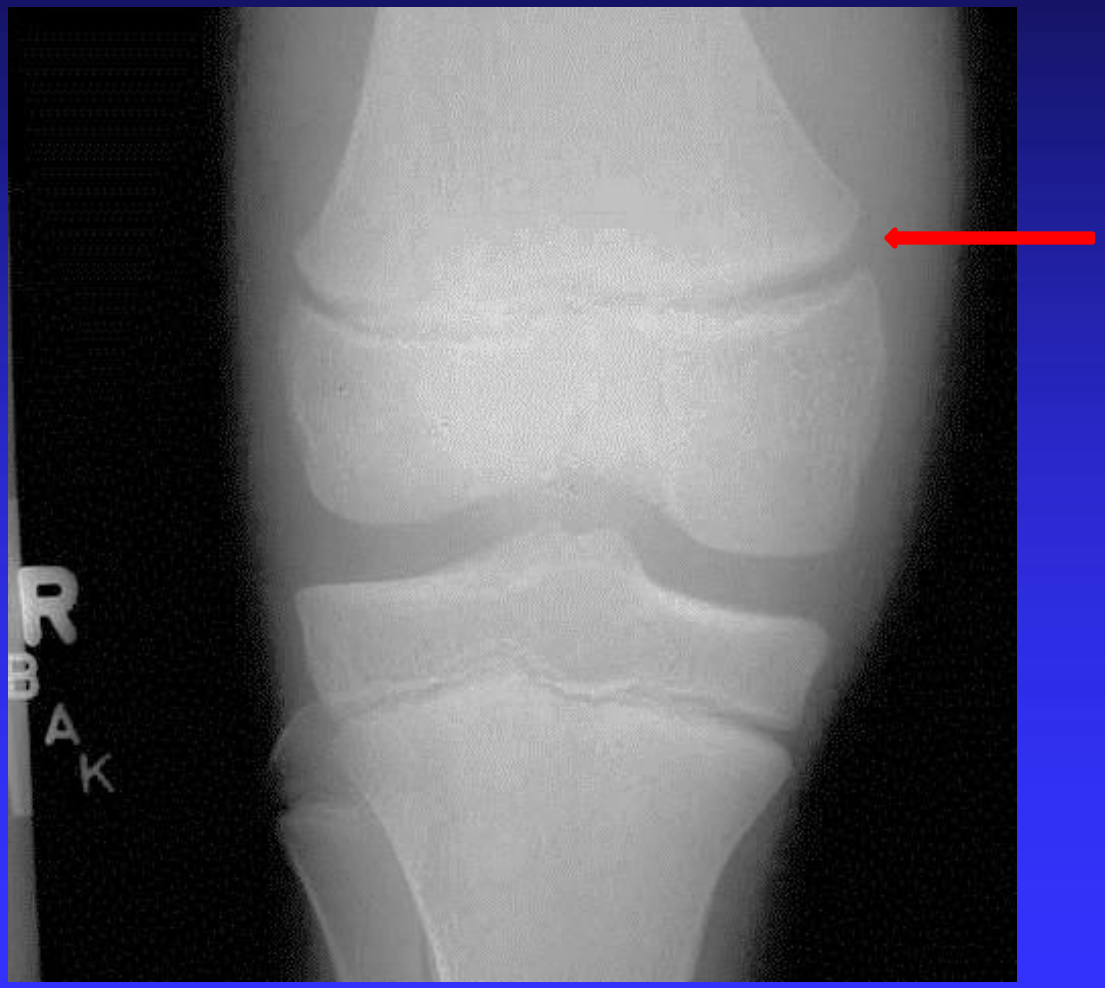
Toddler's Fracture

Stress Fracture

Child Abuse

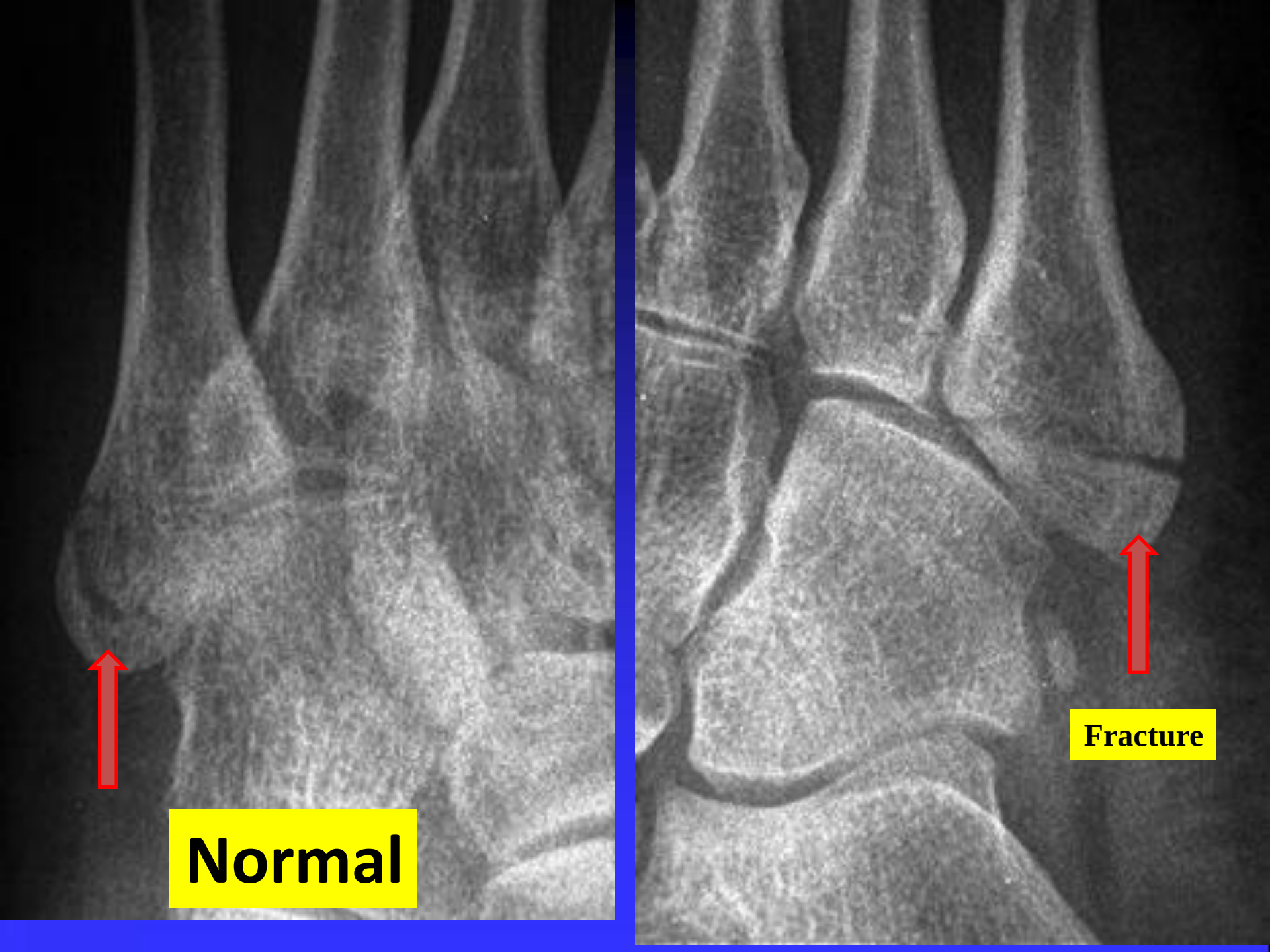
Soft tissue injury

Physeal Fracture



Early stage of ossification

Another variation of normal


Normal
Fracture


Fracture
Apophysis


Ap
Fx

Toddler's Fractures

Typical nondisplaced spiral fracture of tibia with no fibular fracture.

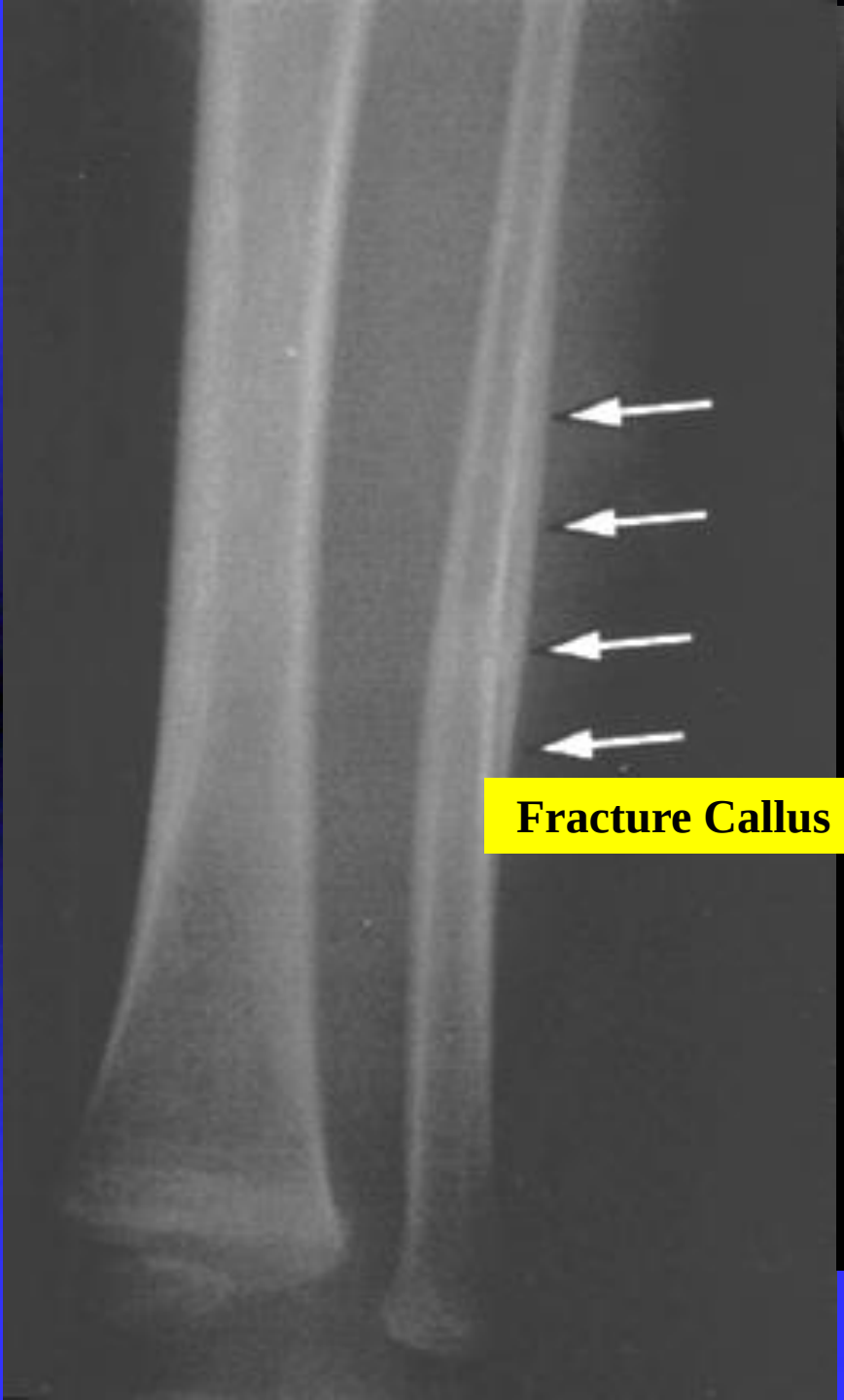
Initial x-ray:

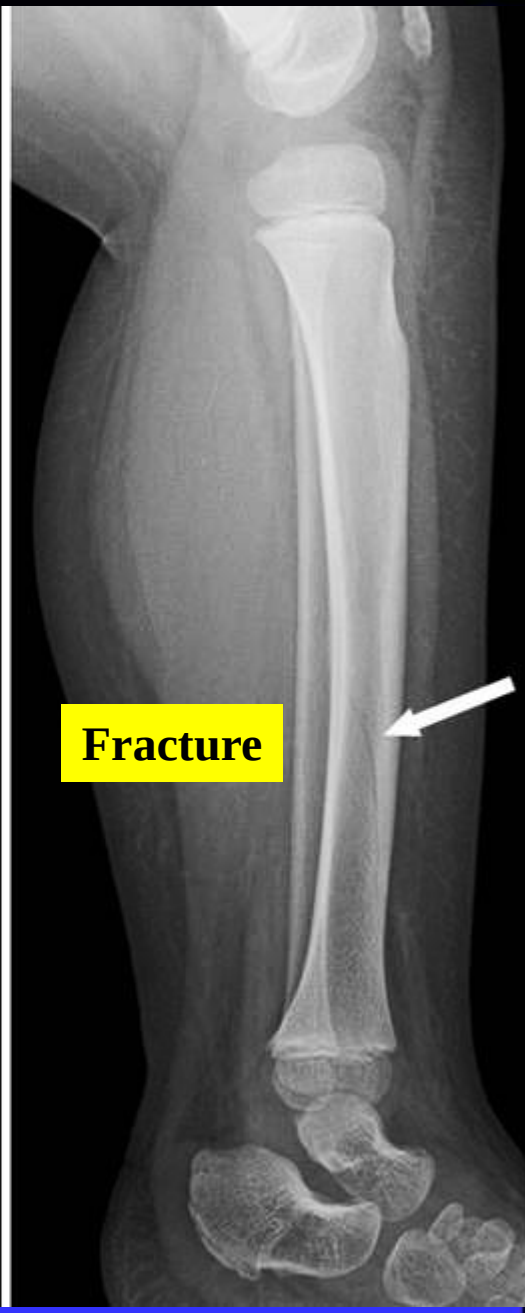
often normal, diagnosis by F/U films with lucent line or periosteal reaction

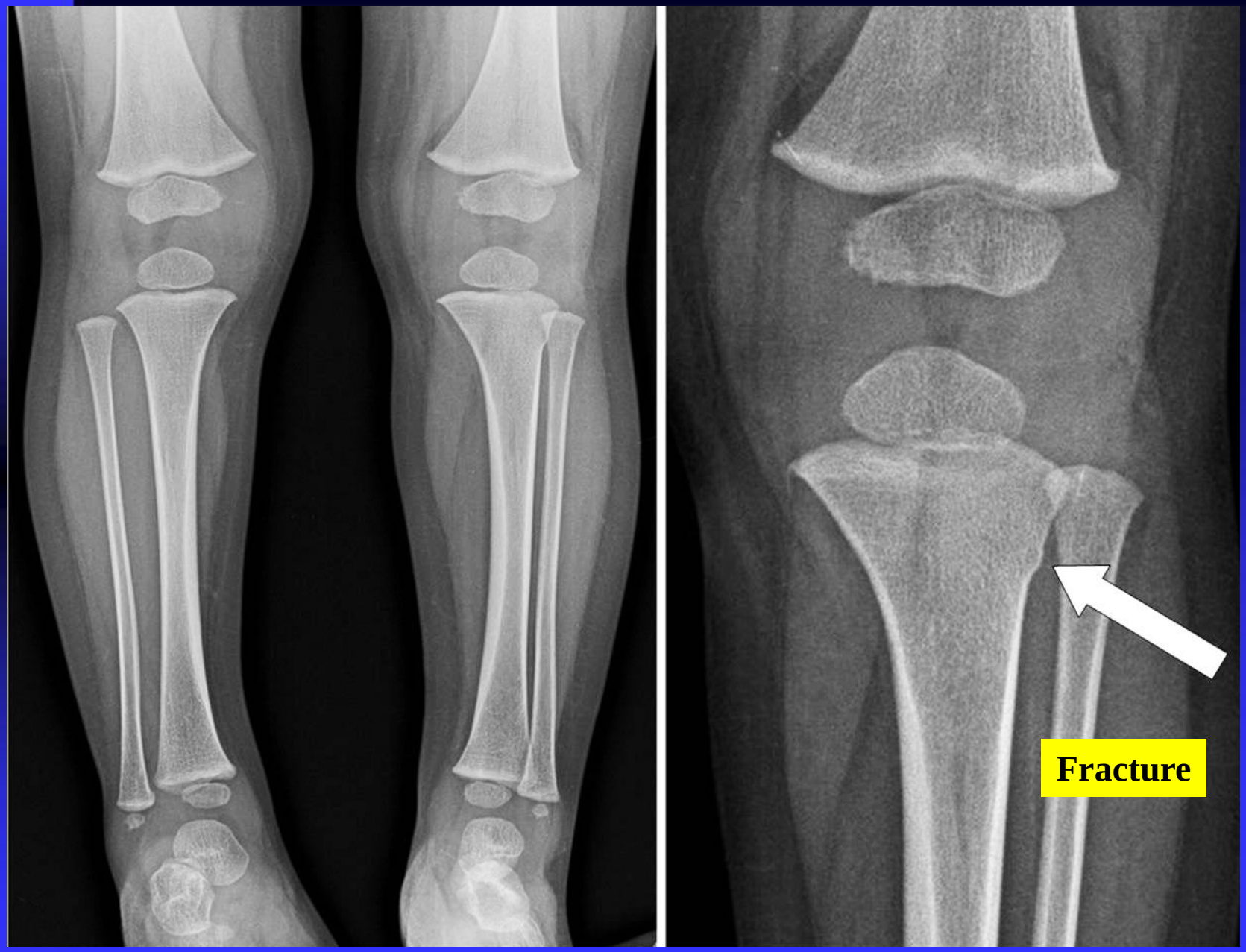
Or by ultrasound

- No specific injury notable most of the time
- Any child refuses to bear weight on leg

Examine (hip, thigh , knee , Leg and foot)


Fracture Callus

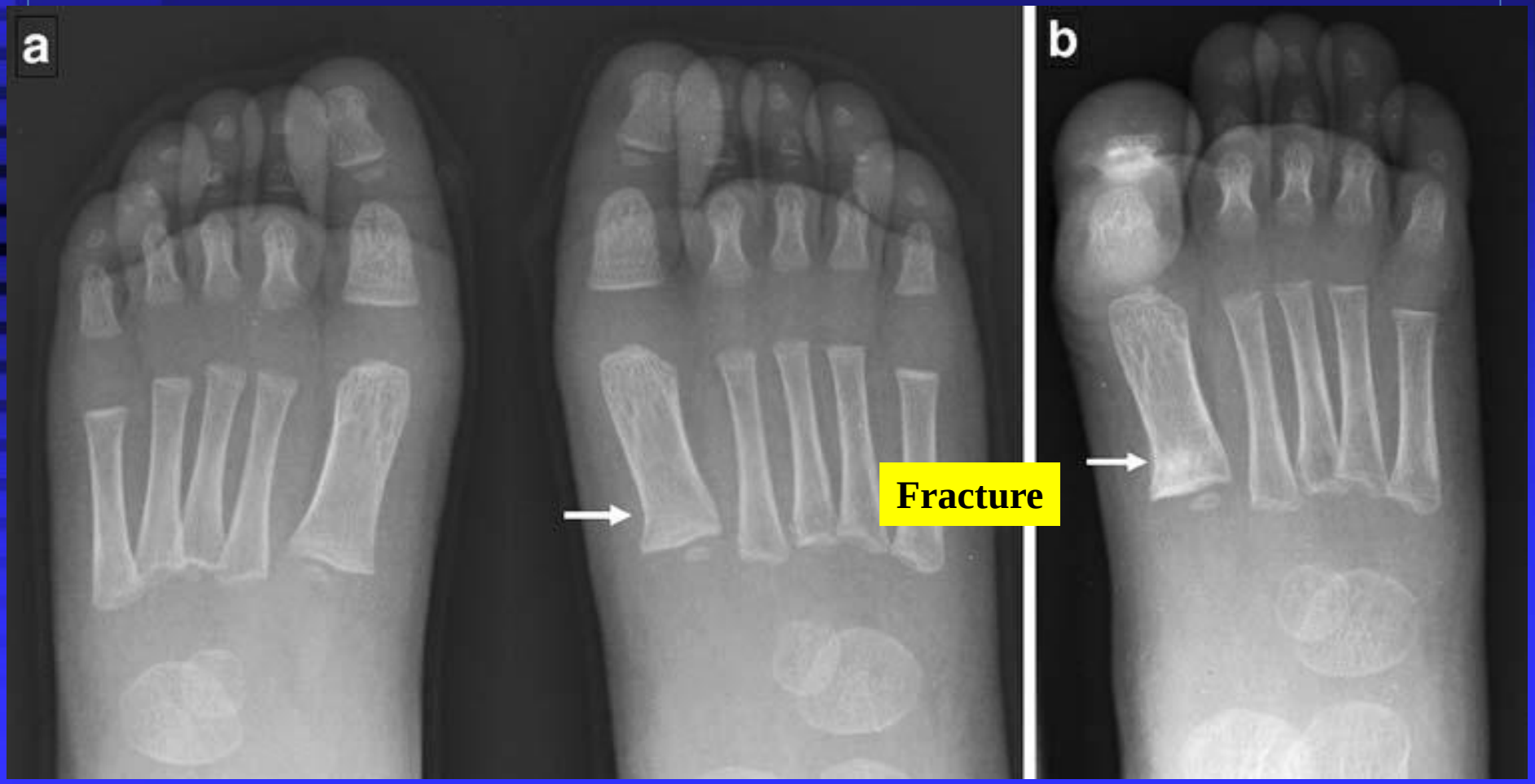

Fracture


Fracture

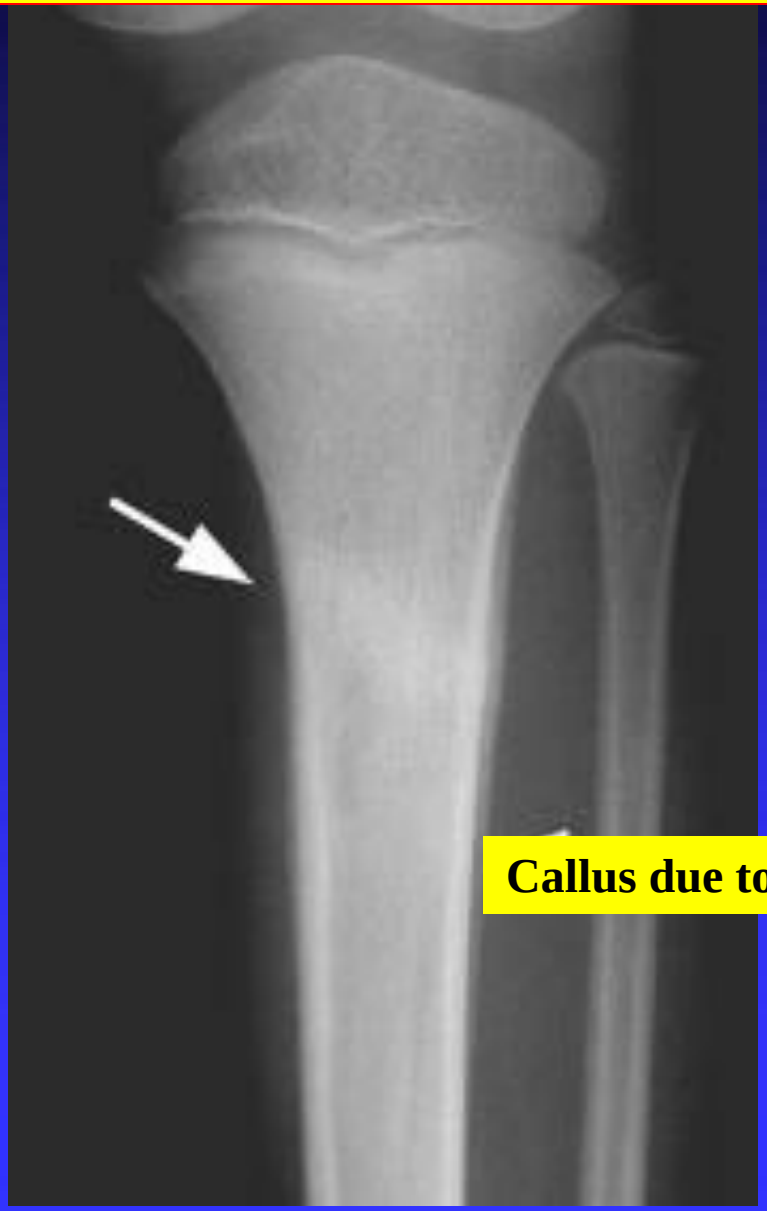
Buckle fracture—bunk-bed fracture.

