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Functional Outcome of Closed Reduction and Percutaneous Screw Fixation of Schatzker Type-II Fracture of Tibia

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ABSTRACT

Objective: To examine how close reduction and percutaneous screw fixation (PSF) work to treat Schatzker type-II tibia fractures. **Scheme of study**: A descriptive case series. **Study site and Extent:** The current investigation was carried out at Orthopedics Surgery Unit, Ghazi Khan medical college & Allama Iqbal Teaching Hospital Dera Ghazi Khan, Pakistan, during 2023-2024. **Materials and Methods:** We examined 60 individuals who had Schatzker type-II tibia fractures and were treated with closed reduction and PSF. Each patient was examined at the outpatient clinic. Three months later, patients were assessed using the Rasmussen criteria, and their scores were recorded. If the score was more than 28, the result was considered exceptional. **Results:** 60 patients were included with mean age of 41.77 ± 11.9 years. Mean Rasmussen score of 60 patients was 20.68 ± 4.721 ranged from 8 to 30. Functional outcome among 5 patients (8.3%) was excellent, among 27 (45%) was good & fair in same number and in only one patient (1.7%) it was poor. Malnutrition, smoking, age, and gender had no influence on functional outcome. **Conclusion:** Patients treated for Schatzker type II tibia fractures had an excellent functional outcome with closed reduction and PSF.

INTRODUCTION

Though often overlooked, among the knee injuries due to generalized trauma, tibial fracture is more common. Based on position and severity of fractures on the lateral tibial bone, six types of tibial fractures are classified[1]. Type I to III bone fracture chiefly affects lateral plateau. These fractures are primarily wedge-shaped fragmentation of tibial bone and most common among the younger patients without osteoporotic bone[2]. However, compartment syndrome, neurovascular injury, crushing of soft tissues and compounding of fractures are the major cause of Schatzker type-II fractures[3]. Conventional care was the most common method of treatment before going to the recent advances, which resulted in joint stiffness that was severely painful for the patient[4]. The surgical technique for stabilizing the broken bone, primarily consisting of closed reduction and internal fixation, reduces the impairments of traditional treatments. Beside of these, this approach is not appropriate for all types of tibial bone fractures, particularly type-VI fractures (Schatzker classification) and compound fractures. Closed reduction can be achieved by applying manual ligamentotaxis technique with traction. The depressed articular fragment is elevated by close manipulation of both sides of the proximal tibia[3]. In the skin, a small puncture is made through which three parallel cancellous screws along with washers are passed to join the broken parts of tibial bone[5]. Currently the optimum and standard treatment method for type-II (Schatzker) tibial plateau fractures is challenging and debatable. Unfortunately, there is no precise approved protocol available yet for the management of these fractures. Much of the patients resulted into considerable residual dysfunction even though exposed to complete treatment cycle. Considering the literature published, numerous studies have focused the Schatzker type-V and type-VI fractures. Reference[6] conducted research work during 2006-2010 to explore the outcome of closed reduction and percutaneous screw fixation for type-V and VI tibial plateau fractures. Reference[7] focused on treatment of tibial plateau schatzker type-VI fractures in Korea,

during 2013. Reference [8] presented their research work in 2016 to explore the functional and radiological consequence of Schatzker type-V and VI tibial plateau fracture. Reference [9] also focused on fractures seems in the proximal tibia during 2020 in UK and delimits the type of tibial fractures along with management and medicine diagnosis. However, In Pakistan little research work has been done on convenient advantages of approach under consideration. Reference [10] has explained the applied significances of percutaneous screw fixation for treatment of Schatzker type-I fractures in Sahiwal teaching hospital, Pakistan. The Existing literature emphasizes that no information is available for the managing of type-ii fractures in tibial bone. There is huge knowledge gap between Schatzker type-I tibial fracture and V, and Vi- Schatzker fracture and this gap highlight the needs for safe and standardized treatment protocol. The basic aim of this study was to address the gap by investigating the current analytical approaches and discovering innovative techniques involving advanced resources and integrated technologies designed to improve tibial fixation achievement. This study will not only improve treatment outcomes in our patients but also help to delineate guidelines. Moreover, the effect of operating time on Schatzker type-II has never been established in previous studies. If early surgery affects the outcome, this study will be very helpful in planning and predicting the results of surgery.

