

“Evaluation of Outcome of Tibial Plateau Fracture (Schatzker Type – II) Treated by ORIF with Buttress Plate and Screws: A study at Dhaka Medical College & Hospital, Dhaka”

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Abstract:

Introduction: Tibial plateau fractures are one of the commonest intra-articular fractures resulting from indirect coronal or direct axial compressive forces. Tibial plateau fractures constitute 1% of all fractures and 8% fractures in elderly.

Objective: To evaluate the functional outcome of tibial plateau fractures (Schatzker Type II) treated by open reduction and internal fixation with buttress plating.

Materials and methods: This were a prospective quasi experimental type of study. The study was conducted at Department of Orthopaedic Surgery, Dhaka Medical College and other private hospital at different area of Dhaka. During the period from July 2014 to June 2016. All patient with Tibial plateau fracture who underwent surgery meet the inclusion and exclusion criteria in the above-mentioned institutions were the study population. The Study has been evaluated & accepted by Thesis committee of Dhaka medical college, Dhaka. And other ethical issues such as inform written consent from patient or from legal guardian after duly informed about the aims and objectives of the study were explained to the patients in easily understandable local language and then informed written consent were taken from each patient. The analysis of different variable will be done according to standard statistical analysis by using SPSS version 17.

Results: Functional grading was done based on Rasmussen scoring system. In the final assessment, 37% of the patients had more than 120° extension, 59% had range of movement between 90° and 120° degrees and 3% had range of motion between 70° and 90° degrees. 3% were unable to walk more than 100 meters and all others were able to walk without much pain. Functional results were excellent in 80%, good in 17%, fair in 3% and poor in 0%.

Conclusion: Tibial plateau fractures (Schatzker type - II) can be effectively treated by ORIF Buttress plate and screws. Bone grafting after elevation of the depressed fracture is always advisable as it gives a good anatomical and functional outcome.

Key words: Tibial condyle fractures, Internal fixation, Buttress Plating.

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I. Introduction

Tibial plateau fractures are one of the commonest intra-articular fractures resulting from indirect coronal or direct axial compressive forces. Fractures of tibial condyles were brought into prominence in 1929 by the papers of Cotton and colleagues¹ in Boston, and Cubbins and colleagues² from Chicago, calling them as fender fracture and other as bumper fracture. Tibial plateau fractures constitute 1% of all fractures and 8% fractures in elderly. A tibia plateau fracture is a bone fracture or break in the continuity of the bone occurring in the proximal part of the tibia or shinbone called the tibial plateau; affecting the knee joint stability and motion. Server^{3,4} reported three cases of fracture tibial plateau. During this time, most of the fractures were treated by immobilization. The plateau is a critical weight-bearing area located on the upper extremity of tibia and is

composed of two slightly concave condyles (medial condyle and lateral condyle) separated by an intercondylar eminence and the sloping areas in front and behind it. It can be divided into three areas: the medial tibial plateau, the lateral plateau and the central tibial plateau. Tibial plateau fractures usually occurring a bimodal age distribution. In young patients, high-energy trauma results in comminuted fractures and severe soft damage, where as in older patients, comminution and soft tissue injury arise mainly from poor bone quality and thin skin. Many different classification systems have been proposed, none with universal acceptance. The system most widely today is the Schatzker classification; type I: split fracture of the lateral plateau, type II: split-depression of the lateral plateau, type III: depression of the lateral plateau, type IV: medial plateau fracture, type V: bicondylar fracture and type VI: a fracture with metaphysealdiaphyseal dissociation. These fractures encompass many and varied fracture configurations that involve the medial condyle (10-23%), lateral condyle (55-70%) or both (11-30%) with differing degrees of articular depression and displacement. Various treatment modalities have been used over the years, with mixed results. These include traction or closed treatment with cast bracing. Barr⁵ described the operative treatment of tibial plateau fracture where depressed plateau is elevated by spike and supported by cancellous bone grafts. Moore and harvey⁷ proposed the tibial plateau view for measuring the exact depression of plateau. Surgical procedures including circular frames, percutaneous screw fixation, open reduction/internal fixation and arthroplasty have also been advocated. More recent techniques such as the use of fixed angle devices, arthroscopically-assisted reduction, calcium-based cement augmentation and the use of novel grafting methods to address articular depression, constantly gain popularity amongst orthopaedic surgeons. Till the date, controversy still exists between the choice of the treatment conservative or surgical. But definitely trend is towards operative treatment. By taking into account of all these facts, we have conducted this study to evaluate the of outcome of tibial plateau fracture by ORIF with buttress plate and screws along with evaluation of functional outcome and influence of other factors.

