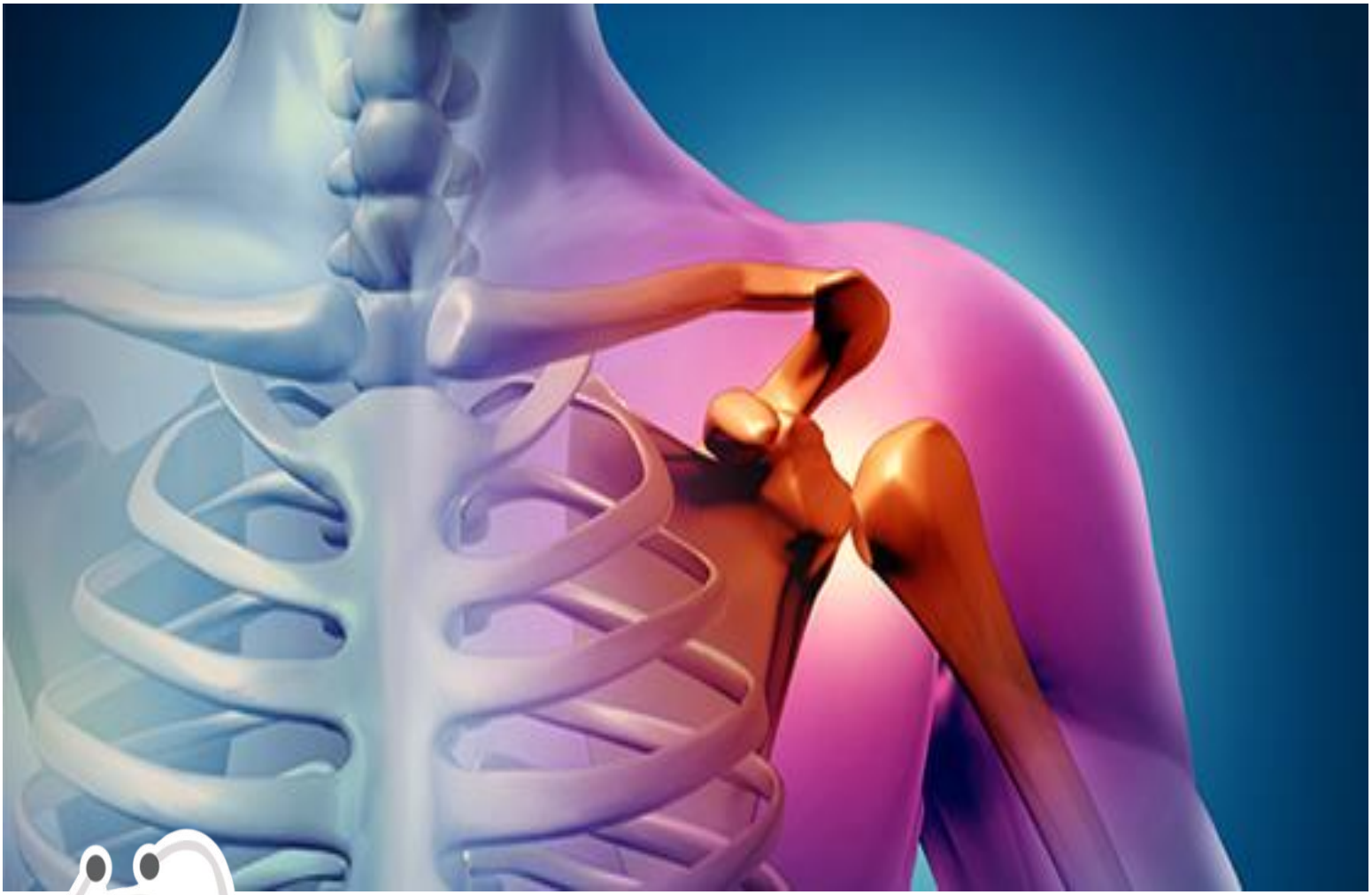
Orthopedics

13 Common Pediatric Hip Problems



1st Edition:

Done By: Abdullah Alhuzaimi (A1)

Revised by: Abdulmehsen Alhusinan (A1)

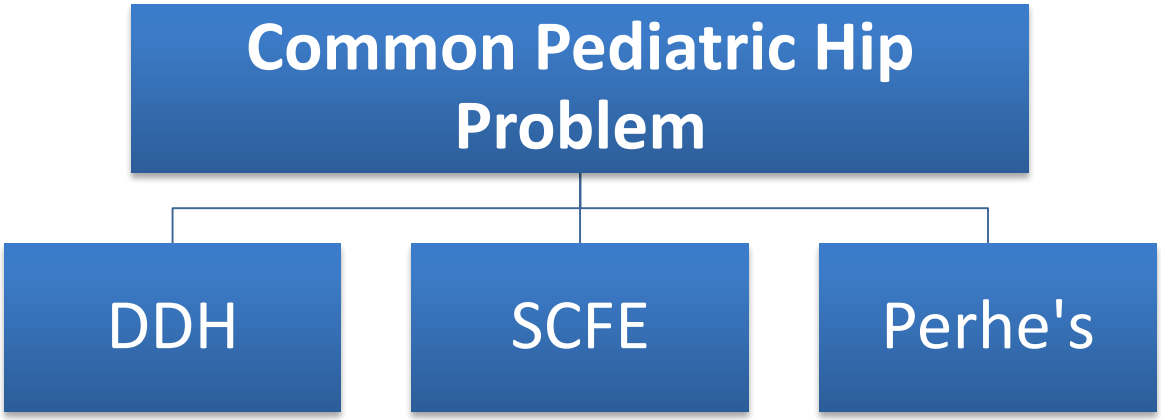
2nd Edition: AlAnoud AlZamil (F1)

Color Code:	Slides	Doctor's Notes	Team Notes	Important
	431 team work	Arabic Words	Books' notes	Other Sources

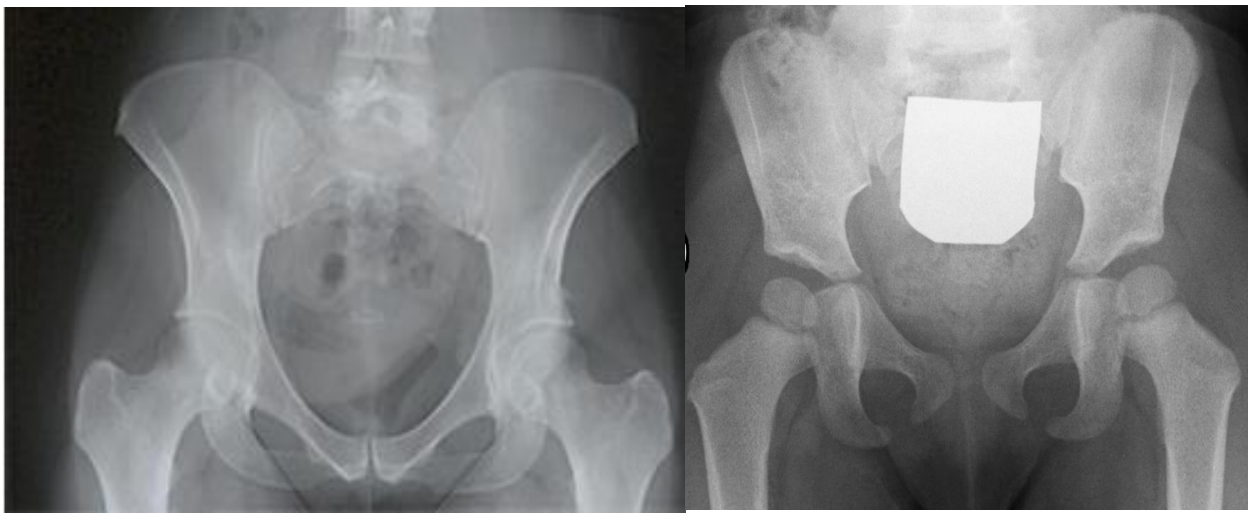
Objectives:

Not Given

Mind Map



Normal pelvis:



Pediatric hip dislocation:

- Types:
  - Idiopathic → isolated pathology
  - Teratologic:
    - Neurologic → as: patient with C.P or MMC
    - Muscular → as: Arthrogryposis
    - Syndromatic → as: Larsen syndrome
  - Miscellaneous:
    - Complication to hip septic arthritis
    - Traumatic
    - Note → delivery in its self (OBGY Dr.) does not dislocate a hip
    - DDH → occurs in the 3ed trimester
    - Teratologic → usually in the 1st trimester

