Case Report

Tortuous Descending Thoracic Aorta in a Patient with a History of Ascending Aorta Replacement as a Confounder in Transesophageal Echocardiographic Evaluation of the Left Atrium: A Procedural Challenge

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Highlights

- Descending thoracic aorta tortuosity, sometimes present as a vascular mass in the mediastinum, distorting nearby cardiac chambers, which may confuse physicians during transesophageal echocardiography.
- Recognizing the potential echocardiographic presentation of aortic tortuosity can aid in the timely identification of this condition during transesophageal echocardiography.

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ABSTRACT

Descending thoracic aorta tortuosity results from elongation of the descending aorta and is associated with aging. It acts as a risk factor for challenging endovascular procedures and has prognostic significance. It may, however, sometimes present as a vascular mass in the mediastinum, distorting nearby cardiac chambers, which may confuse physicians during transesophageal echocardiography.

We describe an elderly woman with severe descending thoracic aorta tortuosity presenting with a tubular vascular mass located behind the left atrium, exerting compression on it. Recognizing the potential echocardiographic presentation of aortic tortuosity can aid in the timely identification of this condition during transesophageal echocardiography.

Keywords: Echocardiography; Mediastinal Mass; Descending Aorta; Aortic Tortuosity

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Introduction

Descending thoracic aorta tortuosity is characterized by abnormal twists and turns of the descending aorta,[1] primarily associated with aging, cardiovascular risk factors, and certain hereditary connective tissue diseases.[2] This condition has clinical implications. Descending thoracic aorta tortuosity can complicate and increase risks during procedures such as transcatheter aortic valve implantation[3,4] and thoracic endovascular aortic repair[5] and can affect left ventricular diastolic function.[6] Nonetheless, the potential influence of descending thoracic aorta tortuosity on the structural changes of nearby cardiac chambers, as detected during echocardiography, is not well demonstrated.

Here, we describe a woman with severe tortuosity of the descending thoracic aorta, which caused an altered shape of anatomical cardiovascular structures observed during transesophageal echocardiography.

Case Presentation

A 70-year-old woman was referred to our hospital due to orthopnea and paroxysmal nocturnal dyspnea. She had a history of hypertension and underwent aortic valve repair along with ascending aorta replacement for an ascending aorta aneurysm 25 years ago. Additionally, she had a percutaneous intervention on the right coronary artery 3 years ago. Physical examination revealed an irregular rhythm. Electrocardiography showed atrial fibrillation with a rapid ventricular response.

After rate control, transthoracic and transesophageal echocardiography revealed severe left ventricular enlargement with moderate systolic dysfunction (ejection fraction, 35%), normal right ventricular size with moderate systolic dysfunction, biatrial enlargement, a thickened and malcoapted aortic valve with severe aortic regurgitation, and mild aortic valve stenosis. During transesophageal echocardiography, the descending aorta was observed to be adjacent to the lateral side of the left atrium (LA), with a transverse tubular structure exhibiting pulsatile flow on the posterior side of the LA (Figure 1A, 1B, 1C; Video 1).

A computed tomography scan of the aorta showed severe tortuosity of the descending aorta. The proximal part was on the left side, crossed the midline acutely at the level of the LA (exerting a compressive effect on the LA), then descended on the right side, crossed the midline smoothly again, and descended on the left side to the diaphragm (Figure 1D, 1E, 1F; Video 2, Video 3). The tortuous thoracic descending aorta had led to approximately 10 mm protrusion on the LA wall and approximately 20° of the LA wall deviation.

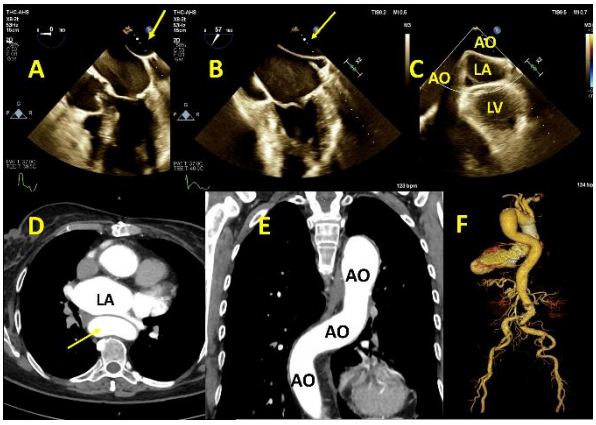

Figure 1. (A) Transesophageal echocardiography showed unusual closeness between the descending aorta and left atrium in the mid-esophageal 0° view and (B) in the 57° view. (C) In addition, transesophageal echocardiography revealed that the descending aorta crossed the midline, appearing as a tubular space posterior to the left atrium, with a compressive effect on it. (D) Axial and (E) coronal sections of the descending aorta on computed tomography angiography demonstrated its crossing of the midline. (F) Reconstructed 3D computed tomography angiography of the descending aorta showed severe tortuosity.

