

COMMON PEDIATRIC HIP DISORDERS



Lecture objectives:

Not Given

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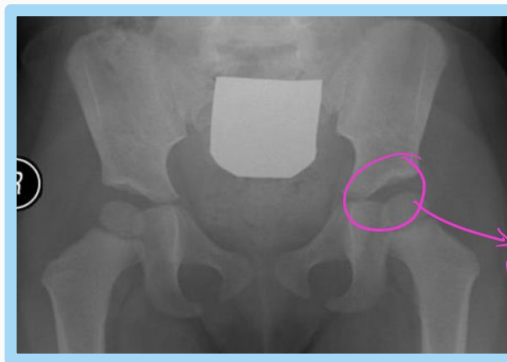
References: Team 436, Slides 437, Toronto Notes'2020'

OVERVIEW

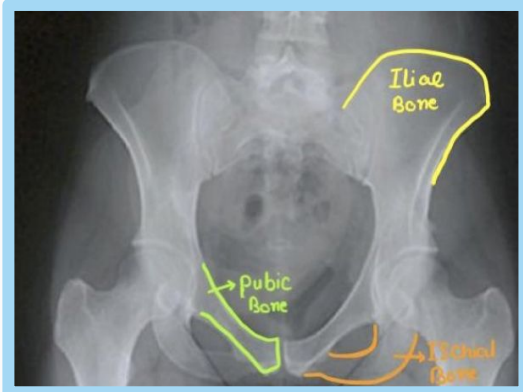
- Pediatrics have a growth plate, the greater trochanter is not yet formed.
- The femoral head in adult is completely formed and connected to the acetabulum. In pediatrics it is small, not connected to the acetabulum and full of cartilages.
- In pediatric **the meeting area between the ischium, pubic 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 starts ossification and it will be called ossification center.

Adult

Child



A Child's Head and neck of femur are separated by the growth plate while in adult there's no separation.



COMMON PEDIATRIC HIP DISORDERS

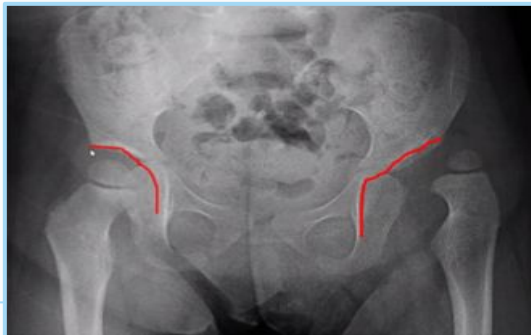
1. DDH (Developmental Dysplasia of the Hip) الخلع الوركي الولادي The abnormality is between the head of the femur and the acetabulum.
2. SCFE (slipped capital femoral epiphysis) انزلاق مَشاش رأس الفخذ The problem is between the head and the neck of the femur, growth plate between them becomes weak فيصير زحلقة.
3. Perthes The problem is at the femoral metaphysis. (Issue is decreased blood supply to the head of femur)

DEVELOPMENTAL DYSPLASIA OF THE HIP (DDH)

- 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**.

<p>Completely Dislocated</p>	<p>Completely separated; out of acetabulum. There's special test for dislocated hip & other for dislocatable hip it's very important to differentiate between them</p>
<p>Subluxated</p>	<p>Partially separated</p>
<p>Dislocatable</p>	<p>Means unstable. Normally, when I want to push out the femoral head it moves, but in a dislocatable hip the femoral head completely goes out when I apply pressure, and when I put it back it goes back fully. The head is inside the acetabulum but is lax.</p>
<p>Acetabular Dysplasia خلل التنسج الحُقي Acetabulum doesn't fit the head of femur</p>	<p>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. The acetabulum takes its shape when the femoral head is attached to it, but if the femoral head is not attached and not inside the acetabulum, it will become flat rather than hemispheric. Evenmore sometimes the baby is born with a flat acetabulum but the femoral head is normal with no pathology but cannot attach to the acetabulum. What is the X-Ray finding? The angle between the acetabulum and horizontal line is increased.</p>

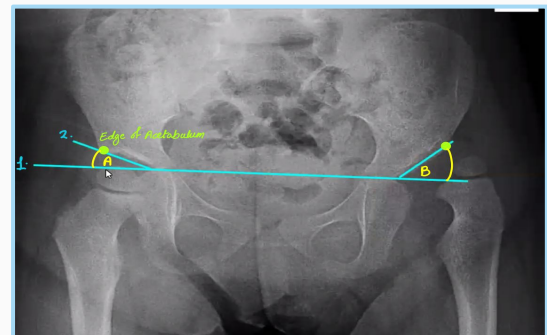


On Right side:

1. Head is inside the hip joint.
2. Acetabulum is covering the head of femur properly.

Left side shows:

1. Head of femur is smaller
2. Lateralization (going out); dislocated or subluxated.
3. Acetabulum is not covering completely; called Open/Shallow Acetabulum or Acetabular Dysplasia.



