A Technique for Removal of Broken Cannulated Tricortical Syndesmotic Screws

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Summary: Breakage rates of tricortical syndesmotic screws after weight bearing range from 10% to 29%. Removal of the portion of the broken screw buried within the tibia often proves quite difficult. We report a new technique to remove a broken cannulated syndesmotic screw. This technique is simple, time saving, and less traumatic than previously reported methods of broken syndesmotic screw removal.

Key Words: syndesmotic screw removal, removal of hardware, broken syndesmotic screw, syndesmosis, broken hardware

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INTRODUCTION

Screw breakage rates of 10%–29% for tricortical syndesmotic screws have been reported.[1,2] Removal of the portion of the broken syndesmotic screw buried within the tibia can be a challenging problem. Techniques for retrieval of the broken screw tip have been described and include overdrilling the fibula with removal through this enlarged portal and using a blunt impaction instrument placed through the fibula to impact the screw out the overdrilled anteromedial tibial cortex.[3] These techniques may be necessary for noncannulated screws. However, the presence of a broken cannulated screw lends itself to a technique described here that is less time consuming and removes less bone, which potentially decreases the risk of fracture.

TECHNIQUE

Retrieval of the screw head fragment is easily performed with an appropriately sized screwdriver through a small incision over the screw head. After removal of the screw head fragment, the retained broken screw tip is cannulated through the prior screw track from the lateral side with an appropriately sized guide wire. Smaller instruments than the broken screw's diameter may be used. In the case described below, the broken 4. 5-mm screws were removed using guide wires and cannulated drills from a 4.0-mm cannulated screw set. The guide wire position within the cannulated screw is then confirmed under fluoroscopy. Next, the guide wire is driven through the anteromedial cortex of the tibia until the guide wire is observed below the medial skin. A stab incision large enough to accommodate the chosen cannulated drill bit is then made directly over the protruding guide wire. The cannulated drill with tissue protector is placed over the medial end of the guide wire and drilled on forward through the anteromedial tibial cortex. The broken screw tip is slowly approached over the guide wire until the drill tip abuts the screw tip (Fig. 1). This should be confirmed under fluoroscopy. On passing through the anteromedial cortex with the drill, changing the drill mode from the drill function to the ream function may allow the drill to approach the screw tip in a more controlled manner. With slow advancement, the tip of the drill bit should engage the screw tip cutting threads (Figs. 2A, B) and act as a screwdriver on reverse, thus unscrewing the broken screw tip out through the fibula along the path of the guide wire (Fig. 3). Care must be taken to remain in line with the guide wire when drilling over the guide wire as misalignment may lead to breakage of the guide wire or cannulated drill bit. The screw tip can then be grasped with a hemostat as it presents through

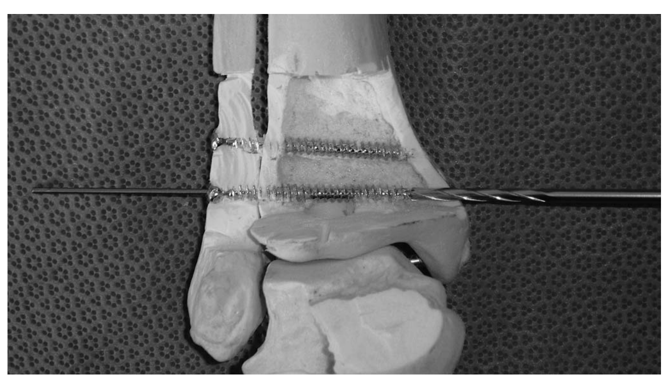

FIGURE 1 . The 3.2-mm cannulated drill is drilled over the guide wire through the anteromedial cortex of the tibia and slowly approaches the screw tip (screw intact in model and tissue protector omitted).

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FIGURE 2. A, The cutting edges of the drill bit approach the cutting edges of the self-drilling cannulated screw over the guide wire. B, The cutting edges of the drill bit and self-drilling cannulated screw engage each other over the guide wire.

the lateral cortex of the fibula and removed manually along the path of the guide wire.

CLINICAL EXAMPLE

A 40-year-old woman presented to the emergency department after sustaining a fall from standing, resulting in a twisting injury to her left ankle. Radiographs revealed a Weber C fracture of the fibula (Figs. 4A, B). In the operating room, stress examination revealed syndesmotic instability, and thus, closed reduction and percutaneous fixation of the syndesmosis were performed. The syndesmosis was reduced percutaneously with a pointed reduction clamp and fixed with 2 tricortical 4.5-mm cannulated screws that were placed parallel to the tibiotalar joint line through stab incisions over the fibula (Figs. 5A, B). Postfixation fluoroscopic evaluation revealed the syndesmosis to be stable. Postoperatively, the patient was made non-weight-bearing and placed in a posterior splint.

At 3 weeks postoperation, the patient returned to clinic for a wound inspection and a new posterior splint was placed. The patient was lost to follow-up after this initial postoperative visit.

