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Case Report

Azygos Vein Aneurysm Mimicking Paratracheal Mass: Dynamic Magnetic Resonance Imaging Findings

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ABSTRACT

Aneurysms of the azygos vein are rare and can sometimes mimic a paratracheal or posterior mediastinal mass. It is important to confirm the diagnosis with radiologic tools before performing invasive procedures, which carry the risk of hemorrhage. Here, we present a case in a 79-year-old asymptomatic patient of an increasing azygos vein aneurysm that mimicked a growing paratracheal mass. Review of images obtained using various modalities, including dynamic magnetic resonance image (MRI), revealed that the image findings were suggestive of azygos vein aneurysm. Using this method, an exact diagnosis can be reached without resorting to invasive procedures.

Key Word: Azygos vein aneurysm, dynamic MRI, growing paratracheal mass

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Introduction

Aneurysms of the azygos vein are rare and the etiology is unknown, but they are known to be commonly associated with elevated central venous pressure due to cardiac failure or portal hypertension (1). Idiopathic lesions are generally assumed to be congenital (2). Aneurysms of the azygos vein are usually asymptomatic, and may mimic the appearance of a mediastinal or paratracheal mass on a chest radiograph. A diagnosis of a mediastinal or paratracheal mass by mediastinoscopic or percutaneous needle biopsy can be very hazardous if there is a venous varix (2). Non-invasive imaging is a safe and superior choice for diagnosis that eliminates the need for potentially invasive diagnostic complications such as hemorrhage. There have been several case reports of azygos vein aneurysms, but, to our knowledge, none reported any radiologic findings such as dynamic magnetic resonance imaging (MRI).

Here we report the case of an azygos vein aneurysm that mimicked the appearance of a growing paratracheal mass. The aneurysm was diagnosed by dynamic MRI in an asymptomatic 79-year-old woman.

Case Report

A 79-year-old woman was admitted to our hospital for surgery for a vertebral disc disorder that had abruptly caused lower leg weakness. She had no specific underlying disease or symptoms such as dyspnea, cough, chest pain, or weight loss except for a tingling sensation and weakness in both lower legs due to her disc disorder. On her pre-operative chest radiographic exam, a right lower paratracheal bulging opacity was noted. At first, we considered the possibility of a paratracheal mass or azygos vein dilatation. We reviewed a previous image taken approximately one year prior, and although the two images were obtained under different inspiratory states and rotation angles, it was clear that the bulge had markedly increased in size from 2.2 to 3.2 cm (Figure 1). The patient underwent contrast enhanced computed tomography (CT) for further evaluation and to exclude the possibility of a growing paratracheal mass. Contrast-enhanced CT of the thorax showed a 3.8 cm, well-defined, oval, homogeneous well-enhancing mass (net 70 HU enhancement on post-enhanced CT over pre-contrast CT image) in the right lower paratracheal area (Figure 2). The mass was located posterior to the superior vena cava (SVC), superior to the right main bronchus, and focally abutted the lateral wall of the trachea. As exact delineation of the azygos vein was not available, the relationship between this mass lesion and the azygos vein could not be determined. The differential diagnosis for this lesion includes not only right paratracheal well-enhancing masses such as paraganglioma, Castleman's disease, or hemangioma, but also aneurysmal dilatation of the azygos vein itself. Therefore, MRI was performed in order to evaluate the relationship between this paratracheal mass and the azygos vein, and to determine more of the characteristics of the mass. On axial T2WI, the mass showed heterogeneous bright high signal intensity (SI) with internal flow voiding. On dynamic axial pre T1WI, the mass showed homogenous iso-SI. On contrast-enhanced T1WI after 20 and 60 seconds, the posteriorly-located hemiazygos vein was gradually filled with contrast material and the connection to the mass-like lesion was definitely shown (Figure 3).

