

Original Research Article

Functional outcome and complications of surgically managed malleolar fractures at ankle

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ABSTRACT

Background: If not treated properly the ankle injuries are a source of disability in the form of pain, instability and early degenerative arthritis of ankle. The aim and objectives of the study were to assess functional outcome of surgically managed malleolar fractures at ankle and to assess the results of complication.

Methods: This study was undertaken from January 2012 to August 2015. In-patients who were admitted in Nizams institute of medical sciences Hyderabad, for surgical management of ankle fracture were taken for the present study. 61 patients were admitted during this period. Among them, 4 patients died, 5 patients were lost from follow up due to various reasons and 4 patients were not fulfilling the inclusion/exclusion criteria. The remaining 48 patients were included in the study.

Results: Pronation abduction injury was more common, seen in 45% of patients. In terms of functional outcome 62% patients achieved excellent to good results as per subjective criteria. 75% good results as per objective criteria and 83% good results as per radiological criteria. Patients with unimalleolar fractures had the best outcome with mean Olerud Molander ankle score (OMA) Score of 94 With regards to lateral malleolar fracture fixation modality, patients with rush nail fixation had mean OMA Score of 86. With regards to medial malleolar fracture fixation modality, patients with Tension band wiring had mean OMA SCORE of 93. The patients with complications has poorer outcome with mean OMA Score of 76.

Conclusions: There was a significant improvement in the functional outcome of the patients as assessed by radiological, subjective and objective parameters compared to preoperative condition.

Keywords: Functional outcome, Complications, Malleolar fractures

INTRODUCTION

Injuries around the ankle are more frequent in adults. Ankle injuries apart from road traffic accidents can also result from a slip while walking or getting down from stairs or a twisting injury in sports and the fall from a height. All these produce ankle injuries when one attempts to turn violently over a fixed foot or the foot being used as the lever to produce twist at the ankle. Great majority of ankle fractures are caused by indirect violence. If not treated properly the ankle injuries are a source of disability in the form of pain, instability and early degenerative arthritis of ankle.¹

It has been shown experimentally by Ramsey, about one mm lateral shift in Talus produces about 42 percent of decrease in tibio-talar contact area.² This obviously shows the need for perfect anatomical reduction, which could be better, achieved by open reduction and better maintained by internal fixation.

Many surgeons reported excellent results in the treatment of displaced ankle fractures with ORIF using the AO-ASIF principles. The Lauge-Hansen and Denis-Weber (AO) classification systems are the two most widely used systems for classification of ankle fractures. The detailed classification by Lauge-Hansen gives good information

about the extent of skeleton and ligamentous involvement but because of the many sub groups, is unpractical in daily routine work. The Weber classification in contrast, only focuses on the fracture of the fibula and its relation to the syndesmosis and is thus insensitive to the degree of skeletal and ligamentous involvements. Furthermore type B includes various injuries with different prognosis. The open reduction and internal fixation using the AO-ASIF method is an excellent treatment for fractures of the ankle that are displaced or unstable.

The present study has been undertaken to analyze the results of internal fixation in displaced ankle fractures by using the AO-ASIF principles. A total of 48 patients were followed and analyzed for results.

METHODS

The data for this study was collected from forty eight patients fulfilling the inclusion/exclusion criteria admitted in IPD in Nizams Institute of Medical Sciences during the period from January 2012 to August 2015.

