Left Innominate Vein Aneurysm: Diagnostic Imaging and Pitfalls

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Abstract

Thoracic venous aneurysms are very rare. They may be asymptomatic and can be found incidentally during imaging. They are associated with few complications including pulmonary embolism, rupture, and venous obstruction. Accurate diagnosis of a mediastinal aneurysm is essential to avoid complications secondary to biopsy or surgical intervention. This is a rare case of left innominate vein aneurysm, its imaging, as well as associated imaging shortfalls.

Keywords

- brachiocephalic vein aneurysm
- innominate vein aneurysm
- thoracic venous aneurysm
- venous aneurysm
- mediastinal mass

Thoracic venous aneurysms are very rare. Only 14 innominate vein aneurysms have been reported previously in the literature.[1] Most venous aneurysms are asymptomatic and are incidental findings. The most common presentation of thoracic venous aneurysm is a widened mediastinum on a chest radiograph.[2] The case that will be discussed involves a right mediastinal mass.

The differential for mediastinal masses includes: primary/secondary lung neoplasm, lymphoma, teratoma, neurofibroma, bronchial cyst, and venous/arterial aneurysm.[1] Accurately differentiating venous/arterial aneurysms from solid masses in the mediastinum is essential to avoid complications (rupture, life threatening pulmonary embolism) from biopsy or surgical intervention. Complications of venous aneurysms include pulmonary embolism, rupture, and venous obstruction.[2] Pulmonary emboli can be life threatening as the clot within a saccular aneurysm may be large. One case reports a fatal pulmonary embolism secondary to intraoperative palpation of a thrombosed superior vena cava aneurysm.[3]

Case Description

An 84-year-old female with no significant past medical history, trauma, or previous catheterization presented from a local independent living facility with back pain radiating to her neck that was associated with nausea and vomiting. The patient was found to be anemic. She had a history of recent multiple falls and underwent radiographic exams of the chest, lumbar spine, and coccyx. These initial radiographs were the first images obtained of this patient who had no prior imaging studies. No fractures were identified. An incidental large pericardiac density was discovered (►**Fig. 1**). It obscured the right heart border and projected into the right mid to lower lung field. Further evaluation with computed tomography (CT) was recommended. A chest CT with IV contrast was performed. The contrast was introduced through the right antecubital vein. The mass was identified and described as a complex appearing cystic and solid mass in the right pericardiac region confined to the pericardial fat (►**Fig. 2**). Mild peripheral enhancement of the solid components was described and a differential diagnosis of thymoma, lymphoma, and teratoma was given.

The patient was admitted for further evaluation. A CT-guided core biopsy was performed 4 days after admission using a 20-guage Temno needle (►**Fig. 3**). Images obtained during the biopsy show the needle within the solid components of the mass. Multiple passes were made. The initial specimens were thought to be necrotic tissue and more tissues

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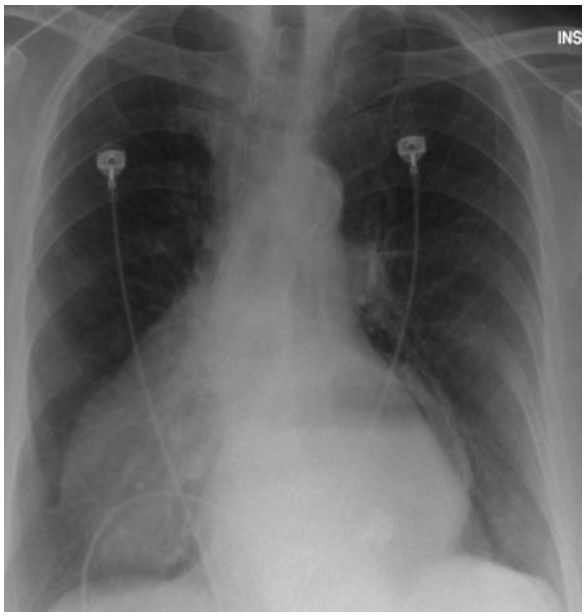

Fig. 1 Chest radiograph demonstrating a large right-sided pericardial soft tissue density extending from just below the aortic arch to the diaphragm.

