

Functional Outcome Following Surgical Management of Bimalleolar Ankle Fractures: A Case Series

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ABSTRACT

Bimalleolar ankle fractures are unstable injuries that frequently result in significant functional impairment. Open Reduction and Internal Fixation (ORIF) is the standard surgical approach aimed at restoring ankle anatomy and stability. The present case series was conducted from January 2023 to July 2024 at the Department of Orthopaedics, Sree Balaji Medical College and Hospital, a tertiary care teaching hospital, included 27 adult patients with closed bimalleolar ankle fractures. All patients underwent ORIF with plate osteosynthesis of the fibula and cannulated cancellous screws of the medial malleolus. Functional outcomes were assessed using the Olerud-Molander Ankle Score (OMAS) preoperatively and at a mean follow-up of six months. The mean preoperative OMAS was 3.7 ± 4.7 (range 0-15), indicating severe functional limitation. At six months, the mean postoperative OMAS improved to 78.5 ± 16.0 (range 40-100). Excellent outcomes were observed in 12 patients (44%), good in 10 (37%), fair in 4 (15%), and poor in 1 (4%). ORIF of closed bimalleolar ankle fractures results in significant short-term functional improvement. Early surgical intervention with accurate anatomical reduction and stable fixation is associated with favourable recovery.

Keywords: Olerud-Molander ankle score, Open reduction and internal fixation, Osteosynthesis

INTRODUCTION

Ankle fractures are among the most common orthopaedic injuries and contribute substantially to functional disability and healthcare burden. Recent epidemiological studies have reported a rising incidence of ankle fractures, attributed to high-energy trauma in younger individuals and low-energy falls in the elderly population [1]. Bimalleolar ankle fractures account for approximately 25-40% of ankle fractures and are considered inherently unstable due to disruption of both the medial and lateral components of the ankle mortise [2]. These fractures most commonly result from rotational mechanisms, with supination-external rotation being the predominant pattern [3]. Owing to their unstable nature, surgical management with ORIF is frequently required to restore joint congruity and optimise functional outcomes.

CASE SERIES

The present case series was conducted from January 2023 to July 2024 at the Department of Orthopaedics, Sree Balaji Medical College and Hospital, a tertiary care teaching hospital. A total of 27 adult patients aged >18 years with closed bimalleolar ankle fractures, classified according to the Lauge-Hansen system were included [4]. All patients completed a minimum follow-up of six months.

All patients underwent ORIF under spinal or general anaesthesia. The fibula was approached laterally and stabilised using a distal fibular anatomical plate or one-third tubular plate of appropriate size. The medial malleolus was reduced anatomically and fixed with cannulated cancellous screws. Intraoperative fluoroscopy was used to confirm fracture reduction and implant positioning. The operated limb was immobilised in a below-knee splint. Toe movements were encouraged immediately post-operatively. Sutures were removed at two weeks, followed by initiation of ankle range-of-motion exercises. Partial weight-bearing was permitted based on clinical and radiological assessment, with progression to full weight-bearing as tolerated.

Functional outcome was assessed at six months post-operatively using the OMAS, a validated patient-reported outcome measure ranging from 0 to 100, with higher scores indicating better ankle function [5].

The study population was male-dominant (81.48%), with most patients in the fifth decade of life. The mean age of the study population was

45.5 ± 3.03 years. The right ankle was involved in 63.3% of cases. Road Traffic Accidents (RTA) were the most common mechanism of injury followed by self-fall and falls from height [Table/Fig-1].

The mean intraoperative blood loss was approximately 120 mL, and the average duration of surgery was 1.5 hours. Surgery was performed within 24 hours of injury in eighteen patients, four within 48 hours, and five within one week, primarily due to soft-tissue swelling or associated comorbidities.

According to the Lauge-Hansen classification, supination-external rotation fractures were most common (n=16), followed by supination-adduction (n=5), pronation-abduction (n=4), and pronation-external rotation (n=2) [Table/Fig-2]. Preoperative scores for ankle fractures are usually very low (0-30) due to acute pain, swelling, and inability to bear weight [Table/Fig-3]. The mean preoperative OMAS was 3.7 ± 4.7 (range 0-15), indicating severe functional limitation.

At six-month follow-up, approximately 82% of patients achieved good to excellent functional outcomes based on OMAS. The mean postoperative OMAS improved to 78.5 ± 16.0 (range 40-100). Minor complications included one superficial and one deep infection, both of which were managed successfully [Table/Fig-4-8]. No cases of implant failure or non union were observed.

Variables	n (%)
Gender (male/female)	22 (81.48%)/5 (18.52%)
Mean age (years)	45.5±3.03
Side involved (right/left)	17 (63.3%)/10 (36.7%)
Mode of injury-RTA	16 (59.25%)
Mode of injury-Self-fall/fall from height	11 (40.74%)

[Table/Fig-1]: Demographic and injury characteristics (N=27).

Fracture pattern	Number of patients
Supination-External Rotation (SER)	16
Supination-Adduction (SAD)	5
Pronation-Abduction (PAB)	4
Pronation-External Rotation (PER)	2

[Table/Fig-2]: Distribution according to Lauge-Hansen classification.

