The Texas Heart Institute® Journal

Case Reports

Surgical Management of Giant Unruptured Left Sinus of Valsalva Aneurysm With Severe Aortic Regurgitation

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Abstract

Left sinus of Valsalva aneurysms are extremely rare. Concomitant aortic valve regurgitation is a comorbidity in this pathology. This case report summarizes successful surgical treatment with aortic root replacement with a modified Bentall procedure in a 49-year-old female patient who had an unruptured huge left sinus of Valsalva aneurysm with severe aortic valve regurgitation. The intraoperative assessment showed severe adhesion between the left main trunk of the coronary artery and the left sinus of Valsalva aneurysm, and meticulous adhesion detachment was required.

Keywords: Sinus of Valsalva; aneurysm; aortic valve insufficiency

Case Report

Presentation and Physical Examination

A 49-year-old woman who presented with progressive dyspnea and New York Heart Association functional class II symptoms was referred for surgical treatment of severe aortic valve regurgitation. Physical examination revealed a 3/6 diastolic heart murmur at the lower left sternal border. Chest radiography revealed a cardiothoracic ratio of 57.0% (Fig. 1). Transthoracic echocardiography revealed severe aortic valve regurgitation, a huge left sinus of Valsalva aneurysm (SVA), a left ventricular ejection fraction of 62%, a left ventricular end-diastolic dimension of 50 mm, and an end-systolic diameter of 35 mm. Computed tomography revealed enlargement of the left SVA (77 mm), calcification of the wall, and dilatation of the aortic valve annulus (Fig. 2). Coronary computed tomographic angiography demonstrated that the left main trunk (LMT) of the coronary artery was elongated by the left SVA; however, no coronary artery stenosis was confirmed (Fig. 3A, Fig. 3B).

Fig. 1 Preoperative chest radiograph showed a cardiothoracic ratio of 57.0%.

Medical History

The patient's medical history included anaphylactoid purpura at 10 years of age, purpura nephritis at 16 years of age, and chronic kidney failure at 44 years of age.

Citation: Ozawa K, Kuwaki K, Furuya H, Yamaguchi M, Yamamoto A. Surgical management of giant unruptured left sinus of Valsalva aneurysm with severe aortic regurgitation. *Tex Heart Inst J*. 2023;50(5):e238134. doi:10.14503/THIJ-23-8134
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Differential Diagnosis

Differential diagnosis was necessary to determine whether the patient's condition was isolated aortic valve regurgitation or aortic valve regurgitation with SVA.

Technique

The patient underwent aortic root replacement with a modified Bentall procedure, including coronary ostial button reimplantation. A median sternotomy and full systemic heparinization were performed. Cardiopulmonary bypass was established between the bicaval venous drainage and ascending aortic arterial blood return, and cardioplegic arrest was achieved with antegrade and retrograde delivery of a cold blood cardioplegic solution. The intraoperative assessment showed severe adhesion between the LMT of the coronary artery and the aneurysmal wall of the left sinus of Valsalva as well as a partially heavily calcified aneurysm. Meticulous attention to adhesion detachment was required because proper trimming of the coronary artery orifice was essential for coronary ostial button reimplantation in the modified Bentall procedure. Electrocautery with low-voltage coagulation mode and an ultrasound scalpel were useful for careful adhesion dissection between the LMT and the aneurysmal wall. After the aortic valve leaflets and sinus of Valsalva were excised, a composite graft that consisted of a 23-mm INSPIRIS RESILIA aortic valve (Edwards Lifesciences LLC) and a 26-mm Gelweave Valsalva graft (Vascutek) was secured in the aortic annulus. Then, the left and right coronary ostial buttons were implanted in an end-to-side fashion in the composite graft, and the distal graft-to-aorta anastomosis was completed (Fig. 4). Although the LMT was elongated by the SVA, the left coronary button could be implanted to the Valsalva part of the Valsalva graft without kinking of the coronary artery, and there was no need to implant the button higher on the Valsalva graft. After the surgery, the patient was brought to the intensive care unit.

