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CASE REPORT

INTERMEDIATE

CLINICAL CASE

Percutaneous Retrieval of a Watchman Device from the Left Ventricle Using a Transarterial Approach

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ABSTRACT

Left atrial appendage closure device embolization is a rare yet serious complication. The location of the embolized device is a major determinant of the retrieval approach, percutaneous or surgical. This paper presents the case of Watchman device embolization in the left ventricle, which was retrieved percutaneously by using a transarterial approach. (**Level of Difficulty: Intermediate.**) (J Am Coll Cardiol Case Rep 2019;1:876–83) © 2019 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

PRESENTATION. A 79-year-old man presented to the electrophysiology (EP) clinic to discuss options for long-term stroke prevention. His CHA_2DS_2-VASc (Congestive heart failure, Hypertension, Age ≥75 years, Diabetes mellitus, Prior stroke, transient ischemic attack [TIA], or thromboembolism, Vascular disease, Age 65-74 years, Sex category [female]) score was 8 and HASBLED (Hypertension, Abnormal renal and liver function, Stroke, Bleeding, Labile INRs, Elderly >65 years, Alcohol or drugs) score was 4.

MEDICAL HISTORY. The patient had a history of permanent atrial fibrillation, transient ischemic attack, coronary artery disease, systolic heart failure (left ventricular ejection fraction of 35% to 40%), hypertension, diabetes, and spontaneous right occipital hemorrhage on warfarin therapy. Given the recent intracerebral hemorrhage, left atrial appendage (LAA) occlusion with a Watchman device (Boston Scientific Corp., Marlborough, Massachusetts) was pursued.

LEARNING OBJECTIVES

- To understand the risk factors and complications associated with WATCHMAN device embolization.
- To review the retrieval options for an embolized device.

INVESTIGATIONS. Imaging of the LAA for appropriate sizing was performed. Computed tomography with intravenous contrast showed an LAA ostium measuring 2.3 × 2.5 cm and a maximal depth of 3.2 cm (Figure 1). Intraprocedural transesophageal echocardiography (TEE) showed a multilobed LAA without evidence of thrombus and with an ostium measuring 2.0 × 1.9 cm. The LAA dimensions (width × depth) were measured at 2.1 × 2.8 cm (0°), 2.1 × 2.5 cm (45°), 2.1 × 2.8 cm (90°), and 2.1 × 2.7 cm (135°). On 3-dimensional (3D) TEE, the maximal LAA orifice area was measured at 2.48 cm^2 (Figure 2).

Based on those measurements, a 27-mm Watchman device was placed successfully under TEE and

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Informed consent was obtained for this case.

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fluoroscopic guidance. TEE showed a well-seated device without evidence of residual flow or paradevice leak by color Doppler. Device compression was excellent at 13% to 18%, and tug test did not show migration, hence meeting proper position, anchor, size and seal criteria (Figure 3).

Six hours after the procedure, the patient developed atrial fibrillation with rapid ventricular response and acute hypoxic respiratory failure. Physical examination was remarkable for respiratory distress with bilateral crackles over the lung fields. A bedside echocardiogram showed that the Watchman had migrated into the LV (Figure 4).

