Every complaint of groin, thigh or knee pain in a child should be taken seriously and examined very carefully without delay. Furthermore, any child who limps or shows limitation of movement at the hip joint should undergo a thorough examination. Most hip lesions in children can be diagnosed adequately with the help of a radiograph. For almost all these lesions, there are good and effective treatments, provided the diagnosis is made early enough.

### Congenital dislocation of the hip

The incidence of congenital dislocation is between 1 and 2 cases per 1000, but it is four times as frequent in girls as in boys. There seems to be a hereditary factor, because there is about a 5% chance of a second child being affected. This rises to 36% if one of the parents also had congenital dislocation of the hip.

Although there are still questions about its aetiology, the condition seems to occur in the presence of some weakness of the joint capsule and elongation of the ligamentum teres. A deficiency of the rim of the acetabulum may also contribute in the development of the disease. However, the most important aetiological factor seems to be an imbalance between the action of the psoas muscle and the hip extensors. A relative shortening of the psoas presses the head of the femur upwards and laterally when the hip is extended by the contraction of the stronger hip extensors. In the presence of a weakness of the capsule, dislocation then occurs.

It is vital to make the diagnosis of a congenital dislocation as soon after birth as possible. Conservative treatment with an abduction brace before the child begins to walk is completely adequate, but after the age of 4 even surgical repositioning is difficult and after the age of 7 it is almost impossible. Without treatment the dislocation may lead to a shorter leg, the formation of a neoacetabulum at the blade of the ilium and the superimposition of early arthrosis.

Radiographs are not reliable in making the diagnosis of congenital hip dislocation in newborn babies. Early diagnosis, therefore, relies entirely on clinical tests. Those most used are known as Ortolani’s and Barlow’s tests. It should be remembered, however, that positive tests only indicate a capsular laxity and therefore the possibility of dislocation. For instance, the incidence of positive Ortolani’s and Barlow’s signs in newborns is about 10–20 per 1000, which is 10 times more than at the age of 2 months, which suggests that there is a tendency towards resolution of the capsular laxity.

### Clinical tests

#### Ortolani’s test

During this test the luxated hip is replaced manually.

**Technique**

The baby lies on the back, hips flexed to 90° and the knees completely flexed (Fig. 1a). The examiner grasps the leg with...
The diagnosis can usually be made with plain radiographs. However, during recent decades sonographic screening examinations have been shown to be superior in the early detection of congenital dislocations of the hip. In a study of sonographic screening examinations on 4177 newborns, all cases of congenital dislocation of the hip joint were found and classified. Consequently, ultrasound screening is currently offered to all newborns in Austria and Germany and to newborns with selected risk factors in the United Kingdom, Scandinavia, Italy and France.

**Technical investigations**

**Ortolani’s test**

The purpose here is to dislocate the hip first and then replace it. The hips of the baby are grasped in the same way as Ortolani’s test.

**Technique**

In this test, the thumb is placed further proximally on the femur. If the capsule is elongated or weak, the examiner can easily push the femoral head over the posterior rim of the acetabulum. This is indicated by a click.

Pressure with the middle finger behind the trochanter then moves the head anteriorly, where it comes to lie in the acetabulum again (Fig. 2). This to-and-fro movement of the femoral head over the acetabular rim indicates that the joint is unstable.

**Barlow’s test**

The purpose here is to dislocate the hip first and then replace it. The hips of the baby are grasped in the same way as Ortolani’s test.

**Technique**

In this test, the thumb is placed further proximally on the femur. If the capsule is elongated or weak, the examiner can easily push the femoral head over the posterior rim of the acetabulum. This is indicated by a click.

Pressure with the middle finger behind the trochanter then moves the head anteriorly, where it comes to lie in the acetabulum again (Fig. 2). This to-and-fro movement of the femoral head over the acetabular rim indicates that the joint is unstable.

The diagnosis can usually be made with plain radiographs. However, during recent decades sonographic screening examinations have been shown to be superior in the early detection of congenital dislocations of the hip. In a study of sonographic screening examinations on 4177 newborns, all cases of congenital dislocation of the hip joint were found and classified. Consequently, ultrasound screening is currently offered to all newborns in Austria and Germany and to newborns with selected risk factors in the United Kingdom, Scandinavia, Italy and France.
**Treatment**

The majority of unstable hips at birth stabilize in a very short time,\textsuperscript{13} but since the outcome of an ‘unstable hip’ is impossible to predict, all cases of hip instability in newborns must be taken seriously and treated. Hence, as soon as a positive Ortolani’s or Barlow’s test is found, an abduction brace is given until these clinical signs disappear.\textsuperscript{16–18}

