

Recurrent sinus of Valsalva aneurysm with right ventricular outflow tract obstruction¹

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We present a patient with a recurrent sinus of Valsalva aneurysm after unsuccessful surgical repair associated with right ventricular outflow tract obstruction. Two-dimensional echocardiography accurately localized the aneurysm and played a key role in the diagnosis, since physical signs of right-sided obstruction were absent. Cardiac catheterization confirmed the diagnosis. Postoperatively, two-dimensional echocardiography appears useful in judging the success or failure of surgery.

Index terms: Aneurysm, cardiac • Heart, surgery • Heart, ultrasound studies • Sinus of Valsalva

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We report a patient with a recurrent sinus of Valsalva aneurysm after unsuccessful surgical repair, which was associated with right ventricular outflow tract obstruction documented by two-dimensional echocardiography and cardiac catheterization.

Case report

A 55-year-old man with a known heart murmur since adolescence was evaluated for increasing dyspnea. Previous cardiac catheterization at another institution revealed an unruptured sinus of Valsalva aneurysm involving the right coronary cusp with no evidence of right ventricular outflow tract obstruction. Surgical repair was attempted by oversewing the aneurysmal sac, but repeat catheterization revealed

persistence of the aneurysm, moderately severe aortic regurgitation, and a 50mm Hg right ventricular outflow tract gradient (Table). Although the patient remained asymptomatic for several months, he later experienced progressive fatigue, dyspnea, and effort intolerance.

Physical examination revealed a slightly dyspneic, afebrile, acyanotic man. Blood pressure was 160/60mm Hg, pulse 84 beats/min and regular, and respirations 24/min. The jugular venous pulse was normal, and carotid pulses were bounding and brisk. The lung fields were clear. The apical impulse was palpable over the sixth left intercostal space at the anterior axillary line. No heaves were noted,

Table

	Catheterization #1	Catheterization #2
	O ₂ Saturation (%)	O ₂ Saturation (%)
SVA	—	67
RA	61	62
RV	60	61
PA	61	63
Aorta	92	92
	Pressure (mm Hg)	Pressure (mm Hg)
RA	Mean = 2	Mean = 9
RV inflow	—	55/8
RV outflow	70/0	55/8
PA	20/8	20/10, Mean = 16
Wedge	Mean = 1-3	Mean = 10
LV	120/12	120/10
Aorta	120/56	120/60, Mean = 80
Cardiac index	1.9 l/min/m ²	2.1 l/min/m ²
Qp/Qs	—	1:1
Systemic resistance	—	19.8 Wood units
Pulmonary resistance	—	4.0 Wood units

Abbreviations: SVA = sinus of Valsalva aneurysms; RA = right atrium; RV = right ventricle; PA = pulmonary artery; Qp/Qs = left/right shunt ratio.

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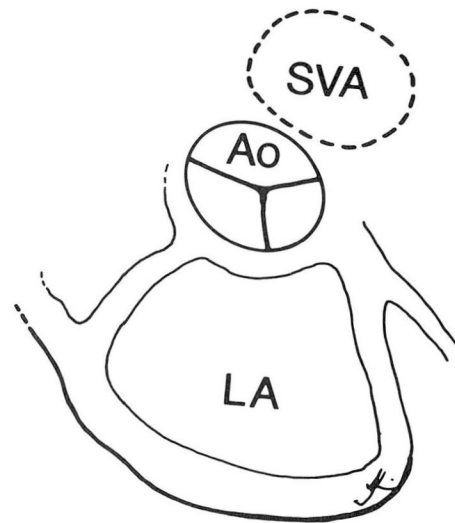
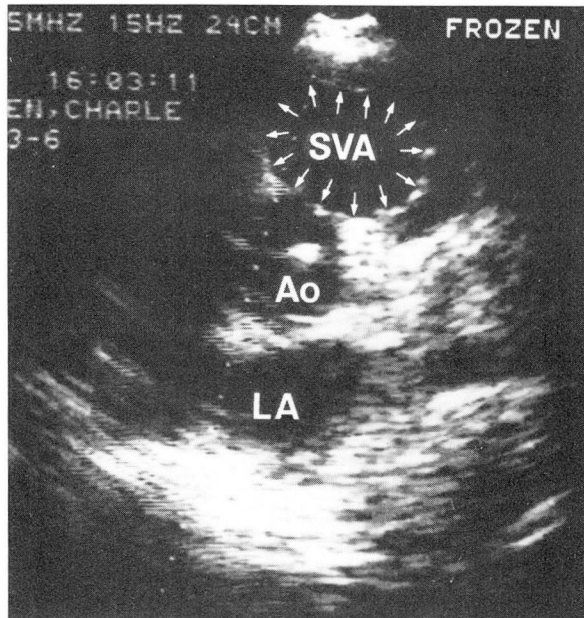