Discussion

Aortic tortuosity is well established to be associated with aging, leading to an increase in aortic length accompanied by a decrease in vertebral column length. Aortic tortuosity is more prevalent in individuals aged 65 years or older. Aging is associated with changes in the elastin-to-collagen ratio in the aortic wall, as well as the presence of atherosclerotic changes.[7] In addition, tortuosity in females is more severe than in males due to hormonal changes that occur after menopause.[8] Hypertension is another risk factor for aortic tortuosity.[1]

Mediastinal masses detected by echocardiography are either echodense or echo-free. Solid masses include lymph nodes, thymomas, and others.[9,10] Echo-free masses encompass cysts, such as pericardial and hydatid

cysts,[11,12] as well as vascular masses. Uncomplicated cysts typically show no color Doppler signals. Nevertheless, vascular masses, especially those with arterial flow, usually display color Doppler signals. Vascular masses of the mediastinum identified by echocardiography include coronary artery aneurysms,[13] aortic dissections,[14] and aortic pseudoaneurysms.[15] In aortic dissection, the presence of a dissecting flap is a key diagnostic feature. A pseudoaneurysm involves the disruption of one aortic wall, connecting through a small orifice to an echo-free space. Detecting a connection between the vascular mass and the sinus of Valsalva, especially when it has a different course than the aorta, aids in diagnosing a giant coronary artery aneurysm. The presence of continuous flow is another helpful finding. Moreover, a thorough evaluation of all aortic segments can help reveal aortic tortuosity. A partial or total anomalous pulmonary venous connection, which is associated with a pulmonary venous convergence, is another differential diagnosis. If pulmonary venous convergence connects to the right atrium or other venous-related cardiac structure, venous flow can be detected. Additionally, the presence of a concomitant atrial septal defect may be helpful.[16] Congenital left atrial aneurysm,[17] LA appendage aneurysm,[18] and LA dissection[19] are other differential diagnoses. In congenital LA aneurysm or LA appendage aneurysm, the aneurysm sac is connected to the LA. In LA dissection, which usually occurs after cardiac surgery, an undulating dissecting flap is present in the LA. Using another imaging modality, such as a computed tomography scan or magnetic resonance imaging, is essential for definitive diagnosis.

Descending aorta tortuosity is associated with increased hemodynamic force on the aortic wall[20] and produces an asymmetric shear stress pattern in the aorta.[21] Aortic tortuosity is related to the expansion rate of the aorta and the composite end point of prophylactic aortic surgery, aortic dissection, and death in patients with Marfan syndrome.[21] Further, computed tomography–based markers of aortic degeneration are increased in patients with aortic tortuosity.[22]

Aortic tortuosity can complicate endovascular procedures involving the aortic valve or descending aorta.[4, 5] Aortic tortuosity is related to a composite of procedural death, stroke, conversion to surgery, valve malposition, aortic dissection, or rupture in patients undergoing transcatheter aortic valve implantation.[4] Still, the risk of rupture in patients with abdominal aorta aneurysm and aortic tortuosity is reduced.[23] In patients undergoing thoracic endovascular aortic repair, those with severe aortic tortuosity had more strokes, endoleak, and mortality at 5-year follow-up.[24] One study demonstrated that after ascending aorta replacement, due to the decreased distensibility of the ascending aorta, the shear stress and strain in the descending aorta increase.[25] Another study revealed increased distensibility in the descending aorta.[26] However, another study did not report changes in compliance of the descending aorta.[27] Therefore, hemodynamic changes in the descending aorta after ascending aorta replacement may play a role in aortic elongation and the development of aortic tortuosity, as seen in our patient.

Our patient demonstrates that aortic tortuosity can present as a vascular mass on transesophageal echocardiography. This tortuosity can occur in the axial, coronal, and sagittal planes. In our patient, it was found in the coronal plane, causing compression of the LA. Recognizing the presentation of descending aorta tortuosity on transesophageal echocardiography and understanding that it may be accompanied by compression of the posterior cardiac chambers and distortion of their anatomy can help clinicians involved in the procedure interpret echocardiography results and prevent unnecessary prolonged transesophageal echocardiography.

Declarations:

Ethical Approval

General informed written consent was obtained at hospital admission time for using patients' data anonymously in research.

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Conflict of Interest

The authors report no conflict of interest.

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