

Surgical Technique



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Removal of Broken Retrograde Rush Rod from Tibia: A Technical Tip

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Abstract

Broken rush rods within the tibia present a challenging problem for orthopaedic surgeons, particularly when a retrogradely inserted rod breaks at the ankle or distal tibial level, leaving the distal fragment embedded within the tibial canal. This technical tip describes a simple, reproducible, and minimally invasive technique for removal of the retained broken rod while minimizing the risk of iatrogenic complications.

Keywords: Broken rush rod, Tibia, Technical tip

Introduction

Nailing of the tibia using a Rush rod/nail is a common procedure employed in the management of a dysplastic tibia in children with congenital pseudoarthrosis of the tibia [1]. Rush nailing is also used in other conditions, such as osteogenesis imperfecta, either following deformity correction or as a prophylactic splint for weak bone [2]. The use of smooth rods is a relatively simple technique and requires minimal instrumentation. However, in long bones, these nails have the disadvantage of not providing rotational stability, unlike interlocking nails used in adolescents and adults. One of the stabilizing factors in such cases is the fit of the nail within the narrowest part of the bone, known as the isthmus. Controlling nail passage through the wider proximal and distal metaphyseal regions of the tibia can be challenging. Tibial nailing can be performed either in an antegrade fashion, with entry through the knee joint and advancement toward the ankle, or in a retrograde fashion, where the nail is introduced from the heel and passed proximally. Both approaches have their advantages and disadvantages. Antegrade nailing is generally preferred, as it preserves knee and ankle motion and is technically less demanding. In contrast, retrograde nailing involves passage through the subtalar and ankle joints, potentially leading to joint immobilization while the nail remains in situ and increasing the risk of subsequent arthritis. However, in certain scenarios, spanning the ankle and subtalar joints is necessary to improve stability, particularly when dealing with small distal fragments. One such indication is congenital pseudoarthrosis of the tibia, which typically involves the distal two-thirds of the bone [3]. In such cases, retrograde nailing becomes an important surgical option. A common complication encountered during follow-up is distal migration or breakage of the nail, especially when children begin mobilization. This may result in retention of the distal two-thirds of the nail within the tibial shaft above the ankle. Retrieval of such buried nail fragments is technically challenging. Previously described techniques include creating a cortical window in the distal tibia and pushing the nail proximally for extraction through the knee, or direct removal through a cortical window [4]. Both methods carry a risk of fracture and often necessitate postoperative immobilization. The proximal one-third of the nail within the calcaneus and talus is usually easier to remove by exposing the hooked end at the calcaneal entry site.

We describe a simple technical tip to facilitate the removal of a buried tibial nail using a metallic suction tip.

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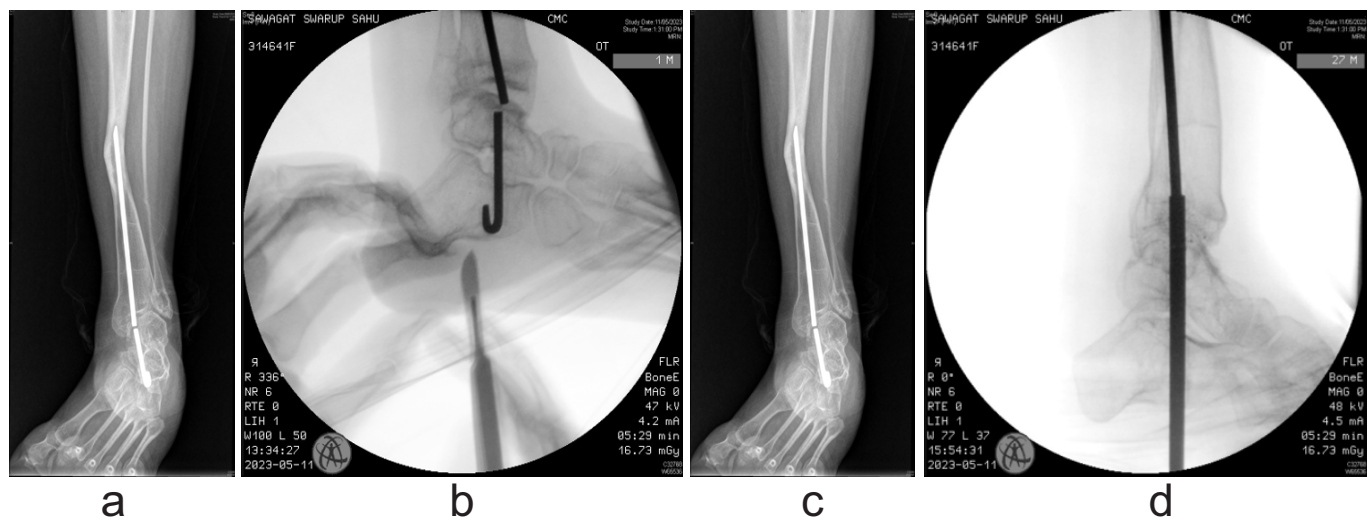


Figure 1: (a) Pre op X-ray lateral. (b) Intra-op. (c) Anterior posterior X-ray. (d) Pre-op image.

Surgical Technique

- The limb is prepared and draped under tourniquet control.
- An incision is made at the entry point of the Rush nail. Although the previous scar is often used, it may have migrated; therefore, localization of the nail end using an image intensifier in both anteroposterior and lateral views is recommended before incision.
- After exposing the proximal end of the nail – sometimes requiring minimal bone removal to uncover the hook – the nail is grasped using a nose plier or the hook of a smaller-diameter Rush nail. The proximal segment is usually straightforward to remove.
- The main challenge lies in retrieving the distal one-third of the nail, which is often deeply embedded within the tibia, particularly in long-standing cases where growth has caused further migration.
- To address this, a metallic suction tip of a diameter slightly larger than that of the retained nail is used. The straight portion of the suction tip is gently advanced by hand along the original nail tract through the talus and calcaneus. In some cases, the tract may require widening using a drill bit.
- Under image intensifier guidance, the suction tip is advanced across the ankle along the previous tract until it engages and slides over the retained nail fragment.
- At this stage, the external end of the suction tip is cut, and a Rush nail is passed through it, following the established tract until it contacts the retained fragment.
- The Rush nail is then gently hammered to push the retained nail proximally toward the knee. A small proximal incision is made to expose and grasp the advancing nail, allowing for its complete removal.
- The suction tip thus serves as a guide, ensuring accurate passage of the new Rush nail and preventing deviation within the wide metaphyseal region of the tibia.

Discussion

The main technical challenge is directing an instrument to the retained nail fragment without creating an additional cortical window. In this technique, the metallic suction tip acts as a temporary sleeve along the existing nail tract, allowing the second Rush nail to reach and engage the retained fragment. This is particularly useful in the wider metaphyseal region, where the advancing Rush nail may otherwise deviate from the original tract.

The technique is simple, uses instruments readily available in the operating room, and avoids direct exposure of the retained fragment. Accurate localisation with image intensifier is important because the retained fragment may have migrated from the original entry site. If the original tract is not patent, it can be gently re-established with a drill. The technique is best suited to cases in which the original tract remains identifiable and should be performed under fluoroscopic guidance with controlled advancement to avoid cortical injury.

Conclusion

The metallic suction-tip technique provides a simple and reproducible method for removing a deeply retained broken retrograde Rush rod. By using the existing nail tract to guide a second Rush nail and advance the retained fragment to an accessible site, it can facilitate removal without requiring a separate cortical window.

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Declaration of patient consent : The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given the consent for his/ her images and other clinical information to be reported in the journal. The patient understands that his/ her names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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