Clinical Case Report

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Left sinus of valsalva aneurysm ruptured into left ventricle

A case report of 320-multidetector CT findings

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Abstract

Rationale: Ruptured aneurysm originating from the left coronary sinus of Valsalva into the left ventricle (LV) is extremely rare. Imaging features of sinus aneurysm has been commonly reported using echocardiography or angiography. Here, we report multidetector computed tomography (MDCT) findings of left sinus of Valsalva aneurysm extending into the LV and caused severe aortic regurgitation (AR) in a 44-year-old male with latent infective endocarditis. The role of MDCT in preoperative surgical planning was also emphasized.

Patient concerns: The patient visited our hospital due to worsening exertional dyspnea for 3 months.

Diagnoses: On cardiac computed tomography (CT) using 320-MDCT, a saccular aneurysm arising from the left coronary sinus of Valsalva extending into the LV was diagnosed as the cause of severe AR.

Interventions: The patient underwent resection of the aneurysm, aortic root reconstruction, and aortic valve replacement.

Outcomes: The patient made an uneventful recovery. Follow-up echocardiography showed no paravalvular leakage with improved LV function.

Lessons: MDCT with wide coverage and high temporal resolution can provide exact and comprehensive information about complicated conditions, leading to confident surgical planning and successful management.

Abbreviations: AR = aortic regurgitation, CT = computed tomography, LV = left ventricle, MDCT = multidetector computed tomography.

Keywords: aortic regurgitation, infective endocarditis, left sinus of Valsalva aneurysm, left ventricle, MDCT

1. Introduction

Sinus of Valsalva aneurysm is a rare condition. Most aneurysms usually originate from the right or noncoronary sinus. Ruptured aneurysm originating from the left coronary sinus into the left ventricle (LV) is extremely rare.[1] This can cause severe aortic regurgitation (AR), coronary insufficiency, and paroxysmal ventricular fibrillation.[2] Only a few studies have reported computed tomography (CT) findings of ruptured left sinus of Valsalva aneurysms using helical CT. Here, we report a case of left sinus of Valsalva aneurysm extending into LV with emphasis on the findings and role of multidetector computed tomography (MDCT) with wide coverage in exact diagnosis and successful management of this critical and complicated disease.

2. Case report

Our institutional ethical committee approved this study. Informed consent for publication of this report and any accompanying images was obtained from the patient. A 44-year-old male visited our hospital due to worsening exertional dyspnea for 3 months. The patient did not exhibit fever or leukocytosis on admission. He was on medication for pulmonary nontuberculous mycobacterial infection. On physical examination, the patient had a regular pulse of 94 beats/minute and blood pressure of 112/70 mm Hg. On auscultation, a grade 4/6 diastolic murmur was heard over the left sternal border. Chest X-ray revealed cardiomegaly and pulmonary venous congestion. ECG showed normal sinus rhythm. Transesophageal echocardiography showed an aneurysmal outpouching between the right and left coronary sinus extending into the LV. It was unclear whether the right or the left sinus was the origin. The aneurysmal structure occupied about 2/3 of the left ventricular outlet tract, causing severe AR and severe LV dysfunction (ejection fraction: 40%) (Fig. 1).

Cardiac CT was performed on a 320-MDCT scanner (Aquilion One Vision, Toshiba Medical Systems, Otawara, Japan) which could allow 16 cm of z-axis coverage per rotation. Scan parameters were as follows: detector collimation,

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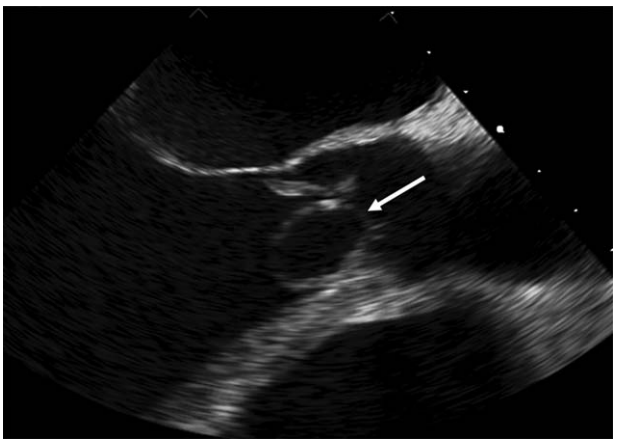

Figure 1. Transesophageal echocardiography showing an aneurysmal structure (arrow) occupying the left ventricular outflow tract.

