

## Clinical Outcome After Surgical Intervention of Malleolar Fracture of Ankle

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### Abstract

**Introduction:** Ankle fractures are increasingly common injuries that require a careful approach for proper and effective management. We aimed to evaluate the functional outcome of surgical management of malleolar fracture and its association with patient characteristics.

**Methodology:** We performed an observational study in the Department of Orthopedics, Rural Medical College, Loni, Maharashtra from January 2016 till December 2016, in which we included patients with ankle fracture and consented for surgery. At the time of admission, we collected patient related information like age, gender, mode of injury, mechanism of injury etc. All patients underwent evaluation of clinical outcome at the end of 6 months using Baird and Jackson criteria. The data will be analyzed by SPSS using appropriate statistical tests. p- value of less than 0.05 will be taken as level of significance.

**Results:** During the study period 70 patients were enrolled in the study, mean age was 48.6 years and 42 were males. According to the Baird and Jackson score, clinical functional outcome was excellent in 20% cases, good in 56%, fair in 18% and poor in 6% of the patients. We found that age group 31 to 50 years was statistically associated with better clinical outcomes (p value 0.0014) and surgery, if performed within 24 hours of the injury, is statistically associated with better clinical outcomes (p value 0.0021).

**Conclusions:** Younger age groups and earlier surgical interventions were associated with better clinical outcomes.

**Keywords:** ankle, surgery, clinical outcome, patient

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### I. Introduction

The ankle and foot are highly evolved structures in the human body, which are designed to support body's weight and to help with movement over varied terrain. Ankle fractures are increasingly common injuries that require a careful approach for proper and effective management. The incidence of ankle fractures is approximately 187 fractures per 100,000 people each year.<sup>1</sup> Since the mid-1900s, this rate has increased significantly in many industrialized countries, most likely due to growth in the number of people involved in athletics and in the size of the elderly population.<sup>2</sup> There are similar fracture rates overall between women and men, but men have a higher rate as young adults, while women have higher rates in the 50 to 70-year age group.<sup>3</sup>

Ankle injuries that result from bending forces are commonly described as inversion or eversion injuries. Technically, inversion and eversion are motions of the subtalar joint and become supination and pronation when combined with ankle and midfoot motion. Internal and external rotation of the ankle refers to the rotation of the talus within the joint. Previous studies have shown the relationship of various patient variables in predicting the occurrence of ankle fractures. But not much work has been done on the factors which are associated with good or poor clinical outcomes. In this study we aimed to evaluate the functional outcome of surgical management of malleolar fracture and its association with patient characteristics.

### II. Methodology

#### Study Design and sample population

We designed a hospital based observational study in the Department of Orthopedics, Rural Medical College, Loni, Ahmednagar from January 2016 till December 2016. Institutional ethics committee approval was sought before we started enrolling the patients. Hospital is a major provider of healthcare in Ahmednagar, Maharashtra. For this study we included patients presenting to emergency ward or outpatient clinic with any type of ankle malleolar fracture (unimalleolar, bimalleolar, trimalleolar), of both the sexes and willing to undergo surgery and who gave their consent to participate in the study. We excluded patients with open ankle fracture, malleolar fracture associated with pilon fracture, malleolar fracture associated with lower one third

fracture tibia, old neglected fracture and those patients who were medically unfit for surgery and or anesthesia. Before the start of the study, we calculated the sample size to be 70.

### **Data Collection and Data Analysis**

On admission of the patient, a careful history was elicited from the patient and / or attendants to reveal the mechanism of injury and the severity of the trauma. The patients were then assessed clinically to evaluate their general condition and local injury. Cases were diagnosed based on history, clinical examination and investigation. Demographic and statistical data included age, gender, mode of injury, mechanism of injury, type of fracture and complications seen post-operatively. All patients underwent plain radiographs in anteroposterior, lateral and mortise views.

Patients with minimally displaced monomalleolar fractures, avulsion fractures, stable fractures, with unhealthy skin, those who were medically unfit for surgery and those who would not cooperate for post-operative regimen will be managed by closed reduction. Operative management was employed when lateral column was unstable and when talus shifted more than 2mm laterally. Removal of the screw was done at six weeks postoperatively for all cases. Patients were put on below knee plaster at the time of discharge and advised non-weight bearing crutch walking. At the end of 6 months, patients were evaluated for functional outcome using the Baird and Jackson criteria.<sup>4</sup> All the data will be noted down in a pre-designed study proforma. The data will be analyzed by SPSS software ver. 21.0, using appropriate statistical tests (based on type and distribution of data). p- value of less than 0.05 will be taken as level of significance.

