

Original Article

Skeletal Traction Followed by Plaster of Paris vs Open Reduction and Internal Fixation – Comparison of the Functional and Radiological Outcome of the Two Treatment Modalities in Schatzker Type V and VI Tibial Fractures

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Abstract

Objective: To compare the functional and radiological outcomes of Schatzker type V and VI tibial fractures for the two currently employed treatment modalities.

Methodology: It was a quasi-experimental study conducted at Orthopedics department. Patients were admitted through ER and OPD of Mayo hospital Lahore over a period of 1 year. Total 84 patients were included in the study. Patients were divided into two groups. Patients in Group A were managed with skeletal traction for 2 weeks followed by plaster of Paris back splint applied for next 2 weeks followed by plaster of Paris casting for stabilization of the fracture for another next 4 weeks. Patients in Group B were managed with ORIF by wires, screws or plates. Functional and Radiographic evaluations were performed to assess pain, range of motion weight bearing and fracture union in each follow-up visit

Results: In this study functional outcome of patients was significantly better and higher in patients who were treated with ORIF technique

Conclusion: ORIF is more effective for treating Schatzker type V and VI tibial fracture in terms of functional and radiological outcome as that skeletal traction followed by plaster of Paris casting.

Keywords: Skeletal Traction; ORIF; Schatzker type V; Schatzker type VI; Tibial Fracture

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Introduction

Proximal tibia and distal femur articulate together to form one of the three major joints of the body namely, the knee joint. Being one of the major weight-bearing joints of the body, it is quite difficult to treat as well. Knee joint injuries when they disrupt joint stability, alignment or mobility, pose a great functional impairment to the patients. Direct axial comp-

ression to the knee joint with varus, valgus, or shear forces, results in 'Tibial Plateau Fractures'. These fractures resulting from direct axial compression can be tibial plateau or proximal fourth; former being intra-articular and later being extra-articular type. Tibial Plateau fractures are the commonest intra-articular fractures contributing 1-3% of all and 8% of the fractures in elderly population.^{1,2}

In the treatment of these fractures, achievement of union and healing can be assessed by hammer et al. radiological assessment scores which number the radiological picture from 1 to 5 depicting a range of radiological appearances from the 'fracture line obliterated' to 'distinct fracture line' 6 months post-treatment.³

To identify the correct treatment option comprising a meticulous alignment of articular surfaces, stable fixation with repair of all associated soft tissue injuries, and early mobility, the most widely employed system of classification currently is 'Schatzker Classification System' which classifies the Tibial Plateau Fractures in six types based upon the anatomy and pattern of the fractured segment. This classification system numbers the fracture type on the basis of increasing severity with I being least severe and VI being most severe⁴. According to Schatzker, type V refers to a split fracture of the medial and lateral tibial plateau whereas type VI refers to a transverse sub condylar fracture with dissociation of the metaphysis from the diaphysis^{4,5}.

Type V and VI tibial plateau fractures usually occur as a result of high-energy impact and present with concomitant injuries to surrounding soft tissue structures. The two most commonly used treatment modalities for these fractures are Skeletal traction followed by a plaster of Paris (POP) cast and an Open Reduction and Internal Fixation (ORIF). ORIF is advocated to have a good prognosis with depressed and split fractures especially ones with >4-5 mm displacement of condyles^{6,7} whereas Skeletal traction

followed by a plaster of Paris (POP) cast was associated with good outcomes in 75-80% of patients prior to the development of surgical techniques for such fractures.^{8,9}

Besides these treatment modalities, the management of Schatzker type V and VI tibial plateau fractures is still controversial and challenging with no specific and proven treatment protocol developed so far. Though ORIF is associated with better outcomes yet it is reported to have reported high rates of complications especially wound infection, unplanned secondary procedures, and even amputation^{10,11}.

Therefore, the objective of our study is to compare the functional and radiological outcomes of Schatzker type V and VI tibial fractures for the two currently employed treatment modalities.

