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FUNCTIONAL OUTCOME OF CLOSED REDUCATION AND PERCUTANEOUS SCREW FIXATION OF SCHATZKER TYPE I FRACTURE OF TIBIA

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Abstract:

Objective: *To determine functional outcome of closed reduction and percutaneous screw fixation of Schatzker type I fracture of proximal tibia.*

Material and methods*:*

Study Design*: Retrospective Case Series.*

Setting: *Department of Orthopaedic Surgery Sheikh Zayed Medical College/ Hospital Rahim Yar Khan from April 2018 to April 2020.* ***Methodology:*** Patients having schatzker type I fracture of tibia selected by non-probability consecutive sampling were included in the study. Closed reduction & percutaneous fixation was done with concellous screws. *These patients were followed for three months and functional outcome (as defined in operational definition) was measured*. Data entry and analysis was done using SPSS version 25.

Results: *Out of 47 cases there were 40 males and 7 females with mean age of 39.46±7.809 years. The mean duration of fracture was 3.68±2.217 days. Satisfactory functional outcome was seen in 40 cases with male showing better results than females. Satisfactory functional outcome was seen in 90% of patients aged 20-50 years whereas 42.9% of cases aged above 50 years had unsatisfactory results and the difference was statistically significant with p value of 0.024. Outcome was poor in cases presented after seven or more days of injury.* ***Conclusion:*** *Closed reduction and percutaneous screw fixation of schatzker type I fractures of proximal tibia is a suitable option to achieve satisfactory functional outcome in terms of knee range of motion and stability in union in physiologically active patients.*

Key words: *Functional outcome, Schatzker type I fracture of tibia, closed recuction and percutaneous screw fixation,*

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INTRODUCTION:

In the modern world with the increase in speed and number of fast-moving vehicles there is a great increase in number and severity of fractures. The goal of fracture treatment is to obtain union of the fracture in the most compatible anatomical position which allows maximal and full restoration of the extremity. [1] Tibia is one of the most commonly fractured long bone of the body [2]. Tibial plateau fractures constitute approximately 1% of all fractures [3,4]. They usually result from axial loading in combination with varus/valgus stress forces. The lateral side of the knee joint is most commonly injured during road traffic accidents, which results in torn ligaments, sprains, and fractures of one or both condyles. Tibial plateau fractures are intra-articular fractures caused by high-velocity trauma. The primary goal in the treatment of proximal tibial articular fracture includes restoration of articular congruity, axial alignment, joint stability, and functional motion. The treatment outcomes for tibial plateau fractures are inconsistent. Closed reduction (based on ligamentotaxis principles) and internal fixation (with percutaneous cancellous screws) avoids the problems of both open surgery and conservative treatments. However, it is not suitable for all types of tibial fractures, particularly grossly comminuted and severally depressed fractures and open fractures [5].

Many classifications on the basis of the degree and type of displacement have been applied and the one used the most is Schatzker's classification [6]. The principles for the treatment of tibial plateau fractures have progressed substantially over the past 50 years. Nonsurgical treatment was used for most of these fractures before the 1980s, but with the development of internal fixation techniques, surgical treatment became more common due to advantages including early mobilization of the knee, rapid bone union, and better quality of reduction. [7, 8] Sament et al [9] reported 86 % satisfactory outcome (good to excellent) with closed reduction and percutaneous screw fixation of tibial plateau fractures.

This study is planned to be conducted in our population to document functional outcome of closed reduction and percutaneous screw fixation Schatzker Type 1 fracture of tibia. There is scarcity of local and international data regarding this topic. Moreover, availability of services and expertise of the surgical team play a pivotal role in the management of such cases, so conducting this study in our local population is need of hour. This research study is carried out to report outcome of the technique which will improve our confidence to offer this technique to the suffering patients. The results will also add useful information to our local database and bring about awareness among surgeons regarding its effectiveness.

