
To Evaluate The Safety of Early Weight Bearing Following Fixation of Displaced Bimalleolar Ankle Fractures

Abstract

Fractures of the ankle joint are among the commonest fractures in adults, with an incidence of up to 174 cases per 100 000 persons per year^[1]. Open anatomic reduction and internal fixation are routinely advocated for displaced, unstable ankle fractures while postoperative protocols of these remain highly variable ^[2-4]. An association have been shown by various authors between clinical outcome & postoperative radiographs. ^[5-7] This particular study was conducted to clarify postoperative fracture union rates, rates of hardware loosening or failure, and radiographic medial clear space changes & functional outcome when comparing early weight bearing (EWB) to late weight bearing (LWB) following open reduction and internal fixation (ORIF) of displaced bimalleolar ankle fractures. This study suggests that EWB at three weeks postoperatively does not increase markers of radiographic failure compared to six weeks of non-weight bearing (NWB), which has been regarded as the gold standard of treatment to allow for healing while EWB has many advantages such as gaining a good range of motion, decreasing risk of soft tissue atrophy and reduced osteoporosis, return to their activities of daily living quicker and provide improved rehabilitation after ORIF of displaced bimalleolar ankle fractures.^[8]

Keywords: Bimalleolar ankle fracture, early weight bearing, non-weight bearing, medial clear space, Baird & Jackson score

Introduction

Ankle fractures are among the most common injuries treated by orthopaedic surgeons in the emergency department. Increase in the prevalence of ankle fractures over the last two decades in the young and old age patients has been observed ^[9,10]. Ankle fractures are complicated injuries that are difficult to manage & are prone for long-term disability and infections ^[11]. Recently, emphasis has been shifted to functional outcome and recovery. The primary goals of fracture surgery and postoperative regimen are to minimize disability from injury. A secondary goal is to minimize the period of convalescence and thus maximize function. Following operative treatment of ankle fractures, most surgeons advocate a period of NWB followed by partial progressive weight-bearing. We believe that a certain subset of patients with unstable ankle fractures treated with open reduction internal fixation can be made weight bearing as tolerated immediately without jeopardizing the operative fixation or clinical outcome and EWB will allow patients to return to their activities of daily living quicker, with an overall easier time during convalescence. EWB is associated with earlier return to full weight bearing without a reduction in functional outcome scores. ^[12,13,14] The purpose of this study is to assess the safety of EWB following fixation of displaced bimalleolar ankle fractures.

Material and methods:

This prospective study was carried out among 30 patients with displaced bimalleolar ankle fractures who were admitted to the orthopaedic department at the tertiary care centre. The study was carried out for a period of 18 months. 30

Patients aged between 18-60 years with displaced bimalleolar fractures were included in the study. The patients were then assessed for general condition and to rule out vital injuries. Written informed consent of the patient had been taken and institutional ethical clearance was obtained. Syndesmotic instability was confirmed with the squeeze test and stress test. Preoperatively all routine blood investigations were done. Radiological evaluation with plain radiographs in antero-posterior, lateral and mortise views was done in supine non weight bearing films. Inclusion criteria for ORIF included patients in the age group of 18-60 years, patients showing closed Bimalleolar Fractures of Ankle, Displaced fractures of lateral & medial malleolus of ankle (more than 2 mm). Patients with open fractures, Undisplaced fractures of lateral & medial malleolus of ankle, Fractures with neurovascular deficit, medical comorbidities such as diabetes or peripheral neuropathy were excluded from the study. The exclusion of open fractures allowed to assess low-energy ankle injuries with a minimal amount of soft tissue attenuation, which could have had a varying effect on healing rates regardless of postoperative weight-bearing protocol. Also excluded were patients with medical comorbidities such as diabetes or peripheral neuropathy that would preclude them from immediate weight bearing. During surgery, participants underwent rigid operative fixation of bony injuries including the lateral malleolus and medial malleolus. The lateral malleolus was fixed using fibular plate & the medial malleolus fragment was secured by either malleolar screws of appropriate length or tension band wiring or percutaneous k wire. Fluoroscopy were evaluated for evidence of residual talar tilt, medial clear space, and syndesmotic clear space. After satisfactory stability was obtained (stress negative mortise), incisions were

