

Surgical Treatment of Pseudoaneurysm of the Sinus of Valsalva after Aortic Valve Replacement for Active Infective Endocarditis

Yuji Katayama, MD, Naoki Minato, MD, Masayuki Sakaguchi, MD,
Atsushi Nakashima, MD, and Kazuhiro Hisajima, MD

Pseudoaneurysm is an uncommon and serious complication of infective endocarditis (IE). It is often fatal because of its rapid progress, high rates of rupture and recurrence, and worsening effects on the systemic condition. We report the rare case of a patient who developed a pseudoaneurysm of the sinus of Valsalva two months after emergency aortic valve replacement for active IE. At the previous operation, we had directly closed a small fistulous hole in the non-coronary sinus of Valsalva using two mattress sutures with autologous pericardial pledgets, because the tissue surrounding the hole did not appear to be infected on visual inspection. A pseudoaneurysm developed from this portion due to detachment of sutures. If the fistula had been completely resected during the first surgery instead of performing a simple closure, the pseudoaneurysm of the sinus of Valsalva would not have formed. However, the primary aim of the first emergency surgery was to spare the life of a critically ill patient. In the second surgery, the pseudoaneurysm was completely resected with the aortic wall — including the non-coronary sinus of Valsalva and the communicating hole. Then, patch plasty of the non-Valsalva sinus was successfully performed. (Ann Thorac Cardiovasc Surg 2005; 11: 419–23)

Key words: infective endocarditis, pseudoaneurysm, sinus of Valsalva, fistula

Introduction

Some complications, such as recurrent infection, prosthetic valve endocarditis, and prosthetic dehiscence, may occur after surgical intervention for infective endocarditis (IE). However, a pseudoaneurysm after heart surgery for IE is rare. Nevertheless, it is a fatal disease because it is often complicated by sepsis and high rates of rupture and recurrence. We report the successful surgical treatment of a pseudoaneurysm of the sinus of Valsalva after surgical intervention for aortic valve endocarditis.

From Department of Thoracic and Cardiovascular Surgery, Fukuoka Tokusyuikai Hospital, Fukuoka, Japan

Received February 22, 2005; accepted for publication April 12, 2005.

Address reprint requests to Yuji Katayama, MD: Department of Thoracic and Cardiovascular Surgery, Fukuoka Tokusyuikai Hospital, 4-5 Sukukita, Kasuga, Fukuoka 816-0864, Japan.

Case

The patient, a 55-year-old woman, was admitted to our institution with complaints of a high fever and general fatigue. Echocardiography demonstrated moderate aortic regurgitation and a small vegetation on the aortic valve. Bacterial culture of the blood revealed *streptococcus mitis*. She was diagnosed with aortic regurgitation due to IE. Despite administering antibiotics, her fever continued and heart failure progressed. Chest X-ray showed pulmonary edema with bilateral pleural effusion. Echocardiography disclosed severe aortic regurgitation and growth of the vegetation. Seven days after admission, she fell into a state of septic shock and was referred to us for surgery. We performed an emergency operation, through a median sternotomy, for uncontrollable infection with septic shock and heart failure due to active aortic valve endocarditis. There was considerable serous pericardial effusion (500 ml). The surfaces of the heart