MATERIAL AND METHODS:

The retrospective case series was conducted on patients presented in Department of Orthopaedic Surgery Sheikh Zayed Medical College/ Hospital Rahim Yar Khan with Schatzker Type I fracture of tibia from April 2018 to April 2020. Total of 47 patients were included in the study. Patients of either sex aged 20-60 years, with post traumatic schatzker type I fractures of tibia presenting within 2 weeks of injury with selected by non-probability consecutive sampling. Patients having pathological fracture proximal tibia, history of previous tibial fractures, patients having contraindication with anesthesia; open fractures, bilateral fractures and patients having multiple fractures known diabetic patients (with lab report FBS more than 126 mg/dl) and known hypertensives were excluded from this study with uncontrolled diabetes mellitus, renal failure were excluded. A specialized proforma has been developed to record the findings. Patients meeting inclusion criteria were enrolled in this study from Department of Orthopaedic Surgery, Sheikh Zayed Hospital, Rahim Yar Khan. Detailed history was taken and physical examination was done for these study cases. Prior permission was taken from institutional ethical committee. Informed consent taken from each patient describing them objectives of this study, ensuring them confidentiality of the information and fact that there is no risk involved to the patient while taking part in this study. Once registered, all relevant baseline investigation were arranged for these patients. All the relevant information was collected and noted in the study proforma and these patients were managed as per hospital protocols and were managed by closed reduction and percutaneous screw fixation of Schatzker type I fracture of tibia. These patients were called for follow up after 2 week for three months, the final outcome will be i.e. functional outcome (as defined in operational definition) was measured and all the relevant information was recorded on the proforma.

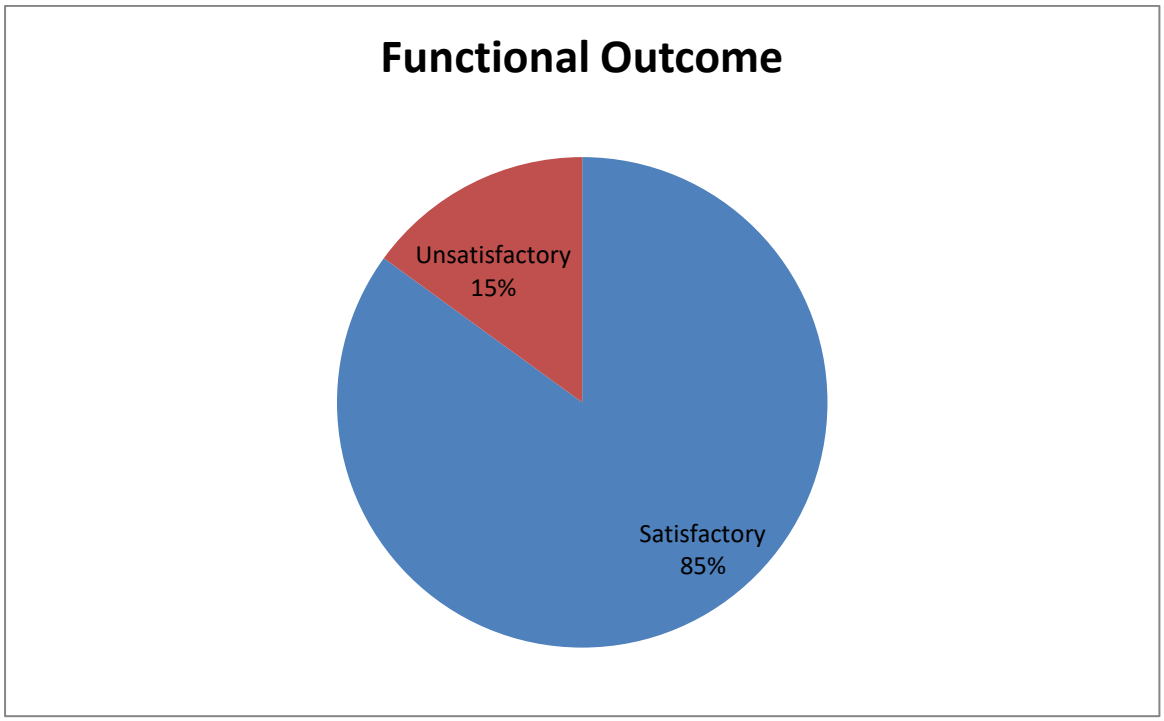
All the data will be entered and analyzed using SPSS - 25. Mean and standard deviation for the age, and duration of fractures are calculated. Frequencies and percentage will be calculated for the categorical variables like gender, occupation, residential status, monthly family income, etiology, functional outcome.

