

# A Prospective Study of Surgical Management of Bimalleolar Fractures with Various Modalities

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## Abstract

Ankle injuries should not be neglected because body weight is transmitted through it and locomotion depends on the stability of this joint. For this, we are conducting a prospective study of surgical management of bimalleolar fractures with various modalities. In our study, we surgically managed 36 patients and their functional assessment was done with Biard-Jackson scoring system. Excellent functional results are obtained with stable fixation of fractures. Tension band wiring was found to be better in internal fixation of medial malleolus as compared to screws fixation whereas lateral plating was best for fibular fractures. It was found that our results were coinciding with the literature.

**Keywords:** Biard-Jackson scoring, bimalleolar fractures, lateral plating, screw fixation, tension band wiring.

## Introduction

Sir Robert Jones said "Ankle is the most injured joint of the body but the least well treated [1]." Ankle joint biomechanics are important because body weight is transmitted through it and locomotion depends on the stability of this joint. There has been an increase in the prevalence of ankle fractures over the past two decades both in the young, active patients and in the elderly [2]. They are usually mixed injuries, ligamentous and bony injury is an end result of the sequence of ligamentous and bony failure due to deforming forces. Ankle joint is highly congruous and any disturbance of the normal articular relationship may result in long-term disability and complications in the form of pain, instability and early degenerative arthritis. The goals of treatment include achieving sound union of fracture and an ankle that moves and functions normally without pain. It is better achieved by open reduction and better maintained by internal fixation. The purpose of this study, on bimalleolar fractures of ankle is to evaluate the functional outcome and results obtained after surgical management by various methods of internal fixation.

## Aims and objectives

1. To study the functional outcome of surgically managed bimalleolar fractures of ankle in adults.
2. Anatomical restoration of ankle joint by operative treatment with internal fixation.
3. To achieve stable fixation and early mobilization of the ankle.

## Classification

1. Anatomical classification

Ankle fractures can be classified purely along anatomical lines as

monomalleolar, bimalleolar, and trimalleolar fractures. This is a simple descriptive system that is commonly used [3].

2. Lauge- Hansen system

Used in this study.

## Functional assessment

Done by Baird- Jackson system.

## Materials and Methods

The following is a prospective study of cases of bimalleolar fractures of ankle in adults, which were treated at our institution by surgical intervention.

## Criteria for selection of the cases

### Inclusion criteria

- Patients having unstable bimalleolar fractures of ankle, treated surgically were considered for the study.
- Patients of both sexes.
- Skeletally mature patient.
- Patient who are medically fit for surgery.

### Exclusion criteria

- Stable malleolar ankle fractures (treated conservatively).
- Open fractures of the ankle.
- Skeletally immature patients.
- Patients who are medically unfit for surgery.

All the patients were explained about the aims of the study, the methods involved and an informed written consent was obtained before being included in the study. On admission of the patient, a

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**Case 1**

Careful history was elicited from the patient and/or attendants to reveal the mechanism of injury and the severity of trauma. The patients were then assessed clinically to evaluate their general condition and a complete survey was done to rule out significant sites.

**Observation and Results**

In our series 36 cases of bimalleolar fractures of the ankle were treated with various surgical methods at our institute. Following were the observations made and the data analyzed as follows:

1. Fracture type: According to Lauge-Hansen classification (Table 1).
2. Fracture type according to Lauge-Hansen classification (Table 2).
3. Treatment of individual fractures.

- Medial malleolus #

Majority of the medial malleolar fractures were fixed with screws (cancellous/malleolar/DCP), i.e., in 16 (44.4%) cases. In rest TBW or K-wires were used.

