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Retrospective Study of Proximal Tibia Fracture In Diabetic Adults Treated with Suprapatellar Nail

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ABSTRACT

This retrospective cohort study aimed to assess the clinical and radiological outcomes of utilizing a suprapatellar approach for intramedullary tibial nailing in the semi-extended knee position to manage proximal tibia fractures in patients with diabetes. Proximal tibia fractures, common in the knee joint, can significantly impact the quality of life, occurring frequently in women as they age and resulting from high-energy trauma in younger patients or low-energy fractures in the elderly. Diabetes, a known cause of delayed bone healing and soft tissue repair, can lead to diabetic dermopathy, reducing blood flow and sensation in the skin, making wound healing challenging. Additionally, high blood sugar levels in diabetes impair the immune response, increasing infection risk and further delaying healing. The study, conducted at the Department of Orthopedics in RGMC & CSMH Kalwa Thane over 18 months, included 30 patients with proximal 1/3rd Tibial fractures and mean HbA1c of 7.1, while excluding those with pathological fractures, periprosthetic fractures, deformities in the same limb, severe knee osteoarthritis, Gustilo Grade 3C open Tibial fractures, or severe soft tissue lacerations, contamination, and suprapatellar area infection. The suprapatellar approach in the semi-extended knee position offered an alternative to traditional methods, facilitating fracture reduction, especially for proximal third tibial and diaphyseal fractures, and yielding excellent functional outcomes with early radiological recovery and no postoperative anterior knee pain or malalignment. This approach appears safe, with minimal complications compared to conventional methods, making it a valuable option for managing proximal tibia fractures in diabetic patients, potentially improving fracture management and patient outcomes

Key Words: *Tibia fracture, Diabetes, Minimal invasive, Intramedullary Nailing, Infection.*

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INTRODUCTION

Fractures around the weight-bearing knee joint, particularly in the tibia, can have a significant impact on a person's quality of life. Proximal tibia fractures are common, accounting for 1% of all fractures and 8% of fractures in the elderly[1]. Women tend to experience an increased incidence of tibia fractures with age, while men have a relatively steady incidence rate. These fractures can occur due to various injury mechanisms and severity levels, with higher-energy fractures in younger patients and lower-energy fractures in the elderly.

Complications associated with tibial fractures in younger patients include non-union, infection, restricted motion, and post-traumatic arthritis. Falls from height and high-speed road traffic accidents are common causes of proximal tibia fractures, resulting in direct axial compression with varus and valgus moments, as well as indirect shear forces. Assessing the force of injury is crucial due to potential soft tissue and neurovascular damage. Additionally, it's important to evaluate associated injuries such as meniscal tears and ligament damage in the knee.

Proximal tibial fractures present a challenge to orthopaedic surgeons due to the joint's articular congruency, complex ligament stability, and biomechanics during weight-bearing. Intramedullary nailing (IMN) has become the preferred treatment for tibial fractures as it provides stability, helps prevent malalignment, and allows for early mobilization[7]. However, inserting an IMN in proximal third tibial fractures is difficult because the quadriceps and extensor mechanism complex may cause malalignment[6]. Patients with diabetes are prone to increased risk of wound complications, and impinging implant hardware in the case of load-bearing implants cause soft tissue irritation and can lead to increased chances of infection or non-healing gaping wound[8].

A technique called semi-extended IMN has been developed to correct proximal tibial malalignment. It involves using a suprapatellar entry point with the knee in a semi-extended position. Despite the challenges and potential intraarticular damage, this approach has gained popularity, and new instruments have simplified and improved the procedure[6]. The study aims to evaluate the clinical and radiological outcomes of suprapatellar nailing in the semi-extended knee position for proximal tibial fractures.

Methods

Study area:

The study was conducted at department of orthopedics RGMC & CSMH Kalwa Thane.

Study duration:

The study period was for 18 months.

Sample size:

In our study 30 patients were included

Inclusion Criteria

- Age more than 18 years.
- Diabetes – HbA1c of more than 6.5
- Proximal 1/3rd Tibial fracture (AO Classification 42)
- Unilateral tibial fracture
- No other fracture in any limb

Exclusion Criteria

- Pathological fractures
- Periprosthetic Fracture
- Existing Deformity of the same limb
- Patients with Severe Osteoarthritis Knee
- Gustilo Grade 3C open fractures of Tibia.
- Severe soft tissue laceration, contamination, and infection of the suprapatellar area.

Method of statistical analysis:

In this study, appropriate statistical analysis was performed to compare the incidence of adverse events and other complications. Both parametric and non-parametric analysis methods were used as necessary, and the data was analysed using the Excel and SPSS software packages (version 27, SPSS Inc., Chicago).

For comparing proportions, the Chi-Square test and Fisher's Exact test were utilized.

To assess the normality of the data, the Kolmogorov-Smirnov (K-S) test and Shapiro-Wilk test were employed. If the P-value from the K-S test was greater than 0.05, it was assumed that the data followed a normal distribution. If the P-value was smaller than 0.05, it was concluded that the data did not follow a normal distribution. Based on this determination, either parametric or non-parametric tests were chosen for further analysis.

Results and observation

In the present study entitled, “Retrospective study of proximal tibia fracture in diabetic adults treated with suprapatellar nail." 30 patients were assessed.

In our study majority of the study subjects were in the age group of 31-40 who are more prone for Road traffic accidents. The mean age in our study was 42.4 ± 7.8

In our study majority of the study subjects had HbA1c more than 6.5. The mean HbA1c in our study was 7.1 ± 0.5

In our study majority of the patients were male 24(80%) and female 6 (20%).

In our study road traffic injury is the higher associated mode of injury for proximal 1/3rd tibial fractures which is around 90 percentage followed by accidental fall from height.

