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STUDY THE FUNCTIONAL OUTCOMES OF PROXIMAL THIRD TIBIA FRACTURES TREATED BY SUPRAPATELLAR NAILING

Orthopaedics

Dr. Ayush Sethi Junior Resident, Department Of Orthopedics, Dr. D.Y. Patil Medical College Hospital & Research Institute, Kolhapur

Dr. P.G. Kulkarni* Professor, Department Of Orthopedics, Dr. D.Y. Patil Medical College Hospital & Research Institute, Kolhapur *Corresponding Author

ABSTRACT

Introduction- Proximal third tibia fractures pose significant challenges in orthopedic trauma management due to their complex anatomy and biomechanical demands. suprapatellar nailing has emerged as a promising technique for addressing these fractures. Suprapatellar nailing in the semi extended position has recently been suggested as a safe and effective surgical technique. This technique allows establishment of an appropriate starting/entry point and semi extended position facilitates the fracture reduction of apex anterior deformity. Understanding the functional outcomes, including pain levels, range of motion, return to pre-injury activities, and patient satisfaction, is crucial for guiding treatment decisions and optimizing patient care. Therefore, this study is aimed to fill this gap in the literature by comprehensively evaluating the functional outcomes of proximal third tibia fractures treated with suprapatellar nailing. **Methodology-** The present study was conducted at tertiary care hospital, Kolhapur. Patients of the age 18 years and above having closed and open proximal tibia fracture who were satisfying inclusion criteria were taken up for study. Functional outcome assessment by Lysholm scoring system done at 3month and 6month. **Result-** The results indicate that suprapatellar nailing is an effective surgical intervention for these fractures, leading to significant improvements in knee function and mobility within a six-month period. The research included 30 male patients with a mean age of 46.33 years. The Lysholm score at three months indicated 56.67% of patients had a fair score, whereas by six months, 50% achieved a good score, and 30% an excellent score. Comparative analysis of Lysholm scores showed significant improvements in pain, swelling, limp, locking sensation, instability, stair climbing, and squatting from three to six months. The total Lysholm score increased from 73.10 to 89.30, reflecting substantial functional recovery. **Conclusion-** This study contributes valuable insights into the postoperative recovery trajectory and underscores the need for continued research to optimize treatment protocols and enhance patient care. Further research with larger, more diverse populations and longer follow-up periods is necessary to validate these findings and explore long-term outcomes and potential complications.

KEYWORDS

Proximal third tibia fractures, supra-patellar nailing,

INTRODUCTION

Proximal third tibia fractures pose significant challenges in orthopedic trauma management due to their complex anatomy and biomechanical demands. Among the various treatment modalities available, suprapatellar nailing has emerged as a promising technique for addressing these fractures. There has been a rising incidence in the proximal third tibia fractures due to the increasing trend in the high velocity motor vehicle accidents. Extra-articular proximal tibia fractures account for 5-11% of all tibia fractures. 1-2 Tibial fractures can be managed conservatively or surgically. There are a variety of surgical treatments available for tibia fractures such as Plating, internal fixation and external fixation. Intramedullary nailing has been considered the gold standard for the treatment of tibial shaft fractures, because it can provide good fracture reduction, fixation and stability and allows early mobilization. 3 Intramedullary nailing (IMN) is traditionally a popular surgical procedure used in the treatment of tibial shaft fractures since it is minimally invasive and allows for early functional rehabilitation. 4 Suprapatellar nailing in the semi extended position has recently been suggested as a safe and effective surgical technique. This technique allows establishment of an appropriate starting/entry point and semi extended position facilitates the fracture reduction of apex anterior deformity. Suprapatellar approach using a midline quadriceps tendon insertion site was developed by Cole et al. 5 Despite the increasing adoption of suprapatellar nailing, there remains a paucity of literature regarding its functional outcomes in the context of proximal third tibia fractures. Understanding the functional outcomes, including pain levels, range of motion, return to pre-injury activities, and patient satisfaction, is crucial for guiding treatment decisions and optimizing patient care. Therefore, this study is aimed to fill this gap in the literature by comprehensively evaluating the functional outcomes of proximal third tibia fractures treated with suprapatellar nailing. By elucidating the clinical efficacy and patient-reported outcomes associated with this surgical technique, I seek to provide valuable insights that can inform evidence-based treatment strategy and improve the overall management of these challenging fractures.

