



Research Article

Short Term Assessment of Functional Results of Surgically Treated Tibial Plateau Fractures

Nawaz Ahmad Bhat¹, Showkat Hussain Tali², John Mohd³, Aiman Wani⁴, Mir Sami Ullah⁵

¹Assistant Professor, Orthopedics, Govt. Medical College, Anantnag

²Associate Professor, Pediatrics, Govt. Medical College, Anantnag

³Senior Resident, Orthopedics, SKIMS

⁴Senior Resident, Orthopedics, Govt. Medical College Anantnag

Ex Consultant, Orthopedics, GMC Anantnag

 OPEN ACCESS

Corresponding Author:

Mir Sami Ullah

Ex Consultant, Orthopedics, GMC Anantnag.

Received: 29-01-2026

Accepted: 01-03-2026

Published: 10-03-2026

Copyright© International Journal of
Medical and Pharmaceutical Research

ABSTRACT

Background: Tibial plateau fractures (TPF) are uncommon and challenging for orthopedic surgeons with controversial reported outcomes. In this study, we aimed to evaluate the functional outcomes with surgically treated TPF.

Materials and Methods: In this prospective observational study 44 patients with tibial plateau fractures (TPFs), who were treated surgically, were enrolled. Assessment of functional outcome was done at the follow-up of 12 months using Knee Society Score.

Results: The mean period of radiological union was 13.50 weeks (range 10 to 15 weeks). 2 (4.55%) patients developed non-union. 4 (9.08 %) patients had varus deformity of 10°. The mean Knee Society Score (KSS) was 79.75 (range 53-100). Final results as per Knee Society Score was excellent in 13 (29.55%), good in 21 (47.73%), fair in 4 (9.08%) and poor in 6 (13.64%) patients.

Conclusion: Functional results of surgically treated tibial plateau fractures underscore satisfactory recovery in most patients.

Clinical significance: This study provides valuable insights into the short-term functional outcomes of surgically treated tibial plateau fractures (TPFs), highlighting the efficacy of surgical intervention in restoring knee function.

Keywords: Tibial plateau fracture, surgicalmanagement, Patient-reported outcome measures, Knee Society Score .

BACKGROUND

Tibial plateau fractures (TPFs) are complex injuries that may greatly impact patients' daily lives and functional abilities. TPF usually occurs in young patients and after high-energy traumas [1, 2]. These fractures are associated with a high rate of complications, including soft tissue injury, nerve damage, vascular injury, infection, delayed union, nonunion, and osteoarthritis (OA), which makes them one of the most challenging injuries to treat [3-5]. TPFs account for 1% of all bone fractures [6] and 9.2% of tibial fractures [7], but there has been a recently described increase in incidence, reaching up to 28.7 per 100,000 persons per year [8-10].

Usually, the fracture patterns are complex and the therapy can be challenging, i.e., to reconstruct the joint surface, the knee axis, and a "height stable" tibial plateau without prolonged immobilization of the joint. All of these factors need to be considered to prevent complications and impairment of the knee. The majority of these fractures are treated surgically [9], and several surgical strategies have been described to achieve the optimal anatomical restoration of the joint plane and alignment of the axis.

The literature categorizes TPFs into high-/complex- and low-/simple-energy fractures [11,12]. Interestingly, there is no significant correlation between radiological and functional outcomes [13,14]. However, the majority of patients can achieve good to excellent functional results in the short [15, 16]. Nevertheless, the literature on patient-reported outcomes of TPFs is limited, and further research is necessary to fully understand the impact of these severe injuries on patients. In this sense this study was conducted to of assess the functional results short term surgically treated tibial plateau fractures.

MATERIALS AND METHODS

This prospective observational study was conducted in a tertiary care center from 2020 to 2022. In this study a total of 44 patients with tibial plateau fractures (TPFs), who were treated surgically were enrolled.

Inclusion criteria

- Age ≥ 18 years
- Patients with isolated tibial plateau fractures (TPFs)
- Patients who will complete follow-up period of 12 months

Exclusion criteria

- Pathological fractures
- Patients who refused participation
- Patients requiring vascular repair

Temporary stabilization of fracture with above knee splint was carried out and limb elevation was given. All enrolled patients were treated with various surgical modalities and followed the same postoperative protocol and were checked in the same standardized manner. Postoperative passive and active knee motion was encouraged the day after surgery to stimulate ROM.

