Trimalleolar Fractures: Late Results After Fixation of the Posterior Fragment

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ABSTRACT: From 1969 to August 1981 60 trimalleolar fractures were operated on with fixation of the posterior fragment. A late follow up (average 8 years) including radiographs was possible in 45 patients. In 36 patients, there are no complaints and full function has been obtained. Films of the articulation are normal in 17 cases and show isolated osteophytes in 19. Five patients show some benign arthrosis but only occasional pain and slightly reduced function; four patients show severe arthrosis caused by clearly visible operative technical faults. Depressed areas in the articular surface were present in ten patients. Their prognosis is doubtful. Thus, a correctly reduced and fixed posterolateral fragment helps avoid or reduce postoperative arthrosis in trimalleolar injuries.

Introduction

For more than 20 years, internal fixation and functional post-treatment of displaced malleolar fractures have been generally accepted. The late results proved to be better than those of conservative treatment, provided perfect reduction and stabilization are achieved. This additional injury is serious because it affects the most sensitive area of the articular surface. In the French literature, it is considered as a fracture of the pilon tibial, which is true from a purely anatomic point of view. Since it is mainly the effect of shearing forces, however, the English- and German-speaking worlds consider it to be a severe additional lesion of malleolar fractures.

This fragment also constitutes the posterior margin of the incisura fibularis and may influence the position and the stability of the fibula itself. The existence of such a fragment implies a circular lesion of the ankle joint and is mentioned in the AO classification of malleolar fractures as the most severe injury.

Although Boehler proposed internal fixation more than 35 years ago and the AO authors have consistently selected this procedure, pessimism regarding it persists, even among experienced surgeons. Indeed, the reduction and fixation technique is associated with some difficulties and requires time, a change of positioning sometimes, and additional radiographic monitoring. We advocate open reduction with internal fixation for articular posterolateral fractures and have systematically documented our cases since 1969, using the techniques described below.

Operative Technique

Reduction and fixation of the lateral and medial malleoli precedes access to the Volkmann fragment, for which the positioning and the incisions must be planned beforehand. If the fragment is large, we prefer to access the fracture on the posteromedial side (Fig 1). After a long incision of the sheath of the tendo posterior tendon, the medial border of the fragment is immediately encountered. The tendons and the neurovascular bundle are retracted dorsally. The tip of the fragment is visualized after incision of the thick peristeum. It is then reduced with a pointed hook and provisionally fixed with forceps. The fixation can be achieved from the anteromedial side or through a small, separate, anterolateral incision. We generally use two lag screws and washers to control rotation.

For smaller fragments, we favor the posterolateral approach (Fig 2). The fascia between the peroneal and the flexor muscles is incised. The reduction is again obtained by visualization of the tip of the fragment. Drilling from the dorsal aspect poses some danger of injuring the articulation, but the "direct fixation" allows strong compression, which is especially valuable in cases of small articular depression.

Following stable fixation of the posterolateral fragment there is full functional postoperative treatment with floor contact, as is used for other, simpler ankle fractures.

Material

Between 1969 and the summer of 1981, internal fixation of articular posterolateral fragments was performed in 60 patients at the author's institution. A preliminary report of the first 42 patients in 1986 showed that some results were...
Fig 1: Indirect screw fixation. Large incision of the posterior tibial canal (A). Incision of the periosteum to visualize the tip of the fragment (B). Reduction by traction, provisional fixation with pointed forceps (C). Cross sectional view of the screw fixation, parallel to a Kirschner guide wire (D).

Fig 2: Direct screw fixation. Access between the peroneal and the flexor tendons, exposure of the tip of the fragment (A). Cross sectional view of the screw fixation (B). The peroneal tendons are retracted laterally, the Achilles and the flexor tendons laterally.
not sufficiently conclusive. At the end of 1988 we were able to reevaluate eight patients and found three additional cases. Of the remaining 15, two had died (leukemia and heart failure), but the surviving relatives reported that these patients had no complaints and full walking range. One patient refused to participate in the follow up, claiming that function was completely restored. Twelve could not be located.

