

Morphology and Outcome of Fractures of the Ankle Treated by Internal Fixation**Haresh K. Hadiya¹, Prabhu N. Chaudhary², Jayur J. Solanki³**¹M.S. Orthopaedics, Consultant Orthopaedic Surgeon, Sadvichar General Hospital, Bhavnagar, Gujarat²M.S. Orthopaedics, Consultant Orthopaedic Surgeon, Advance Orthopaedic Hospital, Tharad, Gujarat³Assistant Professor, GMERS Medical College, Navsari, Gujarat

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Abstract:

The ankle joint is formed of the distal tibia and fibula with their corresponding projections; the medial and lateral malleolus articulating with the dome of talus. The ankle joint is vital for maintaining posture and ambulation. Ankle injuries gain importance because body weight is transmitted through the joint and locomotion depends upon the stability of it. We have studied 68 patients with Ankle fractures at the Department of Orthopaedics, at state run 1500 bedded tertiary care hospital attached to post-graduate teaching institute located at central Gujarat, from August, 2019 to October, 2020. We planned to follow up the patient for a minimum of six months at every six weekly interval. At every follow-up, patient were assessed clinically for pain, swelling, mobility at fracture site, joint stiffness, signs of infection, wound status etc and radiologically for union status, alignment and implant status. The Olerud and Molander score and AOFAS score system rate outcome of patients with ankles fractures on a scale of 1-100 where higher score indicates good outcome. 6 patients showed non-union at final follow up and the scoring system reflected the outcome.

Keywords: Lauge Hansen classification, Olerud and Molander score, AOFAS score system.

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Introduction

The ankle joint is formed of the distal tibia and fibula with their corresponding projections; the medial and lateral malleolus articulating with the dome of talus. The ankle joint is vital for maintaining posture and ambulation. The congruency and stability of the joint are maintained by a combination of the bony components, surrounding ligaments, tendons, musculature and joint capsule. The distal tibia and fibula form a fibrous joint called the distal tibiofibular syndesmosis.

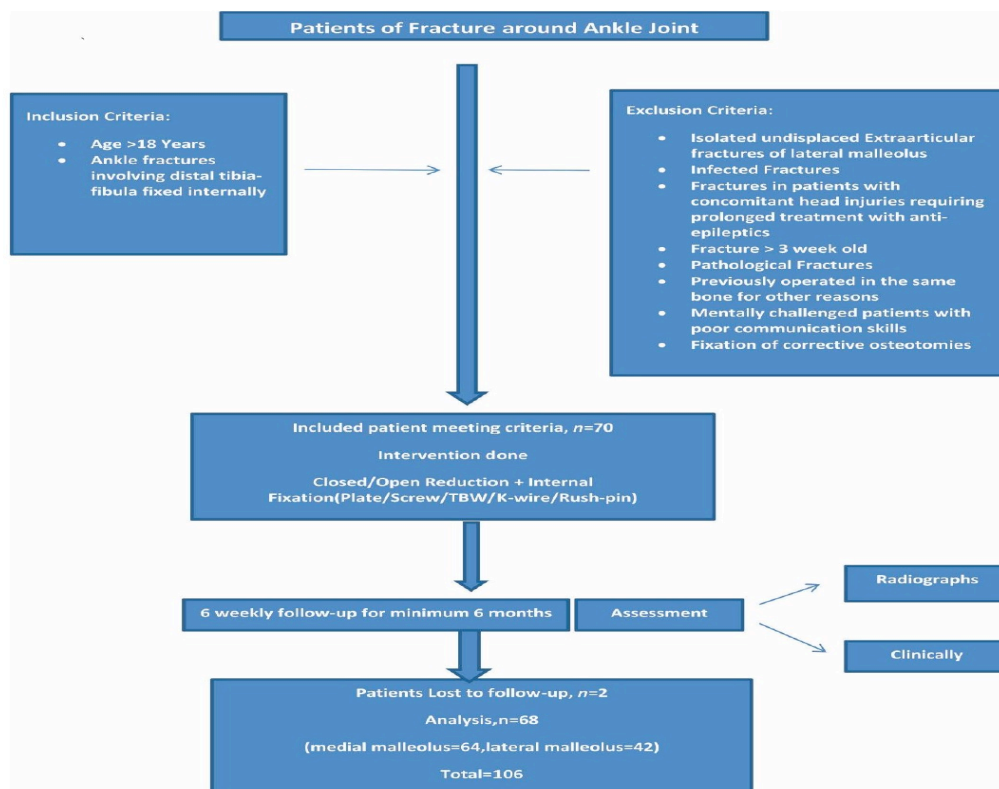
Ankle injuries gain importance because body weight is transmitted through the joint and locomotion depends upon the stability of it. [1] Typically, ankle fractures result from low-energy rotational traumas. Such fractures usually affect young men and older women. [2] But as numbers of traffic accidents have increased, the severity of the fractures and trauma energy have grown steadily. [3-7] A recent study by Shah et al. found an incidence rate of 3.29 ankle sprains per 1000 person years in United States emergency departments. [8]