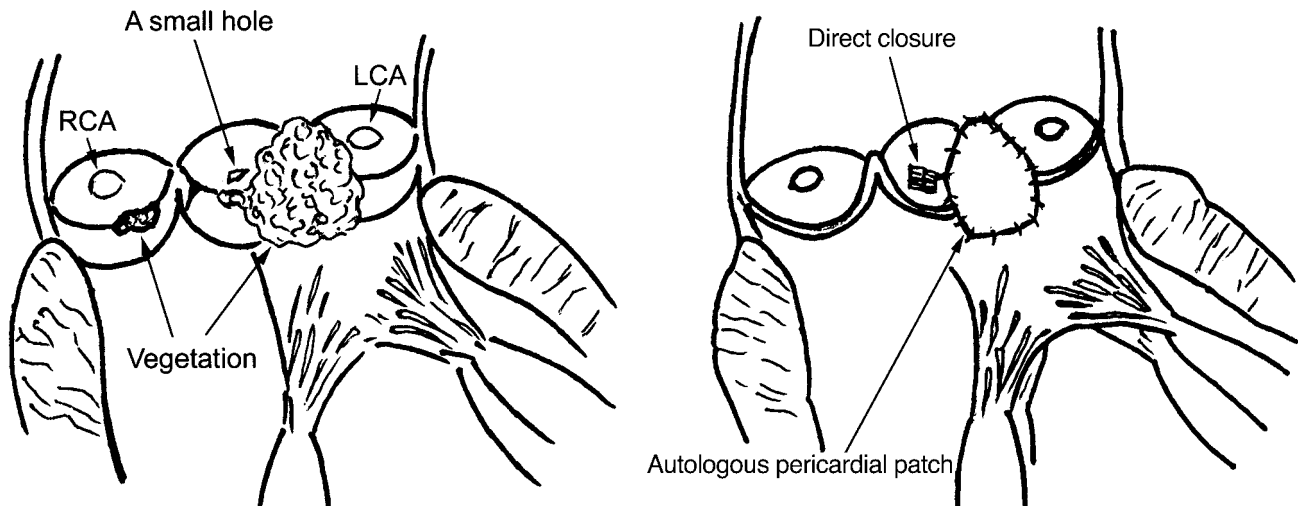


Fig. 1.

A: There was a large vegetation on the non-coronary cusp and the infection was extended to the mitral-aortic intervalvular fibrosa. A small hole was found at the non-coronary sinus.

LCA; left coronary artery, RCA; right coronary artery.

B: Reconstruction of the aortic valve annulus was performed with an autologous pericardial patch. A small hole was directly closed.

A | B

and the aorta were entirely inflamed. Cardiopulmonary bypass was established with right atrial drainage and right femoral arterial return. Aortic valve leaflets were excised together with the vegetation lying on the non-coronary cusp (NCC), the non-left commissure, and the left coronary cusp (LCC). The acute inflammation extended from the non-left commissure to the mitral-aortic intervalvular fibrosa. Also, there was a small hole at the non-coronary sinus (Fig. 1A). After debridement of all the infected tissue on the non-left commissure, part of the non-coronary and left coronary annulus, and the mitral-aortic intervalvular fibrosa, reconstruction of the aortic valve annulus was performed with a properly tailored patch of autologous pericardium, secured to the healthy tissue around the defect by continuous 5-0 polypropylene suture. A small hole at the non-coronary sinus was directly closed by two 5-0 polypropylene mattress sutures with autologous pericardial pledgets, since the tissue around the hole was not inflamed (Fig. 1B). Then, an aortic valve prosthesis was secured to the reconstructed aortic annulus. An intravenous drip of imipenem cilastatin sodium (IPM) was administered for five weeks following surgery. Body temperature fell to normal on the 6th postoperative day; white blood cell (WBC) count and C-reactive protein (CRP) were normal by four weeks after surgery.

Fifty-four days after the first surgery, the patient again

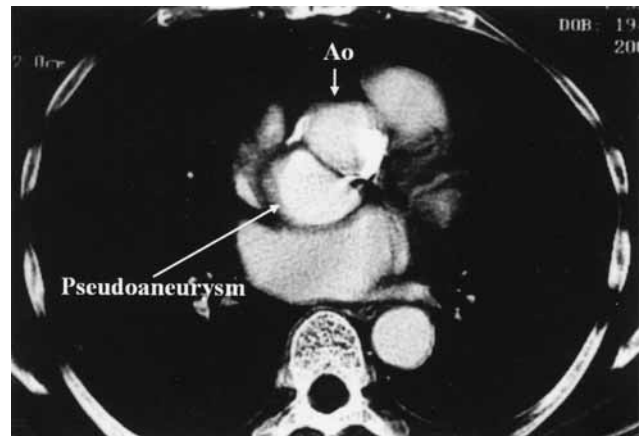


Fig. 2.

