DDH: Developmental dysplasia of the hip

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Simple Anatomy

The hip is a “ball-and-socket” joint that is held together by ligaments (ligament of teres, ileofemoral, ischiofemoral, transverse ligament).

The ball is called the “femoral head” which is the top of the femur or thigh bone.

The socket is called the “acetabulum” and is a part of the pelvis.

The femoral head fits into the acetabulum creating the hip joint. This joint is normally held tightly in place by the surrounding ligaments and joint capsule.
Definition of DDH:

- It’s a spectrum of abnormalities affecting the growing hip.
- A condition where the hip joint is not formed properly where the acetabulum is too shallow (acetabular dysplasia) and the femoral head is sublaxed or dislocated.
- Whether the instability comes first and then affects acetabular development because of imperfect seating of the femoral head, or is a result of a primary acetabular dysplasia, is still uncertain.
The old term for such condition used to be congenital dislocation of the hip (CDH) because they thought it occur in the first month. In the case of DDH, the infant/child’s joint is otherwise normal except for the instability, leading to abnormal growth of the hip joint. The term DDH also describes the range and evolution of abnormalities that occur in this condition.

**It is NOT a one step disease!!**
Pathology:

a. The acetabulum is shallow (shaped like a saucer instead of a cup).
b. The femoral head gets dislocated.
c. The capsule is stretched and the ligamentum teres becomes elongated and hypertrophied.

Two forms of femoral dysplasia are:

Coxa vara, in which the femur head grows at too narrow an angle to the shaft.

Coxa valga, in which the angle is too wide.
• **Incedence**: 1 or 2 per 100 infants (1 in 1000 for dislocation).

• **Left hip** is more often affected, due to the baby’s intrauterine position of the left hip against the mother’s sacrum, which forces it into an adducted position.

• girls:boys = 7:1.

• May be associated with other congenital abnormalities that occur with tighter intrauterine space (e.g., metatarsus adductus).

• 20% bilaterally.

• Rare in prematures; because the hormone "relaxin" which wouldn't have reached its highest levels in these babies when they are born.
Normal position

Breech position
Risk Factors (The 4 F’s)

- First born (small sized uterus)
- Female (relaxin hormone)
- Family History
- Feet first (breech position)
Types of DDH according to severity:

**Dislocated.** In the most severe cases of DDH, the head of the femur is completely out of the socket.

**Dislocatable.** In these cases, the head of the femur lies within the acetabulum, but can easily be pushed out of the socket during a physical examination.

**Subluxatable.** In mild cases of DDH, the head of the femur is simply loose in the socket. During a physical examination, the bone can be moved within the socket, but it will not dislocate.
Signs and Symptoms
(noticed by parents)

1) **Asymmetrical buttock creases**: can suggest hip dysplasia in infants but, like a hip click, an **ultrasound or x-ray study will need to be done** to determine whether the hips are normal or not.

2) **Hip Click**: Hip clicks or pops can sometimes suggest hip dysplasia but a snapping sound can occur in normal hips from developing ligaments in and around the hip joint.

3) **Limited Range of Motion**: Parents may have difficulty diapering because the hips can’t fully spread (**During abduction**)

4) **Pain**: is normally not present in infants and young children with hip dysplasia, but **pain is the most common symptom of hip dysplasia during adolescence or as a young adult due development of osteoarthritis.**
HOW TO ASSES HIP STABILITY IN INFANTS:

1. **Barlow test**: a maneuver that is performed by adducting the hip while applying light pressure on the knee, directing the force posteriorly. If the hip dislocates (pops out of socket with a "clunk" is felt), the test is considered positive. The test is harmful and shouldn’t be done.

2. **Ortolani test**: relocates the dislocation of the hip joint that has just been elicited by the Barlow maneuver by abducting the hip joint.

