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Trimalleolar Fractures with Impaction of the Posteromedial Tibial Plafond: Implications for Talar Stability

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ABSTRACT

***Background*: Trimalleolar fractures usually include a lateral malleolar fracture, a triangular fracture of the posterolateral corner of the tibial plafond, and a horizontal or oblique fracture of the medial malleolus. A subtype of a trimalleolar fracture is reported, differing in the shape and extent of the medial malleolar fracture and the posterior lip fracture, with implications for treatment. *Methods:* In a 3-year period, 10 patients were treated for a trimalleolar fracture with a multifragmentary transverse fracture of the entire posterior tibial lip, including the posterior colliculus of the medial malleolus. The radiographs of all patients showed a pathognomonic double-contour or flake-fragment sign above the medial malleolus. One patient's posteromedial fracture was not initially recognized and he had a standard lateral fracture repair. A double posterior approach was used in nine patients, with fracture repair proceeding from medial to lateral. Intraoperatively, eight of nine patients had impacted osteochondral fragments at the posteromedial corner of the tibial plafond that blocked anatomic reduction and allowed posteromedial subluxation of the talus. *Results:* Nine patients had anatomic reconstruction of the posteromedial corner. All fractures healed, and function was normal at one year. One patient had moderate loss of joint space. The patient with the malunited fracture developed symptomatic posteromedial instability of the talus and required an osteotomy of the malunited fragment. He had a good result at 18 months. *Conclusions:* This unique subtype of trimalleolar fracture has distinct radiological features and implications for the strategy of the operative treatment. If recognized immediately and treated appropriately, the results were excellent. If missed initially, reconstructive osteotomy was possible and led to a good result.**

Key Words: Impaction; Posteromedial Plafond; Trimalleolar Fracture

INTRODUCTION

Malleolar fractures with posterior dislocation of the ankle frequently include an avulsion fracture of the posterolateral triangular fragment (posterior malleolus). Its size is variable, ranging from an extraarticular flake fracture to large articular fragments of up to 40% of the sagittal diameter of the articular surface. The fragment typically is triangular, with its base lateral, from a posterior and an inferior view (Figure 1). A medial malleolar fracture in this context usually presents as a transverse or short-oblique fracture at the level of the tibiotalar joint. During the injury, the posteriorly dislocating talus may impact the posterior (usually lateral) edge of the tibial plafond and may detach additional osteochondral fragments. If these are large enough, they may block anatomic reduction and prevent restoration of normal joint relationship and stability.

In a 3-year period 10 patients were treated for trimalleolar fractures with a different morphology of the posterior tibial lip fracture. All fractures were found to have distinct radiological features and a constant intraoperative anatomy. The entire posterior tibial lip, including the posterior half of the medial malleolus, was fractured. The posteromedial fragment was always larger than the posterolateral fragment. Additionally, osteochondral fragments were detached from the posteromedial tibial plafond (Figure 2). This resulted in a substantially larger defect of the posteromedial than the posterolateral tibial plafond, which was thought might cause posteromedial subluxation of the talus, so the defect was repaired. This hypothesis was found to be clinically relevant when a patient with symptomatic posteromedial talar

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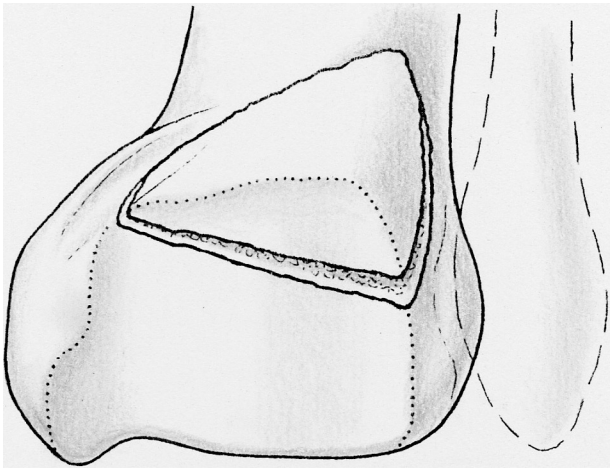

Fig. 1: The usual posterior lip fragment (posterior malleolus) is of triangular shape with its base laterally. The fracture line exits medially short of the posteromedial corner of the tibial plafond.

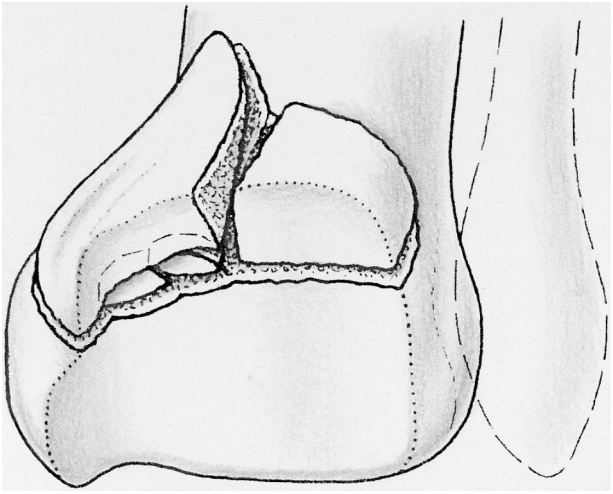

Fig. 2: The fracture described here comprises the entire posterior tibial lip, including the posterior half of the medial malleolus (posterior colliculus). Typically, there are two main fragments: a larger posteromedial and a smaller posterolateral fragment. One or two additional impacted osteochondral fragments are found at the posteromedial corner. The posterior tibial tendon runs obliquely over the middle of the medial fragment (groove).

instability was seen. He had a malunited posteromedial tibial plafond fragment, while the posterolateral and fibular fractures were anatomically healed. The malunited fragment was corrected, and the patient's symptoms disappeared. This subtype of trimalleolar fracture is unique and relevant, with implications for radiological assessment and operative treatment.

