

Percutaneous mitral valve repair with the MitraClip system in a patient with subacute severe mitral regurgitation caused by papillary muscle rupture

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Introduction

Papillary muscle rupture (PMR) is usually associated with acute myocardial infarction (MI) and rarely seen as the only clinical and echocardiographic finding (1). If PMR is treated medically, the prognosis is very poor (2). However, even with surgery, it carries a high mortality (3).

We report, to the best of our knowledge, the first case of mitral valve repair with the MitraClip system of subacute severe MR with flail anterior mitral valve leaflet caused by PMR.

Case Report

A 73-year-old man with a history of very severe chronic obstructive pulmonary disease, chronic hepatitis C, hypertension, diabetes mellitus and MI was referred to our hospital from another hospital because of very symptomatic severe MR.

The patient was first seen by a general physician in a rural hospital. The working diagnosis was unstable angina pectoris and heart failure, and he was medically managed. After 1-week hospitalization, he was transferred to another hospital for further evaluation. In this hospital, creatine kinase and troponin levels were not elevated. A transthoracic echocardiogram (TTE) showed severe MR, but the cause of the MR could not be discerned. His condition was diagnosed as acute severe MR due to unstable angina pectoris.

Initial examination at our hospital revealed the following: blood pressure 115/60 mm Hg, heart rate 92 bpm, bibasilar crackles on lung examination, and a holosystolic murmur at his apex. A new TTE revealed akinesis of inferior wall, left ventricular diastolic diameter of 60 mm, systolic diameter of 41 mm and ejection fraction of 40%. Transesophageal echocardiography (TEE) demonstrated a part of calcified papillary muscle attached via chords to the anterior mitral valve leaflet moving like a whip in the left atrium during systole (Fig.1, Video 1. See corresponding video/movie images at www.anakarder.com). It showed also a posteriorly directed eccentric jet of severe MR from the middle scallops of both mitral leaflets (A2 and P2 segments) with flail anterior mitral valve leaflet and extensive calcification of both papillary muscles (Fig. 2, Video 2. See corresponding video/movie images at www.anakarder.com).

A preoperative coronary angiography showed, a 40% distal left main stenosis, 70% proximal stenosis of the left circumflex coronary artery and a total occlusion of the mid right coronary artery with retrograde filling from the proximal right coronary artery from a collateral circulation. Since the cardiac surgeons refused the patient due to very severe chronic obstructive pulmonary disease, the patient and his family were offered percutaneous repair of severe MR and informed consent was obtained.



Figure 1. Transesophageal echocardiography demonstrates a part of calcified papillary muscle attached via chords to the anterior mitral valve leaflet in four-chamber view

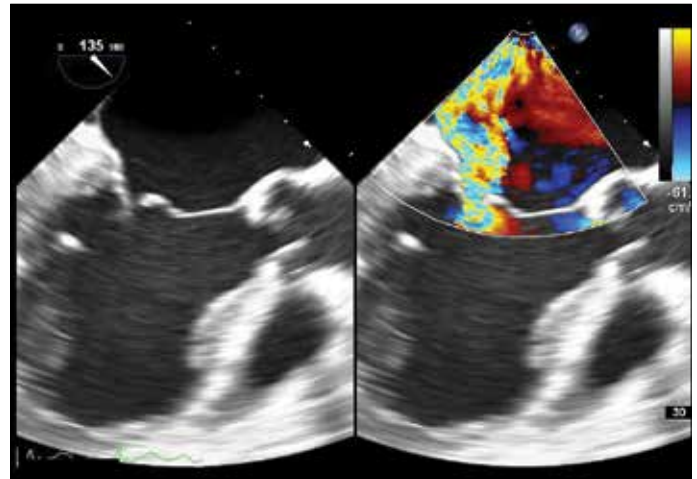


Figure 2. Transesophageal echocardiography demonstrates a posteriorly directed eccentric jet of severe mitral regurgitation from the middle scallops of both mitral leaflets (A2 and P2 segments) with flail anterior mitral valve leaflet in long-axis view

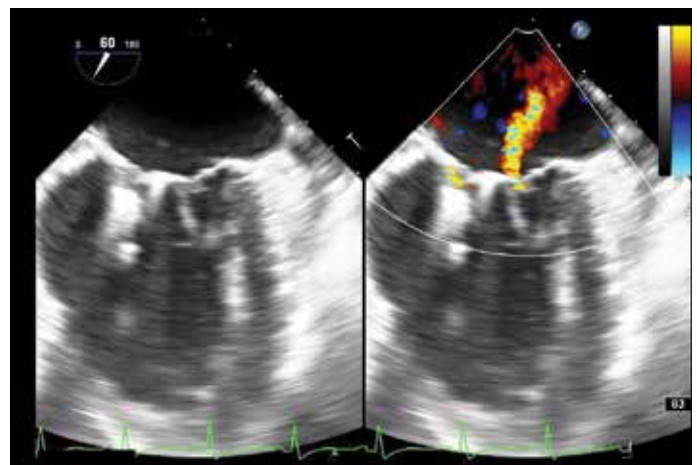


Figure 3. After the procedure, transesophageal echocardiography demonstrates grade I mitral regurgitation in long-axis view

