International Journal of Orthopaedics Sciences

E-ISSN: 2395-1958
P-ISSN: 2706-6630
IJOS 2022; 8(1): 135-138

www.orthopaper.com
Received: 25-11-2021
Accepted: 28-12-2021

Dr Deendayal
M.S. Orthopedic, Medical officer, Alwar, Rajasthan, India

Dr. Rakesh Kumar Sharma
M.S. Orthopedics, Junior specialist, Kanak Vihar Ajmer road, Jaipur, Rajasthan, India

Dr Shubham Aggarwal
M.S. Orthopedics, Senior resident, SMS medical college, Jaipur, Rajasthan, India

Dr. Vishal Shekhawat
Assistant Professor, SMS Medical College, Jaipur, Rajasthan, India

Corresponding Author:
Dr. Vishal Shekhawat
Assistant Professor, SMS Medical College, Jaipur, Rajasthan, India

Posterior malleous fixation in trimalleolar ankle fractures using anterior to posterior screw versus posterolateral plate

Dr Deendayal, Dr. Rakesh Kumar Sharma, Dr Shubham Aggarwal and Dr. Vishal Shekhawat

DOI: https://doi.org/10.22271/ortho.2022.v8.i1b.3000

Abstract
Introduction: Posterior malleolar fractures are observed in approximately 7%-44% of all ankle fractures. Due to the important biomechanical function of the posterior tibial margin in weight-bearing and ankle stability, the affected ankle is prone to degenerative ankle arthritis. In ankle fractures involving the posterior malleolus, the issue of which type of fractures require posterior malleolus fixation is still controversial, suggesting that a trans-syndesmotic fixation may be adequate instead of posterior malleolar fixation.
Objective: This study compares the anterior to posterior screw versus posterolateral plate for posterior malleous fixation in trimalleolar ankle fractures.
Material and Methods: This study was conducted in patients with trimalleolar ankle fracture admitted in a tertiary level health care centre.It is a Prospective, randomized comparative study. Patients were randomized into two groups by using computerized random no. table and subsequent pt. was allocated in alternative groups /In group A fixed with anterior to posterior screw was done by an identified orthopedic surgeon. In group open reduction internal fixation with posterolateral plate fixation. Patients were examined for clinical and radiological, union, bone strength, weight bearing, deformity and range of motion at 2wks, 6wks, till 6 months.
Results: Forty six patients were evaluated in this study and were divided in two groups accordingly. Group A = Anterior to posterior leg screw and Group B = Postero-lateral Plate. Evidence of union in X-ray seen after 18.80±1.92 weeks of operation in group-A and 20.16±2.01 weeks in group-B. In terms of functional result, 28.00% patients were excellent, 58.00% patients were good and 14.00% patients were poor in group-A. 40.00% patients treatment results were excellent, 50.00% patients treatment results were good and 10.00% patients treatment results were poor in group-B.
Conclusion: These results demonstrate that posterior malleolar fracture fixation is closely related to successful radiological and functional outcomes after trimalleolar fractures. Transyndesmal screw fixation may not be needed in the cases where the posterior malleolar fracture fixated. For these reasons, we recommend that all posterior malleolar fractures have to be fixed regardless of size.

Keywords: Posterior malleous fixation, trimalleolar ankle fractures, CTX, PINP, Vitamin D

Introduction
Posterior malleolar fractures are observed in approximately 7%–44% of all ankle fractures. [1-2] Some malleolar fractures involve a fracture of the posterior lip of the distal tibia called the posterior malleolus (PM). These types of fractures usually include the posterior tubercle of the distal tibia or posteromedial tibial plafond [3].
Due to the important biomechanical function of the posterior tibial margin in weight-bearing and ankle stability, the affected ankle is prone to degenerative ankle arthritis. The standard indication for fixing a posterior malleolar fracture is a displaced fragment that involves more than 25%–35% of the articular surface of the distal tibia. Surgical treatment with open reduction and internal fixation is the accepted method of treatment for medial and lateral malleolus fractures. Posterior malleolus fractures are frequently left unfixed because they are expected to be reduced spontaneously after open reduction of the lateral malleolus. In ankle fractures involving the posterior malleolus, the issue of which type of fractures require

posterior malleolus fixation is still [4] controversial [5], suggesting that a trans-syndesmotic fixation may be adequate instead of posterior malleolar fixation [6]. Only a few surgical methodologies concerning the ankle for open reduction and internal fixation of posterior malleolar fragments have been described, whereas a reasonable approach for different fracture patterns and the method of posterior malleolus fixation for trimalleolar fractures have not been addressed in the literature at all.

This study compares the anterior to posterior screw versus posterolateral plate for posterior malleous fixation in trimalleolar ankle fractures.

