



Research Article


Intramedullary Nailing of Proximal one Third Tibia Shaft Fractures Using the Suprapatellar Approach

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ABSTRACT

Background : Proximal one third tibia fractures are caused by high-velocity trauma. They are often associated with soft tissue and other systemic injuries leading to higher complications rates. In this study, we aimed to analyse the clinical, functional and radiological outcome including the fracture following suprapatellar nailing.

Materials and methods : We prospectively analysed 24 patients from May 2025 to Dec 2025 who underwent suprapatellar nailing using at a single tertiary care trauma centre.

Periodic follow-ups were done to evaluate the union rates, the functionality of the limb and associated complications

Observation : The mean time to union was 22 weeks. At 1 year, average LEFS was and of patients had good to excellent function. Of 6 cases with delayed union, only 3 needed

secondary procedures. One case had malalignment. All fractures eventually healed.

Conclusion: We recommend Suprapatellar nailing in proximal one third tibia shaft fractures

Keywords: Intramedullary Nailing, Proximal, Tibia Shaft.

INTRODUCTION

Intramedullary nailing is currently considered the gold standard for treating tibial diaphyseal fractures. It provides excellent fracture stability, prevents malalignment, and permits early mobilization. The traditional approach uses an infrapatellar, patellar tendon-splitting entry with the knee flexed to 90 degrees.

However, extending nailing to proximal and distal tibial fractures presents technical challenges. In proximal fractures, the pull of the patellar tendon tends to cause anterior malalignment of the proximal fragment, and this deforming force increases with knee flexion during nailing.¹ This can lead to poor reduction, suboptimal reaming, and improper nail placement.

To address this, Tornetta and Collins¹ (1996) described a semi-extended technique using a partial medial parapatellar arthrotomy with the knee flexed to only 15 degrees. Two-thirds of the retinaculum was split, and the patella was subluxed laterally to use the trochlear groove as a conduit for instruments and the nail. With minimal knee flexion, patellar tendon pull on the proximal fragment is reduced, making reduction and fixation easier.

Morandi et al.² later reported a percutaneous lateral suprapatellar approach via a 1.5-cm transverse incision at the superolateral corner of the patella. Jakma et al.³ used a 1–2 cm incision just proximal to the patella in line with the tibial shaft. Using unreamed nails, they noted patellofemoral cartilage damage on arthroscopy performed before and after nailing. Cadaveric studies have also shown potential injury to the medial meniscus and intermeniscal ligament with suprapatellar entry.⁴

Despite concerns about different approaches and risk of intra-articular damage, suprapatellar nailing in the semi-extended position has gained popularity. Instrument sets developed by manufacturers have made the technique more straightforward and safer.

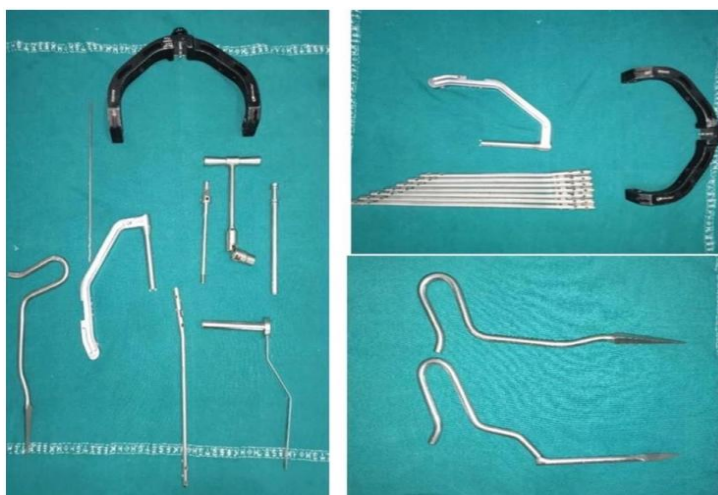
At our institution, we have used this technique for 4 years across different systems. Initially reserved for selected proximal fractures, we now use it for distal and diaphyseal fractures as well. It is especially useful in polytrauma patients with ipsilateral femoral fractures or bilateral tibial-femoral fractures, as all fractures can be addressed without manual traction or repositioning.