The patients were regularly followed at 2, 4, 6 weeks, 3, 6 and 12 months. Toe-touch weight-bearing was suggested for 4 to 6 weeks with the use of two crutches. Weight bearing was deferred until evidence of union was seen on X ray. Assessment of functional outcome was done at the follow-up of 12 months using Knee Society Score [17, 18].

Statistical Analysis:

Data was compiled and entered into a Microsoft Excel spreadsheet, then exported to SPSS Version 20.0 for analysis (SPSS Inc., Chicago, Illinois, USA). Continuous variables were presented as Mean \pm SD, while categorical variables were summarized using frequencies and percentages.

RESULTS

The mean age of the patients was 42.2 ± 16.97 (range 21-68) years. Maximum patients were between 30-39 years of age 15 (34.09%). There were 31 (70.45%) males and 13 (29.55%) females in this study. The most common mode of injury was road traffic accident in 28 (63.64%) patients. 25 (56%) patients had fracture on right side. Maximum patients had grade V 11 (25%), followed by 10 (22.73%) patients (Table 1).

The mean period of radiological union was 13.50 ± 2.28 weeks (range 10 to 15 weeks). 31 (70.45%) patients were allowed complete weight bearing at 10 to 13 weeks. Mean range of motion was $118.8^0 \pm 24.78^0$ (range 80-155⁰). 2 (4.55%) patients developed non-union. 4 (9.09%) patients had varus deformity of 10°.

The mean Knee Society Score (KSS) was 79.75 ± 15.29 (range 53-100). Final results as per Knee Society Score was excellent in 13 (29.55%), good in 21 (47.73%), fair in 4 (9.08%) and poor in 6 (13.64%) patients (Table 2).

Table 1: Demographic details of patients

Demographic Characters		No. of patients	Percentage
Gender	Male	31	70.45
	Female	13	29.55
Age group	<30 Years	7	15.91
	30-39 years	15	34.09
	40-49 years	12	27.27
	>50 years	10	22.73
Mode of injury	Fall	16	36.36
	Road traffic accidents	28	63.64
Side	Right	25	56.82
	Left	19	43.18
Schatzker classification	I	6	13.64
	II	10	22.73
	III	5	11.36
	IV	9	20.45
	V	11	25.00
	VI	3	6.82

Table 2: Results according to Knee Society Score

Grade	Score	No. of patients	Percentage
Excellent	80-100	13	29.55
Good	70-79	21	47.73
Fair	60-69	4	9.08
Poor	<60	6	13.64

DISCUSSION

Tibial plateau fractures, one of the commonest intra articular fractures, are major traumatic injury occurring due to road traffic accidents, fall from height, violence etc. It is sometimes associated with other bony or soft tissue injuries. Any fracture around the joint (especially weight bearing joint in the lower limb) is of paramount importance as it would result in significant morbidity and quality of life. Hence, the treatment of upper tibial fractures with intra articular extension has become a challenge for orthopaedic surgeons. The study presents valuable insights into the demographic profile, clinical characteristics, and short-term functional outcomes of patients surgically treated for tibial plateau fractures (TPFs). By analyzing a cohort of 44 patients over a follow-up period of 12 months, the research provides a comprehensive evaluation of surgical outcomes, emphasizing both demographic details and the role of the Knee Society Score (KSS) as a functional assessment tool.

The mean age of 42.2 years reflects a younger population predominantly affected by high-energy trauma. In a similar study done by Rasmussen et al the average age of patients was 45 years [19]. The majority of fractures occur between 20 to 50 years of age with maximum incidence involving productive age group of 30 to 50 years (61%). In our series male patients (70.45%) constituted a significant proportion, aligning with previous studies indicating a higher incidence of TPFs in males, likely due to increased exposure to high-risk activities. This can be attributed to our Indian set up where the female population largely remains indoors and is less prone to automobile accidents. In this study, road traffic accidents were the most common cause (63.64%), consistent with the high-energy mechanism associated with complex fractures and next being fall accounted for 36.36%. This correlates well with previous study by Chiaux et al who in their series reported that 71% of the injuries occurred due to RTA [20]. It is found that the zeal of modernization, mechanization and industrial development made more automobile accidents due to increase in population and automobiles. The Schatzker classification identified most fractures as Types V (25%) and II (22.73%), indicative of complex injuries often requiring advanced surgical techniques. In a study, done by Girish H V and co-workers, Schatzker type I and II dominated the total fractures making 50% [21]. A slightly higher incidence was observed on the right side (56.82%), possibly reflecting the dominant side in road traffic accidents or workplace injuries.

