

Diagnosing and managing hip problems in childhood

Huntley JS. Diagnosing and managing hip problems in childhood.

Practitioner 2013;257 (1762):19-25

Mr James S Huntley
MA MCh DPhil (Oxon) FRCS (Ed)
Consultant Paediatric Orthopaedic Surgeon, Royal Hospital for Sick Children,
Yorkhill, Glasgow, UK



Diagnosing and managing hip problems in childhood

AUTHOR

Mr James S Huntley

MA MCh DPhil (Oxon)
FRCS (Ed)
Consultant Paediatric
Orthopaedic Surgeon,
Royal Hospital
for Sick Children,
Yorkhill, Glasgow, UK

FIGURE 1

A The pelvis can be stabilised by the non-examining hand with the palm over the sacrum and the thumb over the pubic tubercle

B The femur of the examined hip can be held between the thumb medially and the middle finger over the greater trochanter, allowing gentle controlled movement for Ortolani/Barlow testing



What are the most common hip problems?



THE HIP, A DEEP BALL AND SOCKET JOINT WITH A COMPLEX RANGE OF MOVEMENT, CAN BE

affected by several potentially serious pathologies throughout childhood, though age is a strong indicator for particular conditions.

The sequelae of missed diagnoses can be devastating. Furthermore, examination of the hip, and indeed the musculoskeletal system in general, is not always taught well at medical school. Unsurprisingly therefore, in primary care, the evaluation of the paediatric hip may cause some concern.

This article contains a brief overview of the more common paediatric hip pathologies encountered in primary care, together with suggestions for assessment, management and referral.

DEVELOPMENTAL DYSPLASIA

Developmental dysplasia of the hip (DDH) is a spectrum disorder of joint development and/or instability.¹ It is a major cause of morbidity, indeed potentially avoidable disastrous consequences, in both childhood and adult life.

How should children be examined?

It can be classified into three types:

- Neuromuscular (associated with conditions such as spina bifida)
- Teratological (associated with skeletal dysplasia syndromes such as Larsen's (which involves multiple large joint dislocations, short stature, craniofacial abnormalities, and cervical spine anomalies especially kyphosis)
- Idiopathic

Hereafter the most common type, idiopathic, is focused on.

Females are predominantly affected as are the first born. The other well known major risk factors used to inform selective screening with ultrasound are listed in box 1, below.

Earlier detection is generally held to improve outcomes. This is complicated by the fact that early ultrasound scan yields many sonographically abnormal hips that normalise by themselves.

Early examination of the hips is performed neonatally within 72 hours using Ortolani and Barlow manoeuvres to look for dislocation with reducibility and dislocatability, respectively.

It is recommended that these tests are repeated within the context of a second head to toe examination,

Which children should be referred?

at six to eight weeks^{2,3} with a view to integration into the local DDH screening/referral pathway.

Poorly appreciated facets of these two tests are:

- The baby must be relaxed
- The examination must be gentle
- The examination manoeuvres must be repeated several times (unless indicating pathology, in which case they should be stopped)
- The pelvis should be stabilised by the contralateral (non-examining) hand – this allows for a more controlled (and therefore more gentle) examination (see figure 1, above).

Continued on p22 »

Box 1

Risk factors for developmental dysplasia of the hip

- First-degree relative affected
- Breech position
- Foot abnormalities (other than talipes)
- Torticollis/sternocleidomastoid contracture
- Oligohydramnios

During these tests, the pelvis can be stabilised from the side, by placing the palm of the non-examining hand over the sacrum and the thumb over the pubic tubercle (see figure 1, p19).

In Barlow's original description,⁴ the pelvis is stabilised from below, which may seem threatening to observing parents.

The Ortolani test involves gentle passive abduction of the hip while exerting an anteromedially directed force on the greater trochanter to relocate a dislocated hip. A relocation clunk is a positive result indicating a dislocated but reducible hip.

The Barlow test involves the patient in a similar position i.e. hip and knee at 90/90, and the hip in slight adduction. A posteriorly directed force is used to see if the femoral head is subluxatable posteriorly. If it is, the hip is deemed dislocatable.

