

**PEDIATRIC**

**HIP**

**Disorders**



**LEGG-CALVE-  
PERTHES  
DISEASE  
(LCPD)**

? idiopathic AVN of the femoral head in a growing child.

? 5x more in males  
.presents between 4 and 8 years of age.

? Occurs bilaterally in 10-12% of cases

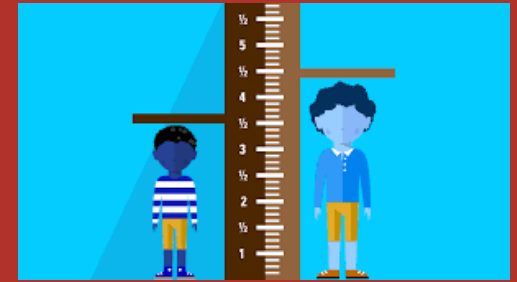
# ETIOLOGY

- ? Unknown
- ? Idiopathic : Disruption of the vascularity of the capital femoral epiphyseas
- ? Secondary :
  - ? Thrombophilia ? in 50% of children w/ LCPD
  - ? Coagulopathy ( factor C,S deficit haemophilia )
    - ? in 75% of pts
  - ? Passive smoking or microtrauma
    - ? affects fibrinolysis

Steroid

# RISK FACTORS (SUSCEPTIBLE CHILD)

- ? Male gender ? 80%
- ? Low social status
- ? Short with delayed bone age (familial cases 10%)
- ? The child is often thin, very active, and smaller than other kids his age
- ? Passive smoking



# PRESENTATION

? Age 4-9

Patient ranging from a painless limp to painful .

If pain present : pain in the anterior thigh , groin , referred to the knee ( like SCFE)

Pain tends to be worsened by activity and relieved by rest

In general : Children aged 4–9 years with asymptomatic limp or symptomatic synovitis lasting longer than 10 days should raise suspicion of LCPD and warrant investigation.



# PHYSICAL EXAMINATION

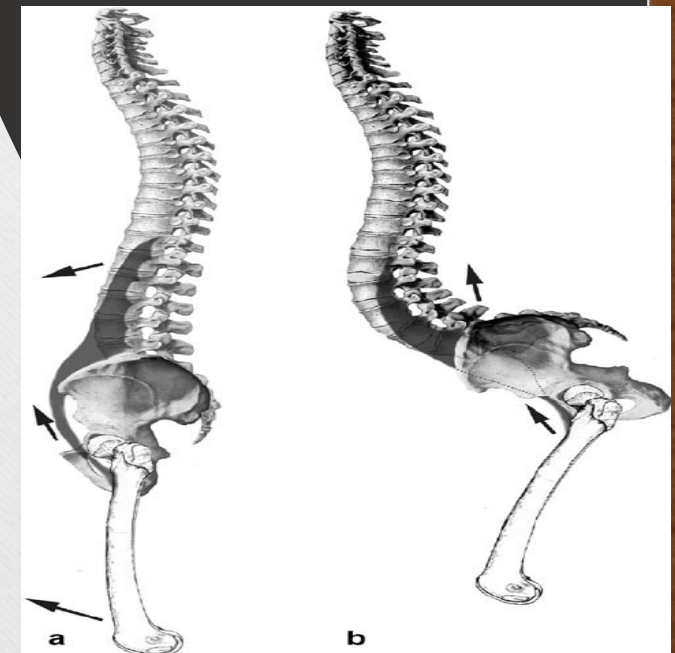
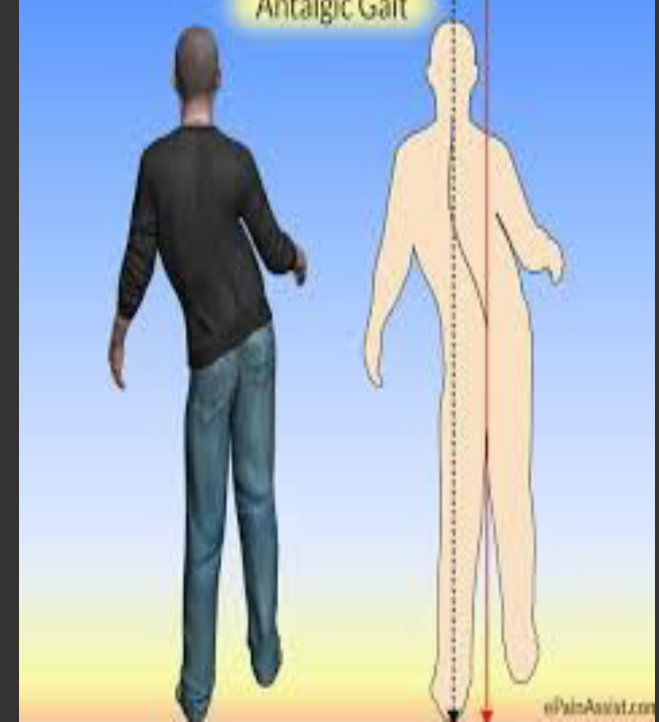
\* hip pain with passive range of motion - including log-roll of leg

\* Abnormal gait  antalgic

\* Decreased abduction and internal rotation range of motion

• hip flexion contracture may be seen in cases of **long-standing disease**

\* Prolonged disease leads to loss of epiphyseal height and proximal femoral deformity resulting in weakening of musculature around the hip. It can present with **Trendelenburg** gait and **leg-length discrepancy**.



# DIAGNOSTIC TESTS: X-RAY

- On AP and Frog Leg View

- **Early** :

- -widening of the joint space
- -Smaller , denser epiphysis
- -Crescent sign : subchondral fracture
- Lateral subluxation

- **Late** :

- -Flattening of femoral head / enlargement





# RADIOGRAPHIC STAGING → “WALDENSTORM”

**Initial stage** – describes the first 3–6 months of the disease, which may be clinically and radiographically silent. If radiographic changes are present, they include medial joint space widening and a small, sclerotic epiphysis with increased density in the ossify nucleus (**necrosis?** initial, avascular necrosis; 6M

**2 - Stage II: Fragmentation** ?  
revascularization and new bone formation ; 6

**3 - Stage III: REOssification** ? healing: 18M

**4 - Stage IV: Final Stage** ? healing  
“remodeling” 3Y

**Fragmentation – this stage is present from approximately 6–12 months and is often associated with clinical symptoms.**

**Necrotic bone is irregularly resorbed and replaced with vascular fibrous tissue as revascularization begins.**

**Radiographically the epiphysis demonstrates fragmentation with alternating areas of sclerosis and fibrosis and it may begin to collapse in height**

**It may show subchondral leucency ( crescent sign ) due to stress fracture**

**Reossification – begins at around 12 months and 19 lasts for up to 18 months. During this time reossification of the nucleus begins peripherally and progresses centrally as necrotic bone is fully removed.**