Fig. 1. Two-dimensional echocardiogram, short axis view at the level of the aortic valve. Note distinct round mass anterior to the aortic root (*arrows*). (SVA = sinus of Valsalva aneurysm; Ao = aorta; LA = left atrium.)

but systolic and diastolic thrills were present along the left sternal border. The first and second heart sounds were normal, and atrial and ventricular gallops were prominent. A Grade IV/VI systolic crescendo-decrescendo murmur and a Grade IV/VI diastolic decrescendo murmur were heard along the left sternal border. No peripheral edema or ascites was present.

The electrocardiogram revealed normal sinus rhythm, left atrial enlargement, first degree AV block, and complete left bundle branch block. The chest radiograph demonstrated left ventricular and left atrial enlargement. Two-dimensional echocardiography revealed a large mass anterior to the aortic root measuring 5×5 cm (*Fig. 1*) which

extended into the right ventricular outflow tract, compressing the interventricular septum (*Fig. 2*). Additional findings included diastolic flutter and early closure of the mitral valve, left ventricular hypertrophy, and moderate left ventricular dysfunction. Radionuclide left ventricular ejection fraction was 41%, and ^{99m}Tc first pass left/right shunt ratio (Qp/Qs) analysis was normal.

At cardiac catheterization, a 35mm Hg systolic gradient was recorded in the right ventricular outflow tract (*Table*). Calculated cardiac index was 2.1 l/min/m^2 . Aortography demonstrated a large sinus of Valsalva aneurysm involving the right coronary cusp associated with moderately severe aortic regurgitation (*Fig. 3*). The aneurysm extended into

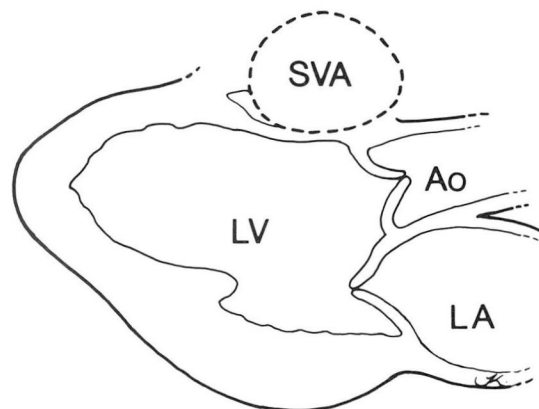
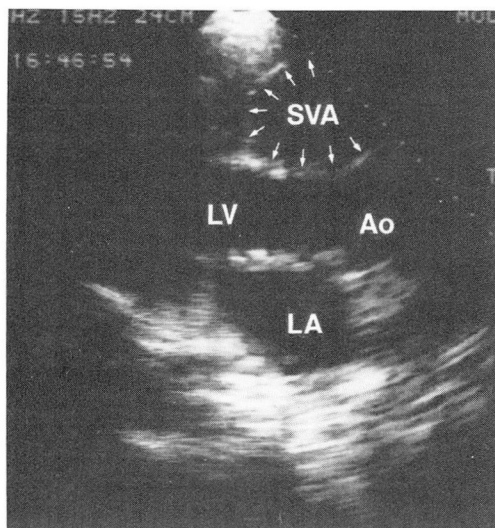


Fig. 2. Two-dimensional echocardiogram, long axis parasternal view. Arrows point to a large round mass in the right ventricular outflow tract above the aorta. (SVA = sinus of Valsalva aneurysm; LV = left ventricle; Ao = aorta; LA = left atrium.)

