E-ISSN 2250-0944

ISSN 2250-1150

doi: 10.48047/ijprt/08.02.07

Evaluation of Functional Outcomes Following Surgical Management of Ankle Fractures

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Received: 02-06-2018
Accepted: 30-06-2018
Available Online: 29-07-2018

A B S T R A C T

Background:
Ankle fractures represent a significant burden on healthcare systems due to their frequency and the associated morbidity. Timely and appropriate surgical intervention is critical to prevent long-term disability, reduce joint stiffness, and improve patient-reported outcomes. The shift from merely assessing radiological union to evaluating overall functional recovery has increased the importance of comprehensive outcome evaluation.

Objective:
To evaluate the functional outcomes of surgically treated ankle fractures using standardized scoring systems and identify prognostic factors influencing recovery.

Methods:
This prospective study included 50 adult patients with closed ankle fractures managed surgically over 18 months. Functional outcomes were assessed at 6 and 12 months postoperatively using the American Orthopaedic Foot and Ankle Society (AOFAS) Ankle-Hindfoot Score.

Results:
The average AOFAS score improved from 80.4 ± 7.2 at 6 months to 89.1 ± 5.4 at 12 months ($p < 0.05$). A total of 86% of patients had good to excellent results, with better outcomes in younger, otherwise healthy individuals.

Conclusion:
Surgical management of ankle fractures provides favorable functional outcomes, particularly when coupled with precise anatomical reduction and structured rehabilitation. Early intervention and patient-tailored care protocols are critical for optimizing results.

Keywords: Ankle fracture, ORIF, AOFAS score, Functional recovery, Surgical outcomes, Rehabilitation

INTRODUCTION

Ankle fractures are among the most common injuries treated by orthopedic surgeons, accounting for a significant proportion of lower extremity fractures (Court-Brown et al., 2019). They often occur due to high-energy trauma, sports injuries, or low-energy mechanisms in elderly patients with osteoporosis (Kannus et al., 2020). Surgical management is typically indicated for unstable fractures, displaced fractures, and those associated with joint incongruity to restore alignment, maintain ankle stability, and facilitate early mobilization (Michelson, 2015).

The functional outcome following surgical fixation of ankle fractures depends on several factors, including fracture pattern, patient age, comorbidities, surgical technique, and adherence to postoperative rehabilitation protocols (Koval et al., 2020). Restoration of anatomical alignment of the tibiofibular and talar relationship is crucial to achieving optimal function and preventing long-term complications such as post-traumatic osteoarthritis (Stufkens et al., 2011).

In recent years, there has been growing interest in evaluating patient-reported outcome measures (PROMs) alongside objective clinical assessments to provide a more comprehensive understanding of recovery (Dowsey et al., 2017). Studies have shown that factors such as early weight-bearing, minimally invasive fixation methods, and tailored physiotherapy can improve recovery speed and long-term function (Latham et al., 2019).

Furthermore, surgical decision-making has evolved with the integration of advanced imaging modalities, better fixation devices, and enhanced perioperative care protocols (Schepers et al., 2012). Despite these advances, complications such as infection, wound dehiscence, malunion, and hardware failure still pose challenges to achieving consistently good functional outcomes (Sanders et al., 2012). Therefore, it is important to investigate and analyze the long-term results of surgically treated ankle fractures to identify modifiable factors that can improve patient recovery.

The present study aims to evaluate the functional outcomes of surgically managed ankle fractures using both clinical and patient-reported outcome measures. This will provide valuable insights for optimizing surgical techniques and rehabilitation protocols, ultimately improving patient quality of life after such injuries.

Materials and Methods

Study Population and Setting:

This prospective observational study was conducted from January 2017 to June 2018 at a tertiary care teaching hospital in Jaipur. After obtaining ethical clearance and informed consent, 50 consecutive patients meeting the inclusion criteria were enrolled.