MATERIALS AND METHODS

Patients who underwent suprapatellar nailing for proximal third tibial fractures between May 2025 and Dec 2026 were prospectively analysed in this study. All patients were followed for a minimum of 6 months and were evaluated for radiological union and functional outcome on a regular interval. All the patients were above 18 years and all fractures were classified under 42C2 based on AO/OTA

Surgical technique: Patients were positioned supine on a radiolucent table with the knee semi-extended at 15° to 30°. A tourniquet was not used. A 2–3 cm longitudinal midline incision was made 2 cm proximal to the superior pole of the patella. After splitting the quadriceps tendon, a guide pin was inserted into the tibia under fluoroscopic guidance. The entry point was medial to the lateral intercondylar tubercle in the coronal plane and at the ventral edge of the articular surface in the sagittal plane. A patellofemoral protection sleeve, with a metal inner component and thermoplastic outer layer, was then placed. The remainder of the procedure followed the standard steps of the infrapatellar nailing technique.

In certain cases, poller screws or supplemental plating were employed depending on the intraoperative evaluation of fracture reduction and stability of the proximal fragment.



Set of instruments used for suprapatellar nailing

Suprapatellar approach





Entry point through guide wire (c-arm)

After locking nail with the screws (C – arm)



Post operative protocol : Postoperatively, patients were encouraged to begin knee and ankle range of motion exercises and quadriceps strengthening on day one, with regular follow-up thereafter.

Weight-bearing was progressed based on fracture pattern, intraoperative stability, and soft tissue condition. Patients with axially and rotationally stable fractures began partial weight-bearing immediately after surgery.

Clinical and radiographic follow-up was performed at 6 weeks, 3 months, 6 months, and 1 year to assess union. Weight-bearing was advanced from partial to full accordingly.

At each visit, functional outcomes were evaluated using the Lower Extremity Functional Scale (LEFS)⁹ via a questionnaire

Radiographic union was assessed using the Radiographic Union Scale for Tibia (RUST)¹⁰ on anteroposterior and lateral radiographs of the entire tibia, including the knee and ankle joints.

RESULTS

In this study, 24 patients with proximal third tibial fractures underwent suprapatellar nailing. One patient was lost to follow-up, leaving 23 patients for analysis.

The mean age was 33.7 years. Most patients were male, and the left tibia was more commonly affected than the right. Road traffic accident was the mode of injury in all cases.

All patients underwent standard suprapatellar nailing. Two patients required poller screws for stabilization of the proximal fragment.

The mean time to radiographic union was 22.1 weeks. At 6-month follow-up, the mean Lower Extremity Functional Scale (LEFS) score was 88%. LEFS scores were good or excellent in 84% of cases at 6 months.



DISCUSSION

Proximal tibial fractures are hard to manage via the infrapatellar approach due to deforming forces from the patellar and hamstring tendons, which frequently lead to malalignment and more difficult fixation⁵

Plate fixation is a therapeutic alternative that permits direct visualization and anatomic reduction. However, it has drawbacks including limited axial and varus stability, as well as higher risks of infection and wound dehiscence when extensive dissection is needed for plate placement.

The two primary indications for the suprapatellar approach are extra-articular proximal tibial fractures and cases with soft tissue compromise at the infrapatellar entry site. Secondary indications include knee flexion deficits, patella baja, or patellar tendon calcification⁶

In 1996, Tornetta and Collins¹ were the first to describe treating proximal tibial fractures in the semi-extended position using a suprapatellar approach, achieved by subluxating the patella medially. Later, in 1998, Cole⁷ proposed a minimally invasive suprapatellar insertion technique through the midline of the quadriceps. A 2018 review by Wang et al.⁸

demonstrated that the suprapatellar approach reduces fluoroscopy time. We concur that the semi-extended position simplifies use of fluoroscopy equipment.

We find that the semi-extended knee position facilitates surgical management in polytrauma patients and in those with soft tissue injury at the infrapatellar entry site. In contrast to some literature reports, we observed no anterior knee pain related to nail insertion with the suprapatellar approach.

CONCLUSION

Using a suprapatellar approach with the knee semi-extended is a good option for proximal extra-articular tibial fractures, especially when soft tissue conditions rule out the standard infrapatellar entry. Our findings indicate this approach may be extended to middle diaphyseal fractures and tibial fractures at any level.

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