irrigated and closed in layered fashion. All patients were instructed to remain non weight bearing (NWB) until their initial office follow-up at three weeks. All the patients were divided into two groups. Patients who had EWB in the form of partial weight bearing in a below-knee cast at 3 weeks post operatively which was gradually progressed to full weight bearing (15 patients, 12 male and 3 female) were in group 1 and immobilization in a plaster splint for the first six weeks postoperatively (15 patients, 13 male and 2 female) were in group 2. **Beginning at the patient's initial three-week follow-up visit, radiographs of the ankle AP, lateral & mortise views non-weight bearing in supine position were evaluated.** These were subsequently followed at routine periods postoperatively including six weeks, twelve weeks, six months, and nine months all in supine position. Close attention was paid to the medial clear space, radiographic evidence of healing, and signs to suggest hardware failure (breakage). Radiographic medial clear space was measured just inferior to the medial shoulder of the talus on the ankle mortise view and was defined as normal if < 5 mm. Radiographic healing was defined as bridging bony callus at three of four cortices or disappearance of fracture lines in fractures treated with absolute stability constructs. Loosening of hardware was also investigated and was defined as lucency about a screw or "backing out" of a screw from its formerly purchased cortex. All radiographs were reviewed by the senior orthopaedic surgeon with nonunion being classified as the absence of the above signs of radiographic healing within the first six months postoperatively. Functional outcome was studied with the help of Baird & Jackson score which included pain, stability of ankle, ability to walk, ability to run, ability to work, motion of ankle, radiographic result. While EWB was allowed strictly at three weeks

postoperatively, the LWB group was allowed to weight bear after evidence of radiographic union was noted as detailed above.



Figure1: Supination External Rotation type of ankle fracture managed with fibular plating with medial malleolar tbw

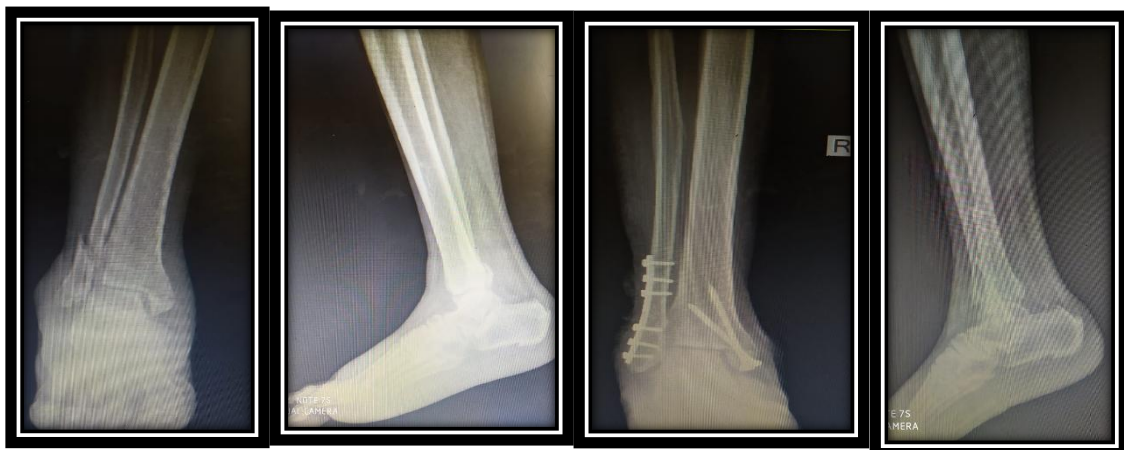


Figure 2: Supination External Rotation type ankle fracture managed with fibular plating with medial malleolar screw

Statistical analyses: Data analysis was done with the help of the appropriate software version. Comparison among the study groups was done with the help of an unpaired T-test. The association among study parameters was assessed with the help of a chi-square test & P-value less than 0.05 is taken as a significant level.