In our study, mean radiological union period was 13.5 weeks which is comparable to Manidakis et al which showed that average time of union was 13 weeks [22]. The mean radiological union observed in our study is within the expected timeline for surgically treated fractures. However, 4.55% non-union cases highlight the challenges of treating complex fractures. Varus deformity (9.08 %) and non-union (4.55%) emphasize the importance of precise surgical techniques and early mobilization to minimize complications.

In this study, the mean KSS of 79.75 demonstrates satisfactory functional recovery. We achieved 77.27% good to excellent outcomes, comparable to the study done by Vasnad et al [21], who had 44% excellent result and 44% good results (overall 88% acceptable results). In our series, a smaller percentage had Fair (9.08%) and Poor (13.64%) outcomes, likely reflecting the severity of initial injury or pre-existing conditions. The mean ROM of 118.8° indicates that most patients regained functional mobility, essential for activities of daily living. The study's results align with prior research indicating that a majority of surgically treated TPF patients achieve satisfactory short-term functional outcomes. The findings also underscore the lack of a significant correlation between radiological and functional outcomes, emphasizing the need to prioritize patient-reported outcomes in addition to radiographic healing.

LIMITATIONS AND FUTURE DIRECTIONS

Our study certainly has some limitations. This was a single centered study with a small sized sample. While the sample size is adequate for initial observations, larger multi-center studies are needed for generalizability. A 12-month follow-up provides short-term results; longer follow-ups could assess complications like post-traumatic osteoarthritis. Incorporating additional tools like the SF-36 or WOMAC scores could provide a broader understanding of the impact on quality of life. Future research could compare different surgical modalities or implants to identify the most effective strategies for specific fracture types.

CONCLUSION

This study highlights the importance of surgical intervention in achieving favorable short-term outcomes for tibial plateau fractures. Demographic analysis reveals high-energy trauma as the predominant cause, while functional

assessment using KSS underscores satisfactory recovery in most patients. However, ongoing research is necessary to refine treatment protocols and address long-term challenges.

CLINICAL SIGNIFICANCE

This study provides valuable insights into the short-term functional outcomes of surgically treated tibial plateau fractures (TPFs), highlighting the efficacy of surgical intervention in restoring knee function. Overall, this study supports the role of surgical management in achieving favorable functional outcomes in TPFs, while also highlighting areas for improvement in surgical technique and post-operative care to minimize complications.

