



Received on 06 April 2022; received in revised form, 20 May 2022; accepted, 18 June 2022; published 01 December 2022

COMPARISON OF FUNCTIONAL AND RADIOLOGICAL OUTCOMES BETWEEN CANNULATED CANCELLOUS SCREW FIXATION AND TENSION BAND WIRING IN CLOSED MEDIAL MALLEOLUS FRACTURES

V. Aakash, N. Adhishwarkumaran, Arun Vignesh and Vignesh

Department of Orthopedics, Saveetha Medical College and Hospital, Thandalam, Chennai - 602105, Tamil Nadu, India.

Keywords:

CC-screw, TBW, LaugeHansen classification, Olerud and Molander scoring system

Correspondence to Author:

Dr. Yeshwanth Subash

Professor,
Department of Orthopedics,
Saveetha Medical College and
Hospital, Thandalam, Chennai -
602105, Tamil Nadu, India.

E-mail: djyesh@rediffmail.com

ABSTRACT: Introduction: Medial malleolus fractures are among the most common fractures encountered around the ankle joint. This study was performed to assess the functional outcome between cannulated cancellous screw fixations versus tension band wiring in managing these fractures. **Method:** A total of 30 patients were selected and were randomly segregated into two groups, Group A and Group B. Group A patients were treated with CC Screw fixation, and Group B patients were treated with TBW. The study was conducted during a time frame of 2 years between 2019- 2021. **Results:** Group A was treated with a CC screw. At the end of 8 weeks, all the patients in this group showed signs of healing at the fracture site. Post-op functional and radiological outcomes were assessed with Olerud and molander scoring. Out of 15 patients, 6 had excellent outcomes, 5 had good results, 3 had fair outcomes, and 1 had a poor outcome. Group B: TBW At the end of 7 weeks all the pts in this group showed signs of healing at the fracture site. Out of 15 pts, 8 had an excellent outcome, 5 had good results, and 2 had fair outcomes. **Conclusion:** Treating medial malleolus fractures with either CC screws or TBW produced good results, with a good range of motion and returning to their daily activities. The study shows fractures fixed with CC screws had 40% excellent outcomes, and those fixed with TBW produced 53.3% excellent outcomes at the end of 1 year.

INTRODUCTION: Ankle fractures are one of the most common injuries managed by orthopedic surgeons. These fractures are most prevalent in young individuals with a history of road traffic accidents. Isolated malleolar fractures are more common than bimalleolar fractures¹. Fractures of the lateral malleolus are more common than medial malleolus fractures².

There are several methods for fixing a medial malleolus fracture in which CC (cannulated cancellous) screw fixation and TBW (Tension Band Wiring) is the most commonly employed fixation method³. The epidemiology of ankle fractures has changed and is now increasingly seen in the elderly due to osteoporosis and increased life expectancy⁴.

Un-displaced medial malleolus fracture can usually be treated with cast mobilization, but operative fixation is considered in individuals with high functional demand. Displaced medial malleolus fractures should be treated surgically as persistent displacement causes the talus to tilt into varus⁵. Medial malleolus fractures are associated with the

	QUICK RESPONSE CODE DOI: 10.13040/IJPSR.0975-8232.13(12).4973-78
	This article can be accessed online on www.ijpsr.com
DOI link: http://dx.doi.org/10.13040/IJPSR.0975-8232.13(12).4973-78	

deltoid ligament's involvement and are responsible for ankle joint stability⁶. This study compares the functional and radiological outcomes of medial

malleolar fractures treated with cannulated cancellous screw vs tension band wiring.

