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A study of 50 cases of tibial plateau fractures in adults

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Abstract

Introduction: Tibial condylar fractures are specially challenging to the orthopaedic surgeons because of their number, variety, complexity, different concepts of management and injuries associated with it. Earlier, most of tibial plateau fractures were treated conservatively which resulted in joint line incongruity, early osteoarthritis and knee stiffness. Now treatment of these fractures has changed radically over the years, as our ability to achieve near anatomic reduction and fixation has improved, thereby reducing the incidence of early osteoarthrosis.

Aim and objectives: To study the advantages and disadvantages of surgical treatment, comparing treatment modalities and finding management strategies, depending on type and displacement of fractures.

Materials and Methods: This is a study of management of 50 cases of closed tibial plateau fractures in adults, conducted in the department of orthopaedics at GMERS Medical College, Valsad, Gujarat between August 2015 to July 2017. 8 patients were treated by conservative methods and 42 patients were treated by surgical methods by Schatzkers classification.

Result: 64.3% of low velocity injuries treated by surgical methods and 35.7% treated with conservative methods. Among the high velocity injuries 81.25% treated by surgical methods and 18.75% by conservative methods. The results showed that surgical treatment produced better results in both low velocity and high velocity injuries.

Conclusion: Fracture treated by surgical methods give excellent results compare to conservative methods.

Keywords: Tibia condyle fracture, Tibia Plateau fracture, conservative methods, surgical methods, Schatzkers classification

1. Introduction

Condylar fractures are specially challenging to the orthopaedic surgeons because of their number, variety, complexity, different concepts of management and injuries associated with it. As proximal tibia gives attachment to the various elements of knee stabilizers and being an integral part of the knee mechanism, alteration of anatomy caused by injury, results in functional impairment.

In India, more than anything, extreme flexion is very important as far as our living habits are concerned. Tibial plateau fracture whether treated conservatively or operatively is known to cause limitation of knee flexion of varying degrees. Most of tibial plateau fractures were treated conservatively which resulted in joint line incongruity, early osteoarthritis and knee stiffness. Now treatment of these fractures has changed radically over the years, as our ability to achieve near anatomic reduction and fixation has improved, thereby reducing the incidence of early osteoarthrosis. But varying amount of knee stiffness was noticed and surgery was blamed for it. A study is being carried out to know the mode of injury, fracture pattern, outcome of various modalities of treatment, complications encountered and associated injuries. To evaluate the outcome of various treatment modalities in tibial condylar fractures. To study the advantages and disadvantages of surgical treatment, comparing treatment modalities and finding management strategies, depending on type and displacement of fractures.

2. Materials and methods

This is a study of management of 50 cases of closed tibial plateau fractures in adults, conducted in the department of orthopedics at GMERS Medical College, Valsad, Gujarat

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between August 2015 to July 2017. 8 patients were treated by conservative methods and 42 patients were treated by surgical methods by Schatzkers classification. All patients with closed tibial plateau fractures in the age group of 18-60 years seen during the period August 2015 – July 2017 and who gave informed written consent were included in study. Patients with Fracture in children less than 18 years, Geriatric patients above 60 years, Compound fracture and Pathological fractures were excluded from the studies. The patients were first seen in the casualty. The history was taken followed by general and local examinations. Relevant X-rays were taken (AP, Lateral views and stress views if instability suspected). The treatment method was based on the type of fracture, the amount of displacement and the amount of depression of the tibial plateau. Minimally displaced fractures were reduced by traction and followed by an above knee cast with the knee in 10° of flexion. Patients who presented with, extensively comminuted fractures, patients who were not fit for surgery and those patients with extensive skin problems (i.e. closed fractures but with extensive soft tissue trauma e.g. Blisters) were initially treated with skeletal traction followed by cast application or external fixator (figure 6,7). Traction was continued till local condition was favorable for cast / surgical management (figure8). During the period of traction patients

