Developmental Dysplasia of the Hip

38

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Introduction

Developmental dysplasia of the hip (DDH) encompasses a spectrum of physical and imaging findings from mild instability to frank dislocation. DDH is usually asymptomatic during infancy and early childhood, making a careful and specific physical examination critical. An early diagnosis markedly improves the prognosis, and health workers caring for newborns and infants at all levels should be trained in screening procedures.

The incidence varies from 1.5 to 25 per 1000 live births. The burden of disease in terms of disability-adjusted life years (DALYs) and years lived with a disability (YLD) is an important concept for DDH. However, there is little published data for this condition, nor is there information for how DALYs and YLD compare to other frequent pediatric lifelong conditions such as clubfoot, musculoskeletal infection, or trauma.

Risk factors include breech position, female, first born, and positive family history. The risk is increased in cultures that tightly swaddle infants with their hips extended (Fig. 38.1). In Africa infants are routinely carried with their hips abducted, and DDH is uncommon (Fig. 38.2).

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Looseness of the femoral head within the acetabulum is termed *instability.* Nonconcentric position is *subluxation*, and deformity of the femoral head and acetabulum is *dysplasia*. The natural history of instability noted in the first few weeks of life is typically benign, and many cases

Fig. 38.1 Extremely tight swaddling, in which the hips are forcefully maintained in extension and adduction, increases the risk of DDH. This infant is from the Amazon region of Ecuador, South America

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Fig. 38.2 (**a**, **b**) Carrying an older infant or young child on the back with hips abducted encourages healthy development of the hip. ((**b**) Courtesy of Byron McCord, MD)

resolve by 8 weeks of age. Conversely, the natural history of a hip that is subluxated or dislocated at walking age is poor.

With time, the child with DDH develops a limp, limb length discrepancy, and limited hip abduction. With bilateral dislocations the child will have lumbar hyperlordosis in addition to an abductor lurch (Fig. 38.3). With maturity the adult patient can develop painful, early-onset degenerative arthritis. Subluxation is often not as well tolerated as frank dislocation. Patients with balanced bilateral hip dislocations, or those who have not yet formed a false acetabulum, may have many years of pain-free ambulation. Other diseases of the hip may occur over the child's lifetime and confound the natural history and outcome, including trauma, sickle cell disease, tuberculosis, and Perthes [1].

Clinical Assessment

The physical examination in infants focuses on instability (Ortolani and Barlow maneuvers), whereas the exam in children older than 3 months identifies secondary changes including loss of passive abduction, shortening of the thigh with or without an extra thigh fold (Fig. 38.4), and leg

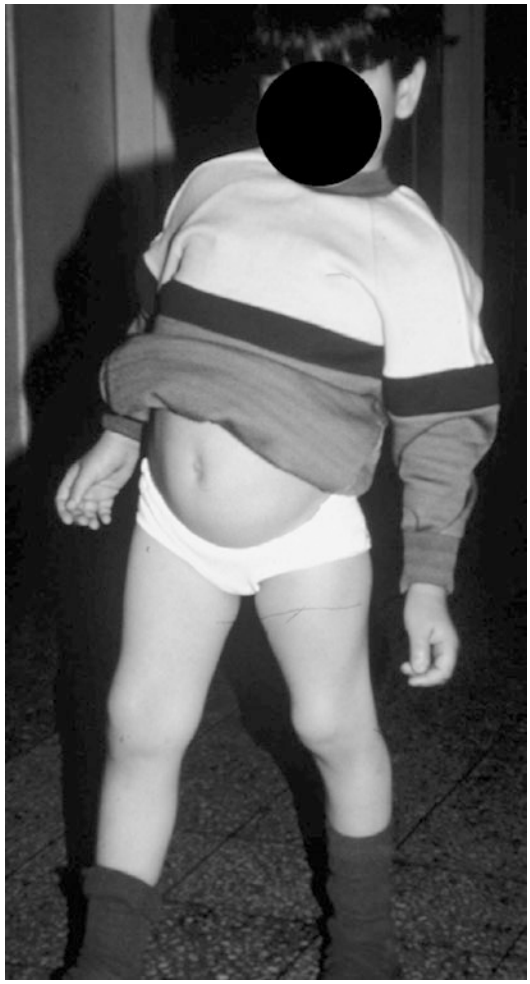

Fig. 38.3 This boy with bilateral DDH ambulates with an abductor lurch on both sides, in which his trunk shifts laterally over each hip during stance phase. He also has increased lumbar lordosis because of coexisting hip flexion contractures, noted by his protuberant abdomen