Effect modifiers like age, duration of fracture, etiology, side of fracture and gender will be controlled by making stratified tables. Post stratification chi-square test will be applied to see its effect on outcome. P value equal or less than 0.05 will be considered as significant.

RESULTS:

This study of 47 Schatzker type I fracture of tibial plateau confirmed the findings of various studies that percutaneous screw fixation is an excellent treatment modality. Out of these 40 were males and 7 females. The mean age was 39.468.±7.809 years. Mean duration of fracture was 3.68±2.217 days, while mean hospital stay post operatively was 2.02±1.259 days. 4 cases had age 20-30 years, 17 were aged 31-40 years, 19 cases were aged 41-50 and rests were above 50 years. 51.1% cases had fracture duration of 1-3 days while 42.6% cases had fracture duration of more than 4-7 days and 6.4% cases presented after 7 or more days of injury. Most common mode of injury (85%) was road traffic accidents while 15% of patients had fracture after history of fall from height. 95% (19 out of 20) Younger patients with age groups 20-40 had fracture proximal tibia caused by high energy trauma after RTA,s, 89.5% of aged 41-50 had RTA and 10.5% occurred after h/o fall while 57.1% of cases occurred after history of fall among age group of 50 and above with p value 0.008.

FUNCTIONAL OUTCOME IN STUDY SUBJECTS



Satisfactory functional outcome assessed by Rasmussen score equal or more than 24 was seen in 40 (85.1%) cases. Post-surgical functional outcome was satisfactory in 87.5% & 71.4% of male and female patients respectively with p value of 0.271.

TABLE NO. 01
FUNCTIONAL OUTCOME WITH RESPECT TO AGE GROUPS

AGE GROUPS (YEARS)	FUNCTIONAL OUTCOME		Total
	Satisfactory	Unsatisfactory	
20-30	4 (100%)	0 (0%)	4 (100%)
31-40	15 (88.2%)	2 (11.8%)	17 (100%)
41-50	17 (89.5%)	2 (10.5%)	19 (100%)
51-60	4(57.1%)	3(42.9%)	7(100%)

Chi square= 5.346, p= 0.143

TABLE NO. 02
FUNCTIONAL OUTCOME WITH RESPECT TO DURATION OF FRACTURE

Fracture duration(days)	FUNCTIONAL OUTCOME		Total
	Satisfactory	Unsatisfactory	
1-3	23 (95.8%)	1 (4.2%)	24 (100%)
4-7	17 (85%)	3 (15%)	20 (100%)
More than 7	0 (0.0%)	3 (100%)	3 (100%)

Chi square= 19.322, p= 0.000

		Acceptable		Unacceptable	
	Points	Excellent	Good	Fair	Poor
A. Subjective complaints					
a. Pain					
No pain	6				
Occasional ache, bad weather pain	5				
Stabbing pain in certain positions	4	5	4	2	0
Afternoon pain, intense, constant pain around the knee after activity	2				
Night pain at rest	0				
b. Walking capacity					
Normal walking capacity (in relation to age)	6				
Walking outdoors at least 1 hour	4	6	4	2	1
Short walks outdoors > 15 minutes	2				
Walking indoors only	1				
Wheel-chair/bedridden	0				
B. Clinical signs					
a. Extension					
Normal	6				
Lack of extension (0–10 degrees)	4	6	4	2	2
Lack of extension > 10 degrees	2				
b. Total range of motion					
At least 140	6				
At least 120	5	5	4	2	2
At least 90	4				
At least 60	2				
At least 30	1				
0	0				
c. Stability					
Normal stability in extension and 20 degrees of flexion	6				
Abnormal instability 20 degrees of flexion	5				
Instability in extension < 10 degrees	4				
Instability in extension > 10 degrees	2				
Sum (minimum)		27	20	10	6

