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Infective Endocarditis with Periannular Abscess and Sinus of Valsalva Aneurysm Rupture

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Abstract

The present study reports a case of a 64-year-old man was admitted for sudden collapse. On auscultation, new grade 4/6 continuous murmur were detected and was best heard along the right sternal border. Blood culture yielded *Staphylococcus haemolyticus* and *Escherichia coli*. Despite appropriate antibiotic treatment, the patient's condition deteriorated and he developed multiple organ failure. Transesophageal echocardiography revealed echo-free spaces with periannular abscess, and two perforations at the noncoronary sinus of Valsalva aneurysms. This case was about an unusual case of prosthetic aortic valve infectious endocarditis with periannular abscess formation and noncoronary sinus of Valsalva aneurysms rupturing into the right atrium and right ventricle.

Keywords: Infective endocarditis; Sinus of valsalva-right atrial fistulas; Transesophageal echocardiography

Introduction

Sinus of Valsalva aneurysms (SVAs) are rare cardiac anomalies that are mostly congenital. Acquired SVAs causing aortic-right atrial fistulas related to infective endocarditis (IE) are even rarer. We report an unusual case of prosthetic aortic valve IE with periannular abscess formation and noncoronary SVA rupturing into the right atrium (RA) and right ventricle (RV). Transesophageal echocardiography (TEE) provided accurate diagnosis. The patient received an aortic valve replacement with a successful surgical outcome and long term clinical outcome.

Case Report

A 64-year-old man was admitted to our emergency department due to sudden collapse. He had a history of *Enterococcus faecalis*-induced aortic valve IE and had undergone aortic valve replacement with Toronto SPV valve Toronto stentless porcine valve bioprosthesis (St. Jude, St. Paul, MN) six years ago. However, half year before admission to our hospital, he developed infective prosthetic aortic valve endocarditis, necessitating another aortic valve replacement with Hancock-II valve (Medtronic, Minneapolis, MN) (25 mm).

Physical examination revealed a blood pressure of 80/43 mmHg, heart rate of 121 beats per minute, respiratory rate of 28 breaths per minute, and body temperature of 36.8°C. Jugular venous engorgement was evident. On auscultation, S3 and S4 gallop and grade 4/6 continuous murmur was detected; the latter was best heard along the right sternal border. Electrocardiogram revealed atrial fibrillation with premature ventricular beats and right bundle branch block. Chest radiography showed minimal infiltration in the right lower lung field. Laboratory findings revealed white blood cell count of 16,700/μL and hemoglobin of 10.8 g/dl. Blood culture yielded *Staphylococcus haemolyticus and Escherichia coli. Staphylococcus haemolyticus and Escherichia coli.* Despite appropriate antibiotic treatment, one week after admission, the patient's condition deteriorated and he developed multiple organ failure.

Echocardiography Findings

Transthoracic echocardiography (TTE) showed left ventricular ejection fraction of 0.54, with mild aortic and tricuspid insufficiency. Aorta, RA, RV, and left atrium were slightly dilated. TEE revealed dilated aorta with echo-free spaces consistent with periannular abscess and aneurysmal dilation of noncoronary SVA. TEE also revealed the presence of two perforations at the noncoronary SVA: one at the dome (1) and another at the anterior end (2) of the SVA pouch (Figure 1A and 1B). There was a third perforation (3) from the aorta to right ventricular inflow tract (RVIT) (Figure 1C). The color Doppler illustrates continuous high-velocity flow jet shunting from the aorta into the RA during systole and directly into the RV during diastole. Moderate aortic insufficiency and mild mitral insufficiency were also noted. The TEE findings suggested a diagnosis of recurrent prosthetic aortic valve IE with periannular abscess and ruptured noncoronary SVA and a defect in the aortic-RVIT.

