

## Transaortic cardioscopic left ventricular thrombectomy

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### ABSTRACT

Left ventricular thrombi are mostly seen after complicated myocardial infarction, endocarditis, and myocarditis. Left ventriculotomy is the most common approach for removing a left ventricular thrombus and treating an aneurysm. However, it may occur without a ventricular aneurysm. Myectomy may cause many cardiac complications for vulnerable myocardium. Herein, we describe the case of a 51-year-old male treated with the successfully transaortic cardioscopic approach for left ventricular thrombectomy with a mobile thrombus and no myocardial aneurysm.

**Keywords:** Cardiac aneurysm, endoscopic surgical procedure, myocarditis, thrombus.

Left ventricular (LV) thrombus is a frequent complication of myocardial infarction, dilated cardiomyopathy, and myocarditis.<sup>[1]</sup> Left ventriculotomy is the most common approach for removing thrombi and treating aneurysms. This approach carries risks such as ventricular dysfunction, cardiac arrhythmias, contractile dysfunction, and bleeding. If the thrombus is mobile and pedunculated and there is no LV aneurysm, left ventriculotomy may not be necessary. We describe a case of endoscopic transaortic LV thrombectomy without ventriculotomy.

### SURGICAL TECHNIQUE

A 51-year-old male presented with complaints of exertional dyspnea, fatigue, and shortness of breath that persisted for five days. He had a history of diabetes mellitus and hypertension. He also had a history of coronavirus disease 2019 (COVID-19) a month ago. There were disseminated crackles on both lungs, abdominal respiration, and hypertension on physical examination. No heart murmurs were heard, heart rhythm was sinus rhythm. Polymerase chain reaction test for COVID-19 was negative. Troponin level was positive (31,766.4 µg/L). The patient was on amlodipine, ramipril, and hydrochlorothiazide, and he was not taking any antiaggregant or anticoagulant therapy before admission. Chest computed tomography scan revealed bilateral pleural effusion and severe pulmonary edema. He was admitted to the medical

intensive care unit for further investigations and intense medical therapy. The patient developed a transient ischemic attack, which appeared as a loss of consciousness for 5 min on the third day of admission.

Two-dimensional echocardiography revealed a 35% ejection fraction, anteroapical dyskinesia, moderate to severe mitral valve regurgitation, moderate tricuspid regurgitation, and a 3.5×1.5 cm mobile pedunculated thrombus, which attached to the apical left ventricle (Figures 1a, b; Video 1). Coronary angiography demonstrated a 20% stenosis in the left main artery, 30% stenosis in the left anterior descending artery, and 20% stenosis in the obtuse margin artery and right coronary artery. The patient was prepared for urgent cardiac surgery due to a potential recurrent thromboembolization.

