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ORIGINAL ARTICLE

Distal targeting device for long Gamma nail®. Monocentric observational study

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KEYWORDS
Fracture;
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Femoral diaphysis;
Nailing;
Distal locking screw

Summary
Introduction: Intramedullary nail distal locking screws make it possible to control length and rotation but include an increased risk of radiation exposure. A distal targeting device was recently developed for long Gamma® nails (Stryker®). The aim of this practical observational study was to evaluate the reliability of this system. Our hypothesis was that the targeting device would be systematically used without conversion or complications.
Materials and methods: All of the long Gamma® nails implanted between November 2011 and October 2012 were recorded: 91 nails (59 W/32 M, mean age 73.5 years old) for 68 traumatic fractures, 14 preventive nailings and nine pathological fractures. A junior surgeon performed the procedure in 45 cases and a senior in 46 cases. The number of times the device was used, the difficulties and complications encountered, the duration of fluoroscopy and the dose of radiation were noted. Risk factors were looked for.
Results: The targeting device was used 79 times (the surgeon chose not to use it 11 times, and it was not available in one case). There was a measurement error in one case, therefore 78 nails could be evaluated. Three wrong positions of the distal locking screw occurred. No statistically significant risk factors were identified. Distal locking screw corresponded to 18% of the entire procedure at a radiation dose of 7.44% (this was higher with titanium nails and pathological fractures). Total fluoroscopy time was longer with junior than with senior surgeons but the dose and duration for distal locking were not different.
Discussion: The hypothesis was not confirmed. The device was not systematically used and the risk of complications was not null. No risk factors were identified. The distal locking screw is a difficult step but the use of the targeting device can limit the dose of radiation. This device is effective and allows young surgeons to perform distal locking without increasing the dose of radiation compared to senior surgeons.
Level of evidence: Level IV, cohort study, observational prospective follow-up.

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Introduction

The reference treatment for long bone fractures is intramedullary nailing. The goal is to obtain rapid functional recovery by providing stable fixation for immediate mobilization and early weight bearing [1]. Locked intramedullary nailing controls shortening and rotation of bone fragments [1,2]. Although the proximal cervical screw procedure is normally easy, facilitated by the use of a nail guide, the distal locking screw procedure is more difficult. Besides the possible complications, the patient and surgical team are exposed to perioperative radiation. Numerous methods have been proposed to reduce this risk [3—5] and even to do without radiation and perioperative fluoroscopy all together [4,6—9].

Recently an external distal targeting device was developed for distal locking of the long Gamma® (Stryker®) cervicomedullary nail. We report our practical experience with this device in a single-center observational series. Our study had several goals: to identify prognostic factors and risk factors of failure of the external targeting device, to evaluate the efficacy of the device and the frequency of use, and finally to evaluate its effect on the dose of radiation in relation to the duration of fluoroscopy and the type of fracture, the material of the nail, the surgeon's experience as well as the age, gender and body mass index of the patients. The hypothesis was that the targeting device would be systematically used in a Level I University Hospital traumatology department without conversion and without specific complications.

Materials and methods

Description of the study

This was an observational prospective study performed from November 2011 to October 2012. All long Gamma® nails (Stryker®) implanted during this period were recorded. The use or not of the distal targeting device was noted as well as the type of lesion (traumatic fracture, pathological fracture, preventive nailing), the nail material (titanium or steel), the nail length, the difficulties encountered, the complications observed (misdrilling, fractures, loss of screws), the duration of fluoroscopy for the distal locking screw procedure alone and for the entire intramedullary nailing procedure, the experience of the surgeon (senior: University Medical Professor l, Hospital Practitioner, University Lecturer Hospital Practitioner; junior: resident, Fellow in Medicine), body mass index, age and gender of the patients.

Measurement of the duration of fluoroscopy and the dose of radiation for the distal locking screw began at the moment fluoroscopy was used to prepare the distal locking screw and ended after the final control of the distal locking screw. The duration of fluoroscopy and the dose of radiation were obtained by subtracting the time at the beginning from that of the end of the distal nailing procedure. Direct measurement by placing the device at zero is not possible. Time was expressed in seconds and the dose of radiation in cGy/cm^2.

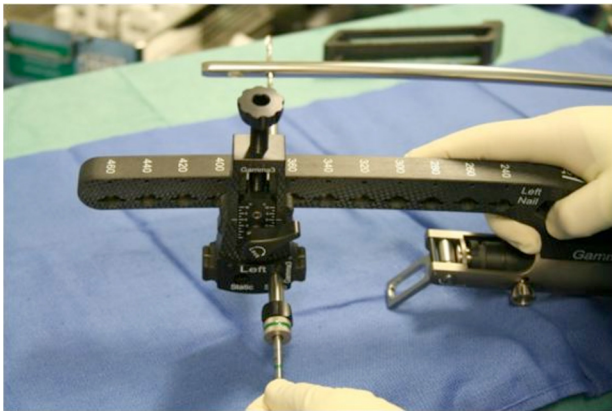

Figure 1 Confirmation of the distal targeting device. Note the position of the drill guide along the mark for the length of the nail (this is a 380 mm nail).

Surgical technique

The usual indications and customary nailing techniques were used, and were not changed for the study. The presence of a total hip prosthesis on the same side was not criteria for exclusion as long as nailing was indicated. A fracture table was always used with the contralateral limb in a gynecological stirrup.

The first step to using the distal targeting device was to confirm the device on the nail (Fig. 1). The drill guide was positioned according to the length of the nail then adjusted using the drill guide sleeve and the 4.2 mm diameter drill tip. The drill tip had to be exactly in the center of the nail hole. Once the nail was in place and the cervicocephalic lag screw was posed, the targeting device was mounted on the traditional nail-guide instrumentation (Fig. 2). With the fluoroscope there was no need to be exactly perpendicular to the nail because unlike the classic free-hand technique, a perfectly aligned image of the sleeve on the distal hole and the image of perfectly round holes were not necessary. A view at a 30° angle of the nail is possible. This angle gives the surgeon working space, facilitating the procedure and limiting the risk of infection (Fig. 3). The nail and the drill sleeves were brought together under fluoroscopic control.

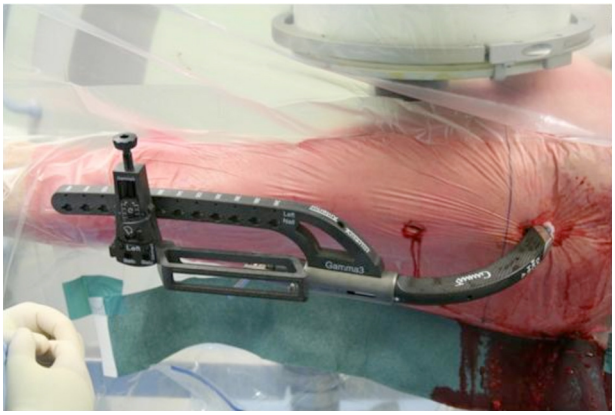

Figure 2 Placement of the external distal targeting device on the classic proximal nail device of the Gamma Long Nail®.