

Original Research Article

## **A prospective study of distal tibial fracture treated by plate osteosynthesis through posterolateral approach**

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**Abstract:** Distal tibial fracture is a complex injury with high complication rate and constitutes about 7% of all tibial fractures. Many treatment options have been described for treating such fractures. Among the surgical options, plate osteosynthesis achieves near anatomic reduction and acceptable union rates with good functional outcome. In our prospective study conducted at Sree Balaji Medical College and Hospital, from September 2012 to March 2016, 15 cases of distal tibial fractures were treated with plate osteosynthesis using posterolateral approach, which achieved good to excellent result in 60% of patients and 40% fair results, based on Baird Jackson ankle scoring system. An advantage of posterolateral approach is fixation of fibula and tibia using a single incision, avoiding wound healing problem and deep infection. We conclude that the posterolateral approach is a safe approach with satisfactory results and provides a viable alternative for the orthopaedic surgeons for the treatment of distal tibial fractures.

**Keywords:** Distal tibial fracture, plate osteosynthesis, postero-lateral approach, Baird-Jackson Score, prospective, short term study

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### **INTRODUCTION:**

Distal tibial fractures are complex injuries with high complication rate. They constitute 7% of all tibial fractures and approximately 5% of lower limb fractures [1]. Majority of these fractures are due to high energy trauma like road traffic accident or fall from a height. In view of compromised vascularity, managing distal tibial fracture has been a challenge for orthopedic surgeons. Many treatment options have been described, ORIF, temporary spanning external fixation, MIPPO and interlocking nailing [2, 3]. Interlocking nailing however has the disadvantage of varus deformity as an undesirable result. Plate osteosynthesis of distal tibia fracture can be done by anteromedial, anterolateral or posterolateral approach [5-8]. The anteromedial approach provides good exposure of the articular surface centrally and medially and allows for placement of a medial buttress plate to support the comminuted metaphyseal portion of the fracture. It is however less advantageous for exposure of the lateral column of the distal tibia and the syndesmosis. The anteromedial approach has been associated with wound dehiscence leaving the distal tibia and hardware exposed [9-11]. An anterolateral approach to distal tibial pilon fractures has been described [12, 13] the approach avoids the fragile medial soft tissues and allows for a single

incision for plating of both the tibia and fibula fractures. However, the superficial peroneal nerve and anterior perforating peroneal artery are at peril.

The postero lateral approach to the distal tibia and fibula is performed through a skin incision that is made along the posterior border of the fibula. The deep portion of the dissection used to approach the tibia from the lateral side does not involve any devitalization of the bone or of the soft tissue flap overlying the distal tibia. This approach provides excellent exposure of all aspects of both the tibial and fibular fractures. This study presents outcome of distal tibia fractures using a single postero-lateral incision.

### **MATERIALS & METHODS:**

This was a prospective study conducted at Sree Balaji Medical College & Hospital, Chromepet from September 2012 to March 2016. This study included 15 patients with distal tibial fractures.

#### **Inclusion criteria:**

- Distal Tibial fractures in those aged 25 to 65 years.
- Closed fractures, Open fractures Type I & II Gustilo and Anderson are included.

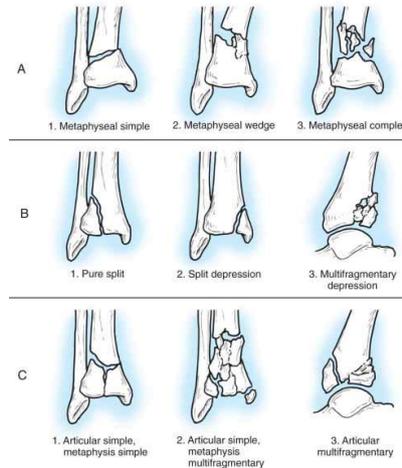
**Exclusion criteria:**

- Those aged below 18 and above 65 years.
- Other open fractures (Type III A, B and C).
- Those with ipsi or contralateral femoral fracture and fractures of the pelvis.

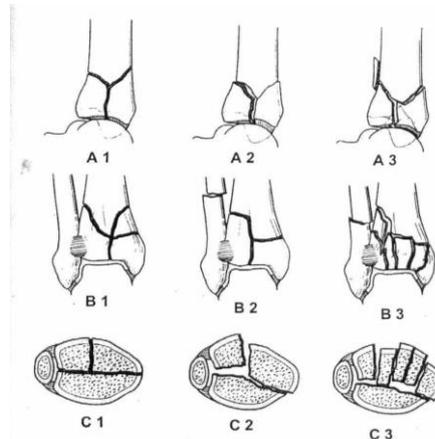
The average follow-up period was of 18 months (range 12-46). At the trauma centre, patients were received stabilized haemodynamically and injectable analgesics given. The mechanism of injury

and the severity of the trauma were then assessed. The patients were then assessed clinically to evaluate their general condition and the local injury.