Fractures that are considered stable can be treated conservatively in a cast or moonboot for a period of at least six weeks. [9] Stable fractures include those with an isolated undisplaced medial or lateral

malleoli fractures without significant talar shift (less than 4 mm). Posterior malleolus fractures are also treated nonoperatively if they involve less than 25% of the articular surface. [10] Unstable fractures are treated surgically unless contraindicated by significant co-morbidities. The indication for surgery include; open fractures, unstable (bimalleolar fractures) or displaced fracture and those with neurovascular compromise. Posterior malleolar fractures should be fixed if the fragment is more than twenty-five percent of the joint surfaces of the distal tibia as viewed on a lateral radiograph.

The morphology of injuries has been changing with time. Also, the outcome of newer fixation methods with respect to the current morphology of injuries requires validation in the setup of our practice. Newer designs of implants used for fixation of ankle fractures have also emerged which have already found place in the huge inventory of implants of this department. This study would be an update of the type of ankle fractures presenting to our hospital and also audit the outcome of such fractures treated by different types of internal fixation principles and devices.

Material and Methods



Flow chart: basic methodology

This prospective cohort study was carried out at the Department of Orthopaedics, at state run 1500 bedded tertiary care hospital attached to post-graduate teaching institute located at central Gujarat, from August, 2019 to October, 2020 with due permission from institutional ethics committee.

During this period, 70 patients with Ankle fractures were treated with internal fixation. 68 patients were available for final follow-up and assessment (2 patients lost to follow up) We planned to follow up the patient for a minimum of six months at every six weekly interval. At every follow-up, patient were assessed clinically for pain, swelling, mobility at fracture site, joint stiffness, signs of infection, wound status etc and radiologically for union status, alignment and implant status.

All data was collated, compared and analysed using descriptive statistics. Measures of statistical location like mean and range was generated. Statistical analysis as applicable was used. Frequency tables and relevant illustrative charts were drawn. *P* values less than 0.05 was considered significant.

We considered a fracture united when plain radiographs showed bridging bone across the fracture in both orthogonal views and the patient could bear full weight without pain. We considered outcome as favourable when fracture union was achieved in both bones. Failure to unite with or without hardware problems and/or non return to

activities involving daily living using the involved limb due to the fracture under study was considered as unfavourable outcome. Any surgical intervention done at any point of time after the pilot surgery to promote union was considered a failure in our study.

Observations and Results

Total 68 patients were available at the final follow up and assessment, of which 79.41% of patients were males (n=54) in this study. The gender distribution in the study was statistically insignificant. The mean age of the patients in this study was 36.94 year. Most ankle fractures were a result of high velocity injury (n=56). Closed fractures of Ankle (n=56) outnumbered open fractures (n=12) in this study. Associated orthopaedic injuries were seen in as many as 18 patients (26.47%) in this study. On the basis of Lauge Hansen classification system, Pronation dorsiflexion injuries of ankle were not found during this study period. Supination external rotation (n=18) and pronation external rotation (n=18) were more commonly seen in this study. We included 8 patients with fractures of segmental fibula with fractures of medial malleolus and plafond fractures of tibia which do not fall in any of the category of injury as shown in Lauge Hansen classification. Hence we labelled such fractures under “unclassified” injuries.

73.53% fractures were treated on the same day of injury and 11.76% fractures were treated within 48 hours of injury. The prolonged hospital stay seen in this study in supination external rotation, pronation external rotation injuries and unclassified injuries was probably due to complications related to these fractures and/or fracture management. In this study, 36 fractures were treated with percutaneous fixation (k-wire, rush Pin, screw) and 70 fractures were

treated by open reduction (plate, TBW). Most of the medial malleolus fractures were treated by open reduction plating or tension band wiring. Fibula fractures were treated equally by both open and close reductions with appropriate fixation. Complications were noted in 14 patients during the study period. 4 patients had infection, 6 had non-union and 4 had implant failure with infection.

