

Original Article

A COMPARATIVE STUDY ON EVALUATING THE OUTCOME OF DISPLACED ISOLATED MEDIAL MALLEOLUS FRACTURE MANAGED WITH TENSION BAND WIRING (TBW) VERSUS MALLEOLAR SCREWS FIXATION

A. M. ILIAS BASHA¹, K. B. VIJAYA MOHAN REDDY^{2*}, A. PAVAN KUMAR BABU³, S. SUJIN⁴

^{1,2,4}KMC, Kurnool, Kisan Ghat Rd, Kurnool-518002, Andhra Pradesh, India. ³GGH, Kurnool, Alluri Sitarama Raju Nagar, Kurnool-518002, Andhra Pradesh, India

*Corresponding author: K. B. Vijaya Mohan Reddy; Email: kbvmr1@gmail.com

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ABSTRACT

Objective: The Ankle fractures are becoming more prevalent as a result of increased road traffic accidents and sports injuries. There are various modalities of treatment available for Medial Malleolus fractures. Undisplaced fractures are managed conservatively with slab or cast and displaced fractures are fixed with screws, k wires, anchors, tension wiring and plates. The main objective of the study is to compare the clinical outcomes of Tension band wiring versus Malleolar screws in managing Displaced Isolated Medial Malleolus fractures.

Methods: This is a cross-sectional study conducted in the Department of Orthopaedics in Kurnool Medical College with 35 patients from November 2022 to November 2023 over one year with displaced isolated Medial Malleolus fractures. Postoperatively the patients are evaluated based on clinical and radiological examinations at one, three, and six months, respectively.

Results: The patients are evaluated with Baird and Jackson scoring system postoperatively, where Excellent score: 8(47%) in group 1 and 7(38.8%) in group 2; Good score: 8(47%) in group 1 and 8(44.4 %) in group 2; Fair score: 1(5.8%) in group 1 and 2(11.1%) in group 2; Poor score: 0 in group 1 and 1(5.5%) in group 2. Hence excellent and good results are obtained in 16(94%) patients in group 1(TBW) and 15(82.2) patients in group 2(Malleolar Screws).

Conclusion: Tension band wiring can be a better option than Malleolar screws in fixation of Displaced Isolated Medial Malleolus fractures.

Keywords: Medial malleolus, Baird and jackson scoring system, Tension band wiring (TBW), Malleolar screws

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INTRODUCTION

The Ankle joint is a modified hinge synovial joint, which transmits the body weight to the ground and helps in Ambulation [1, 2]. It is known as the mortise joint [3], which is formed by the Tibial plafond (mortise) and the Dome of Talus (tenon) and supporting medial and lateral collateral ligaments and distal tibiofibular syndesmosis. The Ankle joint is a complex joint which has bony and ligamentous parts which are more prone to injuries following trivial or low-impact injuries [1]. Ankle injuries show a bimodal distribution of age [2]. Among all those structures, in this, we have concentrated on isolated medial malleolus fractures. The management of medial malleolus fracture is based on the type or pattern of fracture and socio-economic status. The Denis-Weber classification system is more practical system of classifying ankle fractures [4, 5]. The Lauge-Hansen classification is mechanistic classification for Ankle fractures [5, 6]. The treatment varies for both un-displaced and displaced fractures, where un-displaced fractures are managed conservatively with slab or cast. Displaced fractures will have more chances of soft tissue interposition may result in non-union; hence it needs surgical fixation.

The main aims of surgical management are accurate reduction of fracture, maintenance of medial joint space, anatomical reduction of Talus beneath the Tibial plafond and addressing soft tissues.

Various surgical modalities for treating Medial Malleolus fractures are available, which include Tension Band Wiring (TBW), screws/plate fixation, k wires and suture anchors. TBW is a clinically accepted method for displaced Medial Malleolus fractures if the distal fragment is too small. Malleolar Screws fixation is done for stabilization of vertical shear fracture of the Medial Malleolus. In this study, the clinical and radiological outcome of Malleolar fractures is evaluated by comparing the management of the TBW and Malleolus screws.

