ISCHIO-FEMORAL ARTHRODESIS OF THE HIP
BY POSTERIOR OPEN APPROACH

W. B. FOLEY, OXFORD, ENGLAND

I have been much impressed by the rapidity and solidity of the extra-articular fusion of the hip joint that develops after osteotomy of the upper femoral shaft with insertion between the cut femoral surfaces of a strong and wide tibial graft which is driven into the ischium, as described by Brittain (1942). During the years 1942-44 I carried out the procedure described by Trumble (1937). A tibial graft was inserted between the tuber ischii and the shaft of the femur without osteotomy. In a small series of cases, all much younger than those described by Trumble, I found that the results were disappointing because the graft nearly always failed to fuse at either the ischial or the femoral end. Nevertheless, in performing Trumble’s operation I was struck by the excellent view gained of the sciatic nerve, the upper femoral shaft, and the lateral aspect of the pelvis. It seemed feasible to carry out the Brittain type of operation through this posterior approach under full vision, and with no risk of injuring the sciatic nerve. The first operation was performed in November 1945. Since then it has been done in nineteen other cases.

The patient is placed prone on the operation table, rather near to the operator’s side so that the greater trochanter is easily accessible. The limb on the affected side is draped separately so that it can be manipulated by the operator. In earlier cases I used Trumble’s skin incision, but this has now been modified as shown in Fig. 1. It extends from near the posterior-superior iliac spine to the upper part of the great trochanter, with vertical extension downwards as far as may be necessary to give good exposure of the lateral aspect of the subtrochanteric region.

The gluteus maximus muscle is split in the line of its fibres. Part of its fascial insertion and the fascia lata are divided in the subtrochanteric region. Wide retraction with self-retaining retractors gives full exposure of the sciatic nerve, the lateral aspect of the pelvis, the posterior part of the greater trochanter and upper femoral shaft, and the origin of the sciatic nerve.

**TECHNIQUE OF OPERATION**

The patient is placed prone on the operation table, rather near to the operator’s side so that the greater trochanter is easily accessible. The limb on the affected side is draped separately so that it can be manipulated by the operator. In earlier cases I used Trumble’s skin incision, but this has now been modified as shown in Fig. 1. It extends from near the posterior-superior iliac spine to the upper part of the great trochanter, with vertical extension downwards as far as may be necessary to give good exposure of the lateral aspect of the subtrochanteric region.

The gluteus maximus muscle is split in the line of its fibres. Part of its fascial insertion and the fascia lata are divided in the subtrochanteric region. Wide retraction with self-retaining retractors gives full exposure of the sciatic nerve, the lateral aspect of the pelvis, the posterior part of the greater trochanter and upper femoral shaft, and the origin of the sciatic nerve.

**Diagram of the gluteal region showing line of skin incision. (After Trumble.)*

**Diagram showing line of femoral osteotomy in relation to the pelvis and sciatic nerve.**

*Editorial comment—To be anatomically accurate the sciatic nerve in Fig. 1 should lie against the ischium. The old surface marking, half-way between the ischium and greater trochanter, is quite wrong. The anatomists tell us so, and I have confirmed it both in the cadaver and at the operation here described. Incidentally, is this not the ordinary Kocher posterior approach to the hip joint, and should it not be so described? Assistant Editor.*
vastus lateralis (Fig. 2). A tape is passed round the sciatic nerve so that it can be drawn gently backwards and medially. The quadratus femoris muscle, which is often obvious at this stage, serves as a useful guide to femoral levels. The angle between the under-surface of the femoral neck and the side of the pelvis is inspected. It is often wise to palpate with the finger in order to confirm the level, and make sure that there is an area of good solid bone opposite the shaft of the femur, usually part of the pelvis below the acetabulum and above the obturator foramen. In earlier cases I made the mistake of following Trumble's technique too closely and trying to place the graft posteriorly, towards the tuber ischii. This led to difficulty in fitting the graft because the femoral shaft is always in a plane in front of the ischial tuberosity. A point on the pelvis opposite the femoral shaft in the coronal plane must be selected (Fig. 3). It does not in the least matter what particular anatomical part of the pelvis this may be, so long as it is below the level of the acetabulum, and that it offers a sufficient area of solid bone for adequate penetration of the graft. When the line of the graft has been selected the vastus lateralis is split, and the periosteum of the femur is incised
Case 1. Male, aged eleven years. Old tuberculous arthritis of the right hip joint with fibrous ankylosis (Fig. 4). Three months after operation there is evidence of bone fusion (Fig. 5).

Case 2. Male, aged twenty-one years. Old tuberculous arthritis of the left hip joint with fibrous ankylosis and adduction deformity (Fig. 6). Two years later the radiograph shows hypertrophy of the bone bridge (Fig. 7). The adduction deformity has been corrected. Fusion is also occurring across the joint itself.
and retracted with bone levers so as to expose the subtrochanteric region. The femur is divided completely with a sharp thin chisel or osteotome, and the instrument is driven on until it can be seen or felt in contact with the selected area of the pelvis. When this has been confirmed, the chisel is driven in for a distance of from half to one inch.

