CLINICAL EXAMINATION AND URINARY OESTROGEN ASSAYS IN NEWBORN CHILDREN WITH CONGENITAL DISLOCATION OF THE HIP

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In 1961 Andrén and Borglin suggested that congenital dislocation of the hip could be the consequence of abnormal oestrogen metabolism in the perinatal period. They studied oestrogen excretion in eleven newborn infants with dislocated hips and twenty-six control infants during the first three days of life. They found elevated levels of oestrone and oestradiol in the patients with dislocation. Furthermore, they observed that the recovery of administered oestradiol was higher in those with dislocated hips than in the control group during the first week of life. They concluded that an inborn error of oestrogen metabolism contributed to hip joint laxity and congenital dislocation.

Aarskog, Stoa and Thorsen (1966) criticised the work of Andrén and Borglin (1961), pointing out that individual results reported for oestrone and oestradiol were at the lower limit of sensitivity of the assay method employed.

Using techniques developed by Stoa and Thorsen (1962) and Thorsen, Stoa and Aarskog (1964) for the estimation of oestradiol and a fraction considered to represent the sum of the ring D α-ketolic oestrogens, Aarskog et al. (1966) assayed the urine of seven infants with congenital dislocation of the hip and four control subjects during the first three post-natal days. They found no difference in oestrogen excretion between the two groups.

In view of these conflicting reports this study was undertaken to re-examine the subject.

MATERIAL AND METHODS

Clinical—During the six months from August 1966 to January 1967 all babies born at the Simpson Memorial Maternity Pavilion in Edinburgh were examined for dislocation of the hips within twenty-four hours of birth by one person (W. T.). The total number of babies was 1,881 and twenty-one were found to have hip dislocation. The diagnosis of hip dislocation was based on clinical features alone, using the techniques described by Barlow (1962). Cases with dislocation showed a palpable, visible and frequently audible “clunk” as the femoral head was manually dislocated and reduced. It was not possible to distinguish, as did Barlow, between “dislocated” and “unstable” hips.

Sixteen consecutive patients with hip dislocation (eleven female and five male) and nineteen controls (thirteen female and six male) matched for sex, birth weight (within two ounces) and age since birth (within two hours) were subjects for the urinary oestrogen excretion studies. From each baby twenty-four-hour urine collections were attempted on three days. The first collection was started at the initial examination, and subsequent collections began

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forty-eight and ninety-six hours later. A total of forty-four and forty-five twenty-four-hour urine samples were obtained from the babies with dislocation and from the control babies respectively.

Oestrogen assays—Urine samples were first extracted with peroxide-free ether, as described by Diczfalussy, Tillinger and Westman (1957), in order to separate the "free" oestrogens. The conjugated steroids were then hydrolysed with 15 per cent hydrochloric acid and extracted by ether. The two ether extracts were combined at this stage, so that the "total" oestrogen content of the sample could be measured. Urinary oestriol was determined by the method of Brown, Bulbrook and Greenwood (1957), urinary oestrone and oestradiol were estimated by the same method incorporating a micro-Kober modification as described for oestrone by Brown and Blair (1960). Further purification of the final fraction was achieved by extraction of the Kober chromogens into a 2 per cent p-nitrophenol/tetrachloroethane reagent in the manner detailed by Ittrich (1958). The absorption of the chromogens in the organic phase was measured in a microcell of one centimetre light path at wavelengths of 508, 539 and 570 mu. on a spectrophotometer, and the correction described by Allen (1950) was applied. This micro method is approximately five times more sensitive than the original method of Brown et al. (1957), and enables levels of oestrogens as low as 0.2 micrograms to be measured with accuracy.

RESULTS

Clinical—Of the 1,881 infants examined, twenty-one (fifteen female, six male) had congenital dislocation of the hip, giving an incidence of approximately eleven per 1,000 live births. In sixteen the dislocation was on the left side, in four it was bilateral and in one it was on the right. Two cases with dislocated hips were breech presentations and one was a deep transverse arrest. None of the cases had other anomalies. Only one, a girl, presented a family history of congenital dislocation, having an affected brother. Over a four- to seven-month follow-up period, all cases with dislocation of the hip have responded satisfactorily to conservative treatment with the Malmö splint.

Repeated examination of the hips during the first week of life was carried out on fourteen of the infants with dislocated hips. In eight, the hips were normal by the fifth day but in six the instability persisted. All were in splints from the third or fourth day.

FIG. 1
Urinary oestradiol excretion in the newborn.
High-pitched sharp "clicks," which are sometimes misinterpreted as a sign of dislocation, were frequently found in examinations on the first day. Of the total number of infants examined 191—or approximately 10 per cent—gave such "clicks." Some 50 per cent of the "clicks" were in the left hip, 20 per cent were bilateral and 30 per cent were in the right hip. Boys and girls showed an equal incidence of the "clicks."

Hypermobility in terms of easy abduction of the hips past 90 degrees in the frog position was also often found, being present in sixty-one of 970 consecutive cases (6 per cent). However, none of the congenital dislocation of the hip cases showed this hip laxity; they were also examined specifically for excessive extension at the knees and elbows, but none was found.

**OESTROGEN ASSAYS**

The results of the individual urinary oestriol estimations are shown in Figure 1. Marked variability of oestradiol levels from patient to patient is apparent, as is the progressive fall in oestradiol over the first six days of life. The individual results obtained for oestriol and oestriol were similar to those noted for oestradiol and are not reported separately.

