

Radiological outcome of proximal tibia fractures treated with MIPPO – a retrospective study

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Abstract

Background: The concept of minimally invasive Osteosynthesis using percutaneous plate (MIPPO) was established when it is accepted that the length and alignment of proximal tibia can be restored with indirect manipulation and reduction technique. Biological fixation with percutaneous plating augments the healing process without additional risk of wound disruption and infection. **Purpose:** The aim of the study was to evaluate the radiological outcome of proximal tibial fractures treated with minimal invasive percutaneous plate technique osteosynthesis.

Method & Material: The present study is a retrospective cohort study conducted based on the data obtained in the operative registry from the Department of Orthopaedics, during the period of September 2019 to January 2021, at R L Jalappa Hospital, kolar. This study included 32 patients with the fracture proximal tibia treated with MIPPO plating technique and age of patient ranging from 20 to 75 years. All the patients meeting the inclusion and exclusion criteria were included in the study. The radiographic images were taken from the database and classified fractures based on schatzkers classification and were evaluated for the radiological outcome based on union time and Rasmussen's radiological criteria for the outcome. **Result:** A total of 32 patients of proximal tibial fractures were treated with minimally invasive percutaneous plate osteosynthesis technique. There were 20(62.5%) were males and 12(37.5%) were females, with patients in the age group of 26-68 years. 17(53.3%) were right sided and 15(46.8%) were left sided. Lateral condyle involved was 17(53%) >bicondylar condyle involved was 8(25%) >medial condyle involved was 7(21%). Road traffic accident evolved as most common (75%) mode of injury. Fractures were classified according to schatzkers classification. Type 1 of fracture seen in 6 (19 %), type 2 in 3 (9%), type 3 in 10 (21.9%) type 4 in 7 (21.9%) type 5 in 5 (15%) patients and type 6 in 2 (6%) patients. Rasmussen's radiological scoring system was used for final evaluation of the results. According to Rasmussen's radiological score, in our study we excellent radiological outcome was achieved in 25% (8) of the cases and good outcome was achieved in 40.6% (13) of cases and fair outcome was achieved in 34 % (10) of cases and poor outcome was achieved in 3% (1) of cases

Conclusion: Minimally invasive percutaneous plate Osteosynthesis is better technique, and should be considered as primary option for the surgical treatment of the proximal tibia fractures. Radiological outcome of MIPPO technique are excellent and good and comparable to world literature in terms of fracture union. MIPPO technique can be successfully used for the simple or compound fracture of proximal tibia.

Keywords: radiological, tibia, MIPPO.

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Introduction

The proximal tibia is involved in the transfer of body weight through the knee joint and leg, playing a vital role in the function and stability of the knee joint[1,2]. Fractures of the proximal tibia are associated with a wide range of severity that can exist from stable non-displaced fractures with minimal soft-tissue damage to highly comminuted unstable fractures and severe soft-tissue damage and are generally classified into two broad categories, high energy fractures and low fractures. The complications of the treatment and the injuries associated with this fracture have led to different approaches and ways of fixation. Conventional Arbeitsgemeinschaft fur Osteosynthesis fragen (AO) veneers require fracture exposure and extensive soft tissue dissection, leading to the risk of bleeding, infection and soft tissue destruction[3]. While the problem of soft tissue scarring and deep infection can be largely avoided with a hybrid fixator, it carries risks of non-union, vicious callus and pinching infection; Patient dissatisfaction is also a major limitation of this surgical technique[4]. The intramedullary nail (IMN) has its

limitations because it cannot be used in high proximal tibial fractures and fractures with intra-articular extension. It is not effective in providing rigid stability in the proximal tibia due to the trumpet-shaped enlargement of the medullary cavity of the proximal tibia, resulting in an increased incidence of malalignment[5]. With the introduction of the Locking Plate (LCP) and the Less Invasive Stabilization System (LISS) in fracture fixation, fixation of the proximal tibial fracture has undergone a revolutionary change [6]. Percutaneous fixation of the proximal tibia with the above plates showed promising results. The concept of minimally invasive osteosynthesis using a percutaneous plate arose when surgeons realized that the length and alignment of the proximal tibia can be restored with indirect manipulation and other reduction technique [7]. Biological fixation with percutaneous plate increases the healing process without additional risk of wound rupture and infection [8]. The aim of this article is to report the radiological outcome of a proximal tibial fracture treated with MIPPO