3-year-old male.

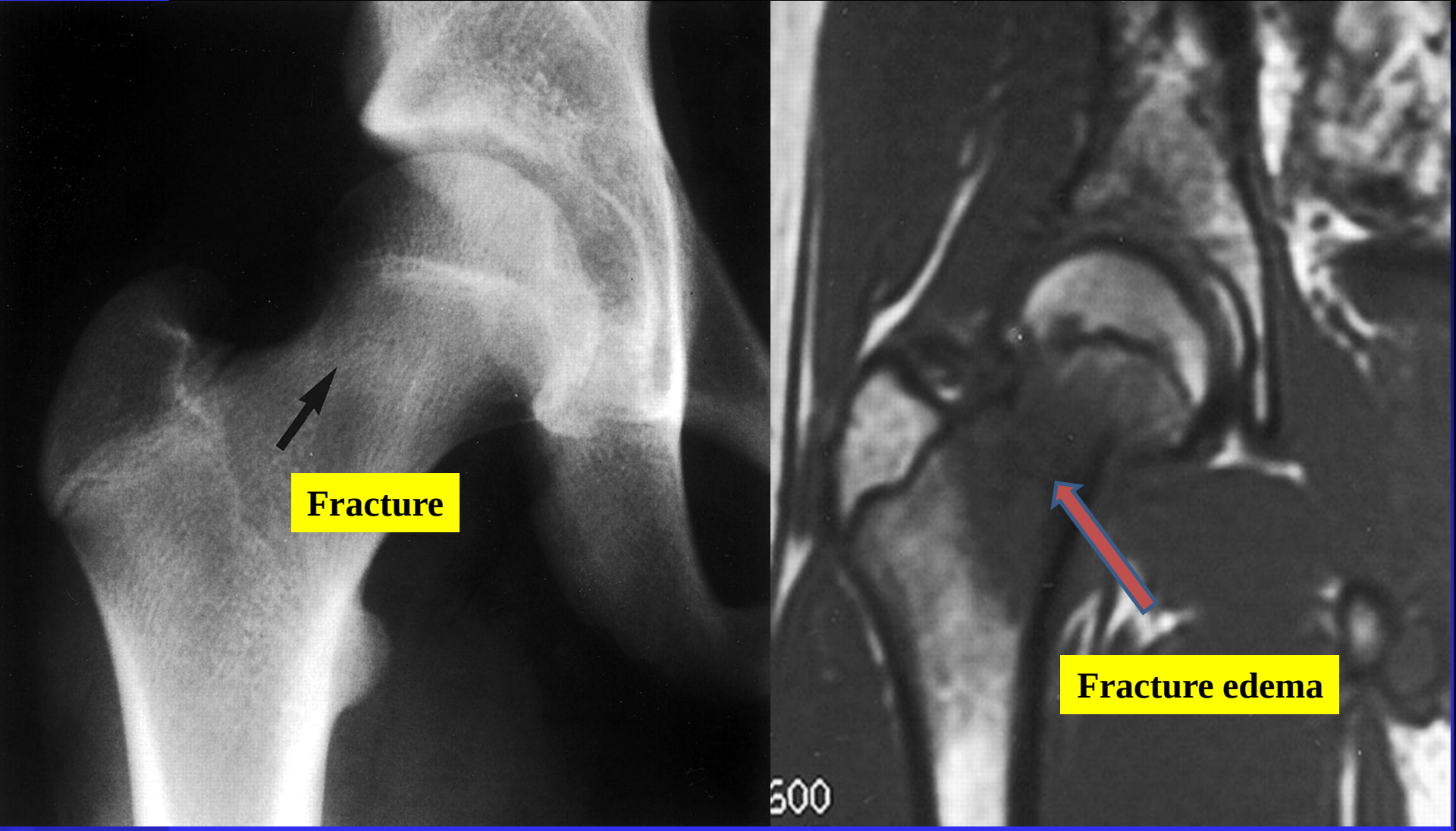
Follow-up radiograph shows healing with sclerosis at the fracture site



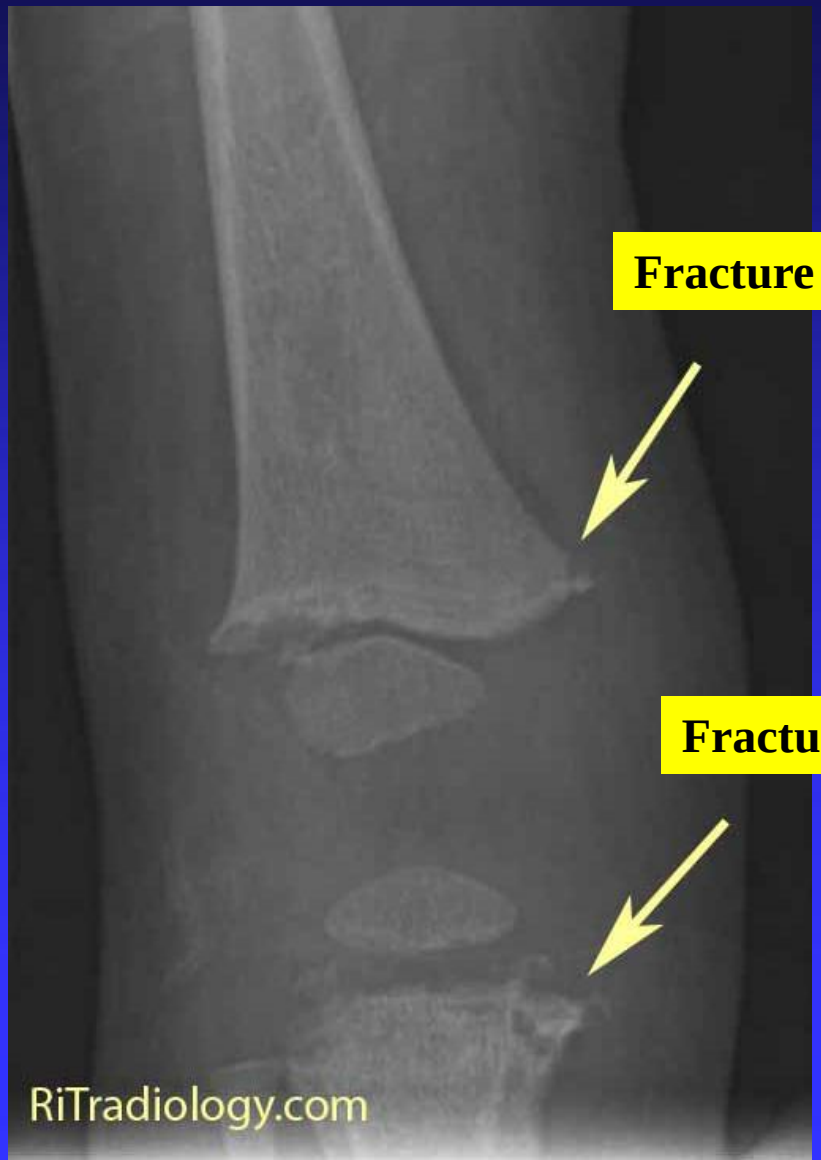
Stress fracture



Callus due to Fracture


Fracture
Fracture edema
600

Child Abuse



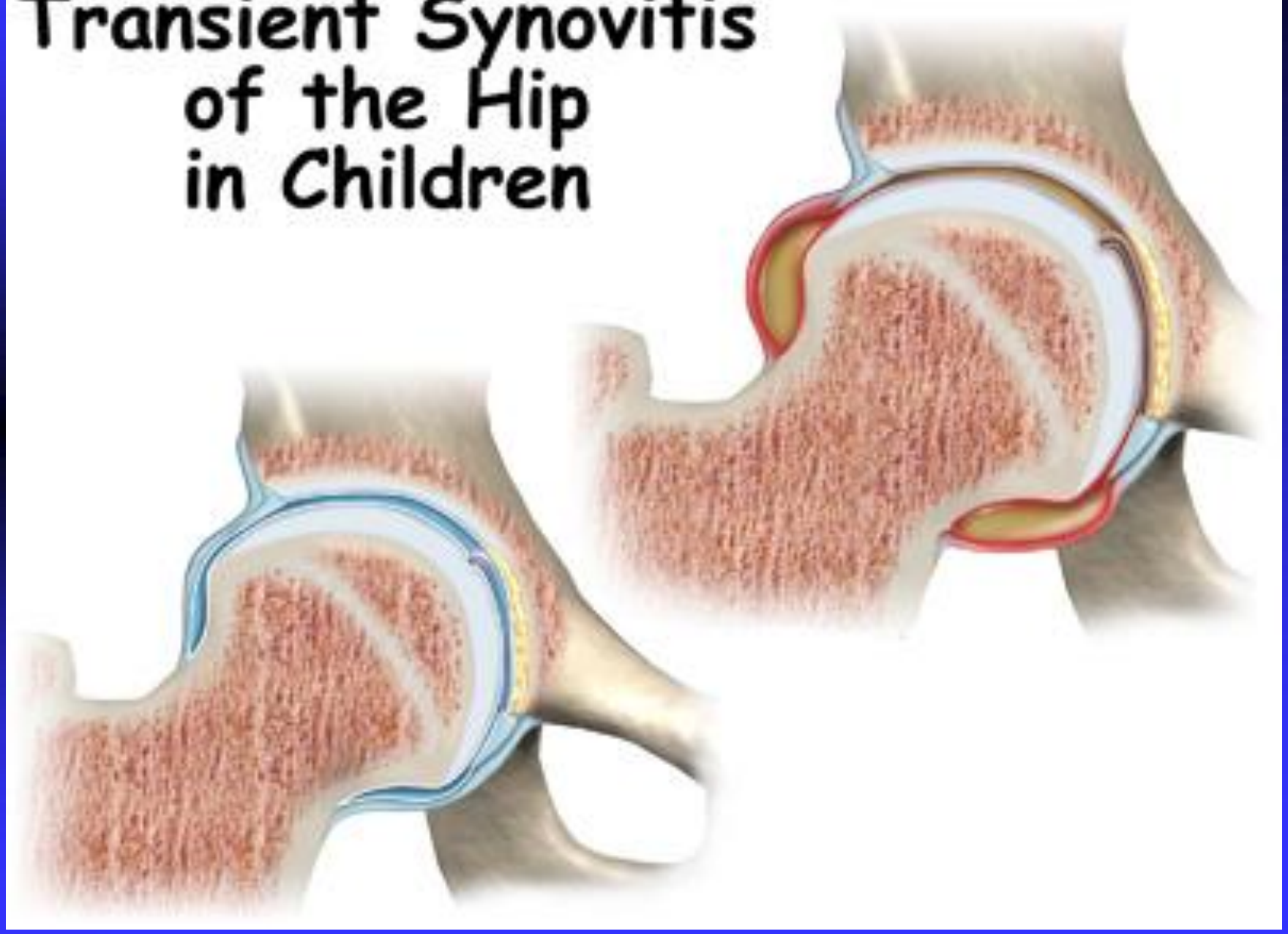
Inflammation

Transient Synovitis

Juvenile Idiopathic Arthritis

Viral Myositis

Transient Synovitis of the Hip in Children



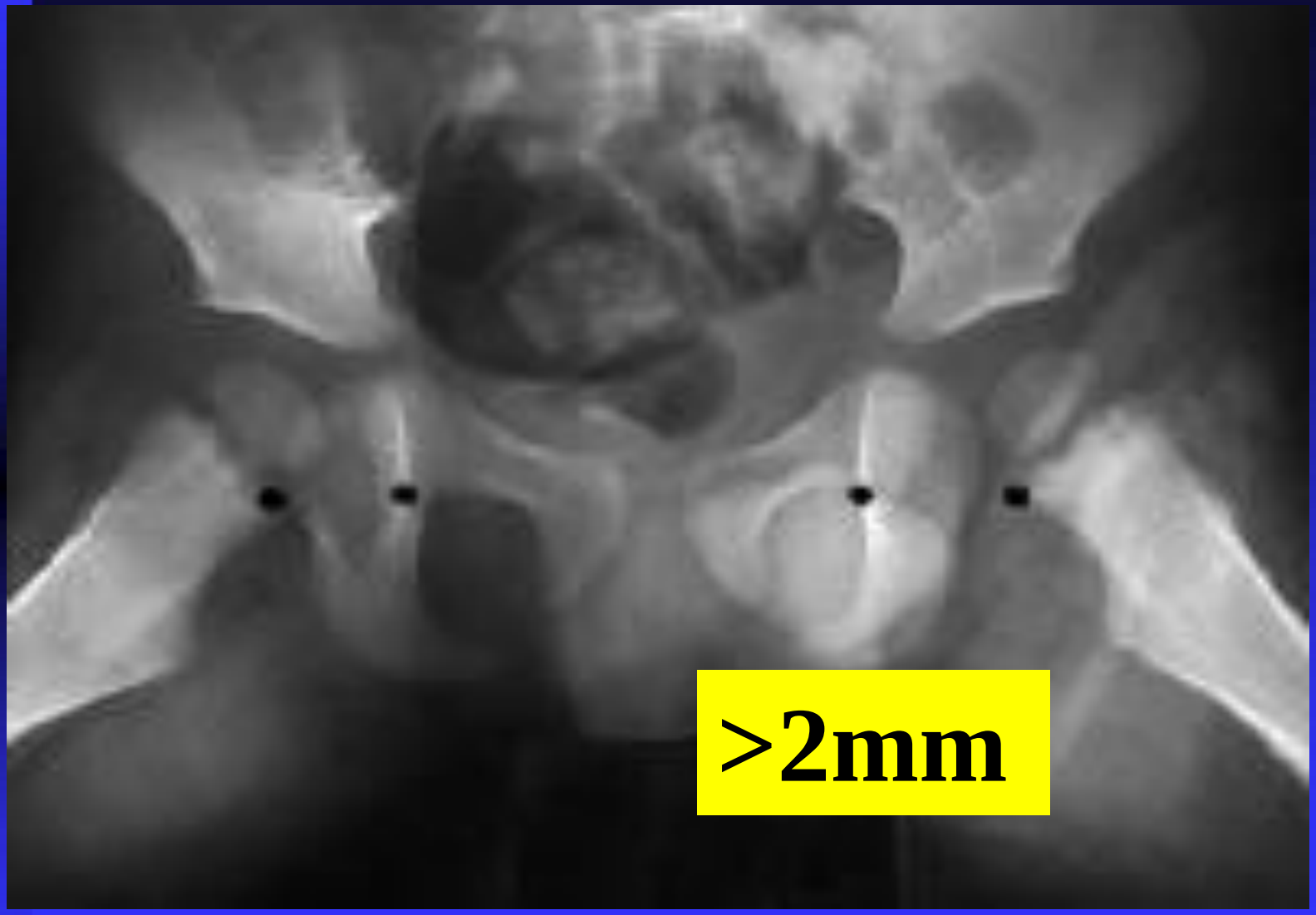
- Sudden hip pain or knee pain
- Afebrile/low-grade fever **(<38.5)**
- Able to ambulate with a limp
  - **Antalgic gait**
- **Hip**: mildly decreased ROM

- **Laboratory Evaluation**
  - **WBC** count <12,000
  - **ESR** (<40); CRP (<5mg/L)
- **X-Ray**
  - **Joint space widening**
  - **>2mm on affected side.**
- **Ultrasound:**
  - **Joint effusion and/or synovial swelling**

Kocher, Etal JBJS -1999.
JBJS -2006

3-year-old

R



Treatment

- Self-limited after 2-7 days
- Bed rest
- **Ibuprofen**
  - Decreased pain by 2.5 days Vs Placebo
  - Mean duration of pain
    - ibuprofen: 2 days
    - placebo: 4.5 days

***Annals of Emergency Medicine* 2002**

Prognosis

- ?? association with increased risk of Perthes disease (1%)

  (Clinical Pediatrics, 1985)

- Recurrance rate in 4-15%

Septic Arthritis Vs Transient Synovitis

= No child with a temperature >38.5 was found to have transient synovitis

= CRP > 5mg/dL was the only independent risk factor strongly associated with Septic arthritis

++

- 86% of patients with ESR ≤ 40 mm/hr had transient synovitis
- 71% of patients with CRP ≤ 5mg/ or WBC ≤ 12,000/mm^3 had transient synovitis

J Bone Joint Surg. 2006

Orthop Clin N Am (2006)

Septic arthritis

- **Predicting of Septic arthritis**
  - **Fever >38.5**
  - **Cannot weight bear**
  - **ESR >40 in 1st hr**
  - **WBCs >12**
  - **CRP >5mg/L**

***JBJS-Am.* 1999.**

Roll test

The Dx of transient synovitis is more likely if an arc of 30 degrees or more of hip rotation is without pain.

Myositis

= Viral myositis causing leg pain may be seen during influenza season

= More common in older children

Infection

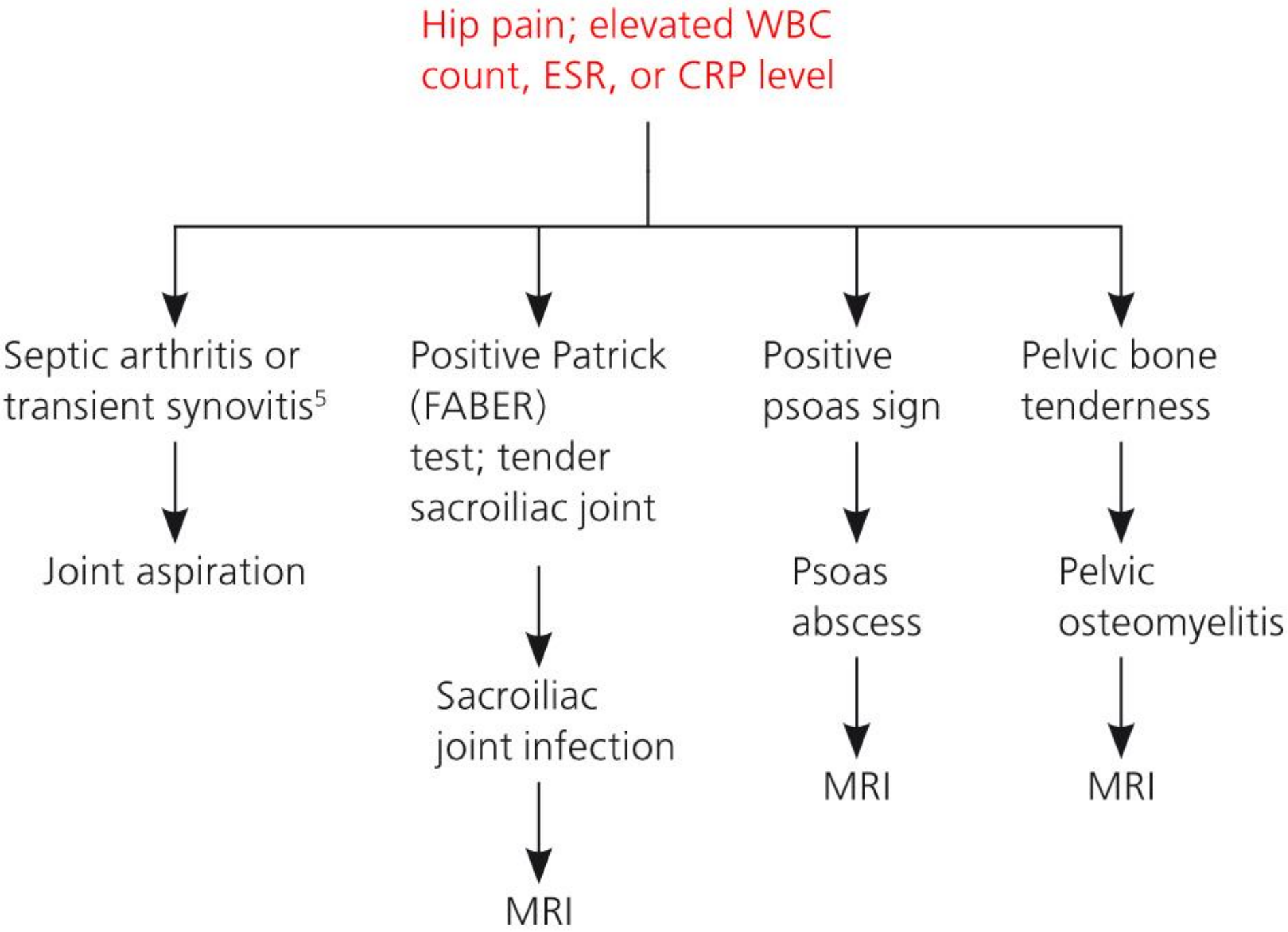
Osteomyelitis

Septic Arthritis

Psoas abscess

Discitis

Children with septic arthritis or osteomylitis usually appear acutely ill than those with transient synovitis.


Hip pain; elevated WBC count, ESR, or CRP level
Septic arthritis or transient synovitis[5]
Joint aspiration
Positive Patrick (FABER) test; tender sacroiliac joint
Sacroiliac joint infection
MRI
Positive psoas sign
Psoas abscess
MRI
Pelvic bone tenderness
Pelvic osteomyelitis
MRI

Culture the Tumour

Biopsy the Infection.

Osteomylitis ← → Tumour

ANTIBIOTICS

Guidelines

- Central Line.
- Large doses.
- Drug level.
- KFT.

Duration 4-6 weeks

* I.V :
* Oral :

When to stop I.V drugs.?

1- Afebrile for 24hr.
2- Known org.
3- Minimal symptoms
4- Reliable parents
5- ESR/CRP → Down.

