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Left Ventricular Pseudoaneurysm after Valve Replacement

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We present a case of left ventricular pseudoaneurysm, which is a very rare and fatal complication of cardiac procedures such as mitral valve replacement. A 55-year-old woman presented to the Department of Thoracic and Cardiovascular Surgery at Hanyang University Seoul Hospital with chest pain. Ten years prior, the patient had undergone double valve replacement due to aortic regurgitation and mitral steno-insufficiency. Surgical repair was successfully performed using a prosthetic pericardial patch via a left lateral thoracotomy.

Key words: 1. Left ventricular pseudoaneurysm
2. Left ventricular rupture
3. Mitral valve, replacement

CASE REPORT

A 55-year-old woman visited the emergency clinic of Hanyang University Seoul Hospital with chest pain that had persisted for one month and had become aggravated two days earlier. Ten years before this admission, the patient had undergone double valve replacement with aortic and mitral mechanical valves due to aortic regurgitation and mitral steno-insufficiency.

An electrocardiogram revealed myocardial ischemia in the inferior wall. However, no abnormalities were observed in laboratory findings, including cardiac markers. Echocardiography revealed normal motion and function of the mitral and aortic valve prostheses, and coronary angiography findings were also normal. However, coronary computed tomographic angiography revealed three large lobulated aneurysms with calcified walls bulging from the base of the left ventricle (Fig. 1). The leak in the left ventricle was located in the sub-mitral valve prosthesis area. Based on this finding, we diagnosed the patient with a pseudoaneurysm of the left ventricle, and surgical treatment was planned.

Surgery was performed under general anesthesia using double-lumen endotracheal intubation. A left lateral thoracotomy was performed via the fifth intercostal space. Arterial cannulation via the left femoral artery and venous cannulation via the left femoral vein and left pulmonary artery were performed. Three communicating aneurysmal sacs were observed in a single plane, identical to that observed in coronary computed tomographic angiography. The neck of the first sac was located at the base of the left ventricle. Under cardiopulmonary bypass and fibrillation, the aneurysmal sacs were incised and the thrombi in the sacs were extirpated. A defect measuring 15 mm in diameter was identified in the sub-mitral left ventricular wall with calcification but with no infection. The

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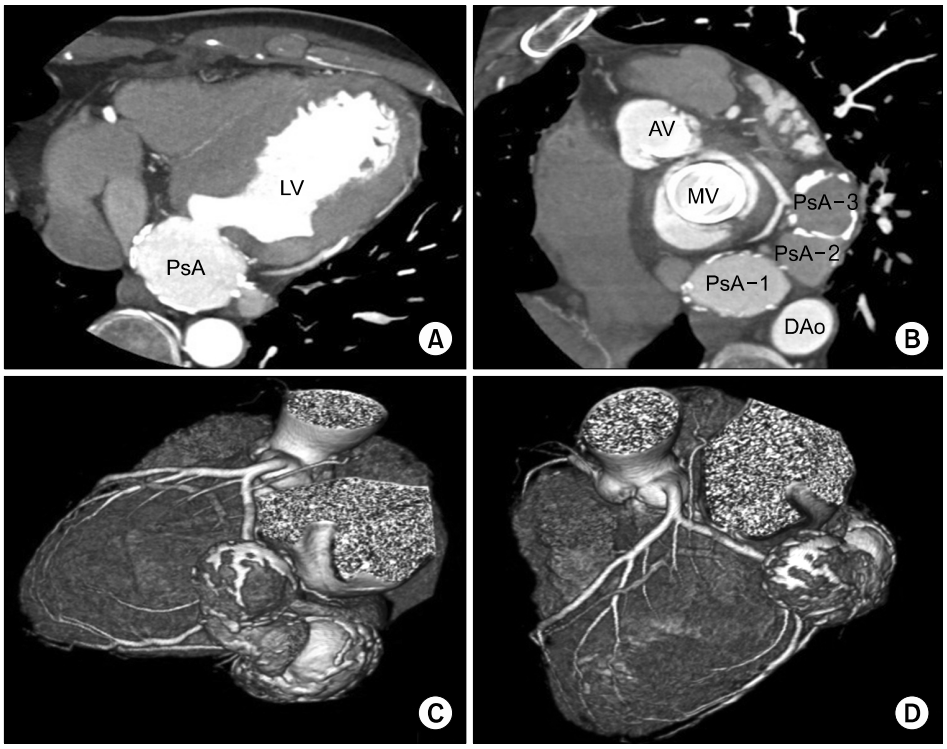