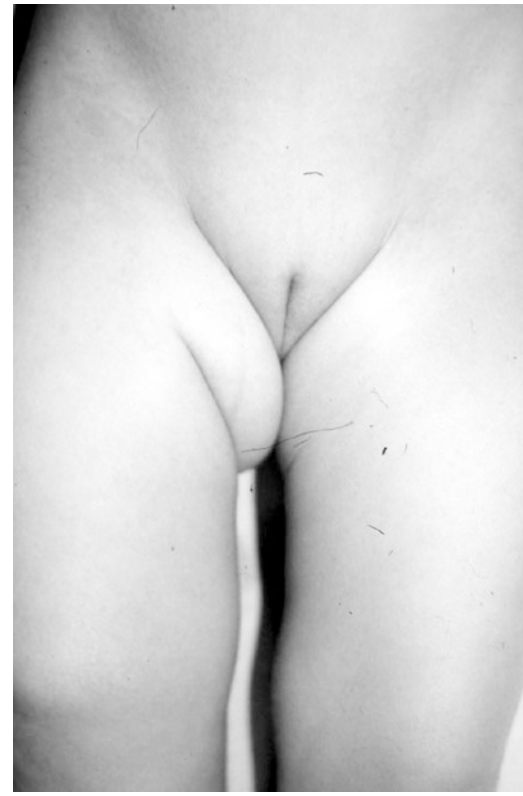

Fig. 38.4 Extra thigh fold on right from femoral shortening associated with dislocation

length discrepancy or limp. The Ortolani maneuver gently reduces the subluxated or dislocated femoral head into the acetabulum by hip abduction [2] and is the basis of the proper examination of the newborn hip. This maneuver begins with the hip in an adducted position. The examiner's hand holds the thigh loosely, with the index and middle fingers on the area of the greater trochanter and the thumb along the medial thigh. The hip is gently abducted while applying an anteriorly directed force through the trochanteric region, sensing whether the hip reduces. The Barlow maneuver assesses whether a reduced hip can be displaced by placing the hip in adduction and gently applying a posteriorly directed force to the proximal anterior thigh.

Plain radiography becomes useful by 4–6 months of age, when the secondary center of ossification of the femoral head forms. Radiographic hip screening should be considered for the infant with risk factors for DDH or if diagnoses such as congenital short femur, proximal focal femoral deficiency, septic arthritis, or coxa vara are suspected.

The American Academy of Pediatrics recently published their revised guidelines for evaluation and referral of DDH in infants [3]. The authors believe screening is worthwhile to prevent a subluxated or dislocated hip by 12 months of age. The principles of prevention and early detection applied to all levels of health systems are outlined in Box 38.1.

Box 38.1 Principles for Evaluation and Referral of DDH

- Physical examination of the infant hip including the Ortolani test is the primary basis of early detection.
- Ultrasound to confirm dislocation, subluxation or dysplasia and the effects of treatment. Radiographs to confirm physical exam and for at risk hips when quality ultrasonography is not available (AP pelvic x-ray at 4–6 months).
- Minor hip abnormalities on physical examination or imaging can resolve spontaneously, but the infant should be followed up on an individual basis.
- Referral to an orthopedic specialist based on an unstable Ortolani exam alone at any age or asymmetric hip abduction after the neonatal period.
- Although no screening program can completely eliminate DDH, periodic hip examinations during infancy can greatly reduce the risk of a dislocated hip at 1 year.
- Tight swaddling of the hips should always be avoided and is most important for primary prevention [4].

Treatment

Early diagnosis and referral of DDH facilitates treatment by nonoperative measures, though this is uncommon in austere environments. If the diagnosis is established shortly after birth, treatment with a hip abduction device, such as a Pavlik harness, is recommended and can be used for infants up to 6 months of age. Orthotic treatment requires weekly monitoring but is discontinued after 2–3 weeks if a reduction is not achieved. Forced abduction should be avoided, given the high risk of avascular necrosis. If bracing fails or if excessive abduction is required to achieve reduction, a closed or open reduction and casting should be considered.

Between 6 and 24 months, closed reduction with percutaneous adductor tenotomy and a spica cast is often effective. The cast is typically worn for 3 months, after which nighttime splinting is used for a variable period of time. Risks of bracing, casting, and surgical treatment include stiffness, avascular necrosis (AVN), nonconcentric reduction, re-dislocation, and femoral nerve palsy.