Longer treatment required

=Pelvis

=Vertebrae

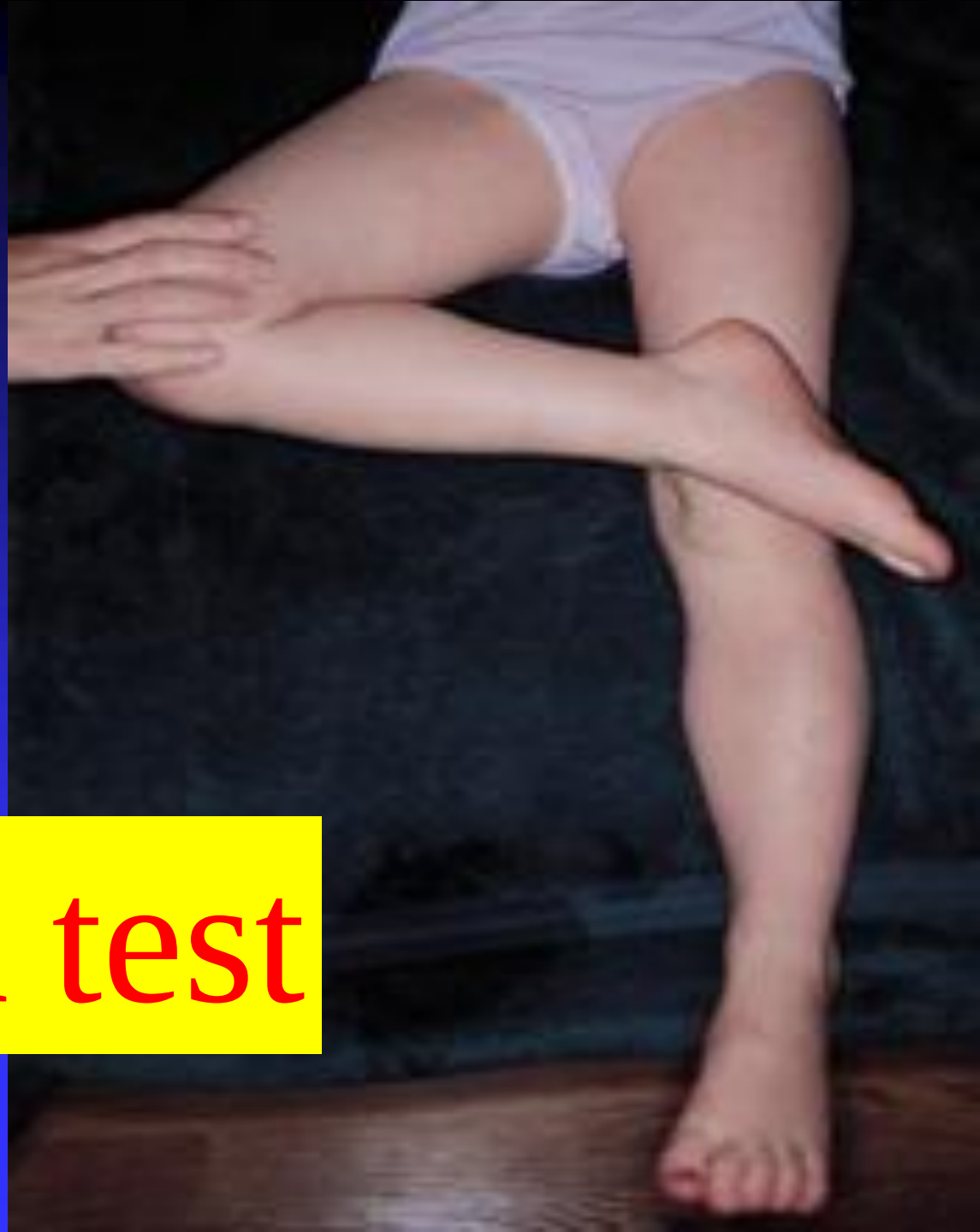
=Diskitis

=Calcaneum

Remember

Tuberculosis is still around

Arthroscopic drainge is dangerous



FABER test

Psoas Abscess Vs. Septic Arthritis

Psoas sign.

(Flexing the hip relieves the pain and allows painless IR+ER of the hip)

Pain when the hip is passively extended or actively flexed against resistance.

= Scoliosis, and Femoral N neuropathy

Septic arthritis ROM is painfully limited in all directions.

CT or MRI Diagnostic.

American Family Physician-2009 | ***Am J Orthop.*** **2008**

Diskitis Vs. Vertebral osteomylitis

Vertebral Osteomylitis.

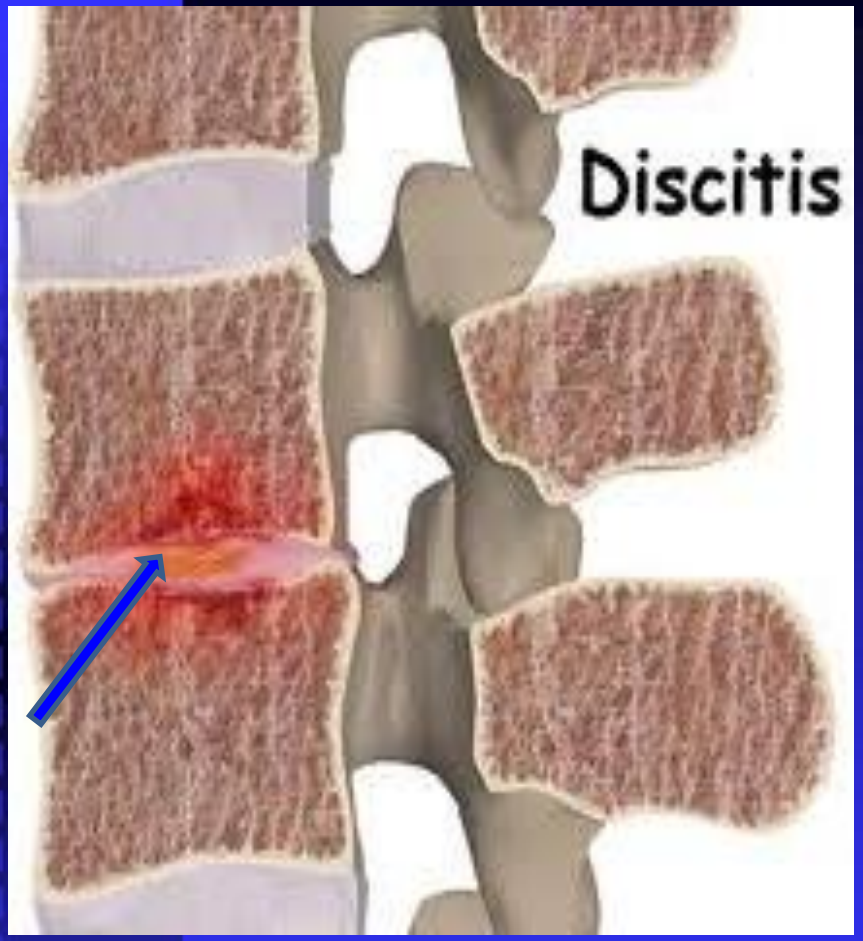
= Toxic appearance.

= Radiographs :localized rarefaction of one vertebral body and bony destruction

Diskitis: Lumbar disk space narrowing and destruction of adjacent vertebral end plates

=MRI is the diagnostic study of choice.

American Family Physician-2009


Discitis


Osteomyelitis

Don’t forget!

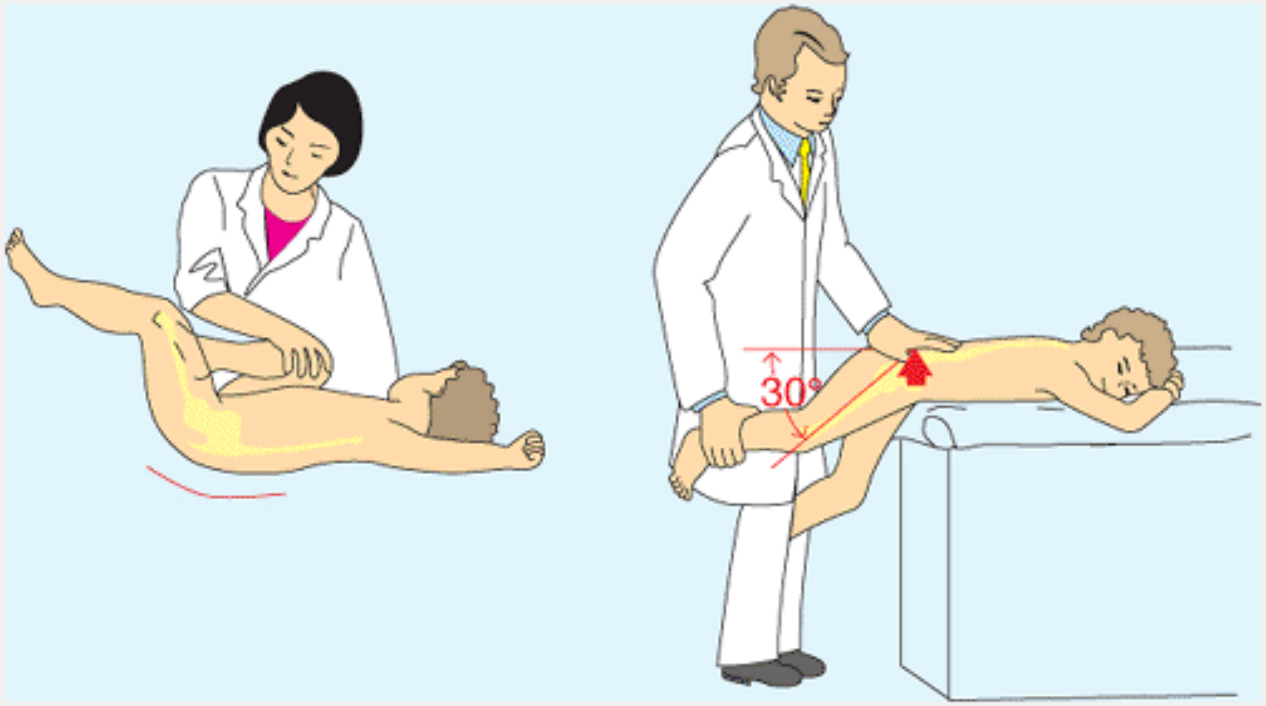
Intra-abdominal pathology and testicular torsion may present simply as a limp –

Examine abdomen and testicles in boys!!

Bony Deformities of the Hip

DDH
SCFE
Perthes Disease
Coxa Vara

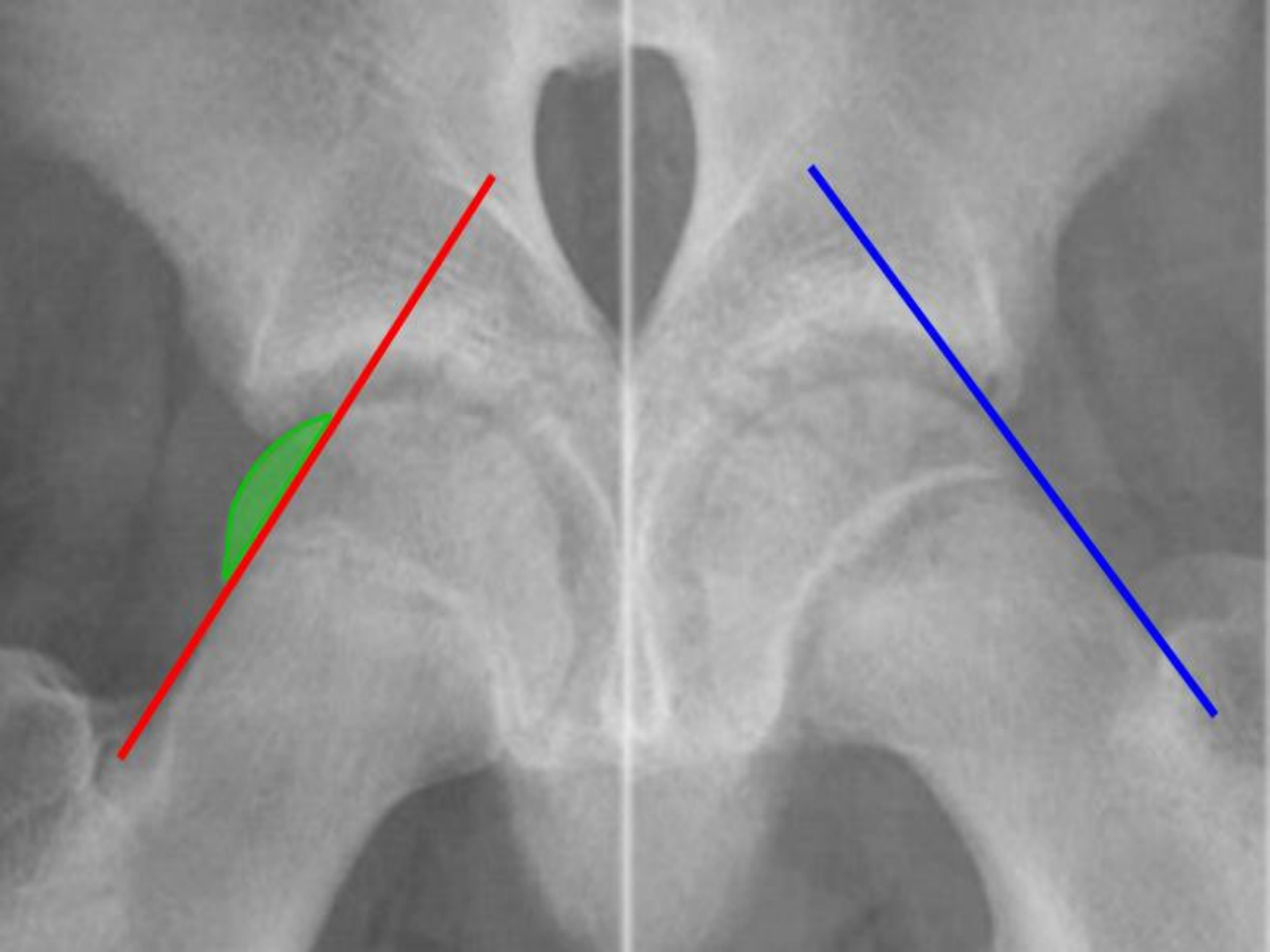
2 years old



C Hip flexion contracture assessment The Thomas test (left) is performed with the contralateral hip flexed. Extend to measure the degree of contracture. The prone extension test (right) is performed with the child prone. Gradually extend the hip until the hand on the pelvis begins to rise. The horizontal-thigh angle indicates the degree of contracture.

= Femoral neck displaces ant. producing an apparent varus, the head is posterior

= Occurs through **Zone of hypertrophy**



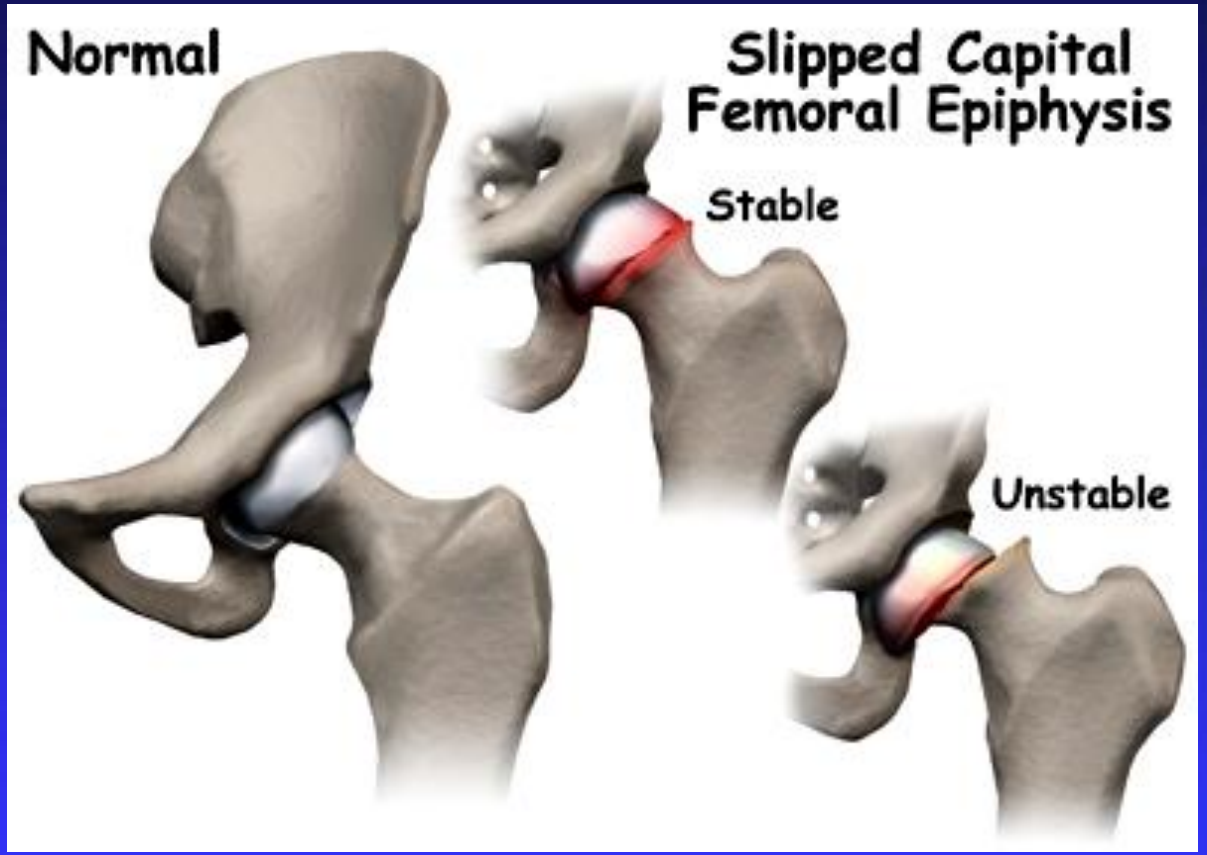
It is important to determine

1. Stable

Walking with or without crutches

2. Unstable

Non walker



Hip flexion

↓

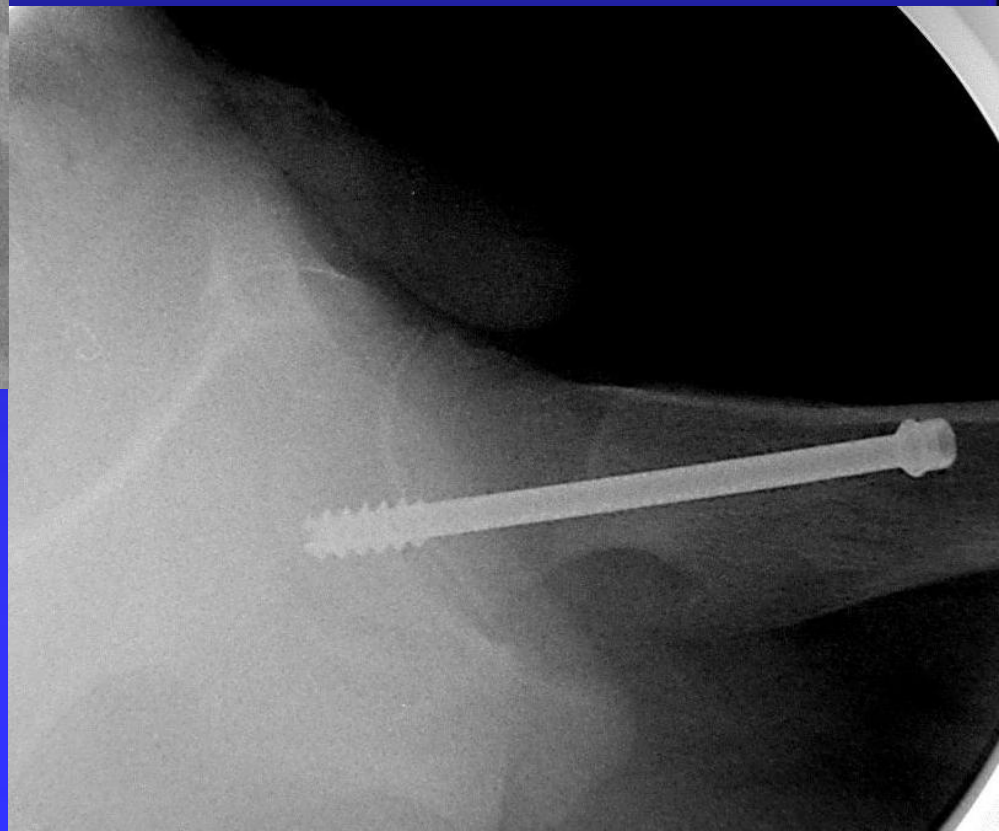
Ext rotation deformity

The goal of treatment for SCFE is to prevent further slippage and to stabilize the epiphysis

Screw advancement until

FIVE

threads engage the epiphysis

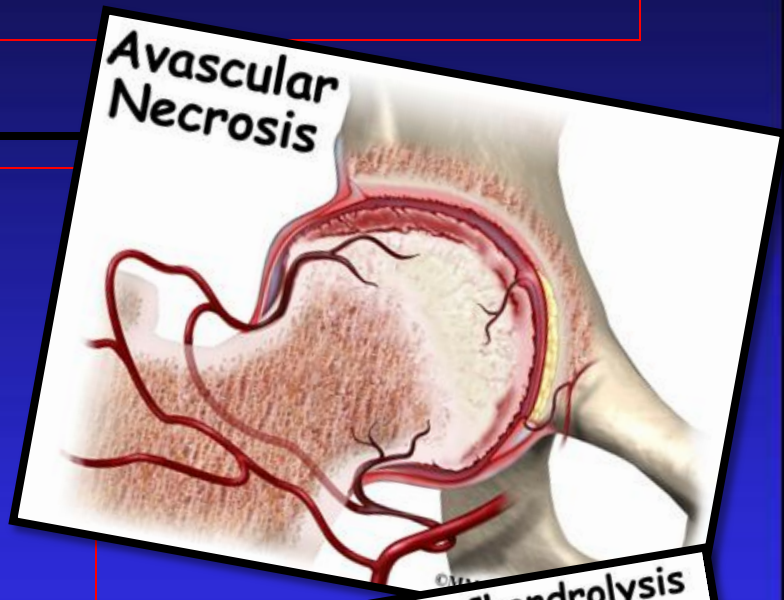


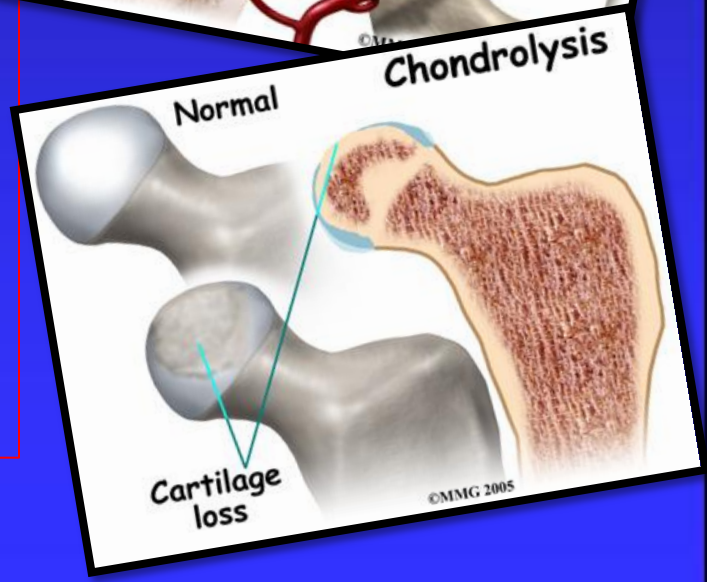
Complications

1. **Avascular necrosis.**
2. **Chondrolysis.**
3. **Osteoarthritis.**
4. **Coxa vara**

