ORIGINAL ARTICLE

OUTCOME OF MANAGEMENT OF CLOSED PROXIMAL TIBIA FRACTURES IN TERTIARY HOSPITAL OF SURAT

Karan Mehta¹, Prashanth G², Shiblee Siddiqui³

HOW TO CITE THIS ARTICLE:

Karan Mehta, Prashanth G. Shiblee Siddiqui, "Outcome of Management of Closed Proximal Tibia Fractures in tertiary Hospital of Surat". Journal of Evolution of Medical and Dental Sciences 2015; Vol. 4, Issue 11, February 05; Page: 1776-1785, DOI: 10.14260/jemds/2015/254

ABSTRACT: BACKGROUND: Proximal tibia fractures are complex injuries associated with a high incidence of soft tissue complications. Management of it varies with the type of fracture and its outcome requires an aggressive approach towards patient, so study was conducted to assess the outcome of closed proximal tibia fracture management. **AIM AND OBJECTIVES:** To evaluate the outcome of various treatment modalities in tibial condylar fractures and to study the advantages and disadvantages of surgical treatment. comparing treatment modalities and finding management strategies, depending on type and displacement of fractures. **STUDY DESIGN:** Prospective type. **MATERIALS AND METHODS:** 50 consecutive closed tibial plateau fractures were included in this study. All fractures were classified according to Schatzker classification. There were 41 men and 9 women. The study was conducted between August 2010 and October 2012 at the Department of Orthopaedics, New Civil hospital, Surat after the Ethical committee approval. The final outcome was assessed using the Rasmussen's score. The results were analyzed using different parameters; male vs. female, age distribution, mode of trauma, functional outcomes and complications etc. **RESULTS AND CONCLUSION:** The average age was 40.52 years with the fracture being more common in the 3rd to 5th decades. Same number of patients had fracture of either limb. 68 % sustained fracture due to road traffic accident. 84% of the patients had Schatzker type I, IV and type V fractures. The average time of interval for fracture union was 3.87 months in case of conservative (n=8) method and 3.33 months in CR – IF (n=16) with cannulated screws and 3.81 months for OR – IF (n=26) with buttress plating. Thus, the average time of union for CR-IF was shorter than for OR-IF which shows the importance of preserving fracture site haematoma. 3 patients had infections and loss of reductions each, 1 peroneal nerve injury, 3 knee stiffness, 4 osteoarthritis and 1 malunion with no non-union.

KEYWORDS: Tibial Plateau Fracture; Functional Outcome; Schatzker classification; CR/ORIF- Close reduction/Open reduction and internal fixation.

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. 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. 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 osteoarthritis. But varying amount of knee stiffness was noticed and surgery was blamed for it, which

ORIGINAL ARTICLE

is being done on an already traumatized knee. Taking all these facts into consideration, 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.

AIMS AND OBJECTIVES: To evaluate the outcome of various treatment modalities in 50 cases of closed tibial condylar fractures and to study the advantages and disadvantages of surgical treatment, comparing treatment modalities and finding management strategies, depending on type and displacement of fractures.

MATERIAL 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 New Civil Hospital, Surat between August 2010 to October 2012. Clearance was obtained from hospital ethical committee.

STUDY DESIGN: Prospective study.

SOURCE OF DATA: Patients treated for closed tibial plateau fractures in adults, conducted in the department of orthopaedics at New Civil Hospital, Surat between August 2010 to October 2012.

SAMPLE SIZE: All patients treated for closed tibial plateau fractures in adults in the department of orthopaedics, New Civil Hospital, Surat between August 2010 to October 2012 were selected for the study.

SELECTION CRITERIA: The Inclusion Criteria: All patients with closed tibial plateau fractures in the age group of 18-60 years treated during the period August 2010 – October 2012, who gave informed written consent for study. The Exclusion criteria were 1) Fracture in children less than 18 years. 2) Geriatric patients above 60 years. 3) Compound fracture. 4) Pathological fractures.

The Schatzkers classification was used to classify these fractures.

PROCEDURE: The study was approved by Ethical and Research committee of Government medical college, Surat. After finding suitability of inclusion and exclusion criteria patients were selected for study and briefed about the nature of the study, the interventions used and written informed consent was obtained. The consented patients were enrolled into present study. Further descriptive data of the participant's like name, age, sex, detailed history were obtained by interviewing the participants and clinical examination and necessary investigations were recorded.

