

Management of extra-articular fractures of proximal shaft tibia in adults by antegrade closed interlock intramedullary nailing and evaluation of clinical results – A prospective study

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Abstract

Background: Extra-articular proximal tibial fractures accounts for 5 to 11% of all tibial shaft fractures. Intramedullary fixation of these fractures is associated with malalignment because of displacing muscular forces acting on proximal fragment, capacious metaphyseal area and inaccurate entry point. The aim of this study is to evaluate the functional outcome of extra-articular fractures of proximal tibia treated with antegrade closed interlock intramedullary nailing supplemented with blocking k wires. **Method:** We studied prospectively 21 patients with proximal tibial fractures between June 2013 and June 2016 in Dept of orthopaedics, Govt Med College, Latur. Patients were admitted and treated in the form of antegrade closed interlock intramedullary nailing. Karlstrom Olerud scoring system was used for the assessment of functional outcome. **Results:** There were 15 males and 6 females in our study. According to AO classification, fracture patterns were classified as 42 A (n=8), 42B(n=8), and 42 C(n=5). Karlstrom Olerud scoring system was used for the assessment. According to this scoring system, results were judged as Excellent in 11 (52.4%), Good in 7(33.3%), Fair in 3(14.3%) and Poor in none of our patients. **Conclusion:** Intramedullary nailing offers functional and mechanically reliable method for fractures of proximal tibia if done with proper understanding of possible difficulties that may encounter intraoperatively, proper understanding of anatomy and muscular forces and relevant surgical techniques.

Key Word: extra-articular fractures, proximal shaft tibia.

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INTRODUCTION

Extra-articular proximal tibial fractures accounts for 5 to 11% of all tibial shaft fractures.^{1,2} These fractures often result from high velocity trauma leading to complex type of injuries involving bone and soft tissues.¹

Unlike the intramedullary fixation of diaphyseal fractures of tibia, nailing of proximal tibial metaphyseal fractures with a short proximal fragment is associated with increase in mal-alignment both in sagittal and coronal plane.²⁻⁵ This has been attributed to displacing muscular forces acting on proximal fragment, capacious metaphyseal area and inaccurate entry point.² Malunion, nonunion, rotational deformities and stiffness of adjacent joints are the complications found in conservatively treated fractures.⁶⁻⁸ To overcome these complications variety of treatment options are available for extra-articular proximal tibial fractures like intramedullary interlock nailing, external fixation, plate fixation or combination of these.⁹⁻¹⁰ The aim of this study is to evaluate the functional outcome of extra-articular fractures of proximal tibia treated with antegrade closed interlock intramedullary nailing.

MATERIALS AND METHODS

We studied prospectively 21 patients of proximal tibial fractures between June 2013 and June 2016 with mean age of 44.29 yrs. According to AO classification, fracture patterns were classified as 42 A (n=8), 42B(n=8), and 42 C(n=5). There were 15 males and 6 females in our study. Road traffic accident was the cause of injury in 15(71.43%) patients, injury by assault in 2(9.52%), and injuries by fall from height in 3(14.28%) patients. Right side was involved in 11 patients while left side was involved in 10 patients. 16 (76.2%) were closed injuries and 5(23.8%) were compound injuries. According to Gustilo Anderson’s classification, 02 were Grade I, 02 were Grade II and 01 patient had Grade III A injury. The mean length of proximal fragment was 10.5 cms. The surgical procedures were performed between 3 to 30 days after trauma with average time of 6.67 days after the injury. Associated injuries of ulna, radius, and femur were present in 9(42.86%) patients but it did not affect the management.

Inclusion criteria included all patients of either sex above 18 years of age, extraarticular tibial fractures with length of proximal shaft > 6cms, all closed fractures and compound fractures up to Grade III A of proximal tibia. Exclusion criteria included pathological fractures, proximal fractures of tibia with intraarticular extension and critically ill patients.

RESULTS

The patients were followed up at intervals of 6-8 weeks up to 1 year and then every 6 monthly thereafter. We were able to achieve union in all the patients with average union time of 18.19 weeks. Karlstrom Olerud scoring system was used for the assessment. According to this scoring system, results were judged as Excellent in 11 (52.4%), Good in 7(33.3%), Fair in 3(14.3%) and Poor in none of our patients.

