Assessing outcome of proximal one-third tibial fractures managed by intramedullary nailing along with reduction plate.

Nitin Choudhary*, Akhil Gupta, Sanjeev Gupta, Amar Saharan

Department of Orthopaedics, Govt. Medical College, Jammu and Kashmir, India

Abstract

Background: Proximal one-third tibial fractures are very commonly encountered in ortho emergencies. The management options include nailing and plating with each having its own downfalls. Usually very long plates have to be used in such fractures creating therefore soft tissue related problems in future. However,the use of nails in such fractures is often marred with malalignment.

Materials and Methods: A total number of seven subjects who were managed with intramedullary nailing along with small reduction plates were included in our study. The study was prospective in nature and was carried from MAR'20 to JUN'20.

Results: The patients were followed-up for a minimum period of 4 months and outcomes were deduced on the basis of Johner and Wruh's criteria.

Conclusion: Intra-medullary nailing of proximal one-third fractures along with small reduction plate can be used for management of these injuries in properly selected cases. However, one has to be very meticulous and vigilant regarding the soft tissue status in such injuries.

Keywords: Proximal tibia Fracture, Closed Interlocking Nail, Malalignment, Nailing Techniques, Small Reduction Plates.

Accepted on 03 April, 2021

Introduction

Tibial fractures are one of the most common fractures encountered in practise. Intramedullary nailing(IMN) became the gold standard in surgical fixation of diaphyseal tibia fractures. Of all tibial fractures, extra-articular proximal diaphyseal tibial fractures account for 5–9%. Although various treatment options are available, there is no consensus regarding the optimal treatment for extra-articular proximal tibial diaphyseal fractures [1]. Open reduction and fixation with load bearing plates is a common approach. Though it permits a direct view of the fracture and anatomical reduction, but open reduction and plate fixation may be associated with an extensive soft tissue dissection which eventually may increase the risk of wound dehiscence and infection. Minimally Invasive Plate Osteosynthesis (MIPO) may overcome this, but reduction and proper alignment of the fracture is much more difficult, and rarely possible, compared to open procedures [2]. Temporary or definitive external fracture fixation is usually not recommended except for cases with extensive soft tissue damage. Intramedullary nailing of extra-articular proximal fractures can be considered a feasible solution to avoid soft tissue complications. But high rates of malunion have been reported for nailing, which is debated. The most common problem encountered with these fractures in anterior translation of proximal fracture segment over the distal one. The use of small reduction plate via mini-incision holds the fracture in place and subsequently nail can be locked with fracture reduced in accurate alignment [3-5].

Materials and Methods

This is a prospective study done in department of orthopaedics, Government Medical College and Hospital, Jammu from MAR'20 to JUN'20.

Inclusion criteria

All subjects sustaining fractures of tibia in the proximal one-third area were included in the study.

Exclusion criteria

- Compound fractures.
- Proximal one-third fractures which were extending intra-articularly.
- Paediatric fractures.
- Pathological fractures.
- Any other associated fractures other than ipsilateral fibula.

The patients were first managed on the lines of ATLS protocols and once stabilized and all other injuries excluded were planned for surgery after proper AP and Lat radiographs of the injured extremity [6].

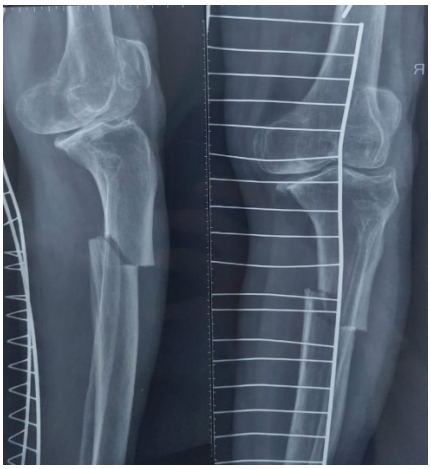

Figure 1. *Ap and lat x-ray of a patient with proximal one-third tibial fracture.*

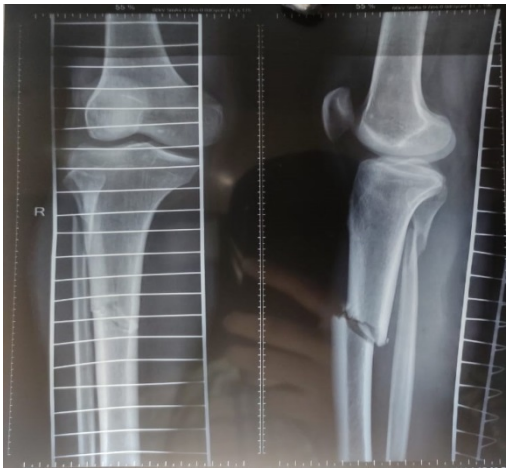

Figure 2. *Ap and lat x-ray of another patient with proximal one-third tibial fracture.*

In our normal(pre-covid) routine work days we when planning fixation of such fractures always kept c-arm handy and also nails with high Herzog bend(which lack distal targeting/ locking zig) were kept along with regular nails (Figure 1).

