Section: Orthopaedics

Original Research Article

COMPARISON OF FUNCTIONAL OUTCOME ANALYSIS OF POSTERIOR PLATING & LATERAL PLATING FOR LATERAL MALLEOLUS FRACTURES OF ANKLE

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ABSTRACT

Background: Lateral malleolus fractures are common ankle injuries requiring anatomical reduction and stable fixation to restore ankle biomechanics and optimize function. This study compared the functional outcomes of posterior versus lateral plating for lateral malleolus fractures.

Materials and Methods: A prospective comparative study was conducted at the Department of Orthopaedics, Navodaya Medical College Hospital and Research Centre, Raichur, Karnataka, from April 2022 to August 2023. Twenty patients with lateral malleolus fractures underwent open reduction and internal fixation and were allocated to posterior plating (n=10) or lateral plating (n=10). Clinical and radiological assessments were performed at 6, 12, and 24 weeks. Functional outcomes were evaluated using the American Orthopaedic Foot and Ankle Society (AOFAS) Ankle-Hindfoot Score at final follow-up.

Results: Of the 20 patients, 11 (55%) were male and 9 (45%) were female, with most aged 20–39 years. Road traffic accidents accounted for 55% of injuries. In the posterior plating group, 70% achieved excellent and 30% good outcomes. In the lateral plating group, 50% had excellent, 30% good, and 20% fair outcomes. The difference in functional outcomes was statistically significant (P=0.043). Three superficial wound infections occurred in the lateral plating group, whereas no wound complications were observed with posterior plating.

Conclusion: Posterior plating demonstrated superior functional outcomes, fewer wound complications, and more stable fixation than lateral plating for lateral malleolus fractures. Its biomechanical advantages support early mobilization and improved ankle function. Larger studies with longer follow-up are needed to confirm these findings.

Keywords: Lateral malleolus fracture, ankle fracture, posterior plating, lateral plating, AOFAS score, functional outcome, internal fixation.

INTRODUCTION

Intra-articular fractures around ankle joint are a commonly encountered entity in the lower extremity. In olden days these fractures ended up in permanent disability. Many of the ankle injuries have mixed bony and ligamentous components.[1-3] In the recent days, MRI is very useful in diagnosing the ligamentous injury. As in all intra articular fractures achieving anatomical reduction by open methods and internal fixation is necessary to avoid complications such as nonunion, malunion & hence altered biomechanics resulting in pain & instability.[4-7] With the advent of A.O principles of management, the results of ankle fractures are becoming better putting more emphasis on anatomical reduction, stable internal fixation, preservation of blood supply, regaining full length of fibula and early active pain free mobilization. This case series involves comparing functional outcome analysis of posterior plating & lateral plating for lateral malleolus fractures of ankle.[8-10]

We compared the functional outcome of posterior plating and lateral plating of lateral malleolus fracture of ankle and to evaluate the benefits and shortcomings of both these procedures.

MATERIALS AND METHODS

Study Design and Setting

This prospective comparative study was conducted at the Department of Orthopaedics, Navodaya Medical College Hospital and Research Centre, Raichur, Karnataka, from April 2022 to August 2023. A total of 20 patients with lateral malleolus fractures of the ankle were included in the study and treated with open reduction and internal fixation using plate osteosynthesis.

Study Population

Patients presenting with lateral malleolus fractures were evaluated clinically and radiologically and enrolled after obtaining informed written consent. Detailed history, clinical examination, routine preoperative investigations, and pre-anaesthetic assessment were performed for all patients.

Sample Size

The study included 20 consecutive patients with lateral malleolus fractures.

Inclusion Criteria

- Skeletally mature adults aged 18–70 years.
- Isolated lateral malleolus fractures.
- Bimalleolar fractures.
- Trimalleolar fractures.

Exclusion Criteria

- Undisplaced or minimally displaced fractures.
- Neglected ankle fractures (>3 weeks old).
- Open ankle fractures.
- Patients with contraindications for surgery.

Preoperative Protocol

At admission, all patients were immobilized using a below-knee slab and maintained on strict limb elevation until surgery. Computed tomography (CT) of the ankle was performed when intra-articular fracture extension was suspected. The plaster slab was bivalved within 12 hours and skin condition was monitored every 24 hours. Routine hematological and biochemical investigations were performed, and associated comorbidities were optimized prior to surgery. Anaesthetic fitness was obtained before the procedure.

Surgical Technique

All patients underwent open reduction and internal fixation with plate osteosynthesis under general, spinal, or epidural anaesthesia. A pneumatic tourniquet was used in all cases.

Patient positioning was determined by the fracture pattern:

- **Isolated lateral malleolus fractures:** Lateral position.
- **Bimalleolar fractures:** Supine or lazy lateral position.
- **Trimalleolar fractures:** Prone position when posterior malleolar fixation was planned.