MATERIALS AND METHODS

This is a retrospective analysis of 10 consecutive patients treated by the author from May, 2000, to December, 2002. All patients gave their informed consent, and the study was approved by the institutional review board. Patient data are summarized in Table 1 (patient 1 is the patient who presented late with the malunited fragment).

Fracture Anatomy

Unlike the well-known morphology of the usual posterior lip fragment (see Figure 1) this fracture presents next to the AO-type B or C fibular fracture[10] as an avulsion fracture of the entire posterior tibial lip, including the posterior half (posterior colliculus) of the medial malleolus. There are usually two main posterior fragments: the posterolateral fragment is the smaller of the two and rectangular in shape, while the posteromedial fragment is larger and triangular in shape and is in one piece with the posterior half of the medial malleolus. Additional osteochondral fragments are detached (nine of 10 patients) from the posteromedial plafond. They are dislocated proximally and impacted under or into the posteromedial fragment (see Figure 2).

Radiological Presentation

The posterior and medial malleolar fractures are not directly visible on the anteroposterior (mortise) view, because both are oriented in the frontal plane. However, since the fracture extends into the medial cortex of the tibial epiphysis and metaphysis, the edge of the dislocated fragment produces a radiological double contour medially above the medial malleolus (Figures 3 and 4). This was seen in all the patients except one, in whom several flake fragments were seen in the same location, implying the presence of a fracture medially. If one of these signs is seen on the initial radiographs or on the radiographs after closed reduction of the dislocation, further assessment with computed tomography (CT) should be obtained. The sagittally-reconstructed CT images (Figure 5) show the large posteromedial fragment, which includes the posterior half of the medial malleolus. The posterolateral fragment is smaller and carries only a minor surface of articular cartilage. Osteochondral fragments are detached from the posteromedial plafond (nine of 10 patients), and are dislocated proximally, under the posteromedial fragment. The resulting large articular defect is well visible. Two of 10 patients had an additional avulsion fracture of the tip of the anterior half of the medial malleolus.

Operative Technique (Acute Fractures)

The patients were positioned prone, with a bolster or towel roll underneath the distal lower leg to allow the foot to hang freely. Thus, the talus reduced spontaneously. A standard posterolateral approach to the distal tibia was used, entering through the interval

Table 1: Patient Data

Pat No	Age	AO Class	Disloc	Rx Sign	Size ptlf	Imp fg	F-up	Rx	Score
1	31	44C2.3	yes	dc	29	yes	18	18	83
2	71	44B3.2	no	dc	26	yes	30	12	100
3	43	44B3.2	yes	dc	25	yes	29	12	100
4	46	44C3.3	yes	ff	20	yes	17	17	100
5	36	44B3.2	yes	dc+	19	yes	12	12	100
6	40	44B3.2	yes	ff	19	no	12	12	100
7	42	44C2.3	yes	dc	21	yes	12	12	90
8	70	44B3.2	yes	dc	27	yes	10	10	90
9	69	44B3.2	yes	dc	20	yes	10	10	90
10	54	44B3.2	no	dc+	13	yes	12	12	90

AO class: AO-ASIF classification.[10]
Disloc: fracture with posterior dislocation at first presentation.
Rx sign: radiological sign indicating posteromedial corner fracture (dc = double contour, ff = flake fragment, + = additional fracture of the tip of the anterior colliculus of the medial malleolus).
Size ptlf: Size of the posterior tibial lip fragment in percentage of the sagittal tibial plafond diameter, measured on the lateral radiograph (after reduction of the dislocation).
Imp fg: presence of impacted osteochondral fragments at the posteromedial tibial corner.
F-up: Clinical follow-up in months.
Rx: Radiological follow-up in months.
Score: AOFAS ankle-hindfoot score.[4]

between the peroneal and the flexor hallucis longus muscles. The fracture line between the posterolateral and the posteromedial main fragment was identified, and the periosteum was incised. The two fragments were elevated to either side (Figure 6). The lateral fragment was hinged on the posterior tibiofibular ligament, and the medial fragment was hinged on the posterior tibial tendon sheath. If the distal fibular fracture was proximal (AO-type C), it was mobilized through the same interval between the flexor hallucis longus and the peroneal muscles. If it was a low fracture (AO-type B), posterior subcutaneous dissection to the posterolateral border of the fibula was carried out. The tibiotalar joint was inspected, and the impacted osteochondral fragments (usually one large fragment or two smaller fragments) were freed. They were anatomically reduced and fixed by being squeezed underneath the reduced posteromedial fragment. Having the posterolateral fragment still elevated at this stage seemed to offer a better view of the posteromedial corner than if the posterolateral complex (fibula, posterior tibiofibular ligament, and posterolateral fragment) was fixed first. Next, the posterolateral fragment was reduced and both were preliminarily fixed with a Kirschner wire. Although the entire posterior tibial plafond was well visible from the posterolateral approach, it was not possible to place adequate fixation from there into the posteromedial fragment without overstretching the soft tissues. A posteromedial incision was therefore made along the posterior tibial tendon. The medial edge of the posteromedial fragment was identified, always with still a few millimeters of posterior displacement. Distally the fracture was seen to separate the posterior colliculus of the medial malleolus from the anterior colliculus. Space for placement of screws or plates into the posteromedial fragment was limited, because the posterior tibial tendon runs directly over the main portion of the fragment. It was elected not to elevate the tendon off the fragment but rather to place the fixation at the periphery of the fragment to minimize the disturbance of its vascularity and to eliminate the potential of hardware interference with the tendon. A 2.7-mm 1/4-tubular plate was fixed in an antiglide fashion over the proximal medial edge of the fracture (Figure 7). The split medial malleolus was fixed with a single posteroanterior lag screw. Returning to the posterolateral approach, the lateral edge of the posteromedial fragment was then definitively fixed with either a single screw or an antiglide-plate, depending on the strength of the bone. The posterolateral fragment was fixed with an antiglide-plate and a lag screw through the plate. The lateral malleolus was then fixed with a plate (Figure 8). No revision of the anterior joint was performed. Anterior fragments (osseous avulsion of the anterior tibiofibular ligament) were left untouched (two patients).

