PRIMARY FUSION OF THE POSTERIOR SUBTALAR JOINT
IN THE TREATMENT OF FRACTURES OF THE CALCANEUM

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The calcaneum is so shaped and so related to the wedge-shaped inferior surface of the talus that when it is fractured the major impact usually falls on the posterior facet of the subtalar joint. This fact is well known. Reference has often been made to it (Malgaigne 1847, Böhler 1935, Watson-Jones 1943) and its importance was again emphasised in the admirable study of fractures of the calcaneum by Essex-Lopresti (1952).

The ultimate function of the foot after the calcaneum has been fractured depends mainly upon two factors: 1) what happens to the subtalar joint; and 2) how much secondary stiffness is allowed to develop in the foot. Osteoarthritis develops in a damaged and distorted subtalar joint and this complication is the main cause of late and prolonged disability. Another crippling complication is added if secondary stiffness is allowed to develop in the foot, as it will if the foot remains swollen or if it is immobilised in plaster after the injury. Treatment, therefore, should be governed by three considerations: the condition of the subtalar joint; the prompt control of swelling; and the maintenance of mobility of the foot.

TYPES OF INJURY TO THE SUBTALAR JOINT

When the fracture involves the subtalar joint there are three possibilities. First, the fracture may be only a crack without distortion of the joint surface or gross damage to the cartilage. If the calcaneum is protected from weight bearing until the bone heals, if swelling is controlled by bed rest, elevation and pressure bandaging, and if active exercises of the ankle and foot are practised from the beginning, there should not be any ultimate disability (Fig. 1).

Secondly, the joint surface may be so severely damaged that the subtalar joint fuses spontaneously. When this happens functional disability is often only slight. Figure 2 shows
the left calcaneum of a man who sustained bilateral calcaneal fractures with other injuries in a fall from a height—injuries so severe that attention was focused on them and the fact that his heels were broken was not noticed. His feet were not treated. He came under my care eighteen months after the accident for the treatment of an ununited fracture of the humerus with a radial nerve palsy. His feet did not trouble him. He walked from four to five miles and he stood throughout a football match. After successful treatment of his arm he is again working as a window cleaner. In spite of contrary opinions that have been expressed it is possible to work on ladders after fusion of the subtalar joint.

Thirdly, damage to and distortion of the joint surface of the calcaneum may be such that traumatic arthritis of the subtalar joint develops. The syndrome is well known. It is
characterised by pain in the heel on walking for a short distance even on a flat surface, sharp stabs of agonising pain on treading upon irregularities in the ground, and a commanding aching pain in the heel at the end of the day—"I don't know what to do with my foot in the evenings."

The patients in this last group are usually treated ultimately by subtalar fusion, often only after weeks or months of pain. This delay in definitive treatment is undesirable for three reasons: 1) disability is needlessly prolonged, perhaps even for months; 2) the patient suffers much avoidable pain; and 3) a "pain-pattern" may be developed in the cerebral cortex so that even successful subtalar fusion may fail to relieve the symptoms.

If the subtalar joint is distorted by the fracture it should be fused early. Fusion should be a part of the primary treatment, and should be undertaken as soon as the foot has recovered from the effects of the initial trauma. About three weeks from the time of injury has been found to be a suitable interval.

**DIAGNOSIS**

Distortion of the posterior articular facet of the calcaneum can often be recognised in the routine lateral view (Fig. 3). If it is not evident in this view an axial view (Fig. 4) or, better still, an oblique view (Fig. 5) (Anthonsen 1943, Bremner and Warrick 1950) must be studied before it is decided that there is not significant distortion of the joint surface. The term "significant" perhaps needs definition. The word distortion must be qualified. A fracture cannot involve a joint surface and not cause any distortion, but unless there is secondary displacement so that a step is formed the joint remains congruous when the fracture heals. The distinction is comparable to that which arises in the assessment of fractures of the head of the radius. The decision about the need for operation must depend on experience and the availability of radiographs of good quality taken in the correct axis.

