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IMAGING

CASE REPORT: CLINICAL CASE

The MICHIGAN Procedure

Mass extraCtIon from the Heart FacIlitated by ONOCOR GlobAl embolic protectioN Device

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ABSTRACT

Intracardiac masses present a challenging diagnostic and therapeutic dilemma and are associated with an increased risk of complications, such as embolic events and obstructive symptoms. We report a novel procedure using an ŌNŌCOR device through subclavian access that acted as a full-body protection device as well as a retrieval device. (JACC Case Rep 2024;29:102448) © 2024 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/).

HISTORY OF PRESENTATION

A 70-year-old female patient was admitted to the hospital with a fever and chills. Upon arrival at the emergency department, the patient was clinically stable. She was hypertensive to 150/50 mm Hg, with an oxygen saturation of 95% on baseline 3 L of oxygen, heart rate of 75 beats/min, and respiratory rate of 19 breaths/min.

LEARNING OBJECTIVES

- Emerging transcatheter interventions in the percutaneous removal of intracardiac masses may provide an effective alternative to surgical intervention.
- Feasible use of ŌNŌ devices through subclavian access as a global embolic protection device.

PAST MEDICAL HISTORY

The patient was diagnosed with a history of prior stroke, factor V Leiden mutation, paroxysmal atrial fibrillation not on anticoagulation secondary to falls, sick sinus syndrome status post-permanent pacemaker insertion, chronic obstructive lung disease, type 2 diabetes mellitus, and chronic kidney disease. She presented to an outpatient clinic to undergo left atrial occlusion closure for atrial fibrillation; however, she was noted to have an incidental finding of mitral valve mass with associated mitral valve regurgitation on transthoracic echocardiography (TTE).

DIFFERENTIAL DIAGNOSIS

The differential diagnosis for mitral valve mass includes atypical myxoma, papillary fibroelastoma, filamentous strand, valvular thrombus, and endocarditis.

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ABBREVIATIONS AND ACRONYMS

LVOT = left ventricular outflow tract

TEE = transesophageal echocardiogram

TTE = transthoracic echocardiogram

INVESTIGATIONS

Initial investigations revealed an elevated white cell count. Blood cultures were negative, and antibiotics were started. There was an incidental finding of a mitral valve mass on a transesophageal echocardiogram (TEE). The mass is a hypermobile 1.2 cm × 49 mm homogenous echogenic mass attached to the ventricular side of the anterior mitral valve leaflet projecting into the left ventricular outflow tract with associated mild-to-moderate mitral valve regurgitation (**Figure 1**, Video 1).

MANAGEMENT

Heart team discussion was carried out between the patient, cardiothoracic surgery, and structural heart team. The patient elected to have the mass removed with a transcatheter approach for both diagnostic and therapeutic reasons. Knowing the hypermobility of this mass, we elected to use a novel method for both full-body protection as well as a transcatheter device to extract the mass using the ŌNŌ endovascular retrieval system (ŌNŌCOR Vascular) through subclavian access.

The procedure was performed under general anesthesia guided by TEE. A 7-F sheath was placed in the right radial artery (to help do right subclavian artery dry access and closure) and a 6-F sheath was placed in the left femoral vein and artery. A 7 mm × 40 mm Armada balloon (Abbott Cardiovascular) was then advanced over the grand slam wire through the right radial artery up to the subclavian artery for dry access and closure. Access was obtained in the right subclavian artery and a 14-F DRYSEAL (Gore Medical) was then advanced over the Amplatz Super Stiff Guidewire (Boston Scientific) up to the ascending aorta. An ŌNŌCOR retrieval device was deployed at the aortic root through which a 7-F Multipurpose (Boston Scientific) guide with a 7-F EnSnare (Merit Medical) was advanced into the left ventricular outflow tract (Videos 2 and 3). This combination was used to remove the mass, which then escaped the EnSnare upon removal, being effectively trapped into the ŌNŌ device (**Figure 2**). TEE revealed resolution of the mobile mass and that the mitral regurgitation was unchanged (Video 4). The ŌNŌCOR retrieval device was recaptured with successful retrieval of the mitral valve mass. The total procedural time was 2 hours and the fluoroscopy time was 23 minutes. Hemostasis was achieved with Percloses (Abbott), and the patient was extubated and returned to the floor accordingly. The specimen was collected and sent to the lab for analysis, which was negative for endocarditis.

