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EVALUATION OF FUNCTIONAL OUTCOME OF OPEN REDUCTION & INTERNAL FIXATION AND CONSERVATIVE MANAGEMENT OF TALUS FRACTURES IN TRAUMA PATIENTS - A RANDOMIZED CONTROL TRIAL

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Abstract

Background: *The talus plays a critical role in ankle joint stability and mobility. Fractures of the talus, although uncommon, are associated with significant morbidity due to its unique vascular anatomy and articular coverage.*

Objectives: *To compare the functional outcomes of ORIF versus conservative management in patients with talus fractures using the AOFAS (American Orthopaedic Foot & Ankle Society) score.*

Study Design & Setting: *This study was conducted at the Department of Orthopedics, Rawalpindi Teaching Hospital, from 16th August 2024 to 15th February 2025.*

Methodology: *A total of 60 with Hawkins Type B, C, or D talus fractures were randomized into two groups: 30 patients received conservative treatment and 30 underwent ORIF. Data were collected using a structured proforma. Functional outcomes were assessed using the AOFAS score at six weeks post-treatment. Data were analyzed using SPSS v23. Chi-square tests were applied to assess associations, with a p-value ≤ 0.05 considered statistically significant.*

Results: *The mean AOFAS score was significantly higher in the ORIF group (60.58 ± 9.42) compared to the conservative group (46.33 ± 10.40), $p < 0.001$. Impaired outcomes (AOFAS < 50) were more frequent in the conservative group (63.3%) versus the ORIF group (13.3%). Stratified analysis showed significant associations between impaired outcomes and age, gender, and trauma type.*

Conclusion: *ORIF resulted in significantly better short-term functional outcomes*

compared to conservative treatment for talus fractures. Surgical intervention should be preferred when feasible to optimize patient recovery.

INTRODUCTION

Talus injuries present a diverse, unique set of challenges in management with a profound impact on the short- and long-term functional outcomes for the patient.[1] The talus is 60% to 70% covered in articular cartilage but has no muscular attachments, and articulates with adjacent bony structures via capsuloligamentous restraints.[2] It is anatomically divided into 3 main structures: the body, the neck, and the head, as well as the lateral and posterior processes. Structurally, it transfers loads from the tibia to the remainder of the foot.[2]

The fractures of the talus neck and body are thought to be extremely difficult to treat. Operative treatment of central talar fractures is associated with a high incidence of early and late complications and often leads to an impaired functional outcome.[3] Previously published data of talar fractures have combined different types such as ipsilateral malleolar, calcaneal, navicular, or distal tibial fracture. Such associated injuries can obscure the true effect of the talar injury on the final clinical outcome. The outcomes of operative intervention previously reported are usually considered as dismal owing to higher rates of complications such as non-union.[4] Therefore, major bulk of talus fractures are usually managed conservatively.

Recently conducted studies state that Open Reduction and Internal Fixation in Talus fractures is associated with better functional outcomes in terms of pain and mobilization when compared with conservative management.[5] The complication rate appears to be comparable in both the management groups. According to a recently conducted RCT; the proportion of patients with impaired functional outcome measured by AOFAS score <50% was 64.7% in the conservative group compared to 33.3% in the ORIF group with no significant difference in complications.[5]

There are several choices to treat talar fracture according to the pathologic pattern of talar fracture.[6] In contrast to the usual practice of conservative management of talus fractures; ORIF can be utilized to better functional outcomes.[6] This study is therefore being conducted to compare functional outcomes measured by AOFAS score of talus fractures treated by conservative management and by open reduction and internal fixation.

MATERIALS AND METHODS

The study was conducted after obtaining approval from the ethical review board (ERB) of the Rawalpindi Medical University (RMU). The study was designed as a randomized controlled trial and was conducted in the Department of Orthopedics, Rawalpindi Teaching Hospital, from 16th August 2024 to 15th February 2025. The duration of the study was six months following the approval of the synopsis. Prior informed consent was taken from all the patients included in the study. A self-made structured proforma was used for data collection. 66 patients who met the sample selection criteria were included in the study.

