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Original Research Article **Orthopedic Surgery**

Outcome of Newer Generation Implant Reducing Post-Operative Co-Morbidity in All Kinds of Tibial Plateau Fracture; An Observational Study

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Abstract

Background: Fractures of the tibial plateau, which are intra-articular injuries of the knee joint, are often difficult to treat and have a high complication rate, including early-onset osteoarthritis. Various treatment options including proximal tibial plating with locking compression plates are available for the treatment of tibial plateau fracture. ***Objective:*** The purpose of this research was to evaluate the functional outcome of tibial plateau fractures treated with locking compression plating; a technique found to effectively reduce post-operative co-morbidities. ***Material and Methods:*** This prospective and observational study was carried out in Multicentral base with Department of Orthopedic Surgery, Rajshahi Medical College, Rajshahi, Bangladesh from January 2020 to June 2022. All patients (n=256) enrolled in the study for the study were included and treated with a locking compression plate for tibial plateau fractures (Schatzker III-VI) after receiving informed written permission. Patients were monitored continuously with clinically, radiographically, and functionally at 6-weeks and 3-6 Month, fellow-up after surgery. ***Results:*** In our study of 256 cases, the mean age was 37.77 ±15.65 years. Most of the cases were Schatzker type VI (161 patients) 63% and type III (89 patients) 35%. The average duration for fractures union was 23.4 ±2.1 weeks. Superficial wound infection was the common complication seen in (6 patient) 2% cases. At six months, the mean knee society score (KSS) was 85 ±7.22 and majority of patients (245 patients) 95% had good results. ***Conclusion:*** The radiological and functional outcome of a locking compression plate is quite excellent. Tibial plateau fractures in adults can be effectively treated with this implant.

Keywords: Locking compression plate, Tibial plateau fracture.

INTRODUCTION

A tibial plateau fracture accounts for 1%-2% of all fractures and 8% of fractures in the elderly [1]. High-energy trauma, such as a car crash, typically causes tibial plateau fractures, which are located closer to the bone's proximal end (RTA). Fractures of the tibial plateau can be anything from a simple lateral condyle fracture to a severely comminuted metaphyseal fracture, and they usually come hand in hand with serious soft tissue damage [2]. Though difficult, the treatment of these fractures aims to restore normal knee joint function by anatomical restoration of joint surfaces and maintaining the reduction by stable implants [3].

Tibial plateau fractures can be treated with a number of different methods, including proximal tibial plating with locking compression plates. In the past, fracture treated with older non-anatomical plates ended with fracture collapse, joint incongruity and malunion. But, now recontoured anatomical locking compression plate (LCP) is considered the implant of choice, which is designed to prevent all these complications. Therefore, with the advent of this LCP, even complex tibial plateau fractures which were once considered difficult to treat, are now having successful outcomes [4]. Thus, with this background we have conducted this study to determine the clinical, radiological and functional outcome of tibial plateau fracture managed with proximal tibial locking compression plates [5].

MATERIAL AND METHODS

This prospective hospital-based, observational study was carried out in Department of Orthopedic Surgery, Rajshahi Medical College, Rajshahi, Bangladesh from January 2020 to June 2022. The

targeted sample size after using the sample size formula was 256.

Inclusion Criteria

- Schatzker type III to VI tibial plateau fracture.
- Age ≥18 years.

Exclusion Criteria

- Polytrauma patients and head injury patients.
- Open fractures.
- Neuromuscular problems.
- Pathological fractures.
- Previous fracture of same limb.

Patient Management

All of the patients who were stable enough to be admitted had had an isolated fracture of the tibial plateau. Detailed history and systemic examination were done to rule out any other co- morbidity. Before admission to ward, all preoperative investigation, along with CT scan if needed, was sent. Depending on the radiological findings, fracture was classified according to Schatzker classification. Pre- operatively patients were managed by analgesics, anti- swelling agents, limb elevation and knee immobilizer. Skeletal traction was applied to patients with coexisting co- morbidities who were likely to require a longer duration for surgery clearance and optimization for surgery.