1. Draw straight line between the two Triradiate Cartilages.
2. Draw line from the Edge of Acetabulum to the Triradiate Cartilage.

Notice that the angle B is wider than A

★ Causes:

The exact cause is **unknown**, But may be due to:

1. Hormonal (Oxytocin, Relaxin (أمراض الليونة))
2. Familial (Ligament Laxity Diseases)
3. Genetic:
4. Females are affected 4 times males
5. Twins (40%)
6. Mechanical: anything can cause adduction
 - a. Prenatal: Breech birth, Oligohydramnios, Primigravida, twins, torticollis, metatarsus adductus, and C-section.
 - b. Postnatal: Swaddling مهاد, Strapping

-breech birth: is when a baby is born bottom first instead of head first.



-Torticollis: defined by an abnormal, asymmetrical head or neck position



Infants at risk

IMP

- Positive family history: 10X
- A baby girl: 4-6 X
- Breech presentation: 5-10 X
- Torticollis الصَّعْر أو الإجل: CDH in 10-20% of cases
- Foot deformities: Calcaneo-valgus حنق عقبي and metatarsus adductus انحناء القدم نحو الداخل
- Knee deformities: hyperextension فرط بسط الركبة and dislocation.

- When risk factors are present? the infant should be reviewed clinically and radiologically. Physical exam + X-ray at least twice on separate visits.
- DDH increase by adduction and decrease by abduction, so anything increase stress on the head causing adduction might be predisposing factor for DDH. Those mentioned here are some factors can cause adduction → DDH
- 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

DDH is rarely seen in those people because they carry their kids in an **abduction** position NOT adduction.

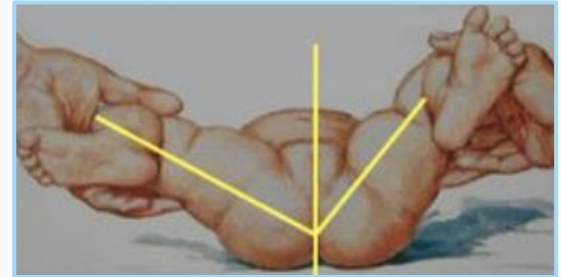
Clinical examination

Must be done on multiple visits

The Infant should be quiet and comfortable.

- ★ **Look** (These features are always found until treated):
 - External Rotation
 - Lateralized Contour
 - **Asymmetric skin folds** (anterior and posterior)
 - **Shortening** of dislocated limb, which moves up leading to formation of skin folds.

- ★ **Move**
 - **Limited hip abduction:** Because there is dislocation of the hip, that is why there is restricted abduction. It is present from birth, the mother will notice it while she's changing the diaper.

