



EVALUATION OF TREATMENT SCHATZKER TYPE-I TIBIAL PLATEAU FRACTURE WITH PERCUTANEOUS CANNULATED CANCELLOUS SCREW FIXATION

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Article Received on 16/10/2021

Article Revised on 06/11/2021

Article Accepted on 26/11/2021

ABSTRACT

Background: Tibial plateau fractures, intra-articular in nature and caused by high-velocity trauma, constitute approximately 1% of all fractures. Primary goal in the management of proximal tibial articular fracture to be a stable, congruous, pain-free, mobile joint. **Objective:** To find out the result of fixation of Schatzker type-I tibial plateau fracture with percutaneous cancellous cannulated screw. **Methods:** The present prospective observational study of management of Schatzker type-I tibial plateau fracture with percutaneous screw fixation was carried out during the period from May 2019 to June 2020 at the National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka. Out of 40 initially selected patients, 7 patients did not report for follow-up. Therefore, the result of the study was based on 33 patients. All the 33 cases were Schatzker type-I tibial plateau fracture. **Results:** The age of the patients ranged from 20 to 53 years, mean (\pm SD) being 38.45 \pm 1.55 years. 24(72.72%) were male and 9(27.28%) were female. Road traffic accident 21(63.6%), domestic accident 5(15.2%) and fall from height 7(21.2%). Right side was affected more, i.e. 20(60.6%). At the final follow-up, all cases were evaluated clinically and radiologically. Plateau tilting was found in 2 case (6.1%), valgus tilt in 2 case (6.1%), condylar widening in 7 (21.2%) cases, articular step-off in 8 (24.2%) cases and >50% joint space narrowing in 1 case (3.0%). Less than 50 percent joint space narrowing was found in 7(21.2%) cases. Results were graded using Rasmussen's criteria. The overall results were satisfactory in 30 (90.9%) and unsatisfactory in 3(9.1%). **Conclusion:** Considering outcome of treatment, it can be concluded that percutaneous screw fixation in Schatzker type-I tibial plateau fracture is a satisfactory method of treatment.

KEYWORDS: Tibial plateau, Percutaneous cancellous, Cannulated screw.

INTRODUCTION

Tibial plateau is the upper part of tibia and is constituted by lateral and medial condyles separated by intercondylar eminence. Medial articular facet is oval and lateral one is more or less circular. These surfaces articulate with condyles of femur to form the knee joint.

Tibial plateau fractures constitute approximately 1% of all fractures. They involve the knee joint and usually result from axial loading in combination with varus/valgus stress forces. The lateral side of the knee joint is most commonly injured during road traffic accidents, which results in torn ligaments, sprains, and fractures of one or both condyles.^[1,2] Tibial plateau fractures are intra-articular fractures caused by high-velocity trauma. They are usually associated with neurovascular injury, compartment syndrome, compounding of fractures, and crushing of soft tissues. Associated injuries at and around the knee joint are more

common and severe in patients with fracture-dislocation. The primary goal in the treatment of proximal tibial articular fracture includes restoration of articular congruity, axial alignment, joint stability, and functional motion.^[3]

This tibial plateau and the knee joint are very important for transmission of body weight. Stability and congruity of the joint is of utmost importance because any incongruity affects its major function tremendously. Ligamentotaxis that is traction along the long axis of lower limb exerts longitudinal force through the ligaments particularly lateral collateral ligament in case of fracture lateral condyle, which brings the fracture fragments in proper position and helps percutaneous screw fixation without open reduction.^[4,5]

Tibial plateau fractures are usually followed by high-energy trauma. These fractures are difficult to treat

because of the involvement of the articular surface, the comminution, and condition of the soft tissues. Internal fixation with locking plates following the principles of MIPPO (Minimally Invasive Percutaneous Plate Osteosynthesis) provides effective and satisfactory fracture reduction with good results in terms of functional outcome.^[6]

There are several classification systems in tibial plateau fracture, of which Schatzker et al. (1979) classification system is more acceptable, which is based on fracture configuration. Each type of fracture needs particular management.^[7]

Difficulties with conservative treatment include inadequate reduction and instability.^[8] Gyling and Lindholm (1953) stated that degenerative changes occurred in 55 percent of their cases after conservative treatment.^[9]

Open reduction and internal fixation may require an extensive exposure resulting in long operative time, increased blood loss and devascularization of bone fragments. Nonoperative treatment can result in articular incongruity and knee instability. An ideal form of management would be minimally invasive, yet allow for an anatomic reduction: fixation would be stable enough to permit early motion.^[10]

At NITOR, we received patients at the emergency and outpatient departments. Usually the patients come immediately to the emergency department and within few days at the outpatient department.

