MCN for Neonatology
West of Scotland
Neonatal Guideline

Developmental dysplasia of the Hips (DDH) and congenital foot deformities

This guideline is intended to provide guidance on the investigation and management of infants at high risk of/suspected developmental dysplasia of the hips and other orthopaedic problems. This guidance should be used in conjunction with appropriate local pathways.

Contents

Background

Developmental Dysplasia of the Hip (DDH) covers a spectrum of hip abnormalities ranging from hip dysplasia, reducible subluxation/dislocation and irreducible hip joint dislocation.[1] The term *Developmental* Dysplasia of the Hip (DDH) was coined in 1989, to encompass the dynamic spectrum of hip conditions seen within the first year of life. Approximately 60-80% of the abnormalities identified by physical examination and more than 90% identified by ultrasound resolve spontaneously in early infancy. The late diagnosis of DDH leads to more invasive treatment than if it is diagnosed in infancy, and is associated with a significant rate of premature degenerative joint disease of the hip in early adulthood."

Key definitions[2]:

- Dislocation: displacement of articulating bones leading to separation of joint surfaces
- Subluxation: incomplete separation of joint surfaces - the femoral head is displaced from its normal position in the acetabulum but remains in contact with it
- Dysplasia: abnormality of development of acetabulum resulting in a shallow and/or dysmorphic socket

Incidence

The incidence of late diagnosed DDH remains to be 1.28/100 despite a targeted hip screening programme. Reported incidence in the UK is 1.2/1000 live births

There is a 4-fold increase in females due to increased ligamentous laxity caused by circulating hormone, relaxin. The left hip is involved in 60% of cases (right 20%, bilateral 20%) which may be due to the anterior position of the occiput and limited space for abduction[3].

Universal vs targeted hip screening

There is controversy over the use of universal ultrasound in diagnosis of DDH as more than 90% of abnormalities detected resolve on follow-up. A Cochrane review of screening programmes for DDH (2011) concluded there was insufficient evidence to give recommendations. There was inconsistent evidence that universal ultrasound increased treatment rates compared with targeted screening. However, neither strategy was shown to reduce late complications of DDH including late diagnosis or surgery.[4] More recently however universal screening has been shown to reduce the risk of late presentation of DDH and the need for surgical intervention (as well as reducing number of surgical procedures required.)

Therefore, in Scotland, hip screening is done using targeted risk factors, clinical assessment and targeted hip ultrasound.

Risk factors for DDH

Infants with the following risk factors should be referred for a hip ultrasound:

Breech presentation

This exerts mechanical forces on the developing hip joint with frank breech being at highest risk.[5] (see high risk infant criteria for more details)

Family history of DDH in first degree relative.

The incidence of DDH increases 12-fold in affected first degree relatives.[6] If there is one affected sibling the risk is 60 per 1000 and increases to 120 per 1000 for an affected parent[7]

Fixed foot deformities

Fixed foot deformities have been shown in studies to be associated with a higher risk of DDH [8,9]

Multiple pregnancies, where any of the above risk factors are present. This is because if one baby meets criteria, it can sometimes be difficult to accurately assess which baby was affected.

There is insufficient evidence to support the inclusion of torticollis or oligohydramnios as these have not been proven to increase the risk of “nonsyndromic” DDH.[10,11]

In general, risk factors are poor predictors of DDH. Female sex, alone, without other known risk factors, accounts for 75% of DDH [12]. This emphasizes the importance of a careful physical examination of all infants in detecting DDH.[13]

Clinical assessment

The neonatal clinical hip examination is part of the routine new born examination. All hip joints should be examined in a systematic manner using the **look, feel, move** approach ideally within 24 hours and certainly before 72 hours after birth[14]. All hips should be re-examined at 6-8 weeks of age for DDH (usually in primary care).

History Before examination, maternal obstetric history, baby's family history and hip risk factors should be reviewed. Family history of DDH, breech presentation after 36 weeks gestation or fixed foot deformity, are triggers for a hip ultrasound (see risk factors for screening).