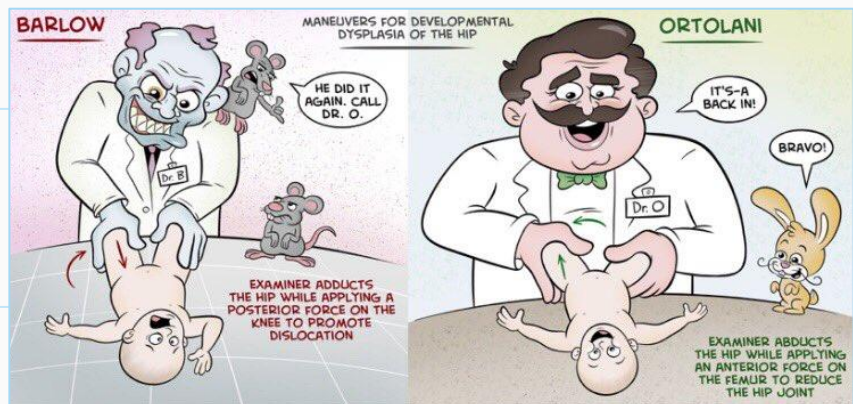


★ Special Tests

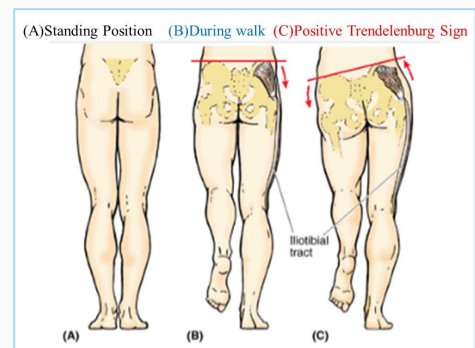
1. **Galiazzi** (Older than 8 months)
2. **Ortolani Test** (The most sensitive in Reducible DDH) (relocation of dislocated hip)
 - This Examination is performed for pediatrics **<6 months**.
 - Do hip flexion then Abduction of hip then pull, if you pop it back into place or hear a click it is a positive test which means the baby is for sure has DDH.
3. **Barlow test**
 - This test is helpful in dislocatable hip, 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)

Barlow test: adduction and push
Ortolani test: abduction and pull

30 sec. [VIDEO](#), start at second 31



4. **Trendelenburg sign** (very late presentation **>2 years**, if you find this then you need to go for surgery)
5. **Limping** painless (waddling gait if bilateral)



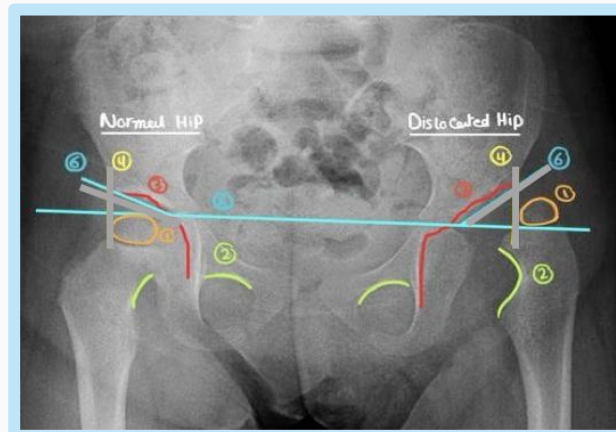
- If you have 8 month old patient with DDH what is the best test to use?
 - Barlow, ortolani, Trendelenburg, limited abduction? The answer is **limited abduction**, key? 8 months. The first two for babies less than 6 months & the third one for babies after 2y.
- If you have a baby older than 6 months, what will you find in the examination which suggest DDH?
 - Limited abduction, shortening, increase skin fold, **limping** when the baby starts to walk.

Investigations

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

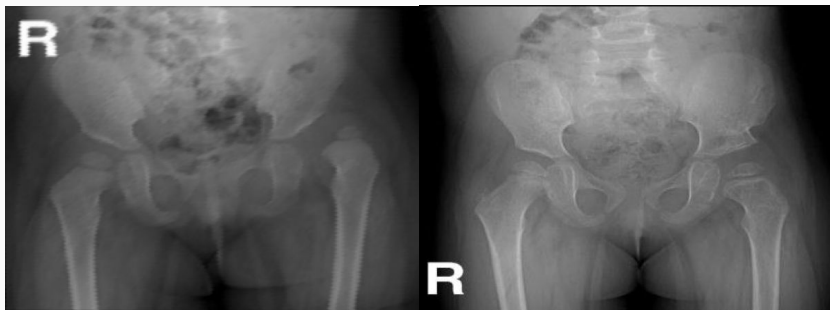
★ Signs of DDH on X-ray: (important)

- 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**.

Treatment

- **Aim:**
 1. **REDUCE:** Obtain concentric reduction.
 2. **STABILIZE:** Maintain concentric reduction.
 3. **SAFELY**³: In a non-traumatic fashion.
 - Without disrupting the blood supply to femoral head.
- **Way:** Refer to pediatric orthopedic clinic.
- **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 OR . 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 الرّد المغلق + maintain with hip spica if it fails, we remove fibrous tissues and do an open reduction. § 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 الرّد المفتوح + maintain with hip spica
18 – 24 m	GA + Open reduction (ORIF) + Acetabuloplasty رأب الخُق + maintain with hip spica
2-8 years	GA + Open reduction + Acetabuloplasty + femoral shortening ⁴ + 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



Bilateral DDH

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


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

Complications

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

	Slipped capital femoral epiphysis (SCFE)	Perthes (Leg Calvé Perthes)
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 · Metabolic, The big number of patients have a metabolic cause, so we have to do a test for growth, thyroid, and parathyroid hormones, renal function. · Mechanical · Obesity · Trauma · Unknown (most common) 	<p>Unknown</p> <p>without any cause same as brain stroke; this is femur clot, it can take 1-2 months, weeks or days then the blood supply return back to femur but it's too late a lot of cells have died.</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		<p>The amount of femoral head involvement, more head involved >> poorer prognosis.</p> <p>+ the time duration of decreased blood supply, and the site if it's weight bearing or not.</p>

