

Early weight bearing compared with non-weight bearing functional mobilization after operative treatment of an ankle fracture

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Abstract

Ankle fractures are the most common types of fractures treated in orthopaedics. When to begin ankle movement and weight bearing and the type of immobilizing devices to use post-operatively have had more intense clinical study than most other aspects of ankle fracture treatment. Aim of this study is to compare the results of two functional methods of post-operative treatment in internally fixed ankle fractures, i.e. one after early weight bearing using walking plaster and the other after non-weight bearing functional mobilization in the first six weeks following stable internal fixation.

This is a prospective, non-randomized study. Between March 2004 and February 2006, thirty- five patients with displaced ankle fractures treated by internal fixation were assigned in a way that every alternate patient fell in different groups. Group A patients, 17, were managed with a below-knee walking plaster and group B patients, 18 with non-weight bearing mobilization with crutches. Five patients were lost in follow up and 30 were followed regularly as in the protocol.

There was a temporary benefit in subjective evaluation (63 v 48 points, student t test. $P=0.262$), return to work (53.8 v 72.9 days, student t test, $p=0.079$) for those with a below-knee walking plaster at six week. There were minimal differences between the groups in the loss of dorsal range of movement (14.7 v 13.1 degree) or in the overall clinical results at the first follow up. But the differences disappeared in any evaluation after three months. Both treatments were considered to be satisfactory and the treatment choice depends on the ability to mobilize or weight bearing, the type of work and personal preference.

Key words: Ankle fracture, weight bearing, functional mobilization.

Introduction

Ankle fractures are the most common types of fractures treated in orthopaedics¹ and the incidence has been constantly increasing in both young active and elderly population.² In developed countries,

population based studies show that the highest incidence of ankle fracture occurs in elderly women.³ Overall, most ankle fractures are isolated malleolar fractures, accounting for two-thirds of fractures, with bimalleolar fractures occurring in one-fourth of the patients and trimalleolar fractures

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Ankle is not a true hinge joint and is a highly congruent saddle shaped joint.⁵ Normally, the ankle joint has 15-20 degree of dorsiflexion and 35-40 degree of planterflexion.⁶ This motion is essential for normal function and anything that reduces this motion will limit function of the entire foot-ankle complex.⁶ As a result of better understanding of the biomechanics of the ankle, improvement in fixation technique, and finding of outcome studies, there has been a gradual evolution in the effective strategies for the treatment of ankle fractures. The goals of treatment continue to be both fracture union and an ankle that moves and functions normally without pain. Operative treatment is indicated when congruity of the joint cannot be restored⁷ with closed methods but controversy remains with regard to many aspects of the post-operative care of these fractures.⁸

When to begin ankle movement and weight bearing and the type of immobilizing devices to use post-operatively have had more intense clinical study than most other aspects of ankle fracture treatment.³ Early motion has been advocated after operative treatment of an ankle fracture.⁷ Theoretically, it reduces intra-articular adhesions and leads to earlier return of movement and faster rehabilitation.⁷ In long-term it results in a greater range of ankle movement and a long-term benefit for the articular cartilage. Earlier weight bearing could lead to earlier return to function. On the other side, motion and weight bearing both increase the forces across the ankle and lead to an increased risk of postoperative fracture displacement.

Materials and methods

This study was carried out over a period of two years, from March 2004 to February 2006. The places of study were Bir hospital, Shree Birendra

hospital and Patan hospital. The details of study were explained in easily understandable language to the patients. Consent was taken from each patient and approval from ethical board of NAMS was also taken out before starting the study.

Patients who have an ankle fracture that is displaced and/or unstable, classified as any type of Lauge-Hansen classification¹⁰ or type A, B and C according to the AO- system and treated operatively were included. Exclusion criteria were insufficiently stable for early mobilization after the operation, open fractures, patients with other severe injuries, patients who are unable to cope with either of the two post-op protocols. Pre-operatively the patients were managed with below knee posterior slab and foot and leg elevation. Ice compression and non-steroid anti-inflammatory drugs were given after the consultation. In most cases, only paracetamol in combination with codeine was prescribed.

35 patients were taken, 17 in group A (5 unimalleolar fractures and 12 bimalleolar) and 18 in group B (5 unimalleolar fractures and 11 bimalleolar and 2 trimalleolar fractures); five were lost from different stages of treatment. So this study comprised of total 30 cases. The fractures were classified according to the Henderson, AO- Weber system combined with the Lauge-Hansen (1942) system.

