

Original Research Article

Suprapatellar versus infrapatellar approach for intramedullary nailing in tibial shaft fractures

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Received: 09 September 2023

Revised: 04 October 2023

Accepted: 19 October 2023

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ABSTRACT

Background: Tibial shaft fractures accounts about 2% of all adult fractures and it is a common traumatic injury caused by high-energy trauma. The intra-medullary nail fixation either by Suprapatellar approach or Infrapatellar approach has been reported to be a successful surgical procedure for the treatment of proximal tibia fractures. Aim was to compare the clinical and functional outcomes of tibial shaft fractures treated with IMN using the suprapatellar and infrapatellar methods.

Methods: The present prospective comparative study was conducted to compare the clinical and functional outcomes of tibial shaft fractures managed by Suprapatellar or Infrapatellar intramedullary nailing technique. This study was conducted in the Post Graduate Department of Orthopedics in SKIMS, MCH Bemina, Srinagar for a period of 02 years from May, 2020 to May, 2022. A total of 40 patients with tibial shaft fracture were included in the study. The statistical analysis was done using SPSS (Statistical Package for the Social Sciences, SPSS Inc., v.16).

Results: It was observed that the majority of the participants (37.5%) were in 31-40 year's age group, there were male predominance with the male to female ratio 2.33:1. In SP technique excellent results were observed in 80% of the study subjects whereas in IP technique, 70% patients had excellent results.

Conclusions: It is concluded that SP technique shows better results as compared to IP technique in the management of tibial shaft fracture.

Keywords: Infrapatellar approach and functional outcome, Intramedullary nailing, Suprapatellar approach, Tibial fracture, Tibial shaft

INTRODUCTION

The tibia is a large weight-bearing medial bone of the leg. It articulates with the condyles of the femur and the head of the fibula proximally and with the talus and the distal end of the fibula distally. It has an expanded upper end, a smaller lower end, and a shaft.¹ Tibial shaft fractures

account about 2% of all adult fractures and it is a common traumatic injury caused by high-energy trauma.²

A greater grasp of biomechanics, the standard of implants, internal fixation principles, soft tissue care, antibiotics, and asepsis have all contributed to the significant change in the treatment of fractures as a result of advancements in orthopaedics, particularly in

orthopaedic trauma. The intra-medullary nail fixation either by Suprapatellar approach or Infrapatellar approach has been reported to be a successful surgical procedure for the treatment of tibia fractures. This procedure adheres to the idea of biological osteosynthesis and allows for minimally invasive, dynamic fracture fixation and preservation of extra osseus blood supply. Additionally, it provides benefits such as better unionization rates and less wound problems.³⁻⁵

Although several studies have been done in various institutes but no such study has been done in our institution so the present study was performed to compare the clinical and functional outcomes of tibial shaft fractures treated with IMN using the suprapatellar and infrapatellar methods.

METHODS

The present prospective study was conducted to compare the clinical and functional outcomes of tibial shaft fractures managed by Suprapatellar or Infrapatellar intramedullary nailing technique. This study was conducted in the Post Graduate Department of Orthopedics in SKIMS, MCH Bemina, Srinagar for a period of 02 years from May, 2020 to May, 2022. A total of 40 patients with tibial shaft fracture were included in the study after taking informed consent from the study subjects.

Inclusion criteria

Patients aged between 18-65 years, patients with comorbidities and patients with tibial shaft fracture and planned for intramedullary nailing were included.

Exclusion criteria

Patients with pre-existing osteoarthritis of knee, patients with polytrauma, and previous tibial surgery were excluded.

The patients were divided into two groups randomly using odd/even system for IP/ SP technique. A detailed history was collected and thorough clinical examination done. Medically unstable patients were first stabilized and then taken up for surgery. Fracture pattern was classified according to AO classification as well as radiological evaluation was done and Antero-Posterior view, Lateral view and Oblique views were taken to study the anatomy of fracture. Prophylactic antibiotics (cefuroxime 1.5gm) were given 15-20 minutes before surgery. Different operative procedures were performed using standard techniques including suprapatellar nailing technique and infrapatellar nailing technique. All the patients were followed up regularly at 2 weeks, 6 weeks, 12 weeks, and every six months for 1 year. At each visit patients were assessed for range of motion, anterior knee pain, union, shortening and rotational alignment and the results were evaluated using John Wruh’s Criteria. The

data was collected with the help of a structured clinical proforma.