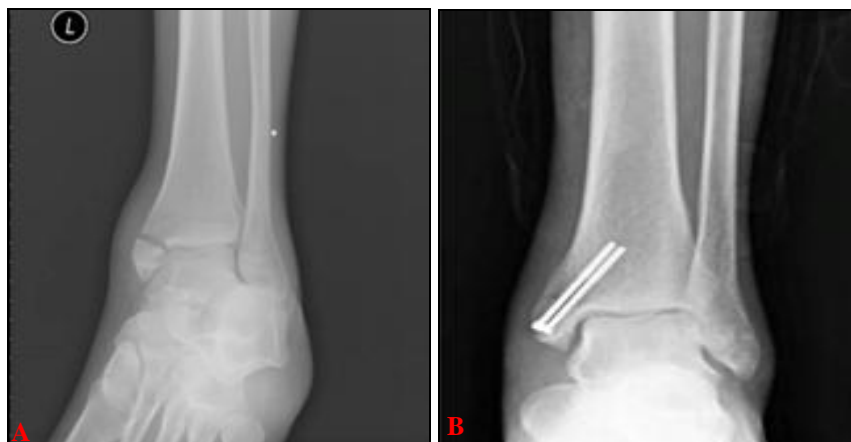


FIG. 1: PRE AND POST OP CC SCREW FIXATION



FIG. 2: POST OP BI-MALLEOLAR FRACTURE

The study was conducted in our hospital for a period of two years, from June 2019 till June 2021. Ethical committee approval was obtained (IEC No.: SMC/IEC/2020/11/56). Patients were randomly segregated into groups A and B, with 15 patients in each group. Group A was treated with Cannulated Cancellous Screw, and group B was treated with Tension Band Wiring.

All patients were followed up for 12 months for functional and radiological outcomes with the help of serial x-rays. Routine blood investigations were done. X-rays for the affected ankle AP, LAT, and Mortise view were taken. A preoperative anesthetic check-up was performed. Patients with >20 years of age with closed medial malleolus fracture, irrespective of the type of fracture were included in the study. Patients who were fit for surgery and willing to participate in the study were included. Patients with open fractures, neurovascular

compromise, fractures extending into tibial plafond, pathological fractures, and immature skeleton were excluded from the study. Patients not fit for surgery and not willing to participate in the study were excluded. All fractures were classified using the Lauge-Hansen classification **Fig. 3**. All patients were initially immobilized with below-knee slab, limb elevation, and ice pack application and were closely monitored for blisters.

All the surgeries performed in the study were single-staged, and those requiring external fixators were excluded. The time required for the patient to be posted based on the swelling and skin conditions was delayed in patients with considerable swelling and blisters. Under aseptic precautions, under spinal anesthesia, and with the patient in the supine position, parts were painted and draped. The incision starts 2cm distal to the anterior edge of medial malleolus via direct medial approach.

Deep dissection done, and care was taken not to dissect the saphenous vein and nerve. The fracture site was visualized, reduced by giving traction, and held in place with the help of a pointed reduction clamp. In all the fractures treated with cc screws,

two 4mm cc screws were used. After reduction, two guide wires were inserted perpendicular to the fracture site, and with the help of the guide wire, the screws were inserted **Fig. 4 & 5**.

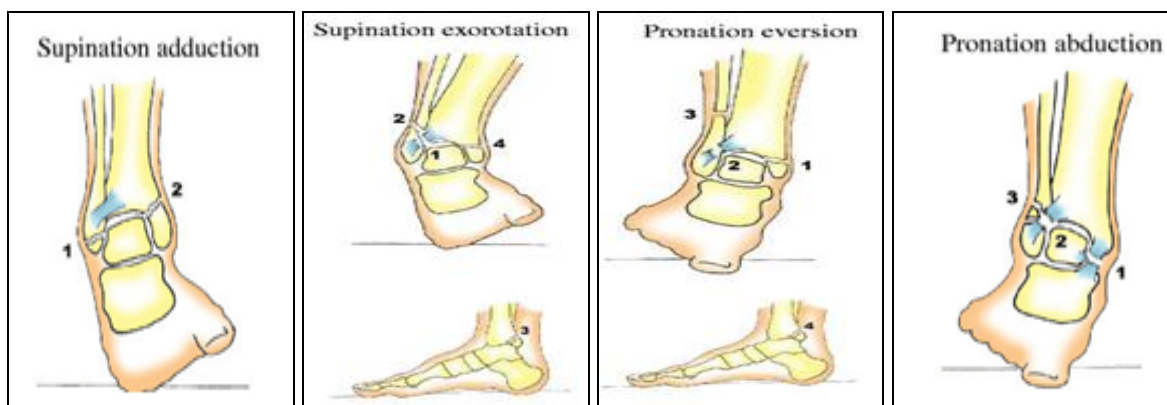


FIG. 3: LAUGE HANSEN CLASSIFICATION



FIG. 4: POST OP TBW



FIG. 5: POST OP TBW

With smaller fracture fragments where two screws could not be used, Tension Band Wiring, a biomechanically stable construct, was used. Cerclage wires of 20-gauge were used in a figure of eight manners around the two 2mm k-wires. All patients were given IV Antibiotics pre-operatively and Post operatively for 5 days followed by oral antibiotics for 5 days. Patients were started on ankle pump exercises, Hamstring and quadriceps strengthening exercises, and non-weight bearing walking following the day of surgery. The wound was inspected on postoperative days 2 and 5, and suture removal was done on the 12th day. At 6 weeks x rays of ankle AP, Lateral and Mortise were done and patients were advised partial weight-bearing walking if the fracture showed signs of

fracture healing. Full weight-bearing walking was started after 12 weeks when there was no fracture site tenderness. All the patients were followed up for 12 months and were assessed by the Olerud and Molander functional score, which contains 100 points. Statistical analysis was performed using SPSS 11 software. A *p-value* of <0.05 was found to be statistically significant.

