



International Journal of Orthopaedics Sciences

ISSN: 2395-1958
IJOS 2018; 4(2): 893-898
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www.orthopaper.com
Received: 09-02-2018
Accepted: 10-03-2018

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Short term outcome analysis of proximal tibia fractures treated with minimally invasive plate osteosynthesis

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DOI: <https://doi.org/10.22271/ortho.2018.v4.i2m.129>

Abstract

Introduction: Proximal tibial fractures caused by high-energy mechanisms are associated with neurovascular injuries, compartment syndrome, deep vein thrombosis, contusion, crush injury to the soft tissues and open wounds. Management of proximal tibia fractures are difficult considering the limited soft tissue cover over the shin of tibia and vascular compromise following injury. Open reduction and internal fixation in oedematous vascular compromised skin will end up in complications like infection and wound dehiscence. Management of proximal tibia fractures using minimally invasive plate osteosynthesis reduces damage to surrounding soft tissues and helps in improved fracture healing without complications. Analysis of functional and radiological outcome along with the complications of proximal tibial fractures treated by minimally invasive plate osteosynthesis using Knee Society Score.

Materials & Methods: We have analysed 20 cases of proximal tibial fractures treated surgically using minimally invasive plate osteosynthesis admitted in our Institute between January 2016 and December 2017. All patients were preoperatively assessed radiologically and classified and managed by MIPO technique and outcome was analysed by Knee Society score.

Results: Majority of injured patients were male (90%) and the highest number of patients were in their 4th decade (60%). Road traffic accidents was the most common mode of injury (80%). Type VI fracture is the most common type in 60% patients. Early complications like wound gaping, skin necrosis were treated. Average time from injury to surgery was 10 days. All of our patient's results were excellent and good. The average knee society score in our study with 20 patients was 81. All fractures united after an average of 20 weeks. The mean time to full, unprotected weight bearing was 16 weeks.

Conclusion: Proximal Tibial fractures treated surgically using minimally invasive plate osteosynthesis technique gives early functional ability and early mobilisation of knee joint. Minimally invasive plate osteosynthesis technique offers improved fracture healing without any risk of soft tissue complications when compared to conventional plating by open reduction and internal fixation.

Keywords: Proximal tibia fractures, MIPO technique, knee society score

Introduction

Proximal tibial fractures caused by high-energy injuries may be associated with neurovascular injuries, compartment syndrome, deep vein thrombosis, contusion, crush injury to the soft tissues, or open wound [1-3]. Management of proximal tibia fractures is difficult while considering the limited soft tissue cover and vascular compromise following injury. Open reduction and internal fixation in oedematous vascular compromised skin will end up in complications like infection and wound dehiscence [4, 5]. Management of proximal tibia fractures using minimally invasive plate osteosynthesis reduces damage to surrounding soft tissues and helps in improved fracture healing without complications.

Aim of the study

Short term analysis of functional and radiological outcome along with the complications of proximal tibial fractures treated by minimally invasive plate osteosynthesis evaluated using Knee society clinical rating score.

Materials and methods

We have analysed 20 cases of proximal tibial fractures treated surgically using minimally invasive plate osteosynthesis admitted at Institute of Orthopaedics & Traumatology,

Rajiv Gandhi Government General Hospital, Madras Medical College, Chennai from January 2016 to December 2017. Average time from injury to surgery was 10 days. All patients were evaluated with standard anteroposterior, lateral radiographs of the affected bone and joint and 3D CT scan. Fractures classified using Schatzker classification [6]. Image intensifier was used for all the patients to assess the reduction

and position of the plate. All the patients were operated in the supine position with sand bag under the knee for selective patients. The patients were operated by the standard medial and lateral approaches using Proximal tibial locking plates. Commonly used plates are precontoured anatomical locking plates, hockey stick shaped locking plates, buttress locking plates [7].