At the first visit of patient, the history was taken with general and local examination of the patient. Once the patient's general condition is stable, 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. Traction was continued till local condition was favourable for cast / surgical

ORIGINAL ARTICLE

management. 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]. All surgeries were done under C-arm image intensifier control. Fractures were fixed either close reduction with percutaneous technique or MIPPO Technique or by open reduction and internal fixation. 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, 4.5 mm cortical screws and 6.5 mm cannulated and non-cannulated cancellous screws. Bone grafts were used in depressed and comminuted fractures. The source of bone graft was ipsilateral iliac crest. Alternately, bone graft substitutes were also used (Tricalcium phosphate wedge / blocks / granules).

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. The follow up were done at 6 week, 3 month, 6 month and 1 year and were evaluated for infection, loss of reduction, fracture union, weight bearing and knee range of motion.

OBSERVATION AND RESULTS: Out of 50 patients, 8 patients were treated conservatively and rest 42 were treated surgically.

There is male preponderance in our series with the M:F ratio being 4:1.

AGE: In the present series 68% of patients were between 30-50 yrs. The youngest patient was 18 years old and the oldest 60 years old. The average age was 40.52 years.

MODE OF INJURY: The Road traffic accident was the most common mode of injury in the present series (68%), remaining 32% were due to fall from height or domestic falls. The delay in discharge was due to associated injuries or infection.

In the present series' most of the fractures were of Schatzker^[1] Type I, II, III(46%). Our series is comparable to Nabil series^[2] considering the age, sex incidence and mode of injury and the most common fracture pattern. In this study, 4 patients sustained injury to ipsilateral fibula, 1 with contralateral fibula, 2 with pelvis injury, 1 patient sustained injury to patella, 1 patient's each with humerus, olecranon.

In our series we have used the Rasmussen Score.^[3] As per this system, considering the conservatively (n=8) treated we had comparable results when compared with Lasinger series.^[4] In CR-IF(n=16) we had 37.5% excellent, 25% good, 25%, fair and 12.5% poor result. In the present series we had more fair and poor results when compared to R Sament series.^[5] In OR-IF(n=26)) we had 57.7% excellent, 30.7% good, 7.7%, fair and 3.8% poor result, which has better results when

ORIGINAL ARTICLE

compared with Nabil series.^[2] Range of motion was within the normal functional range. The average time of union in patients managed by CRIF / MIPPO was a mean of 3.33 months and by ORIF was 3.81 months.

COMPLICATIONS: One of the common complications encountered in plate osteosynthesis group of patients was infection. The rate of infection was 7.7% (n=2) and H Raza series^[6] has 2.4%(n=1) infection. All the infections were superficial infection and healed with time and antibiotics. There were no incidences of deep infection or delayed infection in this study. None of the patients managed by MIPPO technique developed infection. "Favourable outcome is due to less extensive dissection of soft tissue envelope and de vitalization of fracture fragments."^[6] Posttraumatic osteoarthritis was seen in 9.2% (n = 4) of the 42 patients managed surgically. In this study the incidence of secondary arthritis was more common in type IV and VI injuries. Current study shows no incidence of non-union, whereas Nabil et al study^[2] shows 1.7 % incidence of non-union.

DISCUSSION: This is a study of management of closed tibial condylar fractures involving 50 patients and followed up over a period of 2 years. 8 patients were managed by conservative methods and remaining 42 patients were managed by surgical methods. Conservative treatment included closed reduction, traction mobilization and above knee cast application while surgical management included CRIF with cannulated cancellous screws / MIPPO Technique or ORIF with plate osteosynthesis; with or without bone grafting. Functional evaluation of the knee was done, based on the Rasmussen's scoring system. The prognostic factors for condylar tibia fracture include age, intra articular involvement, method of treatment, timing of joint mobilization etc. Multiple articles have been published documenting superior functional results using internal fixation (Nabil series,^[2] H Raza series,^[6] R Sament series^[5]). The result and observation of the present study is compared with the other similar studies which are depicted in tables.

Major contributing factors were:

1. Improper fixation due to complexity of comminution or surgical technique.
2. Elderly age group constituted majority, who were less motivated than young people to initiate exercises. Their bones were osteoporotic with very low osteogenic potential.
3. Delay in surgery was a factor which resulted in bad results.

