RATIONAL IMAGING

Investigating hip pain in a well child

A Gough-Palmer, K McHugh

Great Ormond St Hospital for
Children NHS Trust, London
WC1N 3JH

Correspondence to:
A Gough-Palmer
agoughpalmer@yahoo.com

BMJ 2007;334:1216-7
doi: 10.1136/bmj.39188.515741.47

The patient

A 9 year old girl with a history of conservatively managed left sided Perthes' (Legg-Calvé-Perthes) disease presented to her orthopaedic team via her general practitioner with onset of right hip pain and subsequent limp. She was otherwise well. On clinical examination she had a limp with moderate pain and some limitation of abduction and internal rotation. She did not have a fever, and routine haematology and biochemistry gave normal results.

Differential diagnosis and prognosis

Assuming the disease can confidently be localised to the hip (rather than knee, pelvis, or lower back), a presumptive diagnosis of the painful hip is reasonable, based on age and presentation.

- In a younger, febrile, or unwell child, septic arthritis needs to be excluded urgently.
- Perthes' disease typically affects children aged between 3 and 10 years (peaking between 5 and 7 years); it affects about four boys for each girl affected; and it occurs bilaterally in about 10% of cases.¹
- Slipped upper femoral epiphysis tends to occur in adolescents (aged 10-16 years), again more

commonly in boys (ratio 3:1), patients of Afro-Caribbean origin, and obese patients.

- Transient synovitis typically has an acute onset, and spontaneous recovery with no radiological abnormality or systemic upset. It occurs between the ages of 2 and 10 years (peaking between 5 and 6 years) and is more common in boys, often preceded by viral infection.

Various methods are used to classify the severity of Perthes' disease; these broadly stratify according to the proportion of epiphyseal involvement. Prognosis is variable and depends on amount of epiphyseal involvement and age of the patient. The younger the patient and the smaller the affected area, the more likely that repair will occur without important abnormality. The older the child and the more extensively affected, the more likely they are to have modelling deformities of the femoral head and acetabulum, with resultant premature degenerative change.

What test should I order?

In this context, the differential lay between transient synovitis and Perthes' disease. Several tests are available to help in deciding the diagnosis.

Plain x rays

Both hips should be imaged (fig 1); the improved diagnostic accuracy provided by comparison with the other hip outweighs the small increase in radiation exposure (which can be mitigated by coning or the use of a gonadal shield in the lateral view). Both an anteroposterior and lateral or "frog leg" view (hips flexed and externally rotated) of the whole pelvis must be done (fig 2). The anteroposterior view will show the more advanced changes of Perthes'—enlargement, flattening, sclerosis, or fragmentation of the epiphysis—but early changes such as the crescentic subchondral lucency, particularly in the anteromedial aspect (the site of maximal load bearing), are easily missed and best seen on the lateral view. In older children, slipped upper femoral epiphysis can be missed if the lateral film is omitted.

Ultrasonography

Ultrasound is the most sensitive tool for confirming a hip joint effusion (although a large effusion can sometimes be suspected from the plain x ray). As

Fig 1 | Anteroposterior pelvis x ray in a 9 year old girl with right hip pain. The left hip shows typical healing in the reparative phase of Perthes' disease with a flattened, fragmented, and sclerotic femoral epiphysis (arrows) associated with a broad metaphysis; the right hip appears normal

This series provides an update on the best use of different imaging methods for common or important clinical presentations. The series editors are Fergus Gleeson, consultant radiologist, Churchill Hospital, Oxford, and Kamini Patel, consultant radiologist, Homerton University Hospital, London

USEFUL READING

Carty H, Brunelle F, Stringer D, Kao S. *Imaging children*. 2nd ed. Edinburgh: Churchill Livingstone, 2004.

Fig 2 | Lateral coned hip x ray of the same child showing the classical subchondral lucency of early avascular necrosis (arrow), not visible on the initial film, indicating early right sided Perthes' disease

ultrasound is quick, cheap, free of ionising radiation, and can be used for guidance in fluid aspiration, it can be used as the first line imaging modality in children with hip pain and no relevant previous history. Its main disadvantage is its lack of specificity. In most cases ultrasound cannot differentiate the causes of an effusion—a transient synovitis and septic arthritis cannot be distinguished with certainty²—and Perthes' disease may also be complicated by an effusion in the acute setting. Another potential problem is a lack of

suitably confident and trained paediatric or musculoskeletal radiologists or sonographers.