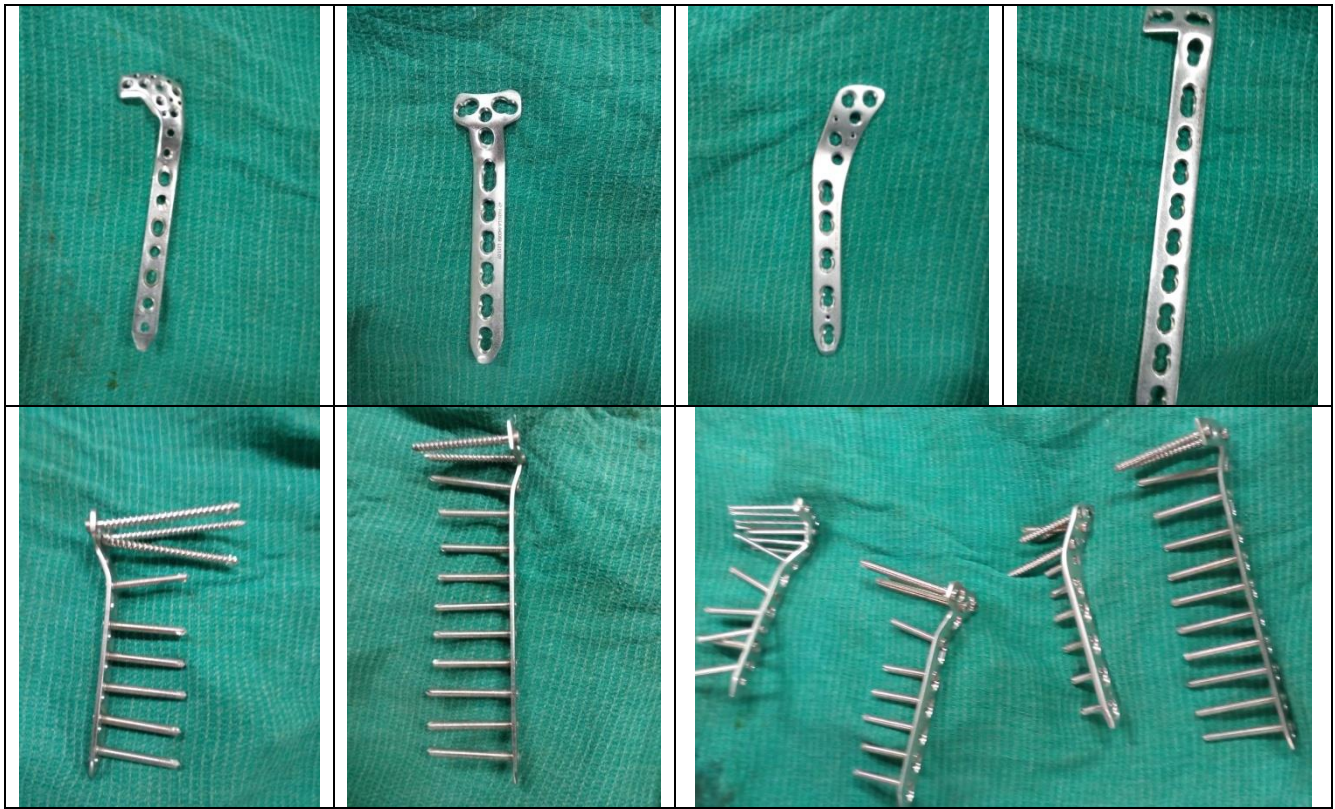


Fig 1: Showing the MIPO Implant models beings used and the screw trajectories to hold the various fragments of proximal tibial fractures.

Fracture reduction was done using Tibial distractor, Schanz pin, point reduction forceps and temporary fixation with K-wires. The minimum follow-up period was one year and maximum follow up period was two years. Radiological evaluation of fracture union was observed by serial X-rays.

Inclusion criteria

1. Age more than 18 years.
2. Both extra-articular and intra-articular fractures of proximal tibia.
3. All closed fractures of proximal tibia.
4. Compound proximal tibia fractures upto Grade IIIA and without any infection.

Exclusion criteria

1. Compound fractures not having adequate soft tissue coverage.
2. Associated neurovascular injury.
3. Associated head injury.

Operative technique

All the patients were operated in supine position with spinal anaesthesia. Precontoured anatomical locking plate, hockey stick shaped locking plates, buttress locking plates were used of appropriate length. Ipsilateral iliac crest was prepared to harvest bone graft for needy patients. Incision of size 2 cm was made over the proximal (medial and lateral) aspect of tibia. Closed reduction of fractures were done under C arm guidance and fixed temporarily with K-wires. Plates were

slided without damaging the soft tissues using minimally invasive plate osteosynthesis technique from proximal to distal direction. Screws were placed in the distal end by stab incisions. Fracture reduction and plate position was checked under image intensifier in both coronal and sagittal planes and then screws were applied. Strength of the fixation was assessed intraoperatively by gentle movement of the knee joint. Skin incisions were closed in layers.

