

Functional Outcome of Closed Reduction and Percutaneous Screw Fixation for Management of Schatzker Type I Fracture of Tibia in a Tertiary Care Hospital

Closed Reduction and Percutaneous Screw Fixation for Management of Fracture of Tibia

Asim Rasool¹, Kashif Raza Khan¹, Majid Rashid¹, Haroon-ur-Rehman Gillani¹, Shahid Sattar² and Talat Ahmad Lodhi²

ABSTRACT

Objective: To determine the functional outcome of closed reduction and percutaneous screw fixation (PSF) for management of Schatzker type I fracture of tibia.

Study Design: A descriptive case series.

Place and Duration of Study: This study was conducted at the Department of Orthopedics, Sahiwal Teaching Hospital, Sahiwal from October 2020 to April 2021.

Materials and Methods: A total of 86 patients presenting with Schatzker type I fracture of tibia and managed with closed reduction and PSF were analyzed. All patients were followed-up in outpatient department. After 3 months, patients were evaluated by using Rasmussen criteria and score was noted. If score >28, then excellent outcome was labeled.

Results: In a total of 86 patients, 79 (91.9%) were male and 7 (8.1%) female. The mean age was 43.41±12.94 (ranging between 16-65 years). The right limb was affected 39 (45.3%) patients and left in 47(54.7%) patients. The mean duration of fracture was 6.93±1.62 hours (ranging between 4-10 hours). The most common mode of injury was road traffic accidents noted in 43 (50.1%) patients. After 3-months of surgery, the mean Rasmussen score was 31.69±5.58 (ranging between 19-48) while excellent functional outcome was found in 70 (81.4%) patients.

Conclusion: The closed reduction and PSF showed excellent functional outcome in 81.4% patients managed for Schatzker type I fracture of tibia in a tertiary care hospital.

Key Words: Closed reduction, fixation, percutaneous screw, Schatzker type-I fracture, tibia.

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INTRODUCTION

That further damage articular cartilage and advance to malalignment, secondary osteoarthritis, and loss of function.¹ Injuries manifested by tibial plateau fractures are complicated and a high or low energy trauma produces them whereas the main affected population is young people.²

Screws and plates have extraordinary acceptance among various treatments that are frequently carried out

¹. Department of Orthopedics, Sahiwal Teaching Hospital & Sahiwal Medical College, Sahiwal.

². Department of Orthopedics, Sahiwal Teaching Hospital, Sahiwal.

Correspondence: Dr. Asim Rasool, Assistant Professor of Orthopedics, Sahiwal Teaching Hospital & Sahiwal Medical College, Sahiwal.

Contact No: 03237520095

Email: drasimrasool159@yahoo.com

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but there are some complications such as injury issues, contamination, distortions and stiffness. Closed reduction and percutaneous fixation (internal) or sympathetic external fixation are negligibly intrusive strategies.³ In Schatzker types 1, 2, 3 and 4 arthroscopy-assisted percutaneous fixation's provision of certain optimal reductions, stable fixations, and consistency in early mobilization, make it a preferred choice. Percutaneous cannulated screw fixation is perhaps the most reliable fixation technique because of its less invasiveness as compared to open plate fixation.⁴ Employing percutaneous screw fixation (PSF), an accurate, minimally invasive procedure is possible that helps in specific anatomical positions, for instance, the postero-lateral tibial plateau.⁵

One study reported that closed reduction by PSF provided excellent functional outcomes (33.3%) for the management of Schatzker type I fracture of the tibia.⁶ Another study reported that the frequency of excellent functional outcomes of closed reduction with PSF was 44%.⁷ On the other hand, a study showed 89% excellent outcome of closed reduction with PSF of a Schatzker type I fracture of the tibia.⁸ Another study also reported

a 91% excellent functional outcome of closed reduction with PSF in in tibia plateau fractures.⁹ Previous data shows varied frequencies of excellent outcomes of closed reduction and PSF for the management of Schatzker type I tibial fracture. This research was conducted to collect evidence about the role of closed reduction and PSF for the management of Schatzker type I fracture of the tibia regarding functional outcome and its reliability. Hence, the aim of our study was to determine the functional outcome of closed reduction and PSF for the management of Schatzker type I fracture of the tibia in a tertiary care hospital. The findings of this study may help to improve the quality of life and assist in reducing morbidity due to the improved outcome of these surgeries.

