

Original Research Article

Prospective study to measure the functional outcome of tibial plateau fractures

Anand Mohan Kayath¹, Ankit Kumar Kayathwal^{2*}

¹Department of Orthopaedics, K.D. Medical College, Mathura, Uttar Pradesh, India

²Department of Orthopaedics, M.G.M Medical College, Indore, Madhya Pradesh, India

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*Correspondence:

Dr. Ankit Kumar Kayathwal,

E-mail: ankitkayathwal2303@gmail.com

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ABSTRACT

Background: Tibial plateau fractures are complex injuries of the knee. The tibial plateau is one of the most critical load-bearing areas in the human body. Early detection and appropriate treatment of these fractures are essential in minimizing patient's disability in range of movement, stability and reducing the risk of documented complications. The aim of the present study is to study the outcome of tibial plateau fractures and their management.

Methods: This is prospective study which comprises of 50 patients with displaced tibial plateau fracture and were treated between January 2018 to December 2018 with minimal invasive percutaneous plate osteosynthesis and cortico-cancellous screw fixation. Statistical analysis was done by Chi-square test and IBM SPSS software.

Results: In our study we included 50 cases, treated with surgical procedure, 30 cases gave excellent result, 16 cases came out with good result, fair in 3 cases and 1 case had poor result. High velocity injuries have poor outcome than low velocity injuries. A single case of malunion was noted in study. Four cases had knee joint stiffness.

Conclusions: We conclude that functional outcome is good in operatively treated patients. Early physiotherapy plays key role in preventing knee stiffness, use of bone grafts and good fixation important for successful outcome.

Keywords: Tibial plateau fractures, Minimal invasive percutaneous plate osteosynthesis, Cortico-cancellous screw

INTRODUCTION

Tibial plateau fractures are complex injuries of the knee. The tibial plateau is one of the most critical load-bearing areas in the human body. Early detection and appropriate treatment of these fractures are essential in minimizing patient's disability in range of movement, stability and reducing the risk of documented complications.^{1,2} Tibial plateau fractures are typically caused by a strong force on the lower leg with the leg in varus or valgus position, or simultaneous vertical stress and flexion of the knee. Each fracture type has its own characteristics and response to the treatment. High-energy trauma is associated with considerable soft tissue and neurovascular damage. Apart from tibial plateau bony injury, meniscal and ligament

injuries should also be addressed.

Production of high velocity vehicles and their increased use have been associated with increase in the number and severity of fractures. Fractures of the upper part of the tibia are no exception to this. The twentieth century there is significant rise in orthopaedic trauma. A better understanding of biomechanics, quality of implants, principles of internal fixation, soft tissue care, grafting substitutes, antibiotics and asepsis have all contributed to the radical change.³ Thus we have advanced from the conservative approach to internal fixation in fractures as an acceptable mode of treatment.

Fractures of the upper tibia are difficult to treat. Conservative treatment at any age, may be complicated by knee stiffness, malunion and nonunion. Open reduction and internal fixation has been advocated using various implants including locking plates, buttress plates, cancellous screws, external fixators etc., to achieve good fracture union and optimal knee function. Our objective was to study the outcome of tibial plateau fractures and their management.

METHODS

A prospective study was conducted to know the functional outcome in operatively treated tibial plateau fractures in adults were included from inpatients of K.D. Medical College and Hospital, Mathura and M.G.M Medical College, Indore within a duration between January 2018 to December 2018 . The total number of cases studied was 50. Those patients who were between the age of 20 and 60 years and operatively treated were included in this study to know the functional outcome after the surgery.

The objective of the study were to know functional outcome of fracture healing in operatively managed tibial plateau fractures treated with plates and screws, screws alone and to restore the optimum functions in fractured limbs with tibia plateau fractures. The patients who are between the age of 20 and 60 with tibia plateau who were managed surgically are included in the study. Fractures in children and those below 20 years and above 60 years of age and those treated non-surgically, medically unfit patients and pathological fractures are excluded from the study.

Out of 50 patients treated surgically, 28 cases treated with minimal invasive percutaneous plate osteosynthesis (MIPPO) locking plate, 05 with cancellous screws and bone grafting, 05 patients were treated with bicondylar locking plate, 09 patients with buttress plate, 03 patients were treated with bone grafting and buttress plate. Whenever rigid internal fixation was achieved, the patient was mobilized 48 hours after removal of the drains, for 2-5 days the range of motion allowed was 0-20°, from the 5th day the range of motion was gradually allowed to be increased to 90° or more. After suture removal, full range of movement was allowed. Whenever there was doubt about the rigidity of fixation, external splinting in the form of plaster of paris slab was given for support. Range of motion exercises (CPM) were done daily under careful supervision and splint reapplied. All the patients were taught and advised to do static quadriceps exercises and dynamic exercises with a quadriceps board as tolerated and throughout the day.

Partial weight bearing was delayed until 6-8 weeks and full weight bearing allowed after 12-16 weeks. The best time for open reduction and internal fixation was within 8 hours of injury or 1 week after the injury, when the swelling and the inflammatory reactions have subsided.

RESULTS

Functional outcome of results was done in relationship to age, sex, laterality of fracture, type of fracture, method of treatment, duration of immobilization, complications and the remarks of different age groups in details is as follows. The youngest being 20 years and the eldest being 60 years.

Table 1: Age group distribution.

Age group (in years)	No. of patients	%
21-30	14	28
31-40	16	32
41-50	12	24
51-60	08	16

The tibial plateau fractures are commonly seen in the active and productive age group in our setup as they belong mostly to road traffic accident. The type of fracture and fracture pattern depends on many factors like amount of force, age, degree of knee flexion, rate of loading of force, valgus or varus stresses, etc. The graph shows patient age groups versus number of cases.

