Case Report

Huge traumatic pulmonary artery pseudoaneurysm

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A B S T R A C T
Pulmonary artery pseudoaneurysm is a very rare complication of penetrating thoracic trauma. We present a case of a 27-year-old woman who developed a 6.5-cm traumatic pulmonary artery pseudoaneurysm after suffering multiple stab wounds to the chest and the abdomen. The pseudoaneurysm was successfully treated endovascularly with vascular plug occlusion and coil embolization.

Keywords:
Pulmonary artery
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Introduction

Post-traumatic pulmonary artery pseudoaneurysms (PAPs) are extremely rare, with only 30 cases reported in the literature. Although pseudoaneurysms can be clinically silent, patients typically present with dyspnea, chest discomfort, or hemothysis. Treatment modalities include surgical resection and trans-arterial embolization. We present a case of a 6.5-cm, post-traumatic PAP that was successfully treated via an endovascular approach.

Case report

A 27-year-old female presented to the emergency department after suffering 2 stab wounds to the right flank and the left posterior thorax, inferior to the scapula. An initial chest X-ray was obtained (Fig. 1), which revealed a left tension hemopneumothorax and contralateral mediastinal shift. The patient was intubated and a left thoracostomy tube was placed in the trauma bay with immediate return of 1200 mL of sanguineous fluid.

The patient was taken emergently to the operating room. A left thoracostomy was performed revealing a posterior left lower lobe 2-cm pulmonary laceration which was repaired with polydioxanone suture. Next, an exploratory laparotomy was performed showing a severe right renal laceration and small liver laceration, necessitating a right nephrectomy and packing of the right retroperitoneum and liver laceration. Daily postoperative chest X-rays were obtained, demonstrating the development of a left infra hilar rounded mass that was first visible on postoperative day (POD) 4 and becoming progressively better visualized on subsequent chest

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X-rays (Fig. 2). This mass was interpreted as a postoperative hematoma or seroma. Owing to elevated liver function tests, on POD 7 an abdominal CT was obtained which showed the known liver laceration and a moderate amount of peritoneal fluid. On POD 8 magnetic resonance cholangiopancreatography was obtained to evaluate for a bile leak. No bile leak was identified. However, a well-defined rounded mass in the posterior left lower lung was incompletely imaged and was interpreted as a hematoma or postoperative fluid collection (Figs 3A and B).

A follow-up CT of the abdomen on POD 12 partially imaged a 4.8-cm pseudoaneurysm in the posterior left lung contacting the posterior costal pleura (Fig. 4). Despite incomplete imaging of the pseudoaneurysm, given its large size, this was felt most likely to arise from the systemic circulation; however, a pulmonary artery source was also considered. Selective digital subtraction angiography (DSA) of the left seventh and eighth intercostal arteries was performed that demonstrated a truncated left eighth intercostal artery with a small site of contrast extravasation, consistent with arterial injury, but no filling of the pseudoaneurysm. Given the clear arterial injury, the left eighth intercostal artery was assumed to be the source vessel. After multiple attempts at crossing the occlusion were unsuccessful, the proximal intercostal artery was completely embolized with detachable coils and the procedure ended. A follow-up Color Doppler ultrasound of the left chest was performed the next day that showed a persistent patent pseudoaneurysm with a “yin-yang sign” (Fig. 5). Therefore, a dedicated CT angiogram of the chest was obtained on POD 13 to better identify the relevant vascular anatomy. A 6 × 6.5 cm pseudoaneurysm with partial mural thrombus was found arising from the left lower lobe posterior basal segmental artery (Fig. 6). After consultation with the thoracic surgery service, the joint decision was made to initially attempt endovascular embolization with plans for operative resection of the entire left lower lobe should this fail.

Working through the right femoral vein, a catheter was passed through the heart into the left main pulmonary artery. Diagnostic DSA demonstrated a large pseudoaneurysm arising from the posterior basal segmental branch of the left lower lobe with 2 distinct distal subsegmental arteries (Fig. 7A). A tri-axial 80-cm 7 French system was created, and the 2 distal posterior basal subsegmental arteries were embolized with fibered coils. Owing to the extremely short segment of normal artery between the origin of the left lower lobe posterior basal segmental branch and the pseudoaneurysm, and the desire to preserve flow into the anterior basal and lateral basal segmental arteries, a plug was chosen to occlude the origin of the pseudoaneurysm. A 6-mm Medtronic MVP microvascular plug was initially deployed but was quickly pushed into the pseudoaneurysm sac. Next, a 10-mm AMPLATZER Vascular Plug II (St. Jude Medical Inc., St. Paul, MN) was deployed slightly more proximally and remained in place within the origin of the posterior basal segmental artery. Completion DSA confirmed no persistent flow within the pseudoaneurysm as well as preserved flow in the superior, anterior basal, lateral basal, and medial basal segmental branch arteries (Fig. 7B).
Postembolization, the patient developed sepsis with blood culture results positive for Enterobacter. She was treated with piperacillin/tazobactam and discharged later that week on oral ciprofloxacin. The patient did well through 2 weeks of outpatient follow-up without complication.

