Evaluation Of Surgically Managed Tibia Plateau Fracture Using Buttress Plate And Cancellous Screws

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ABSTRACT

Introduction: Tibial plateau fractures pose significant challenges in treatment due to their impact on the knee joint and potential for functional impairment. Approximately eight percent of fractures in the elderly occur in the proximal tibia, necessitating effective management strategies to restore function and mobility. Surgical interventions aim for early mobilization, precise articular surface restoration, stable fixation, and addressing ligamentous and soft tissue injuries. Despite advancements in surgical techniques, reassessment of their efficacy is crucial.

Methods: A prospective analysis was conducted over a 2-year period, involving fifty patients with tibial plateau fractures selected for surgical intervention at Liaquat University Hospital, Jamshoro

Results: Among the study cohort, thirteen patients underwent Closed Reduction and Internal Fixation (CRIF) with Percutaneous Cannulated Compression Screw (PCCS), while thirty-seven patients underwent Open Reduction and Internal Fixation (ORIF) with a Buttress plate and bone grafting. Postoperative progress was evaluated for a median duration of 12.56 months, with analysis including factors such as underlying cause, gender distribution, age distribution, fracture classification, affected side dominance, and complications such as osteoarthritis and knee stiffness.

Conclusions: Tibial plateau fractures present substantial treatment challenges, with management modalities largely dictated by fracture type. Goals include restoring articular congruity, facilitating early knee motion, minimizing postoperative complications, and achieving full knee function restoration. Successful treatment necessitates careful assessment, meticulous planning, and expert execution by the operating surgeon.

Keywords: Tibial plateau fracture, Buttress plate, Closed Reduction and Internal Fixation (CRIF), Open Reduction and Internal Fixation (ORIF)

Keywords: Fracture tibia plateau , Buttress Plate , CRIF, ORIF

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INTRODUCTION:

Knee injuries are notoriously difficult to treat. Knee alignment, stability, and mobility can all be negatively impacted by damage to the bones that make up the joint (especially the intraarticular tibial condyle), leading to significant functional impairment. 1 About 8% of all fractures in the elderly and 1% of all fractures are caused by these accidents. Bicondylar lesions involve both condyles, but only occur in 10-30% of reported series [2], with the lateral condyle being the most common site of involvement.

Treatment of tibial plateau fractures has proven difficult in the past. The difficulties of treating these fractures have been chronicled in more than a thousand publications, theses, and books. Tibial fractures have considerably varying indications for surgical versus non-surgical treatment. [3] Accurate articular surface reconstruction, stable fragment fixation, early mobilization, and repair of all concurrent ligamentous and other soft tissue lesions1 are the goals of surgical care of tibial plateau fracture. There has been a shift toward surgical care of these injuries as surgical procedures and implants have advanced. [4] The number, variety, and complexity of tibial plateau fractures continue to provide obstacles, however. Despite a plethora of articles, the outcomes of different management techniques are still unclear.5,6

METHODOLOGY

The research was conducted at Liaquat University of Medical and health Sciences hospital from June 1st, 2021 and June 1st, 2022.

Fifty individuals with fractures of the tibial plateau were included. All the necessary information was gathered during their stay, during follow-up, and from their medical records, according to predetermined inclusion and exclusion criteria.

Patients between the ages of 18 and 65 having a proximal tibia fracture with with depression/ displacement of more than 2 mm were included in the study. Patients were not included if they met any of the following criteria: a) they were younger than 18 or older than 65; b) they had an open fracture (Gustillo Anderson types 2 and 3); c) they had a fracture of the distal end of their femur; d) they had a Glasgow Coma Scale score of less than 7; e) their fracture had a depression or displacement of less than 2 mm.

Methodology for Management:

A brief history, a general and local examination, and an assessment of further injuries are performed in the trauma unit. Patients with low GCS and shock are treated in the intensive care unit. Anteroposterior, lateral, and oblique views, as well as other blood examinations, were performed when the patient was stabilized. According to the severity of the fracture, either closed reduction with Percutaneous Cancellous screws or open reduction and internal fixation with a buttress plate was scheduled for surgery.

