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لذا إن وجدتم أي خلل أو خطأ فاعذرونا و بلغونا حتى يتم تصحيحه
نتمنى لكم التوفيق و السداد
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Common Pediatric Hip Problem

Dr. Abdulmonem AlSiddiky, MD, SSC0

F1 lecture notes added by : Eman Al-shareef

References: notes, Wikipedia, emedicine

Common Pediatric Hip problems:

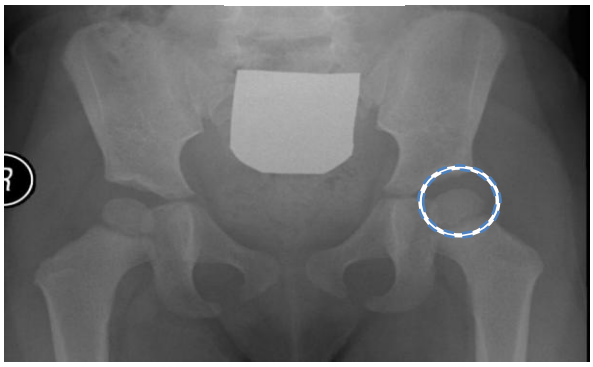
- DDH
- SCFE
- Perthes

***Note:** DDH is not painful while SCFE & Perthes are painful conditions
*DDH is a congenital disorder

Normal pelvis

Adult

Child



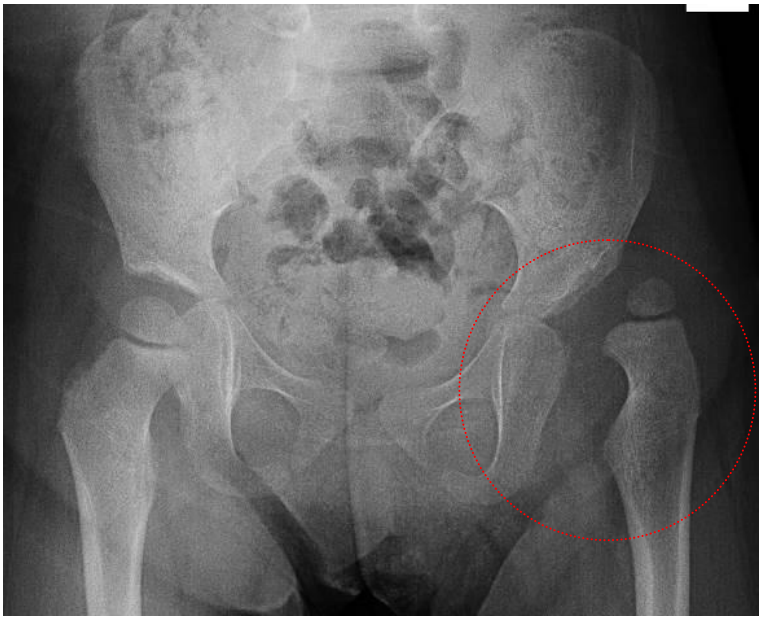
Ossification Center consists of: ossification nucleus & cartilage.

To differentiate between growth plate and factures on X-Ray: a fracture will appear as a sharp line while the growth plate appears as a wide blunt line.

DDH

Nomenclature

- **CDH:** Congenital Dislocation of the Hip
- **DDH:** Developmental Dysplasia of the Hip