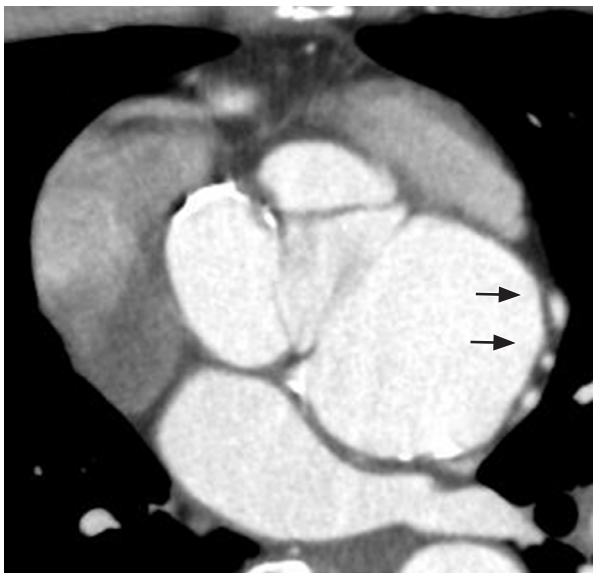

Fig. 2 Preoperative computed tomography image revealing the left sinus of Valsalva aneurysm. The arrows indicate calcification in the left sinus of Valsalva aneurysm.

Key Points

- Surgical repair should be considered for an unruptured giant SVA with severe aortic valve regurgitation.
- Adhesion between the LMT and left SVA could be safely dissected using electrocautery with low-voltage coagulation mode and an ultrasound scalpel.
- Coronary computed tomographic angiography can provide important information about the LMT of the coronary artery and left SVA.

Abbreviations and Acronyms

LMT	left main trunk
SVA	sinus of Valsalva aneurysm

Outcome

The patient was weaned from mechanical ventilation on the day of surgery, and hemodynamic and respiratory statuses were stable during the postoperative period. Intermittent fever over 38 °C was observed every day starting on postoperative day 7, but no infectious complications were confirmed. On postoperative day 16, prednisolone was administered in consideration of pericarditis or immune response to an artificial vascular prosthesis or biological valve, and the fever improved rapidly. The prednisolone dose was tapered, and the patient was discharged 30 days postoperatively.

Latest Follow-Up

The patient developed end-stage kidney failure, which required hemodialysis 5 months later, and then underwent living donor kidney transplant 11 months later. The patient is now living a normal, active life with New York Heart Association class I heart disease. The cardiothoracic ratio on chest radiography improved from 57.0% preoperatively to 43.1% 12 months postoperatively (Fig. 5).