MATERIALS AND METHODS

This is a cross-sectional study conducted in the Department of Orthopedics, Government General Hospital, Kurnool on 35 displaced Isolated Medial Malleolus fracture patients from November 2022 to November 2023. The study was approved by the Institutional Ethical Review Committee (IEC-KMC-GGH dated on 27/08/2018), and written informed consent was obtained from all the participants.

Inclusion criteria of the study are Age>18 y, Displaced Isolated Medial Malleolus fractures, Patients fit for surgery, Patients willing to study and follow up. Exclusion criteria of the study are Age<18 y and >60 y, Pathological fractures Associated with Compound grade 2 and 3 injuries, Tri-malleolar fractures, Patients not willing for surgery, Patients unfit for surgery.

Table 1: Demographic data

Time duration	TBW (Group 1)	Malleolar screws (Group 2)
Number of patients	17	18
Age (Mean Age) in Years	26-49(36.52)	25-53(38.54)
Male: Female	10:7	12:6
Right: Left	9:8	9:9

Table 2: Mode of injury

Injury	TBW (Group 1)	Malleolar screws (Group 2)
RTA	11	12
Sports injuries	4	3
Others	2	3

Sampling

In our study, 35 patients with displaced Isolated Medial Malleolus fractures are taken and categorized into two groups which includes Group 1(17 patients)-patients who have displaced Medial Malleolus fractures managed by TBW and Group 2(18 patients)-patients who have displaced Medial Malleolus fractures managed by Malleolar Screws.

Pre-operative planning: After receiving the patient, basic information about the patient is recorded (name, age, sex, time, place and mode of injury). The General condition of the patient is assessed and routine investigations are done. A Plain radiograph of the ankle joint was taken (AP, Lateral and Mortise view) and below knee, slab is applied and limb elevation is maintained until surgery.

Pre-op Preparations: After keeping the patient in nil per oral for 8 h, informed written consent was taken. Prophylactic I. V. antibiotics 30 min before the surgery. Xylocaine test dose and TT Injection were given.

Surgical techniques

Under spinal anaesthesia, the patient is placed in the supine position; surgical parts are scrubbed and draped. An anteromedial incision of 6 cm was given over the fracture site which is slightly curved anteriorly at the distal end. The main advantages of this incision are 1. Articular surfaces are completely visualized. 2. Tibialis posterior tendon and overlying sheath are preserved. 3. The Saphenous vein and nerve are protected. Then, the fracture site is exposed. Saline wash is given to remove debris and hematoma and

interposing soft tissue is released. Fracture ends are reduced with the help of reduction clamps and checked under the C-arm.

Tension band wiring (TBW)

Two 1.8 mm Kirschner wires are inserted perpendicular to the fracture line, anterior and posterior to the clamp. A 3.5 mm drill hole is made 3 cm proximal to the fracture site and an unicortical screw is passed. An 18 Gauge, stainless steel wire is applied between the Kirschner wires and cortical screw, in fig. of eight fashion and tightened. Fracture compression and ankle movements are checked.

Malleolar screw fixation

Two 1.8 mm Kirschner wires are inserted perpendicular to the fracture line, anterior and posterior to the clamp. After drilling with two 3.2 mm drill bit, two 4.5 mm malleolar screws were passed and tightened for compression of the fracture. Ankle movements are checked.

A Wound wash was given and closed in layers and dressing done. Post-operatively intravenous antibiotics should be given for 5 d followed by oral antibiotics until suture removal supported by limb elevation. Post-op X-rays were taken (AP, Lateral and Mortise views). Below Knee slab was kept until swelling subsides. Non-weight bearing for 6 w followed by physiotherapy was done to get functional improvement in movements.