Forty-five patients were evaluated by radiographic records and personal examination or by means of a schematized form. Forty patients were women, and 15 were men. Average age was 50 years at the time of the accident (range 18 to 75 years). Causes of the original injuries were skiing (10); other sports (3); and other accidents (29). All fractures were closed. In the AO classification, there were 20 type B, 16 type C1 and C2, and 8 type C3 “Maisonneuve.” One patient had an isolated fragment with no other skeletal lesion.

On the basis of radiographs, the fragments were judged large in 21 patients and small or “probably small” in 24. A posterior dislocation of the talus was found in 21 films (15 large and 6 small fragments). Depressed areas of the articular tibial surface existed in ten cases, of which six were not visible on the first radiographs (eight had a small and only two a large fragment).

ORIF of the malleolar fractures was performed as an emergency the day of the accident itself or the next day, except in two cases. For the posterolateral fragment, the indirect screw technique (from the anterior side) was used in 25 cases, the direct screw technique (from the posterior side) was used in 20 cases. There was no problem of scarring or other early complications.

Results

Four patients showed a severe arthrosis, of which three were early observations after 2 years 4 months, 5 years, and 5 years 10 months. Since the fate of these articulations had manifested, there was no reason for a later evaluation.

The remaining 41 patients were called a second time to get the latest possible result, if necessary. The delay between accident and follow up of the whole group averaged 8 years and 4 months. In two patients the control time was under 5 years (3 years 3 months; 4 years 2 months); unfortunately, they could not be located later. In 13 patients, the delay was more than 10 years; the longest being 13 years 5 months.

The quality of the radiographs, coming from different sources, was unequal. There were no comparisons with the uninjured side or investigations with the joint under stress. It was possible, however, to consider such factors as follow up, complaints, walking performance in the elderly, and sports activities in the younger patients (Figs 3-4). By this procedure, we arrived at a simple and reliable gradation in three stages of arthrosis with the characteristics shown in the Table.

Discussion

The first concern is the dimension of these fragments in proportion to the supporting articular surface. This factor is often discouragingly difficult to evaluate on the first radiographs. The surgeon then decides to consider it as small, expecting it to reduce itself spontaneously with the fibula settling into a correct position. In fact, this sometimes occurs. I question the feasibility of exact measurement and prefer simply to designate the articular fragment as large or small. Systematic CT scan examinations have shown that the fragments are usually larger than suspected and are sometimes even comminuted.

Depressed areas in the articular surface created by the dislocated talus are present but are usually not recognized in the first x-ray (Fig 5). These may enlarge the lesion considerably.

For all of these reasons, we consider every true articular fragment (clinically, approximately 50% of all posterior avulsions) as an indication for internal fixation.

To date there has been no proof that postoperative arthrosis can be avoided or reduced by a correct and stable internal fixation. Available statistics deal only with malleolar fractures in general and do not focus on this specific area.

The radiologic signs of a beginning arthrosis are visible comparatively early, but the evolution may be very different. The material of the AO documentation center in Berne has been questioned, but the late follow up comprises rarely more than 14 months. From the thorough research of late follow up in tibial pilon fractures, we know that the final state of arthrosis of the ankle joint should not be judged before 5 years, and that there is little further change. Some improvement seems even possible. Our statistics confirm these results.

Other details that can be deduced from our statistics are:

1. The type of the fibular fracture and its location do not influence the prognosis if reduction is performed correctly. This applies especially to Maisonneuve fractures—high subcapital fibular fractures in which all ligaments of the ankle are torn. This most severe injury of all malleolar fractures occurred in eight of our cases. Three of these patients are in stage 0, 4 in stage 1, and only 1 in stage 2. The prognosis of these fractures depends highly on the whole management and not only on the posterior fragment alone.

2. The prognosis of the large Volkmann triangle is as follows: Among 21 patients 8 are in stage 0, 9 in stage 1, but 4 in stage 2. In 17, the screws were inserted from the anterior side (indirectly). This classic technique for extremely big fragments gives good results, but the four patients in whom screws were inserted dorsally (directly) are in stage 0 or 1.

