

Original Research Article

Demographic profile and functional outcome following fixation of malleolar fractures in adults

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ABSTRACT

Background: Malleolus are important structures which forms part of ankle mortise and provide stability to it. This article underlines the current demographic profile of patients sustaining malleolar fractures in adults. It also discusses the modalities of treatment and functional outcomes following open reduction and internal fixation of these fractures as well as the improvement in functional outcome following early mobilization.

Methods: 30 patients sustaining malleolar fractures who attended the Department of Orthopedics were included in the study. The patients were operated as and when the soft tissue condition permitted and were followed up in outpatient department at 6 weeks, 3 months and 6 months where functional outcome based on Baird and Jackson scoring system was assessed.

Results: In this study, the average age of patients was 43.8 years with a male preponderance. Supination-external rotation was the most common mechanism of injury following a slip or twisting injury. According to Baird and Jackson scoring system 20% patients had excellent, 50% patients had good results, 20% patients had fair results and 10% patients had poor results.

Conclusions: 70% patients had excellent to good results following fixation of malleolar fractures. Early mobilization was started in 5 patients with 80% patients showing excellent results. Open reduction and Internal fixation proved to be an excellent procedure leading to union in all cases, less complication and early resumption of routine activities.

Keywords: Demographic profile, Malleolar fracture, Lauge-Hansen classification, Baird and Jackson scoring, Early mobilization

INTRODUCTION

Ankle mortise injuries are common injuries of lower extremity of which malleolar fractures are the commonest. The ankle is a mortise joint formed by lower end of tibia and fibula articulating with the talus. Its anatomy makes it very unstable in cases of fractures and ligament injuries

Around the 1960's, closed reduction was the primary modality of treatment of ankle fractures and operative treatment was performed after repeated failed attempts.¹

From 1970, greater emphasis was placed on anatomic reduction and rigid fixation of these fractures.²

Operative treatment is based on the AO (Arbeitsgemeinschaft für Osteosynthesefragen) principles and choice of fixation depends on the size of fragment, comminution and syndesmotic stability.^{3,4} Early mobilization of these fractures stabilizes the ankle joint and prevents translational talar movement as well as external rotation. Thus, early mobilization must be encouraged following operative stabilization.

The study was done with the objective to study the demographic profile of patients sustaining malleolar fractures, to assess the functional outcome following fixation of these fractures and to evaluate the importance of early non weight mobilization and their influence on functional outcome in these fractures.

METHODS

In this prospective observational study, 30 patients sustaining malleolar fractures and treated in Hindu Rao Hospital were followed up for a period of 6 months from July 2017 to June 2018. Patients were admitted and vital parameters recorded. Detailed history was taken noting the mode, severity, event and type of trauma. All the required routine investigations and radiological examination was done. Fracture was classified on the basis of pattern and was planned for surgery. Patient information was collected and compiled.

Inclusion criteria

Patients with malleolar of ankle (uni, bi and trimalleolar), patients above 18 years of age and patients willing for treatment and given informed consent.

Exclusion criteria

Patients with open fractures, patients with associated comorbidities like diabetes mellitus, peripheral vascular disease, neuropathy and medically unfit patients.

Operative procedure

Open reduction and internal fixation of malleolar fractures was performed by standard medial and lateral approaches. Posterior malleolar fractures greater than 25% of the joint surface area or fracture with greater than 2 mm articular incongruity were planned for fixation. Medial malleolus was fixed using tension band wiring or 4 mm lag screw based on the size and stability of the fragment. Lateral malleolus was fixed using 1/3 tubular plate. Posterior malleolus was fixed with 4 mm lag screw by modifying the lateral approach to a posterolateral approach. Syndesmotic injury was assessed pre-operatively and intra-operatively and was fixed using 3.5 mm cortical screws.⁵

Patients were followed up for a period of 6 months and radiographs were taken at every visit and patient was clinically and radiologically assessed for fracture union, functional outcome and complications. The statistical data were compiled and analysed by SPSS (statistical package for social sciences) Statistical software version 17.0.

RESULTS

After compiling the proforma, the patients were followed up at 6 weeks, 3 months and 6 months in which scoring

was performed using Baird and Jackson scoring system.⁶ The following were the results of the study.

Age distribution

All the patients of 18 years or above age were included in this study. The mean age of the patients was 43.8 years (standard deviation 14.12) with a range of 18-72 years.

Table 1: Age distribution (n=30).

Age (in years)	Frequency	%
18-20	2	7
21-30	5	17
31-40	5	17
41-50	10	33
51-60	3	10
61-70	4	13
>70	1	3

Gender distribution

Males were found to be more affected in present series (80%).