If the diagnosis is made when the child starts to walk, surgical repositioning is required. Surgical reduction is almost impossible after the age of 7 years. If a ‘false acetabulum’ develops at the iliac bone, the functional disability may be small, especially if the disorder is bilateral.\textsuperscript{19} Pain and serious disability then start only in the fourth or fifth decade, when pseudarthrosis has occurred. If pain is not too severe, treatment can be conservative;\textsuperscript{20} often some relief is obtained by one or two infiltrations with 50 ml of procaine 0.5% at the posterior aspect of the capsule.\textsuperscript{21} If pain and disability are too severe, surgery is required.\textsuperscript{22}

**Congenital limitation of extension**

Some children have an excessive forward tilt of the pelvis, as the result of congenital limitation of extension at the hip joints. They walk with a hyperlordosis, extending at the back instead of at their hips. This limitation is probably the result of a shortening of the psoas muscles.

Treatment consists of stretching the psoas and capsule in the same way as for early osteoarthrosis (see p. 633).

**Arthritis of the hip in children**

**Transient synovitis**

This is the commonest cause of hip pain in children and usually occurs under the age of 10 years. The child complains of pain in the groin, thigh and knee after some previous exertion. Sometimes only knee pain is present. The child limps and clinical examination of the hip shows a capsular pattern.

Although the pathogenesis of the disorder remains obscure, the conventional view is that it results from ordinary overuse. However, a correlation between transient arthritis and the development of Perthes’ disease has been shown repeatedly.\textsuperscript{23,24}

Sonographic examination, together with X-ray examination, represent the first choices in the evaluation of a capsular pattern in a child and in the follow-up of transient synovitis.\textsuperscript{25} In transient synovitis there is effusion but the effusion persists for less than 2 weeks. In the early stage of Legg–Calvé–Perthes’ disease the capsular distension persists for more than 6 weeks. A differential diagnosis between transient synovitis and Legg–Calvé–Perthes’ disease is therefore only possible by observing the ultrasonographic course of the disease.\textsuperscript{26}

*Treatment* is bed rest and non-weight bearing. It is advisable, if excessive intra-articular effusion is demonstrated by ultrasonography, to aspirate the fluid.\textsuperscript{27} Most cases recover completely and without sequelae after a few weeks of bed rest.\textsuperscript{28}

**Septic arthritis**

The differential diagnosis with a transient synovitis is difficult.\textsuperscript{29} A septic arthritis of the hip may have similar early symptoms as a transient synovitis, with the spontaneous onset of progressive hip, groin, or thigh pain; limp or inability to bear weight, fever and irritability.\textsuperscript{30} Clinical examination shows a capsular pattern. A variety of clinical, laboratory, and radiographic criteria are used to help differentiate septic arthritis from transient synovitis. The four clinical predictors to differentiate between septic arthritis and transient synovitis are: history of fever, pain at rest, erythrocyte sedimentation rate of at least 40 mm per hour, and serum white blood-cell count of more than 12 000 cells per mm\textsuperscript{3}.\textsuperscript{31} In cases of doubt, hip aspiration should be performed.

**Tuberculosis of the hip**

The child complains of pain in the groin, thigh and knee, and limps. Clinical examination shows a gross capsular pattern, sometimes to such an extent that the hip is fixed in flexion, abduction and lateral rotation. There is considerable wasting of the thigh muscles. Symptoms of general illness, with slight fever and fatigue complete the picture. Radiography and examination of articular fluid give a decisive answer.

**Haemarthrosis**

The hip is very rarely affected in haemophilia. Acute hip pain and gross articular pattern in a haemophilic reveal the diagnosis. Prompt aspiration and specific anti-haemophilic measures must be taken in order to protect the cartilage against the erosive effects of the presence of the blood.

**Perthes’ disease (pseudocoxalgia)**

Perthes’ disease, an idiopathic avascular necrosis/osteonecrosis of the femoral epiphysis, was described in 1910 by Legg as ‘an obscure affection of the hip joint’,\textsuperscript{32} by Calvé as ‘pseudocoxalgia’\textsuperscript{33} and by Perthes as ‘arthritis deformans juvenilis’.\textsuperscript{34} The disease affects 4 to 10 year olds, peaking between 5 and 7 years. It affects about four boys for each girl and is bilateral in 10%. Although it is generally accepted that the necrosis is the result of a change in the blood supply to the femoral head,\textsuperscript{35} there still remains much controversy about the way this occurs. There have been reports suggesting retarded skeletal ageing in relation to the chronological age.\textsuperscript{36} Some studies have also demonstrated an association with pituitary growth hormone deficiency.\textsuperscript{37} However the most likely aetiology for Legg–Calvé–Perthes’ disease seems to be the hypothesis of clotting abnormalities with vascular thrombosis.\textsuperscript{38,39}

In the early stage, the only symptom is a slight limp or pain in the hip, thigh or knee. Examination of the knee is normal.
but there is a capsular pattern of the hip. The Trendelenburg sign may also be positive: when the patient stands on one leg, pain in the weight-bearing hip or weakness of the ipsilateral gluteus medius results in a downwards pelvic tilt on the contralateral side. In a later stage, limitation of adduction during flexion is noticed – as passive flexion is performed, the knee gradually moves into abduction. When the flexed hip is now drawn toward the opposite side, limitation, pain and a hard end-feel are noted.