Chronic Posteromedial Instability

Posteromedial subluxation of the talus was suspected when a patient (no. 1 on Table 1) presented with a loud

Fig. 3: Anteroposterior and lateral radiographs of a malleolar fracture with posterior dislocation (patient no 6). The medial double contour (arrow) is well visible.

and painful snapping at the posteromedial ankle. He was unable to work (construction). Seven months prior he had had reconstruction of a lateral and posterior malleolar fracture, with posterior antiglide plating of the fibula and posterolateral antiglide plating of the posterior tibial lip fracture. The radiographs showed a perfectly reconstructed fibula but an incongruity of the posterior tibial lip and a posterior subluxation of the talus (compare Figure 9 to Figure 11). Sagittally reconstructed CT scans revealed a well-reduced and healed posterolateral fragment (Figure 10, A, middle to lateral section of the ankle), while a larger posteromedial fragment was malunited (Figure 10, B, medial half of ankle; Figure 10, C, immediately adjacent to medial malleolus) with proximal displacement and rotation. Consequently, the ankle joint was congruent laterally (Figure 10, A), but medially there was posterior subluxation of the talus (Figure 10, B and C).

Operative Technique (Osteotomy)

The patient was placed supine. A standard medial malleolar osteotomy exposed the posterior tibial plafond. The malunited fragment was identified and posteromedial subluxation of the talus could be verified. The posterolateral joint was found to be stable. An osteotomy was done along the former fracture line. The fragment was advanced and derotated to fit the reduced talus and was fixed with screws and an antiglide minifragment plate (Figure 11).

After Treatment (All Patients)

The patients were placed in a non-weightbearing cast for 4 weeks, then they were allowed to partially bear weight in a cast for another 4 weeks. Afterwards they progressed to full weightbearing in an ankle boot or in normal shoes, depending on their ease of walking.

RESULTS

No additional chondral damage was found intraoperatively on the talus or the tibial plafond, although the talus was not redislocated for full inspection. No intraoperative or postoperative complications occurred.

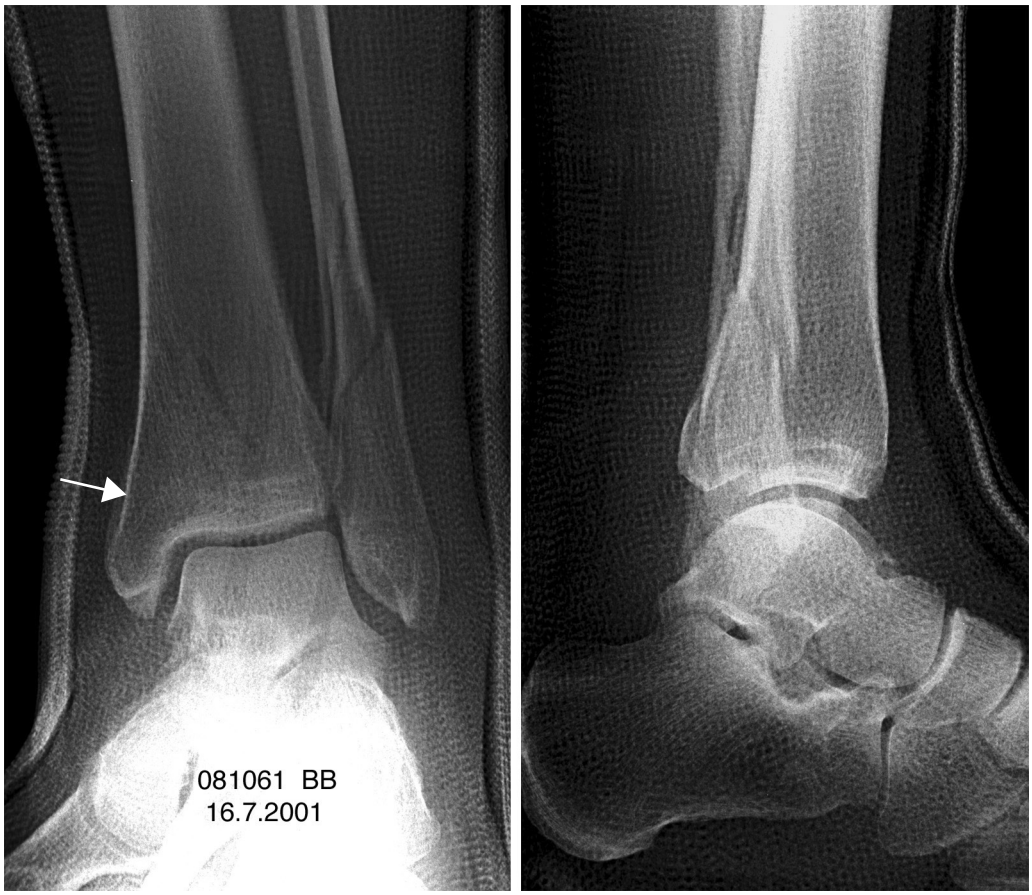

Fig. 4: Anteroposterior and lateral radiographs of the same patient's ankle after closed reduction. The double contour (arrow) medially above the medial malleolus is visible but discrete. Note that the medial malleolus looks intact.