320 × 0.5 mm; tube voltage, 100 to 135 kV; tube current, 290 to 850 mA; and gantry rotation time, 0.275 seconds. A total of 70 mL of intravenous nonionic contrast material (iomeprol, 400 mg/mL Iomeron, Bracco, Milan, Italy) was administered at a rate of 4 mL/sec followed by administration of 30 mL saline at a rate of 3 mL/sec. The patient received 0.6 mg of nitroglycerin sublingually just before CT scanning without a beta-blocker. The effective radiation dose used in CT scanning was 2.6 mSv.

Volume rendered 3-dimensional image of the heart revealed about 2 cm sized bi-lobed saccular aneurysm arising from the left coronary sinus of Valsalva, protruding between the left and right sinus of Valsalva (Fig. 2A). A larger part of the aneurysm extended into the LV (Fig. 2B). On axial view, the origin site of the aneurysm was clearly identified (Fig. 3A). On long axis view of LV, the intraventricular portion of aneurysm occupying left ventricular outlet tract was clearly shown (Fig. 3B). Since MDCT provided comprehensive 3-dimensional information about the location, extent, and the relationship between intracardiac and extracardiac components of the aneurysm, cardiac catheterization was not performed. The patient underwent resection of the aneurysm, aortic root reconstruction, and aortic valve replacement.

Histopathologic examination of the resected valve tissue showed myxoid degeneration with many neutrophil infiltrations suggestive of infective endocarditis as the cause of aneurysm (Fig. 4). Although no organism could be identified from specimens, the patient underwent a 4-week course of antibiotic therapy for infective endocarditis. The patient made an uneventful recovery. Follow-up echocardiography showed no paravalvular leakage with slightly improved LV function.

3. Discussion

Sinus of Valsalva aneurysm is infrequent. Most sinus of Valsalva aneurysms originate from the right or noncoronary sinus. Left sinus of Valsalva aneurysm is rare.[3] Ruptured aneurysm originating from the left coronary sinus into the LV is extremely rare, ranging from 0% to 3% of reported ruptured sinus of Valsalva aneurysms.[1,4] Unruptured sinus of Valsalva aneurysms are usually clinically silent, but sometimes can cause obstruction to the ventricular outflow tract, arrhythmias, complete heart block, myocardial ischemia, and transient ischemic attacks.[5] Ruptured aneurysms cause AR, left to right shunt following the aneurysm rupture into a cardiac chamber, and acute progressive heart failure.[5] Cardiac tamponade can occur in case of left coronary sinus aneurysm, though rare rupture into the pericardium is also possible.

Sinus of Valsalva aneurysms might be congenital or acquired. Congenital aneurysms are more prevalent than acquired ones. They are caused by localized weakness of elastic lamina at the junction of aortic media and fibrotic annulus. Congenital aneurysms are usually seen in patients with Marfan or Ehlers–Danlos syndrome.[6] Acquired aneurysm is caused by infections such as bacterial endocarditis, syphilis, tuberculosis, trauma, and degenerative diseases.[7] Our patient did not exhibit prominent signs of infective endocarditis preoperatively. However, histopathological examination after an aortic valve replacement revealed neutrophil infiltration in the resected specimen,

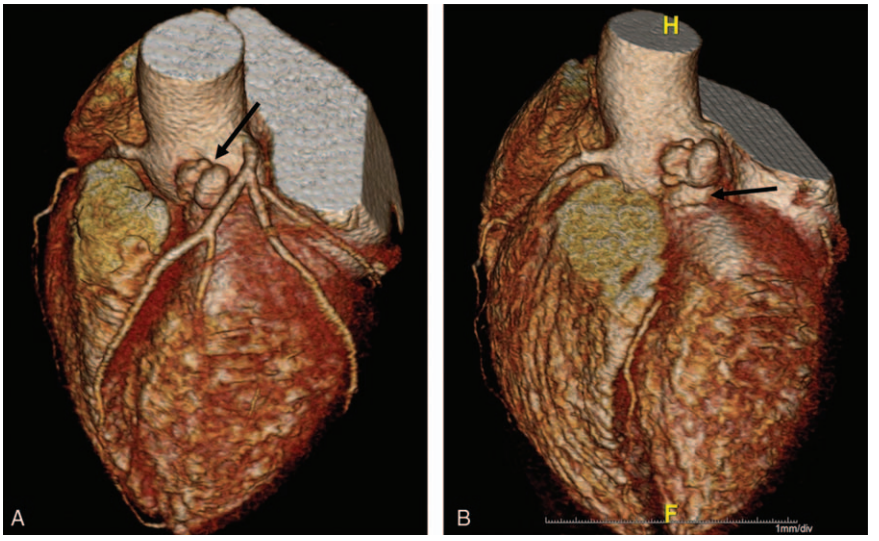

Figure 2. (A) Volume rendering image of the heart showing a bi-lobed saccular aneurysm (arrow) arising from the left coronary sinus of Valsalva. Coronary arteries are all patent. (B) Volume rendering image after removing coronary arteries and the tilted upward revealing that the larger part of aneurysm has a component protruding into the left ventricle (arrow).

