Developmental Dysplasia of the Hip

Jeanna Auriemma, MD,* Nicholas M. Potisek, MD*
**Wake Forest School of Medicine, Winston-Salem, NC*

AUTHOR DISCLOSURE Drs Auriemma and Potisek have disclosed no financial relationships relevant to this article. This commentary does not contain a discussion of an unapproved/investigative use of a commercial product/device.

Pediatricians may discover a click or a clunk when performing a physical examination of the neonatal hip. Assessment for developmental dysplasia of the hip (DDH) is a routine part of the neonatal examination because failure to detect neonatal hip instability or to respond appropriately to an abnormal examination may result in long-term disability for the child.

Developmental dysplasia of the hip covers a wide range of diseases related to abnormal development of the acetabulum and femoral head. The primary cause of DDH is improper fetal or postnatal positioning, which limits contact between the femoral head and the acetabulum, hindering proper growth. The resulting spectrum of disease extends from subtle abnormalities detected only on imaging through more severe manifestations such as dislocated hips that are unstable at rest.

With the lack of a standardized definition and the uncertain clinical relevance of particular imaging findings, the true incidence of DDH remains unclear. The incidence of DDH with dislocation is approximated to be 1 in every 1,000 live births; however, this likely represents an underestimate considering the full range of congenital hip disease. If mild dysplasia without dislocation is included, the overall incidence is approximately 1% of newborns; and when including any abnormality detected by screening ultrasonography, the incidence increases to 5% to 7%.

Factors that increase the risk of DDH include female sex, breech presentation, DDH in a first-degree relative, and improper swaddling methods. It occurs in females up to 4 times more often than in males. Breech presentation is reported in 17% to 23% of cases. Frank breech presentation confers the highest risk and occurs when the fetal hips are in flexion and both knees are extended with the feet in close proximity to the head. Breech presentation occurs in approximately 1 in 25 term births, with more than half being frank breech. At what point before delivery spontaneous or external cephalic version decreases the risk of DDH remains unclear. Although breech presentation is so strong a risk factor, breech-born infants with DDH may have better outcomes than non–breech-born infants. Recent evidence suggests that DDH related to breech positioning may have a higher propensity toward spontaneous resolution. Removing the infant from the in utero breech position may alleviate strain on the joint capsule, allowing the hip to stabilize naturally. Interestingly, breech presentation in twins does not seem to increase the risk of DDH compared with singleton pregnancies. Breech twins often have their knees flexed, whereas breech singleton fetuses are more likely to be in frank breech position, with knees extended. Family history is another factor in stratifying the risk of DDH, as infants with an affected parent or sibling are at 12 times higher risk. In twin gestations, genetics also plays a strong role: if a monozygotic twin has DDH, the risk of the other twin being affected is approximately 40%. Last, improper swaddling may force an infant's hips into

Evaluation and Referral for Developmental Dysplasia of the Hip in Infants. Shaw BA, Segal LS. *Pediatrics.* 2016;138(6)

American Academy of Orthopaedic Surgeons: Detection and Nonoperative Management of Pediatric Developmental Dysplasia of the Hip in Infants up to Six Months of Age. http://www.aaos.org/research/guidelines/DDHGuidelineFINAL.pdf. Accessed September 22, 2017

extension and adduction, increasing the risk of DDH. A hip healthy swaddling technique should be followed, allowing sufficient space for the hips to move and the knees to be slightly flexed. Although risk factors are additive, in 3 of 4 affected infants the only risk factor is female sex.

Careful examination of the hips is an essential aspect of screening and surveillance of DDH. The appropriate test depends on the infant's age. In the first 3 months of life, the Ortolani and Barlow maneuvers are the standard examinations, and they should be performed on a relaxed infant laying supine on a flat surface with the hips flexed to 90°. The examiner's thumb should rest on the inner thigh while the index and middle fingers apply pressure over the greater trochanter area. To perform the Ortolani maneuver, the hip is abducted with simultaneous anterior pressure on the trochanter. A positive test occurs when a "clunk" is felt as the head of the dislocated femoral head travels over the posterior acetabular cartilage and reduces back into the hip socket. The Barlow maneuver is performed by adducting the hip while palpating for the head of the femur dislocating from the socket. Dislocating a hip with the Barlow maneuver does not necessarily indicate future dislocation or predict DDH. With maturation of the acetabulum and reduced laxity of the joint capsule, a positive Barlow typically resolves spontaneously after 2 weeks. An audible "click," rather than a felt "clunk," during either maneuver is considered normal and represents snapping of soft tissue.

