

Ultrasound for Screening and Management of Developmental dysplasia of the Hip – Recommendations for Clinical Practice

Diagnosis

- Clinical Examination (Basis for Discussion by Richard Placzek)

In Germany, the nationwide introduction of ultrasound hip screening in the 1990's (*Mitteilungen (1995) Einführung eines sonographischen Screening der Säuglingshüfte. Dtsch Arztebl 92:3641*) has unjustly led to neglect of the clinical examination of the infant hip, as it still represents an essential diagnostic pillar in the detection of congenital hip luxation and hip joint instability. The examination technique is easy to learn, practical and, in the case of unilateral hip dislocation, sufficiently sensitive.

To conduct a sufficient clinical examination, the infant is undressed in a warm and dry environment (infrared lamp) and placed on its back on a firm examination table, as an incubator or bed is not adequate. Ideally, the infant should have a meal prior to examination (*Placzek R, Funk JF, Druschel C (2013) Congenital hip dysplasia in newborns : Clinical and ultrasound examination, arthrography and closed reduction. Oper Orthop Traumatol 25:417-429*).

The inspection encompasses any form of asymmetry of the extremities in regards to active mobility, limb circumference and length. Foot deformities in particular may indicate hip abnormality/ dysmaturity. The classically described asymmetry of inguinal, vaginal or anal skin folds often only appears when the muscles of the hip have already significantly shortened and is therefore to be labelled as insignificant (*Ryder CT, Mellin GW, Caffey J (1962) The infant's hip normal or dysplastic? Clin Orthop 22:7–15 Schneider WH (1960) Asymmetry of femoral and gluteal folds and their diagnostic significance. Z Orthop Ihre Grenzgeb 93:508–514*).

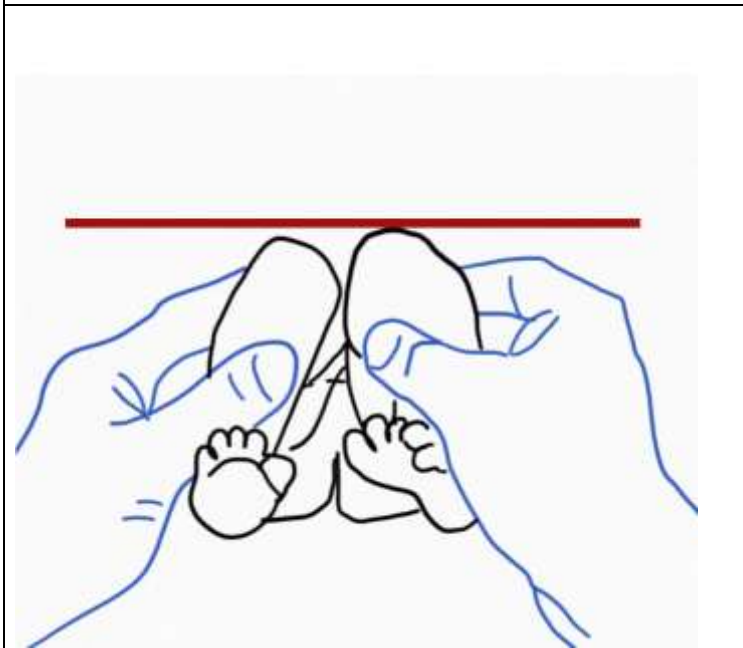
The classic hip instability assessment is comprised of the Roser- Ortolani- (*Ortolani M (1937) Un segno poconoto e sua importanza per la diagnosa de prelussione congenita dell'anca. Pediatra 45:129–136*) and Barlow (*Barlow TG (1963) Early diagnosis and treatment of congenital dislocation of the hip. Proc R Soc Med 56:804–806*) maneuver, which both yield a palpable and sometimes audible (“Ortolani’s click”) repositioning of the hip out of its sub- / luxation. These tests are limited in

value when examining a restless, tensed infant or when confronted with a primarily incorrigible hip dislocation. Too rough examination and inexperience of the examiner may present a risk to the cartilaginous structures of the hip, and is part of the reason why the standard examination algorithm presented by the authors does not include these steps.

Instead, the examination is composed of three simple tests of leg length (Galeazzi-sign), of hip abduction in 90 degree hip flexion and of joint instability (Palmén-Ludloff-sign).

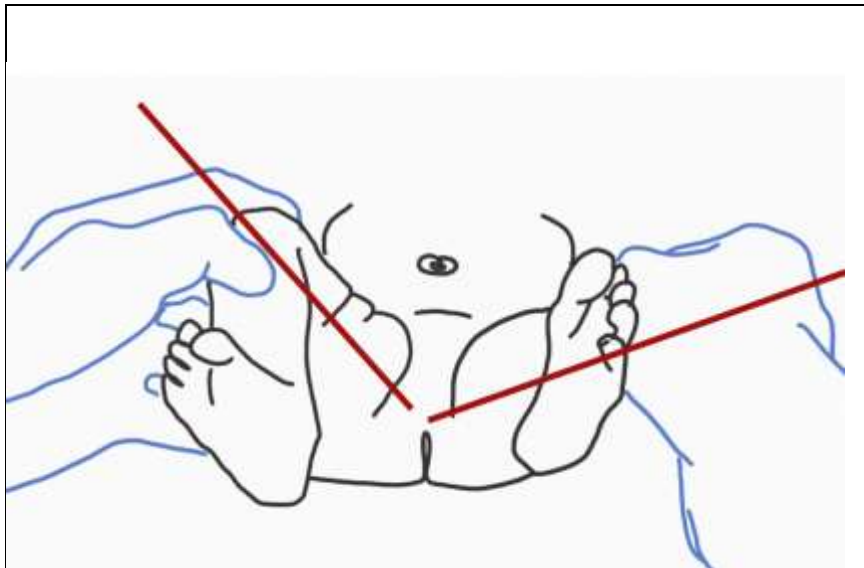
First, the examiner sits or kneels down to bring his eyes on level with the supine infant.