### **III. Results**

During the study period 70 patients were enrolled in the study, mean age was 48.6 years and 42 were males. Road traffic accidents was the most common mode of injury, followed by domestic falls. (Table 1) Supination external rotation and pronation external rotation were the most commonly observed mechanisms of injury present in our patient population. Bimalleolar fracture was seen in 61% of the patients. (Table 1) Superficial skin infections were seen in 13% and ankle movement restriction was seen in 4% patients post-operatively. According to the Baird and Jackson score, clinical functional outcome was excellent in 20% cases, good in 56%, fair in 18% and poor in 6% of the patients. When we looked for association between patient variables and functional outcome score, we found that age group 31 to 50 years was statistically associated with better clinical outcomes (p value 0.0014) (Table 3). Similarly, surgery, if performed within 24 hours of the injury, is statistically associated with better clinical outcomes (p value 0.0021). Either of the genders were not associated with better or worse clinical outcomes.

### **IV. Discussion**

Our study has described the patients of ankle fracture at our center. Average of the patients in our study is comparable to other studies.<sup>5</sup> Road traffic accidents were the most common cause of injury in our patients, and so was in the study by Lee et al.<sup>6</sup> Similar to our study, supination external rotation is the most common mechanism of injury.<sup>7,8</sup> Isolated malleolar fractures tend to be stable if they are nondisplaced (ie, there is no contralateral or syndesmotic injury). However, care must be taken with fractures of the medial malleolus. Disruption of lateral or posterior structures often occurs in association with these fractures, though they may initially appear to be isolated injuries. Posterior malleolar fractures occur either from the impact of the talus on the posterior aspect of the tibia or from an external rotation or pronation (eversion) force.<sup>9</sup> Fractures of both the lateral and medial malleoli are called bimalleolar and are generally unstable. A bimalleolar fracture with a fracture of the posterior malleolus is referred to as a trimalleolar fracture. Trimalleolar fractures are unstable and typically occur with injuries of greater force. They have a higher risk of complication than bimalleolar fractures and require surgical stabilization. Fracture stability determines treatment. The location of an isolated lateral malleolar fracture in relationship to the joint can help to determine if the fracture is stable. Lateral malleolar fractures below the level of the mortise are typically stable and less likely to be associated with additional ligament injuries.<sup>10</sup> When an ankle injury causes a fracture above the level of the mortise, it is typically unstable due to the associated syndesmosis injury and must be referred for surgical evaluation.

Instability is demonstrated by 2 mm or more of displacement of the fibular fracture, an associated medial fracture, or a medial ligament disruption, all of which should prompt orthopedic referral.<sup>11</sup> Two long-term follow-up studies of patients with isolated lateral malleolar fractures at or below the level of the ankle joint reported that greater than 90% of patients had good clinical results regardless of treatment, provided fibular displacement did not exceed 3 mm.<sup>12</sup> Bimalleolar and trimalleolar fractures are unstable and require operative fixation. Patients should be splinted with the ankle joint at 90 degrees, remain nonweightbearing, and be referred to an orthopedist within a few days.

This study has a few limitations. The results of this study was observed at a single location. Therefore the results might not be applicable to other centers. The sample size of the study population should have been more. We chose a sample size of 70 based on the number of patients we treat at our particular center.

### Conclusions

Our study has described the patients who presented to our hospital with ankle fracture. Our study findings suggest that age group 31 to 50 years is associated with better clinical outcomes. Also if operated within 24 hours, the functional outcomes are better. Future studies should focus at long term clinical outcomes and quality of life of such patients.

**Table 1.** Baseline characteristics of patients included in the study

Number of patients	70
Average age (standard deviation)	48.6 ( $\pm$ 4.76) years
Males	42 (60%)
Mode of injury	
Road traffic accident	37 (53%)
Domestic falls	23 (33%)
Sports injury	10 (14%)
Mechanism of injury	
Supination external rotation	24 (34%)
Supination adduction	14 (20%)
Pronation abduction	6 (9%)
Pronation External Rotation	21 (30%)
Pronation Dorsiflexion	5 (7%)
Type of fracture	
Bimalleolar fracture	43 (61%)
Lateral malleolar fracture	16 (23%)
Medial malleolar fracture	8 (11%)
Trimalleolar fracture	3 (5%)
Post-operative complications	
Superficial skin infection	9 (13%)
Ankle movement restriction	3 (4%)

**Table 2.** Functional outcome using Baird and Jackson score

Result	Number of cases
Excellent	14 (20%)
Good	39 (56%)
Fair	13 (18%)
Poor	4 (6%)

**Table 3.** Association of patient variables with clinical outcomes

Variable	Functional Outcome using Baird & Jackson score				p value
	Excellent	Good	Fair	Poor	
Age (years)					
21-30	1	3	1	0	0.0014
31-40	5	18	4	0	
41-50	4	13	3	0	
51-60	3	3	4	2	
61-70	1	2	1	2	
Gender					
Males	21	16	3	2	0.72
Females	17	4	5	2	
Duration between injury and duration of surgery					
Less than 24 hours	12	18	6	3	0.0021
More than 24 hours	6	12	4	9	

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