A sample size of 60 patients with fracture of the talus, with 30 patients in each group, was calculated using the WHO sample size calculator for RCTs based on the following parameters: the level of significance was 0.05 and the power of the test was 80%. The proportion of patients with impaired functional outcome after conservative management was 64.7%, while the proportion of patients with impaired functional outcome after open reduction and internal fixation was 33%. Non-random consecutive sampling was done.

Patients aged between 18–55 years, including both genders, were included in the study. Patients with Hawkins's type B, C, and D fractures (Appendix B) who opted either for ORIF or conservative management were included. Patients with a history of traumatic injury to the ankle joint with radiological evidence of fracture involving the talus were also included. Furthermore, patients diagnosed with a fracture of the talus and undergoing ORIF (open reduction and internal fixation) were included in the study. Patients with multiple comorbidities such as uncontrolled hypertension and diabetes mellitus were excluded. Additionally, patients with prior limb defects or with congenital limb defects

that limited mobilization prior to trauma were excluded from the study.

Patients were divided into two groups. Group A included 30 patients with talus fractures undergoing conservative management. Group B included 30 patients with talus fractures undergoing open reduction and internal fixation. Patients were divided into the two groups using the lottery method. Patients who presented with traumatic fracture of the talus bone were classified as per the Hawkins' classification (Appendix B), and subsequently, types B, C, and D were selected as per the sample selection criteria and thereby underwent subsequent conservative management or Open Reduction & Internal Fixation. Prior informed consent was taken from all the patients undergoing surgery. Patients underwent Open Reduction and Internal Fixation using screws and plates as per the guidelines and departmental protocol. Patients were discharged postoperatively with follow-up visits at 6 weeks, and AOFAS score was determined.

Conservative management of talus fracture included cast application and immobilization for 6 weeks. At follow-up visits after 6 weeks, patients' cast was removed, and AOFAS score was calculated for each patient and recorded subsequently. The AOFAS (American Orthopaedic Foot & Ankle Society) Ankle-Hindfoot Score was used to assess functional outcomes. It combines pain (40 points), function (50 points), and alignment (10 points) into a total score out of 100. Scores were recorded at 6 weeks post-treatment. A score below 50 was considered indicative of impaired functional outcome. The patients with AOFAS score less than 50 were considered to have impaired functional outcome. Patients with an AOFAS score of less than 50, measured at the 6-week follow-up after management—either conservative or ORIF—were considered to have impaired functional outcomes. Fractures of the talus bone were classified using the Hawkins classification system, in which Type B indicated a talar neck fracture with subluxation or dislocation of the subtalar joint, Type C involved dislocation of both the subtalar and tibiotalar joints, and Type D included dislocation of the talonavicular joint as well. Types B, C, and D were managed operatively. Data collection variables included demographic data such as age, gender, address, and educational status. The clinical data included mechanism of trauma, fracture classification, and AOFAS score.

Data were analyzed using the Statistical Package for Social Sciences (SPSS v 23.0). Mean with standard deviation was used to represent continuous variables such as age and AOFAS score. Frequency with percentage was used to represent the categorical variables such as gender, educational status, mechanism of trauma, and fracture classification. Both groups were compared for the frequency of patients with impaired functional outcome using the Pearson chi-square test, and a p-value ≤ 0.05 was considered significant. Data were stratified for effect modifiers like age, gender, mode of trauma, and fracture classification using the Pearson chi-square test. A p-value ≤ 0.05 was considered significant.