CONCLUSION: Though the series is small and period of follow up is small to draw definitive conclusions with complete physical examination is most vital. Radiographic examinations with good quality x rays are required for classification and to decide on the management and for post-operative follow up. Preoperative and postoperative examination of neurovascular status of injured limb is of paramount importance. A good surgical technique, respect for soft tissue will minimize intra and post-operative complications. The choice of surgical approach for plate osteosynthesis should be based on direction of displacement of fracture fragments. A strong association exists between development of osteoarthritis and residual displacement of articular fragments at the time of osseous union. Clinically patient can have excellent or good functional outcome irrespective of radiographic evidence of osteoarthritis. Factors such as size, number and location of articular fracture fragments may be more important prognostically. Displacement of fracture fragments is

ORIGINAL ARTICLE

always a possibility following treatment. Fracture healing is usually not a problem as fracture is at metaphyseal cancellous bone with plenty of blood supply. A good postoperative physiotherapy is of help in gaining better functional results. We conclude that 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.

ACKNOWLEDGEMENT: The author did not receive any grants or outside funding for support of the research or preparation of the manuscripts. No funding was received for this work from any of the organization.

REFERENCES:

1. Hohl M. Part-I: fractures of proximal tibia and fibula. In: Rockwood C, Green D, Bucholz R, eds. Fractures in adults, 3rd ed. Philadelphia: JB Lippincott, 1991; 1725-1761.
2. Nabil A Ebraheim et al. Open reduction internal fixation of 117 tibial plateau fractures. University of Ohio, Spotlight hip and knee DEC 2004; Volume 27: page 12.
3. Rasmussen DS. Tibial condylar fractures, Impairment of knee joint stability as an indication of surgical treatment. JBJS 1973; 55: 1331.
4. Lansinger O, Bergman B, Korner L. Tibial Condylar fractures, a twenty-year follow up. JBJS 1986; 68: 13-19.
5. R Sament et al. Closed reduction and percutaneous screw fixation for tibial plateau fractures. PGI – Chandigarh. Journal of orthopedic surgery 2012; 20 (1): 37-41.
6. H Raza et al. Minimally Invasive Percutaneous Plate Osteosynthesis in tibia plateau fractures. Journal of Orthopedic surgery 2012; 20 (1): 42-7.

Age (yrs)	Frequency	Percentage
18-30	7	14
30-40	11	22
40-50	23	46
50-60	9	18
Total	50	100.0
Table 1: age incidence:		

Sex	Frequency	Percentage
Male	41	82
Female	9	18
Total	50	100.0
Table 2: SEX INCIDENCE		

ORIGINAL ARTICLE

	Frequency	Percent
Right	25	50
Left	25	50
Total	50	100.0

Table 3: Frequency of Side of injury

	Frequency	Percent
Fall (L)	11	22
RTA	34	68
Fall (H)	5	10
Total	50	100.0

Table 4: MECHANISM OF INJURY

The mechanism of injury was grouped into 2 categories. High velocity trauma including road traffic accidents and fall from > 10 feet height. Low velocity injuries were due to fall on ground level or <10 feet height. 68% of the patients sustained injury secondary to RTA, 22 % due to fall from a level surface[0 to 10 feet height] and the rest 10% due to fall from a height [10 feet or higher]. Major cases were due to high velocity trauma {68 %}.

Type of Fracture (Schatzker's Cl.^[1])	Frequency	Percent
I	16	32
II	6	12
III	1	2
IV	11	22
V	15	30
VI	1	2
Total	50	100.0

Table 5: TYPE OF FRACTURE:

ORIGINAL ARTICLE

Early Complications		Treatment		Total
		Conservative	Surgery	
No	No.	6	37	43
	%	75%	88.1%	86%
Peroneal nerve injury	No.	1		1
	%	12.5%		2%
Infection	No.	0	3	3
	%	0	7.13%	6%
Loss of reduction	No.	1	2	3
	%	12.5%	4.77%	6%
Compartment syndrome	No.	0	0	0
	%	0%	0%	0%
Total	No.	8	42	50
	%	100.0%	100.0%	100.0%

Table 6: EARLY COMPLICATIONS

Late Complications		Treatment			Total
		Conservative	Cannulated Cancellous screws	Buttress Plating	
No	No.	4	12	21	37
	%	50%	75.0%	80.1%	74%
Anterior knee pain	No.	1	0		1
	%	12.5%	0%		2%
Knee instability	No.	2	0	2	4
	%	25%	0%	7.7%	8%
Knee stiffness	No.	1	0	2	3
	%	12.5%	0%	7.7%	6%
Osteoarthritis	No.	0	4	0	4
	%	0%	25%	0%	8%
Mal union	No.	0	0	1	1
	%	0%	0%	3.85%	2%
Total	No.	8	16	26	50
	%	100.0%	100.0%	100.0%	100.0%

Table 7: LATE COMPLICATIONS

The average time of union for CR-IF was shorter than for OR-IF which shows the importance of preserving fracture site hematoma.

