ORIGINAL ARTICLE

Illizarov Hybrid External Fixation for Schatzker V and VI Tibial Plateau Fractures

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ABSTRACT

Aim: To determine the efficacy of Illizarov hybrid external fixation for Schatzker V and VI tibial plateau fractures secondary to high energy trauma.

Methods: A descriptive case series was carried out. Ninety patients with high energy Schatzker V and VI tibial plateau fractures (fracture that relay on the existence of huge degree of articular dispersion, displace multiple condylar fracture line and metaphyseal comminution determined by CT scan of the affected knee joint) were treated using hybrid IIlizarov external fixator and followed for outcome at 12 weeks. It was measured in terms of radiological union, pin tract infection and functional outcome using knee society score and rated as excellent (>90/100), good (74 to 89) and fair (60 to 73) and poor (<60).

Results: Eight patients (8.9%) developed pin tract infection. 82 patients (91.1%) had attained radiological union. By functional outcome 22 patients (24.4%) showed excellent results, 56(62.2%) were good, 4 (4.4%) were fair and rest of 8 (8.9%) had poor outcome.

Conclusion: Radiological union is excellent as 91.1% achieved radiological union, pin tract infection rate and functional outcome is also acceptable in patients with Schatzker V and VI tibial plateau fractures being treated with hybrid Ilizarov external fixator.

Keywords: Tibial plateau fractures, High energy Schatzker V and VI, Hybrid Ilizarov external fixator,

INTRODUCTION

Subcutaneous bone, tibia is more exposed to the complex fractures[1,2,3,4]. Intra-articular fracture of proximal end of tibia is a common outcome of high energy trauma as so called plateau fractures. Treatment of these complex and serious injuries are very difficult[5]. Schatzker (S) proposed this widely used classification system do deal with these complex fractures. Involvement of articular depression, condylar displacement, dissociation of comminuted metaphysis and closed degloving made plateau fractures (high-energy Schatzker V and VI tibial) are difficult to treat[3]. However that may result in non-union. Range of tibial non-union for all tibia fracture is 2-10%[6].

The Ilizarov circular ring fixator, a "minimal invasive technique", in the treatment of S-V and S-VI, an external-fixator, may provide some reasonably better results for reduction, without compromising the soft tissue elements. It can provide a valuable opportunity for high-energy fractures with gross intra-articular comminution[7,8,9,10]. In a case series of 30 fractures, all fractures healed. Knee society score was used to measure the functional outcome. It showed excellent in results in 16.7% patients, good in 60%, fair in 20%, and poor in 3.3%[3].

In a Malaysian study with sample of 31 patients, the average time for union of fracture was 14 weeks as recorded however eight of the patients (24%) showed superficial pin track infection around the proximal ring[11]. In 3.4 months (range 3 to 7 months) of study period, a radiographic proof of union was noted in another study of Schatzker V and VI fractures. One non union was observed only after treatment with hybrid Ilizarov external fixator[5].

The purpose of the current study was to determine the efficacy of Ilizarov fused external fixation for tibial plateau fractures of Schatzker V and VI, secondary to high energy trauma as it is less invasive procedure.

PATIENTS AND METHODS

This descriptive case series comprised 90 patients and carried out at Department of Orthopaedics of three different hospitals from 2013 to April 2016. Patients age 18 years to 50 years, high energy Schatzker V and VI tibial plateau fractures and both open and closed fractures were included. Patients having previous surgery or intervention for tibial fracture determined by history and advanced

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osteoporosis as diagnosed by X ray knee were excluded. For the treatment of these complex injuries an internal percutaneous fixator with half pin external fixator and an anterior T frame was used. The configuration of AP-directed Schanz pins with the proximal half pin into the lateral and medial condylar fragments along with oblique pin placed from antero-inferior to postero-superior in the proximal tibial metaphysis that helps us to achieve a triangulation effect for periarticular metaphyseal segments to stabilize them in three planes. With minimal additional devitalisation of the bone, its periosteal and osteal blood supply, the articular wires are arranged percutaneously. These patients were followed for 12 weeks for outcome. Data collected was entered and analyzed in the SPSS version 17.

RESULTS

The patients age between 18-48 years with mean age of 32.08±7.144. There were 61 (67.8%) were males and 29 (32.2%) were females. Twenty four patients (26.7%) have Schatzker V fractures and 66 (73.3%) have Schatzker VI fractures. Fifty three patients (58.9%) had open fracture while 37 (41.1%) had close fracture. Eight patients (8.9%) developed pin tract infection. Eighty two patients (91.1%) had attained radiological union. According to functional outcome, 22 patients (24.4%) showed excellent results, 56 (62.2%) were good, 4 (4.4%) were fair and rest of 8 (8.9%) had poor outcome (Table 1). When pin tract infection compared with fracture class, 8 patients with pin tract infection, 2 were in Schatzker V and 6 in class VI. Statistically the difference was non-significant [p=1.00] (Table 2). When pin tract infection compared with type of fracture, it showed up statistically non-significant results (p=0.71). Among 8 patients with pin tract infection, 4 were with open fracture and 4 were with close fracture (Table 3). Among 82 patients with radiological union, 24 were in Schatzker V and58 in class VI. Statistically the difference was non-significant [p=0.103] (Table 4). When compared the radiological union with type of fracture, results were non-significant [p=0.712] (Table 5). When compared the functional outcome and fracture showed statistically significant [p=0.007] (Table 6) and functional outcome with type of fracture it showed non-significant results [p=0.816] (Table 7).

