

## Simultaneous Repair of a Sinus of Valsalva Aneurysm and a Bicuspid Aortic Valve

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### ABSTRACT

Sinus of Valsalva aneurysms (SOVA) are rare cardiac abnormalities that are most commonly congenital in origin and frequently associated with aortic valve pathology. Unruptured SOVA are more frequently identified currently, owing to the increased use and accuracy of diagnostic investigations. Early surgical intervention is recommended to prevent complications. We describe a case of a young patient with an enlarging right SOVA and a regurgitant bicuspid aortic valve who subsequently underwent simultaneous patch repair of the SOVA and primary aortic valve repair.

### INTRODUCTION

Sinus of Valsalva aneurysms (SOVA) are rare cardiac abnormalities that are caused by separations of the aortic media from the aortic annulus [Ring 2000]. An unruptured SOVA is usually detected incidentally on investigation. They may remain clinically silent for many years and are frequently associated with other cardiac anomalies. Early surgical intervention is recommended to prevent complications [Vural 2001; Wang 2007], and various methods for repair have been described. We present a case of simultaneous repair of a SOVA and a regurgitant bicuspid aortic valve.

A right SOVA was detected incidentally in a 44-year-old man who presented with chronic hypertension during the workup. His medical history was significant for Conn syndrome, asthma, and anxiety disorder. He had no personal or family history of connective tissue disease. A transesophageal echocardiography examination (Figure 1) demonstrated a type I bicuspid aortic valve with moderate aortic insufficiency and an unruptured SOVA with a trans-sinus diameter of 5.8 cm across the right coronary sinus, an annular diameter of 2.4 cm, a sinotubular diameter of 4.0 cm, and an ascending aorta diameter of 3.5 cm. The patient was asymptomatic. Repeat

imaging studies showed that the aneurysm size was increasing over time and was impinging on but not obstructing the right ventricular outflow tract. Considering the size of the SOVA and the increase in size over time, surgery was planned. A computed tomography coronary angiogram showed normal coronary arteries and further delineated the SOVA in a 3-dimensional reconstruction (Figure 2). The preoperative plan was to replace the affected sinus with Dacron patch via a partial Yacoub remodeling procedure, with reimplantation of the right coronary button and primary repair of the regurgitant bicuspid valve.

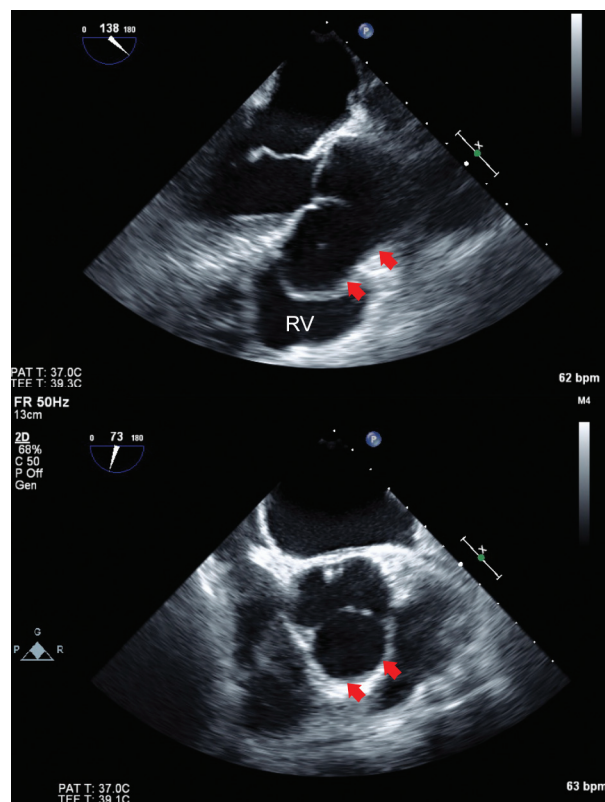


Figure 1. Transesophageal echocardiogram in the long and short axes demonstrating a large right sinus of Valsalva aneurysm (arrows) abutting the right atrium and right ventricle.

