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A Prospective Study Critical Analysis Of Functional & Radiological Outcome Of Tibial Condyle Fracture Treated By Internal Fixation.

R Kathiresan[1]*, R Suganthi[2], and G Vimalan[3].

[1]Assistant Professor, Department Of Orthopedics, Government Dharmapuri Medical College & Hospital, Dharmapuri, Tamil Nadu, India.
[2]Assistant Professor, Department Of Obstetrics & Gynecology, Government Mohan Kumara Mangalam Medical College & Hospital, Salem, Tamil Nadu, India.
[3]Senior, Assistant Professor, Department Of Orthopedics, Government Dharmapuri Medical College & Hospital, Dharmapuri, Tamil Nadu, India.

ABSTRACT

The tibial plateau is one of the most critical load-bearing areas in the human body; fractures of the plateau affect knee alignment, stability, and motion. The knee is one of the major weight-bearing joints of the body, fractures around it will be of paramount importance. This study aims to analyze functional and radiological outcomes of tibial condyle fractures treated with internal fixation CRIF or ORIF with or without bone grafting prospectively and to compare the outcome based on radiological criteria and functional criteria.30 cases of tibial plateau fractures treated by various modalities were studied from May 2020 to Sep 2021 at the Department Of Orthopedics, Government Dharmapuri Medical College& Hospital, Dharmapuri, Tamil Nadu, India Fractures were evaluated using Modified Rasmussen's Clinical, Radiological grading system. The selected patients were evaluated thoroughly and after the relevant investigations, were taken for surgery. The fractures were classified as per the SCHATZKER'S types and operated accordingly with CRIF with Percutaneous cannulated cancellous screws, and ORIF with buttress plate/LCP with or without bone grafting. Immobilization of fractures continued for 3 weeks by POP slab. An early range of motion was then started. Weight- bearing up to 6- 8 weeks was not allowed. The full weight bearing is deferred until 12 weeks or complete fracture union. The knee range of motion was excellent to very good, gait and weight bearing after the complete union was satisfactory, knee stiffness in 3 cases, wound dehiscence and infection in 1 case, and non-union in none of our cases was noted. Functional outcome is better in operatively treated tibial plateau fractures in adults, because it gives excellent anatomical reduction and rigid fixation to restore articular congruity and early motion thereby preventing knee stiffness.

Keywords: Tibial Plateau, Battress Plate, Internal Fixation, Proximal tibia.

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Corresponding author

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INTRODUCTION

The tibial plateau is one of the most critical load-bearing areas in the human body; Fractures of the plateau affect knee alignment, stability, and motion. These fractures constitute about 8% of all fractures in the elderly and 1% overall. Plateau fractures cover a broad spectrum of injuries with differing degrees of articular depression and displacement [1]. Published studies have shown that the majority of injuries affect the lateral plateau (55%–70%). Isolated injuries to the medial plateau occur in 10% to 23% of cases, while the involvement of both plateaus, the so-called bicondylar lesions, is found in 10% to 30% of reported series. In young adults, they are the result of high-energy trauma, while in the elderly bicondylar tibial plateau fractures usually occur in a bimodal age distribution. In young patients, high-energy trauma; most commonly road traffic accidents (RTAs) results in comminuted fractures and severe soft tissue damage, whereas in older patients, comminution and soft tissue injury arise mainly from poor bone quality and thin skin, usually following domestic falls [2]. Low and high-energy tibial plateau fractures usually result from axial loading in combination with varus /valgus stress forces [3]. Potential complications vary with the degree of trauma energy and include compartment syndrome, open fractures requiring coverage procedures, and neurovascular injury [4]. Associated injuries include cruciate and collateral ligament significant articular comminution and depression, open or closed soft tissue, and metaphyseal fracture extension often challenges in selecting treatment options [5]. Surgical fixation of bicondylar tibial plateau fractures is challenging because of geographic complexity and compromise of the soft tissue envelope. High-energy tibial plateau fractures remain a challenge to orthopedic surgeons, with the bicondylar type (Schatzker type V), and the reduction and internal fixation, especially done through injured soft tissues have been associated with major wound complications [6]. Treatment goals include preservation of soft tissues, restoration of articular congruity, and correction of anatomic alignment in the lower extremities. Various other methods of treatment have been described by various authors, each with its own merits and demerits [7]. The use of external fixators as a mode of treatment often leads to joint stiffness because of delayed mobilization of the knee joint. Treatment by open reduction and internal fixation either with a single or dual plate through a single midline incision causes extensive soft tissue injury of the proximal tibia, causing de-vascularization of the fracture fragments, thereby decreasing fracture healing and leading to risks of wound complications [8]. Locking plate in bicondylar tibial fractures provides greater stability in unstable fractures and creates a strong connection between the articular components. Joint surface stabilization might be a stable enough fixation when the medial condyle is not comminuted and there is no separate posteromedial segment [9]. Dual plating is needed in bicondylar tibial plateau fractures with a separate posteromedial segment, complete separation of the entire medial plateau, and medial articular comminution. The objectives of surgical management are precise reconstruction of the articular surfaces, stable fragment fixation, normal limb alignment, repair of all concomitant ligamentous and other soft tissue lesions, and early mobilization. with a functional range of knee motion and adequate postoperative functioning. Adequate fixation and early achievement of postoperative range of motion are important for a good prognosis. Despite a plethora of articles, the results of various methods of management remain controversial in this view, success of surgical management needs descriptive evaluation [10].