On postembolization day 104, the patient presented to the emergency department with left chest wall sharp pain at her prior surgical incision site. A chest X-ray was performed that demonstrated decreased size of the PAP to 3.6 cm and otherwise no acute cardiopulmonary disease (Fig. 8). Her pain resolved without treatment and she was discharged without complication.

Discussion

It is estimated that 20%-25% of trauma-related deaths in the United States are due to blunt and penetrating thoracic trauma [1]. Sequela of penetrating thoracic trauma may involve the heart, aorta, great vessels, esophagus, lung, and tracheobronchial tree. Penetrating trauma to the thoracic vasculature may be suggested by “the presence of a large
hemothorax, foreign bodies in the proximity of the great vessels, a foreign body out of focus with respect to the remainder of the radiograph, or a trajectory with a confusing course and a ‘missing missile’ in a patient with a gunshot wound to the chest [2]. These injuries may present acutely as active hemorrhagic extravasation or chronically as a fistula, pseudoaneurysm, or aneurysm.

PAPs are rare entities and can be divided into 2 categories: congenital and acquired. PAPs can originate from non-traumatic vascular abnormalities such as cystic medial necrosis, Marfan syndrome, or Behçet disease. They may also be caused by mycobacterial, fungal, or syphilitic infections. Alternatively, PAPs can develop from an iatrogenic insult; cases due to Swan-Ganz catheter placement have also been reported. Traumatic sources of PAPs are extremely rare, with only 30 reported cases in the English literature [3,4]. Most of these cases resulted from penetrating trauma, specifically gunshot-related trauma to the chest [3,4].

Making the diagnosis of PAP is challenging and high clinical suspicion is required after a traumatic event. Low clinical suspicion may lead to an alternate diagnosis and a delay in treatment as it did in our case. The patient’s PAP was initially felt to represent a postoperative seroma or hematoma given that the patient had open surgical repair of a pulmonary laceration in the area. Also, the patient exhibited no hemoptysis. Discovery and treatment of an injured intercostal artery provided another etiology of the pseudoaneurysm that ultimately proved to be incorrect.

Symptoms of PAP may include chest pain, hemoptysis, and dyspnea. The most frequent clinical presentation is hemoptysis, which is hypothesized to be secondary to communication of the pseudoaneurysm with the bronchial tree [5]. The diagnosis is made via contrast-enhanced CT scan, but a pulmonary angiogram is recommended to assist with treatment planning [6]. Multiple treatment options exist, including either complete or partial pneumonectomy and interventional endovascular treatments such as percutaneous thrombin ablation or coil embolization [7]. Even though coil embolization is considered the preferred treatment [3], surgery historically was the most popular treatment option possibly due to a lack of endovascular repair availability.
Traumatic PAPs are extremely rare. We presented a case of a 6.5-cm pseudoaneurysm that developed following a stab wound to the chest. Treatment of a traumatic PAP of this size has never been reported. Our physician team elected to pursue a minimally invasive approach with successful trans-arterial coil and vascular plug embolization. Endovascular embolization is a viable treatment option for carefully selected PAPs; however, surgery may still be most appropriate for other cases due to anatomic location.

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REFERENCES

[1] LeBlang SD, Dolich MO. Imaging of penetrating thoracic trauma. J Thorac Imaging 2000;15(2):128–35.
[2] Dente CJ, Feliciano DV. Torso vascular trauma at an urban level-I trauma center. Perspect Vasc Surg Endovasc Ther 2011;23(1):36–46.
[3] Huet N, Rodiere M, Badet M, Michoud M, Brichon P-Y, Ferretti G, et al. Covered stent and coils embolization of a pulmonary artery pseudoaneurysm after gunshot wound. Cardiovasc Intervent Radiol 2016;39(5):778–81.
[4] Chen Y, Gilman MD, Humphrey KL, Salazar GM, Sharma A, Muniappan A, et al. Pulmonary artery pseudoaneurysms: clinical features and CT findings. AJR Am J Roentgenol 2017;208(1):84–91.
[5] Ferretti GR, Thony F, Link KM, Durand M, Wollschlager K, Blin D, et al. False aneurysm of the pulmonary artery induced by a Swan-Ganz catheter: clinical presentation and radiologic management. AJR Am J Roentgenol 1996;167(4):941–5.
[6] Savage C, Zwischenberger JB, Ventura KC, Wittich GR. Hemoptysis secondary to pulmonary pseudoaneurysm 30 years after a gunshot wound. Ann Thorac Surg 2001;71(3):1021–3.
[7] Sridhar SK, Sadler D, McFadden SD, Ball CG, Kirkpatrick AW. Percutaneous embolization of an angiographically inaccessible pulmonary artery pseudoaneurysm after blunt chest trauma: a case report and review of the literature. J Trauma 2010;69(3):729.