

Clinical Study to Evaluate the Outcome of Conservatively Managing the Posterior Malleolus Fracture in a Trimalleolar Ankle Fracture**Gaurav Agarwal¹, Harshit Khare², Gaurav Jain³**¹Assistant Professor, Department of Orthopaedics, Bundelkhand Medical College, Sagar, M.P.²Senior Resident, Department of Orthopaedics, Bundelkhand Medical College, Sagar, M.P.³Assistant Professor, Department of Orthopaedics, LNCT Vidhyapeeth, Sewakunj Hospital and Research Centre, Indore, M.P.

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Corresponding author: Dr. Harshit Khare

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Abstract:

Background: Ankle fractures are one of the most common lower limb injuries, accounting for about 9 % of all fractures. The incidence of ankle fracture is roughly 187 cases per 1 lac people each year, out of which 7-11% constitutes the Trimalleolar ankle fracture. [1] The treatment of the posterior malleolus still remains controversial as to when to fix it and when to conservatively manage it, if at all. This Clinical study aimed at assessing the functional outcome of conservatively managing the posterior malleolar fragment of Trimalleolar ankle fractures based on functional scoring systems.

Materials and Methods: 30 patients with Trimalleolar ankle fracture were managed with operative treatment for medial and lateral malleoli and conservative management for posterior malleoli. The functional outcome was evaluated at 6 months by AOFAS score.

Result: The mean age in this study was 35.4 years (range 20 to 55 years) with male and right-side predominance. The mean follow up was 5.4 months (range 2 to 7 months). The mean AOFAS score at 6 months follow up was 88.6 (range 71 to 93), with 18 cases having an excellent score, 7 cases of a good score and 5 cases with a fair result. None of cases had poor results. None of the patients have any limitation to the daily activities, wound dehiscence, gait abnormality, implant failure, non-union. 5 patients had limitation of recreational activities but without support.

Conclusion: Conservatively managing the posterior malleolar fracture can give favourable functional outcome but requires further comparative studies and employ the use of CT for better diagnosis and decision making.

Keywords: Posterior Malleolus Fracture, Trimalleolar Ankle Fracture, Conservative management.

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Introduction

Ankle fractures are among the most common injuries to the lower limb and can significantly impact its functionality. A trimalleolar ankle fracture involves the lateral malleolar portion of the fibula, as well as the medial and posterior malleolar portions of the tibia. This type of fracture is one of the most frequently occurring types in ankle injuries. Posterior malleolus fractures have been attributed by Lauge-Hansen to rotational injuries, particularly in complex and unstable ankle injuries. These types of injuries are often associated with high degrees of supination-external rotation, pronation-external rotation, and pronation-abduction.

The treatment options for fixing posterior malleolar fractures have been extensively researched and documented in textbooks worldwide; however, orthopedic surgeons still struggle with determining when it is necessary to fix them. In recent decades,

there has been a protocol indicating that if an articular fragment is more than 25% - 33% of its length, then surgery should be performed on these fractures. However, presently there are no clear guidelines regarding this dilemma.[3]

Yuan Quan et al proposed a CT based fragment classification guide in 2021[4] which mentions posterior malleolar fragments were classified into small-shell, single-fragment, and multi fragment groups according to the mechanism of injury. A small-shell fragment was distinguished from a single fragment by the fracture line involvement of only a few fibular notches and a small part of the posterior lip of the tibial plafond. The single fragment group included small-fragment and large-fragment, and in the transverse plane, the fracture line of the small fragment originated from one-third of the entire Tibialis Posterior lip, whereas those in the large-fragment group originated from the

groove of the tibialis posterior. Multi fragment referred to double-fragment and compressive-fragment. In the multi fragment group, double-fragment included postero lateral and postero-medial parts and compressive-fragment included impacted fragments in the articular surface.[4]

Materials and Methods

We conducted this prospective interventional study at LNCT Vidhyapeeth University, Indore (M.P.) where we included 30 patients with Trimalleolar ankle fracture from August 2022 till August 2023. The exclusion criteria were as follows: 1. Open fractures; 2. Age less than 18 and above 65; 3. patients with multiple co-morbidities. Due to lack of resources, no CT scan was available and the decision regarding surgery was based on X-rays.

All patients were evaluated with proper history, clinical examination and standard AP and lateral radiographs. All patients were stabilized haemodynamically. After obtaining fitness for surgery, all patients were operated under spinal anaesthesia in a supine position. A standard medial

incision was given over the medial malleolus, and after proper articular reduction, the fracture was fixed with CC screw or TBW. The lateral malleolus was either fixed with percutaneous rush nail or open reduction and plating using standard lateral approach. The posterior malleolus was checked under C-arm and was conservatively managed using below knee slab.

Post operatively, patients were started on IV antibiotics and analgesics for 5 days. Patients were advised non weight bearing for 6 weeks. Walker assisted ambulation and knee range of motion exercises were started from day one. Suture removal was done in two weeks. Below knee slab was removed at 6 weeks. Gradual weight bearing was started. Patients were followed for 6 months. Outcome assessment was done by functional outcome at 6 months follow up. Functional outcome was graded as per AOFAS score (100 points) and the patients were graded accordingly as excellent (86-100), good (71-85), fair (51-70) and poor (< 50) as per the score.



