



15- Common pediatric hip disorders

Objectives:

- ◆ Not given

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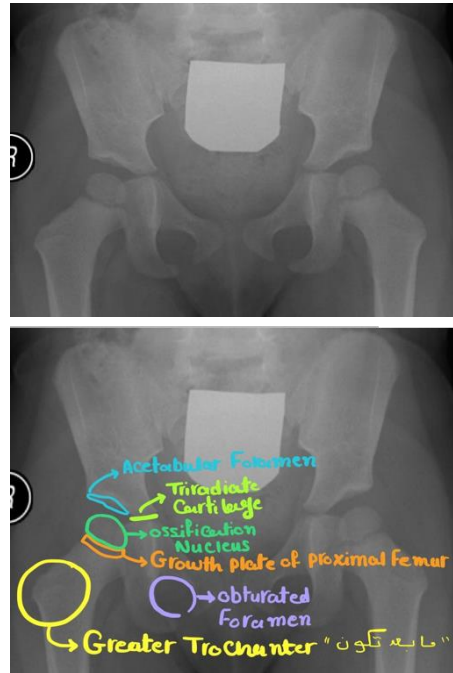
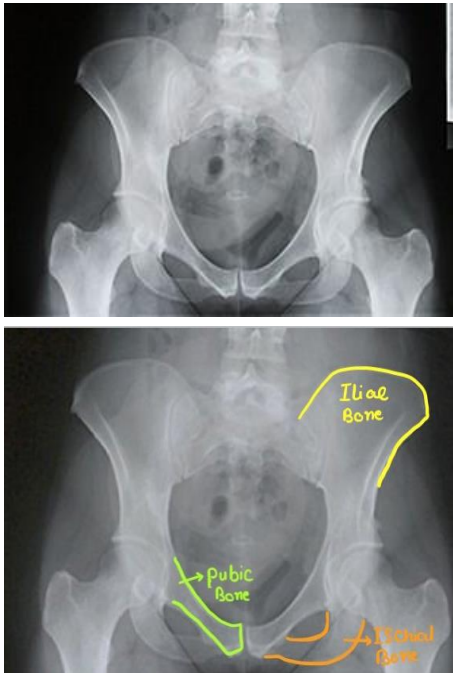
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References: Slides, notes, team435

Overview

- Pediatric have growth plate, the greater trochanter is not yet formed.
- The femoral head in adult is completely formed and connected to the acetabulum. In pediatric it is small, not connected to the acetabulum and full of cartilages.
- In pediatric the meeting area between the ischium, pubic bone and iliac bone is called triradiate cartilage. It is a transverse opening near to the top of the acetabulum.
- The femoral head is not present at the very early days (it is only cartilage), after a while the femoral head will start to be formed and the cartilage start to ossification and it will be called ossification center.



★ Common pediatric hip problems

1. DDH (developmental dysplasia of the hip) the abnormality is between the head of the femur and the acetabulum
2. SCFE (slipped capital femoral epiphysis) the problem is between the head and the neck of the femur
3. Perthes the problem is at the femoral metaphysis

Developmental dysplasia of the hip (DDH) الخلع الولادي

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- CDH: Congenital Dislocation of the Hip. This name means this disease will happen only during in utero development, and only hip dislocation
- DDH: Developmental Dysplasia of the Hip. This is the new name of the disease, why did they change it? Bc it could happen with hip dislocation, subluxation, dislocatable, Acetabular dysplasia. It also could happen bc of mechanical problem not only developmental problem (not only congenital)

★ Patterns of disease “The main problem is between the head of the femur and acetabulum”

