

Targeted screening of hip dysplasia in newborns: experience at a district general hospital in Scotland

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Abstract

National Health Service Quality Improvement Scotland (NHS QIS) published a health technology scoping report in 2006 acknowledging that there are serious concerns within Scotland in relation to Developmental Dysplasia of Hip (DDH) as there is no formal screening program in place and there are significant variations between NHS boards leading to confusion for staff and parents. NHS QIS identified need for audit work to improve hip screening in Scotland. The aim of this study is review of current practice of selective screening for DDH. All newborns who had their first hip scan during one year period (2014) were included in this retrospective study and followed up until June 2015 to include any surgical intervention for dysplastic hip. Out of 428 babies (856 hip scans), abnormality was seen in 119 babies/147 hips (134 Graf 2a/2b, 10 hips were 2c and 3 hips were Graf grade 3). Average age when first scan was performed was 5 weeks (range 3 weeks to 22 weeks). Analysis of risk factors in 119 babies with abnormal scan was consistent with literature (83 breech, 12 family history, 12 HBW, 10 instability and 2 twins of breech). Twelve babies (16 hips) required treatment and were successfully treated in Pavlik harness. There was one case of missed/late dislocation, which lived in outside catchment area for 3 years since birth. During this study period there was no case of avascular necrosis or femoral nerve palsy as a result of treatment. In our experience, selective hip screening by ultrasound scan is useful in avoiding overtreatment and minimizing late presentations.

Introduction

Since introduction of ultrasound scan for screening of hip dysplasia in 1980,¹ incidence of hip dysplasia is reported to be around 7/1000 live births in Caucasians in comparison to 3.9/1000 in 1966 in Scotland.^{2,3} This variation

could be due to different screening methods or due to variability in defining dysplastic hips. Breech presentation and family history are the two most common risk factors and National Institute of Clinical Excellence has included these two in Neonatal and Infant Physical Examination screening tool for dysplasia.⁴ In Aberdeen incidence of breech in dysplastic hips was 18%.⁵ Neonatal hip instability seem to resolve in vast majority of cases 5 days to 6 months following birth.⁶⁻⁸ For those who are treated with Pavlik harness or abduction brace, success rate have been reported be 80 to 100% depending on the age when treatment commenced and on the severity of dysplasia.⁹⁻¹¹ Incidence of late presentation vary depending on the definition (3 weeks to 1 year),¹² in Scotland it was reported to be 0.13/1000 in 1966 and 0.5/1000 in 2002 in Glasgow.^{3,13}

Screening program for hip dysplasia is a controversial issue and there is not current consensus on the best way to deal with it. German speaking countries follow universal screening but majority of health services offer selective screening of high-risk group. In England selective screening is in place,¹⁴ whereas in Scotland practice vary in different health boards. National Health Service Quality Improvement Scotland (NHS QIS) published a scoping report in 2006 and concluded that further audit work is necessary.¹⁵

Background

University Hospital Crosshouse is a district general hospital providing pediatric orthopedic service for Ayrshire and Arran population in Scotland. There is hip dysplasia selective screening program in place and pathways for referral are shown in Figure 1.

All newborns have physical examination at birth by a maternity care professional and subsequently by health visitor before 8 weeks. Some referrals are from general practitioner when there is a parental concern. Any hip abnormality picked up by these sources results in referral for an ultrasound scan which is performed by either a radiographer or the consultant radiologist, both trained in performing hip ultrasound scans by Graf static method.¹ A senior orthopedic surgeon, who has special interest in this field supervised hip scan clinic and identified children who need follow up scans and treatment. Departmental protocol used in decision making for treatment of hip dysplasia is as follows: Graf 1 hips are discharged, Graf 2a are observed, Graf 2c are observed if presenting before 4 weeks and clinically stable otherwise treatment in pavlik harness is commenced. Graf 3 and 4 receive harness treatment in first instance and monitored closely by repeat scan. After 6-8 weeks treatment and when hip approaches near Graf type 1, harness is worn for 12 hours for another 4 to 6 weeks.

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Key words: Hip dysplasia screening; selective screening; ultrasound; Scotland.

Contributions: RT, performed data review, literature review, analysis of results with discussion and conclusion. Wrote first draft of manuscript; MRZ, reviewed the manuscript and suggested revision; RS, provided data, supervised the whole study reviewed the manuscript and suggested revision.

Conflict of interest: the authors declare no potential conflict of interest.

Received for publication: 9 June 2016.

Revision received: 4 August 2016.

Accepted for publication: 6 August 2016.

