Case report

Non-invasive repair of an iatrogenic tibial artery branch pseudoaneurysm after intramedullary nailing

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ABSTRACT

Tibial fractures are a commonly seen injury in orthopedic surgery. Intramedullary nailing is considered the standard of care, as complications are rare. Those of a vascular nature, including iatrogenically induced pseudoaneurysms of the tibial artery have been previously described in the literature, however each reported case has required surgical repair. In the current case, we describe a repair of a tibial artery branch pseudoaneurysm, after direct contact with an interlocking screw from tibial intramedullary nailing, via ultrasound-guided thrombin injection. To the authors' knowledge, this is the first reported case of a tibial artery pseudoaneurysm repaired non-surgically. This adds support to the promising literature on non-invasive repair of orthopedically related pseudoaneurysms.

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1. Introduction

Intramedullary nailing is a routinely performed procedure for commonly seen tibial fractures, and complications remain infrequent.¹ Vascular complications of intramedullary nailing, including traumatic and iatrogenically induced pseudoaneurysms, have been previously described in the literature^{2–6} and are a potentially serious complication. Orthopaedic associated pseudoaneurysms have a variable time frame of presentation, and have previously been reported up to eight years after surgical fracture repair utilizing intramedullary nailing.¹⁰ Cases of interlocking screws as the primary etiology of pseudoaneurysms are significantly more rare, and each reported case has required invasive surgical repair.^{5,6} We describe a novel ultrasound (US)-guided thrombin embolization repair of an anterior tibial artery branch pseudoaneurysm as a result of a proximal interlocking screw acutely after intramedullary nailing of a traumatic Gustilo and Anderson type IIIA tibial shaft fracture.

2. Case presentation

A 38-year-old man presented to the emergency department (ED) after a motor vehicle accident with an obvious fracture of the left leg. Past medical history included occasional alcohol use and daily tobacco use. Radiographic imaging showed a segmental, comminuted distal third diaphyseal tibia fracture (Fig. 1). On clinical exam, a traumatic ruptured anterior tibialis tendon was also discovered. The patient's fracture was splinted in the ED and, having met criteria, was transferred to a level one trauma center for repair.

At the trauma center and after a discussion with the patient, intramedullary nailing of the fracture with irrigation and debridement, and repair of anterior tibialis tendon was performed. Reaming to 11.5 mm was done to allow for a 10 mm nail with excellent restoration of length and alignment (Fig. 2). The patient had an uneventful postoperative day one and day two with well controlled pain, and was subsequently discharged home on postoperative day number two. Seven-days postoperative, the patient reported swelling in the proximal operated leg and severe pain extending to the foot after attempting to get out of bed. The patient went to an outside ED. An US was performed to rule out deep vein thrombosis, which was negative. After contacting the orthopedic surgeon who performed the repair, an office visit was recommended. At the appointment that same day, swelling with mild erythema about the proximal incision was noted with pain at

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Fig. 1. Anterior radiograph imaging indicating a left segmented, comminuted distal diaphyseal/metaphyseal tibia fracture (Gustilo and Anderson type IIIA).

Fig. 2. Lateral radiograph imaging of repaired type IIIA tibia/fibula fracture with intramedullary nailing.

the proximal tibia area. There were no signs of compartment syndrome. At this time, a computed tomography (CT) of the lower extremity was ordered, revealing an isolated $14 \times 13 \times 12$ mm pseudoaneurysm off an anterior tibial artery branch in the anterior compartment directly contacting a proximal interlocking screw from the intramedullary nailing (Figs. 3 and 4). After a consult with vascular surgery, US-guided embolization with thrombin was the chosen course of treatment. A 4-French micropuncture needle

Fig. 3. Transverse CT of the lower extremity revealing a $14 \times 13 \times 12$ mm pseudoaneurysm off a branch of the tibial artery at the proximal interlocking screw site.

Fig. 4. Sagittal CT of the lower extremity revealing a $14 \times 13 \times 12$ mm pseudoaneurysm off a branch of the tibial artery at the proximal interlocking screw site.

verified cannulation within the pseudoaneurysm. Prior to cannulation, the patient was experiencing excruciating pain. The pseudoaneurysm was decompressed partially, successfully decreasing the pain. Then, a total of 2000 units of thrombin at two separate injections allowed for near complete closure of the

pseudoaneurysm. Verification of thrombosis was achieved by B-mode imaging, and was seen within the aneurysm sac by color flow. There was a residual area eccentric placement of flow in the pseudoaneurysm sac, however, attempts at angulating the needle were unsuccessful at penetrating the area. It was estimated the procedure had achieved approximately 85% thrombosis and the vascular team agreed that complete thrombosis would be achieved over time. The procedure was then ended. Documented flow through the anterior tibial artery was achieved on completion of the procedure. At two-weeks postoperatively, pain and edema has significantly improved about the proximal tibia. At thirteen-weeks postoperatively, the patient had resolution of the pseudoaneurysm related pain and swelling. Mobility, range of motion and patient reported pain was comparable to an uneventful postoperative tibial intramedullary nail.

3. Discussion

Pseudoaneurysms as a complicating factor of intramedullary nailing are rare. Those involving interlocking screws as a primary cause have been previously described. In the few cases reported of pseudoaneurysms of the tibial artery caused by proximal interlocking screws, the selected modality has been surgical resection or repair. Although considered the “gold standard,” there are notable risks involved in invasive repair⁷ and recently, interventional radiology techniques, including US-guided embolization with thrombin, have shown promise in the repair of pseudoaneurysms.^{8,9} After examining the literature, we believe this is the first reported case of a tibial artery or tibial artery branch pseudoaneurysm, as a result of an interlocking screw from commonly performed intramedullary nailing, in which has been repaired non-surgically. Indeed most of the literature associated with orthopedic implants and pseudoaneurysm have elected surgical repair.^{2–6} However, non-invasive repair of the peroneal artery after an ankle fracture fixation has been reported with good success.¹⁰ CT imaging was key in identifying the pseudoaneurysm early, as well as confirming the involvement of the interlocking screw. The current case along with the emergent literature on non-invasive pseudoaneurysm repair, indicates that in the rare case of a pseudoaneurysm caused by orthopedic interlocking screws, US-

guided embolization with thrombin is a viable option. The authors suggest that non-invasive repair be strongly considered in cases of pseudoaneurysms associated with orthopedic implants and demonstrates the importance of early clinical suspicion, appropriate imaging and early consultation with a vascular surgeon capable of less invasive image guided techniques.

4. Disclosure

Informed consent was obtained from the patient to publish this case report. This study received no financial assistance from any public or private entity.

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