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Original Article

COMPARATIVE STUDY OF MANAGEMENT OF SCHATZKER TYPE V AND VI TIBIAL PLATEAU FRACTURES WITH OPEN REDUCTION AND INTERNAL FIXATION USING PLATING VERSUS HYBRID EXTERNAL FIXATOR

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ABSTRACT

Background: Tibial plateau fractures are intra-articular fractures involving the proximal tibia and account for approximately 1–2% of all fractures. Schatzker type V and VI fractures are bicondylar injuries commonly resulting from high-energy trauma and are frequently associated with significant soft-tissue damage. Surgical management aims to restore articular congruity, maintain limb alignment, and achieve stable fixation that allows early mobilization. This study compares the outcomes of open reduction and internal fixation (ORIF) with plating and hybrid external fixation in the management of these complex fractures.

Methods: This prospective comparative study included 30 patients with Schatzker type V and VI closed tibial plateau fractures treated at a tertiary care centre. Patients were randomly divided into two groups:
Group A – ORIF with plating (15 patients)
Group B – Hybrid external fixation (15 patients)
Functional outcome was assessed using the Modified Rasmussen Functional Score, and radiological outcomes were evaluated using Modified Rasmussen Radiological Criteria. Statistical analysis was performed using SPSS software.

Results: The mean age was 38.8 ± 9.18 years in the plating group and 35.26 ± 12.53 years in the hybrid fixation group. Road traffic accidents were the most common mechanism of injury.
The mean time to radiological union was:
Plating group → 17.40 ± 1.77 weeks
Hybrid group → 15.87 ± 0.84 weeks
Functional outcomes were comparable in both groups. Deep infection occurred more frequently in the plating group, whereas pin tract infections were more common in the hybrid fixation group.

Conclusion: Both ORIF with plating and hybrid external fixation provide satisfactory clinical and radiological outcomes in Schatzker type V and VI tibial plateau fractures. Hybrid fixation offers advantages such as minimal soft-tissue disruption, reduced blood loss, and earlier fracture union, whereas plating allows better anatomical reduction of the articular surface.

Keywords*: Tibial plateau fracture, Schatzker type V, Schatzker type VI, ORIF plating, Hybrid external fixation, Bicondylar fracture.*

INTRODUCTION

Tibial plateau fractures involve the articular surface of the proximal tibia and account for approximately **1.2% of all fractures**. These fractures commonly occur following high-energy trauma such as road traffic accidents and falls from height. Bicondylar fractures of the tibial plateau, classified as **Schatzker type V and VI**, are associated with significant articular disruption, metaphyseal comminution, and soft tissue injury.

The goals of treatment in tibial plateau fractures include:

- Restoration of articular congruity
- Maintenance of mechanical alignment
- Stable fixation of fracture fragments
- Early mobilization of the knee joint

Open reduction and internal fixation with plating allows direct visualization of fracture fragments and anatomical reconstruction of the articular surface. However, extensive surgical exposure may increase the risk of soft-tissue complications.

Hybrid external fixation uses the principle of **ligamentotaxis** and allows indirect fracture reduction while preserving soft-tissue integrity. This technique provides stable fixation with minimal surgical dissection and allows early mobilization.

Despite numerous studies evaluating these techniques, the optimal surgical method for bicondylar tibial plateau fractures remains controversial. Therefore, the present study aims to compare **clinical and radiological outcomes of ORIF with plating versus hybrid external fixation** in Schatzker type V and VI tibial plateau fractures.

MATERIALS & METHODS

Study Design

Prospective comparative study.

Study Setting

Department of Orthopaedics Gauhati Medical College and Hospital-Tertiary care teaching hospital.

Study Duration

Oct 2024 – Oct 2025.

Sample Size

30 patients.

Inclusion Criteria

- Age between **18–60 years**
- Closed **Schatzker type V and VI tibial plateau fractures**
- Patients willing to participate in the study

Exclusion Criteria

- Open fractures
- Pathological fractures
- Polytrauma requiring emergency surgery
- Previous surgery around the knee

Surgical Procedeure

Group A – ORIF with Plating

- Open reduction using anterolateral or dual approach
- Anatomical reduction of articular fragments
- Fixation using locking compression plates
- Bone grafting when required

Group B – Hybrid External Fixator

- Percutaneous reduction of fracture fragments
- Hybrid external fixation using tensioned wires proximally and half pins distally
- Reduction achieved through ligamentotaxis

OUTCOME ASSESSSMENT

Functional outcome was assessed using the **Modified Rasmussen Functional Score**.

