

CASE REPORT

Transmitral extraction of a huge left ventricular mural thrombus using a novel mitral leaflet retractor

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Abstract

A 52-year-old woman with a past history of anterior myocardial infarction 15 years previously was found to have a pedunculated mobile thrombus with a narrow stalk originating from the left ventricle, and a huge laminated mural thrombus. Surgical extraction of the two organized thrombi was successfully performed with transmitral approach using a novel, flexible, self-retained, and reusable leaflet retractor, which was originally developed for exposure of the subvalvular apparatus during mitral valve repair. Excellent access, exposure, and visualization of the left ventricle were achieved by this heart valve retractor and an endoscope for removal of a huge mural thrombus.

KEYWORDS

left ventricular thrombus, mitral leaflet retractor, transmitral approach

1 | INTRODUCTION

Most of the left ventricular (LV) thrombi occur after anterior myocardial infarction.¹ Surgical extraction is required if a thrombus carries a risk of thromboembolism. Trans-aortic or transmitral approach without left ventriculotomy has been reported to be feasible for relatively small mobile thrombi.²⁻⁴ We herein report a case of a pedunculated mobile and a huge laminated mural thrombi, which was successfully removed via left atrium using a flexible, self-retained mitral leaflet retractor to obtain an excellent exposure of the LV.

2 | CASE SUMMARY

An asymptomatic 52-year-old woman was found to have a pedunculated mobile mass with a narrow stalk

originating from the left ventricular free wall, and a large immobile mass laminated along the apex on echocardiography (Figure 1A). She had undergone percutaneous coronary intervention to the left anterior descending artery (LAD) for acute myocardial infarction 15 years previously, but had been lost to follow-up since. These two masses appeared to be organized thrombi on cardiac magnetic resonance imaging (MRI) study (Figure 1B). Coronary angiography showed total occlusion of the LAD at the level of the previously placed stent. MRI revealed no viability of the LAD territory, which excluded candidacy for surgical revascularization. Echocardiography also showed impaired left ventricular ejection fraction (LVEF) of 25% with anterior wall akinesis, and diastolic and systolic left ventricular diameters were 60 mm and 53 mm, respectively. There were trace mitral and tricuspid regurgitations.

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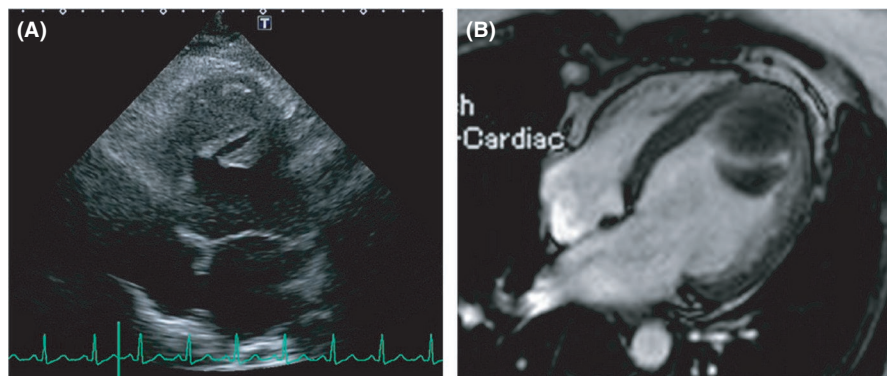


FIGURE 1 Transthoracic echocardiography (A) and magnetic resonance imaging (B) showed a pedunculated mobile and a laminated mural thrombi in the left ventricle



FIGURE 2 MitrOB mitral leaflet retractors

She underwent surgery considering the potential risk of thromboembolism. Cardiopulmonary bypass was established with ascending aortic perfusion and bicaval venous drainage through median sternotomy. The anterior wall and the apex of the heart were adhered to the pericardium. There was no apical aneurysm formation detected after this adhesion was dissected. The heart was

arrested with antegrade cold blood cardioplegia, and the left atrium was entered via the right side left atriotomy. Cardiac arrest was then maintained by antegrade infusion of cold blood cardioplegia every 20 min. A flexible leaflet retractor, MitrOB (Delacroix-Chevalier), was used to facilitate exposure of the LV through the mitral valve (Figure 2). The pedunculated mass was observed and removed by cutting the fibrous narrow stalk which attached to the ventricular wall (Figure 3A). The other mural thrombus which was laminated along the apex was scraped off the left ventricular wall, and extracted almost in one piece to avoid fragmentation (Figure 3B,C). Putting some sponges in the pericardial space against the apex of the heart further enhanced exposure of the LV. An endoscope was used to detect residual pieces of the thrombus, which were thoroughly removed piece by piece especially from the septal wall and papillary trabeculations (Figure 3D). The LV was copiously irrigated to remove all residual debris. Competency of the mitral valve was confirmed on water test and transesophageal echocardiography. Visually estimated LVEF was approximately 20% immediately after aortic unclamping, and 30 min

