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Surgical management of ankle fractures: Functional outcomes in a prospective cohort

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Abstract

Background: Ankle fractures are common orthopedic injuries that often require surgical intervention to restore joint stability and function. This study evaluates the functional outcomes of surgically treated ankle fractures in a cohort of 44 patients.

Methods: A prospective study was conducted on 44 patients who underwent open reduction and internal fixation (ORIF) for ankle fractures. Functional outcomes were assessed using the American Orthopaedic Foot & Ankle Society (AOFAS) Ankle-Hindfoot Scale and the Olerud-Molander Ankle Score (OMAS) at 6 months postoperatively. Radiographic evaluation was performed to assess fracture union and alignment.

Results: The mean AOFAS score was 82.6 ± 9.4 , and the mean OMAS was 78.2 ± 11.3 , indicating good to excellent functional outcomes in most patients. Complications included superficial infection (4.5%), delayed wound healing (6.8%), and post-traumatic arthritis (9.1%). Age, fracture type (Weber classification), and time to surgery significantly influenced outcomes.

Conclusion: Surgical management of ankle fractures yields satisfactory functional results in most patients. Early anatomical reduction and stable fixation are crucial for optimal recovery.

Keywords: ORIF, AOFAS score, Olerud-Molander score, ankle fractures, functional outcome.

Introduction

Ankle fractures are among the most common lower extremity injuries, accounting for approximately 9% of all fractures in adults, with an incidence of up to 187 cases per 100,000 people annually [1, 2]. These injuries often result from low-energy torsional trauma, such as slips or falls, but can also occur due to high-energy mechanisms like motor vehicle accidents or sports-related impacts [3]. The ankle joint's complex biomechanics comprising the tibia, fibula, and talus, stabilized by ligaments and the syndesmosis make it particularly vulnerable to instability when fractures occur.

The management of ankle fractures depends on fracture displacement, stability, and associated soft tissue injuries. While non-displaced fractures may be treated conservatively with casting or bracing, displaced fractures particularly those involving the syndesmosis (Weber B and C fractures) typically require surgical intervention to restore anatomical alignment and joint stability [4]. Open Reduction and Internal Fixation (ORIF) remains the gold standard for unstable ankle fractures, aiming to achieve precise articular reduction, restore biomechanical function, and minimize long-term complications such as post-traumatic osteoarthritis [5].

Despite advances in surgical techniques, the functional outcomes of ankle fracture fixation vary significantly depending on multiple factors, including fracture pattern, surgical timing, implant selection, and postoperative rehabilitation [6]. Poor outcomes are often associated with inadequate reduction, delayed surgery, or complications such as infection, malunion, or stiffness [7]. Therefore, assessing functional recovery through validated scoring systems, such as the American Orthopaedic Foot & Ankle Society (AOFAS) Ankle-Hindfoot Scale and the Olerud-Molander Ankle Score (OMAS), is crucial in determining the effectiveness of surgical management.

While numerous studies have evaluated ankle fracture outcomes, many focus on large cohorts or specific fracture subtypes.

There remains a need for focused research on medium-sized patient groups to better understand real-world functional recovery patterns and complications. This study aims to evaluate the functional outcomes of surgically treated ankle fractures in a cohort of 44 patients, analyzing factors that influence recovery, including age, fracture classification, surgical timing, and postoperative complications. The findings of this study will contribute to the existing literature by providing insights into optimal surgical management strategies and rehabilitation protocols to maximize functional recovery in ankle fracture patients.

Methodology

This prospective observational study was conducted at a tertiary care orthopedic center over a two-year period, enrolling 44 patients with displaced ankle fractures requiring surgical intervention.

Inclusion & Exclusion criteria

Patients aged above 18 years with closed Weber B or C fractures were included, while those with open fractures, pre-existing arthritis, or polytrauma were excluded.

Data collection

All participants underwent thorough preoperative evaluation including clinical examination and radiographic assessment (standard ankle X-rays and CT scans where necessary) to classify fractures using the Weber and Lauge-Hansen systems. Surgical management followed a standardized ORIF protocol under tourniquet control, with lateral malleolar fractures fixed using plates/screws, medial malleolar fractures with cannulated screws, and syndesmotic injuries addressed via suture-button or screw fixation. Intraoperative fluoroscopy confirmed anatomical reduction and stability.

Postoperatively, patients were immobilized in a splint for two weeks followed by progressive weight-bearing and physiotherapy. Functional outcomes were assessed at 6 months, while radiographic union and complications were monitored.

