



THE USE OF THE NEOSUPRA TIBIAL NAIL SYSTEM IN THE TREATMENT OF TIBIAL FRACTURES

Introduction to Suprapatellar IMN

Tibial fractures, which are common long-bone fractures, account for approximately 4% of all fractures^[1,2]. In particular, the prevalence of tibial shaft fractures is approximately 2% of all fractures^[2]. Treatment options for tibial fractures include open reduction-internal fixation, external fixation, and IMN^[2]. The IMN procedure has become the standard treatment for most closed and selected open long-bone fractures because of recent substantial improvements in metallurgy, surgical techniques, and fluoroscopy^[3].

As reported in the clinical literature, the IMN procedure has several advantages over other treatment options, including minimal soft tissue destruction, protection of the blood supply to the periosteum, and enabling early patient mobilization and weight-bearing^[2,4]. These advantages improve patient clinical outcomes such as high fracture union rates and low perioperative complication incidence rates^[2,4].

The infrapatellar (IP) approach, which is the traditional approach for IMN characterized by maintaining the knee in flexion during the operation, often causes postoperative anterior knee pain with an incidence rate of 10-80% and proximal fragment displacement, leading to valgus and procurvatum^[2,5,6]. The suprapatellar (SP) approach (**Fig. 1**) aims to address the weakness of proximal fragment migration due to hyperflexion in the IP approach by maintaining the knee in a semiextended position throughout the procedure^[7]. Additionally, the SP approach facilitates fracture reduction and simplifies intraoperative imaging^[6]. The SP approach involves splitting the quadriceps tendon and placing a flexible cannula in the suprapatellar space, followed by the retropatellar space^[2]. This allows the insertion of a standard nail system using a simple extension of the jig^[2].

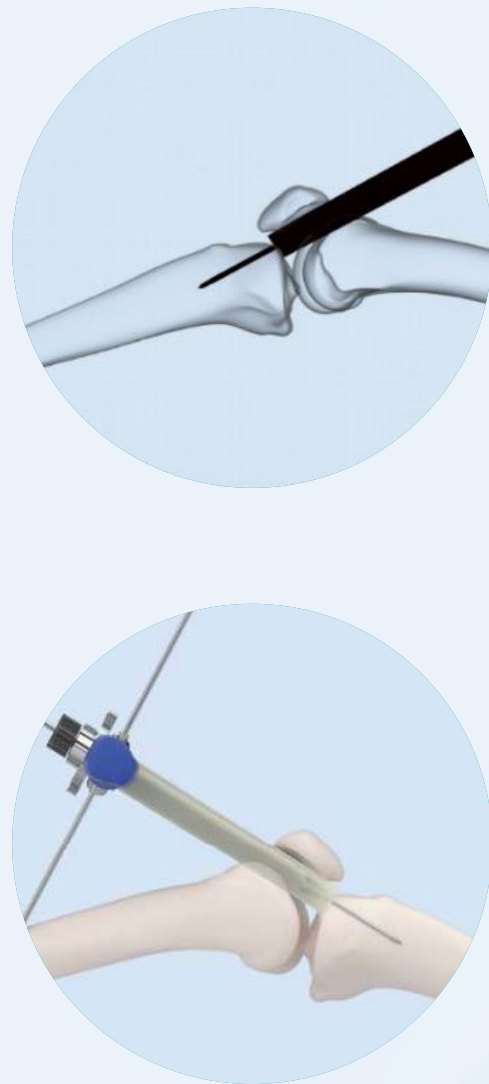
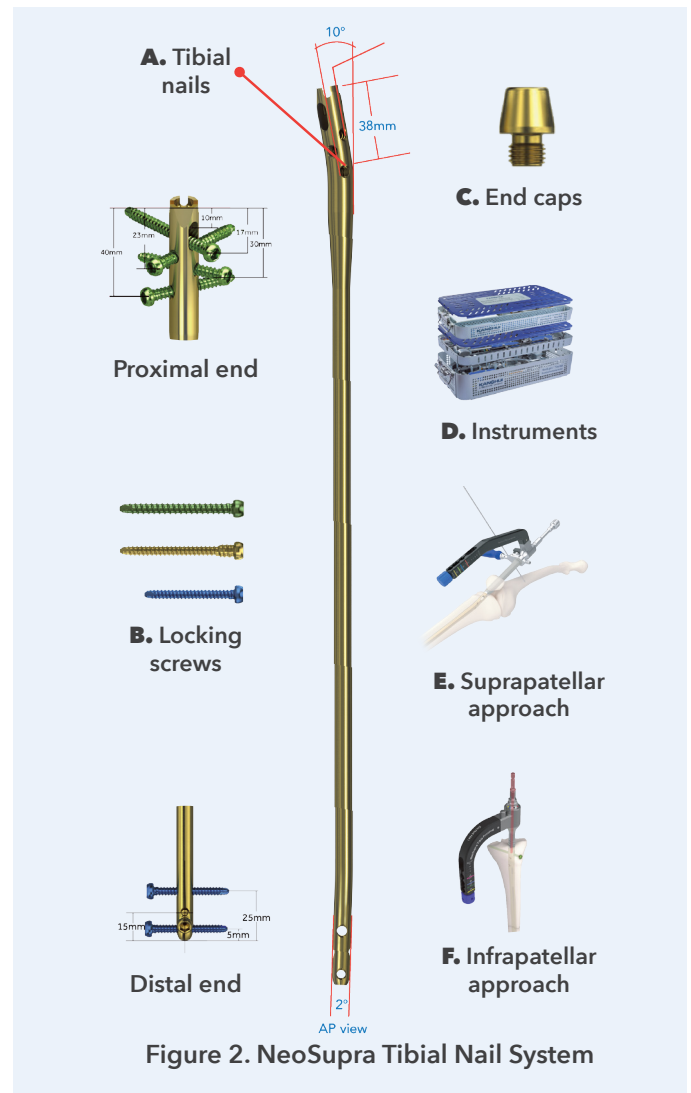


