Posterior Malleolus: Which Ones to Fix and How to Approach and Reduce

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Posterior malleolar fractures have been increasingly recognized over the past several years both in terms of their incidence and their effect on outcome. This summary will review posterior ankle fractures, with the goal of defining the injuries, then reviewing surgical indications, and finally surveying surgical techniques.

An appropriate starting point is a review of how these injuries are defined. The presence of a posterior malleolar fracture was predicted by Lauge-Hansen in his mechanistic studies of ankle fractures for the purposes of classification. More recently, the posterior pilon variant has been identified that is likely a combination of rotational mechanism and axial load. Switaj et al. looked at the relative frequency of posterior malleolar fractures and the posterior pilon variant in a large set of operatively treated ankle fractures, noting that 50% of patients had a posterior malleolar fracture and 20% had a posterior pilon variant. Some authors have sought to further define the posterior pilon variant. Weber defined injuries with a posteromedial component. Klammer et al. subsequently assessed these fractures further and suggested a classification scheme.

Traditionally, the size of this fragment has been the principal deciding factor in terms of whether the fragment requires open reduction internal fixation (ORIF). More rarely, some patients have posterior tibial instability, even with smaller fragments, that would suggest the need for posterior malleolar ORIF. However, many have argued that reduction of the distal fibula fracture allows for indirect reduction of the posterior malleolus through the intact posterior-inferior tibio-fibular ligament (PITFL). Moreover, some have argued that the posterior malleolus plays little role in the stability of the tibiotalar joint. More recently, however, the role of the posterior malleolus in syndesmotic stability has been brought to the forefront. More specifically, in those patients with a posterior malleolar fracture, the PITFL is typically intact. Therefore, by reestablishing the posterior malleolus, then the need for syndesmotic fixation may be obviated. Certainly, given that the presence of syndesmotic screws means a longer period of nonweight bearing for some surgeons and/or a possible concern in the future about the need for syndesmotic screw removal and/or breakage, then a situation in which that fixation proves

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unnecessary may be beneficial. Also, anatomically fixing the posterior malleolus potentially increases the accuracy of syndesmotic reduction, which has been shown to correlate with outcome.6

Evaluation of ankle fractures typically begins with three views of the ankle. Clear indications for CT scanning have not been defined at this point. Ferries et al. found that plain radiographs were unreliable in assessing posterior malleolar fragment size.7 However, Büchler et al. found that plain radiographs reliably assessed the size of the posterior malleolar fracture, although it did not accurately show surgically relevant information, such as impaction or comminution.8 Furthermore, Black et al. noted that preoperative CT scanning changed the operative plan in 24% of patients with malleolar fractures.9 In my own institution if the plain xray shows a posterior malleolar fracture, then a CT scan of the ankle is obtained. We would agree with Buchler et al. that the fracture can often be much more complex than is appreciated by a plain radiograph.

Approaches to fixation of posterior malleolar fractures vary to some degree with the pathology present. For more rotational type fractures in which there is a clear posterolateral, Volkmann-type fracture, some surgeons will simply make an approach to the fibula that is positioned a little posterior to the typical lateral approach. By mobilizing the peroneal tendons, the surgeon can then gain access to the fractured fragment. The advantage of this approach is that it allows for supine or lazy lateral positioning which can make any medial surgery that is necessary much easier. However, the visualization of the posterior malleolar fragment is limited relative to more direct posterior approaches. A formal posterolateral approach is favored by many surgeons. The relative advantages include improved visualization relative to a more lateral approach, as well as greater ease of fragment reduction and fixation. If there is any posterior comminution or a concomitant posterior medial fragment, a direct posterolateral approach provides the surgeon better access to visualize, reduce, and fix the fragments. Moreover, it can provide some guidance for a posteromedial approach, if that proves necessary.

Complications can occur with the posterolateral approach. Little et al. listed some of these in a review of 112 patients who had this approach. In their series 12.5% of patients experienced wound healing complications, 4.4% of patients had a wound infection, and 7% of patients had symptomatic hardware that was removed.10 The reoperation rate for any reason was 12.5%. Wound healing problems can be encountered with this approach, likely due to the fact that distal branches of the peroneal artery can be ligated, if the dissection is not performed carefully.11 These branches often supply the skin in the area of the approach.12 Also, sural nerve paresthesia and/or dysesthesia can occur, often transiently, after this

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approach.\textsuperscript{13} Given the proximity of the nerve to the approach\textsuperscript{14\textsuperscript{15}}, it must often be mobilized, which can lead to some degree of neuropraxia.

Reduction of the posterior malleolus fracture is often not terribly challenging technically. However, visualization of the joint from the posterior view is virtually nil. In the setting of impaction anterior to the posterior malleolar fracture or comminution in general, this limitation can be more problematic. As a result, some authors have used an intact PITFL as an advantage, rotating the posterior malleolar fragment out of the way to gain access to the impaction or comminution anterior to it.\textsuperscript{16} As for medial fractures, the authors approach is to close the posterior wound completely and then flip the patient supine to reduce and fix the medial fracture. Although this sequence can take a few extra minutes, the ease of reduction of reduction and fixation of medial fractures with the patient supine more than makes up for any lost time.

In conclusion posterior malleolar fractures can occur with some regularity. With a concerted approach in terms of identification of the fracture, the surgeon can plan appropriately. Approaches can be safely made to reduce and fix the fractures, although the surgeon must be aware of the local anatomy.


\textsuperscript{14} Jowett AJ, Sheikh FT, Carare RO and Goodwin MI. Location of the sural nerve during posterolateral approach to the ankle. \textit{Foot Ankle Int.} 2010: 31(10), 880-883.


\textsuperscript{16} Franzzone JM and Vosseller JT. Posterolateral approach for open reduction and internal fixation of a posterior malleolus fracture – hinging on an intact PITFL to disimpact the tibial plafond: a technical note. \textit{Foot Ankle Int.} 2013: 34(8), 117-1181.