

# DEVELOPMENTAL DYSPLASIA OF THE HIP – CLINICAL MANAGEMENT AND ULTRASOUND SCREENING

P Marshall, Consultant Orthopaedic Surgeon;  
S Wildon, Chartered Physiotherapist,  
Royal Lancaster Infirmary

## SUMMARY

Although there is an agreed national protocol for the clinical screening of developmental hip dysplasia (DDH) there are no national guidelines for the use of ultrasound to detect this condition. The increased incidence of babies requiring surgery for this condition across the bay has led us to institute a selective screening programme in line with best clinical practice.

This article describes care pathways in primary and hospital care in some detail and will therefore be of direct clinical relevance to the midwives, health visitors, general practitioners, physiotherapists, paediatricians, and orthopaedic surgeons involved in the management of babies at higher risk of DDH. We also outline the physiotherapy and orthopaedic management of children with this condition.

Feedback or suggestions relating to the recently introduced screening programme would be welcomed.

## INTRODUCTION

Although the terms 'developmental dysplasia of the hip' (DDH) and 'congenital dislocation of the hip' (CDH) tend to be used interchangeably, the former is more accurate and now generally preferred because:

- 1) Some babies' hips are undoubtedly enlocated at birth and subsequently dislocate in the postnatal period – these dislocations have not been present since birth and are not, therefore, 'congenital'.
- 2) The term 'dysplasia' indicates that the condition encompasses a spectrum ranging from a mildly shallow acetabulum with an enlocated hip to a frank dislocation. The majority of mild acetabular dysplasias (which would not be detected by clinical examination, but would be apparent on ultrasound) do resolve spontaneously, **but some progress and can lead to instability and dislocation.**

Clinical screening for DDH was recommended in the UK by the Department of Health in 1969 and the advice was updated in 1986. Despite the almost universal adoption of this policy, however, there has been only a marginal impact on the number of children requiring surgery for DDH which remains at approximately 1 in 1000 births. The number requiring abduction splintage is approximately five per 1000 births.

In 1999 the first author (PM) performed open surgery to reduce seven dislocated hips (Figure 1). As approximately 3500 babies are delivered each year in the three maternity units across the bay, this figure is higher than would be expected, and it is possible that the incidence of DDH in our catchment area is greater than the national average. We are currently undertaking an epidemiological survey to investigate this matter further.

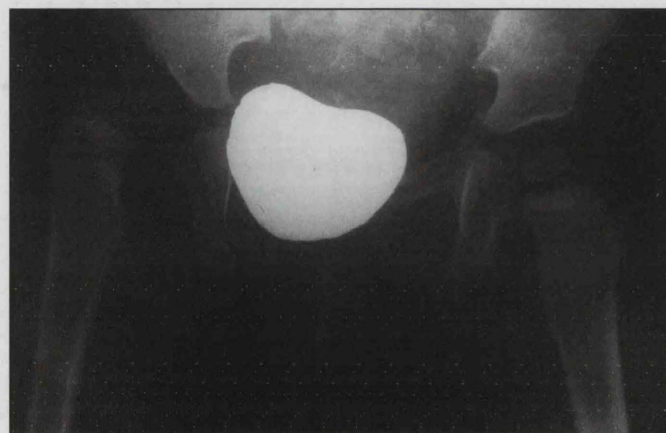


Figure 1 Radiograph showing a dislocated right hip

Our present selective ultrasound screening programme commenced in April 2000, and a continuous audit is in progress. It is hoped that the requirements for surgery will fall to less than 0.5 per 1000 births, as in other regions where selective ultrasound screening has been adopted<sup>(1)</sup>. The results of the audit will, hopefully, be published in a subsequent edition of this journal.

### Ultrasound imaging of the hip

Ultrasound offers a reliable, safe and non-invasive method of imaging the neonatal hip and can be used from the time of birth until around the age of five months at which time the capital femoral epiphysis ossifies, thus obscuring the acetabulum from ultrasound assessment. From the time of appearance of the capital epiphysis radiographs become clinically helpful in diagnosis (Figure 2).

## CLINICAL EXAMINATION FOR DDH

Although ultrasound screening for DDH is superior to clinical screening, the majority of not at risk babies will continue to have clinical screening alone. Therefore, the clinical examination of babies for possible DDH will be described in detail.



