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### Evaluation and Outcome of Surgical Management of Plateau Fracture- A Study in Shaheed Monsur Ali Medical College, Dhaka, Bangladesh

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#### ABSTRACT ORIGINAL RESEARCH ARTICLE

**Introduction:** Orthopaedic tibial plateau fractures are common. These fractures affect the knee's articular tibia. Plateau fractures may be simple or complicated. Skeletal and ligamentous injuries determine stability.

**Methodology:** The Department of Orthopaedic and Trauma Surgery at Shaheed Monsur Ali Medical College and Hospital in Dhaka, Bangladesh, performed this prospective study from June to December 2022. This study operated on 22 tibial plateau fracture patients. These individuals have significant injuries from motor vehicle accidents, falls, attacks, etc. These patients were assessed pre- and post-surgery. Schatzker, Hohl-Moore, and AO categorised these examples.

**Results:** 22 individuals had tibial plateau fractures. Patients averaged 45,4 years old. RTA damaged most patients. Schatzker's classifications called for CRIF, percutaneously cannulated cancellous screws, ORIF with buttress plate with or without bone transplantation, and external fixation for the identified fractures. Post-surgery range of motion started

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early. Weightless for 6-8 weeks. Weight bearing is delayed until fracture union or 12 weeks. POP casts immobilise unstable fractures for 3-6 weeks. After union, locomotion, weight bearing, and knee range of motion were excellent to very good. Fractures healed as expected. The series showed no non-union. Union averaged 14 weeks (10-22 weeks). Due to the severity of the injuries and infections, ten of the twenty-two surgical cases had excellent outcomes, whereas one had a poor result.

**Conclusion:** As car accidents grow, so do high-velocity tibial plateau fractures. In depressed and displaced fractures, surgery may stabilise the knee.

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## INTRODUCTION

Fractures of the Tibial Plateau are a common orthopaedic injury. These fractures affect the articular surface of the tibia, which is a component of the knee joint. Plateau fractures can range from low-energy injuries with minimal or no relegation to complex fractures with severe associated injuries. The stability of these injuries is determined by a combination of skeletal and ligamentous injuries. Tibial table fractures are among the most prevalent intra-articular fractures caused by circular coronal or direct axial compression forces. Tibial table fractures account for 1 of all fractures and 8 of all fractures in the elderly [1]. These fractures involve the medial condyle (10-23%), the lateral condyle (57-80%), or both (11-30%), with varying degrees of articular depression and displacement. In the event of improper restoration of the plateau surface and axis of the limb, these fractures may result in the development of premature osteoarthritis, ligament injury, and enduring pain and disability [2,3,4]. Fractures of the tibial plateau may be accompanied by meniscal and ligamentous knee injuries [5,6,7]. Surgical treatment consists of open reduction and internal fixation by proximal tibial plate and fastener using both conventional and MIPO techniques. As the patient requires early mobilisation, the surgical management measures are vastly preferable in terms of outcome in all respects. Surgical management by proximal tibial plate and

screw plays a significant role in internal fixation of various varieties of proximal tibial fracture [8,9]. Each increasing numeric category specifies an increase in the level of energy imparted to the bone, thereby increasing the severity of the fracture. Types I through IV are unicondylar, whereas types V and VI are bicondylar. The pattern of each fracture in the Schatzker classification assists orthopaedic surgeons in selecting an appropriate treatment modality [10,11].

## MATERIALS & METHODS

From June to December 2022, this prospective investigation was conducted at the Department of Orthopaedic and Trauma Surgery at Shaheed Monsur Ali Medical College and Hospital in Dhaka, Bangladesh. During this research, 22 patients with tibial plateau fractures underwent surgery. All of these patients presented to the emergency room with severe injuries resulting from motor vehicle accidents, falls from heights, assaults, etc. All of these patients were evaluated prior to and following surgery. These cases were all classified using the Schatzker, Hohl-Moore, and AO system. The average age of the patients was 41, with the eldest patient being 60 and the youngest being 24.

