

## A comparative study of operative versus non-operative management of isolated lateral malleolar fracture

C. Lalduhawma<sup>1</sup>, Prof. Sanjib Waikhom<sup>2</sup>, Prasenjit Debnath<sup>3</sup>, Debraj Bhaumik<sup>3</sup>,  
Suman Gurung<sup>3</sup>, Pallab Banik<sup>3</sup>

<sup>1</sup>(Senior Resident, Department of Orthopaedics, RIMS, Imphal, Manipur University, India)

<sup>2</sup>(Professor, Department of Orthopaedics, RIMS, Imphal, Manipur University, India)

<sup>3</sup>(Post Graduate Trainee, Department of Orthopaedics, RIMS, Imphal, Manipur University, India)

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### Abstract:

**Background:** Supination-external rotation injury is the most common type of rotational injuries in the ankle. In the absence of ligamentous injury the isolated lateral malleolar fracture is quite stable and can be managed conservatively without resorting to invasive procedures. This study reports the functional outcomes between operatively treated and non-operatively treated isolated lateral malleolar fractures.

**Materials and Methods:** After obtaining the approval of the institutional ethics committee, 22 patients with isolated lateral malleolar fractures between the age group 18 to 60 years were enrolled in the study. Patients were randomly divided into two groups Group A and Group B with 11 patients each. Group A underwent operative treatment and Group B was treated with non-operative management. Functional outcomes were measured with the Olerud Molander scoring system during each scheduled follow-ups at 6 weeks, 12 weeks, 24 weeks and 52 weeks.

**Results:** No significant differences were found between both the demographic profile and OMAS score between the two treatment modalities.

**Conclusion:** Isolated lateral malleolar fractures in the absence of ligamentous injury can be safely treated non-operatively provided that thorough clinical examinations and radiographic studies are carried out at the time of presentation.

**Key Word:** Isolated lateral malleolar fracture; Olerud Molander scoring system; Ankle stress view; Medial clear space; Supination-external rotation type-2; Supination-adduction type-1.

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### I. Introduction

Ankle fractures are the most common fractures encountered in orthopaedics practice with the incidence increasing in both young active adults and elderly population.<sup>1</sup> Isolated lateral malleolar fractures account for the most common type in ankle fractures.<sup>2</sup> The Lauge-Hansen classification is used for the classification of ankle injuries based on injury mechanisms that have predictable patterns and imaging findings.<sup>3</sup> Supination-external rotation type 2 (SER2) of the Lauge-Hansen classification comprises upto 40% of all ankle fractures. SER2 is the classical short oblique fracture of the distal fibula without a medial side injury, which generally responds well to non-operative treatment as it is a stable fracture. SER2 has favorable outcome with non-operative approach as compared to others such as stage 4 (tear of deltoid ligament or transverse avulsion of medial malleolus).<sup>2</sup>

Advocates for surgical management emphasize the importance of achieving an anatomical reduction with internal fixation thereby limiting the potential for displacement and instability.<sup>4</sup> However, advocates for non-surgical management argue that surgical stabilization has no superiority in the functional outcome with the added cost of treatment and possible adverse events.<sup>5,6,7,8</sup> Biomechanical studies in an axially loaded ankle model indicated that despite fracture of the distal fibula and complete disruption of the anterior and posterior syndesmosis, in the absence of a medial side injury, the talus remains stable. Isolated lateral malleolar fracture as such does not disturb the joint kinematics or cause talar displacement with axial loading.<sup>9</sup> The purpose of this study was to compare the functional outcomes between operatively treated and non-operatively treated isolated lateral malleolar fracture.

## **II. Material And Methods**

With the approval of the REB (Research Ethics Board), RIMS, all cases of isolated lateral malleolar fractures who attended casualty and OPD from August 2019 to July 2021 were identified. All the patients were subjected to stress view radiograph to determine medial clear space and all patients with medial clear space more than 5 mm were excluded from the study. Other exclusion criteria included open fractures, patients younger than 18 years and patients unwilling to give consent for the study. Randomisation was done with computer generated numbers into two groups Group A and Group B. 11 patients were enrolled in Group A for operative treatment and Group B for non-operative treatment. Prior to initiation of treatment informed written consent was taken from each patients for inclusion for the study.

The protocol for the non-operative treatment (Group B) consisted of below knee cast with non-weight bearing. The cast was removed after signs of union on radiograph during the subsequent follow-up after which partial weight bearing with axillary crutch was allowed and ankle range of motion exercises was started. For the operative group, open reduction and internal fixation was done with interfragmentary screw (3.5mm) fixation with neutralization plate using one-third tubular locking plate. Partial weight bearing with axillary crutch was allowed after stitch removal on the 10<sup>th</sup> day post-surgery. Range of motion exercise was then started promptly after the suture removal.

Assessment was done with the OMAS (Olerud-Molander ankle scoring system)<sup>10</sup> for both the groups every follow-up at 6 weeks, 12 weeks, 24 weeks and 52 weeks. The OMAS score consists of 9 parameters like pain, stiffness, swelling, etc and the scores were recorded during each follow-ups for each patients. Fracture union was determined by callus formation, cortical continuity and progressive disappearance of fracture line.

Standard statistical analysis was done and data were analyzed by Student's t-test and chi-square test to compare demographic and functional outcomes of the two cohorts. P<0.05 was taken as significant in this study.



**Fig 1.** Stress view Xray being taken for a patient showing widening of medial clear space indicating unstable ankle injury.



