ISCHIO-FEMORAL ARTHRODESIS FOR TUBERCULOSIS OF THE HIP

DOOJIN HAHN, SEOUL, KOREA

From Wrightington Hospital, Appley Bridge, England

Brittain described a method of ischio-femoral arthrodesis in 1941, and in 1948 reported successful fusion in eighty-four of 105 hips. Comparable figures were reported by Freiberg (1946) in six cases, by Foley (1949) in nineteen cases and by Cholmeley (1956) in fifty-five cases.

The purpose of this paper is to review the cases of sixty-four patients who underwent arthrodesis of the hip at Wrightington Hospital during the period 1949 to 1958. In all but two patients the diagnosis of tuberculosis was established by guinea-pig inoculation, by demonstration of tubercle bacilli on the direct smear, or by culture. In one child infection was caused by pyogenic organisms and in one other the diagnosis remained unproven, though the clinical course suggested tuberculosis and the Mantoux test was positive.

MATERIAL

The patients were divided into two groups according to age at the time of operation in order to illustrate more particularly the problems of arthrodesis in children. There were thirty-five adults and adolescents (Table I) and twenty-nine children under the age of fourteen.

TABLE I

AGE DISTRIBUTION: THIRTY-FIVE ADULTS AND ADOLESCENTS

<table>
<thead>
<tr>
<th>Age at time of operation (years)</th>
<th>Number of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-20</td>
<td>12</td>
</tr>
<tr>
<td>21-30</td>
<td>14</td>
</tr>
<tr>
<td>31-40</td>
<td>4</td>
</tr>
<tr>
<td>41 and over</td>
<td>5</td>
</tr>
</tbody>
</table>

In the latter group there were sixteen boys and thirteen girls. The youngest was five years and three months old at the time of operation; the oldest was aged thirteen years and six months. The average age was about nine years.

Period of observation—In the first group the period of observation varied from thirteen months to twelve and a half years; the average period was seven years and eight months. In the children the period of observation varied from eleven months to twelve years, the average being seven years and eight months. Sixteen children were examined by the author for the purpose of accurate measurement of the length of the limbs; in all except three of the patients who did not report for examination the records provided adequate information. In these three remaining patients the periods of observation were eleven, eighteen and twenty months.

METHOD OF TREATMENT

Medical treatment—All the patients were given drugs active against tuberculosis both before and after operation. In adults 1 gramme of streptomycin, 100 milligrams of isoniazid and 12 grammes of sodium aminosalicylate were given daily for 120 days. In children over five half a gramme of streptomycin, 50 milligrams of isoniazid and 6 grammes of sodium...
aminosalicylate were given daily for 120 days; and in children under five the dose of the drugs was further reduced. During treatment the hip was splinted by weight traction, by an abduction frame or by a plaster hip spica.

Operation and subsequent management—In fifty-one patients—twenty-nine adults and adolescents and twenty-two children—the hip was exposed by the posterior approach described by Foley (1949). In thirteen patients—six adults and adolescents and seven children—the “blind” approach with radiographic control (Brittain 1941) was used.

The graft was taken from the tibia of the opposite leg. After osteotomy the femoral shaft was widely abducted and the limbs were immobilised in a double hip spica. In all cases the femoral shaft was displaced medially at the site of osteotomy. After two weeks a general anaesthetic was given and the plaster was changed, the limb being brought into the neutral position. With children considerable force was often needed to reduce the amount of abduction if the plaster change was delayed longer than two weeks. Immobilisation was continued until there was a satisfactory degree of union.

RESULTS

Adults and adolescents—Fusion was obtained in thirty-three of the thirty-five hips. The average time for extra-articular fusion was 8.9 months in thirty-three hips. The average time for intra-articular fusion was 22.9 months in thirty hips. Five patients—two of whom were the failures—never developed intra-articular fusion. Two of these were followed for five and a half and eleven years respectively; they both led active lives and did not need external splintage.

One patient had an ischio-femoral arthrodesis because of failure of fusion of an ilio-femoral graft. This hip did not show intra-articular fusion six years after operation, but five and three-quarter years later solid intra-articular fusion was shown to have taken place (Figs. 1 to 3).

The two failures—One patient fell nine months after operation and broke the graft; the fragments did not unite. In the other case the femoral fragments did not unite, but fusion was secured by a second operation in which a McLaughlin plate and an iliac bone graft were used. Failure did not appear to be related to the patient’s age or to the technique of operation.

Change in length of limb—There was increase of shortening by one inch in four patients, and by half an inch in three. In nine patients there was no change, and in three some gain in length was observed. The records of the remaining sixteen patients did not provide adequate information about the effect of the operation on limb length.

Complications—Six patients sustained fracture of the donor tibia. The fractures were undisplaced and united readily after immobilisation in plaster. There was no instance of sciatic nerve paralysis. One patient died of renal tuberculosis thirteen months after operation, his hip then being solidly fused.

Children—The results of the Brittain procedure were disappointing: only one of the seven hips fused after the first operation. The detailed study of the results was therefore confined to the twenty-two children who had the Foley operation.

All twenty-two hips subjected to the Foley procedure showed extra-articular fusion after an average period of about four months from operation. In one child, who had gained extra-articular fusion three months after operation, the graft broke six weeks later. The graft was absorbed, but the hip went on without further operation or external splintage to achieve intra-articular fusion sixty-three months after the primary operation.