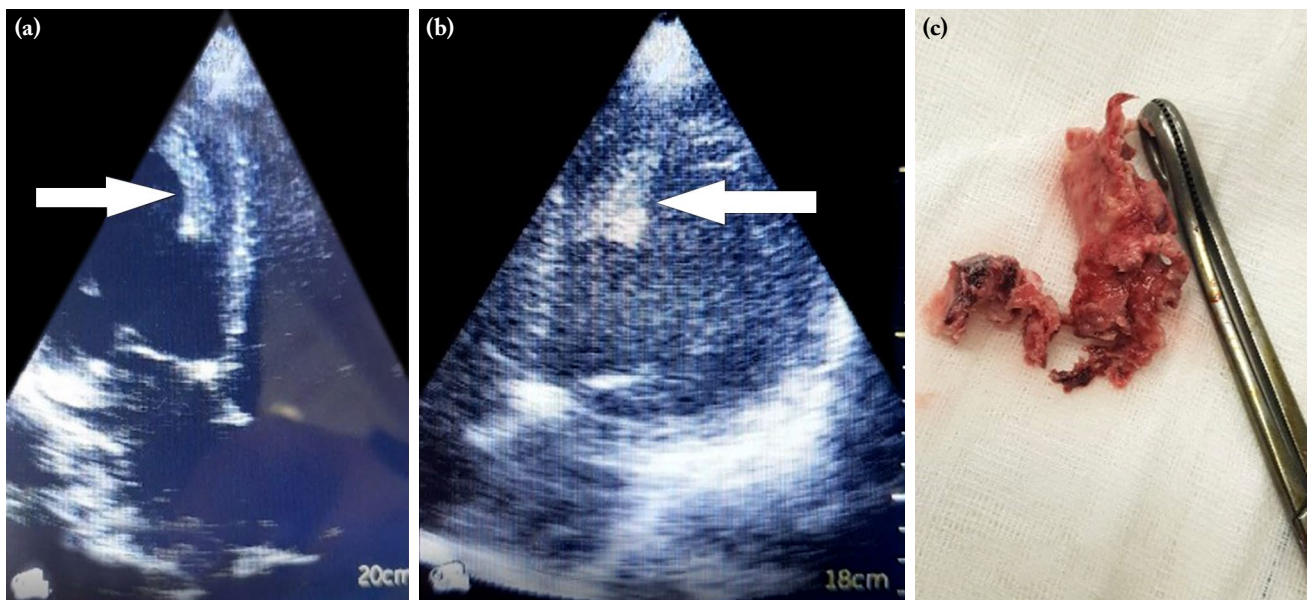
A median sternotomy was done under general anesthesia. Aorta-right atrial cannulation was performed after heparinization. Cardiopulmonary bypass (CPB) was established. A cross clamp was placed on the aorta and antegrade blood cardioplegia

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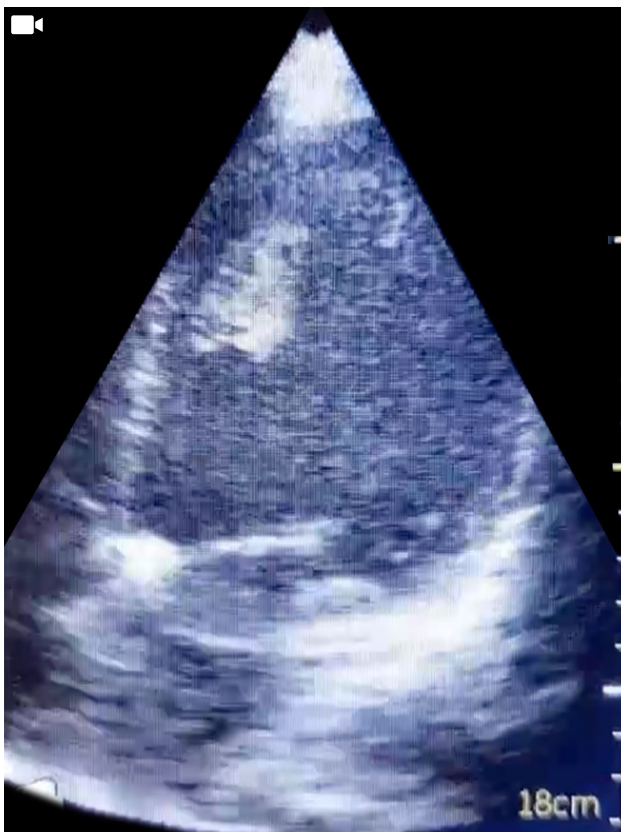
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**Figure 1.** (a, b) Two-dimensional transthoracic echocardiographic images of the LV thrombus (White arrows). (c) Thrombus material extracted by transaortic cardioscopy.



**Video 1.** Transthoracic echocardiographic view of the mobile left ventricular thrombus.

was delivered to arrest the heart. There was no LV aneurysm on direct cardiac examination. A left atriotomy was done, and the LV cavity was checked through the mitral valve. There was a fresh thrombus attached to the LV apex. It was hard to remove the thrombus via the left atrial approach due to the mitral chordal engagement.

