

Outcome Analysis of dual plating in bicondylar fracture of Tibia.

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Abstract

Background: The operative treatment of bicondylar fractures of tibial plateau remains a challenging job. Treatment goals include, restoration of articular congruity and alignment in the lower extremity and preservation of soft tissues and achieving functional range of knee motion. With multitude of surgical procedures available, there still remains ambiguity regarding the ideal approach for tibial plateau fractures. The aim of this study is to evaluate the functional outcome of dual plating via two incisions for bicondylar tibial plateau fractures.

Methods: A prospective analytical cohort study was undertaken in the Department of Orthopaedics in Hamidia Hospital, Bhopal. Twenty eight patients who presented with Schatzker type V or VI tibial plateau fractures during the period of July 2014 to July 2016, were treated with dual plating via lateral plate through an anterolateral approach and a medial plate through an posteromedial approach. Rasmussen Functional criteria was used to evaluate functional outcome.

Results: Twenty-eight patients with tibial plateau fractures of Schatzker type V and VI treated by dual plating were analysed. The Mean range of motion at 14 weeks follow up was 110°. The mean time to union was 14.6 weeks. As per Rasmussen's knee criteria, 57 % of patients had excellent results and 43% of patients had good results. The mean score was 26.54 (Range 21 - 29). Mean Functional Score was higher in patients with fractured fibula as compared to patients with intact fibula in patients with bicondylar tibial plateau fractures.

Conclusion: Treatment of Bicondylar Tibial Plateau Fractures (Schatzker type V & VI) with dual plating gives excellent functional outcome with a very low complication rate.

Keywords: Bicondylar Tibia, Dual plate, Schatzker, Tibial plateau.

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Introduction

The tibial plateau is amongst the most important weight bearing region of human body. Intra-articular fractures of the proximal end of tibia are serious complex injuries and difficult to treat. Proximal tibial fractures

account for 1.2% of all fractures in adults [1]. Such injuries generally result due to high energy trauma, majority due to road traffic accidents and the rest are sports related or fall from height. As per the Schatzker classification Bicondylar Fracture fall under type V and VI [2]. Surgical fixation of

bicondylar tibial plateau fracture is complicated because of metaphyseal and articular comminution and the frequent occurrence of associated soft tissue injuries. Treatment goals include, restoration of articular congruity and alignment in the lower extremity and preservation of soft tissues and achieving functional range of knee motion. To achieve these goals open reduction and internal fixation is mandatory. For open reduction and internal fixation of bicondylar tibial plateau fractures, several methods can be used like unilateral fixation with single plate, dual plating or bicolumnar plating, hybrid external fixator or a less invasive stabilisation system(LISS). Dual plating via two incision technique has received recent support because it allows for direct visualization of the articular reduction while minimizing the need for stripping off the soft tissue in the fracture area. With multitude of surgical procedures available, there still remains ambiguity regarding the ideal approach for bicondylar tibial plateau fractures. The aim of this study is to evaluate the functional outcome of dual plating via two incisions for bicondylar tibial plateau fractures.

Material and methods

A prospective analytical cohort study was undertaken in the Department of Orthopaedics, Hamidia Hospital, Bhopal. Twenty-eight patients aged between 18-65 years who presented with Schatzker type V or VI tibial plateau fractures during the period July 2014 to July 2016 were enrolled in the study. All patients were treated with dual plating - lateral plate through an anterolateral approach and a medial plate through an posteromedial approach. Patient with compound fracture, pathological fracture and with polytrauma were excluded from the study. Patients were given initial Splintagein the form of above knee slabor calcaneal skeletal traction along with limb elevation for soft tissue swelling to subside.

After taking patient's consent, patient was posted for elective surgery under spinal anaesthesia. Institutional Antibiotic protocol was followed, all patients were operated under tourniquet. The medial column was fixed first through posteromedial approach followed by lateral column by anterolateral approach.

Non-weight bearing mobilisation and quadriceps exercises were started on first post-operative day. Partial weight bearing was started after 6 weeks till fracture union. Thereafter, full weight bearing was started.

Patients were followed up at regular interval with clinical and radiological assessment. The functional outcome parameters were measured by same observer to minimize inter-observer bias. The parameters measured were according to the scale given by Rasmussen. Patients were graded as excellent, good, fair and poor as per their functional outcomes. Any complication noted was managed accordingly. Data entry and appropriate statistical analysis was done.

