Original Article

Indian Journal of Public Health Research & Development
Volume 13 Issue 3 July-September 2022
DOI: http://dx.doi.org/xxxxx/ijphrd.xxxx.13221.1

Management of Tibial Plateau Fractures in a Tertiary Care Hospital

Bhukya Tejkumar

Assistant Professor, Mamata Medical College, Khammam

How to cite this article: Bhukya Tejkumar et al. Management of Tibial Plateau Fractures in a Tertiary Care Hospital. Volume 13 Issue 3 July-September 2022

Abstract

Background: The multitude, diversity, and complexity of tibial plateau fractures make them difficult to treat. In the literature, the indications for non-operative vs operative management differ substantially. Varied surgeons have advocated for different treatment procedures, with some advocating for conservative management and others advocating for aggressive management.

Objectives: To compare the surgical management of tibial plateau fractures with percutaneous CC screw fixation, ORIF with plating and CC screw fixation and universal mini external fixator.

Methods: After the diagnosis of 30 patients has been established, the patient was informed of the fracture and the necessity for surgery. The consent is obtained, and pre-operative planning is done. The Schatzker classification was used to classify all Tibial plateau fractures prior to surgery. After a minimum of six months post-surgery, patients were followed up periodically. The functional outcome of the knee was assessed using the Rasmussen score and the knee society score for all patients who met the inclusion criteria.

Results: The average time for tibial plateau fracture union was 18 weeks (range from 18-22 weeks). In majority of the cases, around 50% had union of tibial plateau fracture by 16th weeks, 40% had fracture union by 18th week. 7% had fracture union by 20th week, 3% had fracture union by 22nd week.

Conclusion: PCCS or PF + CC screw fixation can attain near anatomical repair of the articular surface of the tibial plateau fracture. Since they are confined to the pattern of the fracture and its size, each of the three procedures employed to treat tibial plateau fractures has its own array of pros and cons.

Keywords: Tibial plateau fracture, PCSC, CC Screw and Plate Fixation, UMEX

Introduction

The knee joint is a complex synovial joint that controls the centre of body mass and posture, requiring a wide range of motion in three dimensions as well as the capacity to endure significant stresses. It is required for everyday tasks such as standing, walking, and stair climbing, as well as for sprinting, leaping, kicking, and changing directions.[1] The interaction of the articular surfaces, passive stabilisers, and muscles that traverse the joint is crucial for maintaining both range of motion and stability.[2]

The majority of tibial plateau fractures are caused by articular extension and can occur as a result of high-speed collisions or falls from considerable heights, when fractures are caused by indirect shear pressures and direct axial compression, respectively.[3] Due to the poor resistance of their subchondral bone to axially directed stresses, depression fractures are more likely in elderly people with osteopenic bones.[4]

Internal fixation had not yet supplanted conservative treatments as the major therapeutic option until recently. While it emphasises early mobilisation and lower morbidities, it excludes soft tissue problems.[5]

The primary goal of surgical treatment for tibial plateau fractures is to a) restore articular congruity and

b) restore mechanical axis. c) to restore ligamentous stability; all of these can result in an ideal functioning, pain-free knee with a decent range of motion.[6]

The process of repairing a bone is known as osteosynthesis. It is a surgical procedure in which bone pieces are fused together by screws, plates, nails, or wires to repair bone fractures.[7] The aforementioned fixes the broken bone and allows it to knit solidly in the correct position.

Osteosynthesis or internal bone fixation are not used to treat all types of bone fractures. Osteosynthesis is best suited for open bone fractures with concomitant skin or soft tissue injury. It is also the preferred method of treatment for bone fractures with multiple fragments, leg fractures, and osteoporosis-related bone fractures.[8]

The articular congruency, complex ligamentous stability, and complex biomechanics of knee weight bearing position are important reasons why orthopaedic surgeons are concerned about tibial plateau fractures.[9]

The treatment of proximal tibial plateau fractures is still evolving. The rate of wound infection and wound dehiscence is significantly higher in open reduction and internal fixation techniques (ORIF) than in other techniques.[10]

Materials and Methods

Study design: Prospective study.

Place of study:

Duration:

Inclusion Criteria:

- Tibial plateau fractures with no prominent osteoarthritis.
- Closed fractures

Exclusion Criteria:

- Patients with Osteoarthritis
- Open fractures

Sample size: 30 patients.

On admission, demographic information was collected, and a comprehensive history was conducted to determine the mode of injury and any co-morbidities. To examine other connected injuries and open wounds, a general systemic and local examination was performed, followed by radiological evaluation in AP and Lateral views.

After the diagnosis has been established, the patient was informed of the fracture and the necessity for surgery. The consent is obtained, and pre-operative planning is done. The Schatzker classification was used to classify all Tibial plateau fractures prior to surgery. After a minimum of six months post-surgery, patients were followed up periodically. The functional outcome of the knee was assessed using the Rasmussen score and the knee society score for all patients who met the inclusion criteria.