Twenty hips showed intra-articular fusion after an average period of twenty-nine months. Two hips never got to this state. In one, extra-articular fusion was apparent at five and a half months, and the patient started bearing full weight on the limb soon after this. Four and a
half years after operation there was great hypertrophy of the graft but no evidence of intra-articular fusion (Figs. 4 to 6). In the other case the period of observation was only eighteen months. At that stage extra-articular fusion was complete but there was no fusion across the joint.

**Radiographs showing delay in intra-articular fusion.** Figure 1—Failure of fusion of ilio-femoral graft. Figure 2—Nearly six years after ischio-femoral arthrodesis. The graft is well incorporated but there is no evidence of intra-articular fusion. Figure 3—Six years later. Fusion has taken place across the joint.

**DISPARITY IN LENGTH OF LIMBS**

*Premature epiphysial fusion*—Gill (1944) reported ten cases of premature closure of the epiphyses of the knees in 150 children with tuberculosis of the hip who had been treated by prolonged immobilisation. McCarroll and Heath (1947) again emphasised the harmful effect of prolonged immobilisation.
Ten of the twenty-two children in this series showed premature epiphysial fusion. Three had shortening of four inches; three others had shortening of three and a quarter inches, three inches and two and a half inches.

Effect of operation on growth of limb—The proximal femoral epiphyses account for 15 per cent of growth of the limb and 30 per cent of that of the femur (Green and Anderson 1947). Stopping growth at the proximal femoral epiphyses in a girl of eight or in a boy of ten will result in a disparity of seven-eighths of an inch by the time of maturity. Any method of fusion of the hip liable to produce premature closure of the upper femoral epiphysis would therefore be most undesirable.
The effect of the operation on growth of the limb could be studied in six children. Those with premature closure of the epiphyses at the knee and those under thirteen at the time of review were excluded. In one other case there was no record of the amount of disparity at the time of operation. In four children operation made no difference to the amount of disparity;

<table>
<thead>
<tr>
<th>Case number</th>
<th>Sex</th>
<th>Age (years)</th>
<th>Disparity (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>At operation</td>
<td>At review</td>
</tr>
<tr>
<td>1</td>
<td>M</td>
<td>5 ½</td>
<td>16 ½</td>
</tr>
<tr>
<td>2</td>
<td>M</td>
<td>6 ½</td>
<td>14 ½</td>
</tr>
<tr>
<td>3</td>
<td>F</td>
<td>7 ½</td>
<td>17</td>
</tr>
<tr>
<td>4</td>
<td>M</td>
<td>12</td>
<td>23</td>
</tr>
<tr>
<td>5</td>
<td>M</td>
<td>8 ½</td>
<td>14 ½</td>
</tr>
<tr>
<td>6</td>
<td>F</td>
<td>9</td>
<td>15</td>
</tr>
</tbody>
</table>

in one there was an increase of half an inch and in one the disparity decreased by half an inch (Table II).

The evidence suggests that ischio-femoral arthrodesis does not cause retardation of growth of the limb. The maintenance of the rate of growth may be caused by stimulation by the osteotomy; certainly the proximal femoral epiphysis can persist after operation (Figs. 7 and 8).

Complications—There was no death and no instance of severe shock after operation. Four children sustained greenstick fractures of the donor tibia. These were treated by immobilisation in plaster and did not cause any permanent disability.
DISCUSSION

Ischio-femoral arthrodesis by Brittain’s method is clearly a satisfactory method for tuberculous hips in adolescents and adults. In this series the results in children’s hips were poor, and other workers have reported difficulty in getting such hips to fuse. McC Carroll and Heath (1947) reported successful fusion in 72 per cent of fifty-two tuberculous hips in children, many of whom developed complications from the prolonged immobilisation. Yu (1951) recorded successful fusion in thirteen of thirty-three primary operations for fusion of tuberculous hips. Compere and Thompson (1955) were successful in fourteen of twenty-four such hips.

Brittain (1941, 1948) did not report the results of his operation specifically in children, but Knight and Bluhm (1945) successfully arthrodesed six of ten hips by his method. Nine of their patients were children. They attributed their failures to technical faults, and this is the most likely explanation for the failures in the present series. It is certainly difficult to penetrate the ischium when the “blind” approach is used.

The results obtained by Foley’s method were uniformly satisfactory in adults, adolescents and children.

SUMMARY

1. The results of ischio-femoral arthrodesis for tuberculous arthritis of the hip in thirty-five adults and in twenty-nine children are reported. The “blind” technique of Brittain was used in thirteen patients and the open technique in fifty-one.
2. Bony fusion was obtained by the first operation in thirty-three out of the thirty-five adults and in twenty-three out of twenty-nine children. In children strikingly better results were gained from the posterior open technique than from the original “blind” technique of Brittain.
3. There was no evidence that ischio-femoral arthrodesis in children interfered with the growth of the limb.

I am indebted to Mr. John Charnley and Mr. C. Cullen for permission to study their case records at Wrightington Hospital. I wish to thank Mr. Charnley for suggesting this investigation and for helping in the presentation of the results.

REFERENCES