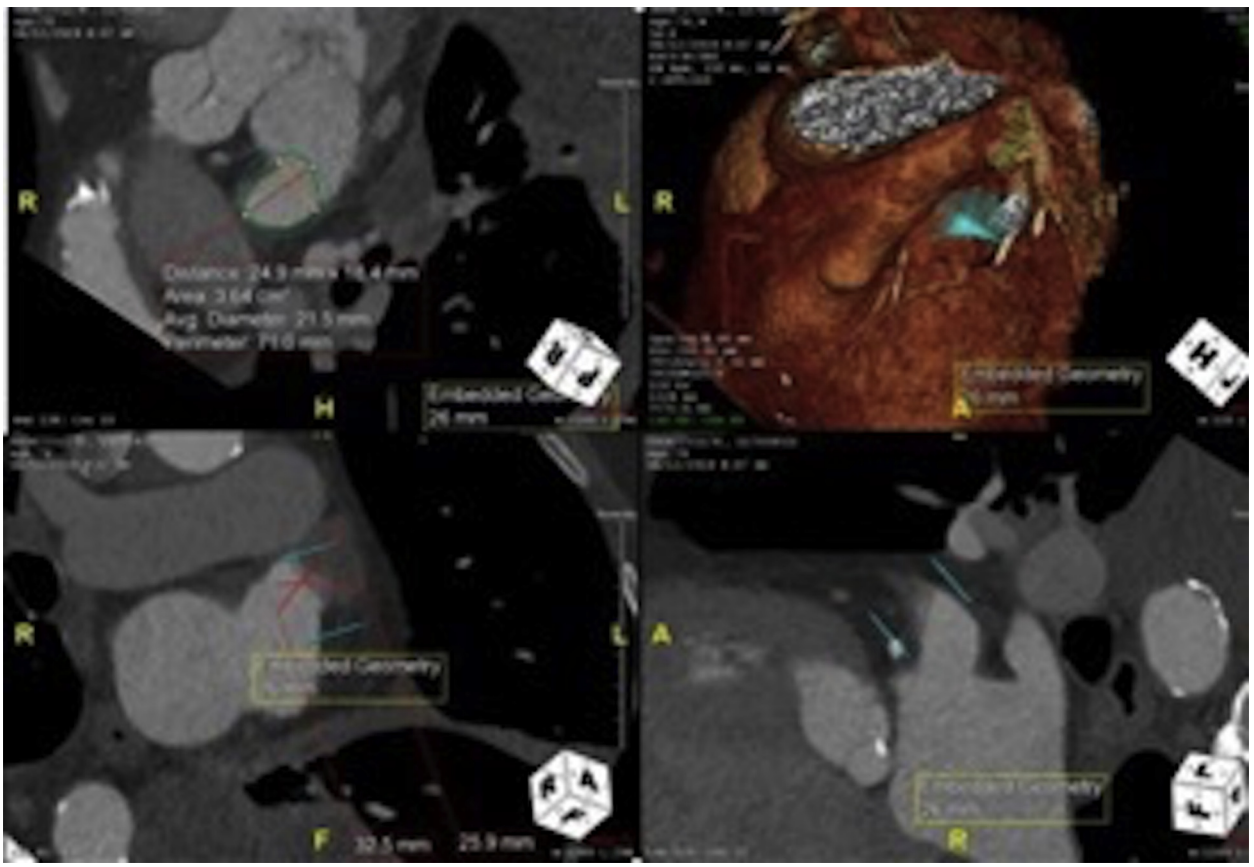
MANAGEMENT. Given the patient's age and comorbidities, the decision was made to attempt percutaneous retrieval of the device in the cardiac catheterization laboratory. The procedure was performed with the patient under general anesthesia, by TEE and fluoroscopic guidance. Baseline TEE demonstrated the Watchman device was within the mitral valve (MV) apparatus, with the tines abutting the septum (Figures 5 and 6). Vascular access was obtained in the right common femoral artery (18-F 85-cm Cook sheath, Cook Medical, Bloomington, Indiana) and vein (20-F sheath, Cook Medical).

Retrieval by using the transseptal approach was initially attempted by crossing the previously performed septal puncture with a Mullins sheath (Medtronic, Fridely, Minnesota). With the use of a Lunderquist and a Toray guidewire (Toray America, New York, New York) to minimize risk of perforation, an 8-F medium curl Agilis (Foster City, California) steerable guide was advanced into the left atrium (LA). Then a 30-mm One-Snare (Medtronic) was advanced through the MV into the LV. At the same time, a 4-F angled Glidecath (Medtronic) was advanced into the LV cavity from the arterial side. An attempt to free or

