



## POSTERIOR ANTIGLIDE PLATE VERSUS LATERAL PLATE FOR DISPLACED DISTAL FIBULA FRACTURES – RESULTS FROM A TERTIARY CARE CENTRE IN CENTRAL INDIA.

### Orthopaedics

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### ABSTRACT

**BACKGROUND :** The purpose of our study was to compare the functional and radiological outcome in patients treated with conventional lateral fibula plating and posterior antiglide plating for distal fibula fractures. Controversy still persists over various fixation methods and their subsequent risks and benefits.

**METHODS:** Short oblique fractures of the distal fibula were fixed with either a lateral plate or a posterior antiglide plate. A prospective surgeon-randomized comparative study was performed on 54 patients with at least 14 months of follow-up. A total of 28 patients were treated with a conventional lateral plate (group A) whereas 26 patients were treated with a posterior antiglide plate (group B).

**RESULTS:** Both groups were comparable for age, sex distribution, mechanism of injury, and occupation. A statistically significant difference was noted in ADLs (Activities of Daily Living) across the two groups for distal fibula plating ( $P = 0.02$ ), with ADL score being higher for the posterior antiglide plating group. The incidence of wound dehiscence and reoperation for hardware removal was higher in the lateral plate group, but this difference was not statistically significant.

**CONCLUSIONS:** The functional and radiological outcome of the surgical management of a displaced distal fibula fracture is comparable with both techniques. Although few studies have reported some advantages using the posterior antiglide technique,

### KEYWORDS

ankle fracture; distal fibula fracture; lateral plating; posterior antiglide plating

### INTRODUCTION

Fractures of the lateral malleolus are among the most common injuries seen and treated by orthopedic surgeons. In the presence of a medial side injury, a displaced lateral malleolus fracture is best treated with fixation of the fibula. However, it is less clear which type of fixation is best.(1)

When surgical fixation of a fractured distal fibula is required a number of fixation methods such as circlage wires, lag screws, intramedullary rush nail are available. However for short oblique fractures of distal fibula, plating is usually preferred. Lateral neutralization plate has become widely accepted as a treatment for these type of fractures. However, there are certain limitations to the lateral plating technique. The lateral plate is subcutaneous and tends to be prominent under the surgical scar. Moreover the screws in the distal fragment must be uncortical to avoid penetration into the joint. This leads to poor fixation in the distal fibular fragment.(2)(3)

In external rotation injuries, obliquity of fracture is such that there is a tendency toward posterior and proximal displacement of the distal fragment.(4) The application of a posterior antiglide plate will assist in the reduction of this fracture as well as provide a buttress to prevent redisplacement. This posterior antiglide plate offers many advantages over the lateral plate, including a biomechanically stronger construct, less palpable hardware, and no potential for penetration of a screw into the joint.(5)

Discussion still persists over the gold standard treatment for fixation of fractures of distal fibula occurring as a result of external rotation injuries to the ankle.(2)(6)

Our study aims at comparing lateral fibula plating versus posterior antiglide fibula plating in external rotation injuries of the ankle with distal fibula fracture.

### METHODS

This was a prospective study conducted in the department of Orthopaedics at a tertiary care centre in between May 2018 to December 2019. A total of 54 patients with a lateral malleolus fracture due to external rotation injuries were included.

All the patients were first assessed and managed according to ATLS protocol and once the patient's general condition was stable, anteroposterior and lateral xrays of the ankle joint were taken. Fractures were classified according to the Denis Weber classification and the injured limb was immobilized by below knee slab. Patients with severe swelling were managed with limb elevation and ice pack application over the fracture site till the swelling subsided.

A follow-up longer than one year was necessary to be included in our study. Inclusion criteria were patients older than eighteen years and younger than eighty years of age, of both genders, with Denis-Weber type B ankle fractures involving one, two or three malleoli, injury less than fifteen days old. Exclusion criteria were exposed fractures, patients with neuromuscular, vascular disorders and old ankle injuries. Patients sustaining multiple injuries with associated injuries to the lower limbs were also excluded to avoid any interference with the outcome of the ankle fracture fixation.

We have divided patients into two groups namely group A and group B. Patients treated with lateral plating were included in Group A while those treated with posterior antiglide plate were included in Group B. A total of 28 patients were treated with a conventional lateral plate (group A), and 26 patients were treated with a posterior antiglide plate (group B).

All procedures were carried out under regional anaesthesia with tourniquet. All patients were positioned supine with a sandbag under the ipsilateral pelvis.