Patients were allocated to two different groups of treatment using the date of surgery so every alternate patient fell in different groups. The first patient fell into group B and second into group A and third into group B, so on and so forth alternating. Thus, non- randomized systemic

Comparison of the differences between the groups is made with student t test for continuous variables and with the chi-square test for categorical variables. 95% confidence interval was also observed for the results.

The patients were followed in two weeks; stitches were removed after the removal of the plaster slab. Then, they were put to either method of post-operative protocols for another four weeks. The recovery of patients was assessed clinically with use of subjective, objective and radiographic evaluation criteria at six weeks, three months and six months.

At six weeks, group A patients removed their cast and both groups started walking with full weight bearing and more active exercises were recommended.

- rising on toes
- isometric and isotonic contraction of the dorsiflexor and plantarflexor muscles of ankle
- eversion and inversion exercises for the subtalar joint
- training on balance board

Patients were evaluated subjectively using a modification of the scoring system proposed by Olerud and Molander (1984).¹² Patients were also asked to express their complaints, progress in mobilization and ability to perform everyday activities. Clinical assessment was also done on swelling of the ankle, atrophy of the calf muscles, and active range of motion of the ankle joint.

Standardized antero-posterior, mortise and lateral views were taken at each follow-up to assess fracture healing, alignment and implant complications if any.

Results

Among the 35 patients, the age ranged from 14 to 75 years. Out of these, the age group 21 to 40 comprised 18 (>50%). The difference between the two groups was not significant ($p=0.692$). The mean age in patients of group A was 27.2 year (14-58) and that in group B patients was 34.2 year (14-74).

Out of 35 patients, 27 patients were male and 8 were female, so the incidence was significantly high in male. The male/female ratio was 3.1:1. But the difference between the two groups was not significant ($p=1.00$) by chi-square test.

Ten cases were operated in emergency basis within 12 hours but many were done after few days elapsed. The rest, 25, cases were done in routine O.T. The average time taken to go for surgery after injury was 7 days (1-28). Two patients had associated soft tissue injury grade 0 in each group and grade 1 injury in each group by Tscherne classification. Two patients had Gustilo 1 open fracture which were cleaned and debrided within six hours.

In 10 of the patients, the fracture was unimalleolar i.e. medial malleolus; in 23 it was bimalleolar; and only 2 had trimalleolar. So majority of the fractures were bimalleolar in both the groups. The difference of the cases in each class was not significant (cst, 0.365).

The mechanism of injury was mainly pronation-abduction in group A (60%) while it was pronation-external rotation (40%) in group B. Supination-adduction was second type of mechanism of injury in both groups. Majority of the patients fell in these

intra-operative findings. Deltoid ligament was found entrapped between fracture fragments in six patients. Three times, deep part was found ruptured and was repaired. The mean period of hospital admission was eight days (2 to 25). All patients were advised and instructed the required exercises. Commonest mode of injury was motorbike accidents. Second common mode of injury was fall injury. Ladies were found more with stumbling injury when they were in perimenopausal period.

Complications occurred in 7 patients (23.3). They were implant complication (1), deep wound infection (1) and reflex sympathetic dystrophy (5). No further surgical intervention was needed. One patient had got medial malleolar screw encroaching into the joint so removed after five months.

For the subjective evaluation, the modified subjective ankle score of Olerud and Molander (1984) was used. The subjective score was classified into four groups; poor (<60), fair (60-80), good (81-90) and excellent (>90). The subjective score was found more in group A in 6 week follow up where 1 patient had excellent result, 4 patients had good score in comparison to none in the other group. The mean subjective score was 63 in group A in 6 week follow up in comparison to the 48 score in other group. The differences decreased in the latter follow ups. In six months follow up, results were similar in both groups.

Clinical results were evaluated on the basis of patients' complaints, activity, loss of dorsal range of motion and widening of the medial clear space. In group A, only three patients had poor results while seven patients in group B had poor results in six weeks follow up. But most patients in either

group attained the similar results at three month follow up. One patient in group A and two patients in group B had poor results at three month. No patient in either group could attain excellent result till six month period. In six month also, the results were very comparable where 4 patients got excellent results in both groups.

The ability of returning to work primarily seems depending on the type of the work each individual had. Patients with sitting jobs could return earlier. Those with standing work, cycling and the work of army personnel took long time to return. It was a subjective evaluation and enquiry was done when they felt comfortable to go to their work with full capacity. The mean period of return to full time work was 53.8 days (14 to 90) for the walking plaster group and 72.9 days (21 days to 90 days) for the non-weight bearing patients. But the difference had no statistical significance (student T test, $p=0.079$).