OBJECTIVE

General

The aims of this study was to find out the result of fixation of Schatzker type-I tibial plateau fracture with percutaneous screw.

Specific

- To find out the incidence of Schatzker-I tibial plateau fracture in different age, sex and side.
- To find out the functional outcome after minimal fixation of tibial plateau Schatzker type-I.
- To find out postoperative complications.

METHODOLOGY

Type of study

This is a prospective observational study.

Place of study

National Institute of Traumatology and Orthopedic Rehabilitation, Dhaka.

Period of study: May 2019 to June 2020.

Study population

All the patients above 18 years of age with tibial plateau fracture Schatzker Type-1 admitted in the different units of NITOR.

Sample size

Due to time limitation and insufficient number of available patients, a total of 40 consecutive patients who underwent fixation with percutaneous cancellous screw. Purposive sampling was followed as per inclusion and exclusion criteria. 7 patients were drop out. So, a total of 33 patients were included for evaluation.

Sampling technique

A total number of 40 patients were selected for this study. Cases were diagnoses on clinical and radiological basis at the emergency or outpatient department of NITOR as tibial plateau fracture Schatzker type-1. During admission the patients were labelled as 1, 2, 3 and so on were treated by ligamentotaxis and percutaneous screw fixation. Initially, 40 cases were included in the study. However, among them, 7 patients did not report in subsequent follow-up visits and were excluded from the study. So, the final study was done among the remaining 33 cases.

Data analysis

After completion of data collection it was compiled and tabulated according to key variables. Analysis of different variables was done according to standard statistical method and calculations using scientific calculators & SPSS version 22.

Data presentation

Suitable charts and tables used to present the observation & result of the study and statistical analysis.

RESULTS

After an average of 6 months follow-up. The following findings were compiled.

Table 1: Age incidence of the study patients.

Age group (years)	Frequency	Percentage (%)
20-30	6	18.18
31-40	15	45.45
41-50	9	27.28
51-60	3	9.09
Total	33	100.0

The age of the patients ranged from 20 to 53 years, mean (\pm SD) being 38.45+1.55 years. The commonest age group was 31-40 years. Out of 33 patients, 15 (45.45%) were in this group. The second peak was between 41-50 years (27.28%). The age distribution of the patients are shown in Table-1.

Table 2: Sex distribution of the patients.

Sex	Frequency	Percentage (%)
Male	24	72.7
Female	9	27.3
Total	33	100.0

Male patients were more frequently affected than female. Out of 33 patients. 24 (72.72%) were male and 9

(27.28%) female. The male-female ratio was 2.67:1. The results are shown in Table-2.

Table 3: Causes of trauma.

Cause of trauma	Frequency	Percentage (%)
Road traffic accident	21	63.6
Domestic accident (fall on the slippery ground, fall from staircase)	5	15.2
Fall from height	7	21.2
Total	33	100

All the 33 patients presented with a history of trauma (100%). Out of them 21 (63.64%) had road traffic accident, 5 (15.15%) had domestic accident and 7

(21.21) had fall from height. The results are shown in Table-3.3

Table 4: Time interval between injury and fixation (n =33).

Time interval between injury and fixation	Number of cases	Percentage
Within 5 days	0	0.0
5-10 days	23	69.7
11-15 days	8	24.3
Total	33	100.00

Most of the 23(69.7%) patients were operated within 5-10 days of injury, 8(24.3%) were within 11-15 days. Mean injury surgical interval time was 8.1 ± 2.4 days.

