



Orthopaedics

THE CLINICO-RADIOLOGICAL AND FUNCTIONAL OUTCOME OF MINIMALLY INVASIVE PLATE OSTEOSYNTHESIS IN PROXIMAL TIBIAL FRACTURES.

Dr. Vikas Rao	Post Graduate Student, Department of Orthopaedics, MAMC, Agroha (Hisar), Haryana.
Dr. Ashok Kumar*	Professor & Unit Head, Department of Orthopaedics, MAMC, Agroha (Hisar), Haryana*Corresponding Author
Dr. Anurag Chhabra	Senior Professor & Head of Department, Department of Orthopaedics, MAMC Agroha (Hisar), Haryana
Dr. Anubhav Chhabra	Senior Resident , Department of Orthopaedics, MAMC Agroha (Hisar),
Dr. Saurav Brar	Post Graduate Student, Department of Orthopaedics, MAMC, Agroha (Hisar), Haryana
Dr. Manish Kumar	Post Graduate Student, Department of Orthopaedics, MAMC, Agroha (Hisar), Haryana

ABSTRACT The proximal tibia helps in transmission of body weight and plays an important role in the stability and functioning of the knee joint. The goal of proximal tibial fractures treatment is to obtain early union of fracture in the most acceptable anatomical position with early and maximum functional return of activity. This study aims to determine the clinico-radiological and functional outcome of Minimally Invasive Plate Osteosynthesis in proximal tibia fractures. A total of 30 patients with proximal tibial fractures and fulfilling the inclusion criteria were included in the study. The fractures were classified according to the Schatzker classification. Patients were evaluated functionally using the Knee Society score and radiologically according to the Modified Rasmussen criteria. According to the Knee Society Score, 23 (76.67%) of the patients had excellent results, 4 (13.33%) patients had good results, 2 (6.67%) patient had fair results and 1 (3.33%) patient performed poorly. According to the Modified Rasmussen criteria, 24 (80.00%) of the patients had excellent results, 5 (16.67%) patients had good results, 1 (3.33%) patient had fair result and none of the patient performed poorly. Superficial surgical site infection was observed in 2 (6.67%) of the patients. 1 (3.33%) patient had delayed union and 1 (3.33%) patient had aseptic exposure of implant. In 26 of the patients there were no complications. There were no cases of deep infection. The present study shows and demonstrates that closed reduction and internal fixation using the principles of minimally invasive plate osteosynthesis is a reliable method for the management of proximal tibial fractures.

KEYWORDS : proximal tibial fractures, minimally invasive plate osteosynthesis, MIPO

INTRODUCTION

The proximal tibia helps in transmission of body weight from distal femur and plays an important role in the stability and functioning of the knee joint. Any injury to this area may lead to loss of function and stability of knee joint.^{1,2} Proximal tibial fractures can range in severity from stable undisplaced fractures to highly comminuted and unstable fractures. There may be minimal to severe soft tissue involvement.

The goal of proximal tibial fractures treatment is to obtain early union of fracture in the most acceptable anatomical position with early and maximum functional return of activity. The single most important factor in treatment of these fractures is the management of overlying soft tissue.

The principle of minimally invasive technique include indirect closed reduction, extra periosteal dissection and relative stability which allows limited controlled motion at the fracture site with secondary bone healing with callus formation.^{3,4} Biological plating provides relative stability and preserves vascularity around the fractures with less damage to the periosteum.⁵⁻⁷ Moreover, MIPO has certain advantages which include decreased operative time, smaller incision, less blood loss, short hospital stay and early rehabilitation.^{8,9}

Materials and Methods

The present prospective study was carried out at Maharaja Agrasen Medical College, Agroha, Hisar in patients of proximal tibial fractures presenting to Orthopaedics OPD or Emergency from April 2021 to April 2022. Ethical committee clearance was obtained for our study. A total of 30 patients fulfilling the inclusion criteria were treated with minimally invasive plate osteosynthesis. The fractures were classified according to the Schatzker classification

Patient remained non weight bearing on operated limb for a minimum period of 8 weeks. In most of the patients, partial weight bearing was started after 8 weeks starting with 25% and gradually increasing 25% every week. In some of the comminuted intraarticular fractures, weight

bearing was delayed even after 8 weeks. Patients were evaluated functionally using the Knee Society score and radiologically according to the Modified Rasmussen criteria at followup.

Inclusion Criteria

- i) Patients with closed and open grade 1 extraarticular proximal tibial fractures of duration <2 weeks.
- ii) Patients with closed and open grade 1 intraarticular fractures (Undepressed Schatzker type 5 and 6) of duration <2 weeks.

Exclusion Criteria

- i) Patients with vascular injury, uncontrolled Diabetes Mellitus, peripheral vascular disease.
- ii) Patients with pathological fractures other than osteoporosis.
- iii) Patients with open tibial fractures grade 2, grade 3 and grade 4.
- iv) Patients with intraarticular fractures (Schatzker type 1 to 4 and depressed Schatzker type 5 and 6).

Results

Mean age of the study population was 36.30±12.75 years with age ranging from 18 to 70 years. There were 25 (83.33%) male patients as compared to 5 (16.67%) females. Majority of patients i.e. 25 (83.33%) were injured in road traffic accidents (RTA) and 5 (16.67%) patients were injured due to fall.