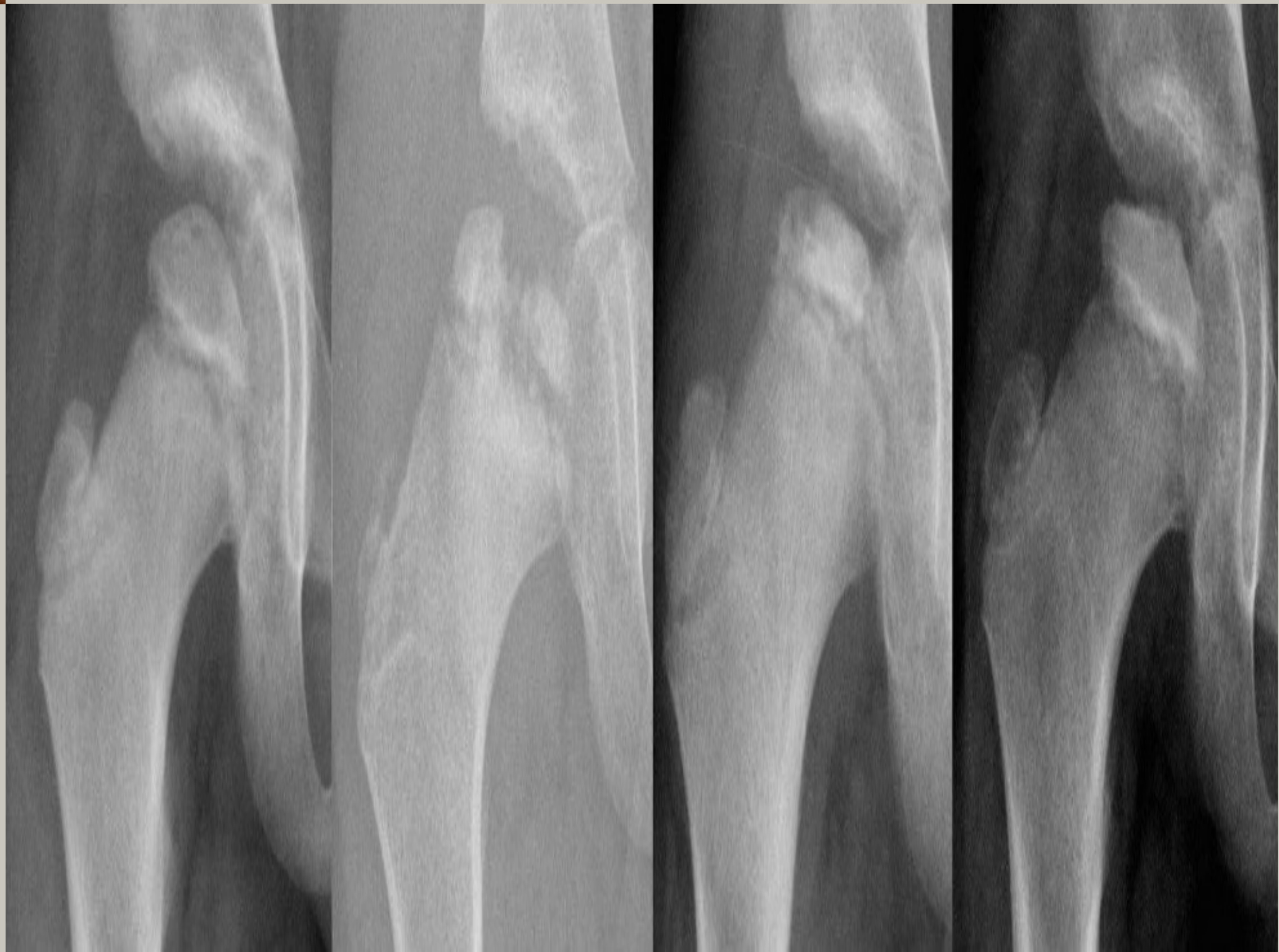
**Gradually the epiphysis regains normal strength and density**

***Remodeling*** – begins once the ossify nucleus is

completely reossified and continues until skeletal

maturity. Trabecular pattern is reformed throughout

epiphysis although the femoral head may remain flattened and ovoid or may return to normal.

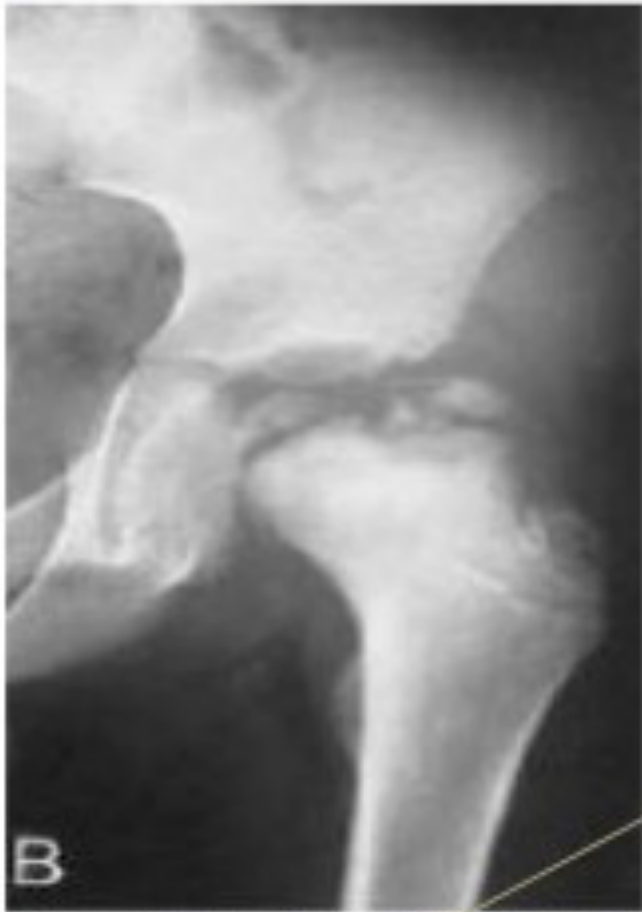


- STAGE I



- Due to initial compression and fractures the epiphysis progressively breaks and flattens up.
- There is widening of joint space too.

- STAGE II



- STAGE III

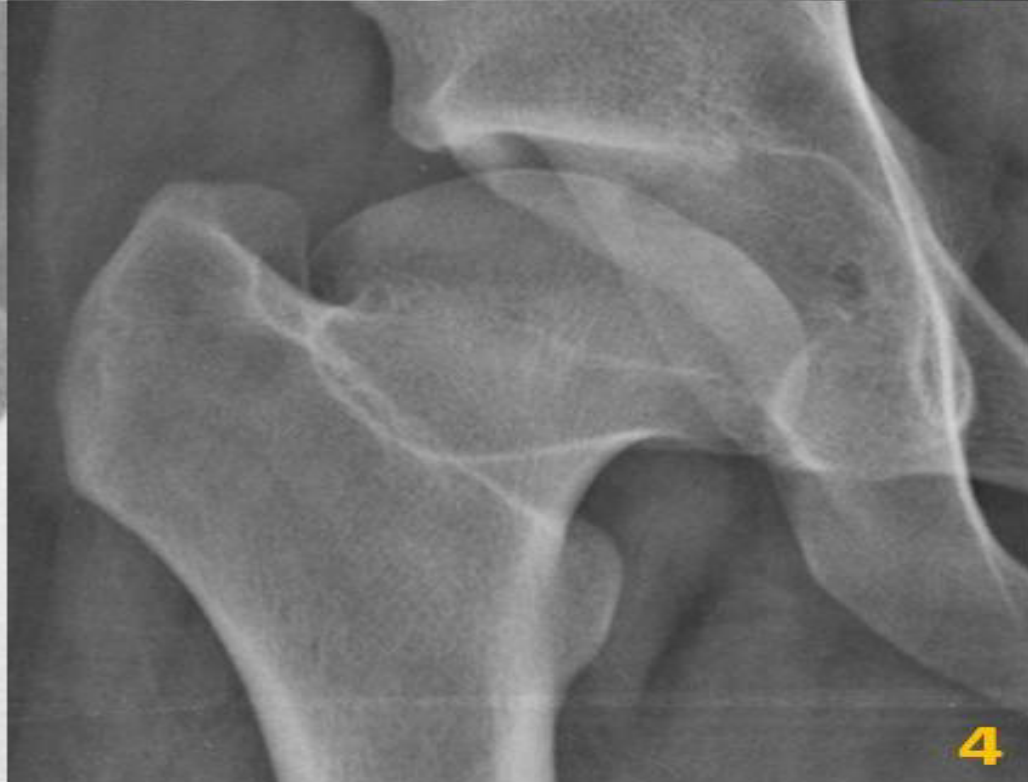


- As repair occurs the reformed head reappears which is flattened. Note the radiolucent metaphyseal cysts and broad, short femoral neck

- STAGE IV



- It's the end stage deformity, in which the head appears enlarged (coxa magna).
- There is gross flattening of head (coxa plana or mushroom deformity).
- A sagging rope sign can be seen (arrow).