Table 1: Outcome Assessment: (Subjective)

Type of Injury	Pain AS (Average	Per VAS values)	Subjective Satisfaction Score (average values)
	12 Weeks	24 Weeks	
Supination- Adduction	3	1	8.2
Supination External Rotation	3.92	0.92	8.25
Pronation Abduction	4	0.5	9
Pronation External Rotation	3.18	1.09	8.09
unclassified	2.75	1	7
Note	1- Severe Pain 10-No Pain		1-Poor 10-Excellent

Table 2: Outcome Assessment: (Union & Score)

Outcome	No. of Patients	Olerud Molander Score	AOFAS Score
Union	62	92.74	92.06
Non-Union	6	60	73.66
Total	68	89.85	90.44

The Olerud and Molander score and AOFAS score system rate outcome of patients with ankle fractures on a scale of 1-100 where higher score indicates good outcome. 6 patients showed non-union at final follow up and the scoring system reflected the outcome.

Grossly both scoring systems did not show any difference in outcome evaluation at the end of study period. Scoring of more than 85 points was noted in 58 patients when evaluated as per Olerud and Molander scoring system and in 56 patients when evaluate as per AOFAS score. Lesser score were noted in patients who developed complications. The least score noted was 35 in a patient with pronation external rotation injury who developed non-union during the study period.

Discussion

There has been gradual evolution in the management of ankle fractures owing to improved analysis of biomechanics, improvement in fixation techniques, and analysis of results of recent studies.

The goal of the treatment is to provide fracture union with painless full motion of ankle, with anatomical restoration. Increased knowledge about the normal and post traumatic anatomy and function of the ankle joint has lead to a demand for the exact reduction and rigid fixation of the ankle fractures. Burwell and Charnley showed that anatomical reduction and rigid fixation led to early return to function. [11] Prompt operative treatment of displaced ankle fractures decreases morbidity and improves functional outcome. [12,13,14] The

treatment of malleolar fractures with accurate open reduction and stable internal fixation applying AO method and principles was found to provide a high percentage of excellent and good results. [15] This study supports these conclusions. In the current study, 68 patients with bimalleolar ankle fractures were operated and followed for a period of 6 months. In our study, fractures were common below 50 years age group, with mean age being 36.94 years. Our finding is comparable with the study by Roberts SR [16], Baird and Jackson [17], Beris et al [15]. Our study had a male prominence with 79.41% and male: female ratio of 4:1 which is comparable with the study by Baird and Jackson [17]. In the current study, high velocity trauma constituted majority of cases.

In this study, Lauge-Hansen classification system and AO classification system were used for operative evaluation. The most common type of injury was supination-external rotation (35.29%), followed by pronation external rotation injury (32.35%). Pronation dorsiflexion injury was not encountered in study. The pattern and incidence of these varieties of ankle fracture was in accordance with Roberts SR [16], Beris et al [15], and Baird and Jackson [17]. In our study we considered velocity as high or low depending on the mode of injury. In this study high velocity injuries were more common than low velocity injuries. Likewise, Baird and Jackson [17], Lee et al [1] suggested that road traffic accidents were more common.

In this study most of the medial malleolus fractures were treated by open reduction plating or tension

band wiring. Fibula fractures were treated equally by both open and close reductions with appropriate fixation. In the current study, the functional outcome was better in patients who underwent stable internal fixation of the medial malleolus by TBW. The results were not equally satisfactory in those patients who had less rigid fixation of the medial malleolus using only K-wire mainly due to failure of reduction when the patient was mobilized. TBW of the medial malleolus gave results equivalent of those fixed with screws with lesser reporting of skin irritation.

Although early mobilization was advocated by AO group, other studies have found no such inferences. In the current study, mobilization was done at 4 weeks. Partial weight bearing was advised for when early radiological signs of union were seen. In our 68 patients, there was no instability of ankle joint, probably because of adequate period of immobilization. The results in this study were comparable with those of Robert SR16, Baird and Jackson [17] and Beris et al [15]. In the study by Robert SR16 88% of the patients showed good to excellent results. Baird and Jackson [17] in their series of 24 patients found 90% good results. In the study by Beris et al [15] 89% had good to excellent results. The functional results of this study were comparable with that of the above cited studies, with 94% good and 6% poor results. The treatment of bimalleolar fractures with accurate open reduction and stable internal fixation using AO method and principles was found to give a high percentage of excellent and good results. This study supports these recommendations of A.O.

Limitations of the study

- a) Low sample size.
- b) Possible inter observer bias of radiographic observations.
- c) Short duration of follow up.
- d) Purposive sampling.

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