Types Of Proximal Tibia Fractures

Schatzker Classification 6 Schatzker et al. (1979) introduced a morphological classification system based on anteroposterior radiographs, identifying six categories of fractures, spanning from straightforward split fractures to intricate fractures. Type 1: lateral split fracture, 2: lateral split-depressed fracture, 3: central/lateral pure depression fracture, 4: medial condyle fracture, 5: bicondylar fracture, 6: metaphyseal-diaphyseal association.

AO/OTA classification of proximal tibia fractures.

This descriptive classification has gained worldwide acceptance and has been adopted by the AO/OTA (Arbeits gemeinschaft für Osteosynthesefragen/Orthopedic Trauma Association) for their comprehensive classification in 1990. The AO/OTA classification system categorizes proximal tibia fractures based on their morphology and severity. Here's a simplified breakdown of the classification: 7

Type A: Extraarticular Proximal Tibial End Segment Fracture

A1: proximal tibial avulsion fracture, A1.1 capsular attachment avulsion: lateral (Segond fracture)/medial, A1.2 tibial tuberosity avulsion (patella tendon), A1.3 tibial spine fracture: anterior/posterior, **A2:** simple extraarticular proximal tibial fracture, A2.1 spiral proximal tibial fracture, A2.2 oblique proximal tibial fracture, A2.3 transverse proximal tibial fracture,

The AO/OTA classification system helps surgeons to better understand the nature of proximal tibia fractures and guides treatment decisions based on the specific characteristics of the fracture. 8

AO/OTA classification of proximal tibia fractures. A- extra-articular fracture. A1 avulsion. A2- extraarticular simple. A3- extraarticular, wedge, or multifragmentary. B- partial articular fracture. B1- pure split. B2- pure depression. B3- split-depression. C- complete articular fracture. 8

Diagnosis Of Proximal Tibia Fractures

An integral aspect of diagnostic procedures involves examining and assessing the extent of soft tissue damage, whether the injury is open or closed. This evaluation, as classified by Tscherne and Oestern, serves as a crucial step in planning subsequent treatment strategies. 9 Conventional X-ray imaging of the knee joint and proximal lower leg, captured in anterior-posterior and lateral planes, typically enables prompt assessment of the fracture type. However, computed tomography (CT) offers the most comprehensive depiction of the fracture in all dimensions and is therefore recommended for more intricate fractures. Furthermore, the use of two-dimensional (2D) and three-dimensional (3D) reconstructions enhances the accuracy of

classification and aids in planning therapeutic interventions. 10

In cases of knee dislocations where arterial injuries are suspected or when the ankle-brachial index (ABI) measures less than 0.9, angiography, including CT angiography, becomes imperative. This is because even patients with a seemingly intact pulse status exhibit intimal lesions in approximately 9% of instances, as demonstrated by Howells et al. 11 In conventional X-rays, identifying barely dislocated edge fragments in ligament trauma can be challenging. In such cases, MRI (magnetic resonance imaging) proves to be valuable. MRI allows for the identification of the impact zone, often termed a "bone bruise," which signifies edema beneath the cartilage layer, even with undislocated fragments. Additionally, MRI facilitates the assessment of intra- and extraarticular soft tissue structures such as menisci, cruciate, and collateral ligaments. It expands the diagnostic capabilities in cases of uncertainty, especially since evaluating knee joint stability during the initial phase is often impractical from a clinical standpoint. Moreover, studies have indicated that MRI enhances interobserver agreement on fracture classification and aids in the operative management of tibial plateau fractures. 12

Treatment 8 There are three aims in the therapy of proximal tibial fractures: **Reconstruction of the joint surface:** It is crucial to restore the tibial joint surface as precisely as possible following injury or fracture. Failure to achieve even levels of the joint surface may result in increased impact forces and accelerated erosion, potentially leading to secondary osteoarthritis. This risk is particularly heightened in areas of maximum weight bearing where there is no meniscal cover. **Early mobilization:** Extended immobilization of the joint leads to a decline in cartilage nutrition, which is already compromised. Prolonged immobilization can also result in arthrofibrosis, a condition characterized by the excessive formation of scar tissue within the joint, further limiting its range of motion and function.

Surgical Treatment: Internal Fixation: Surgical fixation may be necessary for displaced or unstable fractures. Internal fixation methods include the use of plates and screws, intramedullary nails, or external fixators. The choice of fixation method depends on factors such as fracture pattern, bone quality, and surgeon preference.

Joint Reconstruction: In cases of severe articular involvement, joint reconstruction procedures such as open reduction and internal fixation (ORIF), arthroplasty, or joint-sparing techniques may be considered to restore joint congruity and function.