Figure 1: A case of Trimalleolar ankle fracture with ankle subluxation fixed with CC screw and locking plate with conservative management of posterior malleolus





Figure 2: A case of Trimalleolar ankle fracture fixed with CC screw and rush nail with conservative management of posterior malleolus.

Results

30 patients of Trimalleolar ankle fracture with a mean age of 35.4 years (range 20 to 55 years) were included in the study. 23 were male and 7 patients were female. 19 patients sustained fracture of the right side whereas 11 sustained left side fracture. The mean follow up was 5.4 months (range 2 to 7 months). The mean AOFAS score at 6 months

follow up was 88.6 (range 71 to 93), with 18 cases having an excellent score and 7 cases with a good score and 5 cases with a fair result. None of cases had poor results. None of the patients have any limitations to their daily activities. 5 patients had limitation of recreational activities but without support. No patient had wound dehiscence, gait abnormality, implant failure, non-union.

Table 1:

Mean age	35.4 years	
Gender distribution	Male	Female
	23	7
Side distribution	Right	Left
	19	11
Mean follow up	5.4 months	
Mean AOFAS score	88.6	

Discussion

The fixation of posterior malleolus has always been a subject of controversy and debate throughout the worlds of Orthopaedics. Largely, the consensus has been to fix all fragments that are more than 25% of the articular length. Recently, there are several authors who have stated that any single fragment should be fixed to maintain articular congruity.

Blom et al classified, in a retrospective study that included a total of 73 patients who had sustained an ankle fracture with involvement of the posterior malleolus in a four-year period, the patients into three groups according to the CT-based Haraguchi morphology.[5] The patients were followed for 2 years, and the outcome was assessed based on FAOS (Foot and Ankle Outcome Scores). In

this study, it was revealed that Haraguchi type II ankle fractures, characterized by posterior malleolar fractures with medial extension, demonstrated inferior functional outcomes when compared to the other groups.. The morphology of the posterior malleolus fragment is a crucial determinant of the outcome and should be the primarily assessed. Drijfhout van Hooff et al performed a study which reviewed the incidence of osteoarthritis and the long-term functional and radiological outcomes in 131 patients with ankle fractures including the posterior malleolus [6]. The patients were categorized into three groups based on two factors: the size of the posterior malleolus fragment (<5%, 5%-25%, and >25%) and the presence of a postoperative step-off. The research indicated that osteoarthritis was more common in

cases with larger fragment sizes (>5%) and step-offs exceeding 1 mm on the tibiotalar joint surface. However, no variations in osteoarthritis incidence were observed when the posterior malleolus fracture was surgically addressed. Furthermore, the functional outcomes and range of motion were found to be consistent across all three groups. The researchers demonstrated that achieving anatomical restoration of the joint surface is linked to a reduced risk of osteoarthritis, irrespective of the fragment size and whether the posterior malleolus fracture was fixed.

De Vries et al conducted a study involving 45 patients who had experienced ankle fractures involving the posterior malleolus [7]. Their research aimed to examine the long-term outcomes and evaluate the need for surgical fixation in cases where posterior malleolus fragments were smaller than 25% of the ankle. According to the study's findings, there were no significant differences in long-term patient outcomes between surgical and non-surgical (conservative) approaches. Notably, in 38% of the patients, the larger posterior malleolar fragment (>25%) was managed conservatively, and this group displayed comparable outcomes to the group in which the posterior malleolus was surgically fixed.

Mingo-Robinet and colleagues conducted a retrospective study involving 45 patients who underwent surgical fixation for trimalleolar ankle fractures over a four-year period [8]. They examined the relationship between the size of the posterior malleolar fragment and patient outcomes. The results indicated that in patients with posterior malleolar fragment sizes of less than 25%, outcomes were more favorable, as assessed by the American Orthopedic Foot and Ankle Society (AOFAS) score. Interestingly, this study found that achieving an anatomical reduction of posterior malleolar fractures did not necessarily lead to better functional outcomes. While the statistical significance was lacking, the authors emphasized that smaller fragments (<25%) tended to be associated with less favorable outcomes when anatomical reduction was not achieved.

In a separate study by Langenhuijsen and colleagues, it was demonstrated that restoring joint congruity in posterior malleolar fragments exceeding 10% in size improved long-term outcomes, regardless of whether surgical fixation was performed or not [9].

Due to these inconsistency in the various aforementioned studies, we performed this study at our institute. Our studied showed that conservatively managing the posterior malleolus associated with favourable outcome. Our study is

limited by lack of comparison groups and longer follow-ups. The availability of CT would have also added to the significance of this study. The measurement of the fragment size using CT could help us in determine the outcome better.

Conclusion

There is considerable debate in the world of Orthopaedics regarding the management of Posterior malleolus in a Trimalleolar ankle fracture. The current evidence suggests that orthopedic surgeons should assess the fragment size in correlation with the fracture configuration and articular surface congruity. Our study showed that conservatively managing the posterior malleolar fractures gives good results. Fixing the posterior malleolus adds on to the surgery duration, blood loss and exposure. It has a steep learning curve, especially after the aftermath of COVID-19. This topic needs further discussion with studies with comparative groups and better diagnostic tools.

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