

Comparison of Early Versus Delayed Weight-bearing Outcomes after Ankle Fractures Surgical Treatment; A Retrospective Analytical Study

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Abstract

Introduction: This study aimed to evaluate the early and delayed weight-bearing outcomes in patients with ankle fractures who underwent surgical treatment. **Materials and Methods:** This retrospective analytical study was conducted on 38 patients with bimalleolar or trimalleolar fractures referred to Taleghani Hospital, Tehran, Iran. Patients who underwent ankle fracture surgical treatment were divided into the early weight-bearing group (study group) and the delayed weight-bearing group (comparison group). The outcomes were functional factors including pain, bulging, running, support, daycare, and stiffness were assessed and compared between the groups. Data were analyzed by IBM SPSS Statistics ver.23 at significant level of P -values <0.05 . The Kolmogorov-Smirnov test approved the normality of data. Chi-squared test and independent T-Test were used to compare the outcomes between the groups. **Results:** Out of 38 patients, 30 were men (79%), and 8 were female (21%), with a mean age of 32.12 ± 1.22 years old (range: 17 to 58 years). Contrary to the comparison group (delayed weight-bearing), pain ($P=0.006$), running ($P=0.035$), support ($P=0.003$), daycare ($P=0.001$), and total scores ($P=0.001$) were significantly higher in the intervention group (early weight-bearing) two weeks after the surgery. The other variables (bulging, stiffness, staring up, jumping, sitting/standing) did not significantly differ between the groups ($P>0.05$). **Conclusions:** Based on the results, early weight-bearing compared to delayed weight-bearing, has better outcomes in patients with ankle fractures who underwent surgical management.

Key Words: Ankle fracture; Rehabilitation; Weight-bearing

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Introduction

Ankle fractures are defined as a fracture or multiple fractures in bones, including the tibia, the fibula, talus, and ankle joint. Ankle fractures are one of the most common musculoskeletal injuries among older adults. Based on previous studies, ankle fracture incidence is almost 170 cases per 100,000 person-years worldwide, and it accounts for about 10 percent of fractures treated in the emergency departments (1-7). Twisting, turning, or rolling of the ankle may cause broken ankles. Such injuries are more reported in the elderly, athletes, and people with osteoporosis, especially during physical activities (8).

Ankle fractures are categorized into different types based on fracture region. The most common ankle fractures include

lateral malleolus fracture, bimalleolar ankle fracture, trimalleolar ankle fracture, and plafond fracture. The lateral malleolus fracture, which occurs in the lower part of the fibula, is the most prevalent. In broken ankles, sometimes bones related to ankle joints are broken while still in the correct position and alignment, named non-displaced fractures. On the other hand, fractures occur as bones are out of alignment, called displaced fractures. Contrary to the non-displaced fractures, surgical or non-surgical interventions may be required to fix and align the ankle's bones (9-11).

Regarding previous studies, losing the muscular volume and strength, reducing the joint range of motion, and having pain are some of the potential adverse events related to lack of activity due to the fractures. These consequences may affect the

Table 1. Characteristics of patients, frequency (%)

Variables		Group A (Early weight-bearing) (N=16)	Group B (Delayed weight-bearing) (N=22)	P-Value
Age (years)	Less than 50	11(68.7%)	11(50%)	0.24
	More than 50	5(31.2%)	11(50%)	
Sex	Male	15(93.7%)	15(68.2%)	0.10
	Female	1(6.3%)	7(31.8%)	
Underlying Disease	No	13 (81.2%)	15(68.2%)	0.596
	Yes	3 (18.7%)	7(31.8%)	

Table 2. The results of the Weight-bearing outcomes in two groups

Variables	Groups	Mean (SD)	P-value
Pain	A	24.38 (1.70)	0.006*
	B	18.41 (8.91)	
Stiffness	A	9.38 (2.50)	0.263
	B	8.18 (3.94)	
Staring up	A	8.13 (2.50)	0.221
	B	6.82 (3.94)	
Running	A	3.75 (2.23)	0.035*
	B	2.05 (2.51)	
Jumping	A	2.50 (2.58)	0.096
	B	1.14 (2.14)	
Sitting/standing	A	5.00 (0.00)	0.083
	B	4.32 (1.75)	
Support	A	9.69 (1.25)	0.003*
	B	6.14 (4.86)	
Daycare	A	18.75 (2.88)	0.001*
	B	12.73 (7.02)	
Bulging	A	9.06 (2.01)	0.481
	B	8.41 (3.23)	
Total score	A	90.63 (6.02)	0.001*
	B	68.64 (25.73)	

*P<0.05, Group A: early weight-bearing, Group B: delayed weight-bearing

patient's performance and delay patient's recovery. In such situations, weight-bearing practices may improve the physical functions of patients. It would be considered an effective post-surgery treatment for the lower extremity fractures (12-21). This study aimed to compare the early and delayed weight-bearing outcomes in patients with ankle fractures who underwent surgical treatment.

