



## Original Research Article

## A comparative study based on surgical and functional outcome of proximal tibia fractures between unicondylar and bicondylar fractures

Sambit Kumar Panda<sup>1,\*</sup>, Pradyut Kumar Pradhan<sup>2</sup>, Sanjay Kumar Behera<sup>1</sup>, Chinmaya Debasis Panda<sup>2</sup>

<sup>1</sup>Dept. of Orthopaedic Surgery, M.K.C.G. Medical College, Berhampur, Odisha, India

<sup>2</sup>Dept. of Pharmacology, M.K.C.G. Medical College, Berhampur, Odisha, India



## ARTICLE INFO

## Article history:

Received 01-06-2020

Accepted 04-07-2020

Available online 29-12-2020

## Keywords:

Proximal Tibia Fractures

Unicondylar fractures

Bicondylar Fractures

## ABSTRACT

**Background:** Tibia plateau fractures constitute 1% of all fractures. Bicondylar fractures account for 10-30%, whereas isolated medial and lateral condyle fractures constitute the remaining injuries. Although only 3% of these fractures are open injuries, many of them have closed degloving, deep abrasions or severe soft tissue injuries which require careful consideration in deciding the timing and the nature of surgery. Proximal tibia fractures may be difficult to treat even in experienced hands due to intraarticular extension, comminution, cartilage damage and soft tissue injuries of the cruciate ligaments and menisci.

**Aim:** To compare the functional and surgical outcomes of operative treatment of unicondylar and bicondylar fractures.

**Materials and Methods:** It was a prospective and comparative study of Surgical and functional outcome of proximal tibial fractures in the department of orthopaedics from July 2019 to December 2019. Clearance was obtained from the hospital ethical committee. Fifty patients were taken into consideration for the study. All patients are selected on the basis of history, clinical examination and radiography. The Schatzker's classification was used to classify these fractures. The patients were followed up for an average period of 6 to 12 months. The patients were divided into two groups. Twenty-five patients in the unicondylar fracture group 1 and 25 patients in the bicondylar fracture group 2.

**Results:** The mean age of group 1 patients was  $45.72 \pm 10.85$  years, and that of group 2 patients was  $46.40 \pm 8.602$  years ( $p > 0.05$ ). In group 1 there were 18 (72%) males and 7 (28%) females, in group 2 there were 21 (84%) males and 4 (16%) females. In group 1, the mean union time was  $3.04 \pm 0.351$  and in group 2 was  $3.1 \pm 0.433$  ( $p > 0.05$ ). In group 1, the mean follow-up time was  $12.81 \pm 2.09$  and in group 2 was  $13.04 \pm 2.28$  ( $p > 0.05$ ). The mean functional score of group 1 was  $91.2 \pm 12.27$ , and in group 2, it was  $87 \pm 18.2$  ( $p > 0.05$ ). In group 1 mean WOMAC score was  $12.2 \pm 21.179$ , and in group 2 was  $16.72 \pm 16.923$  ( $p > 0.05$ ). 2 patients had hypertension, and none of the patients had diabetes. While in group two, three patients had diabetes, and two patients had hypertension.

**Conclusion:** In the light of the aforementioned results, it was found in the surgical and functional outcomes of both unicondylar and bicondylar fractures of the proximal tibia are satisfactory and comparable to each other. Furthermore, it was identified that Factors such as age, gender and the fracture type did not influence the outcome in both the study groups. Additionally, most fractures occurred in the middle age group with male preponderance in both unicondylar and bicondylar fractures.

© This is an open access article distributed under the terms of the Creative Commons Attribution License (<https://creativecommons.org/licenses/by/4.0/>) which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

### 1. Introduction

Tibia plateau fractures constitute 1% of all fractures. Bicondylar fractures account for 10-30%, whereas isolated medial and lateral condyle fractures constitute the remaining

\* Corresponding author.