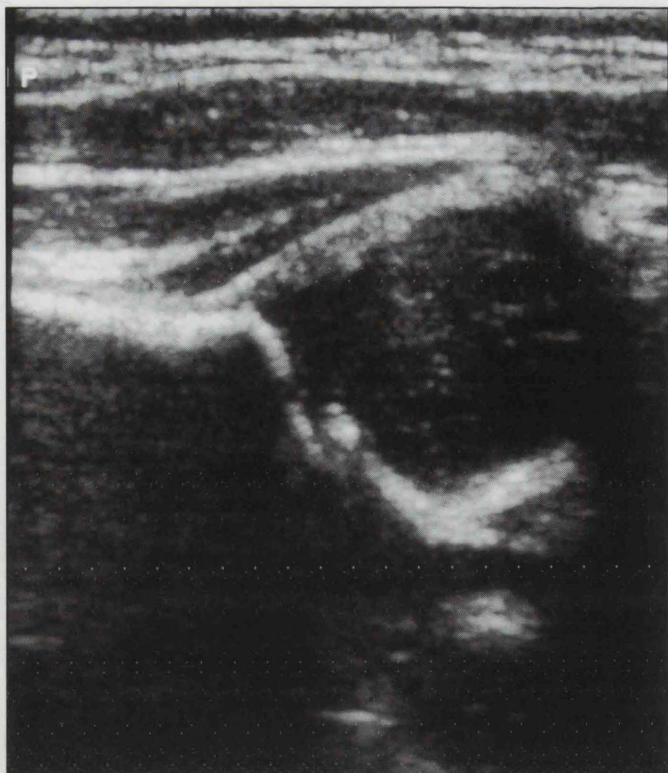


Figure 2a Ultrasound examination of a normal hip. Note that the circular femoral head lies within the 'wineglass' acetabulum

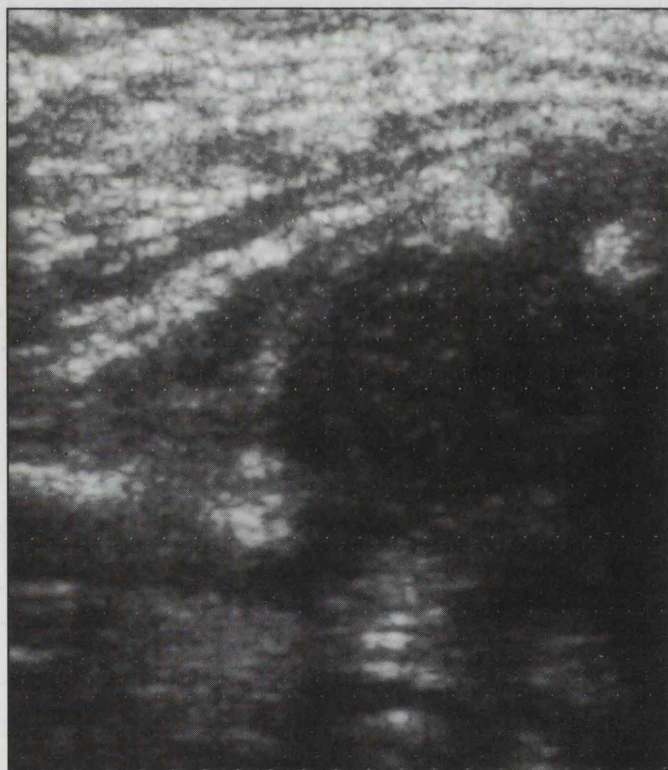


Figure 2b Ultrasound examination of a dislocated hip. Note that there is no 'wineglass' acetabulum adjacent to the femoral head

## 1 THE NEONATAL AND SIX-WEEK EXAMINATION

The classic "clunk" of an unstable hip as it dislocates and relocates is sometimes felt, but the clinical signs may be more subtle if there is a dysplastic shallow acetabulum, in which the femoral head slides from the centre to the edge of the saucer-like acetabulum.

### Examination technique and clinical findings

Ideally, the breastfed baby should be fed prior to the examination. Allowing the baby to suck on a bottle nipple or a finger encourages relaxation. The baby should be placed on

a blanket, usually on a table top, with the nappy removed. To avoid disturbing a quiet, relaxed baby, the hands should be warm (wash with warm water, if needed). Both the baby and the examiner should be relaxed. The strength of grip on the baby's thigh is said to be comparable to that used when holding an egg or a tennis ball.