Methodology

A quasi-experimental study conducted at Orthopedics department of Mayo Hospital Lahore over a period of one year after taking permission from Ethical Review Committee. Patients were admitted through Emergency and Out-patient Department. 84 patients were included after taking informed consent. They were briefed about the nature of disease, type of the procedure being employed and complications associated with the procedure. Patients were divided into Group A and Group B. All the patients were followed-up for a period of 6 months. Group A was managed with skeletal traction for 2 weeks followed by a POP backslab for 4 weeks whereas Group B was managed with ORIF using screws, plates and wires, and a delayed weight bearing (10 weeks). Outcome of the treatment in both groups was evaluated using functional and radiological assessment. Both the groups were evaluated at week 2,6,12,16, 20, and 24 for functional modalities such as pain, weight-bearing, and range of motion as well as for Hammer's Radiological Score. Data were recorded

on self-made questionnaires and tables and analyzed using Statistical Package for Social Sciences (SPSS) version 24. Chi square test was applied to compare treatment outcome in both study groups. P-value < 0.05 was considered as significant.

Results

A total of 84 patients were included in the study. Mean age of patients in Group-A and in Group-B was 44.90±11.76 and 41.02±7.18 years. In Group-A all patients were male while in Group-B there were 39 (46.43%) male and 3 (3.57%) female patients. In Group-A 30 patients had fracture of Schatzker Type-5 and 12 patients had fracture of Schatzker Type-6 while in Group-B 19 patients had fracture of Schatzker Type-5 and 23 patients had fracture of Schatzker Type-6 (Figure -1). Functional outcome was significantly better in patients of Group-B except at 2nd week. Detailed comparison of functional outcome in both groups at different time is given in Table 1. At 2nd, 12th and 16th week post treatment no statistically significant difference was seen bet-

ween radiological grades in both treatment group. However, at 6th, 20th and at 24th week a statistically significant difference was seen in radiological grades in both treatment groups. During this post treatment follow up time duration it was observed that radiological grades were significantly improved in Group-B patients as compared to that of Group-A patients Table 2. From 2nd week till 6th week no statistically significant difference was seen for infection in both treatment groups. On the other hand, in Group-B from 12th week till 20th week 8 patients suffered from infection and at 24th week 12 patients suffered from infection. During the follow up time duration from 12th week till 24th week infection rate was significantly higher in Group-A patients. i.e., 12th week (p-value=0.003), 16th week (p-value=0.003), 20th week (p-value=0.003) & 24th week (p-value=0.003) (Table 3).

Table 1: Functional Outcome in Treatment Groups

Functional Outcome	2 nd Week		6 th Week		12 th Week		16 th Week		20 th Week		24 th Week	
	Groups		Groups		Groups		Groups		Groups		Groups	
	A	B	A	B	A	B	A	B	A	B	A	B
Excellent	0	0	0	0	0	0	0	0	0	0	4	25
Good	0	0	0	0	0	6	0	10	17	31	26	17
Fair	0	0	0	6	10	12	31	27	21	11	12	0
Poor	42	42	42	36	32	24	11	5	4	0	0	0
p-value	-		0.011		0.026		0.002		0.004		0.000	

Table 2: Radiological Outcome in Treatment Groups

Radiological Outcome	2 nd Week		6 th Week		12 th Week		16 th Week		20 th Week		24 th Week	
	Groups		Groups		Groups		Groups		Groups		Groups	
	A	B	A	B	A	B	A	B	A	B	A	B
Grade-I	0	0	0	0	0	0	0	0	0	0	4	12
Grade-II	0	0	0	0	0	0	0	10	20	32	40	22
Grade-III	0	0	0	0	0	3	27	33	19	9	2	8
Grade-IV	0	0	0	7	38	35	15	9	3	1	0	0
Grade-V	42	42	42	35	4	4	0	0	0	0	0	0
p-value	-		0.006		0.210		0.147		0.025		0.000	