E-mail address: [drsambitpanda@gmail.com](mailto:drsambitpanda@gmail.com) (S. K. Panda).

injuries.<sup>1</sup> Although only 3% of these fractures are open injuries, many of them have closed degloving, deep abrasions or severe soft tissue injuries which require careful consideration in deciding the timing and the nature of surgery.<sup>2</sup> Fractures in men tend to occur at a younger age and tend to be the result of high energy trauma; women have increased incidence with advancing age due to osteoporosis.<sup>3</sup>

Proximal tibia fractures may be difficult to treat even in experienced hands due to intraarticular extension, comminution, cartilage damage and soft tissue injuries of the cruciate ligaments and menisci.<sup>4</sup>

Not every fracture requires surgery; presently, conservative treatment is only for undisplaced or minimally displaced without any associated soft tissue and neurovascular injury.<sup>5</sup> The aim of surgery is the anatomical reduction and stable fixation to allow early non-weight-bearing mobilisation and knee bending exercises to prevent the development of any arthritic changes.<sup>6</sup> Locking plates are the present choice of implants for internal fixation for proximal tibia fractures. Due to soft tissue complication associated with open reduction internal fixation, newer advances such as arthroscopic fixation, percutaneous reduction techniques, minimally invasive plating technique and hybrid external fixators are coming up.<sup>7</sup>

Postoperative care is important to minimise complications and loss of reduction of the fracture and to maximise knee motion while speeding recovery and return to function. Mobilising the knee postoperatively is very important in such fractures.<sup>8</sup> The most common complication is knee stiffness as a result of trauma itself, surgical dissection and prolonged postoperative immobility. Malunion or nonunion is commonly seen in Schatzker type 6 fractures at the metaphyseal diaphyseal junction and is related to the extent of comminution, unstable fixation, implant failure or infection.<sup>9</sup> Post-traumatic osteoarthritis results from articular incongruity, chondral damage or malalignment of the mechanical axis. Infection and sepsis may occur as a result of the incision through compromised soft tissue with extensive dissection for implant placement.<sup>10</sup>

## 2. Aim

To compare the functional and surgical outcomes of operative treatment of unicondylar and bicondylar fractures.

## 3. Material and Methods

It was a prospective and comparative study of surgical and functional outcome of proximal tibial fractures in the department of orthopaedics from July 2019 to December 2019. Clearance was obtained from the hospital ethical committee. Fifty patients were taken into consideration for the study. All patients are selected on the basis of history,

clinical examination and radiography. The Schatzker's classification was used to classify these fractures. The patients were followed up for an average period of 6 to 12 months. The patients were divided into two groups. Twenty-five patients in the unicondylar fracture group 1 and 25 patients in the bicondylar fracture group 2.

### 3.1. Inclusion criteria

1. Adults aged over 18 years (skeletally mature), all males and females having proximal tibia metaphysis fracture (closed and up to grade IIIb compound).
2. Patients willing for treatment and given informed written consent.

### 3.2. Exclusion criteria

1. Patients aged below 18 years.
2. Patients medically unfit for surgery.
3. Patients with neurovascular injuries (grade IIIc compound injuries)
4. Patients not willing for surgery
5. Patients having chronic neuromuscular problems affecting the limb
6. Patients concurrent lower limb fractures
7. Patients having previous unrelated surgeries in the area of study

## 4. Results

**Table 1:** Mean Age

Group	Mean age (years)	P- value
Group 1	45.72±10.85	>0.05
Group 2	46.40±8.602	

From the above table, it is evident that the mean age of group 1 patients was 45.72±10.85 years, and that of group 2 patients was 46.40±8.602 years. There was no statistically significant difference among the mean age of group 1 and group 2 as the p-value was >0.05.

**Table 2:** Sex Distribution

Sex	Group I	Group II	Total
Female	7(28%)	4(16.0%)	11
Male	18(72%)	21(84%)	39

In group 1 there were 18 (72%) males and 7 (28%) females, in group 2 there were 21 (84%) males and 4 (16%) females.

**Table 3:** Comparison of union time between both the study groups

Group	Mean union time	P- value
Group I	3.04±0.3512	>0.05
Group II	3.1±0.433	

In group 1, mean union time was  $3.04 \pm 0.351$  and in group 2 was  $3.1 \pm 0.433$ , the p-value was  $(0.593) > 0.05$ . Therefore there is no significant difference in group 1 and group 2 with respect to union time (months).

**Table 4:** Comparison of follow-up time between both the study groups

Group	Mean follow-up time	p-value
Group I	$12.81 \pm 2.09$	$> 0.05$
Group II	$13.04 \pm 2.28$	

In group 1, the mean follow-up time was  $12.81 \pm 2.09$  and in group 2 was  $13.04 \pm 2.28$ , the p-value was  $> 0.05$ . Therefore, there was no statistically significant difference in group 1 and group 2 with respect to follow-up time.