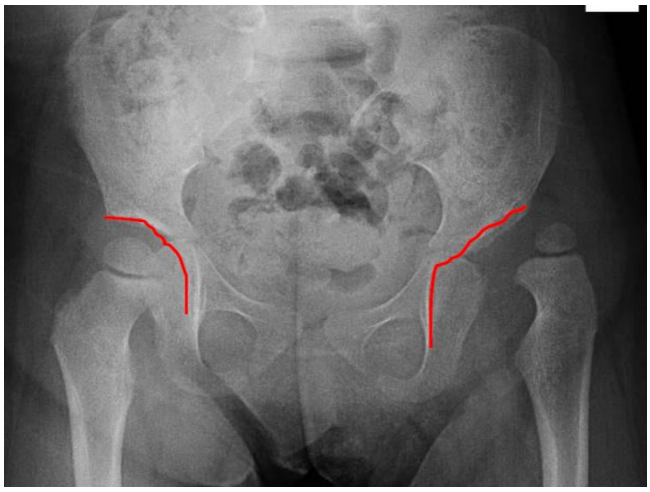


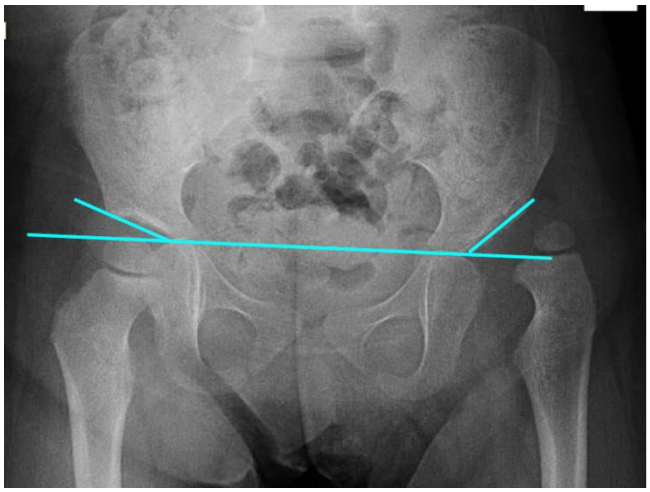
Patterns of disease

- Dislocated: Complete disengagement of the articular surfaces
- Dislocatable→ Femoral head goes in & out while the child is walking >> Thus, the child will be at high risk of dislocation
- Sublaxated: Partial contact between the articular surfaces
- Acetabular dysplasia: Femoral head is in but the acetabulum is shallow. So initially at birth, their PE is normal; however, once the child starts walking, subluxation will develop and eventually it leads to hip joint dislocation. Therefore, once it is suspected, please refer the patient immediately to the orthopedic surgeon!

Criteria to Dx a dislocated hip on X-Ray:

- Medial joint space widening (or femoral head lateralization)
- Upward migration of the femoral head





- ***Acetabular index:*** "The acetabular index is the angle between the Hilgenreiner line and a line drawn from the triradiate epiphysis to the lateral edge of the acetabulum. Typically, this angle decreases with age."
- The left hip has a larger angle because it is dislocated

Causes (multi factorial) >> unknown

•Hormonal

–Relaxin, oxytocin

Relaxin is secreted during the 3rd trimester to relax the Sacroiliac joint & symphisis 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!

•Familial

–Lig.laxity diseases: Incidence of DDH increases in the presence of ligament laxity

•Genetics

–Female 4 X male ---twins 40% (due to the availability of a small space)

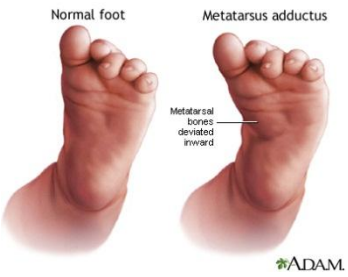
•Mechanical: (COMPACTED: decrease in the space available for the fetus inside the uterus)

–Pre natal (Breach , oligohydrominus , primigravida , twins)

- More common in frank breech with the legs extended and both hips flexed
- Primigravida: because the uterus is still tight>> decrease in the available uterine space

– Torticollis: tightness of the sternomastoid muscle (whenever this is present, ALWAYS look at the hips because it is associated with a very high incidence of DDH)

– metatarsus adductus: Forefoot deformity



–Post natal (Swaddling , strapping)
الكوفلة/المهاد

Infants at risk who?

