Original Article

Analysis of the Outcome of Distal Tibia Fracture Treated by Surgical Management with Distal Tibia Locking Plate in Tertiary Care Hospital, Ahmedabad

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Abstract

Background : Fracture through the epi-metaphyseal part at the distal end of tibia is very common. The outcome of such fractures depends on the proximity of the fracture site with the tibia plafond, type of fracture (whether comminute or simple), displacement, if any and injury to the surrounding soft tissue.

Materials and Methods : In this prospective study, conducted between March, 2021 to March, 2023, 30 Patients treated with Distal Tibia Plate Fixation were evaluated. All patients included in this study were operated with a minimal access approach to the distal tibia fractures and fixation was done using distal tibia anatomical plate.

Results : Operated patients were evaluated over a period of 1 year regularly at 6 weeks, 3 months, 6 months and 1 year. The patients were assessed for functional outcome on the basis of Olerud and Molander Functional Evaluation Score.

Discussion : The Functional Ankle score measured by Olerud and Molander Functional Evaluation Scoring in patients treated with distal tibia plating was 82% (Average of 60-90).

Conclusion : It is observed from this study that plate and screw fixation in cases with complex and comminuted fractures provides better alignment, reduction and fixation of such fractures.

Key words : Fracture, Distal Tibia Plate, Outcome, Internal Fixation.

Tibia is the largest of the two bones in the leg and is also the second strongest bone in the body after femur. The subcutaneous nature of the bone along with its weight bearing nature makes it more prone to fracture. One of the most common modes of trauma causing distal tibia fracture is road traffic accident or fall from height. The basic mechanism is either torsional or compressive forces acting on the bone. Treating patients with distal tibia epi-metaphyseal fractures with or without distal articular surface involvement is a surgical challenge[1-4].

With advances in technologies and better understanding of bio-mechanics of the human body, various modalities for surgical management of the distal tibia fractures are available. Traditional method of fixation being osteosynthesis plate fixation. Other methods include intramedullary nail, limited internal fixation with screws and/or Kirschner wire and in some cases external fixation of the bone can be performed. The most recent method being Minimally Invasive Plate Osteosynthesis (MIPO)[5-9]. Each technique has its own merits and demerits and there is no consensus as to which method is the best for treating distal tibia fractures[2,10].

Editor's Comment :

- Distal tibia epi-metaphyseal fractures treated with open osteosynthesis plate and screw provides better alignment in more complex forms of fractures and should be considered as primary appraoch for better outcome.

Despite all the advancements, the outcome is not always excellent and complication rate is approximately 20-50%[2,11,12]. The purpose of this study is to determine radiological and functional outcome of patients treated with MIPO/ORIF Plate Fixation (Figs 1&2).

Materials and Methods

In this prospective study, conducted between March, 2021 to March, 2023, 30 Patients treated with Distal Tibia Plate Fixation were evaluated. Both Antero-

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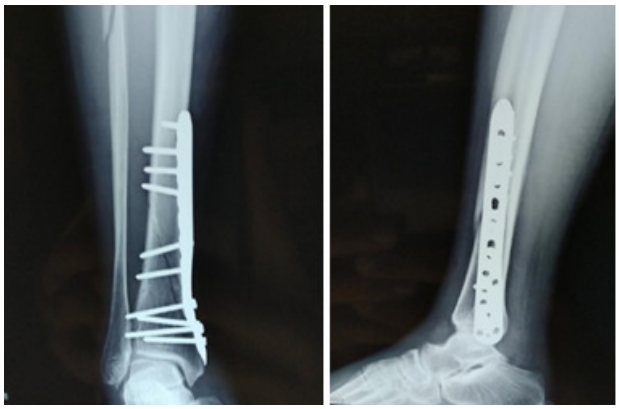

Fig 1 — Distal Tibia and Fibula Fracture X-Ray Lateral and AP view

Posterior and Lateral view X-Rays were analysed to determine the fracture site, type of fracture and the type of plate fixation for the best possible functional outcome. All patients included in this study were operated with a minimal access approach to the distal tibia fractures and fixation was done using distal tibia anatomical plate.

Minimal Access Approach to Distal Tibia :

The patient is placed in supine position with a sandbag under the ipsilateral buttocks to prevent the limb from rotating externally. The patella is kept facing anteriorly. The procedure is performed under torniquet control. After the limb is exsanguinated, fibula is reduced first to achieve stabilization. Fibula fixation is done first following which tibial fixation is done. A linear incision is placed at the most distal part of lateral malleolus. The fracture is reduced and fixed with appropriate size intramedullary nail. Alternatively, in few cases of comminuted fibula fracture, an incision was placed over the posterior border of the lateral malleolus and extended proximally. Final fixation of the fracture by fibular anatomical plate and 3.5mm screw. Medially the most distal part of medial malleolus being the anatomical landmark, a 3-5 cm size incision is placed halfway between the anterior and posterior borders of medial malleolus. Proximally the incision is placed over the subcutaneous surface of the tibia in similar manner. This approach has no internervous plane as this approach is along the subcutaneous surface of tibia and hence the periosteum can be seen once the initial incision is deepened. An Epi-Periosteal plane is created by passing a periosteum elevator. Once exposed, fracture is reduced with the help of traction and Kirschner wire. After achieving reduction, a 3.5mm Anteromedial plate is slid from distal incision proximally. Once desired placement is achieved, the plate is fixed with 3.5mm screws.