**Table 5:** Comparison of range of motion between both the study groups

Group	Mean Range of Motion	p-value
Group I	$131.2 \pm 26.337$	$> 0.05$
Group II	$130.4 \pm 7.059$	

In group 1 mean range of motion (ROM) was  $131.2 \pm 6.337$  and in group 2 was  $130.4 \pm 7.059$ , the p-value was  $> 0.05$ . Therefore, there was no statistically significant difference in group 1 and group 2 with respect to the range of motion (ROM) (in degree).

**Table 6:** Outcome in the two study groups based on the functional score

Functional Score	Group I	Group II	Total
Excellent	19 (76.9%)	16 (64.0%)	35 (70.0%)
Very Good	2 (8.0%)	4 (16.0%)	6 (12.0%)
Good	2 (8.0%)	1 (4.0%)	3 (6.0%)
Fair	2 (8.0%)	2 (8.0%)	4 (8.0%)
Poor	0 (0.0%)	2 (8.0%)	2 (4.0%)

In group 1, excellent (90-100) results were 19, very good(80-89)-2, good(70-79)-2, fair(60-69)-2, bad(less than 60)-0. In group 2 excellent (90-100) results were 16, very good(80-89)-4, good(70-79)-1, fair(60-69)-2, bad(less than 60)-2. The mean functional score of group 1 was  $91.2 \pm 12.27$  and in group 2 it was  $87 \pm 18.2$ , p-value  $> 0.05$ . Therefore, there is no significant difference between group 1 and group 2 with respect to functional score.

**Table 7:** Comparison of WOMAC Score between both the study groups

Group	Mean WOMAC Score	P- value
Group I	$12.2 \pm 21.179$	$> 0.05$
Group II	$16.72 \pm 16.923$	

In group 1 mean WOMAC score was  $12.2 \pm 21.179$  and in group 2 was  $16.72 \pm 16.923$ , the p-value was  $> 0.05$ .

Therefore, there was no statistically significant difference in group 1 and group 2 with respect to the WOMAC score.

**Table 8:** Comparison of pain score between both the study groups

Pain Score	Schatzker 1-4	Schatzker 5-6
0-3	22 (88%)	21 (84%)
4-6	3 (12%)	4 (16%)
$> 7$	0	0

In group 1 good (0-3) results were 22, fair(4-6) -3 and no poor(more than 7) result. Similarly in group 2 good (0-3) results were 21; fair (4-6) -4 and no poor (more than 7) result.

**Table 9:** Co-morbidities in the two study groups

Co-morbidity	Group I	Group II
0-3	0	3
4-6	2	2
$> 7$	0	0

Two patients had hypertension, and none of the patients had diabetes. While in group two, three patients had diabetes, and two patients had hypertension.

## 5. Discussion

The mean age in the current study was 46.06 years, and the mean follows up time was 12.88 months. It was observed that Unicondylar And Bicondylar fractures were common in the middle age group. There was a male preponderance in both the study groups with a male/female ratio of 18:7 in group 1 and 21:4 in group 2. Rademakers et al., (2007) found that the mean age at the time of injury was 46 year.<sup>11</sup> The results were at par with that of the current study. However, according to the study of Nikolaou et al., (2011),<sup>6</sup> the mean age was 52.8 years which was more as compared to that of the current study. Furthermore, the male: female ratio was 26:31.

In the current study, the mean union time of 3.04 months for group 1 and 3.1 months for group 2 was achieved. This result was comparable with the study of Nikolaou et al. (2011).<sup>6</sup> On the contrary, Phisitkul et al. (2007)<sup>12</sup> achieved a mean union time of 12 weeks. Also, as per the Oh et al., (2006),<sup>13</sup> the mean union time was 19 weeks. Both the results were higher as compared to the current study.

## 6. Conclusion

In the light of the aforementioned results, it was found in the surgical and functional outcomes of both unicondylar and bicondylar fractures of the proximal tibia are satisfactory and comparable to each other. Furthermore, it was identified that Factors such as age, gender and the fracture type did not influence the outcome in both the study groups. Additionally, most fractures occurred in the middle age

group with male preponderance in both unicondylar and bicondylar fractures. The study also, concluded that time taken for fracture union was the same for both unicondylar and bicondylar fractures, and the complication rate was found to be low in both the study groups.

