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Observational Study to Find Association Between Congenital Talipes Equinovarus and Developmental Dysplasia of the Hip and Role of Ultrasound Screening

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ABSTRACT

Introduction: *The association between idiopathic congenital talipes equinovarus (CTEV) and developmental dysplasia of the hip is uncertain.*

Method: *We present an observational cohort study spanning 6 years of selective ultrasound screening of hips in clubfoot.*

Result: *From 119 babies with CTEV there were nine cases of hip dysplasia, in seven individuals. This suggests that 1 in 17 babies with CTEV will have underlying hip dysplasia.*

Conclusion: *This study supports selective ultrasound screening of hips in infants with CTEV.*

KEYWORDS : Idiopathic Congenital Talipes Equinovarus (CTEV), Developmental Dysplasia Of The Hip, Ultrasonography

INTRODUCTION

Clubfoot or congenital talipes equinovarus (CTEV) and developmental dysplasia of the hip (DDH) are commonly encountered by the paediatric orthopaedic specialist. The underlying etiology of both is unknown but an association between the two has been suggested.[1,2]

Whereas the diagnosis of CTEV is clinical, it is more difficult to diagnose DDH clinically because affected individuals can appear normal when examined in infancy and routine neonatal clinical screening tests lack sensitivity.[3-5] Selective screening has been directed towards children 'at risk' of DDH, including those with a positive family history, following breech delivery or with torticollis, oligohydramnious and deformities of the foot.[6]

The presumed association between CTEV and DDH has been beneficial in providing a target population for screening of the hip, given that the former is apparent at birth. Recently, however, there has been debate concerning the relationship between CTEV and DDH, and the efficacy of screening hips in these patients has been questioned.[7,8]

We present an observational cohort study spanning 6 years of routine screening of the hips of neonates with CTEV.

MATERIAL AND METHOD:

Since JULY 2010, all cases of neonatal CTEV in our hospital underwent routine clinical and ultrasound screening of the hip at the age of six weeks as part of a defined protocol.

The diagnosis of CTEV was based on the classical appearance of a fixed deformity incor-porating equinus at the ankle, varus at the heel, supination at the midfoot and adductus at the forefoot. Each diagnosis was made by a single observer and graded using the Pirani classification.[9,10]

Children with CTEV have their hips examined clinically at the initial visit and ultrasound screening at six weeks. All ultrasound assessments were performed by an experienced radiographer. The degree of dysplasia was classified according to Graf.[11] Hips with Graf angles > 60° were classified as normal (type 1), from 43° to 60° as type II (A if under three months of age, B if aged over three months),

43° and stable as type III and a dislocated hip as type IV. Type II hips were deemed physiological before three months of age (type IIA) but pathological if the abnormality persisted above this age (type IIB). Therefore all type II hips underwent repeat ultrasound screening at three months and, if abnormal, treatment was instigated. All infants with neurological or muscular abnormalities and those with syndromic conditions were excluded.

STASTICAL ANALYSIS:

The results were analysed using the chi-squared goodness-of-fit test, and confidence intervals for the rate were established using the Poisson rate distribution. A p-value of 0.05 was considered significant.

RESULTS

Between JULY 2010 and JUNE 2016, 119 cases of idiopathic CTEV were screened for hip dysplasia.

Table I. Year of presentation

Year	Cases
2010	10
2011	23
2012	18
2013	18
2014	21
2015	18
2016	11

Table II. Degree of hip dysplasia, classified by hip and by most severely affected hip for each individual using the Graf classification system[11]

Degree of dysplasia	Right hip	Left hip	Number of babies classified by most severely affected hip
I	97	91	86
IIA	18	23	26
IIB	1	2	3
III	2	3	3
IV	1	0	1
Total	119	119	119

Table III. Degree of hip dysplasia of the worst affected hip classified by the side of congenital talipes equinovarus (CTEV)

