Paravalvular Abscess of the Mitral Valve with Fistula to the Left Ventricle and Detachment of the Coronary Sinus in a Young Woman

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Infective endocarditis (IE) of the mitral valve (MV) manifesting paravalvular abscess (PA) is challenging. A 30-year-old woman presented with PA fistulating to the left ventricle, detachment of the coronary sinus and systemic embolization. During a course of fever of unknown origin, the patient received laparoscopic surgery under the diagnosis of strangulating intestinal obstruction due to colitis. Following abdominal surgery, abscess having blood flow within it from the left ventricle was pointed out at the left ventriculo-atrial junction by transthoracic echocardiography. Emergency surgery was performed under the diagnosis of PA of MV. Abscess debridement followed by reconstruction of the mitral annulus and coronary sinus with fresh autologous pericardium and mitral valve replacement (MVR) using a mechanical prosthetic valve were successfully performed. Timely and accurate diagnosis followed by the early surgical intervention with aggressive debridement of abscess and reconstruction with autologous pericardium should improve the outcome of this high-risk disease.

Keywords: mitral valve, infective endocarditis, paravalvular abscess, systemic embolization, valve replacement

Introduction

Paravalvular abscess (PA) or intracardiac fistula formation to the left ventricle is a serious complication of infective endocarditis (IE) at a native valve or prosthetic valve of the mitral valve (MV). PA is usually suspected in a patient with a well-established IE and persistent fever despite appropriate antimicrobial therapy. The reported incidence of PA of MV (6 of 42 patients; 14.3%) is less common than that of the aortic valve (37 of 71 patients; 52.1%) in surgical cases with IE.\(^1\) PA of MV manifests a variety of clinical manifestations from an asymptomatic state to catastrophic extracardiac abscess rupture. We present a successfully treated case of PA of MV with fistula to the left ventricle and detachment of the coronary sinus and systemic embolization.

Case Report

A 30-year-old woman was transferred to our hospital for surgical treatment of IE with a history of fever and abdominal pain for the last 2 months. During a course of fever of unknown origin, the patient received laparoscopic surgery under the diagnosis of strangulating intestinal obstruction due to colitis in another hospital. Following abdominal surgery, painful and blackish brown discoloration palm and sole nodes appeared, and...
blood cultures confirmed methicillin-resistant Staphylococcus aureus. Vigorous antibiotic treatment including teicoplanin was not effective, and disseminated intravascular coagulation developed one week before transfer to our hospital. On admission, she was treated with catecholamine for maintenance of hemodynamics due to septic shock, and subdural hematoma was suspected by brain computed tomography (CT). By transthoracic echocardiography (TTE), the left ventricular posterior wall diffusely thickened just below the posterior mitral annulus having blood flow from the left ventricle was pointed out (Fig. 1). No mitral regurgitation (MR) was present. Despite the risk of a cerebral complication, emergency surgery was undertaken under the diagnosis of IE with MV annular abscess. MV was approached through a T-incision (right atriotomy and interatrial septotomy) and examined. Two frond-like vegetations existed around the coronary sinus in the right atrium. In the left atrium, the fluctuating hemisphere red soft mass, which was not fistulated to the left atrium, protruded along the posterior mitral annulus. There were no vegetations in the left atrium or the left ventricle. MV leaflets were not destroyed and seemed to be almost normal. After opening the mass, massive dark brown pus spouted out, and the abscess was perforated to the atrio-ventricular groove forming the left ventriculo-atrial fistula (Fig. 2). After radical debridement, this abscess was revealed to extend to the coronary sinus, and the coronary sinus was detached at the atrial junction. The left ventriculo-atrial fistula was closed by multiple, interrupted pledgeted mattress sutures (Fig. 3B). A destroyed mitral annulus and atrio-ventricular groove were reconstructed by autologous pericardium extending onto the free wall of the ventricular myocardium as well as onto the posterior left atrial wall (Fig. 3C). MV was replaced with a 25-mm St. Jude Medical valve, because enough posterior leaflet tissue was not left for MV repair. The defect of interatrial septum and coronary sinus were also reconstructed by autologous pericardium. Before termination of CPB, the patient became pacemaker-dependent because of a complete atrio-ventricular block. The patient subsequently made a good recovery without any neurological complications. Postoperatively, the patient received gentamicin and vancomycin for 3 months, and gradually, inflammatory markers returned to normal, and complete atrio-ventricular block recovered to normal sinus rhythm before discharge. The patient is doing well without any signs of re-infection or paravalvular leakage, for 8 years after surgery.