These tests have high sensitivity but low specificity⁵ and this is one of the reasons that DDH is still picked up late. Through later infancy, several other tests are useful:

- The Galeazzi test. The test involves setting the pelvis level with the infant supine, hips flexed to 45 degrees, in neutral (abduction/adduction), knee at 90 degrees, and the ankle malleoli together. This gives a comparative view of femoral length — a relative shortening may indicate a unilateral dislocated hip or, more rarely, a congenitally short femur

‘Suspicion of developmental dysplasia of the hip mandates specialist referral at any age’

- Limitation of abduction. Progressively through infancy, a limitation by 20 degrees or more compared with the contralateral side (with hips and knee flexed) is a useful indicator of unilateral DDH.⁶

DDH may be detected in the walking child. If it is unilateral it may involve an asymmetric gait, possibly tiptoe on the affected side, as well as asymmetry around the thigh. If bilateral, the child characteristically walks with a Trendelenburg gait, and a prominent belly (actually a reflection of the lumbar lordosis compensating

Box 2

Rotational profile

Examination

- Foot progression angle (reference line of forward gait)
- Femoral anteversion (correlates to hip rotation)
- Foot-thigh angle and tibial torsion
- Foot shape

Features of concern in rotational deformity

- Unilateral/asymmetric
- Progressive
- Painful

for the fixed flexion deformities). Suspicion of DDH mandates specialist referral at any age.

THE IN-TOER

In-toeing is a common reason for referral of children under the age of five to orthopaedic specialists. Such referrals are usually made without an assessment of the rotational profile of the child.

Children usually in-toe because of torsion at one of three levels:

- the foot (metatarsus adductus)
- the tibia (tibial in-torsion)
- femoral in-torsion (or increased femoral anteversion)

Clinical features that are important in the assessment of rotational profile are listed in box 2, above.

In a recent study from Edinburgh,⁷ 202 patients were referred for in-toeing over the course of 2.75 years: 86% were discharged after their first visit, and although 14% were reviewed a second time, no pathology was identified. The majority of diagnoses involved either increased femoral anteversion or internal tibial torsion.

At birth, mean femoral anteversion is about 30 degrees, and gradually decreases to about 10 degrees by skeletal maturity. However, there is a large range of normal variation around this value.

With the child prone, the knees are flexed to 90 degrees and the limbs allowed to rotate first laterally, internal rotation (IR), and then medially external rotation (ER), to define maximum values for both IR and ER with the hip in extension.

In early life IR and ER are similar, but advancing through childhood ER exceeds IR as the femur grows rotationally, meaning that the femoral anteversion decreases. The rotational profile should be symmetrical side to side.

For patients with an extreme of physiological variation in rotational profile, there is no evidence that splints, braces, insoles or orthotics are of any use. These conditions improve of their own accord over time.

Certain pathologies can present as in-toeing e.g. metatarsus adductus, cerebral palsy and tibia vara. However, as the Edinburgh study has shown, these diagnoses underlie few of the referred cases.

‘For patients with an extreme of physiological variation in rotational profile, there is no evidence that splints, braces, insoles or orthotics are of any use’

THE LIMPING CHILD

The limping child is a common presentation to primary care, A&E and orthopaedic departments, and can present a diagnostic quandary.

It is important that the more uncommon diagnoses, including infection, neoplasia and slipped femoral epiphysis are kept in mind and appropriate urgent referral to the acute musculoskeletal team/emergency department made if appropriate (see box 3, p23).

A thorough history and examination localises the site of pathology and limits the differential diagnosis. The key features of the clinical history and examination are given in box 4, p23.

Sometimes there is a history of trauma, which can make interpretation easier. However, it is important to be aware that occasionally a history of trauma is given which unwittingly conceals a more sinister cause such as infection, neoplasia, slipped upper femoral epiphysis, see box 3, p23.

Over a six-month period, Fischer and Beattie⁸ investigated the epidemiology of the atraumatic limping child presenting to an emergency department.