### Thigh segment shortening (Galeazzi sign) (Figure 3).

This clinical sign is very valuable in all ages and is the first thing to look for when examining a baby's hips. It is very important that the baby is relaxed as the struggling baby will often raise one hemi-pelvis off the examination couch by muscular contraction. The baby should lie on a firm, supportive surface, and the examiner should bring his eye level down to the level of the baby's flexed knees in order to determine whether there is any thigh segment shortening.



Figure 3 Positive Galeazzi sign on left side - thigh segment shortening

### Restriction of hip abduction in flexion

This is the second sign to look for. Restricted abduction may be difficult to elicit in the examination of the newborn, but becomes an increasingly valuable clinical sign in the older baby and toddler.

With **bilateral** hip dislocations there may be symmetrically reduced abduction in flexion and there may be no symmetrical thigh segment shortening. The clinical diagnosis of bilateral DDH is more difficult, but may be suspected by a widened perineum and the medial groin creases which end posterior to the anus when the hips are flexed. Figure 4 shows the position for examination of posterior extent of groin creases.

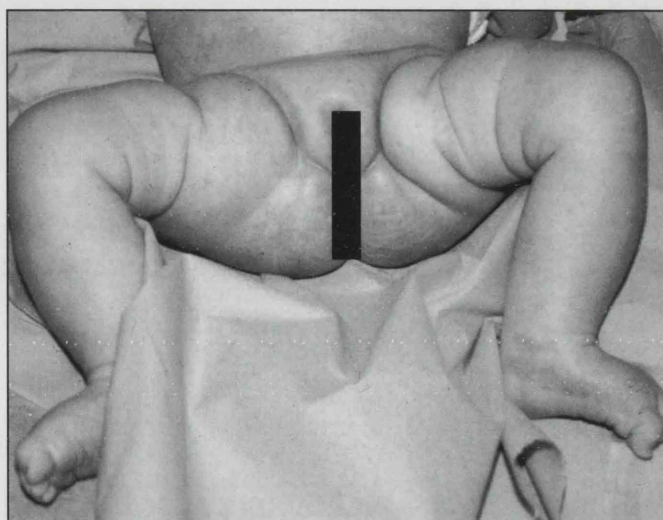


Figure 4 Dislocated left hip with groin crease asymmetry. Note that on the side of the dislocated hip the medial end of the groin skin crease extends posteriorly to the level of the anus when the hips are flexed



### The Barlow and Ortolani tests

The baby's hips are flexed above 90° allowing one to grasp the thigh and, in the newborn, the fully-flexed calf. The thumbs should be placed on the medial side of the thigh, and the lateral thigh and greater trochanter gently held with the fingers. The right and left hips are held at the same time in order to control the pelvis, but each hip is examined independently. In uncertain cases the pelvis may be stabilised by one hand holding between the symphysis pubis and the sacrum whilst the other hand manipulates the suspected hip.

**The Barlow test is antero-posterior subluxation to detect a 'dislocatable' hip.** Note that often the actual sensation experienced is that of sliding the femoral head from the centre of a saucer onto its edge. The flexed hip is adducted beyond the midline to 10-20° of adduction and a gentle posterior force is applied to determine whether the femoral head will slide posteriorly within the acetabulum. Then the hip is moved to abduction, with gentle traction applied to relocate the femoral head. This sequence may be repeated if necessary.

**The Ortolani test is for a dislocated hip.** The hip is flexed to 90° and then into abduction, with gentle traction. As the hip approaches full abduction gentle forward pressure is implemented with the posteriorly positioned fingers pressing on the greater trochanter in an attempt to reduce the hip. If the dislocated hip reduces a reduction clunk is felt.