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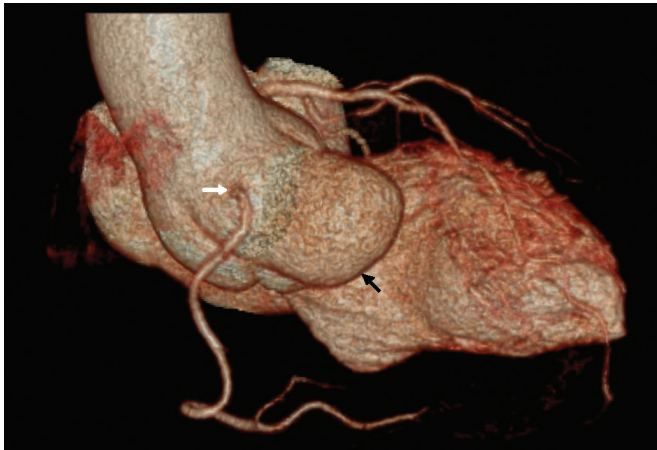


Figure 2. Three-dimensional computed tomography reconstruction demonstrating a well-demarcated large right sinus of Valsalva aneurysm (black arrow) separate from the right coronary ostia (white arrow).

A median sternotomy was performed. The patient was placed on cardiopulmonary bypass, and the heart was arrested with antegrade cold blood and retrograde cardioplegia. A transverse aortotomy was performed. A well-demarcated defect (2.5 × 1.3 cm) was observed in the right coronary sinus just below the opening of the right coronary artery and above the annulus, with the rest of the sinus wall appearing of normal thickness and texture. A bovine pericardial patch was used to cover the entire area of the defect and was secured with a 4-0 Prolene continuous suture (Figure 3). The aortic valve was a type 1 bicuspid valve with a conjoined cusp formed by the right and left coronary sinus. The raphe was excised. The prolapsed conjoined cusps were plicated, and subcommisural annuloplasty was undertaken. A transesophageal echocardiogram taken at the time of the repair demonstrated a cusp coaptation length of

8 mm above the annulus with trivial insufficiency, and no flow through the SOVA was observed.

The patient experienced an uneventful recovery and was discharged from the hospital. An echocardiogram at 6 weeks postoperatively demonstrated complete exclusion of the aneurysm and a type 1 repair of the aortic valve with trivial insufficiency and satisfactory transvalvular gradients.

#### COMMENT

SOVA were first described by Thurman in 1840 and are defined as a dilatation or enlargement of one or more of the aortic sinuses between the aortic valve annulus and the sinotubular junction. Such defects may be congenital or degenerative [Ring 2000]. These lesions are rare, with an incidence of 0.09% in autopsy series [Takach 1999]. Most SOVA are caused by a congenital deficiency in elastic laminae in the wall of the affected sinus, which can produce separation of the media of the sinus adjacent to the aortic valve annulus, creating the potential to rupture. They are most commonly associated with the right coronary sinus (70%-90% of cases). Other locations are the noncoronary sinus (10%-20%) and, rarely, the left coronary sinus (<5%). They also are frequently associated with other abnormalities, including ventricular septal defects (30%-50%) and bicuspid aortic valves (10%). Aortic insufficiency is present in 30% to 40% of SOVA patients and is most commonly due to progressive annular dilatation. The aortic valve is replaced in 50%-80% of patients with SOVA [Feldman 2006]. Our patient had a right SOVA, which we believe was congenital in origin because of the well-demarcated defect with normal-looking surrounding sinus walls. The regurgitant valve was likely due to prolapsing conjoined cusps rather than to annular dilation. The number of patients undergoing surgery for SOVA has been increasing recently because of the increased use and accuracy of diagnostic