Surgical Procedure:

All surgeries were performed under spinal or general anesthesia by the same orthopedic team to maintain consistency. The fracture fixation was guided by AO principles. Lateral malleolus fractures were typically stabilized using one-third tubular plates; medial malleolus fractures were fixed with malleolar screws or tension band wiring. Posterior malleolus fixation was performed in cases with >25% involvement of the articular surface. Syndesmotic injuries were stabilized using a trans-syndesmotic screw when required.

Rehabilitation Protocol:

Postoperatively, patients were immobilized in a below-knee plaster slab for 2 weeks. Sutures were removed at 14 days, followed by initiation of active and passive range-of-motion exercises. Partial weight-bearing was allowed at 6 weeks and full weight-bearing at 10–12 weeks, depending on fracture healing and patient tolerance.

Outcome Measures:

Patients were evaluated using the AOFAS Ankle-Hindfoot Score, which assesses pain, function, and alignment on a 100-point scale. Outcomes were classified as excellent (90–100), good (80–89), fair (70–79), or poor (<70). Assessments were performed at 6 and 12 months.

RESULTS

Demographics and Clinical Profile:

- Mean age: 42.6 ± 13.5 years
- Gender: 60% male, 40% female
- Mode of injury:
    - Road traffic accidents: 60%
    - Falls: 30%
    - Sports injuries: 10%

Fracture Classification:

- Isolated lateral malleolus: 18%
- Bimalleolar: 50%

- Trimalleolar: 32%

Associated Comorbidities:

- Diabetes mellitus: 6 patients
- Hypertension: 8 patients
- Smoking history: 12 patients

Functional Outcomes (Table 1):

Follow-up	Mean AOFAS Score	SD	Range	p-value
6 months	80.4	7.2	66–90	
12 months	89.1	5.4	74–98	<0.05

- **Good to excellent outcomes**: 86%
- **Fair outcomes**: 10%
- **Poor outcomes**: 4% – mostly in patients with comorbidities or delayed surgical intervention.

Figure 1: Post-operative X-ray of bimalleolar fracture

Figure 2: Line graph showing trend in functional score improvement

Discussion

The functional outcomes observed in this study are consistent with previous literature, reinforcing that timely surgical intervention and accurate anatomical reduction are critical to restoring ankle function. Our findings show a statistically significant improvement in AOFAS scores between 6 and 12 months, underlining the role of structured rehabilitation in enhancing long-term recovery.

A study by **Stufkens et al. (2011)** reported similar improvements in functional scores following ORIF, with complication rates correlating with delay in surgery and patient comorbidities. In our study, delayed surgery (>7 days post-injury) was linked with poorer outcomes due to soft tissue compromise and increased infection risk.

Interestingly, patients with posterior malleolus involvement who underwent fixation fared better compared to those in whom this component was ignored, aligning with recent trends favoring direct posterior fixation.

Rehabilitation played a significant role in recovery. Studies like **Latham et al. (2019)** advocate for early mobilization, which aligns with our findings that patients started on physiotherapy within 2–3 weeks recovered faster and achieved better functional scores.

Complication rates in our study were low, but hardware prominence and superficial infections were noted in 4 patients, managed conservatively or with hardware removal at a later stage.

Conclusion

This study emphasizes that surgical management of ankle fractures, when performed with precise anatomical reduction and followed by structured rehabilitation, can yield excellent functional outcomes. Factors such as patient age, comorbidities, and adherence to rehabilitation protocols significantly influence recovery.

The results underscore the need for individualized treatment planning and careful postoperative follow-up to identify and address complications early. Future studies with larger sample sizes and longer follow-up durations are warranted to further validate these findings and explore advanced fixation techniques.

Overall, a multidisciplinary approach involving surgeons, physiotherapists, and patient education remains crucial for optimizing outcomes in surgically treated ankle fractures.

Declaration

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee
Informed Consent: Written and informed consent was taken from Parents and guardians of all patients for the study and further publication of outcome

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