

A study of Outcome of Tibial Plateau Fracture with Minimally Invasive Percutaneous Plate Osteosynthesis (MIPPO) Technique

RK Ambulgekar^{1,*}, Pritesh Kothari², Rahul Berlia³

¹Professor & HOD, ^{2,3}Resident, Shankar Rao Chauhan Govt. Medical College, Nanded, Maharashtra

***Corresponding Author:**

Email: drambulgekar@gmail.com, drrahulhealth@gmail.com

Abstract

Introduction: The tibial plateau is one of the most critical load bearing areas in the human body; fractures of the plateau affect knee alignment, stability, and motion. Early detection and appropriate treatment of these fractures are critical for minimizing patient disability and reducing the risk of documented complications, particularly posttraumatic arthritis.

Aims and Objectives: To study Outcome of Tibial Plateau Fracture with Minimally Invasive Percutaneous Plate Osteosynthesis (MIPPO) Technique.

Methodology: This is institutional based prospective study which comprises of 50 patients with displaced tibial plateau fracture and were treated between Jan 2012 to Jun 2013 with minimal invasive percutaneous plate osteosynthesis (MIPPO). ECG and chest x-ray was done for patients above 35 years of age for cardiorespiratory fitness. Rasmussen scoring system - Scores of 28 and more indicate excellent, 20 to 27 good, 10 to 20 fair, and 6 to 10 poor result. Data Analysis Statistical analysis was done using percentage, proportions, chi-square test.

Result: The Hospital Stay was (Mean±S.D.) 14.8±2.67 days. 68% required <15 days 24% required 15-20 and 8% required >20. 80% of the patients had union between 10-15 weeks, 18% had union between 15-20 weeks, 2% of patients had union in >20 weeks whereas 0% had non-union. Radiological union was 13.74 weeks. S.D. 13.74±2.00. 78% of the patients achieved full weight bearing between 12-15 weeks, 20% of patients achieved full weight bearing between 16-20 weeks while 2% of patients achieved full weight bearing 20-24 weeks. Mean duration of full weight bearing was 14.54 weeks. S.D. 14.54±2.31. 56% patients had knee flexion >120 degrees, 30% patients had flexion between 120-90 degrees while 14% of patients had flexion < 90 degrees. Mean knee flexion was 115.6 degrees. S.D. 115.6±19.85. 46% patients had excellent results, 38% patients had good results, 12% patients had fair results while 4% patients had poor results.

Keywords: Tibial Plateau Fracture, Minimally Invasive Percutaneous Plate Osteosynthesis (MIPPO) Technique

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Introduction

The tibial plateau is one of the most critical loadbearing areas in the human body; fractures of the plateau affect knee alignment, stability, and motion. Early detection and appropriate treatment of these fractures are critical for minimizing patient disability and reducing the risk of documented complications, particularly posttraumatic arthritis.¹

Sir Astley Cooper first described fractures of the proximal tibia in 1825. Anger treated most minimally displaced fractures with early knee traction mobilization.² Rasmussen introduced open reduction and internal fixation (ORIF) of tibial condylar fractures, and Sarmiento popularized functional cast bracing of most tibial condylar fractures.^{3,4} There have been many classifications of tibial plateau fractures,⁵ of which the following are probably the most historically significant.

In 1900, Muller proposed a classification system for tibial plateau fractures that categorized fractures

according to the amount of articular involvement. Hohl and Luck proposed a classification of plateau fractures that included nondisplaced, local-depression, split-depression, and splitting fractures.⁶ Hohl later expanded the classification to include comminuted fractures.⁷ In 1981, Moore proposed a classification system for fracture-dislocation of the tibial condyle that took into consideration soft-tissue injury.⁸

Schatzker et al proposed a classification system of condyle fractures based on the fracture pattern and fragment anatomy. This classification system, which is widely accepted and used today, divides these fractures into the following six types¹⁴:

Type I - This is a wedge or split fracture of the lateral aspect of the plateau, usually as a result of valgus and axial forces; the wedge fragment is not compressed (depressed), because the underlying cancellous bone is strong; this pattern is usually seen in younger patients

Type II - This is a lateral wedge or split fracture associated with compression; the mechanism of injury is similar to that of a type I fracture, but the underlying bone may be osteoporotic and unable to resist depression, or the force may have been greater (see the first and second images below)

Type III - This is a pure compression fracture of the lateral plateau; as a result of an axial force, the depression is usually located laterally or centrally, but it

may involve any portion of the articular surface (see the third image below)

Type IV - This is a fracture that involves the medial plateau; as a result of either varus or axial compression forces, the pattern may be either split alone or split with compression; because this fracture involves the larger and stronger medial plateau, the forces causing this type are generally greater than those associated with types I, II, or III (see the fourth image below)

Type V - This fracture includes split elements of both the medial and the lateral condyles and may include medial or lateral articular compression, usually as a result of a pure axial force occurring while the knee is in extension

Type VI - This is a complex, bicondylar fracture in which the condylar components separate from the diaphysis; depression and impaction of fracture fragments are the rule; this pattern results from high-energy trauma and diverse combinations of forces (see the fifth, sixth, and seventh images below) ¹⁵

Aims and Objectives

To study of Outcome of Tibial Plateau Fracture with Minimally Invasive Percutaneous Plate Osteosynthesis (MIPPO) Technique.