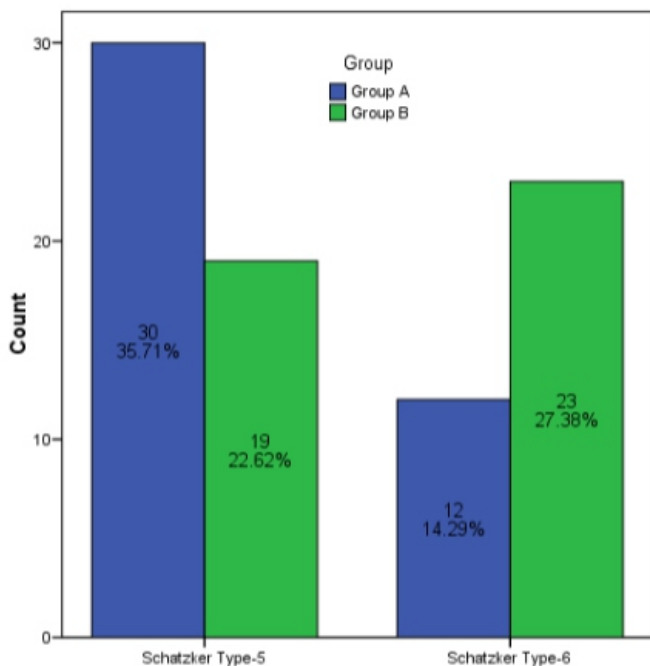


Figure 1: Type of Fracture in Treatment Groups

Table 3: Infection in Treatment Groups

Follow Up	Infection	Group-A	Group-B	p-value
2 nd Week	Yes	3	1	0.306
	No	39	41	
6 th Week	Yes	3	5	0.457
	No	39	37	
12 th Week	Yes	0	8	0.003
	No	42	34	
16 th Week	Yes	0	8	0.003
	No	42	34	
20 th Week	Yes	0	8	0.003
	No	42	34	
24 th Week	Yes	2	12	0.003
	No	40	30	

Discussion

In this study functional outcome of patients was significantly better and higher in patients who were treated with ORIF technique. The above-mentioned results are in congruence with a previous study¹² indicating that ORIF in tibial plateau fractures exhibits minimal injuries to soft tissues and also have a better functional prognosis. It should be performed with minimally invasive techniques to avoid injury to

surrounding tissues and to achieve a better and faster healing. Other studies^{13,14} also report favorable results with conservative management in about 80% of cases with this percentage being 89-97% in surgically treated cases.

Both conservative as well as operative treatment, thus show satisfactory outcome yet depends greatly on the type of the fracture and the expertise of the surgeon. Another study comparing the outcome of the two treatment modalities indicates that congruency of articular surfaces and the restoration of joint surfaces are the two factors significantly influencing the outcome of the treatment modality. Therefore, one might expect a better prognosis with a meticulous alignment and resartation using ORIF as a compared to a blind conservative procedure¹⁵. In the recent years, ORIF has been more widely employed in the treatment of these fractures as compared to the conservative management with skeletal traction¹⁶⁻¹⁸.

Conclusion

In conclusion, ORIF is a better method of treatment for Schatzker type V and VI fractures in carefully selected cases. Conservative treatment with skeletal traction though does not have a poor outcome, it should be employed only when ORIF is not available or possible.

Conflict of interest: None

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References

1. Aitken SA, Rodrigues MA, Duckworth AD, Clement ND, McQueen MM. Determining the incidence of adult fractures: how accurate are emergency department data?. *Epidemiology Res Inte.* 2012;1(1): <https://doi.org/10.1155/2012/837928>
2. Garnavos C, Lasanianos NG. The management of complex fractures of the proximal tibia with minimal intra-articular impaction in fragility