RESULTS

The mean age was similar between groups (36.97 ± 10.10 vs. 36.90 ± 11.34 years, p = 0.43). In the 18–35 years age group, 12 (40.0%) patients were in the conservative group and 18 (60.0%) in the ORIF group (p = 0.22). Among males, 17 (56.7%) were managed conservatively and 15 (50.0%) with ORIF (p = 1.00). Primary education was reported in 9 (30.0%) of the conservative group and 6 (20.0%) of the ORIF group; tertiary education was higher in the ORIF group, 12 (40.0%) vs. 8 (26.7%) (p = 0.42). Road traffic accidents were the most common mechanism in both groups: 13 (43.3%) conservative and 10 (33.3%) ORIF (p = 0.71). Fracture type distribution was comparable, with Type D being most frequent in the conservative group 14 (46.7%) and Type C more common in the ORIF group 11 (36.7%) (p = 0.36) as shown in table 1.

The mean AOFAS score was significantly higher in the ORIF group (60.58 ± 9.42) compared to the conservative group (46.33 ± 10.40), with $p < 0.001$. Impaired functional outcome (AOFAS < 50) was observed in 19 (63.3%) patients in the conservative group versus only 4 (13.3%) in the ORIF group ($p < 0.001$). Conversely, 26 (86.7%) patients in the ORIF group achieved a non-impaired outcome (AOFAS ≥ 50), compared to 11 (36.7%) in the conservative group as given in table 2.

Impaired functional outcomes were significantly more common in the conservative group across both

age categories: 18–35 years (p = 0.02) and 36–55 years (p = 0.01). Similarly, both male (p = 0.01) and female (p = 0.01) patients in the conservative group showed higher rates of impairment compared to ORIF. Among trauma types, only sports injury showed a significant association with better outcomes in the ORIF group (p = 0.04), while fall and RTA were not significant. No statistically significant difference was observed across fracture types B (p = 0.25), C (p = 0.12), or D (p = 0.41), although trends favored ORIF in all categories as shown in table 3.

Table 1: Baseline Characteristics of Study Groups

Variables	Characteristics	Conservative (n = 30)	ORIF (n = 30)	p-value
Age (years)	Mean ± SD	36.97 ± 10.10	36.90 ± 11.34	0.43
	18–35 years	12 (40.0%)	18 (60.0%)	0.22
	36–55 years	18 (60.0%)	12 (40.0%)	
Gender	Male	17 (56.7%)	15 (50.0%)	1.00
	Female	13 (43.3%)	15 (50.0%)	
Educational Status	Primary	9 (30.0%)	6 (20.0%)	0.42
	Secondary	13 (43.3%)	12 (40.0%)	
	Tertiary	8 (26.7%)	12 (40.0%)	
Mechanism of Trauma	Road Traffic Accident	13 (43.3%)	10 (33.3%)	0.71
	Fall	11 (36.7%)	13 (43.3%)	
	Sports Injury	6 (20.0%)	7 (23.3%)	
Fracture Classification	Type B	9 (30.0%)	10 (33.3%)	0.36
	Type C	7 (23.3%)	11 (36.7%)	
	Type D	14 (46.7%)	9 (30.0%)	

Table 2: Functional Outcome Comparison Between Study Groups

Outcome	Characteristics	Conservative (n = 30)	ORIF (n = 30)	p-value
AOFAS Score	Mean ± SD	46.33 ± 10.40	60.58 ± 9.42	< 0.001
	Impaired (< 50)	19 (63.3%)	4 (13.3%)	< 0.001
	Not Impaired (≥ 50)	11 (36.7%)	26 (86.7%)	

Table 3: Stratified Comparison of Impaired Functional Outcome Across Effect Modifiers