Barlow and Ortolani tests are inapplicable after 3 months of age because of certain changes that happen in the hip joint and make it fixed and no more reducible by that age. Specifically, this tests for posterior dislocation of the hip.
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3. **Galeazzi test “sign”**: It is performed by flexing the knees while lying down so that the feet touch the surface and the ankles touch the buttocks. If the knees are not level (apparent limb length discrepancy) then the test is positive. Shorter leg is the affected leg.
Ortonali’s test:
To assess if the hip is dislocated

CLUNK : POSITIVE RESULT
BARLOW’S TEST: To assess if the hip is sublaxable (can be easily dislocated of the acetabulum)
Investigation:
1) U/S
The triradiate cartilage is the 'Y'-shaped epiphyseal plate between the ilium, ischium and pubis to form the acetabulum of the hip bone.
RECOMMENDATION OF THE AMERICAN ACADEMY OF PEDIATRICIANS (AAP) FOR HIP ASSESSMENT FOR DDH

- All newborns should be screened by physical exam
- Routine ultrasound for all newborns is NOT needed
- If there is positive Ortonali or Barlow sign (clunk)
  1. Orthopedic referral
  2. No need for ultrasound or radiograph
  3. Use of triple diapers is not recommended (will delay more appropriate treatment).
- If there is "equivocal" (soft clunk or asymmetry), repeat the exam after 2 weeks.
  1. If the results are the same (soft clunk, asymmetry), orthopedic referral or ultrasound
  2. If the results became negative: no need for further action
  3. If the results became positive Ortonali or Barlow (clunk): orthopedic referral
- **Risk factors**: If the results of the newborn examination are negative (or equivocally positive), risk factors may be considered.

- **Females**: Hips should be reevaluated **at 2 weeks of age**.

- **Infants with a positive family history of DDH or breech presentation**:
  - For boys, hips reevaluated at 2 weeks of age.
  - For females, ultrasound at the age of 6 weeks or radiographs at the age of 4 months should be performed.
  - Consider radiographs for **all breech (boys and girls)** at the age of 4 months for detection of acetabular development.
Periodicity

1. The hips must be examined at **every well-baby visit**

2. If DDH is suspected (by abnormal exam or prenatal complain for difficult change of diaper) in any visit, one of the following has to be done:
   - focus exam of the hip with the child relaxed
   - orthopedic referral
   - imaging study (ultrasound for children less than 4 months or radiographs for children older than 4 months)
HOW TO ASSES HIP STABILITY IN TODDLERS AND CHILDREN

- Shortening of the femur (Galeazzi sign)
- Unequal gluteal fold
- Limited abduction
- Limping (for unilateral cases) and waddling gait (for bilateral cases)

- Pain is NEVER a symptom of UNTREATED DDH until the development of hip arthritis (usually by the 4th decade of life)
Management

1. If the age of presentation is < 6 months or the weight is < 9 kg: Pavlik harness for at least 6 weeks and no more than 3 months.

- The ideal position for pavlik harness is 35-60° abduction (it should be abducted with distance btw the 2 knees cannot be less than 3-4 fingers (controlled by posterior straps). and 90-100° flexion. (control by anterior strap)

- Pavlik harness is designed to hold the hip in the proper position while allowing free movement of the legs and easy diaper care, by keeping the hip flexed and abducted.
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2. If the age is between 6-12 months or failure of pavlik harness: arthrogram, closed reduction and spica casting and then we bring the child to OR and inject the dye again and do another exam, make sure it is stable and apply a spica for another 6 weeks - spica cast usually applied for 6 weeks.

3. If age of presentation is 1-2 years or failure of closed reduction: open reduction and femoral osteotomy (to make reduction more stable, and to reduce stress on the femoral head to avoid development of avascular necrosis) + spica casting.

Do CT to the patient after the surgery to ensure there's no posterior dislocation.

4. If >2 years → open surgery + pelvic and femoral osteotomy

5. If age of presentation > 3 years: palliative surgery because acetabular remodeling ends by the age of 3.

NOTE: any form of treatment can affect blood supply, even the pavlic harness and it is more than in open reduction than closed reduction.
THANK YOU