Material and Methods

This study was conducted in patients with trimalleolar ankle fracture admitted in a tertiary level health care center from April 2017 to November 2018. It is a Prospective, randomized comparative study. We included patients of ankle fracture than underwent surgical stablization of all three malleolar fragment, were of 18-60 years at the time of surgery and gave informed consent for the study. We excluded patients who had additional ipsilateral or contralateral lower extremity injury, Pilon fracture trimalleolar fracture and had a history of a lower of extremity fracture.

Patient fulfilling inclusion/exclusion criteria recruited from and approached by investigator himself and detailed history and thorough general and systemic examination was done. Routine & special investigation including biochemical and radiological was done to fulfill inclusion &exclusion criteria. patient was randomized into two groups by using computerized random no. table and subsequent pt. was allocated in alternative groups /In group A fixed with anterior to posterior screw was done by an identified orthopedic surgeon./in group open reduction internal fixation with posterolateral plate fixation was done by same orthopedic surgeon to eliminate surgeons bias.

Patient was examined for clinical and radiological, union, bone strength, weight bearing, deformity and range of motion at 2wks, 6wks, till 6 months. All data thus collected was on a predesigned, semi structured proforma.

The data was analysed in MS Excel, Primer, and SPSS softwares. The data presented in tables and graphs wherever applicable.

Results

Forty-six patients were evaluated in this study and were divided in two groups accordingly. Group A = Anterior to posterior leg screw and Group B = Postero-lateral Plate. Mean age in group A was 39.08±10.02 years and in group B was36.44±6.95 years. 44.00% patients presented close fracture and 56.00% patients presented open fracture in group-A. 56.00% patients presented close fracture and 44.00% patients presented open fracture in group-B. The type of fracture difference between both group was statistically Insignificant. Mean weight bearing time after surgery in group A was 7.04±0.73 weeks and in group B was 12.02±1.50 weeks. The weight bearing time after surgery difference between both group was statistically highly significant (FIG 1).

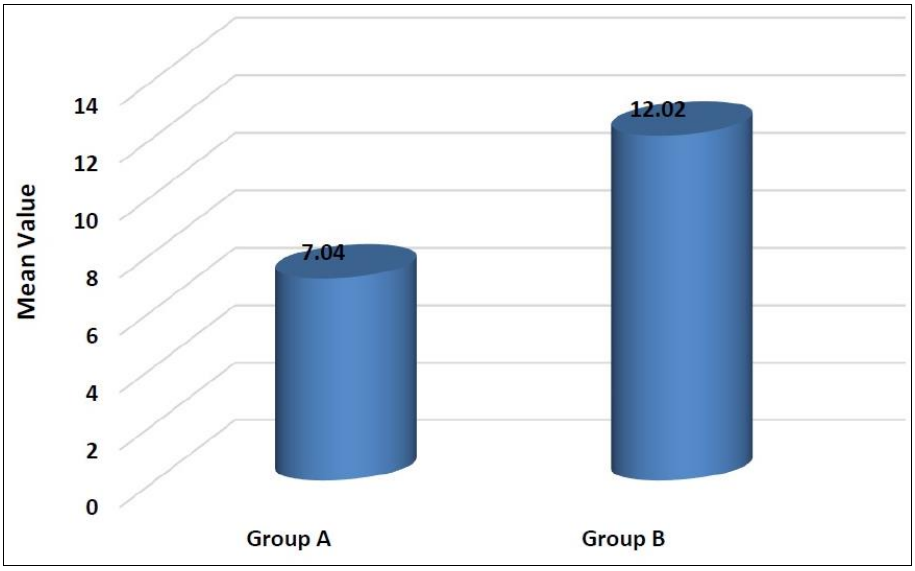

Fig 1: Weight bearing in both groups (in weeks)

Evidence of union in X-ray seen after 18.80±1.92 weeks of operation in group-A and 20.16±2.01 weeks in group-B. The difference between both group was statistically highly significant.

In terms of functional result, 28.00% patients were excellent, 58.00% patients were good and 14.00% patients were poor in group-A. 40.00% patients treatment results were excellent, 50.00% patients treatment results were good and 10.00% patients treatment results were poor in group-B (Table 1)

Table 1: Functional results

Group A		Group B		
Number of Cases	**%**	**Number of Cases**		**%**
Excellent	14	28.00	20	40.00
Good	29	58.00	25	50.00
Poor	7	14.00	5	10.00
Total	50	100.00	50	100.00