Magnetic resonance imaging

If further investigations are necessary because the diagnosis is still not clear, magnetic resonance imaging can identify the earliest (pre-radiographic) changes, illustrate the extent or severity of the disease (allowing an estimate of prognosis), and offer multiplanar 3D imaging for surgical planning.^{3 4} In everyday practice it is rarely required: diagnosis can usually be made from plain films, and most cases are managed conservatively with rest and physiotherapy. Bracing and splinting are occasionally required with surgery reserved for the older and more severely affected children.

Other tests

Bone scintigraphy shows both the early avascular and later revascularisation or reparative phases of Perthes' disease, but it is seldom used in practice as it offers no more information than magnetic resonance imaging and involves ionising radiation.³ In the same way, although computed tomography can detail bony anatomy and the extent of disease, magnetic resonance imaging offers adequate preoperative 3D imaging without exposing the patient to radiation.

Patient outcome

The plain films show established Perthes' in the left hip of our patient, but avascular necrosis was apparent in her right hip only on the lateral view. We diagnosed (bilateral metachronous) Perthes' disease. The patient was managed conservatively. She was advised to be relatively active and is now well, although she avoids contact sports.

Contributors: Both authors contributed equally to the research, design, content, and editing of the manuscript.

Funding: None.

Competing interests: None declared.

Accepted: 29 March 2007

- 1 Wiig O, Terjesen T, Svenningsson S, Lie S. The epidemiology and aetiology of Perthes' disease in Norway. *J Bone Joint Surg Br* 2006;88-B:1217-23.
- 2 Zamzam MM. The role of ultrasound in differentiating septic arthritis from transient synovitis of the hip in children. *J Pediatr Orthop B* 2006;15:418-22.
- 3 Lamer S, Dorgeret S, Khairoumi A, Mazda K, Brillet PY, Bacheville E, et al. Femoral head vascularisation in Legg-Calvé-Perthes disease: comparison of dynamic gadolinium enhanced subtraction MRI with bone scintigraphy. *Pediatr Radiol* 2002;32:580-5.
- 4 Jaramillo D, Galen TA, Winalski CS, DiCanzio J, Zurakowski D, Mulkern RV, et al. Legg-Calvé-Perthes: MR imaging evaluation during manual positioning of the hip—comparison with conventional arthrography. *Radiology* 1999;212:519-25.

LEARNING POINTS

Presumptive diagnosis can be based on clinical presentation; imaging is then used to confirm the diagnosis. Plain films of both hips at initial diagnosis should always include a "frog leg" lateral view for suspected Perthes' disease and slipped upper femoral epiphysis.

Ultrasonography should be used to identify an effusion, although it lacks specificity regarding the underlying disease.

If diagnosis is difficult or further preoperative assessment is required, magnetic resonance imaging should be used. Bilateral Perthes' disease is usually metachronous; apparently synchronous bilateral Perthes' should raise the suspicion of an alternative diagnosis, such as epiphyseal dysplasia.

Call for papers for *BMJ* theme issue on diabetes

If you would like your original research article to be considered for this September's theme issue, please send it to our online editorial office at <http://submit.bmj.com> by Monday 11 June. We will give priority to articles that will help readers to make better decisions about diabetes. To ensure we attract the best new research, we are keeping the remit broad: suitable research may aid decisions on risk, prevention, treatment, or management of

diabetes and may be relevant to clinical practice, health services, further research, education, or policy making.

Our resources for authors on bmj.com and the recent editorial at *BMJ* 2007;334:4-5 (doi: 10.1136/bmj.39057.516250.80) should answer your general questions about submitting research to the *BMJ*. For specific advice on possible submissions for this theme issue, please email [Trish Groves](mailto:Trish.Groves@bmj.com) at tgroves@bmj.com.