Surgical procedure:

After the swelling had gone down, surgery was scheduled. Image guidance was used in all surgical procedures. In 37 of the 50 patients, ORIF with a buttress plate and screws was used to stabilize the fracture. Depressed and comminuted fractures were treated with bone grafting. T Buttress plates, L Buttress plates, 4.5 mm cortical screws, 6.5 mm and 7.0 mm cannulated and non-cannulated cancellous screws, and other fixation devices were used. Closed reduction and percutaneous cancellous screw fixation with 6.5mm and 7.0mm screws was used to treat thirteen (13) patients.

Patients were applied above knee posterior slab for the duration of their recovery. On day 12 after surgery, the sutures were taken out. Antibiotics were administered intravenously for three days, followed by seven days of oral medication. Patients were instructed to perform quadriceps exercises, knee mobilization, and non-weight bearing crutch walking after fracture surgery. Moreover, an X-ray was taken right after the surgery.

Sutures were removed, the surgical scar was examined, and the patient's range of motion was recorded during the 2-week follow-up. Fracture union and loss of reduction, if any, were checked for with an X-ray during the one-month follow-up. At 2 months, we did our third follow-up, and at 3 months, we did a clinical examination of the union. Patients were allowed partial weight bearing based on clinical and radiographic indicators of union, progressing to complete weight bearing over time.

Table No: 1 - Functional grading used in evaluatio
Modified Hohl and Luck Evaluation Method 5

Grade	Lack of extension (degrees)	Range of motion, knee (degrees)	Varus / valgus instability (degrees)	Walking distance (meters)	Pain*
EXCELLENT all of the following	0	>120	<5	>3000	None
GOOD not more than one of the following	<10	<90	>5	<1000	Mild on activity
FAIR more than two of the following	>10	<75	>10	<100	Moderate on activity, Intermittent at rest
POOR	All results worse than fair				

*The grade cannot be higher than that for pain

At 6 months, 12 months, and 24 months (monthly for patients with problems), the anatomic and functional evaluation was repeated using the modified Hohl and Luck evaluation method. Recent standing radiographs were used to evaluate the extent of posttraumatic osteoarthrosis.

Statistical Analysis: Mean SD, Chi-square test, Fisher Exact test, Confidence Interval, Statistical software (Systat 11.0 and others) have all been used to calculate the data.

RESULTS

Patients' ages ranged from 23 to 65, with the average being 42.12 years. Nearly half of all patients (48%) were between the ages of 31 and 50. 56% were hurt on the left side and 44% on the right; 78% were men and 22% were women. Injuries from motor

Table No: 2 - Radiographic grading used in evaluation
Radiographic grading in evaluation6:

Grade	Valgus/varus Deformity (degrees)	Degression of articular surfaces(mm)	Osteoarthritis
EXCELLENT[all of the following]	≤5	< 5	None
GOOD [not more than one of the following]	>5	> 5	Minimal
FAIR [not more than two of the following]	>10	> 5	Moderate
POOR	All results worse than fair		

*The grade cannot be higher than that for osteoarthritis

Table no- 3: Treatment and Outcome

Treatment modalities	No. Of patients	Excellent	Good	Fair	Poor
ORIF	37	6(16.2%)	19(51.35%)	7(18.91%)	5(13.51%)
PCCS	13	6(46.1%)	5(38.46%)	2(15.38%)	0(0%)
TOTAL	50	12(24%)	24(48%)	9(18%)	5(10%)
P VALUE	0.001				

vehicle accidents account for 68% of all injury cases, while falls account for 32%. According to Schatzker's method, the most common kind was II, with 10% of patients falling into type I, 36% into type II, 16% into type III, 10% into type IV, 20% into type V, and 8% into type VI.