Mode of injury

Mode of injury was classified into fall from the same level/ twisting injury, road traffic accident and others (fall from height, assault etc.). 43% patients in this study had slip and fall closely followed by road traffic accident (RTA) (40%).

Laterality of fracture

In present study in 60% cases (18 cases) right limb was affected.

Delay in presentation

Delay in presentation indicates the time interval between injury and first contact with the hospital. Maximum number of cases reported to the hospital within 7 days of injury (90%).

Injury surgery interval

In the present series duration between injury and surgery varied from being operated after 1 day to 16 days. The mean injury surgery interval was 7.67 days. This period of delay was utilized towards making the patient fit for surgery besides reduction in preoperative swelling.

Type of fracture

In this series, 3 patients had isolated lateral malleolus fracture, 22 patients had bimalleolar fractures and 5 patients had trimalleolar fractures.

Mechanism of injury

The various fracture patterns and mechanism of injuries were studied and classified on the basis of Lauge Hansen classification.⁷ Supination-external rotation was the most common mechanism (43%) followed by pronation-external rotation (33%).

Table 2: Mechanism of injury (n=30).

Classification	Frequency	%
Supination-external rotation	13	43
Supination-adduction	2	7
Pronation-external rotation	10	33
Pronation-abduction	5	17

Syndesmotic injury

Eight patients (26.7%) were suspected to have syndesmotic injury and confirmed intra operatively. All these patients required fixation and syndesmotic screw removal at 6 weeks.

Modality of fixation

Of the 30 patients included in this study, 27 patients had a fractured medial malleolus. The various modalities of fixation used were 4 mm cancellous lag screw (13 patients), tension band wiring (13 patients) and 3.5 dynamic compression plate (1 patient).

All the 30 patients in the study had a fractured fibula, of which 29 were fixed and 1 was left alone as it was in the proximal one third of fibula.

In the present study, of the 5 posterior malleolus fractures, only 1 was fixed. All other fractures were treated conservatively as the fracture was well reduced after fixation of medial and lateral malleolus.

Time of fracture union

The union of fracture was assessed radiologically and clinically. In the present series mean union time was 12.11 weeks with standard deviation of 1.65 weeks. In 76.67% cases (23 patients) union time was within 14 weeks and in 6.67% cases (2 patients) union time was delayed to 16 weeks.

Complications

3 patients had superficial infection which healed in 2 weeks with antibiotics and antiseptic dressing.

Functional outcome

Functional outcome was assessed using Baird and Jackson scoring system. In the present series all the patients were followed up for 6-month period and periodically assessed

clinically and radiologically. After the end of 6 months follow up, “excellent” results were seen in 6 patients (20%) while most patients showed “good” results (15 patients, 50%). 6 patients (20%) showed “fair” results while 3 patients showed “poor” results (10%).

Table 3: Functional outcome according to Baird and Jackson scoring (n=30).

Result	Frequency	%
Excellent (96-100)	6	20
Good (91-95)	15	50
Fair (81-90)	6	20
Poor (≤ 80)	3	10

Early mobilization and functional outcome

In the present study, of the 30 patients, 5 were started on early non weight bearing mobilization after suture removal and slab removal at an average of 12-14 days. Others were continued on below knee slab for 6 weeks. Initially isometric exercises were begun followed by flexion extension exercises at knee and ankle joint.

Statistical analysis correlation between early non weight bearing mobilization and results was done. Here p value 0.016 is significant, which means there is association between early non weight bearing mobilization at 2 weeks with functional outcome.

Weight bearing mobilization

23 patients (76.67%) started partial weight bearing by 6-8 weeks while 5 patients started partial weight bearing by 8-10 weeks. 2 patients had associated lower limb fractures and partial weight bearing was delayed to 12 weeks.

Full weight bearing was started from 12 weeks in 28 patients. The remaining 2 patients had associated fractures of lower limb and full weight bearing was delayed to 16 weeks.

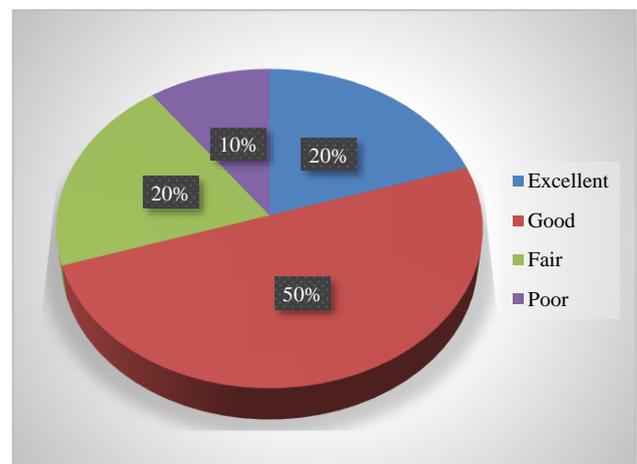


Figure 1: Analysis of functional outcome.

