

Infant with an Abnormal Hip Exam

1. Background:

Routine neonatal screening for developmental dysplasia of the hip (DDH) is very important in all newborns. DDH refers to abnormal development of the hip where there is instability (dislocatability) of the hip and dysplasia (abnormal shape) of the acetabulum. Physical examination using the Barlow and Ortolani tests are frequently positive in individuals with DDH, however it is not pathognomonic for dysplasia/dislocation of the femoral head in the acetabulum. Rather, the presence of an abnormal physical exam warrants immediate further investigation and possible intervention. This article outlines the epidemiology, risk factors, signs and symptoms, diagnosis, and treatment of DDH as well as its complications and differential diagnoses.

2. Epidemiology and Risk Factors

DDH affects one in one thousand live births and most commonly occurs in otherwise healthy infants. Laxity of the hip and immaturity of the development of the acetabulum is often detected in normal newborns in the first few weeks of life. This laxity resolves in most cases and acetabulum goes on to develop normally. The cause of DDH in most cases is unknown, but presumed to be multifactorial despite many competing theories that attempt to explain its etiology.

DDH can however occur in association with other conditions such as Ehlers-Danlos, Down Syndrome and various forms of neuromuscular hip dysplasia. Other causes of DDH are by teratogens during the gestational period.

Risk factors for DDH include female gender, breech presentation, and a positive family history of DDH. Girls with a breech presentation are at the highest risk with an estimated risk of 12%. Boys with a breech presentation have a 2.6% risk. Girls with a positive family history have a risk of 4.4% while boys with a family history of DDH have a risk of only 0.9%. The estimated risk of DDH in girls without other risk factors is 1.9%.

3. Presentation:

Congenital DDH presents along a spectrum that can be classified as: acetabular dysplasia (no dislocation), subluxation or partial dislocation of the femoral head, or complete dislocation of the femoral head from the acetabulum. The clinical presentation of DDH depends upon the age at presentation and the severity of the abnormality (See Table 1). Age at presentation, however, carries the largest impact on treatment options, remodeling ability, and thus final outcome.

Infants with DDH may be asymptomatic or symptomatic. In decreasing frequency, patients present with pathology in the left hip, bilateral hips, and right hip.

Age at Presentation	Clinical Features
Birth to 3 months	<p>Diagnostic: Hip instability demonstrated by positive Ortolani or Barlow tests</p> <p>Suggestive: Asymmetric leg creases (inguinal, gluteal, thigh, popliteal), apparent shortening of the femur</p> <p>Associated findings: metatarsus adductus, clubfoot, torticollis, plagiocephaly, extension contractures of the knee</p>
3 to 12 months	<p>Limitation of hip abduction in 90° of flexion</p> <p>Apparent shortening of femur</p> <p>Laterally rotated posture of lower limbs</p> <p>Marked asymmetry of leg creases</p>
After the child begins to walk	<p>Excessive lumbar lordosis</p> <p>Prominent greater trochanter</p> <p>Gluteus medius lurch</p> <p>Positive Trendelenburg sign</p> <p>Short leg limp, with toe-heel gait and out-toeing</p> <p>Increasing adduction contracture of the hip</p>

Table 1: Clinical Findings in DDH – *Adapted from Clinical Features and Diagnosis of DDH, www.uptodate.com*

The differential diagnosis of hip instability in the infant includes proximal femoral focal deficiency, congenital coxa vera, infected hip leading to pathologic dislocation, muscle imbalance in children with cerebral palsy or myelomeningocele.

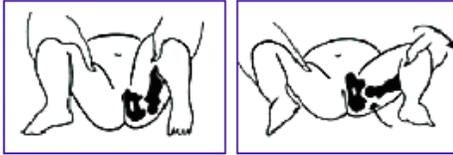
4. Physical Examination

Routine screening for hip dysplasia is performed on all newborns and infants with the Ortolani and Barlow maneuvers. Each hip should be examined separately and ideally when the infant is calm. Place the infant supine with the hip flexed to 90° in a neutral position.