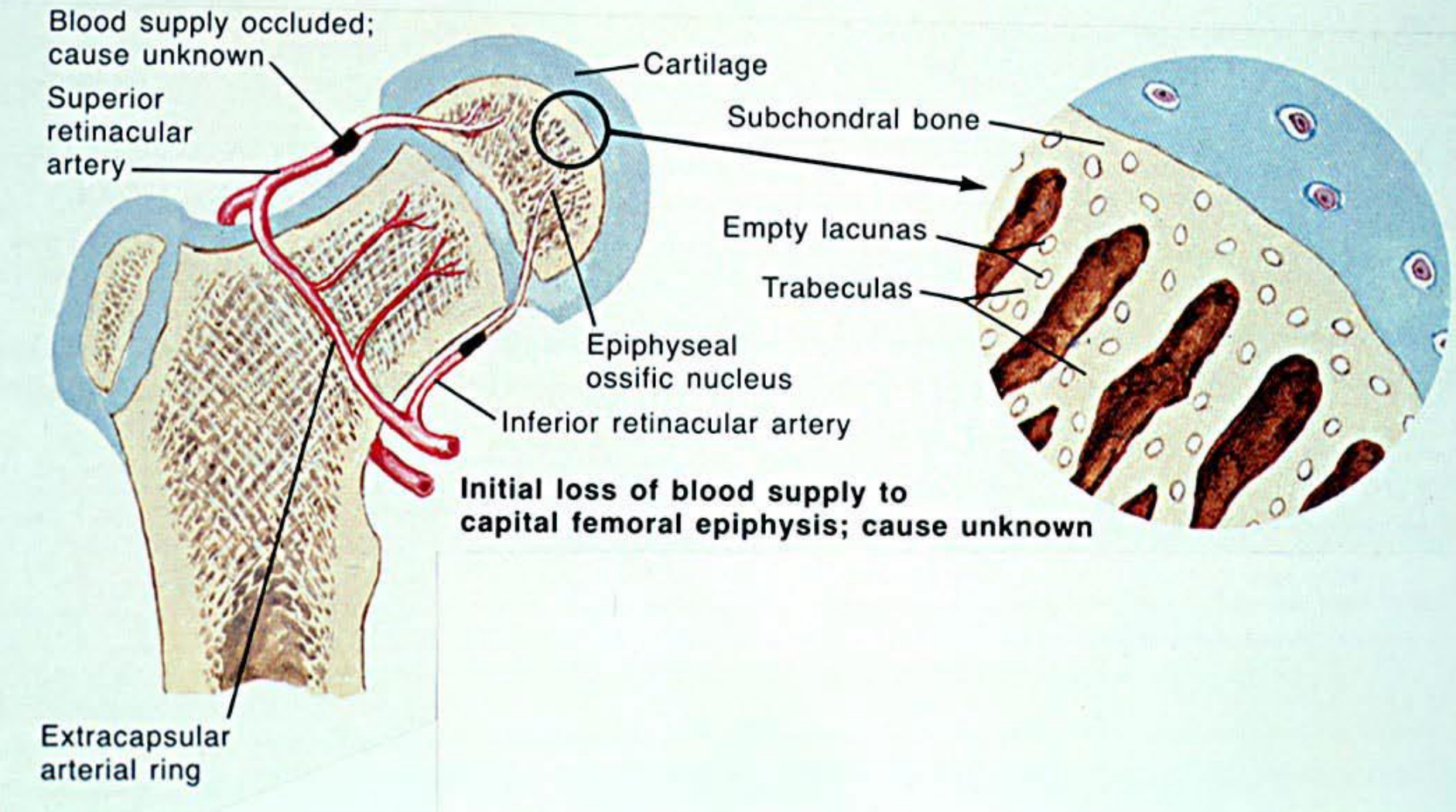
NSA less than 120 degrees.

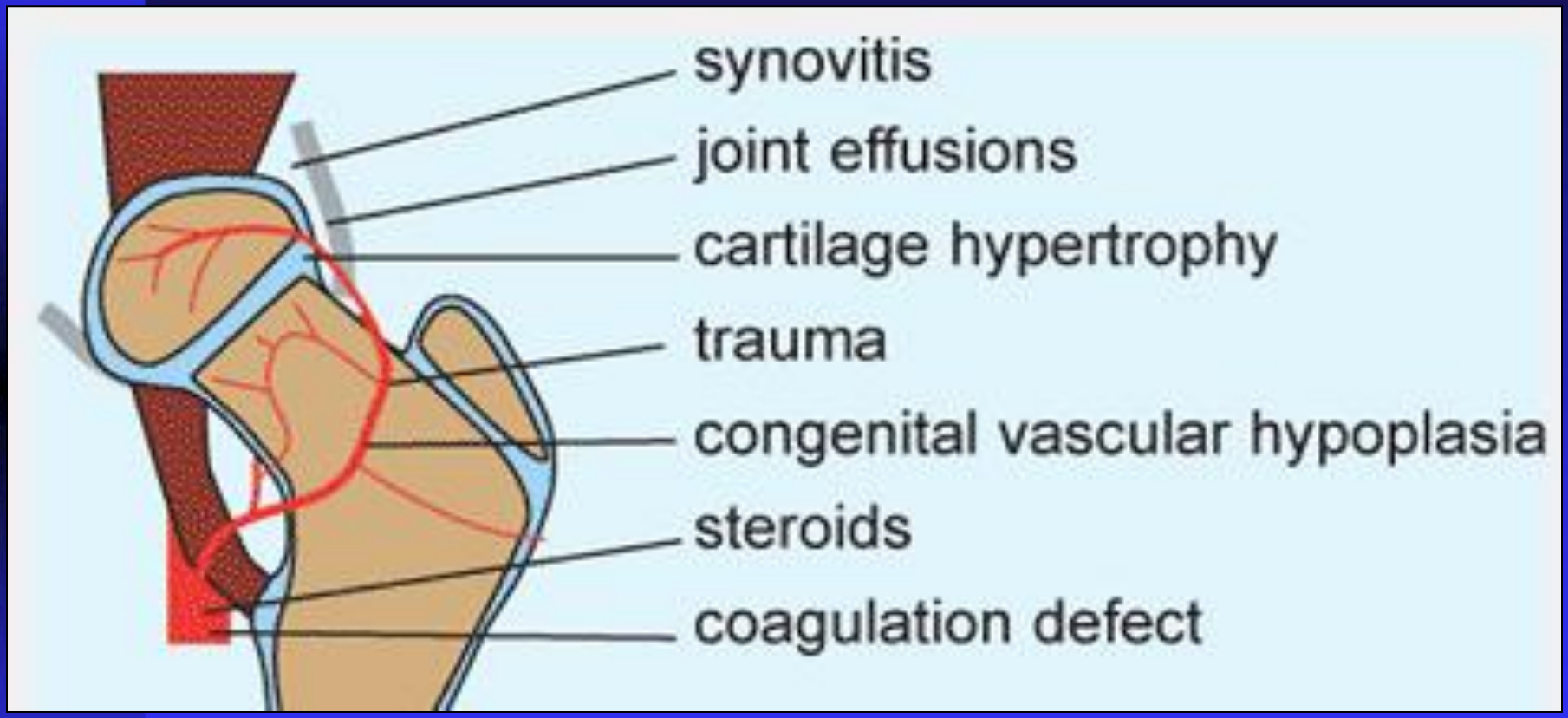
5. **Slipping of the opposite hip** ≈ 20% of cases





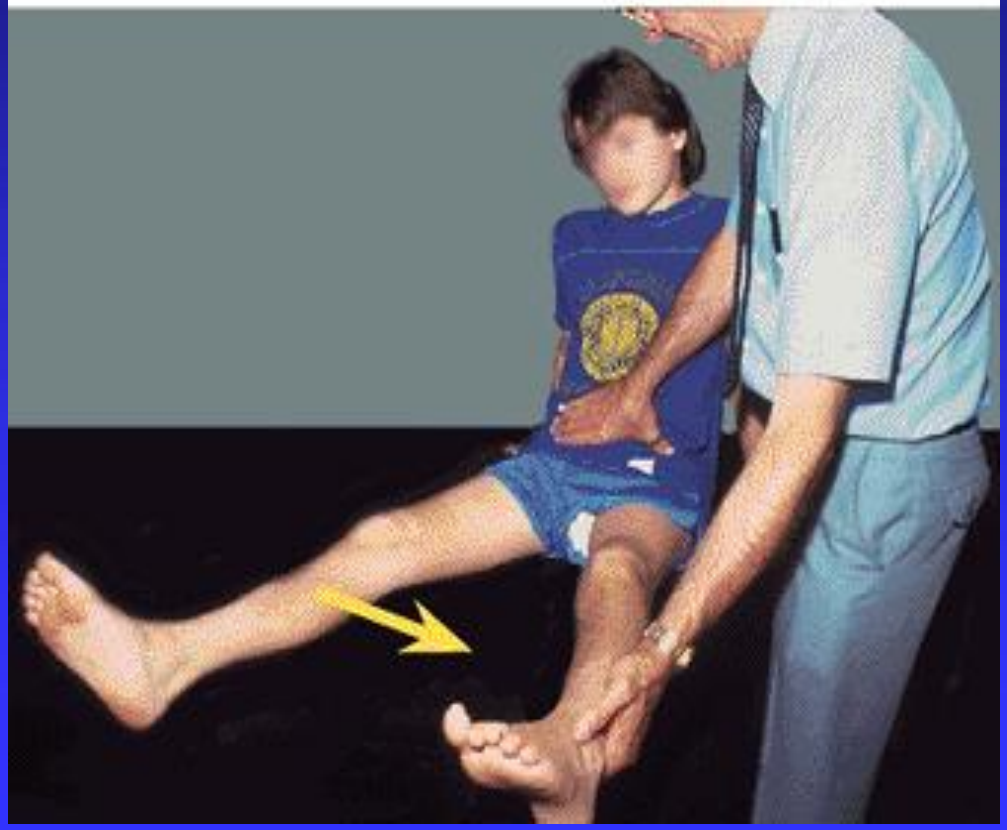
Legg-Calvé-Perthes disease



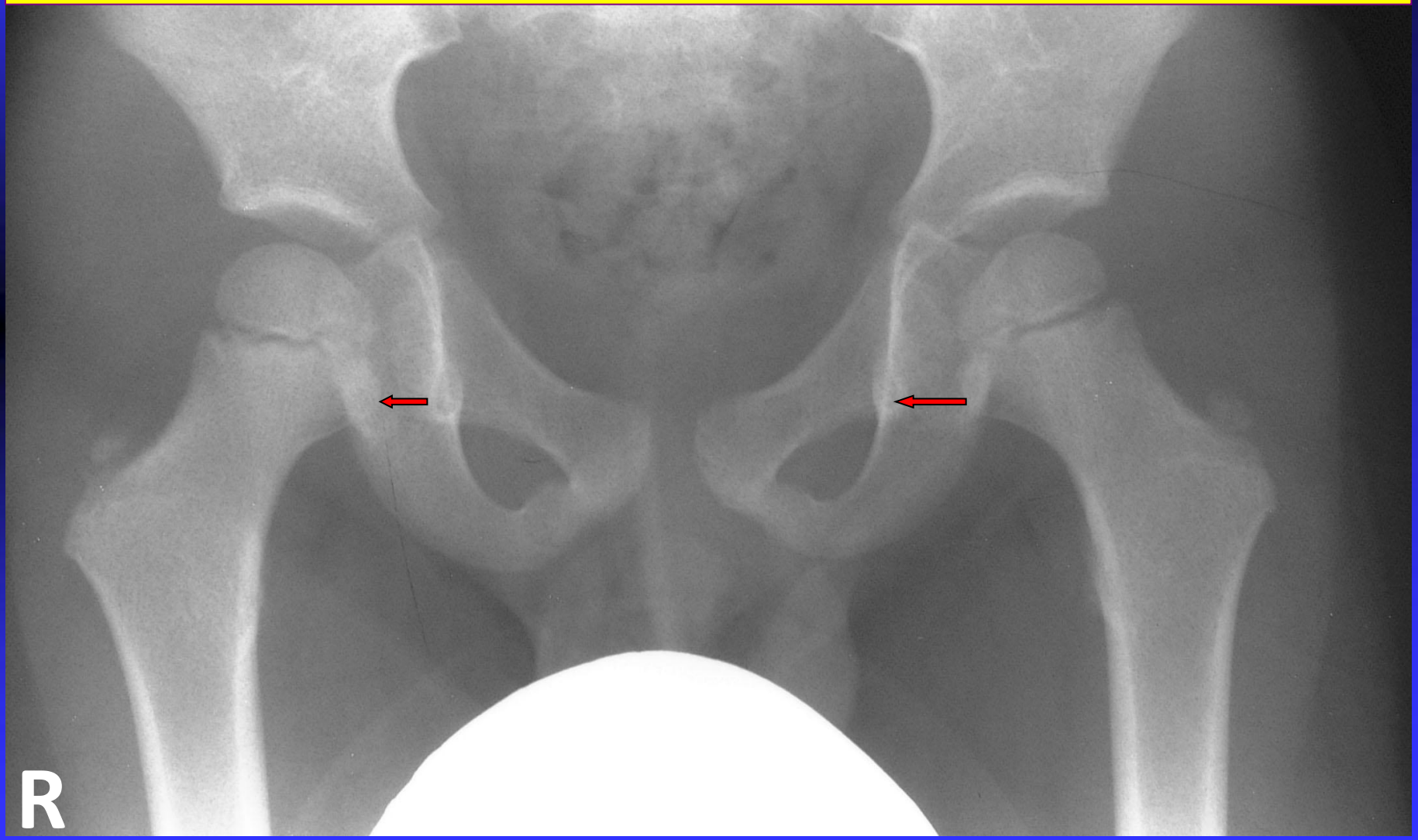

synovitis
joint effusions
cartilage hypertrophy
trauma
congenital vascular hypoplasia
steroids
coagulation defect

Symptoms of Perthes usually have been present for weeks.

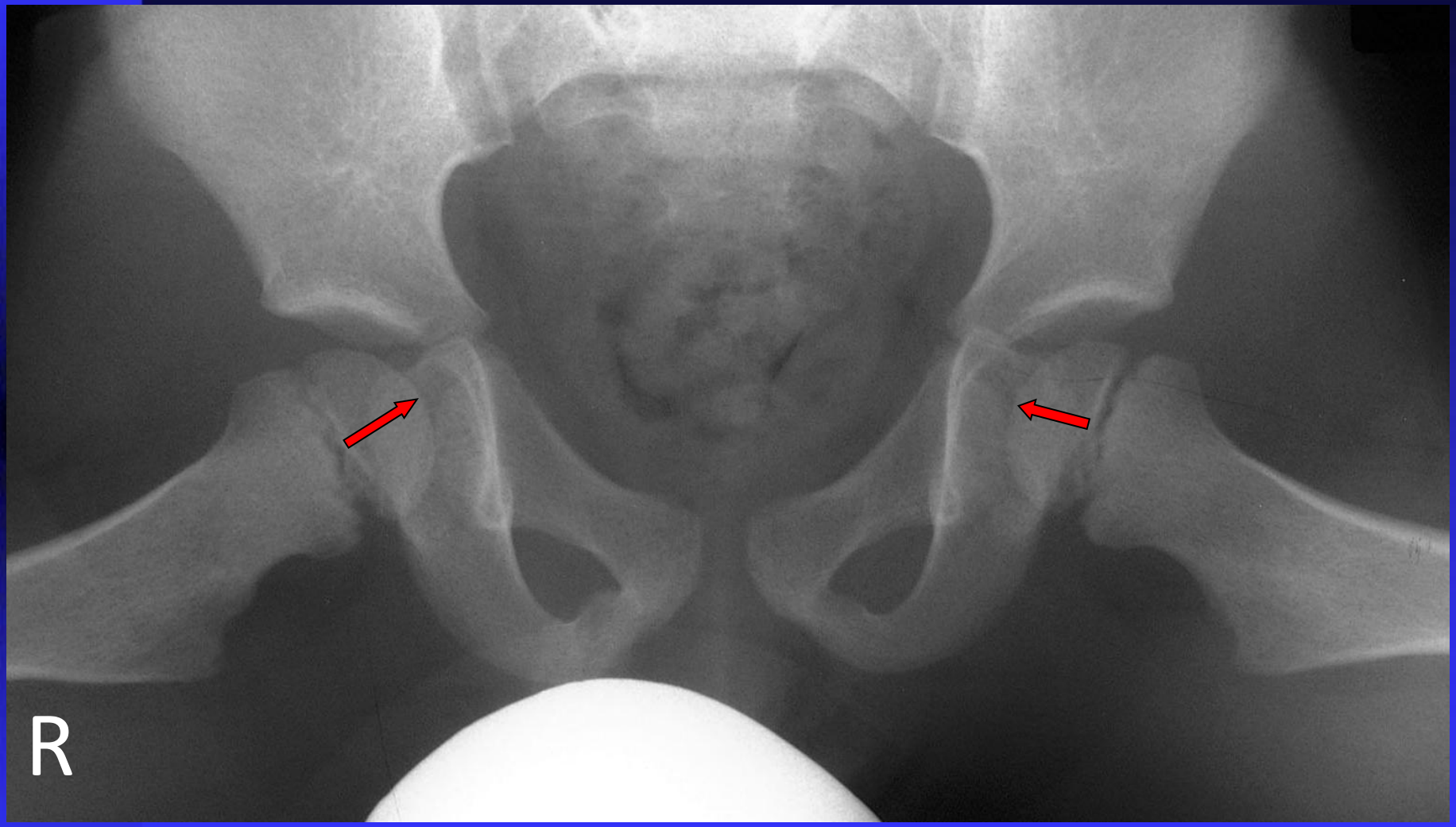
- **Hip, groin, thigh or knee pain**
- **Limp** :painless and intermittent.
- Limitation of **internal rotation**.



* Slight widening of the left hip joint
* Small joint effusion



* Decrease epiphyseal hight



= The F.H smaller denser on the left

= Joint widening can also be 2ry to hypertrophy of the cartilage.

Head-at-risk signs

= Extrusion- subluxation (**red arrow**),

= Metaphyseal reaction (**yellow arrow**),

= Lateral rarifaction or Gage sign (**white arrow**)

Treatment Goals

1-Relief of symptoms

2-Restoration of ROM

3-Containment

Management according to Lat. Pillar

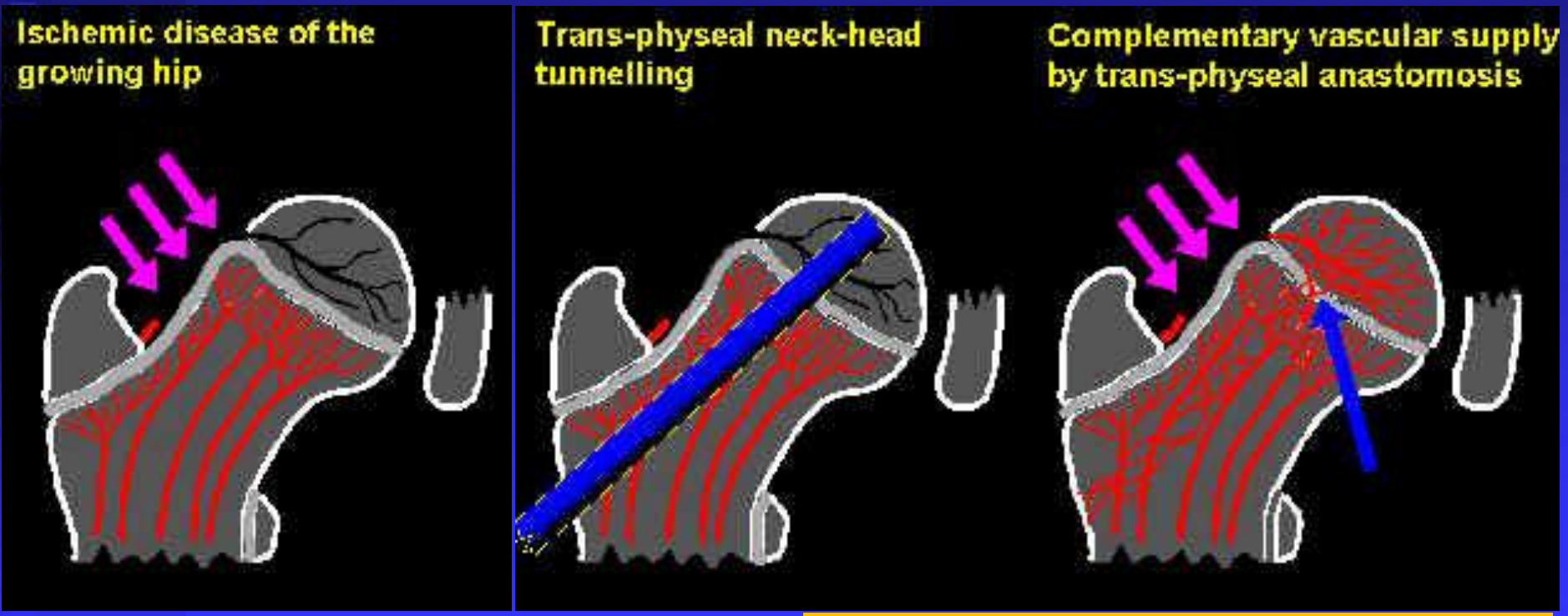
(Skeletal Age)

* **Age < 6y at any stage - Conservative.**
* **Group A any age - Conservative.**