**TREATMENT**

If there is significant distortion of the subtalar joint, operative fusion of the joint should be undertaken as a primary procedure. Fusion is indicated not because the displacement cannot be reduced—it can, as Gissane (1947) and Essex-Lopresti (1952) have shown—but because violence severe enough to displace the calcaneum has almost certainly caused irreparable damage to the articular cartilage. The programme therefore should be as follows. 1) Rest in bed with elevation of the foot in a pressure bandage usually for three weeks. Occasionally the post-traumatic swelling and ecchymosis subside rapidly so that fusion may be undertaken sooner, but not often. During this waiting period the toes, foot, and ankle should be exercised actively for five minutes every waking hour. 2) Posterior subtalar fusion by the posterior approach first described by Gallie (1943).

**Operation**—The patient is prone, the limb is exsanguinated and a pneumatic tourniquet is applied to the thigh. A four-inch incision is made along the lateral border of the tendo calcaneus. The pad of fibrous-fatty tissue which lies under the tendon should be excised—if it is simply incised it is difficult to retract and it gets in the way. A well defined layer of deep fascia covers the
muscle on the back of the tibia; when it is incised the fibres of the flexor hallucis longus are recognised by their medial obliquity. This muscle is retracted medially, and the posterior tibial neurovascular bundle is safe on the medial side of it and its tendon. The lower end of the peroneal artery lies close against the fibula. It is of variable size and because it may be large care should be taken to avoid it. The ankle joint is easily recognised—it can be identified beyond doubt by movement of the foot—and the subtalar joint is seen just below it covered by the posterior talo-fibular ligament (Fig. 6). The shape of the posterior aspect of the talus is not constant. It may be deep or shallow, the posterior process may be well developed and tongue-like, or it may be almost non-existent. It is therefore helpful to have a lateral radiograph of the foot on the viewing box in the operating theatre. If the joint cannot be seen with certainty it can be identified with a scalpel. The articular cartilage is excised from both surfaces with a thin-bladed osteotome as far forward as the sinus tarsi. The excision of cartilage may be awkward at first; it rapidly becomes easier as the joint is opened. The cavity is firmly packed with cancellous bone from the patient’s iliac crest or from the bone bank. Only the skin has to be sutured and a pressure bandage is applied, not a plaster.

After-treatment—This follows the same lines as the treatment during the period of pre-operative waiting and is directed to the same ends—the control of swelling and the maintenance of mobility. Active exercises are practised regularly from the first. The foot is elevated in a pressure bandage. As soon as the swelling is under control the patient may begin to get up with viscopaste or some similar supporting bandage on the foot. Regular non-weight-bearing exercises are continued throughout the convalescence; these movements do not interfere with fusion of the subtalar joint. Weight bearing is not allowed until there is radiographic evidence of fusion, usually at eight to ten weeks from operation.

### TABLE 1

**Details of Nine Patients with Fractures of the Calcaneum Treated by Posterior Subtalar Fusion (Fractures Bilateral in One Case)**