Examination Clinical assessment involves an inspection (**look**), palpation (**feel**) and (**move**)ment approach.

'Look': Inspection is important to assess for symmetry of leg length and gluteals.

'**Feel'** – evaluated by flexing the hips and knees. Unequal knee lengths (Galeazzi sign), is a sign of a dislocated hip. A dislocated hip is a more common cause of leg length discrepancy than any other causes. Leg length discrepancy in a neonate is a trigger for a hip ultrasound.

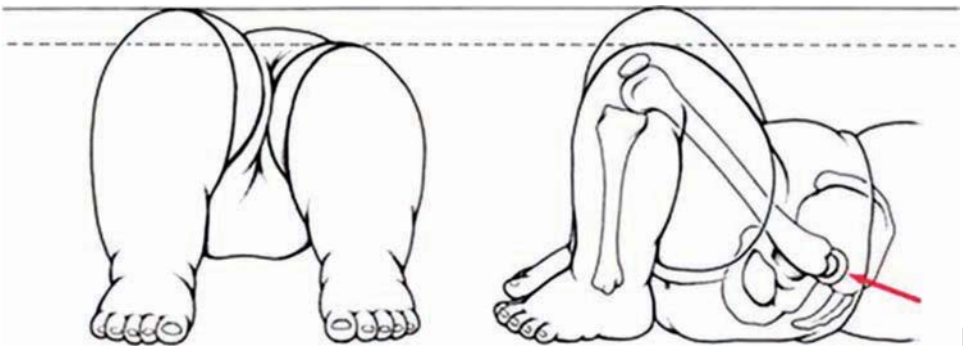

Figure 2[15]

'Move'

Gentle abduction test

The hips should be fully flexed and abducted together, to detect any difference between the sides. The examiner's middle fingers are placed on the greater trochanter with the flexed legs contained in the palms. The thumbs rest on the inner side of the thighs opposite the lesser trochanter. Even slight limitation of abduction may be significant, indicating a hip that is starting to subluxate. Asymmetry or reduction of hip abduction of the hip in a neonate is a trigger for a hip ultrasound.

Ortolani and Barlow's manoeuvres are then performed *with the pelvis stabilised by the opposite hand*. **Ortolani is a test of hip joint reducibility and Barlow's for dislocatability. Examine one hip at a time. Ideally the baby should be relaxed and the family reassured that the test is not painful**.

Ortolani's test returns a posteriorly dislocated femoral head back into the acetabulum. It is performed by holding the hip with the thumb over the inner thigh, the middle finger over the greater trochanter and abducting the hip. An abnormal Ortolani test is when the greater trochanter is *felt* to move forward as the hip reduces into the acetabulum. It must be stressed that reduction of the hip almost never produces an audible sound.

In ***Barlow's test***, a similar hand position is used and the hips are flexed. Posterior pressure is applied in the line of the femur with the hips in neutral ab/adduction. An abnormal test is when the femur is felt to move backwards relative to the fixed pelvis, and indicates hip instability.

Referral protocol for Hip Ultrasound Screening

1. H - History

Patients with the following risk factors and a normal clinical hip examination should undergo hip ultrasound within 4-6 weeks corrected gestational age.

- **Breech presentation at or after 36 completed weeks** of pregnancy, irrespective of presentation at birth or mode of delivery. This includes breech babies who have had a successful external cephalic version (ECV).

- **Breech presentation at delivery if ≥ 28 weeks gestation**.

- **Positive family history in first degree relative**

- **Foot deformities** – calcaneovalgus, fixed talipes equinovarus

- In **multiple births, where any of these risk factors are present**, all babies in the pregnancy should be referred for a hip USS.[10]

2. Abnormal Clinical Examination in the neonatal period

I – Inspection – asymmetrical groin creases, leg length discrepancy
P – Palpation – Asymmetrical hip abduction
S – Stability – Either an abnormal Barlow (dislocatable) or Ortolani (dislocated) test – findings will need to be confirmed by an experienced team member. If confirmed, contact the local orthopaedic team-on-call prior to discharge.