Fig. 1. Preoperative coronary computed tomography (CT) angiography. (A) The location of the leak in the left ventricle is the sub-mitral valve prosthesis area. (B) Three large lobulated aneurysms are seen bulging from the base of the left ventricle with calcified walls. (C, D) Three-dimensional reconstruction of preoperative coronary CT angiography. PsA, pseudoaneurysm; LV, left ventricle; AV, aortic valve; MV, mitral valve; DAo, descending aorta.

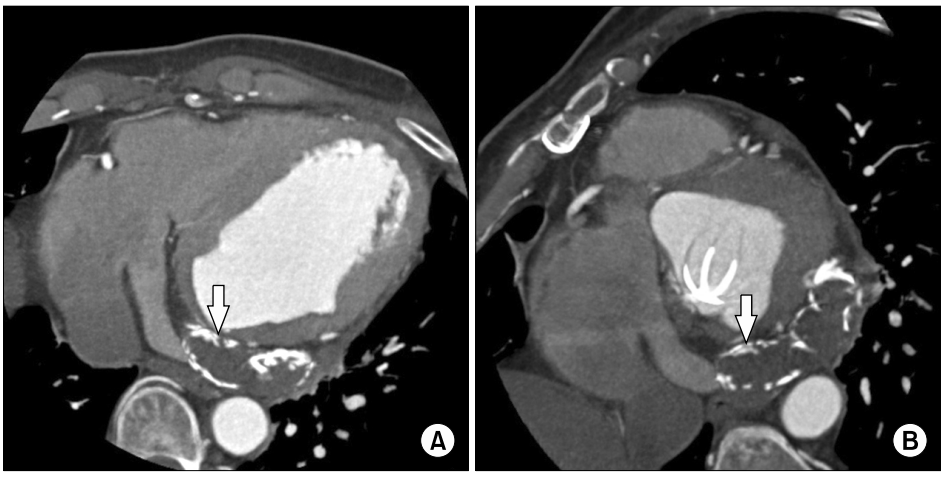

Fig. 2. (A, B) Postoperative coronary computed tomographic angiography. There is no evidence of recurrence of the pseudoaneurysm. The arrows show no leakage at the closed aneurysmal neck.

pseudoaneurysm of the left ventricle was determined to be caused by myocardial discontinuity. Closure of the defect was performed with a Supple Peri-Guard Pericardium Patch with APEX Processing (Synovis, St. Paul, MN, USA) using pledgeted horizontal mattress sutures. The walls of the aneurysmal sacs were closed, and the patient was weaned from cardiopulmonary bypass without difficulty. The total cardiopulmonary bypass time was 70 minutes.

The vital signs of the patient remained stable, and she was extubated six hours after the operation. Follow-up echocardiography was performed on postoperative day eight, and no abnormal findings, including cardiac wall motion, were noted. The patient underwent coronary computed tomographic angiography on postoperative day 14. No leakage at the closed aneurysmal neck was observed, and there was no evidence of recurrence of the pseudoaneurysm (Fig. 2). The patient was discharged on postoperative day 16, without any complications. She has remained disease-free for six years

postoperatively, with regular Coumadin anticoagulation therapy due to the presence of the prosthetic aortic and mitral valves.

