



Insertion of intramedullary nails from the suprapatellar pouch for proximal tibial shaft fractures. A technical note

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Intramedullary nailing of proximal tibial fractures can be difficult when using the standard entry portal. We evaluated the suprapatellar portal, using a midline quadriceps tendon incision, to perform intramedullary nailing of the tibia. Seven patients were treated with this adaptation of the standard intramedullary nailing procedure.

An arthroscopy was done before and after the nailing procedure. No special equipment was used to perform the intramedullary nailing. We evaluated the handling and necessary modifications of the standard intramedullary technique to introduce the locked tibial nail through the suprapatellar approach.

We found this technique not necessarily more difficult than the standard intramedullary nailing of the tibia through the infrapatellar entry portal. Although the patients did not complain of patellofemoral discomfort after the suprapatellar nailing, definitive scuffing of the cartilage in the lower part of the femoral trochlea was visible.

Introduction of a locked tibial nail via the suprapatellar approach was found to be possible and even advantageous for some complex upper tibial shaft fractures in compromised limbs. Some possible downsides of this approach need to be taken into account but, in some cases, they can be outweighed by the benefits.

Keywords : tibial fracture ; intramedullary nailing ; suprapatellar approach.

INTRODUCTION

Standard paratendon or tendon splitting tibial nailing can pose a problem in two specific situations. The first are proximal tibial fractures. When the knee is bent for nail insertion, the proximal fragment is extended by the strong pull of the quadriceps and hence the nail tends to pass the proximal tibial medullary canal posteriorly with the fracture opening out anteriorly. The proximal broadening of the tibia also adds to this problem. Therefore these fractures are usually treated with plate osteosynthesis.

Standard nailing can also be difficult if the skin or soft tissue covering the proximal tibia is in a poor

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Fig. 1. — Introduction of the hand reamer, fluoroscopy, lateral view.



Fig. 2. — Introduction of the nail, fluoroscopy, lateral view

condition. Making a skin incision in an already traumatized area may cause impaired wound healing or infection.

Several alternatives for nail introduction have been developed, each with their own advantages and pitfalls (1,7-9). We investigated a technique of intra-articular insertion of the intramedullary nail from the suprapatellar pouch with the knee in minimal flexion, thereby making the nail pass more through the centre of the proximal fragment. Better reduction of proximal fractures can be obtained and there is no anterior opening out of the fracture. The skin incision is well away from the patellar tendon thus making it possible to avoid extra trauma in patients with already traumatized soft tissue.

SURGICAL TECHNIQUE

A small incision is made 1-2 centimeters above the patella in line with the tibial shaft, followed by blunt dissection to the suprapatellar pouch. A small diameter hand reamer (7 mm) is introduced into the incision and into the suprapatellar pouch. It is

passed through the patello-femoral joint into the anterior intercondylar tibial region (area intercondylaris anterioris). The medullary canal of the tibia is then opened along its axis in both the AP and lateral views using fluoroscopy (Fig. 1). The guide wire is introduced into the medullary canal. Then the tibial nail is directly introduced over the guide wire (Fig. 2). We use an unreamed nail (Expert® tibial nail from AO, Synthes). The first part of the nail is introduced using the standard aiming jig. When the lower part of the nail has passed well below the fracture, the aiming jig is removed and the extraction device is fitted on the nail. The switch to the extraction device is crucial since the aiming jig prevents deeper positioning of the nail. The guide wire should be removed before attaching the extraction device since the extraction device is not cannulated. The nail is then driven completely into the medullary canal of the tibia (Fig. 3). To avoid unwanted damage to the patella-femoral cartilage, no reaming is performed. Proximal locking is done with a freehand aiming technique with the



Fig. 3. — Definitive placement of the nail, fluoroscopy, lateral view.



Fig. 4. — Postoperative radiograph, lateral view, after several weeks.

radiolucent drill . At least three locking bolts should be used in the proximal nail part. In four out of seven cases we performed a pre-and post arthroscopy evaluation through the suprapatellar incision to evaluate cartilage damage to the femoropatellar compartment. Total operating time ranged from 40 to 100 minutes.

RESULTS

We performed suprapatellar nailing in seven patients. Postoperative radiographs showed adequate position of the nail and the screws in all patients. The nail was passing through the centre of the medullary canal. In the second patient, there was a small gap in the lateral view. Five patients have started weight bearing. The soft tissues are well healed in our first five patients with minimal cosmetic deficit from the procedure and good bone healing (Fig. 4).

DISCUSSION

We treated seven patients with different indications with an intramedullary tibial nail, inserted through a suprapatellar incision.

Most surgeons are hesitant to use this technique because of the possibility of damaging the articular surface (3,6). Recently, several cadaveric studies have shown that this route might be used relatively safely with the aid of a protection sleeve (2,3,5). We found that the procedure can also be performed with existing instruments and tools. Morandi *et al* described a more lateral suprapatellar technique in which the patella is sublaxed medially. The entry point of the nail is in the safe zone of the tibia described by Hernigou *et al*, in both techniques (6). We believe our technique is slightly easier to perform though, because the route from skin to entry-point is a straight line. Also, there is less strain on the capsule surrounding the patella.

Proximal free-hand locking and the possible need to remove these nails in the future can make suprapatellar nailing more technically demanding.

We used only the thinnest reamer to open the tibial medullary canal. The nails were then introduced without further reaming. Still, we could see articular damage to the patello-femoral compartment on arthroscopy. Most damage was seen on the femoral trochlea. The damage seen did not result in pain complaints from our patients, though. The cartilage damage we noticed at the most distal part of the trochlea femoris is a site that has less contact pressure. Osteochondral plugs for mosaicplasty typically are removed from this area (4). We did not see any damage to the anterior horns of the menisci.

The operating time is slightly longer than conventional nailing since all the locking has to be done free hand. Still the operating time is well acceptable and less than plate osteosynthesis, which is usually the treatment of choice for proximal tibial fractures.

The suprapatellar nail insertion certainly has its benefits as far as the reduction of the fracture is concerned. There was no need to hyperflex the knee to introduce the nail, which in fact causes anterior opening out of the fracture. There is no risk of damaging the patellar tendon and the infrapatellar nerve. Anterior knee pain, which is regularly seen in conventional nailing, is probably less when nailing is done with this route.

We are aware that all the above mentioned is not time tested. Paratendon or tendon splitting introduction remains the gold standard for intramedullary nail insertion. In specific cases that route can be compromised though.

We conclude that introduction of an intramedullary tibial nail for proximal tibial fractures through a suprapatellar incision is a technique which is relatively easy to perform and which can be considered as an alternative to plate osteosynthesis or standard nailing when the situation demands.

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