

## MANAGEMENT OF THE TIBIAL SHAFT FRACTURES WITH A SUPRAPATELLAR APPROACH

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## ABSTRACT

**Objectives:** Tibia fractures are the most common long bone fractures, among which diaphyseal fractures are more common. Tibial diaphyseal fractures have a significant risk of non-union and malunion among all long bone fractures. Among adults, IMILN is the treatment of choice for unstable and displaced fractures. The traditional surgical method is the infrapatellar approach, which has its own drawbacks. Here, we are studying the suprapatellar approach.

**Methods:** The prospective study was conducted on 25 patients in the Department of Orthopedics, Government General Hospital, Kurnool for 1 year from November 2022 to November 2023. Patients were examined clinically and functional outcomes were noted.

**Results:** The suprapatellar approach shows an average operative time was 40–80 min and blood loss was around 70–90 mL. The mean time of union was 15–16 weeks.

**Conclusion:** For tibial diaphyseal fractures, the suprapatellar approach is a safe and effective alternative nail insertion.

**Keywords:** Tibial shaft fractures, Suprapatellar Approach, Malunion

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## INTRODUCTION

Tibia fractures are the most common long bone fractures [1], among which diaphyseal fractures are more common. About 80% of these are associated with fibula fractures [2]. Among males, the common age group is between 15 and 19, and among females, it is more than 80 years. Tibial diaphyseal fractures have a significant risk of non-union and malunion among all long bone fractures [3]. Low-energy is more prevalent in falls from standing height and sports injuries whereas RTA Leads to high-energy tibial fractures [2]. Among adults, IMILN is the treatment of choice for unstable and displaced fractures. The advantage of IMILN is that there is minimal surgical dissection and preservation of extraosseous blood supply near the fracture [4]. The traditional surgical method is the infrapatellar approach, but proximal fragment displacement due to quadriceps and patellar tendon pull and increased chances of procurvatum and valgus angulation problems [4]. Hence, the suprapatellar approach with the knee in semi-extension has been found a safe and effective surgical treatment. Clinical data show good results with a low incidence of post-operative pain [5]. Our purpose of this study is to report experience with intramedullary fixation of the tibia with a suprapatellar approach and semi-extension position.

## METHODS

The prospective study was conducted on 25 patients in the Department of Orthopedics, Government General Hospital, Kurnool for 1 year from November 2022 to November 2023. Patients were examined clinically and functional outcomes were noted.

## Inclusion criteria

Patients with all tibial diaphyseal fractures, proximal 1/3<sup>rd</sup> fractures, segmental fractures, and age more than or equal to 20 were included in the study.

## Exclusion criteria

Age <20 and more than 70, open fractures (compound Grades – 3b and 3c), pathological fractures, and congenital deformities.

## Surgical technique

Patients were kept in a supine position with a knee in semi-extension at an angle of 15–30° on a radiolucent table. The Tourniquet was not applied. A 2–3 cm longitudinal skin incision at the midline 2 cm proximal to the superior pole of the patella was given. With thorough blunt dissection quadriceps tendon is exposed and split longitudinally along its fibers. Under image intensifier guidance, a guide wire was inserted. The ideal entry point on the coronal plane was just medial to lateral tibial spine and anterior to anterior articular margin on the sagittal plane. Reaming was performed with proper protection of soft tissue and intra-articular structures. A proper-sized nail was inserted with a fracture in reduction and locked with screws. A thorough wound wash was given and wound closure was done. Regular monitoring, I.V. antibiotics, and analgesics were given postoperatively. X-rays were taken postoperatively to assess implant position and fracture reduction. Immediate weight bearing is allowed after 3–5 days. Patients were followed up at 1, 2, 3, 6, and 12 months and X-rays were taken at each visit to assess fracture healing and implant position.

## OBSERVATIONS AND RESULTS

Fracture type – out of 25, 5 (20%) of them had closed type, and 20 (80%) of them had open type.

Open fracture grading – out of 20, 16 (80%) had compound Grade –2, and 4 (20%) had compound Grade – 1.

Sex incidence – out of 25, 21 (84%) are male and 4 (16%) are females.

Side of fracture – Out of 25, 17 (68%) have suffered on the right side and 8 (32%) on the left side.

## Post-operative complications

Out of 25, 2 (8%) had complications, one had delayed union and one had an infected proximal screw. Other 23 (92%) had good outcomes without any complications.