Results

A total of 30 patients met the inclusion criteria, and of these patients, 83% were male. The EWB and LWB groups had 15 patients each. Between the two groups, demographic recorded were: age, sex, fracture pattern, or type of fracture according to Lauge & Hansen classification, functional outcome by Baird & Jackson score. The majority of these patients (51%) suffered road traffic accidents as the primary mode of trauma. **Supination External rotation type (Lauge & Hansen Type) fracture was common than other types of fracture (50%) followed by Pronation External rotation type (40%), Supination Adduction type (7%) & Pronation Abduction type (3%).** Mean bony union was achieved in 8.5 weeks. In our study, no significant differences were found between the EWB and LWB groups with regard to any of the demographic variables listed in Table 1 & Table 2. **(P value < 0.05)**

Variable	Delayed weight bearing (n=15) (mean)	Early weight bearing (n=15) (mean)	P Value
Age (years)	48.5	39.4	<0.05
Sex (male)	86.66	80	<0.05
Lauge & Hansen type (Supination External rotation)	46.6	53.3	<0.05

TABLE 1: Patient Demographics

Variable (mean)	Delayed weight bearing (n=15) (mean)	Early weight bearing (n=15) (mean)	P Value
Time to full weight bearing (weeks)	6.23	3.13	<0.05
Union rate (%)	95.4%	100%	<0.05
Time to union (weeks)	9.5	7.5	<0.05
Radiographic clear space after 6 months (mm)	2.38	2.41	<0.05
Baird & Jackson score	96	91	<0.05
Implant loosening	0	0	-
Implant breakage	0	0	-

TABLE 2: Postoperative outcomes

No disadvantage was noted in regard to the early weight-bearing group both clinically and radiographically. In our study, it was found that mean bony union was achieved in 8.5 weeks, mean union rate was 97.85 % while mean radiographic clear space was 2.40 mm. There was no evidence of implant loosening or breakage. In our study, no significant differences were found between the EWB and LWB groups with regard to any of the postoperative outcomes listed in Table 2.

Discussion

The EWB group achieved full weight-bearing status at an average of 3.13 weeks weeks, which was significantly lower than the LWB group at 6.23 weeks. All patients in the EWB group went to union, with time to radiographic union of 7.5 weeks on average. These findings were in consensus with the findings from the study conducted by Egol et al, Ahl et al.^[15,16] Simanski et al. performed a prospective study comparing functional early weight bearing (3 weeks) to 6 weeks without weight-bearing in a below knee cast^[17]. The only study that we found that allowed immediate weight-bearing without a below knee cast Arif et al's^[18] In the LWB group, 1/30 (3.33%) patients were designated as nonunion after six months. The remainder of the LWB group did go on to union at a time of 9.5 weeks. Functional outcome according to Baird and Jackson's ankle scoring system we found that, most of the patients had good(76%) to excellent(20%) results. Postoperatively, there was no significant difference in medial clear space between the EWB and LWB groups at any time interval postoperatively. Radiographic interpretation for implant loosening was also performed at the same time intervals, and no significant differences were noted regarding implant loosening between the two groups. These findings were in consensus with the findings from the study conducted by Simanski et al, Arif et al.^[17,18] Finally, implant failure was not appreciated in either patient in LWB and EWB group. The above stated studies all suggest that EWB and motion would allow patients earlier return to function without any compelling disadvantage. Our findings show that EWB is associated with earlier return to full weight bearing without a reduction in functional outcome scores.^[12,13,14]

Conclusion

This study found that EWB at three weeks following ORIF of displaced bimalleolar ankle fractures led to no increase in complications or nonunion rates. EWB for bimalleolar ankle fractures does not affect the radiographic medial clear space when compared to LWB. No differences in time to union, union rate, implant loosening, or failure, functional outcome were noted between the groups. Orthopaedic surgeons should feel comfortable progressing patients' weight-bearing status prior to six weeks postoperatively in the setting of rigid ankle ORIF without fear of implant failure or loss of reduction. Further investigations are necessary to consider the clinical impact of EWB in these fractures.

Conflicts of interest: There are no conflicts of interest.

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