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Distal Tibia Fractures Treated With Posterior Plating Through Posterolateral Approach.

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ABSTRACT

Distal tibia fractures are difficult to treat. Various modalities are available for the treatment. Our study aims to find out how efficient and safe is posterior plating through posterolateral approach in middle and old aged individuals and in individuals with anteromedial type 1 & 2 compound injury for distal tibial fractures. Thirteen cases of distal Tibial Fractures that came to our hospital were selected for Posterior plating through posterolateral approach. Of these 7 were closed type of fractures and 6 were open type (Gustillo Anderson type I). Other parameters such as the varus and valgus deformity, duration of wound healing, blood loss, duration healing time of the fractures and complications were taken into consideration to assess the treatment. The mean surgery time was 75 minutes with a mean blood loss of 40 ml. The post-operative healing period was good in all thirteen patients. The union occurred at a mean time of 20 weeks. There was No incidence of non-union, mal union, Limb length discrepancy, varus or valgus deformity or any neuro vascular injury. Thus our study proved that posterior plating through posterolateral approach is an efficient and effective method for treating distal tibial fractures.

Keywords: Distal Tibial Fractures, Posterior Plating, Posterolateral approach.

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INTRODUCTION

Distal tibia fracture is often associated degrees of vascular and soft tissue injury. [1–4] Fractures with anterior soft tissue injury are difficult to treat. The difficulty is between anterior soft tissue injuries and its accurate fracture fixation[5,6]. Good Anterior soft tissue is needed for medial and lateral plates to be fixed firmly. [7,8] .External fixators are also a choice for distal tibia fractures with anterior skin loss [3,9]. But all these methods also has High prevalence of pin tract infection, malunion, nonunion makes it difficult to manage [6–8,10]. Modified intramedullary nailing can be applied in distal tibia fractures, but its effectiveness is controversial [7,11,12]. It is difficult to choose between treatment options for distal tibial fractures with anterior soft tissue injury. Tibial locking compression plates were used for fixation of distal tibial fractures. Our aim was providing accurate anatomical fixation and avoiding injured anterior soft tissues injury.

INCLUSION AND EXCLUSION CRITERIA:

- Distal Tibial fracture type I and Type II gustilo Anderson classification. [13]
- No posterior soft tissue involvement.
- No intra articular involvement.
- With or without Fibula fractures.
- Patients with pathologic fractures, autoimmune diseases, blood disorders, severe multiple trauma, and surgical contraindications were excluded.

Investigations

Anteroposterior (AP) and lateral radiographs of the leg, including the ankle joint, were taken in all patients. computed tomography and MRI also taken if needed.

MATERIALS AND METHODS

13 cases of fracture of the lower tibia Fracture were recovered. Locking compression plates are used.



Figure 1:locking compression plates

Incision and Technique Of Surgery

Patient under epidural or general anaesthesia in prone position.

Skin incision is made along the posteromedial border of the fibula and can extend from the tip of the fibula as far proximally as is required. It should never be more medial than the lateral border of the Achilles tendon. It is important to be aware of the course of the sural nerve as it courses from the center of the calf proximally to just posterior to the fibula distally. Identify the sural nerve under the superficial fascial layer and usually include it in the lateral flap. If the dissection is extended more proximally, it may be necessary to work on either side of this nerve. Superficial dissection should be taken down to the attachment of the peroneal fascia on the posterolateral border of the fibula. Incise the fascia, and retract the peroneals medially. Access to the tibia is through a separate plane which is developed on the posteromedial border of the peroneal muscles. These are now retracted laterally. Exposure of the posterior aspect of the tibia is achieved by developing the interval between the peroneal tendons and muscles laterally and the flexor hallucis longus (FHL) medially.fracture site reached and reduction and length of tibia achieved^{17,18}.locking compression plates were placed posteriorly and fixed.