MATERIALS AND METHODS

This was a descriptive case series study performed at the department of orthopedics, Sahiwal Teaching Hospital, Sahiwal, Pakistan, from October 2020 to April 2021. A sample size of 86 was calculated on the basis of the expected percentage of excellent functional outcome as 33.3%⁶ with closed reduction and PSF for the management of Schatzker type I fracture of the tibia with 95% confidence level and 10% margin of error. Inclusion criteria were patients of both genders, aged between 16 and 65 years, with Schatzker type I fractures. Exclusion criteria were patients with recurrent fractures at the same site, patients with diabetes mellitus (random blood glucose >200mg/dl), hypothyroidism (thyroid-stimulating hormone >5mIU), open wounds or burst wounds, and gunshot injuries. Schatzker type I fracture was defined as a fracture of the tibia at the lateral plateau without depression, assessed as a breach in the continuity of bone on the AP lateral X-ray.¹⁰ Informed as well as written consents were obtained. Approval from the “Institutional Ethical Committee” was also taken.

The patients were managed with closed reduction and PSF under general anesthesia by a single surgical team. After completing the procedure, patients were shifted to post-surgical wards and then discharged. Standard surgical and treatment protocols were adopted. The follow-up of the patients was done in the outpatient department. After 3 months, patients were evaluated using Rasmussen criteria and the score was noted. Functional outcome was assessed in terms of excellent outcome (total score of 28 to 36) after 3 months of surgery. Data collection was done with a predesigned proforma.

Statistical analysis was done by “Statistical Package for Social Sciences (SPSS)”, version 26.0. Quantitative variables like age, duration of fracture and Rasmussen score were represented as mean and standard deviation (SD). The frequency and percentages were calculated for qualitative variables such as gender, mode of injury, lateral side and functional outcome. Stratification was

done for age, gender, lateral side and duration of fracture. Post-stratification chi-square test was applied. P-value ≤ 0.05 was considered as significant.

RESULTS

In a total of 86 patients, 79 (91.9%) were male and 7 (8.1%) female. The mean age was 43.41±12.94 (ranging between 16-65 years). The right limb was affected 39 (45.3%) patients and left in 47(54.7%) patients. The mean duration of fracture was 6.93±1.62 hours (ranging between 4-10 hours). The most common mode of injury was road traffic accidents noted in 43 (50.1%) patients. Table-1 is showing characteristics of patients studied.

Table No. 1: Characteristics of the patients with Schatzker type I fracture of the tibia (n=86)

Characteristics		Number (%)
Gender	Male	79 (91.8%)
	Female	7 (8.2%)
Age (years)	≤50	56 (58.1%)
	>50	30 (41.9%)
Affected limb	Right	47 (54.6%)
	Left	39 (45.4%)
Duration of fracture	≤6	42 (48.8%)
	>6	44 (51.2%)
Mode of injury	Fall from height	23 (26.7%)
	Fall from bike	20 (23.2%)
	Road traffic accident	43 (50.1%)

After 3-months of surgery, the mean Rasmussen score was 31.69±5.58 (ranging between 19-48) while excellent functional outcome was found in 70 (81.4%) patients. Figure-1 is showing distribution of functional outcomes among patients after 3-months of follow up.

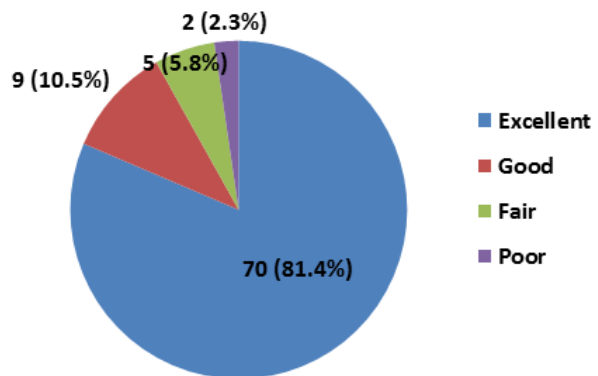


Figure No. 1: Distribution of functional outcomes (n=86)

Stratification of patients characteristics with respect to excellent functional outcome showed that no statistically significant findings were found (p>0.05) as shown in table-2.