Operative Findings

The patient underwent surgical intervention. Open heart surgery revealed that the aortic prosthesis was severely damaged. Two perforations of the noncoronary SVA were identified. One was at the doom of the SVA pouch and another one was at anterior end of the pouch. Third perforation was noted at the necrotic interventricular membranous septum. These three defects in the noncoronary SVA communicated with the RA (1-2) and the RV (3). After debridement of the necrotic tissue, we performed aortic root reconstruction with Bentall operation [1] (Freestyle xenograft, 21 mm), reimplantation of the left main and right coronary arteries, and repair of the atrioventricular septal defect with equine pericardium.

After operation, the patient was discharged after a full course of antibiotic treatment and returned his usual life. Follow-up TTE showed trivial aortic regurgitation (Figure 2A) and maximal aortic valve pressure gradient 16.8 mmHg (Figure 2B) after xenograft aortic

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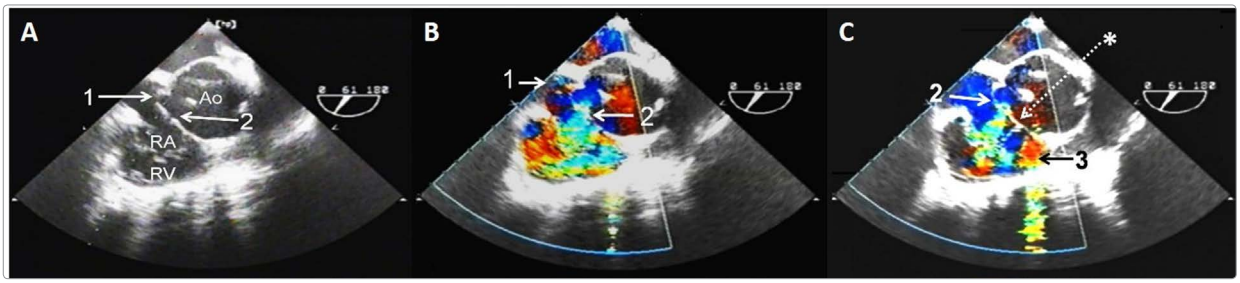

Figure 1: (A) Transesophageal echocardiography (TEE) (Mid-esophageal aortic valve short - axis view) depicting the aneurysmal change in the noncoronary cuspid (NCC) - sinus of Valsalva protruding into the right atrium (RA). Two defects are shown—one at the NCC - sinus of Valsalva aneurysm (SVA) dome (white arrow 1) and another at the NCC SVA anterior end (white arrow 2). (B) TEE with color Doppler illustrating the minute turbulent jet from the aorta to RA at the dome of the NCC - SVA (white arrow 1), and another jet at the anterior side of the NCC - SVA from the aorta to the RA and right ventricle (RV) (white arrow 2). (C) TEE with color Doppler showing another small jet (black arrow 3) from the aortic root to the RV. Tricuspid valve hinge point is marked (white arrow *).

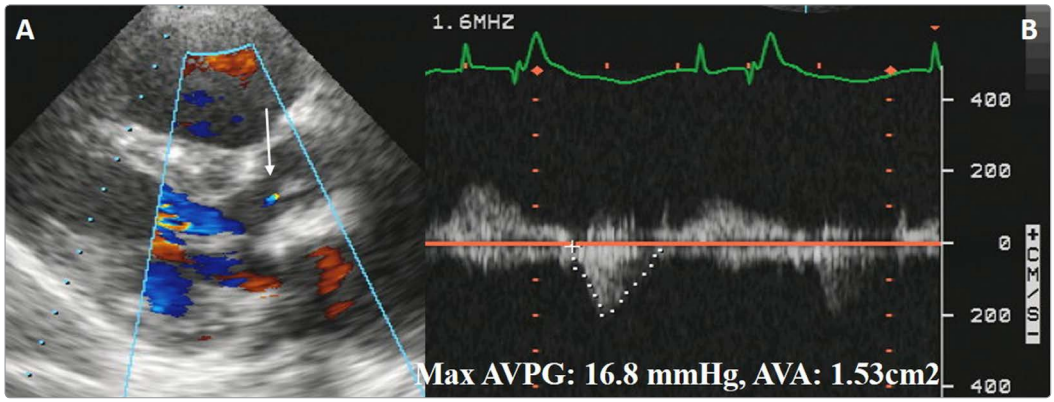

Figure 2: (A) Transthoracic echocardiography (TTE): trivial aortic regurgitation (white arrow). (B) Continuous waveform of aortic valve: maximal aortic valve pressure gradient (AVPG) was 16.8 mmHg and aortic valve area (AVA) was 1.53 cm^2.