FIGURE 2: shows the line of incision and the sural nerve

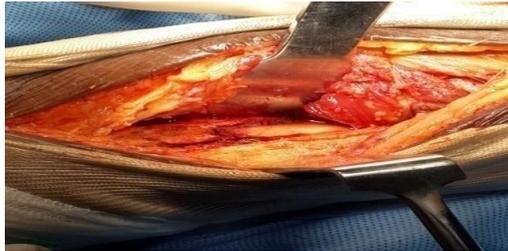


Figure 3: shows the fracture site



Figure 4: shows the sural nerve and the Icp used



Figure 5: anteroposterior and lateral view radiograph shows distal tibia fracture



Figure 6: post-operative AP and lateral radiograph shows hardware insitu.



Figure 7: post-operative follow up radiograph which shows good callus formation.

Postoperative Management

Post operatively Antibiotic treatment was given. Peripheral circulation and skin sensation were checked. Knee and ankle joint exercises were started immediately. Based on the type of fracture, fixation strength, age, and growth of the callus the weight bearing walking time was determined. After 6 to 8 weeks partial weight bearing was allowed and after 10 to 12 weeks full weight bearing was allowed.

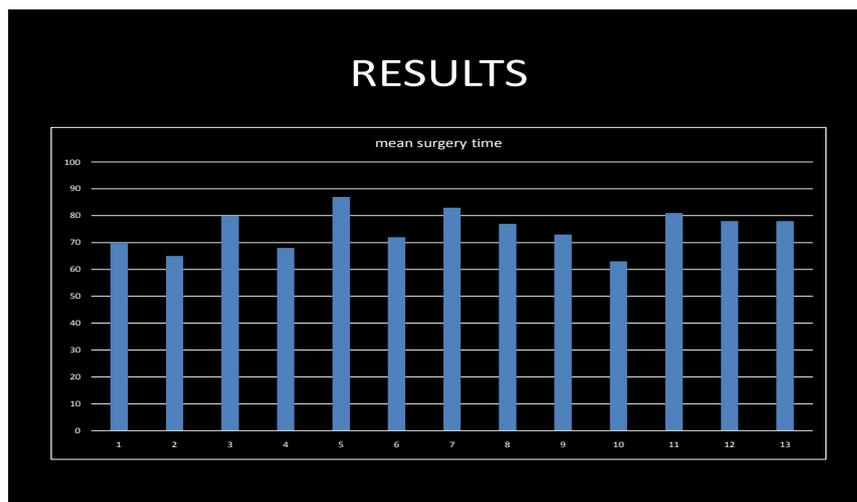
Complication rates that are looked for are:

Malunion of fracture evaluation: Johnson angle of ankle joint measured on latest AP and lateral radiographs of full-length lower leg [6,21,22]. If varus and valgus or AP angle was $>5^\circ$, malunion was confirmed. Limb-shortening deformity: >1 cm shortening of the limbs. [5-8].

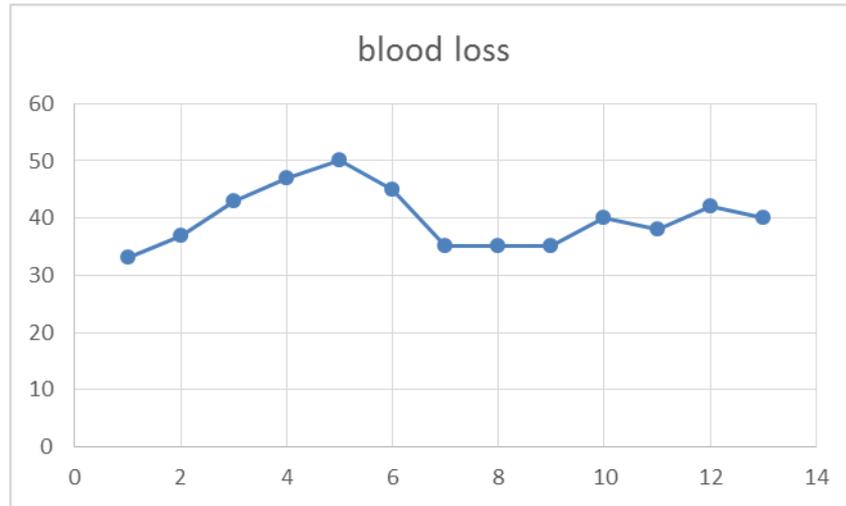
Fracture nonunion, delayed union, infection of anterior skin wound and surgical incisions infection, skin necrosis, failed internal fixation, and neurovascular injury.