**Table 1**

**Urinary Oestrogen Excretion ± the Standard Deviation in Micrograms per Twenty-four Hours in Infants with Congenital Dislocation of the Hip (CDH) and in Controls**

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Day</th>
<th>Number of samples</th>
<th>Oestradiol</th>
<th>Oestriol</th>
<th>Oestriol</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDH</td>
<td>1</td>
<td>7</td>
<td>0.69±0.67</td>
<td>0.64±0.68</td>
<td>290.4±403.0</td>
</tr>
<tr>
<td>Control</td>
<td>9</td>
<td></td>
<td>0.35±0.43</td>
<td>0.42±0.53</td>
<td>175.9± 83.5</td>
</tr>
<tr>
<td>CDH</td>
<td>2</td>
<td>7</td>
<td>0.50±0.50</td>
<td>0.47±0.37</td>
<td>214.9±206.0</td>
</tr>
<tr>
<td>Control</td>
<td>9</td>
<td></td>
<td>0.35±0.42</td>
<td>0.44±0.89</td>
<td>134.6± 56.0</td>
</tr>
<tr>
<td>CDH</td>
<td>3</td>
<td>7</td>
<td>0.10±0.12</td>
<td>0.13±0.21</td>
<td>26.8± 33.0</td>
</tr>
<tr>
<td>Control</td>
<td>8</td>
<td></td>
<td>0.01±0.02</td>
<td>0.01±0.03</td>
<td>26.3± 33.5</td>
</tr>
<tr>
<td>CDH</td>
<td>4</td>
<td>9</td>
<td>0.16±0.39</td>
<td>0.13±0.36</td>
<td>18.3± 41.4</td>
</tr>
<tr>
<td>Control</td>
<td>7</td>
<td></td>
<td>0.03±0.05</td>
<td>0.03±0.04</td>
<td>3.9±  3.3</td>
</tr>
<tr>
<td>CDH</td>
<td>5</td>
<td>8</td>
<td>0.06±0.16</td>
<td>0.08±0.18</td>
<td>4.1±  4.9</td>
</tr>
<tr>
<td>Control</td>
<td>7</td>
<td></td>
<td>0.09±0.14</td>
<td>0.10±0.15</td>
<td>0.8±  0.6</td>
</tr>
<tr>
<td>CDH</td>
<td>6</td>
<td>6</td>
<td>0.0±0</td>
<td>0.04±0.10</td>
<td>1.3±  1.8</td>
</tr>
<tr>
<td>Control</td>
<td>5</td>
<td></td>
<td>0.02±0.05</td>
<td>0.0</td>
<td>8.7± 16.8</td>
</tr>
</tbody>
</table>

Mean levels of oestradiol, oestriol and oestriol for the dislocated and control groups are shown in Table I, together with standard deviations. Although the mean oestrogen values tend to be greater for the infants with congenital dislocation, there is no significant difference between the two groups; neither can a difference between them and the controls be shown by use of a paired data analysis comparing matched individuals.

Oestrogen levels could not be correlated with the sex or birth weight of the infant, or with hip stability in those infants with congenital dislocation of the hip when examined on the fifth day.

**DISCUSSION**

The incidence of congenital dislocation of the hip found in this series on the first day of life is high—eleven per 1,000 live births. Von Rosen (1962), who examined his patients within two days of birth, reported only 1.7 per 1,000, and Palmén (1961) found 5.6 per 1,000 in
CLINICAL EXAMINATION AND URINARY OESTROGEN ASSAYS IN NEWBORN CHILDREN

549

CLINICAL EXAMINATION AND URINARY OESTROGEN ASSAYS IN NEWBORN CHILDREN

infants less than four days old. However, Barlow (1962) detected instability of the hip in fifteen per 1,000 newborns examined during the first week. He also noted that the incidence of unstable hips in infants under three and a half days old was twice that for those three and a half to seven days old. The same phenomenon was observed in the present study, in which spontaneous stabilisation occurred in approximately half of the dislocated hips within the first week. Thus, the first day examinations can be expected to give a higher incidence of dislocation than would examination of older newborns. Another factor which may contribute to the high incidence recorded here is that examinations were made in the autumn and winter, at which times congenital dislocation of the hip has been reported to occur more frequently (Medalie, Makin, Alkalay, Yofe, Cochavi and Ehrlich 1966; Weissman and Salama 1966).

The common occurrence of trivial high-pitched “clicks” in the early newborn hip is perhaps not widely appreciated, but should be borne in mind when examining for congenital dislocation.

Hypermobility of the hips, although not an unusual finding in this study, did not occur in any of the patients with dislocation. This is in contrast to the observations of Carter and Wilkinson (1964), who found an increased incidence of joint laxity in older children who had congenital dislocation of the hips.

Failure to find significant differences in oestrogen excretion between infants with congenital dislocation of the hips and control subjects supports the observations of Aarskog et al. (1966) and is at variance with the report of Andrén and Borglin (1961). This investigation has provided no evidence of abnormal urinary oestrogen excretion in congenital dislocation of the hip.

SUMMARY

1. Twenty-one cases of congenital dislocation of the hip were found on examination of 1,881 consecutive neonates on the first day of life, giving an incidence of eleven per 1,000 live births.
2. Insignificant high-pitched “clicks” were noted in 10 per cent of newborn children.
3. Conversion of half of the patients with hip dislocation to normal occurred during the first post-natal week.
4. Joint laxity was not a feature of the newborn with congenital dislocation of the hip.
5. Oestradiol, oestrone and oestriol were estimated in twenty-four-hour urine samples collected from sixteen patients with congenital dislocation of the hip and nineteen matched controls during the first six days of life. No significant differences in oestrogen output between the two groups were found.
6. The hypothesis that congenital dislocation of the hip is a result of an inborn error of oestrogen metabolism in the newborn is not supported.

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REFERENCES


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