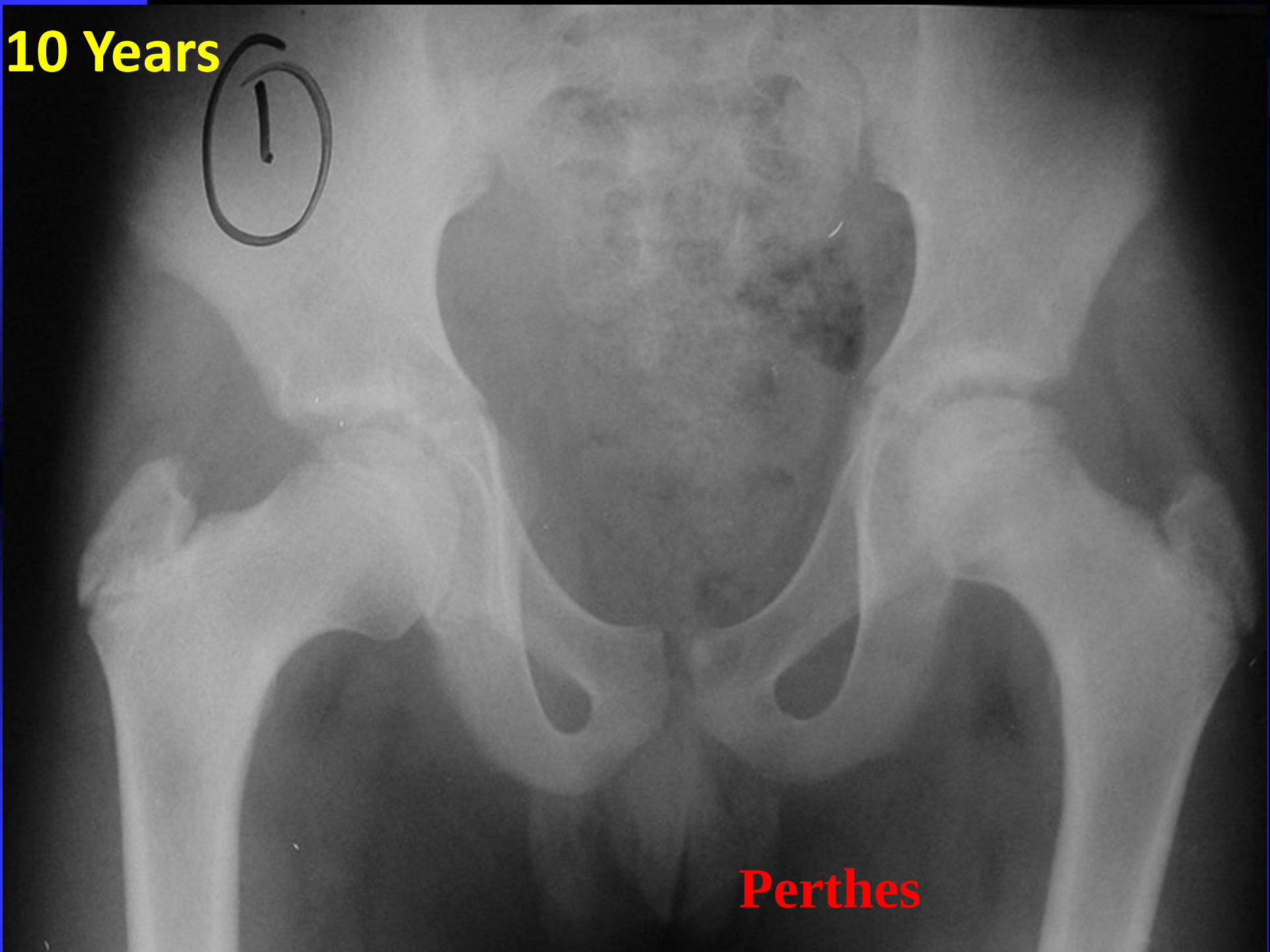
==========

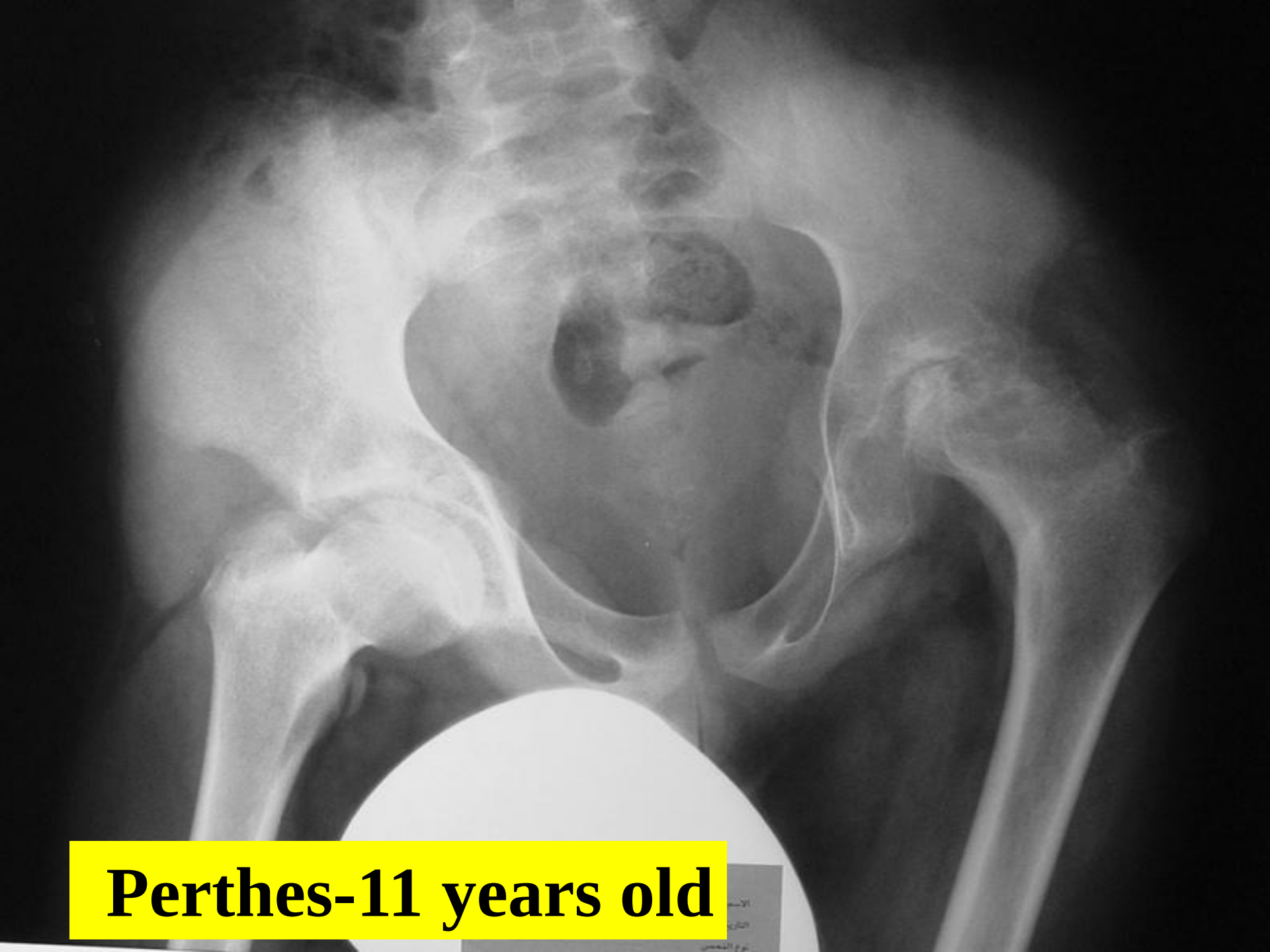
* **Group B 6→>8Y --- Containment**
* **Group C > 6Y --- Surgery.**

=Bisphosphonates
=Drilling of the head

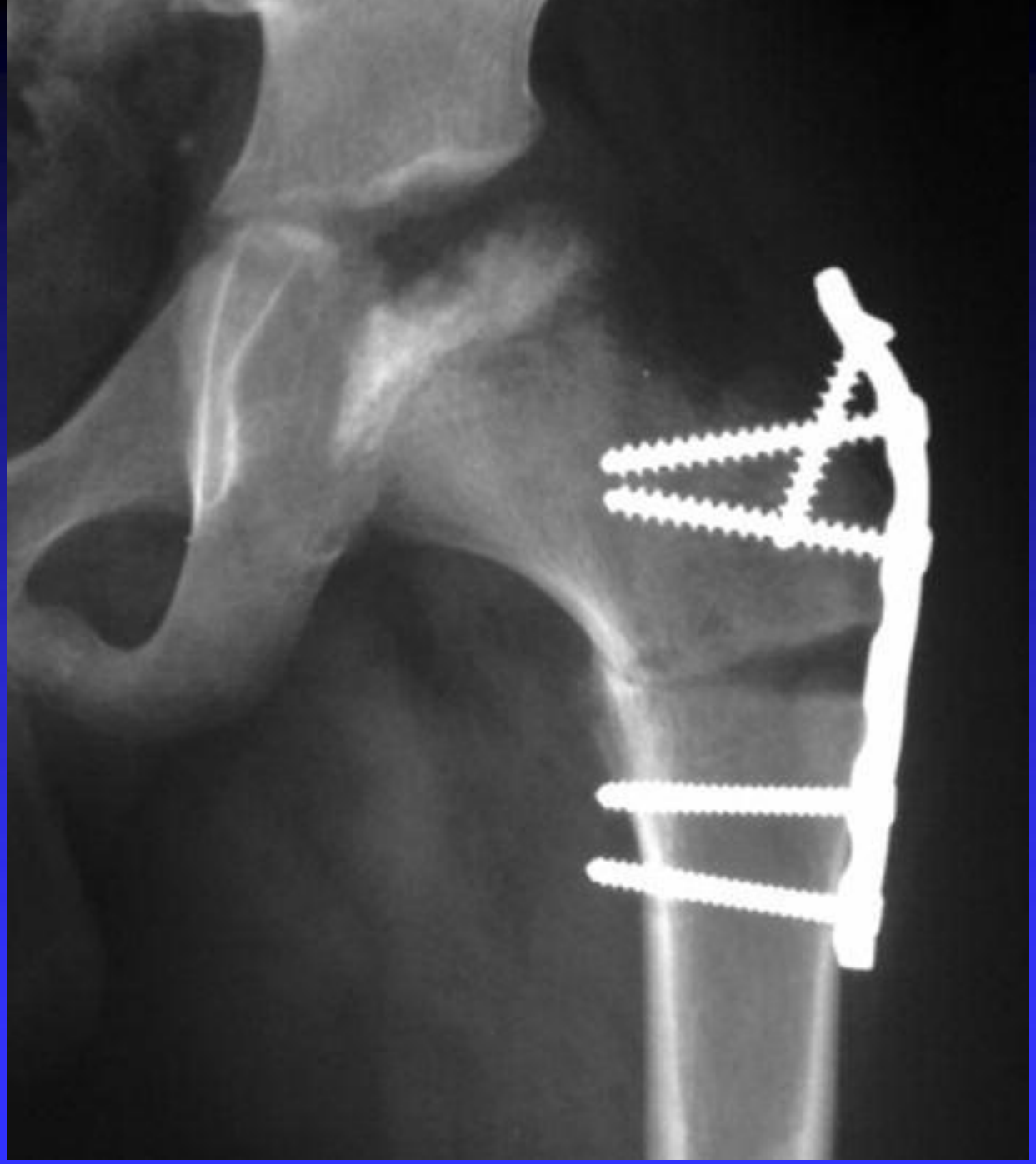


J Orthop Res 2005


10 Years
Perthes


Perthes-11 years old

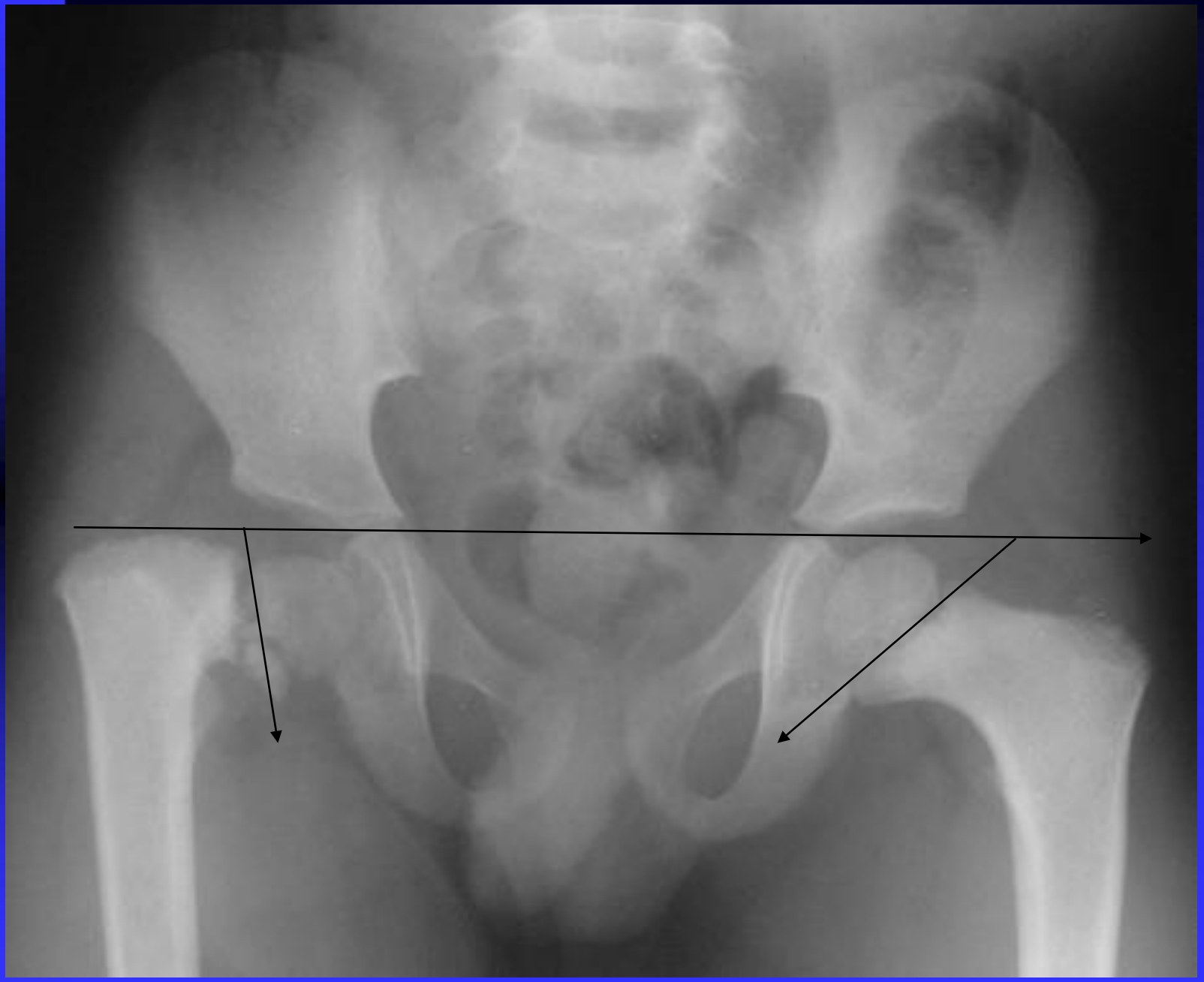

L



Developmental Coxa Vara

Hilgenreiner's Epiphyseal angle

20^0-25^0



Surgery is indicated in

= H.E. angle > 45 degrees
= NS angle < 90-100 degrees
= Trendelenburg gait
= Limping

Idiopathic Chondrolysis of the Hip

Autoimmune response in susceptible patient !!!

= Female > male 5:1
= Adolescent
= Insidious onset of pain
= Limp
= **Decreased ROM in all planes**

Pathology

= Thick fibrotic capsule

= Dry joint

= Thin synovium

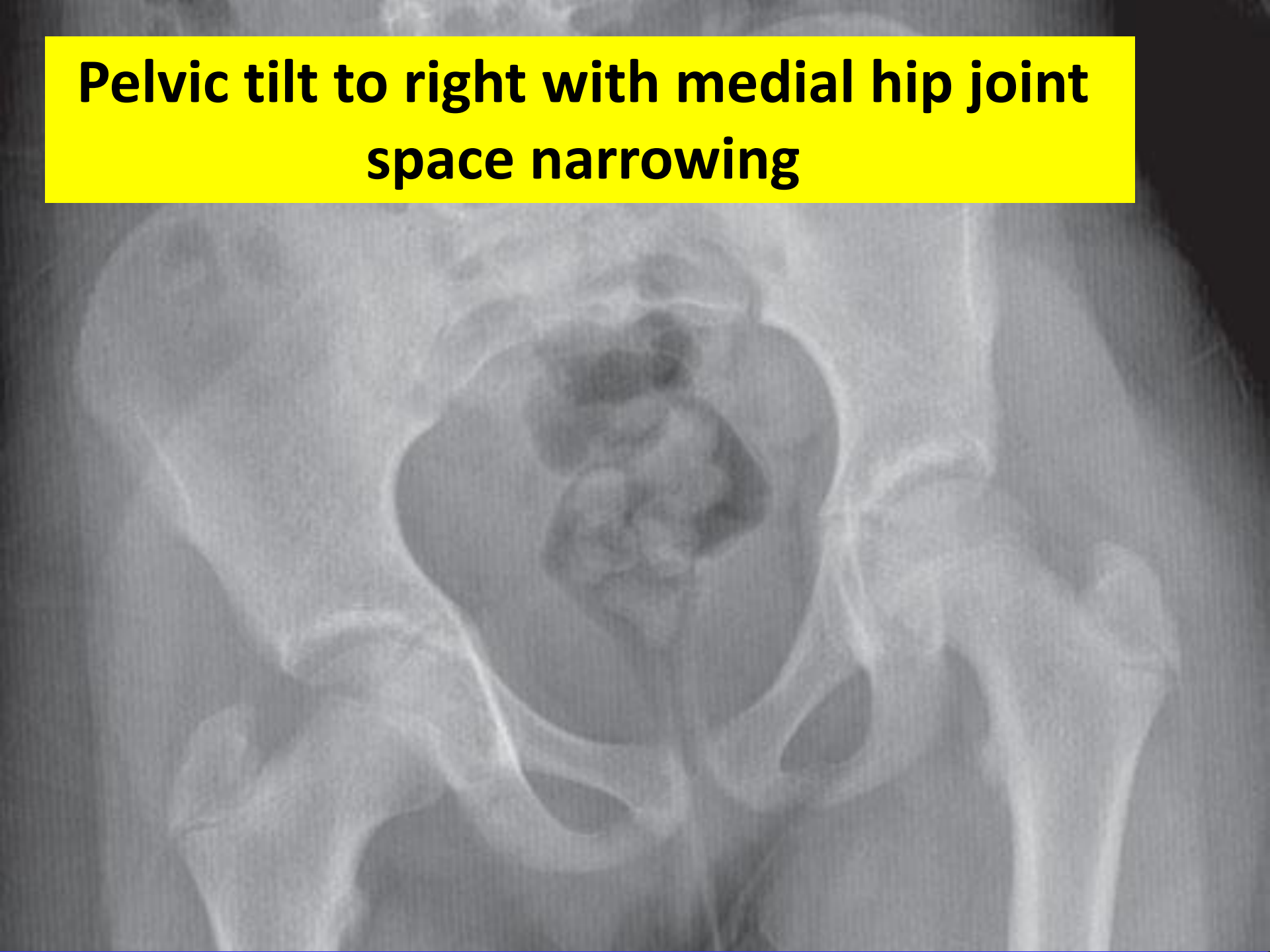
= Thin cartilage

Plain radiography

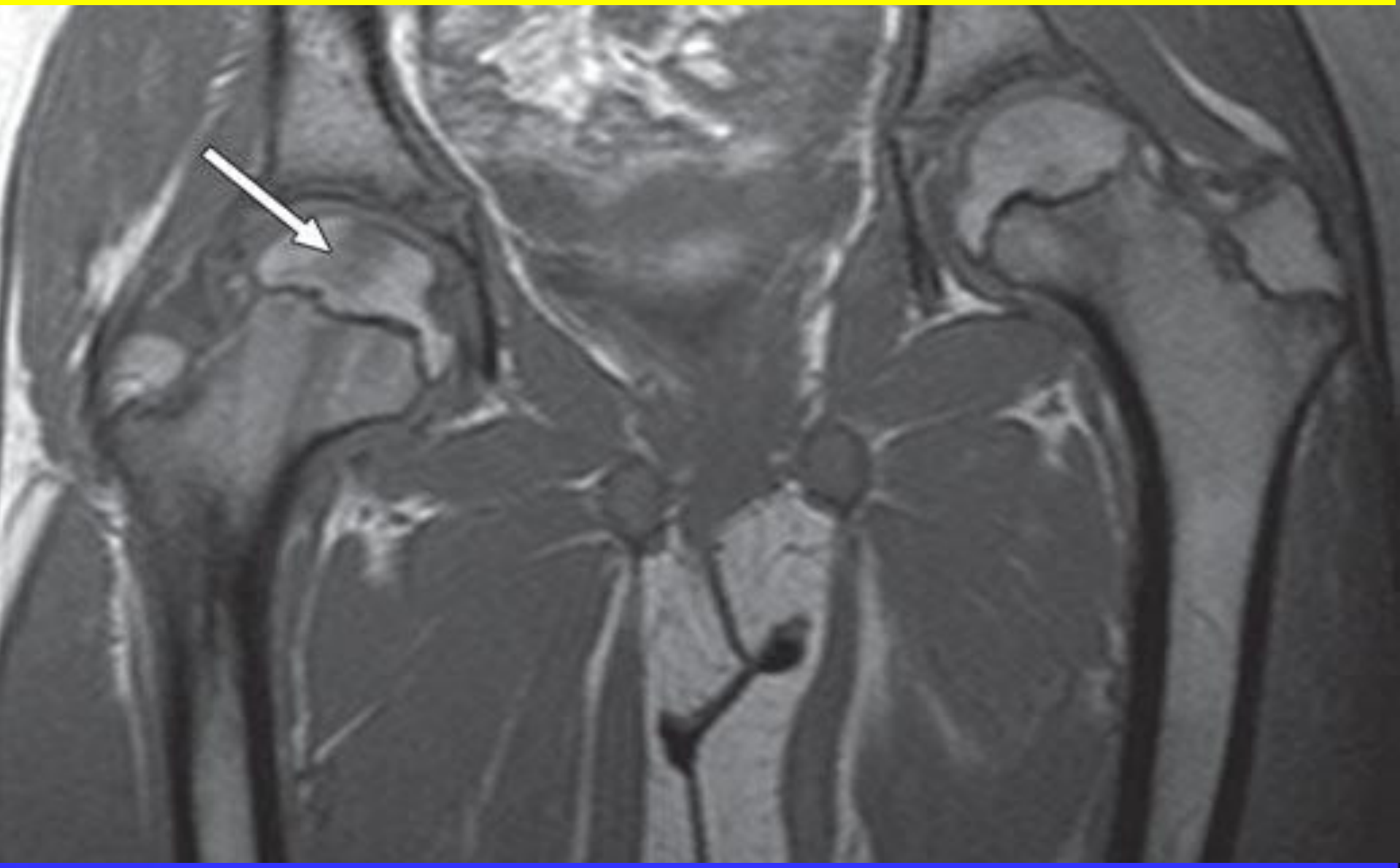
N joint space 3.5-5 mm

= < 3 mm joint space

= Osteopenia


Pelvic tilt to right with medial hip joint space narrowing

Focus of abnormal signal intensity in middle one third of proximal femoral epiphysis.



