

Radiological measurement of Schatzker type II Tibial Plateau Fracture by Proximal Tibial Metaphyseal Plate

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ABSTRACT

Background: The tibial plateau fracture rates among the top 10 intra-articular fractures in terms of frequency. Due to the extreme displacement of the bony fragments, the accompanying depression and impaction of the cancellous subchondral bone, and the unavoidable cartilage injury, the fracture patterns are extremely complex and difficult to manage.

Objective: The study aimed to figure out the distribution of Radiological measurement of Schatzker type II Tibial Plateau Fracture by Proximal Tibial Metaphyseal.

Methodology: This was a prospective observational study, carried out at NITOR, Dhaka, Bangladesh from July 2019 to June 2021. Purposive sampling technique was used.

Results: The mean duration of radiological union was 13.3 ± 1.6 weeks. The mean angular depression was 0.68 ± 1.1 mm, condylar widening was 0.26 ± 0.68 mm, and the angulation was 0.480 ± 1.50 mm. 64.5% cases were excellent and 35.5% were good at the most recent follow-up. Normal coronal alignments were observed in 87.1% instances upon final follow-up.

Conclusion: Schatzker type II tibial plateau fracture by proximal tibial metaphyseal plate gives excellent to good functional outcome with minimal complications, so this is an effective and safe method.

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INTRODUCTION

In terms of frequency, a fracture of the tibial plateau ranks among the top ten intra-articular fractures. Because of the extreme displacement of the bony fragments, the accompanying depression and impaction of the cancellous subchondral bone, and the unavoidable related cartilage injury, the fracture patterns are very complex, and their management is tough. Complications such as compartment syndrome, cartilage loss, soft-tissue envelope injury, post-surgery infection, knee instability/stiffness, and early/late post-traumatic arthritis are often severe(1). Schatzker type II tibial plateau fractures are characterized by a split wedge fracture of the lateral column and an accompanying depression(2). An orthopedic surgeon's therapeutic options are limited when dealing with tibial plateau fractures(3)(4). Fractures of the tibial plateau are notoriously difficult to heal,

as the joint is often broken along with the bone, making consolidation and proper limb alignment nearly impossible. Even with closed fractures, soft-tissue injury is frequently significant, raising the question of when to perform open reduction and fixation. Different methods of knee injury led to a wide range of possible tibial plateau fracture types. These fractures need more energy to initiate and have a different mechanism of injury depending on age(5). These fractures are more common in younger patients as a result of high energy trauma like an automobile accident or a fall from a great height, whereas they are more common in elderly patients as a result of low energy trauma like a simple fall(6). Open reduction, combined with bone grafting in any case of cancellous bone depression, and rigid internal fixation with plates and screws has been regarded as the gold standard approach for decades because of the knee's complex anatomy

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and the need for an anatomic reduction as in all intra-articular fractures(1,7,8).Temporary stabilization with a spanning the knee external fixator is often necessary to allow for soft-tissue resuscitation, pain alleviation, gaining more information relating to the fracture structure (typically with a CT-scan), and definitive treatment at the optimum moment(9). Age, concomitant health problems, smoking history, occupation, functional capacity, and personal aspirations are also crucial in predicting both short- and long-term outcomes(1).

The study aimed to figure out the distribution of Radiological measurement of Schatzker type II Tibial Plateau Fracture by Proximal Tibial Metaphyseal.

METHODOLOGY

This was a prospective observational study. The study was carried out at NITOR, Dhaka, Bangladesh. The study was conducted from July 2019 to June 2021. Purposive sampling (non-randomized) was done according to availability of the patients and strictly considering the inclusion and exclusion criteria. Data were collected with a pre tested structured questionnaire containing history, clinical examination, laboratory investigations, pre-operative, perioperative, post-operative complications and post-operative follow up findings. Data sheet was formulated to evaluate the outcomes according to Rasmussen criteria and Hospital for Special Surgery (HSS) criteria. Data were processed and analyzed using computer software program SPSS version 23.0. The data present on categorical scale was expressed as frequency and corresponding percentage, while the quantitative data was presented as mean and standard deviation (SD).

Data procedure

After selecting a case according to inclusion and exclusion criteria, patients were evaluated pre-operatively. Initially immobilization was done with application with cast. After preparing the patients for operation, surgery was done. Injection Cefuroxime and Inj. Flucloxacillin was given pre-operatively followed by oral Cefuroxime and Flucloxacillin for 14 days. Drain was removed at 2nd POD and discharged from hospital at 3rd POD. 1st follow up was given at 14th POD to check any signs of infection, pain status and distal neurovascular status. Stitch was removed on the same day. X-ray was done to check fracture alignment. Next follow up was at 6th week after operation. Range of motion was tested. X-ray was done. Improvement was noted. HSS was measured.

After that, next follow up was given at 12th week after operation(10). X-ray was done to check for radiological union and HSS score was measured. If radiological union was not achieved, next follow up was given at every 4 weeks until union was achieved. But if union was achieved, next follow up was given at the end of 24th week (6th month). X-ray was done to see final radiological alignment according to Rasmussen criteria(11). Functional assessment was done according to HSS score(12).

RESULT

In this study, a total of 31 patients with type II Schatzker tibial plateau fractures who met the inclusion criteria for this thesis were chosen. Patients were examined and treated between September 2019 and May 2021. All patients were observed for a minimum of 24 weeks. The following results were obtained in this series. In this study, the maximum proportion of patients (35.5%) were between the ages of 18 - 31 and 32 - 45. 9 (29%) patients were between the ages of 46 - 59. The range of ages was 18 to 59 years, with a mean age of 37.4 ± 10.9 years. A total of 27 (87.1%) of the study participants were men, while 4 (12.9%) were women (a male-to-female ratio of 6.75:1). 7 (22.6%) cases were businessman, followed by 7 (22.6%) service holder, 5 (16.1%) were student, 5 (16.1%) were farmer, 2 (6.5%) were housewives, 2 (6.5%) were vehicle drivers and 3 (9.7%) were other occupants.