Post op protocol

During post-operative period, all patients were given IV antibiotic injection Cefotaxime 1 gm plus IV injection Amikacin 500 mg 12 hourly for five days. Isometric exercises were initiated from first post op day. Gradual knee mobilization was started from third post op day. Suture removal was done at 10th post-operative day. Non weight bearing was advised. Patients were asked to perform straight leg raising exercises and knee flexion exercises. Patients were followed up every three weeks for first two months, thereafter every four weeks upto six months and thereafter every twelve weeks for one year. During follow up, patients were examined for skin condition, signs of infection, range of knee movements, rest and activity pain. Partial weight bearing was started 8 weeks after surgery when there were signs of callus on radiograph. Full weight bearing was allowed only after fracture union was seen on radiograph.

Discussion

The aim of this study is to analyse the short term functional and radiological outcome of proximal tibia fractures treated with minimally invasive plate osteosynthesis technique. Proximal tibial fractures are usually associated with high energy trauma and soft tissue injury is common. Not only the closed fractures but also the open fractures can also be treated with success using minimally invasive plate osteosynthesis technique as a second stage procedure after initial emergency debridement and temporary external fixation.^[8] This will provide rapid fracture healing, minimization of soft tissue complication and loss of function. In conventional methods of open reduction and internal fixation, surgical trauma devitalizes soft tissues, periosteum thereby resulting in wound dehiscence, deep infection and even non-union^[9-15].

The time duration from injury to surgery also plays a major role in bringing the patient to early mobilization and near normal function^[8, 16-18]. Timing of surgery when the tissues are least oedematous ensures better outcome in terms of soft tissue healing, fracture healing and early mobilization without any complications like knee stiffness^[19, 20]. In our study, patients operated within 5-7 days of injury came up with excellent results when compared to patients operated after one week.

Minimally invasive plate osteosynthesis also offers advantage in Bicolumn plating for bicondylar tibial plateau fractures^[21-23]. Usually in conventional methods, bicolumn plating involves two separate incisions which can lead to extensive damage to soft tissues, periosteum and sometimes the viability of the skin and soft tissues in between the incisions can be affected leading to postoperative complications.^[24,25] Major limitations are: it is highly demanding and technically challenging in patients with complex proximal tibial fractures and in fractures requiring bone grafting which needs adequate exposure limiting the use of minimally invasive plate osteosynthesis^[26, 27]. Barring these, this technique can be considered for proximal tibial fractures which will give satisfactory functional and radiological outcomes without much soft tissue complications.

Results and observation

Majority of injured patients were males (90%) and the highest number of patients were in their 4th decade (60%). Road traffic accidents was the most common mode of injury (80%). No case with bilateral fractures was reported. Type VI fracture is the most common type in 60% patients. Early complications like wound gaping, skin necrosis were treated.

Table 1: Showing the distribution of cases and their outcome by knee society score

S. No	Age/Sex	Type (Schatzker)	Knee society score	Outcome
1	42/M	V	90	Excellent
2	19/M	IV	85	Excellent
3	70/M	VI	70	Good
4	26/M	VI	80	Good
5	62/M	VI	75	Good
6	26/M	V	85	Excellent
7	35/M	VI	80	Good
8	38/M	VI	80	Good
9	60/F	VI	75	Good
10	42/M	I	90	Excellent
11	32/M	V	90	Excellent
12	40/F	IV	85	Excellent
13	30/M	VI	70	Good
14	44/M	VI	80	Good
15	42/M	VI	75	Good
16	45/F	V	85	Excellent
17	48/F	VI	80	Good
18	43/M	VI	80	Good
19	53/M	VI	75	Good
20	28/F	I	90	Excellent

Table 2: Shows the fracture type and its associated complications and its management

Type (Schatzker)	No. of patients	Associated injuries	Complications	Initial management	Time of injury to surgery
I	2	Nil	Nil	AK Slab	5 days
IV	2	Grade I, II wounds	Nil	Wound wash, Suturing, AK slab, Antibiotics	5-7 days
V	4	Grade I, II wounds	Nil	Wound wash, Suturing, AK slab, Antibiotics	5-7 days
VI	12	Grade I,II,III A wounds	Skin necrosis, wound infection	Wound wash, Suturing, Antibiotics, External fixation	1-3 weeks

Knee society clinical rating score was used to assess the functional outcome of our patients. In this scoring system, excellent result means 85-100 score, good result means 70-84 score, 60-69 score means fair result and <60 score means poor

result. All of our patients results were excellent and good. The average knee society score in our study with 20 patients was 81. All fractures united after an average of 20 weeks. The mean time to full, unprotected weight bearing was 16 weeks.



