

# Minimally Invasive Percutaneous Plate Osteosynthesis (MIPPO) For Proximal Tibial Fractures.

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## ABSTRACT

**Background:** The concept of biological osteosynthesis refers basically to the conservation of vascularity of the bone during surgical intervention to ensure the continued vitality of the individual fragments and to achieve improved fracture healing. Aim: To study outcome of proximal tibial fractures treated with proximal tibial plate using minimally invasive percutaneous plate osteosynthesis (MIPPO) technique. **Methods:** The present study was carried out for evaluation & analysis of the role of minimally invasive percutaneous plate osteosynthesis in cases of proximal tibial fractures. **Results:** Total of 30 patients were taken up & after proper pre-operative assessment plating was done and the results were evaluated. **Conclusion:** On the basis of the finding of this study it was concluded that MIPPO technique preserves most of the osseous vascularity thus providing for a more biological repair.

**Keywords:** Proximal tibial fractures, minimally invasive plate osteosynthesis.

## INTRODUCTION

Fracture is the result of mechanical overload with important biological consequences. Proper understanding of mechanical and biological aspects of fracture repair is the key to selection of particular type of treatment modality for a given fracture. With the damage to soft tissues following the high energy of proximal tibial fractures, conventional open reduction and internal fixation often result in substantial soft tissue complications such as wound breakdown and deep infection.<sup>[1-3]</sup> To avoid these complications, the hybrid or circular wire external fixator is a good option, but problems of nonunion, mal-union, and pin track infections are common.<sup>[4]</sup>

The Minimal Invasive percutaneous Plate Osteosynthesis (MIPPO) technique was developed not only to improve the rate of fracture healing, but also to limit soft tissue elevation at the fracture site.<sup>[5-7]</sup> Biological plating techniques are those in which blood supply to the fractured fragments is

maximally preserved. The objective of biologic fixation is to assist physiological process of bone healing wisely and optimally with minimal amount of operative intervention.<sup>[8]</sup> Thus, the emphasis should be laid on maintaining a precarious balance between devascularization and mechanical perfection.

Minimally invasive percutaneous plating techniques reduce surgical trauma and maintain a more biologically favorable environment for fracture healing, reducing risks of infection and nonunion.<sup>[9]</sup> Fractures fixed by MIPPO do not show primary bone healing as seen in rigidly fixed fractures with DCP (Dynamic Compression Plate). The bone healing in case of MIPPO depends upon the formation of bridging callus.

## MATERIALS AND METHODS

30 patients were operated by minimally invasive plate osteosynthesis and the results were observed. The patients were placed supine on a table to allow access to the image intensifier. Closed reduction of the fracture was done. The whole of operative limb was cleaned. For proximal tibial fractures the anteromedial/anterolateral approach was used. A 2 cm incision was made proximal to the fracture site and a subcutaneous tunnel was created with the help of a periosteal elevator. The appropriate length of the plate (T- buttress or a locking compression plate) was determined by placing a plate along the

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anterior aspect of the leg and adjusting it so that under fluoroscopy the proximal end of the plate is just below the joint line and the distal end extends at least three screw holes beyond the distal limit of the tibial fracture. The plate was then slid subcutaneously across the fracture site to reach distal fragment.

Another 2 cm incision was given distally where the plate ended. This plate was then contoured precisely to conform to the condyle and proximal metaphyses and secured to the condyle with appropriate locking / cortical / cancellous screws of sufficient length.

Post operative check X-ray was taken to assess the reduction. Parenteral antibiotics (Inj ceftriaxone + Inj amikacin) were given for two days followed by oral antibiotics depending upon the condition of the wound. On 3rd post-operative day wound was examined and antiseptic dressing done. The splint was removed and physical therapy with quadriceps exercises and gentle active assisted exercises started depending on toleration of patient. Sutures were removed between 10th to 14th days.



**Figure 1: Percutaneous placement of plate**



**Figure 2: MIPPO of proximal tibial fracture**



**Figure 3: Photograph showing range of motion at knee in post-op case of proximal tibia fracture.**

## RESULTS

In case of proximal tibial fractures mean age of the patients was 38.2 years. Most of the patients were in the age group of 20-40 years.

Of the 30 patients with proximal tibial fractures 23 were males and 7 were females.

Road traffic accidents were the commonest mode of trauma in proximal tibial fractures. Overall out of 30 cases, in 22 cases the injury was due to road traffic accidents.

In 30 cases of proximal tibial fractures, radiological union was seen between 14 to 22 weeks with average time to union being 15.5 weeks.

In this study of 30 cases of proximal tibial fractures, 20 patients had achieved 00 to 1100 of movement at the knee, in 8 patients range of movement at the knee achieved was 0-50(extension gap) to 900-1100 (flexion) and in only 2 patient the range of motion was >50 (extension gap) to 900 (flexion).

The overall results in case of proximal tibial fractures

were tabulated into three groups i.e. excellent, good and poor, according to the criteria laid down by Savoie et al (1987)<sup>10</sup>. Out of a total of 30 cases 29 had an acceptable result (19 excellent and 10 good) whereas one patient had poor result.

In this study of 30 cases of upper end tibial fractures, 2 cases had mild persistent pain at the site of implant at 6 months after the tibial plating.

Overall there were three cases who had early infection; all three were superficial, that healed after appropriate antibiotics and antiseptic dressing. There was one case of delayed union in the proximal tibial group which was managed conservatively. There was no case of non-union.

## DISCUSSION

Intramedullary nailing is reported to have the lowest infection rates compared with other techniques but the technique is associated with other complications such as malunion,<sup>[11-13]</sup> fat embolus syndrome, compartment syndrome and anterior knee pain.<sup>[14-16]</sup> Angular malalignment and malunion have been reported with intramedullary nailing of these fractures. Studies involving external fixation techniques showed complications such as loosening, malunion, imperfect articular reductions and pin tract infections.<sup>[17,18]</sup> Open reduction and fixation with plate has the advantage of lowest rate of angular malunion compared to external fixation or intramedullary nailing but the downside is the high infection rates.<sup>[19]</sup> MIPPO however relies primarily on the indirect reduction of the fractures using various techniques and in this way, the fracture environment is better preserved, as well as the blood supply to the bony fragments is

not disturbed, which finally leads to decreased infection rate better fracture healing.

MIPPO offers several theoretical advantages compared to conventional open plating technique. A mechanically stable fracture-bridging osteosynthesis can be obtained without significant dissection and surgical trauma to the bone and surrounding soft tissues. As a consequence, the vascular integrity of the fracture and the osteogenic fracture hematoma are preserved.<sup>[20,21]</sup> However MIPPO does not allow direct visualization of the fracture and the surgeon is dependent on intraoperative fluoroscopy to confirm that an adequate reduction has been achieved. Additional radiation exposure during application of the plate to the bone and screw fixation and therefore extended operating time are the disadvantages of this technique.

## CONCLUSION

On the basis of the finding of this study it can be concluded that MIPPO technique preserves most of the osseous vascularity and fracture hematoma thus providing for a more biological repair. There is rapid fracture consolidation due to preserved vascularity. There are fewer incidences of delayed union and non union.

There is a decreased need for bone grafting and incidence of infection is less due to limited exposure.

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