In the present study, 16 (53.33%) of the patients had extraarticular fractures while 14 (46.67%) had intraarticular fractures. There was closed fracture in 27 (90%) of the patients while 3 (10%) had Gustilo Anderson open grade 1 fractures. Out of the 30 patients included in the study, 14 patients had intraarticular fractures which were further classified according to the Schatzker classification. Out of these 14, 11 (36.67%) had Schatzker type 6 fracture and 3 (10.00%) patients had Schatzker type 5 fractures.

The mean interval from injury to surgery was 6.77±3.70 days. In 4 (13.33%) patients the duration of surgery was less than 60 minutes.

Mean time for surgery was 75.50±9.22 minutes. Mean time for union of fracture was 16.40±2.79 weeks. According to the Knee Society Score, 23 (76.67%) of the patients had excellent results, 4 (13.33%) patients had good results, 2 (6.67%) patient had fair results and 1 (3.33%) patient performed poorly. (Fig.1)

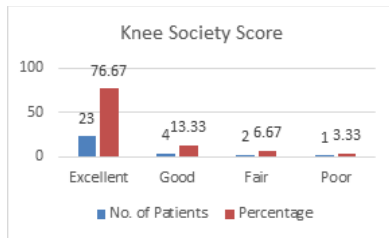


Fig 1: Knee society score

According to the Modified Rasmussen criteria, 24 (80.00%) of the patients had excellent results, 5 (16.67%) patients had good results, 1 (3.33%) patient had fair result and none of the patient performed poorly. (Fig. 2)

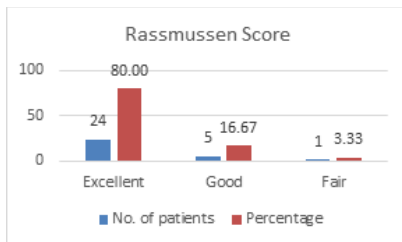


Fig 2 : Rasmussen score

Superficial surgical site infection was observed in 2 (6.67%) of the patients. 1 (3.33%) patient had delayed union and 1 (3.33%) patient had aseptic exposure of implant. In 26 of the patients there were no complications. There were no cases of deep infection. (Fig. 3)

Complications		No. of patients	Percentage
Infection	Superficial	2	6.66%
	Deep	0	0%
Knee stiffness	1	3.33%	
Any nerve injury	0	0%	
Loss of reduction	0	0%	
Implant failure	0	0%	
Aseptic implant exposure	1	3.33%	
Delayed Union	1	3.33%	
None	25	83.33%	

Fig 3: Complications

Discussion

The treatment of fractures of proximal tibia has been a challenge, because of the limited soft tissue envelope and poor vascularity. Earlier, proximal tibial fractures were treated conservatively with POP casts, tractions and braces. These conservative methods were associated with very poor functional outcome. This was followed by the use of external fixator as a treatment method for proximal tibial fractures. These had improved short term results but lead to long term complications like pin tract infections, malunion, non-union, frame failure and secondary osteoarthritis. 10 Due to the need for a secondary procedure post external fixation, this procedure is limited to only fractures with open wound and poor soft tissue conditions.¹¹⁻¹⁴

The management of proximal tibial fractures changed dramatically in 1960s. Patients were treated with internal fixation and were pain free and had good functional outcome. This led to widespread use of internal fixation as a treatment modality for management of proximal tibial fractures. Significant soft tissue and periosteal injury are caused by open reduction and internal fixation with plates, which can lead to problems such infection, malunion, and non-union.

In the 1990's Krettek et al. popularized the Minimally Invasive Plate Osteosynthesis (MIPO) technique in which conventional plates were placed through a small incision and slid through a subcutaneous

tunnel. As there is minimal soft tissue handling, biological plating using minimally invasive technique provides good functional outcome.¹⁵

In the present study, the average time for union was 16.40±2.79 weeks. The maximum number of fractures united between 12-18 weeks. There was 1 case of delayed union which united at 26 weeks. The nutritional status of the patient, tobacco consumption affects the union rate of the fracture. Krettek et al, Biggi et al, Gupta et al, Vora et al reported union times which were comparable to the present study and were 16 weeks, 16.8 weeks, 17 weeks and 17.6 weeks respectively.

The extraarticular fractures were associated with good and excellent results. Most of the intraarticular fractures were also associated with good and excellent results. A few of the intraarticular fractures with comminution were associated with poor and fair outcomes. The lack of proper physical therapy attributed to the poor outcome. One of the patients who was non-compliant and did not follow the physical therapy regime had knee stiffness. Efforts were made and physical therapy was started but the patient's knee could not attain its pre-operative range of motion. The age of the patient and associated comorbidities also contributed to the poor outcome. So, proper physical rehabilitation, age and associated co-morbidities play a very important to attain the pre-operative functional status.

In the present study the radiological outcome was evaluated using the Modified Rasmussen criteria. Condylar widening in intraarticular fractures was associated with poor outcomes.

2 cases had superficial surgical site infection in early post op period. The infection subsided with 7 days of i.v. antibiotics. There were no cases of deep infection. There was one case of delayed union and one case of wound dehiscence with aseptic exposure of the implant. Low socioeconomic status, poor nutrition and smoking might have contributed to the delayed union.

Conclusion

The present study shows and demonstrates that closed reduction and internal fixation using the principles of minimally invasive plate osteosynthesis is a reliable method for the management of proximal tibial fractures. There is minimal soft tissue stripping, decreased operative time and better healing of the surgical site wound. With a well-planned approach and following all principles and technique, acceptably good results can be obtained both functionally and radiologically at midterm follow up with minimal complications. The management of proximal tibial fractures still remain a challenge and various surgical techniques have been evolved to address this challenge. Further studies with a long term follow up and larger sample size are required to validate the results of present study.

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