### Inclusion Criteria:

1. Age: Patients above 18 years of either sex.
2. Radiological diagnosis of fractures with classification based on Schatzker's classification.

**Exclusion Criteria:**

1. Age: Less than 18 years.
2. Patients who are medically unfit for the surgery.

3. Compound tibial plateau fracture.

The consent of the patient for anaesthesia and surgery and Institutional ethical clearance was obtained (Table-1).

**Table-1:** Methods of treatment of 22 patients treated surgically.

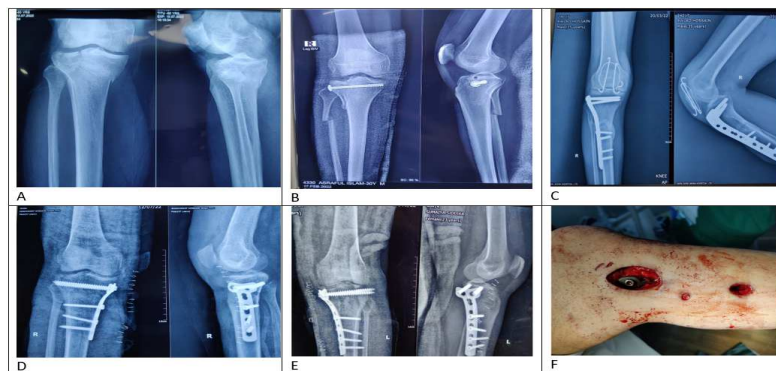
Methods of treatment	No. of cases	Percentage
Percutaneous cancellous screw fixation	5	22.7
Cancellous screw and bone grafting	2	9.1
ORIF with buttress plate and screws	10	45.5
ORIF with buttress plate and bone graft	4	18.2
ORIF with buttress plate and external fixator	1	4.5

Whenever rigid internal fixation was obtained, the patient was mobilised 48 hours after the removal of the drains; for the first two to five days, the range of motion permitted was 0 to 20 degrees; beginning on the fifth day, the range of motion allowed was gradually increased to 90 degrees or more. After fissure junking, complete range of motion was permitted. Whenever there was scepticism regarding the severity of obsession, external splinting in the form of cataplastm of Paris arbour was administered as a means of support. Everyday range of stir exercises (CPM) were performed under close supervision, and flake was reapplied. All cases were instructed and advised to perform stationary and dynamic quadriceps exercises with a quadriceps board as frequently as practicable and throughout the day. Full weight bearing was permitted after 12- 16 weeks of partial weight bearing, which was

delayed until 6-8 weeks. Within four hours of injury or one week after the injury, when the swelling and inflammatory responses have subsided, was the optimal time for open reduction and internal fixation.

Pre-operative guidelines: Consent for anaesthesia and surgery was obtained, and the patient was placed on NBM eight hours prior to surgery. Injection TT IM 0.5cc stat was administered. A preoperative antibiotic was administered.

Blood pressure, temperature, pulse, and respiration were monitored hourly per postoperative instructions. Analgesia was administered after surgery, and antibiotics were prescribed for 7 to 10 days. Patients were monitored for signs of haemorrhage. As the procedures are performed under spinal anaesthesia, the foot was elevated. Postoperative X-rays were obtained, ideally the following day.

**Figure-1(a-f):** Surgical management of plateau fracture.

**RESULTS**

22 patients were diagnosed with tibial plateau fracture. 45,4 4.26 years was the mean age of the patients. The majority of patients were injured due to RTA. Observations and

analyses of results were conducted in relation to age, type of fracture, method of treatment, duration of immobilisation, complications, and comments of various age groups, as detailed in (Table-2).