Materials and methods

The study design is retrospective cohort study. The present study was conducted in the Department of Orthopaedics, during the period of September 2019 to January 2021, at R L Jalappa Hospital, kolar. Patients that meet the inclusion criteria i. e patients between 20 – 75 years of age with closed/ open proximal tibial fractures treated with MIPPO technique and exclusion criteria such as Pathological fracture, any knee deformity, Surgery on ipsilateral knee, associated any other

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long bone fracture, non-ambulatory patient were taken up for studies. This study included 32 patients with the fracture proximal tibia of the patients and age of patient ranging from 25 to 70 years. Patient details were obtained from the admission and surgical register present in the department of orthopaedics, R L Jalappa Hospital, kolar. The pre op and follow up x-rays will be taken from the moksha online software rented by the hospital. Pre-operative X-rays were collected and fractures were classified according to Schatzkers classification. Fractures according to Schatzkers staging system. It is classified as Type I—pure cleavage, Type II—cleavage combined with depression,

Type III—pure central depression, Type IV—fractures of medial condyle, Type V-bicondylar fractures, Type VI-plateau fracture with dissociation of metaphysis and diaphysis. The fracture was considered united if three or more than three cortices on two radiographic views showed callous formation[8].

Nonunion was defined only if three consecutive months X-rays do not show progressive healing in the fracture site. The patients were followed up at 6 weeks, 3 months and 6 months Rasmussen’s radiological scoring system was used for final evaluation of the results The data collected will be analysed using SPSS software

Subjective	Points
A. Articular depression	6
Not present	0
≤5 mm	4
6–10 mm	2
>10 mm	0
B. Condylar widening	6
Not present	0
≤5 mm	4
6–10 mm	2
>10 mm	0
C. Angulation (valgus/varus)	6
Not present	0
<10°	4
10–20°	2
>20°	0
Maximum	18
Excellent	18
Good	12–17
Fair	6–11
Poor	<6

Results

Our study population included 32 patients treated with MIPPO technique for proximal tibia fractures. Out of 32 proximally tibia fractures treated with MIPPO technique patients 20 (62.5%) were

males and 12(37.5%) were females. Average age of the patients was 47yrs(26yrs-68yrs) Out of 32 operated proximal tibia 17(53.3%) were right sided and 15(46.8%) was left sided as depicted in Fig -1

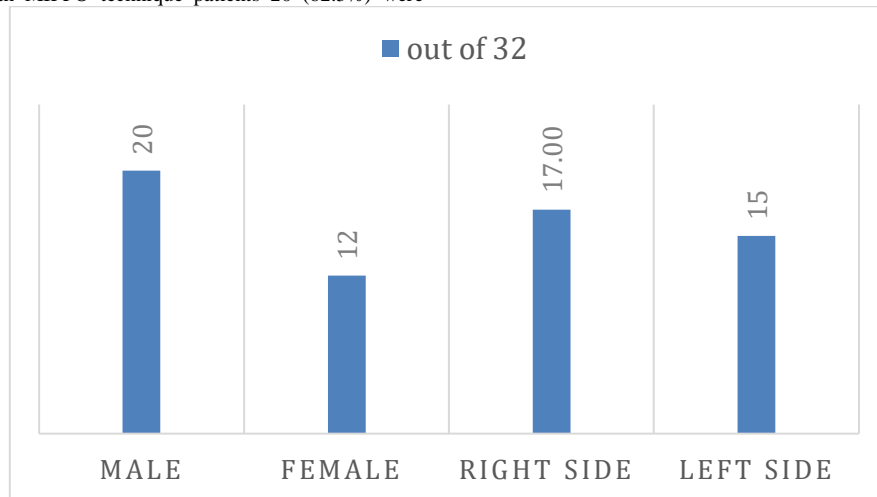


Fig 1: Individual characteristics distribution in gender and side of injury

Lateral17/32(53%)>medial condyle7/32(21%) <bicondylar fracture 8/32 (25%). Type 1 of fracture seen in 6 (19 %), type 2 in 3 (9%), type 3 in 10 (31.9%) type 4 in 7 (21.9%) type 5 in 5(15%) patients and type 6 in 2 (6%) patients. High trauma injury 24(75%) and low

trauma injury 8(25%). Four patients (12.5%) developed deep infection (3 with open injury (75%) and one in closed (25%) as depicted in fig -2.

