Radiology Case Reports

Volume 9, Issue 1, 2014

Post-traumatic internal mammary artery pseudoaneurysm: A rare complication of pericardiocentesis

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Before the advent of ultrasound, percutaneous pericardiocentesis was associated with relatively high mortality and complication rates (6% and 20-50%, respectively) [1-3]. Ultrasound (US)-guided pericardiocentesis has dramatically decreased the incidence of complications by direct visualization of the heart and other adjacent vital structures. US helps localize the size and location of the pericardial effusion, measure the distance from the chest wall, localize adjacent, vital organs, and determine the optimal access site to the effusion. We report a case of posttraumatic internal mammary artery pseudoaneurysm, a rare complication of pericardiocentesis.

Case report

A 78-year-old Caucasian woman with past medical history significant for paroxysmal atrial fibrillation, nonobstructive coronary artery disease, hypertension, hyperlipidemia, and diabetes mellitus type 2 was admitted for increasing weakness and shortness of breath for two weeks. On admission, she was noted to be in atrial fibrillation with rapid ventricular rate. She underwent anticoagulation with intravenous heparin and was treated with the diltiazem and metoprolol. Transthoracic echocardiogram (TTE) at that time showed moderate circumferential pericardial effusion without evidence of constrictive pericarditis or pericardial tamponade.

The patient developed acute respiratory distress with altered mental status requiring noninvasive ventilation over the next few days. One week after her admission, pericardiocentesis was performed in an attempt to optimize hemodynamics and to obtain pericardial fluid for diagnosis. Anticoagulation was discontinued before procedure. Pericardiocentesis was performed using an apical approach under US guidance, and 460cc of straw-colored serous fluid was removed. The procedure was uneventful. TTE afterward showed resolution of the pericardial effusion. A pericardial drain was left in situ. The patient showed clinical improvement after the procedure. However, two days later, her respiratory status deteriorated and she was intubated and placed on ventilator support. She was found to have increasing bilateral pleural effusions and underwent US-guided right posterior pleurocentesis. A bedside echocardiogram revealed minimal pericardial effusion, and the pericardial drain was removed without complication. The patient was extubated a day later and was subsequently transferred to a step-down unit.

Four days after the drain was removed, the patient complained of sudden-onset pain and swelling of the left breast. Within a few hours, the swelling increased markedly. US of her left breast was ordered, but was limited due to severe pain. The limited images obtained revealed a hyperechoic, masslike area measuring 52 x 32 mm. Differential diagnosis included phlegmon, early abscess formation, and acute mastitis with severe inflammation. She denied any shortness of breath, dizziness, or local trauma to the region. The patient was not on systemic anticoagulation recently except for deep-vein thrombosis prophylaxis with heparin. Followup physical examination revealed diffuse swelling of the left breast with local tenderness and new bruising underneath the breast. Her hemoglobin dropped from 9.5 g/dL to 7.4 g/dL within 12

Citation: Mehra S, Buch A, Truong CN, Moshiri M, Shriki JE, Bhargava P. Post-traumatic internal mammary artery pseudoaneurysm: A rare complication of pericardiocentesis. *Radiology Case Reports.* (Online) 2014;1;931.

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Competing Interests: The authors have declared that no competing interests exist.

DOI: 10.2484/rcr.v9i1.931

hours, and she was transfused with 2 units of packed red blood cells (PRBC). Compression with ACE bandages was applied. Computed tomography (CT) of the chest without contrast (Fig. 1) was requested, which demonstrated a large heterogeneous, hyperdense mass within the left medial breast measuring approximately 15.3 x 9.3 x 10.9 cm and which was compatible with a large hematoma with subcutaneous edema and overlying skin thickening. Limited repeat TTE demonstrated a trivial pericardial effusion.

