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

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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Short Research Article

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ABSTRACT

The most common fractures in adults are the ankle fracture accounting for incidence up to 173 occurrences per 1,00,000 people per year. Ankle fractures which are displaced, are commonly treated with ORIF with variable regimens available. Various authors have shown a link between clinical outcome and postoperative radiography. After open reduction and internal fixation (ORIF) of displaced bimalleolar ankle fractures, this paper compared early weight bearing (EWB) to late weight bearing (LWB) to determine union rates after operation, hardware loosening rate, medial clear space on x-ray, and functional outcome. This study found that EWB did not increase markers of outcome failure 3 weeks after surgery compared to 6 weeks of NWB which is considered the gold standard of care to enable healing, good range of motion, reduced risk of muscle weakning and bone osteoporosis, return more quickly for day-to-day living activities and improve postoperative rehabilitation.

Keywords: Medial and lateral malleolar ankle fracture; early weight bearing (EWB); non-weight bearing (NWB); baird & jackson score.

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1. INTRODUCTION

In emergency room, the most common injuries encountered by orthopaedics surgeon are ankle fractures are bimalleolar fracture [1] & these displaced unstabe fractures are reduced with ORIF with various available implants [2–4]. A link has been associated between clinical outcome and post reduction xray & associated with improved post operative clinical outcome [5–8]. During the last few decades an increase in bimalleolar fracture occurrence has been observed in both young and senior patients [9,10]. Ankle fractures are difficult-to-manage injuries that can result in long-term incapacity and infection [11]. The focus has now turned to the functional outcomes and recovery. Main aim of this fracture surgery is to improve post operative rehabilitation. Fracture surgery and following care have the purpose of reducing injury-related disability. Shortening the convalescence period and hence optimising function is a secondary goal. After surgery for ankle fractures, it is usually recommended to be non-weight bearing followed by partial progressive weight-bearing. In routine a small number of patients with unstable bimalleolar fractures treated with ORIF can be made to bear weight as tolerated as soon as possible without affecting the fixation or functional outcome, and EWB allows patients to return to their day-to-day activities sooner. EWB is associated with improved return to full weight bearing without affecting the functional outcome [12,13,14]. This study aims to see if EWB instituted for displaced bimalleolar fracture are stable.

2. MATERIALS AND METHODS

Thirty individuals with displaced bimalleolar fracture were included in this study who were hospitalised to a tertiary care centre's orthopaedic department. The research took place over the course of 18 months. The study comprised 30 patients with displaced bimalleolar fractures aged 18 to 60 years. Patients underwent evaluation for their overall health and to rule out any life-threatening injuries. The patient's written informed permission had been obtained, as well as institutional ethical clearance. The squeeze test and stress test confirmed syndesmotic instability. All standard blood tests were completed prior to surgery. X-rays in AP, lateral, and mortise views were taken in supine non-weight bearing films for radiological examination. Inclusion criteria for ORIF included aged between 18 to 60, patients showing closed Bimalleolar Fractures of Ankle, Displaced fractures of lateral & medial malleolus of ankle (more than 2 mm). Patients with open fractures, Un-displaced fractures of lateral & medial malleolus of ankle, Fractures with neurovascular deficit were excluded. With no open fractures, researchers were able to assess ankle damage with low energy and minimal soft tissue injuries. This may have affected cure rates depending on postoperative weight bearing protocols. At the time of surgery, patients underwent ORIF for rigid fixation of the lateral and medial malleolus of which the lateral malleolus was fixed with fibular plate & the medial malleolus fragment was fixed by either malleolar screws or TBW or percutaneous k wire. Intra operative c arm shoot were taken to look for residual talar tilt, medial clear space, and syndesmotic clear space. After obtaining stress negative fluoroscopy images, through wash was given and suturing done in layers. Non weight bearing (NWB) instructions were given to be followed for three weeks after which patients advised to follow up in opd. Two groups of patients were made- EWB patients having partial weight bearing on short leg cast at 3 weeks after operation with gradually progression to full weight bearing (15 patients, 12 male and 3 female) consisting of group 1 and below knee slab immobilised for the first six weeks postoperatively (15 patients, 13 male and 2 female) consisting of group 2. Follow up xray after initial 3 weeks of operation of ankle AP, lateral, and mortise were evaluated for non-weight bearing group in the supine position. On further follow up xray were done at eight weeks, twelve weeks, six months, and nine months all in supine position. The medial clear space, healing of fracture and hardware failure or breakage suggestive signs were evaluated by senior orthopaedic surgeon of which medial clear space just inferior to the medial shoulder of the talus on the ankle mortise was measured. It is normally < 5 mm. Healing of fracture being defined as bridging bony callus in three out of four cortex or fracture line disappearance treated with ORIF & rigid fixation. Hardware loosening is lucency around the screw or screw back out in a previously purchased cortex. Nonunion is the lack of evidence of healing on xray within postoperatively six months. 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. The LWB group had weight bearing after fracture was

united on xray & EWB patients were kept 3 weeks strict advice of non weight bearing.

Statistical analyses: The data was analysed using the relevant software version. The researchers used an unpaired T-test to compare the study groups. To analyse the relationship among research parameters chi-square test was performed, and a P-value of < 0.05 was considered of significance value.