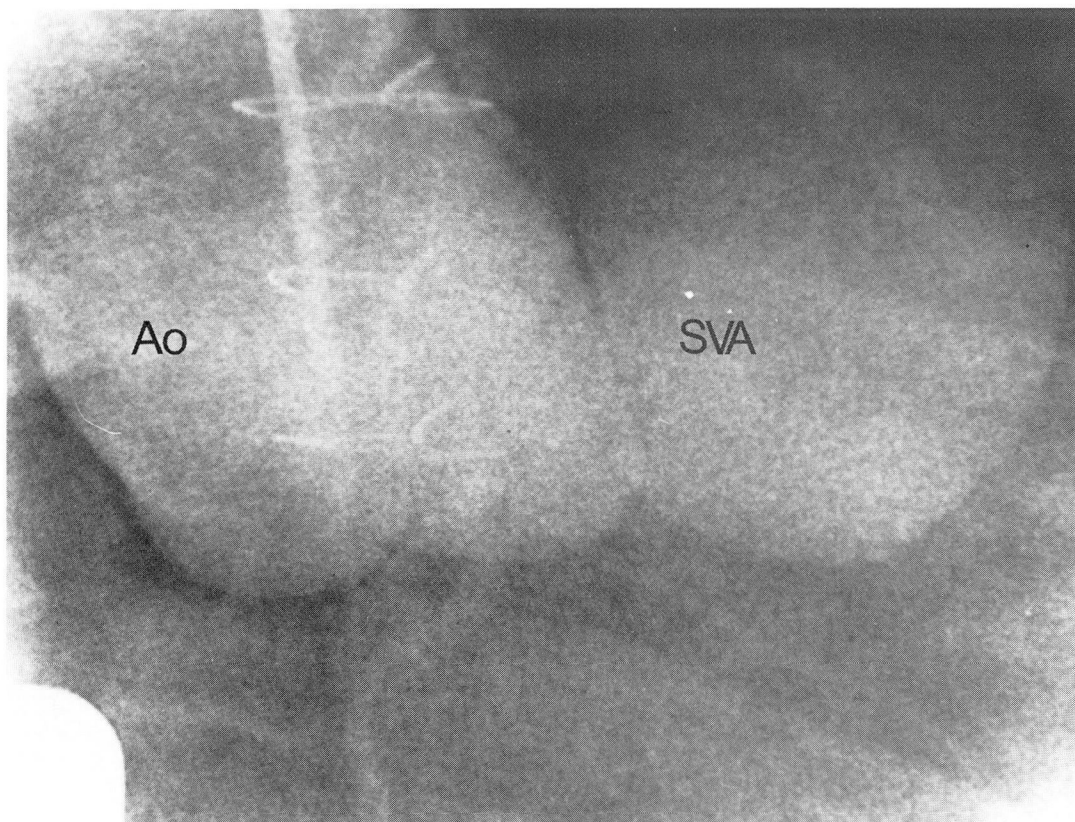


Fig. 3. Aortogram in right anterior oblique projection demonstrating a large sinus of Valsalva aneurysm. (*Ao* = aorta; *SVA* = sinus of Valsalva aneurysm.)

