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Functional Outcome of Unreamed Nailing in Open Shaft of Tibia Fracture

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ABSTRACT

Background: The major bone in the lower limb that bears weight is the tibia. Compared to developed countries, tibial fractures are more common in less developed countries due to traffic accidents. Treatment options for tibial fractures include both conservative and surgical methods. Because they improve functional outcome with a lower incidence of malunion, infection, range of motion, and early recovery, reamed and unreamed nailing surgical procedures are becoming increasingly important in the surgical treatment of tibial fractures. **Objective:** The aim of the present investigation was to ascertain the functional outcome of unreamed nails in patients who presented with open shaft of tibia fractures to Orthopedics Surgery Unit, Ghazi Khan medical college & Allama Iqbal Teaching Hospital Dera Ghazi Khan, Pakistan. **Study Design:** Descriptive case series. **Study Duration:** The present research was conducted from 27-7-2024 to 25-2-2025. **Material and Methods:** The study involved the selection of around 24 patients. After a description of the study's advantages and dangers, patients were prompted to execute a written informed consent form before they could participate. The performa contained information on their demographic statistics. At each follow-up, patients who had unreamed nailing were assessed, and the functional result was recorded. **Results:** The respondent's age ranged from 19 to 55 years old, with a mean age of 33.781. 31.25 percent were women and 68.75 percent were men. The union lasted an average of 14.7188 SD 3.039 weeks, with a minimum of 10 weeks and a maximum of 23 weeks. Sixty-two percent of the union lasted less than 15 weeks, while 37.5% of the union lasted more than 15 weeks. While 18.8% shown poor functional performance, 56.3% demonstrated good outcome, and 25% demonstrated excellent outcome. **Conclusion:** In the open shaft of the tibia fracture, the study demonstrated an outstanding to good functional result for the unreamed nail. Age, gender, patient BMI, and functional outcome all varied statistically.

INTRODUCTION

The major bone in the lower limb that bears weight is the tibia. The lower surface of the knee joint is formed by the tibial plateau, the proximal part of the bone[1]. By bridging the gap to the distal tibia, the tibial shaft supports the medial malleolus and the superior articular surface of the ankle joint at the tibiotalar articulation[2]. Along the length of the two bones, the tibia and fibula are joined by a robust fibrous material called the interosseous membrane. This structure is strengthened proximally by stout anterior and posterior ligaments, and the superior ankle joint is stabilized distally by the interosseous membrane and three ligaments. Neurovascular impairment may arise from trauma that results in substantial edema in the anterior and deep posterior compartments, which hold nerves and arteries[3, 4]. The prevalence of high energy trauma is increasing every year at the same rate as urbanization and industrialization, which are accompanied by a sharp rise in traffic. Road traffic accidents in emerging nations are disturbingly on the rise[5]. Due to improvements in roads, motor vehicles, and laws and regulations, there are traffic accidents in industrialized countries, which also cause of mortalities and financial strain on medical institutions[6]. A long bone fracture is among the most frequent injuries sustained in auto accidents[5]. While low energy trauma injuries, such as those sustained in sports or falls while standing, typically result in fractures in the distal tibial shaft, high energy trauma injuries are more commonly cause of complicated and tibial fractures. These injuries more frequently cause simple transverse or linear tibia fractures[7]. Because of its limited muscle cover, the tibia has a susceptible blood supply compared to the rest of the appendicular bone. Neural, vascular, and compartment syndrome may be linked to tibia fractures. The standard method of surgical treatment is still debatable and challenging due to the high

frequency of repercussion linked to these fractures, particularly when they are open fractures. However, various approaches can be applied by surgeons for different treatment modalities, includes intramedullary fixation (including unreamed and interlocking intramedullary nails), open reduction and internal fixation with plates and screws, use of a lengthy leg cast with a window, gentle manipulation, and external fixation procedures. Owing the importance and advancement of each technique, it is imperative to delimit the benefits and drawbacks of each technique and choose the optimal method, which should be decided by carefully examining the fracture's morphology, the amount of energy applied to the extremity, the mechanical properties of the bone, the patient's age and general health, and most importantly the condition of the soft tissues.