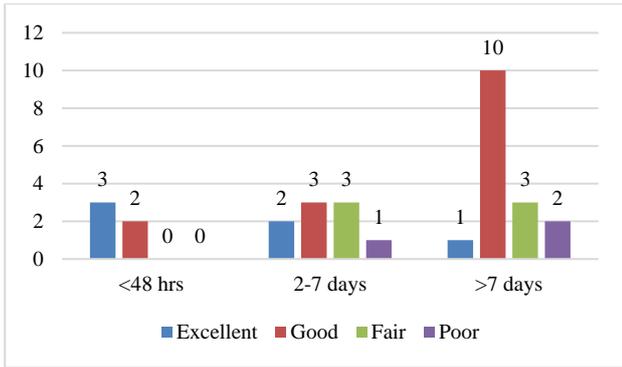


Figure 2: Injury surgery interval and functional outcome.

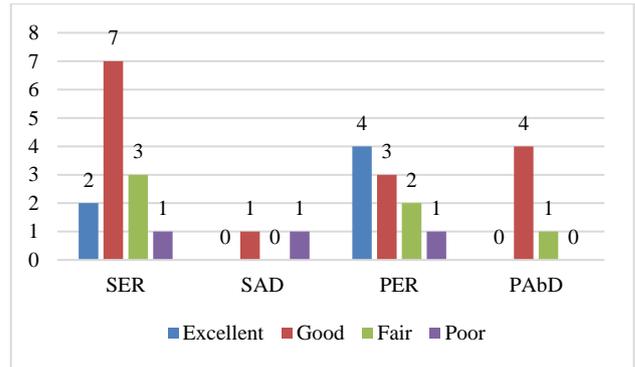


Figure 3: Mechanism of injury and functional outcome.



Figure 4: (a, b) Pre-operative radiograph of a 40-year-old male showing supination-external rotation type injury. (c, d) immediate post op radiograph and (e, f) radiograph after 6 months.

DISCUSSION

The purpose of the present study was to study the demographic profile of patients with malleolar fractures and assess functional outcome following fixation. The implants were chosen based on the fracture pattern and classification of fractures (Lauge and Hansen

classification).⁷ The results of this study were compared to various other studies.

We found in our study that malleolar fractures are more common in 2nd, 3rd and 4th decades of life. Maximum numbers of patients (33%) were in the age group of 41-50 years. Mean age was found to be 43.8 years. These results

were comparable to studies conducted by Roberts and Liestal et al.^{8,9}

Males were predominantly affected in our series (80%) compared to females (20%). High incidence of males involved in RTA may be reason for male predominance. Roberts in his study, found 44% incidence in males compared to females.⁸ Beris et al found an incidence of 38.8% in males compared to females¹⁰. Sex distribution in our study showed a male preponderance compared to other studies.

Right side (63%) was more commonly affected than left in our study which was comparable to the study conducted by Beris et al.¹⁰

In our study fall due to slipping or twisting injury was the mode of injury in maximum number of cases (43%) closely followed by road traffic accidents (40%). Kristenson series (58.9%) and Van Laarhoven (58%) showed the commonest mode of injury to be twisting injury of the foot and ankle.^{11,12}

Supination-external rotation was the most common mechanism accounting for 43% of patients followed by Pronation-external rotation injuries (33%) which was comparable to the studies conducted by Roberts et al and Gregory et al.^{8,13}

Early non-weight bearing mobilization of ankle was started as soon as suture removal at 2 weeks in 5 of our patients. Out of these, 4 patients had excellent results and 1 patient had good result.

Average union time in our study (clinically and radiologically assessed) was 12.11 weeks with a standard deviation of 1.65 weeks. 76.67% of fractures (23) united within 14 weeks. 7 fractures (16.67%) united by 16 weeks. Maruthi et al in their study of 40 patients showed radiological union by 10-12 weeks.¹⁴

Functional assessment according to Baird and Jackson scoring system was done at 6 months with 70% excellent to good results. These results were comparable to the Beris et al and Reddy et al series.^{10,15}

CONCLUSION

From this prospective study we conclude that malleolar fractures are commonly seen in active young people. Open reduction and internal fixation have proven to be an excellent procedure leading to union in all the cases. It allows early weight bearing with less morbidity and early resumption of daily activities/occupation. Preferred fixation for lateral malleolus is 1/3 tubular plate. For the medial malleolus, both tension band wiring and lag screws were used with comparable results indicating that one is not superior to other. Early non weight bearing mobilization showed improved results and should be promoted in these types of injuries.

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Ethical approval: The study was approved by the institutional ethics committee of Hindu Rao Hospital on 18 July 2017

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