were advised isometric quadriceps exercises and active knee mobilization i.e. traction mobilization. At 6 weeks an X-ray was repeated and if showed signs of union, the cast were removed and the patients were advised non-weight bearing crutch ambulation with active knee movements. At 3 months a repeat X-ray was done and based on clinical and radiological evidence of union partial weight bearing was allowed which was gradually progressed to full weight bearing. Surgical method of treatment was mainly based on the type of fracture and amount of displacement or depression and the degree of instability (detected by stress views). The patients were taken for surgery at the earliest possible time depending on their medical condition, skin condition and the amount of swelling. All surgeries were done under C-arm image intensifier control. Fractures were fixed either close reduction with percutaneous technique (figure 3) or MIPPO Technique or by open reduction and internal fixation (figure 4, 5). Depending on the fracture pattern either single column or dual column plating was done. The fixation devices consisted of simple and locking T & L Buttress plate, locking hockey plate (Figure 1), 4.5 mm cortical screws and 6.5 mm cannulated and non-cannulated cancellous screws (Figure 2).



Fig 1: Buttress plate and instrumentation set

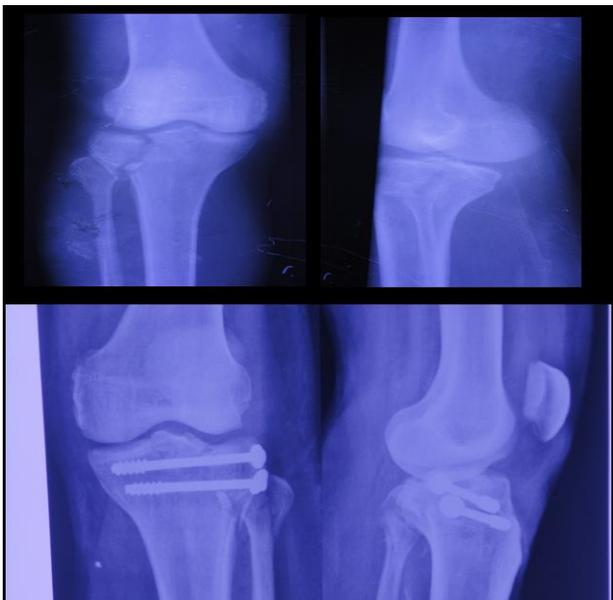


Fig 2: Lateral condyle tibia fracture treated with two 6.5 cc screw



Fig 3: Position for anterolateral approach

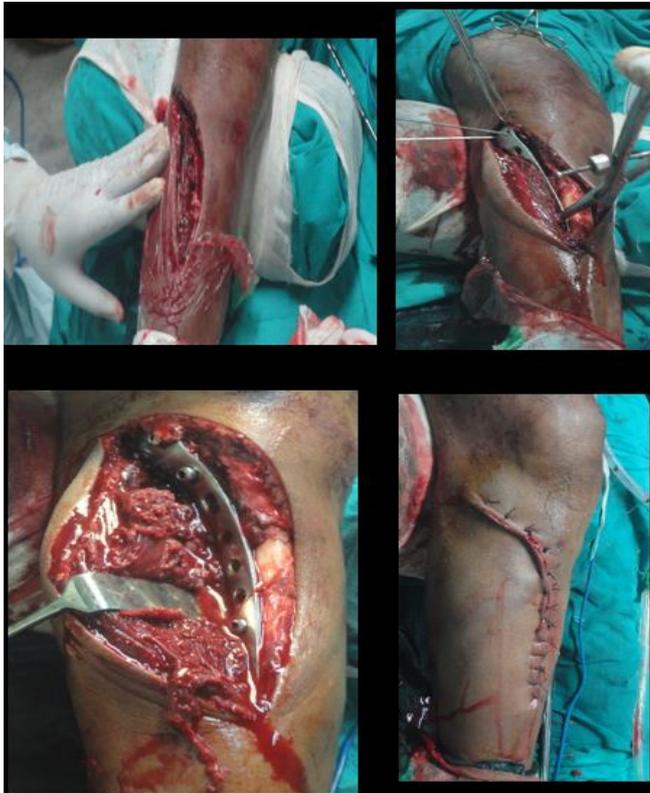


Fig 4: Anterolateral approach to proximal tibia for osteosynthesis



Fig 7: Preop X-ray of patient with extensive soft injury



Fig 8: Immediate post op xray with plate fixation after 3 weeks

Bone grafts were used in depressed and comminuted fractures. Postoperatively patients were immobilized with an above knee posterior slab or a compression bandage. The sutures were removed on the 11th postoperative day. Antibiotics were given till 3rd post-operative day. The patients were advised quadriceps exercises, knee mobilization on continuous passive mobilization machine (CPM) and non-weight bearing crutch walking, on discharge. An immediate postoperative X-ray was also done.