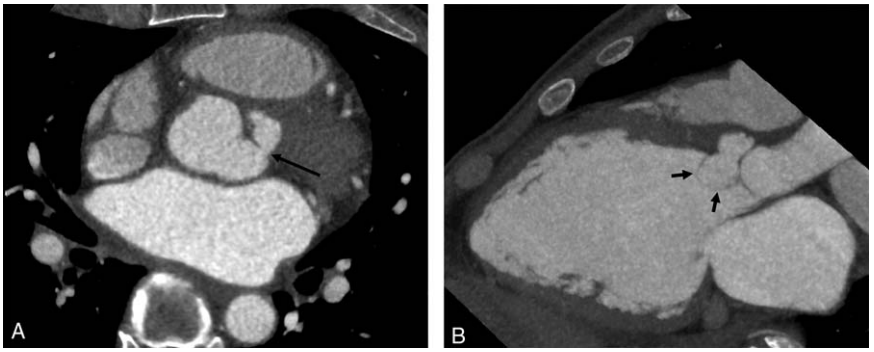

Figure 3. (A) Axial image of the aortic root showing that the origin of the aneurysm is left sinus of Valsalva (arrow). (B) Long-axis view of the left ventricle clearly showing intra- and extracardiac components of the aneurysm. Intracardiac portion occupies the left ventricular outlet tract, causing aortic regurgitation (short arrows).

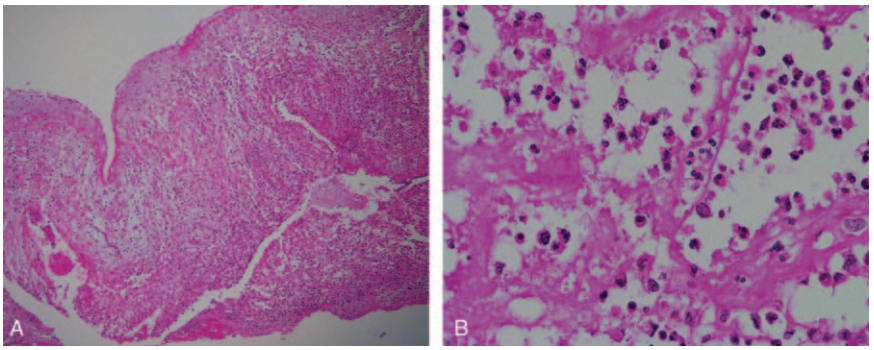

Figure 4. (A) Histopathologic examination of the resected tissue (hematoxylin eosin stain, ×40) shows myxoid degeneration and inflammatory cell infiltrations. (B) A magnified photography (hematoxylin eosin stain, ×200) shows the presence of many neutrophils among the inflammatory cells.

suggesting that latent infective endocarditis might be the cause as reported previously.[8]

This report described 320-MDCT features of left sinus of Valsalva aneurysm extending into the LV. Although echocardiography is useful for evaluating sinus of Valsalva aneurysms, sometimes it is difficult to delineate their exact origin or relationships with associated lesions. Cardiac catheterization is a more reliable diagnostic tool. However, it is invasive. MDCT can provide objective and detailed overall features of the aneurysm at various angles, thus helping surgeon understand the extent of the lesion and plan operation. In our case, aneurysmal component causing AR was identified by transesophageal echocardiography. However, the exact origin of aneurysm and overall features of intra- and extracardiac components could be clearly defined through using MDCT.

Until recently, few studies have reported CT findings of ruptured left sinus of Valsalva aneurysms.[9,10] Because helical CT scanner was used in these studies, cardiac motion might affect image quality. Therefore, this disease should be confirmed by angiography. Since our 320-MDCT protocol enabled volume scan covering the whole heart per single rotation (16 cm coverage per rotation) with high temporal resolution (0.275 seconds), images without motion artifact provided precise information about the complicated disease, obviating preoperative need of cardiac catheterization for surgical planning.

Apart from MDCT, cardiac MRI is also a useful tool in the diagnosis and evaluation of sinus of Valsalva aneurysm.[11] MRI can provide comprehensive information on the disease without exposure to radiation and iodinated contrast agent. In addition, it reveals the shape and size of the aneurysm, provides functional information of the LV, and can identify and quantify the shunt fraction in AR or left to right shunt, if any.

In conclusion, we reported 320-MDCT findings of a rare case of left sinus of Valsalva aneurysm extending into the LV caused by latent infective endocarditis. MDCT with wide coverage and high temporal resolution can provide exact and comprehensive information about complicated conditions, leading to confident surgical planning and successful management.

Acknowledgments

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