A chest CT scan on the 54th post-operative day showed a 35×30 mm pseudoaneurysm in the right posterior aortic root.

Ao, ascending aorta.

ran a fever with increased WBC and CRP, despite taking oral antibiotics. A chest CT scan showed a 35×30 mm pseudoaneurysm in the right posterior aortic root (Fig. 2). Aortography revealed a saccular pseudoaneurysm communicating with the non-coronary sinus (Fig. 3A). We restarted intravenous IPM for the recurrence of infection. The patient underwent a re-operation for

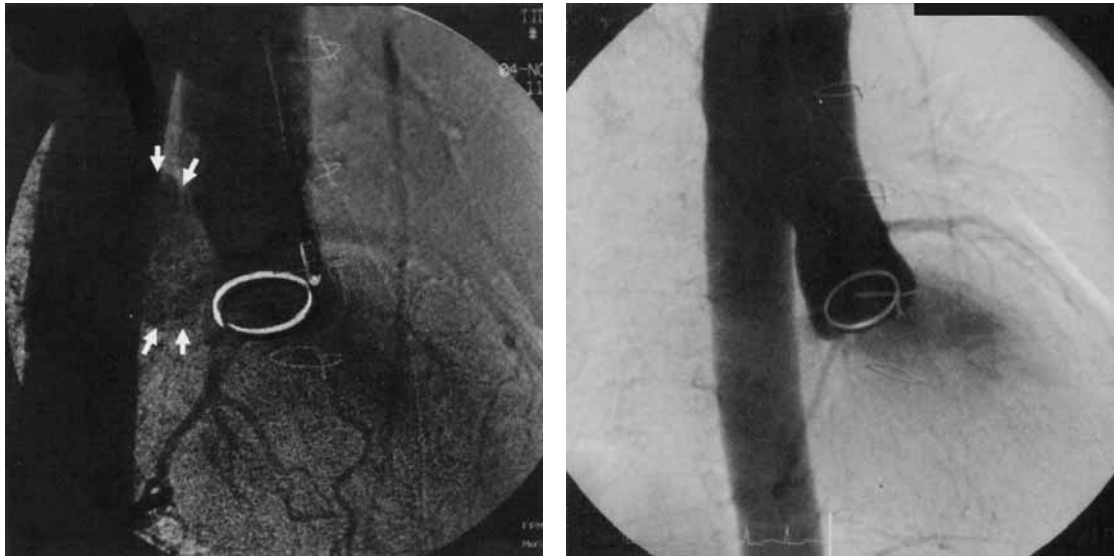


Fig. 3.
A: Aortography two months after the previous surgery revealed a saccular pseudoaneurysm (arrows) communicating with the non-coronary sinus.
B: Aortography after the second surgery showed disappearance of the pseudoaneurysm and good shape of the sinus of Valsalva.

A | B

pseudoaneurysm of a sinus of Valsalva eighty-three days after the first surgery. A median re-sternotomy was performed safely after the left femoral artery was exposed. Severe pericardial adhesion was freed. After cannulation of the left femoral artery and the right atrium, cardiopulmonary bypass was initiated. The ascending aorta was clamped and transected 3 cm above the ostium of the right coronary artery. A 4×4 cm pseudoaneurysm of the sinus of Valsalva with mural thrombus lay behind the proximal ascending aorta and the superior vena cava. A hole communicating with the pseudoaneurysm was found in the non-coronary sinus of Valsalva, 5 mm above the sewing ring of the aortic prosthesis and 1 cm from the ostium of the left coronary artery. No perivalvular detachment was found upon direct visual inspection. The pseudoaneurysm was completely excised together with the non-coronary sinus wall, including the communicating hole. A tongue-shaped Hemashield woven-velour fabric patch was anastomosed to the edge of the non-coronary sinus of Valsalva using 4-0 polypropylene continuous sutures with autologous pericardial strips for reinforcement. The ascending aorta was re-approximated by 4-0 polypropylene continuous suture with felt strips placed outside the lumen (Fig. 4). Cardiopulmonary bypass was easily discontinued. No bacteria were detected in the tissue of the pseudoaneurysm upon culturing. Ad-

