

An Epidemiological Study of Developmental Dysplasia of the Hip in Infants in Singapore

K C Ang,**MBBS, FRCS (Edin)*, E H Lee,***MD, FRCS*, P Y C Lee,****FRCS (Edin), MCh (Orth)*, K L Tan,*****FRCPE, FRACP, DCH (Lond)*

Abstract

The incidence of congenital dislocation of the hip (CDH) in Singapore and Malaysia has been reported as being lower than in the West. In our hospital, we have seen an increasing number of congenital hip dislocations as well as dysplastic hips. We undertook a prospective study from December 1989 to December 1994 of 20 000 live births. The neonates were all screened by a consultant neonatologist and the findings were confirmed by a consultant paediatric orthopaedic surgeon. All babies had plain X-rays at 3 months and an acetabular index (AI) of 30° or more was considered dysplastic. All babies with positive signs were followed up for 1 year and again had radiographs taken at 1 year.

Comparison of plain X-rays and ultrasound assessment in a subgroup of 130 neonates showed that 44% of patients with AI >20° had hip dysplasia by ultrasonographic criteria (a angle <60°)

The incidence of dysplastic hips was 16.8 per 1000 live births. The overall incidence of neonates with dislocated hips was 4.7 per 1000 live births. The Malays were most affected with an incidence of 5.4 per 1000 live births.

The incidence of developmental dysplasia of the hip in Singapore is higher than previously reported, with the Malays having the highest incidence. A significant number of babies with clicking hips have radiological evidence of acetabular dysplasia (AI >30°). One-third of the babies' hips were still dysplastic at 1 year of age. A well-organised screening programme with experienced examiners has proved to be useful in making early and accurate clinical diagnosis.

Ann Acad Med Singapore 1997; 26:456-8

Key words: Congenital hip dislocation, Incidence, Screening programme, Ultrasound

Introduction

Developmental dysplasia of the hip (DDH) is a term that more accurately describes the spectrum of hip problems seen in infants and children.¹ A dysplastic or dislocated hip is not always present at birth and can develop later, thus accounting for a normal neonatal hip screening examination.

Many studies have been done to assess the efficacy of neonatal hip screening programmes with controversial differences of opinion. Tredwell and Bell² felt that a standardised screening programme would significantly alter the natural history of congenital hip dislocations but not acetabular dysplasia. The value of a well-designed protocol was also considered important for effective clinical screening. Poul et al,³ Krikler and Dwyer³ and Menelaus⁴ all felt that the experience of the examin-

ers was vital to improve the effectiveness of any screening programme. The judicious use of radiography is also important as an adjunct to physical examination for infants over the age of 3 months.^{4,5} It was the aim of this study to look at the epidemiology of DDH in our hospital. All babies were screened by both a consultant neonatologist and those with positive findings were referred to a consultant paediatric orthopaedic surgeon. In keeping with the guidelines mentioned above, we had an organised protocol following up all referred babies at regular intervals for at least 1 year with plain X-rays at 3 months and 1 year of age.

Materials and Methods

All newborn infants born between December 1989 and December 1994 at the National University Hospital,

* Resident

Department of Orthopaedic Surgery

**** Chief

Department of Neonatology

National University Hospital

** Head

Division of Paediatric Orthopaedics

*** Senior Lecturer

Department of Orthopaedic Surgery

National University of Singapore

Address for Reprints: Dr Ang Kian Chuan, Department of Orthopaedic Surgery, National University Hospital, 5 Lower Kent Ridge Road, Singapore 119074.

Singapore, were screened first by a consultant neonatologist and then referred to the paediatric orthopaedic surgeons if found to have "clicking", dislocatable or dislocated hips. Barlow's and Ortolani's methods of examination were used to screen the babies.

Babies referred to the paediatric orthopaedic surgeon with "clicking" hips were followed up at 6 weeks, 3 months and 1 year. All infants had plain X-rays of the pelvis at 3 months and 1 year. An acetabular index (AI) of $>30^\circ$ was considered as evidence of hip dysplasia. Babies with hip dysplasia were additionally examined at 6 months and 9 months of age both clinically and radiologically, and followed up until full resolution of the problem.

Patients with no further clicking and an AI of $<25^\circ$ at the end of 1 year were discharged. Patients considered dysplastic are still being followed up as part of an ongoing study.

An attempt was made to correlate X-ray findings with ultrasonography so that all unstable hips were treated from birth with abduction splints and followed up more frequently. Operative treatment was offered only after failed conservative treatment.

Results

According to our criteria (AI $>30^\circ$), out of a total of 20 295 live births between December 1989 to December 1994, 1396 babies had clicking hips, 96 babies had dislocatable or dislocated hips and 341 babies had acetabular dysplasia.

Malays had the highest incidence of dislocated hips according to racial distribution (Table I). Male infants, those born after more than 37 weeks of gestation, first born and babies born via breech delivery had a high incidence of dislocated hips (Table II).

There was a strong correlation between static ultrasonographic measurements of α angles and plain radiograph measurements of acetabular index (Table III) of neonates with AI $>20^\circ$, up to 64% had a angle $<60^\circ$ suggestive of dysplasia hip.