Patients were divided into two groups based on the surgical approach and plate position:

Posterior Plating Group

A longitudinal skin incision was made between the lateral malleolus and the Achilles tendon. After exposing the peroneal and deep flexor compartments, the peroneal retinaculum was incised, and the peroneal tendons were retracted. An internervous plane was developed between the peroneus brevis and flexor hallucis longus muscles to expose the distal fibula. Anatomical reduction was achieved under fluoroscopic guidance, followed by fixation using a posteriorly placed plate.

Lateral Plating Group

A standard lateral approach to the distal fibula was used. Following incision of the skin and subcutaneous tissues, the fracture site was directly exposed. Anatomical reduction was achieved under C-arm fluoroscopic guidance, and fixation was performed using a lateral plate with appropriate instrumentation.

Postoperative Protocol and Follow-up

Postoperatively, strict limb elevation was maintained until swelling subsided. Dressings were performed on postoperative days 2, 5, and 10. Sutures were removed on the 12th postoperative day, after which active ankle and toe mobilization was initiated. Patients remained non-weight-bearing for 4–6 weeks, followed by gradual progression to partial and full weight-bearing based on radiological evidence of fracture healing.

Patients were followed up at 6, 12, and 24 weeks. At each visit, clinical evaluation, radiographic assessment of fracture union, range of motion, scar assessment, and rehabilitation progress were documented.

Outcome Assessment

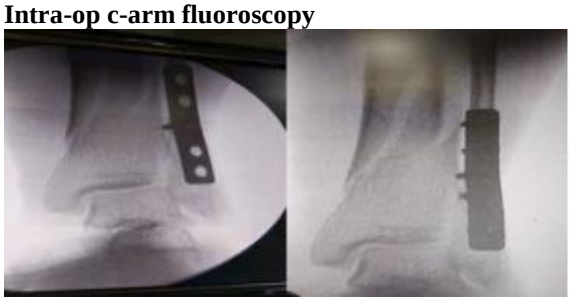
Functional outcomes were evaluated at the final follow-up using the **American Orthopaedic Foot and Ankle Society (AOFAS) Ankle-Hindfoot Score**. The score assessed pain, function, walking ability, range of motion, stability, and alignment. The final AOFAS score was used to compare the functional outcomes between the posterior plating and lateral plating groups.

CASE 1: (POSTERIOR PLATING)

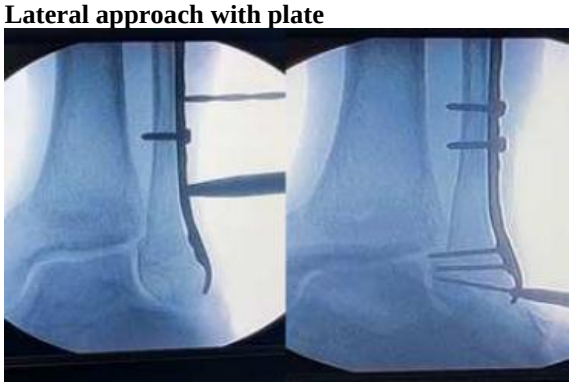
Pre-op Xray

Posterior Approach

Intra-op c-arm fluoroscopy



Lateral approach with plate



Case 2: (Lateral plating)
Pre-op xray

Posterior Approach

RESULTS

Demographic Characteristics of Study Participants (n=20)

The study included 20 patients, comprising 11 males (55%) and 9 females (45%). The most common age group was 20–29 years (40%), followed by 30–39 years (35%), 40–49 years (15%), and 50–60 years (10%).

Table 1: Gender Distribution

Gender	Number of Patients (n)	Percentage (%)
Male	11	55.0
Female	9	45.0
Total	20	100.0

Table 2: Age Distribution

Age Group (Years)	Number of Patients (n)	Percentage (%)
20–29	8	40.0
30–39	7	35.0
40–49	3	15.0
50–60	2	10.0
Total	20	100.0

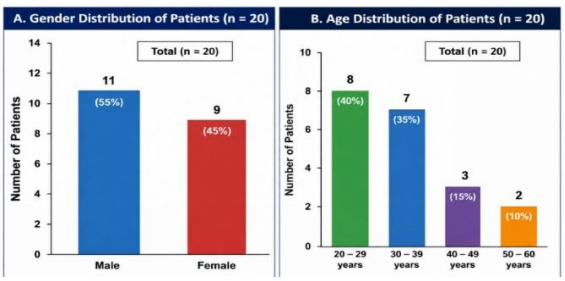


Figure 1: Demographic Characteristics

Mechanism of Injury

Road traffic accidents were the most common mechanism of injury, accounting for 55% of cases, followed by falls from height (20%) and slip-and-fall injuries (15%). Sports-related and twisting injuries each contributed 5% of cases.