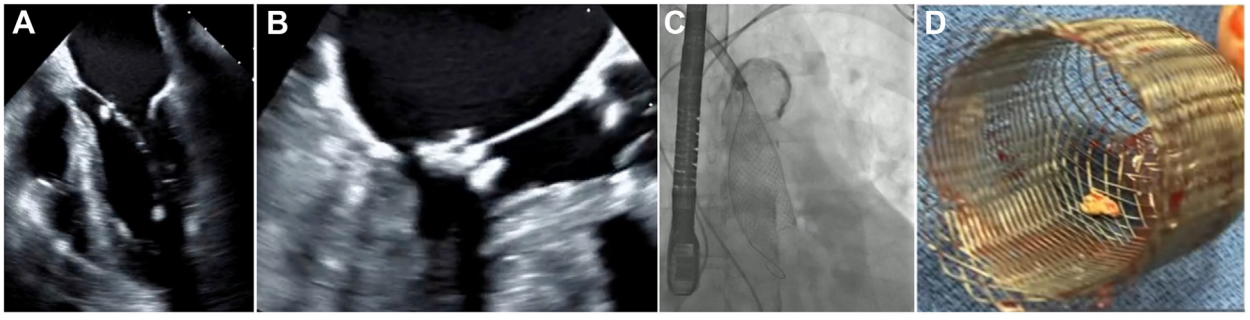
OUTCOME AND FOLLOW-UP

The patient tolerated the procedure well, and no postoperative complications were noted. The following day, postoperative TTE showed resolution of the mass with unchanged mitral regurgitation.

DISCUSSION

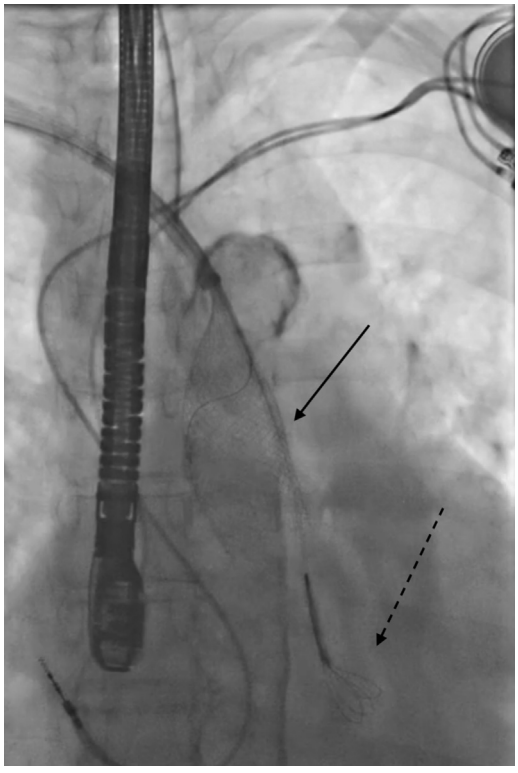
Intracardiac masses remain a diagnostic challenge and hard to treat, with an estimated incidence ranging between 0.02% and 0.2%.[1-3] Associated complications may include constitutional symptoms,

FIGURE 1 Step-by-Step Excision and Removal of a Mitral Valve Mass Using Electrocardiography and Fluoroscopy-Guided Endovascular Retrieval



(A, B) Transesophageal echocardiogram demonstrating a mobile, calcified appearing mass measuring 1.2 × 0.41 cm attached to the anterior mitral valve leaflet near A2 (ventricular side) projecting into the left ventricular outflow tract. (C) Fluoroscopy image showing the ŌNŌ endovascular retrieval system basket in the ascending aorta. (D) Mitral valve mass captured within the ŌNŌ endovascular retrieval system device.

FIGURE 2 **Fluoroscopy Showing the Snare in Action Through the ŌNŌ**



Solid line showing the ŌNŌ device and dotted line showing the Snare.

blood flow obstruction, interference with valve function, and an associated risk of 4.5% of the cardioembolic events.[4] Surgical intervention has been and remains to be the widely accepted method for the excision of intracardiac tumors with an elevated risk of complications.[5]

Recently, transcatheter intracardiac excision options have been developed and trialed, but this can be associated with the risk of mass embolization during excision attempts.[5] Left-sided transcatheter mass extraction is an evolving field that has its own pros and cons. Case series demonstrate the feasibility and safety of this approach.[6] What remains challenging is understanding how to protect the systemic circulation from possible embolic events during the procedure. Sentinel cerebral protection is typically used to protect brain circulation by protecting the innominate artery and left common carotid artery, but it does not protect left vertebral arterial circulation. Our case report is the first of its kind using a novel device for both retrieval and global body protection through subclavian access.

CONCLUSIONS

The trans-subclavian percutaneous basket retrieval approach using ŌNŌCOR provided a safe and effective method to remove intracardiac masses in this particular case while serving as a full-body protection device. Further large-scale studies can inform the field of this approach's efficacy and safety.

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

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KEY WORDS endovascular excision, endovascular retrieval, intracardiac mass, percutaneous intervention

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