Patients presenting after walking age with a limb length discrepancy, a limp, or toe walking may require open reduction of the hip with a capsulorrhaphy, femoral shortening osteotomy, and/or pelvic osteotomy (Fig. 38.5).

Open reduction removes barriers to a concentric reduction of the femoral head within the acetabulum by releasing the medial capsule and transverse acetabular ligament and removing the ligamentum teres and pulvinar. Femoral shortening reduces the risk of osteonecrosis in the older child. An intraoperative assessment of the degree of femoral anteversion will determine whether, and to what degree, the anteversion should be corrected. Femoral version varies considerably in patients with DDH, so no uniform recommendations can be made. Pelvic osteotomies include the Salter (redirectional) and the Pemberton. These procedures are technically demanding, and complications such as stiffness, osteonecrosis, or redislocation can result in outcomes that are inferior to observation alone (Fig. 38.6). Fifty percent of surgically reduced hips require further surgery, and repeat surgery in the older child is associated with poor results.

While there are no exact age criteria for when to surgically reduce a developmentally dislocated hip, we suggest that surgical reduction be avoided

in patients older than 4–5 years with bilateral dislocations and older than 7–8 years with a unilateral dislocation.

In settings with limited resources, lack of expertise, and inadequate follow-up, the visiting volunteer surgeon should not perform this highly technical surgery in the older child with a dislocated hip, especially if previous surgery has failed or there is osteonecrosis. However, developing a trusting long-term relationship between an experienced visiting surgeon or organization and a committed and well-trained local surgeon can lead to an effective team to provide this high level of specialty care.

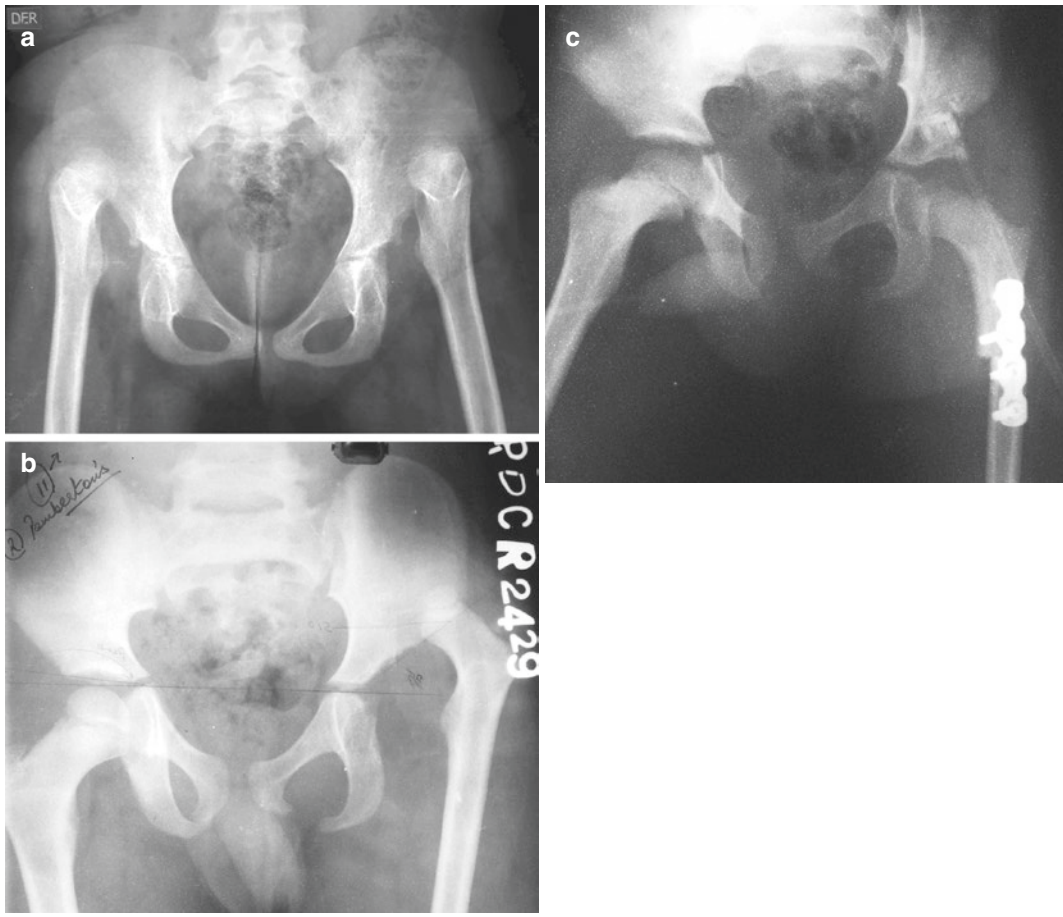

Fig. 38.5 (**a**) High bilateral hip dislocation with extreme acetabular and femoral head dysplasia in an older child should be left alone. (**b**, **c**) This unilateral dislocation in a younger child was treated surgically