•Positive family history: 10X
•A baby girl: 4-6 X
•Breach presentation: 5-10 X
•Torticollis: CDH in 10-20% of cases
•Foot deformities: Calcaneo-valgus and 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

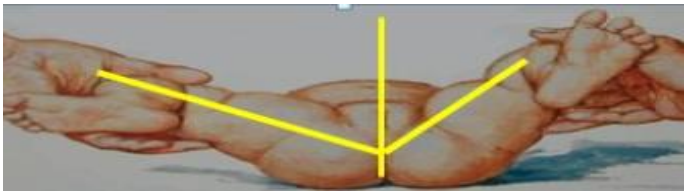
–quiet –comfortable

•Look: (anteriorly & posteriorly)

–External rotation
–Lateralized contour
–Shortening
–Asymmetrical skin folds : (Anterior –posterior)

•Move

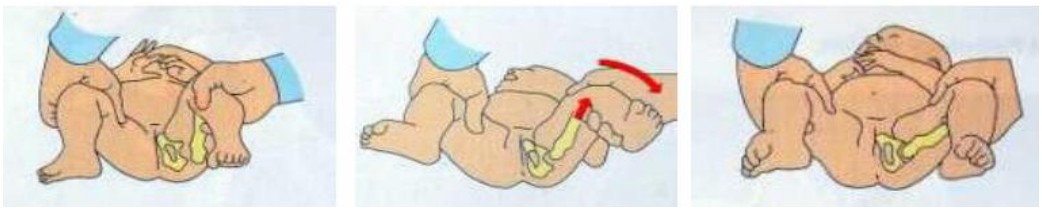
–Limited abduction



•Special test:

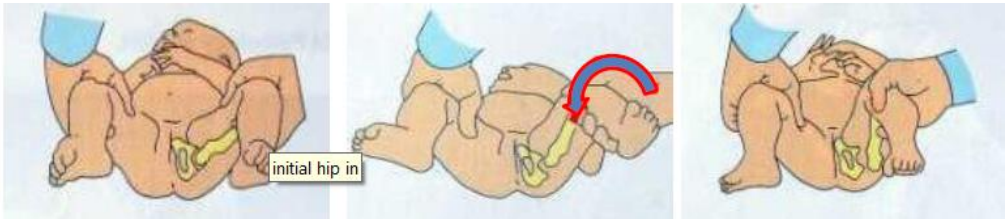
1) –Galiazzi
   (Difference in the knee level, generally, is due to femoral or tibial shortening)

2) Ortolani: " It is performed by an examiner first flexing the hips and knees of a supine infant to 90 degrees, then with the examiner's index fingers placing anterior pressure on the greater trochanters, gently and smoothly abducting the infant's legs using the examiner's thumbs.A positive sign is a distinctive 'clunk' which can be heard and felt as the femoral head relocates anteriorly into the acetabulum."



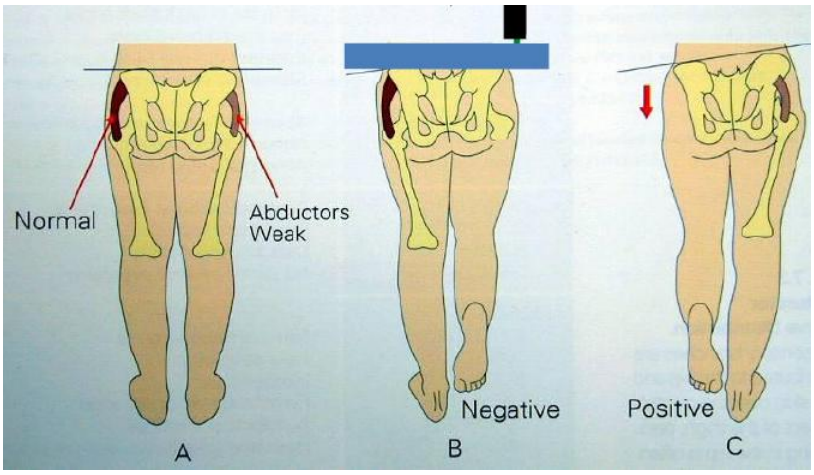
Hold the proximal femur & Push the femoral head in. It is discomfort able but not painful.

