Published in final edited form as:

JBJS Case Connect. 2016 ; 6(4): e102. doi:10.2106/JBJS.CC.16.00069.

Ruptured Dorsalis Pedis Pseudoaneurysm Following Ankle Arthroscopy

Clay P. Wiske, MD, MBA, MPhil¹, Nathan K. Itoga, MD², Brant W. Ullery, MD², Kenneth J. Hunt, MD², and Venita Chandra, MD²

¹Warren Alpert Medical School, Brown University, Providence, Rhode Island. ²Division of Vascular Surgery (N.K.I., B.W.U., and V.C.) and Department of Orthopaedic Surgery (K.J.H.), Stanford University School of Medicine, Stanford, California.

Abstract

Case—We describe the case of a dorsalis pedis artery pseudoaneurysm that developed following a repeat ankle arthrotomy for persistent bony impingement. The patient underwent attempted fluid aspiration for a presumed effusion, and ultimately experienced rupture of the aneurysm with significant blood loss and need for emergent vascular repair.

Conclusion—Anterior tibial or dorsalis pedis artery pseudoaneurysms are relatively rare but well-documented complications of ankle arthroscopy; however, their clinical significance is poorly understood. To our knowledge, this is the first reported case of a ruptured dorsalis pedis artery pseudoaneurysm following ankle surgery, and it highlights the need for timely diagnosis.

Introduction

Anterior tibial artery (AT) and dorsalis pedis artery (DP) pseudoaneurysms are rare, but not uncommon, complications of ankle arthroscopy and other ankle manipulations or injuries. Accurate diagnosis and appropriate treatment, however, are crucial, because pseudoaneurysms can lead to thrombosis, distal embolization, hemorrhage, or rupture. Unlike true aneurysms, which involve all three layers of the arterial wall, pseudoaneurysms are due to leakage of blood from an artery, which is contained by adventitia and perivascular tissue, with persistent communication between the originating artery and the resultant adjacent cavity. Pseudoaneurysms, unlike true aneurysms, are most often caused by trauma or vascular instrumentation, such as arterial access.

Ankle arthroscopy poses a legitimate risk of vascular injury to the AT or DP arteries due to the proximity of these vessels to the joint. The rate of AT pseudoaneurysms following arthroscopy has been reported at 0.008%, and DP artery pseudoaneurysms are thought to be rarer.¹ In most cases, arterial pseudoaneurysms of the ankle and foot present as pain, swelling, and/or an expanding pulsatile mass following an inciting trauma or procedure, but they can also be asymptomatic. They vary in size and are often misdiagnosed as lymphoceles, abscesses, or hematomas. Here we present a case of DP pseudoaneurysm complicated by rupture.

Case Report

A 52-year old Caucasian man with a past medical history of hypertension, multiple psychiatric conditions including anxiety, schizoaffective disorder and post-traumatic stress disorder, had a remote history of a fall from a cliff, fracturing his left ankle. Given persistent pain, he underwent a left ankle arthroscopic debridement with removal of talar and tibial osteophytes 18 years after his fall. He remained very active, running 1–2 miles a day, but due to increasing ankle pain from recurrent osteophytes in the anterolateral aspect of the tibia (Figure 1a, 1b), he underwent an additional arthroscopy four years after his initial arthroscopic debridement. A 2.7mm scope was used through initial incisions of 4mm. Because several of the bony impingements were located anterolaterally, the medial arthroscopic portal was extended into an arthrotomy, enabling complete removal of all anterior bony impingements and loose bodies using an osteotome and rongeur. Two months later, post-operative x-rays showed eradication of the tibial and talar osteophytes, as well as a well-aligned ankle mortise (Figure 1c, d). On physical exam the patient was noted to have mild tenderness and well-circumscribed swelling on the anterolateral ankle, which was initially thought to be an effusion or hematoma and was followed with conservative management. The swelling continued to increase in size at 6 months follow-up, and needle aspiration was attempted from a lateral approach with an 18-gauge needle to avoid the neurovascular bundle, without any return of fluid. The patient was then scheduled for an MRI for further evaluation of the growing mass, which demonstrated a cystic structure near the ankle joint. (Figure 2). Subsequently, the patient apparently noticed substantial increase in size of the mass, including some drainage, but he did not seek medical attention. He presented to the orthopaedic clinic for a scheduled follow-up appointment to discuss the MRI findings (performed at an outside facility and brought with the patient on a compact disc), and he was found to have a large, pulsatile and bleeding mass with some skin necrosis. Pressure was immediately applied, and he was urgently transported to the emergency department for further assessment and treatment.