DISCUSSION

A left ventricular (LV) pseudoaneurysm, or false aneurysm, is defined as a contained rupture or perforation of the myocardium [1]. The rupture of the myocardium occurs rarely in clinical practice; it is most often associated with myocardial infarction or cardiac surgery, such as mitral valve replacement (MVR), and is usually fatal [2-4].

In 1980, Cobb et al. [5] described the transverse midventricular disruption of the LV free wall after MVR. They proposed that an incomplete rupture could be the cause of a false aneurysm. Roberts and Morrow [6] suggested that inadvertent invasion into the LV free wall is possible during excision of the mitral valve if there is poor visualization of the operating field when using the tips of the scissors. Other causes of complete or incomplete rupture of the LV free wall include an oversized prosthetic valve, excessive extirpation of calcium in the mitral annulus, myocardial erosion caused by the struts of the prosthetic valve, the untethering of the fibrous structures of the left ventricle during resection of mitral leaflets, an increase in LV contractility after aortic cross-clamping, enhanced LV wall stress with the support of inotropic agents, and other mechanical trauma between the free wall and the papillary muscles, such as rubber catheter wedging or metal pump suction during valve replacement [7]. Moreover, perioperative rupture of the myocardium is known to be a lethal complication [4].

The wall of a false aneurysm comprises the fibrous obliteration of the pericardial sac, resulting from adhesion between the parietal and visceral layer of the pericardium. This can prevent the complete and fatal rupture of the LV free wall [7].

While a true aneurysm has nonrestrictive continuity with the LV cavity, a pseudoaneurysm has a defect in the myocardial continuity and a well-defined neck, representing a history of LV wall perforation [1,2]. Thus, such pseudoaneurysms are more likely to undergo rapid enlargement and rupture than true aneurysms [1]. Therefore, surgical correction, including the resection of the aneurysmal sac and patch repair or primary closure of the aneurysmal neck, is indicated and recommended for pseudoaneurysms [1,2].

In the present case, we diagnosed a LV pseudoaneurysm using coronary computed tomographic angiography. Myocardial infarction was excluded as a cause of the LV pseudoaneurysm because coronary angiography revealed normal findings and cardiac markers were in the normal range, although electrocardiography revealed myocardial ischemia in the inferior wall. The cause of LV pseudoaneurysm in our patient was a late-term complication of MVR. Echocardiography revealed normal function of the mitral valve prosthesis; therefore, mitral reoperation was not indicated.

In such patients, if a repeat sternotomy for entering the operative field is considered, it may be difficult to approach the heart due to massive pericardial adhesions, and the possibility of injury or rupture of the pseudoaneurysm during dissection may be higher [4]. A direct approach to the operative field via a left lateral thoracotomy can avoid these complications and preserve the previously implanted prosthetic valves. Further, it has other advantages, such as making it easier to establish cardiopulmonary bypass and obviating the need to cross-clamp the aorta, in contrast to the sternotomy approach [4]. In our operation, a fibrillator was used and the exposure of the operative field was excellent.

In the operative field, we found three large lobulated pseudoaneurysms with calcified walls in a line, bulging from the base of the left ventricle. The configuration of the pseudoaneurysms suggested a previous episode of LV rupture, which had developed over time.

In patients with LV pseudoaneurysms, there is a well-defined approach to surgical correction. The neck of the pseudoaneurysm is dissected, and the perforated site can be closed by patch repair or primarily. The mortality rate of this surgery is approximately 10% [8]. However, no complications occurred in our case.

In conclusion, we have reported a case of LV pseudoaneurysm that occurred as a late complication after MVR. We performed a left lateral thoracotomy via the fifth intercostal space to approach the operative field directly and successfully repaired the sub-mitral LV pseudoaneurysm using a prosthetic patch. A few cases of LV pseudoaneurysms have been previously reported; however, no case reports have previously been presented of Korean patients with an LV pseudoaneur-

ysm following MVR who were treated with an operative technique employing a left lateral thoracotomy. We consider the approach described here to be feasible, safe, and reproducible.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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