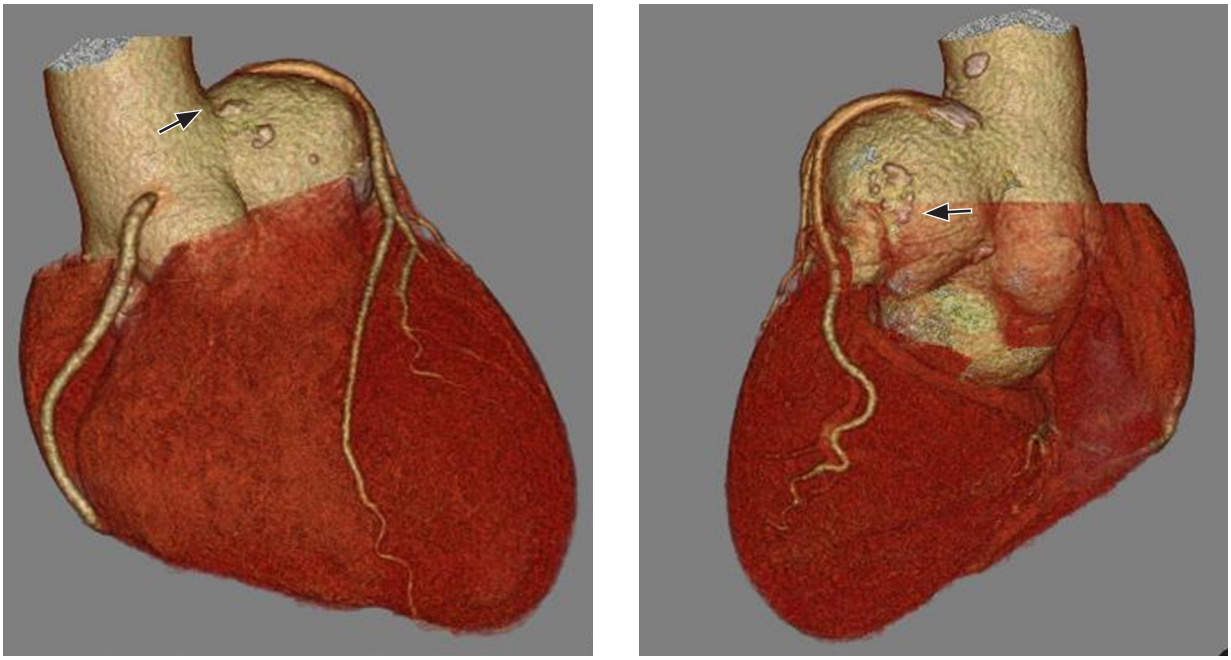

Fig. 3 Preoperative coronary computed tomographic angiogram demonstrating that the left main trunk of the coronary artery was elongated by the left sinus of Valsalva aneurysm. The arrows indicate calcification in the left sinus of Valsalva aneurysm in the **A**) anterior and **B**) posterior visews.

Fig. 4 Postoperative multidetector computed tomography image showing the aortic root replacement by modified Bentall procedure, including Carrel button reimplantation for coronary orifice reconstruction.

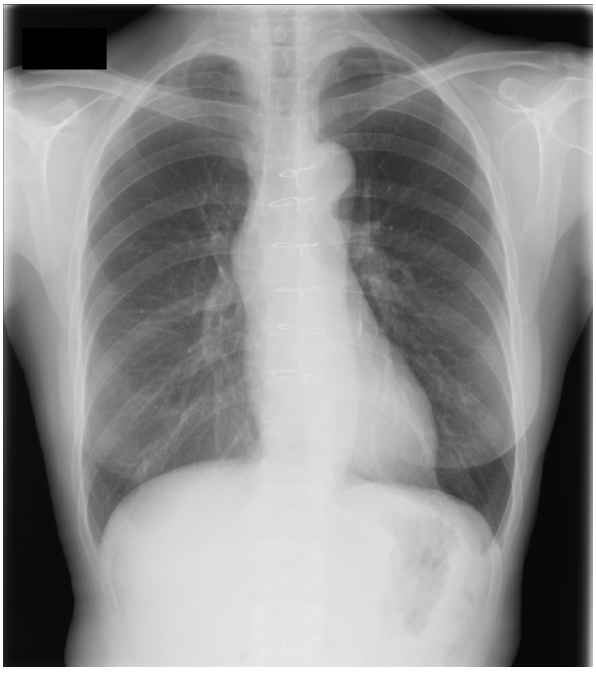

Fig. 5 Postoperative chest radiograph 12 months after surgery showing a cardiothoracic ratio of 43.1%.

The pathology results of the resected specimen of the aneurysmal wall showed fibrous connective tissue with calcification. Neither mycotic aneurysm nor connective tissue abnormalities were found.

Discussion

Sinus of Valsalva aneurysm is a rare disease, with an incidence of 0.09% in the general population. Sinus of Valsalva aneurysm arises from the right coronary sinus in 70% of patients, the noncoronary sinus in 25% of patients, and the left coronary sinus in 5% of patients.[1] Therefore, left SVA is extremely rare. Sinus of Valsalva aneurysm can be congenital or acquired. Congenital SVA is frequently associated with connective tissue disorders, such as Marfan syndrome and Ehlers-Danlos syndrome, as well as bicuspid aortic valve or ventricular septal defects.[1] Inflammatory etiologies, including bacterial endocarditis, syphilis, and tuberculosis, are linked to acquired SVA[2]; however, this patient had no connective tissue disorders, congenital heart disease, or inflammatory disease. Therefore, the etiology was unknown. Unruptured SVA is usually asymptomatic, but it sometimes shows a variety of clinical presentations with increased aneurysm, such as arrhythmia awareness, palpitations, chest pain, easy fatigability, and dyspnea.[2-5]

Sinus of Valsalva aneurysm is an enlargement of the aortic root between the aortic annulus and the sinotubular junction. The natural history of the unruptured SVA is not well understood, but surgical repair should be considered if the SVA exceeds 55 mm in patients with connective tissue disease; if the growth rate of the SVA exceeds 5 mm per year; or if the SVA causes ventricular outflow obstruction, coronary artery obstruction, aortic valve regurgitation, or malignant arrhythmia.

