

Original Research Article

Comparison of intramedullary nailing versus proximal locking plating in the management of closed extra-articular proximal tibial fracture

Siddhartha Gupta*, Rafeeq M. D.

Department of Orthopaedics, Sanjay Gandhi Institute of Trauma and Orthopaedics, Bangalore, Karnataka, India

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***Correspondence:**

Dr. Siddhartha Gupta,

E-mail: ssidgupta@gmail.com

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ABSTRACT

Background: To compare the outcomes of closed reduction and expert tibial nailing (ETN) versus minimally invasive proximal tibial plating in treating proximal extraarticular tibial fractures.

Methods: This study included 30 cases of extraarticular proximal tibial shaft fractures. They were admitted to our department between March 2014 and June 2016 and treated respectively by closed reduction and ETN (group A, n=15) or minimally invasive proximal tibial plating (group B, n=15). To compare the therapeutic effects between two groups, the intraoperative condition, post-operative function, related complications and malalignment were investigated.

Results: All the patients were successfully followed up till radiological union. The average union time for group A was 14.2 months and for group B was 16.7 months. 3 patients in group A developed delayed union and was treated with dynamization and ultimately lead to union whereas 1 patient developed non-union in group B. There were 3 cases of superficial infection in group B cured by antibiotics and repeated dressing change. Moreover, group A showed better result in terms of intraoperative blood loss, operation time, postoperative weight bearing time and fracture union time. Functional scores as calculated by the knee rating scale of the hospital for special surgery, 12 (80%) had excellent results in group A compared to 10 (66.66%) in group B which was not statistically significant.

Conclusions: Compared with plate and screw fixation, ETN fixation has the advantages of fewer complications, shorter operation time, being less invasive, earlier postoperative rehabilitation and weight bearing, quicker fracture union and better functional recovery, thus being an effective way to treat extra articular proximal tibial fractures.

Keywords: Expert tibial nail, Locking plate, Proximal tibial fractures

INTRODUCTION

Extraarticular fractures of the proximal third of the tibial shaft are somewhat uncommon, ranging between 5% and 11% of all tibial fractures.¹ Intramedullary nailing has become the standard of care for most displaced tibial diaphyseal fractures but proximal tibial fractures can be much more difficult to treat with intramedullary nailing than other tibial shaft fractures.² These fractures frequently result in malunion with apex anterior and

valgus deformities.³ Other options of stabilizing these fractures are half-pin external fixation, hybrid or thin-wire external fixation, plate fixation, or a combination of these techniques.⁴ Treatment of tibial fracture with intramedullary devices is considered ideal because this method spares the extra articular blood supply without opening the fracture site and thus reduces the chance of infection. In recent years minimally invasive plating with locking plates for fixation of closed extraarticular proximal tibial fracture has gained popularity.⁵

This study was conducted to compare the functional outcome of management of extraarticular proximal tibial fractures with locking compression plate (LCP™) fixation plates (synthes) and intramedullary nailing (expert tibial nail, synthes).

METHODS

This study was conducted on 30 patients with extraarticular fractures of the proximal tibia (OTA 41-A2/A3) treated with intramedullary nailing (ETN) {group A} or minimally invasive proximal tibial plating (PTP) {group B} by trained surgeons at a tertiary trauma care centre in the Department of Orthopaedics, Sanjay Gandhi institute of trauma and orthopaedics, between January 2014 and December 2016. Patients who were skeletally mature and willing for surgery were included in the study. Patients with type III open fractures, intraarticular fractures and pathological fractures were excluded from the study. In type I and II fractures debridement and primary suturing was done and later were taken for definitive management viz intramedullary nailing or plating.

Surgical technique

For proximal fractures, the starting point was identified to be in line with the lateral tibial spine, thus slightly more lateral than for standard nailing. In the sagittal plane, the starting point was as far proximal in the tibia as possible while remaining extraarticular and the guide wire was inserted taking care to avoid posterior angulation, thus running along the anterior cortex as best as possible while staying intramedullary. This served to prevent flexion deformity. Temporary blocking screws and reduction clamp were used to achieve reduction and removed after fracture fixation. The intramedullary nail used had a proximal Herzog band and four multilevel, multiplanar, and multidirectional screws (expert tibial nail).

A curvilinear incision over the lateral aspect of the proximal tibia was taken in the patients to be operated by plating. Axial traction and reduction clamp was used to achieve reduction. Internal fixation was then achieved with a proximal tibial lateral locking compression plate (LCP). A minimum of three screws were used on both sides of the fracture, and plating was done using a minimally invasive technique.

Postoperatively static quadriceps exercise and ankle mobilization was started on the first postoperative day. Active and assisted knee mobilization was started on 3rd postoperative as tolerated by the patient. Partial weight bearing was started from 5th postoperative day. Full weight bearing only when signs of clinical and radiological union were present during follow up. Patients were followed up at intervals of 4 weeks for a year, and 6 monthly thereafter. Alignment and functions of the affected limb were assessed. Alignment and

deformity was calculated by drawing the anatomic axis of tibia in both proximal and distal fragments on radiographs. The amounts of varus/valgus and procurvatum/recurvatum were then calculated. Varus and procurvatum angulation were expressed as positive values, and valgus and recurvatum as negative values. Union was defined as the ability to bear full weight without pain and support, with callus bridging in 3 of 4 cortices on radiographs.