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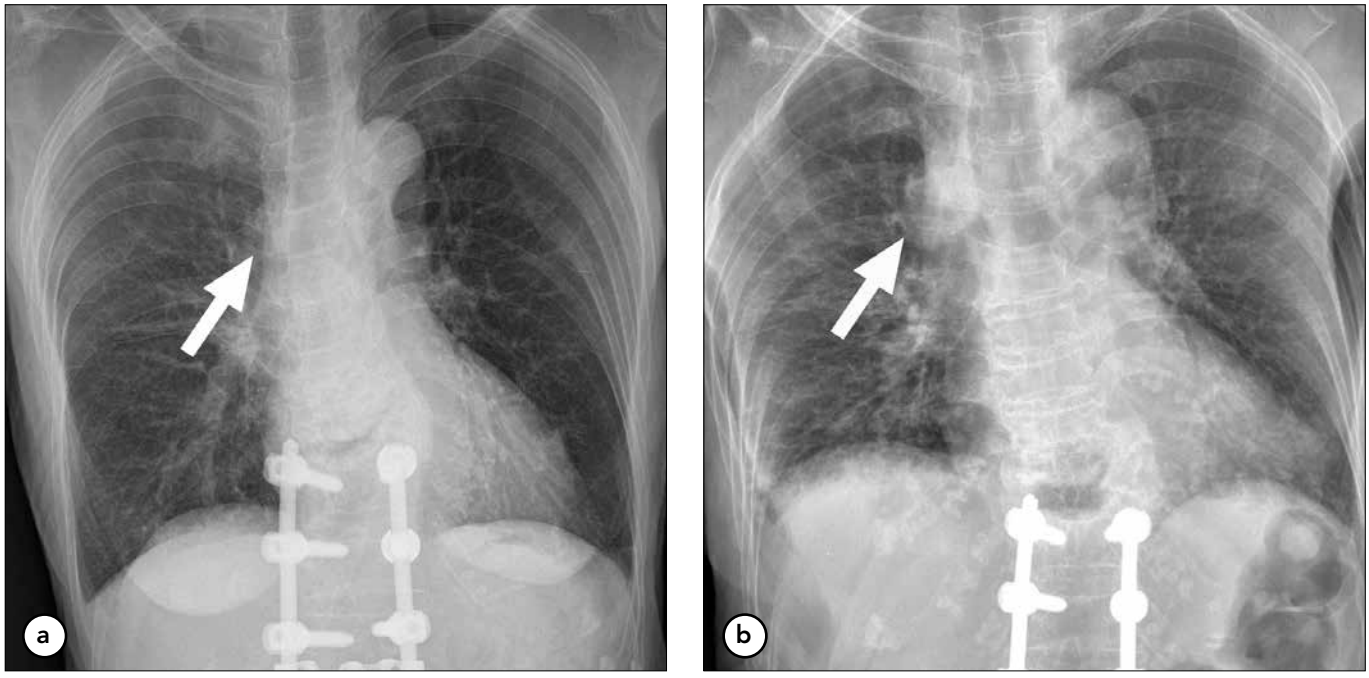

Figure 1. Increased right lower paratracheal bulging opacity on follow-up chest radiography, a) The initial chest radiography demonstrated a small bulging opacity (arrow) in the right paratracheal area, suggesting an aneurysm of the azygos vein or a right lower paratracheal lymph node or mass, b) A follow-up image taken one year later for pre-operation evaluation showed enlargement of the right lower paratracheal opacity from 2.2 cm to 3.2 cm (arrow)