Then the knees are maximally flexed and the height of the knee compared in 90 degree hip flexion. A slight, equal axial pressure on both knees using the examiner's index finger may prove helpful. An asymmetrical, softly springing femur with consequent dropping of the ipsilateral knee indicates an instability or subluxation (Palmén-sign) (*Palmen K (1961) Preluxation of the hip joint. Diagnosis and treatment in the newborn and the diagnosis of congenital dislocation of the hip joint in Sweden during the years 1948–1960. Acta Paediatr Suppl 50(Suppl 129):1–71*). A fixed difference in knee joint height is a sign of unilateral hip dislocation (Galeazzi-sign) (*Scaglietti O (1953) Riccardo Galeazzi, 1866–1952. J Bone Joint Surg Br 35-B:679–680*).



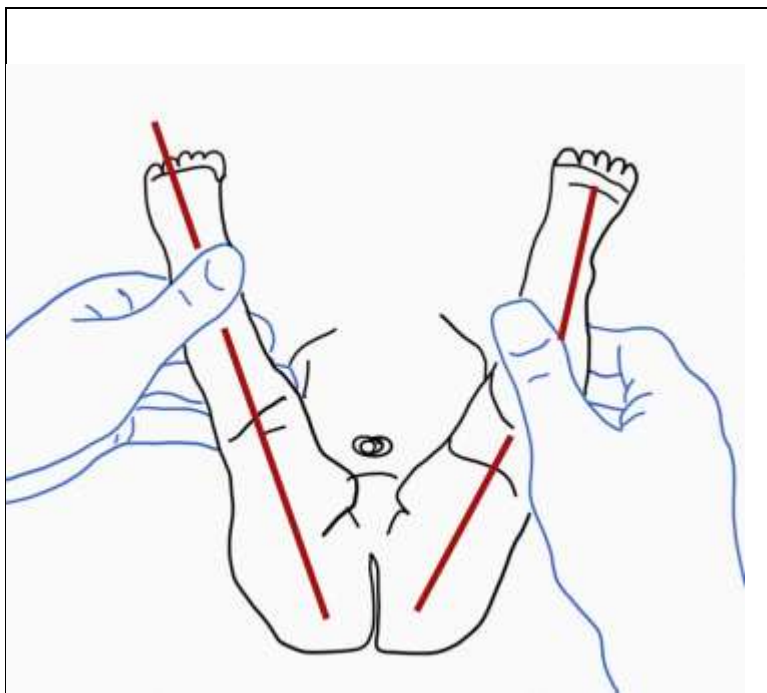
Galeazzi- sign from a standing (a) and kneeling position. If the examiner's eyes are on level with the infant, the discrepancy in height is easily observed (b).

Subsequently, we test the hips' range of abduction. Due to the hip flexion contracture physiologically present in infants, we conduct the exam through abduction and simultaneous external rotation in 90° hip flexion. In neonates up to one month of age we can often hereby produce a 90° splaying of the legs; this range of motion decreases to 60-70° by the age of nine months. However, considerable fluctuation margins are observed (*Haas SS, Epps CH Jr, Adams JP (1973) Normal ranges of hip motion in the newborn. Clin Orthop Relat Res 114–118; Harris LE, Lipscomb PR, Hodgson JR (1960) Early diagnosis of congenital dysplasia and congenital dislocation of the hip. Value of the abduction test. J Am Med Assoc 173:229–233; Hoffer MM (1980) Joint motion limitation in newborns. Clin Orthop Relat Res 94–96; Ryder CT, Mellin GW, Caffey J (1962) The infant's hip normal or dysplastic? Clin Orthop 22:7–15*). A unilateral hip splaying impairment indicates a possible sub-/luxation of the impaired hip. In case of bilateral impairment of abduction, values of 40-50° should be seen as pathological (*Tonnis D, Storch K, Ulbrich H (1990) Results of newborn screening for CDH with and without sonography and correlation of risk factors. J Pediatr Orthop 10:145–152*) and require further (ultrasound) clarification.



The image shows a right-sided inhibition of abduction viewed from a kneeling examination position.

Testing for the Ludloff luxation sign (*Tönnis D (1984) Die angeborene Hüftdysplasie un Hüftluxation im Kindes- und Erwachsenenalter: Grundlagen Diagnostik, konservative u. operative Behandlung/Dietrich Tönnis. Unter Mitarb. von Helmut Legal*) provides a further simple examination pathognomonic for hip luxation. In healthy infants, hip flexion of $>110\text{-}120^\circ$ inhibits the extension of the knee joint due to tension in the ischiocrural muscles. In the case of a dislocated hip, knee extension is possible in this position, as the head of the femur finds no support in the soft tissues surrounding the hip. In the case of breech presentation, the Ludloff sign often is not applicable due to the overstretching of the ischiocrural muscles allowing for bilaterally equal extension of the knees under maximum hip flexion.



The image depicts a relatively hyperextendable knee in approx. 120° hip flexion on the right side.

Finally an abnormal high external rotation in 90° flexion of the hip may indicate a Coxa vara. This clinical finding typical of Coxa vara can be used for orientation in ultra sound examination. Overlapping of the greater trochanter and femoral head may make the anatomical identification more difficult (double head sign).