Statistical analysis was done using software SPSS software version 21. Post-operative data between two groups was analysed using student t -test to calculate the p value. A p value of <0.05 was considered significant.

RESULTS

There were 30 patients in the study including 24 males and 6 females. All 30 patients had proximal 1/3rd tibia fractures and articular surface was not involved. Mode of injury was road traffic accident in 21 cases and rest 9 cases had a history of fall from a tree or while working in fields. Age group affected were in the range of 19-59 years. 20 people were in the age group of 31-50 years indicating that tibial fractures occur in active people. Skeletally immature and type III open fractures were excluded from the study.

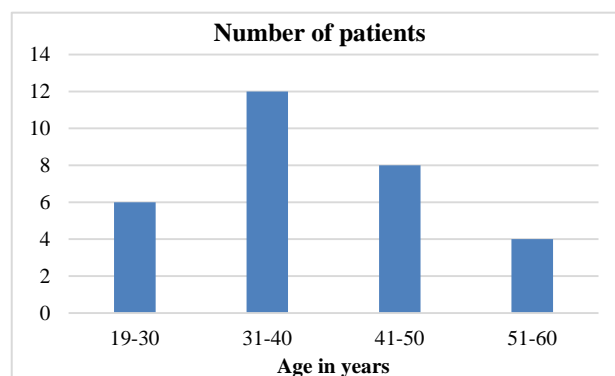


Figure 1: Age distribution of patients.

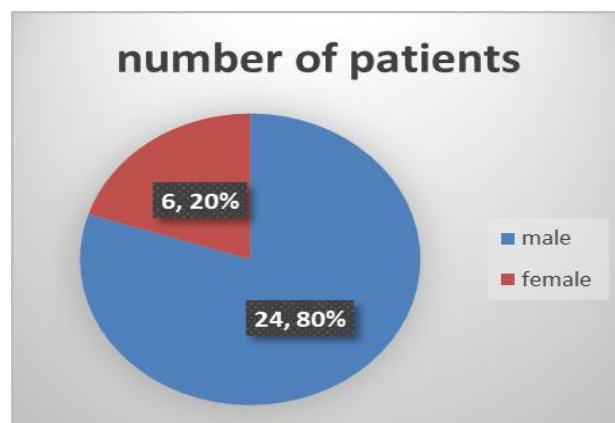


Figure 2: Sex distribution of patients.

Table 1: Comparison between intramedullary nailing and plate fixation of proximal tibia fractures.

	Group A	Group B	P value
Operative time (mins)	76.70 (60-100)	82.57 (50-110)	P<0.05
Hospital stay (days)	3.9 (3-7)	7.8 (5-12)	P<0.05
Union time (months)	14.2 (12-16)	16.7 (15-18)	P<0.05
Infection	0	2	P<0.05
Delayed union	3	0	P<0.05
Non union	0	1	P>0.05
Malalignment			
Coronal plane	2.7 (-2 to +8)	2.3 ⁰ (-2 to +7)	P>0.05
Sagittal plane	2.5 (-3 to +8)	2.1 (-2 to +7)	

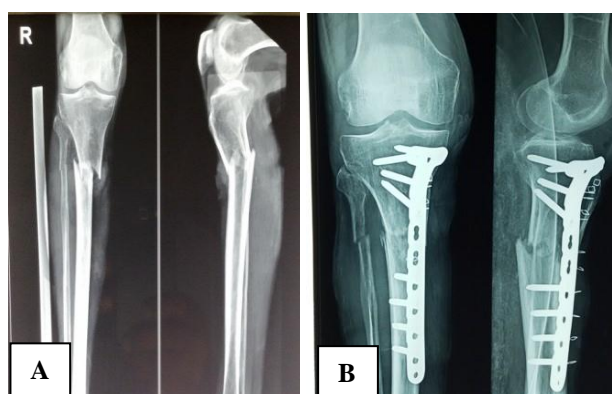


Figure 3: A=Preoperative radiograph showing proximal tibial extraarticular fracture; B=Radiograph showing fracture fixed by plate and screws.



Figure 4: Post-operative radiograph of proximal tibial fracture fixed by expert tibial nail.