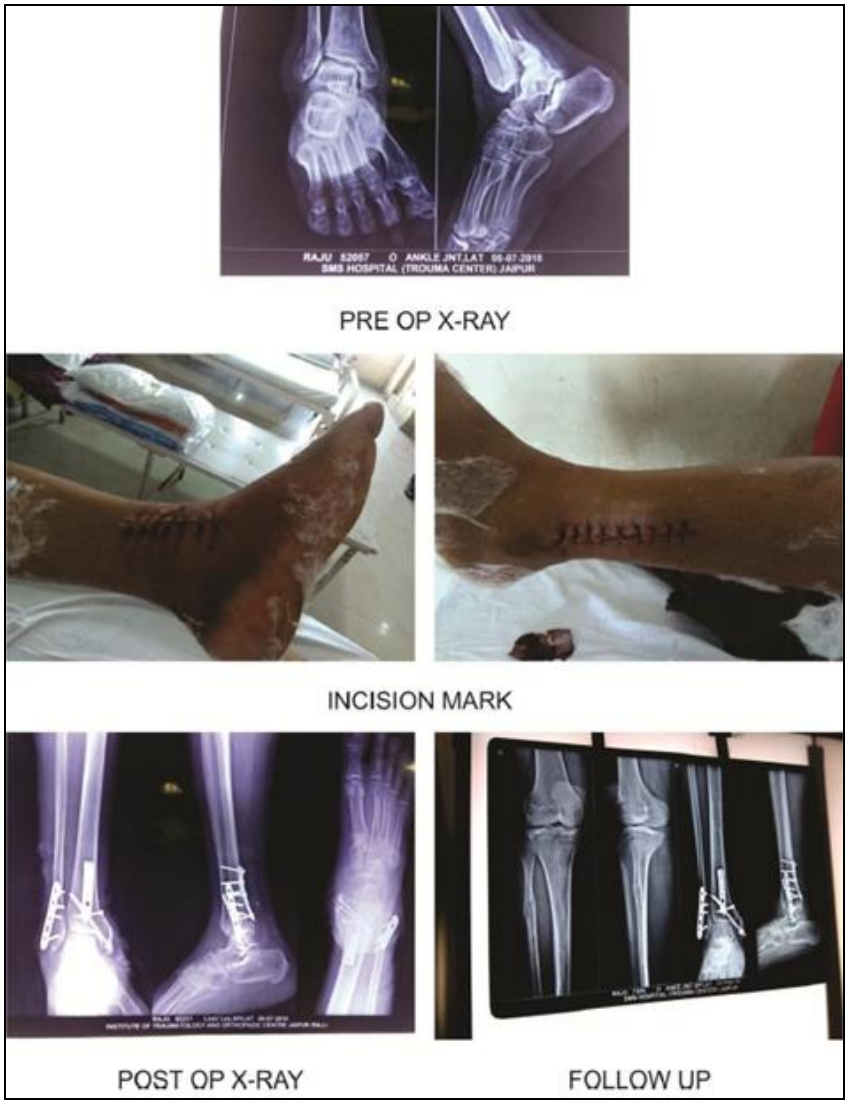

Fig 2: Clinical Picture and Xray radiographs of group A

Discussion

Ankle fractures are common and account for 3.92% of all fractures sustained in the entire body [2]. Posterior malleolus fractures accompany about 7%–44% of ankle fractures [7]. The injury ranks secondary to external rotation of the talus under the tibial plafond with the foot in a pronated or supinated position.

In ankle fractures, an orthopedic surgeon usually tends to attach a plate for lateral malleolus fracture and fix the medial malleolus with a screw in almost all cases due to the simplicity of the procedure. Since both malleoli stay just underneath the skin, there is no need for surgical exploration. Thus, the posterior malleolus is left unfixed.

The PITFL complex is regarded as core for the stability of the ankle syndesmosis [8]. Posterior malleolus fractures alter the tibiofibular syndesmotic stability. When the posterior malleolus is fractured, the posterior syndesmotic ligaments may remain intact and attached to the fragment. Failure through the bone usually suggests the integrity of the PITFL [9]. Rigid fixation of the fibula followed by reduction and fixation of the posterior malleolar fracture may restore the ligamentous tension of the PITFL adequately and stabilize the syndesmosis [10]. Without trans-syndesmotic fixation. In a biomechanical study of Gardner *et al*., 70% stiffness of the distal tibiofibular articulation was restored by reducing and stabilizing the posterior malleolus compared to 40% through the use of a syndesmotic screw [11].

We evaluated results of 46 patients. A similar study was conducted by Timothy J O'Connor *et al*. (2014) [12], who observed that thirty-seven patients were eligible for the study and 27 chose to participate. Sixteen patients underwent posterior buttress plating and 11 underwent AP screw fixation with mean follow-15 up times of 54.9 and 32 months respectively.

The age & sex difference between both group was statistically Insignificant, similar to O'Connor TJ *et al*. [13] observed that the age & sex difference between both group was statistically Insignificant.