II. Objectives

a) General objective:

- To evaluate the outcome of ORIF in tibial plateau fracture(Schatzker type - II) by buttress plate.

b) Specific Objectives:

- To restore the anatomy of articular surface of upper end of tibia and knee joint perfectly by operative treatment with internal fixation.
- To achieve rigid fixation.
- Early mobilization of knee
- To evaluate the final outcome.

III. Methodology And Materials

This was a prospective quasi experimental type of study. The study was conducted at Department of Orthopaedic Surgery, Dhaka Medical College and other private hospital at different area of Dhaka. During the period from July 2014 to June 2016. All patient with Tibial plateau fracture who underwent surgery meet the inclusion and exclusion criteria in the above-mentioned institutions were the study population. The Study has been evaluated & accepted by Thesis committee of Dhaka medical college, Dhaka. And other ethical issues such as inform written consent from patient or from legal guardian after duly informed about the aims and objectives of the study were explained to the patients in easily understandable local language and then informed written consent were taken from each patient. Data was collected with a pre-tested structured questionnaire containing history, clinical, laboratory investigations, pre-operative, post-operative follow up findings and complications. Data collection sheet is included later on. Data was collected, compiled and tabulated according to key variables and functional assessment scoring. The analysis of different variable will be done according to standard statistical analysis by using SPSS version 17.

• Inclusion Criteria

- Schatzker type II
- Patients above 18 years of age.
- Presented within two weeks of injury.

• Exclusion Criteria

- Open fracture.
- Patient with pathological fracture.
- Spinal injury or pelvic injury.
- Patients suffering from Systemic illness like Diabetes.

IV. Results

All the relevant findings obtained from data analysis are presented in tables and figures. Results were evaluated according to Rasmussen Functional Grading Criteria (appendix IV).(Table I) The mean age of patients was 38 years with SD \pm 9.23 and the lowest and the highest age were 29 and 47 years respectively. (Table II) shows the male and female ratio is 9:1. (Table III) Out of 30 patients, 9 patients were service holder which includes 30% of total patients. (Figure I) Out of 30 patients, 27 patients (90%) were affected by RTA, 03 patients (10%) by fall from height. (Figure II) Out of 30 patients, 18 patients (60%) were affected by left side and 12 patients (40%) were affected by right side. (Table IV) The mean hospital stay was 11 days with \pm SD 4.43; the lowest and the highest stay were 6 and 16 days respectively. All the 30 patients were followed up for at least 3 months, up to a maximum of 6 months, average 4.5 months. All patients were advised to attend to OPD at DMCH for follow-up at 2, 4, 8, 12, 16 week and at 6 months after operation and then every 6 months interval. The patients were follow-up for a minimum of 4 months to a maximum of 6 months. Each patient was evaluated both clinically and radiologically. At final follow-up the results were graded as excellent, good, fair or poor according Rasmussen Functional Grading Criteria for evaluation of final results after tibial plateau fracture. (Table V) Mean ROM 117° degree; range 108-126° degree. The mean Rom of patients are 108° and the lowest and the highest ROM were 108° and 126° respectively. (Table VI) Height score was 29, lowest score was 19. In this series 24 excellent, 5 good and 1 fair result achieved in patients. (Figure IV) Out of 30 patients, 24 patients (80%) showed excellent, 05 patients (17%) showed good and 01 patients (3%) showed fair result. Acceptable = Excellent + Good = 97%, Unacceptable = Fair + poor = 3%. (Table VII) Among the population we will find almost 91% to 103% acceptable result by this procedure, it is quite acceptable outcome.

Table I: Age distribution of the patients (n=30)

Age (years)	N	%
21-30	7	23.3
31-40	14	46.7
41-50	7	23.3
51-60	2	6.7
Mean \pm SD	38.07 \pm 9.23	

Table II: Sex distribution of the patients (n=30)

Sex	N	%
Male	27	90
Female	3	10

Table III: Occupation of the patients (n=30)

Occupation	N	%
Day laborer	6	20
Student	3	10
Teacher	3	10
Farmer	3	10
Businessman	3	10
Service holder	9	30
Policeman	3	10

Figure I: Cause of injury (n=30)

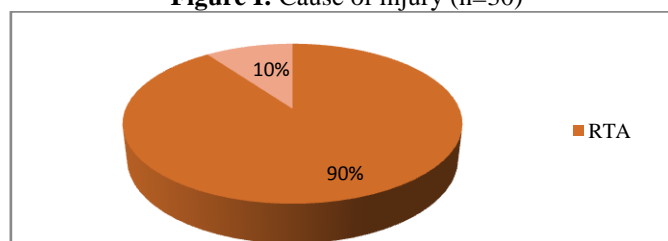


Figure II: Affected side of the patients. (n=30)