Method of collection of data

This study was done in orthopedic department from January 2012 to August 2015. During this period the In-patients who were admitted in Nizams Institute of Medical Sciences, Hyderabad, for surgical management of ankle fracture were taken for the present study. 48 patients were included in the study. Demographic data including patient age and gender, mechanism of injury, date of injury, type of fracture, and date of surgery were obtained from the records. Operative details were reviewed from the records to determine the specific fixation technique. Post-operative details till discharge were collected from the records. The consultation and x ray to be taken was made free of charge. Patients were told in detail regarding the study and informed consent was taken. Details of follow-up after surgery were gathered. An X-ray of ankle AP and Lateral were taken during this visit of the patient. The X- ray taken at this follow-up time was analyzed. Radiological outcome was assessed as per Cedell et al criteria.⁴ we have taken the help of radiologist for the assessment of radiological outcome. In these criteria various parameters like posterior malleolus, lateral malleolus, medial joint space, and syndesmosis were taken into consideration. The outcome was graded as good, fair, or poor. The patient functional outcome was then assessed subjectively by OMAS.⁵ The OMAS is a self-administered patient questionnaire developed to evaluate symptoms following surgery of ankle fractures. The scoring scale is rated from 0 (totally impaired) to 100 (completely unimpaired) and consists of nine questions. The first three questions include primary complaints (pain, stiffness and swelling), the following four questions cover ability to perform simple tasks (stair-climbing, running and jumping) and the last two questions concern the patient's situation in everyday life (supports and activities of daily life). The

subjective score was classified into four groups; poor (<60), fair (60-80), good (81-90) and excellent (>90). For this subjective assessment the patients were given a questionnaire which was in their vernacular language. The patients were told to tick the suitable degree of the parameter as per their present situation. The outcome was graded as poor, fair, good and excellent as per the score obtained by the patient. Then the objective outcome was assessed as per Cedell criteria in these criteria parameters like gait, malleolar distance, calf atrophy, ligamentous tenderness, ankle stiffness, pes planus, heel valgus, and swelling were taken into consideration.⁶ The patient's outcome was graded as good, fair, and poor as per the condition of the patient. In this way the data was obtained from all the 48 patients. The data obtained was then analyzed

Statistical analysis

The information collected regarding all the selected cases were recorded in the master chart. Data analysis was done with the statistical software namely SPSS 19.0 and Microsoft word and Excel has been used to generate graphs tables. Using this software range, frequencies, percentages, means and standard deviation were calculation. The final outcome was assessed by Wilcoxon Sign rank test by using the radiological score, subjective and objective score in pre-operative and at final follow up. (Radiological score consists of scores of lateral malleolus, posterior malleolus, medial joint space, syndesmosis parameters; objective score consists of scores of intermalleolar distance, calf atrophy, ligamentous tenderness, loss of motion, pes planus, heel valgus, swelling parameters; whereas subjective score consists scores of pain, stiffness, swelling, stair climbing, running, jumping, squatting, supports and activities of daily living parameters) A $p < 0.05$ was considered as significant.

RESULTS

In Table 1, closed injuries were observed in 36 (75%) of patients whereas 12 (25%) patients had compound fractures or fracture dislocations. Among them 2 (4.2%) were technically compound, 4 (8.3%) were Grade 1 Gustilo Anderson, 4 (8.3%) were Grade II and 2 (4.2%) were Grade III A.

In Table 2, the distribution of patients according to Lauge-Hansen Classification is shown in above table. The patients with supination adduction injuries were 4 (8.3%), supination external rotation injuries were 12 (25%), pronation abduction was 22 (45.8%) and pronation-external rotation was 10 (20.8%). There were no pronation dorsi flexion injuries in this study group.

As shown in Table 3, in terms of Henderson classification, bimalleolar fractures were commonest 28 (59%) followed by trimalleolar fractures 10 (21%) isolated medial malleolus 10 (21%) and no isolated

lateral malleolus. There were no isolated posterior or anterior malleolar fractures in this series.

C of injuries was more common with 63%, whereas Type B were seen in 21% of patient's type A were seen in 16% patients.

As shown in Table 4, as per Weber's classification Type

Table 1: Distribution of study subjects as per type of injury.

Injury	No. of patients	Percentage (%)
Closed injuries	36	75
Technically compound	2	4.2
Compound Grade I	4	8.3
Compound Grade II	4	8.3
Compound Grade IIIA	2	4.2
Total	48	100

Table 2: Fracture distribution according to Lauge Hansen classification.

