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Original Article

Comparison of below knee cast and elasticated support bandage treatment for an isolated fracture of the lateral malleolus

Maharjan R

Orthopaedics Department, National Academy of Medical Sciences (NAMS), Kathmandu, Nepal

Corespondence: Dr Rajram Maharjan,

E-mail: rajram.maharjan@gmail.com.

Abstract

Introduction: Ankle fractures are the most common type of fractures treated in orthopaedics with isolated malleolar fractures, accounting for two-thirds of fractures. The most common injury mechanism is supination external rotation, which accounts for the majority of all ankle fracture patterns. Supination external rotation stage II is the classic short oblique fracture of the distal fibula without a medial side injury, which responds well to non-operative treatment as it is a stable fracture. The purpose of this study is to compare efficacy of elasticated support bandage versus plaster cast in the patient with isolated lateral malleolus fracture (Lauge-Hansen supination- eversion external stage II.)

Method: A prospective comparative study was carried out in the Department of Orthopaedics in Bir Hospital from February 2007 to January 2009. Patients with ankle fracture were initially treated by below knee posterior slab for seven days to allow the swelling to subside and on seventh day follow-up they were grouped in two groups. Group A were patients with below knee cast and Group B were elasticated support bandage. Both groups were followed-up in the 5th week for cast or elasticated bandage removal and were evaluated after a week, thereafter, every monthly for 3 months and finally at 6 month.

Result: Of the 48 cases enrolled, the mean age of the patients was 38.85 years. The common mode of injury was fall from height followed by road traffic accident. The modified subjective ankle score of Olerud and Molander (1984) was found more in group B in comparison to group A in all follow ups. In initial three successive follow ups at 6 week, 12 week and at 3 month subjective score was found statistically significant ($p > 0.05$). However, it was not significant at 6 month follow up. The range of motion was significantly improved in group B in all follow ups but the difference between the two groups at 6 weeks and 10 weeks follow ups was statistically significant. Immobilized group required less analgesic but the difference was not significant statistically.

Conclusion: Both below knee cast and elasticated support bandage treatment methods are safe, satisfactory and equally effective with a better early result in elasticated support bandage. Supination external rotation stage II type fracture can be treated conservatively, if there is no medial tenderness.

Key words: Below knee cast; Elasticated support bandage; Fracture; Lateral malleolus, Olerud and Molander.

Introduction

Ankle joint is a complex, three-bone joint. It consists of articulation between tibia and talus, talus and fibula, and tibia and fibula along with capsule and stabilizing ligamentous structures and distal projections from the medial side of the tibia and from the distal fibula which form the malleoli. Normally, the ankle joint has 15-20 degree of dorsiflexion and 35-40 degree of planterflexion. This motion is essential for normal function and anything that reduces this motion will limit function of the entire foot-ankle complex. It is not a true hinge joint and is a highly congruent saddle shaped joint.

Ankle fractures are the most common type of fractures treated in orthopaedics and the incidence has been constantly increasing in both young active and elderly population.[4] 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 occurring in the remaining 7%. Open fractures are rare accounting for just 2% of all ankle fractures. The overall estimated incidence of ankle fractures is 100 fractures per 10^5 populations in a year.

The Lauge-Hansen and the Weber classification are well known and widely used for ankle fractures. The Lauge-Hansen classification is of greater value in comparing the results of treatment because it accurately describes the severity of injury. The Weber classification is more useful in deciding on the appropriate form of treatment.

The most common injury mechanism is supination external rotation, which accounts for the majority of all ankle fracture patterns. In a study from Denmark, Supination External Rotation stage II fractures made up 58% of all supination external rotation fractures. Lauge-Hansen Supination External Rotation stage II fractures comprises upto 40% of all ankle fractures. The injury begins laterally, at the anterior tibial fibular ligament, and proceeds externally, sequentially involving the lateral malleolus, the posterior tibial fibular ligaments or posterior malleolus, and finally the medial structures, the medial malleolus or the deltoid ligament. Supination External Rotation stage II is the classic short oblique fracture of the distal fibula without a medial side injury, which responds well to non-operative treatment as it is a stable fracture.[2] Long term clinical follow up studies of closed treatment of Supination External Rotation stage II fracture reported 90% to 98% good functional results, even with 3mm of fibular displacement.'The result of operative treatment is similar to that of closed treatment in Supination External Rotation stage II injuries.