Just 26% of patients underwent percutaneous cancellous screw fixation, while 74% underwent open reduction and plate fixation. Seven out of fifty patients (14%), or patients with infection, loss of reduction, peroneal nerve damage, or compartment syndrome; twenty-two percent, or patients with posttraumatic osteoarthritis, knee stiffness, knee instability, or malunion. When comparing open reduction and plate fixation to close cancellous screw fixation, more early and late problems are seen with the former. Fracture union typically takes about 3.70 months. After using the H&L criteria, the outcomes for 24% of patients were excellent, 48% were good, 18% were fair, and 10% were bad.

When comparing people over 30 to those under 30, falls are more common in the older age range. Two people broke their lower arms, one broke their kneecaps, two broke their metatarsals, one broke their medial malleolus, one broke their femur shaft, one broke their forearm in two places, and one broke

Table no. 4: Treatment and type of fracture

Type of fracture	Patients	Mode of treatment	
		ORIF with buttress plate	Percutaneous cancellous screws
TYPE I	5	0	5
TYPE II	18	13	5
TYPE III	8	7	1
TYPE IV	5	3	2
TYPE V	10	10	0
TYPE VI	4	4	0
TOTAL	50		

Table no. 5: Treatment and hospital stay in days, Time of union in months, Follow up in months

Treatment Modalities	No. of patients	Hospital stay (days)	Time of union(moths)	Follow up (moths)
ORIF WITH B PLATE	37	9.32±5.20	4.05±1.29	13.43±6.39
PCCS	13	5.54± 3.33	3.07±0.86	9.84±3.13
TOTAL	50	8.34± 5.04	3.76±1.09	12.56±5.97
P Value		0.005	0.0046	0.011

their pelvis.

Type I: A 6.5 cc screw was used for all # percutaneous repairs.

Type II: Two patients out of thirteen had to have their contralateral bimalleolar fracture treated at the same time.

Two of the seven Type III patients who needed ORIF also needed the depressed plateau elevated and bone grafting.

One patient with type IV required a percutaneous k-wire to treat an associated right foot third metatarsal fracture.

Table no. 6: Pain during follow up

Pain during follow up	No. of patients	Percentage (%)
Mild ache	9	18
Occasional pain	14	28
Discomfort in ordinary	7	14
Pin on all activity	8	16
No Pain	12	24

Bone grafting was required for three patients classified as Type V. The patient's undisplaced patella fracture was treated conservatively. One pt. had a medial malleolus fracture, too, which required two screws to fix. The accompanying mildly displaced pelvic fracture in one patient was treated conservatively.

Two patients needed bone grafting, and one patient had an accompanying fracture in both forearm bones that needed to be treated at the same time as the open reduction and plating for his type VI fracture. Closed reduction with a percutaneous cancellous screw results in a mean hospital stay of 5.54 days, while open reduction with buttress plating averages 9.32 days. Cancellous screw fixation was significantly related to both the excellent and good outcomes.

88% of patients have no more than grade 0 post-traumatic OA, while 8% have grades 1 and 2, and 4% have grades 3.

DISCUSSION

Orthopaedic surgeons continue to face difficulties in managing high-energy intraarticular tibial plateau fractures.7,8 The intra articular location of the fracture makes recovery more challenging. The outcomes of non-operative treatment for severe injuries have traditionally been poor,8,9. Fifty patients were tracked for a total of 24 months in this study. Closed reduction with a percutaneous cancellous screw was used to treat 13 patients, whereas open reduction and internal fixation with a buttress plate and bone grafting was used to treat the remaining 37. Between three months and two years, patients were tracked. Since most of the patients suffering from these fractures are men, the working and earning age group / household heads, they require the finest treatment choice which can provide maximal function.10,11 In young individuals, especially those who engage in greater outdoor activity, RTA was shown to be the primary cause of fracture, while FALL was found to be the primary cause of fracture in the older age group. 12 However, low-velocity Type II fractures were discovered to be the most common, followed by Type V and Type III fractures, and the full assessment of the patient as a whole with serial assessment (secondary and tertiary survey) of injuries is required due to the variable associated injuries such as Coronal and sagittal plane instability, other bone fractures, etc.[14,15] A speedier road to recovery and rehabilitation might be expected if accompanying trauma is diagnosed and treated as soon as possible.[16-18]