Upon arrival at the emergency department, he was pale, lightheaded, and diaphoretic, which improved with fluid resuscitation; he had lost an estimated 800 mL of blood by this point. A radiograph taken in the emergency department after resuscitation showed a significant increase in size of the pseudoaneurysm (Figure 3a.). His physical exam revealed a 6 cm × 6 cm ulcerated mass with overlying skin necrosis around the left lateral malleolus, (Figure 3b, c), there were no motor or sensory deficits on exam.

The patient was emergently taken to the operating room for evacuation of the hematoma and repair of the ruptured pseudoaneurysm (Figures 4). After blunt evacuation of the hematoma, proximal vascular control of the pseudoaneurysm was obtained with a tourniquet in place. An anterior incision over the ankle was made to gain proximal control of the anterior tibial artery. The tourniquet was released, revealing two punctate areas of active bleeding within the pseudoaneurysm capsule. While the initial plan had been to ligate the dorsalis pedis artery (patient had an intact posterior tibial artery), placement of a simple 6-0 prolene stitch after evacuation of the hematoma resulted in primary repair of the artery and hemostasis with intact distal perfusion.

The patient's postoperative course was unremarkable; his skin defect was treated initially with wet-to-dry dressings and subsequently negative pressure dressings. He completely healed his wound with no further arterial complications within 2 months. At his one-year follow up, he was completely pain free, walking 2–3 miles a day and was completely neurovascularly intact with palpable pulses.

Discussion

This case underscores the importance of prompt identification and diagnosis of post-arthroscopic pseudoaneurysms, which are potentially dangerous complications of ankle surgery. While similar cases of AT pseudoaneurysms exist in the literature, this particular case is notable for the location in the DP artery, the size of the pseudoaneurysm, late presentation, and eventual rupture.^{2–8}

Variations in presentations of pseudoaneurysms, however, make initial misdiagnosis common. The majority of pseudoaneurysms present within three weeks of the inciting injury or surgery; however, late presentations up to five years have been reported.³ Arterial pseudoaneurysm is a common complication of cardiac interventions with rates of femoral artery pseudoaneurysm formation as high as 7%.⁹ In the pedal arteries, which are much less likely to be the site of vascular access, orthopedic procedures are more commonly the cause of pseudoaneurysms. In a recent literature review by Yu *et al.*, only 8 of 33 reported pseudoaneurysms around the foot and ankle affected the DP and only one of these was attributed to ankle arthroscopy.³ Though the rate of pseudoaneurysm formation is approximately 0.008% following ankle arthroscopy, the increasing frequency of ankle arthroscopy has driven up rates of AT pseudoaneurysm formation.¹ Nerve injury, however, continues to be the most common complication of ankle arthroscopy at a rate of 1.9%.¹⁰

Arthroscopic ankle surgery is associated with pseudoaneurysms, both because of the potential for arterial wall injury during the procedure, and because prominent hardware or bony exostoses can also cause damage to arterial walls, accounting for many cases of late-onset pseudoaneurysms.^{3,4,11–13}

During ankle arthroscopy, the most at-risk artery is the AT, due to the location of the anterior portals and the variation in vascular anatomy of the foot and ankle. The anterocentral port site for arthroscopy is often avoided in favor of an anterolateral port, in order to decrease the risk of injuring the AT.^{3,14} However, deviation of AT toward the anterolateral port site is present in 6.3% of patients, making pre-operative confirmation of vascular anatomy a crucial part of ankle arthroscopy.⁸ Furthermore, in 2–12% of patients, the DP arises aberrantly from the peroneal artery.^{15,16} In the case described above, existing scarring and the need to extend the typical arthroscopic portal site into an arthrotomy increased the risk that the artery wall would be damaged during removal of the osteophytes.

A thorough post-operative physical exam and a low threshold for imaging are key to early detection and prevention of further complications. When history and physical examination are concerning for pseudoaneurysm, the diagnosis can be confirmed by color Doppler sonography or angiography, which typically demonstrate a cystic outpouching from the

artery with both inflow and outflow.¹⁷ Adjunctive imaging modalities, such as MRI/MRA or CTA, can also be used to better evaluate surrounding soft tissue as well as the structure of the pseudoaneurysm itself. The risks and benefits of needle aspiration of any suspicious post-arthroscopic swelling should be given close consideration.