<p>History</p>	<ul style="list-style-type: none"> • Hip pain • Referred knee pain (only)⁶ • Minor/major trauma or no trauma(the cause of the slipped is abnormal growth plate not the trauma) • Limping (painful). in DDH it was painless 	<ul style="list-style-type: none"> • Hip pain or knee pain • Minor trauma or no trauma • Limping (painful) • What are the DDx of painful limping in pediatrics?
<p>Clinical Examination</p>	<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).
<p>Investigations</p>	<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. (done in early cases) 	<ul style="list-style-type: none"> • X-ray <ul style="list-style-type: none"> ○ No slippage, no dislocation, no infection; so Perthes disease is what left. ○ The ball of head is smaller and irregular. ○ Pelvis: decrease head size (irregular shape) ○ Knee ○ If early X-ray might not show anything. • MRI: can help if X-ray is not show anything in early cases.

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>Treatment</p>	<p>Refer to orthopedic as an emergency case.</p> <p>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 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 ● We follow up the patient and make sure that the head of the femur is inside the acetabular. ● This treatment doesn't need any surgical intervention, the closed vessels open by themselves.
<p>Late complications (without or with partial treatment)</p>	<ul style="list-style-type: none"> ● Femoral Acetabular Impingement (FAI) الاصطدام⁸ الوركي. ● Early arthritis. ● Leg Length Discrepancy (LLD) طول الساق المتناقض. ● 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.

Which Image is the worse, Rt or Lt?

Lt



Rt



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

⁸ A condition in which extra bone grows along one or both bones that form the hip joint — giving the bones an irregular shape. Neck of femur has protrusion, then if pt do abduction this protrusion, will attach the Acetabulum then causes impingement and early arthritis happens.

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.

Treatment of SCFE



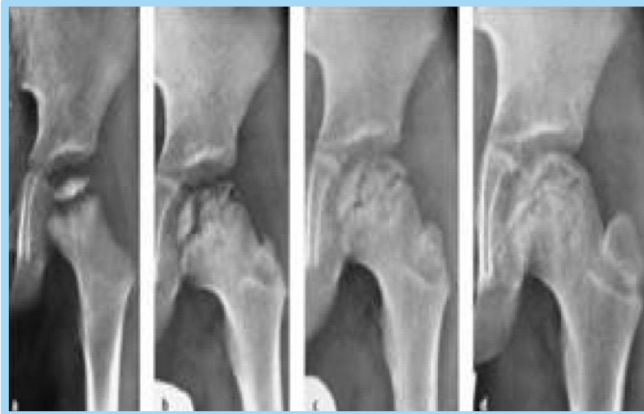
- On the right side only wide growth plate
- (we put screw for prevention)
- on the left side both widening and slipping

Perthes Disease on the Lt



- Perthes on the left side (small head of femur with fragmentations)

Healing phases of Perthes Disease



- 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 by remodeling. This process will take up to 4 years
- I need to control the disease by keeping the hip inside, maintained & reduced + good ROM to reach good result and prognosis after the disease resolved.

QUESTIONS

1- 16 months old baby has a DDH, which one of the following is the management?

- A. Pavlik harness.
- B. ORIF.
- C. open reduction w/ acetabuloplasty.
- D. open reduction w/o acetabuloplasty

2- An 8-year-old child came to the ER with painful limping x-ray was done in the picture, what is the dx?

- A. Perthes disease
- B. DDH.
- C. SCFE.
- D. Septic arthritis.



3- 4 months old child with suspicion of reducible DDH, what is the most sensitive test:

- A. Limited abduction.
- B. Ortolani.
- C. Barlow.
- D. Galeazzi.

4- 8-month-old patient with DDH what is the best test to use?

- A. Barlow,
- B. Ortolani
- C. Trendelenburg
- D. limited abduction

5- 8 months old child brought by his parents because he has painless limping that was noticed recently. Which one of the following tests will be positive?

