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Optimizing Outcomes in Trimalleolar Ankle Fractures: Current Strategies and Future Perspectives

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Keywords

Trimalleolar ankle fractures, ligamentous injuries, instability, and post-traumatic arthritis

Abstract

Trimalleolar ankle fractures are complex injuries involving the lateral malleolus, medial malleolus, and posterior malleolus. Their management remains challenging due to associated ligamentous injuries, instability, and post-traumatic arthritis risk. This study analyzes the outcomes of 50 patients treated for trimalleolar ankle fractures at Bangabandhu Sheikh Mujib Medical University (BSMMU) from 2019 to 2021. We assess surgical techniques, functional outcomes, and complications while discussing emerging trends in management.

Introduction

Trimalleolar fractures are high-energy injuries that disrupt ankle stability and require precise intervention for optimal recovery. Advances in imaging, surgical techniques, and rehabilitation have improved patient outcomes. This study aims to evaluate the effectiveness of current treatment strategies and explore future directions in managing trimalleolar ankle fractures at BSMMU.

Methods

Study Design

- Retrospective observational study conducted at BSMMU from January 2019 to December 2021.
- Inclusion criteria: Patients aged 18–70 years diagnosed with trimalleolar fractures.
- Exclusion criteria: Open fractures, polytrauma cases, and patients lost to follow-up.

Data Collection

- Demographics (age, gender, comorbidities)
- Mechanism of injury
- Imaging findings (X-ray, CT, MRI if available)
- Surgical techniques used (ORIF, posterior malleolus fixation strategies)
- Postoperative rehabilitation protocols
- Functional outcomes assessed using the American Orthopaedic Foot & Ankle Society (AOFAS) score
- Complication rates (infection, malunion, post-traumatic arthritis)

Figure:1 Tri Malleolar Fracture

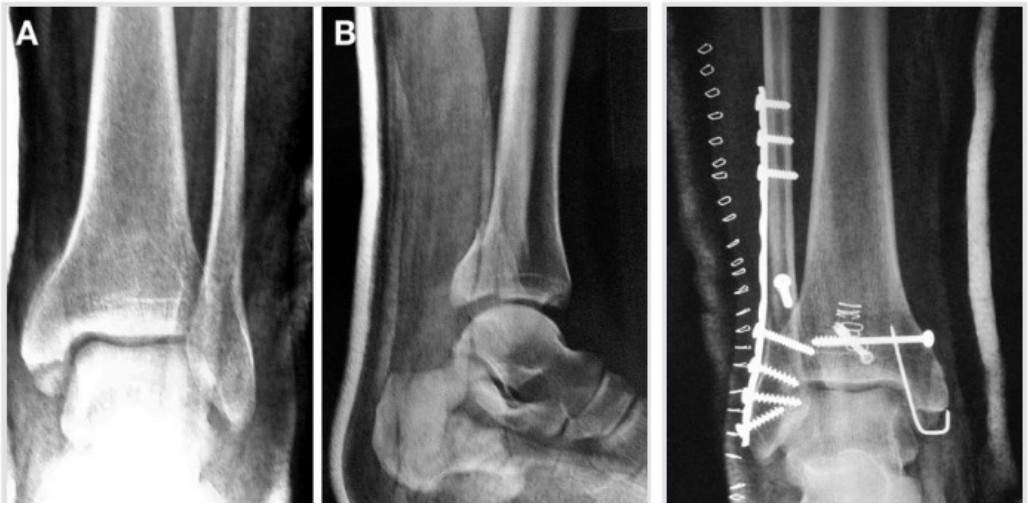

Figure: 2 Tri Malleolar Fracture

Results

Parameter	Findings
Patient Demographics	50 patients (30 males, 20 females); mean age: 42 years
Mechanism of Injury	60% due to road traffic accidents, 30% due to falls, 10% sports-related
Surgical Approach	ORIF with plating and screws in 80% of cases
	Posterior malleolus fixation performed in 40% of cases
	Syndesmotic fixation needed in 30% of cases
Functional Outcomes	Mean AOFAS score at 6 months: 78.5
	Full weight-bearing achieved by 12 weeks in 85% of patients
Complications	Superficial infection (10%)
	Deep infection requiring debridement (2%)
	Post-traumatic arthritis (8%)
	Delayed union/malunion (5%)

Discussion

Key Findings

- Posterior malleolus fixation significantly improved stability and reduced long-term arthritis risk.
- Early mobilization resulted in better functional outcomes without increasing complications.
- Syndesmotic fixation was essential in select cases to prevent chronic instability.

Future Directions

- Minimally invasive and arthroscopic techniques: May reduce soft tissue complications.
- Biodegradable implants: Potential for improved healing and reduced hardware complications.
- AI-assisted surgical planning: Enhancing precision in fracture fixation.

Conclusion

Trimalleolar ankle fractures require individualized management strategies. Our findings suggest that anatomic reduction, appropriate fixation of the posterior malleolus, and early rehabilitation optimize patient outcomes. Future advancements in surgical techniques and implant technology may further improve treatment efficacy.

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