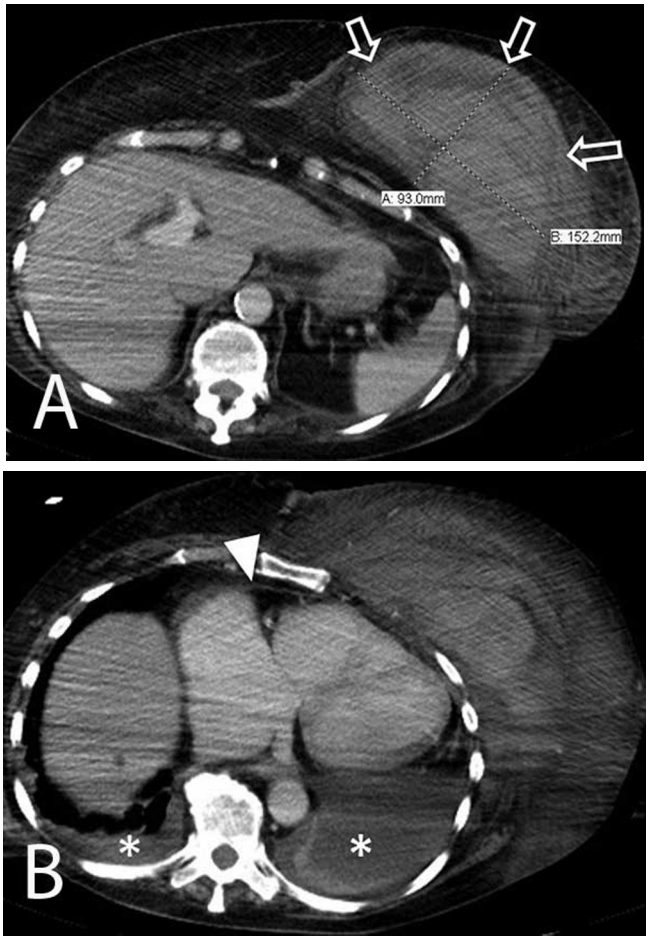

Figure 1. Axial postcontrast CT image through the lower chest/upper abdomen (A) demonstrated a large, heterogeneously hyperattenuating hematoma in the left chest wall/left breast within the subcutaneous fat, measuring up to 15.2 x 9.3 cm in size (open, white arrows). The CT scan was performed in a portal venous phase, rather than an arterial phase, and did not demonstrate the pseudoaneurysm. There was a large amount of fat stranding and some skin thickening, indicating edema. A more cranial image (B) demonstrated the same large hematoma, with adjacent fat stranding and some associated skin thickening. Note that the pericardial effusion is absent on this study, and the pericardium had a normal thickness of 2 mm or less (white arrowhead). Bilateral pleural effusions were also evident (asterisks), with the left effusion being larger than the right.

The patient required 2 more units of PRBCs after her hemoglobin level dropped from 8.9 g/dL to 6.4 g/dL the next day. The surgical team advised against intervention due to the lack of a clear bleeding source. A selective arteriogram delineated the site of bleeding (Fig. 2). The site of hemorrhage was localized to a pseudoaneurysm in a lateral branch of the left internal mammary artery. Successful microcoil and gel-foam embolization of the pseudoaneurysm was performed. Her hemoglobin slowly trended upward, and she remained hemodynamically stable until discharge.

