

Functional Outcome in Surgical Management of Bi-Malleolar Ankle Fractures

Medapureddi Pavani Kumari^{1□}, Shaik Ruby Zaheena², Sahay Sajeev Tuluri³

^{1□} Junior Resident, Department of Orthopaedics, ASRAMS, Eluru, Andhra Pradesh

² Junior Resident, Department of Orthopaedics, ASRAMS, Eluru, Andhra Pradesh

³ Junior Resident, Department of Orthopaedics, ASRAMS, Eluru, Andhra Pradesh

Address for corresponding author: Department of Orthopaedics, Alluri Sitaramaraju Academy Of Medical Sciences, Malkapuram, Eluru, 534005

ABSTRACT:

Background: Malleolar injuries are complex injuries that are difficult to manage. These injuries gain importance because whole body weight is transmitted through the ankle and have the potential to produce significant long-term disability and complications in the form of instability, pain and early degenerative arthritis. The surgical method restores a perfect anatomy and contact loading characteristics of the ankle, which could be achieved by open reduction and internal fixation. **Materials and methods:** A prospective study of 30 cases of bimalleolar fractures of ankle managed surgically from November 2020 to October 2022 were studied. The functional outcome was evaluated using Olerud and Molander scoring system. **Results:** In our study

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we achieved 26.66% excellent results, 56.66% good results, 13.33% fair results, 3.3% poor results. **Conclusion:** The operative results were satisfactory in 83.32% cases with good to excellent functional outcome. Malleolar screws are far better in internal fixation of medial malleolus compared to Kirschner wires fixation and lateral plating was the best for fibular fractures. Tension band wiring technique is the preferred method for small fragments and osteoporotic bones of both medial and lateral malleolus. Surgical management provides good functional outcome. By stable fixation of the fracture, early weight bearing and mobilization is achieved.

Key Word: Tension band wiring(TBW), Locking compression plate(LCP)

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I. 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 elderly.^{1, 2}

Most of the ankle fractures are complex injuries that are difficult to manage. 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.¹

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As a result of a better understanding of the biomechanics of ankle, improvement in fixation techniques and findings of outcome studies, there has been gradual progress in the effective strategies for the treatment of ankle fractures. The goals of treatment include achieving a sound union of fracture and an ankle that functions normally without pain which has been shown experimentally by Paul L.Ramsey, about 1mm lateral shift in talus, produces about 42 per cent decrease in tibiotalar contact area.² This shows the need for a perfect anatomical reduction, which could be better achieved by open reduction and maintained by internal fixation.

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 bearing³.

Although ankle fractures have traditionally been considered non-controversial with respect to the indications for operative intervention. Recent advances in the understanding of the biomechanics of the ankle have given rise to particular areas of clinical uncertainty. These include the indications for the operative treatment of Bimalleolar fractures, the operative techniques for syndesmotic injury and its post-operative management and the reliability of radiographic assessment of fractures about the ankle.

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.

II. Materials and Methods

From November 2020 to October 2022, 30 cases of Bimalleolar fractures of the ankle were treated at Alluri Sitarama Raju Academy of Medical Sciences, Department of Orthopaedics, by surgical intervention and studied for a period of 6 – 18 months.

Inclusion criteria:

- Age above 18 years
- All displaced bimalleolar ankle fractures

Exclusion criteria:

- Patients unfit for surgery
- Undisplaced fractures and fractures treated by closed reduction
- With associated Pilon fractures
- Childhood and epiphyseal injuries around the ankle

Operative technique:

In our study, tension band wiring, malleolar screws, K-wires and LCP were used for fixing medial malleolus. One third tubular plate, Rush pins, K- wires were used to fix lateral malleolus.



FIG1: TBW FOR LATERAL MALLEOLUS



FIG 2: TBW FOR MEDIAL MALLEOLUS

III. RESULTS

In our study, majority of the patients were from 30 to 50 years age group with mean age of 41.8 years and incidence of 53.33% in males and 46.66% in females. Majority of patients sustained these injuries following road traffic accidents (66.66%). Supination external rotation injury is the most common fracture type in this study (66.66%). 3 patients had associated Syndesmotic injury.