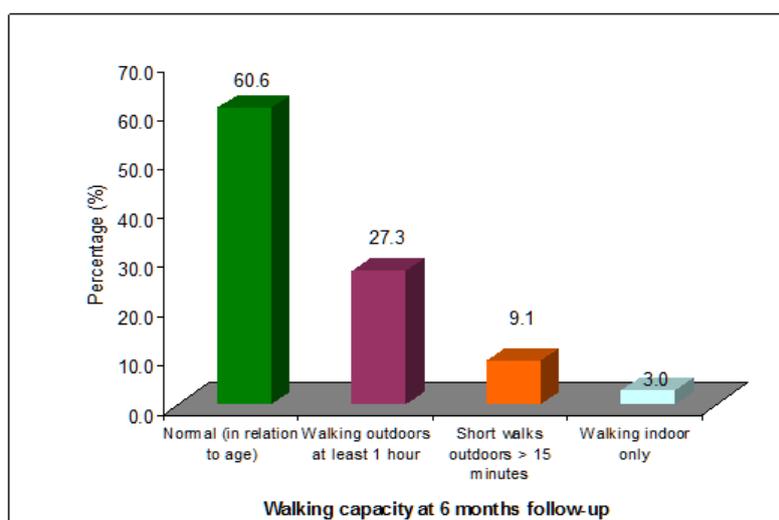


Chart 1: Bar diagram showing the walking capacity at 6 months follow up.

At 6 months follow-up, out of 33 treated patients, 20(60.6%) had normal and 13 (39.4%) had decreased walking capacity. The results are shown in Chart-1

Table 4: Stability of knee joint at 6 months follow-up.

	Frequency	Percentage (%)
Normal in extension and 20° of flexion	30	90.9
Abnormality in 20° of flexion	2	6.1
Instability in extension < 10°	1	3.0
Instability in extension > 10°	0	0.0

At 6 months follow-up, among 33 patients, normal stability of knee joint was found in 30(90.9) patients, abnormality in 20° of flexion in 2(6.1%) patients and

instability in extension (<10°) in 1(3.0%) patient. The results are shown in Table-4.

Table 5: Radiological evaluation of tibial plateau (Honkonen and Jarvinen, 1992) at final follow-up.

		Frequency	Percentage (%)
Plateau tilting (degree)			
1	None	31	93.9
2	1-5	2	6.1
3	6-10	0	0.0
4	>10	0	0.0
Varus/valgus tilt (degree)			
1	None	31	93.9
2	1-5	2	6.1
3	6-10	0	0.0
4	>10	0	0.0
Condylar widening (mm)			
1	None	26	78.8
2	1-5	6	18.2
3	6-10	1	3.0
4	>10	0	0.0
Articular step-off (mm)			
1	None	25	75.8
2	1-3	8	24.2
3	4-6	0	0.0
4	>16	0	0.0
Degeneration (relative narrowing of joint space)			
1	None	25	75.8
2	<50%	7	21.2
3	>50%	1	3.0
4	Obliterated	0	0.0

1 = Excellent; 2 = Good; 3 = Fair; 4 = Poor

At the final follow-up, all cases were evaluated clinically and radiologically with the help from the Department of Radiology, NITOR. Out of 33 cases, plateau tilting was found in 2 case (6.1%), valgus tilt in 2 case (6.1%),

condylar widening in 7 (21.2%) cases, articular step-off in 8 (24.2%) cases and >50% joint space narrowing in 1 case (3.0%). The results of radiological evaluation are shown in Table-5.

Table 6: Final outcome of management.

Results	Frequency	Percentage (%)
Excellent	25	75.7
Good	5	15.2
Fair	3	9.1
Poor	0	0
Total	33	100.0
Final assessment		
Satisfactory (excellent + good)	30	90.9
Unsatisfactory (fair + poor)	3	9.1
Total	33	100.0

Table-7 shows that the satisfactory result (excellent + good) was 30(90.9%) and unsatisfactory (fair) 3(9.1%). So, among the population we found almost 81.1% to 100.7% satisfactory result by this procedure. It is quite acceptable outcome.

Among 33 study patients, 25(75.7%) had excellent, 5(15.2%) good and 3(9.1%) fair results.