## LATE X-RAY FINDINGS

- ❑ Coxa magna ❑  
asymmetric,  
circumferential  
enlargement and  
deformation of the  
femoral head and neck
- ❑ Sagging rope sign ❑  
Sclerotic line running  
horizontally across the  
femoral neck
- ❑ Flat femoral head
- ❑ Irregular articular  
surface



# OTHER IMAGING STUDIES

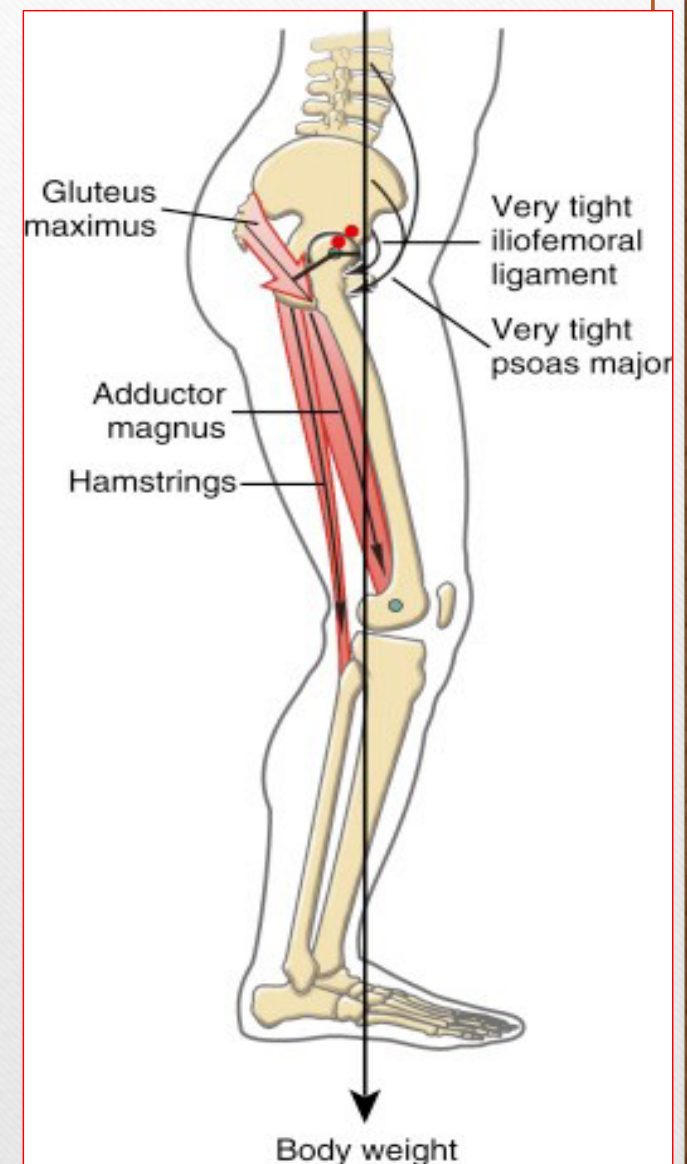
1. **Bone scan**: cold lesions >> decreased blood flow>> earliest sign in LCPD
2. **MRI** ? not routinely used, but may show areas of decreased signal intensity in the femoral head
- 3: **Arthrography**: used at the time of surgery to determine the degree of correction needed

# CATTERALL "HEAD AT RISK" SIGNS:

Associated with deterioration of shape of femoral head :

Progressive loss of hip motion, especially **abduction**

- ? Fixed flexion deformity and adduction deformities of the hip
- ? Obese child
- ? Older age