ABBREVIATIONS AND ACRONYMS

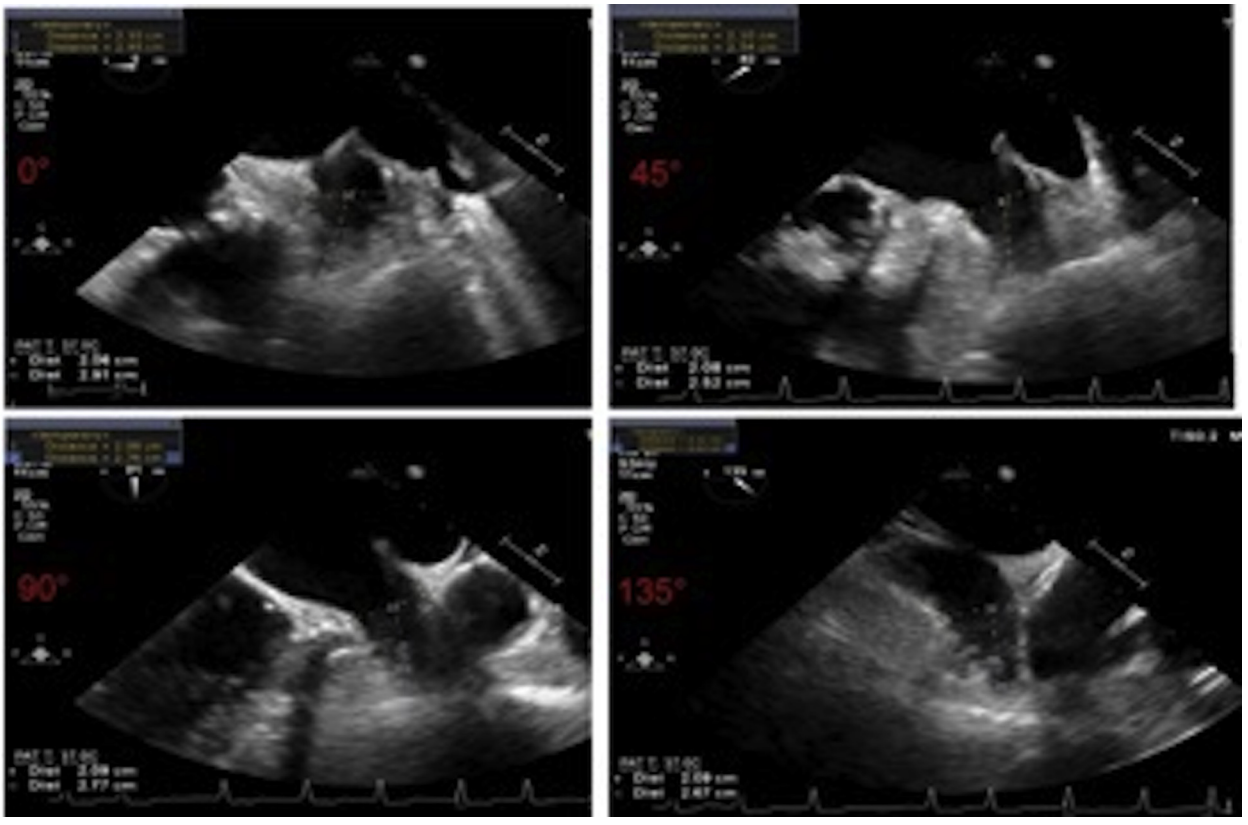
EP = electrophysiology
LA = left atrium
LAA = left atrial appendage
LV = left ventricle
LVOT = left ventricular outflow tract
MR = mitral regurgitation
MV = mitral valve
TEE = transesophageal echocardiography

FIGURE 1 Computed Tomography With Intravenous Contrast



Measurement of left atrial appendage dimensions.

FIGURE 2 Intraprocedural Transesophageal Echocardiography



Measurements of left atrial appendage dimensions.

mobilize the device from the mitral apparatus was performed using a Whisper J coronary wire (Medtronic) to minimize risk of damage to the chordae tendineae.