Complete dislocated	Difference between Dislocated and Subluxated: - Dislocated: complete separation. completely out of acetabulum. - Subluxated: the head subluxates out of joint when provoked, it is not 100% away from the joint / إزاحة المفصل لكن فيه كوميونيكيشن بين الكارتلاجز
Subluxated	
Dislocatable	means unstable المفروض لما احاول اطبع ال femoral head يتحرك بس ما يطلع بس في حالة dislocatable يصير يطلع بالكامل ولما ادخله يدخل كامل. ال head موجود داخل ال acetabulum بس laxated. وإذا ما تعالج ومشى الطفل راح يصير فيه خلل ويكون عنده unstable hip ونحتاج نعمل له stability.
Acetabular dysplasia	Normally the head of the femur is inside the acetabulum and both of them are surrounding each other so they will have their shape (the hemispherical shape). If the femoral head is dislocated the acetabulum will not find anything to surround, so it will become shallow. Or sometimes the acetabulum is formed as shallow shape with no femoral head dislocation, but bc the acetabulum is shallow the head can't go in يعني acetabulum يأخذ شكله لمن تكون رأس الفخذ جواها، إذا رأس الفخذ منفصلة ومب جوا acetabulum بيصير شكله مسطح بدال ما يكون نصف كروي، أو أحيان هو أصلاً مخلوق مسطح ورأس الفخذ طبيعية ما فيها شي بس مراح تقدر تدخل What is the X-ray finding? The angle between the horizontal line and the acetabulum is increased

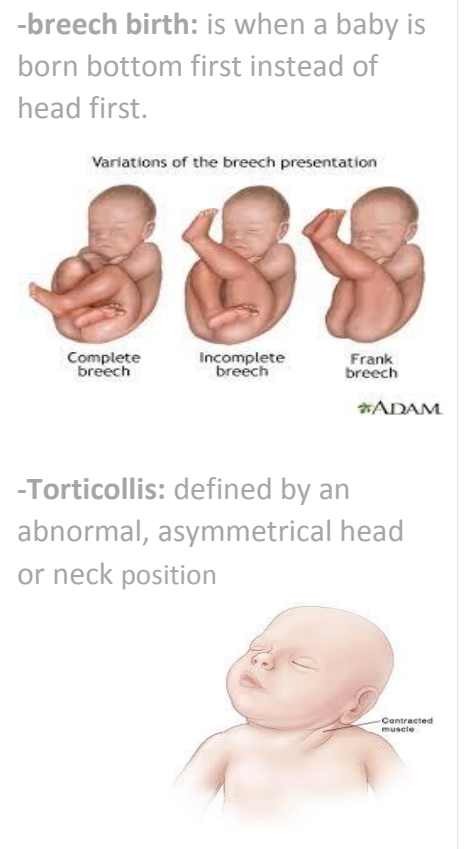
★ Causes: The exact cause is **unknown**, but it could be due to

1. Hormonal (Relaxin, oxytocin)
2. Familial (Ligament laxity diseases)
3. Genetics:
 - a. Female 4 X male
 - b. Twins 40%
4. Mechanical¹
 - a. Pre-natal: Breach, **oligohydrominosis**, primigravida, twins, torticollis, metatarsus adductus
 - b. Post-natal: Swaddling مهاد, strapping

#Infants at risk:

- 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 and radiologically. The patient will come to the pediatrician for checkup or vaccine, if the



¹ DDH increase by adduction and decrease by abduction, so any increase stress on the head will lead to adduction -> DDH. Those mentioned here are some factors can cause adduction -> DDH

baby have lots of risk factor you have to do physical exam + X-ray, if no risk factor and the physical exam is normal then discharge the patient.

OSCE: History Taking of DDH patient. (the most important thing is to ask about the risk factors that are mentioned above)!

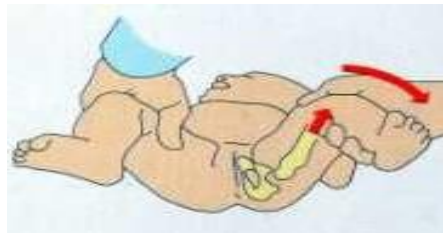
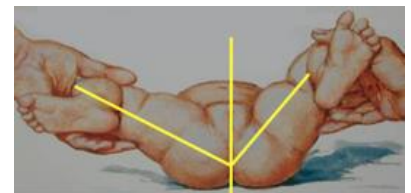


Does this increase risk of DDH? No, it will decrease the risk because it's an abduction NOT adduction.

