

Surgical repair of a giant unruptured left sinus of Valsalva aneurysm in an older patient

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Title Page

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CONFLICT OF INTEREST STATEMENT

Not applicable.

ETHICS APPROVAL

The Shin-Oyama City Hospital Ethics Committee approved this study.

PATIENT CONSENT

We obtained her written informed consent for the publication of this case report, including the accompanying images, using the patient consent form of this journal.

MANUSCRIPT TYPE

Case Report

Key Clinical Message

Unruptured left sinus of Valsalva aneurysms (SVAs) are extremely rare. Even if it is asymptomatic, surgical repair should be performed because of the serious risks such as ischemic heart disease, rupture, and thromboembolism. When possible, patch repair should be performed because it is less invasive and benefits older patients.

Abstract

Symptoms of SVAs, such as chest pain due to acute coronary syndrome, are caused by the compression of the coronary artery by the aneurysm. If asymptomatic, left SVAs are often incidentally diagnosed during a close examination for other diseases. Here, we report the surgical case of a patient with an asymptomatic, unruptured, giant left SVA. An 82-year-old woman with hypertension showed abnormalities on an electrocardiogram during a regular medical examination. Coronary computed tomography angiography revealed an aneurysm with a diameter of $50 \times 48 \times 45$ mm protruding from the left sinus to the extracardiac space, compressing the left anterior descending artery. Moderate aortic regurgitation was observed on echocardiography. Since there was no foreseen risk other than advanced age, surgical repair was planned based on the size of the aneurysm and extrinsic compression of the coronary arteries. Patch repair was performed using an artificial patch as the lesion was confined to the left sinus. The left coronary artery button was sutured to the patch, and coronary artery bypass grafting was performed using a saphenous vein graft. Aortic regurgitation improved after annuloplasty with the patch and ringed fixation of the sinotubular junction using a polytetrafluoroethylene felt strip. Thus, for the surgical repair of a giant SVA, although aortic root replacement is often performed, if the lesion is localized and isolated, patch repair is less invasive and beneficial, especially in older patients.

Keywords

sinus of Valsalva aneurysm, aortic regurgitation, coronary artery bypass, older patient

Introduction

Sinus of Valsalva Aneurysm (SVA) is an uncommon cardiovascular disease. An unruptured SVA is asymptomatic and mostly located in the right coronary sinus.¹⁻⁵ Left SVAs are rare and often symptomatic because of a left coronary event, such as acute coronary syndrome.⁶⁻⁹ In many cases, patch closure, root replacement with aortic valve replacement, or valve-sparing procedures are performed for the management of SVAs.

Here, we describe the case of an asymptomatic unruptured large left SVA that was successfully managed with patch repair and coronary artery bypass grafting.

Case presentation

2-1. Case History and Examination

An 82-year-old woman with hypertension visited our hospital with abnormal electrocardiogram findings during a regular medical check-up. Although the patient was asymptomatic, detailed tests were scheduled for suspected ischemic heart disease.

She had undergone Halsted radical mastectomy for left breast cancer at the age of 32 years and cholecystectomy for cholelithiasis at the age of 53 years.

She had no history of infectious diseases, such as syphilis, tuberculosis, or infectious endocarditis, and no history of trauma or inflammatory diseases such as aortitis.

Electrocardiography revealed a heart rate of 50/min, regular sinus rhythm, non-specific QS complexes in $V_{1,2}$, and ST depression in $V_{4,5,6}$.

Further, echocardiography revealed a left SVA. No asynergy was observed, the ejection fraction was 73%, and moderate aortic regurgitation was observed.

Computed tomography (CT) angiography confirmed the presence of a saccular left SVA measuring $50 \times 48 \times 45$ mm. A small mural thrombus was observed in the aneurysm (Figure 1). Furthermore, extrinsic

compression of the left anterior descending artery was observed, and approximately 50% stenosis was noted (Figure 2).

2-2. Surgical treatment

Surgery was performed via median sternotomy on standard cardiopulmonary bypass under cold blood cardioplegic arrest with moderate hypothermia. The SVA originated from the left aortic sinus and expanded into the left extracardiac space. The ascending aorta was clamped and transected. The orifice of the SVA was approximately 20 mm in diameter, and it was located close to the left coronary ostium. However, the vascular wall of the left coronary ostium was preserved. The right and non-coronary sinuses were not dilated and had intact intima. The aortic valve cusp was neither calcified nor thickened. Only the left aortic annulus was elongated because of an aneurysmal defect in the left sinus wall.

Patch repair (Hemashield Woven Double Velour Fabric; GETINGE) of the left sinus was performed. The patch was cut into a D-shape, similar to that of the other sinuses. The left sinus wall was resected and was replaced by the patch via interrupted sutures using 2-0 polyethylene terephthalate suture (ETHIBOND EXCEL, ETHICON).

The trimmed left coronary button was reattached to the left sinus patch using a 6-0 polyvinylidene fluoride suture (ASFLEX; CROWNJUN). The aortic sinotubular junction diameter was fixed at 30 mm in diameter with a polytetrafluoroethylene felt strip to prevent the exacerbation of aortic regurgitation caused by the dilatation of the sinotubular junction. For the stenotic lesions in the left coronary artery, coronary artery bypass grafting to the left descending artery using a saphenous vein graft was performed (Figure 3). No aortic regurgitation was observed on intraoperative transesophageal echocardiography.

