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Ultrasound screening for developmental dysplasia of the hip and its socioeconomic impact: Experience of tertiary care health level

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KEYWORDS

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Screening;
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Abstract *Objective:* The purpose of this study was to investigate the usefulness of screening ultrasound to detect developmental dysplasia of the hip in infants with risk factors and to assess its socioeconomic impact.

Patients and methods: This is a retrospective study. In the duration of 30 months, all infants born at Hospitals in our region were examined clinically for hip dislocation. All those with clinically dislocated hips were excluded and referred for follow up to a pediatric orthopedic surgeon. After referral to our tertiary care center, a 6 week hip ultrasound scan was performed for those infants with stable hips on examination, having risk factors for dysplastic hips including positive family history, breech presentation and inconclusive clinical findings.

We used an ultrasound technique that combines the two known methods (Graf's technique and Harcke's method).

Results: 3540 Hip ultrasound scans were performed, of those scanned 12 (0.33%) were found to have dislocated hips and 98 (2.8%) to have different grades of dysplastic hips. Among these twelve patients; six of them had a first degree relative with congenital dislocation of hips, three had breech presentation at birth and three had inconclusive clinical findings. Those with dysplastic hips were followed up by serial ultrasound examinations but did not require active intervention.

Conclusion: Screening ultrasound is a useful tool for detection of hip dislocation and dysplasia especially among the population of infants at increased risk of developmental dysplasia of the

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hip. Limitation of screening ultrasound programs for those at risk only reduces the financial burden with better outcome in choosing candidates for further workup especially surgical intervention.

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1. Introduction and aim of the work

Developmental dysplasia of the hip (DDH) comprises a spectrum of abnormalities, ranging from laxity of the joint and mild subluxation to fixed dislocation. Early diagnosis of DDH usually preserves normal hip development by adolescence with its socio-economic impacts.¹ Late diagnosis of DDH in children may lead to increased surgical intervention and premature debilitating end-stage adolescent degenerative hip joint disease.⁹

Ultrasonography (US) is the preferred modality for evaluating the hip in infants younger than 6 months. It combines

the privileges of direct imaging of the cartilaginous portions of the hip that cannot be seen on plain radiographs and enables dynamic evaluation of the hip with stress maneuvering.²

US examination is generally an operator-dependent technique, and its musculoskeletal examinations, specially require long-training curves and experience for confident diagnosis.³

Pediatric hip ultrasonography has proven ability to recognize abnormal hip position, instability, and dysplasia not evident on clinical examination.¹⁰ Yet, improper sonographic screening of the neonatal hip can lead to either over diagnosis with subsequent unnecessary intervention⁷ or recommended re-screening at a second-examination with increased hip screening program costs.

1.1. Aim of the work

We thought to present our experience with pediatric US evaluation to detect developmental dysplasia of the hip in infants with risk factors.

2. Patients and methods

This is a retrospective study. In the duration of 30 months, all infants born at Hospitals in our region were examined clinically for hip dislocation. All those with clinically dislocated hips were excluded and referred for follow up to a pediatric orthopedic surgeon.

Our group included 3540 live births with risk factors for dysplastic hips including:

- a. Infants with persistent positive click on Ortolani and Barlow maneuvers, 6 weeks post-natally.
- b. High-risk infants for DDH including those with positive family history and breech presentation; still clinically unremarkable.

All pediatric hip US examinations are scheduled at 6 weeks postnatal in our tertiary care centers to overcome the false-positive cases resulting from the wide spectrum of post-natal normal hip development.¹¹

Our protocol for pediatric US hip adheres to the American College of Radiology (ACR) guidelines that combine the static method of Graf¹² and the dynamic method of Harcke.¹³ These examinations are conducted with a superficial linear 7.5 MHz transducer.

An acceptable reproducible static projection for making diagnosis has to fulfill the following criteria:

- a. The middle portion of the acetabular roof is identified in line with the transducer central line; as much as possible.
- b. The iliac contour above the bony rim is straight and parallel to the transducer surface.