Variable	Category	Outcome	Conservative (n = 30)	ORIF (n = 30)	Total (N = 60)	p-value
Age Group	18–35 years	Impaired	7 (58.3%)	1 (5.6%)	8 (26.7%)	0.02
		Not Impaired	5 (41.7%)	17 (94.4%)	22 (73.3%)	
	36–55 years	Impaired	12 (66.7%)	3 (25.0%)	15 (50.0%)	0.01
		Not Impaired	6 (33.3%)	9 (75.0%)	15 (50.0%)	
Gender	Male	Impaired	11 (64.7%)	2 (13.3%)	13 (43.3%)	0.01
		Not Impaired	6 (35.3%)	13 (86.7%)	19 (56.7%)	
	Female	Impaired	8 (61.5%)	2 (13.3%)	10 (33.3%)	0.01
		Not Impaired	5 (38.5%)	13 (86.7%)	18 (60.0%)	
Mode of Trauma	Fall	Impaired	7 (63.6%)	2 (15.4%)	9 (30.0%)	0.85
		Not Impaired	4 (36.4%)	11 (84.6%)	15 (50.0%)	
	RTA	Impaired	8 (61.5%)	1 (10.0%)	9 (30.0%)	0.56
		Not Impaired	5 (38.5%)	9 (90.0%)	14 (46.7%)	
	Sports Injury	Impaired	4 (66.7%)	1 (14.3%)	5 (16.7%)	0.04

		Not Impaired	2 (33.3%)	6 (85.7%)	8 (13.3%)	
Fracture Classification	Type B	Impaired	5 (55.6%)	1 (10.0%)	6 (20.0%)	0.25
		Not Impaired	4 (44.4%)	9 (90.0%)	13 (43.3%)	
	Type C	Impaired	5 (71.4%)	2 (18.2%)	7 (23.3%)	0.12
		Not Impaired	2 (28.6%)	9 (81.8%)	11 (36.7%)	
	Type D	Impaired	9 (64.3%)	1 (11.1%)	10 (33.3%)	0.41
		Not Impaired	5 (35.7%)	8 (88.9%)	13 (43.3%)	

DISCUSSION

Talus fractures are rare but complex injuries that pose significant challenges due to the talus' unique anatomy and limited blood supply.[7] These fractures often lead to long-term morbidity, including restricted mobility and post-traumatic arthritis. Open Reduction and Internal Fixation (ORIF) has emerged as a surgical option to improve anatomical alignment and functional outcomes.[8] Conversely, conservative management is still practiced in selected cases, particularly where surgical risks outweigh benefits. Literature remains divided on which approach offers superior recovery and fewer complications. Recent advances have prompted interest in comparing both strategies through clinical trials.[9] The American Orthopaedic Foot and Ankle Society (AOFAS) score is widely used to evaluate functional outcomes post-treatment. This study aims to assess and compare functional outcomes of ORIF and conservative management in talus fractures through a randomized controlled design.

Our study found that ORIF significantly improved short-term functional outcomes in talus fractures compared to conservative management. The mean AOFAS score in the ORIF group was 60.58 ± 9.42 versus 46.33 ± 10.40 in the conservative group ($p < 0.001$). Impaired functional outcome (AOFAS < 50) was observed in 19 (63.3%) patients in the conservative group compared to only 4 (13.3%) in the ORIF group ($p < 0.001$). These findings were further supported by stratified analysis showing significantly better outcomes in surgically treated patients across age, gender, and specific trauma categories (e.g., sports injury, $p = 0.04$).

In line with our results, Nandi et al. reported a statistically significant correlation between Hawkin's classification and AOFAS scores ($p = 0.03$), with higher grades yielding poorer outcomes. Although our study did not isolate Hawkins Type III fractures, we observed similar trends—impaired outcomes were most frequent in patients with Type D fractures (30.0% in ORIF vs. 46.7% in conservative group). Their findings of higher scores with the anterolateral approach ($p = 0.005$) align with our observed benefit of surgical management overall.[10] Saravi et al. conducted a meta-analysis including 987 fractures, reporting a 25% rate of AVN, 43% rate of post-traumatic osteoarthritis, and success rates of only 60–62%. Though we did not assess long-term complications, our significantly lower impaired outcome rate in the ORIF group (13.3%) compared to their pooled success benchmarks suggests that short-term surgical success may exceed long-term averages.[11]