RESULTS: This study comprises two groups of 15 each. Demographically the group is segregated into age, sex, and mode of injury. The mode of injury in this study was mostly RTA (road traffic accidents) with 40% incidence and WPI (workplace injury) 40% **Table 1**.

TABLE 1: MODE OF INJURY

MOI	No.	%
WPI	12	40%
RTA	12	40%
SAF	6	20%

Types of fracture based on Lauge Hansen Classification. Group A consists of medial malleolar fracture treated with cc screw had 6 pts between 20 -25 years, 3 pts between 25-35, 3 pts between 35-45, and 3 pts between 45-55 **Table 2.**

TABLE 2: DEMOGRAPHIC DATA

AGE	CC Screw	TBW
20-25	6	5
25-35	3	4
35-45	3	2
45-55	3	4

There were 7 male and 8 females. 12 pts were SER, PER 4, PAB 2 and SAD 12 **Table 3.**

TABLE 3: FRACTURE TYPE

Fracture Type	No.	%
SER	12	40%
SAD	12	40%
PER	4	13.33%
PAB	2	6.66%

In 11 patients, right side ankle were affected while 4 had left. There was no significant difference in the categories mentioned above. The average surgical time for the CC SCREW fixation for medial malleolus was 58.26 min. Average blood loss in this surgical procedure was 190ml. Both the groups were closely followed up for the period till compete union of the fracture site. In the group with CC SCREW showed variable time of fracture healing with 4-5 weeks in 5 pts, 5-6n weeks in 4 pts, 6-7 weeks in 4 pts and 7-8 weeks in 2 pts.

At the end of 8 weeks, all the patients in this group showed signs of healing at the fracture site. Post-op functional and radiological outcomes were assessed with Olerud and Molander Scoring. Out of 15 pts, 6 pts had excellent outcomes (>90score), 5 had good results (80-89), 3 had fair outcomes (61-80) and 1 patient had poor outcome (<60) **Table 4.**

TABLE 4: POST OP CC SCREW

Score	1 st Month	2 nd Month	3 rd month
>90	6(40%)	7(46.6%)	8(53.3%)
80-89	5(33.3%)	7(46.6%)	5(33.3%)
61-80	3(20%)	1(6.6%)	2(13.3%)
<60	1(6.6%)		

Bar diagrams were used to present the 1st month, 2nd month, and 3rd month post cc screw fixation are recorded in **Fig. 6.**

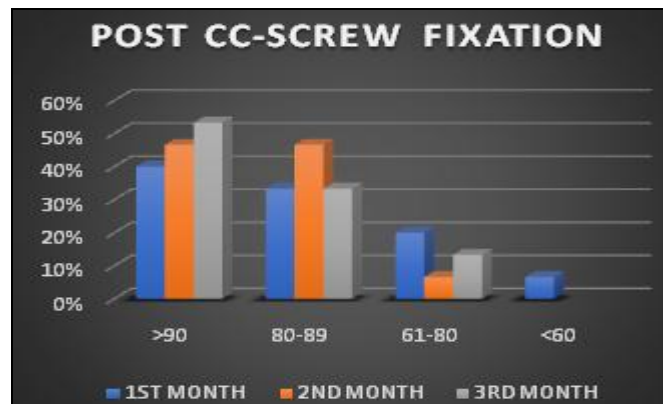


FIG. 6: POST-OP CC-SCREW FIXATION

Group B: TBW. The average surgical time for the TBW for medial malleolus was 50 min. The average blood loss in this surgical procedure was 190ml. In this group with TBW showed fracture healing with 4-5 weeks in 6 pts, 5-6 weeks in 5 pts, 6-7 weeks in 2 and 7 weeks 2 pts. At the end of 7 weeks, all the patients in this group showed signs of healing at the fracture site. Out of 15 pts 7 pts had excellent outcomes (>90score), 5 had good results (80-89), 2 had fair outcomes (61-80), and 1 patient had poor outcome (<60) **Table 5.**

