

# Successful Repair of a Large Pseudoaneurysm of the Left Ventricle Late after Mitral Valve Replacement Due to Rupture of the Papillary Muscle Following Acute Myocardial Infarction

Yoshiharu Nishimura, Yoshitaka Okamura, Yasuzo Noguchi, Shuji Yamamoto, Atsutoshi Hatada, and Takahiro Hisaoka

**We present a rare case demonstrating a large pseudoaneurysm of the left ventricle late after mitral valve replacement due to rupture of the papillary muscle following acute myocardial infarction. A 52-year-old man, who had undergone mitral valve replacement 7 months previously, presented with severe congestive heart failure. Echocardiography and computed tomography of the chest demonstrated a large pseudoaneurysm of the left ventricle. The patch repair of the orifice of the pseudoaneurysm was successfully performed. (*Ann Thorac Cardiovasc Surg* 2004; 10: 386–8)**

**Key words:** pseudoaneurysm, mitral valve replacement, myocardial infarction

## Introduction

Pseudoaneurysm of the left ventricle is a rare cardiac disease that occurs after myocardial infarction or cardiac surgery.<sup>1-4)</sup> This report describes an unusual case demonstrating a large pseudoaneurysm of the left ventricle late after mitral valve replacement for papillary muscle rupture due to acute myocardial infarction, which was repaired successfully.

## Case Report

A 52-year-old man was admitted to our hospital with a complaint of progressive severe dyspnea. The patient had a history of acute myocardial infarction combined with papillary muscle rupture of the mitral valve 7 months previously. At that time, coronary angiography revealed complete occlusion of the atrioventricular branch of the right coronary artery. Coronary intervention was not indicated. The patient had successfully undergone mitral valve replacement using a 27-mm prosthesis (Carbomedics Inc.,

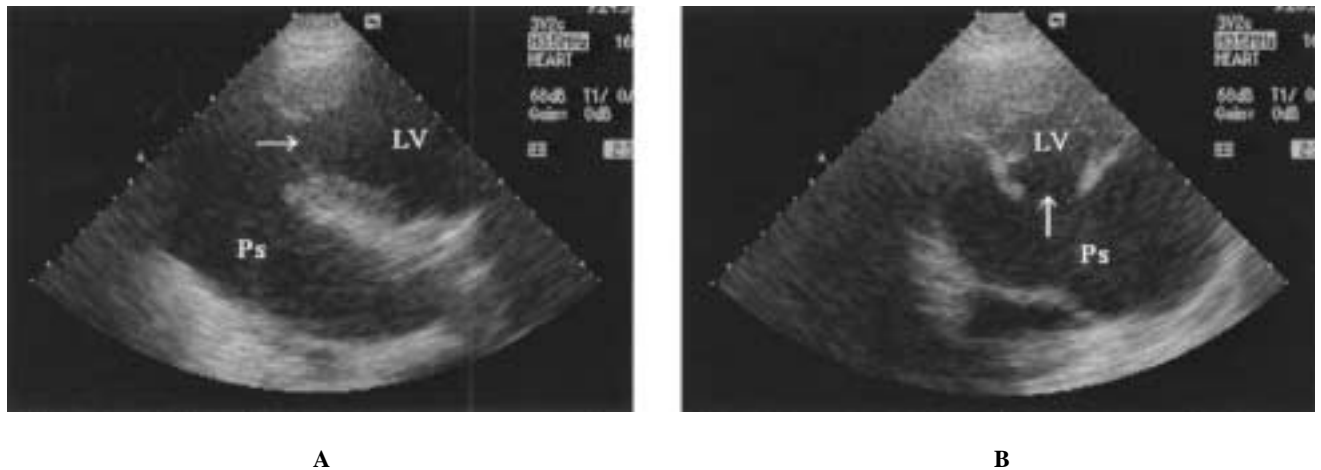
*From Department of Thoracic and Cardiovascular Surgery, Wakayama Medical University, Wakayama, Japan*

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Address reprint requests to Yoshiharu Nishimura: Department of Thoracic and Cardiovascular Surgery, Wakayama Medical University, 811-1 Kimiidera, Wakayama City, Wakayama 641-8509, Japan.

Austin, TX) following rupture of the posteromedial papillary muscle without any findings of aneurysmal change or surgical injury on the posterolateral wall of the left ventricle.