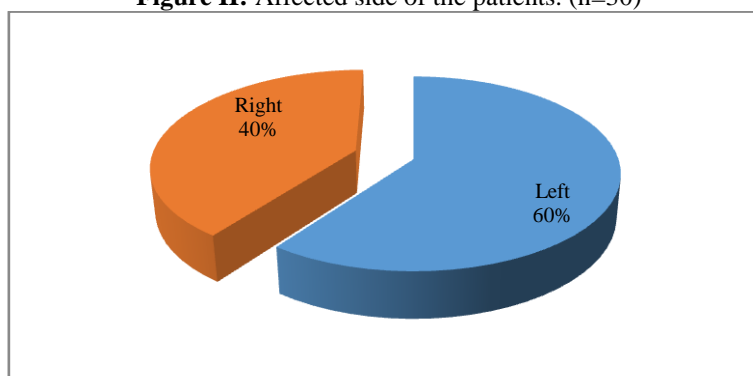


Table IV: Hospital stay of the patients (n=30)

Length of stay (week)	N	%
≤ 1 Week	9	30
≤ 2 weeks	12	40
≤ 3 weeks	9	30
Meant±SD	11.30 ± 4.84	

Figure III: Post-operative complication

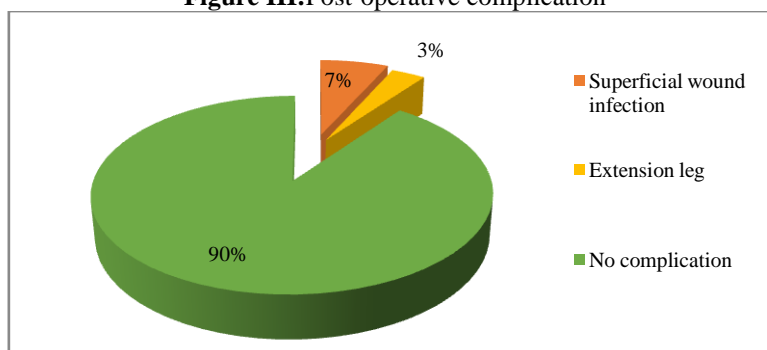


Table V: Distribution of patients by ROM of affected knee (n=30)

ROM (degrees)	N	%
61-70	1	3
71-80	0	0
81-90	0	0
91-100	4	13
101-110	1	3
111-120	13	43
121 – 130	11	37
Meant±SD	117.17 ± 8.87	

Table VI: Functional outcome according to Rasmussen Functional Grading Criteria (n=30)

Patient Serial no.	Pain	Walking capacity	Extension	Total ROM	Stability	Final Score	Result
1	6	6	6	5	6	29	Excellent
2	6	4	6	5	6	27	Excellent
3	6	6	6	5	6	29	Excellent
4	6	4	6	5	6	27	Excellent
5	6	4	6	4	6	26	Good
6	6	6	6	5	6	29	Excellent
7	6	6	6	5	6	29	Excellent
8	6	4	6	4	6	26	Good
9	6	4	6	5	6	27	Excellent
10	6	4	6	5	6	27	Excellent
11	6	6	6	5	6	29	Excellent
12	6	6	6	5	6	29	Excellent
13	6	4	6	5	6	27	Excellent
14	6	6	6	5	6	29	Excellent
15	6	4	6	4	6	26	Good
16	6	4	6	4	6	26	Good

17	6	4	6	5	6	27	Excellent
18	6	6	6	5	6	29	Excellent
19	5	2	4	2	6	19	Fair
20	6	6	6	5	6	29	Excellent
21	6	6	6	5	6	29	Excellent
22	6	4	6	5	6	27	Excellent
23	6	4	6	5	6	27	Excellent
24	6	4	6	5	6	27	Excellent
25	6	4	6	5	6	27	Excellent
26	6	4	6	4	6	26	Good
27	6	6	6	5	6	29	Excellent
28	6	6	6	5	6	29	Excellent
29	6	4	6	5	6	27	Excellent
30	6	4	6	5	6	27	Excellent

Figure IV: Bar chart showing final clinical outcome

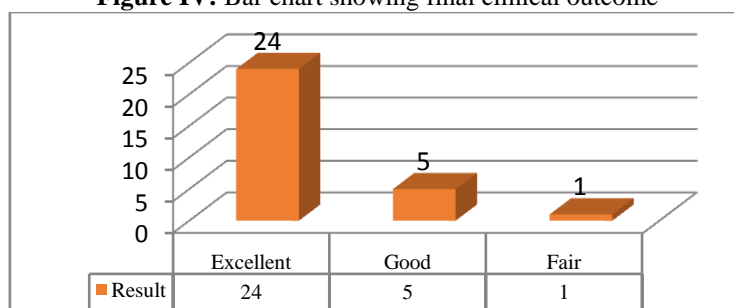


Table VII: Distribution of the results according to functional outcome.