Early sign of union in radiograph is considered when trabeculae is seen traversing the fracture site and there is loss of gap in the fracture site. In 14 patients of this study, the early sign of union couldn't be interpreted. Continuation of the trabeculae couldn't be well visualized in most of the cases. The interpretation was done in the rest by the loss of fracture gap. In the interpretation, patients in the first group showed slightly earlier union in comparison to the next group.

Loss of dorsal range of motion was more in group A at six week. It must be because of that the patients had just removed the cast from the leg. The patients had regained the range in later follow ups. The loss

degree at six weeks, 8.3 degree at 3 month and 5.2 at 6 month.

The mean ankle swelling at six week period was 1.6 cm; it was 1.3 at three month period and only 1.0 at six month. Similarly, the mean wasting of the calf was 1.9 cm in six week period; 1.3 cm in three month and 1.0 cm in six month follow up. There was no any clinical and statistical difference between the two groups in any period in ankle swelling and calf wasting.

Discussion

The treatment of ankle fractures involves both a risk-benefit and a cost-benefit analysis.⁴ The primary risk associated with early walking in post-operative period is loss of fixation or wound complication which can lead to a poor outcome. Conversely, delaying independent walking may relate to costs because of the loss of productivity of the individual. Functional treatment has been widely accepted for use after internal fixation of an ankle fracture¹¹ to lower the loss of productivity or opportunity cost. But there is no common consensus which type of functional treatment would lead to optimal results in term of more productivity and lesser cost. So this issue has had more studies than other aspects of ankle fracture treatment.⁴ Hence, in this study, comparison was carried out between two types of functional treatment; one by early weight bearing in a walking cast and other by early mobilization of the ankle without weight bearing.

Thirty-five patients were included in the study. Five dropped out. They were left while analyzing for

clinical results. Patients' age ranged from 14 to 74 years. Majority, 18 out of 35, of the injuries were in the age range of 21-40 years means that young working individuals who were more outgoing suffered the most. The male dominance (27 out of 35) in the injuries also verified the similar interpretation. The most common mode of injury was road side accidents (18 out of 35). It signifies high incidence of the road accidents causing ankle fractures which were also associated with multiple injuries. Other common modes of injury were fall from height and stumbling on pavement. The cause of fractures in post-menopausal ladies (7 out of 8) was fall injury. The distribution of these variables was similar in both groups. Majority of the patients had bimalleolar (23 out of 35) fracture. Three types of mechanisms of injury covered maximum of the incidents (27 out of 35) i.e. pronation-abduction (11), supination-adduction (8) and pronation-eversion (8).

There were no intra-operative or immediate post-operative complications. Few (in 7 out of 30 patients) complications were encountered (23.3%) in the follow up period. The complications relating directly to method of post-operative functional methods were studied. One deep infection was also linked to the undiscovered type II diabetes mellitus.

There were no cases of wound dehiscence and other wound related complications. One case of implant complication i.e. screw migration to the joint space in group B was reported after five months of the operation. But the fracture was already united so the implant was simply removed. Reflex sympathetic dystrophy was seen in 5 of the patients

to cast treatment group (16%). There was no radiographically documented post-operative loss of reduction of the ankle fracture in either group, although one patient in the group treated with a brace had loss of internal fixation. In this study, no loss of reduction was found.

The mean subjective score at 6 week period was 63 in group A in comparison to 48 score in group B (p=0.262) but the difference was not that much in later follow ups. In 3 month, it was only 91 and 86 respectively in group A and B and it further decreased in 6 month. In the study of Van Laarhoven et al.⁷, the patients with a walking plaster had a significantly higher linear analogue score and a higher subjective ankle score at six weeks. There was no difference afterwards. Egol et al.¹⁵ found that patients who were treated with a functional brace with early movement had higher functional outcome score at six and twelve weeks than did patients who were treated with a below knee cast, although the difference was significant only at six weeks.

The difference in clinical results was obvious in six week. 20% patients in group A had got poor results while 33.3% in other group had poor results. 46.7% of the group A had good results while only 26.7% had got this result in this period. But the results were very similar in both the groups in later follow ups. The clinical results include patients' complaints, work activity, loss of medial and dorsal range of movement.

Conclusion

The results of these two postoperative treatment protocols are comparable with respect to the

subjective, objective and functional outcome. Both treatment methods are safe, satisfactory and equally effective. Since early weight bearing in walking cast ensures earlier independent ambulation and offers the prospect of a rapid convalescence, it should be preferred. But, the post-operative protocol should be individualized according to patient's preference, capacity to mobilize or weight-bearing, wound healing, the type of work, personal preference and the socioeconomic status.

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