1- Developmental Dysplasia of the Hip (DDH):

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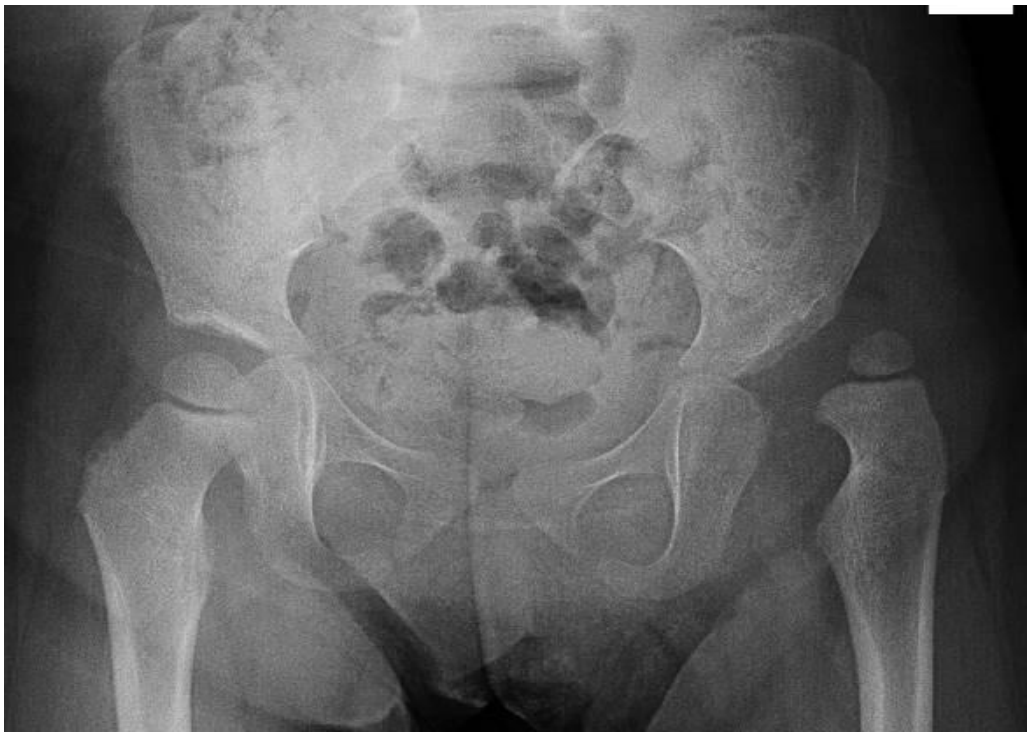
Normal hip dislocated hip



Note:

- The head of femur is not articulating/attached to the acetabulum
- The acetabulum is shallow (dysplastic acetabulum) not curved (cannot hold the head)
- DDH is not due to an injury during delivery (not congenital

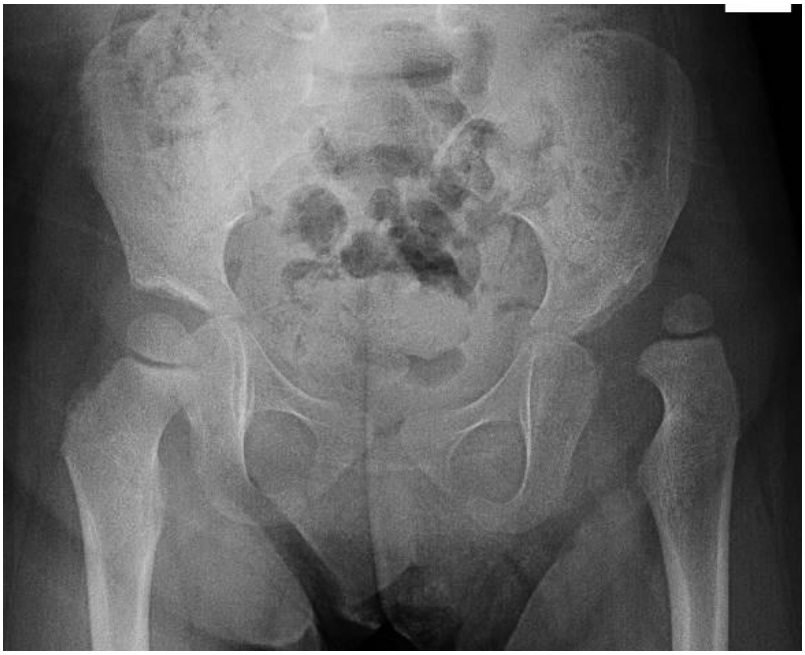
(What is DDH: the relationship between the acetabulum and the head of femur NOT like the SCFE epiphysis and the neck of femur).

Nomenclature

- CDH : Congenital Dislocation of the Hip (this is the old name)
- DDH : Developmental Dysplasia of the Hip

Patterns of disease:

- Dislocated
- Dislocatable high risk of dislocation (Femoral head goes in & out while the child is walking >> Thus, the child will be at high)
- Sublaxated Partial contact between the articular surfaces
- Acetabular dysplasia.



Shallow acetabulum.

Causes: Multi focal – unknown-

- Hormonal
  - Relaxin is secreted during the 3rd trimester to relax the Sacroiliac joint & symphysis pubis leading to enlargement of the pelvis. However, a Female fetus also has Receptors to relaxin>> this will lead to widening of the hip joint capsule>> pushing femoral head up & thus, it is more common in girls than in boys!
  - oxytocin
- Familial
  - Lig.laxity diseases
- Genetics
  - Female 4-6 X male -- twins 40%

- Mechanical causes
  - Pre natal: Breach , oligohydrominus , primigravida , twins (torticollis , metatarsus adductus)
  - Post natal: Swaddling , strapping

Note:

- ❖ Breach: the fetus should be caudal in position and the legs should be cephalic in position any other position is called breach (renders the place tight).
- ❖ Oligohydrominus: little amionatic fluid.
- ❖ Primigravida: first pregnancy.
- ❖ Twin.
- ❖ Torticollis: a twisted neck in which the head is tipped in on side. When you find Torticollis you need to check the hip, femur and foot deformity and neck deformity.
  - Metatarsus adductus : foot deformity
  - Swaddling , strapping : induce adduction of the hip (risk of dislocation) **How to Diagnose?** *History (Risk Factors): [You must ask all when taking history!]

- Infants at Risk :
  - Parents who are relatives (consanguinity)
  - Positive family history: 10X
  - 1st child
  - Breach presentation: 5-10 X
  - Oligohydrominus
  - Twins: 40%
  - A baby girl: 4-6 X
  - Torticollis: CDH in 10-20% of cases
  - Foot deformities:
    Calcaneo-valgus
    Metatarsus adductus
  - Knee deformities:
    hyperextension and dislocation

When risk factors are present, the infant should be reviewed:
– Clinically
– radiologically

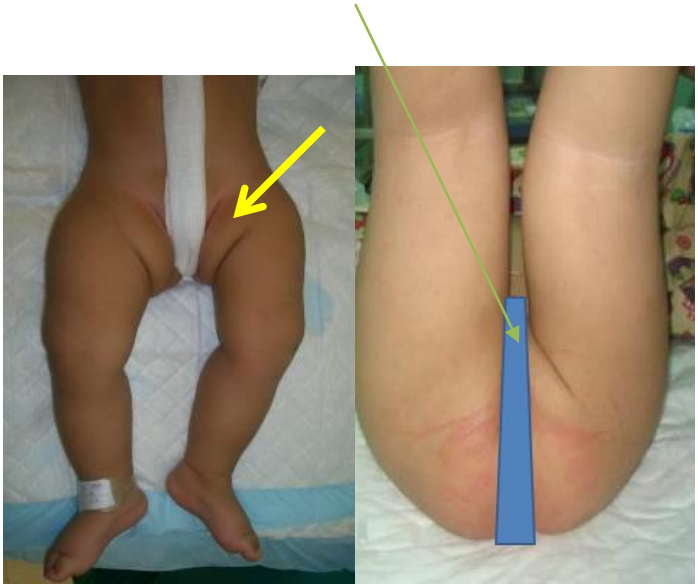
Clinical examination:

- The infant should be
  - Quiet NO pain
  - Comfortable

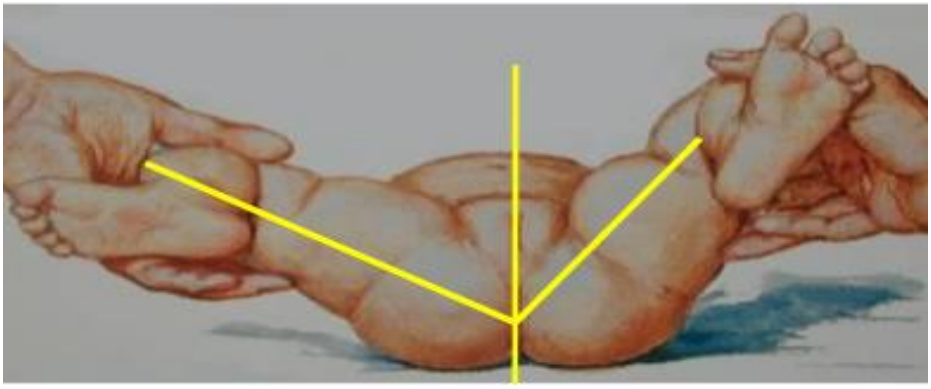
- Look:
  - External rotation
  - Lateralized contour
  - Shortening
  - Asymmetrical skin folds

Anterior - posterior

* most accurate way is to check the buttock creases. if it is asymmetrical it highly suggests DDH.



- Move– Limited abduction



- Special test (depending on the age):
  - Galiazzi sign
  - Ortolani, Barlow test → only till 4-6 m of age
  - Hamstring Stretch test
  - Trendelenburg sign → older comprehending child
  - Limping:
    - Unilateral → one sided limping
    - Bilateral → waddling gait (Trendelenburg gait)

1. Galiazzi:

- to assess for hip dislocation, primarily in order to test for developmental dysplasia of the hip. It is performed by flexing an infant's knees when they are lying down so that the feet touch the surface and the ankles touch the buttocks. If the knees are not level then the test is positive, indicating a potential congenital hip malformation

2. Ortolani , Barlow test:

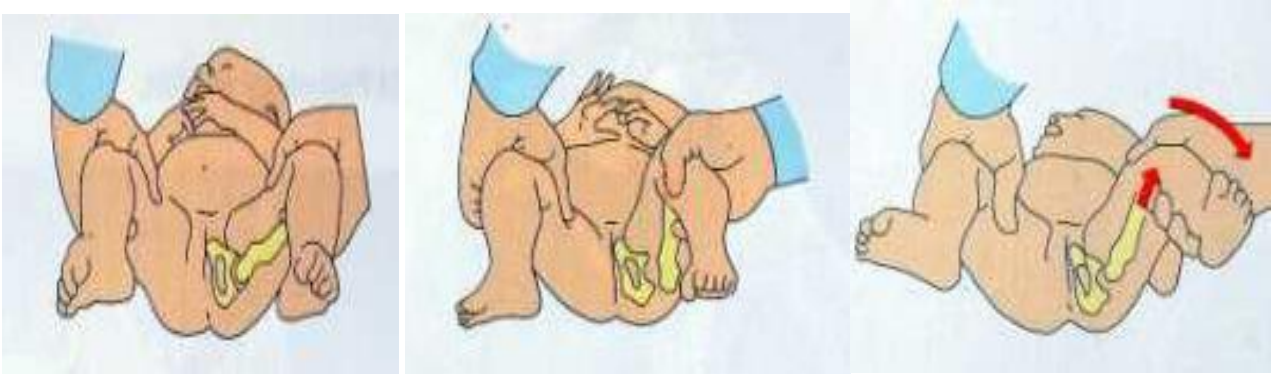
- Ortolani test:

  Pull and **abduct**

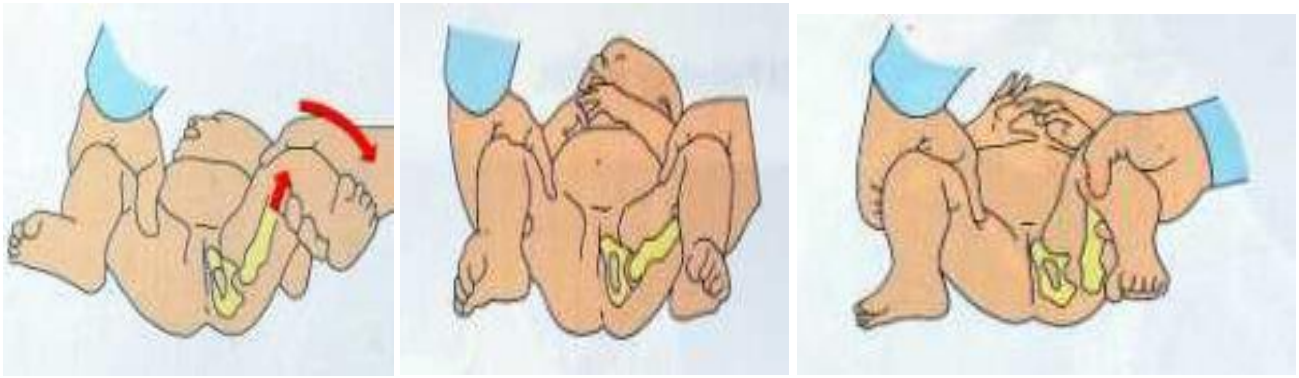
  A clunk will be felt after reduction. The hip will soon be dislocated again (not a treatment, just to diagnostic test for DDH)

  Cannot be done on dislocatable DDH Do barlow test.

  Forth acetabulum is risk after the baby start to walk



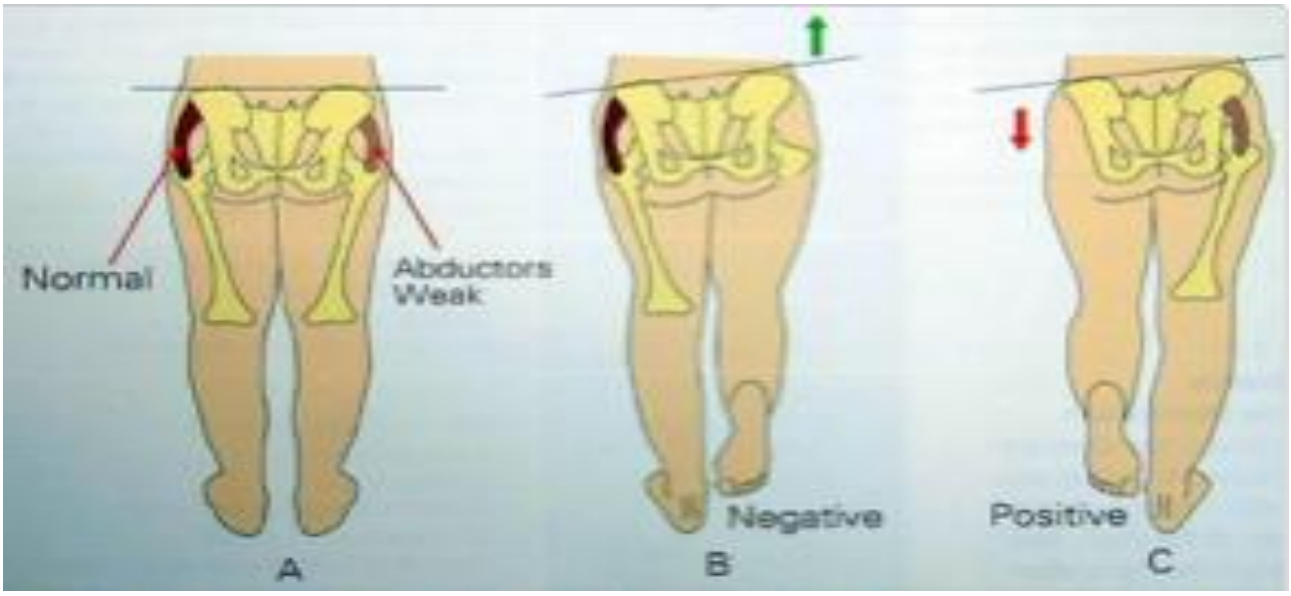
- Barlow test:



Pull and **adduct if the hip can be popped out of socket with this maneuver - the test is considered positive**