Discussion

The incidence of DDH in Singapore and Malaysia has previously been thought to be low. Boo and Rajaram⁶ reported an incidence of 0.7 per 1000 live births in Malaysia. We have, however, noticed an increasing number of babies with DDH in our hospital.

Like Boo and Rajaram, we found that our affected babies were more likely to be female, first born, born after more than 37 weeks of gestation and presenting with a breech position.⁶ Bilateral dislocation of the hips was more common than unilateral dislocation in both our studies, perhaps reflecting our similar population demographics.⁶

TABLE I: DISTRIBUTION OF NEONATES WITH DISLOCATED HIPs ACCORDING TO RACE

	No. of live births	No. of patients	Incidence per 1000 live births
Malay	7439	40	5.4
Chinese	9519	42	4.4
Indian	2810	13	4.6
Others	527	1	0.5
Total	20 295	96	4.7

TABLE II: BASIC DATA OF NEONATES WITH DISLOCATED HIPs

	No. of neonates	Incidence %
Sex		
Male	35	36.5
Female	61	63.5
Gestation		
<37 weeks	18	18.7
37 weeks and above	78	81.3
Birth order		
1st born	42	43.8
Presentation		
No. of breech deliveries	21	21.8

TABLE III: COMPARISON OF ULTRASOUND MEASUREMENTS OF α ANGLE WITH PLAIN RADIOGRAPH MEASUREMENTS OF ACETABULAR INDEX IN 130 NEONATES

	a angle on ultrasound a angle $>60^\circ$	α angle $<60^\circ$	No. of patients (n = 130)
AI $<20^\circ$	62.5% (15)	37.5% (9)	24
AI $>20^\circ$	36% (38)	64% (68)	106

With Fisher's exact test, the two-sided *P* value is 0.0215 and considered significant.

There is a significant association between rows and columns.

Odds ratios = 2.982

95% confidence interval: 1.192 to 7.462 (using the approximation of Woolf)

AI: acetabular index

The high pickup rate of our study compared to previous studies is probably due to the experience of our personnel in picking up the abnormal hips. A number of series have shown that there is more accurate clinical diagnosis and a reduced rate of late diagnosis when the screening is run by experienced, senior personnel compared to junior personnel.^{1,3,4,7} Boo and Rajaram commented that they had possibly underestimated the incidence of DDH in their study due to the inexperience of their personnel.⁶ Care must be taken however, not to be too aggressive in examining the newborn hip as the hip can actually be dislocated or damaged by an overzealous examiner.

Jones⁸ felt that the presence of a clicking hip was a significant factor in the diagnosis of dysplastic hips.

Opinion is divided on the importance of the clicking hip and Jones suggested that the experience of the primary screener was important in assessing the significance of the click.⁸ Although clicks can arise from soft tissue in and around the hip, or may be transmitted from the knee, persistent clicks can indicate potentially unstable or dysplastic hip. In our study, as many as 25% of the babies referred with clicks had radiological evidence of dysplasia (AI >30°). This shows that hip clicks can be significant and require serial X-rays for follow up.⁹ Our recent clinical experience with the use of ultrasound in the assessment and follow-up of developmental dysplasia of the hip showed that many infant hips with acetabular indices of between 20° and 30° were dysplastic. Therefore as of January 1995, babies with AI >25° have all been asked to return for follow-up until resolution of their dysplasia.

Of the 96 patients with dislocatable or dislocated hips, only 6 needed operative treatment, 4 were treated with adductor tenotomy and closed reduction while 2 required open reduction, capsulorrhaphy and innominate osteotomy.

Our study shows that DDH is a common condition in this region. An organised screening programme run by

experienced personnel is important for accurate diagnosis and early treatment of this condition.

REFERENCES

1. Poul J, Bajerova J, Sommernitz M, Straka M, Pokorny M, Wong F Y H. Early diagnosis of congenital dislocation of the hip. *J Bone Joint Surg (Br)* 1992; 74B:695-700.
2. Tredwell S J, Bell H M. Efficacy of neonatal hip examination. *J Pediatr Orthop* 1981; 1:61-5.
3. Krikler S J, Dwyer N P. Comparison of results of two approaches to hip screening in infants. *J Bone Joint Surg (Br)* 1992; 74B:701-3.
4. Menelaus M B. The early diagnosis and treatment of congenital dislocation of the hip. *Aust N Z J Obstet Gynaecol* 1990; 30:114-9.
5. Garvey M, Donoghue O, Gorman W A, O'Brien N, Murphy J F A. Radiographic screening at four months of infants at risk for congenital hip dislocation. *J Bone Joint Surg (Br)* 1992; 74B:704-7.
6. Boo N Y, Rajaram T. Congenital dislocation of hips in Malaysian neonates. *Singapore Med J* 1984; 30:368-71.
7. Mac Nicol M F. Results of a 25-year screening programme for neonatal hip instability. *J Bone Joint Surg (Br)* 1990; 72B:57-60.
8. Jones D A. Importance of the clicking hip in screening for congenital dislocation of the hip. *Lancet* 1989; 1:599-601.
9. Broughton N S, Boruham D I, Cole W G, Menelaus H B. Reliability of radiological measurements in the assessment of the child's hip. *J Bone Joint Surg (Br)* 1989; 71B:6-8.