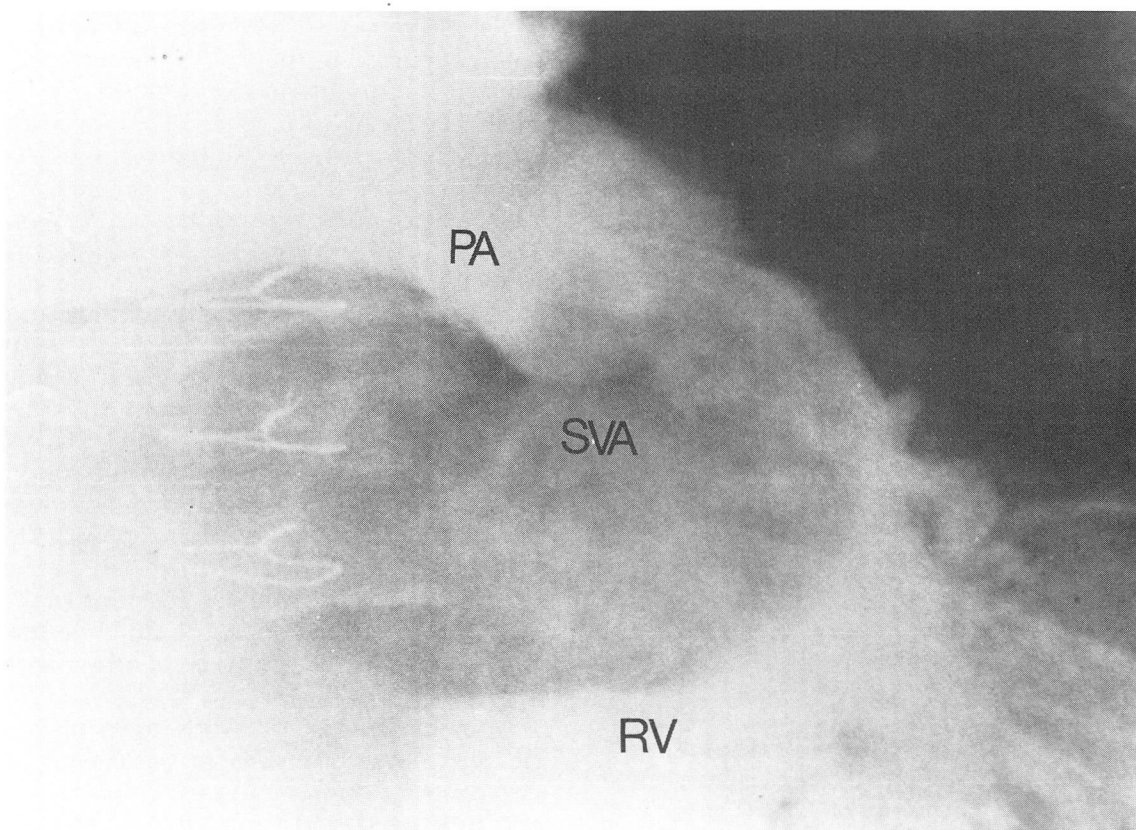


Fig. 4. Right ventriculogram in right anterior oblique projection demonstrating sinus of Valsalva aneurysm extending into the right ventricular outflow tract and obstructing pulmonary flow. (*PA* = pulmonary artery; *SVA* = sinus of Valsalva aneurysm; *RV* = right ventricle.)

the right ventricular outflow tract, resulting in marked obstruction below the pulmonic valve (*Fig. 4*). No intracardiac or extracardiac shunts were detectable. The left ventricle was dilated and contractility moderately impaired. The coronary arteries were normal.

At surgery, a 6 × 6-cm thin-walled sinus of Valsalva aneurysm protruded from the right coronary cusp into the right ventricular outflow tract between the pulmonic valve and the crista supraventricularis, which appeared to severely obstruct the right ventricular outflow tract. A small communication between the aneurysm and the left ventricle was found below the aortic valve. The aortic valve was attenuated and the non-coronary cusp redundant. The wall of the aneurysm was excised, and the defect was closed with pledgeted sutures. A #29 Björk-Shiley aortic valve prosthesis was implanted. Postoperative cardiac index increased from 2.1 to 3.8 l/min/m.² Repeat two-dimensional echocardiography showed no recurrence of the aneurysm at 18 months of follow-up (*Figs. 5 and 6*). The patient's functional status improved from NYHA Functional Class IV to Functional Class II two weeks after repair and remained Functional Class II at 18 months of follow-up.

Discussion

This case demonstrates two uncommon features of sinus of Valsalva aneurysms. The first, persistence or recurrence, is relatively unusual after successful surgical repair. Bonfils-Roberts