Natural History

= **Acute phase**: 6-16 months (inflammatory)

= **Chronic phase**:

painful fibrous ankylosis

improvement

50-60 % have favourable long term outcome

Treatment

= Physiotherapy
= NSAIDS,
= Protected weight bearing
= Etanercept (TNF)

Orthopedics. 2009

Osteochondroses

Köhler Disease
Freiberg Disease
Sever Disease
Sinding-Larsen- Johansson Syndrome
Osgood-Schlatter Disease
Osteochondritis Dessicans

Tumors

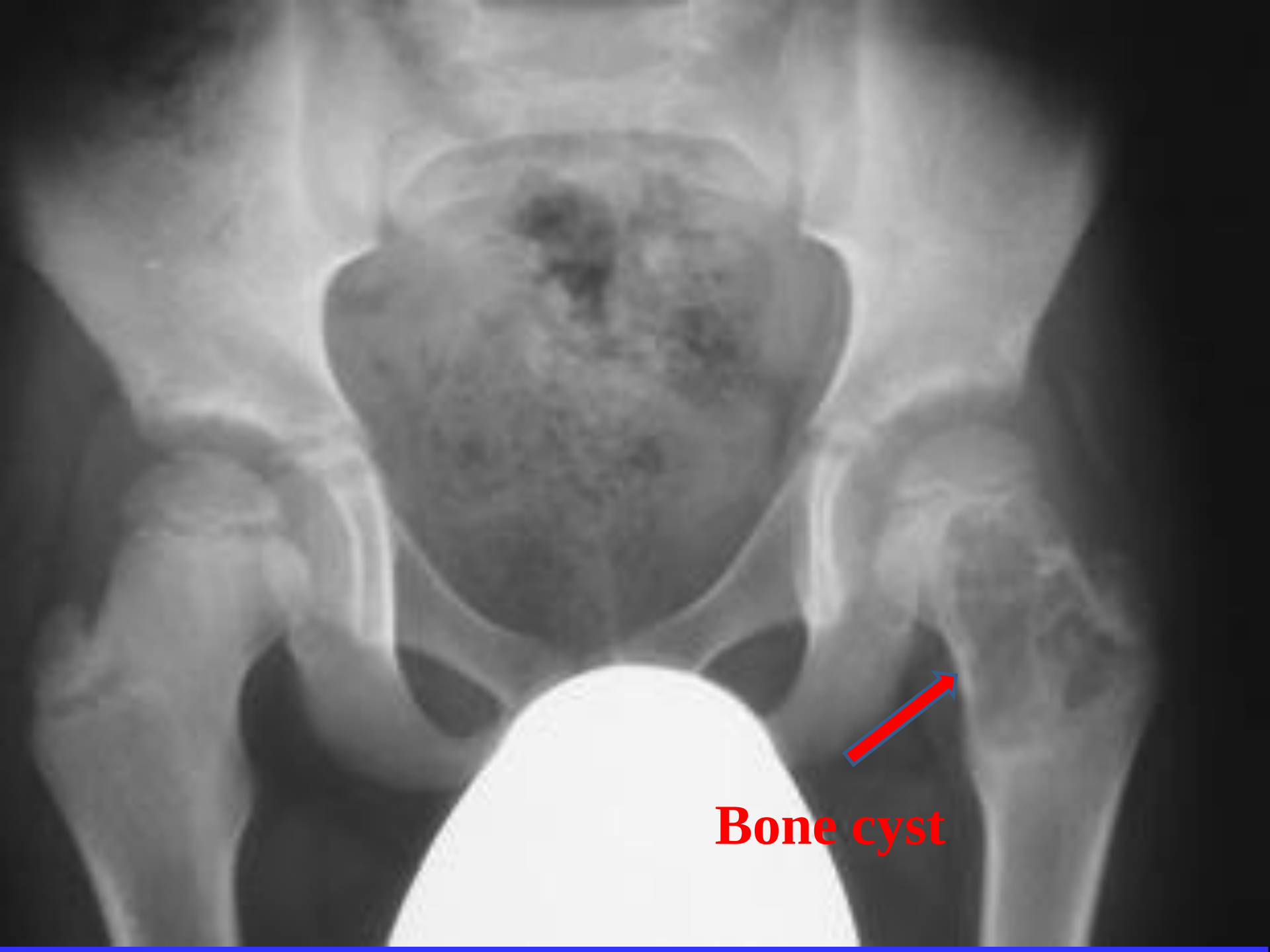
Bone cyst

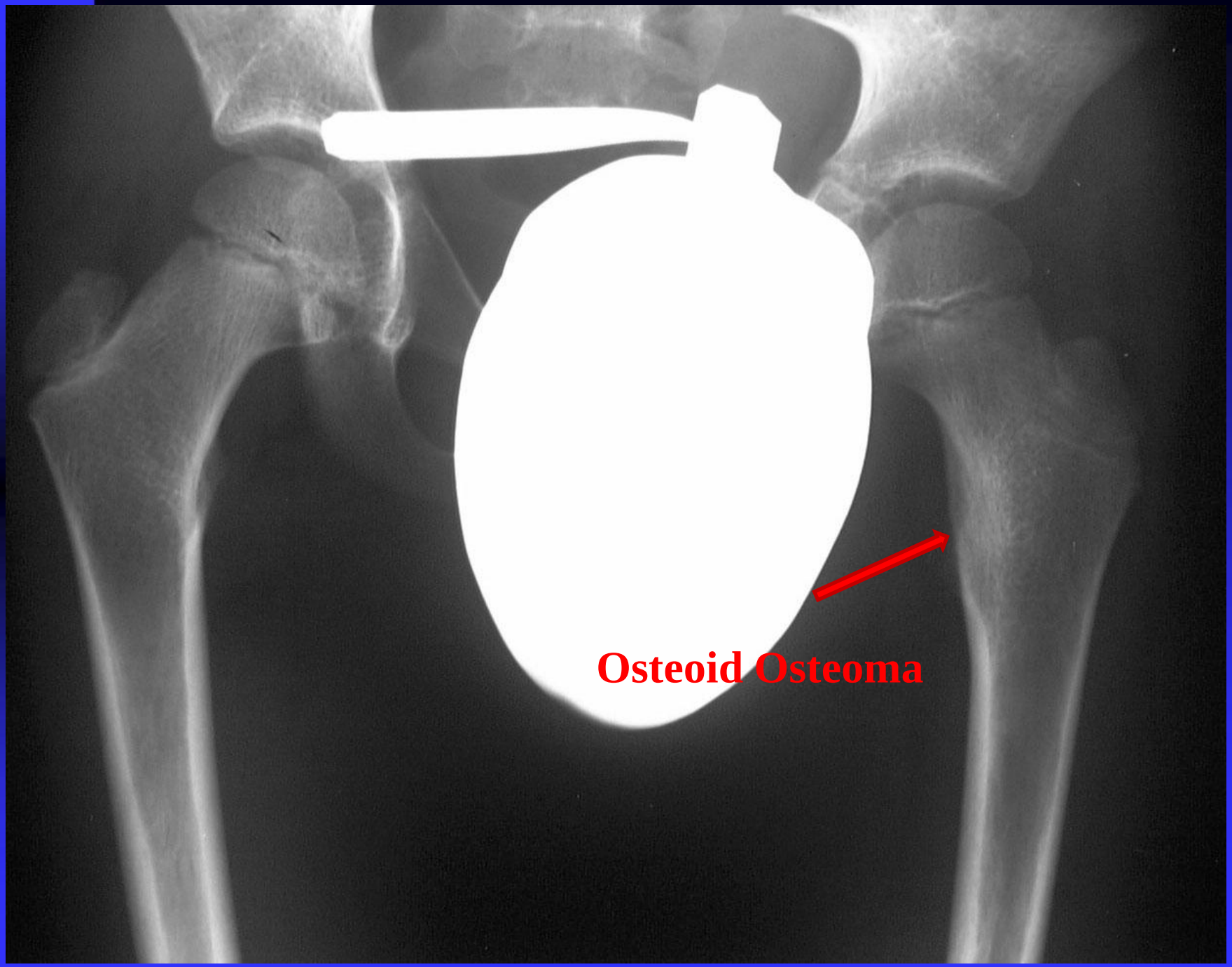
Osteoid Osteoma

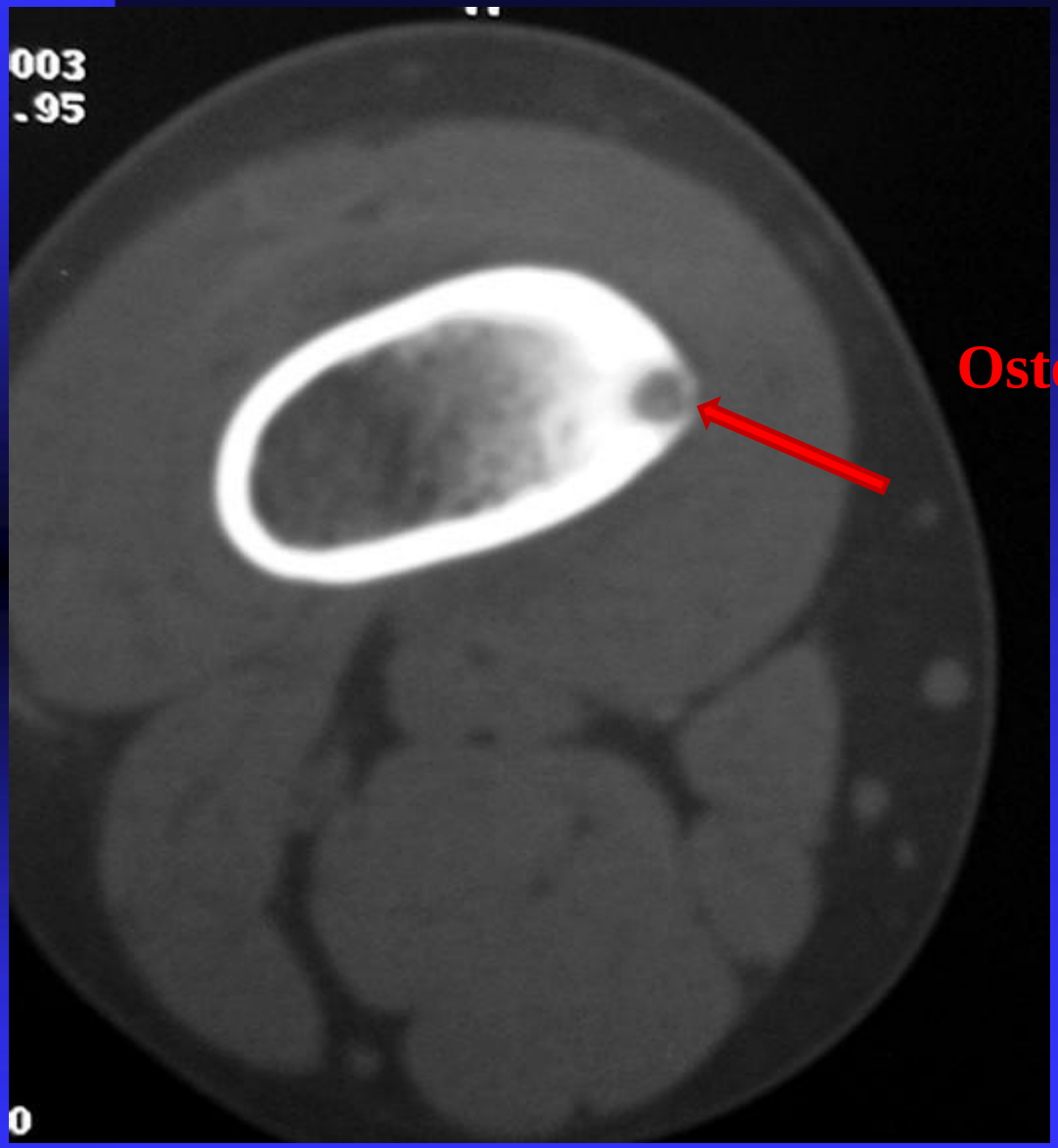
Osteosarcoma

Ewing's Sarcoma

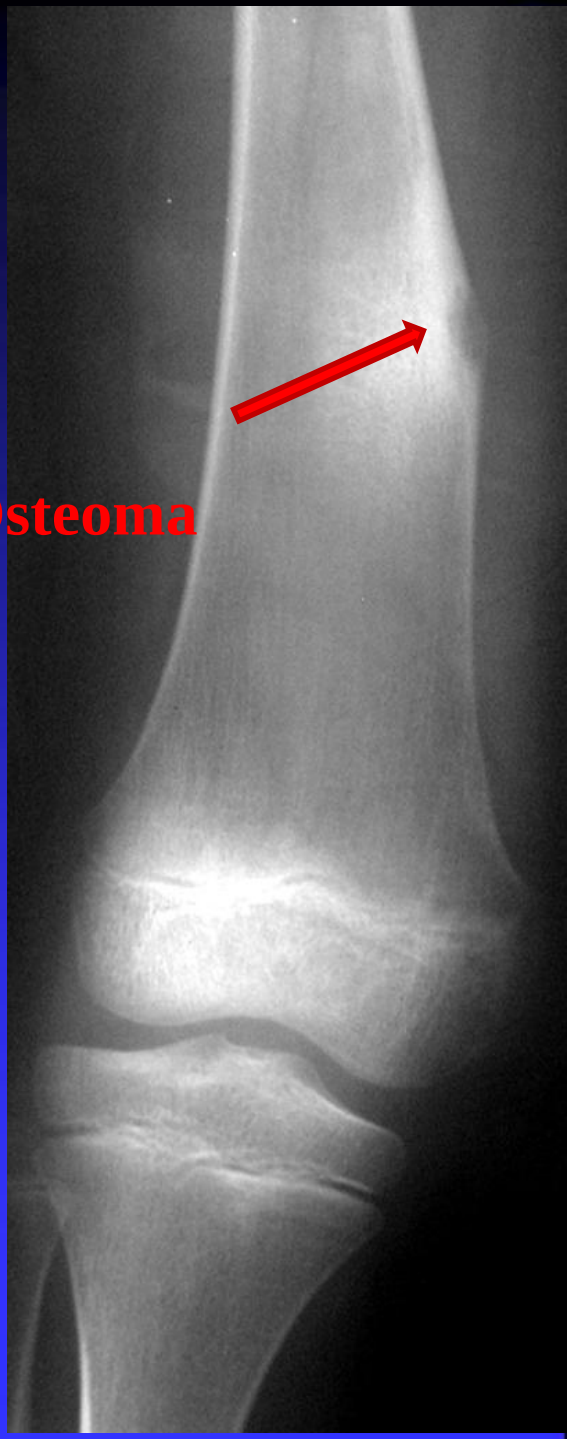
Acute Lymphoblatic Leukemia


Bone cyst


Osteoid Osteoma



Osteoid Osteoma




Ewing's Sarcoma
Rt

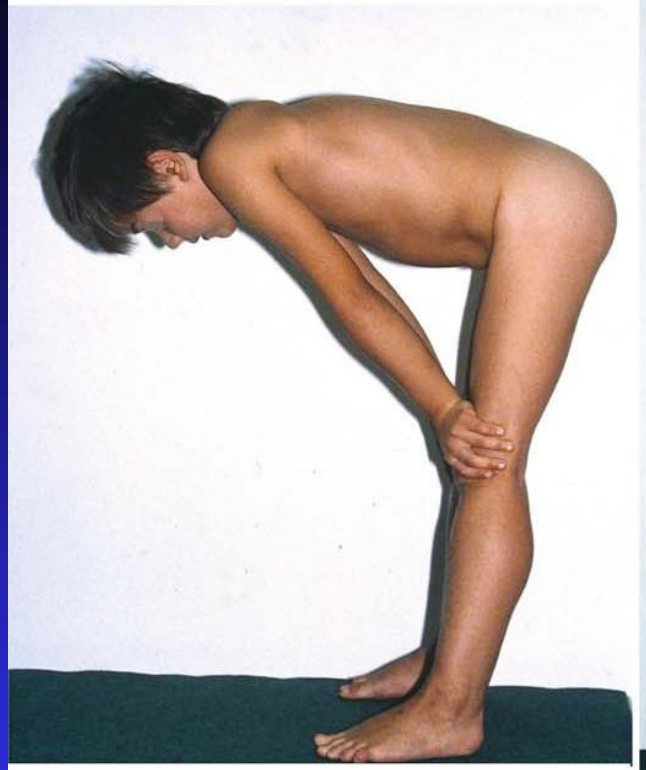
Lucent metaphyseal bands (arrows), a finding present in 90% of patients with leukemia.

Equinus gait

Child walks on toes

↓

CTEV; cerebral palsy; idiopathic tight Achilles tendon; calcaneal fracture; foreign body in the foot; limb-length discrepancy

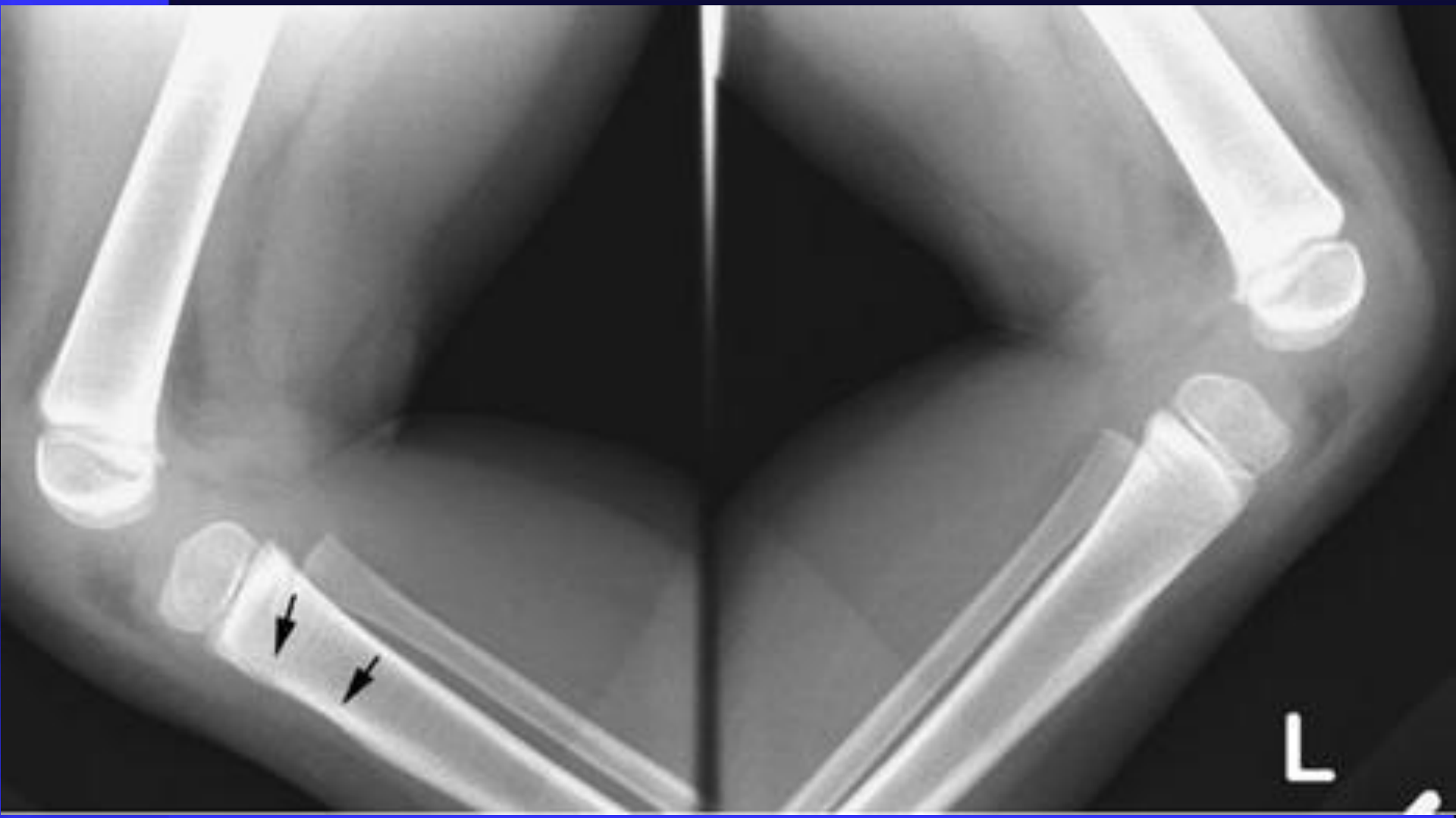


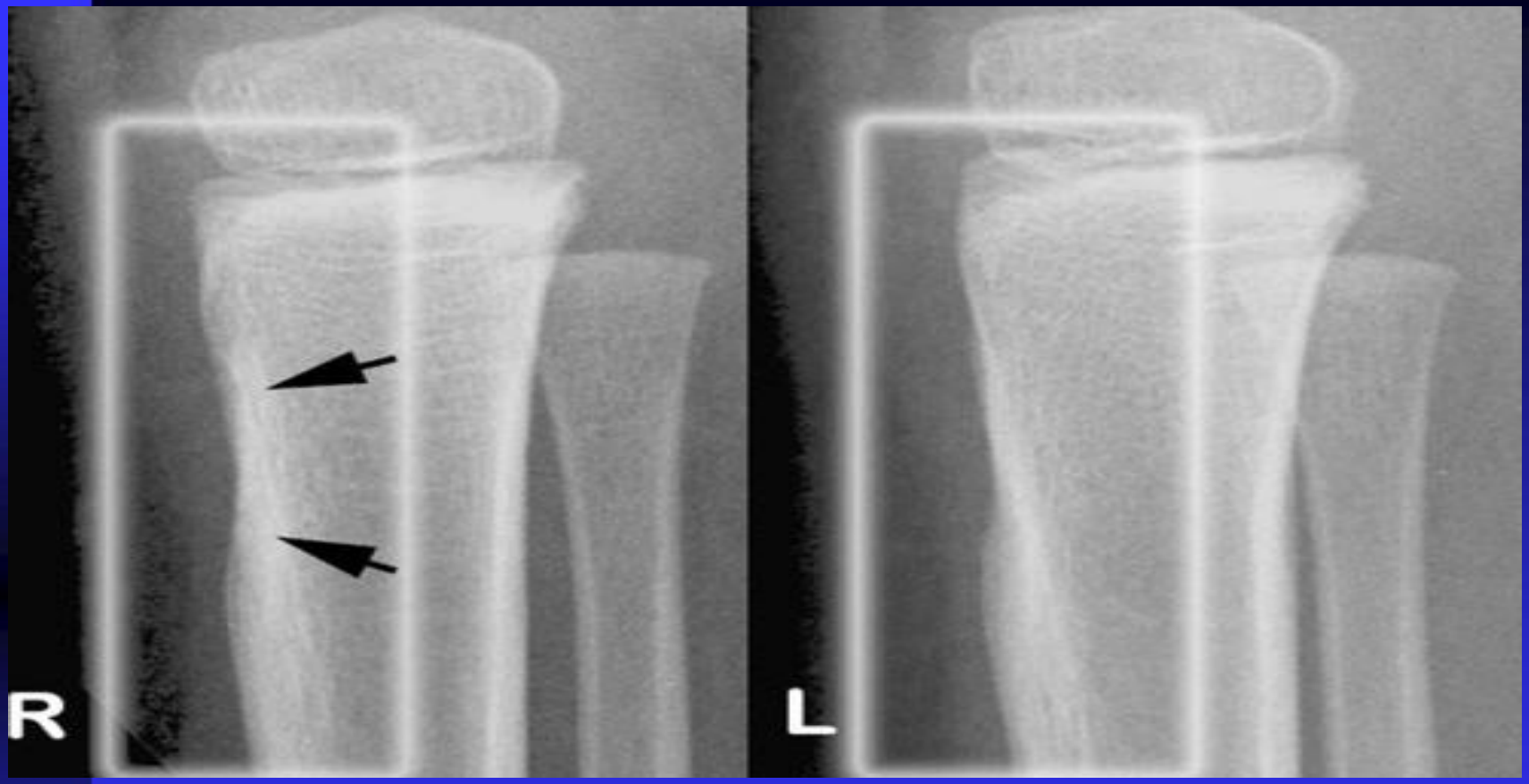
Case-1

A 3-y-old male , C/O persistent pain around the knee and inability to bear weight on his right leg after a kick from an 11y old boy to his leg.