Fig 2: A 42-year-old male patient who sustained Type V closed proximal tibia fracture left side in a road traffic accident. Bicolumnar plating by primary minimally invasive plate osteosynthesis was performed which showed excellent result after one year follow up.

Conclusion

Proximal Tibial fractures treated surgically using minimally invasive plate osteosynthesis technique gives excellent functional outcome with early mobilisation of the knee joint. Minimally invasive plate osteosynthesis technique offers improved fracture healing without soft tissue complications

when compared to conventional plating by open reduction and internal fixation. The satisfactory short term functional and radiological outcome without much soft tissue complications suggests that this technique is a better option for proximal tibia fractures irrespective of their severity.

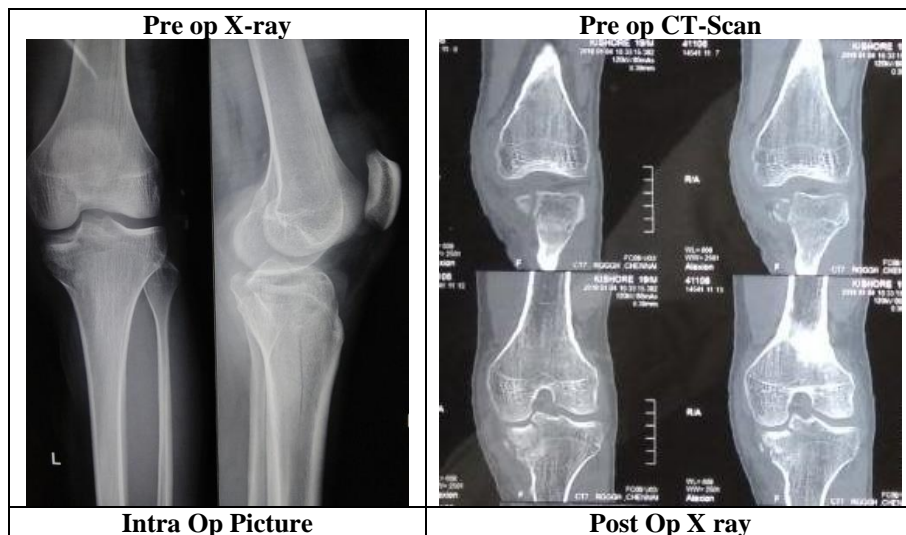




Fig 3: A 19-year-old male patient, sustained Type IV closed proximal tibial fracture left side in a road traffic accident. Medial column plating by primary minimally invasive plate osteosynthesis was performed with bone grafting which showed excellent result.