Soft Tissue Management: Soft tissue injuries associated with proximal tibia fractures require careful management. Surgical exploration and repair of damaged soft tissues, including the menisci, ligaments, and neurovascular structures, may be necessary to optimize outcomes and reduce the risk of complications such as compartment syndrome or vascular compromise.

Rehabilitation: Regardless of the treatment modality, rehabilitation plays a crucial role in the recovery process. Physical therapy aims to restore the range of motion, strength, and function of the affected limb. Early mobilization and weight-bearing as tolerated are often encouraged to prevent stiffness and muscle atrophy. **Complications Management:** Proximal tibia fractures are associated with potential complications such as infection, malunion, nonunion, post-traumatic arthritis, and compartment syndrome. Close monitoring and timely intervention are essential to address any complications that may arise during the course of treatment.

Suprapatellar nailing technique Suprapatellar nailing is a surgical technique used for the fixation of certain types of fractures of the tibia. It involves the insertion of an intramedullary nail (IM nail) through a suprapatellar approach, meaning the nail is inserted through a small incision made above the patella (kneecap) rather than through the knee joint itself. As Sanders et al. reported, Dean Cole was the first who advocate a suprapatellar approach using a midline quadriceps tendon insertion. 13 This method enables intramedullary nailing in a semi extended knee position, addressing challenges associated with reducing fractures in a 90-degree flexion, which can lead to subsequent fragment misalignment. It simplifies the maintenance of fracture reduction and facilitates radiographic imaging. 14

Indications For Suprapatellar Nailing Of Tibia

A proximal tibial fracture situated solely within the metaphysis, categorized under AO/OTA classification 41-A2 and A3, is a typical indication for suprapatellar nailing of the tibia. [figure 5] The primary advantage of intramedullary nailing in a semi-extended position is the enhancement of postoperative fracture alignment. Optimal fracture reduction is attainable in almost every instance through positioning the limb in slight flexion. Another advantage of the semi-extended position for tibial nailing is that it simplifies intraoperative fluoroscopic monitoring. 15-16

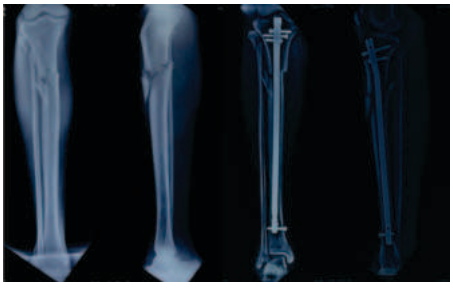


Figure 5. Metaphyseal extra-articular proximal tibia fracture treated with suprapatellar nail (AO 41-A3). 31

Another reason to consider suprapatellar nailing of the tibia is when there is a fracture accompanied by a skin lesion or significant soft tissue damage in the infrapatellar region. By positioning the suprapatellar skin incision away from the site of soft tissue trauma, the risk of secondary trauma due to surgical access is minimized, which supports fracture healing. In such cases, the location of the fracture becomes less significant for considering suprapatellar nailing. 17 [Figure 6a and 6b]

Figure 6a. Infrapatellar soft tissue damage in a tibia fracture. 31

Figure 6b. Suprapatellar approach with adequate distance from the skin defect 31

The Technique Of Suprapatellar Nailing Of The Tibia

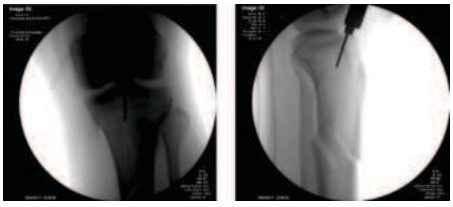
Before surgery, the patient undergoes a thorough evaluation, including clinical examination, imaging studies (such as X-rays or CT scans), and assessment of overall health status to determine the best course of treatment. The injured leg is positioned on the operating table with the knee bent to about 20^0.

Figure 7. Positioning of patient [31]

The suprapatellar approach begins with a 3–5 cm skin cut originating from the upper border of the patella and extending upward. Following this, a longitudinal split is made in the quadriceps tendon, facilitating the smooth insertion of the trocar into the space behind the patella. A K-wire/guide wire is inserted through the trocar at the determined entry site, following the guidelines provided by McConnell et al. (Fig. 8a).

According to their recommendations, the entry point is chosen under radiographic supervision, positioned precisely medial to the lateral intercondylar tubercle in the coronal plane, and situated precisely at the ventral edge of the joint surface in the sagittal plane. Fluoroscopy is used to verify the accuracy of placement. 18

Figure 8. a. Trocar System Inserted By The Suprapatellar Approach.