Fig. 1: Surgical procedure

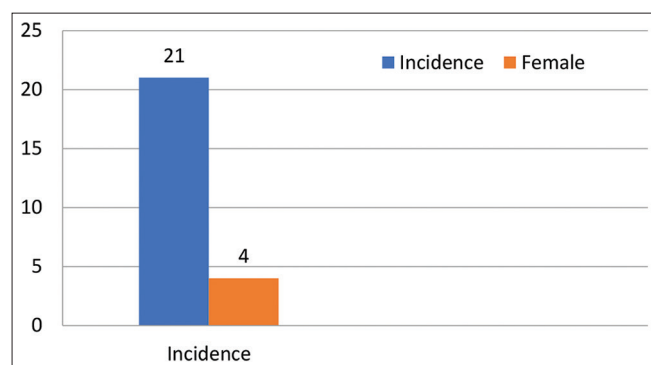


Fig. 2: Sex incidence

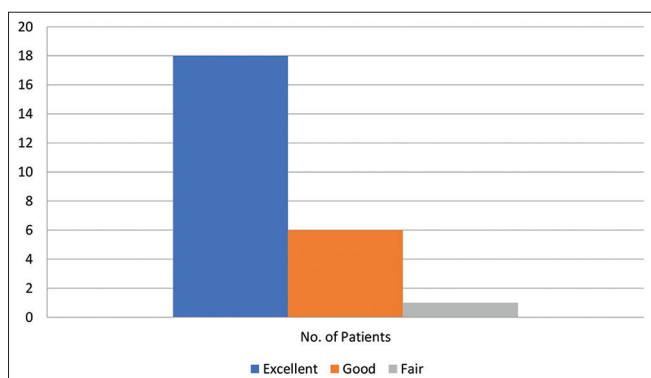


Fig. 3: Lower extremity functional scale

The average operative time was 40–80 min. Blood loss was around 70–90 mL. The mean time of union was 15–16 weeks (Figures 1-3 and Table 1).

**DISCUSSION**

As per the literature, it is difficult to manage proximal tibia fractures using the infrapatellar approach in all cases. Malalignment occurs due to the pull of the patellar and quadriceps tendons [6]. Plating is an alternative, that allows direct visualization of fracture, but there is a disadvantage of improper axial fixation and increased risk of infection [7]. Primary indications for the suprapatellar approach are those with soft-tissue damage at the infrapatellar site and proximal tibial extra-articular fractures. Secondary indications are patellar tendon calcifications, patella baja, and flexion deficit of the knee [7]. It requires

Table 1: Time of union

No. of patients (%)	Time of union in weeks
10 (40)	12 weeks
8 (32)	14 weeks
6 (24)	16 weeks
1 (2)	26 weeks (delayed union)

very few adjustments of C-arm position and also decreases the need for assistance along with decreased surgical procedure time [8]. In a study conducted by Gelbke *et al.* [9], it was found that the average contact pressure of the patellofemoral joint was increased when compared to the infrapatellar approach, but the highest recorded pressure did not lead to the death of the articular chondrocytes. It was further concluded that there was no risk to articular cartilage with this approach.

It is more important to achieve the correct entry point to overcome the risk of intra-articular damage. An advantage in this semi-extended position is that fluoroscopy is much easier to perform and correct entry point may be achieved more reliably.

In studies by Chan *et al.* [10] and Jones *et al.* [11], similar conclusions were made that the visual analog scale score is the same in both supra and infrapatellar approaches. The Mean follow-up period in our study was 12 months during which 23 patients were able to review and two got difficulty in reviewing who were followed by telephone. It took 6–8 weeks on average for callus formation after surgery with 14–20 weeks of fracture healing time.

In the present study, post-operative knee pain was noticed in none of the patients. None of them had breakage or loosening of internal fixation.

**CONCLUSION**

For tibial diaphyseal fractures, the suprapatellar approach is a safe and effective alternative nail insertion. It allows less surgical time and easy reduction. Our results came up with perfect tibial alignment, knee range of motion, union, less blood loss, and less fluoroscopy time and were deemed to be the most successful approach for the treatment of tibial shaft fractures.

**Limitations**

The study limitations are Loss of follow-up of patients, selection bias, and short period.

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**AUTHORS CONTRIBUTIONS**

All authors participated in every aspect of the study, including conceptualization, design, data collection, data analysis, interpretation, manuscript preparation, critical review, and approval of the final version to be published.

**CONFLICTS OF INTERESTS**

The authors confirm that they have no conflicts of interest related to this research, authorship, and publication of this article.

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