METHODOLOGY

A descriptive case series study was conducted to elucidate the closed schatzker type-II fractures of tibia as per operational definition in department of Orthopedics Surgery Unit, Ghazi Khan medical college & Allama Iqbal Teaching Hospital Dera Ghazi Khan, Pakistan. Inclusion criteria were followed by selecting patients aged between 18 and 65 years presented within 24 hours of injury, of both male and female gender, having Schatzker type-II fractures. Similarly, patients who had previously experienced fractures at the same location, had diabetes mellitus (random blood glucose >200 mg/dl), hypothyroidism (thyroid-stimulating hormone >5 mIU), open wounds or burst wounds, or had been gunshot were excluded [10]. A total of 60 Schatzker type-II fracture patients that met the inclusion and exclusion criteria were admitted through the accident and emergency department of orthopedic surgery unit following informed consent. Following preoperative evaluation and preparation, the consultant operated on these patients within 24 hours of the injury using aseptic procedures. Closed reduction was accomplished by manual ligamentotaxis with traction in extension that was monitored by an image intensifier. Two parallel cancellous screws (6.5 mm) and washers were then inserted percutaneously. All patients were followed at 6 and 12 weeks and evaluated for pain and range of motion according to Rasmussen criteria. All data were subjected for statistical analysis using SPSS (version-29). The quantitative variable like pain, range of motion was determined and findings were expressed in Mean values [11]. The qualitative variables like gender and outcome variables (Rasmussen scoring system) was measured as poor, fair, good or excellent and presented as frequency and percentages. Data were subjected for statistical analysis to find out the significance of variance ($P<0.001$) among the variables, including age, gender, malnutrition, and smoking history, to address their influences on the outcomes.

RESULTS

The result (Table 1) described that in our research population, 60 patients were subjected for present investigation. A total of 25 patients (41.70%) were 40 years of age or older, whereas 35 patients (58.3%) were under 40 (Table 2). Beside of these, 17 patients (28.3%) were female and 43 patients (71.7%) were male (Table II). It was observed that only three patients (5%) among sampled population were suffering with malnutrition and 33 patients (55%) were habitual of smoking (Table 3). Mean Rasmussen score of 60 patients was 20.68 ± 4.721 ranged from 8 to 30 (Table 4).

Table 1

Age Distribution of Sampled Population

Source	Population (N)	Mean Minimum	Mean Maximum	Mean
Age (Years)	60	25	65	41.77±11.931

Table 2

Frequency Distribution of Sampled Population by Age Groups and Sex

Variables		Frequency	Percent
Age Groups	Less than 40 Years	35	58.30
	More than 40 Years	25	41.70
Sex	Female	28.3	17
	Male	71.7	43

*N=60; Total Percentage=100

Table 3

Frequency Distribution of Sampled Population by Malnutrition and Current Smoking

Variables		Percent	Frequency
Malnutrition	Yes	5.00	3
	No	95.00	57
Current Smoking	No	45.0	27
	Yes	55.0	33

*N=60; Total Percentage=100

Table 4

Rasmussen Score of Sampled Population

	N	Minimum	Maximum	Mean	Std. Deviation
Rasmussen Score	60	8	30	20.68	±4.721

Figure 1

Frequency Distribution of Sampled Population by

Functional Outcome

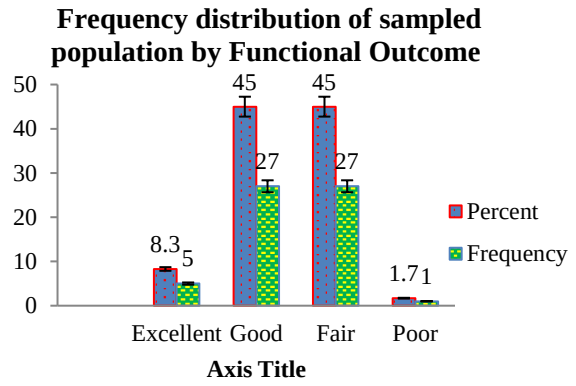

Table 5

Cross Tabulation between Variables & Functional Outcome

Variables		Age Groups & Functional Outcome				Total
		Excellent	Good	Fair	Poor	
Age Groups	Less than 40 Years	2	20	13	0	35
	More than 40 Years	3	7	14	1	25
Total		5	27	27	1	60
P<0.095						

