

Systolic anterior motion: an unusual cause of late mitral valve repair failure

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DESCRIPTION

A 50-year-old woman, who underwent mitral valve repair (MVR) with a complete rigid mitral ring annuloplasty (Carpentier-Edwards 30; Edwards Life-sciences) 8 years ago for severe mitral regurgitation (MR) due to Barlow's disease, was apparently asymptomatic for 5 years and then started to develop progressively worsening exertional dyspnoea (New York Heart Association stage III on presentation) and intermittent palpitation for last 3 years. Details of her surgical procedures were not available as the surgeries took place 8 years back in different hospitals in different states of India. Her pulse was 78 beats per minute with a rapid upstroke. Cardiac auscultation revealed an ejection systolic murmur in the neo-aortic area which decreased on squatting. Also a pan-systolic murmur was noted in the apical region with radiation to axilla. The 12 lead surface electrocardiograms showed sinus rhythm features of left ventricular hypertrophy (LVH) with strain pattern. Holter monitoring for 24 hours revealed paroxysmal atrial fibrillation (AF). Two-dimensional trans-thoracic echocardiography (2D-TTE) showed dilated left atrium with annuloplasty ring (figure 1A), with systolic anterior motion (SAM) of anterior mitral valve leaflet (AML) in para-sternal long axis view causing turbulence in colour Doppler (figure 1B) and M-mode (figure 1C), with concentric LVH and redundant AML touching interventricular septum in apical four-chamber view (figure 1D) causing turbulence in left ventricular outflow tract (LVOT) obstruction (figure 1E) with LVOT gradient of

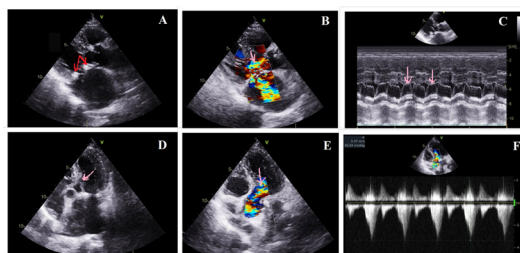


Figure 1 Two-dimensional trans-thoracic echocardiography showed dilated left atrium with annuloplasty ring (red arrows, A), with systolic anterior motion of anterior mitral leaflet (AML) in para-sternal long axis view causing turbulence in colour Doppler (pink arrow, B) and M-mode (pink arrow, C), with concentric left ventricular hypertrophy and redundant anterior mitral leaflet touching inter-ventricular septum in apical four-chamber view (pink arrow, D) causing turbulence in left ventricular outflow tract (LVOT) (pink arrow, E) with LVOT gradient of 45 mm Hg (F).

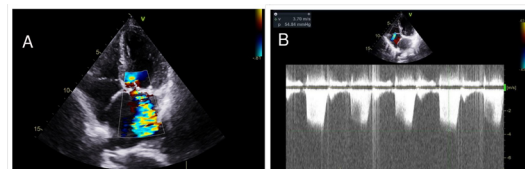


Figure 2 Two-dimensional trans-thoracic echocardiography of a post-mitral valve repair. (A–B) Patient showing severe mitral regurgitation with posterior jet in apical four-chamber view (A) and mild tricuspid regurgitation with peak right ventricular systolic pressure gradient of 54 mm Hg were also noted in continuous wave Doppler (B).

45 mm Hg (figure 1F). Severe MR with posterior jet (figure 2A) and mild tricuspid regurgitation (TR) with peak right ventricular systolic pressure gradient of 54 mm Hg were also noted (figure 2B).

Following the MVR, the patient was apparently well on medical treatment with beta-blocker, diuretic and anticoagulant. For last 3 years, she developed progressively worsening exertional dyspnoea despite medical treatments. And her echocardiography revealed SAM causing LVOT obstruction. Dose of beta-blockers were optimised and yet the patient remained symptomatic with dyspnoea and SAM in echocardiography was persistent. Opinion was taken from the cardiothoracic surgeons and the patient was posted for re-operation after informed consent for MVR or mitral valve replacement (MVR). Midline re-sternotomy was done, cardiopulmonary bypass was established and mitral valve was approached through the left atrium. AML was found to be thick and redundant and entire AML was excised. No thickened papillary muscle was seen to cause LVOT obstruction. The LVOT gradient came down to 5 mm Hg but intraoperative trans-oesophageal echocardiography (TOE) revealed no reduction of MR. So, decision of MVR was made on the table. Annuloplasty ring was excised, and MVR with bileaflet metallic valve (30 mm, St Jude Medical) was done successfully with favourable postoperative evolution. The patient was discharged 14 days after surgery. The patient is on warfarin, aspirin and beta-blocker. Three months later, the patient is asymptomatic and free from SAM and no MR on repeated TTE.

SAM is a known but infrequent complication of mitral reconstructive surgery which may result from patient-related factors like excessive leaflet tissue (Barlow's disease) with a tall posterior leaflet (>15 mm), ratio between the heights of the anterior and posterior leaflets ≤ 1.3 , aorto-mitral plane angle $< 120^\circ$, short distance between the



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inter-ventricular septum and the mitral leaflet co-aptation point (<15 mm), small and hyperkinetic left ventricle and anterior displacement of the papillary muscles and procedure-related factors like inadequate reduction of the posterior leaflet height (which still remains >15 mm) and insertion of a small prosthetic ring.^{1–3} Surgical techniques of MVRe have been tailored to prevent SAM which include leaflet resection with sliding plasty, folding plasty, the posterior leaflet shortening technique, partial ring rather than complete ring, septal myectomy in case of bulging sub-aortic inter-ventricular septum and edge-to-edge (EE) suture.^{3–6} However, if SAM is detected during weaning from cardiopulmonary bypass, measures can be undertaken to minimise SAM by discontinuing inotropes followed by volume expansion, use of intravenous beta-blockers and partial digital compression of the ascending aorta to increase afterload.^{6,7} Late clinical outcome of patients who had transient SAM was found to be satisfactory with conservative measures.⁶ However, if SAM persists and the patient deteriorates haemodynamically, surgical revisions may be required which include EE suture, posterior leaflet shortening, excision of anterior leaflet and rarely MVR.^{2,4,8}

SAM is an unusual cause of MV repair failure after 8 years of surgery and has rarely been reported in the literature.⁹ This may occur due to multitudes of reasons including inadequate excision of redundant AML, regrowth of AML postoperatively, missing diagnosis of thickened papillary muscle which later causes SAM, mitral ring implantation without leaflet excision. A large surface of leaflet co-aptation should be ensured to achieve

good long-term results in MVRe. However, too much reduction of the height of the AML may compromise the long-term durability of the repair.¹⁰

Details of previous surgery were not available in our case. During the re-operation, AML was found to be thick and redundant and may be due to incomplete excision of AML or regrowth of AML due to degenerative Barlow's disease. Considering the symptoms of the patient and the lacunae of evidence in managing SAM so late after MVRe, and the persistence of MR despite excision of redundant AML tissue, the surgeons advised for MVR in our case.

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Learning points

- ▶ The degree of systolic anterior motion (SAM) after mitral valve repair can range from minor chordal protrusion with minimal left ventricular outflow tract obstruction and trivial mitral regurgitation (MR) to more severe obstruction with massive MR.
- ▶ SAM can be transient and reversible or resistant, not responding to conservative approach and requiring surgical revision.
- ▶ SAM typically occurs immediately after the reparative surgery and it is detected while weaning from cardiopulmonary bypass. Occasionally it is discovered after surgery, and exceptionally it is observed postoperatively after years.

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