## 7. Source of Funding

No financial support was received for the work within this manuscript.

## 8. Conflict of Interest

The authors declare they have no conflict of interest.

## References

- Moore TM, Patzakis MJ, Harvey JP. Tibial plateau fractures: definition, demographics, treatment rationale, and long-term results of closed traction management or operative reduction. *J Orthop Trauma*. 1987;1(2):97–119.
- Schatzker JO, Mcbroom R, Bruce D. The Tibial Plateau Fracture: The Toronto Experience 1968-1975. *Clin Orthop Related Res*. 1979;138:94–104.
- Zura RD, Browne JA, Black MD, Olson SA. Current management of high-energy tibial plateau fractures. *Curr Orthop*. 2007;21(3):229–35. doi:10.1016/j.cuor.2007.02.007.
- Weimann A, Heinkele T, Herbort M, Schliemann B, Petersen W, Raschke MJ, et al. Minimally invasive reconstruction of lateral tibial plateau fractures using the jail technique: a biomechanical study. *BMC Musculoskelet Disord*. 2013;14(1):1. doi:10.1186/1471-2474-14-120.
- Musahl V, Tarkin I, Kobbe P, Tzioupis C, Siska PA, Pape HC, et al. New trends and techniques in open reduction and internal fixation of fractures of the tibial plateau. *Bone Joint J*. 2009;91-B(4):426–33. doi:10.1302/0301-620x.91b4.20966.
- Nikolaou VS, Tan HB, Haidukewych G, Kanakaris N, Giannoudis PV. Proximal tibial fractures: early experience using polyaxial locking-plate technology. *Int Orthop*. 2011;35(8):1215–21. doi:10.1007/s00264-010-1153-y.
- Barei DP, Nork SE, Mills WJ, Coles CP, Henley MB, Benirschke SK, et al. Functional outcomes of severe bicondylar tibial plateau fractures treated with dual incisions and medial and lateral plates. *J Bone Joint Surg Am*. 2006;88(8):1713–21.
- Haidukewych G, Sems SA, Huebner D, Horwitz D, Levy B. Results of polyaxial locked-plate fixation of periarticular fractures of the knee. *J Bone Joint Surg*. 2007;89(3):614–20.
- Hall JA, Beuerlein MJ, McKee MD. Open Reduction and Internal Fixation Compared with Circular Fixator Application for Bicondylar Tibial Plateau Fractures. *J Bone Joint Surg-Am*. 2009;91(Suppl 2):74–88. doi:10.2106/jbjs.g.01165.
- Haidukewych G, Sems SA, Huebner D, Horwitz D, Levy B. Results of polyaxial locked-plate fixation of periarticular fractures of the knee. *J Bone Joint Surg*. 2007;89(3):614–20.
- Rademakers MV, Kerkhoffs GMMJ, Sierevelt IN, Raaymakers ELFB, Marti RK. Operative Treatment of 109 Tibial Plateau Fractures: Five- to 27-Year Follow-up Results. *J Orthop Trauma*. 2007;21(1):5–10. doi:10.1097/bot.0b013e31802e5b51.
- Phisitkul P, McKinley TO, Nepola JV, Marsh JL. Complications of Locking Plate Fixation in Complex Proximal Tibia Injuries. *J Orthop Trauma*. 2007;21(2):83–91. doi:10.1097/bot.0b013e318030df96.
- Oh CW, Oh JK, Kyung HS, Jeon IH, Park BC, Min WK, et al. Double plating of unstable proximal tibial fractures using minimally invasive percutaneous osteosynthesis technique. *Acta Orthop*. 2006;77(3):524–30.

## Author biography

**Sambit Kumar Panda**, Assistant Professor

**Pradyut Kumar Pradhan**, Assistant Professor

**Sanjay Kumar Behera**, Assistant Professor

**Chinmaya Debasis Panda**, Assistant Professor

**Cite this article:** Panda SK, Pradhan PK, Behera SK, Panda CD. A comparative study based on surgical and functional outcome of proximal tibia fractures between unicondylar and bicondylar fractures. *Panacea J Med Sci* 2020;10(3):291-294.