B And C. Fluoroscopic control of guide wire positioning to obtain the correct entry point. 17

Access to the intramedullary canal is achieved using a one-step reamer inserted through the guide wire. Subsequently, an extra-long reamer is utilized to prepare the medullary canal for the insertion of the nail. Similar to the process in the infrapatellar technique, the appropriate nail length is determined. Damage to the articular surfaces of the knee joint, especially patellofemoral joint, while entering the joint through this approach cannot be ignored , therefore , to safeguard the cartilage of the patellofemoral joint, the external part of the trocar system, which comprises a protection sleeve, remains within the joint during the nail insertion procedure. The nail placement and interlocking procedure are conducted like the infrapatellar technique. However, particular emphasis should be placed on ensuring the correct depth of nail insertion. Like the infrapatellar technique, the depth of nail insertion can only be adequately monitored using fluoroscopy. 17

Figure 9. Suprapatellar Nail Insertion Via The Trocar System. 17

Functional Outcomes 19-20

The functional outcomes of the suprapatellar approach in proximal third tibia fractures depend on various factors including the severity of the fracture, surgical technique, patient characteristics, and postoperative rehabilitation. However, generally speaking, the suprapatellar approach offers several potential advantages:

Improved Fracture Visualization: The suprapatellar approach provides better visualization of the fracture site, which can lead to more accurate reduction and fixation of the fracture fragments. Reduced Soft Tissue Trauma: By avoiding extensive dissection of the soft tissues around the knee joint, the suprapatellar approach may result in reduced soft tissue trauma, potentially leading to faster recovery and fewer complications related to soft tissue damage.

Preservation Of Patellar Tendon: Since the approach does not involve manipulation or retraction of the patellar tendon, there is a lower risk of patellar tendon injury or dysfunction.

Improved Knee Function: Patients treated with the suprapatellar approach may experience better preservation of knee function due to reduced disruption of the extensor mechanism and surrounding soft tissues. Faster Rehabilitation: With potentially less soft tissue trauma and disruption of the extensor mechanism, patients may experience faster rehabilitation and return to activities of daily living.

Methodology

The present prospective as well as retrospective observational longitudinal study was conducted in department of Orthopaedics in Dr. D.Y. Patil Medical College, Hospital & Research Institute, Kolhapur from August 2022 to July 2024 after institutional ethical committee approval. A total of 30 patients satisfying the below inclusion and exclusion criteria were involved in the study. **Inclusion criteria** All adults aged 18 years and above, Proximal third tibia fractures, Comminuted fractures, Proximal tibia fracture associated with metaphyseal and diaphyseal extension. **Exclusion criteria** Previous knee surgery, Patella fracture, External wound at entry (operative)site, Partial and complete intraarticular fractures.

Sample size Minimum 30 subjects, fulfilling the inclusion criteria were included in the study. Sample size calculation was based on the annual prevalence of the condition in our centre which was 5 %. **Source of data:** Patients of the age 18 years and above having closed and open proximal tibia fracture who were satisfying inclusion criteria were taken up for study after obtaining their written informed valid consent. 30 patients of proximal third tibia fracture treated with suprapatellar nailing were included in the study **Collection of data:** For patients presenting with fracture of proximal tibia are as follows: Prior written informed valid consent was taken for inclusion in the study. Evaluation of X-rays within 48 hrs postoperatively. Follow up at 3 months and 6 months for functional outcome assessment. **Duration of study**: 2 years (from 2022 to 2024) **Outcome measurement** Radiological outcome was assessed by X-ray radiographs taken within 48 hrs post-operatively. Functional outcome assessment by Lysholm scoring system done at 3month and 6month.

RESULTS

Age: The mean age of the study subjects was 46.33±14.32 years. Participants aged 22-30 years comprised 6 individuals, accounting for 20.00% of the total population. The 31-40 years age group included 4 participants, representing 13.33%. The largest group was aged 41-50 years, with 10 participants, making up 33.33% of the population. The 51-60 years age group had 4 participants (13.33%), while those aged 61-70 years included 5 participants (16.67%). The oldest age group, those over 70 years, consisted of 1 participant, representing 3.33% of the total. The distribution of subjects according to age is shown in Table 1 and Figure 1.

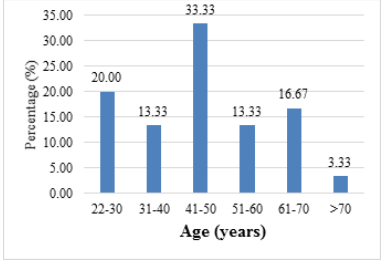


Figure 1. Distribution Of Subjects According To Age

Sex In this study, all patients were male (n=30, 100%).