Type of fracture	No. of patients	Percentage (%)
Supination adduction	4	8.3
Supination external rotation	12	25
Pronation abduction	22	45.8
Pronation external rotation	10	20.8

Table 3: Fracture distribution according to Henderson Classification.

Type of fracture	No. of patients	Percentage(%)
Isolated malleolar fractures	10	21
Bimalleolar fractures	28	59
Trimalleolar fractures	10	21

Table 4: Fracture distribution according to Weber's classification.

Type of fracture	No. of patients	Percentage
Type A	6	16
Type B	8	21
Type C	24	63

Table 5: Distribution according to type of fixation in particular fractures.

Part	Type of fixation	No. of patients	Percentage (%)
Later malleolus / Distal Fibula (n =38)	One third tubular plate	30	79
	Rush nail	8	21
Medial malleolus (n =48)	Malleolar /cancellous Screws	32	66.7
	Tension band technique	16	33.3
Posterior malleolus (n =10)	Lag screw(s)	6	60
	No fixation	4	40
Syndesmotic injury (n =4)	Syndesmotic screw through fibular plate	4	100

"N" Indicates the number of patients with particular condition.

In Table 5, among the 38 lateral malleolar (or distal fibular) fixations 30 (79%) were done with tubular plate, 8 (21%) were done with rush nail. Among the 48 medial malleolar fixation, malleolar or cancellous screw fixation was done in 32 (66.7%) patients, and Tension band technique in 16 (33.3%) patients. Among 10 patients with posterior malleolar fracture, 6 patients were with lag screw, while the rest of 4 patients no fixation was required as it got reduced with fixation of other

malleolus. The syndesmotic screw was applied in 4 fractures. All were placed through fibular plate. These screws were removed before weight bearing after 10 weeks in all the patients post-operatively.

Out of total 48 patients 12 (25%) were found with complications, 2 patients had asymptomatic nonunion of medial malleolus, 1 patient had fibular non-union, 4 patients had periarticular osteoporosis whereas 4 patients

had superficial wound infection. In this study, 2 medial malleolus nonunion and 2 fibular nonunion were seen, which were asymptomatic.

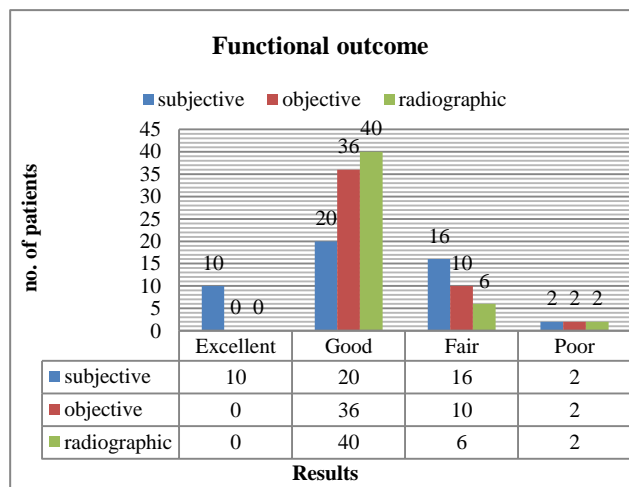


Figure 1: Functional outcome in terms of subjective objective and radiological scores.

The subjective outcome was divided into excellent, good, fair or poor as per Olerud and Molander scale. Among the 48 patients we achieved excellent and good results in 30 (62.5%) patients where as poor results seen only in 2 patients as per the subjective outcome. Similarly, the objective outcome was divided into good, fair or poor according to Cedell criteria. Among the 48 patients we achieved good objective result in 36 (75%) patients, whereas poor results seen only in 2 patients. Further, the radiological outcome was divided into good, fair or poor according to Cedell criteria. Among the 48 patients, we achieved good radiological results in 40 (83.3%) patients. Whereas poor results was seen only in 2 patients

The functional outcome in patients with complications were observed that the mean OMA score was 76 and 33% patients achieved good objective and 33% patients achieved good radiological outcome and there were poor outcome in 17% patients in terms of objective and radiological outcome. The time taken for full weight bearing was 11.5 weeks.