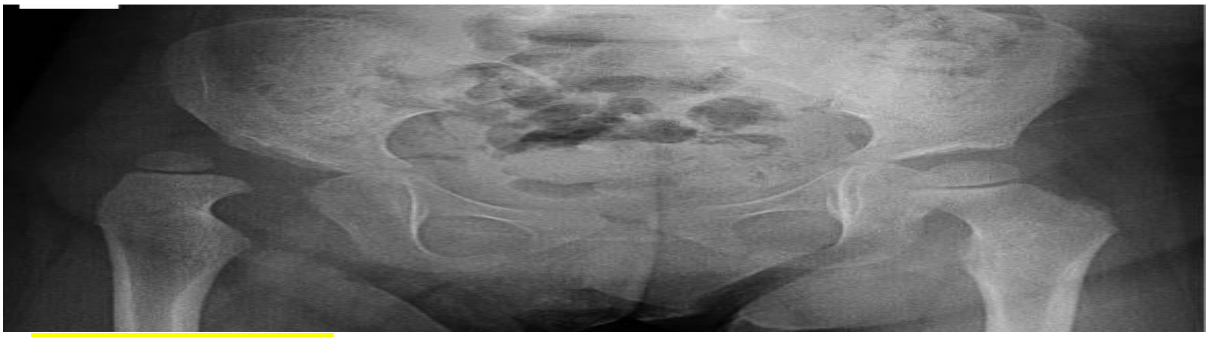
Trendelenburgh sign:

a physical examination finding associated with various hip abnormalities (those associated with abduction muscle weakness or hip pain for example, congenital dislocation, hip rheumatic arthritis, osteoarthritis) in which the pelvis sags on the side opposite the affected side during single leg stance on the affected side; during gait, compensation occurs by leaning the torso toward the involved side during stance phase on the affected extremity.



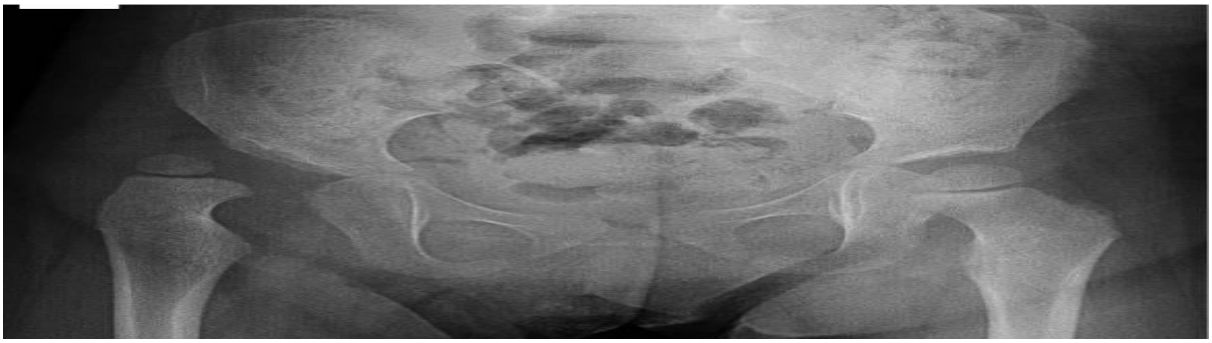
Investigations:

• 3 weeks t -3 months U/S : because most of the head and the neck are cartilage. We do it after 3 weeks to give time to the body to get rid of the relaxin hormone. it will be truly positive or truly negative



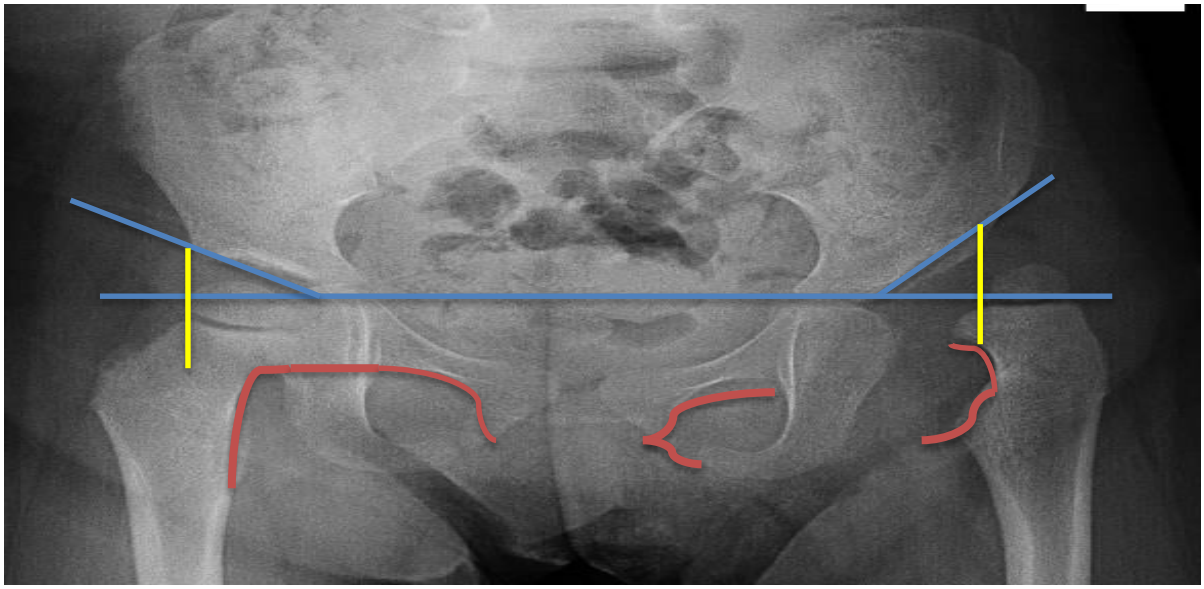
• > 3months X-ray pelvis AP + abduction

• After 6 months: reliable



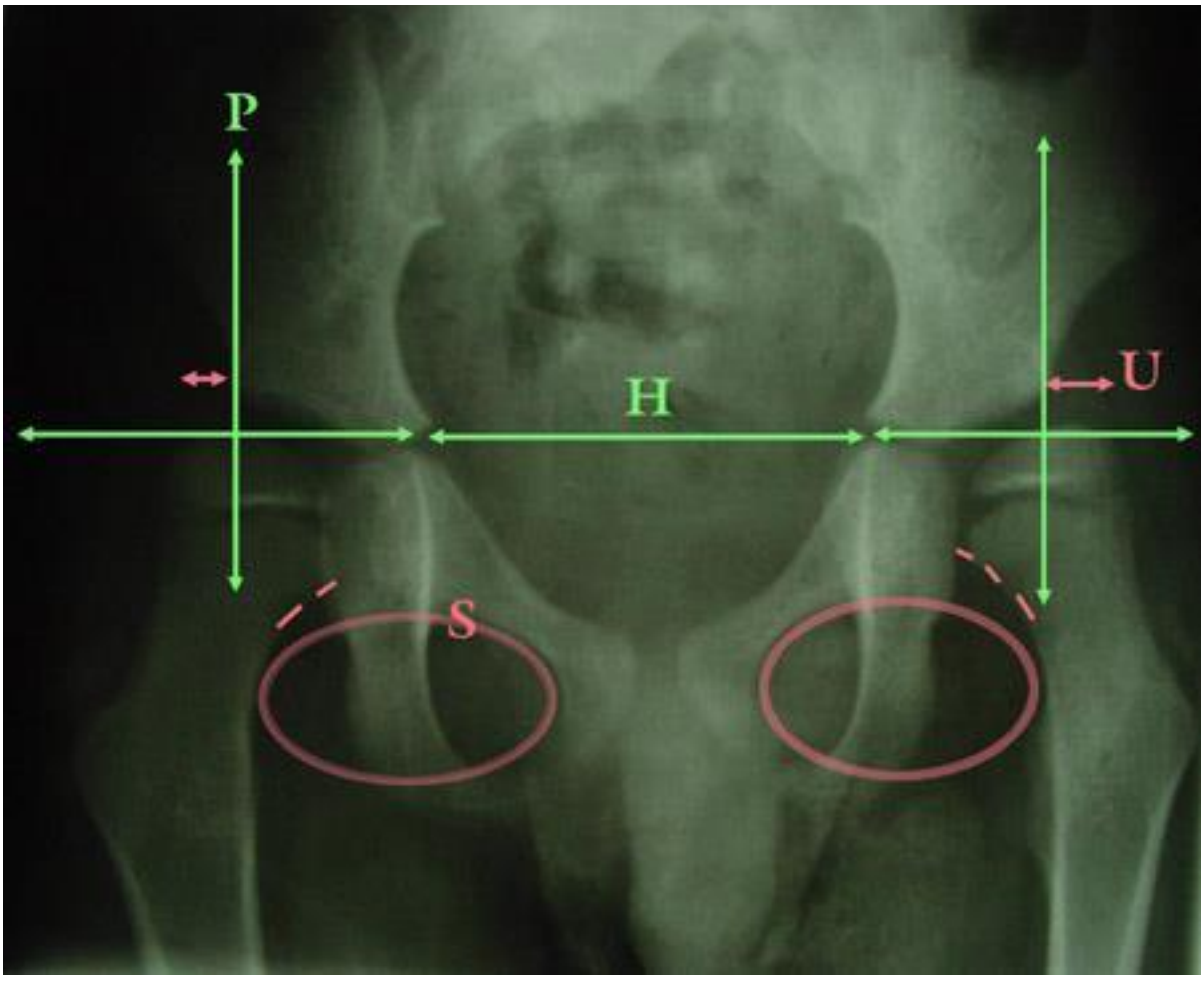
Radiology:

• After 6 months: reliable & ossification center normally appears (5-6m) of age, if delayed or did not appear it's one of the signs of DDH



Note :

- Red: shenton line (disrupted in DDH) – MOST IMP ONE -
- Blue: hilgenreiner's line (a horizontal line drawn between the two triradiate cartilage centers of the hips defines a horizontal planne and an approximation to flexion axis of the hips). Notice the angle marking the acetabulum.
- yellow: perkin's line : it drawns vertically and prependiculat to hilgenreiner's line starts at lateral acetabulum
- hilgenreiner's line + perkin's line form four quadrant. In normal limb, the head of femur is found in the bottom inner quadrant, unlike the affected limb, where the head is in the top outer quadrant.



H = a horizontal line drawn between the two triradiate cartilage centers of the hips defines a horizontal planne and an approximation to flexion axis of the hips. Hilgenreiner's Line

P = a perpendicular line to the horizontal line drawn at the edge of the boney part of the socket (there's more in cartilage that can't be seen). Perkin's Line

The center of the femoral head ought to be well within the lower inner quadrant of the drossing of those two lines.

S = an oval that traces the lower pubis contour, ought to smoothly continue on to trace the lower edge of the neck of the femur. Shenton's Line. In this case, Shenton's line is off and discloses that the femur is migrating upward as these shallow hip sockets do not satisfactorily contain the ball in the sockets.

U = uncovering. That's the amount of the femoral head that has no boney coverage.

Five signs of DDH:

- disrupted shenton's line
- wide acetabulum angel on hilgeniner's line
- head of femur located on the top outer quadrant when perkin's line is drawn
- shallow acetabulum
- ossification center/head of femur is smaller than the one in the other limb

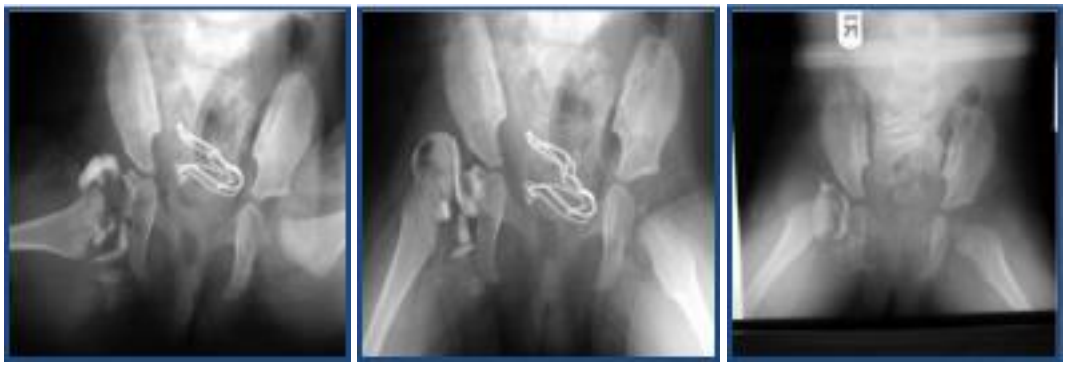
Management Aims:

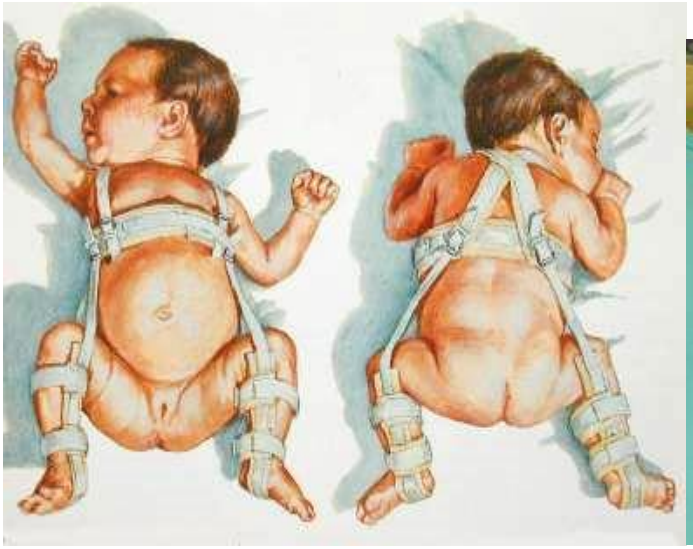
A concentrically, reduced, stable, painless, mobile hip joint.

- Obtain concentric reduction REDUCE
- Maintain concentric reduction STABELIZE
- In a non-traumatic fashion SAFELY
- Without disrupting the blood supply to femoral head
- **This is why** → Refer to pediatric orthopedic clinic

Treatment

- Method depends on age.
- The earlier started, the easier , better the results and non operative method
- Should be detected EARLY
- Could be surgical or non-surgical
- If not treated: OA. Stiffness. Pain. Limping. Spine problems. Difficult life





- Pavlik harness:

- hip spica

Palvik harness: maximum to start → 6m of age, if older use other method Is kept on for 6w continuous, then use a rigid abduction splint This is to achieve stable reduction It's a

NOTE : Abduction splint It's a rigid splint it is to maintain the reduction & wait for improvement of the acetabular cover to be < 30° & with concavity

Treatment: IMP

• **Birth – 6m:** In OPD: reduce + maintain with Pavlik harness or hip spica (H.S)

• **6-12 m:** GA + Closed reduction + maintain with hip spica + Open reduction if not return

• **12-18m:** GA + Open reduction + maintain with H.S 6w, then B.S cast for months

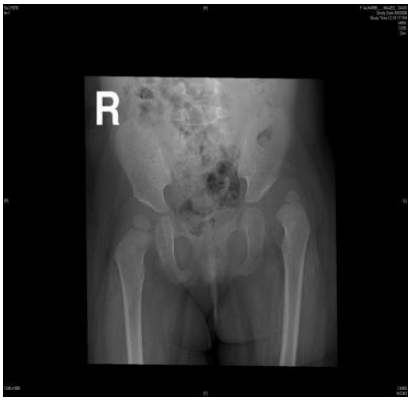
• **18 – 24 m:** GA + Open reduction + Acetabuloplasty + maintain with hip spica 6w, then B.S cast 6w

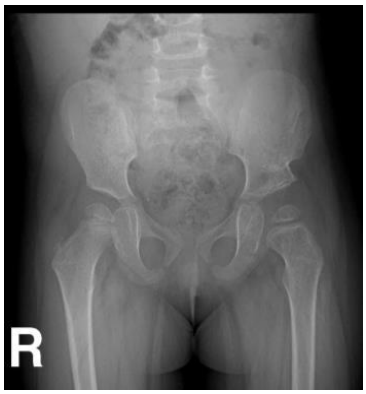
• **2-8 years:** GA + Open reduction + Acetabuloplasty + femoral shortening + H.S 6w, B.S 4-6w

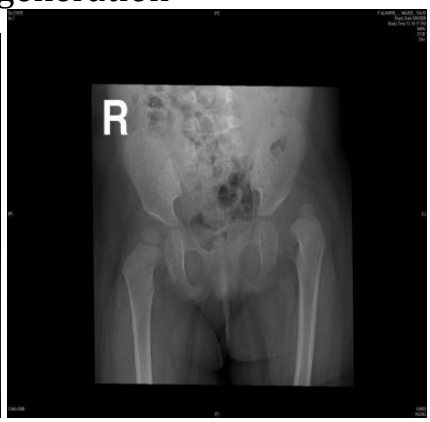
• **Above 8 years:** GA +Open reduction + Acetabuloplasty (advanced) + femoral shortening + H.S