Radiographs vary with the stage of the disease but may show evidence of bone necrosis, fragmentation, reossification or remodelling and healing. The earliest signs include decreased size or increased density of the proximal femoral epiphyses on an antero-posterior view and crescent sign (a subchondral fracture that correlates with the extent of necrosis) on the lateral view.

Treatment and prognosis depend on the degree of the slip.50,51 It is therefore vital to make the diagnosis as soon as possible, and a child or teenager in whom epiphysiolysis is suspected should not be allowed to walk around until the result of radiography is known. Epiphysiolysis is an orthopaedic medical emergency and requires immediate relief of weight bearing.52,53 Treatment is surgical and consists of in situ cannulated-screw fixation54 of the slipped capital femoral epiphysis or an open replacement of the femoral head.55,56

Slipped epiphysis

Due to gravity, a lysis of the proximal epiphysial junction results in downwards and backwards slipping of the epiphysis in relation to the neck of the femur. This causes a varus position and slight outwards rotation of the leg – coxa vara in adolescence. It is a disorder of teenagers (aged between 12 and 17 years), with an incidence of 5–10 per 100,000.42 The epiphysial junction softens for an unknown reason, although there is strong suspicion that some hormone imbalance could cause the weakening.43,44

Early symptoms can be mild, variable and insidious in onset. Children presenting with a slipped femoral epiphysis may complain of pain in the affected hip or groin, thigh or knee. The pain may be mild or intermittent, or so severe that the child is unable to bear weight.45,46

Gait abnormality is frequently observed: the child may walk with a limp and the affected leg in external rotation. Trendelenburg’s sign is usually present. Clinical examination reveals a clear non-capsular pattern with limitation of medial rotation and increase of lateral rotation.47 This can be observed best during bilateral medial rotation in the prone lying position.48

Resisted movements are strong and painless. Diagnosis is confirmed by antero-posterior and lateral hip radiographs which demonstrate the posterior and inferior displacement of the epiphysis relative to the metaphysis (Fig. 3).

Treatment and prognosis depend largely on the degree of the slip.50,51 It is therefore vital to make the diagnosis as soon as possible, and a child or teenager in whom epiphysiolysis is suspected should not be allowed to walk around until the result of radiography is known. Epiphysiolysis is an orthopaedic medical emergency and requires immediate relief of weight bearing.52,53 Treatment is surgical and consists of in situ cannulated-screw fixation54 of the slipped capital femoral epiphysis or an open replacement of the femoral head.55,56

Avulsion fractures about the hip

Avulsion fractures occur more commonly in skeletally immature athletes than in adults because young patients’ tendons are stronger than their cartilaginous growth centres. The same stress that causes a muscle strain in an adult can cause an avulsion fracture in an adolescent. These fractures occur at the secondary growth centres, or apophyses, which become separated from the underlying bone. The fractures do not become widely displaced because of the surrounding thick periosteum.57

The mechanism of injury is a sudden, violent muscle contraction or excessive repetitive action across the apophysis. Hip avulsion fractures are common in young sprinters, soccer players and jumpers.58 Patients typically describe local pain and swelling after an extreme effort and report no external trauma.

Physical examination reveals pain during the resisted movements that activate the contractile structures inserting at or nearby the fracture line:

- The anterior superior iliac spine – sartorius
- The anterior inferior iliac spine – rectus femoris
- The ischial tuberosity – hamstring
- The lesser tubercle – psoas.

There is also palpable tenderness (and often ecchymosis) at the specific bony sites (Fig. 4).

Plain radiographs reveal the avulsion fracture. It is useful to compare the injured side with the contralateral side. During the healing phase of an avulsion fracture the abundant reactive ossification in the soft tissues may clinically and radiographically be mistaken for neoplasia.59

Treatment is rest. Most patients can be treated non-operatively over 6–12 weeks, although some authors recommend surgery for severely displaced fragments in rare cases.
Fig 4 • Bony sites of the pelvis: 1, anterior superior iliac spine; 2, anterior inferior iliac spine; 3, ischial tuberosity; 4, lesser tubercle.

References