### Clicks and clunks

**The hip which moves and 'clunks' as it does so is definitely abnormal. The hip which does not move, but 'clicks' may be normal, but also may be abnormal.** This is a relatively common clinical occurrence. The traditional wisdom was that a clicky hip which was clinically stable was normal, and that no further investigation was required. There is now, however, increasing evidence in the literature<sup>(2,3)</sup> supported by an internal audit at the Royal Lancaster Infirmary<sup>(4)</sup> that clicking is not always benign and may be associated with acetabular dysplasia, detectable ultrasonographically, which may require treatment in a hip harness. **In our audit it was found that 'clicky' hips did have a higher incidence of subsequent hip abnormalities than non-clicky hips and hence all 'clicky' hips have been entered into our ultrasound screening programme.**

### Asymmetrical thigh creases

This is one of the commonest reasons for referral to the paediatric orthopaedic outpatient clinic. Some asymmetry of the medial thigh creases is common and is normal. Asymmetry can often be reduced or increased by rotation of the legs. **Providing that there are otherwise no abnormal clinical signs the parents are reassured that the hips are clinically normal and an ultrasound scan is not requested unless there is a family history of DDH.** Skin crease asymmetry is a more reliable clinical sign if the medial extension of the groin crease extends posteriorly to the level of the anus when the hips flexed to 90° (Figure 4).

## 2 THE EIGHT-MONTH EXAMINATION

By the time the baby is eight months old the hips are either in or out, i.e. the Barlow and Ortolani manoeuvres will not demonstrate any evidence of movement of the hip from the dislocated to enlocated positions and vice versa. In this older age group thigh segment shortening and restricted abduction in flexion are the key features on clinical examination.

## PROTOCOL FOR THE SELECTION OF BABIES FOR HIP ULTRASONOGRAPHY

### 1 Newborn

Should clinical examination reveal that the hips are either dislocated or dislocatable then an ultrasound examination of the hips is performed as an outpatient within the next two to three weeks and review in Mr Marshall's paediatric orthopaedic clinic arranged following the scan. In the interim period double nappies should be applied.

Should the baby's hip be 'clicky', or should there be any risk factors for hip dysplasia (breech, family history of DDH in a first degree relative, torticollis or foot deformity) then an ultrasound examination of the hips is performed as an outpatient at around six weeks of age and review in paediatric orthopaedic clinic will be arranged if the scan is abnormal. Double nappies are not indicated in this group.

### 2 Six-week assessment

All clinical abnormalities require ultrasound investigation. **This includes 'clicky' hips, but excludes babies with isolated asymmetry of the medial thigh skin creases.** At the present time, there is no open access to baby hip ultrasounds for general practitioners and therefore requests should be made directly to Mr P Marshall at the Royal Lancaster Infirmary or Westmorland General Hospital. A letter will then be sent to the parents (and a copy of the letter to the GP) enclosing an appointment time for the ultrasound scan. Should the scan be normal the parents will be informed at the time and a letter sent to the GP. Should the scan be abnormal then review in the paediatric orthopaedic clinic will be arranged, so that further management may be planned.

### 3 Eight-month assessment

All clinical abnormalities require further assessment by pelvic radiograph. Ultrasound cannot be used to image the acetabulum in the presence of an ossified femoral head epiphysis, which normally appears around the age of five months.

Mr Marshall would be very pleased to review the baby himself to see whether an X-ray is clinically warranted. All such referrals would normally be seen in the next outpatient clinic.

## CLINICAL MANAGEMENT OF DDH

### 1 Diagnosis at 0-6 months

- Such children are invariably managed by a period of time in a hip harness, such as the Pavilk or Tübingen (Figure 5) fitted by a paediatric physiotherapist. Our experience with the Tübingen harness has been very favourable. Compliance is high as it is easy to fit and is generally 'parent friendly'.
- Infants diagnosed and treated with adequate splintage in the first year of life have a greater than 90% chance of developing a normal hip radiologically, clinically, and functionally. In unstable hips the reduction rate is 92%, and in dysplastic hips the healing rate is 95%<sup>(5)</sup>.
- The rationale for harness treatment is to hold the femoral head in the vicinity of the centre of the shallow acetabulum to stimulate normal acetabular development. The harness is usually worn for 23 hours each day, allowing removal for bathing and changing. We no longer splint the hip in forceful abduction as this stresses the