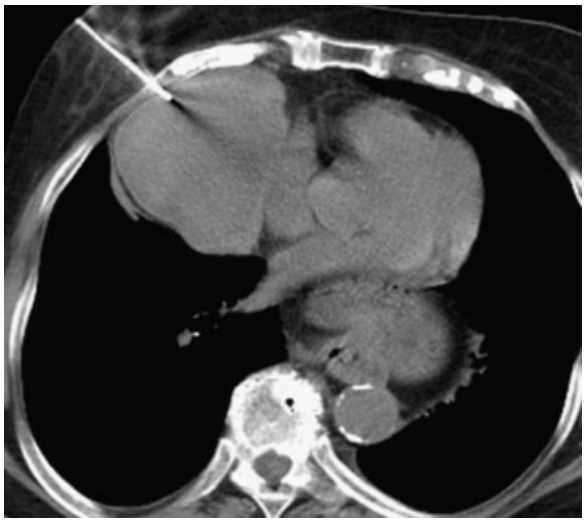

Fig. 3 Axial chest CT without contrast showing percutaneous biopsy of the low-density region of the right chest mass.

were obtained. The specimens were sent to pathology and reported to be necrotic tissue. The patient's clinical course improved and she was discharged 5 days after admission.

A follow-up CT with contrast was performed 3 months after initial presentation. This time the contrast was injected through the left antecubital vein (►**Fig. 4**). The right-side mass was again identified and measured 8.3 × 6.7 cm. However, on this exam it filled partially with contrast. A communication was identified between the lumen of this lesion and the distal portion of the left innominate vein. A soft tissue-like density representing a clot was present as well within the lesion. A sagittal oblique image was also obtained, demonstrating the left innominate vein with contrast and its confluence with the right internal jugular vein as they drain into the superior vena cava (►**Fig. 5**). A final diagnosis of left innominate vein aneurysm was made.

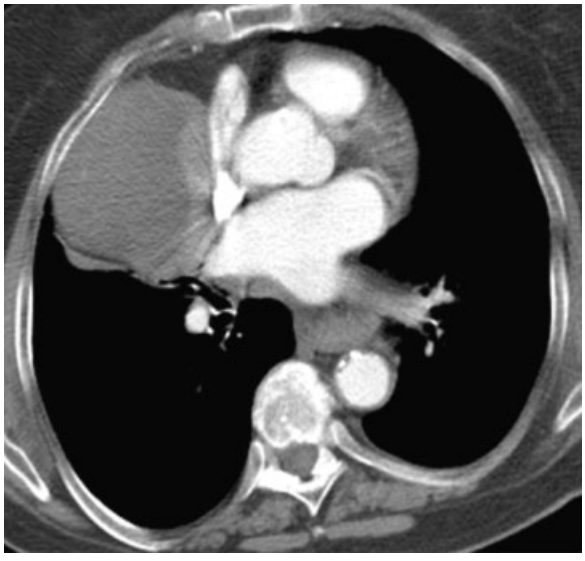

Fig. 2 Axial chest CT with contrast demonstrates a large solid/cystic mass in the right chest adjacent to the superior vena cava and right pulmonary artery. This was described as being confined to the pericardial fat. Note the contrast is in the superior vena cava, aorta, and pulmonary arteries and does not fill the lesion in the right chest.

Fig. 4 Coronal reconstructed chest CT image with contrast from a follow-up exam clearly demonstrates connection with the left innominate vein just above the superior vena cava. The low-density structure represents a large thrombus within the aneurysm sac.

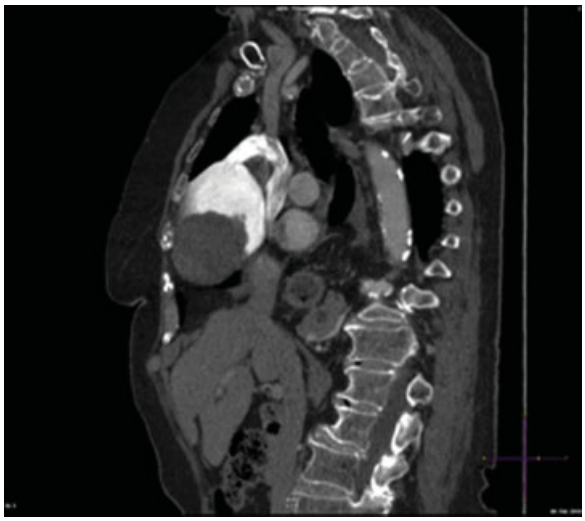

Fig. 5 Reconstructed multiplanar CT slice in a sagittal oblique plane demonstrates the left innominate vein with contrast and its confluence with the right internal jugular vein as they empty into the superior vena cava. There is a distinct fat plane between the superior vena cava and the left innominate vein aneurysm.