Biomechanical studies in an axially loaded ankle model indicate that despite fracture of the fibula and complete disruption of the anterior and posterior syndesmosis, in absence of a medial side injury the talus remains stable and centered in the mortise. Isolated fracture of lateral malleolus does not disturb joint kinematics or cause talar displacement with axial loading.[1]

Non-operative method is cost effective and has no difference in long term follow up as compared to operative treatment. A comparative study between protected weight-bearing in a walking cast versus elasticated bandage would help avoid unnecessary use of cast and further decrease cost of the treatment.

Methods

Forty eight patients who attended outpatient departments of Bir hospital, Shree Birendra Army hospital and Patan hospital with supination external rotation stage II fractures were assigned to the study from February 2007 to January 2009. This was the sample size intended in the beginning by considering the incidence of the particular cases in the institutions in earlier years. Approval from ethical board of National Academy of Medical Sciences and informed consent from each patient was taken before the study.

The criteria for entry were skeletally mature patients <65 years who presented with isolated fractures of the lateral malleolus Lauge-Hansen Supination-External Rotation Stage II. Patients were excluded if they had medial tenderness or associated medal malleolus fracture, skeletally immature patients, pathological fractures, associated injuries to the foot ankle, tibia or knee, open fractures, associated neurovascular injury in the affected limb, who had had previous ankle trauma, patients using walking aids and pregnancy.

The standard radiographic evaluation of the ankle included anteroposterior, lateral and mortise views. A number of radiographic measurements can be made from these views and, if necessary, compared with the opposite side. These parameters provide an objective measurement of instability and are useful not only in diagnosis but also in planning treatment.

All the patients who fulfilled the criteria were treated initially by the application of a below knee back slab and the patients were reviewed in outpatient department 24 hours after injury to check any plaster related complications. Patients were advised to elevate the ankle for swelling to subside and were followed up after 7 days. Check x-ray was not obtained at the first week as it was considered that fracture displacement was unlikely when the affected

limb was protected by a below knee slab and restriction of weight bearing.

They were then allocated to one of two treatment group according to the predetermined randomized schedule. One group had a full plaster cast applied below the knee when the soft tissue swelling subsided. This group was called treatment 'A' group. Second group was given an elasticated support bandage and had early mobilization with the help of physiotherapy. This group was called treatment 'B' group. First case was included in group A, second case was included in group B, third case was again included in group A, fourth case was group B, so on and so forth alternating.

All forty eight patients were treated according to a standard protocol consisting of the use of non-steroidal anti-inflammatory medications (i.e. Aceclofenac 100 mg) as required and crutches for pain relief and were encouraged to bear weight as soon as possible. All patients were reviewed in an outpatient department one week after removal of cast or elasticated bandage and followed up at monthly intervals until three months and finally at six months. The standard radiographic evaluation of the ankle included anteroposterior, lateral and mortise views which were taken after the removal of cast or elasticated bandage to asses fracture healing. All patients were also asked to visit as early as possible if plaster related complications appeared. Symptoms and function were assessed using the modified subjective ankle scoring system of Olerud and Molander (1984). Pain was measured using a Visual Analogue Scale (VAS) and the days of analgesic required were recorded. Range of motion was recorded by the help of goniometer and was compared to the normal ankle. Early sign of union in radiology was considered when trabeculae was seen traversing the fracture site and there was loss of gap in the fracture site.

The selected data were analyzed with the help of Statistical Package for Social Sciences using student't' test for continuous variables and with Chi-square test for categorical variables. Values of P=<0.05 was considered significant with confidence level of 95% throughout the study.

