Case report

Technique tip for the removal of a “non-removable” tibial nail (Expert Tibial Nail)

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1. Introduction

Open tibial fractures are challenging fractures to treat. After union the question of whether to remove the nail often arises—especially in young multiple injured patients, where sometimes other operations have to be performed for functional or cosmetic amelioration.

Routine removal is usually not any more recommended in the recent literature [1,4,6,14,17]. Nevertheless there remain circumstances where the decision is made to remove the implant.

We report on a young female patient where we had problems in removing the new Synthes® Expert Tibial Nail (ETN), a titanium alloy cannulated intramedullary nail with numerous locking options at its proximal and distal ends to allow proximal and distal locking in various extended fracture patterns [7].

2. Case history

Our patient, a 20 years old female, sustained a tibial mid-shaft fracture suitable for treatment with intramedullary nailing (Figs. 1–3).

After primary external fixation in the resuscitating phase (additional thoracic, abdominal and pelvic trauma with an ISS 57) uneventful intramedullary nailing was performed and the soft tissue coverage was done by split skin grafted after demarcation of one third of the skin.

![Fig. 1. (a–e) Initial tibial fracture (AO 42 B 2), primary external fixator. Secondary intramedullary osteosynthesis with ETN, consolidation of the tibial fracture in excellent alignment 2 years after trauma and before metal removal, after metal removal and redrilling of locking holes.](image-url)
Two years later, after full recovery metal removal at the pelvic ring and additional closure of a posttraumatic hernia at the right inguinal region and at the symphysis was planned. The patient requested removal of the implant in her right tibia.

No problems occurred during looking bolt removal and approach to the proximal nail’s end. But the treads for engaging the extraction device were destroyed because of cross-threading of the end cap. Correct placement of the extraction rod was not possible. Creating new treads by the use of the specially hardened extraction rod was successful. But even with powerful attempts of extraction the nail moved neither out- nor inwards. As we first thought that the weight of the slap hammer was too low we tried a power tool to disengage the nail, but without success. Only overdrilling of all locking holes using the well-known free hand technique with the radiolucent drill bit allowed uneventful extraction of the nail without damage to the tibial shaft.

3. Discussion

Over the last few years opinion concerning implant removal has changed. Routine removal of intramedullary implants is not recommended in general. A sample of problems during nail removal is published in the recent literature and includes broken looking bolts, broken nails–cannulated and not cannulated, destroyed inner treads and so on [2,3,5,8–10,12,13,15,16].

Titanium alloy is a well tolerated implant material. On one side there is the wish for biological ingrowths without infection as a crucial benefit for permanent implants as in the mouth in dentistry or in the prosthetic replacement all over the body (hip, knee, spine etc). But on the other hand titanium with unpolished surfaces can bring trauma surgeons problems, if there is a wish for removal of so-called temporary implants after the goal of consolidation in fracture care is reached [11,17]. Besides special tools to remove implants we like to add the redrilling of locking holes to the armentarium of trauma surgeons to remove intramedullary nails. If “normal” extraction-attempts fail, surgery has not automatically be interrupted under the circumstances of the term of “unremovable nail”. Maybe redrilling of the multiple locking holes helps to reduce the restraining force of the bony integration so the nail can be removed without splitting the bone.

![Fig. 2.](image-url) (a and b) In- and ongrowth on the titanium alloy implant after removal, complicating the removal.

![Fig. 3.](image-url) (a and b) Distal shaft of the tibia after removal of the nail, nicely showing the bony surrounding of the nail.
4. Conclusion

In the case of an “unremovable” intramedullary implant made of titanium, redrilling of all locking holes should be reconsidered and added to the step-wise approach to this problem (from normal extraction to complete opening of the tibia by a one third cortical window and the use of osteotomes). We should also consider problems possibly arising during nail removal when we speak to patients prior to surgery. In general, the use of stainless steel has to be reconsidered as well as a change in the surface of titanium intramedullary implants by the manufacturers.

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References