valve replacement. Aortic valve area was 1.53 cm^2. He still had regular outpatient department follow-up two years later.

Discussion

The etiology of sinus of Valsalva-right atrial fistulas, abnormal connections between the aorta and the RA, is multifarious. These fistulas can be congenital, caused by dissecting aneurysms and aortic dissections, operations involving the aorta or aortic valve, and infective endocarditis [2]. Aortic-RA fistula resulting from IE is a very rare disorder. According to the review by Anguera et al. from the Aorto-cavitary Fistula in Endocarditis Multicenter Study, of the 4,681 IE cases, only 76 (1.6%) developed aortocavitary fistula [3]. Even after receiving aggressive surgical treatment, the in-hospital mortality rate among such cases has been reported to be as high as 42% [3].

Our case was recurrent infective aortic valve prosthetic endocarditis. Because the paravalvular structure was severely damaged in this case, an extensive repair after adequate debridement of necrotic tissue was required. Aortic root reconstruction with Bentall operation besides aortic valve replacement was performed. To our knowledge, there are only seven reported cases of SVA with suspected jet flows into both the chambers [4]. Most of those cases were congenital. Andras Vereckei et al. [4] reported a case of IE resulting from the rupture of SVA, where in the rupture site communicated with both the right atrium and right ventricle. The rupture was thought to be caused by large RA vegetation adjacent to the SVA, which eroded its wall. Similarly, our patient had periannular abscess adjacent to the noncoronary cuspid, which likewise accounted for the local tissue destruction.

Diagnosing sinus of Valsalva-right atrial fistulas can be challenging, and the clinical presentation will depend on the size of the shunt. Patients with a small fisula may be completely asymptomatic with an associated murmur only [5], but the clinical presentation may range from refractory HF [5] to a chest pain syndrome due to acute coronary syndrome and aortic dissection [6]. Cardiac auscultation may cause reveal a continuous murmur, a thrill or both, and can be the key to further pursue this diagnosis with appropriate imaging modalities. A high index of suspicion is required, especially in the background of recent surgery or previous IE. TEE is superior to TTE for better delineation of function and morphology when intra-cardiac problem, such as ACF, are suspected. TEE could provide an advance understanding of the detailed anatomy of the ruptured SVA aneurysms and has a better sensitivity to detect the fistulous tracts compared to TTE. In our case, TTE failed to demonstrate the aorta-intracavitary fistula tract and may misinterpret the aortic-right atrium shunt as tricuspid regurgitation. This error can be avoided by carefully performing pulse-wave Doppler mapping of the particular systolic jet. On the other hand, TEE allowed detailed analysis of the structural defects related to the infective prosthetic valve endocarditis, which resulted in the deterioration of our patient's condition. Surgery could be performed with a favorable outcome in our case because TEE allowed the early and accurate detection of the perforations of the noncoronary SVA.

We report an unusual case of prosthetic aortic valve IE with periannular abscess formation and noncoronary SVA rupturing into the RA and RV. The patient received an aortic valve replacement with a successful surgical outcome and long term clinical outcome.

Conclusion

A unique case of recurrent infective prosthetic endocarditis with SVA ruptured into the right atrium and right ventricle. In such a clinically complex case of repeat aortic valve surgery, the surgical strategy was performed by careful preoperative evaluation of the prosthetic valvular and perivalvular structures by TEE.

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