Discussion

Thoracic venous aneurysms are very rare. Their management differs depending on whether they are saccular or fusiform. Saccular aneurysms may warrant surgical removal due to risk of pulmonary embolism secondary to intraluminal clot formation, rupture, or venous compression leading to total venous occlusion. Fusiform aneurysms pose a much lower risk of complication and can be treated conservatively.[4] In the case described above, conservative treatment was chosen due to multiple co-morbidities making the patient a poor surgical candidate.

When incidental thoracic masses are discovered, they should be further characterized by contrast-enhanced CT or MRI.[1,4,5] Intraluminal contrast and/or clot can easily be identified on most contrast-enhanced CT studies, making it relatively simple to differentiate between aneurysm and mass. In the case described above, however, an imaging shortfall led to biopsy of the venous aneurysm, which put the patient at risk for serious complications. The injection of contrast through the right antecubital vein caused the contrast to bypass the aneurysm of the distal left innominate vein. This gave the mass the appearance of a mixed solid and cystic mass with some peripheral enhancement. In the follow-up study, the contrast was injected through the left antecubital vein, which provided a direct course into the saccular venous aneurysm. A similar case has been reported involving misdiagnosis of an inferior vena cava aneurysm with clot. This led to biopsy, which revealed fibrin and lymphoid tissue. A subsequent MRI revealed thrombus within an inferior vena cava aneurysm.[6]

Fortunately, the biopsy needle obtained cores directly from the thrombus confined to the wall of this saccular aneurysm. Otherwise, the aneurysm could have ruptured causing serious bleeding in an already anemic patient. This invasive biopsy caused by imaging shortfalls also put the patient at further risk for life threatening pulmonary embolism as the large clot, or portions of the clot, could have dislodged during the biopsy.

This case leads to a difficult question. How can such occurrences be avoided in the future? A quality set of sagittal and coronal reconstructed images may have been helpful in this case. This may have better demonstrated the venous connection between the left innominate vein and the aneurysm. This case also raises the question of whether or not to routinely perform CT venography in mediastinal masses that are adjacent to and may communicate with the vascular structures. Comparison of parenchymal and delayed contrast images would likely have revealed an interval increase in Hounsfield units within the open lumen of the aneurysm. Careful attention should also be paid to the shape of the solid component of such a lesion. In this case, the solid component was lenticular in shape and adherent to a large segment of the periphery of the mass. Mural nodules within cystic masses usually have a more pedunculated appearance protruding out toward the center of the mass. They usually only communicate with a small portion of the wall of the cyst.

Another study that may be helpful in some cases is Doppler imaging. This large mass may have been amenable to Doppler imaging and would have demonstrated flow within what was thought to be the cystic component of the mass. This may be less helpful with smaller or more central mediastinal masses as transthoracic Doppler would be difficult to perform due to overlying lung tissue. Transesophageal Doppler could be performed in patients with smaller suspicious mediastinal masses, although this study would be more difficult for the patient to tolerate.

References

1 Hosein RB, Butler K, Miller P, Jones T, Brawn WJ, Barron DJ. Innominate venous aneurysm presenting as a rapidly expanding mediastinal mass. Ann Thorac Surg 2007;84(2):640–642

2 Burkill GJ, Burn PR, Padley SP. Aneurysm of the left brachiocephalic vein: an unusual cause of mediastinal widening. Br J Radiol 1997;70(836):837–839

3 Ream CR, Giardina A. Congenital superior vena cava aneurysm with complications caused by infectious mononucleosis. Chest 1972;62(6):755–757

4 Koga S, Ikeda S, Sanuki Y, et al. A case of asymptomatic fusiform aneurysm of the superior vena cava detected by magnetic resonance imaging. Int J Cardiol 2006;113:e39–e41

5 Güney B, Demirpolat G, Savaş R, Alper H. An unusual cause of mediastinal widening: bilateral innominate vein aneurysms. Acta Radiol 2004;45(3):266–268

6 French J, Moncrieff N, Englund R, Hanel KC. Thrombotic complications of venous aneurysms. ANZ J Surg 2003;73:384–386