NB: ***Ligamentous clicks without instability (only if outcome unclear)***

There is limited evidence in the literature to support hip ultrasound screening in isolated clicky hips without instabiltiy.[1,16] However, it can be difficult to differentiate between a clicky hip and an unstable hip, by a non-expert examiner. Therefore, ligamentous clicks should be examined by experienced middle grade staff. If screening outcome is still unclear, then an ultrasound should be performed.

Table 1 [14]

Hip ultrasound scan timeframes	
Orthopaedic referral and USS within 2 - 4 weeks (organized by orthopaedic team)	Screen positive - Positive Ortolani or Barlow maneuver – depending on health board, maybe reviewed as inpatient - Difference in leg length - Knees at different levels when hips/knees are flexed (positive Galeazzi sign) - Limited abduction of hip - Asymmetry of skin folds buttocks/posterior thigh
Within 4 - 6 weeks	Screen negative but risk factor positive

Diagnostic Imaging

Ultrasound

The ultrasound is a well-established tool for detecting DDH and evaluation of babies with an abnormal examination. The position of the femoral head, acetabular coverage and stability on dynamic testing can be assessed.

The Graf method is used for joint evaluation, with 3 bony landmarks: 1. lower limb 2. plane and 3. labrum. The condro-osseous border should also be on. Both hips are evaluated.
This method classifies joints as:

- *Type I – normal*
- *Type IIa - if alpha angle appropriate for age the Sonographer/Orthopaedics organises a rescan in 3-4 weeks.*
- *Type IIb - if alpha angle not appropriate for age inform on call paediatric orthopaedic team**
- *Type IIc - inform on call paediatric orthopaedic team**
- *Type IId – inform on call paediatric orthopaedic team**
- *Type III – inform on call paediatric orthopaedic team**
- *Type IV – inform on call paediatric orthopaedic team**

**see specific local pathway below*

Pathways may differ locally:
NHS Lanarkshire – All high-risk infants and those with an abnormal clinical examination are referred to the paediatric orthopaedic team using Badgernet.
*The on call orthopaedic team do not need to contacted in NHS Lanarkshire
NHS GG&C (Glasgow) – Babies with Abnormal Hip examination are referred to Orthopaedics by telephone by calling the orthopaedic middle grade doctor on duty. This should be followed up by completing the written referral proforma in the appendix below (*Appendix 1*) and forwarding to the neonatal secretaries to email to the appointments dept. Babies with risk factors but normal examination are referred for hip USS by neonatology
NHS GG&C (Clyde) – Babies with Abnormal hip examination are referred to local Orthopaedic services using preform letter *(Appendix 2)*

Table 2[16,17]

Limitations of ultrasound
Technical aspects of image interpretation
Over diagnosis of DDH and abnormalities that may resolve without intervention
After 4-6 months, the femoral head calcifies and anteroposterior (AP) hip x-rays are required

X-rays

X-rays before 4 months have higher false negative rate as in the first few months of life, the bones are predominately cartilaginous which makes x-rays unreliable in assessing the hip structure. When the ossification centre of the femoral head appears after 4-6 months, x-ray may be a useful tool as abnormalities are more apparent.

Management of DDH

The aims of early DDH treatment are to achieve stable reduction without complications. The splints used vary. The Pavlik harness is the most commonly used treatment and has a success rate of 95% in dysplastic or subluxed joints. It must be kept on at all times and will be monitored by the orthopaedic team.

Figure 6 Pavlik Harness (with limited hip abduction on the right)[18].

The potential complications of splinting are avascular necrosis of the femoral head and rarely, irreducible dislocation, femoral nerve or accessory nerve palsies[21].

Surgical reduction

Indications: failure of conservative management (splinting) or late diagnosis 6-18 months.
In older infants, open reduction is the main stay of treatment.