Late complications if not treated:

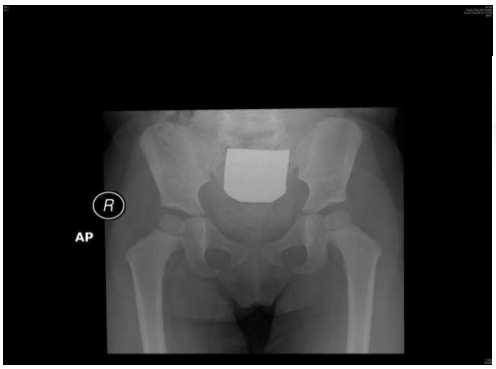
- Severe pain (hip area, back)
- Early hip arthritis
- LLD leg length discrepancy
- Pelvic inequality Early Lumbar spine degeneration

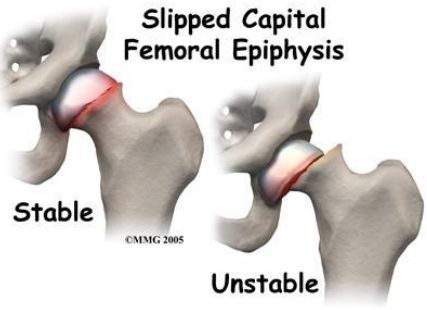






2- SCFE: Slipped Capital Femoral Epiphysis:





Where? at level of growth plate – Physis- (separating the epiphysis from the metaphysis.
it is Salter Harrison type 1 fracture (through the growth plate)
Why? Hormonal (hypothyroidism, low growth hormone and hypogonadism)? Metabolic (renal osteodystrophy)? Mechanical, obesity? Trauma (a minor trauma)? Unknown

Types:

1- Radiological :

-Acute → < 3w
-Chronic → > 3w, can see start of callus formation
-Acute on chronic

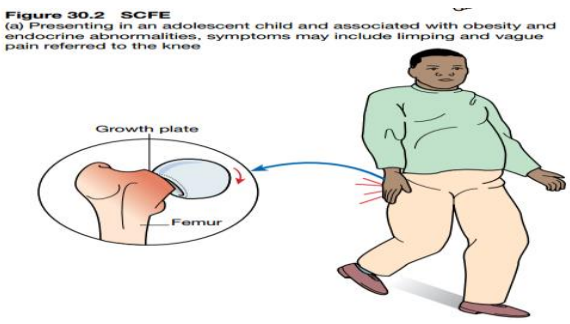
2- Clinical :

-Unstable → can not weight bear on that limb
-Stable → can put weight (walk)

Typically:

8-12 %
- in males
- in obese
- in black

20 - 25 % chance that the other hip will be affected, within 18m post the 1st hip affection.



History:

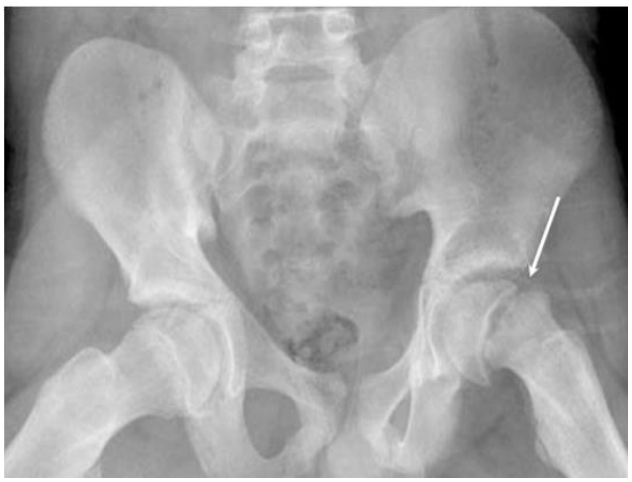
- Pain → hip, anterior thigh, **knee** (radiating through the obturator nerve that crosses 2 joints, so with any knee pain, do hip workup)
- Duration of C/O (more or less than 3w)
- Gait → painful or painless
- Trauma → minor or none
- Any known hormonal or metabolic issues
- no trauma
- Limping (painful)

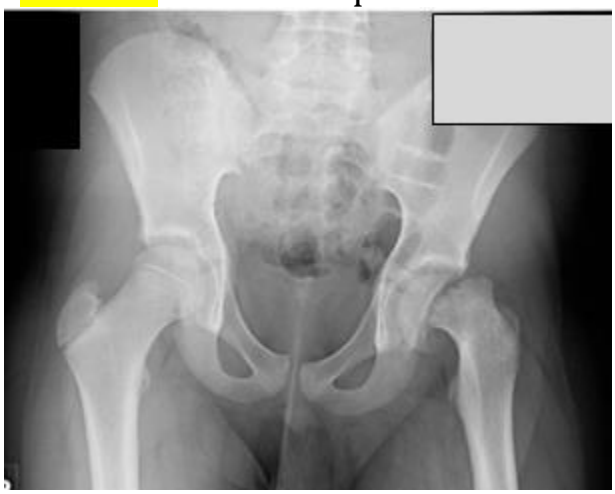
On Examination:

-Hip in ER (external rotation)
- With hip flexion the limb goes in spontaneous ext. rotation
- Limited internal rotation &Abduction
- Usually painful ROM
- Limping (painful)
- Gait → can or can not (antalgic) weight bear on affected limb
- Thigh muscle wasting (disuse), esp. in chronic cases

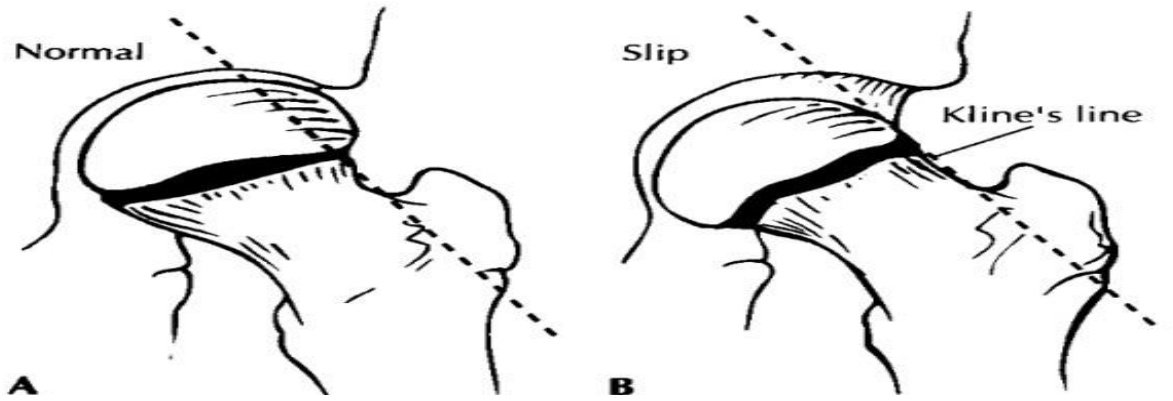
Investigation:

- X-ray of pelvis :
  -AP standing & frog lateral (ask the patient to external rotate, abduct and flex the hips)
  -See the actual slip
  -Positive "Klein Line" Or just wide physis → pre slip phase
- Knee normal ; If not clear but still doubtful MRI can help



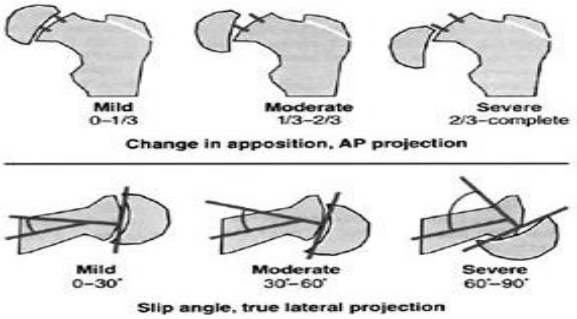


SCFE- Kline's Line:



- Severity:

-Depends on degree of slip
-The metaphysis is divided to 3 (1/3)
-The more the slip the worsted the severity



Treatment:

Refer to orthopedic as emergency case What they will do?