Joint congruity was restored in all the patients, and wound healing was uneventful except for one patient with a minor delay. Follow-up was 10 to 30 months clinically and 10 to 18 months radiographically. Bony healing occurred within 6 to 8 weeks in all patients. Full weightbearing was obtained at 12 weeks postoperatively in all patients. Ankle range of motion at 12 weeks was limited (restriction of 15 degrees for dorsiflexion and plantarflexion compared to the opposite side) but improved to near normal values (equal to the opposite side or restriction of 5 degrees) at 1 year postoperatively. A moderate restriction (15 degrees for dorsiflexion and plantarflexion) and an inability to run persisted in the patient with the reconstructive osteotomy. However, the preoperative painful snapping had completely disappeared, and he was able to resume unrestricted activity as a construction worker. None of the patients developed anterolateral symptoms in spite of the unrepaired anterior tibiofibular ligament, not even the two patients with osseous avulsion of the ligament. None of the patients needed shoe modifications and none had swelling. Radiographically, all the ankles were congruent without loss of cartilage height except for one patient (Table 1, no. 8) who had moderate loss of joint space at 10 months postoperatively.

DISCUSSION

A previously undescribed subtype of malleolar fracture is presented, with unique features and implications for treatment. In a 3-year period, 10 patients were seen with this fracture. In the same period, 112 patients were treated operatively for malleolar fractures in the same institution, suggesting a relative frequency of about 8%.

This special fracture presents as a Danis-Weber-AO-type B or C fracture,[10] with a small posterior malleolar fragment. Typically, there is no visible fracture at the medial malleolus except for a double-contour or flake-fragment sign at the medial cortex just proximal to the medial malleolus. The lateral radiograph does not show the extent of the lesion. A high-resolution CT scan with sagittal reconstruction of thin slices (1 to 2 mm) will show the avulsion fracture of the entire posterior tibial lip, including the posterior half of the medial malleolus.

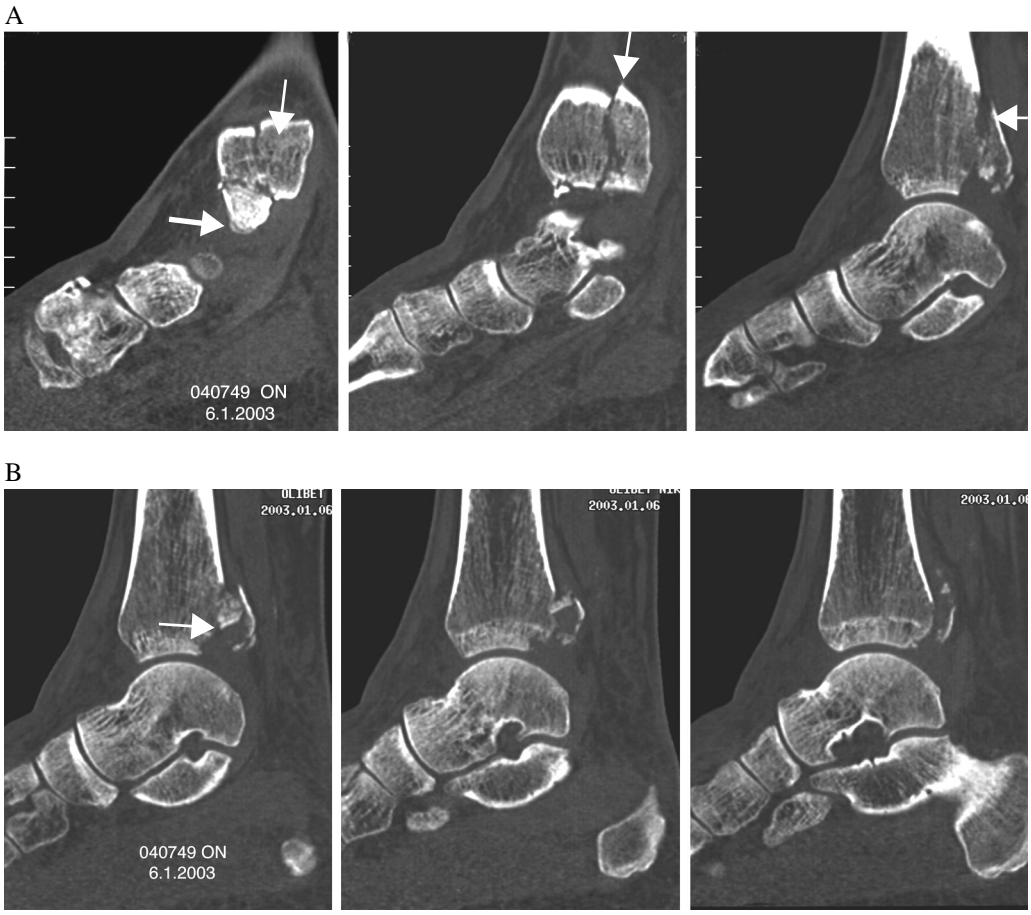

Fig. 5: CT of the ankle of a patient (Table 1: no. 10). **A**, Malleolus and medial border of the plafond. **B**, Medial border and middle section of the ankle. Note the coronal fracture of the medial malleolus (Figure 5,A arrows). This patient had an additional fracture of the tip of the anterior colliculus (Figure 5,A left image, open arrow). Note the shortness of the remaining (anterior) portion of the tibial plafond (images 5,A, right and 5,B, left). At the posteromedial border a large osteochondral fragment is proximally displaced (Figure 5,B, left, arrow).