- patients using intramedullary nailing and compression bolts. *Injury* 2011;42(10):1066- 1072. doi: 10.1016/j.injury.2011.03.024.
3. 80 Whelan DB, Bhandari M, Stephen D, et al. Development of the radiographic union scores for tibial fractures for the assessment of tibial fracture healing after intramedullary fixation. *J Trauma*. 2010; 68(3): 629-632. doi: 10.1097/TA.0b013e3181a7c16d.
 4. Markhardt BK, Gross JM, Monu J. Schatzker Classification of Tibial Plateau Fractures: Use of CT and MR Imaging Improves Assessment 1. *Radiographics* 2009;29(2):585-597. <https://doi.org/10.1148/rg.292085078>
 5. Pelsler P. Controversies in the management of tibial plateau fractures. *SA Ortho J* 2010;9(3):75-82. doi: 10.1007/s12306-017-0514-8.
 6. Sangwan S, Siwach R, Singh R, Mittal R. Minimal invasive osteosynthesis: a biological approach in treatment of tibial plateau fractures. *Indian J Ortho* 2002;36(4):246. doi: 10.1016/j.jcot.2022.101824
 7. Weigel DP, Marsh JL. High-energy fractures of the tibial plateau. *J Bone Joint Surg Am* 2002;84(9):1541-1551. doi: 10.2106/00004623-200209000-00006.
 8. Qing-ping Z, Jian-wo H, Jun-wen C. Treatment of fractures of the tibial plateau. *Journal of Regional Anatomy and Operative Surgery* 2003;4:010. doi: 10.1161/JAHA.114.001250.
 9. Schatzker J. Fractures of the tibial plateau. The rationale of operative fracture care: Springer; 2005. p. 447-469. doi: 10.1111/os.13209
 10. Young MJ, Barrack R. Complications of internal fixation of tibial plateau fractures. *Ortho Review* 1994;23(2):149-154. doi: 10.1097/00005131-200411000-00001.
 11. Hall JA, Beuerlein MJ, McKee MD. Open reduction and internal fixation compared with circular fixator application for bicondylar tibial plateau fractures. *J Bone Joint Surg Am* 2009(Supplement 2 Part 1):74-88. doi: 10.2106/JBJS.G.01165.
 12. Prasad GT, Kumar TS, Kumar RK, Murthy GK, Sundaram N. Functional outcome of Schatzker type V and VI tibial plateau fractures treated with dual plates. *Indian J Ortho* 2013;47(2):188-194. doi: 10.4103/0019-5413.108915.
 13. Burri C, Bartzke G, Coldewey J, Muggler E. Fractures of the tibial plateau. *Clin Ortho Rel Res* 1979;138(1):84-93. doi: 10.1007/s00113-007-1271-1.
 14. GRAHAM A. Fractures of the lateral tibial condyle treated by skeletal traction and early mobilisation. 1956; 38(3): 699-708. doi: 10.1302/0301-620X.38B3.699.
 15. Yong C, Choon D. Mid-term results of tibial plateau fractures. *The Medical journal of Malaysia* 2012; 18(5): 429-435. doi: 10.5505/tjtes.2012.86094.
 16. Rademakers M, Kerkhoffs G, Sierevelt I, Raaymakers E, Marti R. Operative treatment of 109 tibial plateau fractures: five-to 27-year follow-up results. *J Ortho Trauma* 2007;21(1):5-10. doi: 10.1097/BOT.0b013e31802c5b51.
 17. Partenheimer A, Gösling T, Müller M, Schirmer C, Kääb M, Matschke S, et al. Management of bicondylar fractures of the tibial plateau with unilateral fixed-angle plate fixation. *Der Unfallchirurg* 2007;110(8):675-683. doi: 10.1007/s00113-007-1271-1.
 18. TSCHERNE H, LOBENHOFFER P. Tibial Plateau Fractures: Management and Expected Results. *Clinical orthopaedics and related research* 1993 ;292(1):87-100. doi:10.1097/00003086-199307000-00011.

Authors Contribution

NKM: Conceptualization of study

MFZ: Literature Search

NKM: Statistical Analysis

AJ, NKM, HM, HAK: Data Collection and Analysis

AJ, UKK: Writing of Manuscript

MFZ: Drafting, Revision

All authors are equally accountable for accuracy, integrity of all aspects of the research work.