OBSERVATION AND RESULTS

The mean surgery time was 75 minutes with a mean blood loss of 90 ml. The post-operative healing period was good in all thirteen patients. The union occurred at a mean time of 20 week. There was No incidence of non-union, mal union, Limb length discrepancy, or any neuro vascular injury. Thus our study proved that posterior plating is an efficient and effective method for treating distal tibial fractures.



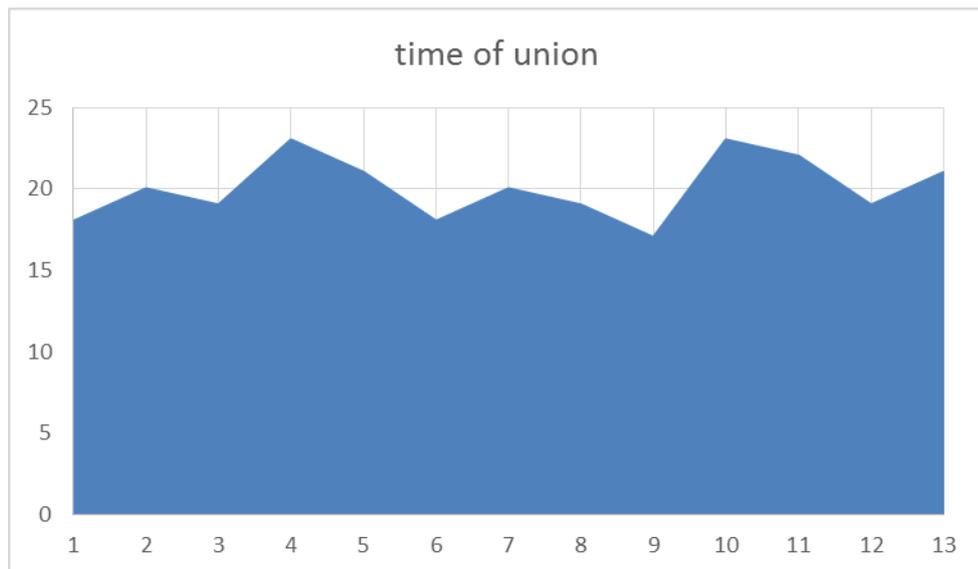
Mean surgical time is 75 min +/- 10 min.