- Lateral malleolus #

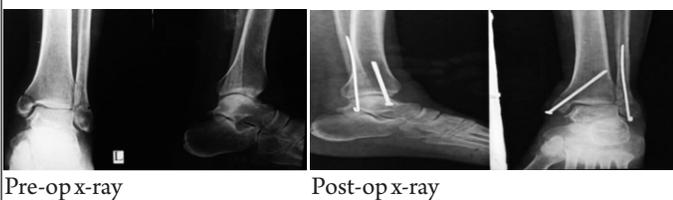
Majority of the lateral malleolar fractures were fixed with plates (semi-tubular/reconstruction/DCP), i.e., in 13 (36.1%) cases. Rest was treated with screws, rush pin, TBW/K-wires.

- Combination of modalities used for Bimalleolar fixation

In our study, we used various combinations of modalities as per the individual fracture configurations (Table 3).

4. Functional results according to Biard-Jackson scoring system (Table 4).

The results in current study were compared with that of Burwell and Charnley [4], Colton [5], Desouza [6] and Beris et al. [7]. In Colton [5] series, 70% of the patients had a good to excellent results. Burwell and Charnley [4] in their series of 132 patients, 102 (77.3%) had good results, 16% had fair results, and 6% were found to have poor score. In Desouza series, 150 cases of ankle fractures treated by open reduction and internal fixation using AO/ASIF method, obtained 90% good results. In a study by Beris et al. [7], of 144 patients with ankle fractures, 105 (74.3%) had a good to excellent results. The functional results of our study were comparable with that of the above-cited studies, with 72.2% had good to excellent results, 5.6% had fair results, and poor results in 22.2%.

**Case 2**

Functional outcome after healing (12 weeks)

**Summary**

36 cases of bimalleolar fractures managed surgically by various techniques are presented. Anatomy, classification, clinical features, review of literature, and methods of surgical management have been detailed out. The study comprises of 55.6% male patients and 44.4% female patients. The most common age group was 41-50, accounting for 33.3% cases. Right side was involved in 66.7% cases compared to left side. Road traffic accident was major cause of injury constituting 50% of the patients. According to Lauge-Hansen classification supination-external rotation type was the most common constituting 33.3% of the cases. Method

of fixation of medial malleolus: Majority of cases were treated with TBW or K-wire, i.e., 55.6% cases. Most of patients with fibular fracture underwent fixation by plating, i.e., 36.1% cases. Most of the cases, i.e., 77.8% were operated between the 2nd and 5th days of injury. Two cases of syndesmosis injury were reduced and fixed with screws. Weight-bearing was delayed till screws removal. No incidences of screw break out were encountered. Superficial infection of the wound was the most common complication in our study, i.e., in 11.1% cases. At the end of the study excellent to good results were seen in 23 (72.2%) cases whereas fair to poor results were seen in 27.8% cases.

**Conclusion**

In this study, 36 patients with bimalleolar ankle fracture were surgically managed with various modalities and functional assessment of these patients was done with Biard-Jackson scoring system. The data were assessed, analyzed, evaluated and the following conclusions were made.

- Ankle injuries should not be neglected because body weight is transmitted through it and locomotion depends on the stability of this joint.
- Stable ankle fractures can be reduced conservatively and give good results but unstable fractures require open reduction and internal fixation.
- Understanding the mechanism of injury is extremely essential for good reduction and internal fixation.
- Anatomical reduction is essential in all intra-articular fractures more so, if a weight-bearing joint like ankle is involved.
- The key to open reduction and internal fixation for displaced ankle fractures is to restore tibiotalar congruency.
- Lateral malleolus is the key to the anatomical reduction of

bimalleolar fractures, because the displacement of the talus faithfully follows that of the lateral malleolus.

- Poor reduction of the lateral malleolus fracture would result in persistent lateral displacement or residual shortening.
- Lateral malleolus should always be fixed first then medial malleolus should be inspected for stability.

Functional results improve when the normal bend of the lateral malleolus, is restored while plating.

