

Treatment of Type V and Type VI Schatzker Tibial Plateau Fractures: Comparison of Functional and Radiological Outcomes of Open Reduction and Internal Fixation Using Lateral Lock Plate and Bicondylar Plating – A Randomized Control Trial

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Abstract

Background: Tibial plateau fractures are complex intra articular fractures which pose a great challenge. The aim of this study compare the clinical and functional outcomes of type V and type VI tibial plateau fractures treated with bicondylar plating and lateral locking plate and to highlight their advantages and disadvantages.

Materials and methods: Forty patients in the age group of 18yrs to 65 yrs with complex tibial plateau fractures (Schatzker type V and VI) were operated between January 2019 to January 2020 either by a single lateral lock plate through an anterolateral incision or through double incision. The fractures were closed or grade I compound with no other injury which hindered the post op rehabilitation. All cases were followed up for a period of 9 months. The final functional assessment was done using the knee society score.

Results: Twenty patients each were included in the two treatment groups having a mean age of 32.97 years. The most common mode of injury was road traffic accidents, accounting for 70% (28) of the cases. The average duration for union in case of lateral lock plate (ULP) was 12.7 weeks (range 8-16 weeks) and in bicondylar plating (BCP) was 14.5 weeks (range 10-20 weeks), the difference was found to be insignificant. The average operating time in ULP was 66.25 mins (range 50-90 mins) while that of BCP was 96.75 mins (range 90-140 mins). The difference was found to be significant ($p=0.001$). The difference in average blood loss was also found to be significant ($p=0.0015$) with an average of 59.5 ml (range 30-90ml) in ULP and 76ml (range 60-110ml) in BCP. The difference between the average Knee Society Score between the two groups was found to be insignificant ($p=0.3142$) with an average score of 87.10 in ULP and 85.08 in BCP. Post operative loss of alignment was seen in 5 cases only in unilateral plating group, all of which showed varus malalignment. Superficial infections were more common in BCP (4 cases) compared to ULP (2 cases).

Conclusions: This study concluded that overall, either of the fixation modalities showed good functional results. The anterolateral lock plate had certain advantages like reduced operating time, blood loss and reduced infection rates. The bicondylar plating however offered better maintenance of articular congruity post fixation

Keywords: tibial plateau, lateral lock plate, bicondylar plating, functional outcomes.

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I. Introduction

Proximal tibial fractures involve one of the major weight bearing joints, injury to which can potentially result in movement and ability dysfunction.¹

Mechanism of injury - abduction, compression, mixed and explosive.²

Extent of damage (viz degree of comminution, displacement, and soft tissue injuries including ligaments of the knee) is proportional to magnitude of impact/force.³

Most commonly classified according to the Schatzker classification.⁴

Many treatment options are available like plating, external fixation, nailing etc.

Goal of treatment

Maintain the normal function of the knee.

Restore joint stability.

Prevent malalignment and deformity.

Prevent post-traumatic knee osteoarthritis.⁵⁻⁷

Surgical management preferred over conservative management.

II. Aims And Objectives

To analyze and compare the results of unicondylar lock plate(ULP) and bicondylar plating(BCP) in complex tibial plateau fractures as per defined outcome variables.

Time for union

Procedural differences

Range of motion at knee joint

Functional outcomes

Complication rates

III. Materials And Methods

This prospective comparative study was carried out on patients of Department of Orthopaedics at Government Medical College And Hospital, Nagpur, India from February 2019 to February 2020. A total 40 adult subjects (both male and females) of aged ≥ 18 , years were for in this study

Prospective single blinded randomized control trial involving 40 patients.

Patients randomly allotted into treatment groups based on computer generated randomization plan.

Treatment groups:

Unilateral lock plate (ULP)

Bicondylar plating (BCP)

Inclusion Criteria

Schatzker type V and VI plateau fractures

Closed and Gustilo type I open fractures

Age group 18-65 years

Patient self ambulatory before trauma

Exclusion criteria

Pre existing arthropathy of the knee

Infected/higher grade of open fractures

Fractures presenting beyond three weeks after trauma

Patients were taken up for surgery once the general and local skin conditions were optimized.

Rehabilitation started on the second postoperative day.

Weight bearing given based on progression of fracture union.