2.1 Follow Up

The first follow up was done at 2 weeks, during which the surgical scar was inspected and range of movements noted. The second follow up done at 6 weeks during which an X-ray was taken to look for signs of fracture union and loss of reduction if any. The third follow up was done at 3 months during which one more X-ray was done and a clinical evaluation of union done. Based on the clinical and radiological signs of union patients were allowed partial weight bearing and gradually progressed to full weight bearing. The patients were then followed up at 6 months, 1 year and 2 years respectively during which time the anatomic and functional evaluation was done using the Rasmussen¹ scoring system.

3. Result

All the fractures in this study is classified according to Schatzker's classification system.

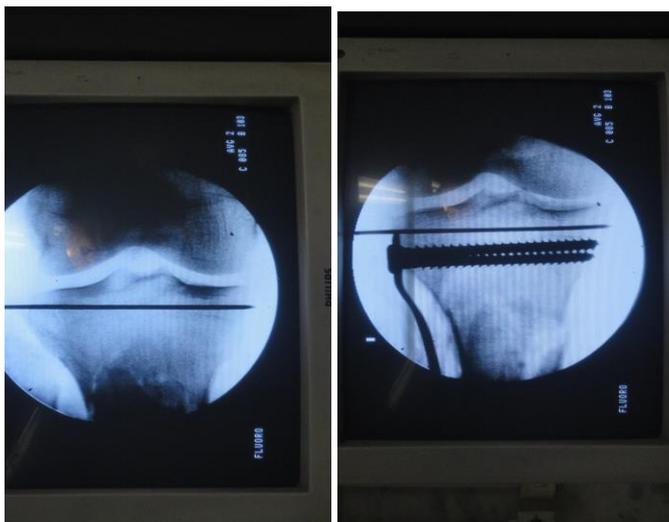


Fig 5: IITV Guidance for plate osteosynthesis

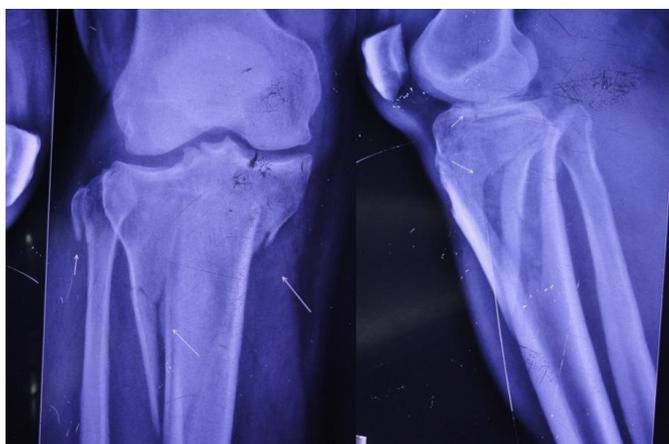


Fig 6: Preop X-ray of patient with extensive soft injury

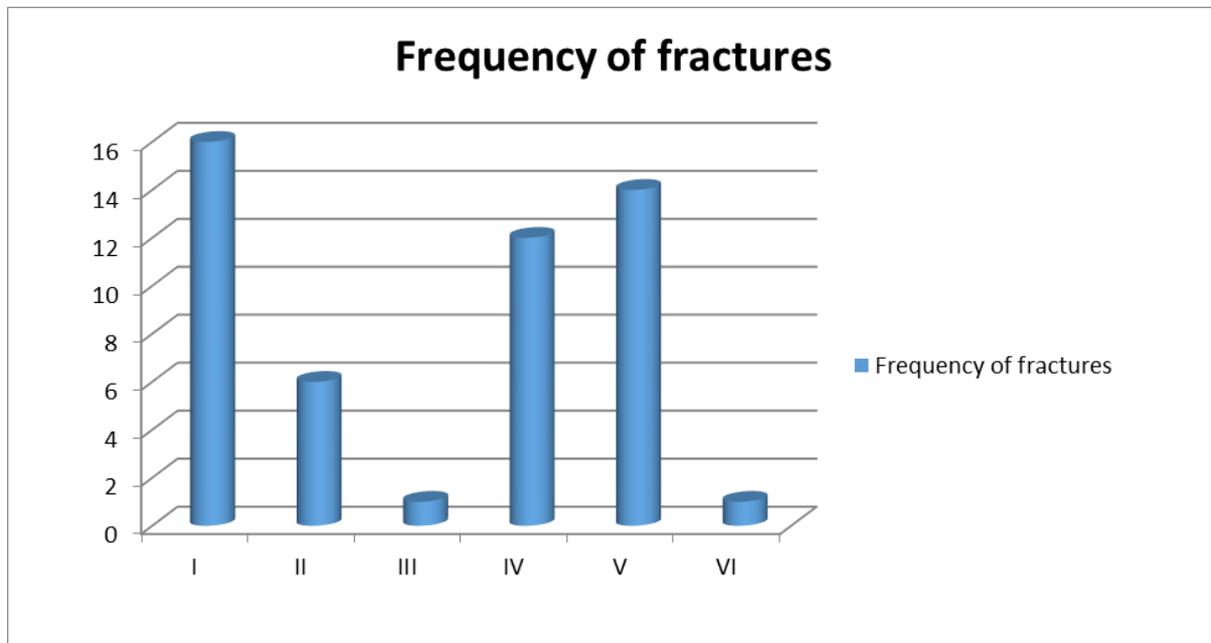


Fig 9: Frequency of fractures

The functional result following conservative treatment was rated excellent in 12.5%, good in 50%, fair in 25% and poor in 12.5%.

4.1 Results of Functional Evaluation Following Surgical Management

The functional result of CRIF with Cannulated cancellous screws was rated excellent in 37.5%, good in 25% , fair in 25% and poor in 12.5%. Excellent results were mainly seen in type I fractures. The functional results following plate osteosynthesis were rated excellent in 57.69%, good in 30.77%, fair in 7.7% and poor in 3.85%. Out of 26 patients treated with plate osteosynthesis, 5 were operated via minimally invasive percutaneous plate osteosynthesis (MIPPO). 3 Patients showed excellent functional outcome while 2 patients showed good outcome, 7 patients had autologous bone grafting done from ipsilateral ASIS. Out of these 7 patients, 6 patients were treated with bicolumnar plating. The results of the conservative management revealed excellent in 12.5%, good in 50%, fair in 25% and poor in 12.5%. The results of the surgical management revealed excellent in 50%, good in 28.57%, fair in 14.28% and poor in

7.14%.

5. Discussion

Despite many advances in the care of intra-articular fractures, tibial condylar fractures continue to be a difficult surgical problem. A survey of the literature indicates that many authors reported more than satisfactory results with either closed or operative methods of treatment. The management of tibial plateau fracture has always been a subject of debate because of their variety and complexity.

The results of the non-operative management of these injuries have historically been unsatisfactory [2-5]. Eight patients treated by conservative methods showed good to excellent results in 62.5% of the patients, 25% fair and 12.5% poor results. O Lasinger⁶ in a twenty year follow up of conservatively treated tibial plateau fractures showed 79.3% excellent results in lateral condyle fractures, 44.44% excellent results in bicondylar fractures and 35.7% excellent results in medial condyle fractures. Average time of union of those fractures management conservatively was 3.875 months (Table 1).