Then, the Watchman was grasped with the snare and partially pulled up into the MV. This resulted in severe mitral regurgitation, worsening hypoxemia, and hypotension (**Figure 7**). The device was then released, and it fell back into the LV and was ejected into the left ventricular outflow tract (LVOT) (**Figure 8**).

At that point, the 18-F arterial sheath was tracked into the ascending aorta, and a 25-mm One-Snare device was advanced into the LV cavity. The Watchman device was grasped and pulled out through the aortic valve and into the 18-F sheath (**Figure 9**). Post-retrieval TEE demonstrated no evidence of damage to the aortic or mitral valve.

FOLLOW-UP. The patient was admitted to the cardiac intensive care unit, extubated the next morning, and discharged 2 days later with a prescription for apixaban. One month later, on his follow-up clinic appointment, he was asymptomatic, without any bleeding issues.

DISCUSSION

Complications of Watchman implantation are overall low, with device embolization rates of 0.6% and 0.7% in the PROTECT-AF (Percutaneous closure of the left atrial appendage versus warfarin therapy for prevention of stroke in patients with atrial fibrillation: a randomised non-inferiority trial) and PREVAIL (Prospective randomized evaluation of the Watchman Left Atrial Appendage Closure device in patients with atrial fibrillation versus long-term warfarin therapy) trials (1–3). The CAP (College of American Pathologists) registry data similarly reported a 0.2% rate of embolization within 7 days of implantation (4). Causes for device migration include incorrect sizing, suboptimal placement, and vigorous tug testing. In the present case, it was most likely related to