★ Clinical examination

The infant should be quiet and comfortable

- Look²:
 - External rotation
 - Lateralized contour
 - Shortening
 - Asymmetrical skin folds Anterior – posterior
- Move
 - Limited hip abduction (because there is dislocation of the hip, that's why there is restricted abduction)
- Special test
 - Gaiazzo
 - **Ortolani test.** The most sensitive test in reducible DDH (relocation of dislocated hip)
 - This examination is done for pediatric **< 6 months.**
 - You will elevate the leg by your hand and do hip abduction, if you feel a jerky movement or hear click or clunk then this is a positive ortolani test. +ve ortolani test means the baby is for sure has DDH.

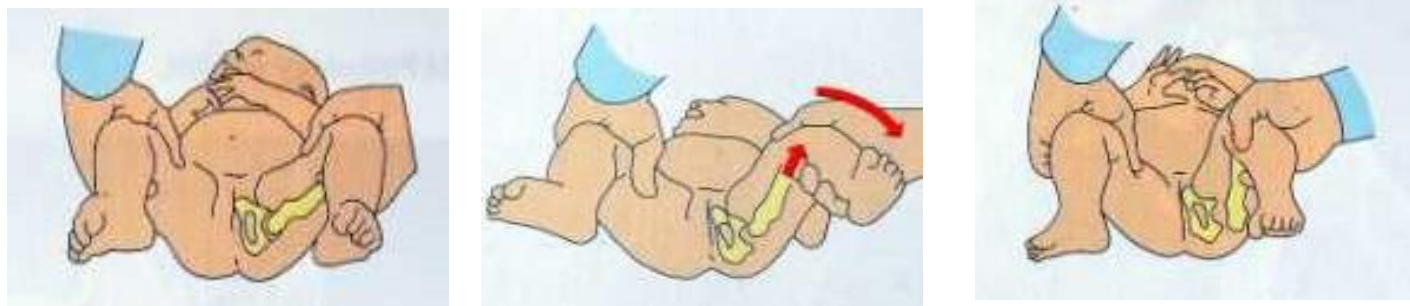


² you will always find those features at any age until DDH is treated

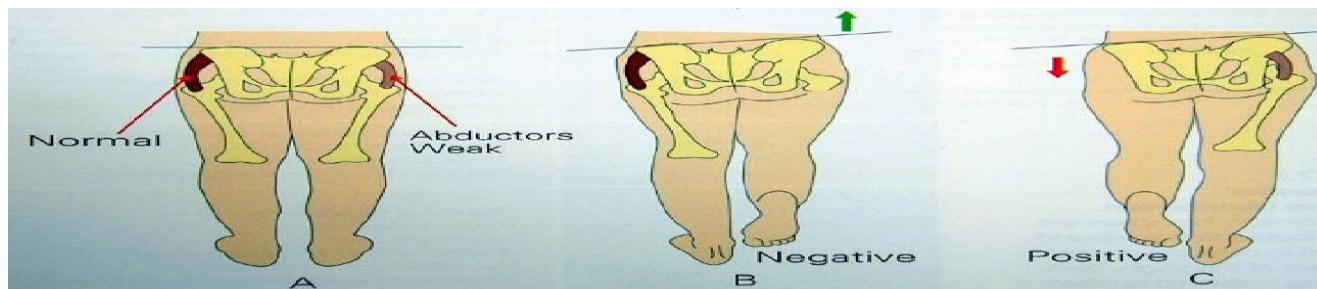
- Barlow test

- This test is helpful in dislocatable hip.
- This test is done only for baby < 6 months.
- You will do adduction and move the femur out a little bit, **if you feel the femur moved out that means unstable hip (dislocatable hip)**

If you have 8 month old patient with DDH what is the best test to use? Barlow, ortolani, Trendelenburg, limited abduction? The answer is **limited abduction**, key? 8 months. The first two for babies less than 6 months & the third one for babies after 2y.



