BILATERAL PROXIMAL RELEASE OF THE HAMSTRINGS IN CEREBRAL PALSY

N. SEYMOUR, PLYMOUTH, and W. J. W. SHARRARD, SHEFFIELD, ENGLAND

From the Children's Hospital and the University Department of Orthopaedics, Sheffield

In the surgery of cerebral palsy, tenotomy of the hamstrings near their insertion, with or without reinsertion into the femur, is an established and useful operation (Eggers 1952, Pollock and Sharrard 1958). Division of the tendinous origin of the hamstring muscles is not so well known. We have done this operation with considerable success when the quadriceps muscle is acting strongly and tightness of the hamstrings limits flexion of the hip.

TABLE I
INCREASE OF STRAIGHT LEG RAISING AND DETAILS OF PREVIOUS OPERATIONS

<table>
<thead>
<tr>
<th>Case number</th>
<th>Age at operation (years)</th>
<th>Age at previous operations (years)</th>
<th>Passive straight leg raising before operation (degrees)</th>
<th>Passive straight leg raising after operation (degrees)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>11</td>
<td>9 Bilateral gastrocnemius slide</td>
<td>20</td>
<td>70</td>
</tr>
<tr>
<td>2</td>
<td>11</td>
<td>5 Bilateral elongation of tendo calcaneus</td>
<td>30</td>
<td>85</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>6 Bilateral adductor tenotomy and anterior branch obturator neurectomy</td>
<td>15</td>
<td>90</td>
</tr>
<tr>
<td>4</td>
<td>9</td>
<td>5 Bilateral gastrocnemius slide and subcutaneous adductor tenotomy</td>
<td>35</td>
<td>65</td>
</tr>
<tr>
<td>5</td>
<td>9</td>
<td>5 Bilateral gastrocnemius slide</td>
<td>25</td>
<td>75</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>4 Bilateral adductor tenotomy and bilateral gastrocnemius slide</td>
<td>25</td>
<td>90</td>
</tr>
<tr>
<td>7</td>
<td>13</td>
<td>5 Bilateral adductor tenotomy and anterior branch obturator neurectomy</td>
<td>40</td>
<td>90</td>
</tr>
<tr>
<td>8</td>
<td>12</td>
<td>6 Bilateral elongation of tendo calcaneus</td>
<td>30</td>
<td>90</td>
</tr>
<tr>
<td>9</td>
<td>10</td>
<td>6 Bilateral gastrocnemius slide</td>
<td>20</td>
<td>80</td>
</tr>
</tbody>
</table>

Indications—There is a small but well defined group of patients with spastic paraplegia or tetraplegia whose disability can be helped by proximal hamstring division. Patients selected for operation have no fixed flexion deformity of the knee but show three signs of tightness of the hamstring muscles affecting the hip: 1) walking can be achieved only by taking short strides with much pelvic rotation; 2) passive straight leg raising is restricted, usually to 30 degrees or less; 3) the patient is unable to sit up with the knees extended, but can sit in a chair with the knees flexed without difficulty.

THE OPERATION

With the patient lying prone, a longitudinal incision is made just lateral to the ischial tuberosity; this avoids pressure on the scar when sitting. Deeper dissection reveals the lower border of gluteus maximus, which is retracted upwards. The hamstring origin from the ischial...
tuberosity and the sciatic nerve are then exposed. It is important to ensure that the whole width of the nerve is seen, because occasionally it may have a high division. A finger is passed round the hamstring origin which is then divided obliquely near the bone. The muscle retracts leaving a gap of up to 7 centimetres. Complete haemostasis should be ensured. After operation the patient is nursed sitting as upright as possible until the wounds are healed, after which walking is allowed.

MATERIAL AND RESULTS

Nine children aged from six to thirteen years have had bilateral proximal hamstring division during the past two years. Table I gives the range of passive straight leg raising before and after operation, together with details of previous operations.

At the end of the operation passive straight leg raising was found to be greatly increased. The range often improved with activity up to the sixth month, after which no increase occurred. The range of passive straight leg raising before operation and the improvement that resulted were usually equal on both sides. A striking feature has been the patients' ability, almost immediately after the operation, to sit up in bed with the knees extended, this being the position in which they are nursed.

Although independent walking was possible in all patients before operation, their gait was awkward and tiring. After operation the length of stride has become twice as great, with much less pelvic rotation and considerably less effort. Independent walking was quickly regained after the patients were allowed up, and the quality of gait improved slowly over several months. The patients also found it much easier to climb stairs.
Figures 1 and 2 illustrate the extent of straight leg raising before and after operation; Figures 3 and 4 show the ability to sit up with the knees extended; and Figures 5 and 6 show the increase in stride only five weeks after proximal hamstring release.

Fig. 3

Case 6. Figure 3—Before operation the child was unable to sit up with knees extended. Figure 4—Showing his ability to sit up after bilateral proximal hamstring release.

DISCUSSION

Shortening of the hamstrings in cerebral palsy is usually due to muscle imbalance between the hamstrings and quadriceps during growth. This may result in knee flexion deformity, but when hip flexion is weak and the quadriceps acts strongly any shortening of the hamstrings will be shown at the hip.

Diminished growth in the stronger of imbalanced antagonist muscles is probably due to lack of tension on them and restriction of their excursion (Sharrard 1967). The hamstrings can be slackened by flexing the knee, and, severe weakness of the hip flexors being very unusual in cerebral palsy, the difference in power between the hip flexors and the hamstrings will not be marked. Thus shortening takes place slowly and the signs can be easily overlooked. A child who has previously walked well may later walk with increasing difficulty.

Silfverskiöld (1924) suggested the conversion of a two-joints muscle to a one-joint muscle in cerebral palsy. He described transference of the ischial origin of the hamstrings to the subtrochanteric region of the back of the femur. For knee flexion deformity, this procedure has been superseded by distal hamstring tenotomy or by Eggers' operation. If there is no knee flexion deformity, transfer of the ischial tuberosity has no advantage over proximal...
hamstring division and is a much bigger procedure. In both procedures the short head of the biceps femoris muscle is not interfered with and the power of knee flexion is maintained. In this series there was no noticeable weakness of knee flexion after the operation.

Lengthening of short muscles is a most rewarding method in the surgical treatment of cerebral palsy. It has the effect of correcting deformity, improving muscle balance and often decreasing spasticity in other muscles (Baker 1956). Like other simple surgical procedures performed in cerebral palsy, in the carefully chosen case the results of proximal hamstring division are good and are rapidly achieved.

SUMMARY
1. In children with cerebral palsy and spastic paraplegia or tetraplegia with no fixed flexion of the knees, tightness of the hamstrings may limit the stride, restrict passive straight leg raising and cause inability to sit up with the knees extended.
2. Nine such children have been treated by bilateral release of the hamstrings from the ischial tuberosity, with marked benefit in all patients.

REFERENCES