Beside of these closed intramedullary nailing is now feasible because of image intensifiers, intramedullary nailing whether locked or unlocked has grown in popularity. A load-sharing device, nails are rigid against axial and torsional forces. Comparing closed nailing to other internal fixation methods, the former causes fewer soft tissue disruptions, fracture hematomas, and the normal healing process of bone. Malunion of comminuted fractures is less common when intramedullary nails are locked to the main proximal and distal ends. To assess the functional result of unreamed nailing in tibial fractures, many investigations were conducted. Reference[8] conducted research work to explore comparison among ender and unreamed interlocking nails for the treatment of tibial shaft fractures in Iran. Reference[9] demonstrated outcome of unreamed interlocking nail in open fractures of tibia in General hospital Lahore. They described that union occurred in 83.3% patient with in five months. Delayed union in 15% patients and followed by 1.7% nonunion patients. They observed the infection and reported that only 13% patients exhibited infection history while there were 86.7% patients have no signs of infections. They suggested that because of greater frequency of union and lower rate of infection, this is safe and paramount method of treatment for open diaphyseal tibial fractures. Reference[10] made studies to determine the effectiveness of unreamed tibial Nailing for the surgical treatment of open fractures of tibial Shaft. They described that higher values of 23.57% were observed for union within 9-28 weeks. Similarly rate of infection magnitude was 7.9% over all. They concluded that unreamed intramedullary for open fractures of tibia is significantly attractable approach. Reference.[11] demonstrated case study to evaluate the functional outcomes of unreamed interlocking intramedullary nailing in tibial fractures, perticularly open fractures. They suggested that unreamed nailing approach is ideal method for treatment of open tibial fractures in term of reduced blood loss, negligible infection during operative time, reduced hospital stay and enhance early mobilization and union of bones is significantly higher rate. Reference[12] also conducted research work to elucidate the importance of unreamed interlocking nail for the management of open tibial fractures. They concluded that this technique is quite enough for treatment of patients presented in hospital having open tibial fracture. Reviewing of above cited literature and internal studies, it can be concluded that unreamed interlocking nailing approach is gaining attention by the orthopedic surgeons and concerned. The rationale of the present study was to assess the efficiency and outcomes of unreamed interlocking nailing approach for the treatment of open tibial fractures in the remote area at local scale, where motorbike and road traffic accidents are more common and peoples have poor resources in term of health stability.

MATERIAL AND METHODS

A total of 32 patients from the Orthopedics Surgery Unit, Ghazi Khan medical college & Allama Iqbal Teaching Hospital Dera Ghazi Khan, Pakistan who met the study's inclusion and exclusion criteria were selected. From each patient a written consent was taken before entering in the study trial, following the method described by Reference[5]. In the performa, information about their demographics and previous health history was recorded by following the Reference[9]. Every follow-up evaluation of the patients who had unreamed nailing was conducted, and the functional result was recorded.

Sampling Approach

The sampling technique was based on consecutive sampling/Non probability approach.

Data Analysis

Primary data obtained from the each patient was interpreted for statistical analysis to determine effectiveness of unreamed nailing in open shaft of tibia fracture by the application of chi-square test using statistical software SPSS version 17.0.

RESULTS

Results of analysis showed that the respondent's age ranged from 19 to 55 years old, with a mean age of 33.781, SD 8.027 (Figure 1). There were 31.25% females (10), and 68.75% males (22). Union duration was less than 15 weeks in 62.5% (20) and more than 15 weeks in 37.5% (12), with a mean duration of 14.7188 SD 3.039 and a minimum and maximum duration of 10 and 23 weeks, respectively (Table 1).