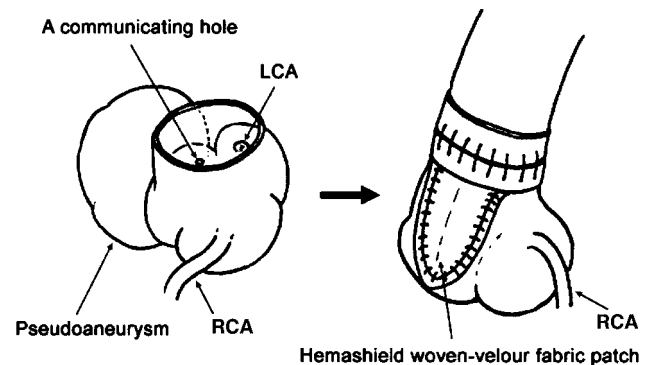


Fig. 4. The schema of the second operation.
 A pseudoaneurysm of the sinus of Valsalva existed behind the proximal ascending aorta. A communicating hole was found at the non-coronary sinus of Valsalva.
 The non-coronary sinus of Valsalva was reconstructed with a tongue-shaped Hemashield fabric patch.
 LCA; left coronary artery, RCA; right coronary artery.

ministration of IPM was continued for four weeks following surgery. The postoperative course was uneventful. Aortography showed disappearance of the pseudoaneurysm and good shape of the sinus of Valsalva (Fig. 3B). The patient was discharged from hospital one hundred twenty-seven days after admission.

Discussion

Although IE is often cured with antibiotics, early surgical intervention is necessary in some patients with rapidly increasing congestive heart failure, uncontrolled sepsis, or major embolization.¹⁻³⁾ The operative mortality for active IE has been reported as 4.8% to 11.5%.^{1-3,9)} Various complications of infected endocarditis occur during the active phase of infection; periannular extension of cardiac valvular infection is especially dangerous. The incidence of annular abscess is higher in aortic valve endocarditis than in mitral infection.⁴⁾ Aortic abscesses and mycotic aneurysms involving the sinus of Valsalva may rupture internally with subsequent development of aortocavitary or aortopericardial fistulas. Fistulization of perivalvular abscesses in IE has been found in 6% to 9% of cases.^{5,6)} Anguera et al. reported that 2% of patients with IE and 3.5% of patients with left-sided endocarditis developed fistulas;⁷⁾ however, those authors supposed the incidence of all cases of IE to be lower than they reported because their hospital was a tertiary referral center for complicated IE.

Patients with infection limited to the leaflets of the native valve are simply treated by valve replacement. On the other hand, if the infection extends into or beyond the annulus, aggressive debridement of the periannular structures is necessary. And, the destroyed structure should be reconstructed with suitable material — such as autologous pericardial patch,^{2-4,8,10)} Dacron patch,⁹⁾ or homograft.^{4,11)} David and associates reported good results for reconstruction of the left ventricular inflow and/or outflow with autologous pericardial patches, for active IE.^{2,8,10)}

Whatever materials are used, the recurrence of infection is a serious complication after surgery for active IE, with an incidence of 1.6% to 7.0%.^{2,3,9)} Yet, pseudoaneurysm formation following surgery for IE is rare^{12,13)} — especially pseudoaneurysm of the sinus of Valsalva.