A pragmatic algorithm for assessment was followed, involving

Box 3

The limping child: differential diagnosis

- 1 Septic arthritis
- 2 Osteomyelitis
- 3 Pyomyositis
- 4 Psoas abscess
- 5 Discitis
- 6 Non-septic arthritis including juvenile rheumatoid arthritis
- 7 Transient synovitis
- 8 Slipped femoral epiphysis
- 9 Neoplasia
 - Ewing's sarcoma, osteosarcoma, leukaemia, metastatic neuroblastoma
- 10 Langerhans' cell histiocytosis
- 11 Sickle cell disease
- 12 Fracture (consider this especially in toddlers and the neuromuscular group)
- 13 Perthes' disease
- 14 Avascular necrosis: haemophilia, infarct
- 15 Gaucher's disease
- 16 Haemarthrosis e.g. haemophilia
- 17 Foreign body
- 18 Knee conditions: discoid meniscus, osteochondritis dissecans, Osgood-Schlatter's disease, chondromalacia
- 19 Foot conditions: tarsal coalition, accessory navicular, Köhler's disease
- 20 Non-musculoskeletal conditions: urinary tract infection, appendicitis, gynaecological problems

clinical examination, appropriate radiography/ultrasound and blood tests, in particular full blood count (and film), CRP and ESR. For those cases in which a diagnosis was made, the hip joint was the culprit in the majority of cases.

'It is important to be aware that occasionally a history of trauma is given which unwittingly conceals a more sinister cause'

Overall there were 243 patients, with an incidence of 1.8/1,000, this is likely to be an underestimate as some cases will be hidden by being managed in primary care.

In 72 patients (30%), no cause was

Box 4

The limping child: History and examination

History

- Pain – site/onset/character/radiation/associated factors/timing (e.g. morning indicative of inflammatory conditions, nighttime = red flag)/exacerbating factors/severity
- Activities – restricted
- Past medical history – recent use of antibiotics (for another infection e.g. tonsillitis/ear infection) may mean that an intercurrent musculoskeletal infection has been partially treated, leading to a subacute picture
- Medications – e.g. steroids/chemotherapy predisposing to avascular necrosis

Examination

- Gait – may be abnormal because of pain, abnormal biomechanics or abnormal neuromusculature (e.g. weakness/spasticity)
- Standing – spine, including forward bend, Trendelenburg
- Cough – symmetry of posture, careful focal palpation to define the exact location of pain, joint range of movement (for pain, contractures, stiffness/spasticity)

Box 5

Managing musculoskeletal infection in primary care

- Suspect osteomyelitis/septic arthritis/pyomyositis in the systemically unwell (especially if pyrexial) child with bone pain/joint pain/limp
- Urgent referral to emergency department/acute on-call team
- Prompt diagnosis and treatment of patients with probable osteomyelitis/septic arthritis/pyomyositis improves outcomes and decreases complications
- Treatment with antibiotics may need to be high dose and prolonged

identified. Forty per cent were diagnosed as irritable hip or transient synovitis.

Other inflammatory arthritides/tendinoses accounted for 3.2%, Perthes' disease 2%, and infection (including osteomyelitis, septic arthritis, discitis, cellulitis, inguinal lymphadenitis) 3.6%. There was one case of a slipped upper femoral epiphysis (0.4%) and one case each of acute lymphoblastic leukaemia and Langerhans' cell histiocytosis. Eighteen per cent were diagnosed with trauma or overuse conditions including stress fracture, anterior knee pain, soft tissue injury, haematoma and Osgood-Schlatter's disease. There were two cases of hypermobility syndrome and one of testicular pathology.

INFECTION

Children of all ages are vulnerable to infection, be this septic arthritis, osteomyelitis or pyomyositis. Early diagnosis and treatment comprising antibiotics with or without surgery, see box 5, above, is critical to optimise outcomes and avoid complications. Hence immediate referral is warranted.