Mode of injury Road traffic accidents were the most common mode of injury, affecting 24 participants, which accounted for 80.00% of the total population. Falls were the second most common, involving 5 participants, or 16.67% of the population. Assaults were the least common mode of injury, reported by 1 participant, making up 3.33% of the total. The distribution of subjects according to mode of injury is shown in Table 3 and Figure 3.

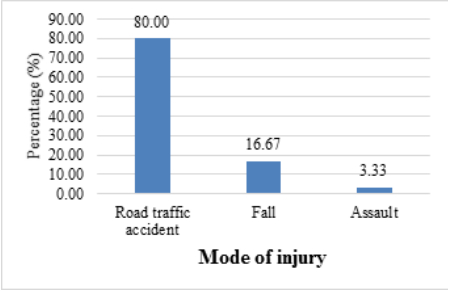


Figure 2. Distribution Of Subjects According To Mode Of Injury.

Intraoperative assessment The mean duration of procedure was 90.11±10.30 minutes whereas, the mean blood loss intraoperatively was 105±20ml. **Postoperative pain assessments using Lysholm score** At 3 months, none of the 30 patients (0.00%) reported no pain in the knee, while 6 patients (20.00%) experienced slight pain during vigorous activities. Additionally, 16 patients (53.33%) reported marked pain during vigorous activities, and 8 patients (26.67%) experienced pain when walking more than one mile. By 6 months, there was a noticeable improvement in pain levels. Nine patients (30.00%) reported no pain in the knee, and 15 patients (50.00%) experienced only slight pain during vigorous activities. The number of patients reporting marked pain during vigorous activities decreased to 6 (20.00%), and none of the patients (0.00%) reported pain when walking more than one mile.

Table 3. Postoperative Pain Assessments Using Lysholm Score

Pain	3 Months		6 Months	
	No of Patients	Percentage	No of Patients	Percentage
No Pain In Knee (25)	0	0.00%	9	30.00%
Slight Pain During Vigorous Activates (20)	6	20.00%	15	50.00%
Marked Pain During Vigorous Activates (15)	16	53.33%	6	20.00%
Pain on Walking More than one Mile (10)	8	26.67%	0	0.00%
Total	30	100.00%	30	100.00%

Postoperative Swelling Assessments Using Lysholm Score
At 3 months, 24 out of 30 patients (80.00%) reported no swelling in the knee, while 6 patients (20.00%) experienced swelling in the knee after vigorous activities. By 6 months, all 30 patients (100.00%) reported no swelling in the knee (Table 3).

Postoperative Limp Assessments Using Lysholm Score
At 3 months, none of the 30 patients (0.00%) reported no limp, while all 30 patients (100.00%) experienced a slight limp while walking. By 6 months, there was a significant improvement, with 21 patients (70.00%) reporting no limp and 9 patients (30.00%) still experiencing a slight limp while walking (Figure 3).

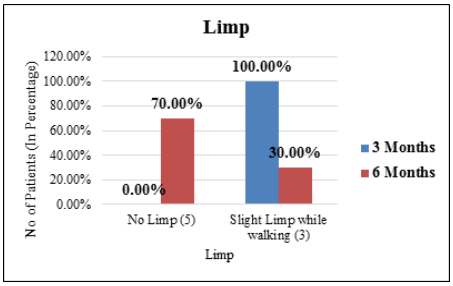


Figure 3. Postoperative Limp Assessments Using Lysholm Score

Postoperative Use Of Support Assessment Using Lysholm Score
At 3 months, 8 out of 30 patients (26.67%) did not use crutches, while 22 patients (73.33%) used crutches with some weight bearing. By 6 months, there was a slight improvement, with 9 patients (30.00%) not using crutches and 21 patients (70.00%) still using crutches with some weight bearing (Figure 4).

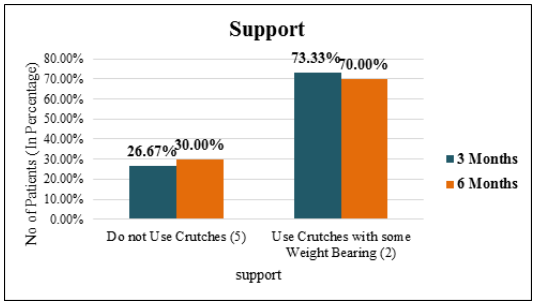


Figure 4. Postoperative use of support assessment using Lysholm score

Postoperative locking sensation assessment using Lysholm score
At 3 months, 25 out of 30 patients (83.33%) reported no catching sensation and no locking in the knee, while 5 patients (16.67%) experienced a catching sensation but no locking. By 6 months, all 30 patients (100.00%) reported no catching sensation and no locking in the knee (Figure 5).

