CASE REPORT

Thrombin Injection to Treat an Iatrogenic Internal Mammary Artery Pseudoaneurysm

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Abstract  A 71-year-old female presented to the emergency room eight weeks status post open heart surgery for aortic valve replacement with right-sided chest wall pain and swelling. Computed tomographic (CT) angiography demonstrated a hyperattenuating structure arising from the right internal mammary artery surrounded by a heterogeneously-attenuating fluid collection in the anterior right chest wall, compatible with a right internal mammary artery pseudoaneurysm with surrounding chest wall hematoma. Follow up color Doppler ultrasound confirmed the diagnosis. Under direct ultrasound visualization, we injected four hundred units of thrombin into the neck of the pseudoaneurysm using a 25-gauge spinal needle. Post-injection imaging demonstrated a successful cessation of flow within the pseudoaneurysm sac.

Introduction

Internal mammary artery pseudoaneurysm are a rare complication of sternotomy procedures, central venous catheter placement, and pacemaker placement [1–3] They have also been reported in the setting of vasculitides and connective tissue disorders [4,5]. It is important to diagnose and treat pseudoaneurysm of the internal mammary artery because life-threatening conditions, such as hemothorax, may develop [6]. Furthermore, patients may report pain and tender at the site, which responds to treatment (see Fig. 1).

Magnetic resonance imaging (MRI), computerized tomography (CT), and ultrasound are all useful techniques used to visualize pseudoaneurysm. However, ultrasound is the only technique that is useful in both diagnostic and interventional settings.

While open surgical treatments have been the gold standard treatment in the past, recently, minimally invasive techniques, such as thrombin injection, have been successfully used to treat these aneurysms [7,8].

We report a case of an internal mammary pseudoaneurysm treated with ultrasound-guided thrombin injection.

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Case report

We report a patient with a pseudoaneurysm of the internal mammary artery eight weeks status post open heart surgery for aortic valve replacement treated percutaneously with a local thrombin injection.

The patient is a 71-year-old female with a history of peripheral vascular disease and coronary artery disease. She presented to the emergency room eight weeks status post open heart surgery for aortic valve replacement with right-sided chest wall swelling, worsening since the prior evening. Of note, her hospital stay for the surgery required placement of a right-sided chest tube with pleural effusion. Shortly after the surgery, she reported noticing a swelling over the right chest wall, adjacent to the surgical incision site. Following discharge, the swelling increased, as did a sense of burning pain in the region.

Computed tomography (CT) angiography revealed a heterogeneously-attenuating fluid collection in the anterior medial chest wall, measuring approximately $11.4 \times 4.8$ cm in the axial plane, consistent with a large hematoma. Within this collection, there was a smaller hyperattenuating structure appearing to arise from the right internal mammary artery, measuring $3.8 \times 3.7$ cm in the axial plane, compatible with a pseudoaneurysm sac. A follow-up ultrasound of the right chest wall for further evaluation confirmed a pseudoaneurysm within the right chest wall. The neck of the pseudoaneurysm measured approximately 0.6 cm.

Because of increased pain and continued growth of the pseudoaneurysm, our patient received a local thrombin injection. Under direct ultrasound visualization, we injected four hundred units of thrombin into the neck of the pseudoaneurysm using a 25-gauge spinal needle. Post injection imaging demonstrated a successful cessation of flow within the pseudoaneurysm sac. There has been no evidence of recurrence or post-treatment complication in the year following the procedure.

It is unclear if the chest tube placement or the aortic valve repair precipitated this complication. Regardless of the etiology, this is the first reported case of internal mammary artery pseudoaneurysm with a description of a successful thrombin injection as therapy.

Discussion

Iatrogenic pseudoaneurysms are a known complication of arterial catheterization. In 1986, Cope and Zeit introduced...
the use of thrombin for the treatment of pseudoaneurysms [9]. Since then, thrombin injection have proven to be an effective treatment for iatrogenic pseudoaneurysms. Thrombin administration to treat femoral artery pseudoaneurysms has a high success rate (94%-100%), a low complication rate (2%). Its efficacy has also been demonstrated in various other arteries [10,11].

References

[1] Falconieri F, Raevsky E, Davies S, et al. Pseudoaneurysm of a branch of left internal mammary artery: a late and potentially fatal complication after redo-sternotomy. Interact Cardiovasc Thorac Surg 2015;20(6):866–7. http://dx.doi.org/10.1093/icvts/ivv059.

[2] Kang K, Maholic R, Kang G. Successful coil embolization of a bleeding internal thoracic artery that caused severe hypotension immediately after permanent pacemaker placement. Indian Heart J 2015;67(5):493–4. http://dx.doi.org/10.1016/j.ihj.2015.06.016.

[3] Hathi R, Patel S, Wilson P. An unusual case of pseudoaneurysm of the left brachiocephalic vein secondary to rupture during central venous catheterization treated with self-expanding, uncovered stent and coils. Clin Radiol 2011;66. http://dx.doi.org/10.1016/j.crad.2010.07.009.

[4] Emmanuel Y, Gordon-Smith J, McKillop G, et al. Late peripheral thoracic aneurysms following aortic root surgery in patients with loeys-dietz syndrome. J Vasc Intervent Radiol 2015;26(10):1539–43. http://dx.doi.org/10.1016/j.jvir.2015.04.014.

[5] Lee SL, Ku YM, Won Y. Spontaneous aortic pseudoaneurysm rupture into the sigmoid colon in Behcet's disease patient. World J Gastroenterol 2015;21(46):13201–4. http://dx.doi.org/10.3748/wjg.v21.i46.13201.

[6] Kim SJ, Kim CW, Kim S, et al. Endovascular treatment of a ruptured internal thoracic artery pseudoaneurysm presenting as a massive hemothorax in a patient with type I neurofibromatosis. Cardiovasc Intervent Radiol 2005;28(6):818–21. http://dx.doi.org/10.1007/s00270-004-0067-8.

[7] Lee GS, Brawley J, Hung R. Complex subclavian artery pseudoaneurysm causing failure of endovascular stent repair with salvage by percutaneous thrombin injection. J Vasc Surg 2010;52. http://dx.doi.org/10.1016/j.jvs.2010.05.085.

[8] Saad NE, Saad WE, Davies MG, et al. Pseudoaneurysms and the Role of minimally invasive techniques in their management. Radiographics 2005;25(Suppl. 1):S173–89. http://dx.doi.org/10.1148/rg.25si055503.

[9] Cope C, Zeit R. Coagulation of aneurysms by direct percutaneous thrombin injection. Am J Roentgenol 1986;147(2):383–7. http://dx.doi.org/10.2214/ajr.147.2.383.

[10] Paulson EK, Nelson RC, Mayes CE, et al. Sonographically guided thrombin injection of iatrogenic femoral pseudoaneurysms. Am J Roentgenol 2001;177(2):309–16. http://dx.doi.org/10.2214/ajr.177.2.1770309.

[11] Garvin RP, Ryer EJ, Yoon HR, et al. Ultrasound-guided percutaneous thrombin injection of iatrogenic upper extremity pseudoaneurysms. J Vasc Surg 2014;59(6):1664–9. http://dx.doi.org/10.1016/j.jvs.2014.01.009.