3) Barlow test :" The maneuver is easily performed by **adducting** the hip (bringing the thigh towards the midline) while applying light pressure on the knee, directing the force posteriorly–If the hip is dislocatable - that is, if the hip can be popped out of socket with this maneuver - the test is considered positive."

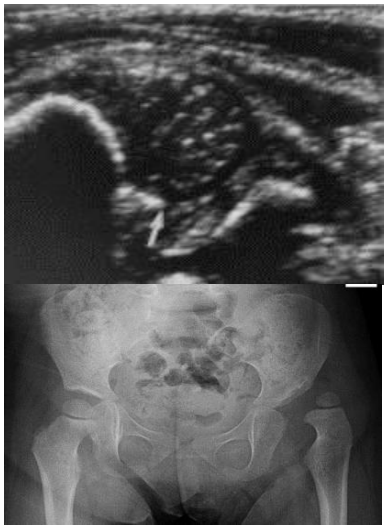


Pull femoral head out
Barlow = بِرا

4) –Limping (waddling gait if bilateral hip abductors weakness)
5) –Trendelenburgh sign



- It tests the abductors, when one leg is raised; the abductors of the other side are being tested!
- The figure is important for the exam!



Investigations

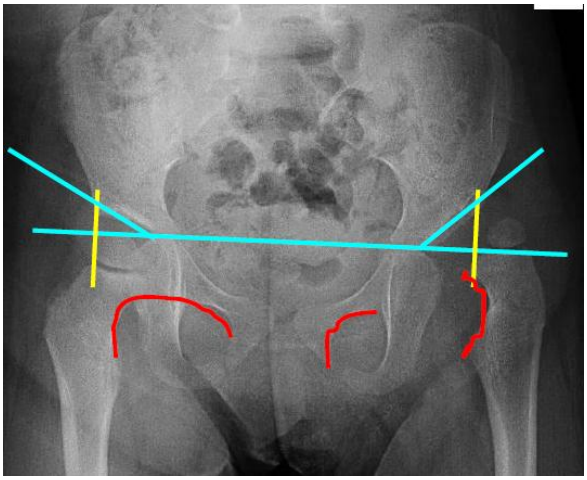
•0-3 months U/S

- X-ray is not done before 3 months because their bone is cartilage! MRI is expensive. Therefore start by US (good, reliable, operator dependent)

•> 3months X-ray pelvis AP +

- In the standing position if the child is old enough to stand + frog position (lower limbs abducted for a better view of the femoral head)

• **Radiology:** After 6 months: reliable



- ***Shenton line*** which is a line drawn from the inferior cortex of the femoral neck ot the obrturator foramen. Normally, the line should be continuous with no disruptions. If the line is discontinuous (broken as on the left side, then this means that the femoral head is out (not in the acetabulum)

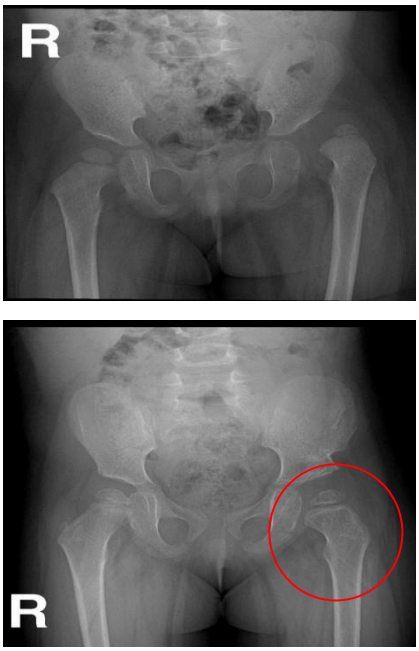
- ***Hilgenreiner's line*** "is a line drawn horizontally through the superior aspect of both triradiate cartilages. It should be horizontal, but is mainly used as a reference for Perkin's line and measurement of the acetabular angle."