**Fig 2.** Open reduction and internal fixation with 1/3<sup>rd</sup> tubular plate and screws.

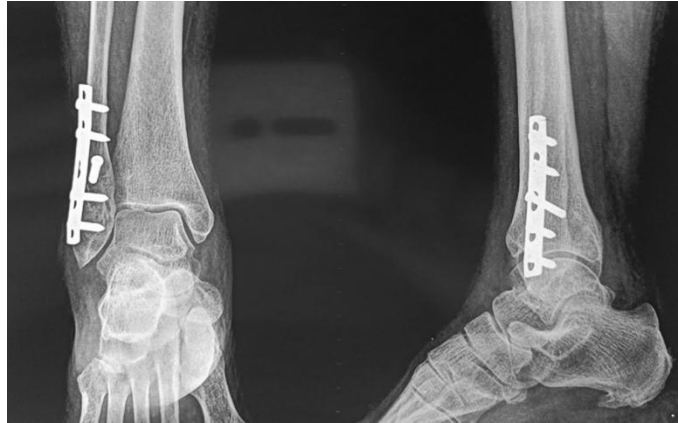


Fig 3. Post-operative xray showing internal fixation with neutralization plate using 1/3<sup>rd</sup> tubular plate and 3.5mm interfragmentary screw.

### III. Result

22 patients were enrolled in the study with 11 patients in each group. The two groups were comparable in patient characteristics with respect to age and sex and statistically not significant (p value>0.05). [Table 1]

**Table 1: Demographic parameters**

Parameter	Group A	Group B	P value
Age	52.36±19.79	48.55±14.09	0.608
Sex(M/F)	5/6	4/7	0.665

54.5% of cases were road traffic accident related injuries and the rest were simple fall or twisting injury. 77.2% of the patients had SER-2 fracture and 22.7% had SAD-1 fractures and there was no significant difference between the two types of fractures in the functional outcome. [Table 2]

**Table 2: Comparison of types of fracture between the two groups.**

Type of fracture	Group A	Group B	Total
SER-2	9(81.8%)	8(72.7%)	17(77.2%)
SAD-1	2(18.1%)	3(27.2%)	5(22.7%)
Total	11	11	22

(P-value>0.005)

By 12 weeks, most of the patients had returned to normal physical activity without much discomfort though some patients had some restrictions like difficulty in walking up stairs or walking on uneven surfaces. By 24 weeks all patients had returned to normal baseline functional status according to the OMAS score.

By 12 weeks all the fractures were united on radiograph except one case of non-union in the non-operative group. This case was treated with ORIF with plating and bone grafting. There was no significant difference in the functional recovery measured with the OMAS scores at 6 weeks, 12 weeks, 24 weeks and 52 weeks between the two groups. [Table 3]One patient from the operative group developed post-operative wound infection which resolved after treatment.

**Table 3: Comparison of OMAS score between the two groups**

OMAS	Group A	Group B	P value
6 weeks	37.27±7.54	36.36±8.39	0.792
12 weeks	55±7.56	55.91±9.17	0.585
24 weeks	77.27±5.18	76.82±6.43	0.857
52 weeks	81.82±5.13	83.64±6.74	0.485

### IV. Discussion

The treatment of isolated lateral malleolar fracture is quite controversial and even when it is clear that stable fractures without deltoid ligament injury can be treated without surgical intervention, the identification of presence of deltoid ligament injury is still a matter of debate.<sup>11</sup> Harris J and Fallat L<sup>12</sup> conducted a

biomechanical study on isolated Weber B fibular fractures in 2004 and found that there was a decrease in the tibiotalar contact area which may predispose to degenerative arthritis of the ankle. However, most authors still advocate for the non-operative approach to isolated distal fibular fractures. A comparative study conducted by Yde K and Kristensen KD<sup>13</sup> between operative and non-operative treatment for SER2 injuries had shown no significant differences between the two modalities which correlates with the findings in our study. A study conducted by Stufkens et al<sup>14</sup> comparing outcomes of distal fibular fractures treated non-operatively(SER2) with operatively treated(SER4) also showed that SER2 had better functional outcome and they were able to associate poorer outcome in the presence of medial injury. An important parameter in this study was the measurement of medial clear space obtained through the stress view radiograph as mentioned in a study by McConnell T et al where they concluded that stress radiographs allow for the accurate diagnosis of deltoid incompetence.<sup>15</sup>

The present study was conducted among patients with isolated lateral malleolar fracture in the Department of Orthopaedics, Regional Institute of Medical Sciences, Imphal for a period of 24 months from August 2019 to July 2021. The results were compared by studying the two groups of patients with isolated lateral malleolar fracture treated non-operatively and operatively treated patients. The following variables of each patient were analysed: age, sex, mode of injury, side of injury, type of fracture, medial clear space on stress view, time of union, OMAS scores at 6, 12, 24 and 52 weeks and complications.

In our study there was one case of non-union in the non-operative group which was treated with revision fixation and bone grafting and there were no subsequent complication. Non-union following stable SER2/3 has been reported by various authors.<sup>16, 17</sup> A study by Walsh and DiGiovanni<sup>17</sup> also concluded that distal fibular non-unions are relatively common cause of persistent ankle pain which may be due to micromotion at the non-uniting site.

The limitation with this study is the relatively small sample size which may not be truly representative of the true comparison between the two treatment modalities.

## V. Conclusion

Isolated lateral malleolar fracture in the absence of medial ligamentous injury can be treated non-operatively provided thorough clinical examinations and radiograph studies are done.

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