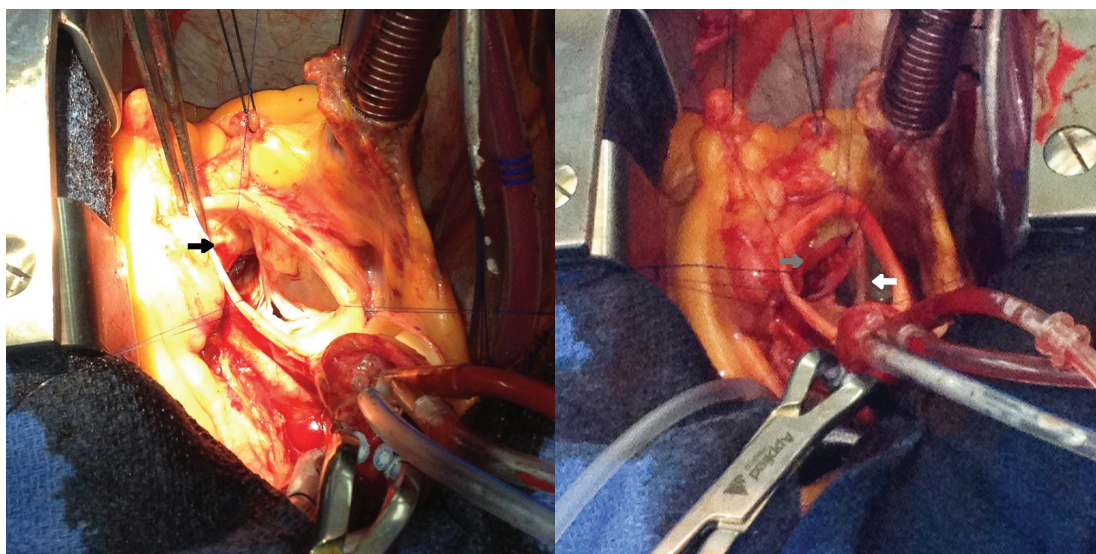


Figure 3. Intraoperative photograph demonstrating the defect in the right coronary sinus (left) inferior to the coronary ostia (black arrow). The image on the right demonstrates the pericardial patch repair over the defect and indicates the conjoined cusp (gray arrow) and the nonconjoined (white arrow) cusp.

investigations, including computed tomography, magnetic resonance imaging, and echocardiography.

The optimal method for repairing early SOVA is not clear. For isolated defects, pericardial patch exclusion of a SOVA has a greater freedom from reoperation than primary closure of the defect. Partial or complete Yacoub sinus remodeling is a common valve-sparing procedure for restoring the normal sinus of Valsalva anatomy. In our case, we initially planned for remodeling of the affected sinus with coronary reimplantation; however, the surrounding aortic tissue had a normal texture and thickness and was separate from the right coronary ostium, which allowed for complete exclusion of the defect with a pericardial patch. The surgical management of congenital SOVA differs from that for degenerative cases, because the elastic laminae defect is limited to the sinus involved, rather than involving all of the sinuses and the aortic root [Nakagiri 2012].

Surgery for resection and repair of a SOVA has a low mortality rate and yields long-term freedom from symptoms. Multiple studies have advocated early surgical and aggressive intervention to prevent lesion enlargement or associated complications, such as rupture, myocardial ischemia, endocarditis, conduction abnormalities, and fistulae formation, which may necessitate more extensive repairs [Takach 1999; Vural 2001]. In our case with a SOVA and a bicuspid aortic valve, concurrent repair of the aneurysm and valve replacement is the conventional strategy; however, anticoagulation for mechanical valves and structural valve deterioration for bioprosthetic valves is troublesome and is associated with a prosthetic valve complication rate of 5% per patient per year, which is particularly concerning for younger patients [Minakata 2004]. Aortic valve repair in selected cases has a success rate comparable to that of valve replacement, with a similar freedom

from operation demonstrated in large prospective studies [Minakata 2004; Aicher 2010]. In conclusion, primary repair of the aortic valve is suitable in these cases and allows for early treatment of the SOVA without exposing the patients to the additional risk associated with prosthetic valves.

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