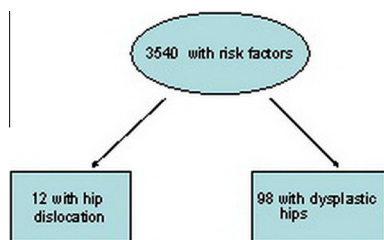


Figure 1 Total number of scanned infants with ultrasound at study period (with risk factors): and number with hip dislocation and dysplasia.

Table 1 Hip dislocation results of 6th week ultrasound of risk factors in infants with normal clinical examination M (male) F (female).

Risk factor	Hip dislocation
Positive family history	6 (2M-4F)
Breech presentation	3 (1M-2F)
Inconclusive clinical findings	3 (0M-3F)
Total	12 (3M-9F)

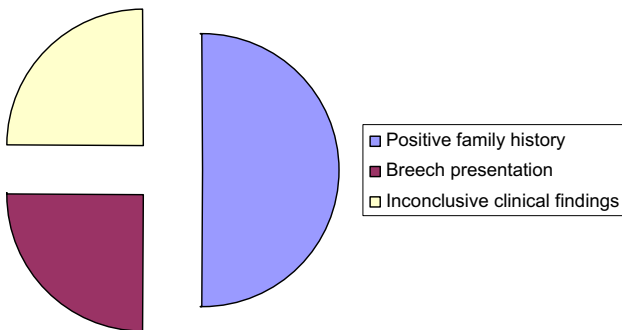


Chart 1 Incidence of hip dislocation at 6th week ultrasound of risk factors in infants with normal clinical examination.

c. The acetabular labrum can usually be seen as a triangular relatively echogenic structure projecting from the superior portion of acetabular roof and continuous with the hypo-echoic joint capsule.

So alpha angle, which reflects the osseous acetabular roof angle, and a beta angle, which defines the position of the echogenic fibro-cartilaginous acetabular labrum could be appropriately measured.

Beta angle is defined as: Angle formed between the vertical cortex of the ilium and the triangular echogenic labral fibrocartilage.

After that, the modified Barlow maneuver is performed by holding the knee with the hip flexed 90° and in adduction. The femur is pushed (pistoned) posteriorly.

Based on the results of the sonographic procedures, we will consider the examined hip as:

Normal: if femoral head is located within the acetabulum, shows alpha angle greater than 60° with no subluxation on Barlow maneuver.

Immature/dysplastic: like the normal hip but the bony acetabulum promontory is rounded and the alpha angle is 50–59°. It could be seen in infants less than 3 months of age. Follow-up 6 weeks later (at the age of 3 months) is recommended in coordination with pediatric orthopedicians

Abnormal: has a similar feature like the immature hip in infants more than 3 months with variable degrees of subluxation on neutral position and/or Barlow maneuver. The Alpha angle in this group is < 50°. These groups are referred back to pediatric orthopedicians.

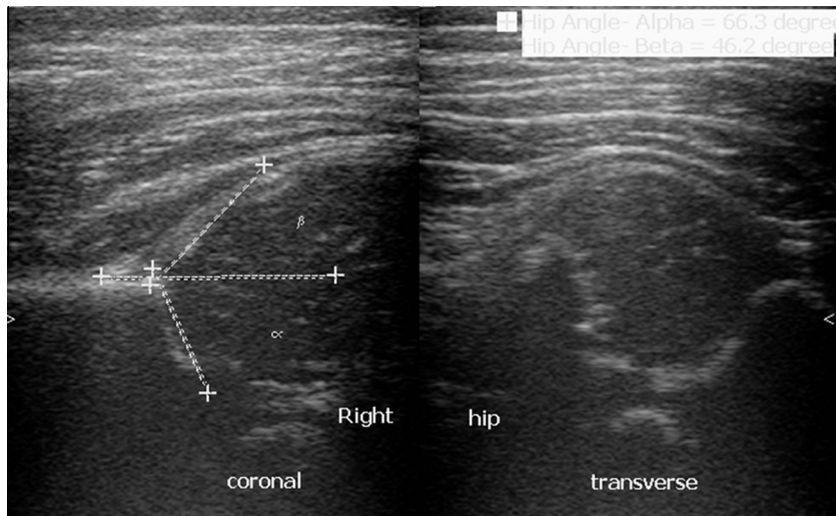


Figure 2 Normal hip US scan of 6W post-natal infant: coronal (right) and axial (left) scans showing measured α - and β - angles.