Our case was one of aortic valve endocarditis complicated with destruction of the non-coronary and left coronary annulus extending into the mitral-aortic intervalvular fibrosa. We completely resected all the infected tissue and reconstructed the aortic annulus and mitral-aortic intervalvular fibrosa using a properly tailored patch of autologous pericardium. We directly closed the small hole in the non-coronary sinus of Valsalva because its surrounding tissue did not appear to be infected. However, the hole might have been a fistu-

lous opening of the nearby periannular lesion, so that the infection recurred with the pseudoaneurysm formation from this area. If the small hole had been completely resected at this time — instead of performing a simple closure — the pseudoaneurysm of the sinus of Valsalva would not have formed. The defect could have been reconstructed using a larger pericardial patch or, more aggressively, by aortic root replacement using a valved conduit. (Homograft replacement in an emergency situation is currently not practical in Japan.) However, we chose a less invasive simple closure because the primary aim of the first emergency surgery was to spare the life of a critically ill patient with progressive heart failure and septic shock.

In the second surgery, the aortic wall was sufficiently strong and without inflammation, so we were able to successfully perform patch plasty of the resected non-coronary sinus of Valsalva.

Conclusion

We have reported a rare case of pseudoaneurysm of the sinus of Valsalva following aortic valve replacement for active IE, and described the surgical technique employed.

References

1. Cukingnan RA Jr, Carey JS, Wittig JH, Cimochowski GE. Early valve replacement in active infective endocarditis. Results and late survival. *J Thorac Cardiovasc Surg* 1983; **85**: 163–73.
2. David TE, Bos J, Christakis GT, Brofman PR, Wong D, Feindel CM. Heart valve operations in patients with active infective endocarditis. *Ann Thorac Surg* 1990; **49**: 701–13.
3. Jault F, Gandjbakhch I, Rama A, et al. Active native valve endocarditis: determinants of operative death and late mortality. *Ann Thorac Surg* 1997; **63**: 1737–41.
4. Baumgartner FJ, Omari BO, Robertson JM, et al. Annular abscesses in surgical endocarditis: anatomic, clinical, and operative features. *Ann Thorac Surg* 2000; **70**: 442–7.
5. Choussat R, Thomas D, Isnard R, et al. Perivalvular abscesses associated with endocarditis: clinical features and prognostic factors of overall survival in a series of 233 cases. Perivalvular Abscesses French Multicentre Study. *Eur Heart J* 1999; **20**: 232–41.
6. San Roman JA, Vilacosta I, Sarria C, et al. Clinical course, microbiologic profile, and diagnosis of periannular complications in prosthetic valve endocarditis. *Am J Cardiol* 1999; **83**: 1075–9.
7. Anguera I, Quaglio G, Miro JM, et al. Aortocardiac fistulas complicating infective endocarditis. *Am J*

- Cardiol* 2001; **87**: 652–4.
8. David TE, Komeda M, Brofman PR. Surgical treatment of aortic root abscess. *Circulation* 1989; **80** (3 pt 1): I269–74.
 9. Bauernschmitt R, Jakob HG, Vahl CF, Lange R, Hagl S. Operation for infective endocarditis: results after implantation of mechanical valves. *Ann Thorac Surg* 1998; **65**: 359–64.
 10. David TE, Feindel CM, Ropchan GV. Reconstruction of the left ventricle with autologous pericardium. *J Thorac Cardiovasc Surg* 1987; **94**: 710–4.
 11. Kirklin JK, Kirklin JW, Pacifico AD. Aortic valve endocarditis with aortic root abscess cavity: surgical treatment with aortic valve homograft. *Ann Thorac Surg* 1988; **45**: 674–7.
 12. Agirbasli M, Fadel BM. Pseudoaneurysm of the Mitral-Aortic Intervalvular Fibrosa: A Long-Term Complication of Infective Endocarditis. *Echocardiography* 1999; **16**: 253–7.
 13. Shigemitsu O, Hamada T, Miyamoto S, Anai H, Sako H. Ascending aortic infected pseudoaneurysm with aortic insufficiency following cardiac operation for infective endocarditis. *Ann Thorac Cardiovasc Surg* 2000; **6**: 336–8.