Fig 2 — Postoperative X-Ray Distal Tibia Plating Lateral and AP View

Inclusion Criteria :

Skeletally Mature patients with fracture involving distal 5cm of tibia (Based on AO Classification 43 Type A1, A2, A3 and 43 Type B1)[2] and Gustilo-Anderson Classification of Open Fracture Type 1 Fractures[13].

Exclusion Criteria :

Skeletally Immature patients with fracture involving distal articular surface of tibia (Based on AO Classification 43 Type B2, B3 and Type C) and Gustilo-Anderson Classification of Open Fracture Type II and III.

Follow-up of all patients was done at regular pre-decided intervals of 6 weeks, 3 months, 6 months and 12 months (Tables 1 & 2).

Results

In 30 patients operated for distal tibia fracture with osteosynthesis plate fixation. Common age group of the patients in the study was 20-60 years. Most common cause leading to fracture was road traffic accident (18 patients) followed by fall from height (8 patients) and sports injuries (2 patients). Concomitant Fibula Fracture was seen in 24 patients out of the 30 patients evaluated for this study (Tables 3 & 4).

Table 1 — *AO Classification of Distal Tibia Fracture*

AO Classification Type 43 :		
A	A1	Metaphyseal Simple
	A2	Metaphyseal Wedge
	A3	Metaphyseal Complex
B	B1	Pure Split
	B2	Split Depression
	B3	Multi-fragmentary Depression
C	C1	Articular Simple, Metaphyseal Simple
	C2	Articular Simple, Metaphyseal Multi-fragmentary
	C3	Articular Multi-fragmentary

Table 2 — *Gustilo-Anderson Classification of open fractures*

Type I		Wound <1cm
Type II		Wound >10cm
Type III	A	Adequate soft tissue coverage
	B	Inadequate soft tissue coverage
	C	Arterial injury requiring repair

The Average duration of Operation was 92 minutes (Range 60-120 minutes). Intra-operatively difficulties were encountered in achieving favourable reduction in 10 patients. Postoperative stay of the patients was uneventful. Patients were allowed partial weight bearing at an average time of 9.2 weeks (range 8-12 weeks) and full weight bearing was promoted at an average time of 16.8 weeks (range of 14-20 weeks). With the average time for union in operated patient being 24 weeks (Range 18-34 weeks), 3 patients developed non-union who were operated again and autologous bone graft from iliac crest was placed at the site of non-union. These patients showed union of distal tibia by 37 weeks. Superficial surgical sire infection was present in 3 patients who were treated with antibiotics and regular dressing. Recovery of these patients was achieved by 28 weeks. No patient had implant failure among the patients evaluated in this study (Table 5).

Operated patients were evaluated over a period of 1 year regularly at 6 weeks, 3 months, 6 months and 1 year. The patients were assessed for functional outcome on the basis of Olerud and Molander Functional Evaluation Score. Based on the scoring system, most patients had good functional outcome.

Discussion

Among the patients included in this case study, the average age of patients was 38. Most common cause of trauma leading to distal tibia fracture is road traffic accident (60% cases) followed by fall from height (30% cases). Fibula fracture was present in 60% cases and was treated with fibular plating depending on the fracture pattern. The reason behind treating both the fractures is that fixation of fibular provides rotational stability initially and also reduces the chances of developing any valgus or varus deformity[14]. Angular deformity was seen in 2 out of the 30 patients included in the study. Mean angulation was 1.1 degree in patients treated with plate and screw fixation. Another complication of fracture fixation is shortening of the fractured limb. Among the 30 patients treated with plate and screw fixation, 1 patient had postoperative shortening of 0.7cm.

The Functional Ankle score measured by Olerud and Molander Functional Evaluation Scoring in patients treated with distal tibia plating was 82% (Average of 60-90)

Conclusion :

Results of the study indicate that distal tibia epi-metaphyseal fractures treated with open osteosynthesis plate and screw provides better alignment in more complex forms of fractures as it also allows employing additional procedures which may be needed for fracture fixation. With the advent of minimally invasive techniques there is fall in number of patients with wound complications and better bridging of comminuted and complex fractures. Patients operated with plate and screw fixation may require protracted weight bearing for 2-4 weeks after initial immobilization of 6-8 weeks. It is observed from this study that plate and screw fixation in cases with complex and comminuted fractures provides better alignment, reduction and fixation of such fractures

Table 3 — *Mode of Trauma*

Mode of Trauma	Number of Patients
Road Traffic Accident	18
Fall From Height	8
Sports Related Injuries	2
Slip and fall	1
Staircase Injury	1

Table 4 — *Fracture pattern based on AO/OTA Type*

AO/OTA Type	Number of Patients
43 Type A1	8
43 Type A2	6
43 Type A3	14
43 Type B1	2

Table 5 — *Functional outcome of patients operated for Distal Tibia Plating (Olerud and Molander Functional Evaluation Score)*

Function	Number of Patients
Excellent (91-100)	5
Good (61-90)	22
Fair (31-60)	3
Poor (0-30)	0

The number of cases in this study is not sufficient to make a broad and more definitive conclusion and further studies are required to make such statements.

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Conflict of Interest : None.

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