



## Orthopaedics

## EVALUATION OF FUNCTIONAL OUTCOME OF SURGICAL MANAGEMENT OF BIMALLEOLAR ANKLE FRACTURES – A PROSPECTIVE STUDY

<b>Dr. Gade Venkatappa Reddy</b>	Associate Professor Department of Orthopaedics Alluri Sitarama Raju Academy of Medical Sciences Eluru, West Godavari District Andhra Pradesh 534005, India
<b>Dr. Kota Aditya*</b>	Associate Professor Department of Orthopaedics, Alluri Sitarama Raju Academy of Medical Sciences Eluru, West Godavari District Andhra Pradesh 534005, India. *Corresponding Author
<b>Dr. Rohit Inuganti</b>	Assistant Professor Department of Orthopaedics, Alluri Sitarama Raju Academy of Medical Sciences Eluru, West Godavari District Andhra Pradesh 534005, India
<b>Dr. Y. Krishna Kousik Reddy</b>	Postgraduate Department of Orthopaedics Alluri Sitarama Raju Academy of Medical Sciences Eluru, West Godavari District Andhra Pradesh 534005, India

**ABSTRACT** **INTRODUCTION:** Ankle fractures are one of the most common types of fractures treated by orthopaedic surgeons. Over the last two decades, there has been an increase in the prevalence of these fractures both in young, active patients and in the elderly.<sup>1,2</sup> These fractures have the potential to produce significant long-term disability and complications in the form of instability pain and early degenerative arthritis.<sup>3</sup> The surgical method restores the anatomy and contact-loading characteristic of the ankle joint. Additional advantages are easier rehabilitation without a cast, early mobilization and earlier weight bearing.<sup>4</sup> The purpose of this study, on Bimalleolar ankle fractures, is to evaluate the functional outcome and results obtained by surgical management by various methods of internal fixation.

**AIMS AND OBJECTIVES:** The main aim of this study is to evaluate the results obtained by the surgical management of Bimalleolar fractures in adults by various methods of internal fixation. Objectives included are: to analyse results of internal fixation in displaced bimalleolar ankle fractures, to analyse the results of faster rehabilitation and to analyse the results of complications.

**MATERIALS AND METHODS:** This study was conducted in the Department of Orthopaedics at Alluri Sitarama Raju Academy of Medical Sciences, Eluru, Andhra Pradesh, from July 2019 to December 2020. 30 ankle injuries were taken into the study who were treated by surgical methods. 30 patients with Bimalleolar fractures were treated surgically with open reduction and internal fixation.

**RESULTS:** Excellent results were achieved in 8 cases (26.66%), good in 17 cases (56.66%), fair results in 4 cases (13.33%) and poor outcome in 1 case (3.33%). Good to excellent results were obtained in 83.33%. Five patients (16.66%) had fair to poor results, were seen in patients with delayed union of the medial malleolus and those with associated syndesmotic injury and those with superficial or deep infections.

**CONCLUSION:** The majority of bimalleolar ankle fractures were caused by supination external rotation injuries. A majority of medial malleolus were treated with malleolar and cancellous screw fixation (60%) followed by tension band wiring. The contour of the lateral malleolus should be reproduced when the plate is being used. Thus with stable surgical fixation of bimalleolar ankle fracture, near anatomical healing and early mobilization can be done with good functional outcome.

**KEYWORDS :** Ankle Fracture, Ankle Surgery, Bimalleolar Fracture, Screws, Tension Band Wiring

**INTRODUCTION:**

Ankle fractures are one of the most common types of fractures treated by orthopaedic surgeons. Over the last two decades, there has been an increase in the prevalence of these fractures both in young, active patients and in the elderly.<sup>1,2</sup> These injuries gain importance because whole body weight is transmitted through the ankle. These fractures have the potential to produce significant long-term disability and complications in the form of instability pain and early degenerative arthritis.<sup>3</sup> The goals of treatment include achieving a sound union of fracture and an ankle that functions normally without pain.

The surgical method restores the anatomy and contact-loading characteristic of the ankle joint. Additional advantages are easier rehabilitation without a cast, early mobilization and earlier weight-bearing.<sup>4</sup> The purpose of this study, on Bimalleolar ankle fractures, is to evaluate the functional outcome and results obtained by surgical management by various methods of internal fixation.