Results

Twenty-eight patients with tibial plateau fractures of Schatzker type V and VI treated by dual plating were analysed. Majority of study subjects were male (24 out of 28). 16 patients had Schatzker type V and 12 patients had Schatzker type VI tibial plateau fracture. Most common mode of injury was road traffic accident (24 out of 28) followed by fall (4 out of 28). Mean age of study subjects was 39 years. Both the sides were almost equally affected left side accounting to 57% and right side 43%. 6 patients (22%) had ipsilateral fibula fracture. Mean range of motion at 14 weeks follow up was 110°. The mean time to union was 14.6 weeks. Mean time to union in patients with schatzker type V fracture was 13.8 weeks and in Schatzker type VI fracture was 14.8 weeks. Patients with fractured fibula had shorter time to

union as compared to patients with intact fibula. This difference in time to union was statistically significant. ($p < .05$) Most common complication seen was stiffness at knee joint in 7% of patients followed by superficial infection and hardware prominence seen in 3.5% of patients.

All the patients had an acceptable knee function according to the Rasmussen's knee criteria. 57 % of patients had excellent results and 43% of patients had good results. The score ranged from 21-29 and the mean score was 26.54.

Mean Functional Score was higher in patients with Fractured fibula as compared to patients with Intact fibula in patients with bicondylar tibial plateau fractures. This difference in mean functional score was statistically significant. ($p < .05$)

Discussion

High-energy tibial plateau fractures remain a challenge to the orthopaedic surgeon. The use of open reduction and internal fixation techniques has historically been associated with wound complications, especially when a single midline incision is employed. This has led to the emergence of alternate methods of fixation such as Ilizarov ring fixation, external fixation with limited internal fixation, hybrid external fixation, etc., achieving good reduction and stable fixation sparing knee joint is a challenging task in external fixation [3]. Reaching the posteromedial fragment through a single incision causes wide periosteal stripping and extensive muscle dissection and may hamper reduction as well. Dual incisions have proved better than single incision in preserving soft tissue and visualization of articular reduction [4]. 28 patients with tibial plateau fractures were treated operatively in our study by dual plating via anterolateral and posteromedial approach with an aim to preserve the biology of fractures and to provide better axial and angular stability,

maintaining the articular congruity. The most common associated injury in our series was ipsilateral fibula fracture. None of the patients had common peroneal nerve palsy in our study. Using Rasmussen's functional criteria, 58% of the patients had excellent, 42% had good and none had poor or fair outcome. All had satisfactory results. The mean Rasmussen score was 26.57 at 16 weeks follow up. Partenheimer A, et al had an average score of 26.7 [5]. Chang wug oh et al reported similar good results with dual plating in 23 patients with unstable proximal tibia fractures [6]. Schatzker et al obtained 78% and 58% acceptable results in those operatively and non-operatively respectively [2]. Thus similar to other studies on dual plating our study also reported better Functional outcomes with bicolumnar plating. Union was achieved in all cases. The average time of union was 14.6 weeks. All the patients had union within 18 weeks. George C. et al found the average union time in their study to be 14.3 weeks [7]. Cole, Peter A et al in their study of tibial plateau fixation using locking compression plate reported the average time of union to be 12.6 weeks with range of 6 to 21 weeks [8]. Time to union in our study was comparable to most other studies done on different modalities of surgical treatment. In our study, Patients with associated fibular fracture had shorter time to union and better functional score as compared to patients who had intact fibula. Sarmiento et al found that fractures of both the condyle did not collapse further or angulate, when the proximal fibula was fractured and displaced. However medial condyle usually collapses creating varus deformity when the fibula is intact [9]. Soft tissue complications are a major concern in the treatment of bicondylar tibial plateau fractures with dual plates and have been reported to be as high as 23% to 100% with dual plates through a single incision [10,11]. With advances in surgical

technique, the deep infection rate has been reported to have reduced to 4.7% with dual plates through 2 incisions[12]. To minimize soft tissue stripping, small wire external fixators were explored for the treatment of tibial plateau fractures. Deep infection and osteomyelitis remain a significant problem, with rates between 7% and 13% [13]. In our study, no patient had deep infection. There was 1 patient with superficial wound infection (3.5%) which responded to antibiotic treatment. Partenheimer A et al had 5.6% rate of superficial infections and 1.5% deep infections [5]. The infection rate in the current study was lower than previous reports. Gentle handling of the soft tissues with a non-traumatic technique allowed the compromised soft tissue to heal and helped reduce soft tissue complications and infection rate. 1 of our patients (3.5%) had hardware prominence where the plates or screws were prominent on medial side. Phisitkul P. et al also found hardware prominence with rates corresponding to our study [14]. The mean range of motion in our study was from 0-109° at 16 weeks follow up. 2 (7%) patients developed knee stiffness similar results were reported by Yercan et

al[15]. Cole Peter A et al reported the mean range of motion to be 1-122 degrees [8]. Schatzker et al reported >90 degrees flexion at knee in 86% of the patients immobilized for <4 weeks in those treated operatively and in 57% of the cases who were immobilized for more than 4 weeks [2]. Paul F Lachiewicz et al reported 128° mean range of Motion at knee in a study of 43 tibial plateau fractures treated by open reduction and internal fixation [16]. We conclude that open reduction and Internal fixation of high energy tibial plateau fractures with dual plates gives excellent to good functional outcome with minimal soft tissue complications.