Wijers et al. reviewed 1086 operative talar fractures, reporting a 6% surgical site infection rate, 8% nonunion, 29% AVN, 64% osteoarthritis, and 16% requiring secondary arthrodesis. These figures underscore the complication burden of surgical management. However, they also affirm that short-term outcomes can still be favorable—as shown in our study, where 86.7% of ORIF patients achieved AOFAS ≥50 at 6 weeks.[12] Sozera et al. in a comparison of open vs. closed treatment, found average AOFAS scores of 76.45 ± 6.83 and 84.65 ± 7.65, respectively ($p = 0.087$), with higher complications in the open group (33% vs. 10%; $p = 0.0053$). While their complication rate raises concerns, our data show that when compared to non-operative treatment, ORIF results in substantially improved function, with fewer impaired outcomes (13.3% vs. 63.3%).[13]

Pflüger et al. reported an FAOS score of 87 ± 20 in isolated fractures and 60 ± 23.4 in those with concomitant injuries ($p = 0.016$). As our study included only isolated fractures, this likely contributed to the better outcomes observed, particularly in the ORIF group, reinforcing the advantage of early surgical stabilization in isolated injuries.[14] Gavrilovski et al. reported excellent

functional outcomes in 14.3% of patients and good outcomes in 57.1%, with a mean score of 68. Our study showed even stronger results, with 86.7% of ORIF patients classified as having non-impaired outcomes (AOFAS ≥50), and only 13.3% falling into the impaired category.[15]

The findings of our study—demonstrating superior short-term functional outcomes with ORIF in talus fractures—are reinforced by several recent studies. Premkumar et al. found that 65% of patients were under 30 years, and 70% were male, which aligns with our demographic distribution (53.3% male, majority aged 18–35). In their cohort, 40% had excellent outcomes and 60% had good or fair outcomes, with no poor outcomes reported. Similarly, in our study, 86.7% of patients in the ORIF group achieved an AOFAS score ≥50, indicating good to excellent function, while only 13.3% had impaired outcomes.[16] Fournier et al. reported an average Kitaoka score of 70/100 and found that 33% of cases had poor reduction, 34% developed osteonecrosis, and 74% developed peritalar osteoarthritis. Although our follow-up period was limited to 6 weeks and did not allow assessment of these long-term complications, the significantly higher AOFAS score in the ORIF group (60.58 ± 9.42 vs. 46.33 ± 10.40 in the conservative group, $p < 0.001$) indicates that early functional outcomes favor surgical intervention.[17]

Sozera et al. observed concentric reduction in 85% of cases, but noted complications including subtalar PTA in 45.4%, ankle PTA in 20%, AVN in 18.1%, and surgical site infection in 9%. These findings emphasize that even with anatomic reduction, long-term complications are frequent. Our study, however, suggests that in the immediate post-operative period, patients managed with ORIF experience improved function and reduced disability.[18] Khan et al. reported that 65% of their patients experienced no pain post-treatment, and only 2% had severe pain. These pain outcomes reflect our AOFAS score data, where the majority of ORIF patients had minimal impairment, indicating good control of pain and restoration of function.[19] Farhat et al. compared ORIF to the Ilizarov technique and found that 42.3% of ORIF patients had excellent outcomes compared to 67.3% in the Ilizarov group, with a significant difference ($p = 0.024$). Though the Ilizarov technique showed superior results, the 42.3% excellent outcome rate in ORIF patients mirrors our own short-term results, where the majority of surgically treated patients achieved favorable function within six weeks.[20]

This study employed a randomized controlled trial design, which is the gold standard for comparing clinical interventions. Data collection was standardized using a validated proforma and functional outcome was objectively assessed using the AOFAS scoring system. The inclusion of only isolated talus fractures helped control confounding variables. However, the study was limited by a small sample size and short follow-up duration. Being a single-center study, its findings may not be generalizable to broader populations. Long-term outcomes such as arthritis or avascular necrosis could not be evaluated.

CONCLUSION

Open Reduction and Internal Fixation (ORIF) showed significantly better functional outcomes compared to conservative management in talus fractures. AOFAS scores were notably higher in the ORIF group with fewer impaired outcomes. Surgical management should be considered where feasible to enhance recovery and long-term joint function.

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