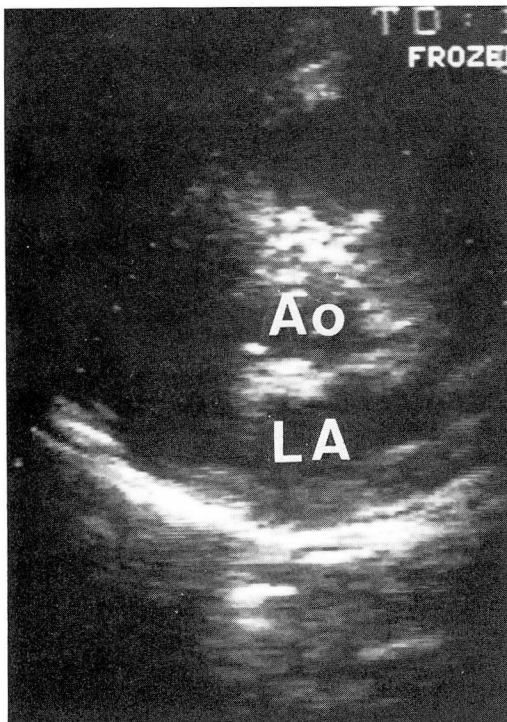


Fig. 5. Postoperative two-dimensional echocardiogram, short axis view at the level of the aortic valve. There is no evidence of a round mass anterior to the aortic root as seen in *Figure 1*. (Ao = aorta; LA = left atrium.)

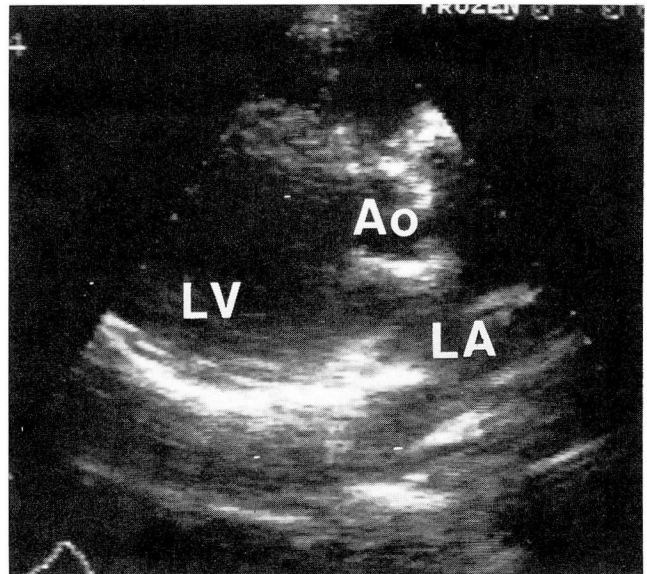


Fig. 6. Postoperative two-dimensional echocardiogram, long axis parasternal view shows no evidence of mass in the right ventricular outflow tract above the aorta. (Ao = aorta; LV = left ventricle; LA = left atrium.)

et al¹ described 21 patients, 3 of whom required reoperation because of wound dehiscence. Nowicki et al² reviewed 176 cases of aorto-cardiac fistulas reported in the English literature. In this group, 126 patients underwent surgery. Repair was successful in 86%, with 13% mortality at the time of operation. Fewer than 1% of cases recurred.

Associated right ventricular outflow tract obstruction is an extremely rare manifestation of sinus of Valsalva aneurysms.³⁻⁷ Kerber et al⁸ described one case of sinus of Valsalva aneurysm with right ventricular outflow tract obstruction demonstrated by venous radioisotope angiography and cardiac catheterization. Bulkley et al⁹ described 3 cases of right ventricular outflow tract obstruction secondary to sinus of Valsalva aneurysms at necropsy in patients who presented with obscure right-sided heart disease. Although Matsumoto et al¹⁰ described the echocardiographic findings of ruptured sinus of Valsalva aneurysm, echocardiographic documentation of right ventricular outflow tract obstruction has not been reported.

In our patient, echocardiography played a key role in the diagnosis, since physical signs of right-sided obstruction were absent. Echocardiography accurately predicted the presence, location, and size of the aneurysm, including obstruction of the right ventricular outflow tract. At catheteriza-

tion, a right ventricular outflow tract gradient was present. The combination of aortic regurgitation, moderate left ventricular dysfunction, and right ventricular outflow tract obstruction accounted for the patient's symptoms. Echocardiographic findings were confirmed by the catheterization studies, and both provided accurate information preoperatively. Two-dimensional echocardiography also appears to be a useful method for judging the success or failure of surgery, as shown in our patient with repeat two-dimensional echocardiography at 18 months of follow-up displaying no evidence of recurrence.

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