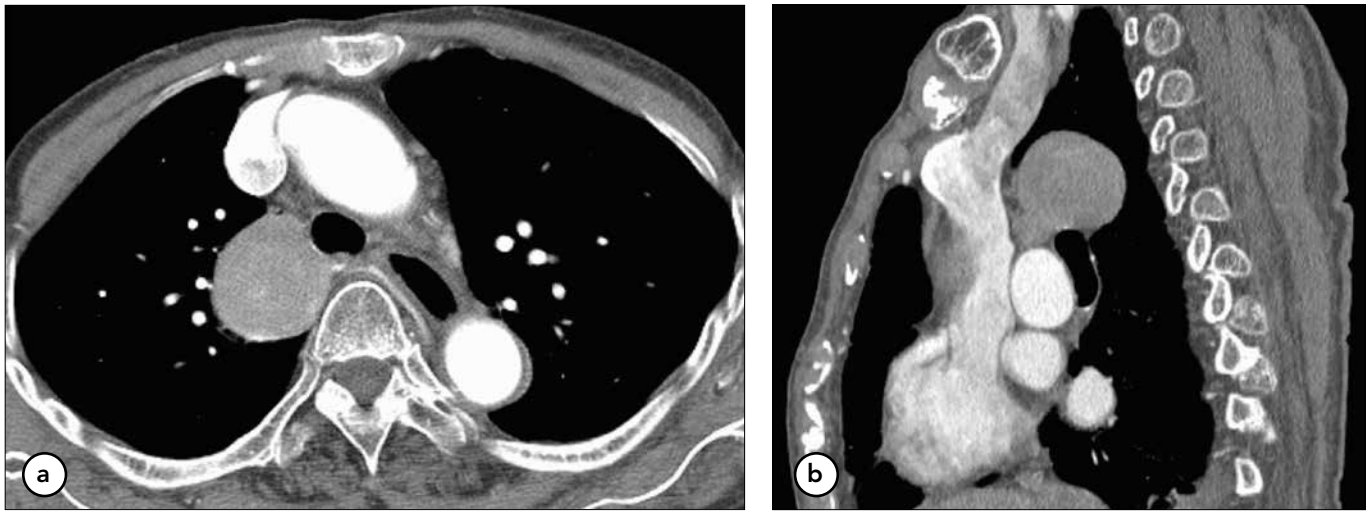

Figure 2. Contrast-enhanced computed tomography of the thorax, a) An axial view showing a 3.8 cm, well-defined, oval, well-enhancing mass in the right lower paratracheal area. This mass focally abutted the lateral wall of trachea, b) On sagital view, the connection between this mass lesion and azygos vein could not be determined

Discussion

Normally, the azygos vein drains to the SVC on the right tracheobronchial angle, and never exceeds 5 mm in diameter. Therefore, an azygos vein exceeding 5 mm can be considered enlarged. Aneurysms of the azygos vein are rare and the etiology is not well characterized, but most cases occur in patients with heart failure, portal hypertension, blunt trauma, malformations of the inferior vena cava including partial or total agenesis, or obstruction of the inferior vena cava by a tumor or lymph node (1). Aneurysm may also be caused by developmental interruption of the intrahepatic inferior vena cava (IVC) (3). When an aneurysm of the azygos vein does not fit any of these causes, as in our case, it is assumed to be congenital (4).

Embryologically, during the fourth week of gestation, venous drainage consists of the anterior and posterior cardinal veins. During the fifth week, several other veins develop, including the supracardinal veins, which afterwards become the azygos vein. The arch of the azygos vein is formed by the persisting part of the posterior cardinal vein, which is joined by