On this admission, chest X-ray showed an enlarged cardiac silhouette and severe pulmonary congestion. Echocardiography demonstrated a large abnormal cardiac chamber adjacent to the lateral wall of the left ventricle (Fig. 1). Doppler echocardiography demonstrated to-and-fro signals in a 3 cm myocardial defect in the lateral wall. There was no perivalvular leak and no prosthetic valve dysfunction observed. Computed tomographic scan of the chest demonstrated a large mass along the posterolateral wall of the left ventricle (Fig. 2). These findings provided a diagnosis of congestive heart failure caused by a large pseudoaneurysm of the left ventricle. The inotropic agent and intra-aortic balloon pumping was required to maintain hemodynamics of this patient.

Urgent surgery was conducted via median sternotomy under cardiopulmonary bypass on July 12, 2002. Dense adhesion after the previous surgery was recognized. The pseudoaneurysm extended to the left posterolateral side of the left ventricular wall and was contained by pericardium adhering to the left pleura. The sac of the pseudoaneurysm was incised from the epicardial surface of the diaphragmatic aspect without opening other cardiac chambers. There were no thrombi or clots in the

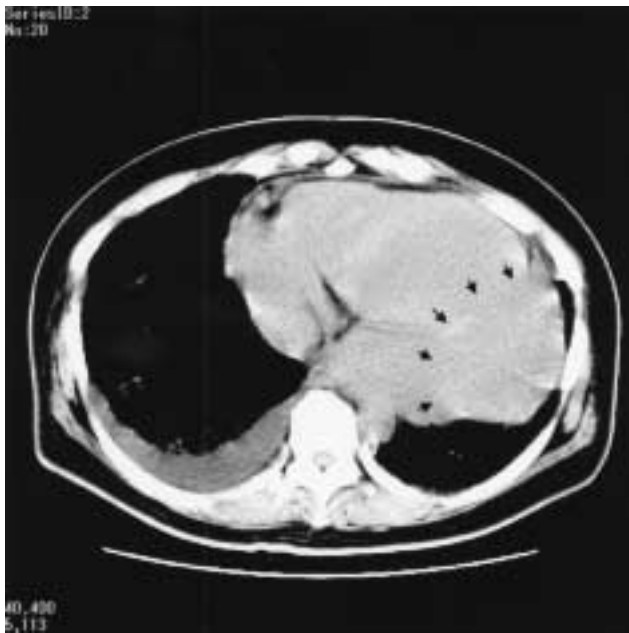


**Fig. 1.** Preoperative echocardiogram.

LV; Left ventricle, Ps; Pseudoaneurysm, Arrow; Orifice

A: Echocardiogram clearly demonstrated a large pseudoaneurysm adjacent to the left ventricle.

B: The orifice of the pseudoaneurysm measured 3 cm in diameter.



**Fig. 2.** Preoperative computed tomographic scan of the chest.

Computed tomographic scan of the chest demonstrated a large left ventricular pseudoaneurysm (arrows).

pseudoaneurysm and the surface of the inner layer was smooth. A round defect in the myocardium forming the communicating neck between the pseudoaneurysm and the left ventricle was located in the lateral wall of the left ventricle. The defect measured 3 cm in diameter and the epicardial tissues around the defect were thick and firm. Purse string sutures were placed around the defect using

2-0 polypropylene, then the defect was closed by patch repair using a Dacron graft with 2-0 pledgeted mattress sutures. An additional 2-0 polypropylene running suture was then placed along the edge of the patch. The patch was covered by the pseudoaneurysmal wall with reinforcement by Gelatin Resorcine Formol glue. The patient was weaned uneventfully from cardiopulmonary bypass.

Postoperative cardiac function was improved satisfactorily. Postoperative echocardiography demonstrated no residual leak from the repair site. Although plication of the left diaphragm was needed due to phrenic nerve palsy, the patient was discharged and reported an active life at the 18 months follow-up examination.

## Discussion

It is well documented that pseudoaneurysm of the left ventricle rarely develops after myocardial infarction, surgery, trauma, or infection.<sup>1-4)</sup> This case represents an unusual presentation of a pseudoaneurysm of the left ventricle occurring after myocardial infarction and mitral valve replacement. In this case, initial cardiac rupture was manifested as a posteromedial papillary muscle rupture of the mitral valve due to acute myocardial infarction and mitral valve replacement preserving a posterior leaflet was successfully performed without postoperative massive bleeding from the chest drainage tube. However, a large pseudoaneurysm gradually developed late after mitral valve replacement.