Table 1: Comparison of conservative treatment of both studies

Rasmussen score	Schatzker Type – I, II, III		Schatzker Type - IV		Schatzker Type – V, VI	
	Current study	Lasinger	Current study	Lasinger	Current study	Lasinger
	Excellent	1 20%	23 79.31%	0 0%	5 35.70%	0 0%
Good	2 40%	5 17.24%	2 100%	9 64.30%	0 0%	7 38.88%
Fair	1 20%	1 3.45%	0 0%	0 0%	1 100%	1 5.55%
Poor	1 20%	0 0%	0 0%	0 0%	0 0%	2 11.11%
Total (N)	5	29	2	14	1	18

The results of functional evaluation of the knees treated by CR – IF with cannulated cancellous screws showed 62.5% good to excellent results and 37.5% fair to poor results. R. Sament *et al.* [7] in their study of percutaneous fixation of

closed tibia plateau fractures found 85.7% good to excellent results and 14.3% fair to poor results. Results of OR-IF with plate osteosynthesis in our study shows 78.58% excellent to good results and 21.42% fair to poor results. H Raza *et al.* [8]

in their study of minimally invasive percutaneous plate osteosynthesis found 90% excellent to good results and 10% fair to poor results. Nabil A Ebraheim *et al.* [9] in their study

of open reduction internal fixation of 117 tibial plateau fractures found 80.34% excellent to good results and 19.66% fair to poor results (Table 2).

Table 2: Comparison of Closed reduction internal fixation (cannulated cancellous screw) and Open Reduction Internal Fixation (plate osteosynthesis) with different studies

Rasmussen Score	Comparison				
	CR – IF with cannulated cancellous screws		Plate Osteosynthesis		
	Current study (n=16)	R Sament <i>et al.</i> (n=56)	Current study (OR-IF/MIPPO)	H Raza <i>et al.</i> (MIPPO)	Nabil <i>et al.</i> (OR-IF)
Excellent	6	20	15	18	78
	37.50%	35.70%	57.70%	43.90%	66.67%
Good	4	28	8	19	16
	25%	50%	30.77%	46.34%	13.67%
Fair	4	6	2	4	13
	25%	10.70%	7.70%	9.75%	11.11%
Poor	2	2	1	0	10
	12.50%	3.57%	3.85%	0%	8.50%
Total (N)	16	56	26	41	117

5.1 Complication

One of the common complications encountered in plate osteosynthesis group of patients was infection. The rate of infection was 7.7%. None of the patients managed by MIPPO technique developed infection. The average time of union in patients managed by CRIF with PCCS / MIPPO was a mean of 3.33 months and by ORIF was 3.81 months.

Table 3: Comparison between post-operative complications in plate osteosynthesis

Complication	Current study (n=26)	Nabil <i>et al.</i> (n=117)
Infection	7.7% (n=2)	4.3% (n=5)
Post traumatic osteoarthritis	3.8% (n=1)	22% (n=26)
Non union	0% (n=0)	1.7% (n=2)

Comparative results of conservative and surgical methods of treatment is as follows. Functional evaluation of the knee joint revealed 12.5% excellent results, 50% good results by conservative treatment and 50% excellent results, 28.57% good results by surgical treatment. After stratification of fractures into low velocity injuries (Type I, II, III) and high velocity injuries (Type IV, V, VI), 64.3% of low velocity injuries are treated by surgical methods and 35.7% treated with conservative methods. Among the high velocity injuries 81.25% are treated by surgical methods and 18.75% by conservative methods. The results showed that surgical treatment produced better results in both low velocity and high velocity injuries as compared to conservative method.

Among the early complication infection was a common problem with surgical methods with 7.14% incidence in this study. One case of peroneal nerve injury was seen which did not recover till last follow up.

6. Conclusion

Surgery is the treatment of choice for displaced fractures belonging to Schatzker type I and II. Schatzker's type III fractures can be managed conservatively if the depression is less than 5 mm. Schatzker's type IV, V and VI should be managed surgically with plate osteosynthesis especially in young individuals who require perfect anatomical reconstruction of the articular surface, stable fixation and early mobilization. Minimally invasive percutaneous plating (MIPPO) is a good alternative to ORIF and minimizes risk of infection.

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