Barlow Maneuver: This test attempts to detect joint subluxation or dislocation by trying to displace the femoral head posteriolaterally from the acetabulum. Place your index and middle finger along the greater trochanter and your thumb on the inner thigh. Then gently adduct the hip and apply pressure posteriorly. You may feel a “clunk” or “jerk” and posterior movement if the hip is dislocatable. You are in feeling the femoral head dislocate out of the acetabulum and



Barlow Test



Ortolani Test

positive Ortolani's test.

this constitutes a positive Barlow test. If the hip is subluxed, you may feel a sliding motion.

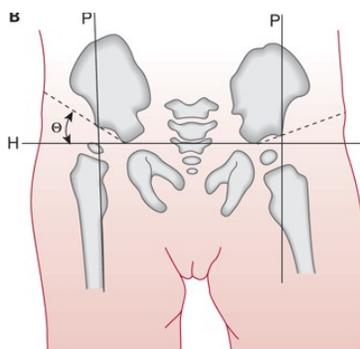
Ortolani's Test: This test attempts to determine if a subluxed or dislocated hip joint is reducible after the Barlow maneuver has been performed. With your hands in the same position as before, gently abduct the hip while lifting the leg anteriorly in an attempt to lift the head of the femur back into the acetabulum. If a palpable "clunk" is detected, this indicates a reducible dislocation and a

Note, it is quite common to detect high pitched "pops" or "clicks" without any detection of hip movement or a palpable clunk; these sounds are NOT associated with DDH.

5. Procedures for Investigation

Radiographic Evaluation:

Ultrasound is widely used to confirm the diagnosis of DDH and is used to assess the morphology and stability of the hip. It is a useful adjunct until 3 to 5 months of age. However, accurate interpretation requires experience and over reporting is common (25/1000), thus leading to unnecessary treatment in many patients. X-rays are indicated and more valuable in older infants (≥ 6 months old) and children due to the presence of a greater amount of ossification. It may also be of



Source: Gerard M. Doherty: *CURRENT Diagnosis & Treatment: Surgery, 13th Edition*
<http://www.accessmedicine.com>

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limited utility in younger infants even if it is coupled with a thorough history and a carefully performed physical exam. An AP radiograph should be obtained with hips in the neutral position; if they are obtained in the newborn period, the hips should be placed at 20-30°. A diagnosis on X-ray is made after Hilgenreiner's (H; horizontal) and Perkin's (P; vertical) lines have been drawn and the proximal femoral epiphysis is seen to have lateral or proximal displacement, indicating dislocation. If the acetabular index (theta) is measured to be greater than 30 degrees, abnormal acetabular development is probable as shown in figure 2.

Figure 2

6. Management

Management of DDH varies by age but treatment becomes increasingly difficult with older patients. Any infant with hip instability should be referred to a pediatric orthopedic surgeon.

- 0-18 months (Dislocated, reducible hip): Neonates with confirmed dislocatable and reducible hip are treated with abduction splinting (Pavlik

- harness) until stability is confirmed. Infants are not to flex and abduct their hip to greater than 60 degrees to avoid interfering with the blood supply to the femoral head and injury to the femoral nerve.
- 0-18 months (Dislocated, non-reducible hip): Closed reduction is often possible followed by a spica cast in order to maintain reduction. If closed reduction cannot be done, open reduction is required. This is followed by an arthrography and a CT scan to confirm successful reduction.
 - 18 months – 4 years old: Open reduction is often required. If reduction is well maintained until age 4 the results are good since acetabular remodeling occurs up to 4 years of age.
 - >4 years old: Treatment is most difficult at this age since acetabular remodeling is minimal. Even a successful reduction may not confer a stable, pain-free hip therefore salvage osteotomies are sometimes performed to improve joint mechanics. In many cases, despite the intervention, a total hip arthroplasty will still be required due to ensuing pain and limited range of motion that many patients experience.

7. Complications

Avascular necrosis of the femoral head following operative and non-operative treatment is a major complication. Many patients may also experience limited range of motion, and an inability to gain or maintain stable reduction.

8. Conclusion

The natural history of untreated DDH carries significant morbidity that can be avoided with early intervention. Thus it is extremely important that the hip examination is completed on all newborns as part of the routine newborn assessment.

9. References

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10. Acknowledgments

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