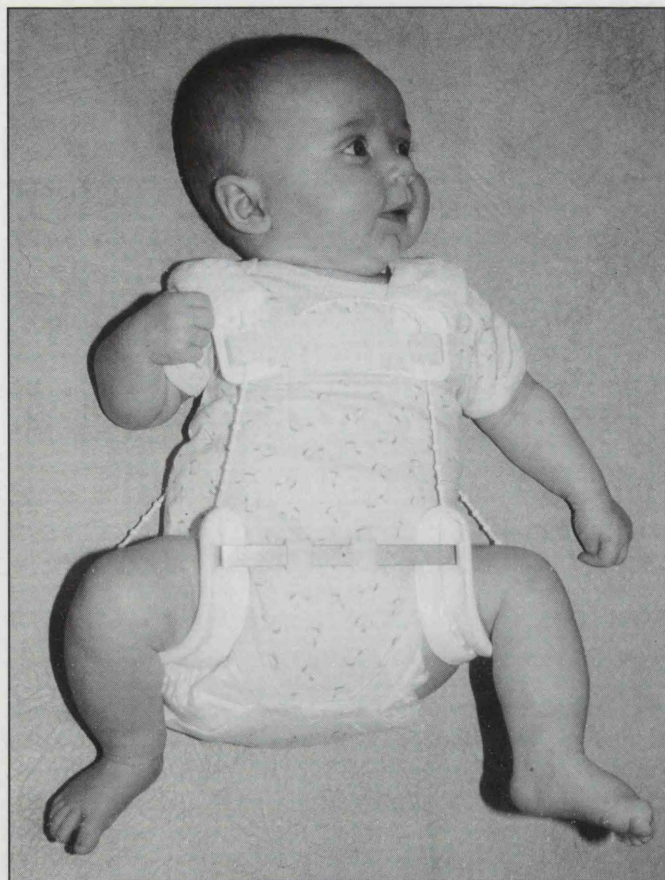


Figure 5 Infant in a Tubingen harness.  
Note that the hips are flexed to greater than 90°

capsular vessels of the hip joint and increases the risk of avascular necrosis of the femoral head (avn).

- Splintage is associated with a risk of avn, which is minimised if the hips are splinted in the squatting position of flexion to 100° and abduction to 20° less than maximal abduction<sup>(6)</sup>. Alternative splinting positions, such as the 'frog' position of maximal abduction and external rotation in flexion are associated with a higher risk of avascular necrosis. In view of this, the splint should be applied and monitored by an experienced physiotherapist who is aware of this potential hazard.
- Whilst being splinted all children are monitored by clinical examination, ultrasonographically and radiologically where appropriate, to ensure continuing progress. In the newborn period weekly checks of the harness are made by the physiotherapist who adjusts the harness as the child grows. As hip abduction improves the splint is adjusted to achieve the squatting position. The splinted position of abduction is always at least 20° less than maximum abduction. Whilst checking the harness the therapist is able to counsel and educate parents as well as assess compliance with wearing the splint.
- The duration of treatment depends on how long it takes for the hip to become stable or for the acetabular dysplasia to improve, but will be usually between three and six months for a frankly unstable hip.
- The upper age limit for harness treatment is around twelve months, but does depend upon the size and strength of the child.
- Our experience is that acetabular dysplasia is not always benign and, when diagnosed, we would advocate splintage until a normal ultrasound appearance is achieved.

## 2 Diagnosis at 6-18 months

- In this age group splintage may also be used, provided that the hip is fully reducible without difficulty. An arthrogram under general anaesthesia may be performed in cases where there is any uncertainty regarding the position of the hip. With increasing age, however, secondary adaptive changes occur, such as tightening of the iliopsoas muscle, which prevent closed reduction (Figure 6). In such cases, surgical open reduction of the dislocated hip is required, followed by a period of immobilisation in a hip spica cast for three months. The child is admitted as a day case for an examination under anaesthesia and change of hip spica at six weeks following the open reduction. It is explained to the parents that the postoperative immobilisation is necessary in order to allow the saucer-like acetabulum to develop into a 'cup'.