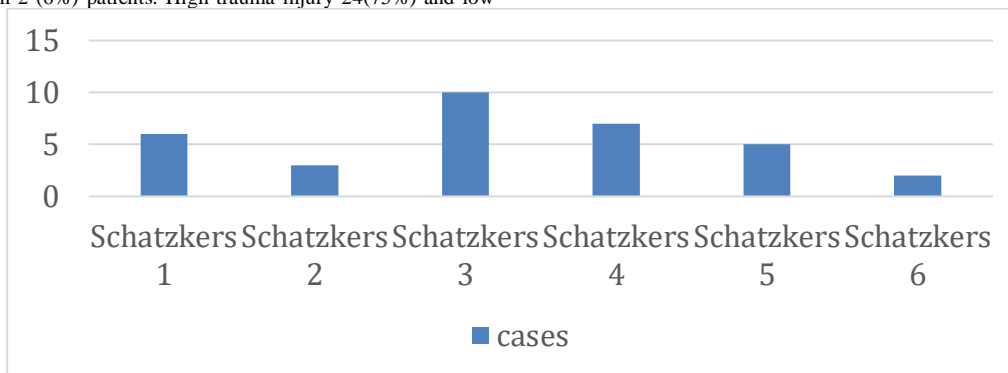


Fig 2 : Schatzkers Classification Distribution

Five patients (15.6%) required fasciotomy for the impending compartment syndrome post operatively 2(40%) in closed and 3(60%) in open cases. 7(21.8%) cases required prolonged antibiotic therapy for the deep infection and the open injuries.2(28.5) in closed cases and 5(71%) in open fractures. The closed and type 1 open fractures got united after an average follow-up of 8 weeks (range 6–12 weeks), type 2 and 3 fractures

(average time 12 weeks, range 10–14 weeks, type 4 united after an average of 13 weeks (11-15 weeks) and type 5 and 6 got united at an average of 20 weeks (16-24 weeks) as depicted in graph-3. Only single patient complained that of hardware prominence.

Radiological outcomes of the patients at 6monthly follow-up have been mentioned in Table below.

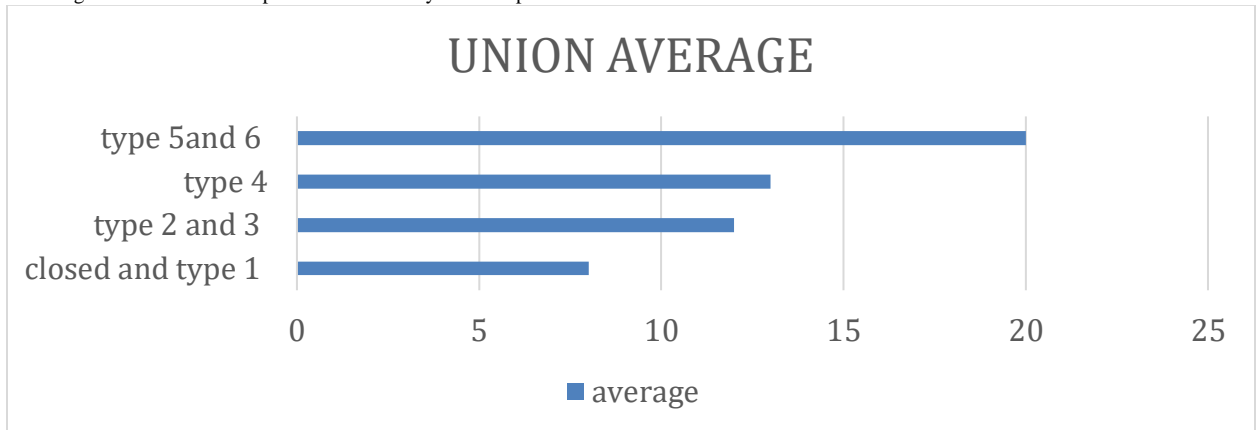


Fig 3: Average time for union of fractures

The alignment of the tibia, measured immediate postoperative period and 6monthly follow up, did not show any difference which indicated that there was no secondary loss of reduction. In our study excellent radiological outcome was achieved in 25% of the cases and good outcome was achieved in exactly 40.6% of cases and fair outcome was achieved in 34% of cases and poor outcome was achieved in 3% of cases. X-rays in our study excellent radiological outcome was achieved in 25% of the cases and good outcome was achieved at 40.6% of cases and fair outcome was achieved in 34% of cases and poor outcome was achieved in 3% of cases as shown in Fig 5.