Statistical Analysis: All the data was entered in the Ms-excel and the SPSS 20 software was used to compute statistical analysis. The outcomes were presented in the form of Tables and graphs with Mean, Standard deviation and percentages. The Rasmussen score was used to grade the outcome. The p-value of <0.05 was considered statistically significant.

Observation and Results

A total of 30 patients with tibial plateau fracture were studied after meeting the inclusion criteria.

Table 1: Distribution based on demographics and laterality of fracture

Gender	Frequency	Percentage
Male	24	80%
Female	6	20%
Age group(years)		
<20	1	3.33%
21-30	10	33.33%
31-40	5	16.66%
41-50	9	30.00%
51-60	5	16.66%
Laterality		
Right	17	56.66%
Left	13	43.33%

Male predominance was seen with 80% and females were 20%. The male : female ratio was 4:1. Majority of the patients around 33% belonged to the 21 to 30 yrs age group followed by 30% in 41 to 50 yrs age group. A total of 16.66% each belonged to the age group of 31 to 40 and 51 to 60 yrs. and only 3% belonged to <20 yrs age group. The mean age was 38.33 $\pm$ 11.41 yrs. Around 57% had right tibial plateau fractures and the rest 43% had left plateau tibial fractures.

Table 2: Distribution based on Schatzker's classification

Type of fracture	Frequency	Percentage	PCCS	PF + CC	UMEX
Lateral split	1	3.33%	1	0	0
Split with depression	9	30.00%	9	0	0
Central depression	0	0	0	0	0
Medial condyle Fracture	3	10.00%	0	3	0
Bicondylar Fracture	9	30.00%	0	7	2
Metaphysiodiaphseal disassociation	8	26.66%	0	0	8
Total	**30**	**100**	**10**	**10**	**10**

Fractures were classified based on Schatzker's Classification. Type II and type V tibial fracture were the most common fractures seen in 30% of the cases each. Followed by Type VI fracture which was seen in 27% of the cases, Type IV Fracture was seen in 10% and Type I fracture was seen in 3% of the cases.

Table 3: Distribution based on Post-op complications

Complications	Frequency	Percentage	PCCS	PF + CC	UMEX
Knee joint stiffness	2	6.66%	1	1	
Implant failure	1	3.33%	0	0	1
Varus deformity	1	3.33%	0	0	1
Infection	2	6.66%	0	2	0
Nil	24	80%	0	0	0

Deep infection occurred in 7% of cases at the post-operative site. As a result, the plate was removed, the patient was given intravenous antibiotics, and an above-knee pop cast was applied. At 26 weeks, the fracture was eventually united. Varus deformity developed in 3% of cases as a result of post-operative medial condyle collapse. Due to a lack of post-operative mobilisation, approximately 7% of the cases developed knee joint stiffness.

Table 4: Distribution based on Rasmussen function score outcomes

Result	Total	Percentage	PCCS	PF + CC	UMEX
Excellent	7	23%	6	0	1
Good	21	70%	4	10	7
Fair	2	7%	0	0	2
Poor	0	0%	0	0	0

According to the Rasmussen functional score, none of the 30 patients in the sample had a poor outcome. 60 % of patients treated with PCCS had excellent results, while 40% had good results. None of the patients had fair or poor outcomes. All of the patients treated with PF + CC screw fixation had good outcomes, while 10% of the patients treated with UMEX had excellent outcome, 70% had good outcomes, and 2% of the patients had fair outcomes.

Table 5: Distribution based on fracture union

Fracture union (in weeks)	Frequency	Percentage	PCCS	PF + CC	UMEX
16	15	50.00%	7	4	4
18	12	40.00%	3	5	4
20	2	6.66%	0	1	1
22	1	3.33%	0	0	1

The average time for tibial plateau fracture union was 18 weeks (range from 18-22 weeks). In majority of the cases, around 50% had union of tibial plateau fracture by 16th weeks, 40% had fracture union by 18th week. 7% had fracture union by 20th week, 3% had fracture union by 22nd week.

Discussion

Tibial plateau fractures are among the most common fractures that occur as a consequence of a road accident, a fall from a great height, a sports injury, or an assault. About 1% of all fractures are tibial plateau fractures. Tibial plateau fractures occur 10.3 per 100,000 persons each year. Patients with tibial plateau fractures are on average 52.6 years old. Tibial plateau fractures have a bimodal distribution, with men under the age of 50 being more prone to sustain them by high-energy processes, which are usually connected with soft tissue injuries. Women over 70 are more prone to have tibial plateau insufficiency fractures as a result of falls. Tibial plateau fractures are more prevalent in males than in females.[11]

Type of fracture	This study	Sangwan et al12
I. Lateral split	3.33%	36%
II. Split with depression	30.00%	4%
III. Central depression	0	0
IV. Medial condyle Fracture	10.00%	20%
V. Bicondylar Fracture	30.00%	8%
VI. Metaphysiodiaphseal disassociation	26.66%	32%

Sangwan ET al conducted research. The fractures were classified as type I in 9 patients, type II in 1 patient, type IV in 5 patients, type V in 2 patients, and type VI in 8 patients using the Schatzker et al criteria.[12]

The Overall Rasmussen score was Excellent in Type I and Type II fractures, the score was good in Type IV, V and VI fractures.