Parental Advice

- Parental Advice Leaflet from STEPS charity – Hip Health
- Parental Advice Leaflet from STEPS charity – Caring for a baby in a Pavlik harness
- Local Leaflet about the Hip screening program – See below

Parent information leaflet
Targeted screening for Developmental Dysplasia of the Hips (DDH)

You are receiving this leaflet as your child has been referred for further investigation of their hips.

Background

All babies' hips are checked at birth. This is to screen for a condition called Developmental Dysplasia of the hips (or DDH). If this examination is not reassuring, or there are any other risk factors for DDH, babies are referred for an ultrasound scan of their hips.

What is DDH?

DDH is a condition where the hips are not properly in joint or not shaped perfectly. The hip joint is a ball and socket joint and in DDH, the ball and socket do not fit together in a normal manner. There are varying degrees of severity. In milder cases the joint is a little loose and in more severe cases the hip may be dislocated. Around 1 per 1000 babies have this condition. Babies with mild instability of the hip may get better over time without treatment. Other cases will require treatment in the Orthopaedic department.

Who gets DDH?

Anyone can be born with DDH. However, we know some babies are more likely to have it than others. DDH is more likely if:

- Your baby is in the breech position at birth (if born at or after 28 weeks' gestation)
- Your baby is in the breech position at any time at or after reaching 36 weeks' gestation, even if they change position by the time of birth
- Your baby has a foot deformity, e.g: talipes/clubfoot
- A parent or sibling (brother or sister) has had DDH diagnosed
- You have twins or triplets, and one of the babies has a risk factor for DDH, each of the other babies will also be referred for an ultrasound

In these situations, most babies are fine, but the chances of a hip problem are a little higher. If your baby has one of these risk factors, they will be referred for ultrasound, even if the hip examination is normal.

What happens if my baby's hip examination is abnormal?

During your baby's newborn examination, the hips will be examined for instability. If an abnormality is found, a more senior doctor may also examine your baby's hips.
If instability is confirmed, this will be explained to you and your baby will be referred to the Orthopaedic team for follow-up and for an ultrasound scan.

What happens if my baby's hip examination is normal but they have a risk factor for DDH?

If the hip examination is normal but your baby has one of the risk factors mentioned above - an ultrasound of the hips will be arranged at around 4-6 weeks after their due date.

Therefore, your baby will be referred if an abnormality is found on their newborn examination or if they have risk factors which are associated with development of DDH.

What does the ultrasound scan involve?

The scan takes place in the …….. radiology department. An ultrasound probe (similar to the one used in pregnancy) is used to check the hip joint. This is quick and painless and does not involve any radiation.

An appointment for the ultrasound will be posted out to you by the radiology department. This will be 4-6 weeks after your baby's due date.

If you have not received your appointment within 3 weeks, please contact the neonatal secretaries/ radiology on…….
If you lose the appointment or need to change the time that you have been given, please ring the radiology department on ……..

Results
You will be told the results at the time of the scan, any abnormalities will be explained and what follow up (if any) will be required.

- The scan of the hip shows a normal appearance
  - No further action is required
- The scan of the hip shows an immature appearance
  - A repeat ultrasound scan will be arranged in 3-4 weeks time
  - In many cases the repeat scan will show that the hip is now normal
- The ultrasound of the hip shows an abnormal appearance. The hip may be out of joint or unstable.
  - Your baby will be seen by an orthopaedic surgeon to advise the best management

What happens next?
There are many changes that take place in the hip over the first few months of life. Many of the minor abnormalities that are picked up on ultrasound get better without treatment. Rather than starting treatment straight away, a 'watch and wait' approach might be used.

If treatment is required, this will usually be in the form of a splint e.g. Pavlik harness which will encourage normal growth. The orthopaedic team will discuss this with you.

Do the tests pick up all hip problems?
The hip examination only picks up instability at the time of the examination. You should contact your midwife, GP or health visitor if you have concerns.

Questions
If you have any questions based on this leaflet or what you have been told, please speak to the midwife looking after your baby.