DISCUSSION:

Tibial plateau fractures are caused by high-energy trauma and have intraarticular fractures, which causes management problems and remains challenging for orthopedic surgeons even in the present day. Intra-articular component of fracture, cancellous bone involvement, proximity to a major weight bearing joint complicates the treatment plan. To obtain a stable, pain-free, nonosteoarthritis knee joint permitting early range of motion is primary goal of surgery in these caess. [10, 11]

Extensile exposure with arthrotomy and reconstruction of the joint surface with plate and screw fixation were the treatment modalities used in past to treat tibial plateau fractures, Which were expensive and an open procedure causing soft tissue compromise, devascularization of bone fragments leading to complications such as infection, wound dehiscence and implant failure. [12, 13] Closed reduction by ligamentotaxis and percutaneous screw fixation is minimally invasive allowing early mobilization and thus reduces the length of hospital stay and costs. [14] However, these are based on indirect reduction techniques and are limited to depression less than 5 mm. [9, 12, 13]

Tibial plateau fractures are most commonly seen in male having 4:1 and 2.1:1 male-female ratio. [15, 16] as seen in our study with 40 out of 47 cases being males. This can be attributed to Pakistani setup where the female population largely works indoor or in agricultural fields and does not travel much. The males are more involved in outdoor activities

and the young male are more enthusiastic about life and are likely to be careless drivers.
The age of our study population ranged from 20 to 60 years and fractures were most common in the 3rd and 4th decades. Earlier series also show higher incidence of fractures in younger age groups. One showed age range from 20 to 60 years with a mean of 32 years [17] and another [18] showed average age of 37 years.

RTA was the most common cause of fracture of tibia. [19] Due to limited sources of income, motorbike is the main mode of transportation of the middle class and in accidents involving motorbikes, tibia is commonly affected. The present study showed the most common mechanism of tibial fractures as RTAs with 85% patients and fall from height was 15%. In one study, [20] the leading cause of limb injury accounting for 76.8% (53 patients) was RTA.

In our study, good to excellent outcome assesd by Ramussen score 26 or more was seen in 85% of patients, and 15% had poor results, which is comparable to the study done by Sament et al. and Agarwal et al. [5],[9]

We used Eshmarch bandage to help in reduction, which we found very helpful to decrease displacement. We used pointed reduction clamps for final reduction, as suggested by Kankate and Singh, [21] with satisfactory results. We have not used intraoperatively arthroscopic evaluation for the reduction or to repair any meniscal injury. According to series of Lobenhoffer and Schulze, arthroscopic reduction had no advantages over reduction under fluoroscopic control. [22] We also have found fluoroscopic assisted percutaneous fixation as good as arthroscopic assisted one. We found that two half-threaded (16 mm or 32 mm) 6.5-mm cannulated cancellous screws give sufficient stability. We agree with Koval and Sanders in that the number of screws, whether two, three, or four, does not matter. [23]

Eleven patients were having complaints of palpable screw head and four of them had painful bursa over the same. We had to remove the implants in two of them within 18 months to relieve their symptoms. [5]

CONCLUSION:

We found that percutaneous screw fixation for Schatzker type I fractures of tibia plateau is an excellent treatment alternative to open reduction internal fixation (ORIF) or conservative management. Percutaneous cancellous screw fixation for closed tibial plateau fractures is minimally invasive, hence less morbid than ORIF. It reduces hospital stay and cost. It enables early mobilization with minimal instrumentation, and achieves satisfactory outcomes without any anatomical deformity or functional impairment as often seen with conservative management.

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