TABLE 5: POST OP TBW

Score	1 st Month	2 nd Month	3 rd month
>90	8(53.3%)	8(53.3%)	10(66.66%)
80-89	5(33.3%)	6(40%)	4(26.66%)
61-80	2(13.3%)	1(6.6%)	1(6.6%)
<60	0		-

Bar diagrams were used to present the 1st month, 2nd month, and 3rd-month post TBW fixation and are recorded in **Table 5 Fig. 7.**

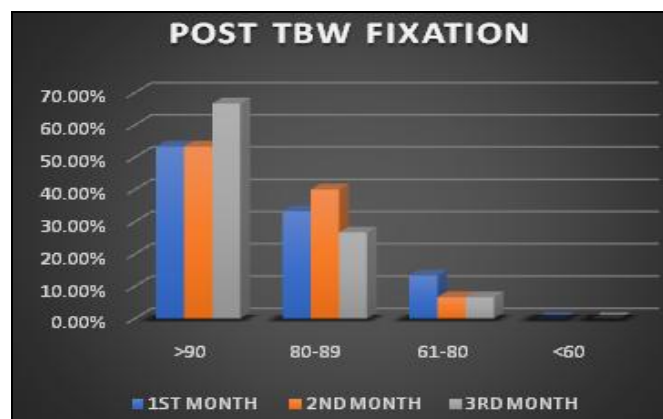


FIG. 7: POST OP TBW

Only a few pts had complications such as skin infection. They had no significance between the study groups and these patients were treated with wound wash and secondary closure with plastic surgeon assistance. Although 2 pts had a failure of screw fixation such as back out, no implant failure was seen in TBW. Delayed and non-union were not seen in Grp B, and 1 case of non-union was seen in Grp A.

DISCUSSION: Fractures around the ankle are the common injuries managed by orthopedic surgeons. Isolated malleolar fractures are more common than bimalleolar fractures. Fractures of the lateral malleolus are more common than medial malleolus fractures⁷. There are several methods for fixing a medial malleolus fracture in which CC (cannulated cancellous) screw fixation is the most commonly employed method of fixation⁸. The study consists of 30 patients with medial malleolar fractures treated with open reduction by either CC screw or tension band wiring conducted in our hospital from 2019 to 2021. We compared the data obtained in this study to find the clinical and radiological outcomes in managing the fracture. These fractures are produced with direct shearing and tensile force⁹.

The results were compared to the previous similar studies. The fracture was either isolated medial malleolus or bi-malleolar fracture. Group A was treated with cannulated cancellous screw, and group B was treated with tension band wiring. All patients were followed up for 12 months for functional and radiological outcomes with the help of serial x-rays. CT ankle was taken for a few cases to exclude the tibial plafond fracture.

Both methods of fixation are commonly used, but in view of lesser non-union rates and with a better biomechanically stable construct, TBW is preferred¹⁰. The mean age was 33.3 years. This finding was similar to the observation of Roberts RS in whose study the mean age was 40 years¹¹ and Beris *et al.*¹². There was male predominance, and most patients had road traffic accidents as their mode of injury, similar to Nabeel Shams *et al.*¹³. In our study, we achieved good results in 70% of patients treated with CC screw and 89% in TBW, as seen in a study done by Sang Hanko and Young- Junpark¹⁴ who got excellent results in 80% in CC screw

and 90% with TBW according to Olerud and Molander scoring system. The patients with TBW had a faster rate of fracture healing with radiological evidence for fracture in about 6 weeks and CC screw fracture healed by 8 weeks. A similar outcome was seen in Al-Obaidy and Al-Lamy¹⁵. Some studies showed few complications like screw backout, but in this study there were no K wire or screw backout loosening. Limitations of the study are small sample size, short follow-up period, and there is no comparative group; hence difficult to assess. Surgical procedure also requires a learning curve to provide good functional results.

CONCLUSION: Treating medial malleolus fractures with either CC screws or TBW produced good results, with a good range of motion and returning to daily activities. In this study, fractures fixed with CC screws had 40% excellent outcome and those fixed with TBW produced 53.3% excellent outcome according to Olerud and Molander Scoring system after 1 year. TBW showed better improvement in the range of motion, and fracture union was seen earlier in patients treated with open reduction and internal fixation with TBW compared to CC screws.

ACKNOWLEDGMENT: None

CONFLICTS OF INTEREST: None to declare.

