

FRACTURES OF THE CALCANEUM: THE ANTEROLATERAL FRAGMENT

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Our previous reports on the pathological anatomy and operative treatment of intra-articular fractures of the calcaneum failed to take account of the fracture pattern anterior to the posterior facet of the subtalar joint. We have reviewed our experience of 63 operative cases and have studied fractures with axial and coronal CT scans reconstructed onto plastic model bones.

A constant anterolateral fragment exists, which is displaced by an extended lateral approach to the fracture. If it is unrecognised and unreduced, union in a displaced position may limit hindfoot eversion and disrupt the calcaneocuboid joint. We describe techniques for reduction and fixation of the fragment.

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We have previously defined the pathological anatomy of fractures of the calcaneum as they affect the posterior part of the bone and described a new approach for open reduction and internal fixation (Eastwood, Gregg and Atkins 1993a; Eastwood, Langkamer and Atkins 1993b). Increasing experience has made us aware that the result may be compromised by inadequate reduction and fixation of the calcaneum *anterior* to the angle of Gissane.

We now report our investigation of a constant anterolateral fragment, describe the effects of residual displacement, and suggest methods for its reduction and fixation.

MATERIALS AND METHODS

From October 1988 to October 1992, the senior author (RMA) treated 93 intra-articular fractures of the calcaneum. In 63 of these cases the fractures were fixed by the methods outlined previously (Eastwood et al 1993a,b)

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and the results have been reviewed in all by serial radiography and in selected cases by CT after the removal of metal. In 26 cases in which both axial and coronal CT scans were available we studied the anterolateral fragment, making reconstructions on a plastic model calcaneum (Adam Rouilly, London, UK) to define its size and displacement.

RESULTS

Genesis and description of the anterolateral fragment.

In an intra-articular fracture of the calcaneum the primary fracture line splits the posterior facet of the subtalar joint from posterolateral to anteromedial dividing the bone in a roughly vertical direction and propagating forwards, often involving the calcaneocuboid joint (Thoren 1964). The secondary fracture line extends laterally just anterior to the posterior subtalar joint passing to the lateral wall of the calcaneum in the region of the peroneal tubercle (Essex-Lopresti 1952). A fragment is created which includes the lateral part of the calcaneocuboid joint and the lateral wall of the calcaneum anterior to the level of the peroneal tubercle.

At operation both fracture lines can be readily identified, but in addition, there is a further constant fracture line which runs horizontally beneath the peroneal tubercle, separating the fragment described above into upper and lower parts. The lower anterolateral fragment is a thin piece of cortical bone not involving the calcaneocuboid joint and is of little clinical significance. We term the upper part of this fragment the anterolateral fragment (Figs 1 and 2).

This anterolateral fragment was a single piece in 54% of cases, and comminuted in the remainder. Preoperative axial and coronal CT scans showed that the fragment was undisplaced in 59% of cases, but displaced in the more severe fractures.

Significance at operation. When the calcaneum is approached through an extended lateral approach (Eastwood and Atkins 1992) the peroneal tendons are elevated with the anterior part of the flap. If the tendons are still held to the bone in the region of the peroneal tubercle, the anterolateral fragment is displaced superiorly with them. When the wound is closed at the end of the operation, there may be partial reduction of this fragment, but some vertical displacement will remain (see Fig. 1) and the

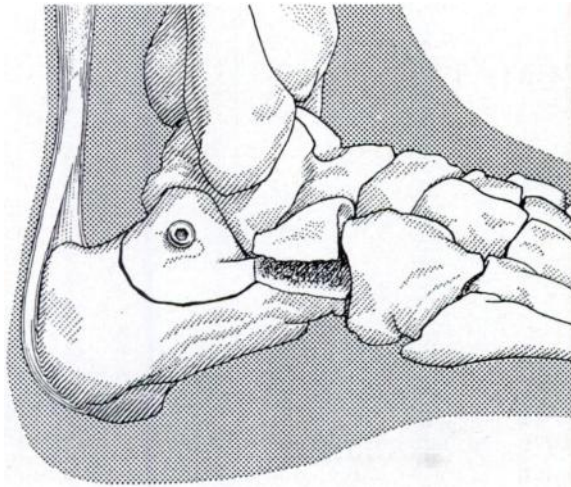


Fig. 1



Fig. 2

Figure 1 – Diagram showing displacement of the anterolateral fragment, persisting after the reduction and fixation of the lateral joint fragment. The fragment is seen to abut against the talus, blocking eversion. Figure 2 – Axial CT scan of a fractured calcaneum showing the anterolateral fragment. This includes the peroneal tubercle and about 50% of the calcaneocuboid joint surface at this level (ALF, anterolateral fragment; C, cuboid; SF, sustentacular fragment; B, body fragment).