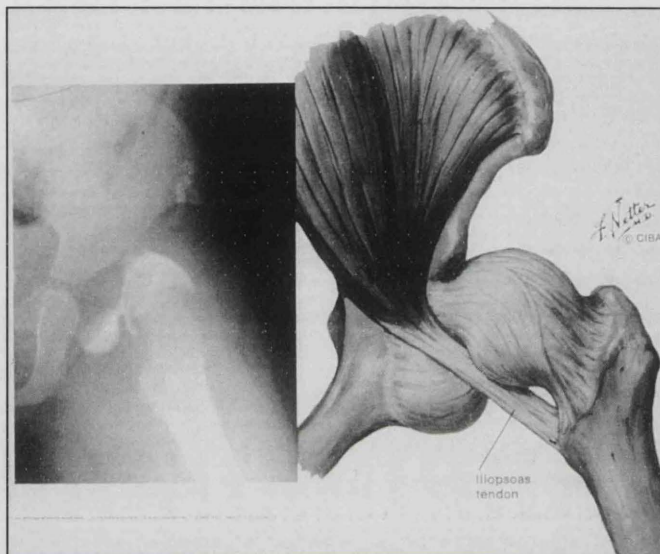


Figure 6 Arthrogram and explanatory diagram showing how the iliopsoas tendon can cause a mechanical block to reduction in DDH

- Parents are helped with the management of a child in the spica. The use of new waterproof thermoplastic splinting materials instead of plaster of paris allows the child to be bathed on a regular basis. Children can be fastened into car seats and can be picked up with the aid of the bar between the legs.
- It is possible that abduction splintage of the hips at night may be required following spica cast removal and we are currently developing an adjustable splint with an orthotic manufacturer.
- Parents are reassured that whilst the hip will be stiff and mobility diminished following spica cast removal, normal movement and mobility will return.
- Parents are advised that there is a possibility that further surgery may be required if there is persistent acetabular dysplasia.

## 3 Diagnosis at 18 months to 3 years

- Surgery – femoral derotation, varising and shortening required at the same time as open reduction (Figure 7). Internal fixation of femoral osteotomy using plate and screws is required and the metalwork will subsequently require removal.
- May require concomitant or subsequent pelvic osteotomy.

## 4 Diagnosis at three to eight years

- Surgery – femoral derotation, varising and shortening required at the same time as open reduction.





Figure 7a Bilateral hip dislocations in a two-year-old girl

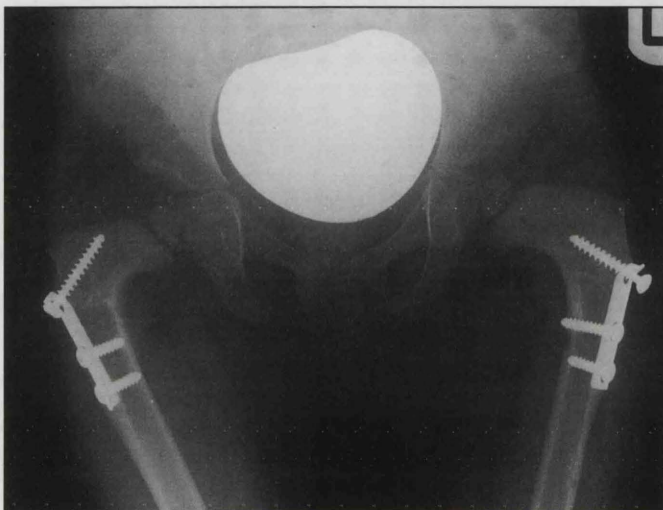


Figure 7b Radiograph following bilateral open reductions and femoral osteotomies

- If older than four years then pelvic osteotomy will be required.

##### 5 Diagnosis above eight years

- Usually surgery to attempt to relocate is not appropriate, but surgery for acetabular dysplasia may be required.

- There are a number of operations which may be indicated as 'salvage' procedures, such as Chiari osteotomy, shelf procedure and arthrodesis.
- Total hip replacement may be required at a relatively young age.

## CONCLUSION

Early detection of developmental hip dysplasia using ultrasound screening and clinical examination allows effective early treatment using a hip harness and will reduce the need for surgery in this condition. We anticipate that the introduction of this best clinical practice across Morecambe Bay will be of significant clinical and economical benefit.

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## Acknowledgements

Thanks to Dr Janet Lavelle, Clinical Director Radiology, and Dr Monica Placzek, Consultant Paediatrician, for helping to develop the ultrasound screening programme and institute this service development. Thanks also to Yvonne Dickinson, Manager, Medical Illustration, Royal Lancaster Infirmary, for help with the illustrations used in this article.