Result	N	%
Acceptable	29	97
Unacceptable	1	3
Total	30	100

V. Discussion

Osteoarticular fractures particularly tibial plateau fractures still possess the problem of stiff knee and early osteoarthritis. Its management still remains controversial, whether surgical or conservative. Both the schools have divergent thoughts and have published excellent results. Keeping in mind the controversy of management this study of 30 cases was carried out which were treated surgically. All the patients were admitted, treated and followed regularly. Common modes of injury in this study were RTA (90%) and fall from height (10%). This fracture usually occurs in middle and old age probably due to reduced strength of subarticular cancellous bone. In our study, the average age was 38 years, meanwhile, in Rasmussen P.S. series⁸ the average age was 55 years. Male to female ratio was 9:1 which corresponds to most of the series. In our study we preferred Schatzker Classification because it is simple, uncomplicated and no special x-rays are required. Its practical utility to carry out treatment and prognosis has got an upper hand. Although Hohl's classification is detailed and excellent, it is complicated.^{9,10} Frequency of involvement of left and right knee is 3:2. Diagnosis of ligament injuries should be made at the earliest to prevent residual disabilities. In Rasmussen P.S. series⁸ overall incidence of ligament injury was 2.5%. According to Muller and colleagues¹¹ depressed type of fractures are very commonly associated with ligament injury (20%). In our study incidence of ligament injury is 0%. Indication of surgery was either depression or displacement and it varies in different series. Average duration of hospitalization was 11 days. It is because of high rate of post-operative wound infection (8%) Awareness of the factors producing permanent disability after tibial condylar fractures permits critical appraisal of current methods of treatment. These factors are limited motion, instability, angular deformity, lack of full extension, pain and post-traumatic arthritis and muscle weakness. A decided trend towards earlier mobilization of the knee after tibial condylar fractures have reduced the incidence of stiff knee by preventing the formation of intra articular adhesions. In our study average range of flexion at the end of 3 month was 117°. The early recognition and surgical repair of ruptures of the collateral ligaments result in restoration of knee stability when no fractures are present. In our study instability was 0. Late valgus or Varus deformities result from incomplete fracture reduction, collapse of soft cancellous bone beneath the articular surface during healing, or thinning of articular cartilage. Many patients with these deformities complain of pain in the medial side of the knee and required support at times. The long-term effect of such deformities is post-traumatic arthritis. Genu valgus is observed commonly after central depression fractures which are treated conservatively. Stable tibial condyles, properly aligned on the femoral condyles are essential to prevent angular deformity of the knees. In our study angular deformity was 0. Lessening the duration of rigid

immobilization and insisting upon early movement, always starting and ending movement with the knee in full extension prevent limited extension. This principle applies to traction treatment. 1 patient had loss of extension of 10 degree. Disabling pain years after a tibial condylar fracture is uncommon, although discomfort is noted frequently. Often the discomfort is on the medial side over the collateral ligament and is the result of chronic strain. Less often the pain is localized in the previously injured compartment of the knee and is caused by the traumatic arthritis that results from irregular surfaces, angular deformity, or degeneration of the articular surface. Prevention of late valgus or Varus deformity seems essential to minimize the later development of knee pain from strain or traumatic arthritis. In our study, occasional scheme is insignificant. Pain at rest was present in one patient. On an average incidence of residual disabilities was more in conservatively treated than surgically. Partial weight bearing was started between 12 to 16 weeks. This corresponds to most of the series. Results of treatment depends upon final outcome of the patients. Functional grading was done based on Rasmussen scoring system.⁸ In our study acceptable results were obtained in 97% of patient (excellent 80% and good 17%) which corresponds to series of Palmer¹², Rasmussen.⁸ Fair result was obtained in one patient with no Varus deformity, loss of extension of 10°, occasional pain and loosening of fixation. About 97% patients were satisfied with the final result, and resumed their duties.

LIMITATIONS OF THE STUDY

This was a prospective quasi experimental type of study in a single community with comparatively small number of sample size. So, the study result may not reflect the exact scenarios of the whole country.

VI. Conclusion And Recommendations

Open reduction and internal fixation by Buttress plate and screws is an effective method of treatment in Tibial Plateau fracture (Schatzker type - II). Post-operative complication is minimum. Functional outcome is also acceptable. AS the outcome evaluation was done 4 months after operation, changes in outcome beyond 4 months like implant failure, osteoarthritis and symptom status could not be ascertained. So further study should be contemplated taking long term evaluation into consideration. A long term randomized comparative study with a large series aiming the merits and demerits of locking plate use in tibial plateau fixation is recommended. Large scale studies with longer follow-up are essential requirement for an optimum outcome comparison. Through the study was very small which may not represent the whole scenario but the results of the study can be utilized for future large study.

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