- A. Galeazzi
- B. Ortolani
- C. Barlow
- D. Thompson

9- A 1-month-old infant is brought to the pediatrics department by his parents for a routine examination. He is their first child, a result of a healthy pregnancy with no complications. His mother was properly immunized and was negative for Group B streptococcus colonization. On examination, the child is alert with positive Moro, Babinski, and grasp reflexes. Pulmonary, cardiac, and abdominal examinations are unremarkable. His left leg appears shorter than his right and a clunk is noted during Ortolani examination. Which of the following is a risk factor for the most likely diagnosis?

- A. Asian American ethnicity
- B. First born
- C. macrosomia
- D. Vaginal delivery

10- A 5-year-old boy comes to the clinic with his father because he has been limping for three weeks. Past medical history includes attention deficit hyperactivity disorder, but the boy does not take any medications. History is unremarkable for trauma or recent illness. His temperature is 37.1°C (98.8°F), pulse is 90/min, respirations are 22/min, and blood pressure is 100/70 mm Hg. Physical examination shows a painful limp of the right lower extremity with limited internal rotation and abduction of the right hip joint. A hip radiograph is obtained and shows the right proximal femoral epiphysis to be misshapen and more horizontal compared to the unaffected hip, the femoral head appears collapsed. Which of the following is the most likely diagnosis?

- A. Perthes disease
- B. DDH.
- C. SCFE.
- D. Achondroplasia

6- Which of the following is a risk factor for DDH?

- A. Oligohydramnios
- B. Negative family history
- C. 3rd child
- D. Baby male

7- A 15 months old infant was managed with closed reduction and hip spica. (Pic of DDH x-ray) Which one of the following is a likely complication of this case?

- A. Growth arrest.
- B. Osteoarthritis.
- C. Avascular necrosis.
- D. Infection.

8- 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

Answers: 1-B 2-C 3-B 4-D 5-A 6-A 7-B 8-A 9-B 10-A

Developmental Dysplasia of the Hip

Definition

- abnormal development of hip, resulting in dysplasia and subluxation/dislocation of hip
- most common orthopedic disorder in newborns

Etiology

- due to ligamentous laxity, muscular underdevelopment, and abnormal shallow slope of acetabular roof
- spectrum of conditions
 - dislocated femoral head completely out of acetabulum
 - dislocatable head in socket
 - head subluxates out of joint when provoked
 - dysplastic acetabulum, more shallow and more vertical than normal

Physical Exam

- diagnosis is clinical
 - limited abduction of the flexed hip ($<60^\circ$)
 - affected leg shortening results in asymmetry in skin folds and gluteal muscles, wide perineum
 - Barlow's test checks if hips are dislocatable
 - ◆ flex hips and knees to 90° and grasp thigh
 - ◆ fully adduct hips, push posteriorly to try to dislocate hips
 - Ortolani's test checks if hips are dislocated
 - ◆ initial position as above but try to reduce hip with fingertips during abduction
 - ◆ positive test: palpable clunk is felt (not heard) if hip is reduced
 - Galeazzi's sign
 - ◆ knees at unequal heights when hips and knees flexed
 - ◆ dislocated hip on side of lower knee
 - ◆ difficult test if child <1 yr
 - ◆ Trendelenburg test and gait useful if older (>2 yr)

Investigations

- U/S in first few months to view cartilage (bone is not calcified in newborns until 4-6 mo)
- follow-up radiograph after 3 mo
- X-ray signs (at 4-6 mo): false acetabulum, acetabular index $>25^\circ$, broken Shenton's line, femoral neck above Hilgenreiner's line, ossification centre outside of inner lower quadrant (quadrants formed by intersection of Hilgenreiner's and Perkin's lines) (Figure 56)

Treatment

- 0-6 mo: reduce hip using Pavlik harness to maintain abduction and flexion
- 6-18 mo: reduction under GA, hip spica cast x 2-3 mo (if Pavlik harness fails)
- >18 mo: open reduction; pelvic and/or femoral osteotomy

Complications

- redislocation, inadequate reduction, stiffness
- AVN of femoral head

Legg-Calvé-Perthes Disease (Coxa Plana)

Definition

- idiopathic AVN of femoral head, presents at 4-8 yr of age
- 12% bilateral, M>F = 5:1, 1/1200
- associations
 - family history
 - low birth weight
 - abnormal pregnancy/delivery
 - ADHD in 33% of cases, delayed bone age in 89%
 - second-hand smoke exposure
 - Asian, Inuit, Central European
- key features
 - AVN of proximal femoral epiphysis, abnormal growth of the physis, and eventual remodelling of regenerated bone

