Case Report

Anterior tibial artery pseudoaneurysm after ankle arthroscopy and Brostrom procedure treated with thrombin injection✩

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Abstract

Ankle arthroscopy and the Brostrom procedure are common interventions for ankle instability, but they do carry a risk of vascular injury resulting in a pseudoaneurysm. We present a rare case of anterior tibial artery pseudoaneurysm after ankle arthroscopy and Brostrom procedure treated with direct thrombin injection. A 40-year-old male patient presented with progressive left anterior ankle pain and swelling 5 months after a left ankle arthroscopy and Brostrom procedure. MRI and ultrasound imaging was consistent with anterior tibial artery pseudoaneurysm. He was referred to interventional radiology for treatment. His pseudoaneurysm was successfully treated with an ultrasound guided direct thrombin injection. Several potential treatments are available for treatment of pseudoaneurysms. This includes surgical intervention, endovascular treatment, external compression, and direct thrombin injection. All of these treatment options have been explored in literature. Of these possible treatments, direct thrombin injection has the best combination of efficacy, complication rate, and recurrence rate, which makes it the preferred treatment for a pseudoaneurysm.

Introduction

Ankle arthroscopy and the Brostrom procedure are common interventions performed for treatment of chronic ankle instability [1]. Ankle arthroscopy involves making small incisions at the ankle followed by instrumentation for minimally invasive evaluation and treatment of intra-articular pathology. The Brostrom procedure is typically performed with an incision along the distal tibia followed by repair of the anterior talofibular ligament. Both procedures involve instrumentation around the ankle, which places the adjacent vasculature at risk of minor or major trauma, and this may lead to the formation of a pseudoaneurysm. Vascular injury resulting in the formation of pseudoaneurysm is a rare complication that has been reported in prior case studies. We present a rare case of anterior tibial artery pseudoaneurysm after ankle arthroscopy and Brostrom procedure that was subsequently treated with imaging guided thrombin injection.

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left ankle demonstrated a 2.6 cm fluid collection with a 1.2 mm wide connection to the anterior tibial artery and “yin-yang” pattern of vascular flow, confirming the pseudoaneurysm (Fig. 3).

Our patient was subsequently referred to interventional radiology for treatment with thrombin injection. In the interventional radiology suite bovine thrombin was reconstituted and diluted to 500 IU/ml. Under real time ultrasound guidance a 25 gauge needle was used to slowly inject thrombin directly into the pseudoaneurysm sac with immediate visualization of thrombus formation. Complete thrombosis of the aneurysmal sac was subsequently confirmed (Fig. 4). Approximately 100 IU of thrombin was administered. Physical exam and ultrasound imaging immediately after the procedure demonstrated strong dorsalis pedis and posterior tibial artery pulses and good flow on color Doppler. The patient was discharged to home immediately after the successful treatment.

Discussion

Overall pseudoaneurysms are a relatively common complication of arterial wall injury. The various causes of pseudoaneurysms include trauma, inflammatory process, chronic vascular disease, and iatrogenic vascular injury [2]. However, pseudoaneurysms involving the arteries of the ankle after arthroscopy or other intervention, such as Broström procedure in this case, are a rare complication with an incidence of approximately 0.08% [3–7]. Despite the rarity of this complication, identification and treatment is essential in preventing morbidity and mortality.

Although conventional angiography is the standard, multiple imaging modalities can be used to identify a pseudoaneurysm when one is suspected. Ultrasound is a relatively inexpensive modality but is operator dependent for accurate identification. An anechoic structure communicating with an artery, swirling flow on Doppler (yin-yang sign), and “to-and-fro” flow at the communication (neck) are sonographic features of pseudoaneurysm. CT angiography has the advantages

Case report

A 40-year-old male patient presented with progressive left anterior ankle pain and swelling 5 months after a left ankle arthroscopy and Broström procedure for chronic ankle instability and pain. Orthopedic surgery initially attributed his symptoms to a post-procedural loose osteochondral body. An MRI of the left ankle without contrast was performed. MRI demonstrated a circumscribed fluid collection near the anterior tibial joint (Fig. 1). The fluid collection demonstrated areas of ill-defined T1 and T2 hypointensity suggestive of a flow void and there was possible continuity with the anterior tibial artery (Fig. 2) with findings concerning for a pseudoaneurysm of the distal anterior tibial artery. Follow-up ultrasound of the
of being less operator dependent and imaging can be obtained relatively quickly. MRI can also be used to identify pseudoaneurysm; however, it is more expensive with long acquisition times. MRI is typically obtained when other pathology is suspected.

Pseudoaneurysms have traditionally been treated with surgical intervention, but less invasive treatment methods have increased in use with lower complication rates and morbidity [2]. Ultrasound guided compression in which the ultrasound probe is used to compress the neck of the pseudoaneurysm or the sac itself can be an effective treatment for superficial pseudoaneurysms, however this method can be painful and require long duration of compression. Endoluminal techniques are commonly used methods of treatment of non-superficial pseudoaneurysms. This involves either embolization or stent graft placement, depending on the features of the pseudoaneurysm, which include expendability of the donor artery, neck width, and collateral circulation [2].

Thrombin injection directly into the sac of a pseudoaneurysm is a quick and effective method for treatment of both superficial as well as deep visceral pseudoaneurysms. Thrombin injection is performed with powder thrombin reconstituted and diluted with sterile water. The thrombin is then injected slowly into the sac with the needle directed away from the neck in order to prevent leakage of thrombin into the donor artery. A relatively little amount of thrombin is required, and complete thrombosis of the sac typically occurs within seconds.

Thrombus extending into the donor artery is the main complication of thrombin injection but occurs at a relatively low rate [2]. Despite potential complications, thrombin injection has a significantly lower complication rate (1%-2%) than surgical intervention, which carries a complication rate as high as 30% [8]. While manual compression of a pseudoaneurysm has a similar complication rate as thrombin injection [8], thrombin injection has a significantly lower failure and
recurrence rate. Manual compression has a failure rate as high as 38% and recurrence rate as high as 30%, while thrombin injection has a failure rate of less than 10% [2]. This makes ultrasound-guided thrombin injection the preferred method of pseudoaneurysm treatment when feasible.

**Patient consent**

I confirm that written informed consent for case publication was obtained from the patient.

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