

Functional outcome of surgical management of trimalleolar fractures

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ABSTRACT

INTRODUCTION: Trimalleolar fractures are encountered by every orthopedic surgeon. It is very disabling if not managed properly. Trimalleolar fracture requires anatomical reduction, which can be achieved with open reduction and then internal fixation. The purpose of this study is to see the functional outcome of surgically treated trimalleolar fractures with open reduction of all fragments and internal fixation.

METHODS: This is a case series of twenty-six patients diagnosed with trimalleolar fractures which were managed surgically. A preoperative x-rays and computed tomography scan were used for knowing the fracture and its pattern of such. A posterolateral approach was used for fixation of posterior malleolus and lateral malleolus in prone position and medial approach for medial malleolus fixation with tension band wiring or screws. The Olerud-Molander Ankle Score system was used at 6 months, 1 year and 2 years of follow-up to assess the functional outcome.

RESULTS: The average age of patients was 46.6 years (range 20 -60 years). There were 18 (69.23%) male and 8 (30.76%) female patients. Among 26 patients, the commonest injury pattern was supination external rotation and followed by supination adduction. The average time to union and full weight-bearing was 15.2 weeks (range 13–18 weeks). Average OMAS score was 70 (IQR- 30) at six month, 82 (IQR- 22.6) at 1 year and 84 (IQR- 22) at 2 years period. Overall good to excellent result was present in 92.3% of the patients.

CONCLUSION: Operative treatment for trimalleolar fractures with posterior malleolus fixation results in good functional outcome. Anatomical reduction is compulsory for obtaining better functional outcome.

KEYWORDS: Operative, outcome, posterolateral approach, trimalleolar

INTRODUCTION

Fractures around ankle region constitute a major proportion of injuries presenting to orthopedic emergencies all over the world.¹ Trimalleolar ankle fracture is very disabling if not managed properly. Various studies described in the literature that trimalleolar fractures are clinically and functionally worse as compared to bimalleolar fractures.² It is very less known about the proper management of the trimalleolar fracture and attain a good functional outcome. Previously, posterior malleolar fragment size has been used to guide whether to fix the posterior fragment or leave it.^{3,4} Recent studies

have found out that anatomical reduction and fixation of the posterior malleolus is essential to obtain a good clinical and functional outcome in all cases of trimalleolar fracture irrespective of its size.^{5,6} Good anatomic restoration of articular surface, joint stability, axial alignment, and early joint mobility are the goal of management in trimalleolar fractures. Open reduction and internal fixation is needed for proper management of trimalleolar fractures.^{7,8} The main purpose of this study is to see the functional outcome of surgically treated trimalleolar fractures with open reduction of all fragments and internal fixation.

METHODS

Prospective study of twenty-six patient with diagnosed closed trimalleolar fractures were enrolled in this study, during a period of 4 years from 2016 to 2020. Inclusion criteria of the study were age-group of 20-60 years, closed fracture and follow-up of at least 24 months. Exclusion criteria were open fractures, neurovascular compromise, polytrauma, patient with co-morbidities who is not able to undergo surgical procedure and patients having arthritis in the affected ankle joint, hip or knee joint in ipsilateral or contralateral side.

Initial management was done in the orthopedic emergency, which included viewing standard anteroposterior, lateral and mortise radiographs of the ankle joint. Patient distal neurovascular status was assessed and documented. Patients with gross ankle dislocation were tried to reduce in the emergency under mild sedation. A below-knee plaster slab was applied to immobilize the joint and analgesics were given. The limb was kept elevated. External fixator was applied in 17 patients to reduce inflammation and edema. An ankle CT scan was conducted in all cases as part of the preoperative planning. After soft tissue were silent, patients were planned for definitive fracture fixation.

Initial step was to fix lateral malleolus and posterior malleolar fragment by single posterolateral approach with patient in prone position. Lateral malleolus was approached through the interval just lateral to peroneal muscles. Fracture was reduced and fixed with plate and screws. Syndesmotic injury was assessed intraoperatively by Cotton test and in case fixed with single syndesmotic screw. Then posterior malleolus was approached through the interval between peroneus muscle and flexor hallucis longus muscle. Fracture was reduced and supported with buttress plate. Then patient position was changed into supine to fix medial malleolus. Medial approach was used to gain access for open reduction and internal fixation using tension band wiring or cannulated cancellous screws.