## **Head at risk signs :**

**1- gage sign** : V shape radiolucent defect in lateral side of epiphysis

**2- calcification lateral to epiphysis** : due to thick and extruded epiphysis

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**3- lateral subluxation**

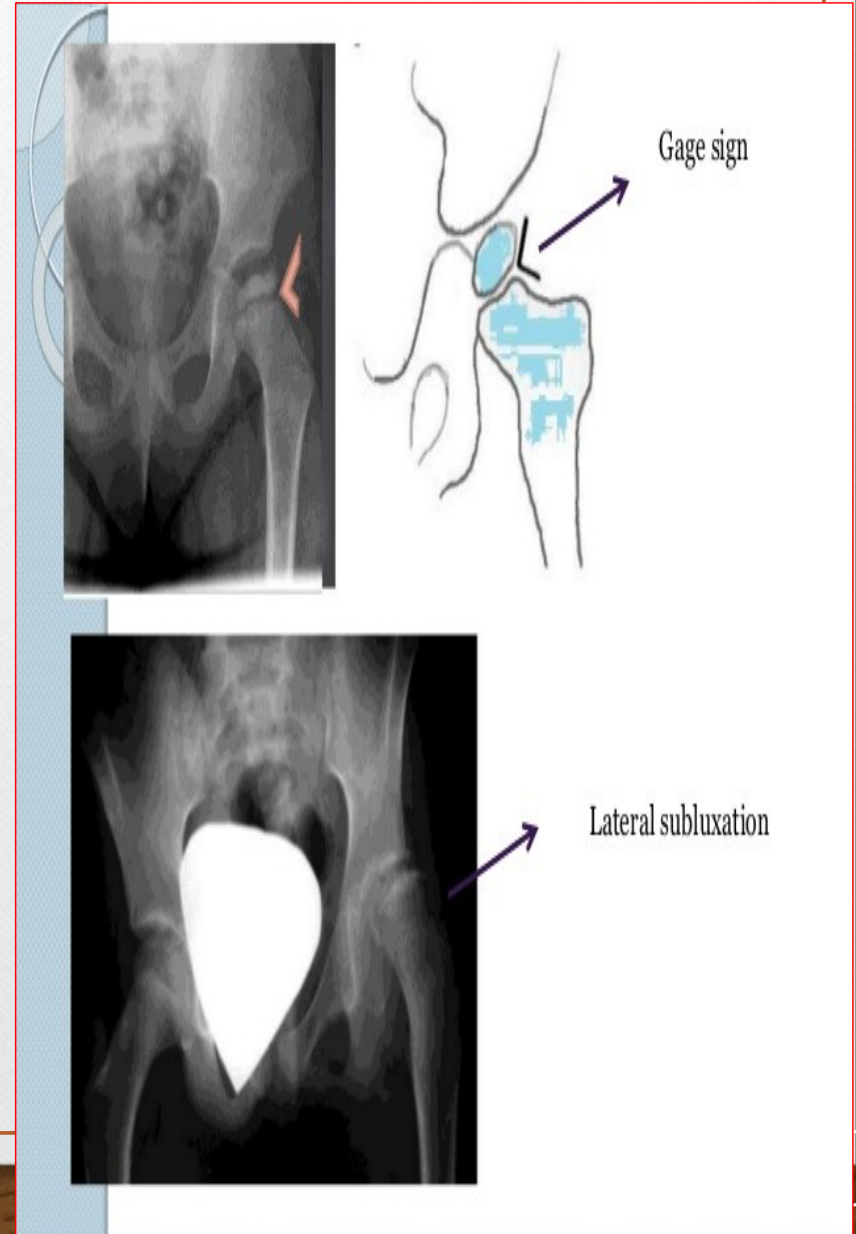
**4- horizontal growth plate**

**5- metaphysical lesion**

# RADIOGRAPHIC SIGNS INDICATING A MORE SEVERE DISEASE COURSE



Head-at-risk signs Extrusion (red arrow), metaphyseal reaction (yellow arrow), and lateral rarification or Gage sign (white arrow)



Gage sign

Lateral subluxation

# TREATMENT

? Conservative is the mainstay of management ? 60% will not require surgery

? Patients with good prognosis will not usually require surgery:

i. Herring group A at any age group ( lateral pillar is at full high )

ii. <6 years at disease onset

iii. Male

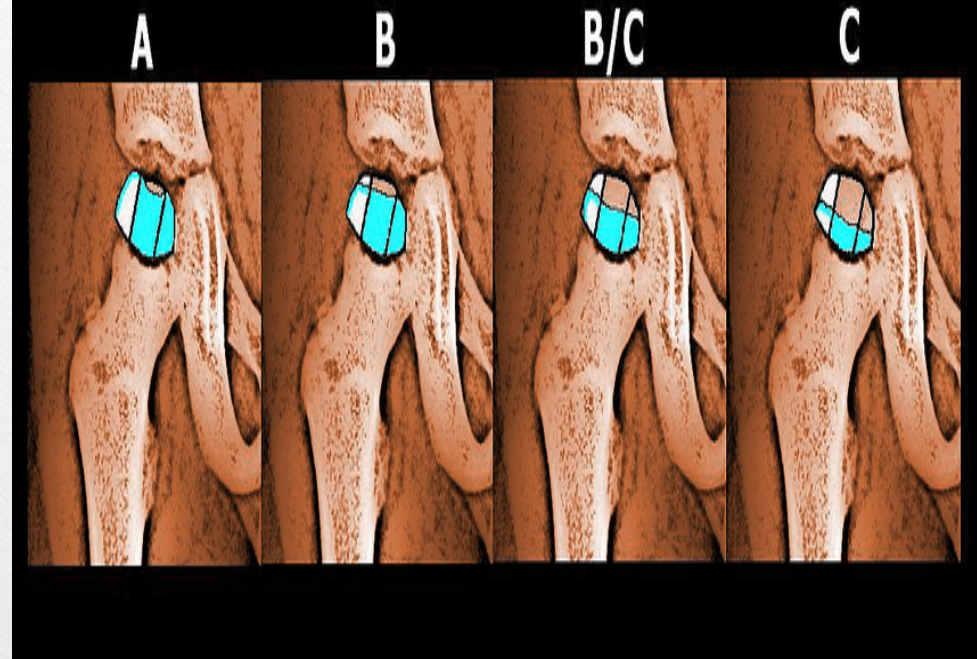
? Patients with bad prognosis will usually require surgery:

i. Herring B or C ( lateral pillar decrease high )

ii. older than 6 years at disease onset

iii. Female

## Lateral Pillar Classification



# TREATMENT

## ? Conservative:

- a. NSAIDS,
- b. Pain killers
- c. Physiotherapy

## ? Surgery: Containment treatment

4. Hip must be “containable” i.e relative full ROM with congruency between the femoral head and acetabulum
5. Salvage procedure: once the hip is no longer containable



# COMPLICATIONS

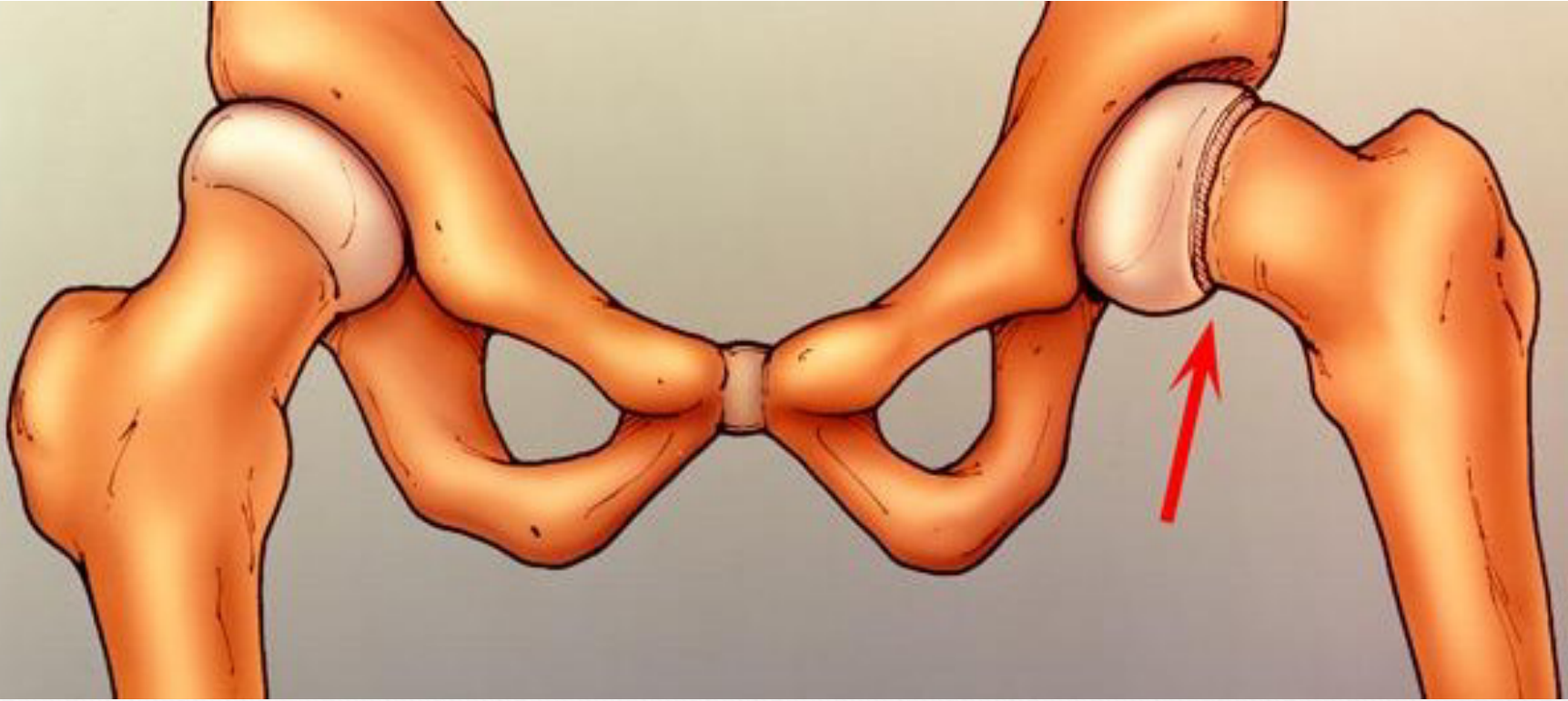
? **Most important prognostic factors: shape of the femoral head (coxa magna , coxa plana ) and its congruency and the age of onset**

