Journal of Orthopedics

Technical Note

SURGICAL TECHNIQUE FOR LATERAL EXTRA-ARTICULAR PARAPATELLAR APPROACH FOR TIBIA NAILING: A TECHNICAL NOTE

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ABSTRACT

The extra-articular lateral parapatellar approach is a surgical technique for tibia nailing, especially useful for the semi-extended knee position, leading to excellent control of the tip apex deformity of proximal shaft fractures. This approach employs a lateral incision near the patella to reach the antero-superior tibial angle, preserving the synovial layer and the intra-articular structures. Studies have shown that the extra-articular lateral parapatellar approach offers a superior knee function and minimizes anterior knee pain. Additionally, this approach correlates with a lower rate of painful hemarthrosis during the hospital stay, significantly enhancing patient comfort and recovery quality. The goal of this technical note is to describe in detail the extra-articular parapatellar surgical approach.

INTRODUCTION

Tibial shaft fractures are the most common type of long bone fractures, with an annual incidence of 16.9 per 100,000 (1). Males are most frequently affected, especially between ages 10 and 20, while the peak for females is between 30 and 40. These fractures primarily result from walking, indoor activity, and sports (2). Various surgical techniques for treating tibial shaft fractures include plates, intramedullary nails, and external fixations (3). Currently, the intramedullary nail is considered the gold standard, especially for tibial diaphyseal fractures.

In the present technical note, we examined the lateral extra-articular parapatellar approach (ELP), first described by Kubiak et al. in 2010. This technique allows for tibial nailing with medial patellar subluxation while preserving the synovium and without violating the articular surface, potentially reducing trochlear damage and mitigating concerns about intra-articular remaining debris of the supra-patellar approach (4). The purpose of this technical note is to describe in detail the ELP approach to tibial nailing in a semi-extended position.

Surgical technique

The surgical steps outlined in the images will be referenced throughout this paper. The indications and advantages of the technique are described in Table I. The contraindications and limitations are presented in Table II.

Received: 25 September 2022
Accepted: 15 November 2022

Table I. *Indications and advantages of the ELP approach.*

Indications	- **Tibial shaft fractures** - **Proximal or distal fractures extension** - **Semi-extended position requirement**
Advantages	- Do not require special instruments - Improved patello-femoral outcome - Reduced anterior knee pain - Lower incidence of painful hemarthrosis

Table II. *Contraindications and limitations of ELP.*

Contraindications	- **Severe patello-femoral osteoarthrtitis** - **Extensor mechanism disruption**
Limitations	- Technically demanding - Difficult clinical interpretation of proximal tibial rotation for the medial patellar subluxation

The patient is placed in a supine position on a radiolucent table, with a foam ramp under the leg. The knee is flexed to about 30 degrees. A clinical examination of the patellar glide over the trochlea is performed to evaluate parapatellar laxity. A 3 to 5 cm lateral parapatellar incision is performed (Fig. 1).

Fig. 1. *Patient set-up with details of the left knee and main surgical landmarks indicating the tibial tubercle, patellar tendon, and patella.*

Dissection is performed until the lateral retinaculum and the third and second layers of the lateral retinaculum are incised and dissected. The cauterization of the supero-lateral genicular artery is performed to avoid bleeding and impaired vision during the procedure. Subsequentially, the antero-superior angle of the tibia is bluntly palpated, and the synovial layer is carefully preserved to avoid intra-articular penetration (Fig. 2).

Fig. 2. *Surgical dissection of the third and second lateral retinacular layers and identification of the supra-lateral genicular artery (**white arrowhead**).*

The patella is then subluxated medially to facilitate access to the proximal tibia for guidewire insertion. A threaded guide pin is placed deep to the patellar tendon and superficial to the synovium (Fig. 3).

Fig. 3. *The guidewire is inserted, maintaining the axis of the tibial shaft and advanced approximately 8-10 cm.*

The entry point is crucial for positioning the tibial nail within the medullary canal and is essential for proper fragment alignment of proximal and metaphyseal fractures. In the anteroposterior view, the entry point aligns with both the axis of the intramedullary canal and the medial aspect of the lateral tubercle of the intercondylar eminence. In the lateral view, the entry point is positioned at the ventral edge of the tibial plateau and remains in line with the medullary canal. To confirm the accuracy, the position is checked using image intensifiers in AP and lateral views (Fig. 4).

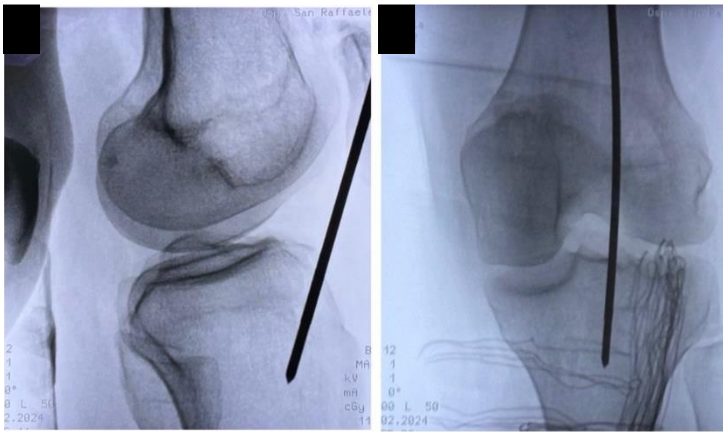

Fig. 4. *Fluoroscopic assessment of guide pin insertion.*

After proximal reaming, the fluoroscopy is used to advance the guidewire through the fracture and to the center of the ankle joint (Fig. 5).