**Table-2:** Distribution age and sex number of cases (N=22)

Age in years	No. of cases	Percentage
21-30	3	13.6
31-40	11	50.0
41-50	5	22.7
51-60	3	13.6
Sex		
Male	20	90.9
Female	2	9.1

**Table-3:** Period of immobilization (N=22)

Period of immobilization	No. of cases	Percentage
< 10 days	16	72.7
Up to 3 weeks	4	18.1
Up to 6 weeks	2	9.2

No patient was immobilised after secure, rigorous fixation was performed. In cases of doubt regarding the rigidity of the fixation, associated ligament injury, or osteoporosis, the immobilisation was preferably extended to three weeks with an above-knee cast. Two

cases of infection and one case of severe metaphyseal comminution required 6-8 weeks of immobilisation. Except for the last group, in which one patient developed knee rigidity (Table-3,4), the majority of cases had a pain-free range of motion (0-130°) in the knee.

**Table-4:** Shows numbers of patients with different complications (N=7)

Complications	No. of cases	Percentage
Knee stiffness	2	9.09
Mal-union	1	4.54
Infection and wound dehiscence's	2	9.09
Extensor lag	1	4.54
Redepression	1	4.54

**Table-5:** Clinical results of surgery (N=22)

Clinical results	No. of cases	Percentage
Excellent	10	45.45
Good	10	45.45
Fair	1	4.54
Poor	1	4.54

All fractures united within expected time. Not a single case of non-union was noted

in given series. Average time for union was 14 weeks (range 10-22 weeks). Out of 22 cases

treated with surgical procedure, 10 cases gave excellent result and 1 cases of poor result were seen, mainly due to the severity of the injury and infections (Table-5).

## DISCUSSION

This study demonstrates that the new APS surgical technique, when combined with early weight bearing and a wide range of motion, can provide non-inferior medical and radiological outcomes in a difficult fracture institution. A clinically significant finding of our study was that the rate of deep SSIs became nil when the new APS technique was used, despite the fact that these fractures were treated with extra plates, which has historically increased the risk of infection [16]. The APS technique was also found to have no deleterious effect on the ability to reduce and stabilise the fracture, nor on the short-term functional outcomes. Tibial plateau fractures, one of the most common intra-articular fractures, are a fundamentally irritating injury caused by motor vehicle accidents, falls from great heights, violence, etc. It is rarely associated with other skeletal or soft tissue injuries. Any fracture across a joint (especially the weight-bearing knee joint in the lower limb) is of the utmost importance because it causes enormous morbidity and negatively influences the quality of life. 22 patients were diagnosed with tibial plateau fracture. 45.4 years was the mean age of the patients. The majority of patients were injured due to RTA. Observation and analysis of results were conducted in relation to age, nature of fracture, treatment method, duration of immobilisation, complications, and age group comments. Therefore, treating fractures of the upper tibia with intra-articular extension is a challenge for orthopaedic surgeons. In the present study, the majority of fractures occurred between the ages of 20 and 60, with the highest incidence occurring between the ages of 31 and 40 (50%). Honkonen SE [6] also demonstrated an age incidence of 20-60 years with a mean of 39.8 years, which correlates with the current