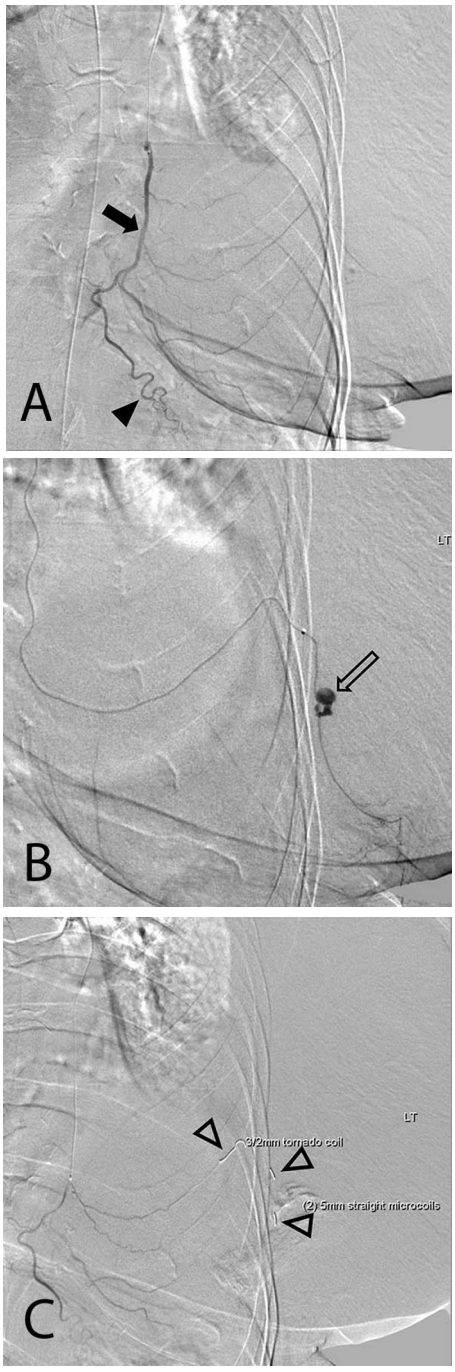

Figure 2. Images are shown from the patient's catheter angiogram, with digital subtraction images displayed. (A) The internal mammary artery was demonstrated (black arrow) during selective catheterization as it terminated as the superior epigastric artery (black arrowhead) and other chest wall vessels. (B) Subselective angiography showed the pseudoaneurysm (open, black arrow) arising from a small, chest wall branch of the internal mammary artery. (C) A selective injection of the internal mammary artery near its termination showed the placement of coils (black, open arrowheads), with the pseudoaneurysm no longer visualized, since the feeding artery is now occluded by the coils.

Discussion

The internal mammary artery (IMA) is a paired artery that runs on each side of the sternum until it terminates as the superior epigastric and musculophrenic arteries. Both blunt and sharp chest-wall trauma may lead to damage to the IMA, leading to bleeding into the mediastinum or pericardium. Kyon et al. (1) reported a case of a 30-year-old man who presented with normal vital signs after trauma. His chest radiograph was normal, and he was discharged home. He returned to the hospital two hours later with chest pain. A CT scan of the chest (performed subsequently) revealed an anterior mediastinal hematoma compressing the left ventricle and a bleeding left internal mammary artery (LIMA), which was then surgically repaired. Another case report by Silverstein et al. (2) reported an iatrogenic arteriovenous fistula formation after a pericardial drain placement for a malignant pericardial effusion. In a case series involving 1,127 patients undergoing pericardiocentesis, Tsang et al. (3) reported major complications in only 1.2% patients, with none having a laceration of the internal mammary artery. However, only 7% of the cases were done from left parasternal approach.

Before the advent of US, the complication rates with percutaneous blind pericardiocentesis were reported as 20-30%, with mortality rates as high as 6%. However, with increased use of US guidance, the complication rates have decreased significantly (4-5). There is risk of LIMA injury when left parasternal and apical approaches are used to drain anterior pericardial effusions. Kronzon et al. (6) have advocated the use of US to localize the LIMA using a high-frequency linear transducer before performing pericardiocentesis. The LIMA is identified as an arterial structure parallel to the sternum and under the costal cartilages at a depth of approximately 2 cm, when the transducer is placed in the left parasternal location. Arterial flow can be confirmed by Doppler US, and the position of the artery should be marked on the patient's skin. The puncture site for pericardiocentesis should ideally be 1 to 2 cm lateral to the artery.

The current complication rate with US-guided pericardiocentesis is significantly lower when compared to a blind, percutaneous approach. However, complications (such as in our case report) emphasize the need for caution to avoid any vital organ/vessel in the path from the skin surface to the pericardial effusion. Ideally, visualization of the LIMA by US before pericardiocentesis should be performed to help minimize risk of injury, particularly during anterior-approach pericardiocentesis. Close monitoring is recommended post-procedure to promptly recognize and treat any complications that may occur.

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