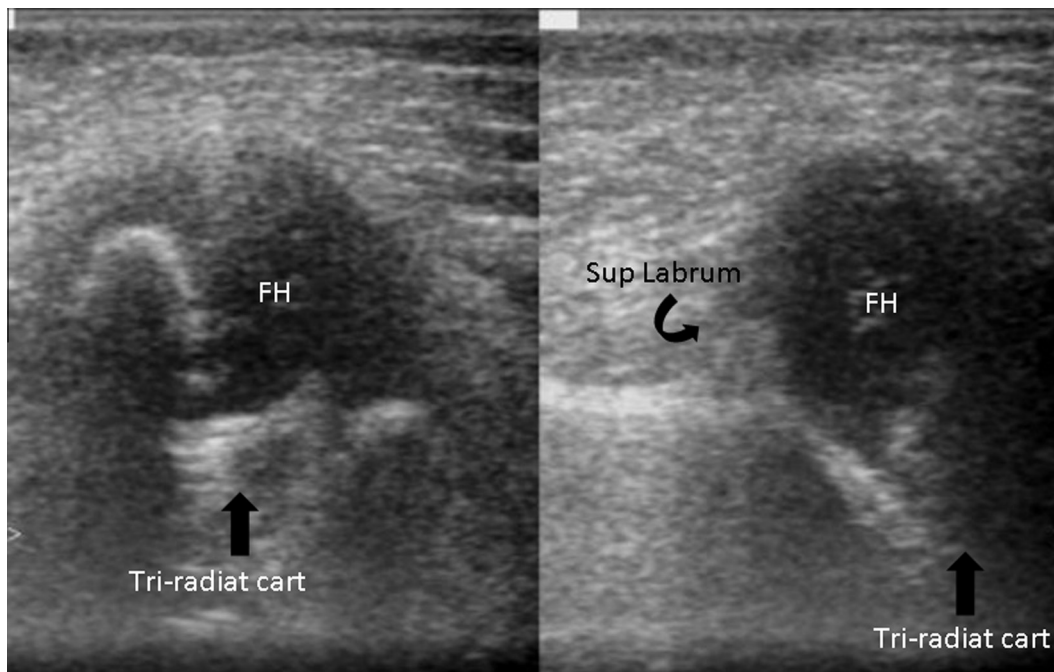


Figure 3 6W postnatal-scan Axial (right) and coronal (left) US scans of a dislocated hip shows the femoral head (FH) located outside the acetabulum along with everted bulky superior hip acetabulum.