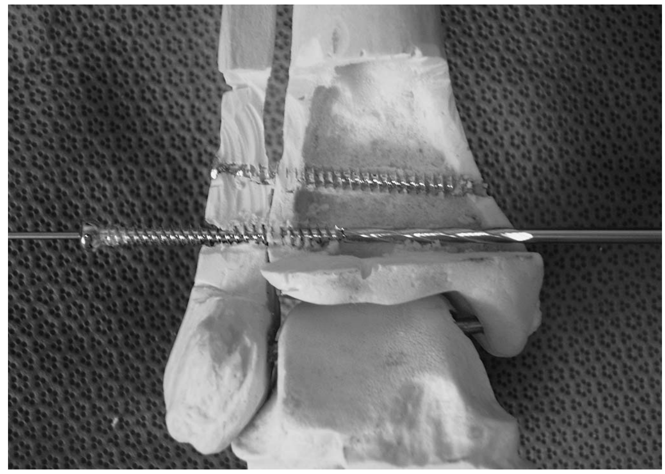

FIGURE 3. The cannulated screw is unscrewed out of the lateral side by a medially placed drill on forward.

At 9-month postprocedure, the patient returned to clinic demonstrating full weight bearing, but now with complaints of ankle pain with focal tenderness over the anterior syndesmosis. Radiographs revealed a healed fibular fracture and failure of both screws between the tibia and the fibula (Figs. 6A, B). The patient elected for removal of hardware and fluoroscopic stress evaluation of the syndesmosis. The broken screws were removed by the above-described technique without complication (Figs. 7A, B), and the syndesmosis was stable under fluoroscopy. The patient reported nearly complete pain relief at her postoperative visit and was instructed to return as needed.

CONCLUSIONS

Fixation of syndesmotic injuries with a cortical screw obtaining rigid quadricortical purchase has traditionally been the recommended method of fixation of these injuries.[4] However, cadaver studies have indicated that rigid fixation

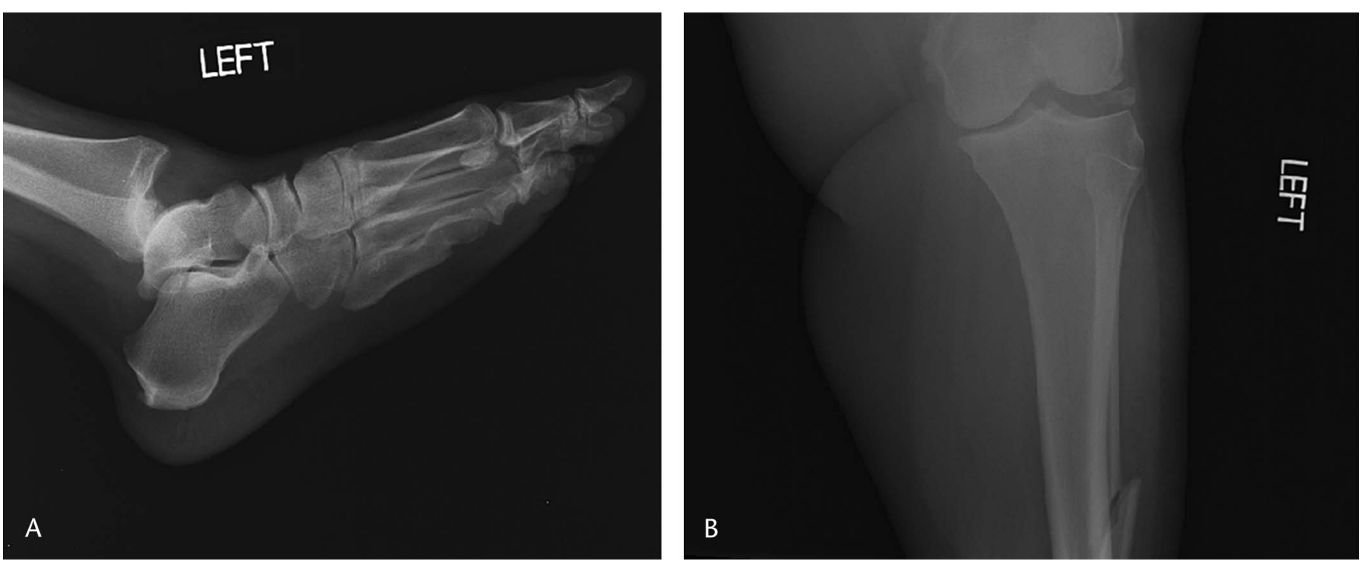

FIGURE 4. A, Lateral radiograph of the left foot revealing an unstable tibiotalar joint. A healed fifth metatarsal fracture is also appreciated. B, AP radiograph of the left tibia reveals a midshaft fibular fracture.