3. In 16 of 24 patients with a small fragment, the dorsal (direct) approach was used. Eight of these patients are
Fig 3: Female patient, age 53. Trimalleolar fracture, type B, with depressed articular area (A). Direct screw technique with compression (B). After 8½ years (439 weeks), normal radiograph (C). Full function, no complaints.
Fig 4: Female patient, age 39. Trimalleolar fracture type B (A). Indirect screw technique, imperfect reduction of the posterior fragment (B). After 11 years (567 weeks), irregularity and reduction of the joint space, subchondral sclerosis (arthrosis stage 2) (C). No complaints clinically, no functional limitation.
Fig 5: Female patient, age 50. Trimalleolar complex fracture, type C (A). Indirect screw technique for the posterolateral fragment (B). After 8 years (399 weeks), normal radiographs (arthrosis stage 0) (C). After 12 years (592 weeks), posterior osteophyte, slight anterior irregularity (arthrosis stage 1) (D). Full function, no complaints.
in stage 0, 7 in stage 1, and only 1 in stage 3 (technical error). For the eight cases in which screws were inserted anteriorly (indirectly), the outcome is significantly worse: none are in stage 0, 4 are in stage 1, 1 in stage 2, and 3 in stage 3 (technical errors). This shows that the more demanding and stable posterior technique is preferred if the fragment is small or if its size is in doubt.

4. Depressed areas in the articular surface were found in ten patients. The reduction is difficult, the prognosis poor. Only 1 is in stage 0, 3 are in stage 1, 3 in stage 2, and 2 in stage 3. By a hard pressure on the fragment from the dorsal side, the subluxation of the talus may be reduced and small depressed areas compressed. The indirect anterior technique showed only unfavorable results (four patients in stage 2 or 3).

5. The dislocation of the talus (21 x-rays) seems to have a worse prognosis. We find 13 patients in stages 0 and 1, 5 in stage 2 and two in stage 3 after excluding operative faults. But we must assume that the effective number of dislocations is higher because visible deviations of the foot are usually reduced before radiographic examination.

6. Conversely, slightly displaced posterior fragments without a suspicion of dislocation have a remarkably good prognosis in our statistics.

7. Elderly people have no more arthrosis than younger individuals. At the time of the accident, 14 patients were over 60 years old. Of those, we find 8 in stage 0, 3 in stage 1, only 2 in stage 2 and 1, after technical error, is in stage 3.

Conclusions

Our late follow up shows that an anatomically reduced and correctly stabilized posterior fragment does not lead to arthrosis. The four severe arthrosis cases (approximately 10%) were due to technical errors. Arthroses of middle severity, unchanged over many years, follow minor technical problems or incompletely reduced depressions (five patients, approximately 12%). Thirty-five patients (more than 75%) have no complaints and full function and are in radiologic stage 0 or 1. The more demanding screw technique from the dorsal (direct) approach seems to give better results than the indirect technique (especially for small fragments and depressions).

References


Table 1

<table>
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<tr>
<th>Stage</th>
<th>No of Patients</th>
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<tbody>
<tr>
<td>0</td>
<td>Normal articulation (see Fig 4).</td>
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<tr>
<td>1</td>
<td>Isolated osteophytes, no irregularity of the articulation (see Figs 3 and 4). The patients of stages 0 and 1 are pain-free and show a full function including sport activities in younger patients.</td>
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<td>2</td>
<td>Irregularities of the joint space, plain osteophytes, subchondral bone sclerosis (see Fig 5). Clinically, these patients were often pain-free or had mild changing complaints; their walking range was rarely reduced. This moderate arthrosis appeared to be caused by some imperfections of the operative technique.</td>
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<td>3</td>
<td>Severe posttraumatic arthrosis: near obliteration of the articular space. Clinically, these patients had severe pain, limitation of walking distance, ankle edema, etc. caused by operative faults (three incomplete reductions of the posterolateral fragment, one shortening of the fibula). (See above.)</td>
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