The patient was subsequently discharged after

a dressing change at 3rd postoperative day. Slab was maintained until 2 weeks postoperatively. Non-weight bearing and ankle range of motion (ROM) exercises was done until 6 weeks postoperative. Follow-up at 6 weeks was done when radiographs of the ankle joint were repeated and partial weight-bearing with the help of walking aids was started. Monthly follow-ups were conducted till 6 months of period then followed up biannually. Once the clinical and radiological union was achieved full weight bearing was initiated. Olerud-Molander Ankle score (OMAS) was documented at 6 months, 1 year and 2 years.⁹

SPSS 17.0 was used for statistical analysis. For descriptive data analysis percentage, mean, SD, minimum-maximum and interquartile range (IQR) were calculated. For inferential data analysis, student's t-test was applied for continuous data to find the significant differences at 95% CI where p-value corresponds to <0.05.

RESULTS

This study includes twenty-six patients with the average age of 46.6 years (range 21- 60) who were followed up 24 to 32 months (average 28.2 months). The fracture was more common in male patient (18). Common mode of injury was road traffic accident (73%) followed by fall from height and sports injury. Nine patients had left ankle fracture. The commonest injury pattern was supination external rotation followed by pronation external rotation and supination adduction (Table 1). The size of the posterior malleolar fragment was divided into three groups: small fragment less than 25% of articular surface of distal tibia (5 cases), 25-40% accounts for medium fragment (17 cases) and more than 40% of articular surface accounts for large fragment (4 cases). Average time duration from injury to surgery was 6 days (range 3-10 days). The average time to union and full weight-bearing was 15.2 weeks (range 13-18 weeks) (Figure 1). All fractures united uneventfully. Average OMAS score was 70 (IQR- 30) at six month, 82 (IQR- 22.6) at 1 year and 84 (IQR- 22) at 2 years period. There was significant difference at 6 month and 1 year period (p-value

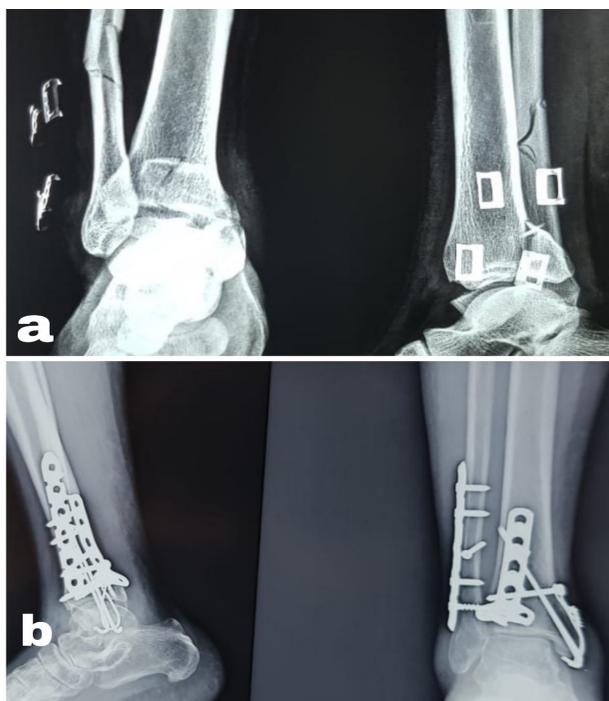


Figure 1 (a): Pre-op x-ray of 46 year old lady with trimalleolar fracture. (b): Two year post-op x-ray of the same lady.

Table 1: Different variables related to patients.

Variables	Patients n=26
Gender	
Male	18
Female	8
Side of injury	
Right	15
Left	9
Mode of injury	
Road Traffic Accident	19
Fall from Height	5
Sports	2
Mechanism	
Supination External Rotation	20
Pronation External Rotation	4
Supination Adduction	2
Complications	
Superficial infection	2
Deep infection	1

0.042) but there was no difference between 1 year and 2 years period (p-value 0.084). An excellent score (91-100) was seen in 14 patients (53.84%) and good score (61-90) was seen in 10 patients (38.46%) and fair score (31-60) was seen in 2 patients (7.69%) at the end of follow-up. Overall good to excellent result was present in 92.3% of the patients (Figure 2).



