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## Ankle fracture: The operative outcome of 30 patients

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### Abstract

**Background & Objectives:** Ankle fractures are the most common injuries treated by orthopaedic surgeons. However very few investigators have examined the functional recovery following operative treatment of ankle fractures. Anatomic restoration with open reduction and internal fixation is the goal of management in ankle fractures. The purpose of this study is to analyse the functional outcome following operative treatment of ankle fractures using subjective as well as objective criteria.

**Methods:** 30 patients with ankle fractures who fulfilled the inclusion criteria were included in the study. All patients underwent surgical fixation of the fractures. The follow-up assessment which consisted of subjective (Pain, Walking, activity, Radiographs, Ankle and Subtalar Joint function) and objective (Ankle-Hindfoot Scoring System) evaluations, were performed at 6 weeks, 3 months and 9 months postoperatively.

**Results:** Out of 30 patients, the commonest injury pattern seen was supination external rotation followed by pronation external rotation. The most common modality of fixation for the lateral malleolus was 1/3rd tubular plate and for the medial malleolus was 4 mm cannulated cancellous screws with washer, K-wire and tension band wiring and for the posterior malleolus fixation with lag screws and Syndesmotomic screws for syndesmotomic injuries. At 6 weeks follow-up of 60% (n=19) had complications of persistent swelling and residual pain, which improved significantly in function from 3rd month to 9 month postoperatively. However subjective radiographic assessment shows statistically significant improvement. The mean Ankle-Hindfoot Scoring System was statistically significant  $50.5 \pm 18.7$  at 3rd month post-op and  $85.1 \pm 14.2$  at 9th month post-op. Age was a significant predictor of final outcome, with younger patients having a better functional outcome.

**Conclusions:** Anatomical reduction of ankle fracture results in good functional outcome postoperatively. Early treatment without delay, anatomic reduction and fracture fixation, stringent postoperative mobilization and rehabilitation should help improve outcome in an operated ankle fracture.

**Keywords:** ankle, operative, outcome

### Introduction

Ankle is a precisely aligned joint with little soft tissue coverage. As result, severe injury combined with inadequate or inappropriate treatment can lead to severe complications and major disability.

As a weight-bearing joint, the ankle is exposed to forces that transiently exceed 1.25 times body weight with normal gait, and that may exceed 5.5 times body weight with vigorous activities. Normal gait requires adequate dorsiflexion and plantar flexion. Inversion and eversion, as well as accommodation to rotational stresses, are provided by the subtalar joint, whose function is linked closely with that of the ankle. The ankle is not intrinsically stable in any position and requires support from the muscles that cross it <sup>[1]</sup>.

Anatomic restoration of the joint is the goal of management in fractures about the ankle. Open reduction and internal fixation is the standard of care for unstable ankle fractures <sup>[2]</sup>.

However very few investigators have examined the functional recovery following operative treatment of ankle fractures <sup>[3]</sup>. The purpose of this study is to analyse the patterns and causes of ankle fractures as well as functional outcome of surgically treated ankle fractures.

### Materials and Methods

A prospective study was carried out in Dr. B.R. Ambedkar Medical College, Bangalore, from November 2015 to May 2017 and all closed bi-malleolar and tri-malleolar ankle fractures surgically managed were taken into the study. Fractures were classified according to the

Lauge-Hansen system and operated within 24hrs to 1 week depending upon the presentation. Surgery was performed under pneumatic tourniquet control.

### Internal fixation of the lateral malleolus

The lateral malleolus was approached through a posterolateral incision. The incision was put about 12cm proximal to the tip of lateral malleolus and extended distally along the posterior margin of the fibula to the tip of malleolus and curved it anteriorly for 2.5cm in line of peroneal tendons. The fibula was exposed subperiosteally by deepening the incision through subcutaneous tissue and deep fascia. Full thickness skin flaps were retracted anteriorly and posteriorly. The foot was externally rotated to separate fracture fragments, blood clots and intervening soft tissue was removed with a small curette from the fracture site. Reduction of the fracture was now done by reversing the force that caused the fracture.

Fixation of the fracture was done using 1/3 tubular plate with or without a lag screw, with lag screws alone or with an intramedullary device namely a Rush pin. Rush pin was used in case of undisplaced pronation-abduction or pronation-external rotation injuries and was passed through an incision made at the tip of the lateral malleolus and passed retrograde under C-arm guidance.