Pseudoaneurysm may develop after acute rupture of

the infarcted myocardium when the rupture is rarely compressed by adhesion of the surrounding pericardium. Furthermore, a pseudoaneurysm may also occur as a type of cardiac rupture after mitral valve replacement. Late rupture of the left ventricle may appear days to years after mitral valve replacement and presents as a pseudoaneurysm.<sup>5)</sup> Regarding the possible mechanism of left ventricular rupture in the present case, an important etiologic factor was the intrinsic myocardial disease of ischemic origin rather than technical injury to the ventricular wall during mitral valve replacement. The site of left ventricular perforation was near the base of the papillary muscle, which is classified as a type II rupture based on a criteria proposed by Treasure and colleagues.<sup>6)</sup> This infarcted area, which did not cause transmural disruption at the time of mitral valve replacement, may have finally caused a full-thickness rupture into a pseudoaneurysm contained by surrounding pericardial tissue. As to the possible mechanism of this ventricular rupture, it is reported that untethering of the left ventricle occurs after mitral valve replacement and this promotes increased longitudinal stress in the left ventricle,<sup>5,7)</sup> which may convert the weakened infarcted area to a transmural rupture contained in the surrounding tissue resulting in pseudoaneurysm in the presented case. Differing from the presented case, dual rupture of the left ventricle and papillary muscle, pseudoaneurysm and mitral regurgitation, were also reported as rare conditions.<sup>8)</sup>

Although a pseudoaneurysm is asymptomatic when small, it usually grows rapidly and is prone to rupture.<sup>1)</sup> Risk of embolization with thrombotic material in the cavity of the pseudoaneurysm was also reported.<sup>3,9)</sup> This case presented with congestive heart failure and severe dyspnea due to extra-output flow to the aneurysmal cavity, therefore urgent surgical treatment was necessary. The principle of surgical treatment is closure of the ventricular wall defect. Direct closure and patch repair including ventriculoplasty of Dor were reported as surgical procedures.<sup>1,3,8,9)</sup> In the present case, the fibrous tissue around the ventricular defect was firm enough to anchor sutures and patch repair was successfully performed. It is also important that adhesiolysis is required during repeated

median sternotomy. To avoid the risk of median sternotomy, left thoracotomy may provide better access to left ventricular pseudoaneurysm in selected cases.<sup>10)</sup>

## Conclusion

An unusual case of a large pseudoaneurysm of the left ventricle late after mitral valve replacement for papillary muscle rupture due to acute myocardial infarction was successfully treated by patch repair.

## References

1. Fujii H, Hattori R, Osako M, Otani H, Imamura H. Patch repair of postinfarction pseudo- and subepicardial aneurysm of the left ventricle. *J Cardiovasc Surg* 2001; **42**: 49–51.
2. Prêtre R, Linka A, Jenni R, Turina MI. Surgical treatment of acquired left ventricular pseudoaneurysms. *Ann Thorac Surg* 2000; **70**: 553–7.
3. Koçak H, Becit N, Ceviz M, Ünlü Y. Left ventricular pseudoaneurysm after myocardial infarction. *Heart Vessels* 2003; **18**: 160–2.
4. Fazio RB, Lewis JF, Mills RM, Normann S, Conti CR. Prolonged survival of a patient with left ventricular pseudoaneurysm following myocardial infarction and mitral valve replacement. *Chest* 1996; **109**: 577–9.
5. Karlson KJ, Ashraf MM, Berger RL. Rupture of left ventricle following mitral valve replacement. *Ann Thorac Surg* 1988; **46**: 590–7.
6. Treasure RL, Rainer WG, Strevey TE, Sadler TR. Intraoperative left ventricular rupture associated with mitral valve replacement. *Chest* 1974; **66**: 511–4.
7. Cobbs BW, Hatcher CR, Craver JM, Jones EL, Sewell CW. Transverse midventricular disruption after mitral valve replacement. *Am Heart J* 1980; **99**: 33–50.
8. Harada T, Ida T, Takano T. Cardiac pseudoaneurysm coupled with a rupture of the papillary muscle complicating myocardial infarction. *Acta Cardiol* 2002; **57**: 435–7.
9. Komeda M, David TE. Surgical treatment of postinfarction false aneurysm of the left ventricle. *J Thorac Cardiovasc Surg* 1993; **106**: 1189–91.
10. Ono M, Wolf RK. Left ventricular pseudoaneurysm late after mitral valve replacement. *Ann Thorac Surg* 2002; **73**: 1303–5.