Statistical analysis employed SPSS software, with p<0.05 considered significant

Table 1: Demographic and Fracture Characteristics

Variable	Value (N=44)
Age (years)	42.5±14.2
Gender	
Male	27 (61.4%)
Female	17 (38.6%)
Fracture Type	
Weber B	30 (68.2%)
Weber C	14 (31.8%)
Fracture Pattern	
Unimalleolar	18 (40.9%)
Bimalleolar	20 (45.5%)
Trimalleolar	6 (13.6%)
Time to Surgery (days)	5.2±2.8

Table 2: Functional Outcomes at 6 Months

Outcome Measure	Mean ± SD	Range
AOFAS Ankle-Hind foot Score	82.6±9.4	62–98
Olerud-Molander Score (OMAS)	78.2±11.3	55–95
Time to Union (weeks)	10.4±2.1	8–16

Discussion

The findings of our prospective study on 44 surgically treated ankle fractures contribute valuable insights to the existing

body of literature while raising several important considerations for clinical practice.

Table 3: Complications

Complication	Number (%)
Superficial Infection	2 (4.5%)
Delayed Wound Healing	3 (6.8%)
Post-Traumatic Arthritis	4 (9.1%)
Hardware Irritation	2 (4.5%)
Nonunion	1 (2.3%)

Table 4: Subgroup analysis of functional outcomes

Subgroup	AOFAS Score (Mean ± SD)	OMAS (Mean ± SD)	P-Value
Weber B (N=30)	86.2±7.1	82.4±8.9	0.02*
Weber C (N=14)	75.8±10.3	68.5±12.6	
Age < 50 (N=28)	85.1±8.3	80.7±9.5	0.03*
Age ≥ 50 (N=16)	78.3±9.8	72.4±13.2	
Surgery ≤ 7 days (N=35)	84.5±8.6	80.1±10.2	0.04*
Surgery > 7 days (N=9)	74.8±11.2	68.3±14.7	

*Statistically significant: p<0.05

Functional Outcomes in Context

Our results demonstrated mean AOFAS (82.6) and OMAS (78.2) scores comparable to larger series reported in literature [6, 7], confirming that anatomical reduction and stable internal fixation reliably restore ankle function. These outcomes are particularly noteworthy given that 31.8% of our cohort had more complex Weber C fractures, which typically portend worse prognosis [8]. The slightly lower OMAS scores compared to AOFAS likely reflect this scoring system's greater emphasis on subjective symptoms like stiffness and swelling [9].

Fracture Pattern as Outcome Determinant

The significant difference between Weber B and C fractures (AOFAS 86.2 vs. 75.8, P=0.02) aligns with biomechanical studies demonstrating that syndesmotic disruption in Weber C injuries creates inherent instability [10]. Our data supports the growing evidence that suture-button fixation may offer advantages over traditional screws for these complex cases [11], though our study wasn't powered to compare fixation methods. The trimalleolar subgroup (13.6%) showed the widest outcome variability, underscoring the need for meticulous posterior malleolar reduction [12].

Timing of Intervention Matters

The strong correlation between early surgery (≤ 7 days) and superior outcomes (AOFAS 84.5 vs. 74.8) reinforces two critical concepts [13]:

1. The "golden period" for soft tissue management before fibrosis develops.
2. The importance of immediate joint congruity in preventing chondral damage.

This finding gains particular relevance in healthcare systems where surgical delays are common due to resource limitations [14].

Age-Related Recovery Patterns

The 6.8-point AOFAS difference between patients <50 and ≥ 50 years old mirrors degenerative changes seen in histological studies of aging periarticular tissues [15]. However, our oldest patient (72 years) achieved an AOFAS of 88, suggesting that biological age and rehabilitation adherence may outweigh

chronological age ^[16]. This has important implications for shared decision-making in elderly patients.

Complications Analysis

Our 4.5% infection rate compares favorably to the 8-12% reported in diabetic populations ^[17], though we excluded Gustilo-Anderson Type III injuries. The 9.1% arthritis incidence at 6 months warrants caution, as longitudinal studies show this may rise to 30% at 5 years ^[18]. Three cases of delayed wound healing (6.8%) occurred in smokers, supporting current protocols for preoperative smoking cessation ^[19].

Conclusion

Surgical management of displaced ankle fractures using open reduction and internal fixation (ORIF) yields favorable functional outcomes, as evidenced by high AOFAS and OMAS scores in this cohort. Early surgical intervention (within 7 days), younger patient age, and less complex fracture patterns (Weber B) were associated with better recovery. Complication rates were low, with post-traumatic arthritis emerging as the most notable long-term concern. These findings underscore the importance of timely, anatomically accurate fixation and comprehensive rehabilitation to optimize outcomes. Further studies with longer follow-up are warranted to evaluate the progression of post-traumatic arthritis and long-term function.

Conflict of Interest

Not available

Financial Support

Not available

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