Giant Anterior Tibial Artery Pseudoaneurysm Successfully Treated on the USNS Mercy

LCDR Victoria S. McDonald, MC USN; LT Kimberly A. Thompson, MC USN; CDR Kevin M. Casey, MC USN

ABSTRACT The need for an experienced vascular surgeon in the combat setting is not questioned; however, there is a paucity of literature exploring the utility of vascular surgery during an elective humanitarian mission. We herein present a case of a post-traumatic pseudoaneurysm of the anterior tibial artery treated in the context of a humanitarian mission during Pacific Partnership 2015 aboard the United States Naval Ship Mercy. This case report demonstrates the necessity and unique opportunities for vascular surgeons to participate in humanitarian surgery.

INTRODUCTION

Pseudoaneurysms (PSAs) of the tibial vessels are rare but have been reported following both blunt and penetrating trauma.[1,2] Iatrogenic causes have also been described following orthopedic procedures.[3–6] Treatment modalities include ultrasound guided thrombin injection, endovascular stenting, external compression, coil embolization, and operative ligation or repair.[2,3,7] Various clinical and anatomic factors influence the best approach for each individual patient. We present a case of a patient treated for a large, traumatic PSA in the proximal aspect of the anterior tibial artery (ATA) in Papua New Guinea during the Pacific Partnership 2015 (PP15) onboard the United States Naval Ship (USNS) Mercy (T-AH-19).

CLINICAL CASE

A 25-year-old male presented to a United States Navy surgical screening in Papua New Guinea during PP15 with a chief complaint of an expanding pulsatile mass on his left lower extremity (LLE). The patient reported a machete injury to the lateral lower leg 6 months prior. The mass first appeared shortly thereafter and had been slowly growing in the interim. The patient complained of increasing paresthesia along the lateral aspect of his ipsilateral foot, but denied any motor deficit. He denied any other significant medical or surgical history, and his social history was significant for betel nut use and cigarette smoking.

On physical examination, the patient had normal vital signs and unremarkable cardiopulmonary examinations. A focused LLE examination revealed a large, pulsatile mass just distal to the knee on the lateral aspect of the lower leg, measuring 15 cm × 6 cm on the skin (Fig. 1). The popliteal, posterior tibial artery (PTA) and dorsalis pedis artery pulses were palpable. Ankle-brachial index was greater than 1.0 and equal to his contralateral limb. He had normal motor strength throughout his foot and lower leg. He reported decreased sensation to light touch on the lateral aspect of his left foot.

A computed tomographic angiogram aboard the USNS Mercy revealed a proximal ATA PSA measuring 10 cm × 5.5 cm × 6.5 cm approximately 2 cm distal to its origin (Fig. 2). There was mild compression of the ATA by the PSA; however, the vessel remained patent throughout its course. The PTA and peroneal artery appeared normal in caliber with patent flow into the foot and ankle, respectively.

The patient was consented via an interpreter for a LLE exploration and PSA ligation. Because of its proximal location on the ATA, proximal control was obtained via a medial approach at the popliteal artery. Distal control was obtained via a lateral approach midway down the lower leg. Temporary clamping revealed an unchanged pulse in the PTA at the ankle and the ATA was subsequently ligated proximally and distally. The PSA itself was then entered directly through a separate incision and a significant amount of clot was evacuated. The cavity was examined and the orifice of the neck of the aneurysm was over sewn. A drain was placed in the PSA cavity and incisions were closed.

The patient recovered without incident on the ward aboard the USNS Mercy. The drain was removed on postoperative day (POD) 2. Distal pulses were palpable throughout his postoperative course and his LLE ankle-brachial index was not different from his preoperative examination. He denied any new claudication symptoms and his paresthesia remained unchanged. He was evaluated by physical therapy for range of motion exercises and discharged to home on POD 3 with follow-up at a local clinic.

DISCUSSION

PSAs form following disruption of the arterial wall, which leads to a contained hemorrhage into the surrounding soft tissues. A hematoma then forms and becomes recanalized as a result of persistent connection with the disrupted vessel. An endothelial lining eventually envelops the cavity.[8] The risks of PSAs include rupture, distal embolization, infection,

Naval Medical Center San Diego,34730 Bob Wilson Drive, Building 3, San Diego, CA 92134.

The views expressed in this manuscript are those of the authors and do not necessarily reflect the official policy of the Department of the Navy, the Department of Defense, or the United States Government.

doi: 10.7205/MILMED-D-16-00130

FIGURE 1. The patient presented to a surgical screening with a large left lower extremity pulsatile mass and ipsilateral foot paresthesia.

fistula formation, and compression of adjacent structures.[6] Observation with close follow-up is acceptable for very small PSAs; however, intervention is warranted for larger or complicated types.

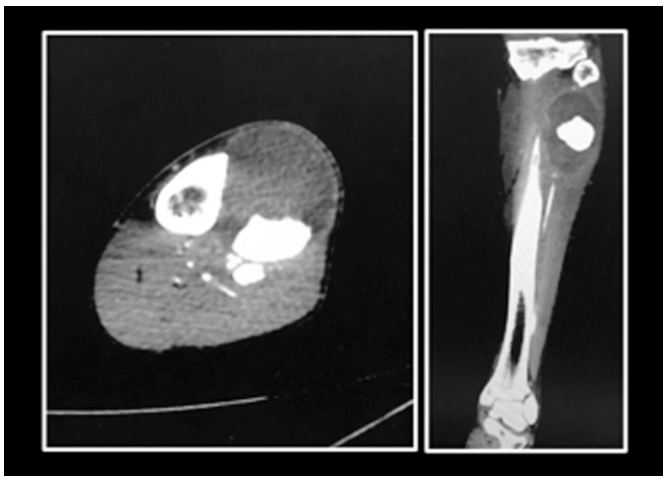

FIGURE 2. CT scan demonstrating large pseudoaneurysm in the proximal portion of the anterior tibial artery; pseudoaneurysms in this location are infrequent and often secondary or iatrogenic cause.

