International Journal of Research in Orthopaedics
Reddy SR et al. Int J Res Orthop. 2019 Sep;5(5):894-898
http://www.ijoro.org

Original Research Article

DOI: http://dx.doi.org/10.18203/issn.2455-4510.IntJResOrthop20193831

Outcome of tibial plateau fractures treated by hybrid and Ilizarov external fixation

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Received: 25 May 2019
Revised: 18 June 2019
Accepted: 19 June 2019

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ABSTRACT

Background: Tibial plateau fractures pose a challenge to the treating surgeon especially in cases with compromised soft tissue envelope. External fixation achieves good results with minimal complications. The objective of our study was to evaluate the functional outcome of tibial plateau fractures treated by Ilizarov and hybrid external fixation.
Methods: 46 patients with tibial plateau fractures were analysed. 6 were lost to follow-up. 20 patients were treated by Ilizarov method and 20 by hybrid external fixation.
Results: Mean time for union was 24.5 weeks in Ilizarov fixator group and 28 weeks in hybrid fixator group. Mean Lysholm's score was 86.1 in Ilizarov cases and 83.4 in hybrid fixator cases. The mean knee society score in Ilizarov fixation cases was 78.5 and 77.3 in hybrid fixator cases. At one year by Lysholm score 6 patients had fair, 10 had good and 4 had excellent result in Ilizarov group and 1 had poor, 8 had fair, 8 had good and 3 had excellent results in hybrid group. 15 patients in Ilizarov method had good and excellent knee society scores and 12 patients had good and excellent results and 1 patient had poor score in Hybrid fixator group.
Conclusions: External fixation in complicated tibial plateau fractures gives acceptable outcomes. Ilizarov external fixator has an advantage of earlier mobilization and earlier union but requires longer operation time and a bulky apparatus. Hybrid fixator on the other hand has lesser operating time and simpler construct but has less stability and longer union time.

Keywords: Tibial plateau fracture, Ilizarov fixation, Hybrid fixation

INTRODUCTION

Tibial plateau fractures constitute one of the important fractures due to involvement of weight bearing joint. High impact injuries with associated soft tissue damage further complicates the management. The main goal of treatment of these fractures is to restore the articular surface, joint stability, maintain the normal function of the knee joint, prevent lower limb malalignment, deformity, and to prevent knee osteoarthritis.[1-3]

The standard approach to these injuries was open reduction of the fragments and internal fixation with plates and screws.[4,5] The advantage of anatomic reduction and stable fixation is attainment of early joint motion but surgical trauma on compromised soft tissues leads to wound infection which further leads to increased re-operation rates and poorer outcomes.[6-9] Closed reduction or minimal open reduction and application of external fixators helps in addressing these issues.

The aim of our study was to evaluate and compare the outcomes of tibial plateau fractures treated by Ilizarov external fixation and Hybrid external fixation.

METHODS

Study included 46 patients with tibial plateau fractures. 6 patients were lost to follow up. 20 were treated by Ilizarov fixation and 20 with hybrid external fixation. All the cases were operated in MS Ramaiah Teaching Hospital, Bengaluru, between July 2011 to June 2017 by single surgeon.

Inclusion criteria

Patients with age between 21 to 70 years, both the sexes were included. Cases with closed tibia plateau fractures with skin abrasions, open tibial plateau fractures and tibial plateau fractures of type 2 to type 6.

Exclusion criteria

Exclusion criteria were the patients with associated ipsilateral limb fractures, pathological fractures of tibia, patients lost to follow up, who associated organ injuries and those who needed longer immobilization after surgery due to other injuries.