To the current prevailing covid crisis being at its peak and due to intermittent shutting down of our main to complexes we were forced to do such cases in ER without any c-arm guidance (Figure 2) [7-8].

Normal routine incision was used for all patients. Entry made with awl at the medial edge of lateral condylar eminence. Once guide-wire was passed fracture and on reaming the anterior translation of proximal fragment was there, a mini-incision was given over the fracture site and 2-4 hole plate was placed after reducing the fracture. Nail was locked with plate holding the fracture in proper alignment. Allgower-Donati sutures were given over the skin incision. Broad-spectrum antibiotics were administered for 5-7 days. Sutures were removed at 14 days of surgery. Patient was ambulated the next day of surgery with gradual weight bearing allowed after 2 weeks (Figure 3) [9].

Figure 3. *Depicting the post-op x-ray images of a patient of proximal one-third tibial fractures managed by intra-medullary nailing with reduction plate.*

Results

Patients were followed up for clinical and radiological evaluation using Johner and Wruh's criteria (Table 1).

Table 1. *Showing the parameters of Johner and wruhs criteria.*

	Excellent left Right	**Good**	**Fair**	**Poor**
Non-union, Osteomyelitis, amputation	None	None	None	Yes
Neurovascular disturbances	None	Miniml	Moderate	Severe
Deformity				
Varus/valgus	None	2-5	6-10	>10
Anteversion/ recurvation	0-5	6-10	11-20	>20
Rotation	0-5	6-10	11-20	>20
Shortening. Mm	0-5	6-10	11-20	>20
Mobility.%				
Knee	Normal	>80	>75	<75
Ankle	Normal	>75	>50	<50
Subtalar Joint	>75	>50	<50	
Pain	None	Occasional	Moderate	Severe
Gait	Normal	Normal	Insignificant limp	Significant limp
Strenuous activities	Possible	Limited	Severely limited	Impossible

Out of seven subjects 5 were male (72%) and two female (28%). The cause of fracture was RTA in six of seven subjects (86%) while one sustained injury due to being hit by a domestic cattle. Out of the seven subjects which were included in our study,5 had excellent outcome (72%), 1 had good outcome (14%), while one patient had poor outcome (14%). Six

of the seven fractures started showing signs of union at an average time of 3.6 ± 0.9 weeks, while one case had delayed union. No case showed loss of alignment whatsoever at any stage of follow-up. Post-op ROM was excellent in all case except for one [10-12].

There were two cases of infection (28%), out of which one was managed by oral antibiotics and regular ASDs, however one subject had a deep infection (14%) of the mini-incision site which required debridement along with removal of the hardware after about 3 weeks of the initial surgery.This case presented with delayed union [13].

Discussion

Proximal one-third tibial extra articular fractures have posed a treatment challenge for orthopaedic surgeons. Intra-medullary nailing definitely has advantage over plating in terms of tissue handling as well as load shearing nature of the nails [14]. Malalignment, however, is common with nailing techniques in these set of tibial fractures as demonstrated by several series since early times also. In a radiographic analysis of 133 tibia fractures treated with IMN fixation, Freedman and Johnson reported that 7(58%) of the 12 proximal tibia diaphyseal fracture were malaligned, compared with an overall rate of 12% in the whole cohort [15-18] Evaluated the outcome of surgical techniques in the management of extra-articular proximal third tibial fractures with regard to rates of nonunion, malunion, infection, compartment syndrome, and implant failure. Their studies also showed higher malalignment associated with IMN [19].

Conclusion

In properly selected cases,proximal one-third tibial fractures can be well managed with IMN along with reduction plate.However,one must be vigilant for any signs of infection in such cases. However,small number of cases is a limiting factor in our study [20-24].

Conflict of Interest

There are no conflicts of interest.

Declaration of Patient Consent

Well informed consent was taken from all patients/their guardians for our study.

Refernces

1 Bono CM, Levine RG, Rao JP, et al. Nonarticular proximal tibia fractures: treatment options and decisionmaking. J AmAcad Orthop Surg. 2001;9:176-86.

