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INTRAMEDULLARY NAILING OF SEGMENTAL FRACTURE OF PROXIMAL TIBIA BY SUPRAPATELLAR APPROACH - A CASE SERIES STUDY

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ABSTRACT

INTRODUCTION:

The most typical long bone fractures are those of the tibia and fibula shaft. More than 45 both bone leg fractures occur annually in the average population for every one lakh people. There is a wide range of injury mechanism and severity associated with tibial fractures. Between the ages of 20 and 40, young males have the highest incidence of adult both bone leg fractures. Nonunion and malunion are more common in tibial fractures than they are in other body fractures. The most common fracture site in the tibia is the tibial diaphysis, and approximately 80% of these injuries are linked to fibular fractures.

Different treatment choices are accessible for tibial shaft fractures depending upon the related delicate tissue injury. The long-term outcomes of severe open tibial fractures are inversely correlated with the prevalence of complications. It typically affects young patients and is brought on by high-energy trauma.

For adults with displaced and undisplaced tibial shaft fractures, intramedullary nail fixation is still the preferred surgical option.

AIM OF THE STUDY:

The aim is to study the clinical, radiological and functional outcome and complication for tibial shaft fractures treated with intramedullary nailing through suprapatellar approach in semi extended position of knee at VINAYAKA MISSION'S MEDICAL COLLEGE AND HOSPITAL, KARAIKAL, during the period of SEPTEMBER 2020 to JUNE 2022

ISSN 2515-8260 Volume 10, Issue 01, 2023

MATERIALS AND METHODS:
This is a prospective study for the study of the clinical, radiological and functional outcome and complication for tibial shaft fractures treated with intramedullary nailing through suprapatellar approach in semi extended position of knee in 3 patients in the period of SEPTEMBER 2020 to JUNE 2022 at VINAYAKA MISSION'S MEDICAL COLLEGE AND HOSPITAL, KARAIKAL.

CONCLUSION:
For displaced tibial shaft fractures, reamed locked intramedullary nailing is still the most common method of treatment. In addition to the advantages of the suprapatellar approach, we provide surgical hints in our study. A good place to start is still an important part of surgery. An alternative to the traditional infrapatellar approach for intramedullary tibial nailing in the semi-extended knee position is the suprapatellar approach. With a canula system and specific instruments, nail insertion is safe and minimizes the risk of iatrogenic damage to intraarticular structures. The proximal third tibial fracture and all diaphyseal tibial fractures benefit most from the semiextended knee position. Stiff Knee, Proximal 1/3 of Tibia Fracture, and Ipsilateral Femoral Shaft Fractures were successfully treated with this method. The initial data suggested that anterior knee pain after surgery was uncommon.

Introduction
Extra-articular proximal tibial fractures account for approximately 10% of all tibial fractures [1]. Intramedullary nailing is the gold standard for diaphyseal fractures of tibia [2]. The consistent success has ensured that the indications have extended to proximal and distal tibial fractures. In proximal tibial shaft fractures, surgeons have struggled with inadequate maintenance of reduction, suboptimal reaming, and poor placement of the nail resulting in malalignment and further complications. This led Tornetta and Collins to develop a nailing technique that employed a semi-extended position of the knee [3]. This resulted in minimal apex anterior angulation in all patients. Dean Cole was the first person to advocate a suprapatellar approach using a midline quadriceps tendon incision. The suprapatellar approach in extra-articular fractures of proximal tibia helped minimize complications by ensuring that the reduction could be done in an extended or semi-extended position. This prevented the malalignment at the fracture site by minimizing the strong extensor action of the patellar tendon. It was reasonably pointed out that injury to the patellofemoral cartilage was unavoidable. Yet, the procedure has been gaining acceptance in recent days.

CASE PRESENTATIONS
CASE 1
An 48 year-old female presented with pain and swelling on the proximal 2/3rd of right leg, following alleged history of fall from two wheeler 2days back sustaining injury to right leg. On physical examination, there was deformity proximal-middle 1/3rd shaft junction, diffuse swelling right leg, tenderness on the proximal 2/3rd shaft tibia with no neurovascular deficit. Plain radiographs showed segmental fracture of shaft tibia. Surgically, expert nailing using suprapatellar approach done without any anterior lift off of proximal segment.