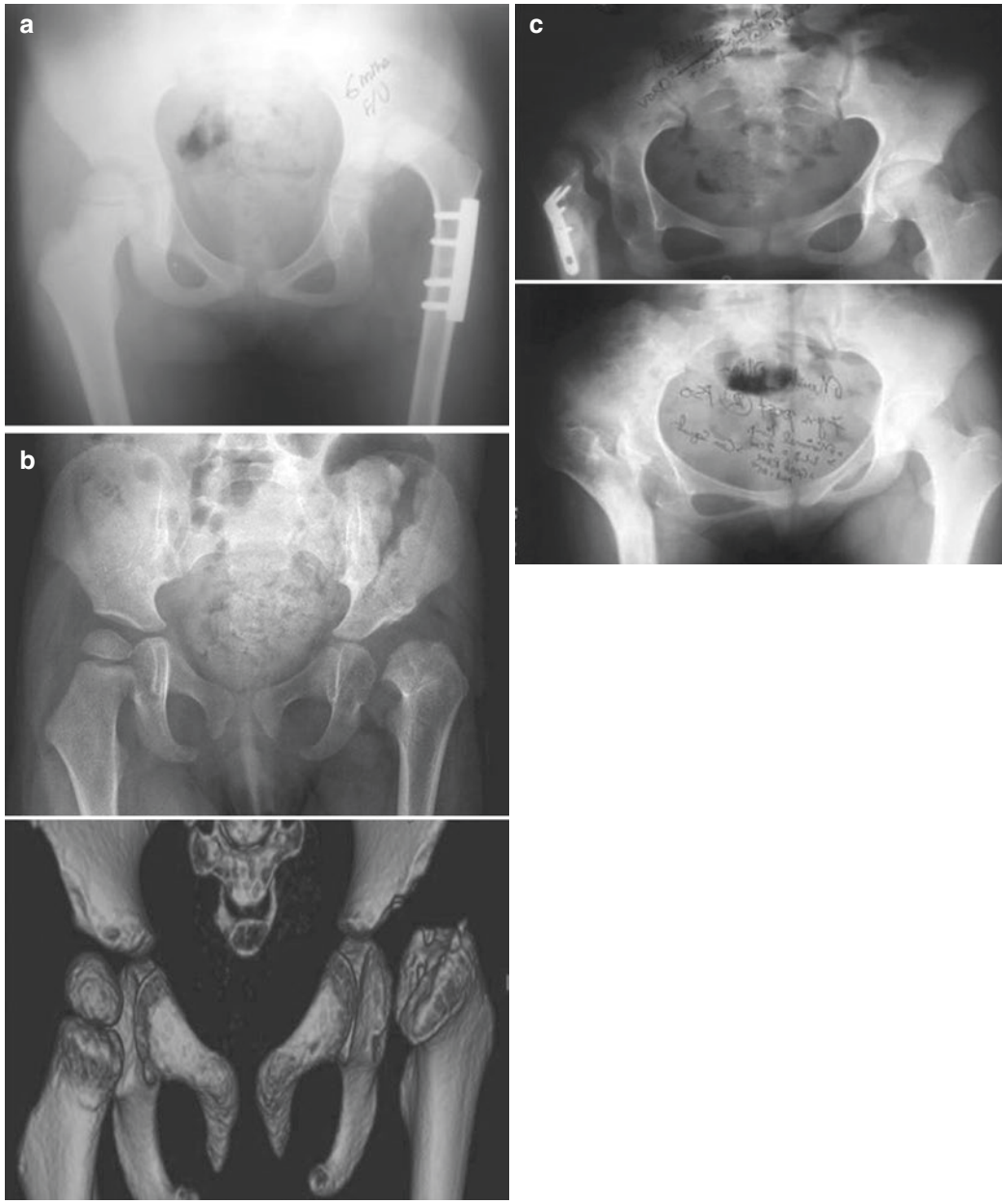

Fig. 38.6 (**a**) Open reduction and femoral shortening complicated by re-dislocation. (**b**) Successful closed reduction was complicated by avascular necrosis and deformity of the femoral head. (**c**) Chronic re-dislocation treated by pelvic support osteotomy

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