- Chances of non-union of medial malleolus



Functional outcome after healing (12 weeks)

Table 1: Biard Jackson scoring system	
Category	Point
<b>Pain</b>	
A. No pain	15
B. Mild pain with strenuous activity	12
C. Mild pain with activities of daily Irvine	5
D. Pain with weight-bearing	4
E. Pain at rest	0
<b>Stability to ankle</b>	
A. No clinical instability	15
B. Instability - with sport activities	5
C. Instability with activities of daily living	0
<b>Ability to walk</b>	
A. Able to walk desired distances without limp or pain	15
B. Able to walk desired distances with mild limp or pain	12
C. Moderately restricted in ability to walk	8
D. Able to walk short distances only	4
E. Unable to walk	0
<b>Ability to run</b>	
A. Able to run desired distances without Darn	10
B. Able to run denied distances with slight pain	5
C. Moderate restriction in ability to run with mild pain	6
D. Able to run short distances only	3
E. Unable to run	0
<b>Ability to work</b>	
A. Able to perform usual occupation without restrictions	10
B. Able to perform usual occupation with restriction m some strenuous activities	8
C. Able to perform usual occupation with substantial restriction	6
D. Partially disabled: Selected jobs only	3
E. Unable to work	0
<b>Motion of the ankle</b>	
A. Within 10° of uninjured ankle	10
B. Within 15° of uninjured ankle	7
C. Within 20° of uninjured ankle	4
D. 50% of uninjured ankle, or dorsiflexion 5°	0
<b>Radiographic result</b>	
A. Anatomical with intact mortise (normal medial clear space, normal superior joint space, no talar tilt)	25
B. Same as A with mild reactive changes at the joint margins	15
C. Measurable narrowing of the superior joint space, with superior joint space 2 mm. or talar alt 2 mm	10
D. Model ate narrowing of the superior joint space, with superior joint space between 2 and 1 mm	5
E. Severe narrowing of the superior joint space, with superior joint space 1 mm widening of the medial clear space, severe reactive changes (sclerotic subchondral bone and osteophyte formation)	0
Maximum possible score	100
Excellent: 96–100 points, Good: 91–95 points, Fair: 81–90 points, Poor: 0–80 points	

Table 2: Fracture type according to Lauge-Hansen classification	
Lauge-Hansen type	Number of cases (%)
Supination - adduction	6 (16.7)
Supination - external rotation	12 (33.3)
Pronation - abduction	9 (25)
Pronation - abduction	9 (25)
Pronation - external rotation	9 (25)

Table 3: Combination of modalities used for Bimalleolar fixation	
Bimalleolar fixation	Frequency (%)
k-wire/TBW + plating	7 (19.4)
k-wires/TBW + rush pin	4 (11.1)
Screws + K-wires/TBW	13 (36.1)
Screw + plating	6 (16.7)
Screw + rush pin	2 (5.6)
Screw + screw	4 (11.1)
Total	36 (100)

Table 4: Functional results as per Baird Jackson scoring system						
Category	Grade A	Grade B	Grade C	Grade D	Grade E	Grade F
Pain	15	16	5	0	0	36
Stability of ankle	36	0	0	0	0	36
Ability to walk	28	8	0	0	0	36
Ability to run	20	12	4	0	0	36
Ability to work	31	5	0	0	0	36
Motion of ankle	22	10	4	0	0	36
Radiographic result	29	4	3	0	0	36

due to interposition of the soft tissue and periosteum are high so care must be taken before fixation.

- Excellent functional results are obtained with stable fixation of the fracture.
- TBW was found to be better in internal fixation of medial malleolus as compared to screws fixation whereas lateral plating was the best for fibular fractures.
- In small transverse fragments and osteoporotic bones, TBW seemed to be a better alternative
- Syndesmotom injury also gives excellent functional results if good anatomical reduction of fibula is obtained before transsyndesmotom screw fixation.
- Fair to poor results are seen in bimalleolar fractures associated with wound infection and those with unsatisfactory reduction of fracture fragments.
- Plaster cast or slab when applied for a period of 4 weeks does not reduce the final outcome because it allows sufficient time for the soft tissues around the ankle to heal and eventually no difference in the results is seen at 6 months follow-up.

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