Discussion

PA of MV is a rare manifestation of IE, characterized by pus and necrotic tissue collection with edematous induration of the deep tissues surrounding MV. Sheikh, et al. reported 28 patients (27%) having PA among 104 patients who underwent surgical intervention for active IE confined to MV over a 27-year old period. Castonguay, et al. reported 15 patients (12.5%) having PA among 120 patients of native valve endocarditis in surgically treated patients. Various organisms cause PA of MV, but Staphylococcus aureus are responsible for most of them. Baumgartner, et al. reported that mitral PA involving fistula/pseudoaneurysm formation, all grew S. aureus as a causative organism. Factors causing PA of MV is not clear, however, risk factors for this condition are staphylococcal endocarditis, hemodialysis patient, presence of other organ infections and prosthetic valve endocarditis. PA often occurs in the posterior portion of MV. The major complication of mitral PA is extracardiac rupture or intracardiac fistula formation, thus in these cases surgical treatment is mandatory. Intracardiac fistulas cause volume overload on the left heart and are associated with a poor patient prognosis. In the present case, hemodynamic derangement was due to septic shock but not cardiac failure because the abscess opened only into the left ventricle and did not form a left ventriculo-atrial fistula and no MR.
After radical debridement, the abscess was revealed to form a fistula to the left ventricle (arrow head, A). The left ventriculo-atrial fistula was closed by multiple interrupted pledgeted mattress sutures (B). The destroyed mitral annulus and the atrio-ventricular groove were reconstructed by autologous pericardium (C). MV was replaced with a mechanical valve because enough posterior leaflet tissue was not left for the valve repair (D). LA: left atrium; LV: left ventricle; PML: posterior mitral leaflet; MV: mitral valve; *: pericardium
Because of the variable clinical manifestations of IE, which overlap with other diseases, the diagnosis of PA is difficult. Multimodality for diagnosis of presence and extension of the mitral valve PA include echocardiography, multi-slice CT and cardiac magnetic resonance imaging (MRI). Echocardiography, especially transesophageal echocardiography (TEE), is the choice for establishing a correct diagnosis. TEE, along with three dimensional imaging, is more sensitive than TTE for detection of a fistula. In our present case, since PA of MV was highly suspected by TTE and hemodynamic instability, and patient’s general conditions did not allow to perform either TEE or other imaging modalities.

The optimal timing of surgery for PA of MV remains controversial, and surgical treatment is usually recommended after appropriate antibiotic treatment. Since patients of IE with PA have higher rates of systemic embolization and fatal outcome, urgent surgery should be considered for patients with local tissue invasions such as fistula or pseudoaneurysm formation, septic emboli and progressive hemodynamic compromise. The timing for MV surgery of IE in patients with cerebrovascular embolism is controversial. In patients undergoing MV surgery for IE, preoperative incidences of cerebrovascular embolism were reported 40%–50% by CT and 80% by MRI. If an unruptured mycotic aneurysm is detected and required endovascular or operative intervention, the valve operation must be delayed.

A well-defined, small PA can be resected and debrided followed by closure of the defect by direct closure or repaired with pericardium. In the case who received extensive and deep debridement causing discontinuity between the left atrium and the left ventricle, or in the case of ventriculo-atrial fistula, closure of fistula and reconstruction of the mitral annulus with pericardium is mandatory, as in our case. Many studies focusing on the possible role of MV repair for IE, however, Sheikh, et al. reported that choice of valve surgery, MV repair versus mitral valve replacement (MVR), or choice of valve prosthesis did not emerge as an independent predictor of death for either the operative period or for late survival. In contrast, recent reports have suggested superior survival after MV repair compared with MVR in patients undergoing surgery for IE. Feringa, et al. reported that a total of 470 patients (39%) underwent MV repair and 724 patients (61%) underwent MVR. Lower in-hospital mortality (2.3% versus 14.4%) and long-term mortality (7.8% versus 40.5%) were observed among patients undergoing MV repair compared with MVR. MVR is often performed in the acute setting for the sickest patients in whom MV repair cannot be performed, therefore, it would not be surprising that postoperative results would be worse for these patients with MVR. Since the circumflex coronary artery, coronary sinus, and ventricular free wall are close to the mitral annulus, debridement of the abscess and reconstruction should be carefully performed. In our case, PA extended to the coronary sinus and detached it. Careful reconstruction of the interatrial septum and coronary sinus were performed using an autologous pericardium. For the mitral PA, patching by the autologous pericardium was the predominant mode of repair. David, et al. have previously emphasized the importance of patch reconstruction of mitral PA as superior to primary closure. In case of prosthetic valve endocarditis or reoperation of MV whose autologous pericardium is not available, bovine pericardium or left atrial appendix flap may be useful. Independent predictors of operative mortality in PA of IE, were reported moderate or severe heart failure, prosthetic valve endocarditis, urgent or emergency operations, preoperative cardiogenic shock and/or septic shock and abscess in both aortic and mitral anuluses.

In conclusion, for a patient with PA in mitral valve IE, timely diagnosis, proper antibiotic treatment and early surgical intervention, including aggressive debridement and reconstruction by the pericardium, should improve the outcome, and prolonged surveillance with echocardiography and other diagnostic modalities are necessary to follow up the potentially fatal complications of MV surgery.

Disclosure Statement

No authors have any conflict of interest disclosures.

References


