Original Research Article

Functional outcome of Column-specific Fixation of Complex Tibial Plateau Fractures

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Received: 16-11-2021 / Revised: 22-12-2021 / Accepted: 16-01-2022

Abstract

Background: Complex tibial plateau fractures are usually high energy injuries presenting with significant articular and soft tissue damage in a major weight bearing joint. The knee is a complex dynamic joint that is subjected to many forces during normal activities, so intact articular surface of tibial plateau is one of important factors to keep the geometry and alignment of the knee joint to act in harmony to perform its crucial function as a flexible weight bearing joint. **Material and Methods:** This prospective study was conducted in the Department of Orthopaedics, a Tertiary Care Teaching Hospital, 27 patients with displaced tibial plateau fractures with posterior column involvement were selected for the study. All age group Patients with complex proximal tibia plateau fractures & closed injuries were included in this study. Involving two or more columns were classified based on the new three column classification system, patients with normal neurovascular function before primary surgery, patients with closed fractures, patients with good soft tissue condition, and patients without serious medical diseases and obvious surgical contraindications. **Result:** In our study, the most of the patients were belongs to 21-30 years old 13 (48.1%). In table 2, predominant were males 92.5% and females were of 7.4%. In our study majority of patients were Three-column fractures, followed by Two-column fracture and Single-column fractures. After operative procedure, 3 (11.1%) patients got discharged on post op day-7, 14 (51.8%) patients on post op day-8, 7 (25.9%) on post op day-9 and 3 (11.1%) on post op day-10. **Conclusion:** Using this new column specific strategy to the treatment of these two or more column tibial plateau fracture injuries, which involves evaluation of three columns, we believe we achieved satisfactory results.

Keywords: Column-specific Fixation, Complex Tibial Plateau Fractures, Functional outcome.

Introduction

Tibial plateau or tibial condylar fractures are defined as proximal tibia fractures that extend into the knee joint. A significant weight-bearing joint is involved in proximal tibia fractures[1]. Because they impact knee alignment, stability, and mobility, they are significant injuries that typically result in functional disability. Tibial plateau fractures account for around 1% of all fractures in adults[2]. Tibial plateau fractures most often occur in a weight-bearing posture, with valgus or Varus forces in split fractures, axial forces alone in pure local compression fractures, and a mix of both forces in split depression fractures as the cause of injury[3].

Most patients will have a favourable outcome if treatment approaches focused on restoring or maintaining limb alignment are used; inadequate alignment will almost always result in a negative outcome[4]. Tibial plateau fractures are traditionally treated using two-dimensional categorization methods. The importance of computed tomography (CT)-based three-dimensional evaluation of the fracture pattern in the treatment of tibial plateau fractures has been emphasised by many publications[5].

The "three-column fixation" approach, which is based on a three-dimensional knowledge of the fractures, has been used to treat multiplanar complicated tibial plateau fractures in recent years[6]. The majority of current tibial plateau fracture categorization methods rely on two-dimensional imaging, which often encourage surgeons to focus on medial and lateral fixation while overlooking posterior fixation. Some surgeons have acknowledged the need of contemplating posterior fixation in tibial plateau fractures, notably for the posteromedial fragment, after carefully reviewing and using the CT scan for assessment of these fractures[7].

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Material and Methods

This prospective study was conducted in the Department of Orthopaedics, a Tertiary Care Teaching Hospital, 27 patients with displaced tibial plateau fractures with posterior column involvement were selected for the study. Patients were evaluated with X-rays (AP and lateral views) and CT (axial, coronal, and sagittal with threedimensional (3D] reconstruction views). Fractures were classified based on three-column concept classification. The functional and radiological outcome was assessed using Modified Rasmussen's Clinical and Radiological Criteria.

Patients between 18 – 60 years of age with complex proximal tibia plateau fractures & closed injuries were included in this study. Involving two or more columns were classified based on the new three column classification system, patients with normal neurovascular function before primary surgery, patients with closed fractures, patients with good soft tissue condition, and patients without serious medical diseases and obvious surgical contraindications.

Skeletally immature individuals, Open fracture of tibial plateau, Ipsilateral femur, tibial shaft, ankle and foot fractures & are those who are not willing for surgery were exclude from study

Results

In our study, the most of the patients were belongs to 21-30 years old 13 (48.1%) in table 1.

Table 1: Distribution of different age groups of patients

Age in years	No. of patients	Percentage
<20	1	3.7
21-30	13	48.1
31-40	9	33.3
41-50	2	7.4

51-60	1	3.7
>60	1	3.7
Total	27	100

Table 2: Distribution of gender

Gender	No. of patients	Percentage
Male	25	92.5
Female	2	7.4
Total	27	100

In table 2, predominant were males 92.5% and females were of 7.4%

Table 3: Distribution of different age groups of patients

Column fractures (N.)		No. of patients	Percentage
Single-column fractures[7]	Medial	4	14.8
	Lateral	2	7.4
	Posterior	1	3.7
Two-column fracture[9]	Lateral+ Posterior	1	3.7
	Medial + Posterior	3	11.1
	Lateral+ Medial	5	18.5
Three-column fractures[10]	-	10	37.0
Zero-column fractures[1]	-	1	3.7
Total		27	100

Single-column fractures (Schatzker Type IV and Hohl and Moore Type I coronal split fracture), Two-column fracture (Schatzker type IV and type V), Three-column fractures (Schatzker Type V).
In table 3, in our study majority of patients were Three-column fractures, followed by Two-column fracture and Single-column fractures.

