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Clinical report

Papillary muscle stump mimicking a left ventricular mass after mitral valve replacement with partial chordal preservation

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Background: Maintaining continuity between the mitral valve and the subvalvular apparatus during mitral valve replacement (MVR) maximizes the left ventricular (LV) function and increases the survival rate. However, MVR potentially cause rupture of the papillary muscles, systemic embolization, or dehiscence of the mitral annulus from the transposed position.

Objective: We presented a case with severe rheumatic mitral valve disease treated with MVR and partial preservation of the posterior and anterior chordae tendineae.

Methods: Retrospectively review of medical records.

Results: Transthoracic echocardiography performed two weeks after surgery revealed a floating mass in the posterior inferior aspect of the left atrium and a lobulated mass joining the tip of the posterior papillary muscle in the left ventricle. Perioperative examination confirmed a large thrombus in the left atrium and the stump of the preserved posterior papillary muscle of the mitral valve.

Conclusion: Thus, the papillary muscle could present itself as an abnormal mass on echocardiography, resulting in misdiagnosing.

Keywords: Intracardiac mass, mitral valve replacement, papillary muscle

Maintaining continuity between the mitral valve and the subvalvular apparatus during mitral valve replacement (MVR) maximizes the left ventricular (LV) function and increases the survival rate [1, 2]. However, MVR with preservation of chordal tendineae can lead to LV inflow and outflow obstruction and alterations in LV geometry, potentially causing rupture of the papillary muscles, systemic embolization, or dehiscence of the mitral annulus from the transposed position [3-7]. This article describes a case of preserved papillary muscle imitating an abnormal mass after MVR with partial chordal preservation.

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Case report

A 26-year-old man with dyspnea and coughing that had worsened in the preceding two days was admitted as an outpatient Chang Gung Memorial Hospital (Linkou, Taiwan). Although exhibiting general malaise, he had no fever or other symptoms. The patient had a family history of neurofibromatosis and epilepsy.

The patient was intubated upon admission. Physical examination revealed marked rales over bilateral lung fields, grade IV apical systolic murmur, wide splitting of S2, multiple cutaneous neurofibromas, and pitting edema of the extremities. Atrial fibrillation was discovered by electrocardiogram. Transthoracic echocardiography (TTE) and transesophageal echocardiography (TEE) indicated rheumatic heart disease with severe mitral regurgitation (MR) due to flail anterior leaflet, mild to moderate aortic

regurgitation, and mild aortic stenosis. LV ejection fraction was 81%. Catheterization with hemodynamic study found normal coronary arteries, severe MR, and a high pulmonary wedge pressure.

Mitral valves of the patient were replaced with a 29 mm porcine stented bioprosthesis (St. Jude Medical, Inc., Belo Horizonte, Brazil) using Miki's MVR technique [8], with excision of the mitral annulus, preservation of the posterior chordae tendineae, and partial preservation of the anterior chordae tendineae. Tricuspid annuloplasty was then performed using a 28 mm MC3 ring (Edwards LifeSciences, Irvine, CA). Maze procedure was accomplished because of atrial fibrillation. Total aortic clamp and cardiopulmonary bypass times were 109 and 191 minutes, respectively. Pathologic report of aortic valve confirmed degenerative fibrosis tissue and was compatible with rheumatic heart disease

Two-weeks later with anticoagulation therapy by heparin, TTE indicated a mass in the posterior roof of the left atrium (LA) (2.69 × 1.65 cm) and another homogenous, spherical and smooth mass (2.08 × 1.0 cm) involving the posterior papillary muscle in the LV cavity (**Figure 1A** and **B**) in sinus rhythm. Moderate aortic stenosis, mild aortic regurgitation, and a moderate amount of pericardial effusion were found, respectively. Urgent re-operation was conducted the following day based on the impression of LA thrombus and suspected LV thrombus. Intra-operative transesophageal echocardiography (TEE) was performed, confirming a floating mass in the posterior inferior aspect of the LA, and another hyperechoic, chaotic motion, lobulated mass joining the tip of the posterior papillary muscle in the LV cavity. The mass located in the posterior roof of the LA was a large thrombus measuring 5.8 × 3.0 cm. The mitral bioprosthesis was apparently functional and intact. No thrombus occurred in the LV. According to our results, the lobulated mass in the LV cavity was the stump of the preserved posterior papillary muscle of the mitral valve (**Figure 2**). However, health of the patient still deteriorated continuously after surgery and he succumbed to severe sepsis and multiple organ failure four days later.