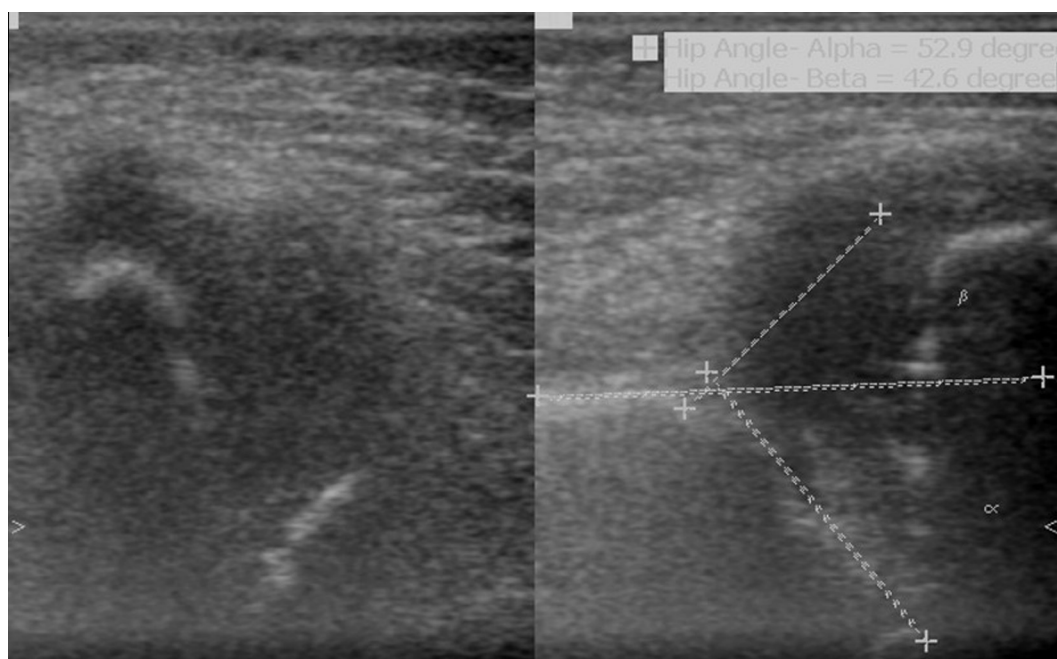


Figure 4 6W postnatal-scan Axial (right) and coronal (left) US scans of same infant with dislocated hip showing measured α - and β -angles.

3. Results

3540 Hip ultrasound scans were performed (2180 females, 1360 males), of those scanned 12 (0.33%) were found to have dislocated hips (nine females, three males) and 98 (2.8%) to have different grades of immaturity or dysplastic hips (67 females, 31 males) (Fig. 1).

Among these twelve patients (having dislocated hips); six of them had a first degree relative with congenital dislocation of hips (four females, two males), three had breech presentation at birth (two females, one male) and three had inconclusive clinical findings (with persistent positive click on Ortolani and Barlow maneuvers, 6 weeks post-natally) and they were all females (Table 1) (Chart 1) (Figs. 2–4).

Among these (98) patients (having dysplastic hips); 36 of them had a first degree relative with congenital dislocation of hips (24 females, 12 males), 28 had breech presentation at birth (20 females, eight males) and 34 had inconclusive clinical findings (23 females, 11 males) (with persistent positive click on Ortolani and Barlow maneuvers, 6 weeks post-natally) (Table 2) (Chart 2).

Those with dysplastic immature hips were followed up by serial ultrasound examinations 6 weeks later (at the age of 3 months), none of this group showed any abnormality and they were considered as normal.

4. Discussion

Consideration for screening with ultrasound is balanced between the benefits of early detection of DDH and the increased treatment as well as cost factors. In addition, randomized trials evaluating primary ultrasound screening did not find a significant decrease in late diagnosis of DDH. In the United States, hip ultrasound is selectively performed in infants with risk fac-

Table 2 Hip dysplasia results of 6th week ultrasound of risk factors in infants with normal clinical examination M (male) F (female).

Risk factor	Hip dysplasia
Positive family history	36 (12M-24F)
Breech presentation	28 (8M-20F)
Inconclusive clinical findings	34 (11M-23F)
Total	98 (31M-67F)

tors, such as family history of DDH, breech presentation, and inconclusive findings on physical examination.¹

Dr. von Kries and colleagues wrote “Our data provide evidence for effectiveness of a general ultrasound screening program to prevent operative procedures in developmental dysplasia of the hip in real life, although the size of the potentially achievable effect of ultrasound screening might be underestimated”.⁴

Early diagnosis of developmental dysplasia of the hip is very important for proper treatment. Use of ultrasound has reduced the number of late-presenting cases, shortened treatment time, and decreased the number of surgical procedures of the hip joint.⁵

Tomà et al., stated that “We support the routine generalized US screening of neonatal hips. The excess of doubtful cases and, consequently, of the extra referrals may be limited, and the overtreatment decreased to the lowest rates reported by optimization of everyone’s approach”.⁶

Dogrueel et al., stated that “our findings suggest that clinical examination does not reliably detect ultrasonographically defined developmental dysplasia of the hip in infants being screened for this disease”.⁸

Our study is limited by the fact that some cases of DDH may have normal neonatal hip screening examination and

