

Complex tibial plateau fractures treated with ilizarov ring fixator

Abstract

We treated 40 tibial plateau fractures¹ in 39 patients with a mean age of 41.2 (20-70) years with Ilizarov ring fixator. All fractures were the result of high energy trauma, and 18 patients had associated injuries.² 38 fractures were available for long term follow up after 28 (16-38) months. Using the Knee Society Clinical Rating System, 28 knees were rated as excellent, 9 as good, 2 as fair and 1 as poor. The most significant concomitant injuries were distal femoral fractures and massive soft tissue injury. This study emphasizes the clinical success and low morbidity associated with the use of Ilizarov fixator.

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Introduction

Complex tibial plateau fractures are the challenging problems in orthopaedic surgery. The Ilizarov technique solves many of the orthopaedic problems encountered in management of such fractures and provides a method for closed reduction and fixation that does not necessitate excessive soft-tissue stripping.³⁻⁶ In this series, we report the outcome of treatment of complex tibial plateau fractures using the Ilizarov technique.

Materials and methods

40 tibial plateau fractures¹ in 38 patients (20 men and 8 women) with mean age of 41.2 (20-70) years were included in this study. There were 30 closed and 8 open fractures. Soft tissue injury for the closed

fractures was classified according to Tschernse and Lobenhoffer^{7,8} and open fractures were classified according to Louis et al.⁹ (Table 1). All fractures were the result of high energy trauma. The frame, consisting of three approximately sized rings connected to each other by threaded rods, was constructed to the already inserted wires with olive wires. The middle ring was position just distal to any shaft fracture component, and the distal ring was placed at a lower level and secured to a transfixion reference wire position parallel to the ankle joint to ensure restoration of the tibial mechanical axis. A femoral frame was applied in seven cases to treat an associated femoral fracture. All patients started exercises on the second postoperative day. Weight bearing was increased as tolerated. Patients with marked articular comminution were advised for non weight bearing for 4 weeks. X-ray, clinical and functional evaluation was done using the method of Rasmussen¹⁰ and the Knee Society clinical rating score.¹¹

Table 1 Grading of soft-tissue injuries for closed and open fractures

	Closed Fractures (Tschernse)				Open Fractures (Gustilo-Anderson)					Total
	0	I	2	3	I	II	IIIA	IIIB	IIIC	
Cases	5	8	12	5	4	3	3	3	2	40

Results

All fractures united, except two with varus malunion. The frame was removed at an average of 15.2 (14-20) weeks. Only 38 patients with 36 fractures were available for follow up. The average follow up was 48 (36-56) months.

Clinical and radiographic outcome

The x-ray reduction of the fractures was rated as excellent in 28 and good in 10 according to Rasmussen's criteria.¹⁰ Knee Society clinical rating system was excellent in 28 cases and 9 as good, 2 as fair

and 1 as poor. The average total range of knee flexion was 114.5° (0-165°), but 5 patients had a total arc of motion less than 65°. 13 patients had no pain while the remaining 28 had mild pain and occasional pain. 8 patients needed walking aids.

Clinical outcome

The most significant was the concomitant distal femoral fractures, but the magnitude of soft-tissue injury also influenced the final outcome. Out of 40 cases, 29 were rated as excellent, 8 as good and 2 as fair. The quality of reduction increases the functional score that was shown in Table 2.

Table 2 Relationship between the quality of reduction and the functional outcome

Functional Outcome	Quality of Reduction				Total
	Anatomical	Good	Fair	Poor	
Excellent	19	10	-	-	29
Good	7	1	-	-	08
Fair	1	1	-	-	2
Poor	-	-	-	-	-
Total	27	12	-	-	39

Complications

No major complications, except the pin tract infection which was mild and controlled by dressing with rectified spirit and antibiotics (Figures 1–6).



Figure 1 Closed right complex tibial plateau fracture with subluxation, CT scan in a 55 year-old male treated with closed reduction, ligamentotaxis and fixation with Ilizarov's apparatus.



Figure 2 Smiling patient with Ilizarov fixator in situ.



Figure 3 Radiograph of right knee just after removal of Ilizarov fixator.



Figure 4 After 1 month follow up. Patient can flex the knee up to 90°.



Figure 5 Radiograph of tibial plateau after 7 months follow up.



Figure 6 Final follow up after 7 months. Patient can squat easily.

Discussion

Management of complex tibial plateau fracture is very difficult for orthopaedic surgeons.^{5,11,12} Restoration of articular congruity is mandatory, careful treatment of soft tissues is as important as the bone.^{7,11} We cannot reduce the fracture fragments with ligamentotaxis alone and a limited open reduction with minimal periosteal stripping is sometimes necessary.^{13,14} Ilizarov ring fixator allows a better choice of treatment in these difficult cases. In our series limited open reduction through a 5-7 cm incision was needed in 8 cases, whereas bone grafting to support the elevated articular surface was needed in 4 cases. Morandi and Pears.^{1,11} Reported elevation and bone grafting in 26% of cases in a series of 50 complex tibial plateau fractures treated with Ilizarov fixator. We did not use any half pins or internal fixation in our series.

The average duration fixation in our series was 15.2 weeks. Using Rasmussen criteria for x-ray assessment, excellent to good reduction was achieved in all our cases.^{15,16} The mean range of movement (ROM) was reported by Morandi and Pearse¹¹ was 113°. The average range of motion in our series was greater than comparable studies, despite presence of 5 cases of knee stiffness. There is little reported information that focuses on the results of treatment of high energy tibial plateau fractures.

In recent study, two variables had a direct correlation with the final range of motion: knee distraction and associated distal femoral fracture. Fair and poor results were present in polytrauma patients, mainly those with concomitant ipsilateral femoral fractures.^{17,18} The magnitude of soft-tissue injury also plays an important role in the functional outcome. In our series open injuries were responsible for 55% of unsatisfactory results.^{19,20}

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None.

Conflicts of interest

The author declares that there is no conflict of interest.

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