FIGURE 5. A, B, Postoperative mortise and lateral radiographs of the ankle demonstrating reduced ankle mortise.

of the syndesmosis restricts normal physiologic motion at the distal tibiofibular joint and may adversely affect ankle biomechanics.[5,6] This led Heim et al[1] to recommend the use of a tricortical syndesmotic screw with purchase in only 1 tibial cortex. It was hypothesized that the reduced rigidity may provide more normal physiologic motion and may reduce the stress on the implant, obviating the need for a subsequent procedure to remove the screw. Heim et al[1] concluded that removal of the screw was necessary only if they fail to loosen or if a persistent limitation of dorsiflexion is still present after 3 months.[1] Recent studies, however, have failed to demonstrate long-term functional differences between tricortical and quadricortical fixation, and thus, either method may be employed at the discretion of the surgeon.[7,8]

Although tricortical fixation may decrease the stress on the screw and theoretically lessen the rate of screw breakage, studies have shown rates of 10%–29% screw breakage for tricortical syndesmotic screws when full weight bearing takes place.[1,2] Although there is little evidence that retained screw fragments are harmful and subsequent removal of the fragments has the potential to cause further damage, broken screws are at times removed when pain continues beyond the healing of the fracture and syndesmosis. In our clinical example, it was felt that the patient's pain was due to the

FIGURE 6. A, B, AP and lateral radiographs of the ankle depicting broken syndesmotic screws.

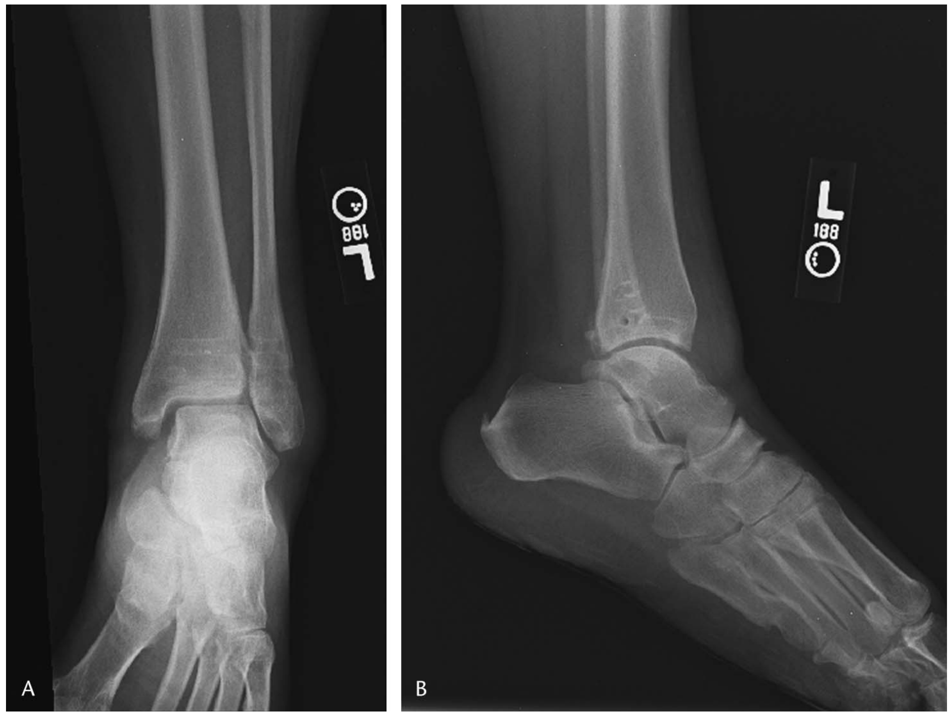

FIGURE 7. A, B, AP and lateral radiographs of the ankle status after removal of hardware.

broken screw ends. However, we could not be certain if all or only some of the 4 screw pieces caused pain. The stable fluoroscopic syndesmotic stress examination likely supports our preoperative supposition that the patient's pain stemmed from the broken screws and not from continued syndesmotic instability.

Although the removal of the screw head of a broken syndesmotic screw is typically performed with the use of a screwdriver, the removal of the deep portion of the screw buried within the tibia may be difficult. The screw typically fails between the tibia and the fibula. Screw removal from the lateral side may require bone removal from the fibula, increasing the risk of fracture. For noncannulated screws, 2 removal techniques have been described. The first involves overdrilling the medial cortex of the tibia and malleting the screw out from medial to lateral, whereas the second uses a broken screw set to overdrill the screw from the medial tibia with a large hollow drill.[3] Screw cannulation provides for use of an alternative technique that uses a conically shaped, threaded "easy out" device that threads into the cannulated portion of the broken screw to gain purchase, allowing for removal from the lateral side. However, our method typically results in less bone removal; obviates the need to overdrill the fibula or tibia, thereby reducing the risk of fracture; and can usually be performed in less time than other methods. Thus, we believe that this technique is a simple and time-saving method of removing broken cannulated syndesmotic screws. Additionally, although cannulated screws have not traditionally been employed in syndesmotic fixation due to concerns over the decreased strength of the screw and potentially increased screw failure rate, this technique illustrates an advantage of cannulated screws over noncannulated screws for syndesmotic fixation.

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