Results

Forty-eight patients were included, among them twenty-three patients were in Group A and twenty five patients in Group B. Two patients in Group A had swelling in the post-slab even after one week and were excluded from study and one patient in the same group did not come in follow-up. Similarly, five patients from Group B did not turn up in subsequent follow-ups and were excluded from the study. Therefore, 40 patients were included in the treatment phase of the study. Twelve women and eight men with an average age of 40.5years were in a full plaster cast applied below the knee and eleven women and nine men with an average age of 37.2 years were in elasticated support bandage. The differences in age and sex distribution were not significant statistically. Most of the patients attended in hospital on the same day of injury (26 patients) while rest came the next day of injury. The mode of injury was mainly fall from height (28 out of 40 patients). The complaints of the patients were pain, swelling and the inability to bear weight. Remaining 12 patients had other minor associated injuries which did not require any intervention and did not hamper for the requirements of the protocol.

The subjective score was found more in group B in comparison to group A in all follow ups. In initial three successive follow ups at 6 week, 12 week and at 3 month subjective score was found statistically significant with p values of 0.00, 0.00 and 0.011 respectively. (Table 1 & Figure 1) However, subjective score was found statistically not significant at 6 month follow up (p= 0.086).

Table 1: Subjective Scores at the follow ups

		6 weeks		10 weeks		3 month		6 month	
		Group		Group		Group		Group	
		A	B	A	B	A	B	A	B
Subjective Score	Poor (<60)	19	2	0	0	0	0	0	0
		95%	10%	0%	0%	0%	0%	0%	0%
	Fair (60-80)	1	18	20	15	7	1	0	0
		5%	90%	100%	75%	35%	5%	0%	0%
	Good (81-90)	0	0	0	5	13	18	13	8
		0%	0%	0%	25%	65%	90%	65%	40%
	Excellent (>90)	0	0	0	0	0	1	7	12
		0%	0%	0%	0%	0%	5%	35%	60%
Total		**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**

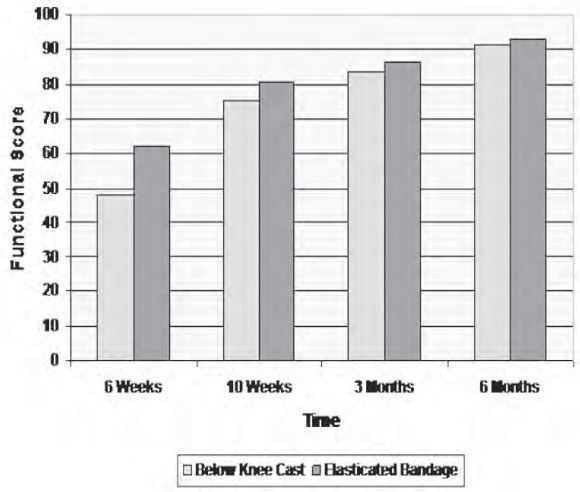

Figure 1: Mean Functional Score according to Olerud & Molander

Similarly, visual analogue pain score (Figure 2) recorded during weight bearing was also significantly improved in group B in comparison to group A in all follow ups. Immobilized group required less analgesic but the difference was not statistically significant.

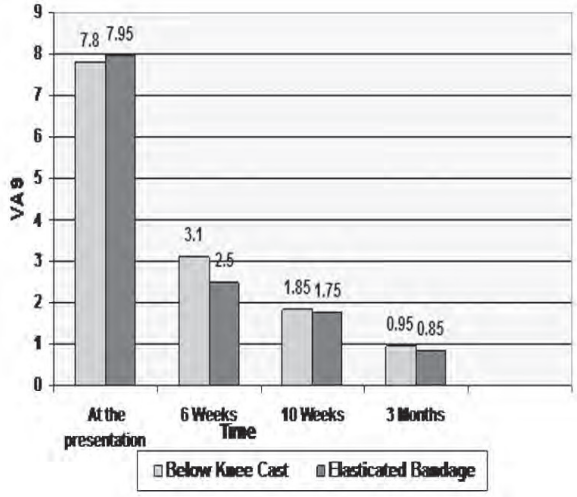

Figure 2: Visual Analogue Score

The range of motion was significantly improved in group B in all follow ups with statistically significant between the two groups at 6 weeks (p=0.000) and 10 weeks (p=0.017) follow ups and statistically not significant at 3 month (p=0.372) and at 6 month (p=0.540) (Figure 2.)