The fracture line of the medial malleolus, therefore, lies in the coronal plane and not in the transverse plane, as usual. The posteromedial fragment of the tibial lip and the posterior half of the medial malleolus are in one piece. Additionally, osteochondral fragments are proximally dislocated and impacted between the posteromedial plafond fragment and the posterior tibia. These fragments are an obstacle to reduction and prevent the fracture gap from closing posteromedially. The posterolateral plafond fragment may reduce indirectly through ligamentotaxis when the lateral malleolus is reduced, but the talus will remain unsupported posteromedially and may sublux into the defect. This hypothesis was substantiated when a patient with posteromedial instability was seen and successfully treated. It may seem premature to draw therapeutic conclusions from a single case. However, the correlation of the pathoanatomy of this chronic instability to the anatomy of acute fractures seemed close enough to warrant a more aggressive approach and to reconstruct the entire posterior tibial lip in these fractures.

In my experience with this type of fracture, it has not been possible to control the reduction of the posteromedial osteochondral fragments from a medial approach. The medial malleolus cannot be reflected through the fracture as it would be possible in the more common complete transverse (or oblique) fractures, in which impactions of the medial and posteromedial plafond can be reduced and fixed directly.[3,6,16] The posteromedial fragment of this particular fracture carried the posterior part of the medial malleolus with the deep part of the deltoid ligament. Opening of this coronal plane medial malleolar fracture pulled the talus into posterior dislocation. This made it impossible to reduce the osteochondral fragments. One would have to reflect the posteromedial fragment, which would devascularize it almost completely. Therefore, access was obtained through a posterolateral approach, through which the lateral edge of the medial fragment could be elevated to reveal the impacted fragments in the posteromedial corner of the tibial plafond.

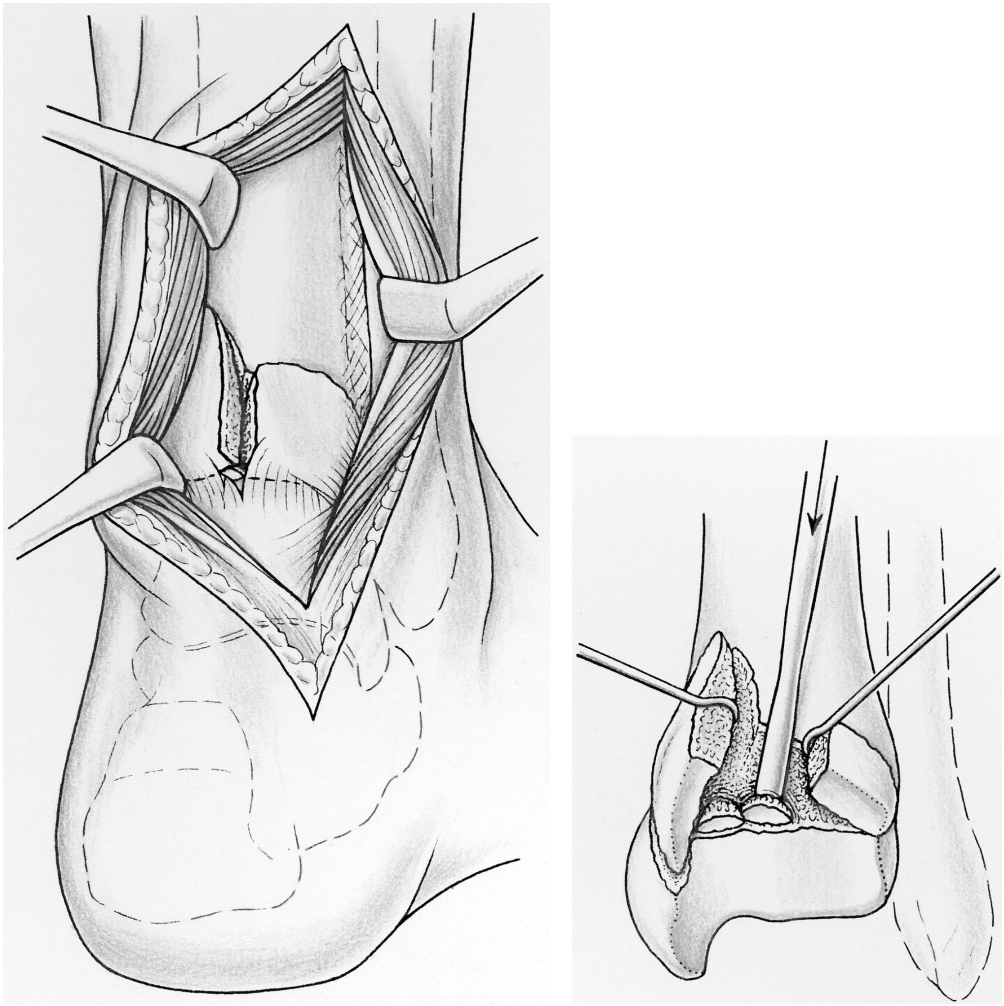

Fig. 6: From a posterolateral approach (left image) the main fragments are elevated, and the impacted osteochondral fragments are reduced (right image). Anatomic reduction of the main posteromedial fragment is now possible.

The ease of reduction was greatly enhanced by having the talus reduced spontaneously. This was easily accomplished when the patient was placed prone with the foot hanging free. Reduction was started at the posteromedial corner rather than reducing and fixing the fibula and the posterolateral fragment first. In my experience, visibility into the ''far corner'' (posteromedial) was best with both ''wings of the trap door'' (see Figure 6) still open. Furthermore, it seemed easier to reduce and fix the larger medial fragment and the osteochondral fragments first, and then reduce the smaller posterolateral fragment next to it. Following these steps the fibular fracture was generally almost spontaneously reduced and easily fixed with a small plate. Both the positioning of the patient (usually supine) and the sequence of reconstruction (''lateral malleolus first'') [1,10,17,19] were reversed for this special fracture type compared with the treatment of a normal bimalleolar or trimalleolar fracture.