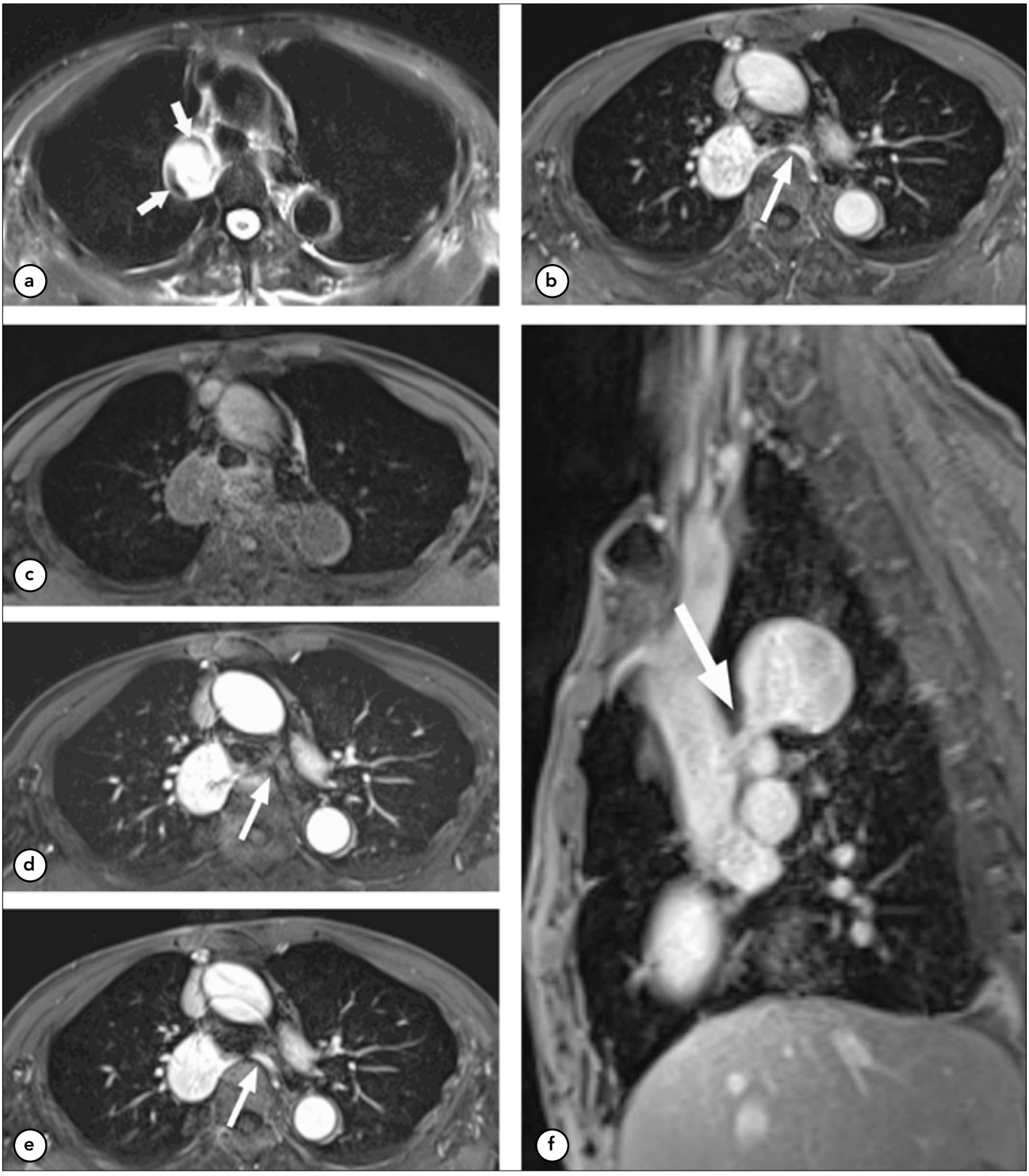

Figure 3. Dynamic MR images, a) On axial T2WI, the mass showed bright high SI with internal flow voiding SI suggesting vascular origin (arrows), b) On axial pre T1WI, the mass showed homogenous iso-SI with vascular mediastinal structures, c) On dynamic T1WIs (20s, 60s, 120s, respectively), the mass is seen posteriorly connected to the hemiazygos vein (arrows) , d) On sagittal TIWI (60s), the stalk (arrow) from the mass was demonstrated and connected to the SVC