Potential complications include joint destruction, femoral head necrosis, overwhelming sepsis, associated venous thrombosis, septic thrombus with embolisation, pathological fractures, chronic infection and growth disturbance.⁹

Staphylococcus aureus remains the predominant pathogen. However, *Kingella kingae* has emerged as an important pathogen; infection may be subacute with the patient presenting in a more insidious and less unwell fashion.

In the limping child (or neonate/pre-walking infant), fever with focal tenderness or restricted range of movement is indicative of infection unless investigations show otherwise. In neonates or patients with compromised immunity, the signs may be subtle until the condition has advanced.

Be mindful of the extensive differential diagnosis (see box 3, above).

TRANSIENT SYNOVITIS

The irritable hip is common, affecting 3% of the paediatric population at some time, predominantly between the ages of three and ten years (peak six years). Left and right hips are »

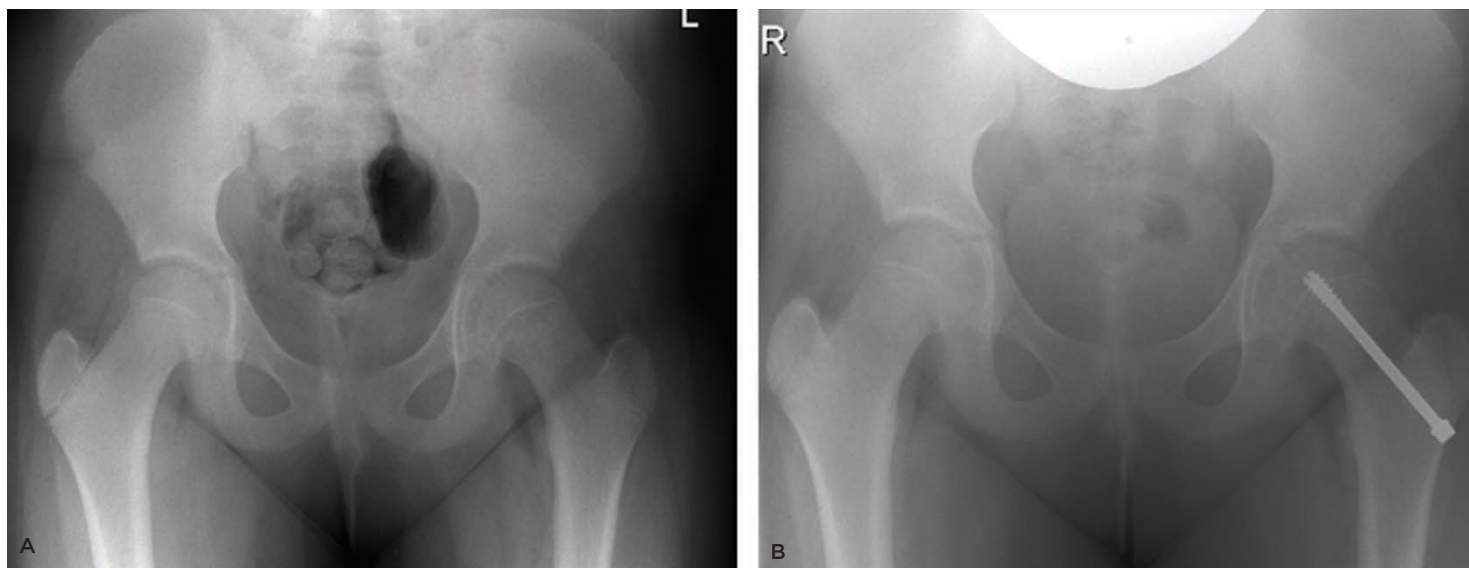


FIGURE 2
Slipped femoral epiphysis. This condition is usually missed at initial presentation, with potentially disastrous consequences
A Preoperative AP pelvis view **B** After operative stabilisation

equally affected. It is more common in Caucasians and twice as common in boys as girls.¹⁰ It is often preceded by a respiratory tract infection.

