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Efficacy of suprapatellar approach for IMIL nailing of proximal and distal tibia shaft fractures

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Abstract

Background: The fractures of tibial shaft are very common. The fractures at the proximal and distal metaphysio-diaphysis treated with Intramedullary Interlocking nails pose challenge during reduction and nail insertion. The use of Suprapatellar approach for the IMIL nail entry is an efficient and time saving.

Materials and Methods: A series of 20 cases of proximal and distal tibia shaft fractures were treated with IMIL nail using the suprapatellar approach. Out of 20 patients 14 were males and 6 were females. The patients were then followed up on regular intervals of 2 weeks, 6 weeks, 3 months, 6 months and 12 months.

Results: All the fractures united well without any major complications. 4 patients had anterior knee pain and 2 patients developed superficial wound infection which was treated with antibiotics.

Conclusion: The suprapatellar approach for proximal and distal shaft (Metaphysio-diaphysis) fractures is an advancement in treating such fractures. It is efficient and time saving and allows easy manipulation while reducing the fracture during the procedure without any major complications.

Keywords: Suprapatellar approach, proximal and distal tibia shaft fractures

Introduction

Fractures of the tibia and fibula are relatively common and have been recognized as serious and debilitating injuries for centuries for many years, the tibia was the most frequently fractured long bone and in many countries this remains the case.

Compared to fractures elsewhere in the body, tibia fractures have relatively high rates of nonunion and malunion.

The tibia diaphysis is the most common site of fracture in the tibia and about 80% of these injuries have associated fibula fractures. Published data suggest an incidence of 17/100,000 person-years Tibia fractures occur in a bimodal distribution with low-energy spiral patterns being more common in patients over 50 years of age and high-energy transverse and comminuted fractures being more common in patients under 30 years of age.

Today, intramedullary nailing seems to be the gold standard for the treatment of diaphyseal tibial fractures. Nailing ensures good fracture stability, safeguards against malalignments, and allows quick mobilization.

It is technically challenging to nail proximal and distal tibial fractures. With proximal fractures, there is a tendency for anterior malalignment of the proximal fragment from pull of the patellar tendon, and this pull is increased further when the knee is flexed during nailing. With nailing in a conventional manner, there is a risk of poor repositioning, suboptimal reaming, and a poor placement of the nail.

When the knee joint is maximally bent to 15 degrees, the pull of the patellar tendon on the proximal fragment is eliminated, and thus the fracture can be easily repositioned and fixed.

New instruments developed by different manufacturers have made the technique simpler and more secure.

Material and Method

This prospective study was conducted between July 2018 to August 2019. A total of 20 patients ranging between 25 to 60 years of age were included in the study. Out of which 14 were males and 6 were females.

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Patients with proximal and distal shaft (metaphysio-diaphyseal) fractures of tibia were included in this study. Out of 20 cases 13 were proximal shaft fractures (9 on the right side and 4 on the left side) and 7 were distal shaft fractures (4 on the right side and 3 on the left).

Follow of the patients were done at 2 weeks, 6 weeks, 3 months, 6 months and 12 months intervals.

Procedure

- The patient is positioned supine on a radiolucent table, and the injured leg is positioned with a roll under the knee joint so that it is flexed 20-30 degrees.
- A 4 cm to 5 cm longitudinal incision was made 2 cm superior to the patella. The quadriceps tendon was then split in line with the incision.
- A specialized blunt tip cannula was inserted in the retropatellar space down to the proximal tibia.
- An opening reamer was used to make the entry at the ideal entry point.
- The fracture is reduced in the usual manner. A percutaneous reduction clamp may be used in reducing oblique fractures to an anatomic or near-anatomic position.
- The guide wire was then passed into tibia. The medullary cavity was reamed using flexible reamers.
- The nail was inserted through the cannula with ease.
- Proximal and distal locking done. The joint was irrigated through the cannula. Wounds were irrigated and closed in a layered fashion and covered by sterile dressings.



Fig 3: Nail Entry



Fig 1: Position of limb



Fig 2: Incision site

Results

In our study, 4 patients complained of anterior knee pain during the follow up period. 2 patients had developed superficial wound infection post operatively, which were treated with antibiotics. In our study, no patients had any injury to the cartilage, meniscus or anterior cruciate ligament. The suprapatellar approach for proximal and distal tibia fractures allows for less manipulation of the fractured extremity, less work against gravity, minimal intraoperative assistance, fewer and easier fluoroscopic views, and greater ease with instrumentation and implantation.

Table 1: Show the complications patients

Complications	No. of patients
Anterior Knee Pain	4
Superficial Infection	2
Cruciate ligaments injury	0
Meniscus injury	0
Cartilage injury	0
Iatrogenic fractures	0

Discussion

With Suprapatellar approach, it has become simpler to perform nailing of proximal and distal tibial fractures. The method has significant advantages but also has potential risks that should be assessed. The main advantages are the simple positioning of the patient and the injured leg, which simplifies

reduction of the fracture and the retention of this during nailing. When the leg is positioned stretched on the table, it also is easier to install blocking/poller screws. It is easier to position the C-arm when the distal screws are to be inserted, with no need for rearrangement. The soft tissue is exposed to less intraoperative trauma compared with traditional positioning, and it is possible that the risk of compartment syndrome is thereby reduced. Further advantages of the method are reduced need for an assistant and a shorter operating time.

Concerns over the use of Suprapatellar nail include entry through a healthy knee joint and the risk of inflicting damage to the knee joint and, at worst, causing an infection in the joint.

Despite this, today many retrograde femoral nailings and arthroscopies of the knee joint are performed without the same concerns. Jakma *et al.* operated on seven patients with SPN, four of whom had arthroscopy performed before or after nailing. In spite of the fact that unreamed nails were inserted and only the thinnest reamers were used to open proximally all showed signs of cartilage damage.

In Tornetta and Collins' original series of 25 patients, one patient developed postoperative hemarthrosis, and two patients had minor cartilage abrasion.

Sanders *et al.* operated on 55 patients with the suprapatellar approach. In 13 of 15 patients, arthroscopy was performed before and after nailing, and no cartilage changes were seen. One year after surgery, 33 patients had MRI performed with respect to cartilage damage, one had grade II patellofemoral changes and one had grade III changes, but there was no correlation between the arthroscopic changes, MRI scans, or the clinical examination.

A major side effect of tibial nailing is anterior knee pain, with a mean incidence of 47% after 2yr. In a study of 37 patients operated with SPN there were no patients with anterior knee pain at 1-year follow-up.

Rothberg *et al.* compared 18 patients with semi-extended tibial nailing and at 1yr there was no increased incidence of anterior knee pain in the fracture group.

Another retrospective study by Ryan *et al.* comparing SPN with standard nailing found no differences in the level pain.

Conclusion

Suprapatellar nailing of tibial shaft fractures is the next advancement in the surgical management of these injuries. When performed appropriately, with specific attention to maintaining the cannula in the retropatellar space, suprapatellar nailing is a safe and effective method. The benefits of surgical ease and potentially less postoperative anterior knee pain make this not only an attractive, but possibly, a better approach for intramedullary nail insertion when treating proximal and distal tibial shaft (metaphysio-diaphyseal) fractures.

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