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SURGICAL TECHNIQUE

Exclusion of a Huge Left Ventricular Outflow Tract Pseudoaneurysm with Konno's Procedure

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ABSTRACT We present the use of Konno's procedure for the reconstruction of a huge left ventricular outflow tract pseudoaneurysm formed after aortic valve replacement. doi: 10.1111/jocs.12653 *(J Card Surg 2015;30:881–884)*

Following aortic valve replacement, left ventricular outflow tract (LVOT) pseudoaneurysm is an extremely rare and catastrophic complication. LVOT pseudoaneurysms are usually located the lateral or posterior part of the left ventricle. Only a few case reports are present for LVOT pseudoaneurysms late after aortic valve replacement.[1,2] We report a huge LVOT pseudoaneurysm detected five years after an aortic valve replacement and its successful treatment.

PATIENT PROFILE

A 39-year-old male was admitted with numbness of the left arm, palpitation, and dyspnea. The patient, who is a former drug user, had a history of mechanical aortic valve replacement five years ago due to aortic insufficiency. The first operation had been performed by using a 23 mm mechanical bileaflet aortic valve prosthesis. He had an uneventful postoperative follow-up for one year, but he continued to use intravenous drugs after that. Before his admission to our hospital he had episodes of fever and constitutional symptoms such as fatigue and loss of appetite. On admission, chest X-ray showed enlargement and peripheral calcification of the left lateral border on the cardiac silhouette (Fig. 1). Transthoracic echocardiography revealed a huge pseudoaneurysm connected to the LVOT with a large neck, some compression of the left atrium and left pulmonary veins by the mass, and a well-functioning mechanical aortic valve prosthesis. His ejection fraction was 45%. Transesophageal echocardiography confirmed the diagnosis and multidetector computed tomographic (MDCT) angiography showed the diameter of the pseudoaneurysm (8×10 cm) with wall calcification and partial thrombosis (Fig. 2). Coronary angiogram showed no coronary lesions. Coronary ostia were not displaced, and were in normal position in the related sinuses.

Surgical technique

Redo sternotomy was performed. Cardiopulmonary bypass was initiated with aortic and bicaval cannulation. Under 28 °C moderate hypothermia, cardiac arrest was obtained by using isothermal intermittent blood cardioplegia. An vertical aortotomy was performed and the mechanical aortic prosthesis was resected. Then, with Konno's incision, the pseudoaneurysm was explored (Figs. 3 and 4). The neck of the pseudoaneurysm was located at the posterolateral part of the LVOT, beginning from 1 cm below the aortic annulus and extending approximately 5 cm toward to the cardiac apex, with a

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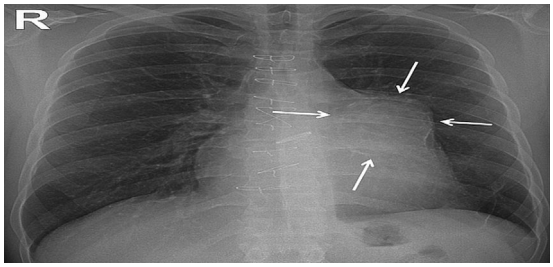

Figure 1. *Chest X-ray showed enlargement and peripheral calcification of the left lateral border on the cardiac silhouette (arrows). LV, left ventricle.*

large orifice and calcified borders. To reach the safe myocardial borders for exclusion of the pseudoaneurysm, a Konno incision was performed. A patch of bovine pericardium was sutured to the neck of the pseudoaneurysm by using continuous 4/0 prolene suture (Fig. 5). After completion of the patch exclusion, the ventricular septum was closed with a small bovine pericardial patch. A new 23 mm bileaflet mechanical aortic prosthesis (St Jude Medical, St Paul, MN, USA) was reimplanted to the aortic annulus. Cardiopulmonary bypass was discontinued without difficulty. Sinus rhythm was restored. Cardiopulmonary bypass and aortic clamp times were 123 and 85 minutes, respectively.

The patient had an uneventful recovery and was discharged on postoperative day 10. No organisms were isolated from the surgical material. Follow-up was 18 months and the patient was in New York Heart Association functional class I condition. Computed tomography angiography showed no connection between the mass and the ventricle at postoperative month three (Fig. 6).