In the lateral plating group (group A), a lateral skin incision was taken extending two cm above and below the fracture site, skin and superficial fascia was incised and deep dissection was carried out to expose the fracture with care being taken to avoid injury to the superficial peroneal nerve. Once the fracture site was carefully exposed and freshened out, an anatomic reduction was sought. Provisional reduction was achieved with a reduction forceps or k wires. A lateral one third tubular plate or a DCP was then applied on the lateral aspect of fibula. Five- and six-hole plates were most commonly used. 3.5 mm cortical non locking screws were used. Reduction was confirmed under C-arm and wound was closed in layers.

In the posterior antiglide plate group (group B), the incision was slightly more posterior, along the posterior edge of the fibula. After careful superficial dissection, the peroneal tendons were retracted posteriorly the fracture was exposed, freshened out, anatomically reduced and held with a reduction forcep. A 3.5 mm five to six hole narrow DCP or a one third tubular plate was then applied on the posterior cortex of the fibula to neutralize the forces across the fracture. For the associated medial malleolus fracture, a 4.0 mm cannulated cancellous screws or Kirschner wires with tension band wiring were used for fixation.

Intraoperative anteroposterior and lateral C arm shoots were taken in all cases to document reduction and fixation. Postoperatively, all patients were placed into a below knee plaster slab. On first postoperative day ankle pumps and static quadricep exercises were

started. Non weight bearing mobilization was initiated with a walker after pain subsided which was on second to third post-operative day.

Antibiotics were used in the perioperative period. Suture removal was done on fourteenth day. The slab was removed at two weeks. At two weeks the patients were encouraged to mobilize their ankles but instructed not to bear weight for a total of six weeks from surgery. At six weeks follow-up, anteroposterior and lateral radiographs were obtained and partial weight bearing was initiated.

Clinical healing was defined by lack of pain and functional improvement as assessed by FAOS score; radiographic healing was determined based on antero-posterior and lateral radiographs.

All patients were subsequently followed up at six weeks, three months, six months and twelve months.



**Fig 3 : Postoperative lateral view xray of lateral fibula plate and tbw k wiring done for bimalleolar ankle fracture**



**Fig 1 : postoperative xray – anteroposterior and lateral view of poseterior antiglide fibula plate.**



**Fig 2 : Postoperative anteroposterior view xray of lateral fibula plate and TBW k wiring done for bimalleolar ankle fracture**

**RESULTS**

There was no statistically significant difference in operating room time (49.6 versus 46 minutes), tourniquet time (49.1 versus 45.6 minutes), or length of hospital stay (9.5 versus 8.9 days) between the Group A (lateral plate group) and group B (posterior antiglide plate group) respectively.

At a mean follow-up of 14 months, 18 out of 54 patients (33.33%) reported pain, while 9 (16.6 %) out of the total 54 patients underwent implant removal . Of the total 9 patients, 6 (11.11%) underwent implant removal secondary to pain while the remaining 3 patients (5.49%) underwent implant removal for reasons other than pain . Out of these 7 patients were of the lateral plate group ( Group A) and 2 were of the posterior antiglide plate group (Group B) .

**Table 1 - Assessment parameters in lateral plate group ( Group A) and posterior antiglide plate group (Group B)**

SR NO	ASSESSMENT CRITERIA	LATERAL PLATE (GROUP A) (28)	POSTERIOR ANTIGLIDE PLATE (GROUP B) (26)
1.	MEAN AGE (YEARS)	44	46
2.	OPERATIVE TIME (Minutes)	50	46
3.	TOURNIQUET TIME (Minutes)	50	46
4.	HOSPITAL DURATION (Days)	10	9
5.	C ARM SHOOTS	14	13

Within the study cohort, FAOS scores (n = 54) were determined and scored as follows :

For patients undergoing posterior antiglide plating via a posterolateral approach, FAOS scores were as follows: ADLs (86.8 ± 19.4), pain (81.7 ± 20.2), , symptoms (76.7 ± 23.5), sports (70 ± 31.7), and quality of life (60.4 ± 31.3). For patients undergoing lateral plating via a lateral approach, FAOS scores were as follows: ADLs (64.7 ± 35.6), pain (66.7 ± 34.0), , symptoms (68.5 ± 24.3), sports (65 ± 33.3), and quality of life (42.7 ± 18.7).

A statistically significant difference was noted in ADLs across the two groups for distal fibula plating (P = 0.02), although other domains also showed better scores for the group B as compared to group A.

**Table 2 - Mean FAOS scores in lateral plate group ( Group A) and posterior antiglide plate group ( Group B)**

	FAOS SCORES	
	Lateral Plate (Group A)	Posterior Plate (Group B)

Activities of Daily Living (ADL)	64.7 ± 35.6	86.8 ± 19.4
Pain	66.7 ± 34.0	81.7 ± 20.2
Symptoms	68.5 ± 24.3	76.7 ± 23.5
Sports	65 ± 33.3	70 ± 31.7
Quality of Life	42.7 ± 18.7	60.4 ± 31.3

One patient in lateral plate group had a superficial infection. Wound was debrided and it healed uneventfully. I.V antibiotics were given for 2 weeks. One patient in the posterior antiglide plate group had peroneal tendon irritation and came with complaints of pain and ankle swelling with painful dorsiflexion and inversion. Patient was treated with ice fomentation and analgesics. Pain settled down gradually over a period of 7-10 days.