Medial malleolus fractures:

Most of the medial malleolus fractures were fixed with Malleolar screws, i.e., 18 cases (60%), followed by tension band wiring, i.e., 9 cases. K- wire used for 2 cases, LCP for 1 case.

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TABLE 1:

IMPLANTS	MALLEOLAR SCREW	TBW	K - WIRE	LCP
No. of cases	18	9	2	1
Percentage	60%	30%	6.66%	3.33%

Lateral malleolus fractures:

Majority of the lateral malleolar fractures, i.e., 21 cases were fixed with plate, of which 19 cases with one-third tubular plate and 2 with 3.5 mm DCP. In the rest of the cases Rush pin, K- wires or TBW were used.

TABLE 2:

IMPLANTS	PLATING	RUSH PIN	K-WIRE	TBW
No. of cases	21	6	2	1
Percentage	70%	20%	6.66%	3.33%

Syndesmotic fixation:

In 3 cases (10%), Syndesmotic injury was noted, and in this case, it was fixed with a fully threaded screw. Weight-bearing was deferred till screw removal, which was done at 6-8 weeks.

Union:

The average time taken for the union was 11 weeks. Majority of the cases showed union between 8 – 12 weeks.

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TABLE 3:

DURATION OF UNION	6 – 8 WEEKS	9 – 12 WEEKS	13 – 18 WEEKS
No. of cases	3	24	3
Percentage	10%	80%	10%

Complications:

16.66% of the patients had complications. 3 patients had a superficial infection; 1 patient had a deep infection; 1 patient had delayed union of the medial malleolus. The superficial and deep infections were managed with debridement and antibiotics. Delayed union of medial malleolus fracture was treated with continued immobilisation, which united eventually without surgical intervention.

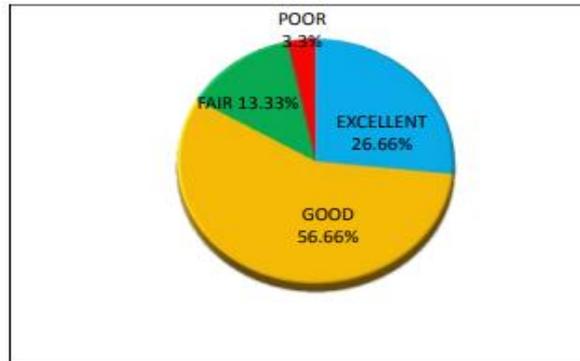
Functional outcome:

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%. 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. The patients with poor results had pain during walking on any surface, constant swelling of the ankle, the reduced motion of the ankle and narrowing of joint space and diminution in their abilities to run, jump or squat and impaired work capacity.

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TABLE 4:

FUNCTIONAL SCORE	No. of patients	Percentage
Excellent	8	26.66%
Good	17	56.66%
Fair	4	13.33%
Poor	1	3.3%



IV. Discussion

Among all the intra-articular fractures occurring in weight-bearing joints, the most common joint involved is the ankle joint. Methods to restore function and to prevent post-op arthritis are either closed treatment, which includes manipulative reduction and immobilisation in a plaster cast and open reduction with internal fixation. Burwell and Charnley showed that the anatomical reduction and rigid fixation led to early return to function⁷

There has been gradual progress in the management of the ankle fractures because of improved analysis of the biomechanics, improvement in fixation techniques and analysis of results of recent studies. The goal of treatment is to achieve fracture union with a painless motion of the ankle, with the anatomical restoration of the injured ankle.

The closed method of treatment is often inadequate in restoring the anatomy and biomechanics of ankle in unstable Bimalleolar ankle fractures. Closed treatment is reserved for un-displaced or minimally displaced isolated fractures; conversely, open reduction with internal fixation is an excellent method to restore the anatomy of ankle joint. Several studies indicate that internal fixation of displaced Bimalleolar fractures of ankle provides better results^{7, 8, 9, 10}

The treatment of Bimalleolar fractures with open reduction and stable internal fixation using the AO principles were found to give a high percentage of excellent and meritorious results¹⁰. This study supports these conclusions.