DISCUSSION

Tibial plateau fracture is not an uncommon problem encountered in emergency and outpatient department of a hospital. This is most frequently caused by road traffic

accident and mechanism as due to fall with. According to Apley and Solomon (1993), tibial plateau fractures are caused by a varus or valgus force combined with axial loading.^[11] The major difficulty with tibial plateau fractures is that they involve the articular surface and the supporting metaphysis of a major weight bearing bone.^[7]

Schatzker type-I fracture is usually the result of high-velocity trauma. It occurs in young people, in whom the cancellous bone of the tibial condyle is very strong and, therefore, it cleaves rather than crumbles.^[7] The aim of treating fractures of the tibial plateau is to produce a

painless stable knee with a good range of movement supported by strong muscles.^[12]

Schatzker type-I tibial plateau fracture can be treated by ligamentotaxis with percutaneous screw fixation. A total number of 40 patients were initially included in this study. Out of 40, 7 patients did not report after 3rd follow-up. So, the study was based on 33 patients.

The age of the patients ranged from 20 to 53 years, mean (\pm SE) being 38.45 ± 1.55 years. The vast majority of fractures occur between 31-40 years of age. In this series, The commonest age group was 31-40 years. Out of 33 patients, 15 (45.45%) were in this group. The second peak was between 41-50 years (27.28%). In this study, there were 24 (72.72%) male and 9 (27.28%) female.

In a series by Lansinger et al. (1986), the mean age was 55 years (range: 16-85 years) and 55 percent were male and 45 percent female.^[13] So, there is age difference with this study. In this study, fracture occurred at a lower age group than the study by Lansinger et al. (1986).^[13] This is probably due to the fact that the average lifespan is lower in this region than western countries. Other causes may be that patients of this region have lack of knowledge regarding traffic rules. Most of the drivers are illiterate, reluctant to follow traffic rules.

Keogh et al. (1992) found average age as 52 years (range: 22-85 years) and 61.2 male and 38.8 percent female. Difference was noted between this series and the present study which may be due to same causes as mentioned before.^[8]

In a study by Koval et al. (1992), the commonest cause of trauma was road traffic accident (57.14%). Road traffic accident was the commonest cause of trauma (63.64%) in the present series.^[10] The increased incidence of road traffic accident in this study is probably due to the fact that high-energy trauma is required for tibia! plateau fracture. Other causes may be lack of public safety education and lack of knowledge about traffic rules.

In the present study, the basis of diagnosis was clinical examination and X-ray of the affected part in both anteroposterior and lateral views. In this series, all the cases had tibial plateau fracture, Schatzker type-I.

At review, all the patients were assessed for pain, range of motion, stability of the knee joint and final result graded using Rasmussen's criteria.^[14]

At follow-up at 24 weeks, there was no complain of pain in 16(48.5%) operatively treated patients, occasional ache was present in 10(30.3%) operatively and stabbing pain in certain position in 4 (12.1%) cases. 29(87.9%) had satisfactory walking capacity after operation. Normal extension of knee and no wasting of thigh muscles were found in 20(60.6%) patients.

More than 120° range of motion of knee joint obtained in 29(87.9%) patients 24th weeks follow up. Stability of knee was normal in 30(90.9%) cases.

In the present series, results was observed excellent in 25(75.7%), good in 5(15.2%) and fair in 3(9.1%) patients and had no poor result. Therefore, 30 (90.9%) patients had satisfactory (excellent + good) results.

In the present study the result is 30(90.9%) out of 33 patients had a satisfactory result, which is similar to those reported by Lansinger et al. (1986) - 13 satisfactory out of 14. It is believed that percutaneous screw fixation has an expanding role to play in the management of Schatzker type-I tibial plateau fracture and will reduce the indications for open reduction.^[13]

We found that percutaneous screw fixation for Schatzker type I fractures is an excellent treatment alternative to open reduction internal fixation (ORIF) or conservative management. Percutaneous cancellous screw fixation for closed tibial plateau fractures is minimally invasive, hence less morbid. It enables early mobilization with minimal instrumentation, and achieves satisfactory outcomes without any anatomical deformity or functional impairment.

CONCLUSION

The expected ideal outcome after a tibial plateau fracture is a stable, pain free. non-osteoarthritic knee joint with a range of motion that is adequate for functional requirements. Considering all the above points, it can be concluded that percutaneous screw fixation in Schatzker type-I tibial plateau fracture is a satisfactory method of treatment.

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