Schatzker's type I displaced intraarticular proximal tibial fractures should be treated with closed reduction with a percutaneous cancellous screw, while displaced types II, III, and IV require open reduction and internal fixation (ORIF) with a buttress plate and bone grafting.19,20 Nonetheless, a percutaneous technique may be an option if it is feasible for the fracture shape. The outcomes of high-velocity injuries classified as Schatzker types IV, V, and VI differed according to whether or not

the articular surface was reconstructed and the fracture collapsed after surgery.21, 22 Those individuals had a greater prevalence of infection and mild to moderate posttraumatic osteoarthritis.23 The prevalence of osteoarthritis was evaluated using radiographic imaging.24 High-velocity injuries exhibit mild to moderate posttraumatic osteoarthritis, according to a new study. However, the occurrence of osteoarthritis is reduced in patients who undergo accurate surgical repair of the articular surfaces.25,26

The primary objective of surgery is to restore full range of motion as soon as possible while also repairing any associated ligamentous or soft tissue damage and precisely reconstructing the articular surface.27,28 There is less of an economic and emotional toll on the family and the community from problems such knee stiffness and post-traumatic osteoarthritis when patients undergo rigid fixation and early rehabilitation. The functional range of motion is improved with early ROM physiotherapy.29Yet, a high grade fracture causes more pain and a longer period of immobilization, both of which reduce the range of motion.

Higher fracture grades and open procedures are linked to more early and late problems than lower fracture grades and percutaneous procedures. One benefit of early mobilization was that patients might return to work sooner. While some people may report feeling no discomfort, others may report only slight ache, and yet others may endure pain during even the most routine of daily tasks.

Union of an anatomically reduced fracture often takes three to four months, thus a period of immobilization and non-weight bearing physical therapy must be planned accordingly. Nevertheless, malunion is a possibility as well. Discharge is possible in about 8 days for patients with even high-grade fractures (Open reduction and fixation requiring more time of stay than, close reduction and fixation). The majority of surgically treated patients had good to excellent functional outcomes, favoring surgical care of tibia condyle fracture, while 10% have poor outcomes according to the modified Hohl and Luck evaluation methodology. Overall, surgical procedures like PCCS and ORIF have become commonplace.

Important function in the management of fractures of the tibial plateau. Significant benefits include a shorter duration of immobilization, restoration of articular congruity, and anatomical reduction of fractures. However, the incidence of infection, malalignment, and osteoarthritis was significantly higher in patients with higher-grade fractures.

Despite the fact that it was a prospective study with a relatively small sample size. Our investigation did find certain results, however, that reveal patterns that are almost significant. These procedures offered a practical means of alleviating pain and stabilizing fractures. Shorter hospital stays, fewer and less severe complications, somewhat faster return to function, and equivalent and superior clinical outcomes are all achieved with closed reduction with Percutaneous cancellous screw.30

Careful ORIF with a Buttress plate has been shown to have great long-term radiological and functional outcomes in our experience. Thus, we advocate therapy by ORIF or PCCS depending on the fracture pattern and stability following closed reduction for patients with high grade fractures and fractures who have displacement greater than 2mm. Closed reduction with PCCS and open reduction and internal fixation (ORIF) with a buttress plate have become standard procedures for treating tibial plateau fractures.[31]

CONCLUSION

For Schatzker Type I displacement fractures, we conclude that closed reduction and internal fixation with PCCS yields excellent outcomes; for Types II, III, and IV, open reduction and internal fixation (ORIF) with a B plate is to be performed; nevertheless, PCCS in select patients also yields good results. In young patients who need precise anatomical reconstruction of the articular surface, stable fixation, early ROM physiotherapy, and rehabilitation, open reduction and internal fixation with a Buttress plate and bone grafting can be effective. This allows the patient to achieve knee arc of motion in the functional degrees earlier. Nonetheless, the outcome of your surgery and the occurrence of postoperative complications are heavily dependent on aseptic operation technique, the surgeon's skill in handling soft tissues, and patient-related factors. In addition, a multi-center

investigation involving a sizable sample size is required to establish causality.

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