Routine Antero-posterior and lateral radiographs of the affected leg along with ankle were taken and the fracture patterns were classified based on the AO/OTA classification (Figure. 1) and Ruedi and Allgower classification (Figure.2). Patients with open fractures were graded using the Gustilo Anderson classification for open fractures.



**Fig 1: AO/OTA Classification for Distal Tibia Fractures**



**Fig-2: Ruedi-Allgower Classification**

Patients were placed in the prone position on a radio-lucent operating table. A tourniquet was applied to achieve a bloodless field. After preparation and draping, a longitudinal skin incision was made along the posterolateral aspect of the ankle, 1 cm behind the fibula at the fracture site.

The fibular fracture was exposed by medially retracting the peroneal muscle group. The fibular fracture was reduced and fixed with a 3.5-mm small fragment plate placed on the posterior surface of the fibula. Correct fibular length restoration was vital for the subsequent ankle joint reconstruction. After

fixation of the fibular fracture, the peroneus longus tendon and peroneus brevis muscle were laterally retracted. The lower third of the flexor hallucis longus was released from the fibula and retracted medially with dissection along the interosseous membrane and then medially to the posterior tibia. Using the same incision, the distal tibia was exposed. The distal tibial articular surface was restored after reduction of the distal tibial fragment. Fracture was fixed with distal tibial locking plate applied on the posterior aspect of distal tibia. For those patients with bone loss, cancellous bone graft from the posterior iliac crest was used to fill the bone gap and restore the articular surface.



**Longitudinal skin incision**



**Exposure of distal tibia**

**Table 1: Baird Jackson Score**

<b>Pain</b>	<b>Score</b>
No Pain	15
Mild pain with strenuous activity	12
Mild pain with activities of daily living	8
Pain with weight bearing	4
Pain at rest	0
<b>Stability of ankle</b>	
No clinical instability	15
Instability with sports activities	5
Instability with activities of daily living ability to walk	0
<b>Able to walk</b>	
Able to walk desired distances without limp or pain	15
Able to walk desired distances with mild limp or pain	12
Moderately restricted in ability to walk	8
Able to walk short distances only	4
Unable to walk	0
<b>Able to run</b>	
Able to run desired distances without pain	10
Able to run desired distances with slight pain	8
Moderate restriction in ability to run with mild pain	6
Able to run short distances only	3
Unable to run	0
<b>Ability to work</b>	
Able to perform usual occupation without restrictions	10
Able to perform usual occupation with restrictions in some strenuous activities	8
Able to perform usual occupation with substantial restriction	6
Partially disabled; selected jobs only	3
Unable to work	0
<b>Motion of the ankle</b>	
Within 10 of uninjured ankle	10
Within 15 of uninjured ankle	7
Within 20 of uninjured ankle	4
<5 of uninjured ankle, or dorsiflexion <5	0
<b>Radiographic result</b>	
Anatomical with intact mortice(normal medial clear space, normal 25 superior joint space, no talar tilt)	25
Same as a with mild reactive changes at the joint margins	15
Measurable narrowing of the superior joint space,superior joint space 2mm, or talar tilt >2mm	10
Moderate narrowing of the superior joint space,with superior space between 2 and 1mm.	5
Severe narrowing of the superior joint space, withsuperior joint space <1mm,widening of the medial clear space, severe reactive changes(Sclerotic subchondral bone and osteophyte formation)	0

Excellent	96-100
Good	91-95
Fair	81-90
Poor	0-80

**Follow up:**

Post-operative IV antibiotics and analgesics given. Antiedema measures were instituted. After periodical wound inspection suture removal was done on 12<sup>th</sup> P.O.D. Post OP BK slab was changed to synthetic BK cast, after suture removal. They are retained for another 4 weeks and after radiological evaluation, PTB cast was applied and partial weight bearing allowed.

The patients were followed up at intervals of 6, 12 and 24 weeks to assess the radiological union and functional outcome was assessed using Baird and Jackson scoring system (Table-1). After the 1<sup>st</sup> follow up of 6 weeks patients were allowed to partial weight bear with a patellar tendon bearing cast.

Full weight bearing was allowed based on the radiological union and consolidation of the fractures. Patellar tendon bearing cast was removed after radiological union of the fracture (average 12 to 16 weeks). The fracture was designated as united, when there was periosteal bridging callus at the fracture site at least in three cortices in the antero - posterior and lateral views. Trabeculations extending across the fracture site was also taken into consideration.

