

ABSTRACT

Introduction

Posterior malleolus fractures are common, either as an element of bimalleolar/trimalleolar fracture or as isolated injuries. The functional outcomes following conservative or surgical management are often not satisfactory. Treatment algorithms have been established to standardise the management of these injuries.

This study aims to provide an update of the current diagnostic and treatment algorithms for the posterior malleolar fractures.

Materials & Methods

Retrospective review of the literature suggests that plain radiographs are not reliable for the delineation of the morphology of the posterior malleolar fractures. Computed tomography (CT) is essential to characterize the fracture patterns, classify and treat accordingly.

Results

Functional outcomes are improved and risks of post-traumatic osteoarthritis is reduced following satisfactory anatomical reduction of the posterior malleolus fractures (no residual articular step-off post-operatively).

Conclusions

Traditional teaching of the indication for surgical management of posterior malleolus (fragment which comprises >25-33% of the articular surface) is outdated. Given the low reliability of the plain radiographs, computed tomography is mandatory to delineate fracture configuration. Anatomical reduction of the articular surface is the key for the management of these injuries. Residual articular step-off is associated with poor functional outcomes and high rate of post-traumatic degenerative changes of the tibiotalar joint.

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INTRODUCTION

Posterior malleolus fractures are common, either as an element of bimalleolar/trimalleolar fracture or as isolated injuries. The functional outcomes following conservative or surgical management are often not satisfactory. Treatment algorithms have been recently established to standardise the management of these injuries.

MATERIALS & METHODS

Retrospective review of the literature and current management of the posterior malleolus fractures

Ankle fractures are very common injuries that usually occur following a twisting injury to the ankle. Clinical history, clinical examination and further investigations/imaging is crucial to diagnose these injuries, delineate the anatomy of the fracture and formulate a management plan for the patient.

Posterior malleolus fractures were treated according to "rule of 1/3" originating from the report by Nelson & Jensen in 1940; surgical management was indicated for posterior malleolar fractures involving more than 1/3 of the distal tibia articular surface.

Recent systematic reviews demonstrated poor results and the size of the posterior malleolus fractures is not the only factor affecting the outcome. The decision to treat these injuries should be determined by other factors as well, such as: fracture displacement, congruency of the articular surface, and residual tibiotalar subluxation,

Veltman et al. reported that the current consensus suggests posterior malleolar fragments comprising of >25% of the distal tibial plafond as seen on a true lateral radiograph and fragments with more than 2mm dislocation require open reduction and internal fixation of the fragment

Ramsey et al. reported on their seminal cadaveric study that 1mm lateral talar displacement can reduce the contact area of the tibiotalar joint by 42%, thereby increasing local stress and arthritis risk; hence highlighting the importance of the anatomical reduction of the ankle fractures to prevent post-traumatic osteoarthritis.

Diagnosis and Management of Posterior Malleolus Fractures.

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DISCUSSION

IMAGING

Plain radiographs are usually readily available and obtained after the injury. Invaluable information can be obtained by plain radiographs, however there is increased evidence that these are not sufficient to delineate the anatomy of the fracture, especially when the posterior malleolus is involved.

BOAST guidelines regarding the management of the ankle fractures reiterate the importance of obtaining cross-sectional imaging (ie. Computed Tomography – CT) : "CT imaging may be helpful in defining fracture configuration in more complex patterns particularly where the posterior malleolus is involved".

Thus, it is strongly indicated to obtain CT scan for every ankle fracture where there is (even a suspicion of) involvement of the posterior malleolus. This will delineate the fracture pattern and help clinicians to formulate a proper management plan for the patients.

CLASSIFICATION

Haraguchi et al. reported that there is a high variation of the fracture lines associated with posterior malleolus fractures. This was the first attempt to classify the posterior malleolus fractures.

Bartonicek and Rammelt have also classified these injuries (Figure 1).

Recently, Mason and Molloy proposed a comprehensive classification with a treatment algorithm for the management of the posterior malleolus fractures (Figure 2, Table 1).



Figure 1. Bartonicek and Rammelt classification of fractures of posterior malleolus. (A) Extraincisural fragment with an intact fibular notch. (B) Intraincisural posterolateral fragment. (C) Intraincisural two-part fragment involving the medial malleolus. (D) Intraincisural large triangular fragment.

Reprinted from : Bartoníček J, Rammelt S, Tuček M. Posterior Malleolar Fractures: Changing **Concepts and Recent** Developments. Foot Ankle Clin. 2017 Mar;22(1):125-145

CONCLUSIONS

CT scan is indicated in all ankle fractures when there is an involvement of the posterior malleolus. This will delineate the fracture pattern and guide management, either conservative or surgical (ie. different approach to reduce/fix fragment).

Surgeons should have a low threshold to address these injuries and anatomically reduce the posterior malleolar fractures to prevent posttraumatic osteoarthritis.

Mason and Molloy Classification of the posterior malleolus fractures and associated treatment algorithm is reproducible and demonstrated an improvement in the Olerud-Molander Ankle Score for all posterior malleolar fractures.



Figure 2. Illustration of the different types of posterior malleolar fractures as described by Mason et al.

The images represent axial CT views 5 mm proximal to the tibial plafond, sagittal CT views 1 cm medial to the incisura, and 3-dimensional surface rendering of the different types.

Reprinted from : Mason LW, Kaye A, Widnall J, Redfern J, Molloy A. Posterior Malleolar Ankle Fractures: An Effort at Improving Outcomes. JB JS Open Access. 2019 Jun 7;4(2):e0058

TABLE I Posterior Malleolar Treatment Algorithm as Dictated by the Mason Classification			
Classification	Treatment	Surgical Approach to Posterior Malleolus	
1	Syndesmotic fixation		
2A	Open reduction and internal fixation	Posterolateral	
2B	Open reduction and internal fixation, posteromedial fragment first	Posteromedial or posterolateral and medial posteromedial	
3	Open reduction and internal fixation	Posteromedial	

Table 1. Surgical approach to posterior malleolus based on the classification of the fracture pattern by Mason and Molloy.

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