A transverse aortotomy was made in the ascending aorta. Aortic leaflets were retracted, and the LV cavity was examined. A 3.5×2×2 cm thrombus was removed under direct vision (Figure 1c). It was hard to fully observe the LV cavity for checking any residual thrombus. An endoscopic camera was advanced to the left ventricle through the aortotomy incision. Another 1×1×1 cm thrombus was removed from the LV apex. The LV cavity was checked by an endoscopic camera. There was no more thrombus in the left ventricle. The cavity was irrigated by saline, and the aortotomy was closed. The mitral valve was examined. There was mitral annular dilatation and partial posterior leaflet prolapsing. Mitral valvuloplasty and ring annuloplasty was done by a 30 mm semirigid ring device. Intraoperative transesophageal echocardiogram demonstrated no intracardiac residual mass or thrombi and mild mitral regurgitation. Dopamine, noradrenaline, and

intra-aortic balloon support were established during weaning from CPB circulation.

The postoperative course was stable. The patient was extubated after 7 h. The intra-aortic balloon was removed on the second day, and the patient was transferred to the ward on the third day and discharged on the seventh day after the surgery. Oral anticoagulant (warfarin) therapy was maintained for six months. His physical condition was good (New York Heart Association Class 1), the ejection fraction was 55-60%, there was mild mitral regurgitation, and no cardiac thrombi were observed on follow-up echocardiograms.

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## DISCUSSION

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Left ventricular thrombi is mostly seen in patients with complicated myocardial infarction. Cardiac surgery morbidity and mortality risk increases in patients who have had COVID-19 infection in the perioperative period. Postponing the cardiac surgery for COVID-19-infected patients was advised if possible.<sup>[2]</sup> Our patient had a history COVID-19 a month before surgery, and the real-time polymerase chain reaction was negative preoperatively.

The presence of LV thrombi is associated with a risk of systemic embolization. The results of conservative treatment for mobile and pedunculated LV thrombi are poor compared to surgical treatment.<sup>[3]</sup> The mobility of an LV thrombus and history of cerebral embolism were strong indications for urgent cardiac surgery.

Surgical treatment is mostly performed by LV aneurysmectomy if there is an aneurysm. However, if there is no LV aneurysm, ventriculotomy may cause severe complications, such as severe arrhythmias, depressed myocardial contractility, and bleeding. A lot of new intracardiac thrombi case reports related to COVID-19 infection were recently published,<sup>[4-6]</sup> and it was remarkable that most of these cases did not form an LV aneurysm.<sup>[7]</sup>

In our case, the patient had no LV aneurysm but a mobile pedunculated thrombus in the LV apex and moderate to severe mitral valve regurgitation with noncritic coronary artery stenosis. Video-assisted cardioscopy was previously reported in a cardiac tumor and a thrombus excision.<sup>[8,9]</sup>

Left atriotomy could be a choice for the LV approach, but mitral chordal structure and fragility of the thrombus may not allow to reach and remove

the thrombus safely. Cardioscopy could be done through the left atriotomy as a transmitral approach. Unfortunately, our camera body was rigid and straight, the chest was deep, and the handle of the camera was not flexible. Transaortic approach is another choice. Therefore, we reached the inside of the left ventricle by the gentle retraction of aortic leaflets, and an endoscopic camera facilitated a view of the deep part of the LV cavity. All thrombus parts were removed safely, and the LV cavity was visualized by an endoscopic camera and irrigated by saline. Mitral ring annuloplasty was performed, and the operation was completed without any complications.

In conclusion, transaortic cardioscopy facilitates LV thrombectomy and avoids ventriculotomy. This is practical for removing a mobile or pedunculated LV thrombus in the absence of an LV aneurysm.

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**Author Contributions:** Idea, concept, design, control/supervision, data collection and processing, analysis, literature review, writing the article, review, references, materials: M.B.A.; Idea, data collection, literature review: B.U.

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