All the patients were evaluated for other injuries, haemodynamically stabilized. 3D CT scans were done to know the extent of articular injury. The time period between the trauma and the surgery varied from 8 h to 10 days with an average of 7 day. Bone grafting and minimal internal fixation with cc screws was done in severely comminuted fractures. Patients were followed up at 6 week, 3 months, 6 months and at 1 year. The functional results were measured by Lysholm's knee score and Knee Society functional Score.[10,11]

RESULTS

The observations and the results of the study are shown in Table 1 and Figures 1-7 as follows. Our study included 40 cases of tibial plateau of various types as 6 patients were lost to follow-up. 20 patients were treated by Ilizarov fixation and 20 by hybrid external fixator. Union was achieved in all the patients. Figure 1 shows that of the 40 patients, 34 were male and 6 were female. Figure 2 shows that maximum patients were between 31 to 40 years. Right sided injuries were seen in 24 patients (Figure 3). Extensive soft tissue injuries were seen in 14 patients (Figure 4). Mean time for radiological union in patients treated by Ilizarov fixator was 24.5 weeks (range 15 to 32 weeks) and in patients treated by hybrid fixator was 28 weeks. Mean fixator period was 26 weeks (16-34 week) in Ilizarov and 30 week in hybrid fixator. Both the fixators were removed after 2 weeks of union (Figure 7). The functional results were measured by Lysholm's knee score and knee society score. The mean Lysholm's score at the end of one year was 86.1 in Ilizarov fixation cases and 83.4 in hybrid fixation cases. The mean knee society score in Ilizarov fixation cases was 78.5 and in hybrid fixator cases it was 77.3. Figure 5 shows that at end of one year by Lysholm score 6 patients had fair, 10 had good and 4 had excellent result in Ilizarov group and 1 had poor, 8 had fair, 8 had good and 3 had excellent results in hybrid fixator group. Figure 6 shows that 15 patients in Ilizarov method had good and excellent knee society scores and 12 patients had good and excellent results and 1 patient had poor score in hybrid fixator group.

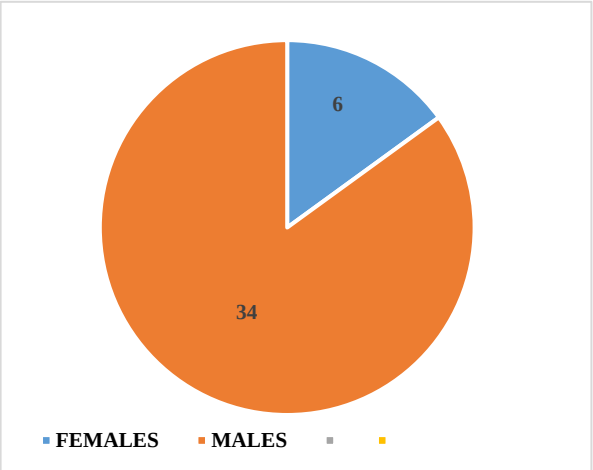

Figure 1: Gender distribution.

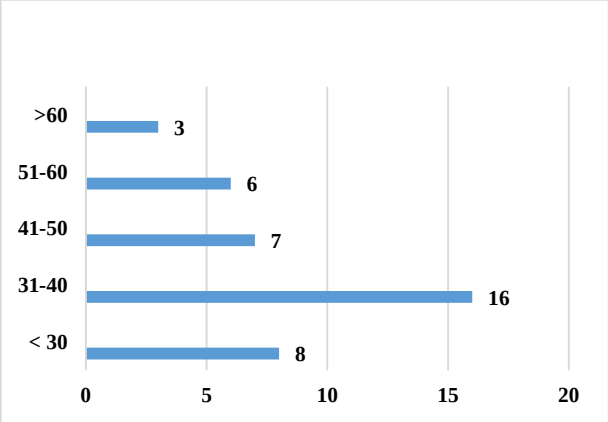

Figure 2: Age distribution.

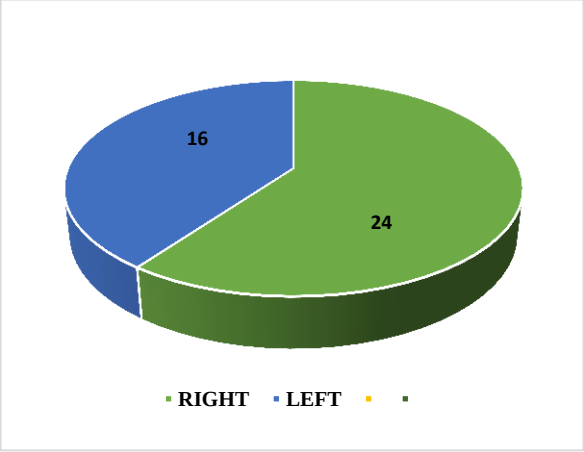

Figure 3: Side incidence.

