JACC: CASE REPORTS VOL. ■, NO. ■, 2026



CASE REPORT

CLINICAL CASE

# Transcatheter Left Ventricular Thrombectomy in a Critically Ill Child Using a Novel Retrieval Device

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## ABSTRACT

**BACKGROUND** Left ventricular (LV) thrombectomy is a high-risk procedure, but when anticoagulation fails, it may be an important treatment option to prevent a catastrophic outcome.

**CASE SUMMARY** A 13-year-old boy with congenitally corrected transposition of the great arteries developed an LV thrombus after heart transplantation despite systemic anticoagulation. Given ongoing cerebrovascular events, we elected thrombus removal via transcatheter snare thrombectomy assisted by the ONO retrieval device.

**DISCUSSION** There is limited evidence on the management of LV thrombectomy if anticoagulation fails. Newer catheter techniques and equipment can allow operators to perform this technique safely with adequate embolic protection in select pediatric patients with suitable arterial vascular access. Collaboration with imaging colleagues is key to success.

**TAKE-HOME MESSAGE** Alternative access sites, novel device use, and collaboration and learning from colleagues can expand the repertoire of congenital interventionalists to treat high-risk and rare conditions. (JACC Case Rep. 2026;■:107756) © 2026 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

## CASE REPORT

A 13-year-old boy weighing 57.4 kg, with a history of congenitally corrected transposition of the great arteries and severe biventricular dysfunction, had undergone placement of a HeartMate 3 ventricular assist device with subsequent listing for orthotopic cardiac transplantation. He had undergone heart transplantation with ongoing depressed function requiring extracorporeal membrane oxygenation (ECMO) cannulation. He was quickly weaned from ECMO, decannulated, and the chest was closed on postoperative day 5.

### TAKE-HOME MESSAGE

- Percutaneous left ventricular thrombectomy can be considered in select high-risk cases, when adequate tools are used that can prevent or mitigate thrombotic events from the procedure.

While on ECMO, the patient had a routine electroencephalogram, which demonstrated a subclinical seizure episode with evidence of infarctions on computed tomography (CT). An echocardiogram during decannulation revealed a mobile 2 × 5 cm

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The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the Author Center.

Manuscript received November 19, 2025; revised manuscript received February 6, 2026, accepted February 18, 2026.

ISSN 2666-0849 https://doi.org/10.1016/j.jaccas.2026.107756

**ABBREVIATIONS AND ACRONYMS**

**CT** = computed tomography

**ECMO** = extracorporeal membrane oxygenation

**LV** = left ventricle

**PE** = pulmonary embolism

thrombus (Figure 1, Video 1) attached to the apical portion of the interventricular septum in the left ventricle (LV). His anticoagulation therapy was continued, but thrombolysis was contraindicated given subtle neurologic signs and CT evidence of cerebral infarctions. There was a risk of further embolization, which could lead to a catastrophic stroke, and thus, after a multidisciplinary team discussion, the decision was made to perform a mechanical thrombectomy in the cardiac catheterization laboratory using the ONO retrieval device (ONOCOR) with transesophageal echocardiography guidance.[1]

The left axillary artery was selected, as it provided a short trajectory length for the ONO device, was the most direct route, and was sufficiently large to accommodate a 12-F sheath for positioning the ONO retrieval device in the ascending aorta. The left axillary artery was percutaneously accessed at its midpoint, located directly posterior to the pectoralis minor muscle, using fluoroscopy and ultrasound to avoid the brachial plexus. Prior to this, 2 Spider FX embolic protection devices (Medtronic) were placed in both common carotid arteries from femoral arterial access sites to further guard against an embolic event (Figure 1). The ONO device was deployed in the ascending aorta; it was elected not to advance further into the LV given concerns with crossing the aortic valve with the nontapered tip of the device delivery sheath, potentially not having enough length to resheath the ONO basket fully, the risk of arrhythmia, and mitral valve injury. A 7-F JR guide catheter (Merit Medical) was advanced through the ONO device and carefully advanced across the aortic valve using a J-tipped wire to the LV, and thrombectomy was carried out using a 25-mm gooseneck snare (Medtronic). The snare was looped around the base of the clot, and when pulled tight, the clot was sheared at its base, and the thrombus was retrieved with the retrieval basket (Figure 2, Videos 1 and 2). The access site was closed with 2 Perclose ProGlide systems (Abbott) and a "dry closure" technique, employing balloon occlusion of the subclavian artery from a femoral access site during sheath removal. The final angiogram confirmed vascular patency without vessel injury. Anticoagulation was continued postprocedurally, and the patient was ultimately discharged from the hospital 4 weeks after transplantation and maintained on low-molecular weight heparin for a further 2 weeks.