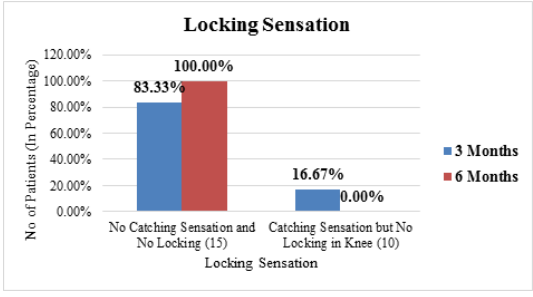


Figure 5. Postoperative locking sensation assessment using Lysholm score

Postoperative Instability Assessment Using Lysholm Score
At 3 months, none of the 30 patients (0.00%) reported that their knee never gives way, while 24 patients (80.00%) indicated that their knee rarely gives way during vigorous activities, and 6 patients (20.00%) experienced frequent knee giving way during vigorous activities. By 6 months, there was significant improvement: 24 patients (80.00%) reported that their knee never gives way, 6 patients (20.00%) indicated that their knee rarely gives way during vigorous activities, and none of the patients (0.00%) experienced frequent knee giving way during vigorous activities (Figure 6).

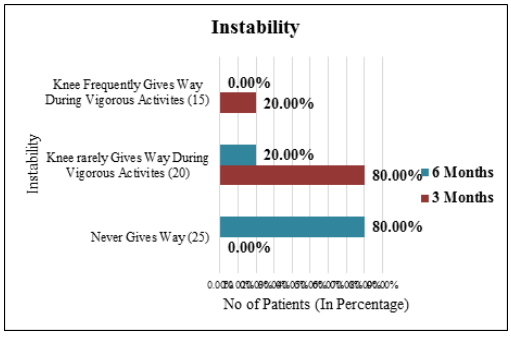


Figure 6. Postoperative instability assessment using Lysholm score

Postoperative Climbing Stairs Assessment Using Lysholm Score
At 3 months, 11 out of 30 patients (36.67%) reported no problems climbing stairs, while 19 patients (63.33%) experienced slight problems. By 6 months, there was a marked improvement: 23 patients (76.67%) reported no problems climbing stairs, and 7 patients (23.33%) experienced slight problems (Figure 7).

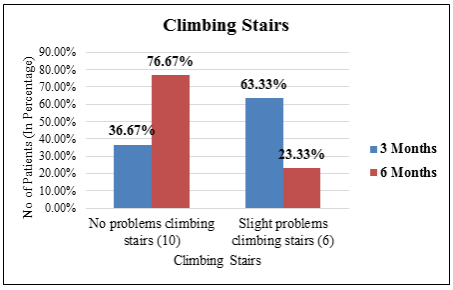


Figure 7. Postoperative climbing stairs assessment using Lysholm score

Postoperative Squatting Assessment Using Lysholm Score

At 3 months, none of the 30 patients (0.00%) reported no problems squatting, 9 patients (30.00%) experienced slight problems, 14 patients (46.67%) could not squat beyond 90 degrees, and 7 patients (23.33%) could not squat at all. By 6 months, there was notable improvement: 9 patients (30.00%) reported no problems squatting, 8 patients (26.67%) experienced slight problems, 13 patients (43.33%) could not squat beyond 90 degrees, and none of the patients (0.00%) were unable to squat (Figure 8).

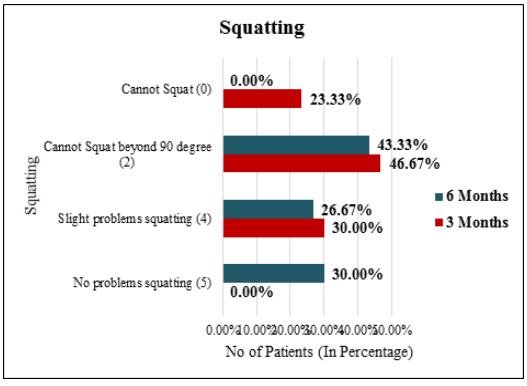


Figure 8. Postoperative squatting assessment using Lysholm score

Lysholm Score

At 3 months, none of the 30 patients (0.00%) achieved an excellent score (95-100), 6 patients (20.00%) had a good score (84-94), 17 patients (56.67%) had a fair score (65-83), and 7 patients (23.33%) had a poor score (≤ 64). By 6 months, there was a significant improvement: 9 patients (30.00%) achieved an excellent score, 15 patients (50.00%) had a good score, 6 patients (20.00%) had a fair score, and none of the patients (0.00%) had a poor score (Table 4).