To our knowledge, this is the first reported case of a ruptured DP pseudoaneurysm.^{3,4,11,18–20} The acute nature of this case presentation to the ER and the overlying skin necrosis suggest that the rupture occurred soon before the appointment; the patient gave a vague history of feeling a sudden pain in his ankle while riding a stationary bicycle.

External compression and close monitoring can often prevent pseudoaneurysm progression; however, rapid expansion, hemorrhage, and embolization are indications for surgical intervention.^{7,18} A variety of techniques for treating pseudoaneurysms have been described, and the chosen method often depends on the size of the lesion and the preference of the surgeon. The primary treatment methods include conservative monitoring with external compression, coil embolization, stentgraft placement, ligation, thrombin injection and aneurysmectomy.^{3,13,20,21} To date, no studies have identified the optimum treatment method; however, a review of endovascular repair of crural artery pseudoaneurysms noted a high rate of stentgraft occlusion.¹⁹ In this patient, the unusually large size of the aneurysm, rupture, and necrosis of the surrounding tissue made open aneurysmectomy the only viable treatment option. Given his relative young age, active lifestyle, and the focal nature of the injury, the decision was made to repair the artery rather than ligate the artery to preserve inline flow to the foot.

This case demonstrates the potential for rupture of post-arthroscopic pseudoaneurysms. This diagnosis should be considered in patients with pain and growing mass after an intervention or trauma to the immediate area. Accurate diagnosis with early use of imaging modalities and rapid treatment can decrease the morbidity and potential complications associated with this problem.

References

1. Mariani P, Mancini L, Giogini T. Pseudoaneurysm as a Complication of Ankle Arthroscopy. *J Arthr and Rel Surg*. 2001; 17:400–2.
2. Battisti D, Oliva F, Tarantino U, Nicola M. Pseudoaneurysm of peroneal artery after ankle arthroscopy. *Muscles, ligaments and tendons journal*. 2014; 4:269–72.
3. Yu JL, Ho E, Wines AP. Pseudoaneurysms around the foot and ankle: case report and literature review. *Foot and ankle surgery : official journal of the European Society of Foot and Ankle Surgeons*. 2013; 19:194–8. [PubMed: 23830169]
4. Christofilopoulos P, Panos A, Masterson K, Abrassart S, Assal M. Pseudoaneurysm of the anterior tibial artery following an ankle sprain: a case report of an uncommon ankle trauma with review of the literature. *Foot and ankle surgery : official journal of the European Society of Foot and Ankle Surgeons*. 2008; 14:40–2. [PubMed: 19083611]
5. Darwish A, Ehsan O, Marynissen H, Al-Khaffaf H. Pseudoaneurysm of the anterior tibial artery after ankle arthroscopy. *Arthroscopy : the journal of arthroscopic & related surgery : official publication of the Arthroscopy Association of North America and the International Arthroscopy Association*. 2004; 20:e63–4.