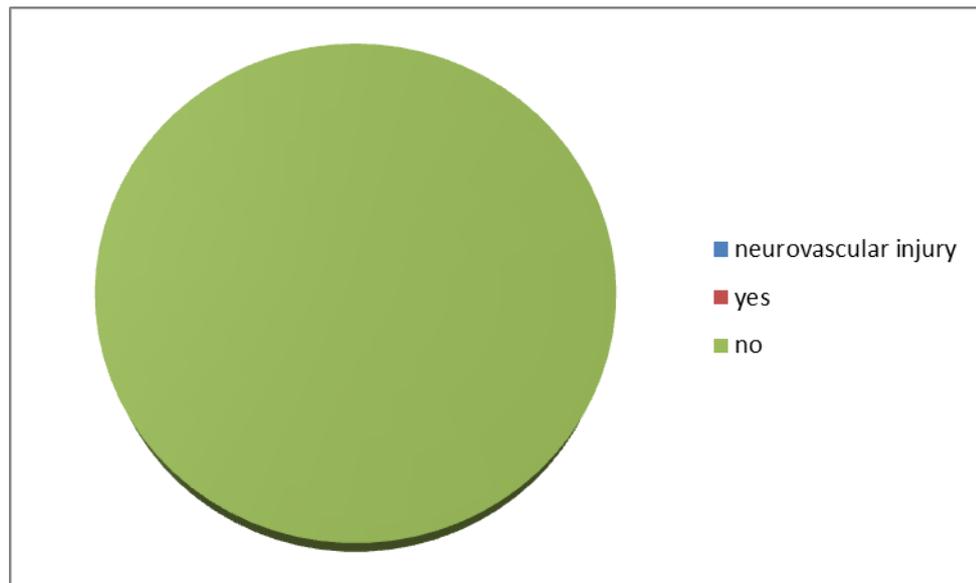
Mean blood loss 40ml +/- 10ml



Limb length discrepancy: no limb length discrepancy



Mean Time of fracture union 20 weeks +/- 5 weeks



Neurovascular injury: no neurovascular injury

DISCUSSION

The presence of soft tissue injuries making our decision for treatment difficult. For those injuries with severe soft tissue involvement application of an external fixator is the preferred treatment because they can stabilise the fracture without causing further compromise.[3,9]. But this method is not without complications such as malunion or pintract infections and inconvenience [6–8,10]. Thus external fixation can be used for emergency procedure. [5,6,23]

Nailing and plating can also be used for fixation of these fractures. Earlier nailing could not be used for these fractures because of their anatomy. Latest nails however have solved these problems. They are however involved with problems such as nonunion, infection, malunion and such mainly in open and comminuted fractures because of severe injuries. [7,11,12,24]

Now medial and lateral plate fixation are the preferred methods of treatment [7,8,10]. However making an anterior skin incision in cases that have soft tissue injuries have higher rates of skin infection. [5,10,21,24,26–30]

Thus the consistency of the anterior soft tissue has been found to influence the treatment options. Krackhardt et al [6] found that fracture fixation through antero medial incision was found to take more time for healing. Although this approach does not compromise the blood flow it however damages the skin.

Sometimes these skin injuries require flap or split skin grafting procedures. Thus our study aimed at finding a better solution for this problem Thus we carried out a single stage posterolateral approach for fracture fixation using locking compression plates without involving the anterior soft tissues.

Our main concept was to avoid the anterior skin damage. The core concept of posterolateral approach fixation is to avoid the anterior damaged soft tissue to fix the fracture. Clinically, the posterolateral approach to fixation of distal tibia fractures had been previously proved by Sheerin et al [5] and has an average healing time of 20 weeks. They also found that both Tibia and Fibula can be fixed through a single incision. However this approach does have its difficulty of difficult exposure because usually achilles tendon blocks our view of the distal Tibia.

CONCLUSION

A locking compression plate through posterolateral approach can be used for the fixation of distal Tibial fractures with associated anterior soft tissue compromise and it did not result in serious complication

like malunion, non-union, limb length discrepancy, sural nerve injury. This method also protects the blood supply of distal tibia.