		Classification of worst hip for individual		
Side of CTEV affected foot	IIA	IIB	III	IV
Right	7	0	0	0
Left	1	2	0	0
Bilateral	18	1	3	1
Total	26	3	3	1

Table IV. Degree of hip dysplasia of the worst affected hip stratified against Pirani score for group

Graf classification of worst hip	Mean Pirani score for group	95% confidence Interval
I	5.04	4.71 to 5.36
IIA	5.00	4.60 to 5.40
IIB, III and IV	5.00	3.97 to 6.03

There were 81 boys and 38 girls. There were 62 bilateral cases, 25 left sided and 32 right sided. The mean Pirani score was 5.02 (3 to 6).

The annual presentations of infant CTEV are shown in Table I. Assuming that the background risk of CTEV was unchanged throughout the period of study, it is assumed that the incidence of CTEV has a uniform distribution. A chi-squared goodness-of-fit test supports this relationship ($p = 0.69$). The distribution of physiological (IIA) hips was unrelated to which foot was involved with CTEV ($p = 0.48$).

The degree of hip dysplasia according to the numbers of hips affected, the side with CTEV and the Pirani score are shown in Tables II, III and IV respectively.

A total of nine hips were of type IIB or worse in seven babies, three boys and four girls. All hips of Graf III or less were treated successfully in a Pavlik harness without complications. The baby with a Graf IV hip moved out of our region at an early stage and followup was not possible.

The seven affected cases from the study group of 119 suggests that the frequency of DDH requiring treatment in babies with CTEV is 5.9% (95% confidence interval 2.4 to 12.1).

The distribution of physiologically immature (IIA) hips was unrelated to which foot was involved with CTEV ($p = 0.08$).

More abnormal hips were seen with bilateral CTEV but given the small numbers, any such trends failed to reach statistical significance ($p = 0.28$).

DISCUSSION:

This study supports an association between CTEV and DDH with one in 17 neonates (5.9%) with CTEV having DDH requiring treatment. By using a similar selective ultrasound screening programme in a neighbouring city, a senior author (JS) demonstrated that the incidence of true DDH (those requiring treatment) was 1.3/1000 live births.[12] This figure suggests that our CTEV group had a 45 times greater chance of requiring treatment for DDH than the general population. Even when Graf IIB hips are excluded, owing to controversy as to whether such hips represent 'true DDH', the proportion of DDH in this cohort remained 25 times greater than that of the general population.

A recent study has suggested the discontinuation of screening for DDH in CTEV because the association was uncertain.[8] There were 60 cases of CTEV collected prospectively who underwent ultrasound screening for DDH. No cases of hip dysplasia requiring treatment were identified. Whereas this study appeared to be well designed, it would seem inappropriate to discontinue screening based on such a relatively small cohort of cases of CTEV. A similar study of 349 patients with CTEV found no association,[7] but radiographs were taken on only 127 patients and the remainder were assessed by clinical examination alone. The authors may therefore have missed some forms of dysplasia.

As in other studies seeking to clarify an association between DDH and CTEV we excluded individuals with a known syndrome or neuromuscular abnormality.[7,8] We acknowledge the possibility that the individuals with CTEV and DDH may have an underlying as yet undiagnosed syndrome. Whereas this could mean our results are erroneous in associating CTEV and DDH in individuals without neuromuscular syndromes, it does not detract from the value of screening to identify such individuals and address their hip pathology at an early stage.

CONCLUSIONS

Patients with CTEV appear to be a defined population at an increased risk of DDH. It is widely accepted that DDH identified at an early stage in infancy requires less invasive treatment than when presenting later.[12] Ultrasound screening is a fast, reliable, readily accessible test which is acceptable to patients and their families. Such targeted screening consequently appears to satisfy the requirements of an ideal screening programme as defined by the World Health Organisation.[13]

From our results, it appears that CTEV remains an important group for selective ultrasound hip screening.

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