FIGURE 3 Transesophageal Echocardiography Post-Device Implantation

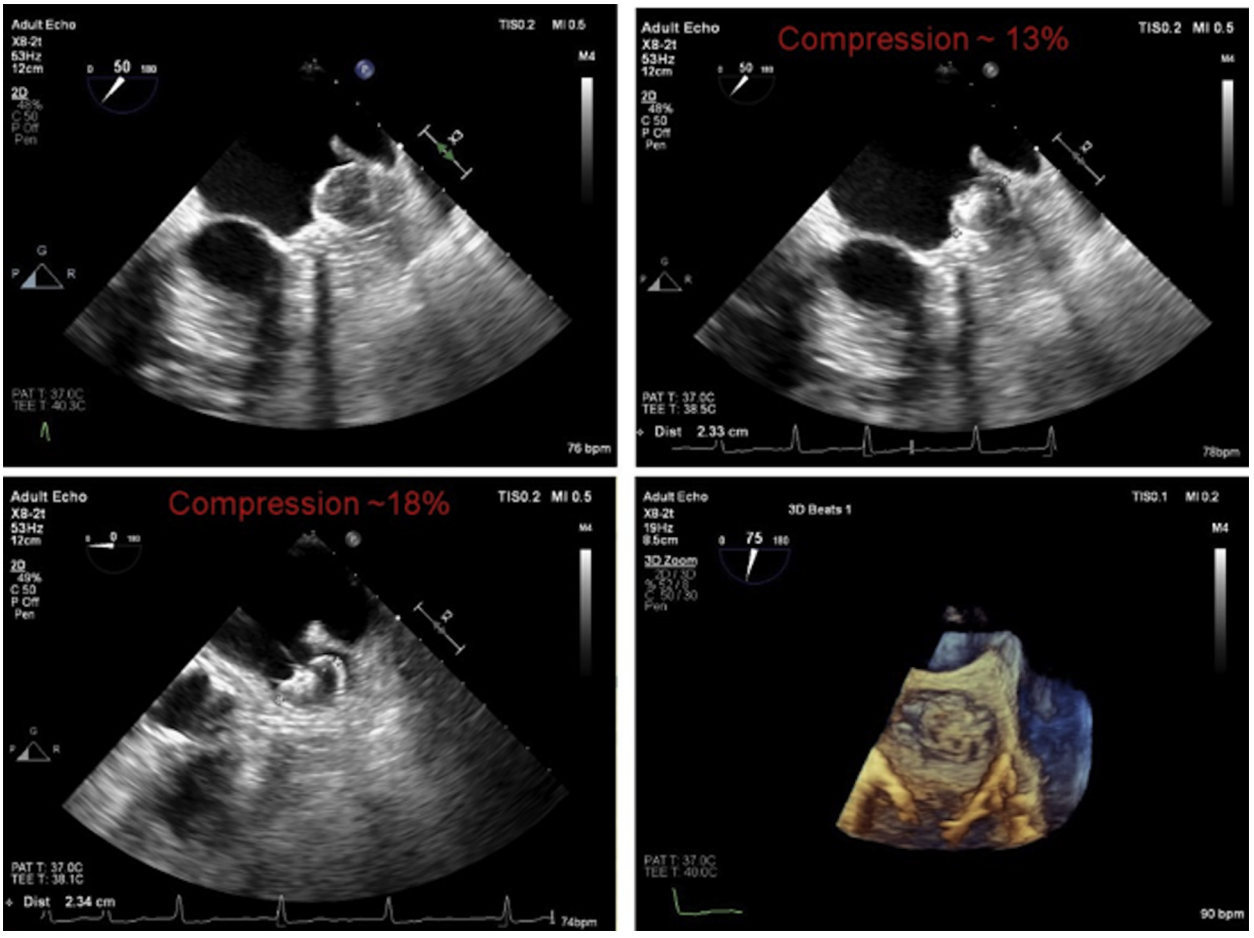


FIGURE 4 Bedside Echocardiogram Showing the Watchman in the Left Ventricle

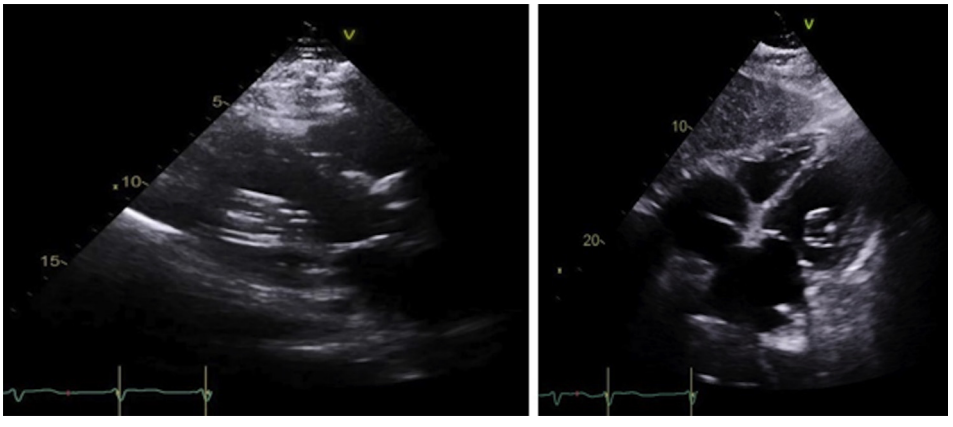
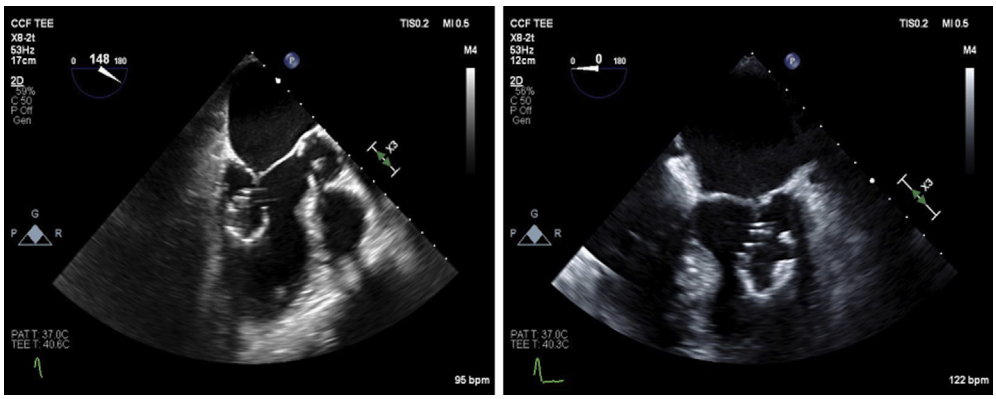