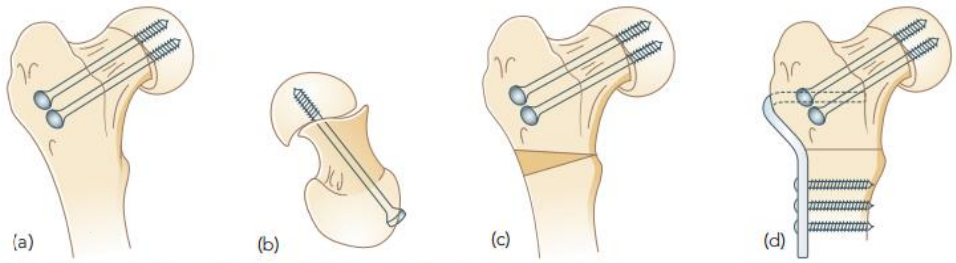
Aim → prevent further slippage & fuse the physis. Fusion of the growth plates will not usually cause leg length discrepancy, because the growth happens around the knees.

1-Acute SCFE:

- **Emergency in-situ paining (no reduction done)**
- **Using 1 or 2 (6mm) screws**
- **Pin threads pass the physis, & stops 5mm before the articular surface to prevent "Chondrolysis"**
- **Do hormonal essay → if any abnormality refer to endocrine**

2-Chronic → salvage corrective osteotomies.

3-Protected weight bearing for 3-4 weeks then full weight bearing and No sport for 6 months.



19.20 Slipped epiphysis - treatment (a,b) In this case slipping was minimal so no reduction was attempted, but further slipping was prevented by pinning the epiphysis in that position. (c,d) In more severe degrees of slip, the epiphysis should be fixed without attempting reduction and then, at a later stage, a complex compensatory osteotomy (d) can be performed to restore the normal position of the limb.

Complications:

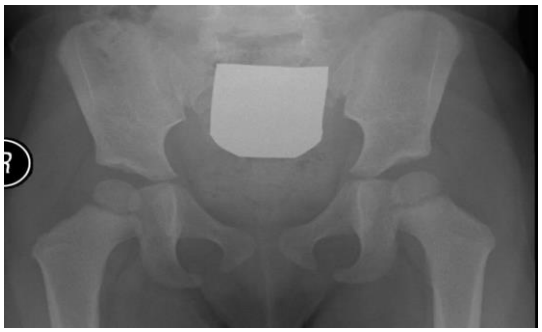
- Chondrolysis → that causes early hip OA
- Femoral AVN
- FAI (Femoral Acetabular Impingement)
- If not treated → coxa vara or valga
- Stiff hip joint
- Premature (early) hip O.A.
- LLI (leg length inequality)
- Pelvic obliquity
- Early Lumbar spine degeneration

Late complications :

- FAI (femoral Acetabular Impingement)
- Early arthritis
- LLD leg length discrepancy
- Pelvic inequality
- Early Lumbar spine degeneration

3- Perthes Disease: Legg-Calvé-Perthes Disease

It is → ↓ vascularity of head of femur (AVN) of an unknown cause so a patient with SCA & femoral AVN does not have Perth's disease.



- Where: at the level of head of femur
- Why: decreases vascularity of head of femur (avascular necrosis)

Cause: unknown

- Theories of its cause:
- Minor trauma (hyperactive child)
- A.V malformation
- Virus infection
- Most agree → its multifactorial

Typically:

- 4-8 years younger than SCFE
- more in males
- more in obese
- Bilateral in 10 – 12% of patients

Severity of the disease depends on:

The amount of femoral head involvement The more the head involvement, the more severe the condition and the worse the outcome.

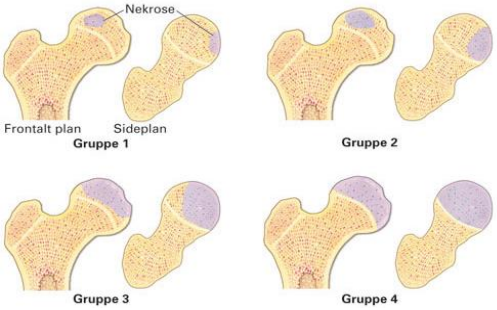
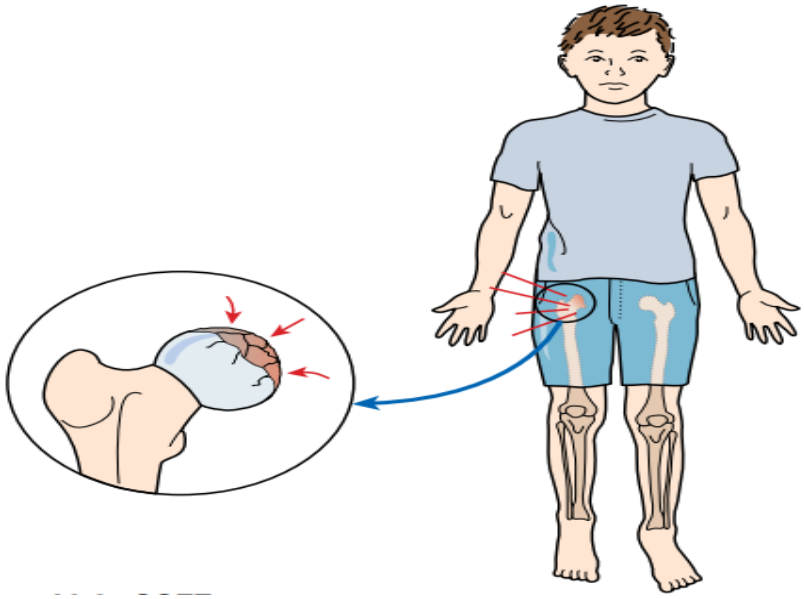
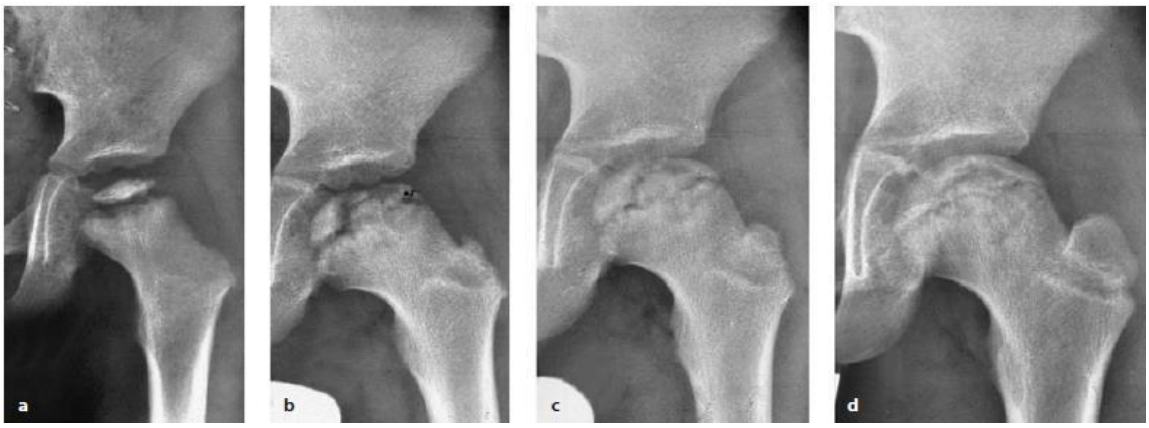


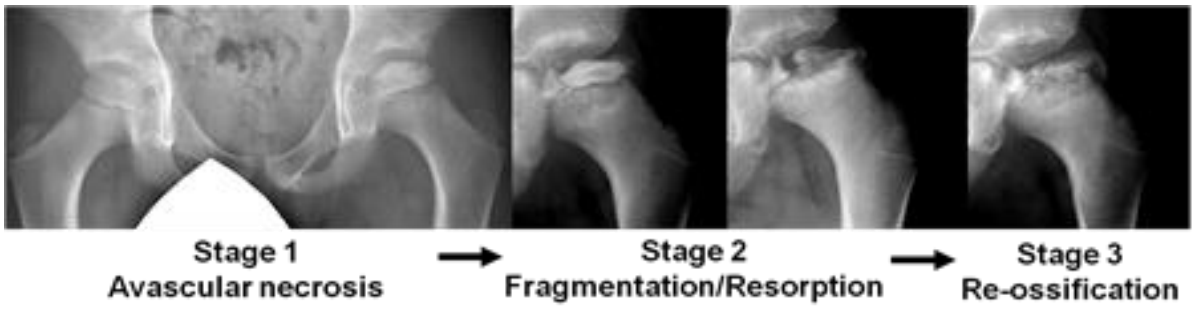
Figure 30.1 Perthes disease
(a) Presenting with a limp and pain in children between 4 and 8 years of age. The femoral head loses its blood supply and becomes flattened





Stages (weeks-years per stage):

1- Vasculitis
2- Fragmentation
3- Reossification / Healing
4- Reossified / Healed



Prognosis:

(< 6y) of age:

- Good prognosis (heals well).
- Usually conservative treatment.