In the present study, we have 30 patients with Bimalleolar ankle fractures, who were operated upon. All patients were followed up at two weeks, six weeks, 12 weeks, six months, 12 months, and at 18 months.

In our study, fractures were common in the 30-50 years age group, with the mean age being 41.8 yrs. Our findings were comparable to the studies made by, Berisetal¹⁰, Roberts RS¹¹, Baird and Jackson⁷, Lee et al

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¹²., charlotte k Thur et al. ¹³ and Tejwani NC et al. ¹⁴ Bhavik Y Dalal et al., ¹⁶ Zakirah Shah et al., ¹⁴ Sunil V Patil et al. ⁶

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 pronation abduction (6.6%), this is in accordance with the study done by Roberts RS¹¹, Baird and Jackson⁷, Hemanth HP et al.⁵, Zakir shah et al.¹⁵, Sunil V Patil et al.⁵

The results in the current study were compared with that of Burnwell & Charnley⁶, De Souza et al⁷, Beris et al¹⁰, Colton¹⁷

In Colton¹⁷ series, 70% of the patients had a good to excellent results. Burnwell & Charnley⁷ in their series of 132 patients, 102 (77.3%) had good results, 16% had fair results, and 6% were found to a poor score

. In the study conducted by De Souza⁸ 150 cases of ankle Fractures were treated with open reduction and internal fixation using the AO method. And obtained 90% good results.

In a study by Beris et al.,¹⁰ of 144 patients with ankle fractures, 105 (74.3%) had good to excellent results, fair results in 14.6% & poor results in others.

The functional outcome of the present study was comparable with that of the above-cited studies, with 83.3% had good to excellent results, 13.3% had fair results and poor results in 3.3%

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Study	Good to excellent	Fair results	Poor results
Present study	25 (83.3%)	4 (13.3%)	1 (3.3%)
Burnwell & Charnley ⁷	102 (77 %)	22 (17%)	8 (6%)
Colton ¹⁷	18 (70%)	4 (15%)	4 (15%)
Beris et al ¹⁰	105 (74.3%)	21 (14.6%)	16 (11.1%)
De souza ⁸	135 (90%)	9 (6%)	6 (4%)
Zakir Shah et al ¹⁵	33 (82.5%)	5(12.5%)	2 (5%)
Sunil V Patil et al ⁶	28 (74%)	8 (21%)	2 (5%)

Most authors had stated that anatomical reduction of displaced medial malleolus fractures ensures correction of talar displacement and has paramount importance in treating unstable fractures. ¹⁸

Although early mobilisation was advocated by AO group, other studies ⁷ have found no significant difference in the results produced after the early mobilisation. In the current study, immobilisation was done for four weeks. Partial weight-bearing was advised for those with early radiological signs of union and full weight-bearing when the signs of the union were complete. The range of motion of ankle was initially reduced but improved over a few weeks.

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

In our 30 patients, we allowed sufficient time for the soft tissues around the ankle to heal; there was no instability of ankle or subtalar joints. We preferred postoperative immobilisation rather than allowing active ankle exercise as there was no difference in the results after six months of follow up.

V. Conclusion

Incidence was more common in middle-aged patients (73.33%), involving the right ankle more often (56.66%). 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. Tension band wiring technique is the preferred method for small fragments and osteoporotic bones of both medial and lateral malleolus. Most of the patients with fibular fracture underwent fixation by one-third tubular plate (60%). The bend 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 was achieved with a fully threaded screw.

Most common complication faced was a postoperative superficial infection in 10% patients.

At the end of the study excellent to good results were seen in 25 (83.3%) cases, 4 (13.3%) had fair results, and 1 (3.3%) had a poor outcome.

Hence, we conclude that the surgical management of Bimalleolar ankle fractures provides good functional outcome. By stable fixation of the fracture, early mobilisation can be done with good functional outcome.

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