Figure 1

Age group of Respondent

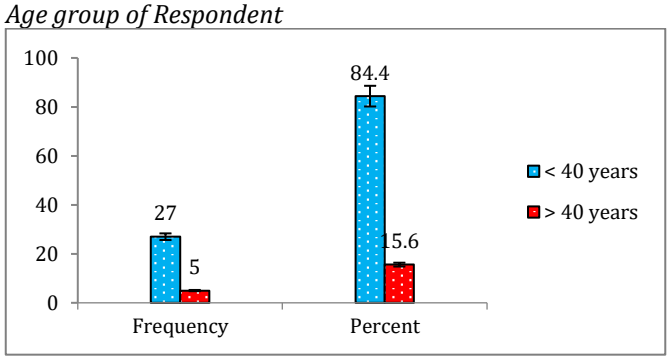

Table 1

Duration of union (Days).

Duration of union (days)	Frequency	Percent
< 15	20	62.50
> 15	12	37.50
Total	32	100.00
Mean=14.7188; SD=3.039; Min= 10.00; Max=23.00		

Results (Table 2) described that 28.10% (9) had a BMI more than 30 kg/m², whereas 71.9% (23) had a BMI below that inception. Similarly, of those who presented, 78.1% (25) had RTA, whereas 21.9% (9), had another form of injury (Table 2).

Table 2

Showing BMI, mechanism of injury and side of fracture (N=32)

BMI		
	Frequency	**Percent**
< 30 kg/m²	23	71.90
> 30 kg/m²	09	28.10
Total	32	100.00
Mechanism of injury		
RTA	25	78.10
Others	7	21.90
Total	32	100
Side of fracture		
Right	21	65.60
Left	11	34.40
Total	32	100

34.4% of patients had a left leg fracture, whereas 65.6% of patients had a right leg tibia fracture (Table 2). 25 percent had great results, 56.3% had fair results, and 18.8% had poor functional results (Table 3). Cross-tabulation of functional outcomes by gender was done. 12.5% of respondents were female, and 87.5% of respondents had good results (Table 4). Beside of these, 61.10% of men and 38.9% of women demonstrated good functional result, whereas 66.7% of men and 33.3% of women had poor functional outcome (*P<0.405*).

Table 3

Showing functional outcomes in term of age groups.

		Functional outcomes			
Variable	**Group**	**Excellent**	**Good**	**Poor**	**Total**
Age	< 40 years	6 75.0	5 88.90	16 83.30	27 84.40
	> 40 years	2 25.00	2 11.10	1 16.70	5 15.60
		8 100	18 100	6 100	32 100
Chi-Square F-vale = 0.816[a] P< 0.665					

In patients with a BMI below 30 kg/m², the cross-tabulation of functional outcome and BMI revealed excellent, good, and poor functional outcomes in 87.5%, 66.7%, and 66.7% of cases, respectively, while in patients with a BMI over 30 kg/m², the results were excellent, good, and poor in 12.5%, 33.3%, and 33.3% of cases, respectively (*P<0.525;* Table 5).

Table 4

Showing functional outcomes in term of gender.

		Functional outcomes			
Variable	**Group**	**Excellent**	**Good**	**Poor**	**Total**
Gender	Male	7 87.50%	11 61.10%	4 66.70%	22 68.80%
	Female	1 12.50%	7 38.90%	2 33.30%	10 31.30%
		8 100	18 100	6 100	32 100
Chi-Square F-vale = 1.810[a] P< 0.405					

However, a cross-tabulation of the functional outcome and fracture type revealed a significantly outstanding functional outcome. 100% of the respondents had a type I fracture, whereas 33.3% had a type II fracture and 66.70% had a type I fracture with a satisfactory functional result (Table 6).

Table 5

Showing functional outcomes in term of BMI.