DISCUSSION

Left ventricular outflow tract pseudoaneurysm is an uncommon disease; with few cases reported in the literature, little is known about its clinical presentation and treatment.[2,3] Once formed, a pseudoaneurysm arises from incomplete myocardial rupture, the cavity being surrounded by cardiac muscle and remains intact

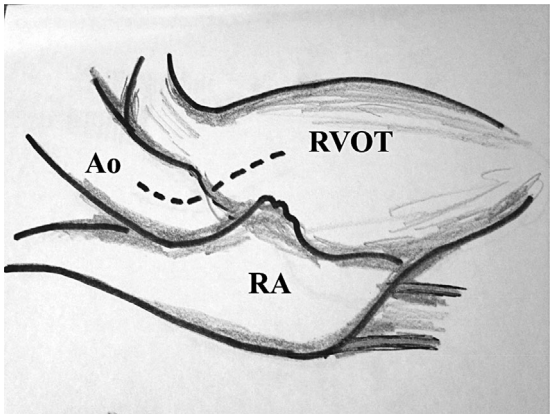

Figure 3. *Illustration shows a vertical incision through the aortic root toward the right ventricular outflow tract. Ao, Aorta; RA, right atrium; RVOT, right ventricular outflow tract.*

due to adhering pericardium or scar tissue in the left ventricular free wall. Valve infective endocarditis (IE) is the most common cause of dehiscence and pseudoaneurysm formation. Areas subjected to surgical manipulation are particularly vulnerable. In addition, endothelial injury from regurgitant flow may be a predisposing cause for infection. Endothelial damage may result from mechanical lesions provoked by turbulent blood flow, electrodes or catheters, inflammation, as in rheumatic carditis, or degenerative changes in elderly individuals, which are associated with inflammation, microulcers, and microthrombi.[4]

The most common site of cardiac pseudoaneurysm in the mitral aortic intervalvular fibrosa (MAIVF) the fact that this region is poorly vascularized makes it more susceptible to infection.[2,3] Contamination occurs either through contact with the aortic wall or through dissemination by the regurgitant jet to subaortic structures and the mitral valve anterior leaflet. In 10–40% of cases of native valve IE, periannular extension, including periannular abscesses, pseudoaneurysm formation in the MAIVF, and the subsequent development of an aorto-cavitary fistulous tract, leads to increased mortality resulting from congestive heart failure.[1] Anguera et al. reported that of 2055 cases of native valve IE, 201 (9.8%) patients developed

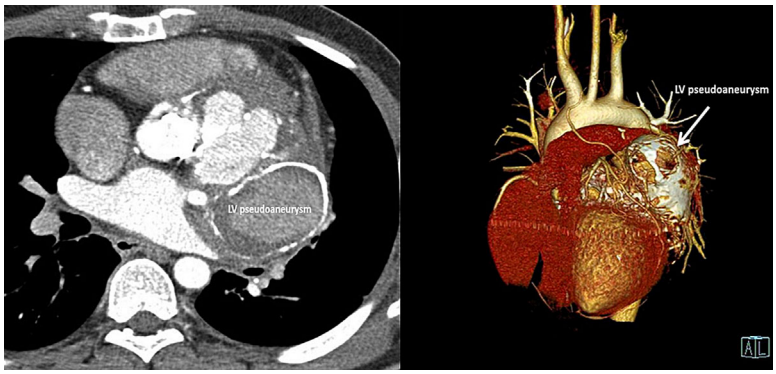

Figure 2. *Contrast-enhanced multislice computed tomography in transverse section demonstrating left ventricular outflow tract pseudoaneurysm 8–10 cm in diameter (A) and 3D reconstruction (B) showing the left ventricular pseudoaneurysm from anterolateral angle (arrow). LV, left ventricle.*

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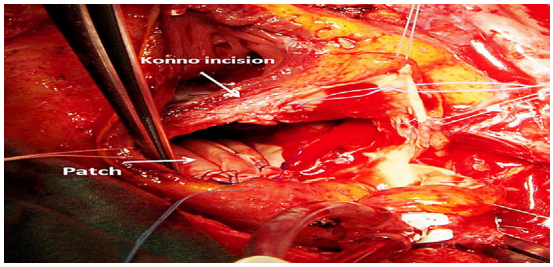