**RESULTS:**

The following data was observed in 15 Adult patients with distal third tibial fracture who were admitted in Sree Balaji Medical College and Hospital, Chromepet, Chennai from September 2012 to March 2016.

**Table 2: Age Distribution**

AGE	FREQUENCY	PERCENTAGE
26-35yrs	3	20.0%
36-45yrs	5	33.3%
46-55yrs	4	26.7%
56-65yrs	3	20.0%
<b>Total</b>	<b>15</b>	<b>100.0%</b>

Patients were aged between 28 and 65 years. The average age of study sample was 45 years. Among the 15 patients 11(73.3%) were male patients and 4(26.7%) were female patients. In 10 patients fracture was involving the (Rt) leg (66.7%) and in the rest 5(33.3%) patients (Lt) leg was involved. 10(66.7%) of the samples sustained fractures following road traffic accident and 5(33.3%) of the samples had injuries due to fall from height. We had 12(80%) closed fractures and 3(20%) were open fractures of type I Gustilo Anderson. Based on AO classification 7(46.7%) patients belonged to A<sub>1</sub> type, 5(33.3%) belonged to

A<sub>2</sub> and 3(20%) belonged to A<sub>3</sub>. All open injuries were of A<sub>1</sub> fractures pattern. All the cases had associated ipsilateral fibula fractures in the distal end. The fractures were operated by the same surgical team. The average duration of surgery was 96 mins. The duration of surgery ranged between 80mins and 110mins. All fractures united between 14 and 20 weeks. The average duration of fracture union was 17 weeks. Based on the ankle Baird Jackson score the functional outcome was excellent in 3 (20%) patients good in 6 (40%) patients and fair in 6 (40%) patients.

**Table 3: Outcome Distribution**

BJ Score	No. of Pts	Total	Outcome
98	2	3	Excellent
96	1		
93	4	6	Good
95	1		
92	1		
85	2	6	Fair
87	2		
83	1		
90	1		



Dillin L, Slabaugh P in a study reported disastrous results when inadequate and unstable fixation was used to treat the distal tibial fractures. They had 36% rate of skin sloughing and a 55% infection rate [15].

Da-wei chen *et al.*; In a retrospective study of 10 patients with posterior pilon fractures of the distal tibia with (mean age, 46.5 years) who had undergone buttress plating via either a posterolateral approach or a dual posterolateral-posteromedial approach. The clinical outcome was evaluated with the American Orthopaedic Foot and Ankle Society (AOFAS) ankle-hindfoot score and the visual analogue scale (VAS). The radiological evaluation was performed using the osteoarthritis-score (OA-score). All patients had good radiological results and showed satisfactory clinical recovery. The mean AOFAS score was 87.8, the mean OA-score was 0.6, and the mean VAS scores during rest, active motion, and weight-bearing walking were 0.6, 0.8, and 1.4, respectively [16].

Sheerin *et al.*; in a series of 15 patients with distal tibia fractures treated with staged ORIF of tibia performed through posterolateral approach. The clinical outcome was evaluated with the American Orthopaedic Foot and Ankle Society (AOFAS) ankle-hindfoot, radiographic union and complications. Average time of union was 20(12 to 47) weeks from time of fixation with blade plate and bone grafting. The average AOFAS score was 81(60 to 97) out of possible 100. There was no infection [17].

Koo SC, Chan SK, Ho YF, A study of 9 patients with tibial pilon fractures using posterolateral surgical approach. The clinical outcome was evaluated with the American Orthopaedic Foot and Ankle Society (AOFAS) ankle-hindfoot, radiographic union. All fractures were healed and there was no skin dehiscence. In 5 of 8 patients AOFAS score was at least 90 out of 100 [18].

Advantage of the posterolateral approach is fixation of fibula and tibia using a single incision. Traditional common open reduction and internal fixation is done using 2 incisions. In the single incision technique the posterolateral approach has adequate skin bridge and circulation is not grossly compromised. Wound healing using this approach was found satisfactory with acceptable cosmesis.

In this procedure, with the aid of an image intensifier, visualization of the fracture configuration is achieved. In our study there were 10 men and 5 women with the mean age of 45 (28-64) years as compared to the mean age of 46.5 years in a study conducted by Chen DW *et al.*; There were no complications such as nonunion, malunion, osteomyelitis, and wound dehiscence after surgery. Wound healing and cosmesis

were satisfactory, with no hypertrophic scars, keloid formation or discomfort when socks or shoes are worn.

Using the ankle Baird Jackson's score, outcome was found to be excellent in 3 patients, good in 6 patients and fair in 6 patients.

#### CONCLUSION:

The posterolateral approach is a safe approach with satisfactory wound healing and cosmesis. Therefore the posterolateral approach provides a viable alternative for the orthopaedic surgeons for the treatment of distal tibial fractures.

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