REFERENCES

- [1] Marsh JL, Saltzman CL. Ankle fractures. In: Buchholz RW, Heckman JD, Court-Brown C, eds. *Rockwood & Green's Fractures in Adults*. 6th ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2006:2147–2247.
- [2] Zelle BA, Bhandari M, Espiritu M, et al. Treatment of distal tibia fractures without articular involvement: a systematic review of 1125 fractures. *J Orthop Trauma*. 2006; 20(1):76–79. doi: 10.1097/01.bot.0000202997.45274.a1
- [3] Babis GC, Kontovazenitis P, Evangelopoulos DS, et al. Distal tibial fractures treated with hybrid external fixation. *Injury*. 2010; 41(3):253–258. doi: 10.1016/j.injury.2009.09.014
- [4] Joveniaux P, Ohl X, Harisboure A, et al. Distal tibia fractures: management and complications of 101 cases [published online ahead of print June 25, 2009]. *Int Orthop*. 2010; 34(4):583–588. doi: 10.1007/s00264-009-0832-z
- [5] Sheerin DV, Turen CH, Nascone JW. Reconstruction of distal tibia fractures using a posterolateral approach and a blade plate. *J Orthop Trauma*. 2006; 20(4):247–252. doi: 10.1097/00005131-200604000-00003
- [6] Krackhardt T, Dilger J, Flesch I, Höntzsch D, Eingartner C, Weise K. Fractures of the distal tibia treated with closed reduction and minimally invasive plating [published online ahead of print February 10, 2005]. *Arch Orthop Trauma Surg*. 2005; 125(2):87–94. doi: 10.1007/s00402-004-0778-y
- [7] Ronga M, Longo UG, Maffulli N. Minimally invasive locked plating of distal tibia fractures is safe and effective [published online ahead of print July 30, 2009]. *Clin Orthop Relat Res*. 2010; 468(4):975–982. doi: 10.1007/s11999-009-0991-7
- [8] Gao H, Zhang CQ, Luo CF, Zhou ZB, Zeng BF. Fractures of the distal tibia treated with polyaxial locking plating [published online ahead of print August 22, 2008]. *Clin Orthop Relat Res*. 2009; 467(3):831–837. doi: 10.1007/s11999-008-0459-1
- [9] Ristiniemi J, Flinkkilä T, Hyvönen P, et al. Two-ring hybrid external fixation of distal tibial fractures: a review of 47 cases. *J Trauma*. 2007; 62(1):174–183. doi: 10.1097/01.ta.0000215424.00039.3b
- [10] Collinge C, Protzman R. Outcomes of minimally invasive plate osteosynthesis for metaphyseal distal tibia fractures. *J Orthop Trauma*. 2010; 24(1):24–29. doi: 10.1097/BOT.0b013e3181ac3426
- [11] Keating JF, O'Brien PJ, Blachut PA, Meek RN, Broekhuysen HM. Locking intramedullary nailing with and without reaming for open fractures of the tibial shaft. A prospective, randomized study. *J Bone Joint Surg Am*. 1997; 79(3):334–341.
- [12] Mohammed A, Saravanan R, Zammit J, King R. Intramedullary tibial nailing in distal third tibial fractures: distal locking screws and fracture non-union [published online ahead of print April 5, 2007]. *Int Orthop*. 2008; 32(4):547–549. doi: 10.1007/s00264-007-0356-3
- [13] Gustilo RB, Anderson JT. Prevention of infection in the treatment of one thousand and twenty-five open fractures of long bones: retrospective and prospective analyses. *J Bone Joint Surg Am*. 1976; 58(4):453–458.
- [14] Oestern HJ, Tschernke H. Pathophysiology and classification of soft tissue injuries associated with fractures. In: Tschernke H, Gotzen L, eds. *Fractures With Soft Tissue Injuries*. Berlin, Germany: Springer-Verlag; 1984:1–9.
- [15] Marsh JL, Slongo TF, Agel J, et al. Fracture and dislocation classification compendium—2007: Orthopaedic Trauma Association classification, database and outcomes committee. *J Orthop Trauma*. 2007; 21(10 Suppl):S1–S133. doi: 10.1097/00005131-200711101-00001
- [16] Faschingbauer M, Kienast B, Schulz AP, Vukelic R, Meiners J. Treatment of distal lower leg fractures: results with fixed-angle plate osteosynthesis. *Eur J Trauma Emerg Surg*. 2009; 35(6):513–519. doi: 10.1007/s00068-009-9176-z
- [17] Lee YS, Chen SW, Chen SH, Chen WC, Lau MJ, Hsu TL. Stabilisation of the fractured fibula plays an important role in the treatment of pilon fractures: a retrospective comparison of fibular fixation methods [published online ahead of print October 18, 2008]. *Int Orthop*. 2009; 33(3):695–699. doi: 10.1007/s00264-008-0654-4
- [18] Varsalona R, Liu GT. Distal tibial metaphyseal fractures: the role of fibular fixation. *Strat Traum Limb Recon*. 2006; 1(1):42–50. doi: 10.1007/s11751-006-0005-1
- [19] Blick SS, Brumback RJ, Lakatos R, Poka A, Burgess AR. Early prophylactic bone grafting of high-energy tibial fractures. *Clin Orthop Relat Res*. 1989; (240):21–41.