(6-9 y) of age:

- Various outcomes.
- Majority of patients present in this age gp.

(> 9y) of age:

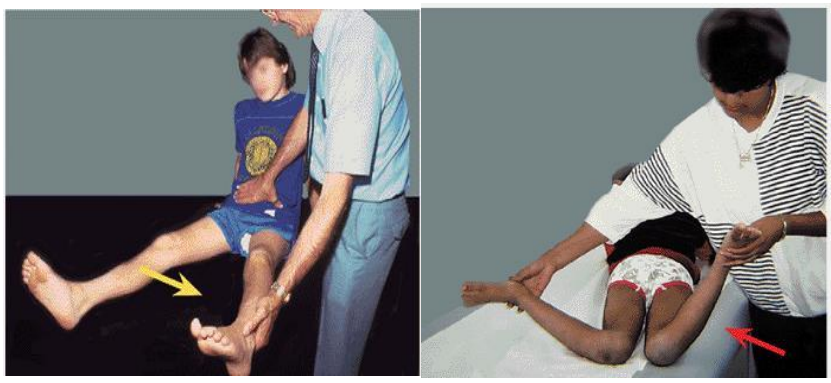
- Usually bad prognosis.
- Needs surgical treatment (may be >1 operation).

History:

- Pain → hip, anterior thigh, knee
- Antalgic gait
- C/O since weeks to months
- Trauma → minor or none
- URTI few weeks earlier
- The usual → a minor trauma few months ago with initial antalgic gait & now pain is better but still limping

On Examination:

- Decreased Abduction.
- Decreased IR (internal rotation).
- Usually painful range of motion –decreased-
- Limping (painful).
- Thigh muscle wasting (disuse).



Investigation:

X-ray:

o Knee : normal.

o Pelvis X-ray " AP standing & frog lateral ": decreased head size (irregular shape). If early: X-ray might not show anything.

o MRI can help

- In unusual presentations
- Vary early in the disease even before classical XR changes

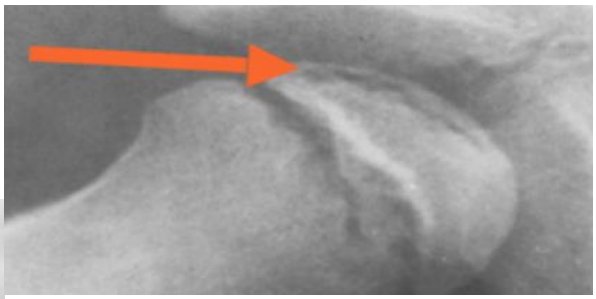
Ossification nucleus is destroyed and damaged · Femoral head collapse is due to necrosis (AVN) >>> then it will re- vascularize (the blood is full of calcium) >> so it will heal maintaining this collapsed shape

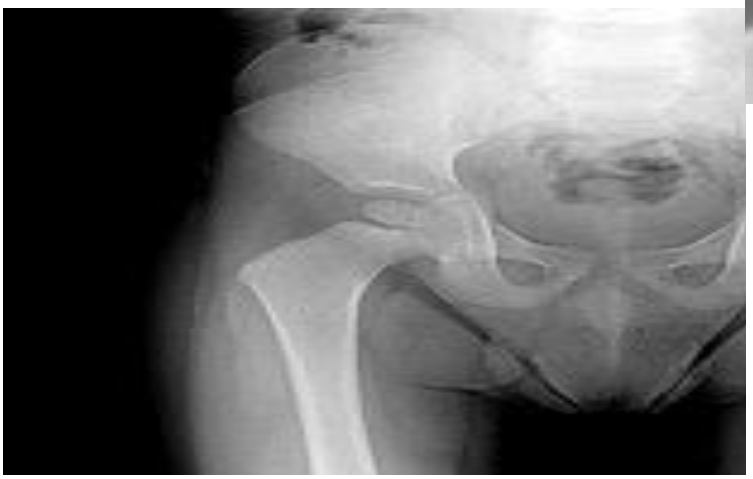
usually · Usually it doesn't go back to normal but in some cases it does; therefore, the outcome is unpredictable.

Subchondral fracture,

one of the 1st signs of LCP,

best seen on frog lat XR





Treatment:

Very controversy refer to pediatric orthopedics as an urgent case Guidelines of treatment:

O Control pain

o Maintain ROM

o Hip containment

- basic guidelines:
  - Pain relief → (may) admit, skin traction few days, analgesia
  - Increase hip ROM → P.T, mobilize PWB or NWB
  - Keep hips abducted:
    - So head will mold better in the acetabulum, and less body weight on the femoral heads.
    - By → abduction splint or casting (Broom-Stick cast or Spica cast)
  - While keeping the head contained:
    - Do containment osteotomy in the fragmentation stage.

- If came in late reossification stage wait till heals then do salvage surgery

Tight hip adductor **is a complication that you have to relieve it**

-Complications:

- Abduction hinge → may need Chelectomy.
- Heals in coxa → magna (big), brevia (short), plana (wide).
- Stiff hip joint.
- LLI (leg length inequality).
- Pelvic obliquity.

- Early hip OA.
- Early Lumbar spine degeneration.

Late complications:

- Early arthritis.
- LLD leg length discrepancy.
- Pelvic inequality.
- Early Lumbar spine degeneration.

Go back to the Lec for more pics and X-Rays.

Summary

1) Developmental dysplasia of the hip (DDH) is a condition in which the femoral head does not lie congruently within the acetabulum
    a. Risk factors: breech position+ first-born+ oligohydramnios= restrict the space in the uterus for foetal development.female
    b. Clinical signs: Gluteal fold asymmetry, Abduction range, Barlow's test, Ortolani's test, Galeazzi test and Trendelenburgh.
    c. Imaging:
    - Ultrasound – not only does US demonstrate the cartilaginous structures, it is dynamic, meaning that real-time screening can be performed as the hip is moved around.
    - X-ray – in children over 6 months of age, Shenton's line can be traced and should be unbroken.
    d. Treatment:
    - Under 6 months, reduce and Pavlik harness.
    - Go check the rest,it's very important
2) Slipped capital femoral epiphysis, is caused by a weakness in the growth plate of the femoral head resulting in the femoral neck slipping on the femoral head.
    i) Risk factor:8-13 years+obese+mles+endocrinopathy+male.
    ii) The child often presents with a limp and groin pain.The pain is frequently referred to the knee.
    iii) X-rays are the mainstay. AP pelvis and frog-leg lateral should be obtained. The frog-leg view is the most sensitive.
    iv) It's an emergency-In situ pinning
    v) It has some serious complications like Avascular necrosis+ Coxa vara+ Slipping at the opposite hip
3) Perthes Disease: necrosis of the femoral head
    i) More in obese and males ☹
    ii) 4-8 years, limping+the joint is 'irritable', so all movements are diminished and their extremes painful. Abduction is nearly always limited and usually internal rotation also.
    iii) X-ray pelvic show decreased head size of the femur,MRI can help.
    iv) Symptomatic treatment+maintain the range of motaion of the joint.
    v) Late complications like Early arthritis + leg length discrepancy+ Early Lumbar spine degeneration due to pelvic inequality

MCQs

1) 9 years old black male came with his mother complaining of knee pain, which one of the following is the most likely diagnosis ?

a) Scefe
b) DDH
c) Perth's

2) Diagnosis was reached in a 3 months old female to have DDH, what shuld be the treatment for her in that age?

a) Pelvic haris
b) Open reduction if not return
c) Acetabuloplasty

3) Which of the following statements regarding Perthes' disease are true?(chose one or more)

a) Perthes' disease is a spontaneous avascular necrosis of the hip.
b) It is most common in boys around puberty.
c) The condition frequently settles spontaneously.
d) A similar problem can occur in children with sickle cell disease.
e) The prognosis is best in those children in whom the condition develops late.

Q1:A

Q2:A

Q3:A,C &D