? **Complications include:**

1. **premature physical arrest,**
2. **labral injury**
3. **Osteochondritis dissecans: cracks form in the articular cartilage and the underlying subchondral bone**
4. **Late osteoarthritis**



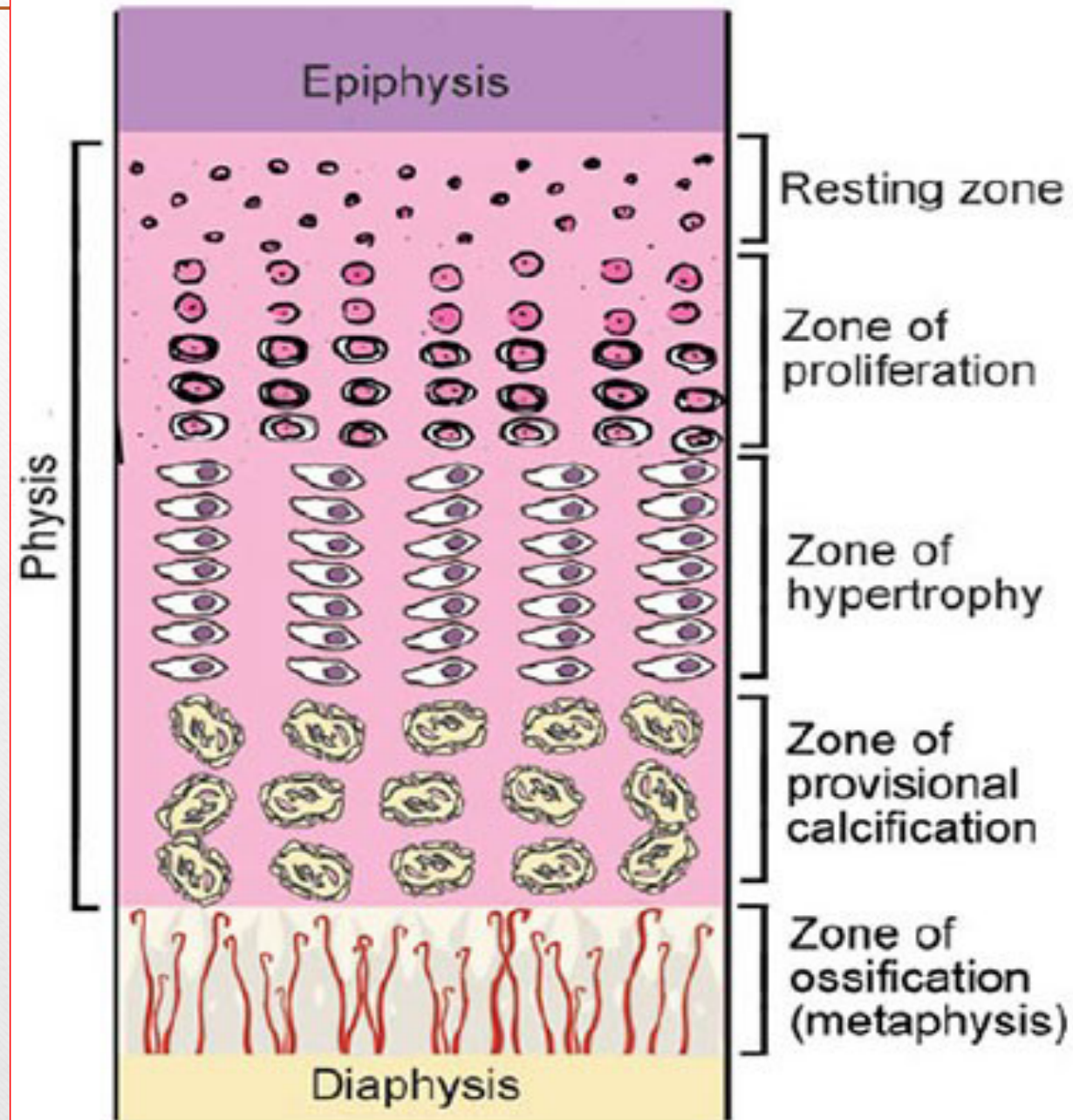




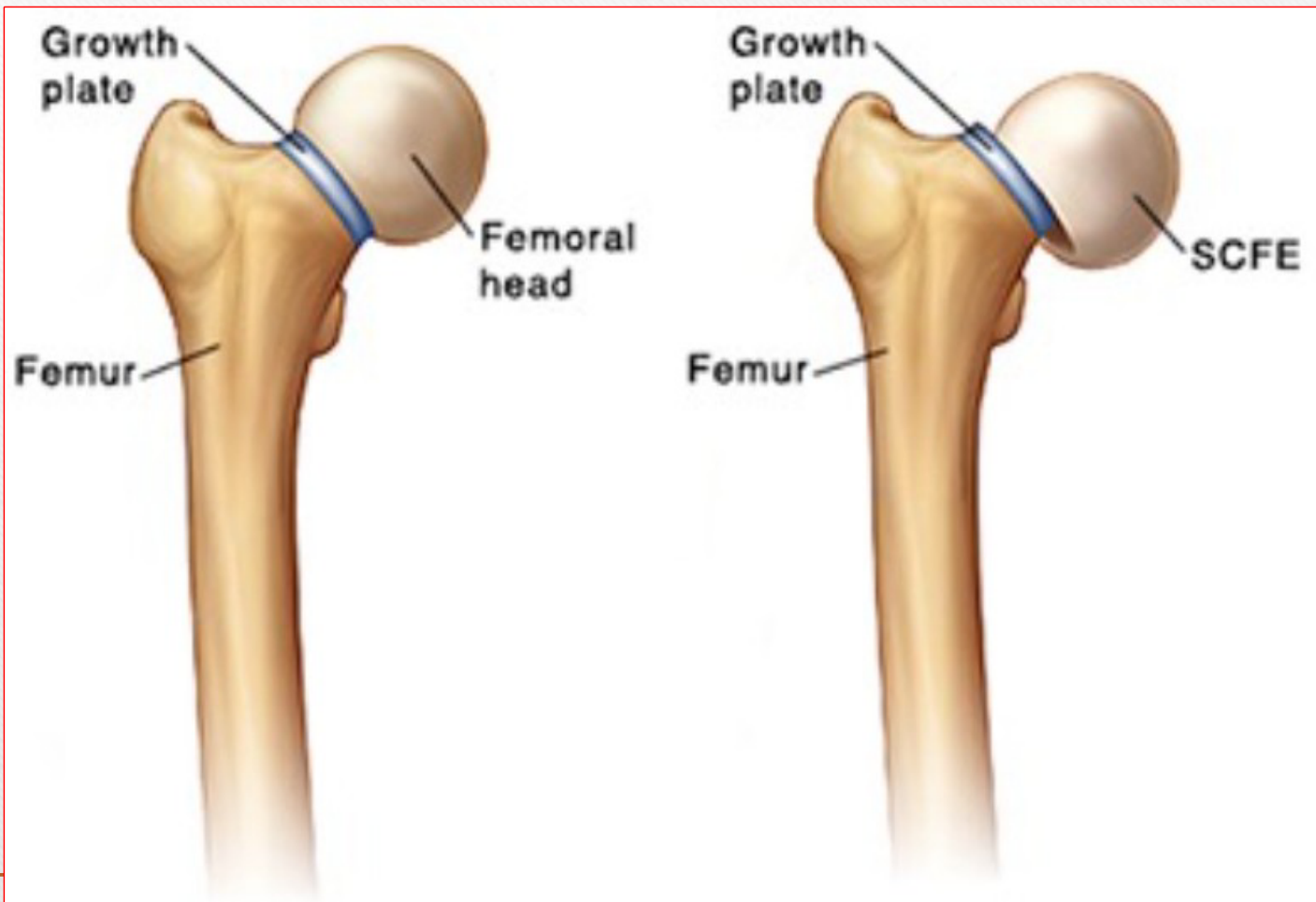
# SLIPPED CAPITAL FEMORAL EPIPHYSIS



**DISPLACEMENT  
THROUGH THE  
GROWTH PLATE,  
OF THE  
IMMATURE HIP  
OCCURS DURING  
THE RAPID  
GROWTH  
PERIOD IN THE  
HYPERTROPHIC  
ZON**



**THE FEMORAL HEAD REMAINS IN THE ACETABULUM  
THE FEMORAL NECK IS DISPLACED ANTERIORLY  
AND ROTATES EXTERNALLY**



# EPIDEMIOLOGY

Most  
common  
disorder of  
the hip in ado  
lescence

M>F ? (12-  
14 years)

80%  
unilateral

Obese hypo  
gonadal  
male OR  
excessively  
thin and tall

# ETIOLOGY & RF

? **Idiopathic** , but in general *anything that weakens the physis is a risk factor* such as:

1. **Endocrinopathies:** hypothyroidism, hypo+hyper parathyroidism, GH abnormalities hypogonadism

? Consider in pt <9 or >16 w/ retarded bone age or short stature ( atypical SCFE )

2-**systemic disease:** rheumatoid, radiation therapy to the pelvis

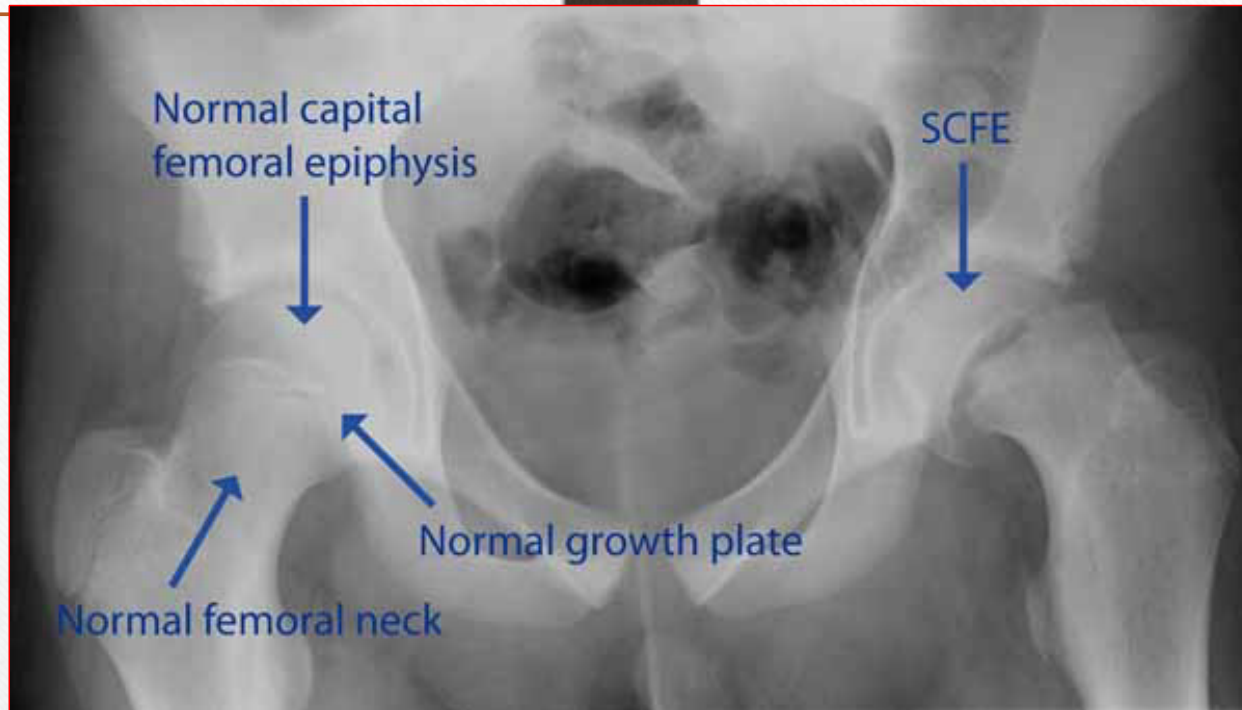
3- **mechanical factors:** overweight children

4- **family history**



# CLINICAL PRESENTATION

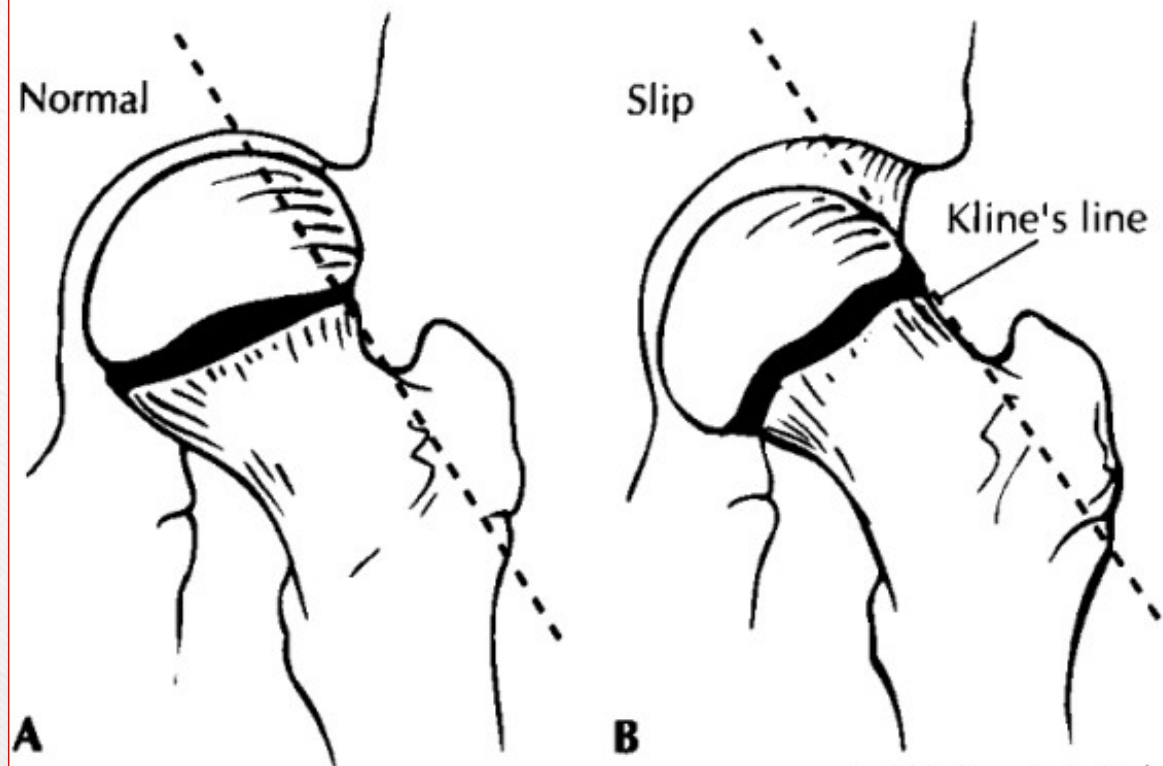
- 1- pain in the thigh, groin or knee ( with no trauma )
- 2- a leg that is shortened and held in external rotation
- 3- significant pain with hip range of motion including log-roll of the leg.
- 4 - Passive range of motion demonstrates limitations to abduction and internal rotation compared to the unaffected side
- 5- *antalgic or Trendelenburg gait*
- 6-*hip flexion often leads to obligate external rotation and abduction; this indicates a positive Drehmann's sign*