Figure 2: Clinical pictures at 2 years follow up of same lady.

There were two cases of superficial wound infection managed by prolonged antibiotics, and one case of deep infection managed with debridement (Table 1). They healed without residual infection. Eight cases needed stabilization

of syndesmotoc joint with syndesmotoc screws which was removed at average 3.6 months (3-5 months). 5 (19.23%) patients complained of pain, 3 (11.5%) had stiffness and few patients complained of swelling, stair-climbing problem

and problem in day-to-day activities (Table 2).

Table 2: Number of patients in different domains of OMAS scoring system at different intervals and their score weights.

Domains	OMAS 6 months n=26	OMAS 1-year n=26	OMAS 2 years n=26	Score weight
Pain				
None	15	19	21	25
While walking on uneven surface	8	5	4	20
While walking on even surface outdoors	1	1	1	10
While walking indoors	0	0	0	5
Constant and severe	0	0	0	0
Stiffness				
None	19	13	23	10
Stiffness	7	3	3	0
Swelling				
None	17	23	25	10
Only evening	8	2	1	5
Constant	1	1	0	0
Stair-climbing				
No problem	21	24	24	10
Impaired	5	2	2	5
Impossible	0	0	0	0
Running				
Possible	24	25	26	5
Impossible	2	1	0	0
Jumping				
Possible	21	24	24	5
Impossible	5	2	2	0
Squatting				
No problem	21	24	24	5
Impossible	5	2	2	0
Support				
None	15	23	23	10
Taping/Wrapping	8	2	2	5
Stick or crutch	1	1	1	0
Work. ADL				
Same as before	19	21	22	20
Loss of tempo	6	4	3	15
Change to simpler job/Part time	1	1	1	10
Severely impaired work capacity	0	0	0	0

DISCUSSION

Trimalleolar fracture is frequently encountered fracture by the orthopedic surgeon. Management of trimalleolar fracture depends on fracture pattern, surgeon preference, soft tissue conditions and distal neurovascular status. Anatomical reduction of the articular surface and reconstructing the bony relationship of ankle mortise is par important while fixing the fracture. In our study we took 26 patients who was diagnosed clinically and radiologically as trimalleolar fracture. Fixation of all the fracture fragments were attempted to make a perfect anatomical reduction. We carried out the surgery in all the patients only after the wrinkle sign was present. Preoperatively, strict limb elevation and ice compression was carried out. Average duration from injury to surgery was 6 days (range 3 -10 days). Few patients had wrinkle sign as soon as 3 to 5 days and were taken for surgery. Appearance of wrinkle sign such early may be attributed to their initial soft tissue condition with milder swelling and their thin built.

Previously small posterior malleolus fractures was treated conservatively.⁸ Various studies have quoted 25% of the articulate surface as a guideline for fixation of the fracture and one study used even 10% as the cutoff limit.^{3,10} Various studies have been inconclusive to find the posterior malleolar fragment size requiring fixation.^{4,11} But the recent studies have shown that posterior malleolus is to be fixed irrespective of its size.^{5,6} Fracture through the posterior malleolus generally leaves PITFL intact.¹² Postero-inferior tibiofibular ligament (PITFL) is important structure for the stability of syndesmosis. So, reduction and fixation of posterior malleolus play important role in syndesmosis stability.⁶

In our study, we fixed the lateral malleolus first using distal fibular locking plate or recon-plate and then we approached for fixing posterior malleolus in all the cases using plate in buttress mode, then medial malleolus was fixed by screws or tension band wiring.^{13,14} Posterior malleolus fracture with vertical shear cannot be tackled by screws alone.^{12,15,16} A study found out

that the patients with trimalleolar ankle fractures treated with posterolateral plating had superior outcomes clinically at follow-up compared to those treated with anterior posterior screws.¹⁷ The study had limitation of relatively small series, with a shorter duration of follow up, measurement error and patient compliance to postoperative rehabilitation.

CONCLUSION

Surgical management of trimalleolar fracture with proper preoperative planning, proper anatomical reduction and adequate rehabilitation results in favorable outcome.

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