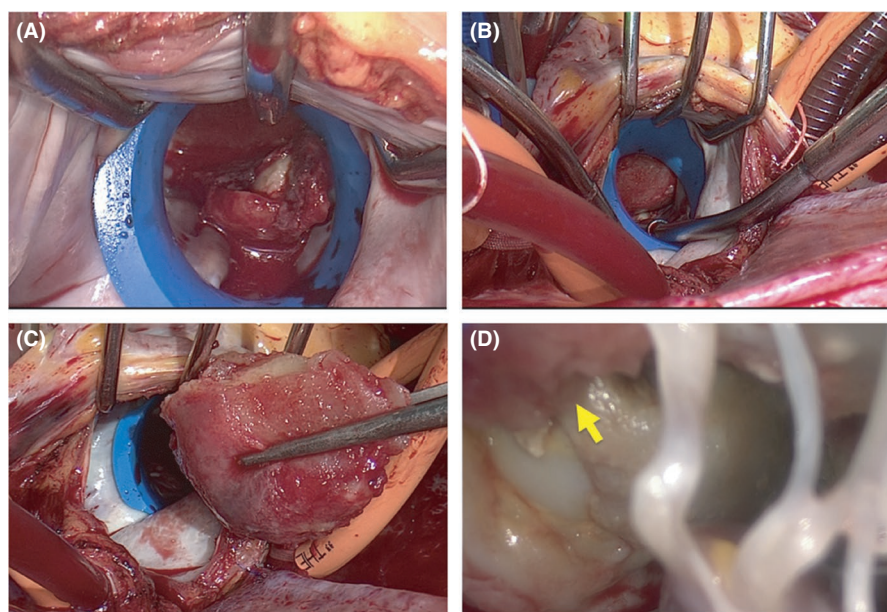


FIGURE 3 (A) Pedunculated thrombus is seen through the mitral annulus with the assistance of the leaflet retractor. (B) Mural thrombus is seen after the mobile one was removed. (C) Organized, mural thrombus is extracted. (D) Endoscopy shows small pieces of the remnant thrombi on the ventricular septum, which are to be further removed thoroughly (arrow)

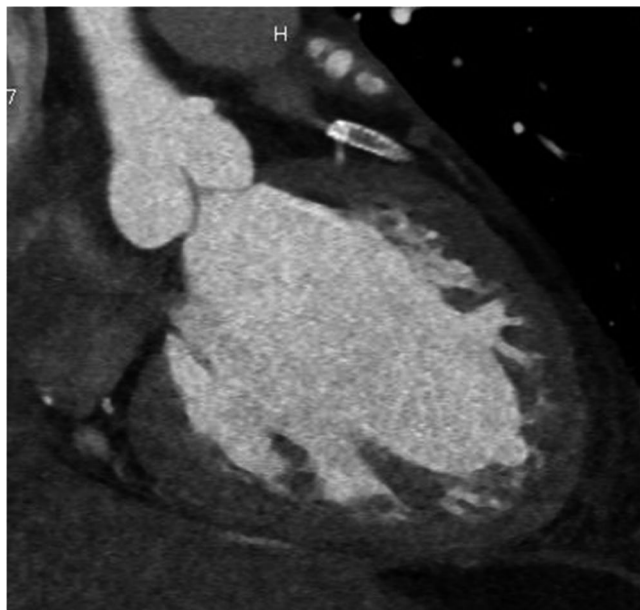


FIGURE 4 There is no evidence of residual thrombus on postoperative computed tomography

of assisted circulation was required before weaning from cardiopulmonary bypass on 4 $\mu\text{g}/\text{kg}/\text{min}$ of dobutamine. The patient required no catecholamines on arrival in the intensive care unit. The operation time, the cardiopulmonary bypass time, and the aortic cross clamp times were 233, 140, and 92 min, respectively. All the extracted specimens were confirmed as organized thrombi on pathology. Postoperative computed tomography showed no residual thrombus (Figure 4). Echocardiography on 10th postoperative day showed LVEF of 27%. The patient was started on anticoagulation with warfarin and discharged home without complications.

3 | DISCUSSION

According to a recent large cohort study, LV thrombus was identified in 1.6% of patients with ST segment elevation myocardial infarction within 2 days after the onset, and 89% of them occurred after anterior myocardial infarction.¹ Surgical extraction is required for mobile thrombi and also for mural thrombi to prevent systemic thromboembolism when anticoagulation therapy is not effective. There has also been a literature to report an infected LV thrombus.⁵ Left ventriculotomy is conventionally performed to remove thrombi, especially mural ones, and may be less time consuming in terms of cardiac arrest, which is crucial for patients with low LVEF. Left ventriculotomy, however, carries a possible risk of hemorrhage, or LV dysfunction if the anterior wall still has some viable areas. Trans-aortic^{2,3} or transmitral⁴ approach has been alternatively performed for small mobile thrombi. To our knowledge, however,

there has been no literature to report transmitral approach for removal of a huge mural thrombus. Excellent access, exposure, and visualization of the LV are of paramount importance. We used a novel flexible, self-retained, and reusable leaflet retractor, which was originally developed for exposure of the subvalvular apparatus during mitral valve repair. This device is made of 0.3 mm thick polypropylene sheet and can be easily folded by forceps followed by deployment in the mitral annulus. Its smooth surface is considered to carry little risk of leaflet injury. Adjustment of the insertion depth and the direction of the device provides a comprehensive view of the inside of the LV. The huge mural thrombus was easily extracted under direct vision by using this device in the present case. An endoscope was also used to visualize the LV cavity after the mural thrombus was removed. It was useful to detect, and get rid of small pieces of remnants on the ventricular septum, which becomes the ceiling of the cavity and can be a blind spot from the transmitral view. Transmitral approach using the MitrOB mitral valve retractor and an endoscope for LV thrombus extraction could be applicable to minimally invasive cardiac surgery not only for a mobile thrombus but also for a large mural one.

In conclusion, a mobile protruding thrombus and a huge embedded LV mural one were successfully removed by using the novel heart valve retractor and an endoscope through the mitral valve without left ventriculotomy.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

AUTHOR CONTRIBUTION

HI drafted the manuscript. HI, SB, BN, ST, and YS treated the patient. MT reviewed and supervised the manuscript. The final version of the manuscript was reviewed and approved by all authors.

CONSENT

A formal written informed consent was obtained from the patient.

DATA AVAILABILITY STATEMENT

The authors declare that the data supporting the findings of this report are available within the article.

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