Developmental Dislocation (Dysplasia) of the Hip (DDH) in Children
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Developmental dysplasia of the hip (DDH) is an abnormal development of the hip resulting in a spectrum of hip instability based on the displaced contact of the proximal femoral head with the acetabulum. It is the most common orthopedic disorder of the newborn and all newborns should be screened for DDH with specific physical exam maneuvers (Barlow and Ortolani tests). Early diagnosis and treatment is extremely important to preventing progression and promoting normal hip alignment.

Definition of Developmental Dislocation of the Hip

Developmental Dislocation (Dysplasia) of the Hip refers to a condition of a young child where the hip joint is dislocated or prone to be dislocated due to abnormal development of the hips. It may be mild or severe, affecting 1-3% of newborns.

Epidemiology of Developmental Dislocation of the Hip

DDH is the most common orthopedic disorder in newborns. 1-2 babies out of 1,000 are born with DDH. Although most infants are born with hip dysplasia, it can also develop during the first year of life.

Risk Factors for Developmental Dislocation of the Hip

- **Gender:** 80% of patients with DDH are females
- **First-born** children
- **Tight swaddling** with hips and knees straight: Parents should be taught how to swaddle infants properly
- **Breech intrauterine positioning:** 20% of patients with DDH were previously in breech position while 2-4% of the general population were previously in breech position.
- **Oligohydramnios:** low levels of amniotic fluid are thought to limit the space available for the fetus.
- **Family history** of DDH: although the cause is not well-known, DDH has been shown to run in families, indicating a genetic influence.
- **Underlying neuromuscular disorders**
Screening in Developmental Dislocation of the Hip

From birth to three months, all infants should be screened for DDH with Barlow and Ortolani:

- Each test should be done one hip at a time
- Barlow maneuver: dislocating an unstable hip: Adduct the hip, flex to 90 degrees, and apply posterior force to the proximal femur to attempt to posteriorly dislocate the hip
- Ortolani maneuver: reducing a dislocated hip: Abduct the hip, flex to 90 degrees, and apply anterior force to the proximal femur to relocate a posteriorly dislocated hip into the socket

From two months to 12 months, all infants should be screened for DDH with an assessment of hip adduction.

Presentation of Developmental Dislocation of the Hip

DDH is diagnosed during the newborn examination with the screening maneuvers described above. Before three months of age, the classic finding is the feeling of a “clunk” that occurs during either the Barlow or Ortolani maneuver as the femur moves in and out of the acetabulum.

This can be accompanied by an audible sound, but the important part is the palpable femur movement. There can be an audible high-pitched “click” that occurs during the exam, but this is not thought to be related to DDH.

Once the infant is past three months of age, the hip is usually in a fixed position that cannot be assessed using the Barlow and Ortolani maneuvers.

A dislocated hip can be identified by limited hip abduction, asymmetry of the gluteal thigh skin folds, and leg-length discrepancy. A test that can be used for the leg-length discrepancy is the Galeazzi sign. To do this test, the infant is laid down supine with hip and knees flexed and if one leg appears shorter than the other, the infant has a positive Galeazzi sign.

Later symptoms, after the child begins walking, can include an uneven gait, a limp causing toe walking on one side, external rotation on one side while walking, and hyperlordosis.

Bilateral hip dysplasia can be hard to identify as many of the diagnosing symptoms are defined by the asymmetry of the unaffected side (asymmetric thigh folds, Galeazzi sign, asymmetrically decreased abduction).
Diagnosis for Developmental Hip Dysplasia

Ultrasound

*Early diagnosis* (by the methods described above) is extremely important to the outcome of DDH. Although *ultrasound* is not recommended as a screening method for all infants, it is a good way to evaluate children with suspicious physical exam findings as it has a high negative predictive value. It is also useful throughout the treatment course for DDH as the slope of the *acetabulum* can be measured by the alpha and beta angles.

- It shows the shape of the cartilaginous socket & the position of the femoral head
- Sequential assessment is straightforward and allows monitoring of the hip during a period of splintage

Radiography

X-rays of infants are difficult to interpret because the acetabulum and femoral head are largely (or entirely) cartilaginous and therefore not visible. X-ray examination is more useful after the first 6 months, and assessment is helped by drawing lines on the x-ray plate to define three geometric indices. Because the femoral head is underdeveloped, the left hip is dislocated.

In this case, the features are very obvious but some little changes can be gauged by certain geometrical tests:

- **Vertical line (Perkins’ line):** which defines the outer edge of the acetabulum.
- **Horizontal line (Hilgenreiner’s line):** which passes through the triradiate
cartilages
- Normally: The epiphysis lie medial to a vertical line below a horizontal line.

The acetabular roof angle should not exceed 30 degrees. Von Rosen’s lines: with the hips abducted 45° the femoral shafts should point into the acetabula.

Because DDH can be part of a syndrome, it is also important to rule out any medical or neuromuscular syndromes.

Treatment of Developmental Dislocation of the Hip

Infants younger than 6 months with evidence of hip instability are treated with bracing, commonly in a Pavlik harness for 1-2 months. The brace will place the infant in a position with hips flexed and abducted while allowing for movement. This position helps the creation of a more stable hip joint over time and is usually very successful at treating DDH.

For children between 6 months and 2 years of age, the recommendation is usually closed reduction. These children may have been diagnosed later in life or failed previous treatment. In closed reduction, the infant is put under general anesthesia and the femur is manipulated back into the socket. Once the hip is in proper alignment, a spica cast is applied, which keeps the hip in position while the joint heals. If closed treatment is successful, the prognosis for children with DDH is very good.

For children older than 2 years of age, open reduction is the recommended treatment. These children may have previously failed closed reduction. With open reduction, tissue preventing the reduction can be identified easily and cleared out of the socket. After open reduction, a spica cast is applied to keep the hip reduced while it heals.

Other options for older children include pelvic osteotomy and femoral osteotomy. Osteotomy refers to the reshaping of bone. Children two years and older often need both types of osteotomy in conjunction with reduction to make the hip a more normal shape and keep it stable. The surgery is followed by a body cast for several weeks and bracing after that.

Complications

Potential complications include redislocation, hip stiffness, infection, lower back pain, premature osteoarthritis, persistent limp on the diseased side and avascular necrosis of the femoral head. Unfortunately, surgical treatments have an increased risk of avascular necrosis (ranging from 0.00% to 73%). Even with the proper treatment, there is also an increased risk of hip deformity and osteoarthritis later in life. However, early detection and prompt management reduce the risk of disabling complications.

Prognosis

The best way to prevent DDH is early detection and management. Certain swaddling exercises are also helpful. DDH with false acetabulum has poor prognosis while bilateral DDH without false acetabulum has a better prognosis.
References

- Developmental Dysplasia of the Hip via medscape.com
- Developmental Dislocation (Dysplasia) of the Hip (DDH) via orthoinfo.aaos.org
- Common Questions About Developmental Dysplasia of the Hip via aafp.org
- Causes of DDH via hipdysplasia.org

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