Table 3: Mechanism of Injury among Study Participants (n = 20)

Mechanism of Injury	Number of Patients (n)	Percentage (%)
Road Traffic Accident (RTA)	11	55.0
Fall from Height	4	20.0
Slip and Fall	3	15.0
Sports Injury	1	5.0
Twisting Injury	1	5.0
Total	20	100.0

AOFAS Score

Clinical examination of surgical scars, difficulty in walking, and pain were assessed at each follow-up. Functional outcomes were analyzed using the AOFAS score, with results calculated at the final follow-up of each patient.

In the posterior group, 7 patients had excellent outcomes and 3 had good outcomes. In the lateral plating group, 5 patients had excellent outcomes, 3 had good outcomes, and 2 had fair outcomes. There were no poor outcomes in either group.

Three patients in the lateral plating group experienced superficial wound infections, with 2 cases resulting in wound gaping and delayed mobilization. No wound healing problems were observed

Table 4: Comparison of Functional Outcome (AOFAS Score) Between Posterior and Lateral Plating Groups

AOFAS Score Category	Posterior Plating Group (n=10)	Posterior Group (%)	Lateral Plating Group (n=10)	Lateral Group (%)	P-value
Excellent (>85)	7	70%	5	50%	
Good (70–85)	3	30%	3	30%	
Fair (55–70)	0	0%	2	20%	
Poor (<55)	0	0%	0	0%	
Total	10	100%	10	100%	0.043*

P < 0.05, statistically significant.

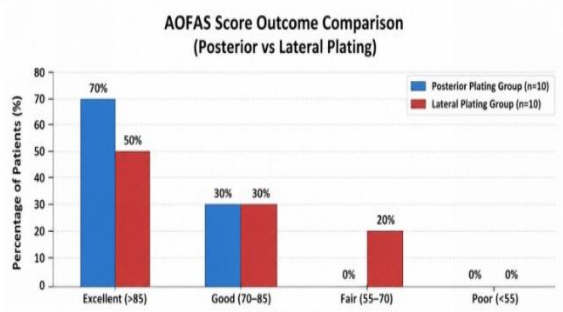


Figure 2: Comparison of Functional Outcome (AOFAS Score) Between Posterior and Lateral Plating Groups

DISCUSSION

Intra-articular ankle fractures are common and historically led to permanent disability. With the advent of A.O. principles, morbidity has decreased significantly. Proper anatomical reduction, achieved through open methods and internal fixation, is crucial to avoid complications like non-union, malunion, and altered biomechanics resulting in pain and instability.[11]

A.O. principles emphasize anatomical reduction, stable internal fixation, preservation of blood supply, regaining full fibular length, and early mobilization. Weber et al. classified ankle fractures by the lateral malleolus fracture level relative to the syndesmosis, while Lauge and Hansen's 1950 classification system is now more commonly used, considering the direction of the injuring force and ankle position at the time of injury.

Lateral plating is commonly used for lateral malleolus fractures due to its ease of application but is associated with hardware irritation. Posterior plating offers better soft tissue and skin coverage, resulting in less hardware irritation and better biomechanical stability, particularly in osteoporotic patients.[12]

In our study, functional outcomes of posterior and lateral plating for lateral malleolus fractures were analyzed using the AOFAS score, with follow-up periods ranging from 7 to 29 months (average 13 months). Road traffic accidents were the major cause of fractures, and patients operated on within 3 days had higher AOFAS scores.

Posterior plating allows for better implant placement and bicortical screw purchase without intra-articular screw penetration, enabling early mobilization and better functional outcomes. The AOFAS scores showed significant functional advantages for posterior plating. Complications were fewer with posterior plating, with no wound issues ,this observation is in concurrence with the study conducted by Shriniwas Yemul et al in which it was concluded that"Posterior plate fixation for lateral malleolus gives bicortical screw purchase without intra-articular screw penetration leading to a secure and stable fixation allowing early mobilization and a better outcome",[13] also in the study conducted by Shriniwas Yemul et al it was noted that posterior plate fixation for lateral malleolus resulted in decreased post-operative complications, hardware penetration and wound dehiscence,[13,14] which is in concurrence with our study.

Malunions were observed in both groups but resulted in good clinical outcomes if the fibular length and intra-articular congruity were maintained. Union rates were higher in the posterior plating group, though not statistically significant due to the small sample size. Peroneal tendon irritation,

a potential issue with posterior plating, was not observed in our study.

Overall, our study found better functional outcomes and earlier union rates with posterior plating, though further long-term studies are needed to confirm these findings.

CONCLUSION

With the short term follow up of our study, we conclude that Posterior plating technique for lateral malleolus fractures of ankle allows better implant placement, good wound healing and a better functional outcome in comparison to the Lateral plating technique.

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