- ***Perkin's line:*** "The Perkin's line is a line drawn perpendicular to Hilgenreiner's line, intersecting the lateral most aspect of the acetabular roof."
  So it's a vertical line drawn from the ASIS on both sides to divide the area along with Hilgenringer's line into 4 quadrants.The hip epiphysis should be normally in the lower inner quadrant (inferiomedial). If it is in the upper outer quadrant (superiolateral), then the hip is either Sublaxated or dislocated.

- ***Acetabular index:*** normally it is less than 30^{o} (range: 25-18^{o}). If more than 30, then it is abnormal & you have to interfere.

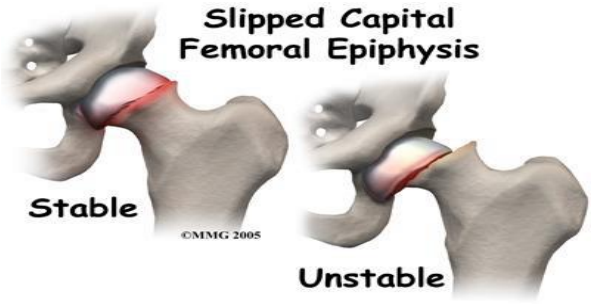
Treatment: (The younger the child, the more conservative the treatment. The older the child the more likely the Tx will be surgical)

- Obtain concentric reduction
- Maintain concentric reduction
- In a non-traumatic fashion (to avoid AVN)
- Without disrupting the blood supply to femoral head
  Way: Refer to pediatric orthopedic clinic
- Method depends on age
- The earlier started, the easier it is
- The earlier started, the better the results are
- Should be detected EARLY
- Either surgical or non surgical



After Surgery

SCFE



Slipped Capital Femoral Epiphysis

- **Where** → at level of growth plate (separating the epiphysis from the metaphysis. Therefore, it is Salter Harrison type 1 fracture (through the growth plate) **MCQ**
- **Why** ? Hormonal (many patients will have hormonal abnormalities
  ? Metabolic
  ? Mechanical, obesity (weight is distributed from feet to tibia to femur to femoral neck to SIJ to spine. So, the more the weight the more the stress on the growth plate)
  ? Trauma (Minor trauma then developed severe pain)
  ? Unknown

Multifactorial/Unknown cause

Typical :

- 8-12
- increase in males
- increase in obese
- increase in black

- increase if other side affected: (always educate the patient and the parents to notice any pain in the contralateral side)

History:

- Hippain/knee pain> *(radiating through the obturator nerve that crosses 2 joints, so with any knee pain, do hip workup)*
- Minor trauma
- no trauma
- Limping (painful)

Physical Examination:

- Hip in ER (external rotation) . *Key sign: Hip flexion will result in spontaneous external rotation due to slippage of the epiphysis)*
- ↓ IR (internal rotation)
- ↓ Abduction
- Usually painful ROM (Range of motion)
- Limping (painful)

Because these movements increase the pressure on the hip causing more pain

Investigations:

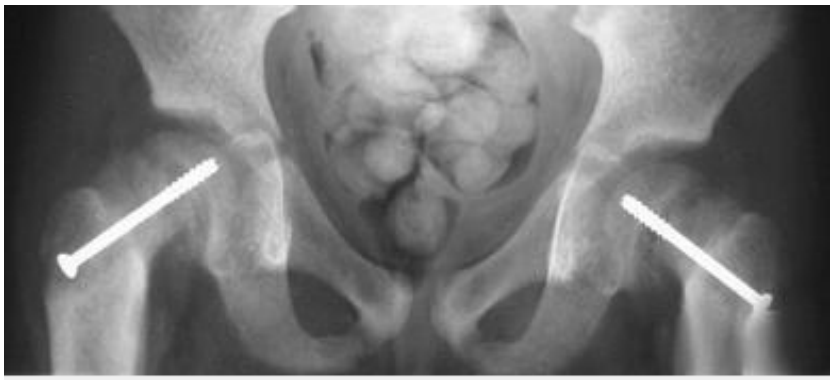
- X-ray
  - Pelvis –slippage positive
    or increase growth plate space [pre slip phase] (Always compare both sides)
  - Knee