Patient ID	Pain (0-25)	Stiffness (0-10)	Swelling (0-10)	Other (0-55)	Total Pre-OP OMAS
P01	0	0	0	0	0
P02	0	0	0	5	5
P03	5	0	0	5	10
P04	0	0	0	0	0
P05	0	0	5	0	5
P06	5	0	0	0	5
P07	0	0	0	10	10
P08	0	0	0	0	0
P09	0	0	0	0	0
P10	10	0	0	5	15
P11	0	0	0	0	0
P12	0	0	0	0	0
P13	5	0	0	5	10
P14	0	0	5	0	5
P15	0	0	0	0	0
P16	0	0	0	0	0
P17	0	0	0	5	5
P18	5	0	0	0	5
P19	0	0	0	0	0
P20	0	0	0	0	0
P21	0	0	5	0	5
P22	10	0	0	5	15
P23	0	0	0	0	0
P24	0	0	0	0	0
P25	0	0	0	0	0
P26	5	0	0	0	5
P27	0	0	0	0	0

[Table/Fig-3]: Preoperative OMAS data (N=27).
Pre-OP - Preoperative

Patient ID	OMAS score	Interpretation	n (%)
P01,03,04,09,11,15,19,20,24,25,26,27	>90	Excellent	12 (44%)
P02,05,08,10,13,14,18,23,16,22	81-90	Good	10 (37%)
P06,07,17,21	60-80	Fair	4 (15%)
P12	<60	Poor	1 (4%)
Mean OMAS	78.5±16.0		

[Table/Fig-4]: Functional outcome based on OMAS at 6 months.

Complications	Number of patients
Superficial infection	1
Deep infection	1
Implant failure	0
Non-union	0

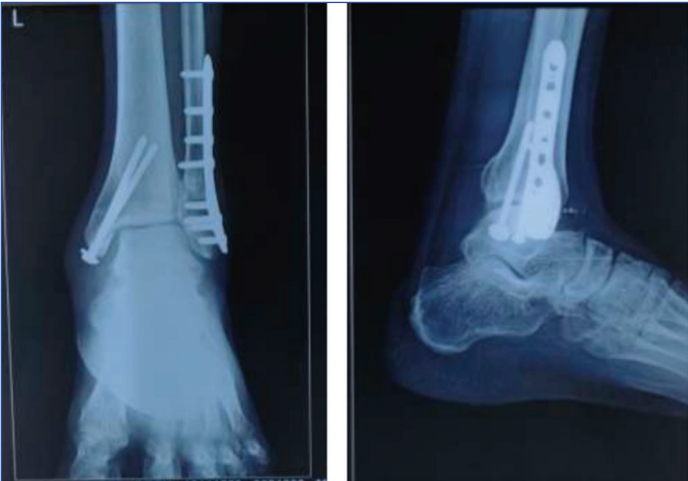
[Table/Fig-5]: Postoperative complications.



[Table/Fig-6a]: Preoperative plain radiography showing (Green Arrow) bimalleolar fracture of left ankle in anteroposterior and lateral view.



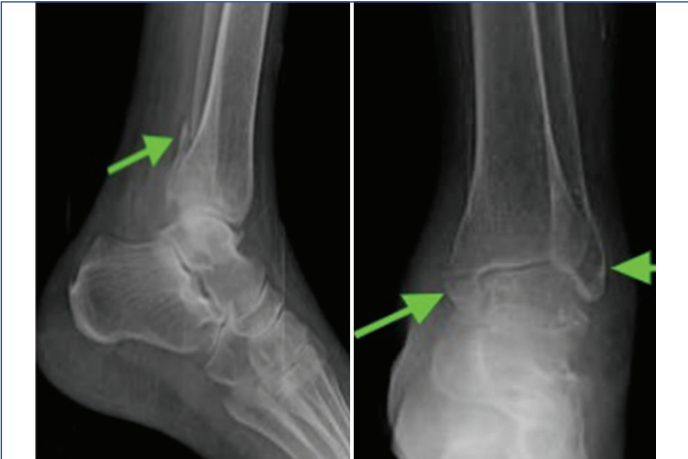
[Table/Fig-6b]: Immediate postoperative anteroposterior and lateral radiographs of the ankle showing ORIF of bimalleolar fracture.



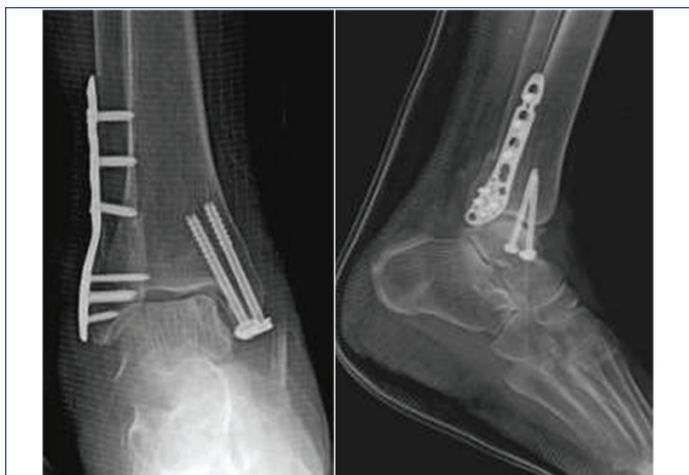
[Table/Fig-6c]: A 6-month follow-up anteroposterior and lateral radiographs of the ankle showing ORIF of bimalleolar fracture.