The posteromedial approach may seem superfluous at first sight, because the main work of reduction and fixation is done from a lateral approach. It has been observed, though, that by pressing down the lateral edge of the medial fragment, it will ''rock'' open at its medial edge. This is possible in spite of adequate reduction of the osteochondral fragments and may be due to the frequent comminution of the lateral edge of the medial fragment. Using the additional posteromedial approach in these fractures has always allowed 2 mm to 3 mm of residual displacement to be found.

One might consider fixing the posteromedial fragment indirectly from anterior. The main disadvantage is that the posterior tibial tendon runs over the middle of this medial fragment. A screw solidly engaging the thin posterior cortex will have its tip somewhat protruding and may cause tendinitis. If the screw tip does not protrude, it is not likely to gain enough purchase in the fragment. Furthermore, with the small posteromedial

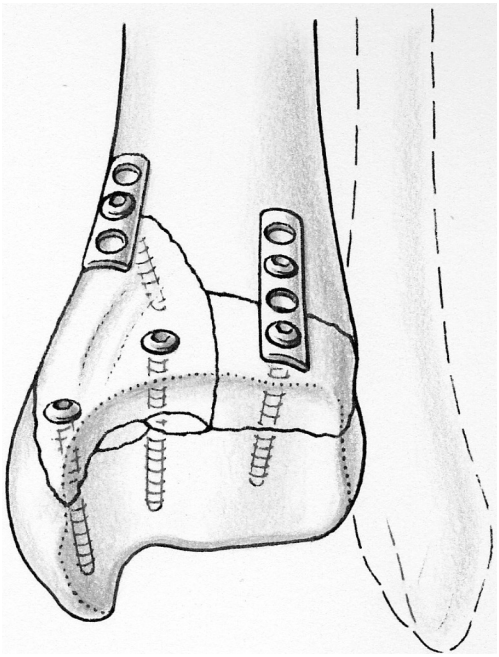

Fig. 7: The posteromedial main fragment is fixed around its periphery, at three points (lateral edge, proximal edge and posterior colliculus), since hardware placement centrally would violate the posterior tibial tendon (groove) and devascularize the fragment. The posterolateral fragment is fixed with a small-fragment (2.7 mm) antiglide plate and a lag screw.

incision already made, it is easy to reduce and fix the fragment directly. Fixing each of the three corners of the triangular fragment resulted in satisfactory stability, eliminating the possibility of ''rocking''.

It is certainly true that in the common rotational malleolar fractures the posterolateral fragment usually reduces spontaneously by ligamentotaxis through the intact posterior tibiofibular ligament when the fibula is reduced and the foot is dorsiflexed. This reduction also is accomplished in this special type of fracture. However, the posteromedial fragment is not affected by this maneuver. This fragment is the larger of the two main fragments, and its displacement presents, together with the osteochondral fragments, as a large defect in the posteromedial corner of the tibial plafond. This defect has the potential to cause chronic posteromedial instability of the talus as evidenced in our patient. We, therefore, believe that it is in the best interest of every patient with this fracture to have the posteromedial corner of the tibial plafond accurately reconstructed.

Posterolateral subluxation of the talus after operative treatment of trimalleolar fractures has been described, including the results of treatment.[7,11,12,18] No reports have been found describing posttraumatic posteromedial subluxation. Our patient with chronic posteromedial subluxation and successful operative treatment led us to believe that this is a relevant clinical entity. The posterior

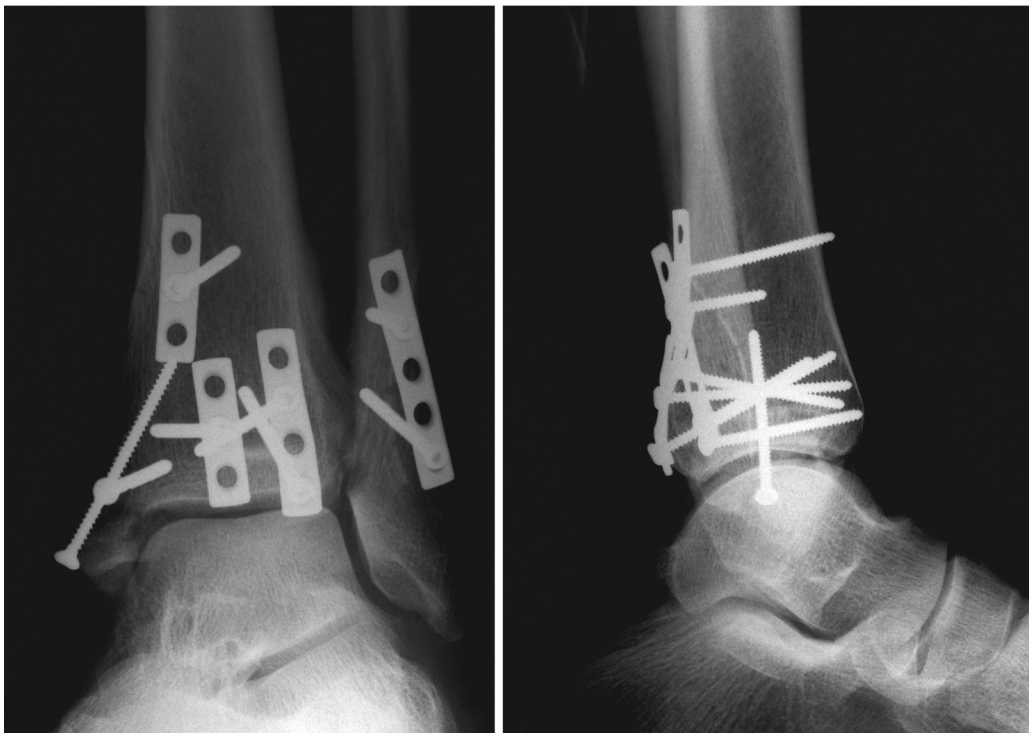

Fig. 8: Anteroposterior and lateral radiographs of the ankle of patient no. 10 after open reduction and internal fixation. Congruency of the ankle joint was restored. Since the lateral edge of the posteromedial fragment was thin, an antiglide plate rather than a single screw was used to prevent the edge from fracturing. Since the tip of the anterior colliculus of the medial malleolus was fractured as well (see Figure 5,A, left image), it was fixed with an additional screw.