- [20] Kitaoka HB, Alexander IJ, Adelaar RS, Nunley JA, Myerson MS, Sanders M. Clinical rating systems for the ankle-hindfoot, mid-foot, hallux, and lesser toes. *Foot Ankle Int.* 1994; 15(7):349–353.
- [21] Krettek C, Schandelmaier P, Lobenhoffer P, Tschernke H. Complex trauma of the knee joint. Diagnosis–management–therapeutic principles [in German]. *Unfallchirurg.* 1996; 99(9):616–627. doi: 10.1007/s001130050034
- [22] Möller T. Untere Extremitäten. In: Möller T, ed. *Röntgennormalbefunde.* Stuttgart, Germany: Thieme; 2003:131–133.
- [23] Haidukewych GJ. Temporary external fixation for the management of complex intra-and periarticular fractures of the lower extremity. *J Orthop Trauma.* 2002; 16(9):678–685. doi: 10.1097/00005131-200210000-00012
- [24] Vallier HA, Le TT, Bedi A. Radiographic and clinical comparisons of distal tibia shaft fractures (4 to 11 cm proximal to the plafond): plating versus intramedullary nailing. *J Orthop Trauma.* 2008; 22(5):307–311. doi: 10.1097/BOT.0b013e31816ed974
- [25] Court-Brown CM, McQueen MM, Quaba AA, Christie J. Locked intramedullary nailing of open tibial fractures. *J Bone Joint Surg Br.* 1991; 73(6):959–964.
- [26] Gupta RK, Rohilla RK, Sangwan K, Singh V, Walia S. Locking plate fixation in distal metaphyseal tibial fractures: series of 79 patients [published online ahead of print October 10, 2009]. *Int Orthop.* 2010; 34(8):1285–1290. doi: 10.1007/s00264-009-0880-4
- [27] Manninen MJ, Lindahl J, Kankare J, Hirvensalo E. Lateral approach for fixation of the fractures of the distal tibia. Outcome of 20 patients. Technical note [published online ahead of print February 28, 2007]. *Arch Orthop Trauma Surg.* 2007; 127(5):349–353. doi: 10.1007/s00402-006-0278-3
- [28] Lau TW, Leung F, Chan CF, Chow SP. Wound complication of minimally invasive plate osteosynthesis in distal tibia fractures [published online ahead of print June 16, 2007]. *Int Orthop.* 2008; 32(5):697–703. doi: 10.1007/s00264-007-0384-z
- [29] Collinge C, Kuper M, Larson K, Protzman R. Minimally invasive plating of high-energy metaphyseal distal tibia fractures. *J Orthop Trauma.* 2007; 21(6):355–361. doi: 10.1097/BOT.0b013e3180ca83c7
- [30] Im GI, Tae SK. Distal metaphyseal fractures of tibia: a prospective randomized trial of closed reduction and intramedullary nail versus open reduction and plate and screws fixation. *J Trauma.* 2005; 59(5):1219–1223. doi: 10.1097/01.ta.0000188936.79798.4e
- [31] Oznur A, Aksoy C, Tokgözoğlu AM. Posteromedial approach and posterior plating of the tibia. *J Trauma.* 2002; 53(4):722–724. doi: 10.1097/00005373-200210000-00017