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Surgical treatment of Posterior Malleolus Fracture

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Abstract

Introduction: Posterior malleolus fractures mostly occur in association with fractures of other malleoli. The current recommendation is fixation based on the size of the fragment.

Materials & Methods: A retrospective study of 30 cases of posterior malleolus was conducted. There were 4 cases in type 1, 8 cases in Type 2, 7 cases in type 3, 10 cases in Type 4 and Type 5 there was one case. Type 1 were not operated, and type 5 were left alone in POP cast for 6 weeks. Type 2, 3 and 4 were operated either by cannulated cancellous screw by trans-Achilles approach, when the fragment was less than 20% of the surface area in 6 cases. When the surface exceeded 15% , those cases were treated with osteosynthesis by posterolateral approach using a buttress plate principle.

Results: Good results were seen in all cases except one which develop post-operative infection and had early arthritis.

Conclusion: Radiological studies are essential to plan, and posterolateral approach provides a good exposure for management of posterior malleolar fractures

Keywords: Posterior malleolar fracture, fixation, 3D CT scan

Introduction:

Posterior malleolus fractures are common in ankle fractures. They usually occur in association with fractures of the other malleoli, hence resulting in an unstable trimalleolar configuration. The posterior malleolus fracture most commonly occurs with the supination-external rotation and pronation-external rotation fracture patterns [1]. Though various attempts at classification & guidelines of treatment were made, there is no clear consensus regarding the minimum size of the fracture that requires fixation. Current trend is directed towards anatomic reduction and fracture fixation of posterior malleolar fragments. Fixation methods vary based on the size of the fragment.

Materials and methods

Our study consisted of 30 patients who had posterior malleolus fractures. All patients were subjected to plain radiographs of ankle AP, Lateral views. CT scans were taken to delineate the morphology of the fracture fragment and estimate the size of the fragment. Fractures were classified using Bartonicek et al created classification [15] which addresses the morphology of the fracture types and use this as a guide towards management (Fig. 1). There were 4 cases in type 1, 8 cases in Type 2, 7 cases in type 3, 10 cases in Type 4 and Type 5 there was one case. Type 1 were not operated, and type 5 were left alone in POP cast for 6 weeks. Type 2, 3 and 4 were operated either by cannulated cancellous screw by transAchilles approach, when the fragment was less than 20% of the surface area in 6 cases. When the surface exceeded 15% , those cases were treated with osteosynthesis by posterolateral approach using a buttress plate principle.

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Classification

1. Type 1 includes an extra-incisural fragment with an intact fibular notch (managed nonoperatively)
2. Type 2 involves a posterolateral fragment extending into the fibular notch (Fig. 2,3)
3. Type 3 is a posteromedial 2-part fragment involving the medial malleolus
4. Type 4 is a large posterolateral triangular fragment (Fig. 4)
5. Type 5 includes the remaining fractures that cannot be classified and include irregular fragments

Indications of surgery

Though there are no clear cut guidelines for conservative and operative treatment, we operated if one of the following criteria were met. [4-8]

1. Bartonicek et al morphological classification type 2-5
2. Fragment size >25 to 33%
3. Displacement>2 mm
4. Ankle instability with concomitant syndesmotic injury

Timing of surgery

Surgery is usually conducted within first 72 hours, if there is excessive swelling in ankle or blisters, surgery is performed after wrinkling occurs.