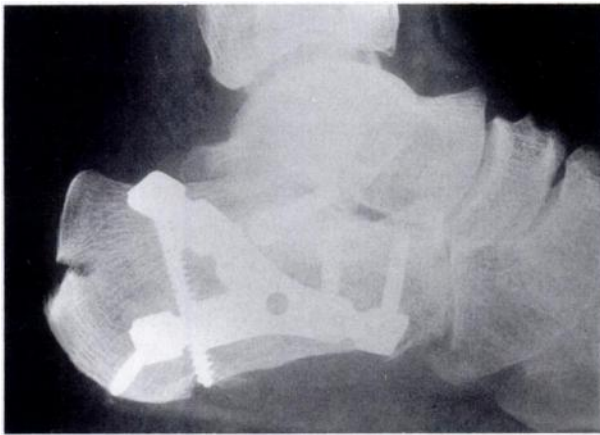


Fig. 3a

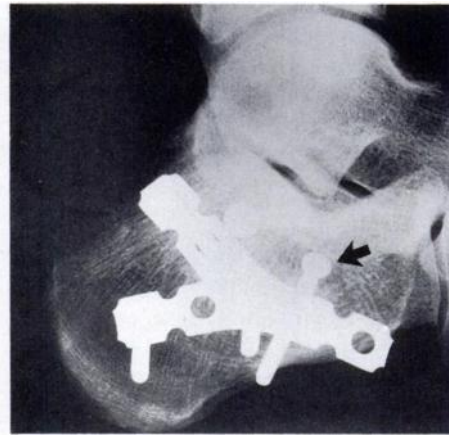


Fig. 3b

Lateral radiographs of two cases of fractured calcaneum after internal fixation. Figure 3a – The crucial angle of Gissane is 'filled in' by the unreduced anterolateral fragment. Figure 3b – In this case the angle is re-established by adequate reduction of the fragment, held by a screw passing into the body fragment (arrow).

fragment will heal in this position. The residual displacement may then be seen as apparent 'filling in' of the crucial angle of Gissane on a lateral radiograph (Fig. 3a) or on a coronal CT scan (Fig. 4). After union of the fracture, patients with this displacement complain of painful inability to evert the hindfoot which is caused by impingement between the talus and the displaced anterolateral fragment.

At the primary operation, it is easy to reduce the anterolateral fragment by subperiosteal dissection beneath the peroneal tendons. If it is large, it can usually be stabilised by placing it under the anterior limb of the Y plate. Alternatively, it may be fixed by a screw passed through it into the sustentaculum tali, or posteroinferiorly into the body of the calcaneum (Fig. 3b).

Rarely, it has been necessary to excise a small

fragment of cortical bone from within the crucial angle of Gissane because it could not be adequately stabilised. We have seen no adverse effects from this excision.

DISCUSSION

The anterolateral fragment which we describe is a consistent feature of intra-articular fractures of the calcaneum, but it is usually little displaced. When a calcaneal fracture is approached by a limited lateral incision (Soeur and Remy 1975; Stephenson 1987) or a medial incision (Burdeaux 1983), the anterolateral fragment may remain undisplaced and unite in this satisfactory position. The use of the extended lateral approach (Eastwood et al 1993b) provides better exposure but inevitably causes displacement of this fragment. It is

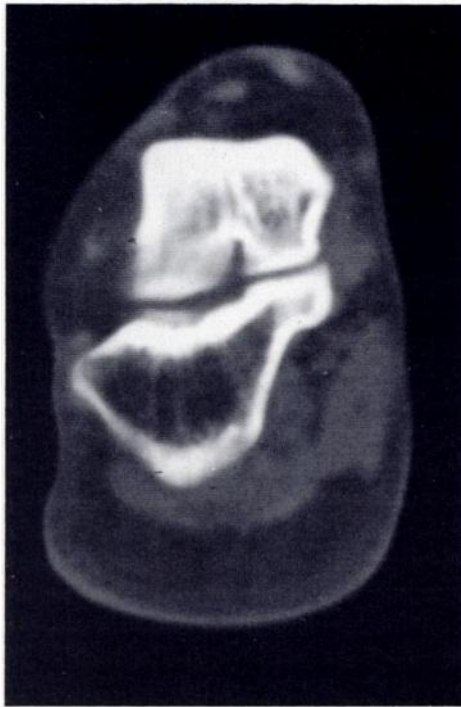


Fig. 4a



Fig. 4b

A coronal CT scan of the calcaneum shown in Figure 3a after the removal of metal fixation (Fig. 4b). The normal side is included for comparison (Fig. 4a). The posterior part of the subtalar joint had been accurately reduced, but the anterolateral fragment is shown to remain displaced. This patient had a generally satisfactory result, but hindfoot eversion was limited and painful (ALF, anterolateral fragment; ST, sustentaculum tali; T, talus).

therefore necessary separately to reduce and fix the anterolateral fragment.

Failure to correct its displacement may cause limitation of eversion of the foot and degenerative changes in the calcaneocuboid joint. This will compromise the potentially good result obtained from anatomical reduction and fixation of the posterior part of the calcaneum.

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