- Trendelenburgh sign (very late presentation >2 years, if you find this then you need to go for surgery)



If you have a baby older than 6 months, what will you find in the examination which suggest DDH? Limited abduction, shortening, increase skin fold, limping if the baby starts to walk. **Ortolani and barlow is NOT DONE WITH BABY ABOVE 6 MONTHS**

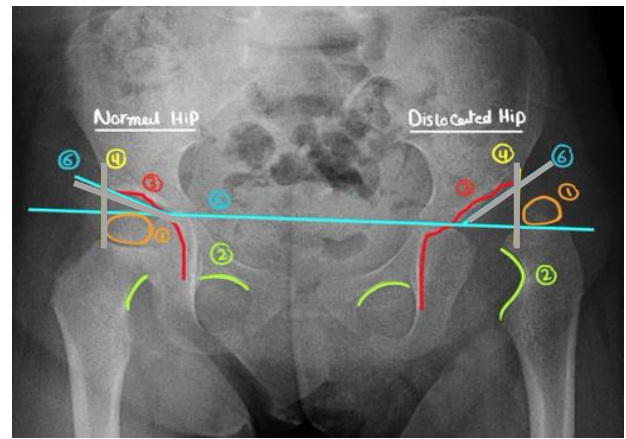
- Limbing (waddling gait if bilateral)

★ Investigation

- 0-3 months: U/S (bc the head of the femur is not yet formed, so X-ray is useless)
- > 3months: X-ray pelvis AP + abduction
- After 6 months: reliable (the best option for baby 6 months or older is X-ray)

The doctor said if the baby is less than 6 months old do US, 6 month or older do X-ray





DDH on X-ray (Very Important!)

First you need to know some radiological terms found in pediatric hip:

- There is two Perpendicular "Perkin's" lines between the edge of acetabulum and the horizontal line (making an angle). **Normally** the femoral head should be medial to the perpendicular line.
- Horizontal line** "Hilgenreiner's Line": is between two triradiate cartilages. **Normally** the femoral head should be below horizontal line.
- Shenton's line.** The upper head of obturator foramen مع ماشي neck of femur.

Signs of DDH on X-ray:

- Head of the femur (ossification nucleus \ center) is **small**
- Disrupted **Shenton's line**. In DDH the obturator foramen is separated from the neck of femur.
- Acetabulum is opened and we call it "**Shallow Acetabulum**". The problem happened in the relationship b/w the head of femur and the acetabulum **that's why it's DDH**.
- Head of the femur (ossification nucleus \ center) is **lateral** to the perpendicular line.
- Head of the femur (ossification nucleus \ center) is **above** the horizontal line

*From base to the tip of the acetabulum: the normal angle is between **18-22 degree**, in DDH it's **30, 40 degree and more**. **If the angle is more than 20 degrees that could be a sign of dislocation**

★ Treatment:

#Aim:

- REDUCE: Obtain concentric reduction.
- STABILIZE: Maintain concentric reduction.
- SAFELY³: In a non-traumatic fashion.
- Without disrupting the blood supply to femoral head.

#Way:

- Refer to pediatric orthopedic clinic.

³ so if you try to reduce and it was tight don't try very hard or you will cause AVN

#Important points:

- Method depends on age.
- The earlier started the easier and better the results.
- Should be detected EARLY.
- Could be surgical or non-surgical if you detected early the surgical management is less likely, that's why it is important to detect it early!