Surgical Technique

All patients were given a preventative dose of cefuroxime (1.5 grams) via intravenous injection in the operating room half an hour before surgery. After spinal anaesthesia, patient was placed in a supine position with thigh tourniquet on injured limb and bolster under knee to allow knee flexion. Various approaches were used for tibial plateau fracture depending on the location and type of fracture fragment (Schatzker classification). For type III and III fracture, lateral plating was done using antero-lateral approach. For Type IV fracture, medial plating was done. For type V and VI fracture, double plating from medial and lateral approach was done [6]. Those with isolated or combined posterior tibial condyle fracture isolated posterior plating or combined posterior plating was done via posterior, posteromedial or posterolateral approach depending on fracture anatomy. The plate used was anatomically recontoured medial, lateral and posterior LCP. For complex fractures additional 3.5 mm distal radius volar LCP was used. Post-operatively, X-ray of knee was taken on the day of surgery. Analgesics and antibiotics were given for days to weeks depending upon the patient's pain tolerance and wounds status respectively. Postoperative immobilization was done by knee immobilizer with intermittent regular active and passive quadriceps and knee range of motion physiotherapy. Non-weight-bearing axillary crutch walking was started as soon as possible depending on patient's pain tolerance. Wound dressing was done on the 3rd, 6th and 10thday and suture removal on 14th postoperative day. Generally, patients were discharged between 7 to 14 days depending upon the condition of the wound.

Regular follow ups were done at 6 weeks, 3 months, and 6 months. In every follow-up, patient's clinical and radiographic findings, range of motion and patient's daily functional activity were assessed and recorded. Finally at 6 months, functional assessment of knee was assessed by using the Knee Society Score [7]. Complications such as wound infection were treated by regular dressing, debridement and antibiotics. Radiological evaluation was made based on the signs of union of fracture, fracture collapse, malunion and implant loosening or failure. Union was considered when at least 3 cortices were united in X-ray. At six-weeks partial weight-bearing walking and at three months, full weight- bearing walking was allowed.

Statistical Analysis

All the data was collected in a proforma that included patients' demographic profile, general history, clinical and radiological findings, its management and regular follow up. Data were entered and analyzed by SPSS Vs.26. Descriptive statistics like frequency, percentage; mean and standard deviation were used to analyze the data.

a. Preoperative X ray

b. Fixation by LCP

c. Six month follow up

d. Cross leg sitting

Figure 1

RESULTS

In this study, the mean age group was 37.77 ±15.65 years ranging from 18 years to 65 years and male patients outnumbered female patients (26 males and 4 females) with male to female ratio of 13:2. Out of 30 cases, 21 cases (70%) were of the right side and 9 cases (30%) were of the left side. Majority of fractures were due to road traffic accident (93.3%) followed by fall injury (6.7%). (Table 1).

Table 1: Demographic and clinical characteristics of the study population

Variables		Frequency (n=256)	Percentage (%)
Age (years)	18-38	153	60
	39-58	60	23.3
	≥59	43	16.7
Mean age = 37.77 ±15.65 years			
Sex	Male	221	86.7
	Female	35	13.3
Side affected	Left	77	30
	Right	179	70
Mode of injury	RTA	239	93.3
	Fall injury	17	6.7
Schatzker classification	Type III	89	33.4
	Type IV	36	13.3
	Type V	26	10
	Type VI	116	43.3
Duration between trauma and surgery (days)	<5 days	94	36.7
	5-10 days	136	53.3
	>10 days	26	10

Majority of cases were Schatzker Type VI (116 patients; 43.3%) and Type III (89 patients; 33.4%). Most of the cases were operated within 5-10 days (136 cases/53.3%) and within 5 days of trauma (94 cases/36.7%) with a mean of 6.33 ±2.74 days between trauma and surgery. The mean duration of fracture union was a 23.4 ±2.11 week ranging from 21-26 weeks. Only 6 patients (2%) had minor complication like superficial wound infection.

At 6 months, majority of cases (162 patients) had good results where 116 patients were from Schatzker type VI. The mean knee society score was 78 ±7.22 where Schatzker type III, Type II and VI had mean of 85, 83.33 ±4.33 and 83.75 ±2.5 respectively. Majority of patients had knee flexion of 90-120 degree where 153 cases were of Schatzker type VI and the average knee flexion of all types was 114.50 ±13.79.