The statistical analysis was done using SPSS (Statistical Package for the Social Sciences, SPSS Inc., v.16). The descriptive statistics were calculated as frequency and percentage for categorical data and as mean and standard deviation for continuous data.

RESULTS

Table 1 depicts that majority of the participants (37.5%) were in 31-40 year’s age group, followed by 12 (30%) participants in 41-50 year’s age group and 09 (22.5%) in 51-60 year’s age group.

Table 1: Age distribution.

Age group (years)	Frequency	Percent
18-30	3	7.5
31-40	15	37.5
41-50	12	30.0
51-60	09	22.5
61-70	1	2.5
Total	40	100.0

Table 2: Gender distribution.

Gender	Frequency	Percent
Male	28	70.0
Female	12	30.0
Total	40	100.0

Table 2 depicts that there were 28 (70%) males and 12 (30%) females in the study.

Figure 1 depicts that most common mode of injury was RTA 23(57.5%) followed by fall in 15 (37.5%) patients.

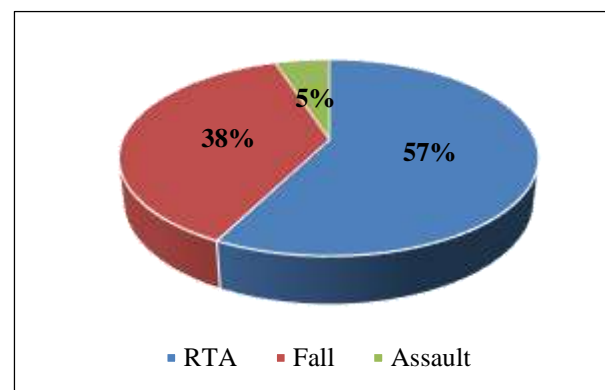


Figure 1: Mode of injury.

The most common type of fracture was closed fracture in 20 (58%) patients followed by open type 2 in 14 (35%) patients and open type 1 in 6 (15%) patients (Figure 2).

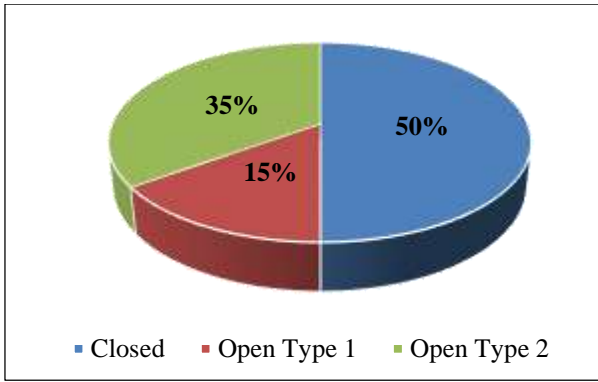


Figure 2: Type of fracture.

Table 3 depicts that in our study, 22 (55%) fractures were on left side and 18 (45%) fractures were on right side.

Table 3: Side of fracture.

Side of fracture	Frequency	Percent
Left	22	55.0
Right	18	45.0
Total	40	100.0

In our study the most common associated injury was fracture of fibula found in 23 (57.5%) patients whereas 16 (40.0%) have not reported any associated injury (Table 4).

Table 4: Associated injury.

Associated injury	Frequency	Percent
Nil	16	40.0
Fracture fibula	23	57.5
Fracture fibula and DER	1	2.5
Total	40	100.0

In our study, 20 (50%) participants were treated with SP technique and 20 (50%) with IP technique.

Table 5: Union time (in weeks).

Fracture union time (in weeks)	Technique		Total
	SP	IP	
10-15	2 10%	0 0%	2 5%
16-20	16 80%	15 75%	31 77.5%
21-25	1 5%	3 15%	4 10%
26-30	1 5%	2 10%	3 7.5%
Total	20 100.0%	20 100.0%	40 100.0%

Table 5 shows the association between techniques used and fracture union time. In SP technique, 16 (80%)

patients had fracture union time between 16-20 weeks and 02 (10%) patients had fracture union time between 10-15 weeks whereas in IP technique, 15 (75%) patients had fracture union time between 16-20 weeks followed by 3 (15%) patients in 21-25 weeks.

