THE MANAGEMENT OF CONGENITAL DISLOCATION OF THE HIP IN THE NEWBORN

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We describe the results of a policy of highly selective splintage for CDH, using knee plasters. No child suffered because splintage was withheld. In those who were treated the results were satisfactory and the proportion who required a subsequent operation was extremely low. Avascular necrosis was not a significant problem. The method, although a little more time consuming, appears to offer significant advantages over current alternatives.

The practice of screening newborn infants for congenital dislocation of the hip is now generally accepted, but there is less unanimity about what should be done when abnormalities are discovered.

Following the initial enthusiastic reports from Sweden by Palmén (1953) and von Rosen (1968) it appeared that simple splintage was a safe and effective treatment which offered the hope that the effects of the disease could be virtually eliminated. Since then the story has been one of progressive disillusionment. Apart from the fact that cases continue to be missed, it has gradually become evident that treatment by splintage is far from safe and by no means wholly effective. It is with these latter problems that this paper is concerned.

The main danger of treatment is, of course, the development of avascular necrosis which, if severe, may damage the hip so badly that the child may arguably be worse off than if the dislocation had never been recognised. The complication was not even mentioned in some of the earlier reports. However, it is now evident that no method of treatment is entirely free of the risk, although the reported rates have varied considerably. Even in the last few years figures of between 2.5% (Pool, Foster and Paterson 1986) and 9.4% (Elsworth and Walker 1986) have been recorded for what appear to be very similar methods.

Some of these variations may reflect differences in the case material studied. The criteria of selection for treatment vary greatly in different series (Table I) and although splintage may damage a normal hip this is much more likely if the hip is dislocated. So the inclusion in a series of a large number of "normal" hips will itself reduce the incidence of the complication. The only reliable way to compare results is by relating the incidence of the complication to the number of live births from which the cases derive rather than to the number of cases treated.

It is now generally recognised (Salter, Kostuik and Dallas 1969) that a position of forced abduction is particularly liable to damage the femoral head, especially when accompanied by rigid splintage (Wilkinson 1985). This led many to prefer the mobility afforded by devices such as the Pavlik harness. However, although Ramsey, Lasser and MacEwen (1976) had no cases of avascular necrosis in a small series of 23 cases using this device, larger series have been less reassuring (Iwasaki 1983). The harness differs in principle from the fixed splints in that reduction is achieved gradually, assisted by muscular effort. It seems possible that early in treatment the hip may be reducing and subsequently redislocating repeatedly; this may offset the benefits of mobility by causing mechanical damage.

Apart from causing damage to the femoral head, splintage may fail to confer stability and in most series a significant number of children ultimately require operation. Again comparisons between series are only possible if the number of live births from which the cases derive are known, together with the number of missed cases. In those series in which this is possible the results are rather disconcerting. If the number of cases missed by the screening programme is added to the number of cases where treatment has failed the total failure rate is very close to the natural incidence of the disease of between one and two cases per 1 000 live births (Table I).
From these figures it might seem that the vast majority of the cases splinted were destined to recover anyway, while the hard core of genuine cases were barely controlled at all by such a simple method. Wilkinson (1985) has argued that this is due to the presence of an incarcerated limbus in most cases. These arguments therefore cast doubt on the whole concept of early splintage. However, others believe that following the introduction of splintage the number of late cases requiring surgery has gradually diminished over the years and that this is the essential vindication of the method (Paterson 1976).

Because of these considerations there is now no discernible consensus on the management of the condition and there are some widely polarised views. While it is generally agreed that screening itself is beneficial since it identifies children at risk, some would recommend splintage of every suspicious case (Fredensborg and Nilsson 1976) even though it is acknowledged that most of these would recover spontaneously. At the other extreme Wilkinson (1985) has virtually rejected splintage altogether because of the failure rate and fear of avascular necrosis, even though the delay means that many of the children will eventually require surgery.

In the hope of finding a compromise between these extreme views an alternative method of management was initiated in Cardiff some 15 years ago. A selective policy of splintage was introduced but the untreated children were carefully followed up to determine if any suffered as a result. A method of splintage was adopted using knee plasters which, it was hoped, would combine the advantages of mobility provided by the Pavlik harness while maintaining an uninterrupted reduction. The method also provides for individual adjustment of the position of the legs.

To provide accurate statistics for comparison purposes this paper presents detailed results only for the three-year period of our prospective study, together with a search for any late presenting cases which arose from the population studied over the same period of time. However, reference will be made to some of the experiences encountered over the longer period.

MATERIAL AND METHOD

Patients. The study covers the period from October 1981 to October 1984. During this time all children born in hospital in South Glamorgan were examined in the paediatric department immediately after birth. All those thought to be abnormal were referred to the orthopaedic department of the University Hospital of Wales in Cardiff. All but a few were seen within a week of birth and the vast majority were examined personally by the senior author.