MATERIALS AND METHODS

This is a study of surgical management of tibial plateau fractures conducted in the 30 cases of tibial plateau fractures treated by various modalities were studied from May 2020 to Sep 2021 at the Department Of Orthopedics, Government Dharmapuri Medical College& Hospital, Dharmapuri, Tamil Nadu, India. During this period 30 patients were treated for tibial plateau fractures in which all patients were treated by internal fixation, out of which, 10 with Percutaneous cancellous screw fixation method, 9 with ORIF with buttress plate, 7 with ORIF with buttress plate and bone grafting and 4 with Locking compression plate. All the required data was collected from the patients during their stay in the hospital, during follow-up at regular intervals, and from the medical records. The Inclusion Criteria: Patient who has been diagnosed with a Closed, Unstable tibial plateau fracture. The age group of 20–70 years for both sexes. The Exclusion Criteria: Skeletally immature individuals. Open fractures of tibial plateau. Fractures associated with knee dislocation. Patients with associated ipsilateral femur, tibia, and foot fractures. All patients are selected based on history, clinical examination, and radiography. The Schatzker's classification was used to classify these fractures. The patients were followed up for an average period of 6 months. Follow up and assessment will be performed using modified Rasmussen's Clinical and Radiological criteria. The history was taken followed by general and local examination of the patient. Concerned specialists undertook appropriate management of the associated injuries. Intensive care was

given to those patients who presented with shock and immediate resuscitative measures were taken. Once the patient's general condition was fit, relevant X-rays were taken, and the degree of instability was graded. The patients were taken for surgery at the earliest possible time depending on their medical condition, skin condition, and the amount of swelling. All surgeries were done under C-arm image intensifier control. Fractures were fixed either with percutaneous technique or by open reduction and internal fixation. The fixation devices consisted of T-Buttress plate, L Buttress plates, 4.5 mm cortical screws, and 6.5 mm Cannulated and Non-cannulated Cancellous screws. Bone grafts and bone graft substitutes were used in depressed and comminuted fractures. The source of the bone graft was the ipsilateral iliac crest.

RESULTS

Table 1: Frequency of Age incidence

Age of the Patient	Frequency	Percentage
<30	4	13.4%
31-40	9	30%
41-50	11	36.6%
51-60	6	20%
Total	**30**	**100%**

Age Incidence: In this study, 66.6% were in the 3rd and 4th decades. Highly signifies the association of fracture in the 3rd and 4th decades. In this study, 66.6% were male patients and 33.4% patients were female patients. A highly significant association of this study is with male patients.

Table 2: Frequency Of Mode Of Injury

Mode of injury	Frequency	Percentage
RTA	17	56. 6%
FFH	7	23. 4%
FLS	6	20%
Total	**30**	**100 %**

In this study mode of injury is highly associated with road traffic accidents which accounts for about 56.6%.

Table 3: Frequency Of Side Of Injury

Side of injury	Frequency	Percentage
RIGHT	11	36.6%
LEFT	19	63.4%
Total	**30**	**100%**

In this study, 63.4% of the patients sustained injury on the left side and 36.6% on the right side. In our study, there was left-sided predominance, compared to the right side.

Table 4: Frequency Of Type Of Fracture

Schatzker Type of Fracture	No. Of cases	Percentage
TYPE I	5	16.6%
TYPE II	9	30%
TYPE III	7	23.4%
TYPE IV	1	3.4%
TYPE V	3	10%
TYPE VI	5	16.6%
Total	**30**	**100%**

Table 5: Frequency of Methods of Treatment

Methods of Treatment	No. Of cases	Percentage
PCCS	10	3 3.3%
OR IF + BP	9	30%
ORIF + BP + BG	7	2 3.3%
ORIF + LCP	4	1 3.4%
Total	**30**	**100%**

Table 6: Frequency of Complication

Complication	No. of cases	Percentage
Knee stiffness	3	10 %
Varus/valgus deformity	1	3.4 %
Infection, wound dehiscence	2	6.8 %
Normal	**24**	**79.8%**

Table 7: Associated Ligament injury

Associated Ligament injury	No. of cases	Percentage
MCL	3	10%
LCL	1	3.3%
ACL	2	6.7%
Total	**6**	**20%**

All the ligamentous injuries were managed conservatively by a Brace. The patient's function and outcome were good even without addressing these injuries. Out of three MCL injuries two were associated with type II fracture and one type V, excellent to good outcome similar to that of others without MCL injury. All areisolated Grade II MCL injuries managed conservatively. Long-leg hinged brace locked-in extension given for the first 6 weeks after injury, during these 6 weeks, weight bearing as tolerated with crutches is permitted. During this early phase, quadriceps strengthening is done in non-weight bearing that is, quad sets,straight-leg raising (SLR), and electrical stimulation. After 6 weeks, the brace isset to allow full ROM and full weight bearing as tolerated is permitted. ROM exercises are initiated once the brace is opened and full ROM is achieved by the end of the eleventh week. Stationary biking is employed early for ROM and closed chain quadriceps are instituted once the patient has attained full weight bearing. Out of two ACL injuries associated with type III & type V each, had a similar outcome compared to one without ACL injury. All are managed conservatively with a brace and staged rehabilitation program.