Table 13. Distribution Of Subjects According To Lysholm Score

Total Score	3 Months		6 Months	
	No of Patients	Percentage	No of Patients	Percentage
Excellent (95 - 100)	0	0.00%	9	30.00%
Good (84 - 94)	6	20.00%	15	50.00%
Fair (65-83)	17	56.67%	6	20.00%
Poor (≤ 64)	7	23.33%	0	0.00%
Total	30	100.00%	30	100.00%

Comparison Of Lysholm Score Between Follow-ups

Initially, patients reported a mean pain score of 15.33 (SD 3.46) at 3 months, which notably decreased to 20.50 (SD 3.56) by 6 months (P = 4.37E-24*). Swelling also improved from a mean score of 9.20 (SD 1.63) to 10.00 (SD 0.00) over the same period (P = 0.0058*). Patients' ability to walk without a limp significantly increased, with the limp score improving from 3.00 (SD 0.00) to 4.40 (SD 0.93) (P = 2.27E-09*). Locking sensations in the knee decreased from 14.17 (SD 1.90) to 15.00 (SD 0.00) (P = 0.0113*), and instability improved from 19.00 (SD 2.03) to 24.00 (SD 2.03) (P = 9.31E-10*). Stair climbing ability and squatting also showed significant enhancements, with respective scores improving from 7.47 (SD 1.96) to 9.07 (SD 1.72) (P = 0.0007*) and from 2.13 (SD 1.48) to 3.43 (SD 1.33) (P = 3.72E-10*). Overall, the total Lysholm score increased substantially from 73.10 (SD 9.91) to 89.30 (SD 8.42) (P = 9.93E-23*) (Table 5).

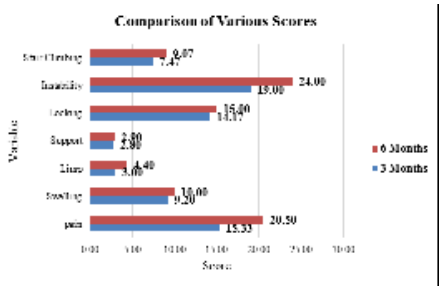


Figure 9. Comparison of Lysholm score between follow-ups

Complications

A majority of individuals, constituting 76.67% (23 out of 30 patients), did not experience any complications at the end of 6 months. However, anterior knee pain was noted in 10.00% (3 patients), while knee stiffness affected 6.67% (2 patients) of the cohort. Additionally, superficial infections were observed in another 6.67% (2 patients) (Figure 10).

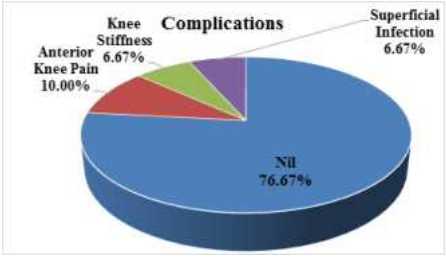


Figure 10. Distribution Of Subjects According To Complications

DISCUSSION

Intramedullary nailing is the preferred treatment for tibia shaft fractures due to its benefits such as stable fixation and reduced damage to the vascularity and soft tissue at the fracture site, in contrast to plating techniques. There are two described techniques for tibial nailing in the literature, yet consensus on the optimal insertion approach remains elusive. 23 The Suprapatellar process has simplified proximal tibial fracture nailing and has also been adapted for tibial shaft and distal metaphyseal fractures, offering several advantages over the traditional infrapatellar approach. 24-25

The present study was aimed to assess the functional outcomes of proximal third tibia fractures treated by suprapatellar nailing. In this study a total of n=30 patients with proximal third tibia fractures were included. Here, the mean age of the study subjects was 46.33±14.32 years whereas, 33.33% of subjects belonged to 41-50years age group. Moreover, in our study all subjects were male (100%). Comparisons with prior research reveal consistency in age distribution and gender predominance among studies evaluating proximal third tibia fractures. 21, 26-27 The findings reinforce that these fractures predominantly affect middle-aged males across different geographical and clinical settings.

Road traffic accidents (80%) emerged as the leading cause of proximal third tibia fractures in this study, highlighting the severity and mechanism of trauma associated with these injuries. Similarly, study of BV SS et al. 21 and Garg A et al. 26 reported road traffic accident as most common cause of tibia fractures.