There was no visible bruising on physical exam. X-ray of the lower extremities was negative for fracture --- immobilized in a splint.

After 5 days returned to OPD with inability to bear full weight.


L



Upper tibial hyperextension fractures another occult toddler's fracture. **Pediatr Radiol , 1999**

Emerg Radiol, 2011

Case-2

A 6y old girl C/O Right painful limping of 3w. Had fever 10 weeks earlier, treated by GP for 1week Augmentain and paracetamol , which were initially effective.

On admission,

= Increased Lumbar Lordosis .
= Tenderness over the hip region
= lower back was asymptomatic,
= Hip movements were pain free apart from slight restriction of extension and IR.

Laboratory tests

= Normal WBCs

= ESR -72 mm/h

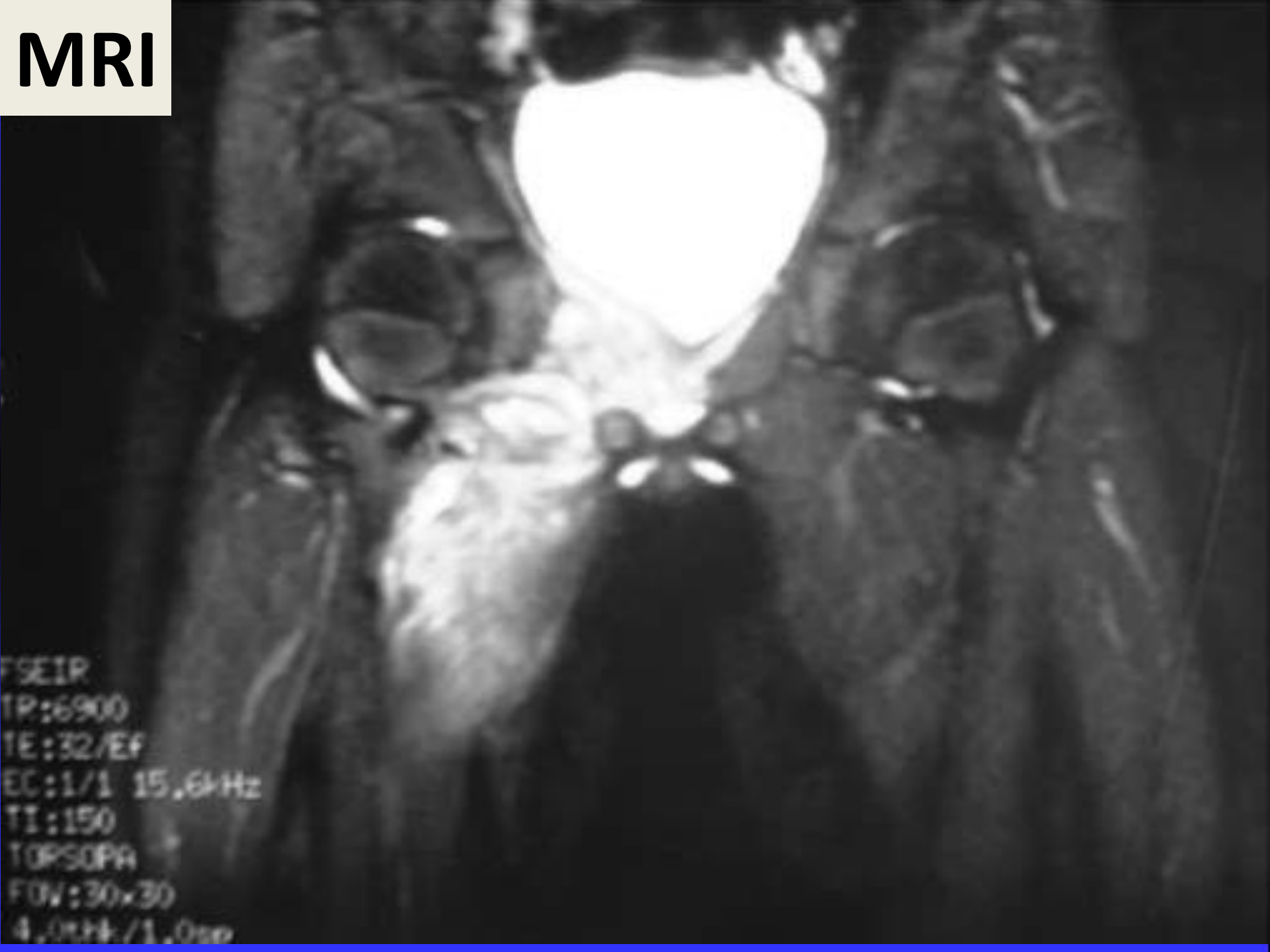
= CRP - 26 mg/l.

Bone scan

= Bone tumour

= Infection

MRI



Biopsy

Pelvic osteomylitis

She was treated with I.V AB for a week followed by oral AB for 10 w.

J Pediatr Orthop B. 2010

J Pediatr Surg. 2007

Case-3

A 5-y-old male tripped and fell down the last 4 stairs.

He went on to play basketball with no pain.

At home he complained of right hip pain.

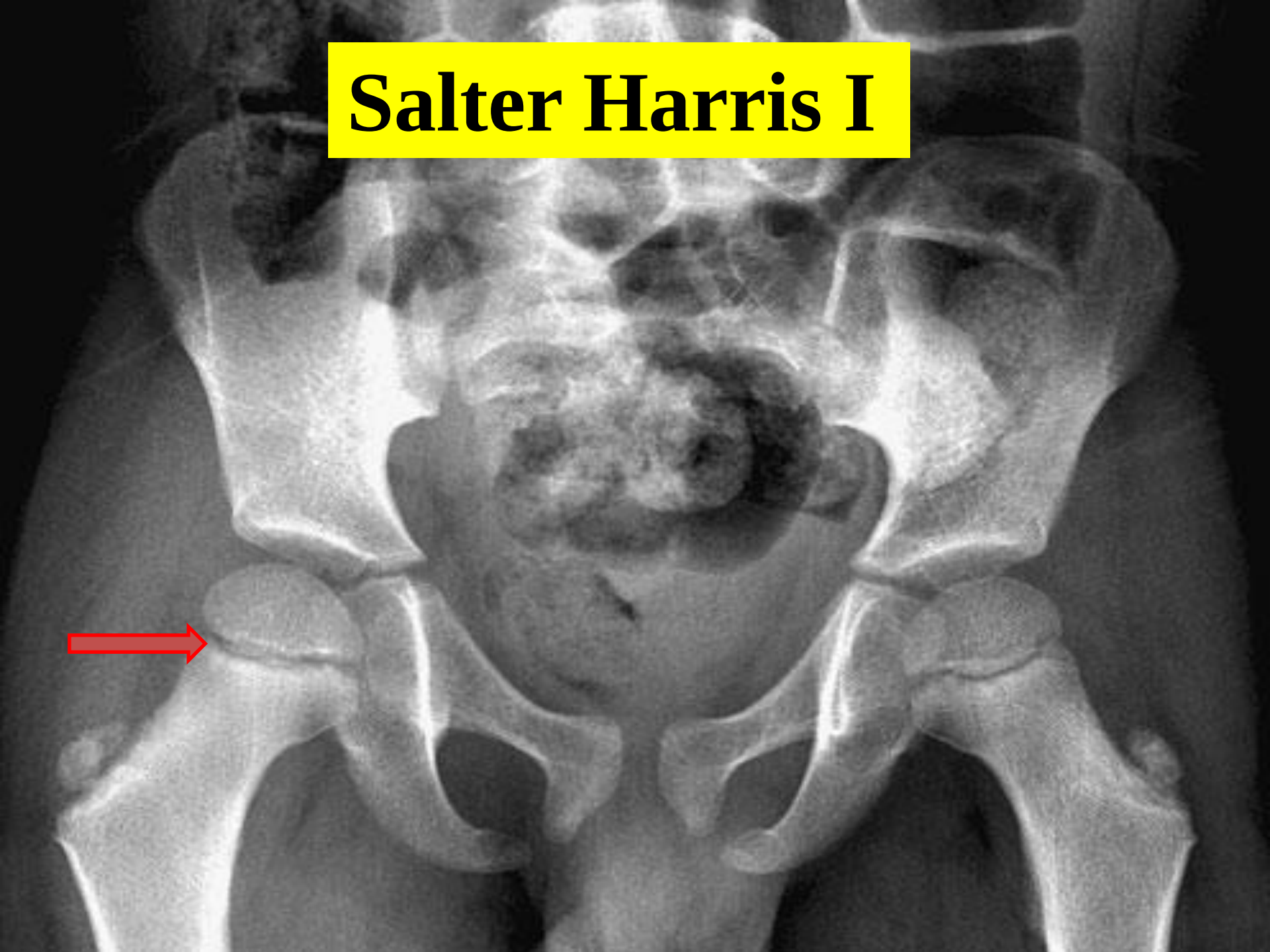
At night he woke up C/O of right hip pain.

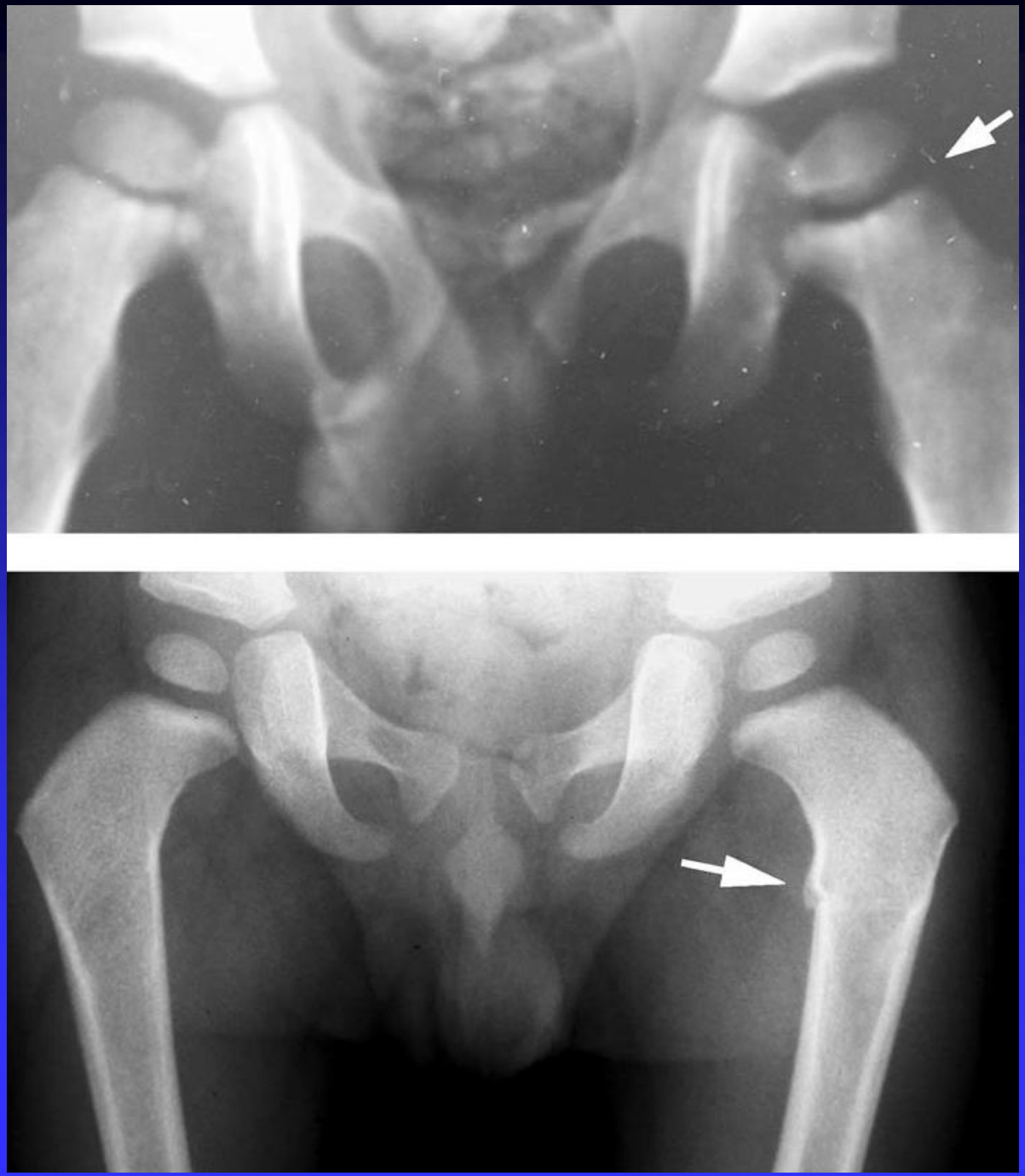
Taken to ER , he had normal ROM of his extremities including the right leg.

However when he moved it, he said it did hurt.

Radiographs of pelvis and hips were obtained


R


Salter Harris I



Case-4

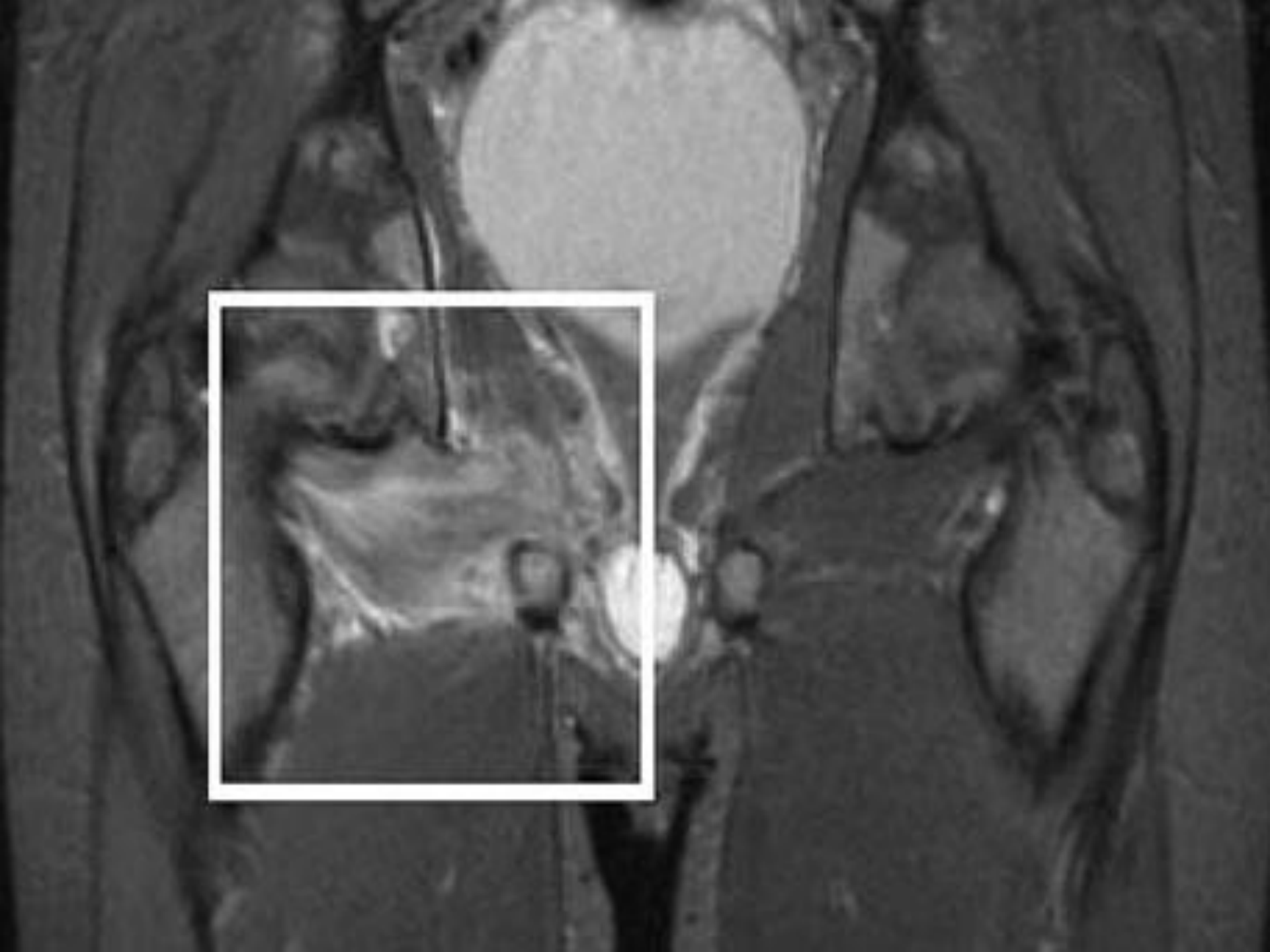
A 9-y-old boy presented with right hip pain and fever of 4 days duration.
There was no history of trauma
His Temp.was 39.9°C.
O/E: pain on flexion and IR of the right hip.

ESR= 58 mm CRP= 149 mmol/l

WBCs = Normal

X-ray and ultrasonography of the hip were normal.
Blood cultures --Staph. Aureus
Creatine kinase :636 U/l

On 3rd day found to have diffuse swelling in the hip region



= IV antibiotic therapy was continued.

He left the hospital in good condition after 18 days with oral AB continued for 4 weeks.

Pyomyositis

Eur J Pediatr. 2007

J Pediatr Orthop B., 2004, 2008

Case-5

A 3-y-old boy presented to ER with a 10-day history of limp. with low-grade pyrexia and hx of URTI. no history of trauma.

O/E:

Reluctant to weight bear. Temp.: 38.5°C, Good ROM was observed in both hips.

ESR:50mm, CRP: 35, normal WBCs.

X-rays were normal

Bone scan

Multifocal lesions in the left femur and other areas of the skeleton

BM aspiration and trephine biopsy showed metastatic neuroblastoma.

(CT Scan) showed a large soft tissue mass of mixed density

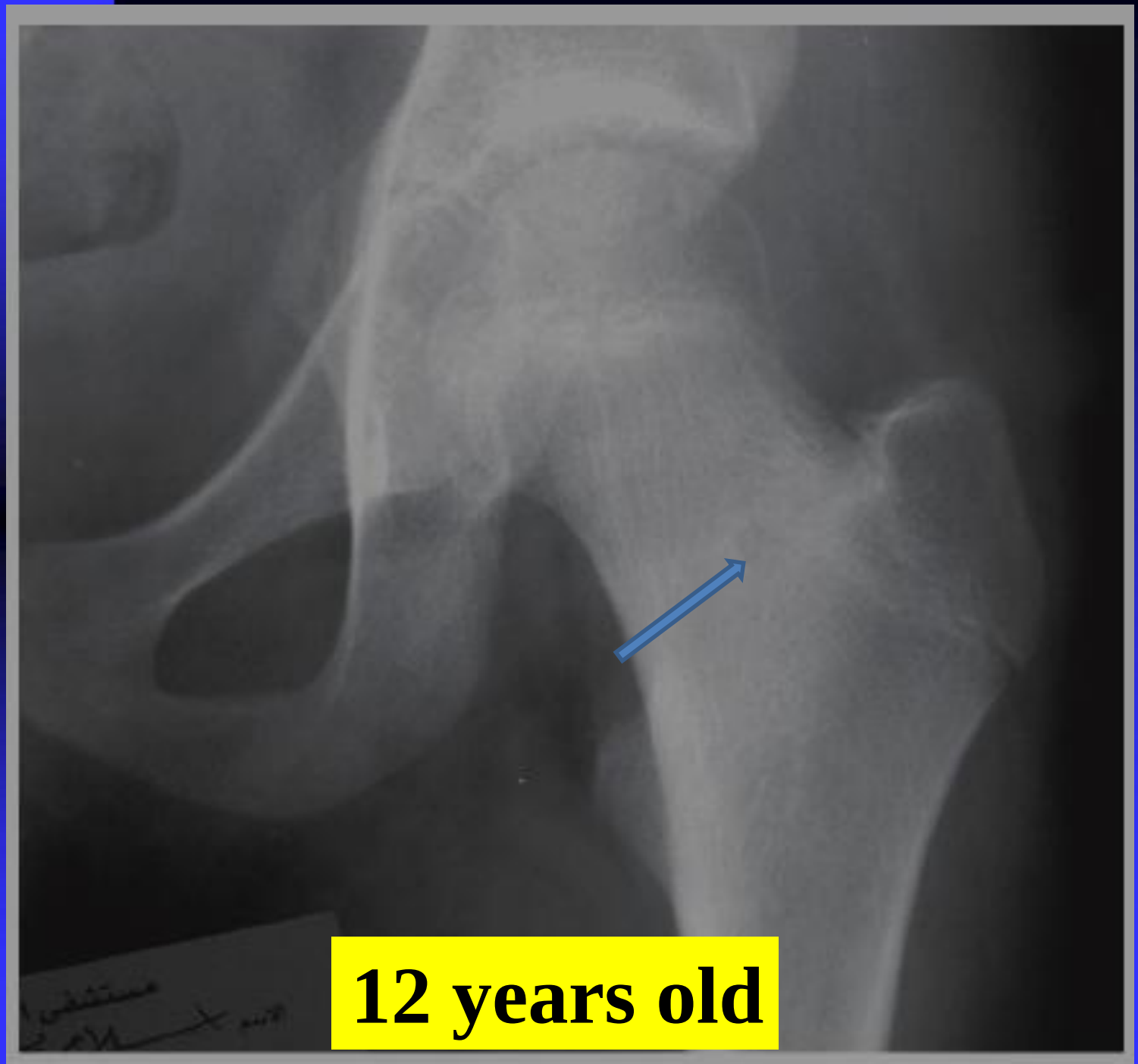
Neuroblastoma adrenal gland.