In our study majority of the patients had right side injury which was 17 (57%)

The mean range of movement post operatively for the affected side was 125.9 ± 5.50 and for the contralateral side was 131.1±5.28, which indicate that majority of the patients regained the range of movement.

In our study post-operatively 2 patients had knee joint stiffness and 1 patient had superficial infection.

In our study majority of the patients had radiological confirmed union by 30th week. The mean duration taken for the union in our study was 24.1 ± 1.3 Weeks.

In our study majority of the patients had excellent functional outcome 23 (76.6%) followed by good among 5 (16.67%). The mean functional outcome score in our study was 82 ± 3.1, which was an excellent functional outcome score.

Discussion

In the study titled "Retrospective study of proximal tibia fracture in diabetic adults treated with suprapatellar nail." the researchers aimed to evaluate the functional and radiological outcomes of patients with proximal 1/3rd tibial fractures treated with suprapatellar nailing. Here are the key points from the study:

1. Patient Selection: The study included 30 patients with fractures of the proximal 1/3rd of the tibia in patients with diabetes. The fractures were commonly caused by motor vehicle accidents, falls from height, and violence.
2. Surgical Technique: All patients underwent an operative procedure using intramedullary tibial nails inserted through a suprapatellar approach with the knee in a semi-extended position. The suprapatellar approach has several advantages, including the ability to treat complex fractures, reduced risk of posterior cortex perforation, maintenance of the mechanical axis of the lower extremity, prevention of malreduction, and utilization of the femoral trochlear groove as a guide to reducing deformities.
3. Functional Outcomes: The study reported excellent functional outcomes for all 30 patients. They achieved a good range of motion and received high scores on the lower extremity functional scale. The mean age of the patients was 42.4 ± 7.8 years, and the majority of patients were male. Road traffic accidents were the most common cause of the fractures. No major infective complications were seen.
4. Advantages of Suprapatellar Nailing: The suprapatellar approach demonstrated several advantages over conventional infrapatellar intramedullary nailing. Patients experienced less postoperative pain, fewer intraarticular structure injuries, and no cases of postoperative knee pain. The approach also resulted in good radiological outcomes, with a mean union time of 24.1 ± 1.3 weeks, which is consistent with previous studies.

In our study titled "Retrospective study of proximal tibia fracture in diabetic adults treated with suprapatellar nail." we selected 30 patients with fractures of the proximal 1/3rd tibia. Proximal tibia fractures are commonly caused by motor vehicle accidents, falls from height, and violence. The management of these fractures has been a topic of discussion due to their complexity and variety. In our study, all patients underwent an operative procedure using intramedullary tibial nails through a suprapatellar approach with the knee in a semi-extended position.

The suprapatellar approach offers several advantages, including the ability to treat complex metaphyseal and diaphyseal tibia fractures. It reduces the risk of posterior cortex perforation and helps maintain the mechanical axis of the lower extremity. It also relaxes the quadriceps muscle and prevents malreduction. This technique aids in reducing varus and valgus deformities by utilizing the femoral trochlear groove as a guide.

All 30 patients in our study achieved excellent functional outcomes, with a good range of motion and high scores on the lower extremity functional scale. The mean age of the patients was 42.4 ± 7.8 years, and the majority were male, with road traffic accidents being the most common cause of the fractures.

Compared to conventional infrapatellar intramedullary nailing and open reduction and plating, the suprapatellar approach resulted in less postoperative pain, fewer intraarticular structure injuries, and no cases of postoperative knee pain in our study. The radiological outcome showed a mean union time of 24.1 ± 1.3 weeks, which is consistent with previous studies.

No significant wound complications were noted in our study. Mild superficial necrosis was seen in 4 patients which healed in a span of 3 weeks without any foci of infection.

In conclusion, suprapatellar nailing of proximal tibial fractures using a semi-extended position offers simplicity and advantages over traditional nailing methods, leading to excellent functional and radiological outcomes without infective complications in patients with diabetes.

Summary

In this study, a total of 30 patients with proximal 1/3rd tibial fractures were examined. The majority of the patients were males, comprising 80% of the study population, and their mean age was 42.4 ± 7.8 years. The most common cause of these fractures was road traffic accidents, accounting for about 90% of the cases, followed by accidental falls from heights. Among the patients, there was a higher prevalence of right-side injuries.

After the surgical procedure using the suprapatellar approach with the knee in a semi-extended position, most patients achieved a good range of motion in their affected legs. The mean range of movement for the affected side was 125.9 ± 5.50 degrees, which was close to the range observed in the non-affected legs (131.1 ± 5.28 degrees), indicating successful restoration of motion.

During the postoperative period, two patients experienced knee joint stiffness, while fourpatients had a superficial infection. These were the complications observed in the study.

Radiological assessments showed that the majority of patients had confirmed the union of their fractures by the 30th week. The average duration for the union was 24.1 ± 1.3 weeks, which aligns with previous studies.

Most patients achieved excellent functional outcomes, accounting for 76.6% of the cases, while 16.67% had good functional outcomes. The mean functional outcome score was 82 ± 3.1, indicating a high level of functional recovery.

To summarize, this study demonstrated positive results for the treatment of proximal 1/3rd tibial fractures using the suprapatellar nailing technique in a semi-extended position. The majority of patients achieved good functional outcomes and regained a satisfactory range of motion in their affected legs.

Informed consent (patient/guardian)
Each patients consent was taken prior to collection of their treatment records.

Conflict of Interest
No conflict of interest

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Institutional ethical committee
Approved.

Authors contribution
All authors are equally contributed in conceptualization, data curation formal analysis,methodology; Project administration, Resources, software supervision and Writing of original draft.

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