The patient had an SVA measuring 77 mm associated with severe aortic valve regurgitation; therefore, aortic root replacement was performed with a modified Bentall procedure, including the Carrel button technique for coronary orifice reconstruction (Fig. 4). Preoperative coronary computed tomographic angiography demonstrated that the LMT of the coronary artery was stretched by the large left SVA, but there was no stenosis. The intraoperative assessment showed very severe adhesion between the LMT and left SVA. To avoid injuring the left coronary artery orifice during the left coronary button preparation, which was the most important point for the patient during the surgical procedure, meticulous adhesion detachment was required.

Previous investigators demonstrated surgical repair of unruptured left SVA using several surgical techniques, including aortic root replacement with a composite graft,[6] valve-sparing aortic root replacement,[5] and aneurysmal orifice closure with a Dacron patch.[7] The size of the aneurysm in these previous reports ranged between 53 and 74 mm. Indication for surgical repair included a high risk of aneurysm rupture because of the large size of the aneurysm, with chest tightness in 1 patient[7] and a large aneurysm with acute coronary syndrome in 2 others.[5,6]

Conclusion

This case report summarizes the successful surgical treatment of a 49-year-old woman with a huge, unruptured left SVA (measuring 77 mm) complicated by severe aortic valve regurgitation. Surgical treatment with the modified Bentall procedure was performed successfully with special care on the division of adhesion between the LMT and the left SVA. The patient's preoperative symptoms, including easy fatigability, dyspnea on effort, and a cold chest feeling, disappeared after the operation.

Article Information

Published: 12 October 2023

Author Contributions: All authors critically reviewed and revised the manuscript draft and approved the final version for submission.

Conflict of Interest Disclosure: None.

Funding/Support: None.

References

1. Moustafa S, Mookadam F, Cooper L, et al. Sinus of Valsalva aneurysm—47 years of a single center experience and systematic overview of published reports. *Am J Cardiol.* 2007;99(8):1159-1164. doi:10.1016/j.amjcard.2006.11.047
2. Lijoi A, Parodi E, Passerone GC, Scarano F, Varuso D, Iannetti MV. Unruptured aneurysm of the left sinus of Valsalva causing coronary insufficiency. case report and review of the literature. *Tex Heart Inst J.* 2002;29(1):40-44.

3. Urbanski PP, Hirano S, Irimie V. Root repair in patient with huge sinus Valsalva aneurysm and severe aortic regurgitation. *Gen Thorac and Cardiovasc Surg.* 2020;68(5):530-533. doi:10.1007/s11748-019-01104-8
4. Ponti A, Qanadli SD, Kirsch M, Tapponnier M. Left sinus of Valsalva aneurysm as a cause of chronic stable angina. *Interact Cardiovasc and Thorac Surg.* 2017;24(6):967-968. doi:10.1093/icvts/ivx041
5. Pedroza AJ, Brewer ZE, Lee AM. Emergency valve-sparing aortic root replacement and coronary artery bypass grafting for giant left sinus of Valsalva aneurysm presenting as acute coronary syndrome. *J Thorac Cardiovasc Surg.* 2018;156(2):e81-e84. doi:10.1016/j.jtcvs.2018.03.009
6. Mork SR, Eftekkhari A, Tang M, Klaaborg KE. Giant unruptured aneurysm of the left coronary sinus of Valsalva presenting as acute coronary syndrome; a case report. *Eur Heart J Case Rep.* 2019;3(2):1-4. doi:10.1093/ehjcr/ytz053
7. Zhang T, Juan C, Yuan GD, Zhang HZ. Ginat unruptured sinus of Valsalva aneurysm: a rare one arise from left sinus. *Cir Cardiovasc Imaging.* 2019;12(11):e009850. doi:10.1161/CIRCIMAGING.119.009850