**AIMS & OBJECTIVES:**

The main aim of this study is to evaluate the results obtained by the surgical management of Bimalleolar fractures in adults by various methods of internal fixation.

**OBJECTIVES INCLUDE,**

1. To analyse results of internal fixation in displaced bimalleolar ankle fractures.
2. To analyse the results of faster rehabilitation.
3. To analyse the results of complications.

**MATERIALS AND METHODS:**

This study was in the Department of Orthopaedics at Alluri Sitaramaraju Academy of Medical Sciences from July 2019 to

December 2020. 30 ankle injuries were taken into the study who were treated by surgical methods.

**INCLUSION CRITERIA:**

1. Age between 18-60 years.
2. Those who gave consent to participate in the study.
3. All displaced bimalleolar ankle fractures in adults were included.

**EXCLUSION CRITERIA:**

1. Those not consented to participation in the study.
2. Associated comorbid conditions making the patient unfit for multiple surgeries.
3. Un displaced fractures and fractures treated by closed reduction.

On admission, a detailed history was elicited from the patient and/or attendants for the mechanism of injury and the severity of trauma. Then patients were assessed clinically to evaluate their general condition, and a complete survey was done to rule out significant injuries.

Careful examination was done to rule out associate injuries. Routine investigations were done. Radiographs of the injured ankle - Antero-posterior views and Lateral views and stress views were taken and the fracture is classified by AO classification and LAUGEHANSEN CLASSIFICATION.<sup>5</sup>

They were operated on as early as possible once their general condition is stable and fit for surgery.

**Fracture Fixation:**

Avulsion fractures of distal fibula were reduced and held with reduction forceps and stabilized by either a lag screw or a tension band technique. Typical of AO type A injuries, a larger avulsed fragment of

the distal lateral malleolus, was best fixed with either a small oblique screw or tension band wire. AO type B fractures were fixed by placing one or two lag screws perpendicular to the line of the fracture. More secure fixation was achieved by one-third semi-tubular plate contoured to fit the concave, slightly spiral, lateral surface of the fibula. Compressing the fracture site with an anterior-posterior interfragmentary lag screw was used to augment the strength of the fixation.

Avulsion fractures of medial malleolus were best reduced by exposing both the medial and the anterior aspects of the fracture by sharply turning back the periosteum and attached fascia. When the medial malleolar fragment was comminuted or too small for screws, K-Wires with a figure-of-eight tension banding was used for fixation.

Parenteral antibiotics were given in the post-op period. After 10 to 12 days, the sutures were removed, and a below-knee cast was applied for four weeks. Non- weight-bearing gait was started from the first or the second postoperative day. Partial weight-bearing was started after the removal of the cast (after clinical and radiological signs of union become evident).Active exercises of the ankle were advised. In patients with syndesmotic screw fixation, weight-bearing was delayed until implant removal. Follow-up was done at regular intervals of 6 weeks for a minimum of 6 months.

**RESULTS:**

In our series, 30 cases of Bimalleolar fractures of the ankle, treated by surgical methods at Alluri Sitarama Raju Academy of Medical Sciences, Department of Orthopaedics, during the period from July 2019 to December 2020 were studied. The following observations were made, and the analysed data are as follows:

The majority of the cases, i.e.,22 (73.33%) were from the 30 to 50 years age group. The eldest patient was 58 years, and the youngest patient was 22 years old. The mean age was 41.8 years.

**Table1: Age Incidence**

Age(inyears)	21-30	31-40	41-50	51-60
No. of cases	3	9	13	5
Percentage	10%	30%	43.33%	16.66%

Twenty cases (66.66%) affected were due to road traffic accident, Sixcases (20%) due to fall, and 4 cases (13.33%) due to twisting injury. The commonest mode of injury was the road traffic accident.

**Table2: Mode Of Injury**

Modeofinjury	No. of cases	Percentage
Road traffic accident	20	66.66%
Fall	6	20%
Twisting injury	4	13.33%

The majority of the cases, i.e., 20 (66.66%) had Supination external rotation injury, followed by 5 (16.66%) cases that had a supination – adduction injury.

**Table 3: Fracture Type According To Lauge Hansen Classification**

Lauge – Hansen Type	No. of cases	Percentage
SA	5	16.66%
SER	20	66.6%
PA	2	6.66%
PER	3	10%

Most of the medial Malleolar fractures were fixed with Malleolar screws,i.e., 18 cases (60%), followed by tension band wiring, i.e. 9 cases. K-wire used for2cases,LCPfor1case.

