Intramedullary Bone Fragment Preventing Passage of Reaming Guide Wire

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In North America, reamed, locked, intramedullary nailing is commonly used to treat closed, displaced fractures of the tibia. Nailing tibia fractures that have simple fracture configurations is relatively straightforward and is commonly done by general orthopedic surgeons and trauma specialists. However, seemingly simple cases are not always without complications. In the case reported here, of a patient who sustained a closed, transverse, tibial shaft fracture, passing the intramedullary guide wire was not possible by traditional closed means because of incarceration of a small bone fragment in the opening of the distal fracture segment. Open retrieval of the fragment was required so that the guide wire could be passed across the fracture.

Case Report

A 37-year-old man was involved in a rollover motor vehicle collision. Physical examination and x-rays obtained in the emergency department revealed that he had sustained an isolated closed left midshaft tibial fracture with moderate comminution (42-A3.2, Arbeitsgemeinschaft für Osteosynthesefragen/Orthopaedic Trauma Association[1]) (Figure 1). The soft-tissue injury was grade 2, according to the classification described by Tscherne and Gotzen.[2] There were no other injuries. The patient was initially placed in a long splint and taken to the operating room for intramedullary nailing within 24 hours of injury.

The patient was placed supine on a radiolucent operating table. We used a patellar tendon splitting approach, correlating with a starting position in line with the medial aspect of the lateral tibial spine. After the anterior cortex was opened with a sharp awl, a ball-tipped guide wire was passed into the canal and advanced distally to the fracture site without difficulty. Under fluoroscopic guidance, the fracture was reduced in the anteroposterior and lateral planes. Several unsuccessful attempts were made to pass the guide wire across the reduced fracture. Careful reinspection of preoperative x-rays revealed the possibility of a small bone fragment in the proximal canal opening of the distal tibial segment. The image intensifier, used to examine the area more closely, confirmed a small bony fragment was likely responsible for blocking the guide wire (Figure 2).

A 6-cm incision was made over the anterior compartment at the level of the fracture. Dissection revealed moderate periosteal stripping at the fracture site. A 20x9x3-mm cortical fragment wedged tightly into the canal was removed with a surgical clamp from the opening of the canal of the distal segment (Figure 3).

The guide wire was then passed distally across the fracture site without difficulty (Figure 4). A statically locked 10x335-mm titanium nail was placed uneventfully after reaming up to 11 mm. Postoperative x-rays confirmed excellent reduction and alignment of the fracture (Figure 5). The patient's postoperative course was satisfactory, with good evidence of healing, maintenance of alignment, and no infection.

Discussion

Treatment of displaced tibial shaft fractures with reamed intramedullary nailing is commonly performed in North America. Midshaft transverse diaphyseal fracture patterns are technically straightforward to treat in most cases. However, we have described a situation that made an otherwise routine operation significantly more difficult. We have not been able to find this problem described in the literature.

We believe that, when there is comminution at the fracture site, the surgeon should carefully inspect the pre-

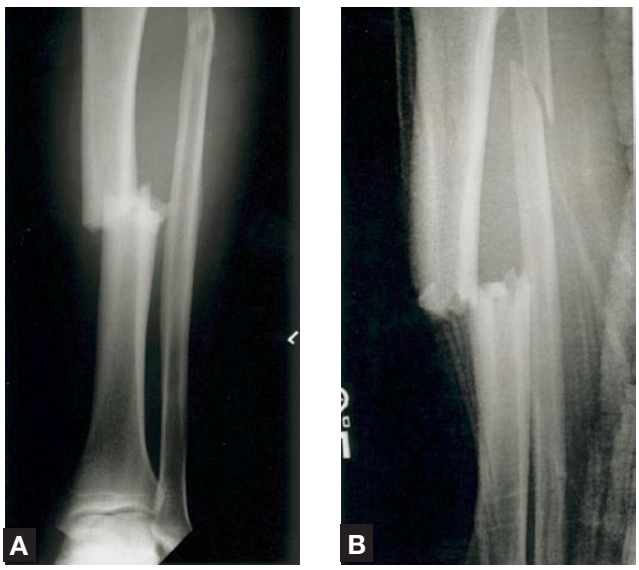

Figure 1. Preoperative anteroposterior **(A)** and lateral **(B)** radiographs of midshaft tibia fracture show the potentially incacerated bone fragment.

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Figure 2. Fluoroscopic anteroposterior image shows the intramedullary bone fragment preventing passage of the ball-tipped guide wire used for intramedullary reaming into the distal tibia.