Online resources: Baby Hip Health, Steps charity website:
https://www.steps-charity.org.uk/conditions/hip-dysplasia-ddh/
https://www.steps-charity.org.uk/wp-content/uploads/2016/11/Baby-Hip-Health.pdf

Management of congenital foot deformities

Calcaneovalgus

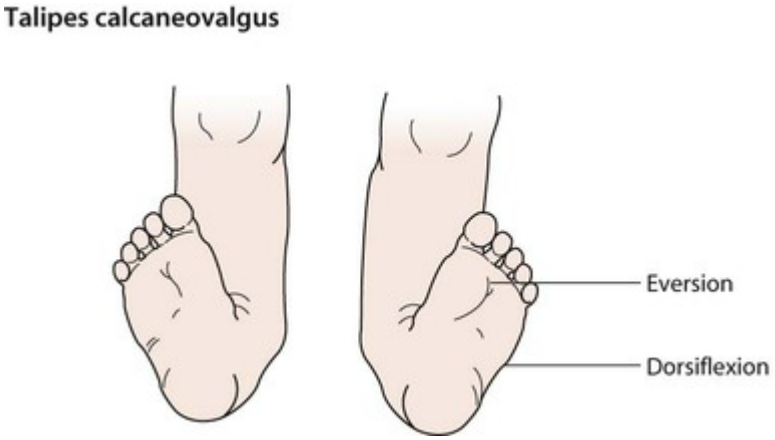

Figure 7[19,20]

The mild form is present in 30 to 40% of neonates. The ankle is dorsiflexed so that the foot is positioned against the anterior aspect of the leg. It is usually a positional deformity with easy passive correction. The vast majority of babies will show spontaneous resolution.
Gentle stretching of the foot into plantarflexion and inversion can be helpful although the majority resolve by 3 to 6 months.[19,20]

Fixed Talipes Equinovarus (Clubfoot)

Figure 8 [21]

Common disorder affecting 1-2/1000 population. Male: female ratio is 2:1. Up to 50% of cases are bilateral. It can be diagnosed antenatally. The foot is turned inward and downward and the forefoot is short, wide, adducted and supinated. The sole of the foot points medially. The involved foot, calf, and leg may be smaller and shorter than the normal side. Should be confirmed by an experienced paediatric team member and referral to local clubfoot service should be made prior to discharge. Gold standard of treatment is the Ponseti method of serial casting and manipulation (successful in >90% of cases).[20,21]

Positional Talipes Equinovarus

The involved hind foot is in correctable equinovarus (foot is turned inward & downward but easily correctable). Can be easily corrected by pushing the foot up into a normal position. If unsure, infant should undergo senior paediatric review to confirm positional talipes and referral to physiotherapy.
An advice leaflet is available from the STEPS charity (see below)

Parental Advice

- Parental Advice leaflet from STEPS charity – Talipes / Club foot
- Parental advice leaflet from STEPS charity - Positional Talipes / Club Foot

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Document Properties

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Implementation / Review Dates:

Implementation – 07/09/20 Next Review – 01/09/23

Urgent Neonatal Orthopaedic referral
Suspected DDH or Talipes

Patient name: _____

CHI: _____

Address: _____
_____
_____

Parent's name: _____

Parent phone number (ESSENTIAL): _____

Brief description of findings:

Telephone referral made to: _____ Date: _____

Referrer: _____ Responsible consultant: _____

Date of referral: _____

Email form to: Appointments.NewChildrensHospital@ggc.scot.nhs.uk

BABY HIP/FEET REFERRALS
(for clinic assessment)

Patient name:

CHI:

Address:

Parent name:

Parent phone number (ESSENTIAL):

Brief description of findings:

Referrer:

Date of referral:

Please forward forms to Carri Pattison, Orthopaedic secretary, Level 4 , Surgical Block, RAH. EMAIL carri.pattison@ggc.scot.nhs.uk

Babies referred will be seen within 2 weeks

J Smith
Consultant Orthopaedic consultant