ORIGINAL ARTICLE

	N	Mean
Conservative	8	3.875
CR – IF	21	3.33
OR – IF	21	3.81
Total	50	3.67

Table 8: AVERAGE TIME OF FRACTURE UNION

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%.

RESULTS OF CONSERVATIVE VS SURGICAL TREATMENT:

			Type of Fracture						Total
			I	II	III	IV	V	VI	
	Poor	No.	1						1
		%	25%						12.5%
	Fair	No.	1				1		2
		%	25%				100%		25.0%
	Good	No.	1		1	2			4
		%	25%		100%	100%			50%
	Excellent	No.	1						1
		%	25%						12.5%
Conservative	Total	No.	4	0	1	2	1	0	8
		%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	Poor	No.	0	0	0	2	0	1	3
		%				22.22%		100%	7.14%
	Fair	No.	2	1	0	2	1		6
		%	16.67%	16.66%		22.22%	7.14%		14.28%
	Good	No.	3	3	0	3	3		12
		%	25%	50%		33.33%	21.43%		28.57%
Surgery	Excellent	No.	7	2	0	2	10		21
		%	58.33%	33.33%		22.22%	71.43%		50%
	Total	No.	12	6	0	9	14	1	42
		%	100.0%	100.0%	100%	100.0%	100.0%	100%	100.0%

Table 9: COMPARATIVE STUDY OF FUNCTIONAL EVALUATION FOLLOWING CONSERVATIVE AND SURGERY

ORIGINAL ARTICLE

Study	Schatzker Type I, II, III.	Schatzker Type IV	Schatzker Type V , VI
Current (n=50)	46 %	22 %	32 %
Nabil et al (n=117)	63.2 %	5.1 %	31.7 %

Table 10: INCIDENCE OF FRACTURE CLASSIFICATION

- Detailed analysis of demographic data showed that “Younger male patients tend to sustain fractures secondary to high velocity trauma such as a road traffic accident or a fall from height, while older patients tend to sustain fractures due to low velocity trauma such as a fall from low level.” [\$\$\$]

COMPARISON BETWEEN RESULTS OF CURRENT STUDY AND LASINGER ET AL STUDY^[4]:

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	23	0	5	0	8
	20%	79.31%	0%	35.7%	0%	44.44%
GOOD	2	5	2	9	0	7
	40%	17.24%	100%	64.3%	0%	38.88%
FAIR	1	1	0	0	1	1
	20%	3.45%	0%	0%	100%	5.55%
POOR	1	0	0	0	0	2
	20%	0 %	0%	0%	0%	11.11%
TOTAL (n)	5	29	2	14	1	18

Table 11: RESULTS OF CONSERVATIVE TREATMENT

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^[5] 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.

ORIGINAL ARTICLE

COMPARISON BETWEEN BOTH STUDIES:

Rasmussen Score	Current study (n=16)	R Sament et al ^[5] (n=56)
EXCELLENT	6	20
	37.5%	35.7%
GOOD	4	28
	25%	50%
FAIR	4	6
	25%	10.7%
POOR	2	2
	12.5%	3.57%
Total (n)	16	56

Table 12: RESULTS OF SURGICAL TREATMENT:

Rasmussen Score	Current study (OR-IF/MIPPO)	H Raza et al ^[6] (MIPPO)	Nabil et al ^[2] (OR-IF)
EXCELLENT	15	18	78
	57.7 %	43.9 %	66.67 %
GOOD	8	19	16
	30.77 %	46.34 %	13.67 %
FAIR	2	4	13
	7.7 %	9.75 %	11.11%
POOR	1	0	10
	3.85 %	0 %	8.5 %
Total	26	41	117

Table 13: Comparison of OR-IF results

AUTHORS:

1. Karan Mehta
2. Prashanth G.
3. Shiblee Siddiqui

PARTICULARS OF CONTRIBUTORS:

1. Orthopaedics Consultant, Department of Orthopaedics, D. N. Mehta Hospital, Surat.
2. Senior Resident, Department of Orthopaedics, Mandya Institute of Medical Sciences, Mandya.
3. Senior Resident, Department of Orthopaedics, Bombay Hospital.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Karan Mehta,
Bungalow No. 37/38,
Vrundavan Enclaves,
Vesu, Surat, Gujarat-395007,
E-mail: drkaranmehta@gmail.com

Date of Submission: 10/01/2015.
Date of Peer Review: 12/01/2015.
Date of Acceptance: 27/01/2015.
Date of Publishing: 03/02/2015.