https://doi.org/10.37723/jumdc.v14i3.724

J. Univ. Med. Dent. Coll.2023;Vol.14(3):683-686
ISSN (Print) 2221-7827, ISSN (Online) 2310-5542
https://www.jumdc.com

Original Article

Open Access

Frequency of interior knee joint pain after interlocking intermedullary nailing for fracture tibia shaft

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ABSTRACT

BACKGROUND & OBJECTIVE: Tibial shaft fracture treatment with intermedullary nailing is very common these days. In the current study, our objective was to determine the percentage of patients with anterior knee pain following tibial shaft fracture treatment with interlocking intermedullary nailing.

METHODOLOGY: Our research design was a Descriptive cross-sectional study. The study duration was approximately one year (03-3-2020 to 3-3-2021). The study was conducted at the orthopedics department of CMH Muzafarrabad. A sample of 125 participants was calculated. All patients underwent interlocking intermedullary nailing. We analyzed data using SPSS version 24. p-value less than 0.05 was considered statistically significant for result authenticity.

RESULTS: In the present study 125 patients were included.Mean age of patients was 42.4±8.6SD years.Among all the patients, 82(65.6%) reported no pain while 43(34.4%) reported pain. Visual analogue scale showed mean pain scores 3.22±2.5SD and lysholm scores were 80.74±3.28SD ($p \leq 0.000$ and $p \leq 0.000$, respectively).

CONCLUSION: Tibial shaft fractures are common these days. A relatively high incidence of anterior knee pain following intermedually nailing after tibial shaft fracture was found in our study.

KEYWORDS: Shaft fracture, Tibia, Pain, Intermedullary nailing.

INTRODUCTION

Tibial shaftfracture treatment with intermedullary nailing is very common these days[1]. In last few decades, we observed a very high incidence of tibial shaft fractures that is around 16.9/100,000 in developing populations[2]. Evidence suggests that 30-40 years of age is very common in females to have these fractures; however, in males, 10-20 years of age is reported as most common age duration for getting tibial shaft fractures [3]. Intermedullary nailing is associated with various complications, including deep venous thrombosis, bone non-union, infection, thermal necrosis etc [4].

Intermedullary nailing of tibial shaft usually results in anterior knee pain as a common complication. An estimated 86% of patients undergoing intermedullry tibial shaft nailing reported anterior knee pain[5]. Several factors contribute to anterior knee pain, including the size of tibial platue, skin incision, gender, destruction of intra-articular structures and existence of implants in medullary cavity. Daily activities of life are affected by anterior knee pain in a normal population. Evidence exists that strength deficiencies of knee reflexes are associated with anterior knee pain. In addition, this kind of knee pain is associated with a high frequency of hospitalization[6].Anterior knee pain at the insertion site is the most common complication of intermedullary nailing in 10-87% of patients[7]. This pain might be due to patella tendon, intra-articular structure violation, Hoffa's fat pad violation, nail diameter, and nail prominence[8].

How to cite this: *Khan SH, Raza MS, Ara Iaffat, Wani R, Mehmood K. Frequency of interior knee joint pain after interlocking intermedullary nailing for fracture tibia shaft. Journal of University Medical & Dental College. 2023;14(3):683-686.*

At the local level, we found very limited studies on this topic, so it was very important to conduct study. In the current study, our objective was to determine the percentage of patients with anterior knee pain following tibial shaft fracture treatment with interlocking intermedullary nailing. Intermeduallry nailing in tibial shaft fractures is a very effective procedure. However, this study will help surgeons to understand knee pain following intermedullary nailing. After understanding postoperative pain frequency surgeons will be able to manage surgical outcomes properly.