Fig 4: Pre and post OP images of an case

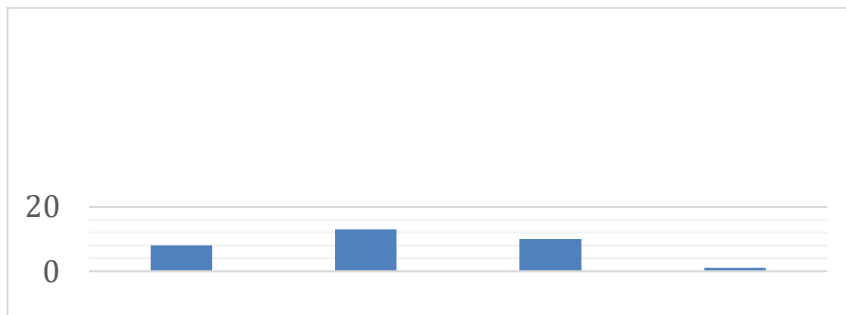


Fig 5: Radiological outcome of the study

Discussion

We were able to identify the radiological outcome of proximal tibia fractures treated with MIPPO plating technique. The incidence of proximal tibial fractures increases not only with increasing road traffic accident, but also the complexity of fracture has changed due to high velocity direct impact causing more comminution at fracture site and pathology[4]. Moreover, the management of high energy proximal tibia fractures is a challenging task for the surgeon, as they are often associated with a number of complications[3,9]. MIPPO enables indirect fracture reduction with percutaneous sub muscular implant placement[7]. In our study the patients with fracture in our

study occurred between 26 to 68 years and an average of 47yrs. The age of with maximum incidence involving the productive age group of 20-50 years (80%) according to Allen Cr et al based on his study[9]. This was in accordance with a study by P.A Cole et al in 2004 who also found the majority of patients with an average of 45 years, and with the study of Ricci and Stannard with average of 53 years and 38yrs respectively[5-7]. In another Indian study by Sharma et al, similar results were found where RTA was the most common cause of fractures[8]. It is comparable with our study which shows the most common fractures are due to high energy trauma like the RTA which approximates to 75%. In our study majority of the patients

were males 65%, which can be attributed to our Indian setup. The right tibia was affected in 55%, left tibia in 45% of cases in our study. And lateral condyle involved more than the medial condyle (53%) The average time for union of fractures was 16 weeks in our series ranging from 8 to 26 weeks. In our study, out of the 32 fractures, most of them fell into schatzkers type 3 and type 4 (nearly 40.8%) classification of proximal tibial fractures. In the study by Sharma et al, type 4 and 5 were more common as was seen in another study by marsh et al, while in a study by Raza et al, type 3 and type 4 were found to be predominant [10] which is similar to our study group results. Amongst the complications observed, 4 patient (12%) developed infection within 2 weeks postoperatively, which was comparable to the studies conducted by Egol et al[2,3] who reported no infection, Stannard et al[7] reported 15.9% rate of infection and Cole et al[5] with 9% rate of infection. The mal-alignment rate was 5% in our study, as compared to 2.6% in a study by Cole et al[2] and 22% in the study by Phistikul et al[1]. We had excellent and good radiological outcome in 65% of the cases and fair in 35% of the cases. Only in 1 (3%) of the patients the result was poor. Reddy et al reported an excellent radiological result as in 86.7% of the cases and 13.3% had good results, while in a study by Rohra et al, 85.29% of the patients had excellent and 14.71% had good results[4,6]. Similar results were observed by Yu et al, Prasad et al, Zhang et al, Oh et al[8,9].

Conclusion

From our study it is further proved that the effectiveness of Minimally invasive plate osteosynthesis (MIPPO) technique has given Excellent/Good functional out come in most of our cases. Radiological outcome of MIPPO technique area unit favourable and similar to world literature in terms of fracture union. MIPPO technique may be with success used for the straightforward or open fracture of proximal tibia.

Conflict of Interest: Nil Source of support: Nil

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