Aside from limp, pain, spasm and mild restriction of passive range, clinical features are not suspicious for more sinister pathology, and haematological indices are not raised. It peaks in late autumn in the UK. Up to 10% of patients experience a recurrence. By definition it is transient, resolving, or at least dramatically improving, by 10–12 days after onset. Persistence of limp beyond this timescale mandates further investigation and referral.

PERTHES' DISEASE

Perthes' disease is an idiopathic avascular necrosis of the femoral head. Its prevalence is 1 in 10,000 children. It mainly affects boys

(male:female ratio 6:1) in the four to nine years age range. This condition presents in a similar manner to transient synovitis. However, it is far less common and the symptoms outlast those that could be accorded to a transient synovitis.

Perthes' disease passes through four radiological stages:

- I sclerosis
- II fragmentation
- III healing
- IV healed

The active stages (I–III) take approximately three years¹¹ during which time orthopaedic specialists may recommend treatment from a spectrum of operative interventions (more likely in those over the age of seven years) and/or restriction of activities that patients and parents find extremely frustrating.

The aim is to minimise subsequent joint deformity/incongruity and thereby give the hip the best and longest lasting function possible. Nevertheless at 40 years follow-up 40% of patients have undergone hip arthroplasty.¹²

SLIPPED UPPER FEMORAL EPIPHYSIS

This condition is uncommon but the seriousness of the sequelae mandate a high index of suspicion. Slipped upper femoral epiphysis requires urgent admission for surgery (see figure 2, above, and box 6, left). Delay in diagnosis is associated with increased severity of slip and poorer outcomes,

including pain, restricted movement and subsequent degenerative arthritis.

Unfortunately, the diagnosis is usually missed at first presentation to a healthcare professional.¹³ The presenting feature of pain ranges from intermittent and mild to incapacitating and precluding weight bearing, the latter being designated unstable.

'Delay in diagnosis of slipped upper femoral epiphysis is associated with increased severity of slip and poorer outcomes'

The site of the pain may misdirect the unwary practitioner. Although the pain may be localised to the groin, it may also be felt over the inner aspect of the knee (obturator nerve referred pain). It affects both boys and girls in the eight to sixteen years age range.

On examination the lower limb may lie in external rotation, and this may occur in the abnormal gait/limp pattern also. There is a decreased range of internal rotation (best

Box 6

Managing slipped upper femoral epiphysis

Features

- Limp
- Age 8–16 years
- Groin or knee pain
- Limited internal rotation of the hip

Management

- Make non-weight bearing
- Refer urgently for AP and frog lateral hip views

key points

SELECTED BY

Dr Peter Saul

GP, Wrexham and Associate GP Dean for North Wales

Developmental dysplasia of the hip (DDH) is a spectrum disorder of joint development and/or instability. It is a major cause of morbidity in both childhood and adult life. It can be classified into three types: neuromuscular; teratological; and idiopathic (the most common type). Early examination of the hips is performed neonatally using Ortolani and Barlow manoeuvres to look for dislocation. These tests have high sensitivity but low specificity and this is one of the reasons that DDH is still picked up late. DDH may be detected in the walking child. If it is unilateral it may involve an asymmetric gait, possibly tiptoe on the affected side, as well as asymmetry around the thigh. If bilateral, the child characteristically walks with a Trendelenburg gait, and a prominent belly.

Children usually in-toe because of torsion at one of three levels: the foot (metatarsus adductus); the tibia (tibial in-torsion); and femoral in-torsion (or increased femoral anteversion). For patients with an extreme of physiological variation in rotational profile, there is no evidence that splints, braces, insoles or orthotics are of any use. These conditions improve of their own accord over time.

When a limping child presents it is important that the more uncommon diagnoses, including infection, neoplasia and slipped femoral epiphysis are kept in mind and appropriate urgent referral made if necessary. In one study, in children where a diagnosis was made, the hip joint was the culprit in the majority of cases. Of these, 40% were diagnosed as irritable hip or transient synovitis. Other inflammatory arthritides/tendinoses accounted for 3.2%, Perthes' disease 2%, and infection 3.6%.