If it is so desired, a radiograph may then be taken to check the alignment of the chisel and the depth of its penetration into the pelvis. Radiographic control is not essential because, even without it, both direction and penetration can be determined easily. The chisel blade can be seen or felt entering the pelvis and, if its length is known, the depth of penetration can be calculated by subtracting the length of blade up to the point of entrance into the pelvis from the known total length. It is still more simple to use a calibrated chisel. The same principle applies to the graft itself, provided that it is cut to a known length. Each of the first fifteen operations was done without radiographic control and later examination showed that there was no material error of direction or penetration of the graft. Nevertheless, radiographs taken during operation do offer an additional safeguard, and more recently I have used them.

The blade of the chisel should be approximately equal to the width of graft to be used—that is to say, the width of the subcutaneous surface of the donor tibia. If the instrument used is too narrow it should be withdrawn and re-inserted in such a way as to lengthen the slot in the pelvis. A second chisel can be driven in above or below the first, or a thicker bladed chisel substituted for it, in order to increase the size of the slot and facilitate engagement of the graft.

The chisel is left in position, and the wound is covered with a sterile towel. The opposite lower limb is then flexed at the knee joint and held by an assistant while a graft is cut in the manner described by Brittain. The peristeme is incised over the subcutaneous surface, completely stripped from the bone, and held retracted by two pairs of bone levers at the upper and lower limits. The length of graft should usually be five inches in an adult, and four inches in a child, thus leaving a short piece to be cut off after sufficient penetration of the pelvis has been obtained. The vertical saw-cuts should be along the margins of the subcutaneous surface of the tibia so that the graft will be as wide as possible, the saw blade being held obliquely in order to penetrate the medullary cavity. The ends of these longitudinal lines of section are joined by a transverse saw cut, vertical to the surface at the proximal end, but oblique at the distal end so as to bevel it.

The bevelled end of the graft is engaged between the cut ends of the femur with its cortical surface towards the hip. This stage is facilitated by longitudinal traction on the limb in order to distract the femoral fragments. The graft is driven carefully along the upper surface of the chisel blade till it reaches the pelvis; the chisel is then withdrawn and the graft is hammered into the slot. Alternatively the chisel may first be withdrawn and the graft be directed along its track. Penetration of the pelvis should usually be about one inch in adults and half an inch in children, this being checked by subtracting from the known total length of graft the distance measured from its free end to the point of pelvic penetration. A second radiograph may be taken in order to confirm the level and penetration of the graft. The projecting end is then removed with the motor saw, flush with the lateral surface of the femur, and the fascial, muscular and skin incisions are sutured.

At the end of the operation it will be found that the graft and upper femoral fragment are stable, but that the upper end of the lower fragment of the femur is fairly mobile against the under surface of the graft. This allows the surgeon to place the limb in the best position for fusion. It was sometimes thought that if the patient were turned to the supine position for the application of plaster there might be some risk of displacing the fragments. This has been avoided by applying a plaster spica with the patient in the prone position—which offers no special difficulty but calls for care in judging the position of the hip accurately. If post-operative radiographs show that an error has been made in alignment of the limb, this can
be corrected by sectioning the plaster and swinging the limb into the position of choice—a procedure that has been necessary in only two cases in this series. After eight or ten weeks the plaster spica is changed. In all but two cases there has at that time been firm clinical union with no detectable movement, or pain on handling. In nearly every case radiographs have shown union of the osteotomy. At this stage a short single spica with knee-jointed caliper extension to the shoe has been used, so that the patient can walk with normal knee action. This is retained for a further two months, or until there is radiographic evidence of sufficient fusion and consolidation to allow external support to be discarded. Illustrative radiographs are shown in Figs. 4–7.

**SUMMARY OF RESULTS**

Ischio-femoral arthrodesis by posterior open approach has been performed in twenty patients. Of these, one is still in hospital and is therefore excluded. In the other nineteen patients, operation was undertaken for tuberculosis of the hip joint in seventeen, and for osteoarthritis of the joint in two. There has been no mortality and no wound infection.

<table>
<thead>
<tr>
<th>Age of youngest patient</th>
<th>8 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of oldest patient</td>
<td>52 years</td>
</tr>
<tr>
<td>Average age</td>
<td>19 years</td>
</tr>
<tr>
<td>Longest follow-up period</td>
<td>3 years</td>
</tr>
<tr>
<td>Shortest follow-up period</td>
<td>8 months</td>
</tr>
<tr>
<td>Average follow-up period</td>
<td>20 months</td>
</tr>
</tbody>
</table>

There has been failure of fusion in only one case, that of an obese patient, aged fifty-two years, with osteoarthritis: nevertheless the functional result is satisfactory. In all other cases there was clinical and radiographic evidence of sound fusion. In practically every case this fusion was present at the time of removal of the first plaster, about ten weeks after operation. In a number of patients, especially the younger, there was some evidence of operative shock, and transfusion of blood or plasma during the operation is a wise precaution.

**SUMMARY**

1. An operation is described for ischio-femoral extra-articular arthrodesis of the hip joint by posterior open approach, based on the techniques of Trumble and Brittain.
2. The operation has the advantages of affording adequate exposure of the sciatic nerve trunk and permitting visual control of the alignment and penetration of the chisel and graft.
3. The operation has been performed successfully without serious shock or subsequent complications in eighteen cases, mostly of tuberculosis of the hip.

**REFERENCES**


THE JOURNAL OF BONE AND JOINT SURGERY