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Orthopedic Reviews 2016;8:6640

doi:10.4081/or.2016.6640

All babies who are treated with harness are seen at 6 months and then yearly until acetabular index is within 2 standard deviation (SD) of the mean for age. Some babies with Graf 2a are also seen in clinic if clinically they have tight abduction to confirm radiographic growth (management plan shown in Table 1)

Materials and Methods

We performed retrospective review of all newborns who were referred for ultrasound scan during one year period. All newborns that had their first hip scan during one year period (January-December 2014) were included in this retrospective study and followed up until June 2015 to include any child who had surgical intervention for dysplastic hip. Data was obtained from both ultrasounds scan clinics (radiographer and radiologist). Data on age, sex, reason for referral, clinical examination findings, first and any subsequent scan/radiograph findings and information about harness treatment and complication is maintained in the department. Risk factors were assessed and descriptive analysis was performed.

Results

In year 2014 there were 3618 live births in Ayrshire and Arran.¹⁶ A total of 856 hip scans (428 babies) were reviewed. 147 hips (119 babies, 109 females and 10 males) were classified as abnormal. As this was review of selective screening, all patients with abnormal scan had one or more risk factors. There was no failure of treatment and none of them required surgical intervention. There was no complication from harness treatment and hip radiograph at 6 to 12 months of age showed acetabular index within 2 SD of mean for age.

The incidence of sonographic hip dysplasia was 32.89/1000, however incidence of dysplasia requiring treatment was 3.31/1000. There was one case of missed diagnosis. This 3-year-old girl was born outside catchment area and moved to Ayrshire at age of three. There was no history of high risk factors in her. Due to her social circumstances there was a delay in diagnosis and when she was reviewed at our clinic, diagnosis of hip dislocation was confirmed. An open reduction and de-rotation osteotomy was performed in first stage and she had satisfactory radiographs at 6 month follow up. Inclusion of this late diagnosis gave us incidence of 0.27/1000 for missed hip dysplasia in Ayrshire and Arran. Tables 2 and 3 presents characteristics of study group and treatment group respectively.

Discussion

In United Kingdom, selective high risk screening for dysplastic hips is in place in England. Public health England published guidance in 2014 and the program recommends selective ultrasound examination for babies with specific risk factors.¹⁴ The baby must receive an ultrasound examination of the hips if there is a family history of hip problems in early life and when the baby has been a breech presentation at or after 36 weeks of pregnancy.

In Scotland, there is wide variability in assessment of newborns after 72 hours and a review by Health Quality Improvement specifically mentioned the need for standardization of practice across Scotland.¹⁵

There is wide variability in reporting Developmental Dysplasia of Hip (DDH) due to difference in criteria used to diagnose and treat hip dysplasia. Late presentation of dysplastic hips vary from 3 weeks to 1 year, we consider Graf 2c or worse dysplastic hips presenting after age of 3 months as delayed presentation. Since introduction of selective screening, we are aware of only one study that looked at incidence of late diagnosis of dysplastic hips in Scotland.¹³ In this retrospective study, late diagnosis was considered when presentation was after 3 months, as nature of dysplastic hips was not defined it is difficult to draw any comparison. Authors noted no statistical difference in incidence (0.8/1000 before and 0.5/1000 after) of late presenting dysplasia before and after introduction of selective screening in Glasgow region. The incidence was calculated from only those cases that were born in the region (78 out of 539 late presentations). In our experience, we have seen 2 late presentations requiring surgical intervention on average in a year over last 4 years except for 2014 when we had only one late presentation. Several studies have shown that majority of missed dislocation patients did not have any risk factors^{17,18} and therefore it is unlikely that this incidence could be reduced by selective screening.

Current understanding is that only breech

presentation and family history in first degree relative should be considered for selective screening.¹⁴ Figures 1 and 2 suggest that sonographic dysplasia is prevalent in high risk groups and selective screening does identify those hips that could have presented late if left untreated initially. It is highly unlikely that late diagnosis can be completely avoided. Evidence from Norway, Austria and Germany suggest that a missed dislocation incidence of less than 0.5/1000 should be considered acceptable.¹⁹

There is no current evidence to support that early diagnosis and treatment with Pavlik harness improves long-term outcome. Majority of Graf 2a hips develops into mature hips (70-80%), type 2c does not always need treatment and can be observed if seen at 3-4 weeks of age.²⁰ We observed that none of Graf 2a required any treatment which differ from finding of Ihme and colleagues, where they reported that 2a (-) (50-54) should be treated in brace. All of the 16 hips (12 babies) treated with harness in our study responded to treatment and had acetabular index within 2SD of mean for their age at the time of 6-9 month follow up. We agree with Atalar and colleagues¹¹ that early treatment affects outcome, in their study median age for first review was 8 weeks in comparison to our study where mean age was 5 weeks, hence difference in outcome.

Wahlen and colleagues²¹ reported on outcome at one year in 40 dysplastic hips treated with a modified abduction brace. They had overall 85% success in treating with a brace but 25% hips were Graf 2a. They had high rate

Table 1. Protocol for treatment of dysplastic hips.

