

**CASE REPORT**

# Removal of a Broken Intramedullary Nail: A Case Report and Technical Description

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**Abstract**

The removal of a broken intramedullary nail is a challenging procedure. Several surgical techniques have been described to remove the distal end of the nail. Here, we report the surgical technique for removing broken Fitbone® lengthening nail using a cerclage wire. This is an effective and reproducible technique that does not require specialized equipment, the development of a cortical window, or an arthrotomy and is applicable for all types of intramedullary nails.

**Level of evidence:** IV**Keywords:** Broken nail, Cerclage wire, Fitbone nail, Removal**Introduction**

Intramedullary nailing is a well-established method for stabilizing long-bone fractures associated with good clinical outcomes and low complication rates. In recent years, nails have been introduced for leg lengthening and deformity correction. One of the potential complications of intramedullary nailing is nail breakage. Nail breakage can occur either due to trauma on the ipsilateral limb or in the setting of a delayed union or nonunion. <sup>1</sup> The removal of a broken intramedullary nail can be a challenging procedure. While implant-specific threaded extraction bolts can be used to extract the proximal end of the nail, the removal of the distal end is often more complicated. Several techniques have been described, including custom-made hooks, multiple guide wires, commercial nail extractors, arthrotomy and retrograde removal of the nail, and development of bony windows and pushing or pulling the distal end of the nails with various instruments. <sup>2-12</sup>

Here, we present a case report of a broken femoral lengthening nail removal with a cerclage wire. This technique does not require any specialized equipment,

is minimally invasive, and can be applied to all types of nails, femoral or tibial, solid or hollow, and lengthening or conventional ones.

**Case presentation**

A 50-year-old male patient presented to the Accident and Emergency department after having sustained a fall with right thigh pain and an inability to bear weight. The patient was involved in a road traffic collision three and a half years ago, which resulted in multiple injuries, including a closed comminuted femoral shaft fracture. The fracture was then temporarily stabilized with an external fixator, followed by intramedullary nailing using a rigid nail. Four months ago, the patient underwent surgery for limb lengthening and deformity correction with a fitbone nail (Fitbone®, motorized intramedullary nail, Orthofix). Plain radiographs of the right femur revealed a nail breakage at the level of the corticotomy [Figure 1].

The patient was placed in a supine position on a traction table during revision. Using the existing incisions, the cable and the receiver were removed

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Figure 1. Anteroposterior (A) and lateral (B) pre-operative x-rays, showing the broken fitbone nail.

from the previously made subcutaneous pouch. Then, the threaded extraction bolt was inserted into the proximal part of the nail and tightened, followed by removing the two proximal screws [Figure 2]. After that, an olive-tipped guide wire was inserted up to the level of the distal end of the nail [Figure 3]. The distal locking screw was removed, and under the image intensifier, the hole was drilled to a bigger diameter [Figure 4]. Through this entry point, a wire was passed through the distal locking hole and around the olive-



Figure 2. Intraoperative imaging shows the insertion of the threaded extraction bolt into the proximal end of the nail.

tipped guide wire and was then twisted, compressing the guide wire against the nail [Figure 5]. The guide wire was pulled from the proximal incision, which at the same time led to the removal of the distal end of the nail and the twisted wire [Figure 6].

All the metalwork was removed except a poller screw in the proximal femur, which was left to be used with the new nail. Using a standard technique, an antegrade femoral nail was inserted (Expert R/AFN, Synthes, USA). The postoperative course was uneventful.



Figure 3. Intraoperative imaging showing insertion of an olive-tipped guide wire up to the level of the distal end of the nail.



**Figure 4.** Intraoperative imaging, drilling of the hole of the distal locking screw.



**Figure 5.** Intraoperative imaging showing the passing of the wire through the distal locking hole of the fitbone nail (A) and around the olive-tipped guide wire (B) and then twisted (C), bringing the nail and the guide wire together.



**Figure 6.** Removal of the nail by pulling the guide wire from the proximal incision.

**Discussion**

Removing the distal part of a broken nail represents a challenge for the orthopedic surgeon due to the absence of specific extraction devices. In the present case report, we present the removal of a broken fitbone nail, which can be used to remove any broken intramedullary nail.

In the literature, there are multiple techniques for removing broken nails. Several authors have used custom-made hooks or multiple guide wires passing through the canal of the nail.<sup>2-6</sup> Limitations of these techniques are that they can be used only for cannulated implants, while at the same time, technical difficulties can arise in the presence of very long nails. The fitbone nail is solid. Therefore, this approach was not applicable in our case. Many authors attempted an arthrotomy for retrograde removal of the nail or the development of a cortical window at the distal end of the nail.<sup>9-12</sup> These techniques, however, add to the trauma and can be associated with a higher infection rate. We opted not to go through the corticotomy or the regeneration to minimize regenerate problems. Finally, specialized extraction instruments have been employed by some authors.<sup>7,8</sup>

To the best of our knowledge, this is the first report of removing a broken fitbone nail. We present a compelling and reproducible method using a cerclage wire applicable in both hollow and solid nails, which does not require specialized equipment.

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