On examination angular deformity noted over the proximal third and middle third of right leg ,Diffuse swelling of the right leg noted ,Shortening of right leg

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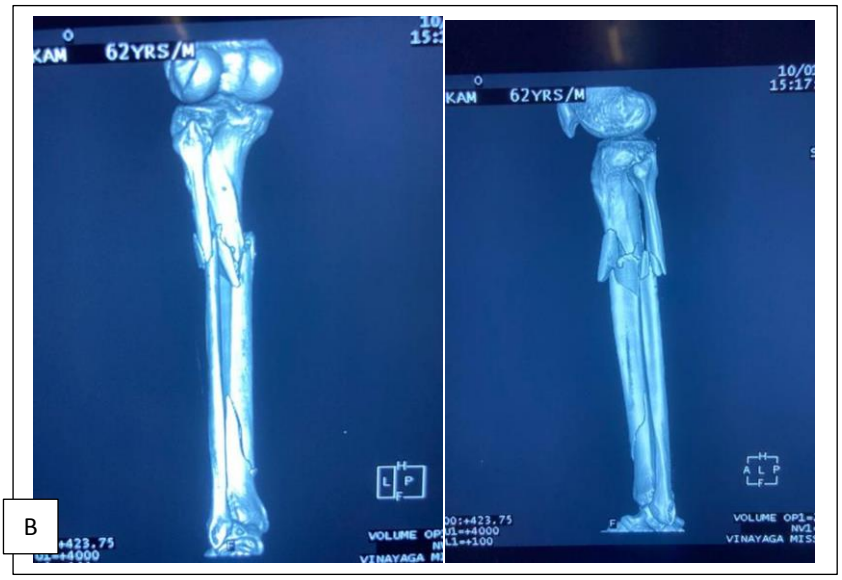
noted ,Overlying skin appears tense,Warmth noted over right leg ,Bony tenderness over proximal 2/3rd tibia ,Bony irregularity present ,Abnormal mobility over proximal-third tibia ,Distal pulse felt - both dorsalis pedis artery and posterior tibial artery.,Capillary refill of toes-normal,Sensations - intact , Active toe movements
Xray shows Segmental fracture with comminution and postero-medial angulation of tibia at proximal-middle third junction with segmental fracture of fibula
DIAGNOSIS - Right Segmental comminuted fracture tibia and fibula with proximal fragment less than 7cm

A-xray of right leg showing segmental fracture of right tibia and fibula
B-Intraoperative image of incision for suprapatellar approach
C-Intraoperative insertion of guide wire
D-Guide wire through fracture site
E-Post operative radiographs with IM nail intact

ISSN 2515-8260 Volume 10, Issue 01, 2023

CASE 2 -An 62 year-old male presented with pain and swelling on the proximal 2/3rd of left leg, following alleged history of fall from two wheeler 1 day back sustaining injury to left leg. On physical examination, there was deformity proximal-middle 1/3rd shaft junction, diffuse swelling left leg, tenderness on the proximal 2/3rd shaft tibia with no neurovascular deficit. Plain radiographs showed segmental fracture of shaft tibia. Surgically, expert nailing using suprapatellar approach done.



ISSN 2515-8260 Volume 10, Issue 01, 2023

A-xray of right leg showing segmental fracture of right tibia and fibula
B-CT image of the fracture
C-Post operative radiographs
D-Post operative day 5 with sutures intact

CASE 3 - An 33 year-old female presented with pain and swelling on the proximal 2/3rd of right leg, following alleged history of fall from two wheeler 1day back sustaining injury to right leg. On physical examination, there was deformity proximal-middle 1/3rd shaft junction, diffuse swelling right leg, tenderness on the proximal 2/3rd shaft tibia with no neurovascular deficit. Plain radiographs showed fracture of shaft tibia. Surgically, expert nailing using suprapatellar approach done

A-Xray radiograph of right leg showing isolated fracture of tibia
B-Post operative radiograph of right leg with nail intact