<table>
<thead>
<tr>
<th>Case</th>
<th>Sex</th>
<th>Age (years)</th>
<th>Interval before operation</th>
<th>Return to work after operation (months)</th>
<th>Time of follow-up (years)</th>
<th>Occupation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M</td>
<td>17</td>
<td>1 year</td>
<td>4</td>
<td>1</td>
<td>Electrician</td>
</tr>
<tr>
<td>2</td>
<td>M</td>
<td>22</td>
<td>3 weeks</td>
<td>4</td>
<td>2</td>
<td>Labourer in bakehouse</td>
</tr>
<tr>
<td>3</td>
<td>M</td>
<td>29</td>
<td>4 weeks (bilateral)</td>
<td>11*</td>
<td>2</td>
<td>House-painter</td>
</tr>
<tr>
<td>4</td>
<td>M</td>
<td>41</td>
<td>3 weeks</td>
<td>6</td>
<td>3</td>
<td>Window-cleaner</td>
</tr>
<tr>
<td>5</td>
<td>M</td>
<td>35</td>
<td>4 weeks</td>
<td>4</td>
<td>3</td>
<td>Builder’s labourer</td>
</tr>
<tr>
<td>6</td>
<td>M</td>
<td>56</td>
<td>3 weeks</td>
<td>7</td>
<td>4</td>
<td>Coal-trimmer</td>
</tr>
<tr>
<td>7</td>
<td>M</td>
<td>61</td>
<td>7 weeks</td>
<td>9</td>
<td>4</td>
<td>Street-hawker</td>
</tr>
<tr>
<td>8</td>
<td>F</td>
<td>48</td>
<td>3 weeks</td>
<td>4</td>
<td>5</td>
<td>Housewife</td>
</tr>
<tr>
<td>9</td>
<td>M</td>
<td>43</td>
<td>8 months</td>
<td>10*</td>
<td>5</td>
<td>Labourer in foundry</td>
</tr>
</tbody>
</table>

* Return to work delayed by compensation difficulties.

### RESULTS

Fourteen patients with fractures of the calcaneum have been treated in this way. In four, the operation was less than one year before the review and one did not report for review; one patient had a bilateral injury. Therefore ten fractures of the calcaneum are studied.
CASE 5—Three years after posterior subtalar arthrodesis.

CASE 7—Four years after posterior subtalar arthrodesis.

CASE 8—Five years after posterior subtalar arthrodesis.
In all, sound bony fusion of the subtalar joint was secured by the method described without post-operative plaster fixation. All returned to full work. None of the jobs was sedentary and some of them were heavy and rough. The average time between operation and return to work was six and a half months—if the two patients in whom the interval was longest and whose resumption of work was delayed by compensation difficulties are discounted, the average time was five and a half months. The results are summarised below and are tabulated in Table 1. All were in full work at the time of review.

SUMMARISED CASE REPORTS

Case 1—Man aged seventeen. First seen one year after injury with typical subtalar arthritis syndrome and operated upon. Returned to work as electrician four months later—ladders and scaffolding. Review one year.

Case 2—Man aged twenty-two. Operation three weeks after injury. Returned to work as labourer in bakehouse four months after operation. Review two years.


Case 4—Man aged forty-one. Operation three weeks after injury. Returned to work as window-cleanner six months after operation. Review three years.

Case 5—Man aged thirty-five. Operation four weeks after injury. Returned to work as a builder’s labourer four months after operation. Review three years (Fig. 7).

Case 6—Man aged fifty-six. Operation three weeks after injury. Returned to work as a coal-trimmer seven months after operation (delayed by compensation). Review four years.

Case 7—Man aged sixty-one. Operation seven weeks after injury (delayed by dental sepsis). Was working as a labourer when he was injured; returned to work as a street-hawker—’Can do owt wi’ t’ foot.’” (May be translated, “does not consider that the condition of the foot constitutes a material disability,” but should not be translated.) Review four years (Fig. 8).

Case 8—Woman aged forty-eight. Operation three weeks after injury. Returned to housework four months after operation. ”Lives up fifty-six stairs—no disability.” Review five years (Fig. 9).

Case 9—Man aged forty-three. Operation eight months after injury—when first seen. Returned to work as a labourer in a foundry ten months after operation (delayed by compensation). Review five years.

SUMMARY AND CONCLUSIONS

1. A small series of fractures of the calcaneum with distortion of the subtalar joint has been reviewed.
2. All were treated by subtalar fusion, in most as part of the primary treatment.
3. In all patients the subtalar joint fused by bone without post-operative plaster immobilisation.
4. Plaster immobilisation is not only unnecessary, it is undesirable.
5. Heavy work, including work on ladders and scaffolding, can be undertaken after subtalar fusion.

REFERENCES