If not clear but still doubtful MRI can help (remember that MRI requires GA at this young age usually)

Displacement of the metaphysis in relation to the epiphysis (the femoral head remains in the acetabulum)

Treatment:

- Refer to orthopedic as **emergency** case
- **What they will do?**
  - ❖ In situ pinning – to prevent further damage to the vascularity (no reduction because it will cause more harm & may damage or crush the growth plate, increase the risk of erosion)
  - ❖ Protected weight bearing for 3-4 weeks then full weight bearing (use walking sticks after surgery because they shouldn't step on their feet!)
  - ❖ No sport (contact sports) for 6 months (Educate the patient and the parents)



Fixed this side also because SCFE started to develop

Please notice the wide growth plate

Perthe'sDisease

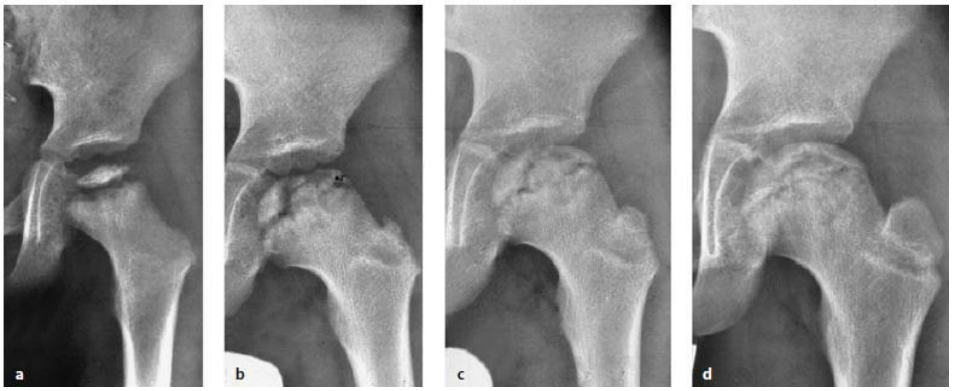
- **AVN of the head of the femur (epiphysis+ growth plate + metaphysis)**
- **Where:** at the level of head of femur
- **Why:** decreased vascularity of head of femur (avascular necrosis)
- **Cause →** unknown

Typical:

- 4-8 years (Perthe's occurs at a younger age when compared to SCFE which reflects that they are more active)
- -increase in males
- -increase in obese

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*



History:

- Hip pain or knee pain
- Minor trauma or no trauma
- Painful limping

** Some say it might be due to viral infections as URTI or malformation of the femoral head in an active child with minor trauma*

On Examination:

- ↓decreased Abduction
- ↓decreased IR (internal rotation)
- Usually painful range of motion decreased ↓↓↓
- Limping (painful)

Investigations:

- X-ray: -knee
  - Pelvis →↓ head size (irregular shape)
- If early –MRI can help (especially in young patients less than 4 years of age, if your suspecting Perthes, do MRI)

- 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 maintaing this collapsed shape usually
- Usually it doesn't go back to normal but in some cases it does; therefore, the outcome is unpredictable

Treatment:

- Very controversy
- Refer to pediatric orthopedics as an **urgent** case
- **Guidelines of treatment:**
  - Admit the patient
  - Control pain
  - Skin traction for a few days to relax the joint by pulling the skin down so it decreases pressure
  - Maintain ROM (by physiotherapy, the head will be similar to a soft dough moving inside the acetabulum)
  - Hip containment
- Start by conservative treatment to see if revascularization occur & how will it change the femoral head shape then deal with the after math. If the head starts sublaxating, do containment surgery to keep the head contained within the acetabulum.
- Very close follow up is required