Table No. 2: Comparison of excellent functional outcomes with respect to gender, age, affected limb, duration of fracture and mode of injury (n=86)

Study variables		Excellent Functional outcomes		P-Value
		Yes (n=70)	No (n=16)	
Gender	Male	64 (81.0%)	15 (19.0%)	0.759
	Female	6 (85.7%)	1 (14.3%)	
Age	≤50	46 (82.1%)	10 (17.9%)	0.808
	>50	24 (80.0%)	6 (20.0%)	
Affected limb	Right	31 (79.5%)	8 (20.5%)	0.679
	Left	39 (83.0%)	8 (17.0%)	
Duration of fracture	≤6	37 (88.1%)	5 (11.9%)	0.119
	>6	33 (75.0%)	11 (25.0%)	
Mode of fracture	Fall from height	18 (78.3%)	5 (21.7%)	0.814
	Fall from bike	17 (85.0%)	3 (15.0%)	
	Road traffic accident	35 (81.4%)	8 (18.6%)	

DISCUSSION

In this study, excellent functional outcome by closed reduction and PSF for management of Schatzker type I fracture of the tibia was found in 81.4% of patients. In patients without excellent outcomes, good outcomes were noted in 56.3% of patients, fair outcomes in 31.3% and poor outcomes in 12.5% of patients. In a study conducted by Sament et al,¹¹ it has been mentioned that using the same surgical procedure for tibial plateau fracture repair, among 80-100% of fracture cases, a satisfactory outcome was achieved depending upon the type of fracture. Akhund et al¹² concluded in their study that for the management of Schatzker type I, II and IV fractures, PSF was an excellent choice to replace the conventional means of treatment. One study showed a doubled rate and reported an 89% excellent outcome of closed reduction with PSF of a Schatzker type I tibial fracture.⁸ Another study reported a 91% excellent functional outcome of closed reduction when they performed PSF in Schatzker type I tibial fracture management.⁹ While treating tibial plateau fractures, the minimal invasiveness of percutaneous cancellous screw fixation allows it to cause less morbidity.¹¹ In comparison with

non-invasive conventional management, prompt recovery to produce quick mobilization with less instrumental usage is achieved by PSF.¹² It brings about extraordinary, satisfactory results, avoiding any anatomical or physiological destruction.¹³

One study by Yasin et al demonstrated that satisfactory functional outcomes were seen in 90% of patients aged 20- 50 years, whereas 42.9% of cases aged above 50 years.¹⁴ In the management of Schatzker type I proximal tibial fractures, closed reduction and PSF achieve a satisfactory functional outcome by providing stability in union and enhancing knee range of motion in physiologically active patients, and hence become a preferred choice.¹⁴ On the other hand, percutaneous screws were fixed after manipulating the fragment by gentle hammering, and then it was assessed that the outcome was excellent in 33% patients, 50% good, 13% fair and 3% poor.¹⁵

According to our findings, the commonest reason for Schatzker type I fracture of the tibia was road traffic accidents (RTAs), found in 50% of patients, followed by falling from height in 26.74% of patients. One study showed that the leading cause of tibial fractures was RTAs with an 85% occurrence rate, followed by falling from height with a 15%.¹⁴ Another study described that limb injury on account of RTA was seen in 76.8% of cases.¹⁶ Limited income resources of the middle and lower class population compel them to use motorbikes for transportation and the most common fracture is of the tibia among motorbike users. Local data on tibial plateau fracture fixation using percutaneous screws and closed reduction is not sufficient so the present study adds important insights.

This study was a single centered study which warrants further verification in multi-centric trials with a larger sample size so that a precise and unbiased assessment of the outcome of PSF and closed reduction could be made.

CONCLUSION

The closed reduction and PSF showed excellent functional outcome in 81.4% patients managed for Schatzker type I fracture of tibia in a tertiary care hospital.

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Author's Contribution:

Concept & Design of Study:	Asim Rasool
Drafting:	Kashif Raza Khan, Majid Rashid
Data Analysis:	Haroon-ur-Rehman Gillani, Shahid Sattar, Talat Ahmad Lodhi
Revisiting Critically:	Asim Rasool, Kashif Raza Khan
Final Approval of version:	Asim Rasool

Conflict of Interest: The study has no conflict of interest to declare by any author.

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