**Table 4: Treatment Of Individual Fractures:**

**Table 4a: Medialmalleolus:**

Implants	Malleolarscrew	LCP	TBW	K-wire	TotalNo.OfMe dial Malleolus fractures
No.ofcases	18	1	9	2	30
Percentage	60%	3.33%	30%	6.66%	100%

The majority of the lateral Malleolar fractures, i.e.,21 cases were fixed with plate, of which Nineteen with the one-third tubular plate and 2 with 3.5 mm DCP. In the rest of the cases rushpin, K-wires or TBW was used.

**Table 4B: LATERALMALLEOLUS:**

Implants	Plating	Rushpin	K-wire	TBW	Total no.ofLat. Malleolar#
No.of cases	21	6	2	1	30
Percentage	70%	20%	6.66%	3.33%	100

16.66% of the patients had complications. Three patients had a superficial infection; one patient had a deep infection; one patient had delayed union of the medialmalleolus. The superficial and deep infections were managed with debridement and antibiotics. Delayed union of medialmalleolus fracture was treated with continued immobilization, which united eventually without surgicalintervention.

**DISCUSSION:**

The treatment of Bimalleolar fractures with open reduction and stableinternal fixation using the AO principles were found to give a high percentage of excellent and meritorious results<sup>6</sup> This study supports these conclusions. In the present study, the Lauge-Hansen classification was used for operative evaluation. The most common type of injury was the Supination-external rotation (66.66%), followed by Supination-adduction injury (16.66%), least common was pronationabduction (6.6%), this is in accordance with the study done by Roberts R S<sup>7</sup>,Bairdand Jackson Hemanth HP et al.<sup>8</sup>, ZakirShah et al.<sup>9</sup>, SunilVPatil et al.<sup>10</sup>.

Observation in this study supports the contention of Yablon etal<sup>11</sup> that lateral malleolus is the key for the anatomical reduction of Bimalleolar ankle fractures because the displacement of the talus faithfully followed that of the lateral malleolus. Inadequate reduction of the lateral malleolus fracture results in a persistent lateral displacement or residual shortening. After following the Post-op and Rehabilitation protocol and final score according to Olerud and Molander scoring system, the functional results of the present study are a majority of the patients (83.3%) had excellent to good results in the present study, similar to that was observed in other series like Beris et al<sup>6</sup>, Zakirah Shah et al.<sup>9</sup> SunilVPatil<sup>10</sup>.

In the present study, 30 patients with Bimalleolar fractures were treated surgically. Excellent results were achieved in 8 cases (26.66%), good in 17 cases (56.66%), fair results in 4 cases (13.33%) and poor outcome in 1 case (3.33%). Good to excellent results were obtained in 83.33%. Fivepatients (16.66%) had fair to poor results, were seen in patients with delayedunion of the medial malleolus and those with associated syndesmotic injury and those with superficial or deep infections. The patients with poor results had pain during walking on any surface, constant swelling of the ankle, thereduced motion of the ankle and narrowing of joint space and diminution in their abilitiesstorun, jumporsquat and impaired work capacity.

**CONCLUSION:**

The majority of them are caused by supination external rotation (66.66%) injuries with the most common aetiology being Road Traffic Accident (66.66%).Method of fixation of medial malleolus: a majority of cases were treated with malleolar and cancellous screw fixation (60%) followed by tension band wiring. The tension band wiring technique is the preferred method for small fragments and osteoporotic bones of both medial and lateral malleolus. The contour of the lateral malleolus should be reproduced when the plate is being used. For lateral stability of the ankle, the fibular length has to be maintained. Syndesmotic trans-fixation can be achieved with a single fully threaded screw. Thus with stable surgical fixation of bimalleolar ankle fracture, near anatomical healing and early mobilisation can be done with good functional outcome.

**Figure1: Open Reduction And Internal Fixation Using Malleolar Screws For Medial Malleolus And Semi Tubular Plate For Fibula**



**Fig1A:PreOperativeX-ray**

**Fig 1B:Immediate Post-opX-ray**



**Fig 1C: Follow up X-ray after 12 weeks**

**Fig 1D: Squatting Position**



**Fig 1E: Dorsiflexion and plantarflexion of the ankle**

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