All interventions were performed as previously described (4). We were not successful at many attempts in grasping of the leaflets. Finally,

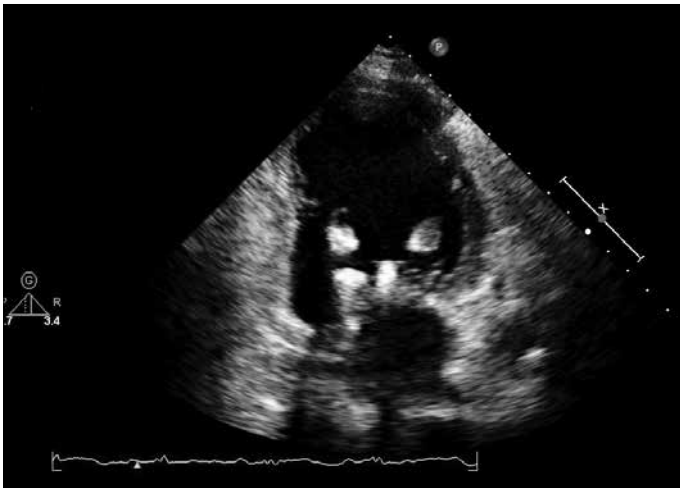


Figure 4. After the procedure control transthoracic echocardiography demonstrates chaotic echoes in the posteromedial papillary muscle in apical two-chamber view

to stabilize anterior and posterior leaflets and to enable placement of target final clip, starting very close to the posteromedial commissure next to the central regurgitation jet, the first MitraClip (Abbott Vascular, Santa Clara, CA, USA) was implanted (Video 3. See corresponding video/movie images at www.anakarder.com). Then, the second MitraClip was directed towards the origin of the regurgitant jet mainly between A2 and P2 scallops and was implanted easily. In the end of the procedure, TEE demonstrated a significant reduction of MR grade from IV to grade I MR (Fig. 3, Videos 4 and 5. See corresponding video/movie images at www.anakarder.com). On a control TTE after the procedure, apical two-chamber view demonstrated chaotic echoes in the posteromedial papillary muscle (Fig. 4, Video 6. See corresponding video/movie images at www.anakarder.com). This suggested possible posteromedial papillary muscle rupture.

Discussion

PMR is defined as the rupture of conical muscular projections from the walls of the cardiac ventricles attached to the cusps of the mitral valve by the chordae tendinae (5). PMR is most frequently associated with acute MI or blunt chest trauma (2, 6). Other causes such as sepsis, vasculitis, endocarditis, hypertrophic or dilated cardiomyopathy, coronary embolism, and spontaneous PMR are very rare (7, 8).

This patient had a total occlusion of the mid right coronary artery. Even though the initial cardiac biomarkers in the rural hospital were not elevated, we can not rule out the causal relationship between a remote ischemic event and papillary muscle rupture. In addition, because of the patient's age and diabetic status, the patient might have a relatively high chance of silent myocardial ischemia. Therefore, the papillary muscle rupture of this patient might be related to a recent or remote event of myocardial infarction.

In a recent study in which feasibility and efficacy of Mitraclip implantation in critically ill patients with severe MR were assessed, they reported 4 patients with acute ischemic functional MR who were successfully treated with MitraClip (9). More recently, it has been shown that MitraClip could be safe, feasible and effective approach in the treatment of acute MR due to PMR as a complication of acute MI (10).

Conclusion

This report indicates that subacute severe MR with flail anterior mitral valve leaflet caused by partial PMR could be treated by the MitraClip system.

Video 1. Transesophageal echocardiography demonstrates a part of calcified papillary muscle attached via chords to the anterior mitral valve leaflet moving like a whip in the left atrium during systole in four-chamber view

Video 2. Transesophageal echocardiography demonstrates a posteriorly directed eccentric jet of severe mitral regurgitation from the middle scallops of both mitral leaflets (A2 and P2 segments) with flail anterior mitral valve leaflet in long-axis view

Video 3. Transesophageal echocardiography showing implantation of the first clip

Video 4. After the procedure, transesophageal echocardiography demonstrates grade I mitral regurgitation in long-axis view

Video 5. After the procedure, transesophageal echocardiography demonstrates grade I mitral regurgitation in two-chamber view

Video 6. After the procedure, control transthoracic echocardiography demonstrates chaotic echoes in the posteromedial papillary muscle in apical two-chamber view

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