Follow-up radiographs were obtained at 6,12,18 & 24 weeks and then every 3 months until clinical and radiological fracture union.

Final functional assessment was done using the Knee Society Score at the end of 3 months.

ULP(Unicondylar lateral plating)- After attaining good fracture reduction and congruent articular surface, fixation was done using an anatomical contoured lateral locking plate.

BCP(Bicolumnar plating)- After addressing the lateral tibial condyle, the medial condylar fracture was reduced and fixed using a medial plate placed posteromedially or medially.

IV. Results And Observations

•Time for union

Criteria for union as given by Anderson et al.⁸

ULP: Avg time for union 13.40 weeks. (Range 8 – 16 weeks)

BCP: Avg time for union 14.40 weeks. (Range 10 – 18 weeks)

•Procedural differences

1. Operative time:

ULP: Avg time 49.5 mins. (Range 40 – 90 mins)

BCP: Avg time 80.5 mins. (Range 70 – 100 mins)

DIFFERENCE SIGNIFICANT

$p < 0.0001$

2. Intraoperative blood loss:

ULP: Avg blood loss 56 ml. (Range 30 – 90 ml)

BCP: Avg blood loss 78.5 ml. (Range 60 – 110 ml)

DIFFERENCE SIGNIFICANT

p=<0.0001

•Range of motion of knee

ULP: Avg amount of flexion 113°. (Range 90 – 130°)

BCP: Avg amount of flexion 110.5°. (Range 90 – 120°)

Functional outcomes

Results analyzed using Knee Society Score modified by Dr John Insall.⁹

ULP: Avg score 87.10. (Range 51 – 100)

BCP: Avg score 85.08. (Range 68 – 99)

•Complications

The complications seen in our study were residual pain, varus malalignment, superficial infection and hardware prominence

V. Discussion

•Time for union

No significant difference (p>0.05) , but higher mean time to unite in BCP (14.40 weeks vs 13.40 weeks) may be due to greater soft tissue dissection.

Study	Modality	Avg Duration of Surgery	Avg Blood Loss
Lee et al. 2014 ¹⁰	ULP	76.6 mins	69.3±14.36 ml
	BCP	101.4 mins	100.1±24.63 ml
Neogi et al. 2015 ¹¹	ULP	112 mins	-
	BCP	134 mins	-
Present study 2016	ULP	49.5 mins	56 ml
	BCP	80.5 mins	78.5 ml

Study	Modality	Knee ROM	Functional outcome
Lee et al. 2014 ¹⁰	ULP	-	Excellent: Majority Good
	BCP	-	Excellent Good: Majority
Neogi et al. 2015 ¹¹	ULP	128°	Excellent Good: Majority
	BCP	124°	Excellent Good: Majority
Present study 2016	ULP	113°	Excellent: 65 % Good: 25 %
	BCP	110.5°	Excellent: 85 % Good: 5 %

STUDY	MODALITY	COMPLICATIONS
T C Lee et al. 2012 ¹²	ULP	Infection: 6%
		Varus malalignment: 20 %
Lee et al. 2014 ¹⁰	ULP	Infection: 19 %
		Varus malalignment: 6 %
	BCP	Infection: 15 %
		Varus malalignment: 0 %
Neogi et al. 2015 ¹¹	ULP	Infection: 6.69 %
		Varus malalignment: 16.6 %
	BCP	Infection: 15.6 %
		Varus malalignment: 0 %
Present study	ULP	Infection: 10 %
		Varus malalignment: 25 %
	BCP	Infection: 20 %
		Varus malalignment: 0 %

Complications

The greater incidence of wound complications in the BCP group can be attributed to the greater soft tissue handling.

The lack of fixation of the posteromedial fragment in the ULP group explains the more frequent varus malalignment observed.

The increased malalignment explains the greater incidence of residual post operative pain in ULP.

VI. Conclusion

Both unilateral and bicolumnar plating are efficient treatment modalities for complex tibial plateau fractures giving **good knee range of motion and functional outcomes.**

They **only differ in a few technical aspects** such as duration of surgery and intraoperative blood loss.

There is a significant incidence of **varus malalignment in the ULP group** which is attributed to the unaddressed posteromedial fragment.

The greater soft tissue dissection explains the greater frequency of **wound complications in the BCP group.**

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