2-3. Outcome and follow-ups

The patient had no major postoperative complications and was discharged on postoperative day 24. At follow-up one year after surgery, there was no aneurysmal lesion on CT, and she was well and had no complications.

Discussion

SVA is a rare congenital or acquired disease. Congenital cases may be associated with ventricular septal defect or bicuspid aortic valve. Acquired cases result from infections, such as syphilis, tuberculosis, and bacterial endocarditis, as well as trauma, aortitis, and connective tissue diseases, such as Marfan syndrome.^{1,2,4,5}

SVAs mostly originate from the right sinus (65–85% cases); non-sinus origin is observed in 10–30% cases, and left sinus origin is even rarer, accounting for less than 5% cases.^{1,2}

Similar to other aneurysms, an unruptured SVA is often asymptomatic; however, as the aneurysm grows, it causes difficulties in adjacent structures. When an unruptured left SVA grows, it can cause chest pain due to acute coronary syndrome caused by the compression of the left coronary artery by the aneurysm.^{6–9}

Aortic regurgitation caused by aortic annulus enlargement and/or cusp prolapse is often associated with SVA. A non-ruptured SVA is associated with aortic regurgitation in 30–50% cases.⁵

Symptomatic aneurysms, including ruptured ones, are indications for surgical repair; however, in the case of unruptured and asymptomatic SVA, the indication and timing of surgery should be determined based on the evaluation of the risk of SVA, which is calculated by determining aneurysm size, grade of aortic regurgitation, and risk of thrombus formation.^{10,11}

Patch closure has been used in many cases for SVAs. Coronary artery bypass grafting and/or prosthetic valve replacement may be performed depending on the lesion. Depending on the condition of the aortic root, such as multiple sinus lesions, aortic root replacement with a prosthetic valve or a valve-sparing procedure can be selected.^{9,10}

In addition to the risk of rupture caused by the large saccular aneurysm protruding into the extracardiac space, the risk of embolism caused by a thrombus in the aneurysm and the risk of myocardial ischemia caused by coronary artery compression, we determined that surgery was necessary. The patient tolerated the operation without any major complications despite her advanced age. Similar cases of aortic root replacement using a biological prosthetic valve or a valve-sparing aortic root replacement have been reported.^{9,10} In this case, because the lesion was localized in the left sinus, we decided to reconstruct only the left sinus with an artificial patch. Coronary artery bypass grafting was performed to prevent cardiac ischemia.

In aortic regurgitation, if the valve cusps are preserved under normal conditions, it is important to correct the enlargement of the aortic valve annulus and the dilated sinotubular junction to control aortic regurgitation.^{12,13} In this case, moderate aortic regurgitation was observed before surgery, and the left aortic annulus was stretched and unstable owing to the aneurysmal wall defect in the left sinus, but no major abnormalities were observed in the cusp. The left sinus and aortic annulus were formed with a patch, and the sinotubular junction was ring-fixed with a felt strip. Aortic regurgitation improved with these procedures.

This is a rare case of SVA in an older patient aged >80 years. In a literature review by Nguyen et al. covering reports from 2000 to 2020, there was only one other case of an unruptured SVA in a patient aged >80 years.^{4,5} It is preferable for older patients to have an SVA treated with a less invasive surgical procedure if the lesion is localized, as in this case.

If aortic enlargement, multiple dilated sinus lesions, marked aortic annular enlargement or severe aortic regurgitation caused by aortic cusp lesions had been observed, aortic root replacement with a biological prosthetic valve would have been performed.

Conclusion

In the extremely rare case of an unruptured giant left SVA in an older patient, patch repair and coronary artery bypass grafting can be performed with satisfactory results.

To avoid the risk of acute coronary syndrome, coronary artery bypass should be performed aggressively if extrinsic compression of the left coronary artery is obvious. Aortic valve replacement may be avoided by correcting the aortic annular enlargement and correcting the dilated sinotubular junction if aortic regurgitation is complicated, as in this case.

AUTHOR CONTRIBUTIONS

Shinichi Oki: Conceptualization, data curation, investigation, and writing-original draft, review and editing.

Hiroataka Sato: Supervision and writing-review and editing.

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Figure legends

Figure 1

Three-dimensional (a, b) and multiplanar (c, d) cardiac computed tomography images.

The saccular left SVA protrudes into the extracardiac space, measuring 50 x 48 x 45 mm. A small amount of mural thrombus was observed in the aneurysm (white arrow).

SVA: sinus of Valsalva aneurysm

Ao: ascending aorta

Figure 2

Multiplanar coronary computed tomography showing extrinsic compression of the left anterior descending artery by the aneurysm sac.

Ao: ascending aorta

SVA: sinus of Valsalva aneurysm

LAD: left anterior descending artery

Figure 3

Three-dimensional computed tomography image of post-surgical repair. The black dotted area shows the left sinus of Valsalva repaired with a patch. Coronary artery bypass grafting was performed with an SVG. The white arrow waistline shows the ring-fixed sinotubular junction.

SVG: saphenous vein graft

LAD: left anterior descending artery