Table 4: Mean duration of surgery of patients

Column fractures	Mean duration of surgery time (Minutes)
Single-column fractures	59.43
Two-column fracture	78.36
Three-column fractures	101.34

In table 4, mean duration of surgery time of single column fractures were 59.43 minutes, two-column fracture 78.36 minutes and 101.34 minutes for Three-column fractures.

Table 5: After operative procedure patients discharged

On post op day discharge	No. of patients	Percentage
7th Day	3	11.1
8th Day	14	51.8
9th Day	7	25.9
10th Day	3	11.1
Total	27	100

In table 5, after operative procedure, 3 (11.1%) patients got discharged on post op day-7, 14 (51.8%) patients on post op day-8, 7 (25.9%) on post op day-9 and 3 (11.1%) on post op day-10.

Table 6: Distribution of the Functional Outcome

Functional Outcome	No. of patients	Percentage
Excellent	14	51.8
Good	11	40.7
Fair	2	7.5
Poor	0	0
Total	27	100

In table 6, total 14 patients had an excellent functional outcome followed by 11 patients had a good outcome, and two patients had fair functional outcome in our study.

Table 7: Mean functional score pre-and post-surgery among patients

Pre-and post-surgery	Mean±SD
Pre-operative	42.23±4.54
Post-operative	93.43±8.45

In table 7, the mean pre-operative functional score was 42.34 in our study, which improved to an average post-operative score of 93.43.

Table 8: Complication among patients

Complication	No. of patients	Percentage
No complication	25	92.5
Delayed wound healing	1	3.7
Infection	1	3.7
Total	27	100

In table 8, maximum number of patients were no complication. Only 1 patients had complication such as delayed wound healing. They were treated with antibiotics, regular dressing and wound healed One patient had deep infection in post op period at 10th day, Patient was treated with surgical debridement, irrigation and polyethylene spacer exchanged.

Discussion

Tibial plateau fractures are one of the most frequent intra-articular fractures, and they may be caused by RTA, a fall from a great height, violence, and other factors. Because of the wide range of fracture patterns and soft tissue consequences, the treatment of these fractures has long been a point of contention[8].

Tibial plateau fractures with a high energy have been linked to a more severe fracture pattern, ligament damage, and significant soft tissue injuries. Dual plating is preferable to single lateral plating for bicondylar fractures because it provides greater anatomic reduction and rigid fixation, as well as less soft tissue problems. Fixation of tibial plateau fractures may be accomplished in a variety of ways, each with its own set of advantages and disadvantages[9].

For improved results, the technique and fixation for tibial plateau fractures are currently being debated. Posteromedial and posterior fractures in high-energy tibial plateau fractures are often unfixable with anterolateral plate alone. Fractures of the posterior tibial plateau are frequent, particularly in high-energy injuries[10]. In high-energy tibial plateau fractures, fixing the posteromedial and posterolateral fractures is critical for a good clinical and radiographic result[11]. In displaced tibial plateau fractures, failure to repair the posteromedial fragment leads in varus collapse, restricted range of motion, and poor clinical outcomes, and posterior tibial fractures are best researched and planned for fixation using the three-column fixation suggested by Luo et al[12].

Posteromedial or posterior approaches, performed in prone or supine, allow for better visualisation of the fractures and aid in better reduction and fixation. They also have the advantage of causing less soft tissue injury, even when combined with anterolateral incision, and they can be used to repair a posterior cruciate ligament injury if one exists. Posterior column fixation with an antiglide plate and medial and lateral column fixation with screws or lateral locking plates allows for precise articular surface reduction, and rigid fracture fixation has the advantages of early mobilisation, reduced soft tissue complications, better range of motion, and early mobilisation over other modes of fixation[13].

Patients treated with single lateral plating exhibited varus malunion at the fracture site, according to a research by Waddell et al. In a study conducted on a tibia bone model by Wang Y et al.[14], the posteromedial T-plate improved the strength and stiffness of posteromedial fragment fixation and had a buttress effect, preventing the fragment from descending under load, compared to other modes of fixation (anteroposterior lag-screws, an anteromedial limited contact dynamic compression plate, and a lateral locking plate)[15].

As a result, by stabilising the unstable posterior pieces, the risk of collapse is reduced and the range of motion is increased. In our study, no patient had collapse. In our research, there was no neurovascular damage, implant breakage, valgus deformity, delayed union, or non-union. In the follow-up research, 90% of the patients had a good-to-excellent result. All of the fractures in our research were also united between 3 and 4 months. Patients had an outstanding result 40% of the time, a good outcome 50% of the time, and a reasonable radiological outcome with a no bad clinical outcome at the time. Patients had an outstanding result, an Excellent functional outcome 51.8%, good functional outcome 40% and no bad clinical outcome of the patient in our study.

Conclusion

Based on our study we observed that column specific fixation is a better option compared to conventional method of fixation as it provides better visualization, control over fragment, stable reduction and fixation of fragment. Using anatomical locking plates on tibial plateau is an effective and safe tool to treat complex three-column fractures of tibial plateau and is more convenient than common plate.

Conflict of Interest: Nil Source of support: Nil

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