REFERENCE

1. Krieg JC. Proximal tibial fractures: current treatment, results, and problems. *Injury*. 2003;34(Suppl 1):A2-10.
2. van Dremel RL, van Wunnik BP, Janssen L, Simons PC, Janzing HM. Mid- to long-term functional outcome after open reduction and internal fixation of tibial plateau fractures. *Injury*. 2015;46(8):1608–12.
3. Bove F, Sala F, Capitani P, Thabet AM, Scita V, Spagnolo R. Treatment of fractures of the tibial plateau (Schatzker VI) with external fixators versus plate osteosynthesis. *Injury*. 2018;49(Suppl 3):S12–8.
4. Debnath UK, Jha DK, Pujari PK. Results of ring (Ilizarov) fixator in high energy Schatzker type VI fractures of proximal tibia. *J Clin Orthop Trauma*. 2018;9(2):186–91.
5. Honkonen SE. Degenerative arthritis after tibial plateau fractures. *J Orthop Trauma*. 1995;9(4):273–7.
6. Gill, T.J.; Moezzi, D.M.; Oates, K.M.; Sterett, W.I. Arthroscopic Reduction and Internal Fixation of Tibial Plateau Fractures in Skiing. *Clin. Orthop. Relat. Res.* 2001, 383, 243–249.
7. Lasanianos NG, Garnavos C, Magnisalis E, Kourkoulis S, Babis GC. A comparative biomechanical study for complex tibial plateau fractures: nailing and compression bolts versus modern and traditional plating. *Injury*, 2013, 44: 1333–1339.
8. Rupp, M.; Walter, N.; Pfeifer, C.; Lang, S.; Kerschbaum, M.; Krutsch, W.; Baumann, F.; Alt, V. The Incidence of Fractures among the Adult Population of Germany. *Dtsch. Arztebl. Int.* 2021, 118, 665–669.
9. Bormann, M.; Neidlein, C.; Gassner, C.; Keppler, A.M.; Bogner-Flatz, V.; Ehrnthaller, C.; Prall, W.C.; Bocker, W.; Furmetz, J. Changing Patterns in the Epidemiology of Tibial Plateau Fractures: A 10-Year Review at a Level-I Trauma Center. *Eur. J. Trauma Emerg. Surg.* 2023, 49, 401–409.
10. Wennergren, D.; Bergdahl, C.; Ekelund, J.; Juto, H.; Sundfeldt, M.; Moller, M. Epidemiology and Incidence of Tibia Fractures in the Swedish Fracture Register. *Injury* 2018, 49, 2068–2074.
11. Kugelman, D.N.; Qatu, A.M.; Haglin, J.M.; Konda, S.R.; Egol, K.A. Participation in Recreational Athletics after Operative Fixation of Tibial Plateau Fractures: Predictors and Functional Outcomes of Those Getting Back in the Game. *Orthop. J. Sports Med.* 2017, 5, 232596711774391.
12. Narayan, B.; Harris, C.; Nayagam, S. Treatment of High-Energy Tibial Plateau Fractures. *Strateg. Trauma Limb Reconstr.* 2006, 1, 18–28.
13. Stevens, D.G.; Beharry, R.; McKee, M.D.; Waddell, J.P.; Schemitsch, E.H. The Long-Term Functional Outcome of Operatively Treated Tibial Plateau Fractures. *J. Orthop. Trauma* 2001, 15, 312–320.
14. Bormann, M.; Bitschi, D.; Neidlein, C.; Berthold, D.P.; Jorgens, M.; Patzold, R.; Watrinet, J.; Bocker, W.; Holzapfel, B.M.; Furmetz, J. Mismatch between Clinical-Functional and Radiological Outcome in Tibial Plateau Fractures: A Retrospective Study. *J. Clin. Med.* 2023, 12, 5583.
15. Baumlein, M.; Hanke, A.; Gueorguiev, B.; Nerlich, M.; Liodakis, E.; Perren, T.; Rillmann, P.; Ryf, C.; Loibl, M. Long-Term Outcome after Surgical Treatment of Intra-Articular Tibial Plateau Fractures in Skiers. *Arch. Orthop. Trauma Surg.* 2019, 139, 951–959.
16. Hap, D.X.F.; Kwek, E.B.K. Functional Outcomes after Surgical Treatment of Tibial Plateau Fractures. *J. Clin. Orthop. Trauma* 2020, 11, S11–S15.
17. Insall JN, Dorr LD, Scott RD, Scott WN. Rationale of the Knee Society clinical rating system. *Clin Orthop Relat Res.* 1989; (248): 13-4.
18. Asif S, Choon DS. Midterm results of cemented Press Fit Condylar Sigma total knee arthroplasty system. *J Orthop Surg (Hong Kong)*. 2005; 13(3): 280-4.
19. Rasmussen PS. Tibial condyle fractures. Impairment of knee joint stability and indication for surgical intervention. *J Bone Joint Surg Am.*1973;55(7):1331-50.
20. De Mourgues G, Chiex D. Treatment of tibial plateau fractures. *Rev Chir orthop Reparatrice Mot.* 1969;55(6):575-6.
21. Vasanad GH, Antin SM, Akkimaradi RC, Policepatil P, Naikawadi G. "Surgical management of tibial plateau fractures - a clinical study". *J Clin Diagn Res.* 2013; 7(12): 3128-30.
22. Manidakis N, Dosani A, Dimitriou R, Stengel D, Matthews S, Giannoudis P. Tibial plateau fractures: functional outcome and incidence of osteoarthritis in 125 cases. *Int Orthop.* 2010; 34(4): 565-70.