2 Court-Brown CM, McBirnie J. The epidemiology of tibial fractures. J Bone Joint Surg Br. 1995;77:417-21.

3 Cole Dean JMD. Intramedullary fixation of proximal tibia fractures.Techniques in Orthopaedics. 1998;13:27-37.

4 Eastman JG, Tseng SS, Lo E, et al. Retropatellar technique for intramedullary nailing of proximal tibia fractures: a cadaveric assessment. J Orthop Trauma. 2010;24:672-76.

5 Feng W, Fu L. Biomechanical evaluation of various fixation methods for proximal extraarticular tibial fractures. J Surg Res. 2012;178:722-27.

6 Flierl MA, Stahel P, Morgan SJ, et al. Surgical fixation of extra-articular tibia fractures: tips and tricks. Minerva Orthop Traumatol. 2009;60:527-40.

7 Lowe JA, Tejwani N, Yoo BJ, et al. Surgical techniques for complex proximal tibial fractures. J Bone Joint Surg Am. 2011;93:1548-59.

8 Oh JK, Sahu D, Hwang JH, et al. Technical pitfall while reducing the mismatch between LCP PLT and upper end tibia in proximal tibia fractures. Arch Orthop Trauma Surg. 2010;130:759-63.

9 Tytherleigh-Strong GM, Keating JF, Court-Brown CM, et al. Extra-articular fractures of the proximal tibia diaphysis: their epidemiology, management and outcome. J R Coll Surg Edinb. 1997;42:334-38.

10 Mueller CA, Eingartner C, Schreitmueller E, et al. Primary stability of various forms of osteosynthesis in the treatment of fractures of the proximal tibia. J Bone Joint Surg Br. 2005; 87:426-32.

11 Kurylo JC, Tornetta P. Extra-articular proximal tibial fractures: Nail or plate. AAOS Instructional Course Lectures. 2013;62:61-77.

12 Lindvall E, Sanders R, DiPasquale T, et al. Intramedullary nailing versus percutaneous locked plating of extra-articular proximal tibial fractures: Comparison of 56 cases. J Orthop Trauma. 2009;23:485-92.

13 Bhandari M, Audige L, Ellis T, et al. Evidence- Based Orthopaedic Trauma Working Group. Operative treatment of extra-articular proximal tibial fractures. J Orthop Trauma. 2003;17:591-95.

14 Hiesterman TG, Shafiq BX, Cole PA, et al. Intramedullary nailing of extra-articular proximal tibia fractures. J Am Acad Orthop Surg. 2011;19:690-700.

15 Attal R, Hansen M, Kirjavainen M, et al. A multicenter case series of tibia fractures treated with the Expert Tibia Nail (ETN). Arch Orthop Trauma Surg. 2012;132:975-84.

16 Cannada LK, Anglen JO, Archdeacon MT, et al. Avoiding complications in the care of fractures of the tibia. J Bone Joint Surg Am. 2008;90:1760-68.

17 Freedman EL, Johnson EE. Radiographic analysis of tibial fracture malalignment following intramedullary nailing. Clin Orthop Relat Res. 1995;315:25-33.

18 Hansen M, Mehler D, Hessmann MH, et al. Intramedullary stabilization of extraarticular proximal tibial fractures: A biomechanical comparison of intramedullary and extramedullary implants including a new proximal tibial nail (PTN). J Orthop Trauma. 2007;21:701-9.

19 Lang GJ, Cohen BE, Bosse MJ, et al. Proximal third tibial shaft fractures. Should they be nailed? Clin Orthop Relat Res. 1995;315:64-74.

20 Nork SE, Barei DP, Schildhauer TA, et al. Intramedullary nailing of proximal quarter tibial fractures. J Orthop Trauma. 2006;20:523-28.

21 Johner R, Wruhs O. Classification of tibial shaft fractures and correlation with results after rigid internal fixation.Clin Orthop Relat Res. 1983;178:7-25.

22 Freedman EL, Johnson EE. Radiographic analysis of tibial fracture malalignment following intramedullary nailing. Clin ortho rel res. 1995;315:25-33.

23 Lang GJ, Cohen BE, Bosse MJ et al. Proximal third tibial shaft fractures: should they be nailed? Clin orth Res. 1995; 315:64-74.

24 Whelan DB, Bhandari M, McKee MD, et al. Interobserver and intraobserver variation in the assessment of the healing of tibial fractures after intramedullary fixation. J Bone Joint Surg. 2002;84:15-8.

***Correspondence to**

Dr. Nitin Choudhary

Department of Orthopaedics,

Govt. Medical College,

Jammu and Kashmir,

India

E-mail: nitchy700@gmail.com