FAILURES OF SCREENING AND MANAGEMENT OF CONGENITAL DISLOCATION OF THE HIP

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We report the screening of 67 093 infants for congenital dislocation of the hip from 1980 to 1989 and compare the results with those during the preceding two decades.

More dislocations have been missed at neonatal examination during the last decade (0.13% of live births). Operative treatment was needed in 54 children (0.08% of live births) some of whom had been diagnosed at birth. We discuss the reasons for the failure of neonatal screening.

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Congenital dislocation of the hip (CDH) is still potentially crippling although Roser (1879), Le Damany (1912) and Putti (1927) showed that neonatal diagnosis and simple splinting were successful as treatment. Ortolani described his test in 1937 and Barlow (1962) modified it for the dislocatable hip by applying posterolateral pressure. It was thought that by screening every child at birth, using a combination of these two tests, and splinting every affected child, the late results of congenital dislocation would be eliminated.

A regional service was started in Aberdeen in 1960, whereby every child born in the Grampian region of Scotland was screened at birth. Those thought to have evidence of CDH were referred to a special clinic for re-examination and splinting if necessary. The result of this programme has, however, fallen short of the original expectations. Thirty years later, some children still present for treatment long after the neonatal period, despite having been screened in a specialist clinic. Their prognosis may be worse than that before screening began, because the diagnosis is not suspected by doctors and

health workers who believe that neonatal screening is fully effective.

PATIENTS AND METHODS

The Grampian Health Board covers 3000 square miles of north-east Scotland, including the Orkney and Shetland Islands, and has a population of about 500 000. Virtually all deliveries take place in hospital; all infants are examined within 24 hours of birth and again before their discharge from the maternity unit. Any child with abnormal signs is referred to a special hip dislocation clinic at the age of about one month. By that time, most of the hips are clinically normal and require no treatment, but infants whose hips are still abnormal are splinted in the Craig splint. Since 1960, this clinic has been run by a surgeon with a special interest in CDH.

All the referred hips are followed up until a radiograph can confirm that both capital femoral epiphyses are located in the acetabula. All the children who have received any form of treatment are followed up for at least a year, or until they are deemed to be normal. All cases with a late diagnosis of CDH are also referred to this clinic. The methods of management and the results from 1960 to 1979 have been reported previously (MacKenzie 1972; MacKenzie and Wilson 1981), and our current study was undertaken along similar lines to assess any changes.

The value of any screening programme must be judged by its failures. The aim is to diagnose and splint infants 'at risk' to avoid the need for surgery at a later date. Complete success should eliminate surgery for CDH for children born in the Grampian region.

The number of children operated on for CDH fell after screening was introduced, but it has risen in every subsequent decade and is now greater than before screening began (Table I). The implications are that screening is not totally effective, and that the incidence of CDH has risen.

RESULTS

From 1980 to 1989 inclusive, there were 67 093 live births in the area served by the special CDH clinic. Of these, 3354 infants (5%) were found to have abnormal hips

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Table I. *Percentage of live births in the Grampian region of Scotland who had an operation for CDH*

Decade		Operation
1950 to 1959	Not screened	0.15
1960 to 1969	Screened	0.11
1970 to 1979	Screened	0.18
1980 to 1989	Screened	0.21

within 24 hours of birth and were referred for re-examination. This proportion was similar to that in the previous decade. About 20% of these children were splinted; it is impossible to determine how many of these would have developed full dislocation had they not been splinted.

In this same decade 163 children (0.24% of live births) were diagnosed as having CDH after the neonatal period and required operations. Ten had been born outside the screened area, and 13 children had been born before the decade under consideration. Since these children were not included in the report for 1970 to 1979, all 23 have been excluded from the current numbers when they are used for comparison with the previous decades. These 163 children showed similar characteristics to the late-diagnosed cases in the previous decade (Table II).

The female-to-male ratio was much the same and the left hip was still affected three times more than the right. The incidence of breech delivery in CDH children was significantly greater than the Grampian average ($p < 0.001$) but not significantly greater than that of the previous decade. The differences between the caesarean section rate in the CDH children and the expected rate or that of the previous decade were not statistically significant.

In their 1981 report, MacKenzie and Wilson considered the 'late' cases of CDH in three groups. The first group were those that had not been found at neonatal screening and were not therefore referred to the CDH clinic; they were classified as failures of neonatal screening. The second group were those that had been referred to the CDH clinic but had not been treated; they were classified as failures of diagnosis. The third group had had early treatment and were classified as failures of management. Table III shows the number of children in each group, in comparison with the numbers for the previous decade.

Failures of neonatal screening. Of the 163 late diagnosed children needing operation 109 were failures of neonatal screening but as discussed above, ten had been born outside the Grampian region. The mean age at presentation was 11 months, as compared with 14 months in 1970 to 1979, and the sources of referral are shown in Table IV. Most were diagnosed before they could walk but some children presented very late (Table V).