References

- Barei DP, Nork SE, Mills WJ. Complications associated with internal fixation of high-energy bicondylar tibial plateau fractures utilizing a two-incision technique. *J Orthop Trauma*. 2004; 18:649-657.
- Belanger M, Fadale P. Compartment syndrome of the leg after arthroscopic examination of a tibial plateau fracture. Case report and review of the literature. *Arthroscopy*. 1997; 13:646-651.
- Dirschl DR, Dawson PA. Injury severity assessment in tibial plateau fractures. *Clin Orthop Relat Res*. 2004; 423:85-92.
- Ebraheim NA, Sabry FF, Haman SP. Open reduction and internal fixation of 117 tibial plateau fractures. *Orthopedics*. 2004; 27:1281-1287.
- Farouk O, Krettek C, Miclau T. Minimally invasive plate osteosynthesis and vascularity: preliminary results of a cadaver injection study. *Injury*. 1997; 28:A7-A12.
- Gaston P, Will EM, Keating JF. Recovery of knee function following fracture of the tibial plateau. *J Bone Joint Surg Br*. 2005; 87:1233-1236.
- Gosling T, Schandelmaier P, Marti A. Less invasive stabilization of complex tibial plateau fractures: a biomechanical evaluation of a unilateral locked screw plate and double plating. *J Orthop Trauma*. 2004; 18:546-551.
- Pazhani J, Sathish M. Strategies in management of Tibial Plateau Fractures. *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*. Ver. 7. 2018, 17(2):39-43.
- Musahl V, Tarkin I, Kobbe P. New trends and techniques in open reduction and internal fixation of fractures of the tibial plateau. *J Bone Joint Surg Br*. 2009; 91:426-433.
- Partenheimer A, Gosling T, Muller M. Management of bicondylar fractures of the tibial plateau with unilateral fixed-angle plate fixation. *Unfallchirurg*. 2007; 110:675-683.
- Perren SM. The technology of minimally invasive percutaneous osteosynthesis (MIPO). *Injury*. 2002; 33:VI-VII.
- Rademakers MV, Kerkhoffs GM, Sierevelt IN. Operative treatment of 109 tibial plateau fractures: five- to 27-year follow-up results. *J Orthop Trauma*. 2007; 21:5-10.
- Sirkin MS, Bono CM, Reilly MC, Behrens FF. Percutaneous methods of tibial plateau fixation. *Clin Orthop Relat Res*. 2000; 375:60-68.
- Rizk AS. Minimally invasive plate osteosynthesis for the treatment of high-energy tibial shaft fractures. *Egypt Orthop J*. 2015; 50:36-44.
- Weller S. Biological fracture fixation - What is this? Is it another traumatological fashion or an important aspect of operating technique? *IGOF News*. 1997, 1.
- Krettek C, Schandelmaier P, Tschern H. New developments in stabilization of dia- and metaphyseal fractures of long tubular bones. *Orthopade*, 1997; 26:408-421.
- Sidhu AS, Brar BS, Mann HS, Bakshi AS, Tanwar YS, Gursukhman DS, Sidhu MB. Minimally invasive plate osteosynthesis for proximal and distal tibial fractures. *Pb J Orthopaed*. 2010; XII:14-17.
- Phisitkul P, McKinley TO, Nepola JV, Marsh JL. Complications of locking plate fixation in complex proximal tibia injuries. *J Orthop Trauma* 2007; 21:83-91.
- Lang GJ, Cohen BE, Bosse MJ, Kellam JF. Proximal third tibial shaft fractures. Should they be nailed? *Clin Orthop Relat Res*. 1995; 315:64-74.
- He GC, Wang HS, Wang QF, Chen ZH, Cai XH. Effect of minimally invasive percutaneous plates versus interlocking intramedullary nailing in tibial shaft treatment for fractures in adults: a meta-analysis. *Clinics (Sao Paulo)*. 2014; 69:234-240.
- Krettek C, Müller M, Miclau T. Evolution of minimally invasive plate osteosynthesis (MIPO) in the femur. *Injury* 2001; 32:SC14-SC23.
- Sirbu PD, Petreus T, Asaftei R, Grigore B, Botez P. Minimally invasive plate osteosynthesis in long bone fractures - Biomechanics - Design - Clinical Results; *Biomechanics in Applications* edited by Václav Klika, 2011, 101-124.
- Oh CW, Oh JK, Kyung HS, Jeon IH, Park BC, Min WK, Kim PT. Double plating of unstable proximal tibial fractures using minimally invasive percutaneous osteosynthesis technique. *Acta Orthop*, 2006; 77:524-530.
- Chen ZY. A comparison of results between minimally invasive percutaneous plate osteosynthesis and interlocking intramedullary nail for treatment of tibial fractures. *Chin J Prim Med Pharm*. 2008; 15:1603-1604.
- Du GZ, Li JJ. A comparative study of treatment of tibial fractures with minimally invasive percutaneous plates and with interlocking intramedullary nails. *Guangzhou Med J*. 2005; 36:69-71.

26. Jiang YB. A retrospective comparative study of tibial fractures treated by closed reduction with minimally invasive percutaneous plates and with interlocking intramedullary nails. *China Foreign Med Treat.* 2011; 30:98.
27. Hasenboehler E, Rikli D, Babst R. Locking compression plate with minimally invasive plate osteosynthesis in diaphyseal and distal tibial fracture: a retrospective study of 32 patients. *Injury.* 2007; 38:365-370.