Figure 4. *Macroscopic view of the Konno incision and closure of left ventricular outflow tract pseudoaneurysm with patch.*

periannular complications (46 with aortocavitary fistulization). They also reported that in 872 cases of prosthetic valve IE, 150 (17%) patients developed periannular complications (29 with aortocavitary fistulization). In contrast, descriptions of pseudoaneurysm after aortic valve replacement for IE are confined almost exclusively to case reports.[5]

In our case, location of the pseudoaneurysm was lateral and posterior border of the LVOT. We speculate that the possible mechanism for this complication might be a previous endothelial injury of aortic regurgitant flow and concomitant bacteremia after the first operation due to the intravenous drug abuse. Another mechanism for the development of pseudoaneurysms after aortic valve replacement may be attributed to suturing technique.[1,3] When a tight suture tears the LVOT wall, the high-velocity blood flow in the LVOT enters the tear and forms a pseudoaneurysm. In the presence of an associated intravenous drug abuse, iatrogenic injury to the LVOT during operation might be a cause for these complications.[5] Barbetseas et al. used echocardiography to evaluate pseudoaneurysm formation after aortic valve replacement.[6] However echocardiography may fail to detect a smaller pseudoaneurysm. Unlike angiography, MDCT is a noninvasive, volumetric, cross-sectional imaging method that is unhampered by superimposition.[7] CT is also useful for evaluating LVOT site and the relationships with mediastinal structures in preoperative assessment for chest re-entry and surgical strategies. On outpatient follow-up, three-dimensional CT or transesophageal echocardiography is considered necessary for postoperative evaluation of periannular extension, for better detection of pseudoaneurysm, especially in patients with endocarditis.[6]

Naturally LVOT pseudoaneurysms predispose to embolization and infection. Rupture into the pericardium can cause cardiac tamponade.[8] There are also reports of compression of the coronary arteries, causing ischemic symptoms, all of which are associated with high morbidity and mortality.[3] In our particular case, the neck of the left ventricular pseudoaneurysm was very large and away from the MAIVF and aortic annulus. Infective endocarditis due to intravenous drug abuse after aortic valve replacement was the predisposing factor. Although there was some compression to the surrounding structures, we did not attempt to resect the LVOT pseudoaneurysm, because it may be very dangerous due to severe calcifications and adhesions to the vital structures. Follow CT angiograms at postoperative third month confirmed the pseudoaneurysm was successfully excluded.

In the literature, there is one case report about the use of Konno incision had for an aortobiventricular fistula associated with pseudoaneurysm of the

