Successful Surgical Repair of the Parachute Mitral Valve with Mitral Valve Regurgitation

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A 65-year-old woman with exercise-related dyspnea was admitted to our hospital. Transthoracic echocardiography demonstrated a large anomalous papillary muscle that originated from the posterior wall of the left ventricle and severe mitral valve regurgitation in systole. Cleft suture, 5-0 polytetrafluoroethylene sutures from a single papillary muscle to the anterior commissure leaflet (AC), 5-0 polypropylene sutures between AC and A1, and between A1 and A2, the double-orifice technique, and ring plasty with 32-mm semi-rigid ring was performed. Postoperative echocardiography showed an improvement in severe mitral valve regurgitation. At the 2-month follow-up, the patient was in good health. In the present case, the elderly patient with an isolated parachute mitral valve but without any other cardiac anomaly and presenting with mitral valve regurgitation is extremely rare. This case of mitral valvuloplasty for a parachute mitral valve with a single papillary muscle in an elderly woman has not been reported before.

Keywords: parachute mitral valve, single papillary muscle, mitral valve regurgitation, mitral valve plasty

Introduction

Parachute mitral valve (PMV) with mitral valve stenosis in infancy and early childhood is a comparatively rare congenital cardiac anomaly. A so-called ‘true parachute mitral valve’ has the chordae tendinae of both leaflets of the mitral valve supported by a single papillary muscle. Most patients are diagnosed in childhood with the pathologic complex known as Shone’s Anomaly. In this report, we describe a case of the elderly patient with an isolated single papillary muscle without other cardiac anomalies and presenting with mitral valve regurgitation.

Case Report

A 65-year-old woman who had exercise-related dyspnea was admitted to our hospital for evaluation. She had been asymptomatic before presentation. On physical examination, there was a grade 4/6 holosystolic regurgitant murmur audible throughout the precordium. The peripheral pulses were normal, and the rest of her examination was unremarkable. Anteroposterior chest X-ray demonstrated no cardiomegaly. A two-dimensional and color Doppler echocardiogram was performed. It demonstrated a large anomalous papillary muscle that originated from the posterior wall of the left ventricle with a dilated left atrium and left ventricle, and a cleft in the posterior leaflet of the mitral valve (Fig. 1a). Color Doppler showed severe mitral valve regurgitation in systole (Fig. 1b). Pulse-Doppler recording of transmitial flow from the left ventricle apex demonstrated no features of mitral valve stenosis (Fig. 1c). Cardiac catheterization was performed which confirmed the diagnosis and demonstrated hyperkinetic pulmonary artery...
hypertension. It demonstrated normal coronary arteries, mean pulmonary artery pressures of 18 mmHg, and pulmonary capillary wedge pressure of 12 mmHg.

The patient was referred for surgical repair. The operation was performed through a median sternotomy with the use of cardiopulmonary bypass with moderate systemic hypothermia (28–30°C). The operative findings included a single papillary muscle attached to both anterior and posterior leaflet of mitral valve (Fig. 2a and 2b). To reduce regurgitant flow (Fig. 3a), cleft suture, 5-0 polytetrafluoroethylene sutures from the single papillary muscle to the anterior commissure leaflet (AC), 5-0 polypropylene sutures between AC and A1, and between A1 and A2, the double-orifice technique (Fig. 3b), and ring plasty with 32-mm semi-rigid ring was performed (Fig. 3c). And, reduction annuloplasty of the right-sided atrioventricular valve was performed. Aortic cross-clamp time was 179 minutes, and cardiopulmonary bypass time was 198 minutes. At the intra-operative transesophageal echocardiography, there was no left-sided atrioventricular valve stenosis or grade I regurgitation, no right-sided atrioventricular valve stenosis or regurgitation. The patient was transferred to the intensive care unit, and postoperative course was uneventful. Apical four-chamber view with color Doppler in the postoperative period demonstrated grade I mitral valve regurgitation. Pulse-Doppler recording of

Fig. 1  a) Two-dimensional transthoracic echocardiographic short-axis view demonstrated the posteri-orly located large single papillary muscle (arrow). b) Apical two-chamber view with color Doppler demonstrated mitral valve regurgitation. c) Pulse-Doppler recording of transmitral flow from the left ventricle apex demonstrated no features of mitral valve stenosis. Peak velocity 0.82 m/sec.
transmitral flow from the left ventricle apex demonstrated no features of mitral valve stenosis. The patient was discharged 11 days after surgery. At the 2-month follow-up, the patient was in good health.

**Discussion**

PMV is defined as a unifocal attachment of mitral valve chordae independent of the number of papillary muscle and may cause subvalvular obstruction. Chordal attachments are more common to the posteromedial papillary muscle (73%) than the anterolateral papillary muscle (27%). The valve is generally stenotic since it only permits blood flow from the left atrium to the left ventricle through the interchordal spaces. Marino et al. reported in the cohort study that 72% of patients with PMV had at least grade I left-sided obstruction, 47% had grade II or more levels of left-sided obstruction, and 21% had grade III or more levels of left-sided obstruction. The levels of left-sided obstruction were identified at the mitral valve (supravalvular mitral ring, MS), aortic valve (subaortic stenosis, aortic stenosis, aortic atresia, supravalvular aortic stenosis), and aortic arch (aortic arch hypoplasia, coarctation of the aorta, interrupted aortic arch). Our patient with PMV did not have subvalvular obstruction and pathological condition of mitral valve stenosis. One reason might be so that blood flow through interchordal space was large enough because of the congenital lack of AC chordae. And, it might cause mitral valve regurgitation.
Most patients are diagnosed in childhood with the pathologic complex known as Shone’s Anomaly, which includes a PMV, aortic coarctation, atrial septal defect, ventricular septal defect, aortic valve stenosis, subaortic stenosis, and left ventricular hypoplasia.4) As in this case, elderly patient of the isolated single papillary muscle without other cardiac anomaly and presenting with mitral valve regurgitation is extremely rare. Marino et al. also reported that most patients with PMV did not have mitral valve regurgitation at initial echocardiogram, and only a small number of patients had progression to hemodynamically significant mitral valve regurgitation.2) It is unknown how long our patient has mitral valve regurgitation. However, according to the report, patients with PMV may be at risk for progressive mitral regurgitation and should be followed up.

On diagnosis and assessment of congenital valve disease, with the use of two-dimensional and color Doppler echocardiogram, it was possible to demonstrate regurgitation in patient with mitral valve anomaly. The result of transthoracic and transesophageal echocardiography led to a subsequent plan for surgical intervention, especially in mitral valvuloplasty. In addition, intraoperative transesophageal echocardiography was superior in defining the anatomy of the subvalvular apparatus with prospective identification of single papillary muscle that supported both mitral valve orifices with parachute phenomenon.5)

From the aspect of long-term prognosis, it is well-known that mitral valvuloplasty is superior to mitral valve replacement. Zhou et al. reported that thirty-day mortality was lower after mitral valvuloplasty compared to after mitral valve replacement. Late survival at 1 and 5 years in the mitral valvuloplasty group was 94.4% and 84.3% versus 80.4% and 64.6% in the mitral valve replacement group, respectively.5) However, the results of the mitral valvuloplasty for congenital mitral valve disease in the adult are not incompletely clarified. Our patient should be carefully followed-up in future.

To our knowledge, this sort of mitral valvuloplasty for PMV with single papillary muscle in elderly woman has not been reported before.

**Conclusion**

We report a successful mitral valvuloplasty for parachute mitral valve with mitral valve regurgitation in elderly woman.

**Disclosure Statement**

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**References**