Any age group is vulnerable to infection such as septic arthritis, osteomyelitis and pelvic pyomyositis. Early diagnosis and treatment, comprising antibiotics with or without surgery, is critical. In the limping child, fever with focal tenderness or restricted range of movement is indicative of infection unless investigations show otherwise.

Perthes' disease is an idiopathic avascular necrosis of the femoral head. Its prevalence is 1 in 10,000 children. It mainly affects boys in the four to nine years age range. This condition presents in a similar manner to transient synovitis. However, it is far less common and the symptoms are longer lasting.

Slipped upper femoral epiphysis is uncommon but the seriousness of the sequelae mandates a high index of suspicion. It requires urgent admission for surgery. It affects both boys and girls in the eight to sixteen years age range. The presenting feature of pain ranges from intermittent and mild to incapacitating and precluding weight bearing.

assessed with the patient prone i.e. hip at neutral in terms of flexion/extension), often with obligate external rotation on hip flexion (with patient supine).

CONCLUSION

Early detection of hip dysplasia gives better long-term outcomes and missed DDH can result in catastrophic long-term morbidity. Slipped femoral epiphyses are missed on first presentation in approximately 50% of cases, with potentially disastrous sequelae. Early diagnosis, referral and treatment is the key to the immediate management of septic arthritis, osteomyelitis and pyomyositis.

The hip and proximate tissues are implicated in a variety of childhood conditions, and in the differential diagnosis of many more. To a large extent the possible diagnoses are limited by the age of the patient, an accurate history and thorough examination.

REFERENCES

- 1 Roposch A, Liu LQ, Hefti F et al. Standardized diagnostic criteria for developmental dysplasia of the hip in early infancy. *Clin Orth Relat Res* 2011;469:3451-61
- 2 National Institute for Health and Clinical Excellence. CG37. Routine postnatal care of women and their babies. NICE. London. 2006
- 3 Baston H, Durward H. Examination of the newborn: a practical guide. Second edition. Routledge. Abingdon, Oxon. 2010
- 4 Barlow TG. Early diagnosis and treatment of congenital dislocation of the hip. *J Bone Joint Surg Br* 1962;44:292-301
- 5 Sewell MD, Eastwood DM. Screening and treatment in developmental dysplasia of the hip - where do we go from here? *Int Orthop* 2011; 35:1359-67
- 6 Jari S, Paton RW, Srinivasan MS. Unilateral limitation of abduction of the hip: a valuable clinical sign for DDH? *J Bone Joint Surg Br* 2002;84:104-7
- 7 Blackmur JP, Murray AW. Do children who in-toe need to be referred to an orthopaedic clinic? *J Pediatr Orthop B* 2010;19:415-7
- 8 Fischer SU, Beattie TF. The limping child: epidemiology, assessment and outcome. *J Bone Joint Surg Br* 1999; 81:1029-34
- 9 Huntley JS, Crawford H. Osteomyelitis and septic arthritis in children. Chapter 13.1 (Section 13), pp.1439-45, in *Oxford Textbook of Orthopaedics*. Eds: J Buckwalter, C Bulstrode, J Fairbank et al. Oxford University Press. Oxford. 2011
- 10 Macnicol MF. The irritable hip in childhood. *Curr Orthop* 2004;18:284-90
- 11 Hunter JB. Legg Calvé-Perthes' disease. *Curr Orthop* 2004;18:273-83
- 12 McAndrew MP, Weinstein SL. A long-term follow-up of Legg-Calvé-Perthes disease. *J Bone Joint Surg Am* 1984;66:860-9
- 13 Weigall P, Vladusic S, Torode I. Slipped upper femoral epiphysis in children - delays to diagnosis. *Aust Fam Physician* 2010;39:151-3

Useful information

STEPS

A national charity supporting children and adults affected by lower limb conditions including all the hip pathologies. Information, contacts and resources are available at www.steps-charity.org.uk

We welcome your feedback

If you would like to comment on this article or have a question for the author, write to: editor@thepractioner.co.uk