3. RESULTS

83% out of 30 patients who were included as per inclusion criteria were male. The EWB and LWB groups had 15 patients each. Among the above two groups, demographic recorded were as follows: age, sex, fracture pattern, or fracture pattern as per Lauge & Hansen classification, functional outcome by Baird & Jackson score. High number of participants (approx. 51%) suffered road traffic accidents as most common mode of trauma. Supination External Rotation type (Lauge & Hansen Type) fractures were more common than other forms of fractures (50%) followed by Pronation External Rotation type (40%) Supination Adduction type (7%), and Pronation Abduction type (2%). Mean bony union was achieved in 8.5 weeks. In our study, no notable differences between the EWB and LWB groups in any of the demographic variables listed in Tables 1 and 2 was concluded. (P value < 0.05).

Clinically and radiographically, there was no disadvantage to the early weight-bearing group. In our research, we discovered that the average bony union took 8.5 weeks, the average union rate was 97.85 percent, and the average radiographic clear space was 2.40 mm. No evidence of implant loosening or breakage was found. In the EWB and LWB groups no notable difference in any of the postoperative outcomes were found indicated in Table 2 in our study.

Fig. 1. Supination External Rotation type of ankle fracture managed with fibular plating with medial malleolar tbw

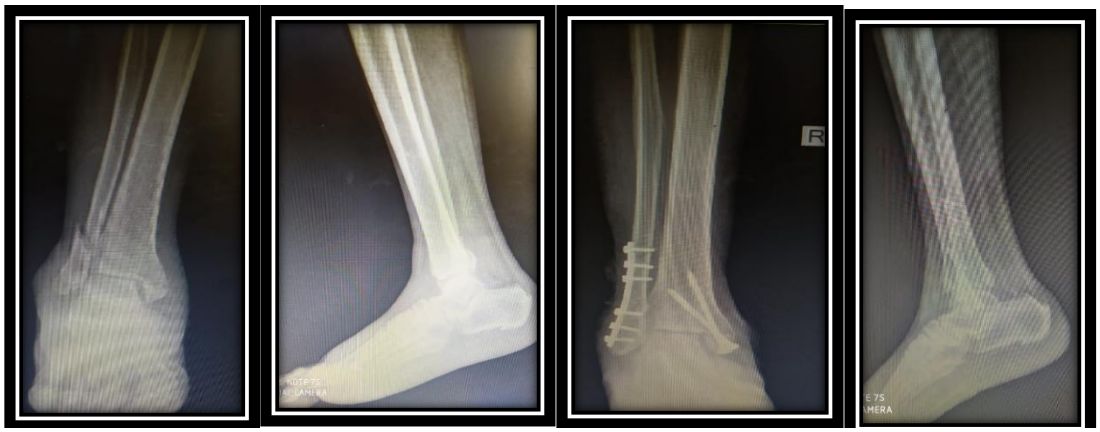

Fig. 2. Supination External Rotation type ankle fracture managed with fibular plating with medial malleolar screw

Table 1. Patient demographics

Variable	DWB (total patients=15) (mean)	EWB (total patients=15) (mean)	Value of P
Age in 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 2. Postoperative outcomes

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 failure (loosening & breakage)	0	0	-

4. DISCUSSION

The EWB group achieved full weight-bearing status at an average of 3.13 weeks, while the LWB group at 6.23 weeks. So EWB went on to achieve early weight bearing. union on xray in the group having EWB had 7.5 weeks of mean time of union. It was found that such conclusions were seen with studies of Egol et al. and Ahl et al. [15,16] Simanski et al. made a comparison between EWB of 3 weeks & 6 weeks in a below knee cast in a prospective trial [17]. In the only study by Arif et al we found that immediate weight-bearing was allowed with short leg cast. [18]. 2 out of 30 (6.66%) patients in the LWB were designated as non-union after six months. The remainder of the LWB group did go on to union at a time of 9.5 weeks. We discovered that, according to Baird and Jackson's ankle assessment system, the majority of the participants had good outcome ~76% to outstanding outcome ~20%. The medial clear space had no notable difference in both the groups in post operative period. Xray interpretation for implant failure (loosening & breakage) showed no notable difference with respect to implant failure in the 2 groups which showed similarity to findings matched those of Simanski et al. and Arif et al. [17,18] In both the groups findings suggestive of implant failure was not appreciated. Hence the study concluded that between both the groups, EWB patients had marked difference of returning to function earlier without any noted drawback. In this research, we discovered that EWB returned to full weight bearing earlier without altering functional outcome scores significantly [12,13,14].

5. CONCLUSION

EWB three weeks after ORIF of displaced bimalleolar ankle fractures resulted in no increase in comorbidities or non-union rates, according to this study. When compared to LWB, EWB had little effect on the radiographic medial clear space in bimalleolar ankle fractures.

In terms of time to union, union rate, implant failure (loosening and breaking), or functional outcome, there were no differences was noted in between the groups. So we suggest that all the surgeon should allow patients' to bear weight earlier to completion of six weeks after operation without risk of implant failure (loosening and breaking) or loss of reduction for patients treated with rigid fixation of ankle by open reduction internal fixation. Thus, it is suggested that further research be carried out for finding the effect of EWB in displaced bimalleolar fracture.

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

CONSENT

As per international standard or university standard, patients' written consent has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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