In this study the mean duration of surgery was 90.11±10.30 minutes which was comparable with the studies of Garg A et al. (81± 10.15 minutes) 50 and Sun Q et al. (71.01± 5.98 minutes. 26 In our study, the mean intraoperative blood loss was 105±20ml whereas in the study of Garg A et al. it was 110±20.5ml. These parameters, although within acceptable ranges, contribute to understanding the procedural complexities and potential impacts on postoperative outcomes. In present study, the functional outcomes assessed using the Lysholm scoring system provide insights into the recovery and rehabilitation of patients following suprapatellar nailing for proximal third tibia fractures. Initially, patients reported significant challenges such as pain during activities, swelling, limping, and limitations in daily activities such as stair climbing and squatting. However, over the course of six months, there was a marked improvement across all assessed parameters. Pain levels decreased, with a notable shift towards less

pain during activities. Swelling subsided entirely in all patients, and the majority achieved a significant reduction in limping. Improvements were also observed in functional activities like stair climbing and squatting, indicating enhanced knee function and mobility.

The patients in the study showed notable improvement in knee function scores between 3 and 6months post-treatment. At 3 months, none achieved an excellent score, with the majority falling into the fair to poor score categories. By the 6-month mark, significant progress was observed, with a substantial increase in the number of patients achieving excellent and good scores, and none scoring poorly. This improvement suggests that the treatment approach implemented was effective in enhancing knee function over the six-month period following treatment.

The significant improvement in the overall Lysholm score from an average of 73.10 initially to 89.30 at six months highlights the effectiveness of suprapatellar nailing in promoting functional recovery. This improvement is statistically significant across all measured domains, reinforcing the procedure's role in facilitating rehabilitation and restoring knee function.

The study conducted by BV SS et al. 21 showed excellent functional out come in majority of patients (71.9%) at 12 month follow up. Moreover, Garg A et al. and Křivohlávek M et al reported the mean Lysholm knee score of 87.91±5.75 and 93.4±8.39 respectively suggested good functional outcomes with suprapatellar tibial nailing. 26-28 Complications associated with suprapatellar nailing were relatively infrequent but notable. Anterior knee pain was reported by a minority of patients, indicating a potential area for further investigation into pain management strategies post-surgery. Knee stiffness and superficial infections were also observed in a small subset of patients, although these issues did not significantly impact the overall functional outcomes observed in the study. These findings are comparable with previous reports. 21, 26-27 Our study findings have several clinical implications. Firstly, suprapatellar nailing appears to be a viable surgical option for managing proximal third tibia fractures, particularly in male patients across various age groups, predominantly affected by road traffic accidents. The procedure effectively addresses functional deficits associated with such fractures, leading to substantial improvements in pain management and knee function over a relatively short follow-up period. This study underscores the positive functional outcomes and manageable complications associated with suprapatellar nailing for proximal third tibia fractures. Despite this we acknowledge certain limitations including: The study included a relatively small sample size of 30 patients, which may limit the generalizability of the findings. Larger studies are needed to confirm these results and ensure they apply to a broader population. Conducted at a single medical center, the study's results may not be representative of outcomes in different healthcare settings or geographic locations. All participants in the study were male. This lack of gender diversity limits the applicability of the findings to female patients, who may experience different outcomes and complications. Since there were different fracture patterns included in the study, therefore, post-operative rehabilitation protocols among patients were not controlled or standardized, which could influence the functional outcomes and the interpretation of results.

CONCLUSION

This study aimed to evaluate the functional outcomes of proximal third tibia fractures treated by suprapatellar nailing, with a specific focus on pain, swelling, limp, use of support, locking sensation, instability, stair climbing, and squatting, as measured by the Lysholm scoring system. The results indicate that suprapatellar nailing is an effective surgical intervention for these fractures, leading to significant improvements in knee function and mobility within a six-month period. A marked reduction in pain levels and swelling, with all patients reporting no swelling and a significant number experiencing minimal to no pain by the end of the study period. Improvement in functional activities such as stair climbing and squatting, with a majority of patients reporting no difficulties. A significant increase in the overall Lysholm score, indicating enhanced knee function and overall recovery. Complications were relatively infrequent, with anterior knee pain, knee stiffness, and superficial infections being the most commonly reported issues. Suprapatellar nailing appears to be a viable and effective treatment option for proximal third tibia fractures, offering significant improvements in functional outcomes and manageable complications. This study contributes valuable insights into the postoperative recovery trajectory and underscores the need for continued research to optimize treatment protocols and enhance patient care. Further research with larger, more diverse populations and longer follow-up periods is necessary to validate these findings and explore long-term outcomes and potential complications.

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