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- DDH defines the spectrum of hip instability, ranging from the hip that is in joint but has a shallow (dysplastic) acetabulum and may be 'pushed out' (Barlow positive) to the dislocated hip that is irreducible (Ortolani negative). The clinical picture varies with the pathology and the age at presentation: neonatal hips may be unstable, a toddler may limp, adolescents may experience exercise-induced pain and an adult may have pain - secondary to degenerative arthritis. Incidence The incidence of neonatal instability is approximately 20 per 1000 live births, whereas that of true dislocation is approximately 2 per 1000 live births; many hips stabilise spontaneously. Aetiology of developmental dysplasia of the hip /uni25CF Gender . Four to five times more common in girls, possibly related to hormonal factors causing temporary joint laxity in the peripartum period. /uni25CF Breech presentation . More common in breech babies, particularly with the extended breech position. /uni25CF Birth order . More common in firstborns and in the left hip because of the common fetal position (left occipito - anterior) in a tight primigravid uterus where movement is restricted. /uni25CF Oligohydramnios . Restricts fetal movement. The presence of other postural deformities (torticollis and metatarsus adductus) raises the possibility of DDH. /uni25CF Family history . A positive family history significantly increases the risk of DDH. /uni25CF Regional and racial variation . More common in certain regions and in certain races because of a combination of genetic, environmental and cultural factors. /uni25CF Swaddling the legs together exacerbates hip instability, whereas carrying the baby astride the carer's hip or back encourages hip flexion and abduction that improve stability. Hip dislocation is often found in association with generalised syndromes or neuromuscular conditions. These teratological hips are often resistant to the simpler treatments and a holistic approach to the child's overall condition and prognosis must be taken. Diagnosis Neonate /uni25CF Clinical assessment and screening . In many countries, neonates are screened for limitation of hip abduction and hip joint instability. In the UK, as part of the newborn and infant physical examination (NIPE) guidelines, the hips are examined again at 6 weeks. The knees and hips are flexed and the thigh held by the examiner with the thumb trochanter. The hips are abducted gently: if abduction is limited, the hip may be dislocated. The examiner's finger then lifts the greater trochanter upwards; a soft clunk - the Ortolani test - with improved hip abduction signifies hip reduction (Figure 44.13a). If the hip does abduct fully, then the flexed hip is brought back to neutral and then adducted while downward pressure is applied to the knee with the examiner's thumb and palm: an unstable hip may dislocate or sublux - the Barlow test (Figure 44.13b With an irreducible hip there is no clunk of reduction but there will be limitation of abduction. Bilateral dislocation may be missed

because abduction is symmetrical and abduction may be normal when there is low muscle tone and joint laxity. In a dislocated hip, the femoral head may be palpable in the buttock. /uni25CF Ultrasonographic assessment. Ultrasonography defines the anatomy and the stability of the hip joint. It is used as a screening tool (universally or selectively for 'at risk' patients) (Figure 44.14). Screening scans should be performed between 4 and 6 weeks of age and treatment, when necessary, started by 6 weeks. The sonographic appearance of most hips improves (in terms of both hip stability and acetabular dysplasia) spontaneously as the baby grows. /uni25CF Radiography. Plain radiographs are used from 4-5 months of age, when the relationship of the femoral ossific nucleus to the acetabulum can be assessed; late ossification of the nucleus is common in DDH (Figure 44.15 Infant Hip checks, looking for limitation of abduction in more than 90° of flexion and limb shortening, are part of developmental monitoring. Children present with a Trendelenburg gait and/or unilateral tiptoeing, as the affected leg is short. Abduction in flexion is Friedrich Trendelenburg, 1844-1924, successively Professor of Surgery at Rostock (1875-1882), Bonn (1822-1895) and Leipzig (1895-1911), Germany. The neonatal clinical examination must ask and answer the following questions: /uni25CF /uni25CF /uni25CF /uni25CF). /uni25CF /uni25CF - limited and there may be an extra thigh crease. The signs may be subtle and easily missed in an unsteady toddler. If both hips are affected there will be a waddling gait and a lumbar lordosis. - Adolescent Discomfort after exercise is common but the pain may be in the knee. In all age groups, radiographs may show dysplasia, subluxation or dislocation. Summary box 44.6 -). Diagnosis of DDH /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF

(a) Figure 44.13 Line diagram illustrating the (a) Ortolani and (b) Barlow tests for developmental dysplasia of the hip. For the Barlow test the femur must be at 90° to the bed. Is the hip dislocated? If so, is it reducible (Ortolani positive) or not (Ortolani negative)? If the hip is not dislocated, is it dislocatable (or sublucatable)? If so, it is Barlow positive. If the hip is not dislocated or dislocatable, is it clinically normal? If so, do the risk factors in the history still demand further assessment with an ultrasound scan or plain radiograph? Based on the history and clinical examination and confirmed by appropriate investigations All neonates are screened clinically (Barlow and Ortolani tests) at birth and at 6 weeks. Ultrasound is used as a selective screening test in 'at-risk' babies. Radiography is useful from 4 months onwards. Older children present with a limp and/or tiptoeing and a lumbar lordosis in bilateral cases (b)

(c) Management The objective is to obtain a stable, congruous reduction of the femoral head within the acetabulum while avoiding damage to the capital epiphysis (avascular necrosis [AVN]), which causes stiffness and proximal femoral deformity. Neonate Owing to the peripartum hormonal effects many neonatal hips are unstable. Most stabilise spontaneously by 6 weeks. Hips that remain unstable or that are dislocated at rest are treated with harnesses or splints that obtain and maintain reduction with the hip abducted and flexed. Joint stability is monitored with ultrasound scanning. Most harnesses (Figure 44.16) allow controlled movement while splints hold the hips more rigidly and may carry a greater risk of AVN and femoral nerve palsy. If the hips fail to relocate or stabilise, treatment should be discontinued. Christian Morin, contemporary, French paediatric orthopaedic surgeon. Heinrich Hilgenreiner, 1870-1954, German surgeon and orthopaedist. George Perkins, 1892-1980, Professor of Surgery, St Thomas' Hospital, London, UK,

described signs by which to diagnose congenital dislocation of the hip in 1928. a α α b Infant Successful harness treatment is unusual after the age of 4–6 months. For the late-presenting hip or one that fails conservative treatment, an examination under anaesthetic may achieve a closed reduction. A psoas/adductor release can

(c) Figure 44.14 Ultrasound images of an infant hip. (a) Normal hip with a high angle and a Morin index of 50% (defined as the percentage of the femoral head covered by the acetabulum, i.e. the portion lying below the horizontal red line). (b) Grossly dysplastic hip with a low angle and a Morin index of $<50\%$. This hip is likely to be unstable on dynamic ultrasound scanning, i.e. Barlow positive. (c) A dislocated hip joint (dislocated femoral head, red

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Anteroposterior pelvic radiograph showing Hilgenrein

er's line (a) and Perkins' line (b). The femoral head (ossi /f_i c nucleus) of a normal hip lies in the inner lower quadrant. The right hip is normal; the left hip has developmental dysplasia of the hip.

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Shoulder strap Chest strap Flexion strap Abduction strap Leg strap Figure 44.16 The anterior strap of the Pavlik harness controls hip /f_l exion, whereas the posterior strap limits adduction and encourages abduction. Many hips that are unstable in the /f_i rst 2–3 weeks of life require no treatment as they improve spontaneously Up to age 4–6 months, a harness or splint is effective treatment In older babies, closed reduction is often possible For failed closed treatment, open surgical reduction is required Figure 44.17 Anteroposterior pelvic radiograph showing acetabular dysplasia with subluxation (developmental dysplasia of the hip) of the left hip. This child presented at age 7 years. Figure 44.18 Anteroposterior pelvic radiograph showing bilateral true dislocations in a 9-year-old child; the decision was made not to offer an operation. The pathology in these hips is different from that shown in Figure 44.17 .

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