Fig 4 : Intraoperative clinical image of posterior fibula plating .



Fig 5 : Intraoperative C-arm image of posterior fibula plating.

**DISCUSSION**

The purpose of this study was to compare our clinical outcomes between lateral plating and posterior antiglide plating of closed and displaced distal fibula fractures.

Within our group of patients with a minimum of 1 years of follow-up, data overall showed good clinical outcomes for posterior antiglide plating of the fibula ( Group B ) . At a mean follow-up of 14 months, only 08 of 26 patients (37.2%) reported some degree of ankle-related

pain. Additionally, mean FAOS scores approached a mean value of 80 for both pain and ADLs for the posterior antiglide plating group (Group B). (7)

In our study we were unable to show any statistically significant difference in terms of operative time, complications, or hardware removal rates.

We noticed several limitations in using the lateral plate. Its application requires tilting and placing it with great precision while forcing it to be frequently bent along its longitudinal axis. Screws in the distal fragment should be unicortical to prevent them from penetrating the joint which leads to poor fixation. Moreover the lateral plate is subcutaneously placed so it may be felt under the skin and cause pain.(8)

In comparison, we found few advantages of posterior antiglide plating. It requires minimum plate moulding and prevents screw penetration of the joint, and also does not show under the skin. Associated fracture of the posterior malleolus can be approached through the same approach as for the lateral malleolus.

One concern of posterior plating of the fibula is whether the position of the plate causes peroneal tendon irritation resulting in hardware removal. Weber and Krause retrospectively reviewed 70 patients who underwent posterior plating of their fibula and found that 43% (30/70) required hardware removal because of peroneal tendon irritation. Of this cohort, peroneal tendon lesions were found in 9 of 30 patients. (9) Our results are in contrast to the findings of Weber and Krause because we found a lower percentage of hardware removal secondary to pain. Our results are more consistent with those of Treadwell and Fallat, who found that in 71 distal fibula fractures treated with a posterior antiglide plate, only 2 patients developed peroneal tendinitis.

Wissing et al found good outcomes and no soft-tissue infections with posterior plating in 48 patients of a total of 321 operated ankle fractures. Although they provided little detail, they reported good outcomes and no soft tissue irritation from the plates.(10)

In a prospective study by Ostrum in 1996 , no malunions, failures of fixation, or wound complications were found across 32 patients treated with posterior fibula plating. The study included 32 patients with displaced Weber Type B fibular fractures . Four patients had a transient peroneal tendinitis, and two patients had later plate removal for symptomatic lag screw caused by poor technique. Twenty of 21 patients who returned a questionnaire were satisfied with their results. Interestingly, Ostrum also compared the surgery times between 11 patients who had posterior plating and 11 patients with lateral plate fixation treated at his institution. There was no statistical difference found between the two groups (79.0 versus 89.1 minutes).

Winkler et al investigated the outcomes of 93 patients who underwent internal fixation with posterior antiglide plates at 1 year of follow-up and found excellent outcomes.

In a biomechanical study on a cadaver, Schaffer and Manoli reported more stability and rigidity with the posterior antiglide plate than with the lateral plate. They claimed certain limitations in using the lateral plate. According to their clinical experience, the authors concluded that the posterior antiglide plate seems to have clinical advantages. (11)

Posterior antiglide plating have several biomechanical and surgical advantages when compared to lateral plating. A posterior plate is often less superficial than a lateral plate, potentially allowing for improved wound healing and fewer hardware-related complications. For oblique distal fibular fractures, the orientation of a plate allows the plate to act as a buttress preventing displacement.(3)(12)

Our study has several limitations. Given our relatively small sample size, and lack of significant long-term outcomes, we are unable to make strong claims regarding the preferential use of posterior antiglide plating compared with lateral plating. Despite these limitations, our findings support the use of posterior antiglide plating as evidenced by good clinical and functional outcome scores, which complement the pre-existing biomechanical studies supporting this surgical approach.

Posterior antiglide and lateral plating of distal fibula fractures achieved good clinical and high functional outcomes across our study population.

Posterior antiglide plating group showed statistically significant difference in terms of ADL as compared to lateral plating group. Although other clinical parameters were not statistically significant but they were better in posterior antiglide plating group as compared to lateral plating group.

**Conflict of Interest** – The Authors declare that there is no conflict of interest.

**Funding** - This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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