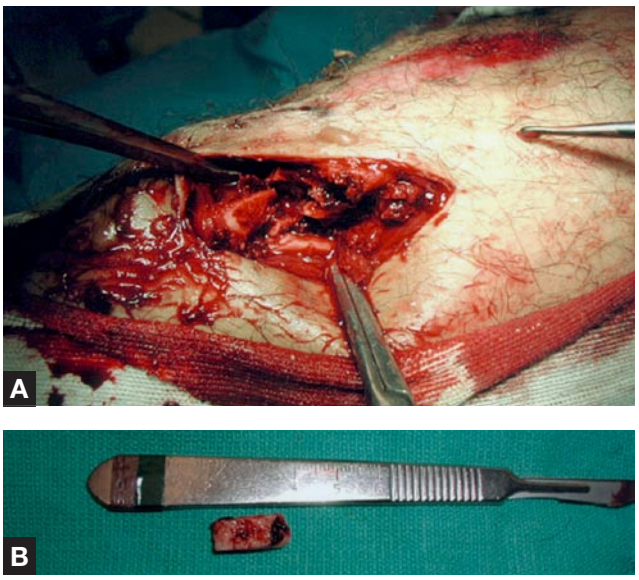

Figure 3. **(A)** The fracture site was opened to identify and remove the obstructing bone fragment. **(B)** The obstructing bone fragment measured 20x9x3 mm.

operative x-rays for intramedullary fragments that may be obstructing the medullary canal. If the guide wire cannot be passed easily across a reduced fracture during the operation, the surgeon should be suspicious of an incarcerated fragment blocking the reduction before forcing the guide wire or nail past the obstruction.

When a bone fragment obstructs the medullary canal, the surgeon should carefully consider open retrieval of the fragment because forcing the wire distally may wedge an incarcerated fragment deeper and more securely into the canal. Furthermore, an intramedullary bone fragment can potentially jam a reamer in the medullary canal.

One advantage of treating closed tibial shaft fractures with an intramedullary device is that soft tissues around the fracture are left intact. Open surgical dissection at or near the fracture site has been reported to increase the risk for infection.[3] However, in some situations, such as

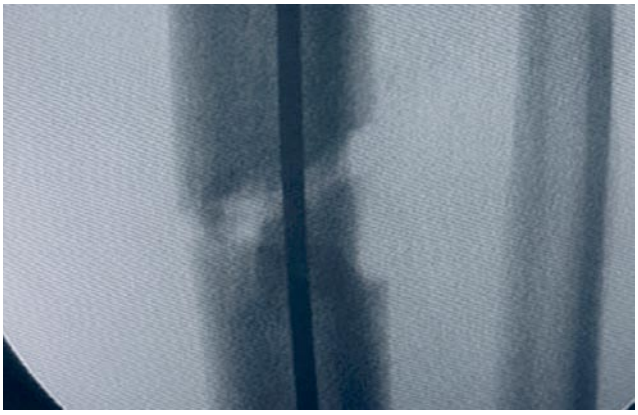

Figure 4. After the obstructing bone fragment was removed, the guide wire easily passed into the distal tibia.

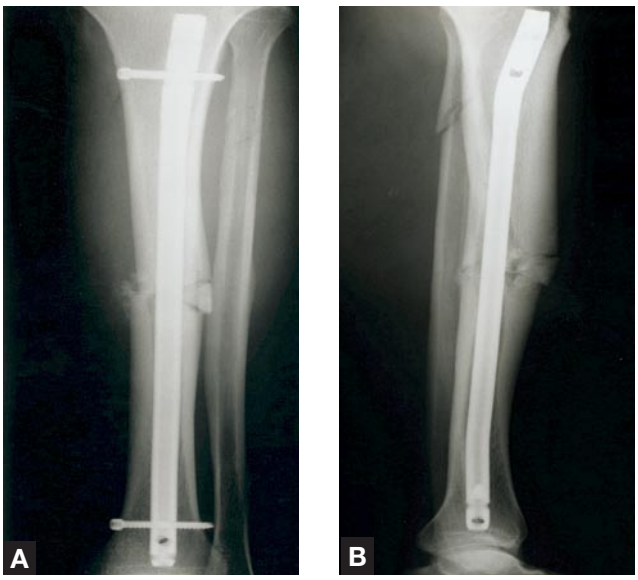

Figure 5. Postoperative anteroposterior **(A)** and lateral **(B)** x-rays.

the one described here, opening the fracture site may be unavoidable. With gentle handling of the soft tissues and no further soft-tissue stripping, the infection rate can be minimized.

Authors' Disclosure Statement

The authors report no actual or potential conflict of interest in relation to this article.

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