Anterior Tibial Artery Pseudoaneurysm: A Case Report and Literature Review

Håkan Charles-Harris, MD, RPVI, FACS

ABSTRACT

Background.—Anterior tibial artery pseudoaneurysm is a very uncommon complication after orthopedic surgery and trauma. A combined treatment modality using thrombin injection, coil embolization, and surgical approach is described and currently being evaluated compared with other treatment modalities.

Patient Description.—This study reports the case of a 33-year-old man who presented in the office with a pulsatile mass just below the right knee. The patient with a history of trauma to his right leg during a motor vehicle accident underwent open reduction internal fixation of a proximal tibia-fibula fracture. Eight weeks later the patient had a pulsatile mass in the surgical area. A venous Doppler ultrasound was initially performed in the emergency room which revealed an incidental finding of a 5.60 cm × 3.54 cm pseudoaneurysm.

Methods.—As modalities of treatment the patient had coil embolization as well as two separate sessions of thrombin injection with poor response. Finally, he underwent repair of the right anterior tibial artery pseudoaneurysm with a vein patch, which was successful. This case highlights different modalities that have been used to treat anterior tibial artery pseudoaneurysms.

Conclusion.—Based on previous reported cases and our own case, we concluded that surgical approach is the most successful modality of treatment for proximal anterior tibial artery pseudoaneurysms.

Introduction

Anterior tibial artery pseudoaneurysm is an unusual condition that can occur after trauma to the artery. Pseudoaneurysms following various iatrogenic factors, including but not limited to, tibio-talar calcaneum fusion surgery, tibial nailing, sports injury, and ankle arthroscopy, have been reported. However, proximal anterior tibial pseudoaneurysm followed by open reduction internal fixation (ORIF) of tibial fracture, as in our case, is rare.

Tibial artery pseudoaneurysm has been treated with different modalities including ultrasound-guided thrombin injection, coil embolization, endovascular stenting, and surgical repair. Ultrasonic thrombin injection is often used to treat pseudoaneurysms, especially the larger common femoral artery, and can be very effective in many cases. Endovascular stenting has also been successful in treating pseudoaneurysms of lower extremity vessels. Coil embolization has been used in the treatment of some aneurysms but its success in treating anterior tibial artery pseudoaneurysms needs more investigations and trials. Our case report although only one case, indicated poor results in treating this type and location pseudoaneurysm. We presented a case of anterior tibial artery pseudoaneurysm occurring after ORIF following a traumatic fracture of the proximal tibia. The patient underwent the treatments described above.

The goal of this case presentation is to review the causes, sonographic and clinical presentations of tibial artery pseudoaneurysms and the treatment option.

Case Report

This case report presents a 33-year-old male patient with a trauma to the right lower extremity proximal tibia; he underwent an ORIF of theibia with an intramedullary rod. Eight weeks later, he presented with a pulsatile mass in the area just below the patella. The initial diagnostic study done was a lower extremity venous Doppler (Figure 1) in the emergency room (ER) and the diagnosis of anterior tibial artery pseudoaneurysm was made. We proceeded with an angiogram-guided coil embolization of the right anterior tibial artery pseudoaneurysm. This procedure though initially had positive result with partial thrombosis of the
pseudoaneurysm, eventually failed to cause complete thrombosis of the pseudoaneurysm (Figure 2). The patient was sent to interventional radiology where two successive days of thrombin injections also had partial success, but later failed to completely thrombose the pseudoaneurysm (Figure 3). The patient was then referred to a vascular surgeon. He had a successful aneurysmectomy with greater saphenous vein patch.

Figure 1
Right lower extremity venous Doppler showing an incidental finding of anterior tibial artery (ATA) pseudoaneurysm.

Figure 2
(A) Angiogram coil embolization of pseudoaneurysm. (B) Arterial Doppler (B-mode) of pseudoaneurysm after coil embolization. (C) Arterial Doppler (color flow) of the pseudoaneurysm after coil embolization showing flow through neck into sack. (D) Partial thrombosis of pseudoaneurysm after coiling. Significant flow remains in the sack.
Discussion

Anterior tibial artery pseudoaneurysm following ORIF is a rare complication. It may present as a swelling and painful mass just below the knee immediately or at a more remote time after the surgery or trauma.

Previously reported cases of pseudoaneurysm following sport injury,\(^2\) tibio-talar-calcaneum fusion with a retrograde nail,\(^1\) tibial nailing,\(^2\) ankle arthroscopy,\(^4\) and proximal tibial Steinmann pin insertion\(^8\) had different modalities of treatment. For instance, thrombin injection of the femoral artery pseudoaneurysm located in the groin area has an initial success rate of 100%,\(^5\) but in our case, treatment of the pseudoaneurysm located in the proximal anterior tibial artery, was only partially successful with thrombin injection. This suggests that the location of the pseudoaneurysm should be taken into account when designing the treatment plan. In addition, in our patient the neck of the pseudoaneurysm was wide, increasing flow into the sack and decreasing the likelihood of successful nonsurgical treatment. Also, his native anatomy was unusual (a true trifurcation of the popliteal artery) and he had a proximal location of the pseudoaneurysm, both factors preventing an adequate proximal landing zone for a covered stent without occluding the other tibial vessels. Thus endovascular stenting was not possible in our patient (Figure 4). On the other hand, endovascular stent graft has been successful in treating anterior tibial artery pseudoaneurysms\(^1,6,9\) in a more distal location, where proximal and distal landing zones are available for the stent.

Many pseudoaneurysm cases including our case resulted from iatrogenic factors. For example, the pseudoaneurysm of the anterior tibial artery following the tibial nailing may have been the result of the initial drilling of the locking screw, which injured the artery.\(^2\) Clearly it could also have resulted from the initial trauma. In the case of pseudoaneurysm following sport injury, injection of thrombin was partially successful,\(^3\) and surgery with ligation of the anterior tibial artery proximal to the aneurysm was successful.\(^3\) Not only can ligation be cost-effective to young population as a modality of treatment, it can also help to avoid the risk of infection presented by the use of synthetic conduit.\(^10\) Coil embolization was reported to be a successful treatment for anterior tibial pseudoaneurysm caused by gunshot injury.\(^6\) However, in our case, both thrombin injection and coil embolization were only partially successful. Surgical approach was reported to be successful in treating pseudoaneurysm of the lower extremity arteries following gunshot injuries among people younger than 45 years.\(^11\)

The most common cause of pseudoaneurysm is endovascular intervention, where of 30 patients studied 90% had pseudoaneurysm as a result of endovascular...
intervention and only 10% was a result of orthopedic surgery. This supports our hypothesis that our case is unusual.

Our review indicates that a surgical approach is an acceptable and perhaps the optimal modality for treating proximal anterior tibial artery pseudoaneurysms.

References