**VISUAL SUMMARY Timeline of Case Presentation**

| Time | Events |
|---|---|
| Day 0 | Orthotopic heart transplantation with ECMO postprocedure |
| Day 2 | Routine EEG demonstrated subclinical seizure, and CT demonstrated evidence of infarction |
| Day 5 | ECMO decannulation; LV thrombus noted |
| Day 7 | LV thrombectomy performed in the cardiac catheterization laboratory |
| Day 28 | Patient discharged from hospital |
| Day 42 | Anticoagulation stopped |

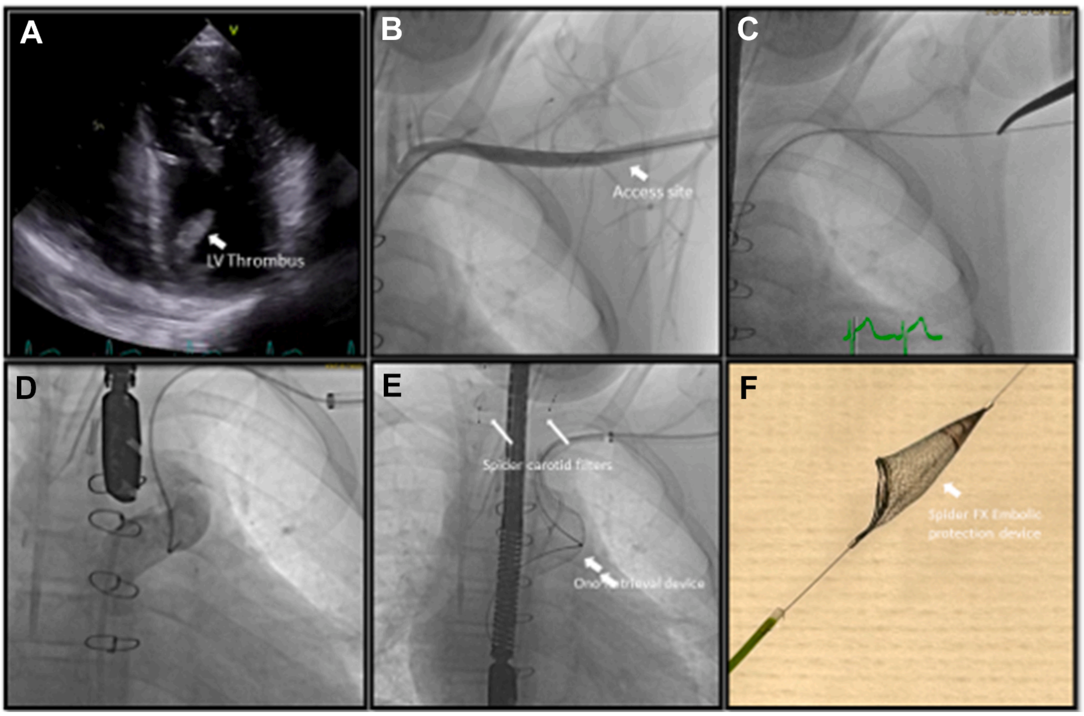
CT = computed tomography; ECMO = extracorporeal membrane oxygenation; EEG = electroencephalogram; LV = left ventricular.

## DISCUSSION

**INDICATIONS.** Mobile, pedunculated intracardiac thrombi represent a serious complication that pose a high risk of embolic events, leading to significant morbidity and mortality.[2] This is particularly concerning on the left side of the heart, where even small emboli from a thrombus can result in devastating outcomes. There is limited evidence regarding the best treatment for LV thrombi in children. Traditionally, invasive surgical thrombectomy has been the standard approach[3]; however, recent reports indicate that most intracardiac thrombi tend to resolve with medical therapy alone, specifically systemic anticoagulation. Despite this, large thrombi carry a high risk of embolization, which can result in considerable morbidity and, in rare cases, death.[4] The most substantial evidence comes from the 2022 American Heart Association guidelines, which primarily address LV thrombi in adults after myocardial infarction. The risk factors for embolization include protuberant, mobile thrombi, with thrombus size not being a significant concern.[2] These guidelines recommend anticoagulation for at least 3 months, reporting a success rate of 62.3%. However, they also highlight limited data on alternative treatment options if the thrombus does not resolve or recurs. The use of systemic thrombolytics is infrequent given concerns about their efficacy and safety, and they are generally not recommended.[2] In our patient, the presence of a large, sessile LV thrombus after recent surgery, combined with CT evidence of neurological findings, indicated a perceived high risk for systemic embolization or stroke, even with anticoagulation therapy.