Age	Treatment very important in MCQs!
Birth – 6 m	Reduce + maintain with Pavlik harness or hip spica (H.S). in the clinic and pt is awake, you do ortolani then if it works stabilize the hip. first 6 weeks with Pavlik harness then abduction splint for 3 months then we follow up the patient
6-12 m	GA (general anesthesia) + Closed reduction + maintain with hip spica if it fails, we do an open reduction. <ul style="list-style-type: none"> ▪ Why we give GA even though we will do closed reduction? because we have to do arthrogram in the OR under GA to check for the presence of fibers ▪ after you do close reduction do arthrogram to check if there are fibers around the head of the femur or not, if there is then you need to do open reduction we do not use pavlik harness because the family can release it and we need to repeat the process and give the child GA again
12 - 18 m	GA + Open reduction + maintain with hip spica
18 – 24 m	GA + Open reduction (ORIF) + Acetabuloplasty + maintain with hip spica
2-8 years	GA + Open reduction + Acetabuloplasty + femoral shortening⁴ + H.S (hip spica)
Above 8 years	GA + Open reduction + Acetabuloplasty (advanced) + femoral shortening + H.S (hip spica) Some hospitals and countries don't treat DDH after 8 years bc there will be erosions and abnormal acetabulum so even if you correct the femur it won't be normal hip + the rate of successful is very low. The patient will have to wait to do total hip replacement

Left DDH



Before treatment



After treatment

Bilateral DDH



★ Complications

- **If not treated:** osteoarthritis (OA) → Stiffness → Pain → Limping → Spine problems → Difficult life. (that's why you should pick it early and treat it even though the baby doesn't have any pain)

⁴ at this age the patient start walking, and with walking the femur will move up more and more, so you need to put it back to its place and shorten it


- **Late complications if not treated: IMP**
 - Severe pain
 - Early arthritis
 - LLD (leg length discrepancy)
 - Pelvic inequality
 - Early Lumbar spine degeneration

Slipped capital femoral epiphysis (SCFE) & Perthes [kaplan notes All](#)

	Slipped capital femoral epiphysis (SCFE) osmosis high yield notes SCFE DR Nabil Toronto notes	Perthes osmosishigh yield notes osmosis video Toronto notes
Where?	At the level of the growth plate (Between head and neck of femur).	At the level of head of the femur.
Why?		↓ Vascularity of head of the femur (avascular necrosis).
Cause	<ul style="list-style-type: none"> • Hormonal • Metabolic⁵ • Mechanical • Obesity • Trauma • Unknown (most common) 	<p>Unknown</p> <p>الأوعية تفتلت وتسببت في موت الخلايا، ويبدأ الجسم بتصريف مع هذه الخلايا الميتة replacement then resorption فلانم أنا أحظها في مكان مهيا ل remodeling عشان يكون بشكل طيب</p>
High-risk patients	<ul style="list-style-type: none"> • 8-12 • ↑ in males • ↑ in obese • ↑ in black • ↑ if other side affected 	<ul style="list-style-type: none"> • 4-8 years • ↑ Males • ↑ Obese
The severity of the disease depends on		The amount of femoral head involvement. Head involved more >> less prognosis
History	<ul style="list-style-type: none"> • Hip pain • Referred knee pain (only)⁶ • Minor trauma or no trauma (the cause of the slipped is abnormal growth plate not 	<ul style="list-style-type: none"> • Hip pain or knee pain • Minor trauma or no trauma • Limping (painful) <p>What are the DDx of painful limping in pediatrics?</p>

⁵ The big number of patients have a metabolic cause, so we have to do a test for growth, thyroid, and parathyroid hormones.



⁶ If the pt come complaining of knee pain and I did X-ray and it was normal, what is the next step? pelvic X-ray