REFERENCES:

1. Barbosa P. Malleoli: infrasyndesmotic, medial fracture with lateral fracture/ avulsion. 2018. <https://www2.aofoundation.org/wps/portal/surgery?showPage=diagnosis&bone=Tibia&segment=Malleoli>. Accessed 1 Sept 2018.
2. Buckley R, Kwek E and Duffy P: Single-screw fixation compared with double screw fixation for treatment of medial malleolar fractures: a prospective randomized trial. *J Orthop Trauma* 2018; 32: 548–53. <https://doi.org/10.1097/BOT.0000000000001311> 2018/09/14.
3. Cheng RZ, Wegner AM and Behn AW: Headless compression screw for horizontal medial malleolus fractures. *Clin Biomech (Bristol, Avon)* 2018; 55: 1–6.
4. Garratt AM, Naumann MG and Sigurdson U: Evaluation of three patient reported outcome measures following operative fixation of closed ankle fractures. *BMC Musculoskelet Disord* 2018; 19: 134. <https://doi.org/10.1186/s12891-018-2051-5> 2018/05/04.
5. Carter TH, Mackenzie SP and Bell KR: Selective fixation of the medial malleolus in unstable ankle fractures. *Injury* 2019; 50(4): 983–9. <https://doi.org/10.1016/j.injury.2019.03.010>. Epub 2019 Mar 11.
6. Veltman ES, Halma JJ and de Gast A: Longterm outcome of 886 posterior malleolar fractures: a systematic review of the literature. *Foot Ankle Surg* 2016; 2: 73–7

7. Downey MW, Duncan K and Kosmopoulos V: Comparing the knotless tension band and the traditional stainless steel wire tension band fixation for medial malleolus fractures: a retrospective clinical study. *Scientifica (Cairo)* 2016; 2016: 3201678. <https://doi.org/10.1155/2016/3201678> 2016/06/14.
8. Hanhisuanto S, Kortekangas T and Pakarinen H: The functional outcome and quality of life after treatment of isolated medial malleolar fractures. *Foot Ankle Surg.* 2017; 23: 225–9. <https://doi.org/10.1016/j.fas.2016.06.004> 2017/12/06.
9. American Academy of Orthopaedic Surgeons. Foot and Ankle Outcomes Questionnaire. American Academy of Orthopaedic Surgeons 2005. Available at: https://www.aaos.org/research/outcomes/Foot_ankle.pdf. Accessed June 23, 2018.
10. Bulut T and GURSOY M: Isolated medial malleolus fractures: conventional techniques versus headless compression screw fixation. *J Foot Ankle Surg* 2018; 57: 552–556.
11. Downey MW, Duncan K and Kosmopoulos V: Comparing the knotless tension band and the traditional stainless steel wire tension band fixation for medial malleolus fractures: a retrospective clinical study. *Scientifica (Cairo)* 2016; 2016: 3201678. <https://doi.org/10.1155/2016/3201678> 2016/06/14.
12. Beris AE, Kabbani KT, Xenakis TA, Mitsionis G, Soucacos PK and Soucacos PN: Surgical treatment of malleolar fractures – a review of 144 patients. *Clin Orthop Related Research* 1997; 341: 90-98.
13. Nabeel Shams, Imthiaz Ahmed and Athmananda Hegde: A study on surgical treatment of ankle fractures- A clinical study of 21 cases. *IJBAR* 2014; 5(04): 190-192.
14. Sang HANKO, Young- Junpark, Ostrum RF and Listsky AS: Tension-band fixation of medial malleolar fracture. *J Orthop Trauma* 1997; 6: 464.
15. Al-Lamy and Al-Obaidy: Comparative Study of internal fixation of displaced closed fracture of medial malleolus using malleolar screw versus tension-band Wiring. *Karbala J Med* 2008; 2(4).

How to cite this article:

Aakash V, Adhishwarkumaran N, Vignesh A and Vignesh: Comparison of functional and radiological outcome between Cannulated cancellous screw fixation and tension band wiring in Closedmedial malleolus fractures. *Int J Pharm Sci & Res* 2022; 13(12): 4973-78. doi: 10.13040/IJPSR.0975-8232.13(12).4973-78.

All © 2022 are reserved by International Journal of Pharmaceutical Sciences and Research. This Journal licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License.

This article can be downloaded to **Android OS** based mobile. Scan QR Code using Code/Bar Scanner from your mobile. (Scanners are available on Google Playstore)