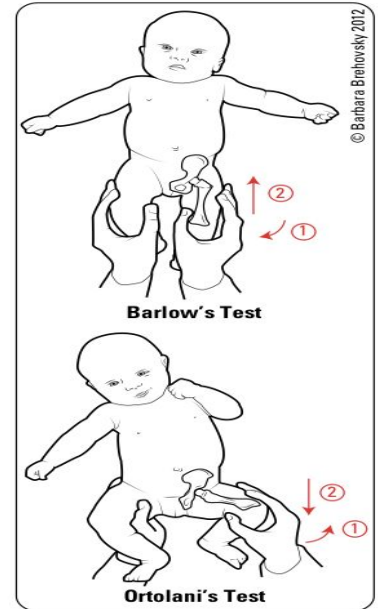


Figure 52. Barlow's test and Ortolani's test



5 Fs that Predispose to Developmental Dysplasia of the Hip

Family history
Female
Frank breech
First born
LeFt hip



Most common in adolescent athletes, especially jumping/sprinting sports



Children diagnosed with coxa plana <6 yr of age have improved prognosis

Clinical Features

- child with antalgic or Trendelenburg gait \pm pain
- intermittent knee, hip, groin, or thigh pain
- flexion contracture (stiff hip): decreased internal rotation and abduction of hip
- limb length discrepancy (late)

Investigations

- X-ray: AP pelvis, frog leg laterals
- initially, may be negative; if high index of suspicion, move to bone scan or MRI
- eventually, collapse of femoral head will be seen (diagnostic)

Treatment

- goal is to preserve ROM and keep femoral head contained in acetabulum
- non-operative
 - physiotherapy: ROM exercises
 - brace in flexion and abduction x 2-3 yr (controversial)
- operative
 - femoral or pelvic osteotomy (>8 yr of age or severe)
 - ◆ prognosis better in males, <6 yr, $<50\%$ of femoral head involved, abduction $>30^\circ$
- 60% of involved hips do not require operative intervention
- natural history is early onset OA and decreased ROM

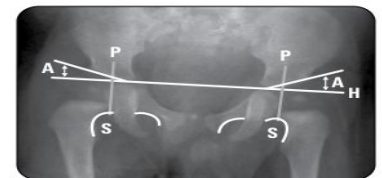


Figure 53. Pelvic x-ray and reference lines and angles for assessment of DDH

Triradiate Cartilage

y-shaped epiphyseal plate at junction of ilium, ischium and pubis

Hilgenreiner's Line

Line running between triradiate cartilages

Perkin's Line

Line through lateral margin of acetabulum, perpendicular to Hilgenreiner's Line

Shenton's Line

Arced line along inferior border of femoral neck and superior margin of obturator foramen

Acetabular Index

Angle between Hilgenreiner's Line and line from triradiate cartilage to point on lateral margin of acetabulum

Slipped Capital Femoral Epiphysis

- most common adolescent hip disorder, peak incidence at pubertal growth spurt

Definition

- type I Salter-Harris epiphyseal injury at proximal hip

Etiology

- multifactorial
 - genetic: autosomal dominant, black children at highest risk
 - cartilaginous physis hypertrophies too rapidly under growth hormone effects
 - sex hormone secretion, which stabilizes physis, has not yet begun
 - overweight: mechanical stress
 - trauma: causes acute slip
- risk factors: male, obese (#1 factor), hypothyroid (risk of bilateral involvement)

Clinical Features

- acute: sudden, severe pain with limp
- chronic: typically groin and anterior thigh pain, may present with knee pain
 - positive Trendelenburg sign on affected side, due to weakened gluteal muscles
- tender over joint capsule
- restricted internal rotation, abduction, flexion
 - Whitman's sign: obligatory external rotation during passive flexion of hip
- Loder classification: stable vs. unstable (provides prognostic information)
 - unstable means patient cannot ambulate even with crutches

Investigations

- X-ray: AP, frog-leg, lateral radiographs both hips
 - posterior and medial slip of epiphysis
 - disruption of Klein's line
 - AP view may be normal or show widened/lucent growth plate compared with opposite side



Bilateral involvement occurs in about 25%



Klein's Line

On AP view, line drawn along supero-lateral border of femoral neck should cross at least a portion of the femoral epiphysis. If it does not, suspect SCFE

Treatment

- operative
 - mild/moderate slip: stabilize physis with pins in current position
 - severe slip: ORIF or pin physis without reduction and osteotomy after epiphyseal fusion

Complications

- AVN (roughly half of unstable SCFEs), chondrolysis (loss of articular cartilage, resulting in narrowing of joint space), pin penetration, premature OA, loss of ROM