Score	Outcome
27–30	Excellent
20–26	Good
10–19	Fair
<10	Poor

Radiological outcome was assessed using:

- Articular depression
- Condylar widening

- Varus/valgus alignment

Statistical Analysis
Data were analysed using **SPSS version 26.0**.
Continuous variables were expressed as **mean ± standard deviation**.
Categorical variables were analysed using the **Chi-square test**.
A **p value <0.05** was considered statistically significant.

RESULT

Age Distribution

Age Group	Plating	Hybrid
18–30	3	4
31–40	5	4
41–50	4	4
51–60	3	3

Mean age
Plating → **38.8 years**
Hybrid → **35.26 years**

Mode of Injury

Mode of Injury	Plating	Hybrid	
Road Traffic Accident	9	10	
Fall from Height	4	3	
Direct Trauma	2	2	

Road traffic accidents were the most common cause.

Time to Radiological Union

Treatment	Mean Union Time
ORIF plating	**17.40 ± 1.77 weeks**
Hybrid fixation	**15.87 ± 0.84 weeks**

Functional Outcome

Outcome	Plating	Hybrid
Excellent	6	7
Good	5	5
Fair	3	2
Poor	1	1

Complications

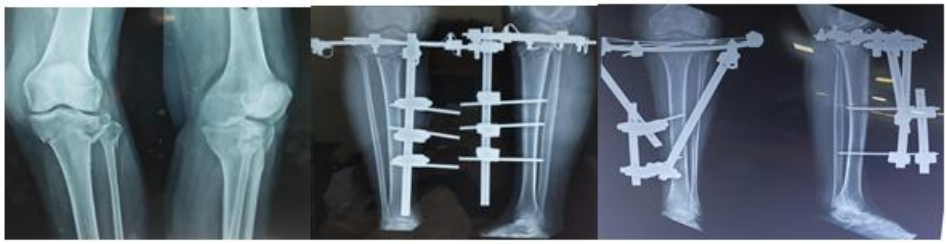
Complication	Plating	Hybrid
Deep Infection	2	0
Superficial Infection	2	1
Pin Tract Infection	0	3
Knee Instability	1	1

CASE TREATED -ORIF WITH PLATING

Pre op xray | Immediate post op | Follow up xray-18 weeks

Full squatting	Complete knee flexion and extension without malalaignment

CASE TREATED WITH HYBRID EXTERNAL FIXATOR



Pre operative xray	Immediate postop	Follow up xray-18 weeks

Full squatting	Complete knee flexion and extension without malalaignment

DISCUSSION

Bicondylar tibial plateau fractures represent complex injuries due to articular involvement and soft-tissue compromise. The mean age distribution in the present study was comparable with studies by **Barei et al. and Khatri et al.**, which also reported that these fractures occur predominantly in young adults exposed to high-energy trauma.

Radiological union occurred earlier in the hybrid fixation group. This may be attributed to **preservation of periosteal blood supply and fracture hematoma**, which facilitates biological fracture healing.

Functional outcomes were comparable between the two groups, consistent with findings reported by **Bertrand et al.**, who demonstrated similar results between plating and hybrid fixation techniques.

Complication patterns differed between the two groups. Deep infections were more common in the plating group due to extensive soft-tissue exposure, whereas pin tract infections were more frequent in the hybrid fixation group but were generally manageable.

CONCLUSION

Both **ORIF with plating and hybrid external fixation** provide satisfactory clinical and radiological outcomes in Schatzker type V and VI tibial plateau fractures.

Hybrid fixation offers advantages such as:

- minimal soft-tissue disruption
- reduced blood loss
- earlier fracture union

However, ORIF with plating allows better anatomical reduction of the articular surface.

Therefore, treatment should be individualized based on **fracture morphology, soft-tissue condition, and surgeon expertise**

LIMITATIONS

- Small sample size
- Short follow-up duration

- Long-term complications such as post-traumatic osteoarthritis were not assessed

CLINICAL MESSAGE

Hybrid external fixation is a reliable alternative to plating in bicondylar tibial plateau fractures, particularly in patients with compromised soft-tissue conditions

Level of Evidence

Level III – Prospective Comparative Study

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