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

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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 and 25 patients in the bicondylar fracture group.

Results: 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 (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±0.351 and in group 2 was 3.10±0.433 (p>0.05). In group 1, the mean follow-up time was 12.81±2.09 and in group 2 was 13.04±2.28 (p>0.05). The mean functional score of group 1 was 91.2±12.27, and in group 2, it was 91.2±12.27. In group 1, mean WOMAC score was 12.2±21.179, and in group 2, it was 16.72±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.

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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...
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. 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.

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.

Not every fracture requires surgery; presently, conservative treatment is only for undisplaced or minimally displaced without any associated soft tissue and neurovascular injury. 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.

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.

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. 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. 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.

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 ± 0.351 and in group 2 was 3.1 ± 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±2.09          | >0.05   |
| Group II| 13.04±2.28         |         |

In group 1, the mean follow-up time was 12.81 ± 2.09 and in group 2 was 13.04 ± 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±26.337         | >0.05   |
| Group II| 130.4±7.059         |         |

In group 1 mean range of motion (ROM) was 131.2 ± 6.337 and in group 2 was 130.4 ± 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±12.27 and in group 2 it was 87±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±0.21.179    | >0.05   |
| Group II| 16.72±923      |         |

In group 1 mean WOMAC score was 12.2 ± 21.179 and in group 2 was 16.72 ± 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. The results were at par with that of the current study. However, according to the study of Nikolaou et al., (2011), 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 Nikolaon et al. (2011). On the contrary, Phisitkul et al. (2007) achieved a mean union time of 12 weeks. Also, as per the Oh et al., (2006), 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.

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8. Conflict of Interest

The authors declare they have no conflict of interest.

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