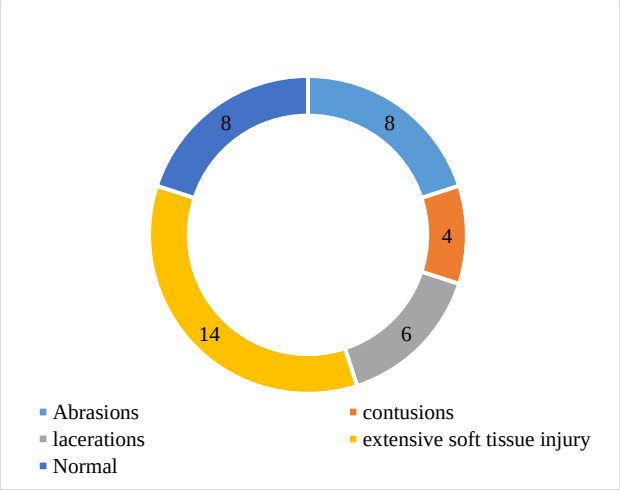

Figure 4: Associated soft tissue injuries.

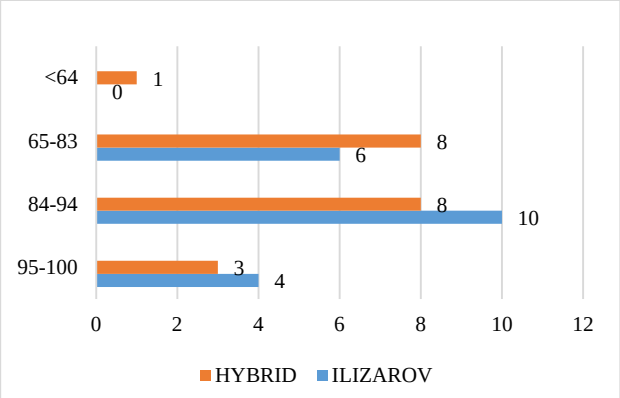

Figure 5: Lysholm score in both the group patients.

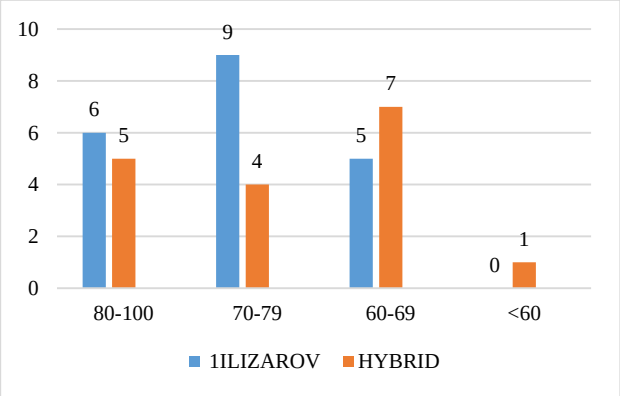

Figure 6: Follow up knee society functional scores in both groups.

Pin site infection was the most common complication. Twenty patients had pin site infection, 12 in hybrid fixator patients and 8 patients treated by Ilizarov fixator. Only in two cases it required change of pins. The other complications were varus malunion seen in 3 patients treated by hybrid fixator. Knee stiffness in 4 patients treated by Ilizarov fixator (Table 1).