Materials and Methods

In this retrospective analytical study conducted between September 2014 to November 2019, 38 patients with ankle fractures referred to Taleghani Hospital, Tehran, Iran were enrolled in the study through a convenient sampling method. This study was approved by the research deputy of the Medical School

of Shahid Beheshti University of Medical Sciences, Tehran, Iran. Informed consent was obtained from all individuals recruited in the study. The study was conducted solely on patients with traumatic bimalleolar and trimalleolar ankle fractures, with the possibility of following up on the therapeutic outcomes defined as inclusion criteria. Participants with pathological fracture, multi-trauma, or established complications secondary to ankle fracture were excluded. A total of 38 patients were found eligible and included in the study. Patients' characteristics (age and sex) alongside their medical histories were assessed and recorded through a pre-designed checklist.

In this study, patients who underwent ankle fracture surgical treatment were divided into the early weight-bearing group (study group) and the delayed weight-bearing group (comparison group). Patients in the study and comparison groups received weight-bearing exercises two weeks and six weeks after the surgery, respectively. Outcomes related to the weight-bearing practices, such as pain, joint stiffness, bulging, running, jumping, sitting and standing, daily care, and support, were evaluated for both groups.

Statistical Analysis

In this study, data were analyzed by IBM SPSS Statistics ver.16. The quantitative variables like age and the outcomes related to the weight-bearing exercises were expressed as Mean (SD). The qualitative variables like sex and grouping were expressed as frequency and percentage. The Kolmogorov-Smirnov test approved the normality of data. Chi-squared test and independent T-Test were used to compare the outcomes between the groups. P-values<0.05 were considered as statistically significant level.

Results

In this study, participants were categorized into group A as patients who underwent the early weight-bearing practices, and group B as patients who underwent the delayed weight-bearing trials. Out of 38 patients, 30 subjects were male (78.9%), and eight were female (21.1%) with a Mean (SD) age of 32.12 (1.22) years

old. In terms of patient age, 22 subjects (57.9%) were less than 50 years old, 16 (42.1%) were more than 50 years old, and underlying disease was reported in 10 patients (diabetes mellitus: 4 patients, hypertension: 5, hypothyroidism: 1). As shown in Table 1, there were no significant differences between patients' demographic characteristics (age, sex, and underlying disease between the groups ($P>0.05$)).

Outcomes associated with the weight-bearing exercises based on the patient's groups were reported in Table 2. **This table shows that** contrary to patients who underwent delayed weight-bearing activities, patients who received early weight-bearing practices had more outstanding scores. There were significant differences between pain ($P=0.006$), running ($P=0.035$), support ($P=0.003$), and daily care ($P=0.001$) scores in the patient groups. In terms of the total score, patients who received early weight-bearing practices had significantly greater scores in comparison to delayed ones ($P=0.001$).

Discussion

Most patients who undergo ankle fracture surgeries will experience post-surgery complications (21). The advantages and disadvantages associated with early and delayed rehabilitation have not been completely understood yet. In addition, clinical outcomes related to such treatment approaches are surrounded by controversy (22-24). In recent years, post-surgery methods like weight-bearing exercises may aid in patients' recovery. In previous studies, adverse events related to weight-bearing practices have not been highly reported in the lower extremity organs (23). However, some factors, such as comorbidity and mechanism of injuries, could impact on surgeon's decision on post-surgery care programs (24). This study aimed to evaluate early weight-bearing exercises, in comparison to delayed ones, in patients with ankle fractures who underwent surgical treatment.

Based on the results, in terms of post-surgery outcomes, scores related to pain, running ability, support, and daily care in patients who underwent early weight-bearing exercises were significantly greater than in patients with delayed weight-bearing activities. In a study conducted by Dogra *et al.* (25), early versus delayed weight-bearing outcomes were evaluated in patients with ankle malleolus fractures. Contrary to the present study, there was no significant difference between the range of motion and pain between the two groups. In a survey carried out by Eiff *et al.* (26), 82 patients with a lateral ankle sprain were randomly included in the early mobilization group and the immobilization group. The finding indicated that

patients in the early mobilization group had lower pain score than patients in the immobilization group.

A randomized controlled trial on the efficacy of early ankle mobilization was performed by Dettori *et al.* (27). In that study, 64 patients were randomly allocated into three groups: plaster cast, an air-stirrup, or an elastic wrap. Each intervention lasted two weeks and was followed by three weeks of rehabilitation. Based on the results, patients allowed early mobilization returned to work and ran significantly sooner than those placed in plaster casts. In another study conducted by Matthew *et al.* (28), outcomes related to early motion and directed exercises (EMADE) versus standard care following post ankle fracture fixation were evaluated. In that study, patients who underwent EMADE, in comparison to patients who underwent standard care, had significantly better results. In previous studies, some complications, such as bulging, pain, and stiffness of joints, were reported with a range of 2 to 60 % (29, 30). There were no significant differences in bulging and stiffness between the patient's groups in our study.

In this study, there were some limitations, including a lack of pre-surgery clinical information related to outcomes investigated. It is recommended that other factors like measuring subjective improvement (LAS) and patient's quality of life are evaluated in future research works. Due to decelerated rate of patients' improvement in the elderly, it would be recommended that the follow-up duration of such patients would be longer.

Conclusion

Based on the results, the outcomes related to post-surgery treatment in patients who underwent early weight-bearing, in comparison to patients with delayed ones, were significantly better results.

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