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*Technical note*

# Safe, rapid, and effortless femoral nail removal using a new third-generation universal femoral nail extraction tool

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## Introduction

Intramedullary nails used for fixation of femoral fractures may require removal for a variety of reasons. Some recommend that all such nails be removed after fracture healing,[1,2] whereas others prefer to remove only those that cause symptoms.[3,4] Regardless of the reason, removal of an intact femoral nail can be difficult and time-consuming. Husain et al.,[3] in a review of 45 femoral nail removals, noted that an average of 110 min was required for removal of titanium nails and 84 min for removal of stainless steel nails. They attributed the longer removal times for titanium nails to the removal of more locking screws than in the stainless steel nails. Femoral nails also frequently require removal of a heterotopic bone cap. Although specific retrieval difficulties are difficult to quantitate, we have found that a new universal extraction tool (Smith-Nephew, Memphis, TN, USA) allows quick, easy, and predictable removal of unbroken antegrade and retrograde femoral nails.

The tool is a conical, threaded extraction device that can be attached to a bar for impaction with a slotted mallet. The extraction head is cannulated for a standard 3.2-mm guide pin or guidewire, which is used to penetrate the nail core to guide the extraction device into place.

## Technique for removing unbroken, antegrade femoral nail

Place the patient in the straight lateral position using a beanbag or other positioning device on a radiolucent operating table. Prepare the entire leg, lateral buttock, and torso to the ribs. Drape the leg out to allow full hip and knee motion for positioning. Flex the hip to almost 90°. Remove the proximal and distal locking screws in standard fashion. Lay a guidewire on the thigh and obtain a fluoroscopic image of the proximal hip. Adjust the wire to coincide with the femoral nail on the lateral view. Draw a line along the wire, extending it onto the buttock. Externally rotate the thigh and mark a line in a similar fashion to determine the anteroposterior nail position. The intersection of the two lines indicates the site of the incision for placing the extractor. If heterotopic bone is to be removed, the incision must be made larger. The wound is bluntly expanded with large Mayo scissors. Once the nail is reached the scissors are used to hold the wound open, and a 3.2 guidewire is inserted along the scissors until it touches the nail. The scissors are removed, and the guide pin is adjusted until it advances into the nail. Anteroposterior and lateral images of the hip are obtained to confirm placement of the guidewire into the nail. The cone-shaped femoral extractor on the extraction bar is inserted into the wound, over the guide pin. The extractor is gently but forcefully screwed into the nail. The first pass may not fully engage the nail, but it will remove much of the interposed soft tissue. The extractor is reinserted over the guide pin or wire and tightened onto the nail with force sufficient to require the use of the wrenches. The slotted mallet is used to hammer the nail out. The wound is irrigated and closed in the standard fashion.

Use of this third-generation extraction device has allowed removal of locked intramedullary nails with a minimal incision and an operating time of 20–30 min. Removal of heterotopic bone may require a larger incision and longer operating time.

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