Variables		Sex & Functional Outcome				Total
		Excellent	Good	Fair	Poor	
Sex	Male	5	17	20	1	43
	Female	0	10	7	0	17
Total		5	27	27	1	60
P< 0.342						

		Malnutrition & Functional Outcome				Total
		Excellent	Good	Fair	Poor	
Malnutrition	No	5	26	25	1	57
	Yes	0	1	2	0	3
Total		5	27	27	1	60
P< 1.000						

		Current Smoking & Functional Outcome				Total
		Excellent	Good	Fair	Poor	
Current Smoking	Yes	1	15	16	1	33
	No	4	12	11	0	27
Total		5	27	27	1	60
P < 0.342						

Figure 1, described that functional outcome among 5 patients (8.3%) was excellent, among 27 (45%) was good & fair in same number and in only one patient (1.7%) it was poor. Beside of these, the results of Table-V described that there were non-significant variance among cross tabulated values of functional outcome and the variables: age group *(P<0.095)*, gender type (*P< 0.342)*, malnutrition (*P< 1.000)* and current smoking *(P < 0.342)*, suggesting that there is no effects of these variables on present applied surgical technique for both male and female patients (Table 5).

DISCUSSION

It is very challenging to treat tibial plateau fractures because of their intra-articular nature, bone involvement, cancellous and proximity to a major weight bearing joint. Around the world, 1% of adults are affected by the tibial plateau[12]. Men often sustain these fractures at a younger age, and they are typically caused by high-energy trauma like vehicle accidents. While in women, low energy trauma causes fractures more commonly later in life, reflecting underlying osteoporosis[13]. The anatomical position of the fracture and the magnitude to which it extends into the tibial metaphysis determine the classification of tibial plateau fractures[14]. Tibial plateau fractures are classified in to six types on the basis of their morphometric attributes in term of fractures. Currently this issue is gaining attention by the surgeons, researchers and health concerns national and international level to delimit the précised protocol for safe treatment of tibial fracture particularly Schatzker type-II fracture. Schatzker type II fractures are pure cleavage fractures of the lateral tibial plateau that have a wedge shape and less than 4 mm of displacement or depression. The present study was conducted to assess the advantages and disadvantages of surgical intervention to treat the Schatzker type II fracture by using a closed reduction and percutaneous screw fixation approach for tibial plateau fractures to minimize invasiveness. The difficulties of both operational and conventional therapies are avoided by closed reduction (based on ligamentotaxis principles) and internal fixation (with percutaneous cancellous screws and washers). It reduces the length of hospital stay and costs, enables early mobilization with minimal instrumentation, and achieves satisfactory outcomes[16]. In our study, the mean Rasmussen score of 60 patients was 20.68 ± 4.721, ranging from 8 to 30. Functional outcome among 5 patients (8.3%) was excellent, 27 (45%) was good & fair in the same number, and in only one patient (1.7%) it was poor, which is not surprising because similar findings were also reported by reference [10]. The major cause of Schatzker type II fracture was road traffic accidents. The higher rate of tibial fracture in underdeveloped countries is due to economic instability and limited resources, where commonly people use motorcycles for transportation in their daily lives [10]. In our study, most of the patients under consideration have tibial fractures caused by road accidents on motorcycles. Similar findings were also reported by reference [15]. The difference in the Rasmussen score may be due to younger age, early presentation, and opting for a surgical option. However, these results are acceptable for a Schatzker type II fracture. There was no effect of age, gender, malnutrition and smoking on functional outcome. These results were line parallel with the findings of reference [3, 16].

CONCLUSION

Present research work was attempted to illustrate the standard protocol for the treatment of Schatzker type II fractures. We concluded that the functional outcome of closed reduction and a percutaneous screw fixation, a surgical technique for a Schatzker type-II fracture of the tibia, is acceptable using the Rasmussen scoring system. This approach has a lower complication rate, decreases the time of hospitalization and rehabilitation, and also has good clinical and radiological outcomes. A meta-analysis of the available data may help to formulate final guidelines.

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