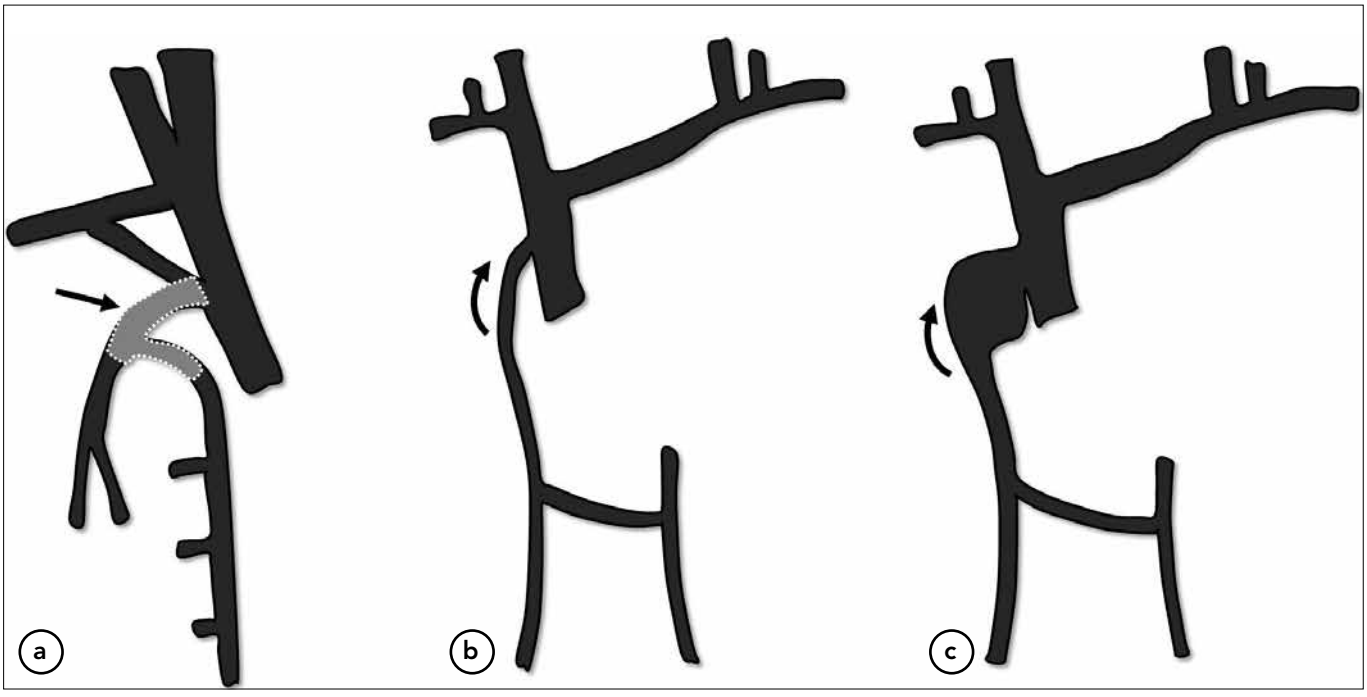

Figure 4. Schematic of the embryonic venous system at the fifth to seventh weeks, a) The shaded area forms the transverse portion of the azygos vein (azygos arch) as a confluence of the right supracardinal vein, the right posterior cardinal vein, and the right supracardinal vein. This area is a critical point that can be the origin of a saccular aneurysm, b-c) Sequential images of the development of an azygos aneurysm. As these aneurysms have several different etiologies, an azygos vein aneurysm may develop at the transverse part of the azygos vein

the supracardinal vein and communicates with the superior vena cava. Therefore, the azygos arch can be considered to be a confluence of three embryologic veins: the right supracardinal vein (azygos vein), the right posterior cardinal vein (azygos arch), and the right anterior cardinal vein (superior vena cava). Anatomically, this confluence can be a critical point that facilitates the development of an aneurysm (4). That is, a remnant of either the right posterior cardinal vein, subcardinal vein, or primitive subclavian veins, which empties into the transverse part of the azygos vein, may be the origin of a saccular aneurysm (Figure 4) (2).