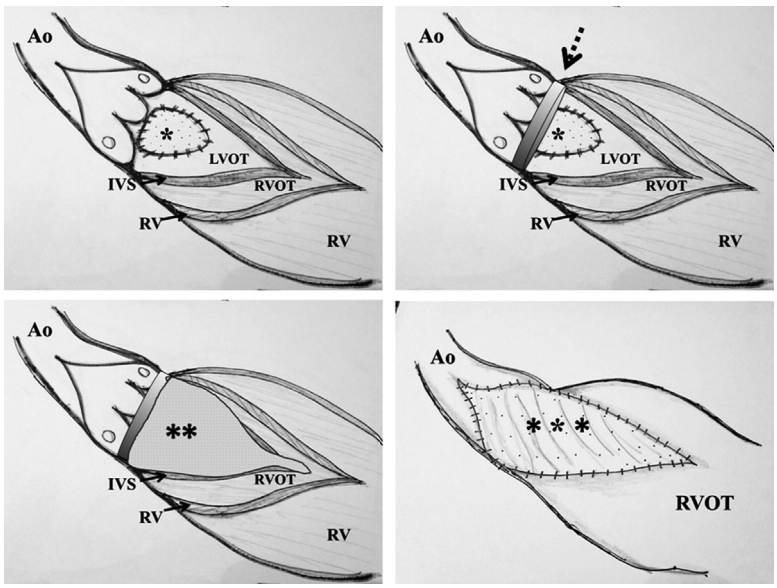

Figure 5. *Left upper view, after Konno's incision to the left ventricular outflow tract, the neck of the pseudoaneurysm was closed with a synthetic patch (*). Right upper view, after placement of the patch (*) along the left ventricular outflow tract, posterior annulus of aortic mechanical prosthesis (dotted arrow) was implanted. Left lower view, anterior annulus of the prosthesis and interventricular septum was reconstructed with a secondary bovine pericardial patch (**). Right lower view, anterior wall of the aortic root and right ventricular outflow were reconstructed with another synthetic patch (***). Ao, aorta; IVS, interventricular septum; LVOT, left ventricular outflow tract; RV, right ventricle; RVOT, right ventricular outflow tract.*

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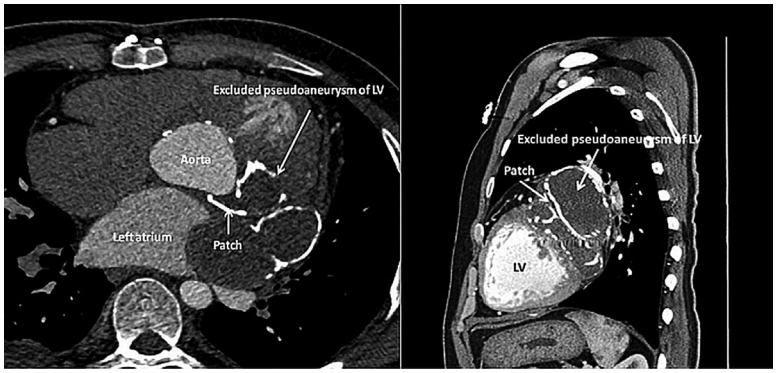

Figure 6. *Postoperative computed tomography showing excluded pseudoaneurysm of LV and patch in transverse section (A) and in saggital view (B) (arrows). LV, left ventricle.*

ascending aorta 12 years after patch repair of supravalvular aortic stenosis.[9] The Konno incision provided perfect exposure of the LVOT for proper exclusion of the aneurysm in our case and we strongly suggest that use of Konno incision may be effective and safe for the treatment of large LVOT pseudoaneurysms.

REFERENCES

1. Pereira LA, Gontijo PF, Farran JA, et al: Giant pseudoaneurys of the left ventricular outflow tract: A rare disease. Rev Port Cardiol 2013;32:541–544.
2. Itodo Y, Komae H, Yamamoto T, et al: Left ventricular pseudoaneurysm after surgery for infective endocarditis. Asian Cardiovasc Thorac Surg 2013;21:82–84.
3. Lewis AJ, Burchell HB, Titus JL: Clinical and pathologic features of postinfarction cardiac rupture. Am J Cardiol 1969;23:43–53.
4. Habib G, Hoen B, Tornos P, et al: Endorsed by the European Society of Clinical Microbiology and Infectious Diseases (ESCMID) and the International Society of Chemotherapy (ISC) for infection and cancer. Eur Heart J 2009;30(19):2369–2413.
5. Anguera I, Miro JM, Vilacosta I, et al: Aorto-cavitary fistulous tract formation in infective endocarditis: Clinical and echocardiographic features of 76 cases and risk factors for mortality. Eur Heart J 2005;26(3):288–297.
6. Jha AK, Pandey R, Gharde P, et al: Idiopathic left ventricular outflow tract pseudoaneurysm. Ann Card Anesth 2013;16:209–211.
7. Barbetseas J, Crawford ES, Safi HJ, et al: Doppler echocardiografphic evaluation of pseudoaneurysms complicating composite grafts of the ascending aorta. Circulation 1992;85(1):212–222.
8. Tsai IC, Lee T, Lee WL, et al: Use of 40-detector row computed tomography before catheter coronary angiography to select early conservative versus early invasive treatment for patients with low-risk acute coronary syndrome. J Comput Assist Tomogr 2007;31(2):258–264.
9. Yokote Y, Kyo S, Matsumura M, et al: Aortobiventricular fistulas associated with pseudoaneurysm of ascending aorta 12 years after patch repair of supravalvular aort stenosis. Jpn J Thorac Cardiovasc Surg 2001;49(2):132–134.

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