Graf type	Action
1	Discharge
2a	Follow up
2b	Treat in harness
2c	Observe or treat in harness
3	Treat in harness
4	Harness/closed/open reduction

Table 2. Distribution of risk factors and Graf type in studied population. In breech babies, 55 had unilateral 2a (55 Graf 2a hips), 24 were bilateral 2a (48 Graf 2a), 2 were bilateral 2c (4 Graf 2c hips) and 2 babies had 2c in one and 2a in the other hip.

Risk Factors	Total number of babies referred	Abnormal scan (number of babies)	Graf 2a	Graf 2b	Graf 2c	Graf 3
Breech	303	83	105	0	6	0
Family history	33	12	8	1	1	2
HBW females	24	12	12	0	0	0
Twins	5	2	2	0	0	0
CTEV	3	0	0	0	0	0
Clinical concern	60	10	4	2	3	1
Combined numbers	428	119	131	3	10	3

(33%) of persistent dysplasia above SD for age possibly due to delayed treatment (mean age at time of treatment commenced was 3.1 months) in comparison to our result of 100% success as our mean age when treatment was started was 6 weeks. Our results are in line with Peled and colleagues,²² who reported high success rate. Early start of the treatment and small number of cases may explain low failure rate. Our findings are very similar to that published by Clarke from Coventry in 1989,¹⁸ out of 4617, 10% babies had either clinical hip abnormality or had a risk factor but only 17 required treatment (3.7/1000). However rate of late dislocations remained unchanged (0.64/1000)

and highlight the fact that zero percent late dislocation rate may never be achieved. We cannot exactly explain having no Graf IV hips in our cohort but incidence of Graf IV hips have been reported to be less than 0.05%,²³ and out of 3618 live births theoretically there should be 1 to 2 Graf IV hips per year. It is possible that these may account for late presentations.

Conclusions

Due to ethical reasons we will probably never know the outcome of untreated but

observed dysplastic hips in a large cohort of newborns; hence we should continue to offer selective screening with the aim of keeping incidence of late dislocations within acceptable range. Incidence of hip dysplasia requiring treatment and late presentation in our institute are similar to what has been reported in literature. We acknowledge the retrospective nature of our study and due to small number of patients in subgroups; statistical analysis was limited to descriptive nature. We are in process of reviewing data on prospective basis to analyze sufficient numbers of abnormal hips to achieve statistical significance.

Table 3. Graf type, age when scanned first and duration of treatment in 12 babies who were treated with Pavlik harness.

Graf type	Age (in weeks) when scanned first	Age (in weeks) when harness treatment started	Total duration of harness treatment
2b	12	12	12
2b	12	13	14
2b	13	13	12
2c (bilateral)	3	observed	
2c (bilateral)	4	observed	
2c	6	6	10
2c	7	7	12
2c	5	5	10
2c	5	5	11
2c (with other hip 2a)	6	6	16
2c (with other hip 2a)	7	7	14
3	4	5	15
3	3	4	16
3	6	6	16

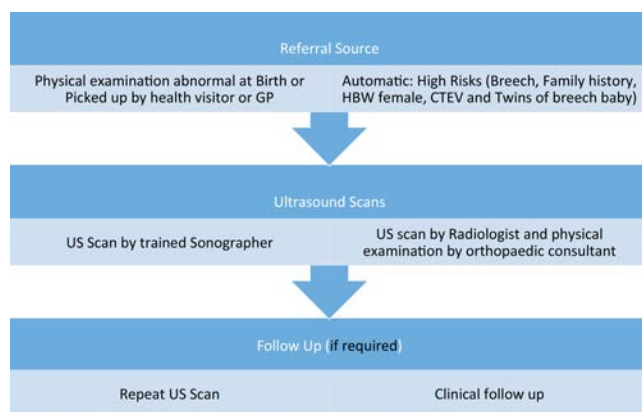


Figure 1. Referral pathway for selective screening of suspected hip dysplasia.

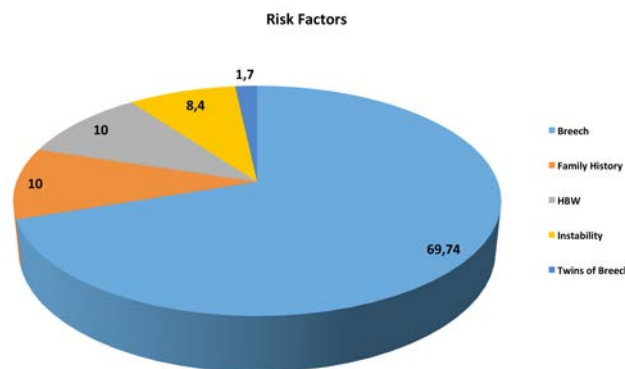


Figure 2. Risk factors in babies with abnormal hip scan.

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