6. Jacobs E, Groot D, Das M, Hermus JP. Pseudoaneurysm of the anterior tibial artery after ankle arthroscopy. *The Journal of foot and ankle surgery : official publication of the American College of Foot and Ankle Surgeons*. 2011; 50:361–3.
7. Jang EC, Kwak BK, Song KS, Jung HJ, Lee JS, Yang JJ. Pseudoaneurysm of the anterior tibial artery after ankle arthroscopy treated with ultrasound-guided compression therapy. A case report. *The Journal of bone and joint surgery American volume*. 2008; 90:2235–9. [PubMed: 18829922]
8. Son KH, Cho JH, Lee JW, Kwack KS, Han SH. Is the anterior tibial artery safe during ankle arthroscopy?: anatomic analysis of the anterior tibial artery at the ankle joint by magnetic resonance imaging. *The American journal of sports medicine*. 2011; 39:2452–6. [PubMed: 21785000]
9. Katzenschlager R, Ugurluoglu A, Ahmadi A, et al. Incidence of pseudoaneurysm after diagnostic and therapeutic angiography. *Radiology*. 1995; 195:463–6. [PubMed: 7724767]
10. Zengerink M, van Dijk CN. Complications in ankle arthroscopy. *Knee surgery, sports traumatology, arthroscopy : official journal of the ESSKA*. 2012; 20:1420–31.
11. Brimmo OA, Parekh SG. Pseudoaneurysm as a complication of ankle arthroscopy. *Indian journal of orthopaedics*. 2010; 44:108–11. [PubMed: 20165687]
12. O'Farrell D, Dudeney S, McNally S, Moran R. Pseudoaneurysm formation after ankle arthroscopy. *Foot & ankle international*. 1997; 18:578–9. [PubMed: 9310770]
13. van Hensbroek PB, Ponsen KJ, Reekers JA, Goslings JC. Endovascular treatment of anterior tibial artery pseudoaneurysm following locking compression plating of the tibia. *Journal of orthopaedic trauma*. 2007; 21:279–82. [PubMed: 17414557]
14. Barber FA, Click J, Britt BT. Complications of ankle arthroscopy. *Foot & ankle*. 1990; 10:263–6. [PubMed: 2187776]
15. Kashir A, Kiely P, Dar W, D'Souza L. Pseudoaneurysm of the dorsalis pedis artery after ankle arthroscopy. *Foot and ankle surgery : official journal of the European Society of Foot and Ankle Surgeons*. 2010; 16:151–2. [PubMed: 20655017]
16. Yamada T, Gloviczki P, Bower TC, Naessens JM, Carmichael SW. Variations of the arterial anatomy of the foot. *American journal of surgery*. 1993; 166:130–5. discussion 5. [PubMed: 8352403]
17. Ozdemir H, Mahmutyazicioglu K, Ozkokeli M, Savranlar A, Ozer T, Demirel F. Pseudoaneurysm of the dorsalis pedis artery: color Doppler sonographic and angiographic findings. *Journal of clinical ultrasound : JCU*. 2003; 31:283–7. [PubMed: 12767024]
18. Williams JC, Roberts JW, Yoo BJ. Dorsalis pedis artery pseudoaneurysm after Lisfranc surgery. *Journal of orthopaedic trauma*. 2010; 24:e98–101. [PubMed: 20926961]
19. Gratl A, Klocker J, Glodny B, Wick M, Fraedrich G. Treatment options of crural pseudoaneurysms. *VASA Zeitschrift fur Gefasskrankheiten*. 2014; 43:209–15. [PubMed: 24797053]
20. Spirito R. Endovascular treatment of a post-traumatic tibial pseudoaneurysm and arteriovenous fistula: Case report and review of the literature. *J Vasc Surg*. 2007; 45:1076–9. [PubMed: 17466805]
21. Joglar F, Kabutay NK, Maree A, Farber A. The role of stent grafts in the management of traumatic tibial artery pseudoaneurysms: case report and review of the literature. *Vascular and endovascular surgery*. 2010; 44:407–9. [PubMed: 20484071]

Fig. 1.

Figs. 1-A through 1-D Radiographs. Anteroposterior (Fig. 1-A) and lateral (Fig. 1-B) views of the ankle prior to the second operation for recurrent ankle pain. There is prominent osseous spurring at the distal part of the medial malleolus and the adjacent medial talus with impingement, and there is a dorsal osteophytosis of the talonavicular joint. Anteroposterior (Fig. 1-C) and lateral (Fig. 1-D) views of the ankle 2 months after the second operation for recurrent ankle pain. A large dorsal osteophyte had been removed. A radiopaque soft-tissue mass is seen in the anterior aspect of the ankle

Fig. 2.

2-A, 2-B, and 2-C Imaging of the pseudoaneurysm. Axial (Fig. 2-A) and sagittal (Fig. 2-B) T2-weighted MRI views of the ankle and foot showing a cystic mass near the anterior aspect of the ankle joint. These images were obtained 1 day after the attempted needle aspiration for the persistent fluid collection that was evident 6 months after the ankle arthrotomy. Radiograph (Fig. 2-C) of the foot taken in the ED 3 days after MRI. A soft-tissue mass is visible at the ankle, showing increased size compared with prior imaging (Figs. 1-C and 1-D).

Fig. 3.
Preoperative photographs showing the ruptured dorsalis pedis artery pseudoaneurysm, which led to skin necrosis and the formation of a 6 × 6-cm hematoma.

Fig. 4.

Intraoperative photograph of the surgical field (lateral view) showing where the rupture of the pseudoaneurysm capsule occurred. This area was repaired primarily with PROLENE sutures to preserve inline blood flow to the foot.

Fig. 5.

Follow-up photograph of the lateral malleolus wound, which was completely healed at 4 months after the pseudoaneurysm repair.