Table 2: Comparison of pin tract infection with fracture

Pin Tract Infection	Fracture Class		Total
	Schatzker V	Schatzker VI	
Yes	2	6	8
No	22	60	82
Using Fisher's Exact Test = 1.000 (Non-significant)			

Table 3: Comparison of pin tract infection with type of fracture

Pin Tract Infection	Type of Fracture		Total
	Open	Close	
Yes	4	4	8
No	49	33	82
Using Fisher's Exact Test = 0.71 (Non-significant)			

Table 1: Demographic information of the patients

Variable	No.	%
Age (years)		
<30	30	33.3
≥30	60	66.7
Gender		
Male	61	67.8
Female	29	32.2
Fracture		
Schatzker V	24	26.7
Schatzker V	66	73.3
Type of Fracture		
Open	53	58.9
Close	37	41.1
Pin Tract Infection		
Yes	8	8.9
No	82	91.1
Radiological Union		
Yes	82	91.1
No	8	8.9
Functional Outcome		
Excellent	22	24.4
Good	56	62.2
Fair	4	4.4
Poor	8	8.9

Table 4: Comparison of radiological union with fracture

Radiological Union	Fracture		Total
	Open	Close	
Yes	24	58	82
No	-	8	8
Using Fisher's Exact Test = 0.103 (Non-significant)			

Table 5: Comparison of radiological union with type of fracture

Radiological Union	Type of Fracture		Total
	Open	Close	
Yes	49	33	82
No	4	4	8
Using Fisher's Exact Test = 0.712 (Non-significant)			

Table 6: Comparison of functional outcome and fracture

Functional outcome	Fracture		Total
	Schatzker V	Schatzker VI	
Excellent	2	20	22
Good	22	34	56
Fair	-	4	4
Poor	-	8	8
Using Fisher's Exact Test = 0.007 (Significant)			

Table 7: Comparison of functional outcome and type of fracture

Functional outcome	Type of Fracture		Total
	Open	Close	
Excellent	12	10	22
Good	34	22	56
Fair	3	1	4
Poor	4	4	8
Using Fisher's Exact Test = 0.816 (Non-significant)			

DISCUSSION

Schatzker V and VI tibial plateau fractures are treated with different procedures while hybrid Ilizarov external fixator is less invasive one. Range of tibial non-union for all tibia fracture is 2-10%[1]. The Ilizarov circular ring fixator, a "minimal invasive technique", in the treatment of S-V and S-VI, an external-fixator, may provide some reasonably better results for reduction, without compromising the soft tissue elements. It can provide a valuable opportunity for high-energy fractures with gross intra-articular comminution[4,13].

In the present study, 90 patients were included 82 patients (91.1%) had attained radiological union. These results are comparable with previous studies. In a case series, it took and average time of 15 (range 9–20) weeks for all 30 fractures to unite. Operation was performed immediately for all of those patients having open fractures (n=10) with Ilizarov frame fixation after debridement, wounds irrigation and intravenous antibiotics. After accident treatment of 12 closed fractures was performed in the first day, whereas there were 8 fractures that treated with an average delay of 5 days (range 3–9 days) in order to allow soft tissue edema to subside[3,14].

In a Malaysian study with sample of 31 patients, the average time for union of fracture was 14 weeks as recorded however eight of the patients (24%) showed superficial pin track infection around the proximal ring[2].

But in another study of Schatzker V and VI fractures, In 3.4 months (range 3 to 7 months) of study period, a radiographic proof of union was noted. One non-union (septic) was observed (3.0%), requiring revision surgery[5,15].

In the present study, 8 patients (8.9%) developed pin tract infection. While in the previous study pin tract infection was detected in 3 patients (9.1%)[3]. This rate is also acceptable.

In the present study, by functional outcome 22 patients (24.4%) showed excellent results, 56(62.2%) were good, 4(4.4%) were fair and rest of 8 (8.9%) had poor outcome.

In a previous study, regarding the functional outcome using knee society score, It showed excellent in results in 16.7% patients, good in 60%, fair in 20%, and poor in 3.3%.[3] It implies that our results are comparable with previous study in this aspect too.

CONCLUSION

Radiological union is excellent as 91.1% achieved radiological union, pin tract infection rate and functional outcome is also acceptable in patients with high energy Schatzker V and VI tibial plateau fractures being treated with hybrid Ilizarov external fixator. Limitation of current study is that we had a smaller sample size.

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