### Fixation of the medial malleolus

A medial longitudinal incision of 8cm was put over the medial malleolus between its anterior and posterior borders with the lower end curving anteriorly at the tip of medial malleolus. The incision was deepened to the bone protecting the long saphenous vein over the anterior part of the incision. The skin and subcutaneous tissue was retracted without undue pressure over the skin. The fracture site was exposed and cleared of blood clots and intervening periosteum with a curette exposing small serrations of the fracture. The distal fragment was held with a towel clip and pulled proximally, reducing the small serrations of the fracture. The fracture was fixed by passing one or two 4 mm cannulated cancellous screws with washer, or by tension band wiring depending on the configuration and size of the fracture fragment.

### Posterior lip fractures

Reduction of posterior lip fragments was done indirectly through either posteromedial or posterolateral incisions. The choice was made by the location of the fragment on the AP radiograph. Posterior lip fragments were reattached with one or two lag screws, occasionally supplemented with K-wires, washers. The most secure fixation was provided by interfragmentary fixation with lag screws, which glide through the fragment adjacent to their head and be threaded only into the opposite fragment. Such screws were placed from posterior to anterior if the fragment is exposed using a poster lateral incision.

### Syndesmotic Injury

Syndesmosis stability was checked by laterally displacing the distal fibula from the tibia while observing the relationship of the two bones under flurosopic guidance. If more than 3 to 4mm of lateral shift of the talus occurs, instability is present. Post-operatively, patients were put on a posterior Plaster of Paris (POP) slab for 3 weeks. Post-operative antibiotics were continued for a period ranging from 5 to 7 days depending on the presence of other injuries and therapy was prolonged if there were signs of infection. Once pain-free, patient was trained in non-weight bearing crutch walking. The splint was

continued till 3 weeks following which the patients were advised dorsiflexion and plantarflexion exercises.

At six weeks both groups of patients were reviewed, specific complaints were sought and check X-rays were taken. Ankle girths were measured to assess the amount of swelling in both groups and the range of dorsiflexion and plantar flexion were also assessed.

The patients were further reviewed at three and six months postoperatively and subjective and objective assessment of the patients' ankles were done using a modification of the scoring system proposed by Ankle-Hindfoot Scoring System.

### Scores according to the ankle-Hind foot scoring systems

Excellent	96-100
Good	91-95
Fair	81-90
Poor	below 80

### Inclusion Criteria

1. All age groups.

These all fractures were classified according to Lauge-Hansen Classification.

### Exclusion criteria

1. Poly trauma
2. Injury more than 3 weeks
3. Neurovascular compromise

### Operative Photographs

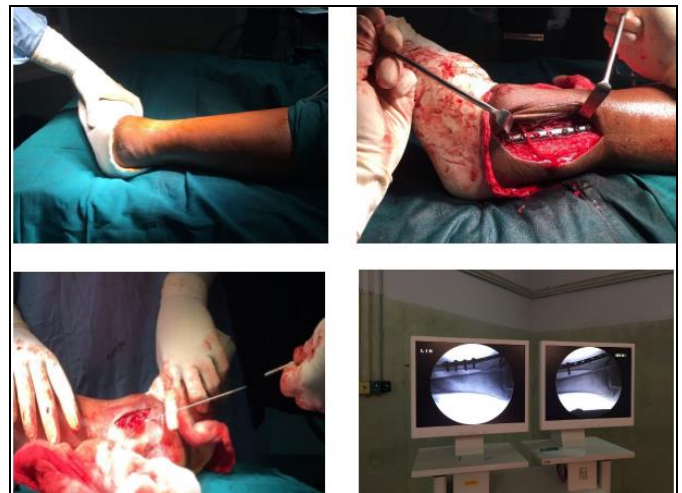


Fig 1

**Results:** Based on the Ankle-hindfoot scoring system, we graded our results as Excellent, Good, Fair and Poor. Our results were,

Excellent - 17 Cases (56%)

Good - 7 Cases (23%)

Fair - 5 Cases (16%)

Poor - 1 Cases (3%)