Table 1 shows that the majority of the patients are found to be between the age group of 31-40 years (16) and 21-30 years (14). The least number of cases are found in the age group between 51-60 years (08).

Table 2: Sex incidence.

Sex	No. of cases	%
Male	42	84
Female	08	16
Total	50	100

In this study, it was seen that majority of the cases were males while the female sex were only a small percentage i.e., 16% (Table 2). This is because majority of the male population are working and therefore were more prone to road side accidents while the females in India are mainly engaged in household work so they are less exposed to vehicular trauma.

In our study, there was right sided predominance, compared to the left side (Table 3).

Table 3: Laterality of fractures.

Side	No. of cases	%
Right	32	64
Left	18	32
Total	50	100

In our study, the majority of the fractures were found to be of type III i.e., pure depression fractures which contribute 46% of the patients (Table4).

Table 4: Distribution according to Schatzker classification.

Schatzker type	No. of cases	%
1. Pure split	7	14
2. Split with depression	4	8
3. Depression	23	46
4. Medial condyle fracture	6	12
5. Bicondylar fracture	8	16
6. Meta-diaphyseal discontinuity	2	4

Table 5: Type of fixation.

Type of fixation	No. of cases	%
MIPPO LCP	28	56
Buttress plating	9	18
Bicolumnar plating	5	10
Cortico-cancellous screw fixation	5	10
Bicolumnar plating with bone grafting	3	6

All the patients were mobilized when secure, rigid fixation was done. When there was doubt about rigidity of fixation, associated ligament injury or osteoporosis the immobilization extended preferably in above knee cast up to 3 weeks. Bone grafting was needed in 3 patients to cover up the bone loss and to elevate the fracture fragment. Bicolumnar plating was done 5 cases which involved fracture of both the condyles (Table 5).

Most of the cases had good range of painless knee motion (0-130°), only 4 patients out of 50 developed knee stiffness.

Table 6: Complications.

Complications	No. of cases
Knee stiffness	4
Malunion	1
Infection	0

All fractures united within expected time. Not a single case of nonunion was noted. Average time of union in our study was 14 weeks, not a single case was reported to be infected.

Table 7: Clinical results according to Rasmussen functional score.

Clinical result	No. of cases	%
Excellent	30	60
Good	16	32
Fair	3	6
Poor	1	2

Table 7 shows that out of 50 cases treated with surgical procedure, 30 cases gave excellent result, 16 cases came out with good result, fair in 3 cases and only 1 case had poor result, according to Rasmussen functional score mainly due to the severity and associated ligamentous injury. It was found that high velocity injuries (type IV-VI) have poorer outcome than low velocity injuries (type I-III).

DISCUSSION

In the early half of the 20th century an author reported two studies having satisfactory percentage of good to excellent short and long term results with surgical method of treatment.^{4,5}

In another published study of 159 cases of tibial plateau fracture of all types, treated by conservative (46%) and surgery (54%), evaluated by Hohl et al method, reported better good-excellent results in surgery (84%) than conservative (62%) methods.⁶

Roberts in 1968 reported 100 cases of tibial condyle fractures treated by conservative and surgical.⁷ The results were good in 72% conservative, 80% traction-mobilization and 81% surgical. He advocated early mobilization, preservation for menisci and repair of torn ligaments for best results.

Another study of 68 cases, both non-surgical and surgical methods observed excellent-good results in 96% of cases by conservative methods with depression <10 mm, 47% in depression >10 mm and 80% in surgical methods. They advocated good anatomical reduction for best results.⁸



Figure 1: Case 1 (A): Pre-operative X-ray; (B): Post-operative X-ray.

Schatzkar, in 1979, reported 70 cases of tibial plateau fractures of all types treated by conservative (56%) and surgical (44%) methods with average follow-up of 28 months.⁹ Acceptable results were obtained in 58% of cases of conservative group and 78% by open methods. Fractures treated by ORIF with buttress plate and bone grafting achieved 88% acceptable results.

A study of 278 cases of tibial plateau of fractures with an average follow up of 2.5 years, all treated by surgical methods. 89% acceptable results when surgery was done by inexperienced surgeons, 97% when done by experienced. They concluded the prognosis improves with the experience and with accurate reconstruction of articular surface. They also said posttraumatic osteoarthritis was directly proportional to the amount of displacement.¹⁰



Figure 2: Case 2 (A): Pre-operative X-ray; (B): post-operative X-ray.

The fracture of the proximal end of the tibia, particularly intra-articular ones are considered to be difficult management problems because of the malalignment, incongruity and instability that frequently result from their surgical or nonsurgical treatment. Cadaveric and clinical studies reproduced the same results. They concluded that loss of articular congruity leads to the degenerative arthritis and is less likely to produce so if joint function is maintained. However, there is no general agreement or clear understanding as to the degree of incongruity, malalignment or residual instability necessary to produce such clinical symptoms.¹¹

Most recently, the minimal invasive methods of fixation like MIPPO has made a difference in treating tibial plateau fractures. A published report in 2005 has shown excellent results with key hole incision and using locking

compression plate. The results of this study are encouraging because of less infection rate, minimal soft tissue damage, high rate of early fracture union and above all it is a biological fixation.

CONCLUSION

We conclude that operatively treated tibial plateau fractures reported a good functional outcome. CT scan played a pivotal in better understanding fracture pattern and treatment planning. Type of the implant used depends on the fracture configuration. Prevention of postoperative stiffness remained a challenging task but early physiotherapy helped us to deal with it.

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Ethical approval: The study was approved by the institutional ethics committee

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