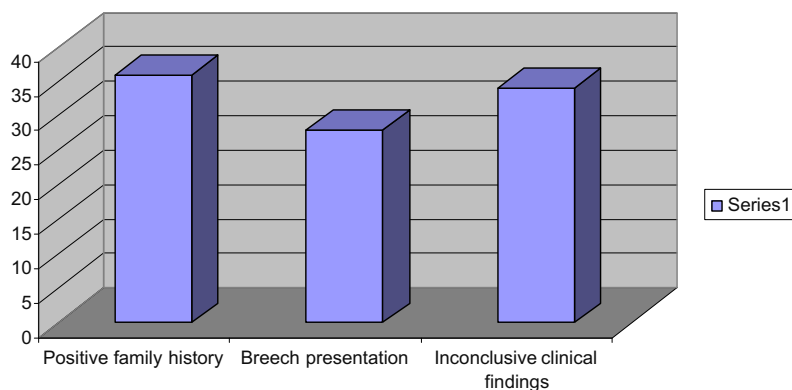


Chart 2 Incidence of hip dysplasia at 6th week ultrasound of risk factors in infants with normal clinical examination.

subsequently develop a dysplastic or dislocated hip. Also, pediatric hip US examination is a time consuming procedure, and must be performed by skilled radiologists, that might be unavailable for many care units. The prevalence of the problem in a certain population determines the need to conduct a screening program with its economic perspectives.

Pediatric hip ultrasound is a useful tool for judging hip development and picking those infants at increased risk of DDH warranting further management. It avoids late-adolescent disabilities with its socio-economic perspectives.

Conflict of interest

None declared.

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References

- Lowry CA, Donoghue VB, Murphy JF. Auditing hip ultrasound screening of infants at increased risk of developmental dysplasia of the hip. *Arch Dis Child* 2005;**90**:579–81.
- American College of Radiology: ACR Practice Guideline for the Performance of the Ultrasound Examination for Detection and Assessment of Developmental Dysplasia of the Hip. http://www.acr.org/SecondaryMainMenuCategories/quality_safety/guidelines/us/us_hip_dysplasia.aspx. Accessed May 24, 2013.
- Dezateux C, Rosendahl K. Developmental dysplasia of the hip. *Lancet* 2007;**369**(9572):1541–52.
- von Kries Reudiger et al. General Ultrasound Screening Reduces the Rate of First Operative Procedures for Developmental Dysplasia of the Hip: A Case-Control Study. *J Pediatr* 2012;**160**(2):271–5.
- Synder M, Harcke HT, Domzalski M. Role of ultrasound in the diagnosis and management of developmental dysplasia of the hip: an international perspective. *Orthop Clin North Am* 2006;**37**(2):141–7.
- Tomà P, Valle M, Rossi U, Brunenghi GM. Paediatric hip–ultrasound screening for developmental dysplasia of the hip: a review. *Eur J Ultrasound* 2001;**14**(1):45–55.
- Peled Eli, Eidelman Mark, Katzman Alexander, Bialik Viktor. Neonatal incidence of hip dysplasia, ten years of experience. *Clin Orthop Relat Res* 2008;**466**(4):771–5.
- Dogruel H, Atalar H, Yavuz OY, Sayli U. Clinical examination versus ultrasonography in detecting developmental dysplasia of the hip. *Int Orthop* 2008;**32**(3):415–9.
- Karmazyn BK, Gunderman RB, Coley BD, Blatt ER, Bulas D, Fordham L, et al. ACR appropriateness criteria on developmental dysplasia of the hip-child. *J Am Coll Radiol* 2009;**6**(8):551–7.
- Gharedaghi M, Mohammadzadeh A, Zandi B. Comparison of clinical and sonographic prevalence of developmental dysplasia of the hip. *Acta Med Iranica* 2011;**49**(1):25–7.
- Rosendahl K. Ultrasound in the diagnosis of congenital dislocation of the hip: an update. Congress of European society of paediatric radiology, Bergen, Norway, 17–21 June 2002.
- Graf R. The diagnosis of congenital hip-joint dislocation by the ultrasonic combound treatment. *Arch Orthop Trauma Surg* 1980;**97**(2):117–33.
- Harcke HT, Grissom LE. Infant hip sonography: current concepts. *Semin Ultrasound CT MR* 1994;**15**(4):256–63.