This study shows a male predominance of 70% (21) over a female percentage of 30%(9). In our study, the mean age group falls in the middle age, with more number of patients between 30 and 50 yrs of age. In our study, there is a right sided predominance of the fracture. Our study shows that RTA, accounting to 66% of the total number of cases, is the most common cause for injury, followed by slipped and fall (20%). In our study, Supination External Rotation (SER) mode of injury is the commonest fracture pattern with 43% of total

cases and Supination Adduction as the rarer presentation in 13% of the cases. Most of the cases in this study presented to the hospital almost immediately following trauma, accounting to 93%, with 7% of the cases presenting late. In our study, there is a delay of 2 – 7 days for surgical treatment for most cases. Depending on various criteria like patients general condition, comorbidities, soft tissue condition at fracture site, etc. surgery was done within 48 hours of trauma or delayed. This clearly showed that when surgery was done within the first week following trauma, patients had a superior end functional and radiological result when compared with patients who were operated after 1 week. Maximum medial malleoli fixations done using cancellous screws alone (60%) and tension band wiring (13%). Maximum lateral malleoli fracture fixations done using plate fixation (63%). Fewer cases of posterior malleolus and joint instability was fixed with lag screw and steinmann pin respectively. A syndesmotic screw was needed to stabilize the syndesmotic joint for 3 cases. Posterior malleolus needed operative fixation in 2 cases. Eight patients of 30 had comorbidities, and 25% of that 2 had complications. Of the 22 patients without any known comorbidities, only 1 developed complication.