## DIAGNOSTIC TESTS

- ❓ X- ray: AP and frog leg lateral view:
- 1. Widening and irregularity of the physis “earliest sign”
- 2. Decreased epiphysis height ❓ slipped posteriorly
- 3. Klein line abnormality





**KLIEN LINE: A LINE FROM THE SUPERIOR BORDER OF THE FEMORAL NECK SHOULD INTERSECT WITH THE PROXIMAL FEMORAL EPIPHYSIS**





Abnormal  
Klein Line

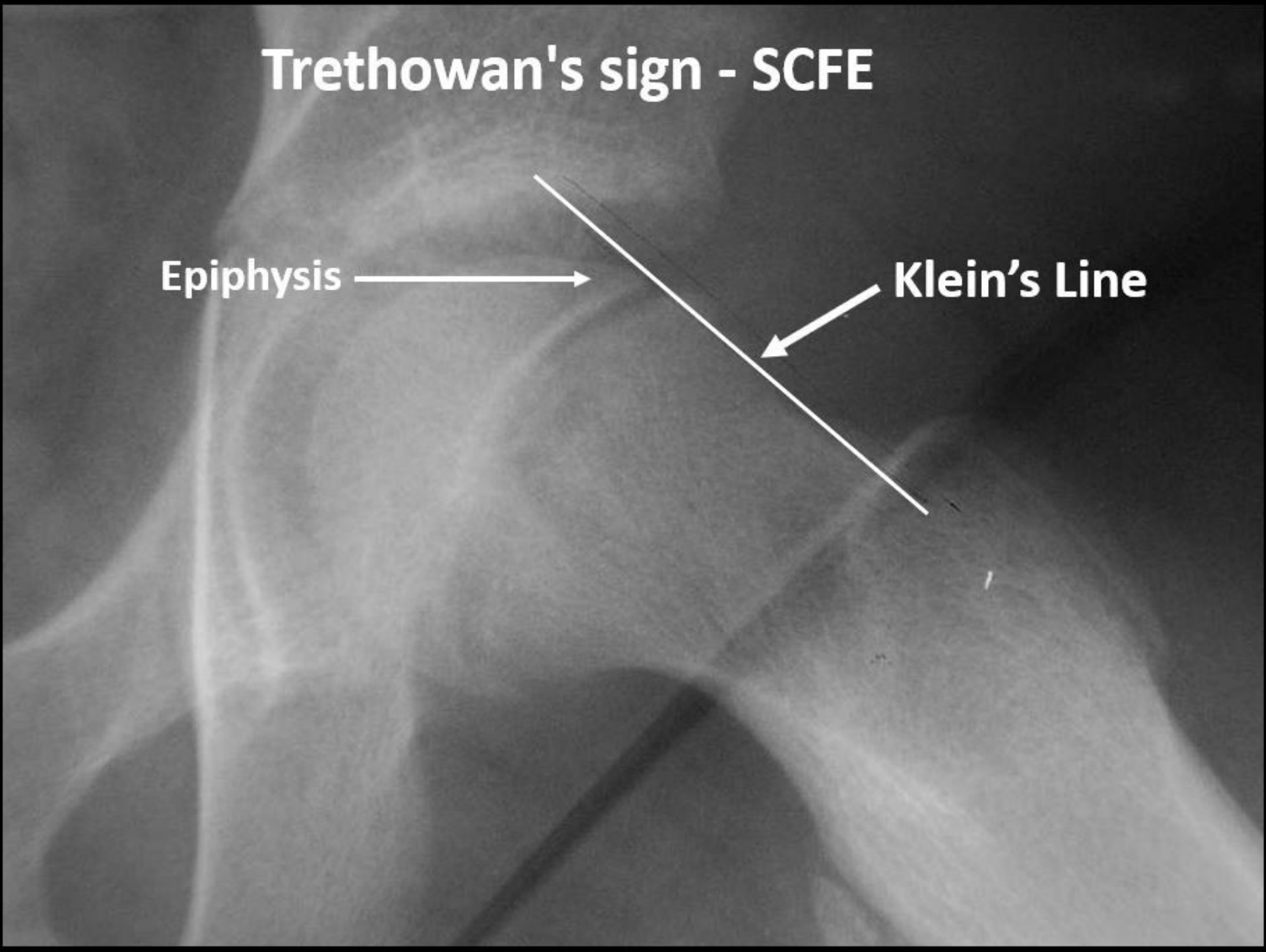
Normal  
Klein Line

# Trethowan's sign - SCFE

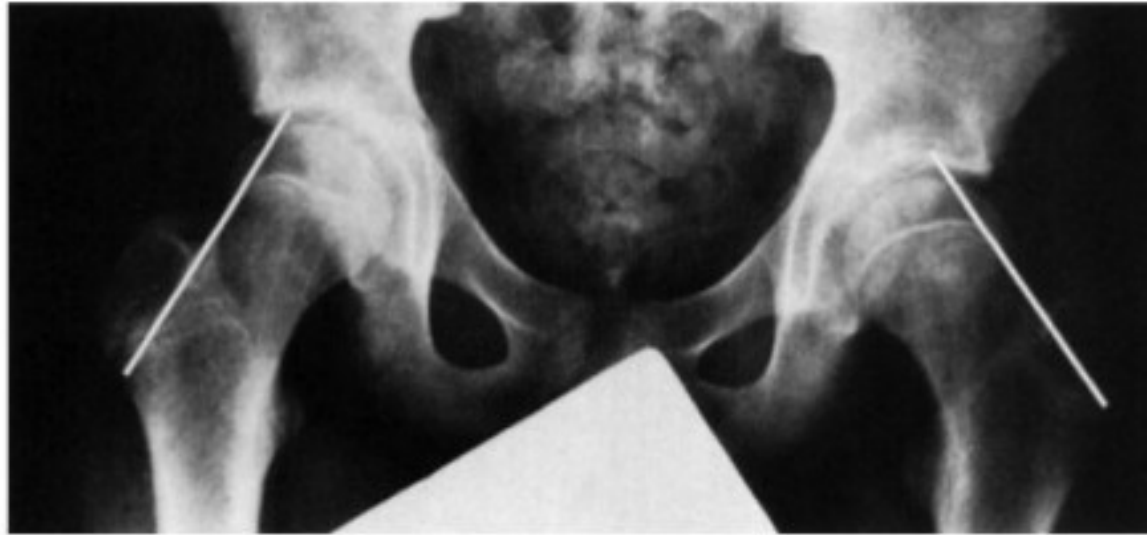
Epiphysis



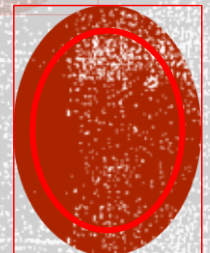
Klein's Line



## “blanch” sign



**METAPHYSEAL BLANCH SIGN(STEEL SIGN): INCREASED DENSITY IN THE METAPHYSIS DUE TO OVERLAPPING OF THE METAPHYSIS WITH THE DISPLACED EPIPHYSIS**