Figure 1. The suprapatellar approach

Description of the NeoSupra System

The NeoSupra Tibial Nail System (NeoSupra) manufactured by Kanghui (a Medtronic company) is composed of tibial nails (**Fig. 2A**), locking screws (**Fig. 2B**), endcaps (**Fig. 2C**), and associated instrument sets (**Fig. 2D**). Nails are available in various diameters and lengths to meet the patient's anatomic needs; locking screws are used to secure the nail position inside the tibia; and end caps of various lengths are used to protect the inner nail hole and facilitate nail removal. The associated instrument sets are used for the SP (**Fig. 2E**) and IP approaches (**Fig. 2F**).

The design features of the NeoSupra system aim to facilitate the surgical procedure. For instance, 1) the proximal designs of Herzog 10° and a bend distance of 38 mm (**Fig. 3A**) are intended to help reduce the risk of nail impingement on the posterior cortex; 2) the proximal dynamization slot enables controlled compression of the fracture end within 7 mm to avoid possible iatrogenic fractures (**Fig. 3B**); and 3) the threaded locking hole (**Fig. 3C**) at the proximal and distal ends is intended to lower the risk of screw backout. In addition, multiplanar proximal locking (**Fig. 3D**) can enhance implant stability and low-profile locking screws (**Fig. 3E**) can decrease the risk of soft tissue irritation. The short distance between the distal locking hole and nail end (5 mm, **Fig. 3F**) can facilitate extreme distal-end fracture fixation. The 2° distal bend (**Fig. 3G**) assists the implant in passing through and fitting into the distal tibia. Furthermore, the design features of the associated instruments are intended for patient safety and ease of use, and the nonmetal protection sleeve and PEEK trocar (**Fig. 3H**) can protect the soft tissue near the nail insertion site. The easy one-button technique for rotation of the proximal aiming arm can facilitate multiple locking options (**Fig. 3I**), and the radiolucent distal aiming arm with thumb wheel adjustment can provide easy and accurate distal targeting (**Fig. 3J**).



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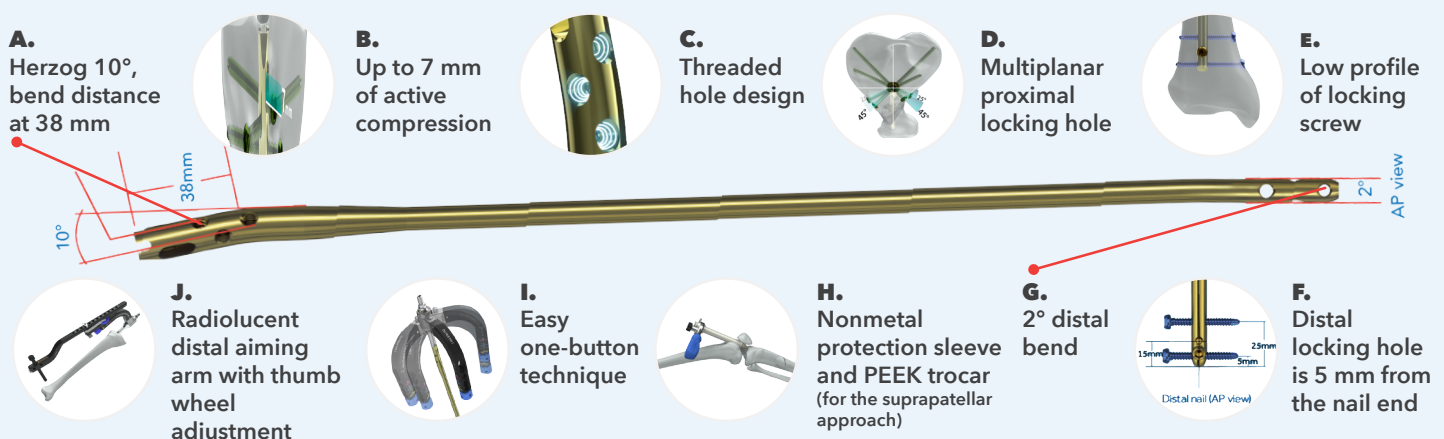


Figure 3. Design features of the NeoSupra Tibial Nail System

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