Follow-up

All the patients are reviewed at one, three, six-month intervals. Clinical and radiological examinations of the patients were done and evaluated based on Baird and Jackson scoring.

Table 3: Average time of fracture union in weeks

Time duration	TBW (Group 1)	Malleolar screws (Group 2)
4-8 w	4	4
12-14 w	12	11
20-24 w	1	3
Average time of fracture union in weeks	12.3	14.5

PAIN	POINTS	D. Partially disabled; selected jobs only	3
A. No pain	15	E. Unable to work	0
B. Mild pain with strenuous activity	12	MOTION OF THE ANKLE	
C. Mild pain with activities of daily living	8	A. Within 10° of uninjured ankle	10
D. Pain with weight bearing	4	B. Within 15° of uninjured ankle	7
E. Pain at rest	0	C. Within 20° of uninjured ankle	4
STABILITY OF ANKLE		D. <50% of uninjured ankle, or dorsiflexion <5°	0
A. No clinical instability	15	RADIOGRAPHIC RESULT	
B. Instability with sports activities	5	A. Anatomic with intact mortise (normal medial clear space, normal superior joint space, no talar tilt)	25
C. Instability with activities of daily living	0	B. Same as A with mild reactive changes at the joint margins	15
ABILITY TO WALK		C. Measurable narrowing of superior joint space, with superior joint space >2 mm, or talar tilt >2 mm	10
A. Able to walk desired distances without limp or pain	15	D. Moderate narrowing of the superior joint space, with superior joint space between 2 and 1 mm	5
B. Able to walk desired distances with mild limp or pain	12	E. Severe narrowing of the superior joint space, with superior joint space <1 mm, widening of the medial clear space, severe reactive changes (sclerotic subchondral bone and osteophyte formation)	0
C. Moderately restricted in ability to walk	8	MAXIMAL POSSIBLE SCORE	100
D. Able to walk short distances only	4		
E. Unable to walk	0		
ABILITY TO RUN			
A. Able to run desired distances without pain	10		
B. Able to run desired distances with slight pain	8		
C. Moderate restriction in ability to run, with mild pain	6		
D. Able to run short distances only	3		
E. Unable to run	0		
ABILITY TO WORK			
A. Able to perform usual occupation	10		
B. Able to perform usual occupation with restrictions in some strenuous activities	8		
C. Able to perform usual occupation with substantial restrictions	6		

*Excellent = 96 to 100 points; Good = 91 to 95 points; Fair = 81 to 90 points; Poor = zero to 80 points.

Fig. 1: Baird and Jackson scoring

RESULTS

On clinical examination of the patients, there is no significant difference between the groups in terms of Age (mean age-37 y), Gender (Male predominance), Side involved (Right side), Etiology or Mode of injury (RTA).

On Radiological examination of both groups confirms that there is an anatomical reduction with stable fixation in all the 35 patients who are treated with TBW and Malleolar screws fixation. A series of radiographs, which are taken at 4-8 w, 12-16 w and 20-24 w, the average time for fracture union is 12.3 w in group 1(TBW) and 14.5 w in group 2(Malleolar Screws) patients.

No patients have non-union or loss of reduction in the groups. The chances of wound infection over the operated site are slightly higher in patients managed with Malleolar Screws fixation compared to patients managed with TBW.

The patients are evaluated with Baird and Jackson scoring system postoperatively, where Excellent score: 8(47%) in group 1 and 7(38.8%) in group 2; Good score: 8(47%) in group 1 and 8(44.4 %) in group 2; Fair score: 1(5.8%) in group 1 and 2(11.1%) in group 2; Poor score: 0 in group 1 and 1(5.5%) in group 2. Hence excellent and good results are obtained in 16(94%) patients in group 1(TBW) and 15(82.2) patients in group 2 (Malleolar Screws).