Lasinger et al. published a long-term outcome of 102 cases of tibial plateau fractures of all types, treated conservatively (45%) and surgically (55%). Using Rasmussen's criteria, they evaluated the functional outcome and found it to be excellent to good in 90 percent of the cases. They advocated open reduction and bone grafting for the treatment of depressed and split depressed fractures.[13]

In the study by Biggi F et al, 94 % of the patients showed radiographic union by 16-18 weeks.[14]

Previous studies	Fracture union duration
This study	18 weeks
Biggi et al14	16 – 18 wks
Stannard et al16	15.6 weeks

The average knee flexion was 0 degrees and 130 degrees. Knee motion is commonly reduced after Tibia plateau fractures. These are the results of articular involvement. These effects are exacerbated by immobilisation following a fracture or internal fixation. Early stable fracture fixation, meticulous soft-tissue handling, and immediate knee mobilisation all increase the chances of a positive outcome after most Tibial plateau fractures.

Conclusion

Percutaneous CC screw fixation (PCCS) or ORIF with plating and CC screw (PF + CC screw) fixation can help achieve near anatomical repair of the articular surface of the tibial plateau fracture. The articular surface can be restored by joystick manipulation of the fragment in the UMEX group, and the metaphyseal extension can also be reinforced by plate fixation in the UMEX group. Because they are confined to the pattern of the fracture and its size, each of the three procedures employed to treat tibial plateau fractures has its own array of pros and cons.

References

1. Bedi A, Le TT, Karunakar MA. Surgical treatment of nonarticular distal tibia fractures. JAAOS-Journal of the American Academy of Orthopaedic Surgeons. 2006 Jul 1;14(7):406-16.
2. Himanshu.H,Prasad.MB,Verma.AK, Minimally Invasive Percutaneous Plate Osteosynthesis(Mippo) A Technique for Treatment of Distal Tibia Fractures,eISSN:2279-0853,p-ISSN:227-0861.Volume 15,Issue 12 Ver.1(December,2016), PP 31-38.
3. Collinge.C,Kuper.M, minimally invasive plating of high-energy metaphyseal distal tibia fractures,JOrthop Trauma 2007;21:355-361
4. David P Barei,Rockwood and Green's, Fracture in adults, 8th edition,vol-2,2473-2540
5. Kundu.A.K, outcome of minimally invasive plate osteosynthesis technique with locking compression

plate in distal tibial fracture management, Indian journal of orthopaedics surgery 2015;1(3):138-145

6. Paluvadi.S.V, management of fracture of the distal third tibia by minimally invasive plate osteosynthesis-a prospective series of 50patients,journal of clinical orthopaedics and trauma 5 2014,129-136
7. Dhakar.A, minimally invasive plate osteosynthesis with locking plates for distal tibia fractures,JCDR,2016Mar,vol-10(3):RC01-RC04
8. Ali,SKI, evaluation of the functional outcome in distal tibia fractures managed by MIPPO technique using distal tibia locking plate,IJOS;2017;3(2):441-444
9. Patel.YC, outcome of minimally invasive plate osteosynthesis(MIPO) technique in distal tibial fracture,IJOS;2017;3(3):10-14 10.
10. Bahari.S, minimally invasive percutaneous plate fixation of distal tibia fractures, Acta orthop. Belg.,2007,73,635-640 11.
11. Elsoe R, Larsen P, Nielsen NP, Swenne J, Rasmussen S, Ostgaard SE. Population-Based Epidemiology of Tibial Plateau Fractures. Orthopedics. 2015 Sep;38(9):e780-6.
12. SangwanSS, SiwachRC, Singh R and Mittal R.Minimal invasive osteosynthesis: a biological approach in treatment of Tibial plateau fractures. Indian Journal Of Orthopaedics 2002; 36 : 4 : 246-50
13. Lansinger O, Burgman B, Korner L. Tibial condylar fracture. 20 years followup. J Bone & Joint Surg 1986;68(AM):13-19
14. Biggi F, Di Fabio S, D'Antimo C, Trevisani S. Tibial plateau fractures: Internal fixation with locking plates and the MIPO technique. Injury. 2010; 41(11):1178-1182.
15. Stannard JP, Wilson TC, Volgas DA, and Alonso JE.The Less Invasive Stabilization System in the Treatment of Complex Fractures of the Tibial Plateau: Short-term Results. J Orthop Trauma 2004;18:552–58