Table 2: Complications and outcome of tibial plateau fracture treated with LCP

		Frequency	Percentage
Complications	Superficial Infection	6	2
Fracture union (weeks)	20	15	6
	21	17	6.6
	22	41	16.1
	23	52	20
	24	84	33.3
	25	26	10
	26	15	6
Outcome (knee society score at 6 months)	Poor (< 60)	8	3.4
	Fair (60-69)	9	3.3
	Good (70-95)	162	63.3
	Excellent (96-100)	77	30
Knee flexion at 6 months (degree)	<90	9	3.3
	90-120	153	60
	>120	94	36.7

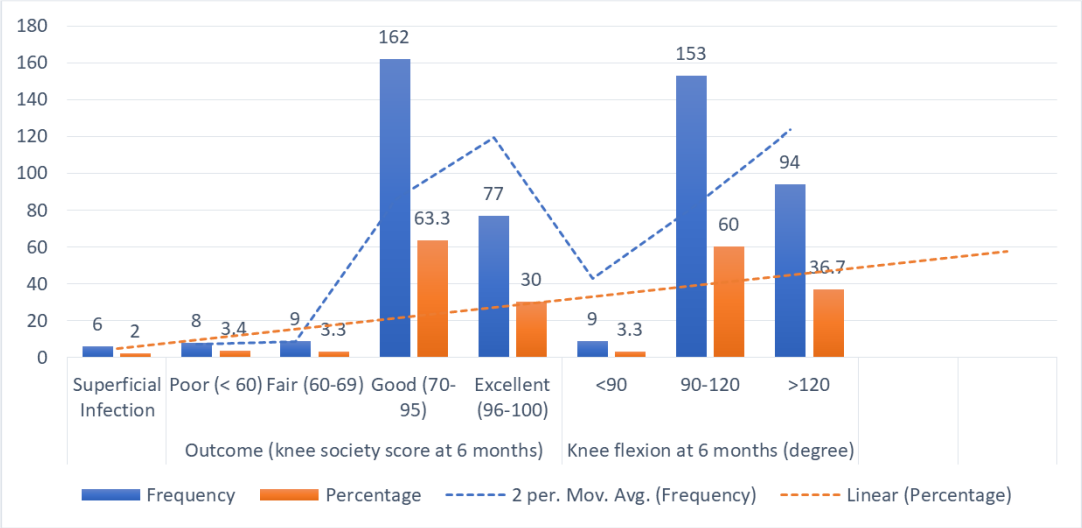

Figure 2: Outcome, Knee flexion (degree) knee society score at 6 months with Complication

DISCUSSION

Tibial plateau fractures can be treated with a variety of surgical techniques, including the use of locking compression plates [8]. Proximal tibial LCP system is associated with better functional outcome, decrease in fracture union time and overall complications [9]. In our study, the mean age group was 37.77 ±15.65 years with majority of patient's age between 18 to 38 years. Similar results was seen in Henley *et al.*, [10] study where the mean age group was 39.03 years and 33 years which is similar to our study.

There were 221 males (86.7%) and 45 females (13.3%) in our study. Similar results was seen in Somashekhara *et al.*, [11] study, where out of 30 patients, 25 (83.33%) were male and only 5 (16.66%) were female. In this study, out of 30 patients 21 cases (70%) were of the right side and 9 cases (30%) were of the left side which is similar to Imran *et al.*, [12] study where 63.3% fracture were of right side and 36.7% were of left side. In this study, majority of cases were of Schatzker Type VI (116 cases/43.3%) and Type III (89 cases/33.3%) which is similar to study with a larger number of patients and for longer duration where majority of cases were of time is recommended for a more appropriate result.

Schatzker Type VI; and Albuquerque *et al.*, [13] where type III (35.14%) and type VI (20.03%) accounted for majority of cases. In Nokolaos *et al.*, [14] study of 125 patients, Schatzker type III (42 cases/33.6%) was the common fracture type which is also similar to our study. In this study, most of the cases were operated between 5-10 days of trauma (16 cases/53.3%) and within 5 days (11 cases/36.7%) and with a mean of 6.33 ±2.74 days between trauma and surgery which is similar to Peter A. Cole *et al.*, [15] study where the mean time between trauma and surgery was 7.1 days.

At 6 months, majority of cases (162 patients) had good results where 116 patients were from Schatzker type VI. The mean knee society score was 78

±7.22. Similar result was seen in study done by Mohammad Ali *et al.*, [9], where the mean knee society score was 80.2. But in Yukai Wang *et al.*, [16] study the mean knee society score was 89 and 93 respectively which is better than our study which could be due to difference in sample size and duration of these studies.

CONCLUSION

For tibial plateau fractures of Schatzker types III–VI, a locking compression plate is the implant of choice because it promotes early fracture union, excellent functional and radiographic outcomes, and controllable complications.

Limitations

This prospective study has significant flaws due to its inadequate sample size and short duration, one more possible.

CONFLICT OF INTEREST

The authors have no competing interests that would prevent them from publishing this paper.

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