**TECHNIQUES AND EQUIPMENT.** There are 2 options for transcatheter removal: commercially available thrombectomy systems or mechanical thrombus removal with a snare system. Most evidence for commercially available systems pertains to pulmonary embolism (PE). The FlowTriever (Inari Medical) is one such device; its safety and efficacy have been

**FIGURE 1 Left Ventricle Thrombus, Arterial Access, and Embolic Device Placement**

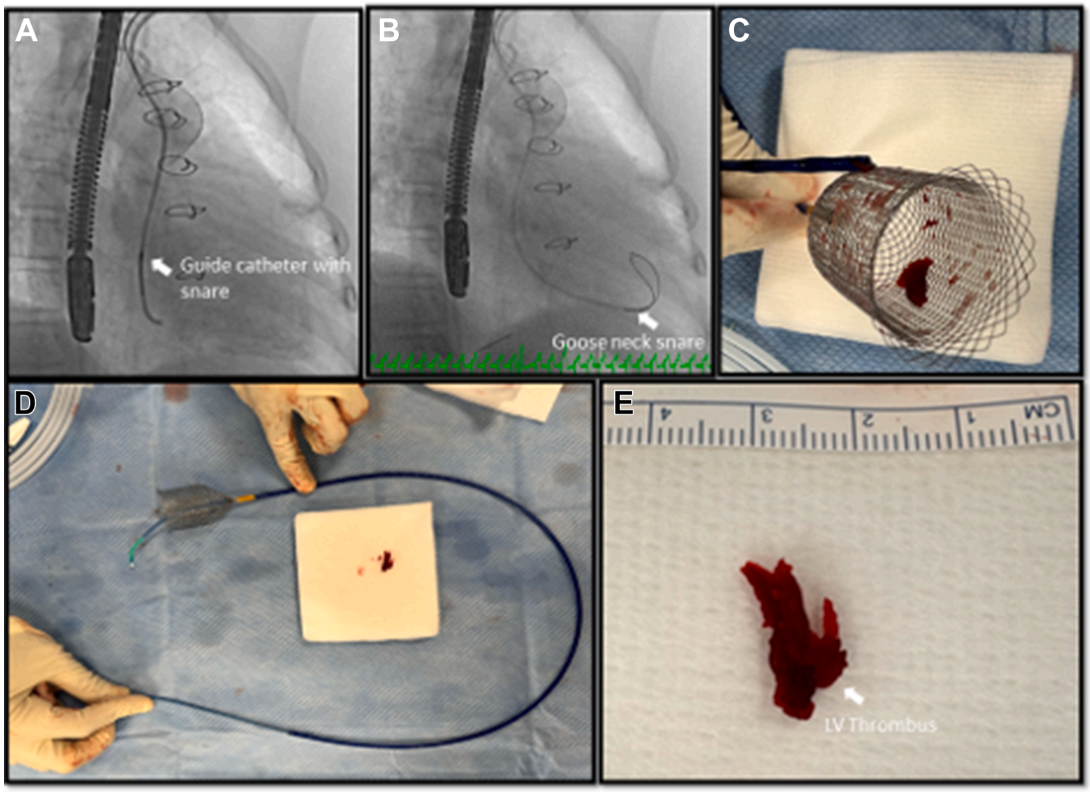



(A) Transesophageal echocardiogram of the thrombus. (B and C) Percutaneous left axillary artery access and (D) placement of the ONO device in the ascending aorta and (E and F) bilateral carotid embolic devices.