The maternity services in the Grampian region have

Table II. *Details of the children who had an operation for CDH in the last two decades*

	1970 to 1979	1980 to 1989
Male:female	1:6	1:8
Left:right	3:1	3:1
Breech deliveries (<i>per cent</i>) (Grampian average 2.5)	8.2	11
Caesarean sections (<i>per cent</i>) (Grampian average 16)	6	11

Table III. *Number and percentage of children who had an operation for CDH, classified according to failure group (see text)*

Failure	1970 to 1979 (n = 53 033)	1980 to 1989 (n = 67 093)
Screening	59 0.11	87 0.13
Diagnosis	22 0.04	33 0.05
Management	16 0.03	21 0.03

Table IV. *Source of referral to the CDH clinic, as a percentage of the total number*

Source	All	Late referral
Maternity unit	81	1
General practitioner	18	61
Community physician	< 1	27
Other hospital departments	< 1	11

Table V. *Age at presentation of late-diagnosed CDH*

Age (yr)	Number	Per cent of live births
< 1	67	0.1
1 to 2	33	0.05
2 to 3	6	0.009
> 3	3	0.0045

been centralised in recent years (Table VI). In 1980 to 1989 most infants were born in the maternity unit in Aberdeen; in previous decades most were born in nursing homes and peripheral hospitals. In the earlier decades, there was half the number of failures in peripheral units, where the screening was done by the patient's general practitioner, than in Aberdeen Maternity Hospital, where screening was carried out by a succession of junior hospital doctors (Table VII). The number of births in the ten peripheral mainland hospitals has decreased by a factor of four; this has reduced the experience of the

Table VI. Changes in the maternity services which took place in 1981

District	Number of births	
	1980	1989
Aberdeen	2430	5266
Kincardine	588	61
Banff and Buchan	1208	402
Gordon	1091	150
Moray	1174	439
Orkney and Shetland	636	561
Total	7127	6879

Table VII. Percentage of live births presenting late with CDH

	1970 to 1979	1980 to 1989
Aberdeen	0.16	0.11
Peripheral hospitals	0.08	0.21

Table VIII. Percentage of children in each of the three failure groups related to three other factors

	Failure		
	Screening	Diagnosis	Management
Breech delivery	6	15	29
Open surgery	17	21	38
Avascular necrosis	20	21	33

Table IX. Number and percentage of children who had each successive stage of operative management

Final procedure		
Closed reduction	128	78.5
Open reduction	10	6.1
Femoral osteotomy	10	6.1
Salter pelvic osteotomy	13	8
Pelvic and femoral osteotomies	2	1.2

screeners, and the 'miss' rate has increased, by a factor of four in some areas ($p < 0.01$). By contrast, the screening in Aberdeen has been taken over by two doctors, dedicated to the task, who screen all new-born infants; the 'miss' rate in Aberdeen is now half that in the peripheral hospitals. The maternity services on Orkney and Shetland have remained unchanged, and the failure rate of screening remains low at 0.16% of live births.

Failures of diagnosis. Thirty-three infants who were seen at the CDH clinic and not splinted because they were

considered to have stable hips were diagnosed as having CDH at subsequent reviews, mostly at three months. A short period of simple splinting was unsuccessful in some, and all required a closed reduction. This group included twice as many breech deliveries as the group with 'failure of screening'.

Failures of management. Twenty-one children, in whom abnormalities were detected at birth and at the CDH clinic, were splinted but still needed surgery at a later date. Of these, six were splinted for less than ten weeks, 14 for three months and one for six months. After splinting, six children developed apparently normal hips on clinical and radiographic examination, and were discharged from the clinic, but were diagnosed as CDH again at a later date. The other 15, despite being diagnosed at birth and treated continuously, all eventually required surgery. This group included five times as many breech deliveries as the 'failure of screening' group and needed twice the number of open operations (Table VIII).

Operative treatment. The first line of treatment was closed reduction under anaesthesia, with or without an adductor tenotomy. If this failed, an open reduction was performed; if this failed to keep the hip reduced, a pelvic or femoral osteotomy was undertaken (Table IX). Some degree of avascular necrosis developed in 21% of the children who had operative treatment.

DISCUSSION

After 30 years of experience of screening in the Grampian region, the late presentation of CDH, far from being eradicated, has increased in incidence. This change may be partly due to the reorganisation of screening in maternity units. Where screening has improved, as in Aberdeen, the incidence of late diagnosis is half that of the rest of the region.

It is disturbing, however, that 40% more children had operations in the last decade than in the decade before the screening service was established (Table I). It appears that the incidence of CDH in the Grampian region must be rising, and the relatively consistent proportion of dislocations missed at screening in each decade may be due to the presence of a group of children who are resistant to screening. In the last decade 33 of the children who were referred to the CDH clinic and found to be normal presented later with a dislocation. The six children who were discharged from the CDH clinic with apparently normal hips, and later presented again with CDH must have had late development of acetabular dysplasia which could not have been found by neonatal screening. Cases of this type have previously been reported by MacKenzie and Wilson (1981) and by Davies and Walker (1984).

There is also some evidence that there is a consistent group of children who are resistant to treatment. This 'failure of management' group showed different charac-

teristics from the 'failure of neonatal screening' group, with significantly more breech deliveries ($p < 0.01$) and significantly more open operations ($p < 0.05$).

Conclusions. It is unlikely that conventional screening will diagnose all cases of CDH at birth; it will probably miss some cases of developmental dislocation and it is important that all screeners are aware of this. It is also important that children referred to a special CDH clinic are kept under review until there is radiographic evidence that the capital femoral epiphyses are correctly located in well-formed acetabula. We also consider that there is probably a group of patients, diagnosed at birth, in whom treatment by splinting fails to succeed. In our series, these children represented one in every 5000 live births.

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