Methodology

This is institutional based prospective study which comprises of 50 patients with displaced tibial plateau fracture and were treated between Jan 2012 to Jun 2013 with minimal invasive percutaneous plate osteosynthesis (MIPPO). All patients were screened using following inclusion and exclusion criteria. Mono-trauma / polytrauma patients, Grade I, II, IIIA compound fracture, Medically fit for surgery, < 2 weeks post fracture were included into study while Fracture due to malignancy, Grade IIIB and IIIC compound fractures, Non-ambulatory previous fracture, Severe dementia Medical contra-indication to surgery were excluded from study. Radiological evaluation by Standard antero-posterior and lateral x-rays were done to known characteristics of fracture. Routine hematological investigations were done for surgical fitness of the patients. ECG and chest x-ray was done for patients above 35 years of age for cardiorespiratory fitness. Rasmussen scoring system - Scores of 28 and more indicate excellent, 20 to 27 good, 10 to 20 fair, and 6 to 10 poor result. Data Analysis Statistical analysis was done using percentage, proportions, chi-square test.

Result

Table 1: Distribution of Cases According To Hospital Stay

Hospital stay (days)	Number of cases	Percentage
<15	34	68%
15-20	12	24%
>20	4	8%

The Hospital Stay was (Mean±S.D.)14.8±2.67days. 68% required <15 days 24% required 15-20 and 8% required >20.

Table 2: Distribution of cases according to period of Radiological Union

Period (weeks)	Number of patients	Percentage
10-15	40	80%
15-20	9	18%
>20	1	2%

In present study, 80% of the patients had union between 10-15 weeks, 18% had union between 15-20 weeks, 2% of patients had union in >20 weeks whereas 0% had non-union.

Mean period of radiological union was 13.74 weeks. S.D. 13.74±2.00.

Table 3: Distribution of cases according to time at which full weight bearing achieved

Period (weeks)	Number of cases	Percentage
12-15	39	78%
16-20	10	20%
21-25	1	2%

In present study, 78% of the patients achieved full weight bearing between 12-15 weeks, 20% of patients achieved full weight bearing between 16-20 weeks while 2% of patients achieved full weight bearing 20-24 weeks. Mean duration of full weight bearing was 14.54 weeks. S.D. 14.54± 2.31.

Table 4: Distributions of cases according to knee range of motion

Range of Motion	Patients	Percentage
≥ 140 ⁰	4	8%
120 ⁰ -139 ⁰	24	48%
90 ⁰ - 119 ⁰	15	30%
60 ⁰ - 89 ⁰	7	14%
30 ⁰ - 59 ⁰	0	00%
0 ⁰ - 29 ⁰	0	00%

In present study, 56% patients had knee flexion >120 degrees, 30% patients had flexion between 120-90 degrees while 14% of patients had flexion < 90 degrees. Mean knee flexion was 115.6 degrees. S.D. 115.6±19.85.

Table 5: Distribution of cases according to rasmussens criateria

Result	Number of cases	Percentage
Excellent	23	46%
Good	19	38%
Fair	6	12%
Poor	2	4%

In present study, 46% patients had excellent results, 38% patients had good results, 12% patients had fair results while 4% patients had poor results.

Duration of hospital stay

In present study, 68% of the patients were discharged within 15 days, 24% of the patients had Hospital stay between 15-20 days, whereas 8% of the patients had Hospital stay more than 20 days.

Old age and associated injuries causes delay in surgery which leads to prolonged hospital stay. The mean duration of hospitalization was 14.8 days.

Study	Average period of stay
Present Study	14.6 days
Pawar et al ⁹	11 days

Period of radiological union: Mean period of radiological union in this study was 13.74weeks. In this study, 80% of the patients had union between 10-15 weeks. Similar observations were also found in the studies of walz M et al, pawar et al.

Study	Average period of union
Present study	13.6 weeks
Walz et al ¹⁰	11.8 weeks
Pawar et al ⁹	12 weeks
Biggi et al ¹¹	16 weeks

Knee range of motion: Extensive physiotherapy in the postoperative period is an important step for achieving good knee range of movements and better results. Mean knee flexion in present study was 115.6 degrees which is comparable to studies done previously.

Study	Mean flexion
Walz et al ¹⁰	121 degrees
Park HG et al ¹²	125 degrees
H Raza et al ¹³	118 degrees
Present study	115.6 degrees

Discussion

High energy intraarticular fractures of the tibial plateau remains challenging for orthopedic surgeonseven in the present day. The fracture being intraarticular complicates the treatment plan. However the goal is to obtain a stable joint reconstitution permitting early range of motion for cartilage nourishment and preservation.

Severe or complex tibial plateau fractures are more commonly seen in the younger age group due to high-energy trauma. Closed treatment of these injuries has enjoyed little success in reducing depressed or displaced fracture fragments. This necessitates open treatment in most displaced and unstable fractures. It is extremely important to do a stable fragment fixation and ligament repair in order to order to regain the complete range of motion. Despite anatomical joint reconstitution, development of osteoarthritis may still occur secondary to the initial damage articular cartilage and meniscal injury

Conclusion

Results	Present study	H Raza et al ¹³	Pawar et al ⁹
Excellent	46%	43.9%	48%
Good	38%	46.34%	48%
Fair	12%	9.75%	4%
Poor	4%	00%	00%

In present study, 46% patients had excellent results, 38% patients had good results, 12% patients had fair results while 4% patients had poor results.

In same study conducted by H Raza et al¹³, 43.9% patients had excellent results, 46.34% patients had good results, 9.75% patients had fair results while none patients had poor results.

And in the study conducted by Pawar et al⁹, 48% patients had excellent results, 48% patients had good results, 4% patients had fair results while none patients had poor results.

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