FIGURE 5 Transesophageal Echocardiography Showing the Embolized Watchman in the Left Ventricle



improper position, as TEE (Figure 3) revealed a shoulder protruding from the appendage. Sizing was appropriate given confirmation of 13% compression after deployment.

Device size can be selected based on computed tomography or TEE. Measurements of the LAA on TEE should be obtained at 0°, 45°, 90°, and 135°. The landing zone diameter is measured from the top of the MV annulus or left circumflex artery to a point 2 cm below the tip of the left upper pulmonary vein. The depth is measured from the LAA orifice to the apex. Devices should be upsized by 8% to 20% from the largest LAA landing zone diameter (5). Confirmation of correct placement includes proper position, anchor, size, and seal criteria. In regard to position, the shoulder should protrude <40% to 50% of the device depth. Anchoring is verified by a tug test. Appropriate sizing is confirmed by compression of the device diameter by 15% to 30% from its original size. Seal is confirmed by measuring the vena contracta of any para device leak (<5 mm) (5).

Device embolization typically occurs early after the procedure with one-third of cases occurring during the procedure (6). The device can migrate into the LA, LV, or aorta. Embolization into the ventricle poses a risk for papillary muscle rupture, damage to the MV apparatus, LVOT obstruction, or damage to the AV. Percutaneous retrieval of LAA closure devices from the LA has been reported; however, migration to the ventricle typically requires open heart surgery.

In a systematic review of published studies, Arminian et al. (6) reported 9 cases of Watchman embolization into the LV, 8 of which required

FIGURE 6 3-Dimensional Transesophageal Echocardiography Showing the Embolized Watchman in the Left Ventricle

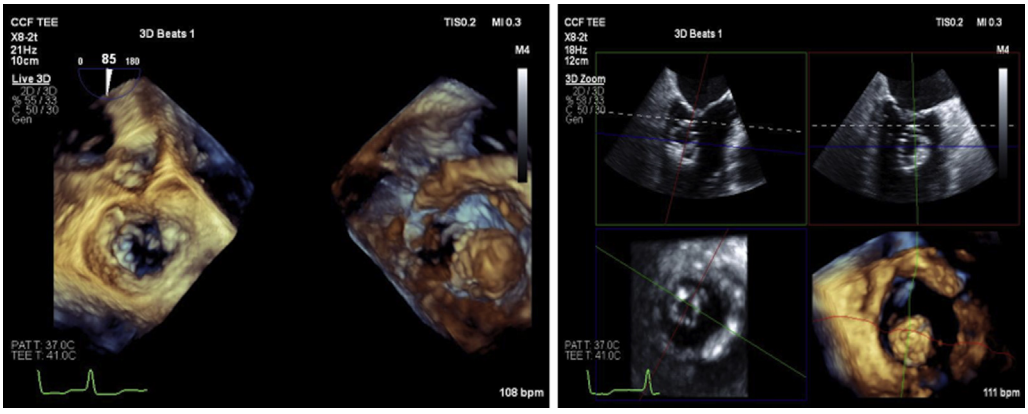
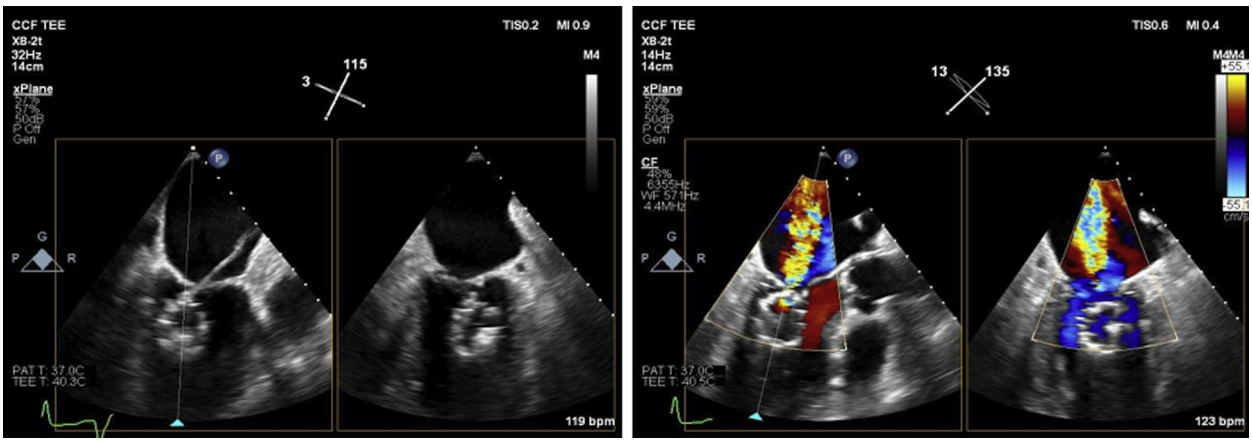