demonstrated in high-risk PE, but its use to remove ventricular thrombi has not been demonstrated.[5] The AngioVac system (AngioDynamics) is a mechanical suction system that enables removal of intravascular material using a venovenous ECMO circuit via a large catheter, with the blood returned postfiltration through a second access site.[6] The AngioVac has been described for use in venous, atrial, and pulmonary arterial thrombi, including in the Fontan circuit,[6,7] but not in ventricular thrombi. One major limitation described is the difficulty of advancing the catheter into the pulmonary arteries,[7] which may preclude its use for LV thrombi, as navigating large, stiff catheters through the aortic arch can be challenging. In addition, large-bore suction devices carry a risk of anemia,[6] and need for large-caliber arterial vascular access limits their use in the pediatric population. The Penumbra Indigo aspiration system (Penumbra Inc) is a suction embolectomy device that is approved for use in treating acute pulmonary embolism.[8] The Penumbra system has a smaller French size (8-F and 12-F) than the AngioVac system, and its safety in PE has been well demonstrated, but there is no evidence of its use in LV thrombi.

In addition to commercially available systems, thrombi can be removed with snare catheters. This process has been made easier and safer with the development of the ONO retrieval device.[1] The ONO device consists of a wire basket attached to a 7.5-F sheath, which can be delivered through a 12-F sheath.[1] The concept is to surround the thrombus with the basket, advance a snare through the ONO device, and ensnare the thrombus within the basket. As the ONO device is being removed into the 12-F sheath, the basket collapses and compresses the thrombus, facilitating its removal.[1] In the present case, this was the preferred option, with the ONO device being deployed in the ascending aorta and the snare advanced into the LV alone. This would allow the ONO device to be used both for ultimate clot extraction but also as a cerebral and systemic protection device.

**FIGURE 2** **Left Ventricular Transcatheter Thrombectomy**




The left ventricular thrombectomy was performed using (A) a guide catheter and (B) a snare, and (C to E) the ONO device successfully captured the thrombus. (F) Postprocedure, the vascular access site was widely patent without injury.

**ACCESS CONSIDERATIONS.** In this case, an ONO device was used; therefore, a 12-F sheath was required. LV thrombectomy in an adult has previously been reported using a transseptal approach,[9] but to achieve the most direct access to the thrombus and provide additional embolic protection with the ONO device, we elected an arterial approach. In order to deploy the device in the ascending aorta, access from the left axillary artery was chosen, given the short distance to the LV to allow the ONO device to reach the ascending aorta, and to minimize or mitigate vascular injury. In addition, the 2 femoral arteries were used to deploy the cerebral embolus protection devices for further protection. Access to the axillary artery is well described in cases of transcatheter aortic valve replacement, with the Society for Cardiovascular Angiography and Interventions publishing a document on specific techniques for percutaneous access to the axillary artery.[10] In summary, the axillary artery should be accessed at its midpoint directly posterior to the pectoralis minor muscle. The second segment is favored, as the brachial plexus cords do not run anterior to the vessel in the second segment, it is distant from the chest cavity, and thus reduces the risk of accidental intrathoracic hematoma.[10] A combination of fluoroscopy with angiography from an alternate access site and ultrasound is used to ensure access in the correct part of the axillary artery and avoid the brachial plexus.[10] Finally, the access site can be preclosed with a Perclose ProGlide system and a "dry closure" technique with balloon occlusion of the subclavian from an alternative access site during sheath removal and deployment of the Perclose suture.[10] All mechanical thrombectomy systems cause thrombus maceration, and with snare removal there is a risk of embolization.[8] Therefore, in cases of LV thrombi, cerebral vascular protection is paramount. We were able to snare the LV thrombus and capture it with the ONO retrieval device safely and successfully, without systemic/cerebral embolization or vascular injury.

## CONCLUSIONS

LV thrombectomy is a high-risk procedure. Although multiple commercially available thrombectomy systems exist, advancing these devices into the LV can be challenging. The ONO device has been extremely useful in facilitating the removal of intracardiac masses and embolized devices. When deployed, it can also provide cerebral and systemic protection during the removal of high-risk LV thrombi. This technique enhances therapeutic options for treating complex thrombi, with the ability to accommodate additional protective devices with adequate vascular access based on age and size of the vessel. Multidisciplinary team discussion and shared team decision-making is key for these high-risk cases.

## FUNDING SUPPORT AND AUTHOR DISCLOSURES

The authors have reported that they have no relationships relevant to the contents of this paper to disclose.

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**KEY WORDS** congenital heart defect, left ventricle, thrombus

**APPENDIX** For supplemental videos, please see the online version of this paper.