	<p>the trauma)</p> <ul style="list-style-type: none"> • Limping (painful). but in DDH it was painless limping 	<p>Fracture, infection (septic arthritis), irritable hip (synovitis), rheumatological disease, sickle cell disease, SCFE, Perthes</p>
Clinical Examination	<ul style="list-style-type: none"> • Inability to weight bearing • Hip in ER (external rotation). • Decrease internal rotation (IR). • Decrease Abduction. • Usually painful ROM. • Limping (painful). • If the pt coming complaining of painful ROM & painful Limping with SCFE risk factors, here we suspected that the pt has SCFE. 	<ul style="list-style-type: none"> • Inability to weight bearing • Decrease Abduction. • Decrease internal rotation (IR). • Usually painful ROM. (↓↓↓) • Limping (painful).
Investigations	<ul style="list-style-type: none"> • X-ray <ul style="list-style-type: none"> - Pelvis <ul style="list-style-type: none"> ▪ <u>Early</u>: could be normal or increase growth plate space [pre slip phase]. ▪ <u>Late</u>: slippage positive. - Knee • MRI: can help if X-ray is not clear or doubtful. If the Hx and PE suggest SCFE and X-ray is normal we do MRI. 	<ul style="list-style-type: none"> • X-ray <ul style="list-style-type: none"> - Pelvis: ↓ in head size (irregular shape) - Knee • MRI: can help if X-ray is not show anything in early cases.
Treatment	<p>Refer to orthopedic as an emergency case. What they will do?</p> <ul style="list-style-type: none"> • In situ pinning –to prevent further damage to the vascularity (don't try reducing على طول اعمل fixation)⁷ • Protected weight bearing for 3-4 weeks then full weight bearing. • No sport for 6 months. 	<ul style="list-style-type: none"> • Very controversy • Refer to pediatric orthopedics as an urgent case • Guidelines of treatment: <ul style="list-style-type: none"> - Control pain. - Maintain ROM to keep the circular shape of the femoral head until the healing process is completed - Hip containment inside the acetabulum. If outside, we do surgery <p>We follow up the patient and make sure that the head of the femur is inside the acetabular.</p> <p>هنا العلاج ما يحتاج تدخل جراحي، الفيسيبلز المسكره تفتح من الله بدون عملية أو أي شيء ثاني</p>

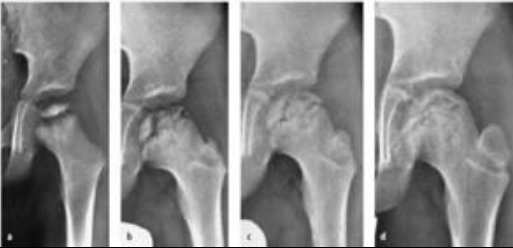
⁷ why we don't do reduction? Bc whenever you move the head you will cut the blood vessels which increase the chance of AVN

<p>Late complications</p>	<ul style="list-style-type: none"> • Femoral Acetabular Impingement (FAI)⁸. • Early arthritis. • Leg Length Discrepancy (LLD). • Pelvic inequality • Chondrolysis⁹. • Early Lumbar spine degeneration. (any abnormality in hip will cause spine problems) 	<ul style="list-style-type: none"> • Early arthritis. • Leg Length Discrepancy (LLD). • Pelvic inequality. • Early Lumbar spine degeneration.
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Which Image is the worse, Rt or Lt?

<p>Lt</p> 	<p>Rt</p> 
<p>On the Lt side, there is widening of growth plate (pre-slipped stage) → needs MRI. The Rt one is the worse (there is slippage) which increases the risk of Arthritis</p>	

<p>Treatment of SCFE</p>	<p>Perthes Disease on the Lt</p>
 <p>On the right side only wide growth plate (we put screw for prevention) on the left side both widening and slippage</p>	 <p>Perthes on the left side (small head of femur with fragmentations)</p>

<p>Healing phases of Perthes Disease</p>	
	<p>.The blood supply will decrease -> some cells will die -> the body try to create new blood vessels -> the blood supply will return -> the dead cells will be reabsorbed -> new cell will be formed -> the femoral head will go back to its normal shape.</p> <p>All this process will take up to 4 years</p>

⁸ A condition in which extra bone grows along one or both bones that form the hip joint — giving the bones an irregular shape.

⁹ Severe type of shoulder arthritis in which the cartilage of the joint is abruptly lost. It can occur in otherwise healthy shoulders after arthroscopic procedures.