DISCUSSION

In our study the most common mode of injury was Road traffic accident which similar to the studies conducted by Lee et al.⁷ Whereas Jensen et al and Thur et al has slip and fall as most common mode of injury had fall from height as most common mode of injury.^{8,9}

In our present study most of the patients belong to Weber type C which similar to the study done by St. Gallen et al whereas studies from Liestal et al and Freibrug et al had Weber type B as more common.¹⁰⁻¹²

According to Daly et al there was a relationship between the severity of trauma and the nature of the ankle fracture.³ Fractures of the supination-external rotation type were associated with moderate trauma and fractures of pronation and abduction was associated with severe trauma. In our study most of the pronation abduction injury was seen in patients of road traffic accidents which is a severe type of trauma. The majority of patients in our study being in Weber type C having road traffic accident as mode of injury also reflects the severity of trauma with Weber type.

Among the 48 patients, we achieved excellent and good results in 30 (62.5%) patients where as poor results seen only in 2 patients as per the subjective outcome. Similarly, the objective outcome was divided into good, fair or poor according to Cedell. Among the 48 patients we achieved good objective result in 36 (75%) patients, whereas poor results seen only in 2 patients. Further, the radiological outcome was divided into good, fair or poor according to Cedell. Among the 48 patients, we achieved good radiological results in 40 (83.3%) patients whereas poor results were seen only in 2 patients. In addition, the final outcome was assessed by using the radiological score, subjective and objective score in pre-operative and at final follow up. There was significant improvement in the outcome of the patients as assessed by radiological, subjective and objective parameters.

The present study found that all the patients managed with rush rods had a good or fair functional result at follow-up compared to 93% with plate fixation 7% of patients experienced poor objective and radiological outcome in those treated with plate fixation were as none of the patients with rush nails have experienced this poor outcome. In addition, patients with Rush nail treatment were able to resume full weight bearing 2 and half weeks earlier than those in the plate and screws population. This was similar to the study conducted by Pritchett et al whose patients experienced early resumption of weight bearing compared to plate fixation.¹³

Rush nail has potential advantages of a smaller incision, less soft tissue dissection, better mechanical stability in osteoporotic bone with less prominent metalwork, and has the potential to reduce the incidence of complications, while it may not control the rotation of fragment neither can effectively maintain the length of the fibula as compared with the plate fixation but such situation can be kept to minimum with good surgical and postoperative management.^{14,15} Hence rush nailing can be encouraged as a good modality of treatment wherever possible for fibula fixation

Surgical treatment of ankle fractures may be accompanied by several complications. The overall complication rate following ORIF of ankle fractures varies considerably in the literature ranging from 1% to 40%.¹⁶ In our study it was 25 percent.

Social security disability (SSI) is the most common complication following ankle fracture surgery. The incidence of SSI following operative treatment of ankle fractures varies considerably in the literature, ranging from 1.4% to 5.5%.¹⁶ In our study it was 8.3%.

The development of infectious wound complications has a direct negative effect on the overall functional outcome.¹⁷ Korim et al studied patient- and surgery-related risk factors for surgical site infection following open reduction and internal fixation of an ankle fracture.¹⁸ They found that surgical site infections result in lower functional scores as assessed by using the Olreud and Molander ankle score.

In our study the mean Olreud and Molander ankle score among patients with surgical site infections was low i.e., 65. Poor results were obtained in among 50% patients. Time taken for full weight bearing was also longest i.e., 11.5 weeks among these patients.

CONCLUSION

There was a significant improvement in the functional outcome of the patients as assessed by radiological, subjective and objective parameters compared to preoperative condition. Rush nailing appears to have better functional outcome compared to one third tubular plate for the lateral malleolar fracture fixations. Tension band wiring appears to have better functional outcome compared to malleolar screw fixations. Patients with Open injuries, diabetes, old age, Weber C type, Infectious wound gave poorer functional outcomes.

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