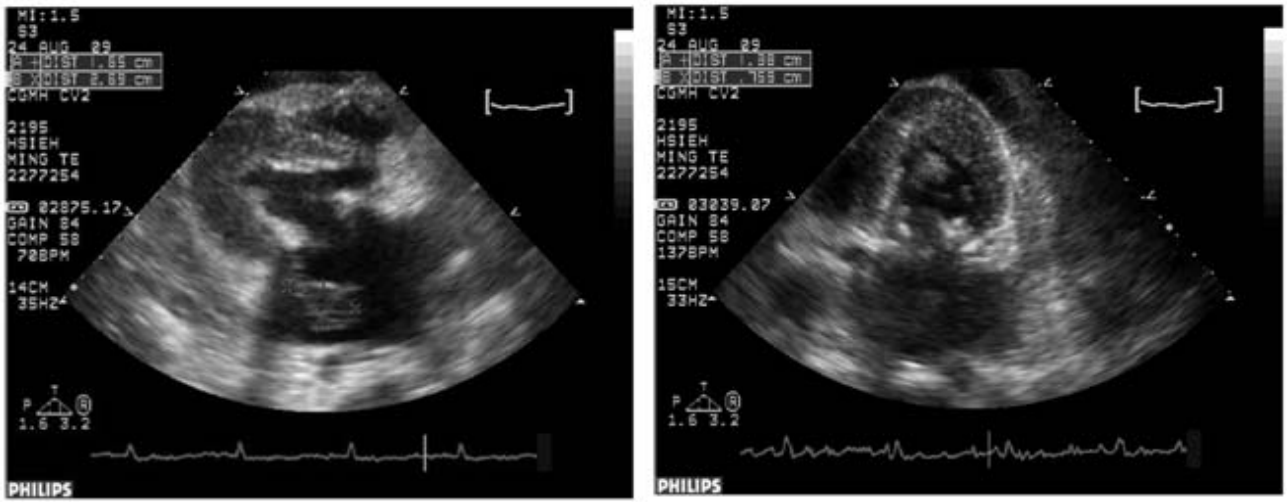

Figure 1. **A:** Transthoracic echocardiogram revealing a mass in the posterior inferior aspect of the left atrium which was subsequently identified as a thrombus. **B:** Another hyperechoic, homogenous, spherical mass involving the posterior papillary muscle in the left ventricular cavity.

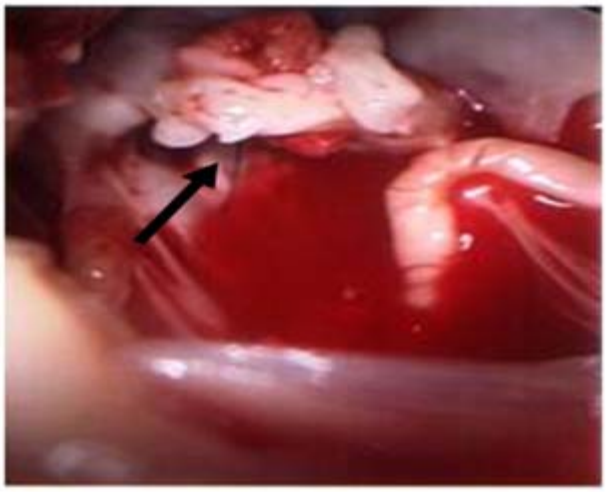

Figure 2. Intraoperative photograph exhibiting the stump of the ruptured posterior papillary muscle of the mitral valve.

Discussion

Previous studies have noted spontaneous rupturing of the papillary muscles following MVR, in which an effort was made to preserve the subvalvular apparatus [3, 5-7]. In most cases, the stump of the ruptured papillary muscle is viewed as an atypically thin, mobile, peduncular structure prolapsing through the aortic valve. A related study described mass arising from the papillary muscles that mimic vegetation [3]. Other studies described disc or poppet entrapment by surgically divided chordal remnants, long suture ends, overhanging knots, and atrial catheters [9].

In this study, two large, abnormal masses following MVR were observed, which we assumed to be thrombi or vegetations. The possibility of subvalvular tumors such as rhabdomyomas, which are strongly associated with tuberous sclerosis, was ruled out because no lesions were identified in preoperative echocardiograms obtained two weeks before the mass appeared. Re-operation was determined based on the presence of new masses and prevention of possible dislocation, thrombosis, and embolization.

Thromboembolism is a potentially lethal complication of valve replacement surgery that is estimated to occur in 0.6-1.8% per patient years for bi-leaflet prostheses [10]. In our study, a large thrombus was found in the posterior roof of the LA, in addition to the stump of the ruptured posterior papillary muscle of the mitral valve. Despite our removal of the thrombus and the stump, the patient still succumbed rapidly to severe sepsis and multiple organ failure.

Maintaining continuity between the anterior and posterior papillary muscles, which are attached to the ventricular surfaces of the anterior and posterior leaflets via chordae tendineae, enhances the LV function and helps to maintain normal geometry [1, 2]. Despite evidence advocating preservation of the subvalvular apparatus, retaining continuity may be difficult in cases of infective endocarditis that the subvalvular apparatus becomes diseased due to sclerosis and thickening. We thus recommend excising the papillary muscles with a subvalvular apparatus completely in a preexisting diseased subvalvular apparatus. In this case study, we believe that recoil of the papillary muscle occurred following MVR and it imitated the LV tumor. This occurrence poses a dilemma for the LV tumor with an unknown etiology appearing in the TTE.

This case demonstrates that the stump of a papillary muscle can present itself as an abnormal homogenous, spherical and elastic mass on echocardiography following MVR with preservation of the subvalvular apparatus. Routine TTE and TEE may be difficult to differentiate the recoiled papillary muscle from another diagnosis, and resection of papillary muscle completely during MVR can prevents this situation.

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