All patients were able to perform activities of daily living and walk with full weight bearing and without a limp or shortening. According to the knee rating scale of the hospital for special surgery 12 (80%) had excellent results in group A compared to 10 (66.66%) in group B. Postoperative hospital stay, time period to full weight bearing, and union time were significantly less in group A as compared to the group B which was statistically

significant. Surgical site infections were seen in three patients in the group B, which resolved with debridement and antibiotics and no surgical intervention was required. No infection was reported in group A. Delayed union was seen in 3 cases of group A and was managed by dynamization. No patient developed non-union in group A. There was non-union in one patient in the group B; bone grafting was done in that case, which eventually led to fracture healing. Coronal plane (varus/valgus) and sagittal plane angulation (recurvatum/procurvatum) was found to be more in group A as compared to group B. 4 patients in group A developed >5% of malalignment (3 anterior apex and one varus) and 2 patients in the group B (1 valgus and 1 anterior apex) which was not found to be statistically significant. 12 out of 15 patients in group A had full range of movement (0-130) and 3 had limitation (0-90). In group B 11 patients developed full range of movement (0-130) and 4 had limitations (0-90). All patients had regained full quadriceps strength, with no ligamentous instability or flexion deformity. Anterior knee joint pain was complained by 5 patients in Group A compared to 2 in group B.

DISCUSSION

Surgical treatment of high energy proximal tibial fractures is still problematic. Problems associated with plating includes wound complications, infection, varus collapse and knee stiffness.⁶ Intramedullary nailing has been associated with malalignment of the proximal fragment most commonly seen as valgus and flexion at the fracture site. In our study patients in the group A had better outcome compared to group B in terms of union time, hospital stay and time taken to weight bearing. Union rates were high in both the groups 100% in group A and 86% in group B. Malunion were comparatively less as compared to another study by Lindvell et al who reported apex anterior malreduction occurred in 36% of the patients in the IMN group and 15% of those in the locking plate group.⁷ In our study only 26% of the patients in group A and only 12% of the patients in group B had malreductions. Results were better due to use of a more proximal and lateral entry point than the conventional one and use of poller screws and reduction clamp to achieve a good reduction at fracture site. Our

results were similar to Nork et al, they conducted a study on 37 patients with proximal tibia fractures and treated these with intramedullary nailing and reported acceptable alignment in 92% patients.⁸ They emphasised proper reduction before the nail insertion which can be obtained by using any of the techniques including unicortical plating, k-wire fixation, femoral distractor alignment, reduction clamp or poller screw. Infection rate were also lower that is no infection in group A and 12% in the group B in our study compared to 28% in the nailing group and 24% in the plating group in the study conducted by Lindvell et al.⁸ This may also be due to the fact that open fractures were not included in our study. Our results are similar to another study conducted by Meena et al who also concluded that IM nailing might be considered as a better option for treatment of proximal tibial extraarticular shaft fractures in terms of better patient related outcomes including less infection, less hospital stay, early union and early weight bearing.⁹

CONCLUSION

The functional scores, union rate and malalignment were not significantly different statistically in both the groups but hospital stay; time to union and infection rate was low in IMN group compared to PLP group. In our study, intramedullary nailing had better outcomes than plating, it should be emphasized that proper reduction before nail insertion and use of expert tibial nail with variable locking is required for reciprocation of good results

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Ethical approval: The study was approved by the institutional ethics committee

REFERENCES

1. Freedman EL, Johnson EE. Radiographic analysis of tibial fracture malalignment following intramedullary nailing. *Clinical Orthop Related Res.* 1995;315:25-33.
2. Alho A, Ekeland A, Stromsoe K, Folleras G, Thoresen BO. Locked intramedullary nailing for displaced tibial shaft fractures. *Bone Joint J.* 1990;72(5):805-9.
3. Lang GJ, Cohen BE, Bosse MJ, Kellam JF. Proximal third tibial shaft fractures. Should they be nailed?. *Clinical Orthop Related Res.* 1995;315:64-74.
4. Bhandari M, Audige L, Ellis T, Hanson B, Evidence-Based Orthopaedic Trauma Working Group. Operative treatment of extra-articular proximal tibial fractures. *J Orthopaedic Trauma.* 2003;17(8):591-5.
5. Ehlinger M, Adam P, Bonnomet F. Minimally invasive locking screw plate fixation of non-articular proximal and distal tibia fractures. *Orthop Traumatol Surg Res.* 2010;96(7):800-9.
6. Young M, Barrack RL. Complications of internal fixation of tibial plateau fractures. *Orthopaedic Rev.* 1994;23(2):149-54.
7. Lindvall E, Sanders R, DiPasquale T, Herscovici D, Haidukewych G, Sagi C. Intramedullary nailing versus percutaneous locked plating of extra-articular proximal tibial fractures: comparison of 56 cases. *J Orthop Trauma.* 2009;23(7):485-92.
8. Nork SE, Barei DP, Schildhauer TA, Agel J, Holt SK, Schrick JL, et al. Intramedullary nailing of proximal quarter tibial fractures. *J Orthop Trauma.* 2006;20(8):523-8.
9. Meena RC, Meena UK, Gupta GL, Gahlot N, Gaba S. Intramedullary nailing versus proximal plating in the management of closed extra-articular proximal tibial fracture: a randomized controlled trial. *J Orthop Traumatol.* 2015;16(3):203-8.

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