DISCUSSION-

For displaced tibial shaft fractures, reamed locked intramedullary nailing is still the most common treatment. In addition to highlighting the advantages of the suprapatellar approach, our research provides surgical guidance. Surgery still relies heavily on having a good place to start. The suprapatellar approach is an alternative to the usual infrapatellar approach for intramedullary tibial nailing in the semi-extended knee position.[7] Using a canula system and specific instruments, nail insertion is safe and reduces the risk of iatrogenic damage to intraarticular structures.[8] The proximal third tibial fracture and all diaphyseal tibial fractures are best treated in the semiextended knee position [7]. A fracture in the proximal third of the tibia, an ipsilateral femoral shaft fracture, and stiff knees were all treated with this technique. The initial data indicated that anterior knee pain following surgery was rare.[9]

Nailing proximal tibial fracture has become more straightforward with SPN. Shaft fractures and distal metaphyseal fractures are among the more common indications for this approach. While the method has a lot going for it, there are also potential risks that need to be investigated. The most significant benefits include the ease with which the patient and the injured leg can be positioned, which makes it simpler to reduce the fracture and keep it in place while nailing.[5]

It is also simpler to insert the blocking screws and position the C-arm for the distal screws when the leg is stretched out on the table. This nailing method may lower the risk of compartment syndrome because the soft tissue is subjected to significantly less intraoperative trauma than in conventional positioning. Additionally, the method reduces the amount of assistance required and the amount of time required to complete the task. The use of SPN raises a number of concerns, one of which is the possibility that it could damage or, worse, infect a healthy knee joint. Despite this, numerous knee joint arthroscopies and retrograde femoral nailings are now carried out without the same concerns. Before or after nailing, four of the seven SPN patients that Jakma et al.[3] treated underwent arthroscopy. In the initial series of 25 patients conducted by Tornetta and Collins[1], one patient developed postoperative hemarthrosis, and two patients sustained minor cartilage abrasions. The suprapatellar

approach was used on 55 patients who had T2 (Stryker, Kalamazoo, MI) and Trigen (Smith and Nephew, Memphis, TN) nails. Later, Ryan and Tornetta [6] modified the procedure by nailing with the knee joint in 20-30 degrees of flexion, changing the surgical entry to a smaller incision of 3-5 cm from the middle to the upper part of the patella, and performing the medial arthrotomy covering only the upper part of the When nailing, arthroscopy was performed on 13 of 15 patients, and no ligament changes were noticed. One patient had patellofemoral changes of grade II, one had changes of grade III, and 33 patients had MRI scans to check for cartilage damage one year after surgery.[13] However, there was no relationship found between the clinical examination, MRI scans, or arthroscopic changes. Although Beltran et al.[4] reported that the nail insertion in six out of 15 patients was close to the ACL insertion, similar injuries to the intermeniscal ligament and medial meniscus were observed in cadaver studies examining the injuries after nailing through a suprapatellar approach. However, no violations were observed to the articular surface, lateral meniscus, or ACL. Gaines et al. [8] demonstrated that the suprapatellar approach had a lower rate of intraarticular injuries than the standard medial parapatellar entry in cadaver studies examining the risk of intraarticular damage by the traditional infrapatellar and others. With a mean incidence of 47% after two years, anterior knee pain is a major side effect of tibial nailing.[9] Although the causes of knee pain are unknown, it is reasonable to assume that nailing may be important for surgical entry. In a retrospective study, there were no differences in pain levels between SPN and standard nailing. Using an entry point within the safe zone, where the center is located 9mm 5mm lateral to the midline of the tibial plateau and 3mm lateral to the center of the tibial tubercle, appears to reduce the risk of injury to the anterior [14].

CONCLUSION

Suprapatellar intramedullary nailing is a safe and easy method for treating extra-articular proximal tibia fractures without causing malalignment, without resorting to additional fixation methods.Although the method appears to be safe and does not appear to have a higher rate of complications than the conventional method, it is evident that additional studies with a longer follow-up and, specifically, randomized studies comparing it to the previous gold standard treatment are required.

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