Left Ventricular Pseudoaneurysm After Mitral Valve Replacement

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Received 2016 September 04; Revised 2016 October 11; Accepted 2016 November 05.

Abstract

Introduction: Left ventricular (LV) pseudoaneurysms due to late rupture after mitral valve replacement (MVR) are very rare. Surgical management of LV pseudoaneurysms is inevitable because of their potential risk of enlargement and rupture.

Case Presentation: A 53-year-old woman was referred to our echocardiography lab because of exertional dyspnea. She had recently undergone MVR and had an uneventful in-hospital course. Echocardiographic study revealed an LV pseudoaneurysm, just below the annulus in the left atrioventricular groove. She refused repeated surgery at this stage.

Conclusions: Rupture of the LV wall after MVR could be a fatal complication. Echocardiography is the most widely used method for the diagnosis of LV pseudoaneurysms. Cardiologists should be aware of this complication and consider it while assessing MVR cases.

Keywords: False Aneurysm, Mitral Valve, Left Ventricle, 3D Echocardiography

1. Introduction

Rupture of the left ventricle (LV) following mitral valve replacement (MVR), albeit infrequent, is a highly lethal complication. It was first reported by Roberts and Morrow (1) in 1967.

The reported incidence is very rare, ranging between 0.02% and 2% of all MVR procedures (2). We herein report a case of the late rupture of the LV after MVR, appearing as a pseudoaneurysm, which was diagnosed by 2D and 3D echocardiography. Recognition of this rare complication of MVR has clinical and therapeutic importance because its prognosis without surgical repair is poor and its high mortality rate (50%-93%) warrants new insights into its prevention and management (3, 4).

2. Case Presentation

A 53-year-old woman was referred to the Echo Lab of Imam Reza hospital due to persistent dyspnea on exertion (function class II). She had undergone MVR (with St Jude, stented porcine bioprosthetic valve) because of severe mitral regurgitation in the setting of prolaptic leaflets, approximately 2 months earlier. At the time, echocardiography early after surgery and also before discharge revealed normal function of the bioprosthesis and severely reduced systolic function of the LV (similar to the preoperative state). The patient was discharged after an uneventful in-hospital course.

Nevertheless, repeated echocardiographic study was requested due to her reduced functional capacity and persistent dyspnea. She had no history or clinical evidence of bacterial endocarditis or rheumatismal heart disease. Physical examination was not remarkable.

In this present study, the LV was severely enlarged (end-diastolic volume index = 114 cc/m²) and was globally hypokinetic without echocardiographic evidence of scar formation. The LV systolic function was also severely impaired (ejection fraction = 20%). In addition, hypertrabeculation with associated deep recesses was noted in the apical segments, which was suggestive of LV non-compaction cardiomyopathy. The left atrium was severely enlarged (volume index = 76 cc/m³). The motion and hemodynamic data of the bioprosthetic mitral leaflets were normal, and there was no detectable trans- or paravalvular regurgitation. Three-dimensional transthoracic echocardiography (TTE) illustrated a pulsatile cavity (2.8 cm × 2.4 cm in size) along the posterolateral wall of the LV (just inferoposterior to the mitral annulus), communicating with the LV cavity (Figure 1) via a narrow and triangular-shaped orifice (major diameter = 12 mm), suggestive of an LV pseudoaneurysm (Figure 2).

The patient was referred for surgical correction, but she refused to undergo surgery. Close surveillance with full medication was, therefore, suggested instead.
3. Discussion

The most frequent cause of LV pseudoaneurysms is myocardial infarction; however, many other etiologies such as trauma, infective endocarditis, and cardiac surgery may also be responsible (5). Rupture of the LV wall after MVR, although infrequent, could be a fatal complication and as such requires early diagnosis and planning for surgical intervention (6, 7). LV pseudoaneurysms can be classified into 3 types according to the location of the rupture (8). In type I, the perforation of the thin attachment of the atrium to the ventricle happens in the posterior atrioventricular groove. In type II, the rupture is in the LV posterior wall, at the base of the papillary muscle. In type III, the rupture occurs in the area between the atrioventricular groove and the papillary muscle. The pseudoaneurysms of the membranous portion of the ventricular septum following MVR have been reported recently (2), which could be regarded as type IV. Another classification is based on the timing of the rupture (9). This classification comprises early, delayed, and late ruptures. Early ruptures are defined as those occurring in the operating room, at any time, before or after the discontinuation of cardiopulmonary bypass. Delayed ruptures occur in the recovery room, usually hours to days postoperatively. Late tears occur days to years after MVR and present as LV pseudoaneurysms. Accordingly, our patient had a type 1, late-occurring LV rupture. The etiology in each type could be different. As was clearly seen in 3D TTE, there was separation of the annulus from the fibrous skeleton of the heart, resulting in blood entry into the myocardium and finally frank tearing. The potential complications in type I include compressive effects on the left circumflex artery (due to its nearby course) and subsequent myocardial infarction, LV failure, thrombus embolization, rupture, and death. Avoiding the left circumflex artery should also be considered during the surgical correction (10). Both patient and technical factors are implicated in the LV rupture. Chronic rheumatic heart disease; excessive calcification of the MV apparatus; old age; female gender; myocardial ischemia; infective endocarditis with MV annular abscesses; myocardial disease; small LV cavities; excessive resections of the mitral leaflets, annulus, and/or papillary muscle; redo MVR (adhesions from a previous operation); oversized prostheses, deeply placed sutures in the myocardium; and forceful traction on the sutures in the mitral annulus and the LV are some of the causative factors. Technical factors were assumed to be responsible in our patient.

Echocardiography is the most widely used method for the diagnosis of LV pseudoaneurysms (11). Cardiologists should be aware of such complications, and a precise post-MVR echocardiographic assessment is needed so as not to miss probable small LV pseudoaneurysms. In our patient, the pseudoaneurysm was clearly defined after a slight posterior angulation of the probe in the apical window. Three-dimensional echocardiography clearly...
revealed the entrance site of the LV pseudoaneurysm as well as its size and anatomical relevance to the adjacent mitral annulus. Accordingly, 3D echocardiography can be employed as a complementary study to 2D TTE (12). Ventriculography, computed tomography, and magnetic resonance imaging have also been drawn upon for the diagnosis of LV pseudoaneurysms (11). Cardiac computed tomography can delineate the anatomical relationship to both coronary arteries and pulmonary veins. The related data could be used in selecting the proper therapy (2, 3).

Once the diagnosis is made, surgical repair on cardiopulmonary bypass should be recommended to all patients. Conservative follow-up is an alternative approach for patients who refuse surgical treatment or are considered high risk for re-operation. In particular, conservative management may be possible in small LV pseudoaneurysms with very narrow necks (11).

3.1. Conclusions

Rupture of the LV wall after MVR can prove fatal. Echocardiography is the most widely used method for the diagnosis of LV pseudoaneurysms. Cardiologists should be aware of this complication and consider it while assessing patients with MVR.

Acknowledgments

None.

Footnote

Conflict of Interest: None.

References