METHODOLOGY

We conducted an observational cross-sectional study at the orthopedics department of CMH Muzafarrabad. Our study duration was one year(03-3-2020 to 3-3-2021). In this study, the WHO calculator was used for sample size calculation (P=19[6], 95% Confidence interval, margin of error 7%); however, the sample size was rounded off to 125 patients. Ethical concerns were approved by CMH hospital (Ref No: Ethical Committee/DME: 363) and consent was taken from all patients. Inclusion criteria was based on patients who require tibial shaft fracture treatment with inter-locking intermedullary nailing, age 18-70 years and both genders. Exclusion criteria was based upon systemic diseases, including cardiovascular disorders, Diabetes mellitus (Type I and Type II), Acute liver function diseases, pulmonary diseases, lactating mothers and pregnant women.

Patients were positioned in supine position for intermedullary nailing of tibial shaft. The patient was given a longitudinal incision (4-6 cm) proximal to patella superior pole,and another 2-4 cm incision was given to patient.After the midline incision quadriceps tendon was splited longitudinally. A cannula device was inserted into knee through the distal part of femur troclea and patella articular surface. This device had a very protective sleeve and blunt trocar.

After this process, for cannula stabilization 2nd pin was inserted with distal part of femur. Following this step, another 3.2 mm guide pin was inserted at joint section of tibial articular surface and tibial cortex anteriorly. This guide pin is then further advanced (8-10 cm) in proximal part of tibial. In next step inner centering sleeve removal is done. In last step surgeon reduced fracture and guide wire (ball tipped) is crossed centrally towards physeal scar of distal tibia. In the end, incremental reaming is done. An appropriately sized tibial nail is inserted. Nail positions were confirmed through radiographic findings. Interlocking of distal screws was done through freehand technique. At last, incisions were closed. Patients were followed for anterior knee pain. In the current study, pain as an outcome was measured using the VAS scoring system and Lysholm knee scoring system [9]. The data analysis process was conducted in SPSS software (version 24). Data was analyzed in terms of frequency/percentages, mean, and standard deviation calculation. Statistical tests (t-test and pearson's chi-square) were applied. We considered p≤0.05 as a statistically significant value.

RESULTS

In the present study 125 patients were included. Among all the participants, 62(49.6%) were male and 63(50.4%) were female. Patients were divided into two age groups; the 18-40 years age group had 53(42.4%) patients, and 41-65 years age group had 72(57.6%) patients. Mean age of patients was 42.4±8.6SD years. Among all the patients, 84(67.2%) patients had unilateral fractures, while 41(32.8%) had bilateral fractures. In present study, 56(44.8%) patients had open fractures, and 69(55.2%) had closed fractures. We found duration of fracture ≤ 1 week in 67(53.6%) patients and 58(46.4%) had duration of fracture >1 week. We found fracture level at upper 1/3 in 42(33.6%), middle 1/3 in 52(41.6%) and lower 1/3 in 31(24.8%).

Among all the patients, 82(65.6%) reported no pain while 43(34.4%) reported pain. Among all the patients, 82(65.5%) did not report any pain intensity, while 18(14.4%) reported low to moderate intensity, and 25(20%) reported worse pain intensity,as shown in table-I.

Table-I: Frequency distribution of pain and pain intensity.

Pain	n(%)	Pain Intensity	n(%)
No	82(65.6)	No (0-3 scores)	82(65.5)
Yes	43(34.4)	Low-Moderate (4-6 scores)	18(14.4)
		Worse (>7 scores)	25(20)

Table-II: Pain measurement using visual analogue scale and Lysholm scale.

Pain measurement scale	n	Mean±SD	Confidence interval		p-vlaue
Visual analogue scale	125	3.22±2.53	2.77	3.67	≤0.001
Lysholm scores	125	80.74±3.28	80.16	81.32	≤0.001

The visual analogue scale showed mean pain scores 3.22±2.5SD and lysholm scores were 80.74±3.28SD (p≤0.000 andp≤0.000, respectively) as shown in table-II. Gender and age showed insignificant association with anterior knee pain (p=0.381 and p=0.639,respectively). Patients with closed fractures are more prone to have pain as compared to open fractures (24.8% vs9.6%, p=0.006). Unilateral fracture patients are more likely to have pain as compared to those who had bilateral fracture (27.2% vs 7.2%, p=0.004). Fracture level also showed a significant association with anterior knee pain (p=0.041), as shown in table-II.