Fig. 5. *Intramedullary tibia guidewire.*

Proper fracture reduction with a Weber reduction clamp is an essential step of intramedullary nailing, as it aligns the fracture to facilitate guidewire placement, reaming, and nail insertion. Length, angulation, and rotation are all important to provide correct nail positioning (Fig. 6). The procedure is verified by using an image intensifier to ensure the accurate position throughout the procedure (Fig. 7).

Fig. 6. *Oblique and spiral fractures can be reduced with Weber reduction clamps applied percutaneously perpendicular to the fracture line.*

Fig. 7. *Fluoroscopic image of the reduction clamp used for percutaneous fracture reduction.*

Once the fracture has been reduced and stabilized with the Weber reduction clamp, the protective sleeve, and the cutter are placed over the guidewire. The medullary canal is reamed until the required diameter is reached. The guidewire and the cutter should not touch the posterior cortex. Depending on the diameter of the nail, the appropriate length and diameter are selected and placed within the intramedullary space.

Nail length can be estimated preoperatively; however, intraoperative measurements provide greater accuracy. The distance from the nail entry point to just above the ankle joint ensures the nail does not protrude above the bony surface. The nail diameter should be sufficiently large to provide an excellent fit and reduction. Reaming should be 1.5 mm greater than the nail diameter since the medullary canal is not perfectly straight. The nail is then inserted using the dedicated handlebar. With the insertion handle, the nail is carefully advanced into the medullary canal through slight rotational movements (Fig. 8).

The passage of the nail across the fracture is monitored by the fluoroscopy in two planes (AP and lateral) to avoid malignant and iatrogenic fractures (Fig. 9).

Fig. 8. *Insertion of the canulated nail over the guidewire by hand, or gentle hammering.*

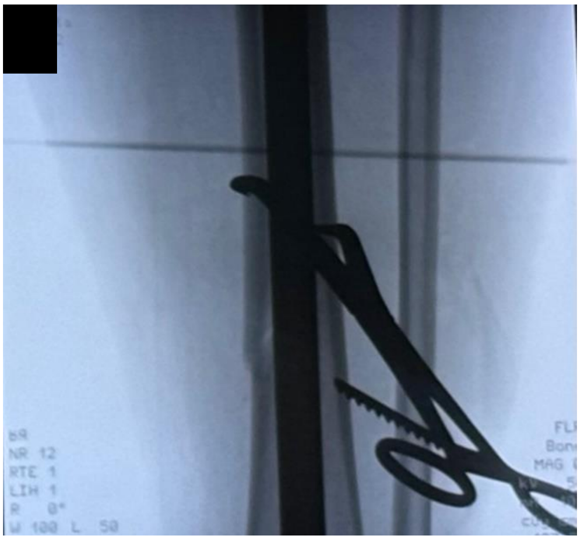

Fig. 9. *The nail is placed in the center of the distal tibia and the proper fracture alignment are maintained in placed by the forceps.*

Once the correct nail position is confirmed, proximal and distal locking screws are inserted, followed by the removal of the insertion handle. Both cortices are drilled until the drill bit just breaks through the far cortex (Fig. 10).

The number of locking screws is based on fracture pattern and fracture stability. Either 4.0- or 5.0-mm locking screws are used depending on the nail diameter. The next step involves performing distal locking. Typically, two distal locking screws are used for diaphyseal or proximal fractures, though if the pattern is length stable. The leg and the fluoroscope are properly positioned, and an incision is made under radiographic guidance. If correct, screw length is measured, the appropriate screw is inserted, and the proper placement is confirmed radiographically (Fig. 11).

Fig. 10. *Guided insertion of proximal locking screws.*

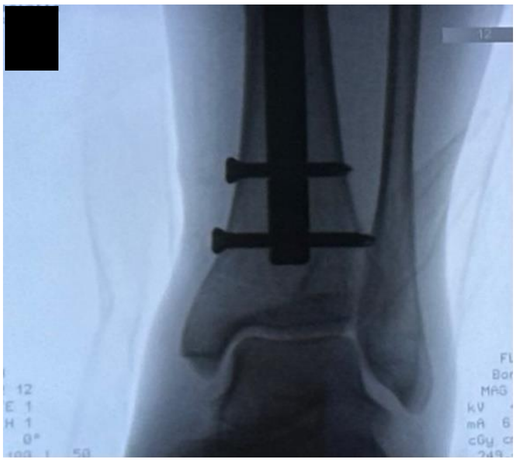

Fig. 11. *Fluoroscopy of distal locking screw.*

After the nail has been locked proximally and distally, the insertion point is irrigated to remove all reamer debris. Reticular tissues are sutured with interrupted absorbable wires. Skin and subcutaneous tissues are closed, and medication is applied (Fig. 12).

Fig. 12. *Final aspect of the left leg after tibia nailing through extra-articular lateral parapatellar approach.*

Immediately after surgery, it is essential to assess pain management, mobilization, infection prevention, and deep vein thrombosis prophylaxis, along with the early detection of complications (i.e., compartment syndrome). A key aspect of this technique is patellar subluxation, which facilitates tibial nailing in a semi-extended position. However, subluxation can lead to reamer impingement and iatrogenic injury of the patella and requires experience and confidence with the surgical technique.

CONCLUSIONS

The surgical technique for lateral extra-articular parapatellar approach for tibia nailing is a reliable technique in selected cases. However to our knowledge, additional case reports are needed to firmly establish the validity of this surgical approach.

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