Multiple treatment modalities are described for PSAs, including external compression, ultrasound-guided thrombin injection, endovascular stenting, coil embolization, and operative ligation or repair.[2,3] An endovascular approach was not appropriate for several reasons. The proximal location and large size of the PSA made this approach technically challenging. Covered stents are rarely placed in the tibial vessels[9] and a large number of coils would have been required to effectively thrombose a PSA of this size. Furthermore, although the USNS Mercy is equipped with a fully functional endovascular suite, it lacks many of the supplies needed for a complex endovascular approach. Given the team's short time in Papua New Guinea, long-term follow-up and surveillance was not possible, therefore making the endovascular approach less ideal.

Instead, an open surgical ligation was chosen. Our preoperative computed tomographic angiogram demonstrated three vessel runoff, thereby allowing us to safely ligate the ATA with a low chance of vascular compromise. A patch angioplasty was possible but again, long-term surveillance was not an option. Ligation remains the most definitive treatment and avoids the possibility of repeated procedures.[3] We chose to evacuate the PSA because of the patient's compressive symptoms, which were likely the cause of his foot paresthesia. The numerous ways to plan for an open ATA ligation are acknowledged, e.g., using a tourniquet and fogarty catheters for vascular control; however, we believe we performed the safest operation for our patient in this austere setting.

Our case is unique for several reasons. ATA PSAs are a rare entity and most commonly result from a variety of orthopedic procedures such as tibial nailing, ankle arthroscopy, or tibial Steinmann pin insertion.[3–6] Less frequently, they may occur following blunt or penetrating trauma.[1,2] The proximal location of the PSA in our patient is also unusual. In our review of the literature, there is only one other report describing a proximal ATA PSA.[4] The majority occur in the mid or distal third of the vessel. The large size of our patient's PSA is also unique. The majority of tibial PSAs described in the literature are less than 5 cm, in contrast to the greater than 10 cm lesion in our patient.[3,5] Finally, we believe this is the first report of an ATA PSA ligated on a humanitarian mission aboard a United States Navy hospital ship.[10]

It is estimated that up to one half of the world's population lack access to basic surgical care. Eleven percent of the global burden of disease can be treated with surgery.[11] The role of vascular surgery has yet to be defined in the humanitarian arena; however, this and other vascular cases can be safely and effectively performed during elective humanitarian missions. There is an unmet disease burden in low- and middle-income countries that can be alleviated by vascular surgery. Research is needed to further explore the potential impact that vascular surgery can have on alleviating the disease burden on humanitarian missions.

CONCLUSION

Tibial vessel PSAs are a rare entity, usually the result of iatrogenic or traumatic etiologies. Our patient presented 6 months following a traumatic machete injury with a massive PSA causing nerve compression. He was treated successfully with open vessel ligation aboard the USNS Mercy during PP15. This case highlights the potential benefit of vascular surgical expertise on elective humanitarian surgery missions.

REFERENCES

1. Spirito R, Trabattoni P, Pompilio G, Zoli S, Agrifoglio M, Biglioli P: Endovascular treatment of a post-traumatic tibial pseudoaneurysm and arteriovenous fistula: case report and review of the literature. J Vasc Surg 2007; 45(5):1076–9.
2. Golledge J, Velu R, Quigley F: Use of a covered stent to treat two large false aneurysms of the anterior tibial artery. J Vasc Surg 2008; 47(5): 1090.
3. Charles-Harris H: Anterior tibial artery pseudoaneurysm: a case report and literature review. J Vasc Ultras 2015; 39(3): 138–41.
4. van Hensbroek PB, Ponsen KJ, Reekers JA, Goslings JC: Endovascular treatment of anterior tibial artery pseudoaneurysm following locking compression plating of the tibia. J Ortho Trauma 2007; 21(4): 279–82.
5. Inamdar D, Alagappan M, Shyam L, Devadoss S, Devadoss A: Pseudoaneurysm of anterior tibial artery following tibial nailing: a case report. J Ortho Surg 2005; 13(2): 186–9.
6. Jacobs E, Groot D, Das M, Hermus JP: Pseudoaneurysm of the anterior tibial artery after ankle arthroscopy. J Foot Ankle Surg 2011; 50(3): 361–3.
7. Fraser JD, Cully BE, Rivard DC, Leys CM, Holcomb GW, St. Peter SD: Traumatic pseudoaneurysm of the anterior tibial artery treated with ultrasound-guided thrombin injection in a pediatric patient. J Ped Surg 2009; 44(2): 444–7.
8. Bandy WD, Strong L, Roberts T, Dyer R: False aneurysm—a complication following an inversion ankle sprain: a case report. J Ortho Sports Phys Ther 1996; 23(4): 272–9.
9. De Troia A, Biasi L, Iazzolino L, et al: Endovascular stent grafting of a posterior tibial artery pseudoaneurysm secondary to penetrating trauma: case report and review of the literature. Ann Vasc Surg 2014; 28: 1789e13–7.
10. Jenesn S, Tadlock MD, Douglas T, Proventcher M, Ignacio RC: Integration of surgical residency training with US military humanitarian missions. J Surg Educ 2015; 72(5): 898–903.
11. Chao TE, Sharma K, Mandigo M, et al: Cost-effectiveness of surgery and its policy implications for global health: a systematic review and analysis. Lancet Glob Health 2014; 2(6): e334–45.