			Functional outcomes			
Variable	**Group**		**Excellent**	**Good**	**Poor**	**Total**
BMI	< 30 kg/m2	Count	7	12	4	23
		% within Functional Outcome	87.50%	66.70%	66.70%	71.90%
	> 30 kg/m2	Count	1	6	2	9
		% within Functional Outcome	12.50%	33.30%	33.30%	28.10%
		Count	8	18	6	32
		% within Functional Outcome	100	100	100	100
Chi-Square F-vale = 1.188[a] P< 0.525						

The result (Table 6) demonstrated that 33.30% of respondents with bad outcomes had type IIIB fractures, 50.0% had type II fractures, and 16.7% had type I fracture.

Table 6

Showing functional outcomes in term of types of fractures.

		Functional outcomes			
Variable		**Excellent**	**Good**	**Poor**	**Total**
Type of Fractures	Type I	8 100%	12 66.70%	1 16.70%	21 65.60%
	Type II	0 0.0%	6 33.30%	3 50.0%	9 28.10%
	Type IIIB	0 0.0%	0 0.0%	2 33.30%	2 6.30%
	Total	8 100	18 100	6 100	32 100

DISCUSSION

Among the bones fractures, tibial bone fracture is more common in underdeveloped than developed countries[5]. Tibial bone is major weight bearing bone of the lower limbs[12]. There are numerous causes of tibial fractures, including sports like football, rugby, cycling, skating, and others, as well as traffic accidents. However, the frequency of tibial fractures from traffic accidents has decreased as a result of the enforcement of traffic laws and regulations, motor vehicles, and road improvements, among other factors. On the other hand, traffic accidents are the leading cause of tibial fractures in developing nations. These accidents are typically caused by excessive speeding, bad road conditions, heavy traffic on tiny roads, improper traffic signals, and improper enforcement of laws and regulations. It's interesting to note that the World Health Organization's Western Pacific and Southeast Asia areas account for more than half of all traffic-related deaths. In addition to causing injuries and fatalities, traffic accidents have a negative impact on the nation's economy, which accounts for 1% to 1.5% of low- to middle-income nations' GDP. The majority of accident victims are men, and a research conducted in the United States found that 58.2% of them were between the ages of 15 and 55 years. Road conditions, human behavior, and automobiles are some of the elements that contribute to traffic accidents[12]. Simple

safety measures can also save lives. The World Health Organization (WHO) reports that Pakistan has a far higher fatality rate from automobile accidents, with 15.5 fatalities per 100,000. Everyone agrees that external fixation is the best method, especially for grade II and III fractures[13]. However, the main drawbacks include surgical demanding as a procedure, malunion, and pin track infection. Unreamed interlocking tibial nails are crucial for healing tibial fractures if the initial trauma has damaged the periosteal blood flow. It makes rotation, axial alignment, and length control possible. Numerous researchers have examined the results of fixing tibial fractures using the unreamed nailing method[3,7,8]. Using the same fixing method, we examined 32 patients with tibial fractures ranging from grade I to grade IIIB. 25 percent of patients had great results, 56.3% had good results, and 18.8% had bad functional results. The majority of patients with poor results had fractures of the grade II and grade III types, whereas patients with grade I fractures had excellent and good functional results. In contrast to our investigation, this revealed a high unsatisfactory outcome, the study conducted by demonstrated outstanding results in 34.5% of cases, good results in 49.1%, fair results in 10.9%, and poor results in 5.5%. Our findings were not in line with the study's findings of Reference[14], which indicated that 66.7% of participants had great results, 16.7% had good outcomes, and 4.2% had bad outcomes. Besides these, it was observed that the majority of patients with poor outcomes came from low socioeconomic backgrounds; it's conceivable that a dietary shortage contributed to their importance in functional outcomes, similar findings were also reported by [15]. Pakistanis typically have low vitamin D levels, which may have contributed to delayed union and subpar functional results. Three patients with poor functional outcomes presented with severe contamination, which may have caused our results to differ from those of previous research.

CONCLUSION

The study demonstrated that an unreamed nail in an open shaft tibia fracture had an outstanding to good functional result. Patients' age, gender, BMI, and functional outcome all varied statistically.

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