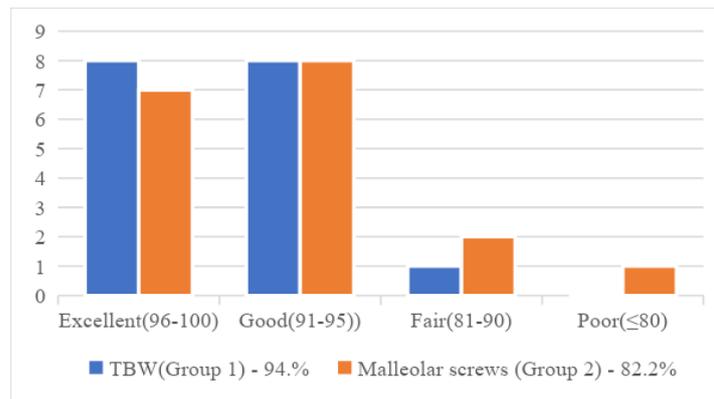


Fig. 2: Results Comparison

Table 4: Post-operative complications

Complications	TBW (Group 1)	Malleolar screws (Group 2)
Non-union	0	0
Wound infections	2	3
Skin necrosis	0	0
Joint arthritis	0	1
Implant failure	0	0

DISCUSSION

Medial Malleolus fracture is an intra-articular fracture; hence, acute reduction is indicated to avoid complications. In our study, we found that the mean age of incidence of Medial Malleolus fractures is 37years; similar observations are seen in Mohammed *et al.* study [7], with male predominance and more common on the right side, with the most common mode of injury as RTA.

Postoperatively, the mean time for fracture union in both TBW and Malleolar screws fixation was evaluated and we found the average time for fracture union(weeks) is 12.3 w in TBW and 14.5 w in Malleolar Screws fixation in our study (ranging from 12–16 w). Where in other studies, the average time for fracture union is 9 w for TBW and 12 w for Malleolar Screws fixation are observed in SK Nurul Alam *et al.* study [8], 9.4 w for TBW and 11.8 w for Malleolar Screws fixation in Mohammed *et al.* study [7], 9.2 w for TBW and 11.6 w for Malleolar Screws fixation are observed in L Wobemo Lotha *et al.* study [9], 14.8 w for TBW and 12.7 w for patients managed with Malleolar Screws fixation in Venkataraman S *et al.* study [10].

According to Baird and Jackson scoring system, our study results were found to be 94% of excellent and good results in group 1(TBW) patients and 82.2% of excellent and good results in group 2 (Malleolar Screws fixation). Similar observations were seen in Shenkeshi *et al.* study [11], with 93.26% excellent and good outcomes in TBW and 79.9% in Malleolar Screws fixation patients. Other studies like Mohammed *et al.* study [7], Sung Hanco and Young-Junpack and Al-Lamy Al-Obaid *et al.* [12, 13], also observed a higher percentage of outcomes in patients managed with TBW compared to patients managed with Malleolar Screws fixation.

In our present study, even after proper post-operative care, 2 patients from group 1(TBW) and 3 patients from group 1(Malleolar Screws fixation) developed wound infections. Similarly, in Shenkeshi *et al.* study [11], wound infections are observed in 3 cases from patients managed with TBW and 2 cases from patients managed with Malleolar Screws fixation. The study limitations are Loss of follow-up of patients, Selection bias and short period. The major limitation of the study is loss of follow-up of patients during the study period.

CONCLUSION

Based on the results of our present study, Medial Malleolus fractures occur at a mean age of 37 y with slight Male predominance with the most common mode of injury found to be RTA. As far as surgical management is concerned, patients managed with TBW have better outcomes with minimal complications compared to Malleolar Screws fixation.

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AUTHORS CONTRIBUTIONS

All authors participated in every aspect of the study, including conceptualization, design, data collection, data analysis,

interpretation, manuscript preparation, critical review, and approval of the final version to be published.

CONFLICTS OF INTERESTS

The authors confirm that they have no conflicts of interest related to this research, authorship, and publication of this article.

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