[Table/Fig-6d]: Ankle dorsiflexion and plantarflexion at the end of 6 months. The pre-op OMAS score was zero and post-operative OMAS score recorded was 85/100.



[Table/Fig-7a]: Preoperative plain radiography showing (Green Arrow) bimalleolar fracture of the left ankle in anteroposterior and lateral view.



[Table/Fig-7b]: Immediate postoperative anteroposterior and lateral radiographs of the ankle showing ORIF bimalleolar fracture.



[Table/Fig-7c]: A 6-month follow-up anteroposterior and lateral radiographs of the ankle showing ORIF of a bimalleolar fracture.



[Table/Fig-7d]: Ankle dorsiflexion and plantarflexion at the end of 6 months. The pre-operative OMAS score was zero, and post-operative OMAS score recorded was 80/100.

DISCUSSION

Bimalleolar ankle fractures are unstable injuries that typically require surgical stabilisation to restore anatomical alignment and congruity of the ankle mortise. ORIF remains the accepted standard of treatment, with accurate reduction and stable fixation being key determinants of functional outcome [2,6].

In the present study, approximately 82% of patients achieved good-to-excellent functional outcomes at six months. Deshpande S and Dudhanale A reported good-to-excellent outcomes in 80% of patients at six months following ORIF of bimalleolar fractures [7]. Dwivedi R et al., reported a mean postoperative OMAS of 89.86 ± 7.95 at final follow-up in a cohort of 29 patients treated with ORIF [8]. Sharma Y et al., reported a significant improvement in functional scores at six months in young adults with bimalleolar fractures and syndesmotic injury [Table/Fig-8] [7-9].

In a study by Gangadhran N and Pillai MG, 45 patients with malleolar fractures were included. The Baird and Jackson scoring system for the ankle were used to measure functional outcomes. The results are excellent to good in 65% of patients, fair in 27%, and poor in 8%. The most common complication was surgical site infection in three cases (6.67%). Two patients underwent implant removal due

Author (year)	N	Follow-up	Mean Post-operative OMAS	Good-Excellent (%)
Deshpande S and Dudhanale A (2025) [7]	30	6 months	—	80%
Dwivedi R et al., (2020) [8]	29	Final follow-up	89.86 ± 7.95	There were 19 excellent (65.51%), six good (20.68%), and four fair (13.79%) results.
Sharma Y et al., (2024) [9]	20	6 months		According to Baird and Jackson scores, out of 20 cases 10% had excellent result, 55% had good result, 25% had fair and 10% had poor functional outcome

[Table/Fig-8]: Comparison of functional outcomes from published literature [7,8,9].

to unresolved infection at three months [10]. In a study by Jose RS et al., 40 patients were assessed based on Baird and Jackson's scoring system. Based on this, 21 (52.5%) had an excellent outcome, 14 (35%) had a good outcome, 3 (7.5%) had a fair outcome, and 2 (5%) had a poor outcome. Of the total population, 35 (87.5%) had no complications, followed by 3 (7.5%) with superficial infection and 2 (5%) with ankle stiffness [11].

In a study by Jaiswal M et al., 30 patients aged between 18-60 years with bimalleolar fractures were included in the study. The mean OMAS was statistically significant 56.667 ± 16.365 at 3rd month post-op and 78.5 ± 17.722 at 6th month postoperative [12].

In the present study, complications included one superficial and one deep infection. In contrast, a study by Deshpande S and Dudhanale A reported complications, such as infection and non-union, were observed in 40% of cases [7].

Supination-external rotation fractures were the most common injury pattern in the present study, consistent with epidemiological reports [1,3]. Despite their association with greater instability, most patients achieved satisfactory outcomes, emphasising the importance of early fixation.

The present study provides contemporary short-term functional outcome data following ORIF of bimalleolar ankle fractures in a tertiary care setting, reinforcing the effectiveness of early surgical management.

A limitation of the present series is that six components of the OMAS namely stair climbing, running, jumping, squatting, use of supports, and work/activities of daily living were combined into a single "Other (0-55)" category in [Table/Fig-3]. Although the total OMAS score remains valid, this aggregation reduces domain-specific resolution and limits the clinical interpretability of functional outcomes, as deficits or improvements in individual activity domains cannot be assessed or compared independently.

CONCLUSION(S)

The ORIF is an effective and reliable method for the management of closed bimalleolar ankle fractures. Early surgical intervention, accurate anatomical reduction, and stable fixation result in favourable functional outcomes and facilitate early rehabilitation.

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