Surgical technique

Surgery can be performed in prone

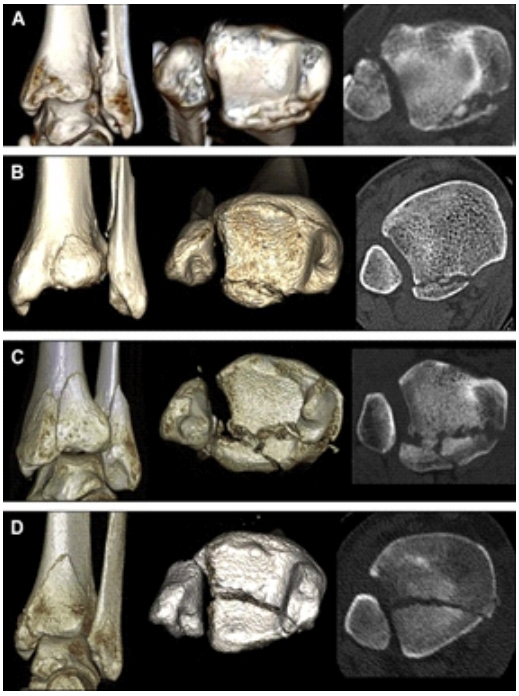

Fig.1: Posterior Malleolus Fracture Classification by Bartonicek et al

Fig.2: Posterior Malleolus Fracture Type 2 - Extending into Fibular notch

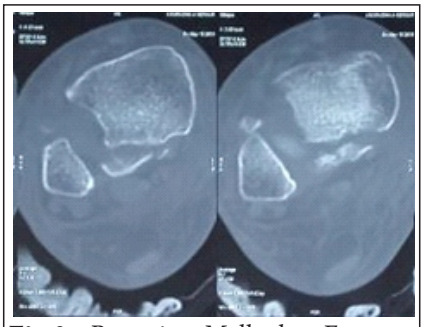

Fig.3: Posterior Malleolus Fracture Type 2

position or the patient may be placed in the lateral decubitus position (Fig. 5). A posterolateral approach is performed [3] with the patient in the lateral position. The longitudinal incision is placed just medial to the posterior border of the fibula. This gives good access to the posterior malleolus and optimal access to the lateral malleolus through mobilisation of peroneal musculature. The lesser saphenous vein and sural nerve are identified and protected. The sural nerve courses from medial to lateral and crosses the lateral border of the Achilles tendon on average 9.8 cm proximal to its insertion in the calcaneus [9]. At a point 7 cm proximal to the tip of the lateral malleolus, the nerve is on average 26 mm posterior to the edge of the fibula [10]. Interval between the peroneal tendons and Achilles tendon more medially is exploited. The flexor hallucis longus is lifted off sharply from the posterior tibia allowing access to the posterior malleolus. Care is taken to preserve the Posterior Inferior Tibia-Fibular ligament attachment to the fragment and the joint capsule, which means the fragment should be hooked open from medial to lateral for joint inspection [11]. Care should be taken merely to clean and define the fracture edge, and not to devascularize the fragment. The posterior malleolus fragment is reduced directly and fixed temporarily with kirschner wires. Depending on its size and morphology, fragment is fixed with cannulated screws or small fragment T plate as a buttress (Fig. 6,7). Image intensifier can be used to confirm the accuracy of reduction, fixation and ensure extra-articular screw placement.

Rehabilitation

Patient is given limb elevation, active toe movements is started immediately post-surgery. Rehabilitation is as per standard protocol [13,14]. Plaster slab is removed at 3 weeks and range of movement exercises for ankle are begun. Patient is allowed to partial weight bearing after 6-8 weeks depending on signs of fracture healing clinically and on radiographs. Full weight bearing is allowed only after 3 months.

Results

All the patients were followed upto 3

Fig.4: Posterior Malleolus Fracture Type 4 - Large Posterior-Lateral Fragment

Fig.5: Patient in Floppy Lateral Position with Posterior-lateral approach and mobilisation of Peroneal Musculature

Fig.6: Ankle AP with Posterior Malleolus Buttress plating in a Type 3 fracture

Fig.7: Ankle Lateral with articular reduction

years and we did not see any post traumatic arthritis or avascular necrosis of the talus except in one case, where there was post traumatic arthritis. This case had compound trimalleolar fracture dislocation and he had developed superficial infection which healed after 6 weeks. The other patients were having good range of ankle motion and were functionally back to per injury activities (Fig. 7,8)

Discussion

Though various studies have been conducted on this topic, posterior malleolus still remains a topic of controversy as far as treatment is concerned. Bartonic et al [15] suggested new classification based on ct scan which can be more useful deciding the plan of treatment. The cole fracture mapping technique [16] suggests a continuous spectrum of increasing articular involvement across all included posterior malleolar fractures using the well-defined 2D transverse plane in which the authors recently described a basic Y-pattern for fractures of the tibial plafond: the pilon map [17]. The current algorithm "when 25%–33% of the tibial plafond is involved, the fragment requires direct fixation [18-22]" seems rather arbitrary, especially when considering that measurements are made on plain lateral radiographs, which are highly unreliable.8 the concept of Regan and Morrey [23] for fixation of coronoid fractures based on size and articular involvement23 has been used for decades, until O'Driscoll showed us that morphology of a coronoid fracture [24-26] is more important than coronoid fracture height [23]. Advanced imaging techniques improved our understanding of pathoanatomy of posterior malleolar fractures; however, the clinical relevance of the morphology and correlation to the overall ankle fracture pattern has yet to be established.

Lukas Mangnus et al [27] in 2015 concluded that coronoid fracture morphology and pattern [24] proved more important than "classic" measures of coronoid height [26] and morphology of the posterior malleolar fragment also might be more important than posterior malleolar fracture size and articular involvement alone for clinical decision making.

Saygılı et al [28] in 2017 found that there has been no significant functional difference found in trimalleolar fracture when posterior malleolus fracture ratio is smaller than 25% in comparison of posterior malleolus fixation, however, the decreased need of trans-syndesmotic fixation needs to be taken into consideration.

In our experience posterolateral approach enables direct visualisation and reduction of the posterior malleolar fragment. With this approach anatomic reduction and supplementation of fixation with buttress plate or cannulated cancellous screw from posterior to anterior trans Achilles can be achieved with ease. Fixation of even small fragment leads to anatomic reduction of the tibial plafond hence improving stability of the ankle and thus helping in early mobilisation. In regards to this, a more aggressive rehabilitation regimen might be more warranted which would improve postoperative results.

Fig.8: 6 months Post-op with anatomic reduction and fracture union

Fig.9: Restoration of articular surface with early mobilisation leads to full gain of function at 6 months follow up

Conclusion

Posterior malleolus fracture is a complex fracture to treat. The key to management is accurate diagnosis based on good radiographs, CT scan preferably with 3D reconstruction to know

exact morphology of the fracture and decide plan for management. Fixation restores articular congruity and ankle stability. Fixation of posterior malleolar fracture restores competence of posterior inferior tibiofibular ligament. Surgical management should not be based only upon fragment size but also fracture dislocation, displacement, articular surface congruity, residual tibiotalar subluxation, fragmentation and comminution, and syndesmotic stability. Posterolateral approach to the ankle provides the optimal exposure for direct reduction and adequate fixation of posterior malleolar fractures.

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