Table-III: Anterior knee pain association with independent variables.

Gender	Anterior knee Pain		Total n(%)	p-value
	No n(%)	Yes n(%)		
Male	43(34.4)	19(15.2)	62(49.6%)	0.381
Female	39(31.2)	24(19.2)	63(50.4%)	
Age				
18-40 years	36(28.8)	17(13.6)	53(42.2%)	0.639
41-65 years	46(36.8)	26(20.8)	72(57.6%)	
Fracture type				
Open	44(35.2)	12(9.6)	56(44.8%)	0.006
Closed	38(30.4)	31(24.8)	69(55.2%)	
Laterality				
Unilateral	50(40)	34(27.2)	84(67.2%)	0.04
Bilateral	32(25.6)	9(7.2)	41(32.8%)	
Fracture level				
Upper 1/3	24(19.2)	18(14.4)	42(33.6%)	
Middle 1/3	42(33.6)	10(8)	52(41.6%)	0.009
Lower 1/3	16(12.8)	15(12)	31(24.8%)	
Total	82(65.6)	43(34.4)	125(100%)	

DISCUSSION

Intermedullary nail fixation is a very common treatment for tibial shaft fracture displacement [10]. This process had high efficacy for fracture tibial rotation, bone alignment, osseous union, and bone length restoration [11]. It also results in low surgical dissection and blood supply maintenance [12]. During this process, tibial shaft fractures result in early post-surgical mobilization and stabilization of fractures [13].

In current research, anterior knee pain was reported in 35.8% of patients. However, a similar study reported anterior knee pain as a complication of intermedually nailing in 45% of tibial shaft fracture patients [14]. Another relevant study reported a frequency of anterior knee pain of 40% following bending strains, reflex knee inhibition, saphenous nerve injuries, several damages to intracrticular structures, and muscular weakness [15].

In our research, Visual analogue scale showed mean pain scores of 3.22±2.5SD, and lysholm scores were 80.74±3.28SD (p=0.000 and p=0.000 respectively). Evidence exists that intermedullary nailing is followed by a high incidence of low VAS scores [16]. A similar study reported that lyshlom pain scores were 86.3±4.4 after intermedullynailing [17]. Bishop et al. reported that 29% of patients had anterior knee pain following intermedually nailing after 8 years of tibial shaft fracture surgery [18].

We found a significant association in fracture type, its level, and laterality with anterior knee pain. Similar studies reported that patients with open fractures and bilateral fracture are more prone to develop anterior knee pain [19,20]. Hansen et al. reported that patients with upper 1/3 level fractures are more prone to develop high pain intensity, similar to our findings [21]. Another similar study reported a high incidence of anterior knee pain 42% to 50%, due to nail prominence and its location proximal 3rd distance (tibia plateau to tuberosity). The process did not indicate any difference in muscle strength, low knee scoring, and function tests. Moreover, no relationship was reported between extensor strength and the occurrence of anterior knee pain [22].

Limitation: Cross-sectional study design is not able to cover all the minor details of the study. There is a need to conduct Randomized clinical trials with multiple follow-ups on knee joint pain followinginterlocking intermedullary nailing.

CONCLUSION

Tibial shaft fractures are common these days. A relatively high incidence of anterior knee pain following intermedually nailing after tibial shaft fracture was found in our study.

ACKNOWLEDGEMENT: None.
CONFLICT OF INTEREST: None.
GRANT SUPPORT AND FINANCIAL DISCLOSURE: None.

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Authorts' Contribution:

Shaukat Hayat Khan: Substantial contributions to the conception of the work.
Muhammad Shahbaz Raza: Reviewing it critically for important intellectual content.
Iffat Ara: Acquisition of the work.
Rehan Wani: Drafting the work.
Khalid Mehmmod: Analysis and interpretation of data for the work.

Submitted for publication: 25-02-2022
Accepted after revision: 22-08-2023