At the initial consultation the hips were divided into five groups: 1. normal, 2. dislocatable hips (using Barlow’s test), 3. dislocated hips (using Ortolani’s test), 4. irreducible hips, 5. stiff hips (limited abduction only).

Treatment. Those children whose hips were thought to be stable at the time of examination (Groups 1 and 5) were not treated. They were reviewed clinically and radiologically at three-monthly intervals until the hips were seen to be unequivocally normal.

The dislocatable hips (Group 2) were not treated initially but were re-examined at weekly intervals. If at the end of three weeks instability was still present plaster splintage was applied for four weeks and follow-up examination was carried out at three-monthly intervals. The child was not discharged until it was walking and showed normal radiographic appearances.

Dislocated hips (Groups 3) were treated immediately after reduction by plaster splintage for between four and six weeks. Splintage was then discontinued if there was no longer any clinical sign of instability and the radiograph showed normal acetabular development. Subsequent follow-up was carried out at three-month intervals, again until the children were walking and had normal radiographic appearances. If during follow-up recurrent instability became evident further splintage was instituted, usually for six weeks. Irreducible hips (Group 4) were excluded from the series.

Method of splintage. Hips which were dislocatable but not dislocated were immobilised in knee plasters; these were applied without an anaesthetic and a crossbar attached ensuring a position of some 45° of abduction and 90° of flexion (Fig. 1). The children were reviewed weekly by a senior member of the nursing staff and the plaster changed if necessary.

The dislocated hips were flexed to right angle then abducted until a satisfactory reduction jerk was felt. Abduction was then increased by about 10° to ensure stability and the plaster applied in this position. Radiographs were taken to ensure a satisfactory reduc—
tion and in some instances a further radiograph was taken after the first week. If the appearances were unsatisfactory, or if a satisfying reduction jerk was not felt, an arthrogram was performed. If this showed any block to reduction, splintage was abandoned and open reduction carried out at about nine months of age.

Although all the children were followed up until they were walking and thought to be radiographically normal, for the purpose of this study all those who had been splinted were recalled for further clinical and radiographic review at between the ages of 3.5 and 5.5 years.

RESULTS

In the period covered by this review there were 15,561 live births in the South Glamorgan area. Of these, 184 babies were referred with hip instability; 43 had bilateral involvement, giving a total of 227 hips (14.4 per 1 000 live births). There were a further 75 referrals for such reasons as a strong family history, crepitant hips, and so on, but none of these had any demonstrable instability. They were not included in the review although they were followed up in the same way as the others.

The hips of all the children from whom splintage had been withheld (Groups 1 and 5) developed normally. Of the 227 unstable hips, 183 were dislocatable at birth (Group 2) and of these, 144 stabilised spontaneously (79%) within three weeks. Thirty-nine remained unstable (21%) and required splintage. There were 44 babies with fully dislocated hips (Group 3) and all were splinted at an average age of three days. The overall splintage rate, therefore, was 3.9 children per 1 000 live births.

During subsequent follow-up 13 children required re-treatment (0.84 per 1 000). Seven of these had recurrent displacement (0.44 per 1 000) and six had radiographic dysplasia only.

None of the dislocated hips proved to be irreducible in the three-year study and no open reductions were performed. However, two cases showed late subluxation, at 18 and 20 months respectively, due to persisting anteversion; both responded well to derotation osteotomy. In the longer-term study, during the 15 years in which the system has been in use there were a total of six irreducible cases requiring open reduction.

Findings at review. Of the 60 children who had been splinted 41 attended for review (68%). None was thought to show any clinical abnormality. The radiographs were reviewed independently by an orthopaedic radiologist (LAW). No residual displacement or dysplasia was found in any case but in two instances there was thought to be evidence of avascular necrosis (Figs 2 and 3). The radiographs taken on discharge of the children who could not be traced were also reviewed again but no abnormalities were found. The final radiographs of the children who had not been treated were also reviewed again but none of these were thought to be in any way abnormal.

At the end of April 1987 a total of nine cases of late presenting CDH were diagnosed among those who had been born in South Glamorgan during the period of the study (0.6 per 1 000).

DISCUSSION

In the controversy surrounding the management of neonatal CDH two main problems may be discerned: which children should be treated? and by what means?

Selection of cases for treatment. In most series in which the results can be related to the number of live births from which the cases derive the splintage rate is very high (Table 1), with as many as 16 per 1 000 being reported from Aberdeen (MacKenzie 1972). In the present series the figure was 3.9 hips per 1 000 and on subsequent follow-up none of the cases from whom treatment had been withheld, some 9.3 hips per 1 000, were found to be unstable. This appears to justify a selective policy.