Table 8: Clinical Assessment

Clinical result	No. of cases	Percentage
Excellent	10	33.3%
Good	15	50 %
Fair	3	10 %
Poor	2	6.7 %
Total	**30**	**100%**

The mean Rasmussen Functional score at final follow-up was 25.062 (range 15-30). Out of 30 cases treated with surgical procedure, 10 cases gave excellent results, 15 cases came out with good results, fair in 3 cases and 2 cases had poor results, mainly due to the severity of the injury and infections.

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Table 9: Radiological Assessment

Radiological Evaluation	No. of cases	Percentage
Excellent	2	6.7%
Good	22	73.2%
Fair	4	13.4%
Poor	2	6.7%
Total	**30**	**100%**

The mean Rasmussen Radiological score at final follow-up was 7.68 (range 0-9). Out of 30 cases treated with surgical procedure, 2 cases gave excellent results, 22 cases came out with good results, fair in 4 cases and 2 cases had poor results.

Table 10: Rasmussen's grading

	Excellent	Good	Fair	Poor
Pain evaluation	13	9	8	0
Walking capacity	13	12	3	2
Extension lag	14	12	3	1
Range of movement	15	8	4	3
Stability	20	10	0	0
Functional results	10	15	3	2
Radiological results	2	22	4	2

DISCUSSION

Tibial plateau fractures are more commonly seen in the active productive age group (31-50 years) due to high-energy trauma. Closed treatment of these injuries has had little success in reducing depressed or displaced fracture fragments; this necessitates open treatment in most displaced and unstable fractures [11]. It is extremely important to do a stable fragment fixation to regain the complete range of motion. In our series majority of the patients were Males. This can be attributed to more involvement in RTA. The significance of tibial plateau fracture-related sex distribution was not available to comment on them [12]. Occupationally tibial plateau fractures were seen in people with high levels of activity, movement, and travel. It is most commonly seen in people with high mobility like businessmen (26.7%), employees (26.7%), and laborers (20%). In our study, there was Left side predominance, compared to the right side with the left side 63.4% and the right side 36.6%. In our study, the majority of the fractures were found to be of type II i.e. Cleavage combined with Depression fractures account for about 30%. Type IV was the least with 3.4%. In this series, we studied 30 cases of tibial plateau fractures treated only by surgical methods. Different authors use different criteria for the surgical management of these fractures. Seppo E, Honkonen conducted 130 tibial plateau fractures taking into consideration the following for the surgical management: Condylar widening of>5mm Lateral condyle step off>3mm All medial condylar fractures In our study, the indications for the surgery were the same standard indications as above and 3mm depression was considered as an indication for surgery in our series [13]. In our series, we have not formulated any criteria as to the particular method of fixation for the particular type of fracture. So each case was individualized and treated accordingly as needed. Most of the type I, some type II were treated with Percutaneous cancellous screw fixation. The split fracture, of >3mm displacement was treated by ORIF. Bone grafting was included along with ORIF with Buttress plate/LCP and screws in type II, III, IV, V, and VI wherever necessary [14]. The major problem faced by us during the study was Knee stiffness and Infection; hence immobilization was more common in these patients for stiffness. The infection might be attributed to nosocomial infection. Inspite of all the associated Ligament injuries and Complications, we were able to achieve 33.4% excellent results, and 50% good results (overall 83.4% acceptable results). In addition, we have 10% fair and 6.6% poor results. These results are comparable and on par with other documented standard studies [15].

CONCLUSION

To manage different types of tibial plateau fractures depends on good clinical judgment. The surgeon must have sound knowledge of the personality of the injury and a clear understanding of the

knee examination, and imaging studies and must be familiar with a variety of techniques available at present for treating tibial plateau fractures. Displaced condylar fractures of the tibial plateau those belonging to Schatzker's type I and II, the treatment of choice is Closed reduction internal fixation/Open reduction internal fixation with Cannulated cancellous screws. Results are excellent to good by this method. The main aim of surgical treatment includes accurate reconstruction of the articular surface with elevation of the depressed bone fragment, bone grafting, and stable fragment fixation allowing early range of movement. Schatzker's type III managed operatively with ORIF with Buttress plate and bone grafting gives good to fair results. In Schatzker's type IV fractures which were managed by ORIF and Buttress plating had fair to good results. In high-velocity injuries belonging to Schatzker V and VI which were managed with Buttress plate/LCP, several good to fair results were seen. This is mainly due to adequate reconstruction of the articular surface during the operative period and prevention of collapse of the reconstructed articular surface. Complications seen in our series are knee stiffness, infection wound dehiscence, and valgus or varus deformities these complications are mainly seen in high-energy injuries (Schatzker's type V, VI).

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