Regardless of the cause, an azygos vein aneurysm is usually asymptomatic, and may be detected on a chest radiograph as mimicking a mediastinal or paratracheal mass. In our case of an asymptomatic 79 year-old woman, a right lower paratracheal bulging opacity was noted on a pre-operation chest radiography. To evaluate the origin of mass, various imaging modalities were performed before any invasive diagnostic procedures. There are a few case reports of azygos vein aneurysms, but these cases did not use various imaging modalities. Although Kurihara et al. (2) and Francis et al. (5) described MRI findings, only a single phase or single sequence with any specific diagnostic value was included. Even though Poll et al. (6) showed MRIs of an azygos aneurysm with various sequences, the case demonstrated the evident continuation of a dilated azygos vein to the SVC with a tubular shape, and they did not perform any dynamic MRI enhancement. However, in our case, various imaging modalities, including dynamic MRI, were performed. The sequential filling of contrast materials into the adjacent vascular structures was the crucial finding that differentiated the azygos vein aneurysm from a growing paratracheal mass. As the right paratracheal bulging opacity had enlarged on serial follow-up radiography, we initially considered a growing paratracheal well-enhancing mass, and further evaluation was performed. Contrast enhanced CT revealed a homogeneous enhancement pattern. However, the relationship between this mass and the azygos vein was unclear, and we thought perhaps the azygos vein was compressed by the mediastinal mass. On axial T2WI of MRI, the mass was seen to be connected to the SVC and showed heterogeneous bright high SI with internal flow voiding, leading us to suspect a vascular origin. On dynamic studies, axial pre T1WI showed that the mass was homogenously iso-SI. On dynamic T1WI, the hemiazygos vein was gradually posteriorly filled with contrast material after 60 seconds of contrast injection.

Through these various imaging modalities, and dynamic MRI in particular, we clarified the nature of the mass and eliminated the need for invasive procedures such as mediastinoscopic, bronchoscopic, or percutaneous needle biopsy, which have the potential to cause a major hemorrhage.

It should be strongly emphasized that even if a definite diagnosis of an azygos vein aneurysm can be made radiologically, follow-up is required as the aneurysm could further enlarge and may compress adjacent structures such as the right main bronchus or SVC (7). The aneurysm could also thrombose, which could lead to a pulmonary thromboembolism (1). Although there have been no reports of an aneurysm rupture, a rupture could theoretically occur (1). Some authors have rec-

ommend video-assisted thoracoscopic resection if it is necessary to remove an azygos vein aneurysm. However, due to the rarity of this condition, the appropriate treatment strategy and indications for surgical resection are not clear (1).

The use of various imaging modalities can aid in the diagnosis of an azygos vein aneurysm. Dynamic MRI is especially helpful in clarifying the nature and origin of the lesion through detecting connections to adjacent vascular structures.

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References

1. Lee DH, Keum DY, Park CK, Kim JB, Rho BH. Case report:azygos vein aneurysm-a case for elective resection by video-assisted thoracic surgery. Korean J Thorac Cardiovasc Surg 2011;44:304-6. **[CrossRef]**
2. Kurihara Y, Nakajima Y, Ishikawa T. Case Report:Saccular of aneurysm of the azygos vein simulating a paratracheal tumour. Clin Radiol 1993;48:427-8. **[CrossRef]**
3. Braun P, José Pamies G, Laura Trilles O. Aneurysm of the azygos arch. European Journal of Radiology Extra 2004;50:71-4. **[CrossRef]**
4. Lee SY, Kuo HT, Peng MJ, Lin FJ, Shih SC, Sheu CY, et al. Case report:azygos vein varix mimicking mediastinal mass in a patient with liver cirrhosis. Chest 2005;127:661-4. **[CrossRef]**
5. Podbielski FJ, Sam AD 2nd, Halldorsson AO, Iasha-Sznajder J, Vigneswaran WT. Giant azygos vein varix. Ann Thorac Surg 1997;63:1167-9. **[CrossRef]**
6. Poll LW, Koch JA, Finken S, Lurz K, Habersang K, Mödder UJ. Azygos continuation syndrome with aneurysm of the azygos vein:CT and MR appearances. Comput Assist Tomogr 1999;23:19-22. **[CrossRef]**
7. Petsasa T, Kalogeropouloua C, Zabakisa P, Apostolakisb E, Dougenis D. Giant azygos vein varix mimicking posttraumatic pseudoaneurysm. European Journal of Radiology Extra 2005;53:25-7. **[CrossRef]**