In our study 28.00% patients treatment results were excellent, 58.00% patients treatment results were good and 14.00% patients treatment results were poor in group-A. 40.00% patients treatment results were excellent, 50.00% patients treatment results were good and 10.00% patients treatment results were poor in group-B. 39 O'Connor TJ *et al*. [13] observed that excellent reduction was achieved in 79.2% and 45.5% of the PA and AP groups, respectively. The quality of reduction was significantly higher in the PA group compared with the AP group ($p = 0.04$).

Sinan Karaca *et al*. (2016) [14] evaluated results in operative and non operative treatment of posterior malleolus fractures and found result was excellent in 21 patients and good in 26 patients after surgery, thus replicating results of our study. When compared with uninjured side, there was no significant difference in plantar flexion of ankle ($p=0.325$) but there was

significant difference in dorsiflexion of ankle joint.
Vidović D *et al*. (2017) [15]. Evaluated forty-six patients and Radiological evaluation of the ankle showed there was significantly better quality of reduction with direct reduction via a posterolateral approach in the PA group.

Conclusion
These results demonstrate that posterior malleolar fracture fixation is closely related to successful radiological and functional outcomes after trimalleolar fractures. Transyndesmal screw fixation may not be needed in the cases where the posterior malleolar fracture fixated. For these reasons, we recommend that all posterior malleolar fractures have to be fixed regardless of size.

References

1. Koval KJ, Lurie J, Zhou W, Sparks MB, Cantu RV, Sporer SM, *et al.* Ankle fractures in the elderly: What you get depends on where you live and who you see. J Orthop Trauma. 2005;19:635-9.
2. Jaskulka RA, Ittner G, Schedl R. Fractures of the posterior tibial margin: Their role in the prognosis of malleolar fractures. J Trauma. 1989;29:1565-70.
3. Bois AJ, Dust W. Posterior fracture dislocation of the ankle: Technique and clinical experience using a posteromedial surgical approach. J Orthop Trauma. 2008;22:629-36.
4. Marsh JL, Saltzman CL. Ankle fractures. In: Bucholz RW, Heckman JD, Court-Brown CM, editors. Rockwood and Green's Fractures in Adults. 6th ed. Philadelphia, PA: Lippincott Williams and Wilkins, 2005, 2147-235.
5. Miller AN, Carroll EA, Parker RJ, Helfet DL, Lorich DG. Posterior malleolar stabilization of syndesmotic injuries is equivalent to screw fixation. Clin Orthop Relat Res. 2010;468:1129-35.
6. Mingo-Robinet J, López-Durán L, Galeote JE, Martinez-Cervell C. Ankle fractures with posterior malleolar fragment: Management and results. J Foot Ankle Surg. 2011;50:141-5.
7. Hartford JM, Gorczyca JT, McNamara JL, Mayor MB. Tibiotalar contact area. Contribution of posterior malleolus and deltoid ligament. Clin Orthop Relat Res. 1995;320:182-7.
8. Stormont DM, Morrey BF, An KN, Cass JR. Stability of the loaded ankle. Relation between articular restraint and primary and secondary static restraints. Am J Sports Med. 1985;13:295-300.
9. Erdem MN, Erken HY, Burc H, Saka G, Korkmaz MF, Aydogan M. Comparison of lag screw versus buttress plate fixation of posterior malleolar fractures. Foot Ankle Int. 2014;35:1022-30.
10. Harper MC. Talar shift. The stabilizing role of the medial, lateral, and posterior ankle structures. Clin Orthop Relat Res. 1990;257:177-83.
11. Gardner MJ, Brodsky A, Briggs SM, Nielson JH, Lorich DG. Fixation of posterior malleolar fractures provides greater syndesmotic stability. Clin Orthop Relat Res. 2006;447:165-71.
12. Timothy O'Connor J, Muller B. A to P" Screw Versus Posterolateral Plate for Posterior Malleolus Fixation in Trimalleolar Ankle Fractures. Journal of Orthopaedic Trauma. 2014;29(4):11-14.
13. O'Connor TJ, Mueller B, Ly TV, Jacobson AR. A to p" screw versus posterolateral plate for posterior malleolus fixation in trimalleolar ankle fractures. J Orthop Trauma. 2015;29(4):e151-6.
14. Sinan Karaca MD, Meriç Enercan. Importance of fixation of posterior malleolus fracture in trimalleolar fractures: A retrospective study. Ulus Travma Acil Cerrahi Derg, November. 2016:22(6):350-4.
15. Vidović D, Elabjer E, Muškardin IVA. Posterior fragment in ankle fractures: anteroposterior vs posteroanterior fixation. Injury. 2017; Nov;(5):S65-S69.