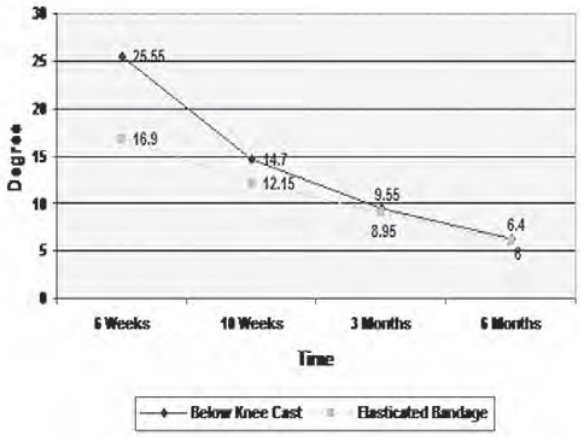

Figure 3: Total Loss of Range of Motion

The swelling of the ankle in Group B was significant improved due to early range of motion of the ankle joint treated by elasticated support bandage in contrast to the effect of immobilization of the ankle by plaster in group A.

There was no evidence of malunion or shorting of the fibula, medial instability, dermatological complications or mal-alignment of the mortise in both groups.

Discussion

Ankle fractures are the most common type of fractures treated in orthopaedics and is best classified by Lauge-Hansen in the year 1950. Lauge-Hansen Supination External Rotation stage II fracture comprises upto 40% of all ankle fractures. Lauge-Hansen believed that a supination-eversion injury produces a predictable and sequential failure of structures around the ankle. In type II injury the first structure to give way is the anterior tibio-fibular ligament followed by a spiral fracture extending between the anterior and posterior tibio-fibular ligament.

The treatment of Lauge-Hansen Supination External Rotation stage II fracture varies from open reduction and internal fixation to non-operative methods like wearing a below knee walking plaster for 4-6 weeks, functional management by ankle braces, elasticated bandage, air stirrup.[2]

Proponents of open reduction and internal fixation suggest that restoration of the normal anatomy will reduce the risk of subsequent osteoarthritis due to incongruency. CT scan has shown that the apparent displacement and external rotation of the distal fragments are actually due to internal rotation of the proximal part of the fibula. The talofibular

articulation is commonly normal, which is to be expected since the talofibular and calcaneofibular ligaments are unaffected by this injury.

Clinical studies have consistently failed to show any difference in outcome between fractures treated operatively and those managed non-operatively and similar outcomes have been observed in other studies as well.[11,] Supination External Rotation stage II fractures are benign injuries and can be treated by close method without reduction.[11]

The swelling of the ankle in Group B was significant improved due to early range of motion of the ankle joint treated by elasticated support bandage in contrast to the effect of immobilization of the ankle by plaster in group A. But the difference was gradually decreased in successive follow-ups with no significant difference at the end of 6 months which might be due to improvement in range of motion exercises in ankle joint treated by plaster immobilization after removal of the cast. There is significant improvement in post-fracture swelling of the ankle in patients treated with functional brace.

Similarly, total range of motion of ankle in elasticated support bandaged was significantly improved in contrast to group A. But the difference was gradually decreased in successive follow-ups which might be due to improvement in range of motion exercises in ankle joint treated by plaster immobilization after removal of the cast. So, at the end of 6 months, there was no difference in range of motion in both the groups and was statistically not significant (p=0.540). Similar study conducted by A.M Port et al showed minimal difference between these two groups which was statistically not significant. This also verifies the similar interpretation. This also supports that the motion improved due to improvement in range of motion exercises in ankle joint treated by plaster immobilization after removal of the cast as in immobilization group.

The patient in Group A required less analgesic as compared to Group B. The reason might be due to immobilization of the ankle which caused less pain and less analgesic. But the difference between two groups was statistically not significant. Similar study has reported absence of statistical significance in analgesic intake between patients treated with plaster immobilization group and elasticated support bandaged group.[20] Clinically none of the patients in both the groups had tenderness at fracture site at the end of 6 months. However, another study found that the mean VAS between the two groups was not significant at any stages.[20]

Conclusion

Lauge-Hansen Supination External Rotation stage II ankle fracture is a stable fracture. Both below knee cast and elasticated support bandage treatment methods are safe, satisfactory and equally effective with a better early result in elasticated support bandage as compared to plaster group. However both treatments show equally good subjective, objective and functional outcome later.

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