There were of course a number of late presenting cases (0.6 per 1 000) from the relevant group of births.
who had never been referred for treatment. These represent a failure of the primary screening procedure. This is a separate problem which will not be considered further here. For present purposes the importance of this figure lies in the fact that, if it is subtracted from the natural incidence of late presenting cases (2 per 1 000), this gives the number of truly abnormal cases which actually presented for treatment, that is, 1.4 per 1 000. Considered against a splintage rate of 3.9 per 1 000 this suggests that an even more selective policy could be safely pursued; a lower figure of 2.6 per 1 000 was in fact reported by Jones (1977).

The criticism is sometimes made that the adoption of a very selective attitude to splinting, although it may save normal cases from unnecessary treatment, sooner or later causes a genuine case to be overlooked and not detected until a time when the result will be prejudiced (Barlow 1962). Although there were no such cases in the small series presented here, over the 15 years in which this regime has been in operation there have been three cases where splintage was withheld and which were subsequently found to have dislocated or severely subluxated hips at radiological follow-up between three and nine months after birth. All responded well to splintage and none required surgery.

Table 1. Reported results of splintage for CDH given per 1 000 live births

<table>
<thead>
<tr>
<th>Centre</th>
<th>Authors</th>
<th>Number treated</th>
<th>Failures of primary splintage</th>
<th>Missed cases</th>
<th>Failure plus missed cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aberdeen</td>
<td>MacKenzie 1972</td>
<td>16</td>
<td>0.4</td>
<td>1.2</td>
<td>1.6</td>
</tr>
<tr>
<td>Belfast</td>
<td>Williamson 1972</td>
<td>4</td>
<td>0.7</td>
<td>0.5</td>
<td>1.2</td>
</tr>
<tr>
<td>Sweden</td>
<td>Fredensborg and Nilsson 1976</td>
<td>10</td>
<td>not given</td>
<td>0.07</td>
<td>N/A</td>
</tr>
<tr>
<td>Australia</td>
<td>Paterson 1976</td>
<td>7</td>
<td>0.8</td>
<td>0.2</td>
<td>1.0</td>
</tr>
<tr>
<td>Norfolk</td>
<td>Jones 1977</td>
<td>2.6</td>
<td>0.3</td>
<td>0.6</td>
<td>0.9</td>
</tr>
<tr>
<td>Sweden</td>
<td>Palmén 1984</td>
<td>12</td>
<td>0.7</td>
<td>0.6</td>
<td>1.3</td>
</tr>
<tr>
<td>Cardiff</td>
<td>McKibbin et al. 1988</td>
<td>3.9 (0.4)</td>
<td></td>
<td>0.6</td>
<td>1.0</td>
</tr>
</tbody>
</table>

None of the cases required open reduction and there have been very few required in the 15 years of the longer study. This is in marked contrast to our experience using the same method for children presenting later on in the first year when it has been frequently necessary to remove an inturned limbus. This suggests that the development of this obstruction can be influenced by early treatment although this conflicts with the views of those who believe that this structure is present at birth (Wilkinson 1985).

Avascular necrosis occurred in two of the cases treated, one of whom had required a double period of splintage. Although this represents 2.5% of the cases splinted, the incidence is only 0.8% of all the unstable hips which presented. In any case the involvement was minimal, both corresponding to Group 1 of the classification of Kalamchi and MacEwen (1980), and no late problems are anticipated. This compares favourably with other published series apart from the remarkable experience recorded with the von Rosen splint by Fredensborg and Nilsson (1976), although it was unfavourable experience with this device which led the senior author to develop the present method.

It is possible therefore to draw a number of conclusions from this review. It appears that a highly selective splintage policy carries no disadvantage for those not treated provided that they are carefully followed up and that the method of splintage gives an acceptably low level of avascular necrosis. However, comparable results have been obtained by other regimes and the main advantage of the method is in relation to the cases which proved to be refractory to initial splintage.

In other series these have varied from 0.3 to 0.8 per 1 000 births (Table 1) and in the majority of cases surgery has been required. Using the present form of splintage the initial failure rate was 0.4 per 1 000 but all of these responded to a second period of splintage and, while two of them subsequently required derotation osteotomy of the femur, none of the index cases needed open reduction or acetabular surgery. One must assume that this advantage derives from the nature of the splintage which permits movement, thus stimulating normal acetabular maturation (McKibbin 1973) and preventing the development of an obstructing limbus, while maintaining the uninterrupted reduction which is not provided by devices such as the Pavlik harness.

Our method is certainly more troublesome in terms of plaster changes and the use of nursing time, but this appears to be adequately compensated for by the shorter time in splints and by minimising the requirement for any subsequent operation. These considerations appear to justify its continued use.

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.
REFERENCES