study. Albuquerque et al. found that 71% of injuries occurred between the ages of 30 and 60, with the highest frequency between the ages of 40 and 49 [8]. Fractures with minimal energy are more prevalent in elderly patients than in younger patients [4]. No patient was immobilised after secure, rigorous fixation was performed. In cases of doubt regarding the rigidity of the fixation, associated ligament injury, or osteoporosis, the immobilisation was preferably extended to three weeks with an above-knee cast. Two cases of infection and one case of severe metaphyseal comminution required 6-8 weeks of immobilisation. One patient in the final group developed knee rigidity, but the majority of patients had a benign range of motion (0-130°) in the knee. Fractures of the tibial plateau are common in the active and productive age group, particularly among male patients who engage in more activities and travel. As reported by Lee et al. (65.71%) [7], Albuquerque et al. (70.3%) [8], Manidakis et al. (58.4%) [9], and Mehin et al. (56%) [10], males were more affected than females in this study. Schatzkar Type I and Type II fractures made up fifty percent of the total fractures in a given series. Similarly, 64% of patients with lateral condyle fractures were reported by Rademakers et al. (Schatzker 1/2/3) [11]. 30% of the injuries were high-grade Type-VI tibia plateau fractures, while 35% were low-grade Type-III fractures, as reported by Mehin and colleagues [10]. Gardner et al. reported in their MRI analysis of 103 patients that the most common fracture pattern was lateral plateau split-depression (Schatzker II) [12]. The number and proportion of cases with various Schatzkar fracture types reported by various studies have been tabulated. In this compilation, 22 cases of simple tibial plateau fractures treated surgically only were examined. Unique authors use unique criteria for the surgical control of these fractures. In gift research, 3mm melancholy was used as an example for surgical procedures. Schatzkar [13] described 70 cases



of tibial plateau fractures of all varieties treated conservatively (56%) and surgically (44%), with a mean follow-up period of 28 months. In 59.09% of cases involving the conservative group and 77.2 % of instances involving the open procedures, the desired results were achieved. In the first half of the 20th century, a researcher reported studies with the highest proportion of appropriate to high-quality short- and long-term results with surgical treatment [14, 15]. Another published study of 159 cases of tibial plateau fractures of all categories found that surgery (84%) yielded superior "good-excellent" results than conservative treatment (62%) [16]. Mehin and colleagues reported that 77% of 286 patients with tibial plateau fractures were surgically treated [10]. Similarly, Pasa et al. [17] reported that 30% of patients were treated conservatively and 70% underwent surgery. We have not established the stringent criteria for a specific method of fracture fixation for a specific type of fracture. Thus, each case was treated individually and according to its specific requirements. A majority of type I fractures, some type II fractures, and one type V fracture were treated with percutaneous cancellous screw fixation. The fracture, which had a displacement of >3mm, was 79 treated with ORIF. Bone grafting was performed in conjunction with ORIF using a Buttress plate and fasteners for Types II, III, V, and VI when required. Pasa et al. [17] treated 25 of 114 patients with proximal tibial fractures with a cancellous screw and fastener, and 27 patients with a buttress plate. They also reported that intra-articular fractures of the proximal tibia were successfully treated with minimally invasive fixation using cancellous screws [17]. The benefits of early knee motion include reduced knee rigidity and accelerated cartilage recovery (regeneration). However, these benefits must be carefully weighed against hazards, such as loss of fracture discount, internal fixation failure, and compromised ligament and soft tissue recovery. Schatzker et al. stated that the

diagnosis is determined by the degree of displacement, nature of fracture, treatment procedure, and quality of postoperative care [13]. All fractures healed within the expected timeframe. Not a solitary instance of non-union was mentioned in the given collection. The new average union duration is 14 weeks (range: 10-22 weeks). Due to the severity of the injuries and infections, ten of the twenty-two cases treated with surgical procedure had an outstanding outcome, while one case had a negative outcome. We achieved 45.54 percent outstanding results, 45.45 percent fair results, and overall 91.08 percent acceptable outcomes with our standard surgical care utilising various standard fixation 80 techniques. In terms of functional outcome, we also had 4.54% acceptable and 4.54% unsatisfactory results. These outcomes are comparable to those of other well-documented standard studies.

#### **CONCLUSION**

With the increase in automobile accidents, tibial plateau fractures (especially high velocity injuries) are increasing. When indicated (specifically in depressed and displaced fractures), surgical treatment is excellent for obtaining a robust knee. The surgical management of tibial plateau fractures is difficult and provides excellent anatomical reduction and rigid fixation to restore articular congruity, facilitate early knee motion by reducing post-demanding osteoarthritis, and achieve optimal knee function.

**Conflict of Interest:** None.

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