Mechanism of injury & Radiological union

Motor vehicle accidents were the leading cause of injury, accounting for 28 (90.3%). The cause of 3 (9.7%) accidents was a fall from a high level. All fractures healed during the research period. The mean duration of radiological union was 13.3 ± 1.6 weeks. In 17 patients (54.84%), the fracture healed at 12 weeks. Radiological union occurred at 14 weeks in 8 cases (25.81%) and 16 weeks in 6 cases (19.35%). The mean angular depression was 0.68 ± 1.1 mm, the mean condylar widening was 0.26 ± 0.68 mm, and the mean angulation was 0.480 ± 1.50 mm. In accordance with the "Rasmussen radiological criteria", 20 (64.5%) of the 31 cases were excellent and 11 (35.5%) were good at the most recent follow-up. Normal coronal alignments were observed in 27 (87.1%) instances upon final follow-up. 50 valgus malalignment was observed in 2 (6.5%) patients, while 100 valgus malalignment was observed in 2 (6.5%) patients.

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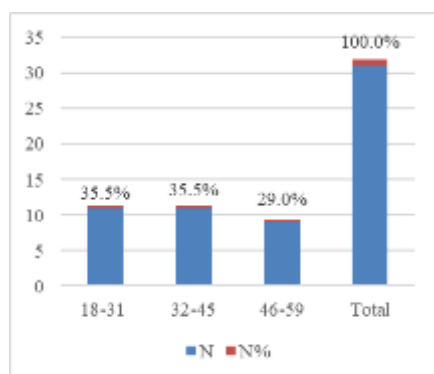


Figure 1: Bar chart diagram of patients according to age range.

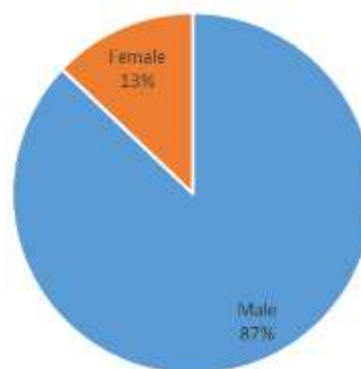


Figure 2: Pie chart distribution of gender among the patients.

Table-1: Distribution of Radiological union among the patient

Distribution of Radiological union		
	N	N%
Radiological union (In weeks)		
12	17	54.84%
14	8	25.81%
18	6	19.35%
	Mean±SD 13.3±1.6	
Rasmussen radiological outcome at last follow up		
Excellent	20	64.5%
Good	11	35.5%
Coronal alignment		
Normal (7° valgus)	27	87.2%
(7° valgus)	2	6.5%
(7° valgus)	2	6.5%

DISCUSSION

In this study, the highest number of patients 11 (35.5 %) were 18-to-31-year age group and in 32-to-45-year age group. Nine (29%) patients were in 46-to-59-year age group. The mean age was 37.4±10.9 years with range from 18 to 59 years. In the series of (1,13), the mean age was 43 and 38 years respectively which is similar to my study. Male was 27 (87.1%) and female 4 (12.9%) with a male-female ratio of 6.75:1. In the study of (14) 83.33% cases were male.

In other studies, also male was seen predominantly affected from this type of fracture which is similar to this study. Still now in our country, males are taken part in most of the outdoor activities thus expose themselves to motor vehicle accident. This may be the cause of high percentage of male patients suffering this low energy fracture. Regarding occupations of the study patients, 7 (22.6%) cases were businessman, followed by 7 (22.6%) service holder, 5 (16.1%) were student, 5 (16.1%) were farmer, 2 (6.5%) were housewives, 2 (6.5%) were vehicle drivers and 3 (9.7%) were other occupants. This occupation pattern also signifies the above-mentioned statement that homebound occupants were the least sufferers. In this study, motor vehicle accident

accounted for 28 (90.3%) cases which was the most common cause of injury (8). Fall from height was accounted for 3 (9.7%) cases. Trauma is the prime cause of Schatzker type II fracture. This is evident in the present series. Also seen in other studies like (6,15) where the main cause of fracture was motor vehicle accident. All fractures were united within the study period. The mean radiological union time was 13.3±1.6 weeks. In 17 (54.84%) cases, fracture was united at 12 weeks. Radiological union was occurred at 14 weeks in 8 (25.81%) cases and at 16 weeks in 6 (19.35%) cases. Various reports have associated a faster time to fracture union with the use of locked plating. Jiang, et al., showed mean healing time was 3.1 months (Jiang, et al., 2008) which is similar to the present study. The quality of reduction was assessed by Rasmussen radiologic criteria (15). At last, follow up, the mean angular depression was 0.68±1.1 mm, mean condylar widening was 0.26± 0.68 mm and mean angulation being 0.480 ±1.50. According to Rasmussen radiological criteria, among the 31 cases, 20 (64.5%) were excellent and 11 (35.5%) were good at last follow up. In the study of Biggi, et al., (2010) of the 47 patients that they examined at the final follow-up, the results were good to excellent in 41 patients (87%) at 6 months.

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Moreover, as the quality of reduction was better in the present study, normal coronal alignments was shown in 27 (87.1%) cases. 50 valgus malalignment was shown in 2 (6.5%) patients and 100 valgus malalignment was shown in 2 (6.5%) patients.

CONCLUSION

It can be concluded that treatment of Schatzker type II tibial plateau fracture by proximal tibial metaphyseal plate gives excellent to good functional outcome with minimal complications thus this is an effective and safe method.

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