# LODER CLASSIFICATION

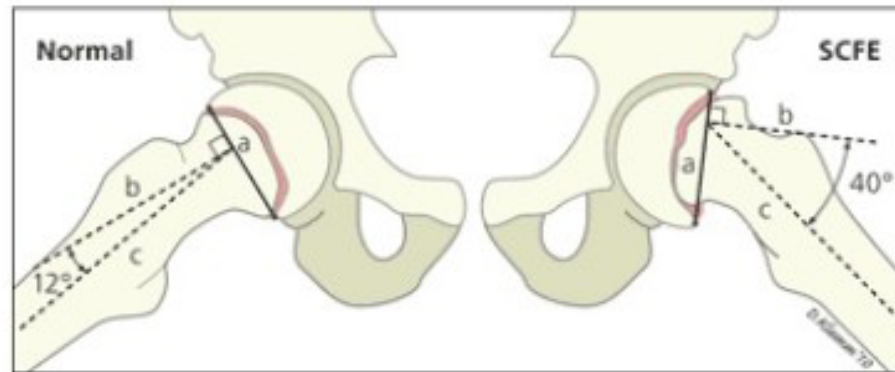
- ? Based on SCFE stability
- ? 85% are stable, pt can bear weight on involved limb
- ? In unstable:
  - ? sudden onset of pain, often after injury
  - ? Inability to walk or bear weight
  - ? External rotation of affected limb
  - ? Leg length discrepancy ? affected limb appears shorter

## Classification - Loder

	Stable	Unstable
Weight bearing	Possible	Impossible
Severity of slip	Less severe	More severe
Good prognosis	96%	47%
Avn	0%	50%

## Southwick Angle Classification

- Mild:  
 $< 30^\circ$
- Moderate:  
 $30^\circ - 60^\circ$
- Severe:  
 $> 60^\circ$

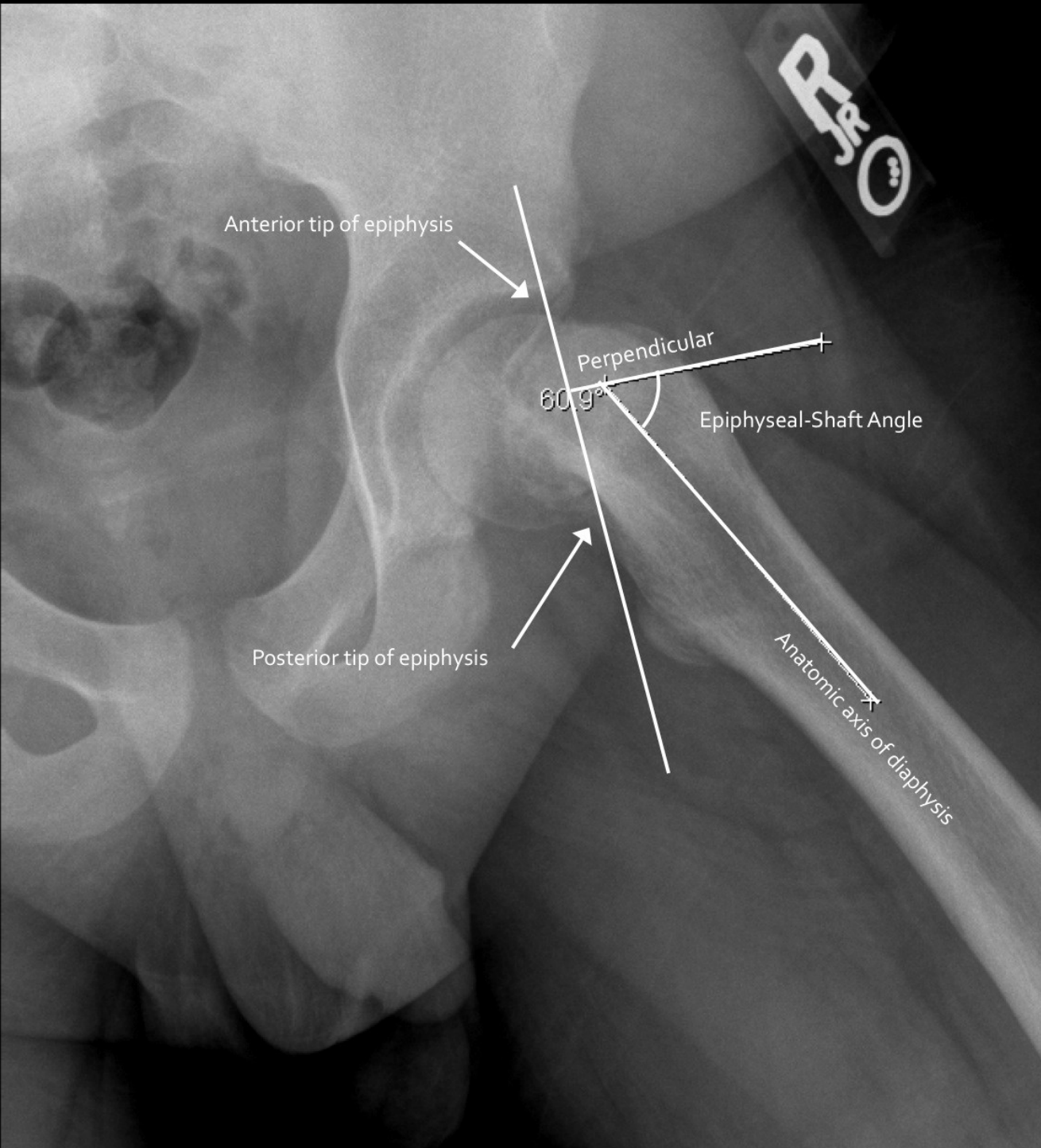


Head shaft angle  
In frog lateral view

## SOUTHWICK CLASSIFICATION: RADIOGRAPHIC

*measured on the frog-lateral view, the angle created by a line drawn perpendicular to the physis and a line parallel to the femoral shaft*

*☐ The angle is increased in SCFE*



### Epiphyseal-Shaft Angle

- aka: "Southwick slip angle"
- Measured on lateral radiograph
- The measurement of interest is the angle of the affected side subtracted from the normal contralateral side.
  - If contralateral SCFE exists, use 12 degrees as "normal"
- $<30^\circ$  = mild
- $30^\circ$ - $50^\circ$  = moderate
- $>50^\circ$  = severe

## TREATMENT



- ? The primary goal of treatment is *stabilization of the slip to prevent further progression* and promote physeal closure
- ? Surgery : in situ screw fixation is the preferred initial treatment of SCFE
- ? Stable: one screw , unstable consider '2



# COMPLICATIONS

## ? Osteonecrosis ?

i. 50% risk in unstable,

? Femoral growth arrest due to premature closure

? rotational deformity

? **Early onset OA and Chondrolysis** ? due to pin penetration of the joint and multiple screw fixations, especially if not recognized and corrected during surgery





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***Thank you***

***Sara Mohammad abo fara***