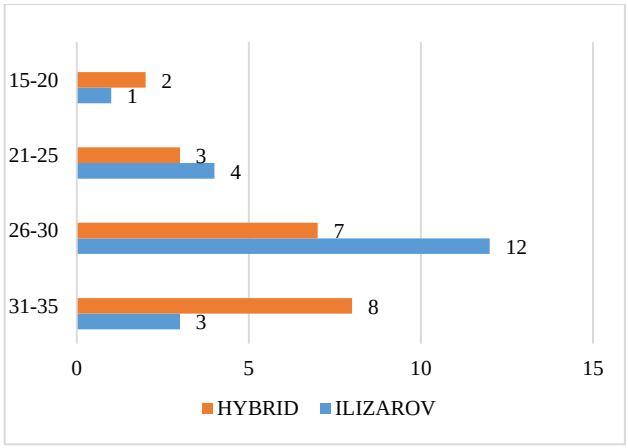

Figure 7: Time for union in weeks in both groups.

Table 1: Complications observed in both groups.

	Ilizarov fixator	Hybrid external fixator
Pin tract infection	8	12
Varus malunion	None	3
Knee stiffness	4	None

DISCUSSION

Tibial plateau fractures both high velocity injury and low velocity injuries due to osteoporosis pose a challenge to the treating surgeon. Over years various treatment options have evolved to manage these complex periarticular fractures.

Various surgical techniques and approaches have been described, all with their own advantages and disadvantages. Likewise, numerous fixation options and devices are available, with their own indications, contraindications, and potential problems.[12,13]

Though open reduction and internal fixation achieves precise anatomic reduction, complications of wound infection are common in a patient with compromised soft tissue envelope.

The role of external fixators, either Ilizarov or hybrid fixators, has been evaluated in various studies and they reveal good results.[14-16] In fractures with severe comminution use of bone graft and percutaneous screw fixation combined with external fixator gives encouraging results.

Study of hybrid fixation of tibial plateau fractures by David et al in 1994 with 22 patients showed excellent results in 13 patients, good in 3, fair in 1 and poor in 6.[17] Studies by Mehmet et al in 2007 with 15 patients showed excellent results in 4, good in 5, fair in 3 and poor results in 3 patients.[18] Babis et al in 2011 used hybrid fixators for tibial plateau fractures in 33 patients and achieved excellent and good results in 78.8% of patients.[19] Mankar

et al operated on 78 patients and achieved excellent results in 47 patients, 25 in good, fair in 2 and poor result in 1 patient.[20] Aseri et al operated on 32 patients and had excellent results in 16, good in 13 and fair in 3 patients.[21] Jahan et al in 2017 had excellent results in 15 patients and fair in 4 patients.[22] In our study, 20 patients were operated with Hybrid external fixation. Out of 20, 3 had excellent results, 8 had good, 8 had fair and 1 patient had poor results.

Study of Ilizarov external fixation of tibial plateau fractures by Magby et al in 2005 showed excellent results in 18, good in 7, fair in 1 and poor in 2 patients.[23] Study by Ferreira et al in 2011 with 11 patients showed excellent results in 6 patients, good in 2 and fair results in 3 patients.[24] Elgafary et al in 2013 operated on 30 patients with Ilizarov external fixation and achieved 76% excellent and good results.[25] Ramos et al had 27 patients with excellent results out of 30 operated cases.[26] Bari et al in 2014 operated on 40 patients with Ilizarov external fixator and had 28 patients with excellent, 9 patients with good, 2 with fair and 1 patient with poor results.[27] Aziz et al in 2016 operated on 20 patients, 18 had excellent and good results, poor in 2 patients.[28] In our study, 20 patients were operated with Ilizarov external fixation. Out of 20, 4 patients had excellent results, 10 had good and 6 patients had fair results.

CONCLUSION

When compared to hybrid external fixator, Ilizarov fixator has an advantage of early weight bearing, good fracture stability and earlier union rates. Though hybrid fixator offers an advantage of less hardware, lesser operating time and better patient compliance, delayed weight bearing and delayed union are a disadvantage. Hybrid fixator offers an advantage of good knee range of movements due to unhampered knee movements with proximal half ring.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the institutional ethics committee

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Cite this article as: Reddy SR, Shah HM, Godhasiri P. Outcome of tibial plateau fractures treated by hybrid and Ilizarov external fixation. Int J Res Orthop 2019;5:894-8.