Fig. 9: Lateral radiograph of patient no 1 (late reconstruction). Note the impacted malunited posterior lip and subtle posterior subluxation of the talus (compare to Figure 11).

subluxation in this patient was evident on the CT scans only medially, and not laterally, and this was seen intraoperatively. In the acute fractures, however, residual posteromedial subluxation was not seen on the CT scans. Since these were mostly fracture-dislocations, the CT scans were obtained after closed reduction of the dislocation and fixation in a cast. Residual posteromedial subluxation was not seen, probably because the patients were positioned with the heel supported, thus giving an anteriorly-directed reducing force to the talus.

It is advisable to anatomically reconstruct this deformity in the acute situation, because the result of late reconstruction in our patient was inferior to the results in the other patients. The follow-up of this group of patients is still short, and only longer follow-up will show the ultimate prognosis of this special type of fracture-dislocation. However, the group was sufficiently homogenous and large to be of interest for the acute treatment of these fractures.

Measuring the size of the posterior malleolar fragment in these fractures is misleading. The measurement is done on a lateral radiograph and put into relation to the total anteroposterior diameter, with a percentage computed. On a lateral radiograph only the longer lateral plafond diameter (the lateral border of the articular surface of the tibial plafond is longer than the medial border)[2,14] is visible. Since the posteromedial fragment is larger than the posterolateral fragment in these fractures, one will see and measure the larger posteromedial fragment and put it into relation to the larger lateral plafond diameter. A falsely low percentage will result, which may lull the surgeon and keep him from more closely analyzing the posterior deformity. It is, therefore, crucial to meticulously analyze the anteroposterior (''mortise'') radiograph, looking for the double-contour sign that is suggestive of this special type of fracture, and obtain a CT scan.

The deep posterior tibiotalar ligament (posterior part of the deep deltoid ligament) is the strongest component of the entire medial ligament and has its origin mainly in the intercollicular groove and on the posterior colliculus of the medial malleolus.[14] Since this fracture separates the colliculi, it will displace the origin of this ligament posteriorly and may facilitate posterior displacement of the talus. With the addition of a displaced fracture of the posteromedial tibial lip this may be sufficient to lead to frank posteromedial talar instability. This could imply that even an apparently minor displacement at the posteromedial corner of the tibial plafond may lead to symptomatic instability.

Incongruity after an ankle fracture can cause morbidity and lead to arthrosis. The deleterious effect of lateral talar shift on the tibiotalar contact area has been well documented.[8,9,13,15] A reduction in contact area and point contact loading is to be assumed for the posteromedially shifted talus as well. Therefore, although this implies more operative dissection, it seems justified to correct even small residual displacements of the posterior part of the medial malleolus and of the posterior tibial lip to reduce and stabilize the talus. Furthermore, the negative effect of concomitant chondral injuries has been shown.[5] Our patients certainly have this negative factor, as the impacted osteochondral fragments represent a major injury of the integrity of the chondral surface.

The vascularity of the fragments is a concern, because an extensive approach is necessary for adequate exposure and anatomical reconstruction. The double posterior approach may be an additional risk to perfusion of the fragments. However, care is taken to preserve the periosteum on the fragments. The fracture is opened in the midline by incising the periosteum strictly along the fracture line. The posteromedial approach is merely used to reduce the medial border of the posteromedial fragment. The periosteum is only incised over the proximal tip of the posteromedial fragment. A minifragment antiglide-plate is placed proximally and one screw fixes the colliculi of the medial malleolus. Together with the single screw-fixation (or additional miniplate) of the lateral border of the posteromedial fragment, this results in a stable three-point-fixation of the fragment, with minimal damage to its vascularity. Delayed healing or sclerosis attributable avascular necrosis of the fragments has not been observed in this study.