After 3 months of age the Barlow and Ortolani tests are poorly sensitive because affected hips have likely become fixed in the dislocated position. If hip dysplasia is unilateral, the Galeazzi sign may be present. In this test, the infant lays supine on the examining surface with knees flexed to 90° and feet planted flat on the surface. Ankles should be brought back into contact with the buttocks. Asymmetry in the level of the knees is considered a positive test. Asymmetrical thigh and gluteal folds may be supportive evidence of DDH in the context of other abnormal findings, but as isolated findings they are poorly predictive. With bilateral hip dysplasia, no asymmetry in the level of the knees may be evident, and restricted range of motion of the hips may be the only positive finding on examination.

For the first 3 months of life, ultrasonography is the imaging modality of choice for evaluation of DDH because ossification of the femoral head does not usually occur until 4 months of age. Then, an anteroposterior plain radiograph can identify asymmetry, subluxation, or frank dislocation. When best to obtain an imaging study is not well-defined, but the decision should be guided by the physical examination findings. In infants with abnormal examination findings concerning for possible DDH, ultrasonography should be considered by 3 to 4 weeks of age. For an infant with risk factors for DDH but normal hip examination findings, waiting until 6 weeks of age may reduce false-positive ultrasonography results. Imaging should be obtained by 6 months of age. A dislocated hip (positive Ortolani test result) requires referral but does not necessarily need imaging before treatment. Imaging may be obtained at the discretion of the provider with shared decision making with the parents, taking into consideration radiation exposure and cost.

The cornerstone of treatment for DDH is abduction bracing, typically reserved for infants with an unstable hip on examination. An infant with an abnormality on imaging but normal examination findings warrants close follow-up, with treatment deferred because most minor findings on ultrasonography resolve spontaneously by 6 months of age. Although the evidence to support one bracing technique over another is limited, the Pavlik harness is most commonly used. With soft straps and Velcro, the harness keeps the hips flexed and abducted, reducing the dislocation and promoting healthy development of the acetabulum. Bracing should ideally be started in the first 9 weeks of life and no later than 5 months of age to increase the likelihood of success. Well-described risks from Pavlik harnesses include femoral head avascular necrosis and femoral nerve palsy. If treatment with a Pavlik harness is unsuccessful in reducing the hip after 3 weeks, closed reduction with subsequent spica cast application is typically attempted. Once a child is 18 months old, an open surgical repair is usually needed to achieve full reduction of a dislocated hip.

When untreated, DDH can leave a child with a leg length discrepancy, a limp or waddling gait, and reduced range of motion of the hip joint. In older children and adolescents, symptoms may be alleviated with a periacetabular osteotomy. However, untreated DDH remains a major contributor to secondary osteoarthritis in adults and potentially can lead to total hip arthroplasty with variable outcomes.

COMMENT: Not too long after magnetic resonance imaging (MRI) became a standard mode in the evaluation of low back pain, a clever study looked at the results of MRI in a group of young adults with low back pain and a control group of age-matched people with no such history. Lo and behold, the

prevalence of bulging discs was the same in both groups. What then does the finding on imaging really mean clinically? I suspect that far too many MRIs are still acquired to investigate back pain, and I have to wonder how many interventions are then initiated based on an imaging finding that may in fact be irrelevant. And so it may be with ultrasonography and infants' hips. In 2016 the American Academy of Pediatrics issued the clinical report on the evaluation of DDH cited by Drs Auriemma and Potisek, acknowledging that "…there is a lack of agreement on ultrasonic diagnostic criteria for DDH as a disease versus developmental variations." Ultrasonography certainly has an important role in evaluating possible DDH, but how often, we need to ask, do findings on ultrasonography that would resolve with time lead instead to intervention? And how many of such ultrasonographic evaluations were ordered in the first place on the basis of a "click" rather than a "clunk"?

– Henry M. Adam, MD
Associate Editor, *In Brief*

ANSWER KEY FOR NOVEMBER 2018 PEDIATRICS IN REVIEW

***Campylobacter* Infections in Children:** 1. C; 2. B; 3. B; 4. D; 5. D.

Pediatric Gastritis, Gastropathy, and Peptic Ulcer Disease: 1. E; 2. B; 3. B; 4. D; 5. D.

Effect of Maternal Substance Abuse on the Fetus, Neonate, and Child: 1. A; 2. D; 3. D; 4. C; 5. E.

Developmental Dysplasia of the Hip

Jeanna Auriemma and Nicholas M. Potisek

Pediatrics in Review 2018;39;570
DOI: 10.1542/pir.2017-0239

Developmental Dysplasia of the Hip

Jeanna Auriemma and Nicholas M. Potisek

Pediatrics in Review 2018;39;570
DOI: 10.1542/pir.2017-0239