We experienced delayed union in one of the patients. We attribute this to compound nature of the injury, however, fracture united eventually at 26 weeks postoperatively. The final range of motions in knee and ankle joint were normal in 12(57.1%) of our patients, restriction of ROM up to 10^0 at ankle joint and 20^0 at knee joint in 06(28.6%) patients and restriction of ROM of 10^0-20^0 at ankle joint and 20^0-40^0 at knee joint in 03(14.3%) patients. 03(14.3%) patients had anterior knee pain. 01(4.76%) patient had superficial skin infection. Post operatively varus malalignment of 3^0-5^0 was noted in 02 (9.52%) patients while procurvatum of 6^0 was noted in 01(4.76%) of the patients. We did not experience implant failure in any of our patients.

Table 1: AO classification wise distribution

AO Type	No of Patients
A1	01
A2	02
A3	05
B1	01
B2	06
B3	01
C1	01
C2	01
C3	03

Table 2: Complications

SR No	Complication	No of Patients
01	Malalignment	03
02	Anterior knee pain	01
03	Superficial infection	01
04	Delayed union	01

Table 3: Clinical Result by Karlstrom Olerud scoring system

Clinical Result	No of Patients	%
Excellent	11	52.4
Good	07	33.3
Fair	03	14.3
Poor	00	00

X rays with clinical photos:- (Proximal 1/3rd Shaft Tibia Fracture)



Pre OP X Rays

Post OP X Rays

Uniting Fracture At 12 Weeks

United Fracture At 19 Weeks

Clinical Photos (continued)



Sitting Cross Legged Knee Flexion Weight Bearing on Operated Leg Knee Extension with Dorsiflexion Knee Extension with Plantar Flexion

X rays with clinical photos:- (Proximal 1/3rd Shaft Tibia Fracture)



Pre OP X Rays

Post OP X Rays



Uniting Fracture At 12 Weeks

United Fracture At 18 Weeks

Clinical Photos (continued)



Sitting Cross Legged Weight Bearing on Operated Leg Knee Flexion Knee Extension with Dorsiflexion Knee Extension with Plantar Flexion

DISCUSSION

The fixation of proximal tibial fractures is associated with high incidence of malalignment.² Valgus malalignment and apex anterior and anterior displacement of proximal fragment are the most common deformities. This is attributed to the muscular forces acting on the fracture fragments. The causes of coronal plane deformities are by the pull of attached pes anserinus medially, medial entry

point and laterally directed nail insertion angle. Saggital plane deformities are caused by pull of the patellar tendon, distal and medial entry point for nail insertion and wedge effect of bent nail in the distal fragment. Other contributing factors include poor bone-nail contact due to capacious metaphysis. Also, lack of long posterior cortex results in apex anterior deformity.

Poller screws or blocking k wires placed adjacent to center of rotation of angulation (CORA) and perpendicular to plane of deformity have been suggested as possible method for reduction of fracture fragments while negotiating displacing forces at fracture site.¹¹ Blocking k wires reduces the effective intramedullary diameter while enabling the reduction. In our study, we put one anteroposterior blocking k wire just adjacent to the central axis of distal part of proximal fragment and another one from medial to lateral direction in the posterior half of the proximal fragment. This has avoided malalignment at the fracture site by negotiating muscular forces acting on fracture fragments.

High and lateral entry point has been advocated to avoid flexion and valgus deformities at fracture site.¹²

In our study, one of the patients had delayed union but that was a Gustilo Anderson's Grade III A injury and we attribute this to the compound nature of the injury. This fracture was united eventually at 26 weeks postoperatively. None of the patient I our study had non union. No cases of implant failure have been noted. The final range of motion at knee and ankle joint were normal in 12 of our patients. This has been attributed to the early rehabilitation of patients. Range of motion was affected in 09 of our patients .We attribute this to compound nature of injuries, associated injuries of ipsilateral lower extremity and incomppliance on the patient's part. More the soft tissue injury, more was the time to initiate mobilization and thus the restriction of range of motions. 01 of the patient had anterior knee pain in the post operative period. We attribute this complication as of possible intra-articular injury during nail insertion while taking high entry point. Superficial skin infection was noted in one of the patient. We attribute to this complication to the compound nature of the injury. None of the patient in our study had deep infection. Malalignment was noted in 03 of the patients at the time of union as axis deviation of proximal and distal fragments on anteroposterior and lateral views radiologically. We attribute malalignment due to technical error intraoperatively in 01 of the patients, due to severe comminution in 01 of the patients and due to early weight bearing in 01 of the patients.

The overall functional results were evaluated by Karlstrom Olerud scoring system. According to this scoring system, results were judged as Excellent in 11

(52.4%), Good in 7(33.3%), Fair in 3(14.3%) and Poor in none of our patients.

Intramedullary nailing offers functional and mechanically reliable method for fractures of proximal tibia if done with proper understanding of possible difficulties that may encounter intraoperatively, proper understanding of anatomy and muscular forces and relevant surgical techniques.

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