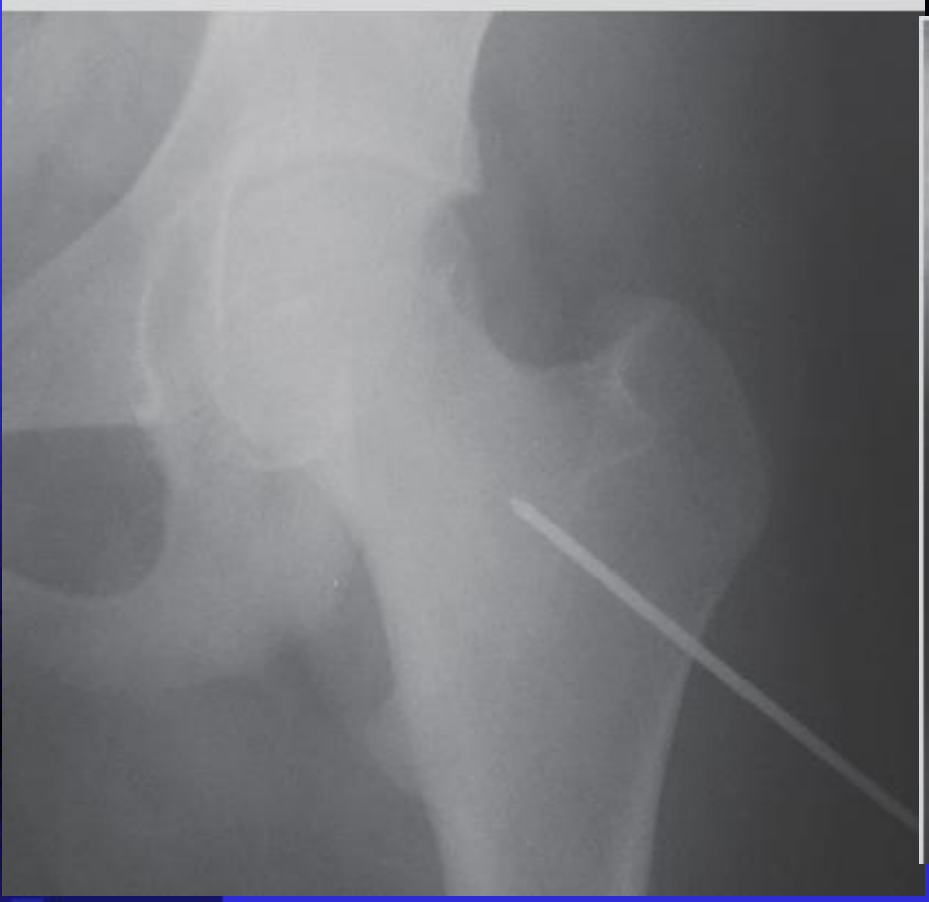
Case-6

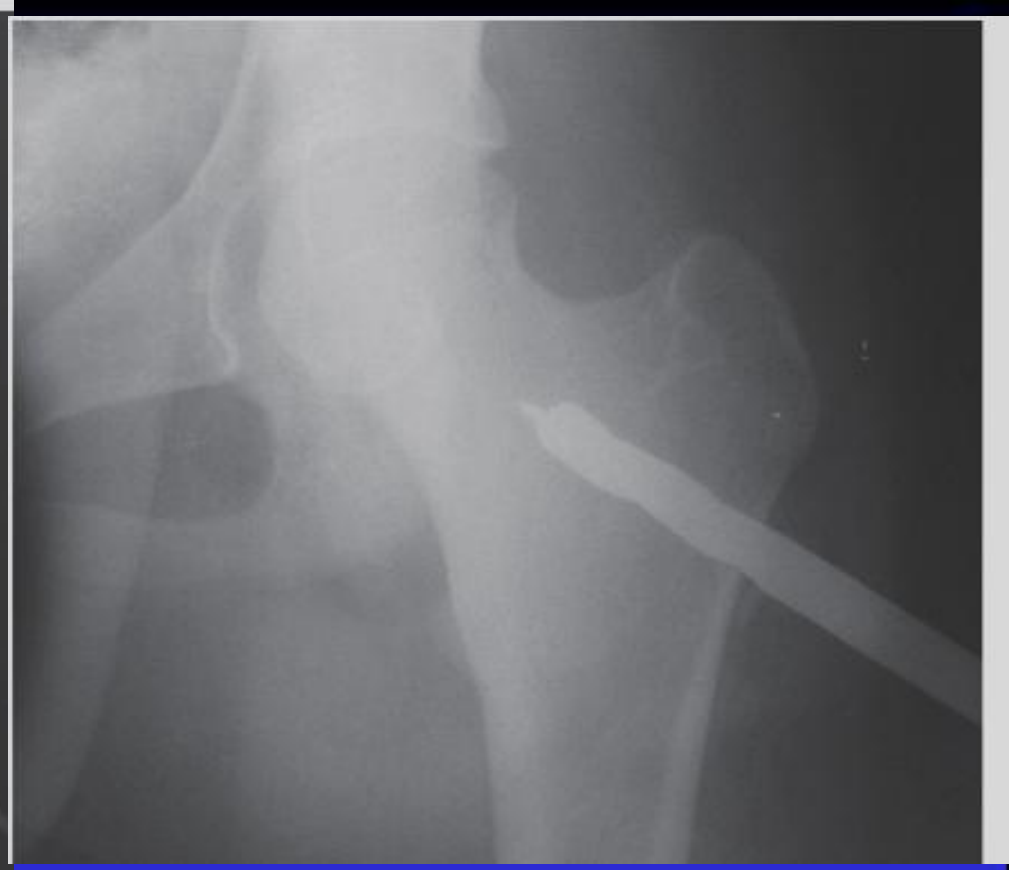
A 12 y old female patient, had hx of chronic pain left knee, limping of 14 m .

She used to wake up at night from the pain, she became a well known case to one of the hospital as pethidine addict patient.

O/E: mild wasting of thigh muscles, full ROM both lower limbs with no focal tenderness.


12 years old





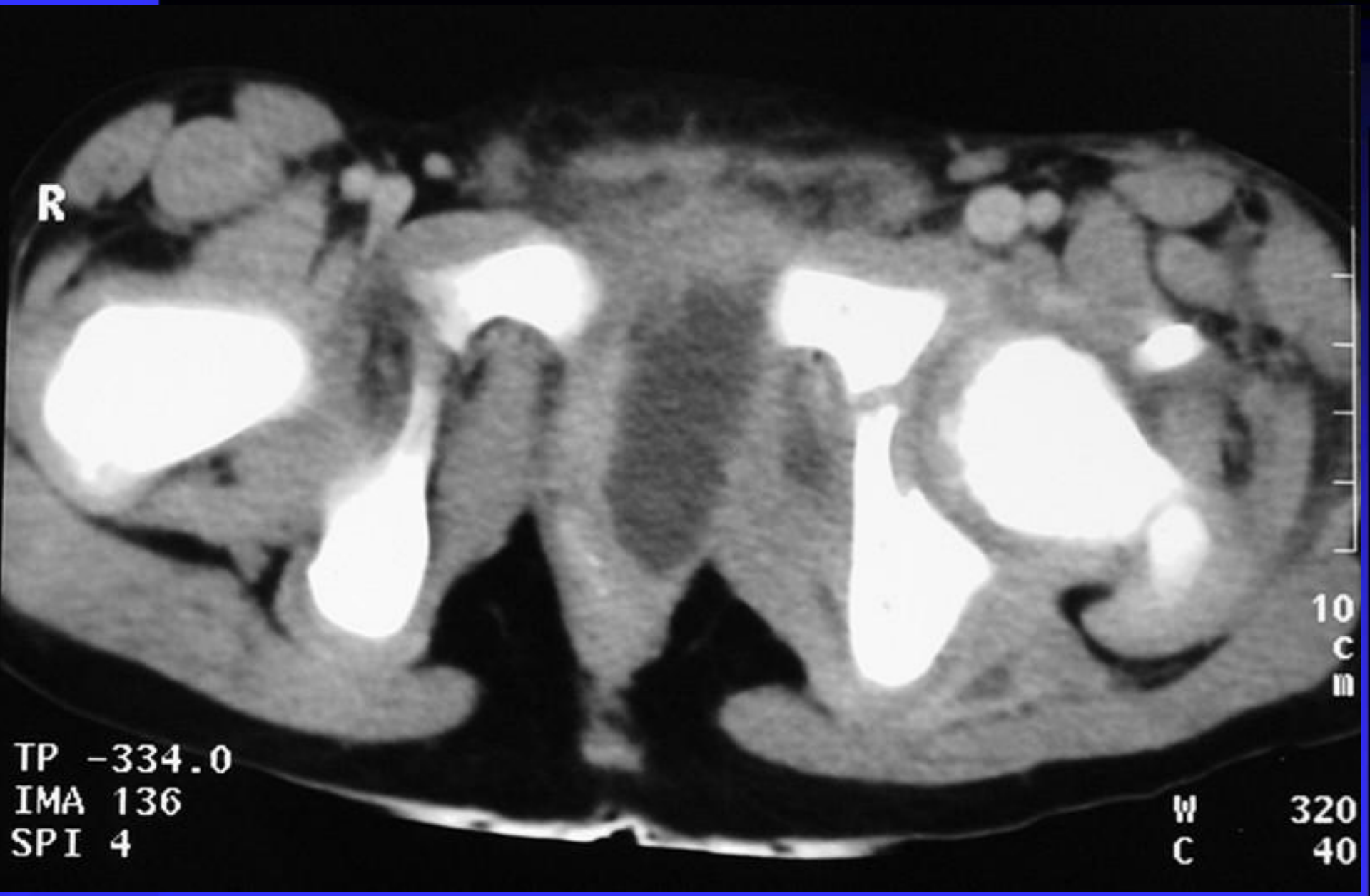
Ablation of Osteoid Osteoma of Lower Extremity using Dynamic Hip Screw Drill

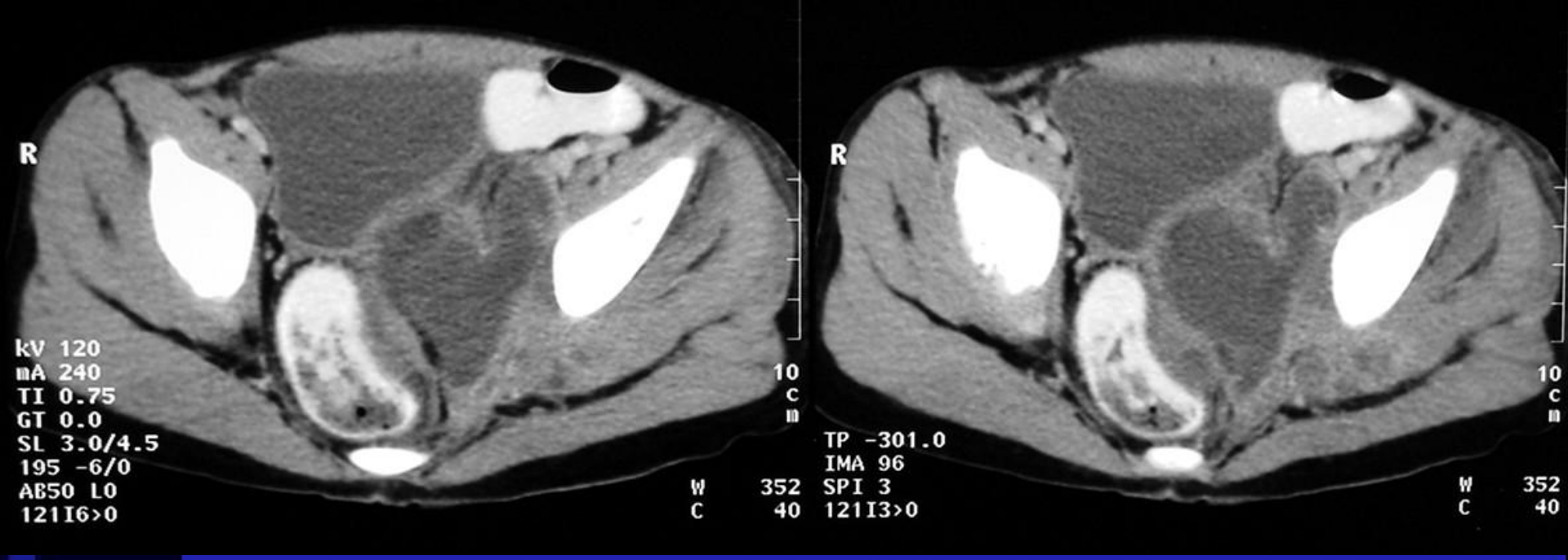
Freih Odeh Abu Hassan[1], F.R.C.S (Eng), F.R.C.S M.B.,BCh. Tarek Nayef Altamimi[1], M.B.,BCh,J.P.Orth

Case-7

A 9-y-old male , C/O: severe pain left hip and limping of 4 days duration, has been given NSAIDS He had history of fall a week before.

O/E: Marked limitation of left hip ROM
Temp. 39.5, ESR: 120mm, CRP: 98
Hip USS– effusion—aspiration--- pus
Arthrotomy – pus, drained and irrigation+ drain.
After 72 hrs of IV AB, no significant drop of Temp, CRP: 130.


R
10
c
m
TP -334.0
IMA 136
SPI 4
W 320
C 40



Pelvic abscess

J Pediatr Orthop B, 2003

Case-8

A 10 y old male patient presented to the Ped. Dept, as swollen left leg.
There was no signs of infection

Diagnosed as **DVT** and given treateemnt for one week without response.
Started to be septic transferred to ICU
Consulted us

DVT associated with osteomyelitis. Indian Pediatr. 2008

J Bone Joint Surg A. 2007

Case-9

A 4-y-old boy presented to ER for pain in the Rt knee and limping.

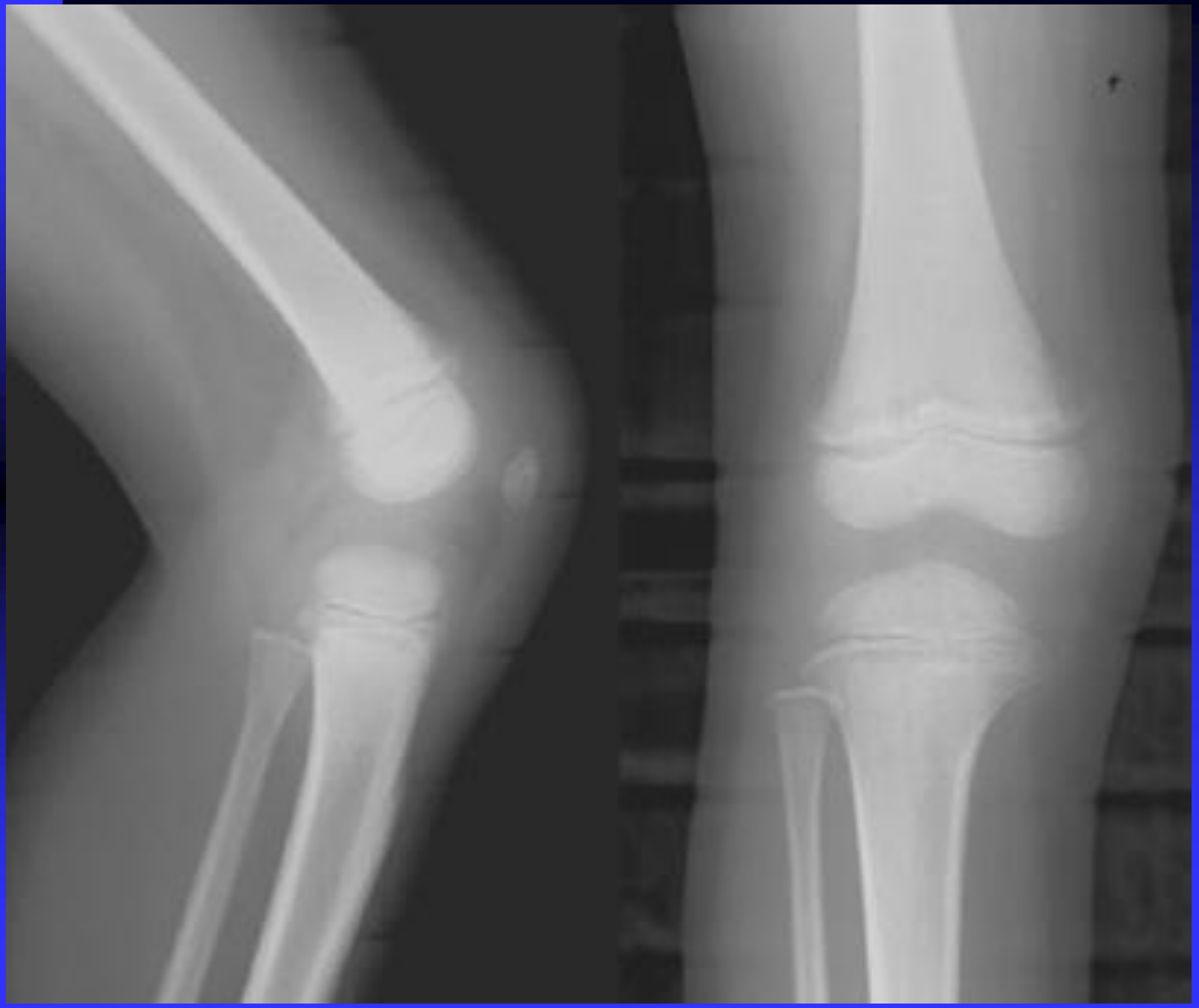
Hx of fall 2 days. X-rays Rt knee -- N.

Dx: simple contusion.

Back after 2 weeks with no improvement

The pain was more localized in medial tibial plateau

No fever ,WBC,CRP were normal, as were the new x-rays



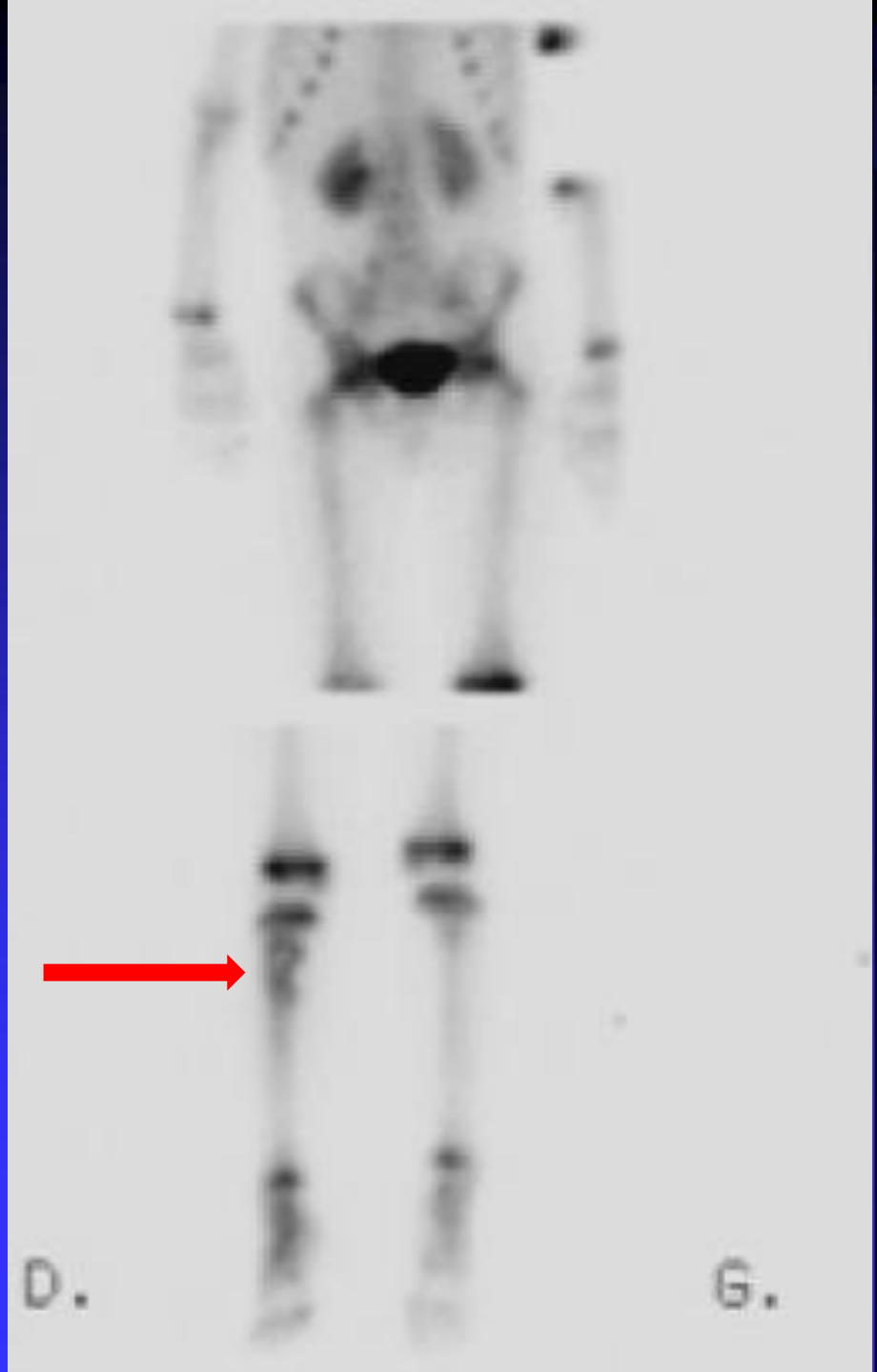
An ultrasound of the knee -- a small collection at the posterior side of the lateral tibial plateau appeared hypoechogenic.

MRI revealed a slight hypersignal in the periphery, suggesting a subperiosteal collection in upper right tibial cortex

The bone biopsy demonstrated no acute inflammation or tumoral lesion


Pos: 15 mm


RE


D.
G.

2 weeks after being hospitalized

=Thrombocytopenia (136 g/l)

= Anemia(11.4 g/l)

= Neutropenia

= No circulating blast cells were visible.

Dx: Pre-B type ALL.

(**extramedullary diseases**)

Am J Hematol. 2010

Orthopaedics & Traumatology Surgery (2009)

Conclusion

= Is a chalange for the treating doctor.
= Might be simple or major problem.
= Careful history and physical exam.
= Basic investigations
= Septic arthritis Dx
= Follow the basic D.Dx.
= Team approach in Odd cases