Conclusion

We conclude that treatment of Tibial Plateau Fractures (Schatzker type V & VI) with dual plating gives excellent functional outcome with a very low complication rate. Functional outcome was better in patients with associated fibula fracture. Further randomised comparative trials with large sample size are recommended to prove superiority of dual plating over other methods.

References

1. Court Brown CM, Caeser B. Epidemiology of adult fractures: a review. *Injury* 2006;37:691-7.
2. Schatzker JO, MCBROOM R, BRUCE D. The Tibial Plateau Fracture: The Toronto Experience 1968-1975. *Clinical orthopaedics and related research*. 1979 Jan 1;138:94-104.
3. Segal D, Mallik AR, Wetzler MJ, Franchi AV, Whitelaw GP. Early weight bearing of lateral tibial plateau fractures. *Clinical orthopaedics and related research*. 1993 Sep 1;294:232-7.
4. Barei DP, Nork SE, Mills WJ, Coles CP, Henley MB, Benirschke SK. Functional outcomes of severe bicondylar tibial plateau fractures treated with dual incisions and medial and lateral plates. *J Bone Joint Surg Am*. 2006 Aug 1;88(8):1713-21.
5. Partenheimer A, Gösling T, Müller M, Schirmer C, Kääh M, Matschke S, Ryf C, Renner N, Wiebking U, Krettek C. [Management of bicondylar fractures of the tibial plateau with unilateral fixed-angle plate fixation]. *Der Unfallchirurg*. 2007 Aug;110(8):675-83
6. Oh CW, Oh JK, Kyung HS, Jeon IH, Park BC, Min WK, Kim PT. Double plating of unstable proximal tibial fractures using minimally invasive percutaneous osteosynthesis technique. *Acta orthopaedica*. 2006 Jan 1;77(3):524-30
7. Babis GC, Evangelopoulos DS, Kontovazenitis P, Nikolopoulos K, Soucacos PN. High energy tibial plateau fractures treated with hybrid external fixation. *Journal of Orthopaedic Surgery and Research*. 2011;6:35. doi:10.1186/1749-799X-6-35
8. Cole PA, Zlowodzki M, Kregor PJ. Treatment of proximal tibia fractures using the less invasive stabilization system: surgical experience and

- early clinical results in 77 fractures. *Journal of orthopaedic trauma*. 2004 Sep 1;18(8):528-35.
9. Sarmiento, A.: Functional Bracing of Tibial fractures. *ClinOrthopRelat Res*. 105;202,1974
 10. Moore TM, Patzakis MJ, Harvey JP. Tibial plateau fractures: definition, demographics, treatment rationale, and long-term results of closed traction management or operative reduction. *J Orthop Trauma*. 1987; 1(2):97–119. doi:10.1097/00005131-198702010-00001
 11. Young MJ, Barrack RL, Complications of internal fixation of tibial plateau fractures. *Orthop Rev*. 1994 Feb;23 (2):149-54.
 12. Jiang R, Luo CF, Wang MC, Yang TY, Zeng BF. A comparative study of Less Invasive Stabilization System (LISS) fixation and two-incision double plating for the treatment of bicondylar tibial plateau fractures. *The Knee*. 2008 Mar 31;15(2):139-43.
 13. Ali AM, El-Shafie M, Willett KM. Failure of fixation of tibial plateau fractures. *Journal of orthopaedic trauma*. 2002 May 1;16(5):323-9.
 14. Phisitkul P, Mckinley TO, Nepola JV, Marsh JL. Complications of locking plate fixation in complex proximal tibia injuries. *Journal of orthopaedic trauma*. 2007 Feb 1;21(2):83-91.
 15. Yercan HS, Sugun TS, Bussiere C, Selmi TA, Davies A, Neyret P. Stiffness after total knee arthroplasty: prevalence, management and outcomes. *The knee*. 2006 Mar 31;13(2):111-7.
 16. Lachiewicz. P.F., Funcik T.: Factors influencing the results of open reduction and internal fixation of Tibial platean fractures *ClinOrthop*. October 1990; 259:210-15.