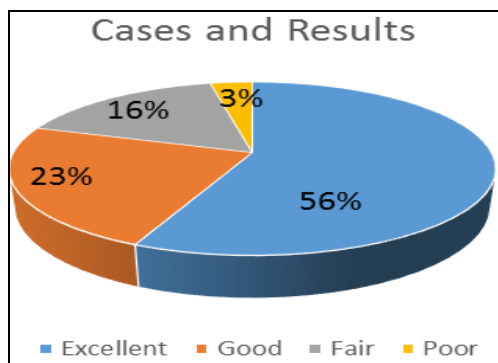


Fig 2

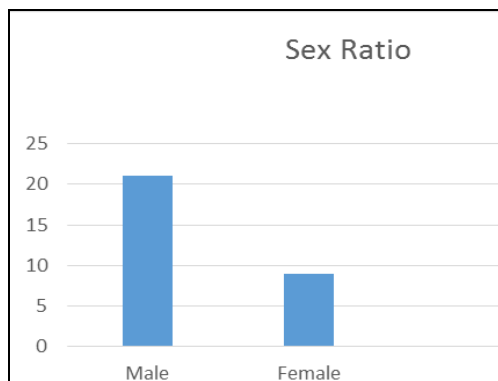


Fig 3

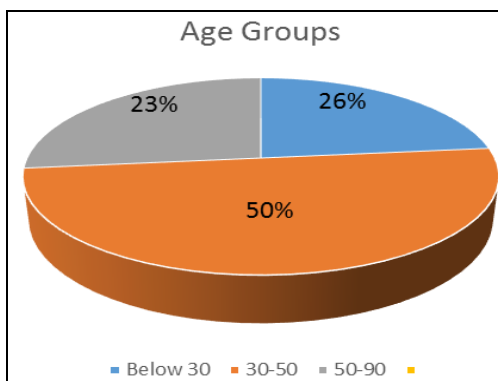


Fig 4

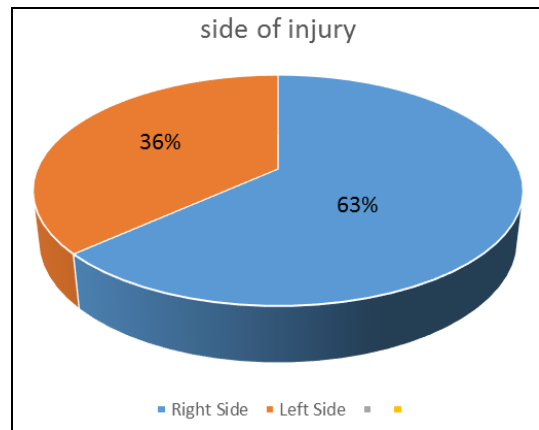


Fig 5

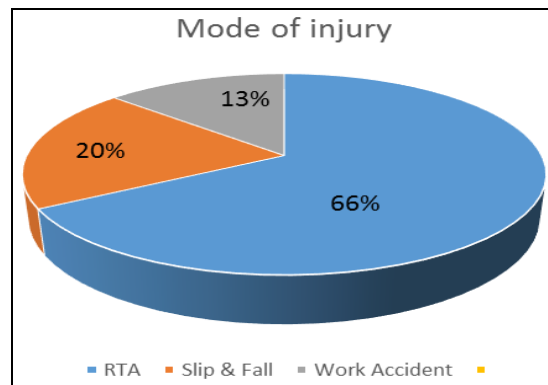


Fig 6

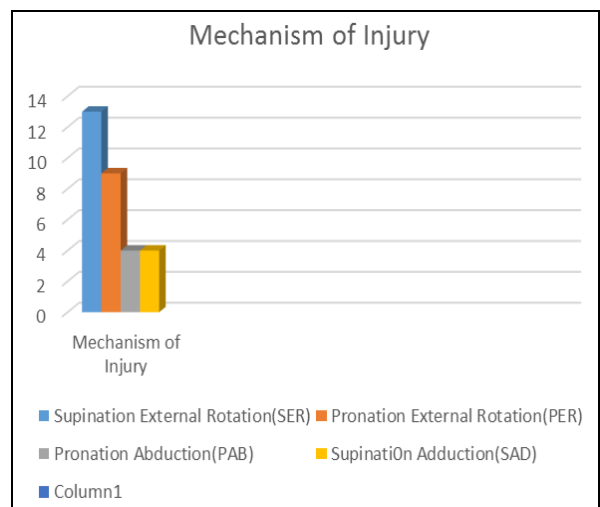


Fig 7

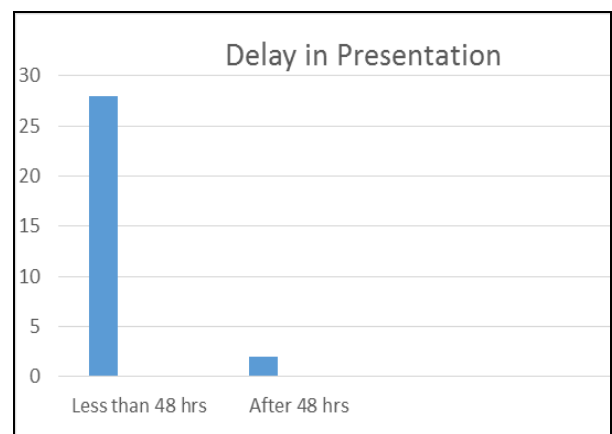


Fig 8

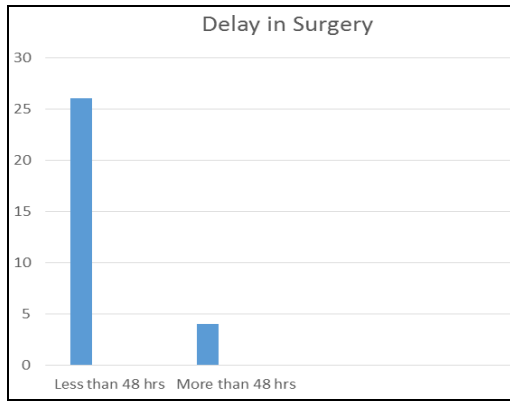


Fig 9

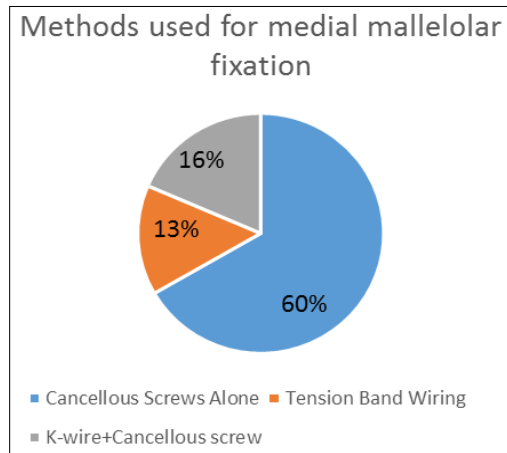


Fig 10

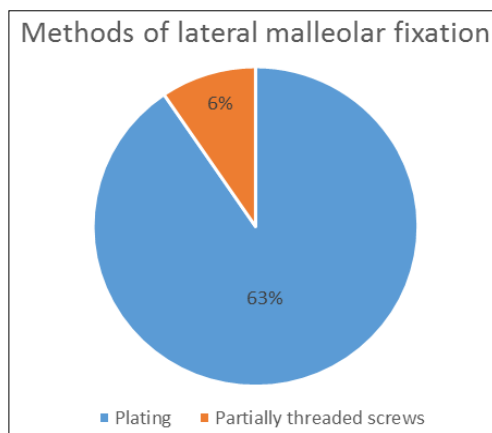


Fig 11

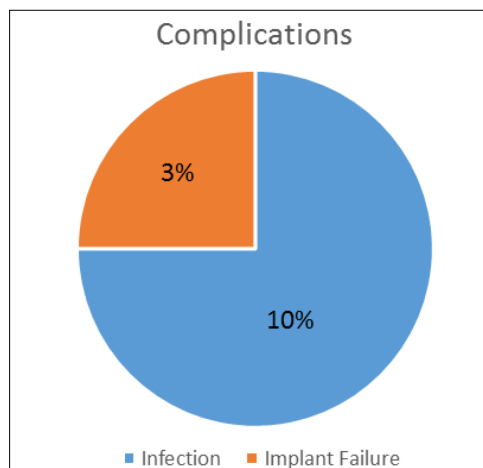


Fig 12

**Discussion**

In 2011, Hafiz *et al.* conducted a study on ‘Ankle Fractures: The operative Outcome’ and concluded that operative treatment for ankle fractures results good functional outcome post operatively, and restores sufficient stability and good mobility of the ankle joint [4].

Kumar *et al.* in 1999 described that internal fixation and early mobilization in displaced ankle fractures are difficult to treat conservatively. However, open reduction and rigid internal fixation affords the most predictable way to carry out an absolute anatomical reduction of fractures. They also noted that displaced ankle fractures should be operated to avoid drawbacks of closed manipulation and for early mobilization to achieve functional, painless ankle [5].

Ehrenfreund *et al.* in 2013 studied the results of operative management of ankle fractures in the elderly, with regard to functional outcome and complication rates. They did not observe any serious complications such as skin necrosis, deep infection, osteomyelitis and failure of metalwork. They recommended that there should not be any delays in treatment, that the reduction is anatomical, that the fracture fixation is satisfactory and that the rehabilitation is commenced early [6].