Table 6 shows that in SP technique, 15 (75%) patients didn't report any complication whereas knee stiffness was reported among 2 (10%) patients, Knee pain in 2(10%) patients and non-union in 1 (5%) patient. Whereas, in IP technique, 13 (65%) didn't report any complications, knee stiffness among 2 (10%) patients, knee pain in 1 (5%) patient, non-union in 2 (10) patients, Infection and ankle stiffness among 2 (10%) patients.

Table 6: Complications.

Complications	Technique		Total
	SP	IP	
Nil	15 75%	13 65%	28 70%
Knee stiffness	2 10%	2 10%	4 10%
Knee pain	2 10%	1 5%	3 7.5%
Non-union	1 5%	2 10%	3 7.5%
Infection	0 0%	1 5%	1 2.5%
Ankle stiffness	0 0%	1 5%	1 2.5%
Total	20 100.0%	20 100.0%	40 100.0%

In SP technique excellent clinical results were observed in 16 (80%) followed by good results among 3 (15%) patients and 1(5%) patient had fair results whereas in IP technique, 14 (70%) patients had excellent results followed by good results among 4 (20%) patients and fair results in 2 (10%) patients. In SP technique better clinical results were observed as compared to IP technique as presented in Table 7.

Table 7: Clinical outcome.

Clinical results	Technique		Total
	SP	IP	
Excellent	16 80%	14 70%	30 75%
Good	3 15%	4 20%	7 17.5%
Fair	1 5%	2 10%	3 7.5%
Total	20 100.0%	20 100.0%	40 100.0%



Figure 3: Pre-op radiograph showing distal tibia fracture.



Figure 7: Post-operative radiograph after supra-patellar technique.



Figure 4: 3 weeks follow up of patient operated with infrapatellar technique.



Figure 8: Radiograph at final follow up after removal of hardware.



Figure 5: At 1 year follow up of patient showing union of fracture site.



Figure 6: Pre-op radiograph showing fracture shaft of tibia.

DISCUSSION

The data was collected, analyzed and discussed with previously available literature. In our study majority of the participants (37.5%) were in 31-40 year's age group, there were male predominance with the male to female ratio 2.33:1. The results are correlated with the study conducted by Kriohlavek et al, (2018) reported that the mean age of the study participants was of 49.6 ± 16.7 years and most of the subjects were males.⁶ Similarly, Loganathan et al, (2021) found male predominance and the mean age of the study participants was 45 years.⁷

It was observed that the commonest mode of injury was RTA 57.5%, the most common type of fracture was closed fracture in 58% and the most common associated injury was fracture of fibula found in 23 (57.5%). The findings of present study are consistent with the study conducted by Sarkar UK (2022) found that road traffic accidents were the most common mode of injury-causing tibial shaft fractures (83.33%), the right side was affected in most of the patients (54.16%) and 75% fractures were close fractures (75%), and 25% fractures were open fractures.⁸ In similar study conducted by Mohammad et al, (2021) observed that most common mode of injury was road traffic accidents (80.64%).⁹

In our study, 50%-50% participants were treated with SP technique and with IP technique. In SP technique, 80%

patients had fracture union time between 16-20 weeks whereas in IP technique, 75% patients had fracture union time between 16-20 weeks. Further, in SP technique excellent results were observed in 80% of the study subjects whereas in IP technique, 70% patients had excellent results. The results are in accordance with the study conducted by Kriohlavek et al, (2018) found excellent or a good result in 45 patients (91.8%), a satisfactory result in three patients (6.2%), and a poor result in one patient (2%).⁶ Similarly, Kadam et al, (2019) observed that among 30 patients; there was 20 excellent, 8 good, 2 fair results. The reported average time taken for radiological union was 18.2 weeks.¹⁰

Some limitations are acknowledged in our study. Firstly, the present study is limited by its small sample size. Further, duration of follow up was limited to 6 months and therefore longer-term benefits or risks have not been reported in this study.

CONCLUSION

The present comparative study concluded that SP technique shows better results as compared to IP technique in the management of tibial shaft fracture.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Lone AH, Rather AA, Bhat AN, Maajid S, Khan K. Suprapatellar versus infrapatellar approach for intramedullary nailing in tibial shaft fractures. *Int J Res Med Sci* 2023;11:4072-6.