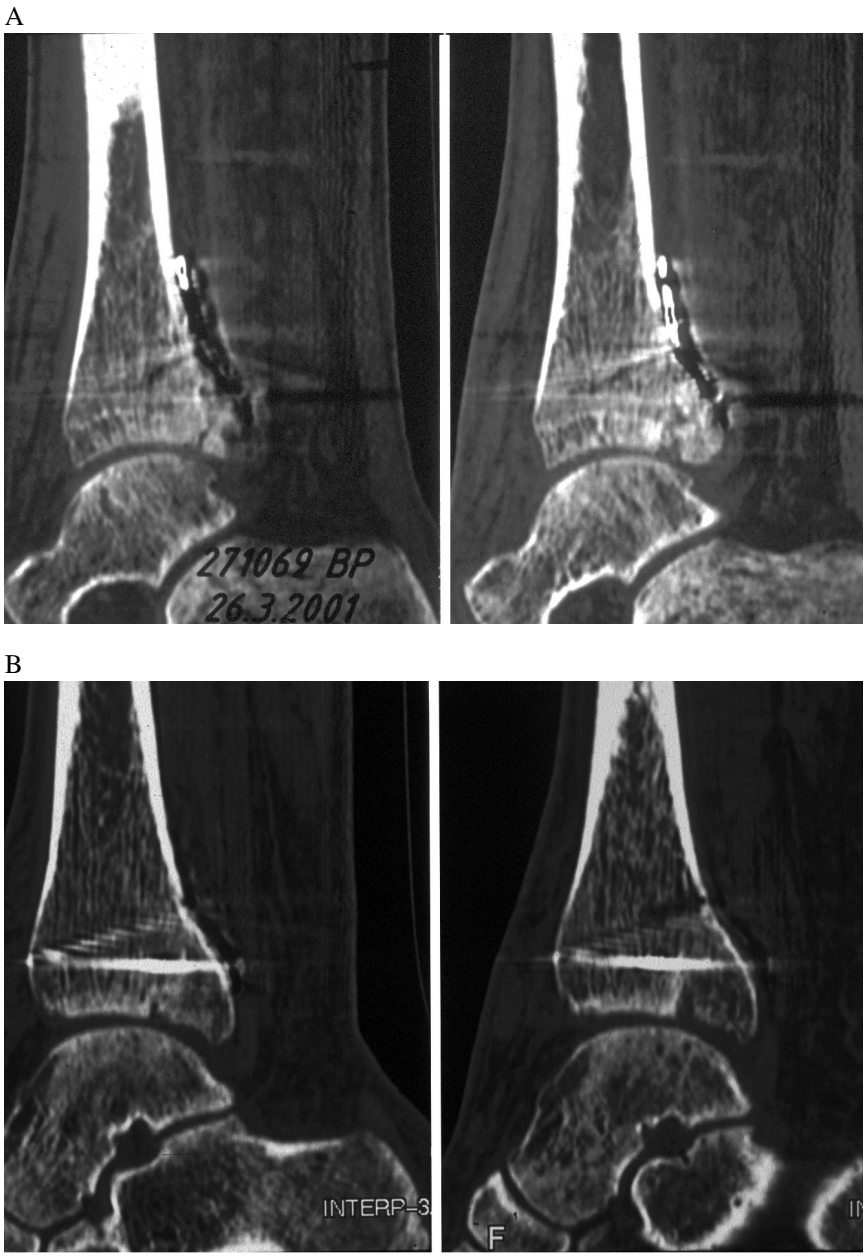

Fig. 10: The sagittally reconstructed CT scans of the same patient show congruency in the lateral aspect of the tibiotalar joint (**A**). However, in the medial part of the plafond (**B**) and adjacent to the medial malleolus (**C**) posterior subluxation of the talar dome occurs (anterior ''opening'' of the joint).

The radiographs of all lateral and posterior malleolar fractures should be scrutinized for a medial pathognomonic double-contour or flake-fragment sign. If such is seen or suspected, a CT scan is needed to identify a fracture of the entire posterior tibial lip, including the posterior colliculus of the medial malleolus, with additional impacted osteochondral fragments posteromedially. This fracture anatomy has important surgical implications, because it is best to place the patient prone and reverse the usual sequence of reconstruction by starting medially and not laterally. If anatomic reduction and stable fixation are obtained, the short-term results are good and equivalent to results after fixation of simpler malleolar fractures. Although more operative dissection is required for the treatment of this fracture, this approach is thought to be necessary to prevent posteromedial subluxation. Knowledge of this entity, careful evaluation of the radiographs of all malleolar fractures, further CT evaluation of suspected cases, and operative treatment that restores normal anatomy at the posteromedial corner of the tibial plafond will help to avoid revisions, morbidity, and patient dissatisfaction.

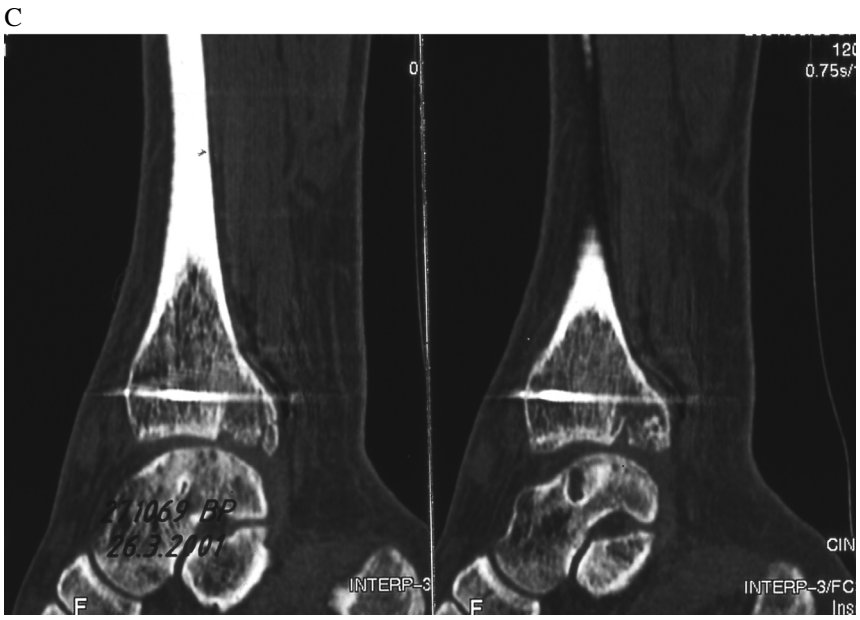

Fig. 10: ***Continued***

Fig. 11: Lateral radiograph of the same patient's ankle after osteotomy and reduction of the malunited posteromedial tibial lip fragment, and internal fixation. Congruency of the ankle joint was restored.

Future follow-up will show the long-term prognosis of these fracture-dislocations.

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