Weening *et al.* conducted a study in 2005 on the predictors of functional outcome following transsyndesmotc screw fixation of ankle fractures. Of 425 ankle fractures treated, 51 fractures had syndesmotc screw fixation. 70% of the injuries were pronation external rotation and 30% were supination external rotation injuries. The most common constructs for fixation included lateral plates with syndesmotc screws (45%). At final follow up, patients achieved good function and quality of life (mean Olreud and Molander score 74.1). The only significant predictor of functional outcome was reduction of the syndesmosis. They however felt 16% of the syndesmotc screws may have been unnecessary [7].

**Conclusion**

Operative treatment for ankle fractures results good functional outcome post operatively, and operative treatment restores sufficient stability and allowed good mobility of the ankle joint. Specific measures must be taken to reduce the number of superficial or deep infections. Other modes of treatment may be considered in cases with severe contamination. Motorcyclists must be aware of risks of ankle fracture and safety measures should be taken to prevent ankle fractures among motorcyclists.

In this study of 30 patients with ankle fractures who were treated operatively, the following salient findings were noted:

- Operative treatment for ankle fractures results in good functional outcome post-operatively.
- Anatomical reduction of the fracture was associated with better functional outcomes.
- A significant improvement was noted in the ankle function from 3rd month to 9th month post-op, assessed using subjective criteria as well as ankle-hindfoot scoring system.
- Age was a significant predictor of the final outcome, with younger patients having a better outcome.
- No significant wound complications were noted.
- The most common late complications reported were persistent swelling and residual pain.
- Early treatment without delay, anatomical reduction and fracture fixation, stringent postoperative mobilization and rehabilitation should help improve outcome in an operated ankle fracture.

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