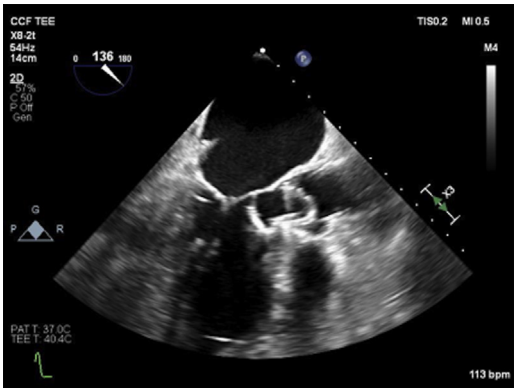
FIGURE 7 Transesophageal Echocardiography Showing the Attempt to Retrieve the Device Transseptally Resulting in Severe Mitral Regurgitation



sternotomy and 1 transapical extraction. In a review performed by the present authors, there was only 1 case of successful percutaneous retrieval of an Amulet device (St. Jude Medical, Memphis, Tennessee) from the LV through a transarterial approach (7). In this case, both the transseptal and transarterial approaches were used.

The technical challenges of percutaneous retrieval from the ventricle are related to the location of the device in association with the MV apparatus. The anchors of the device are usually tangled in the chordae tendineae with the cap pointing towards the LV apex. One option is to grab the side of the device with the snare and try to slowly mobilize it out of the MV apparatus and through the MV into the LA. If this is not feasible, bidirectional jiggling of the device can be attempted using a dual approach, transseptal and transarterial. This is a very delicate procedure that needs to be performed under continuous TEE and fluoroscopic guidance. If there is significant resistance to pulling the device out of the MV apparatus, the procedure should be aborted, and surgical options need to be sought.

FIGURE 8 Transesophageal Echocardiography Showing the Watchman Device in the Left Ventricular Outflow Tract



CONCLUSIONS

LAA occlusion device embolization is a rare yet serious complication that requires emergent management. The most common cause of device embolization is inappropriate sizing. Although the retrieval from the LA or the aorta can be achieved percutaneously, retrieval from the LV usually requires surgery in order to avoid damage to the MV apparatus.

Percutaneous retrieval of a Watchman device from the LV is technically challenging but can be safely performed in select cases by experienced operators, decreasing the morbidity and prolonged hospitalization associated with surgery.

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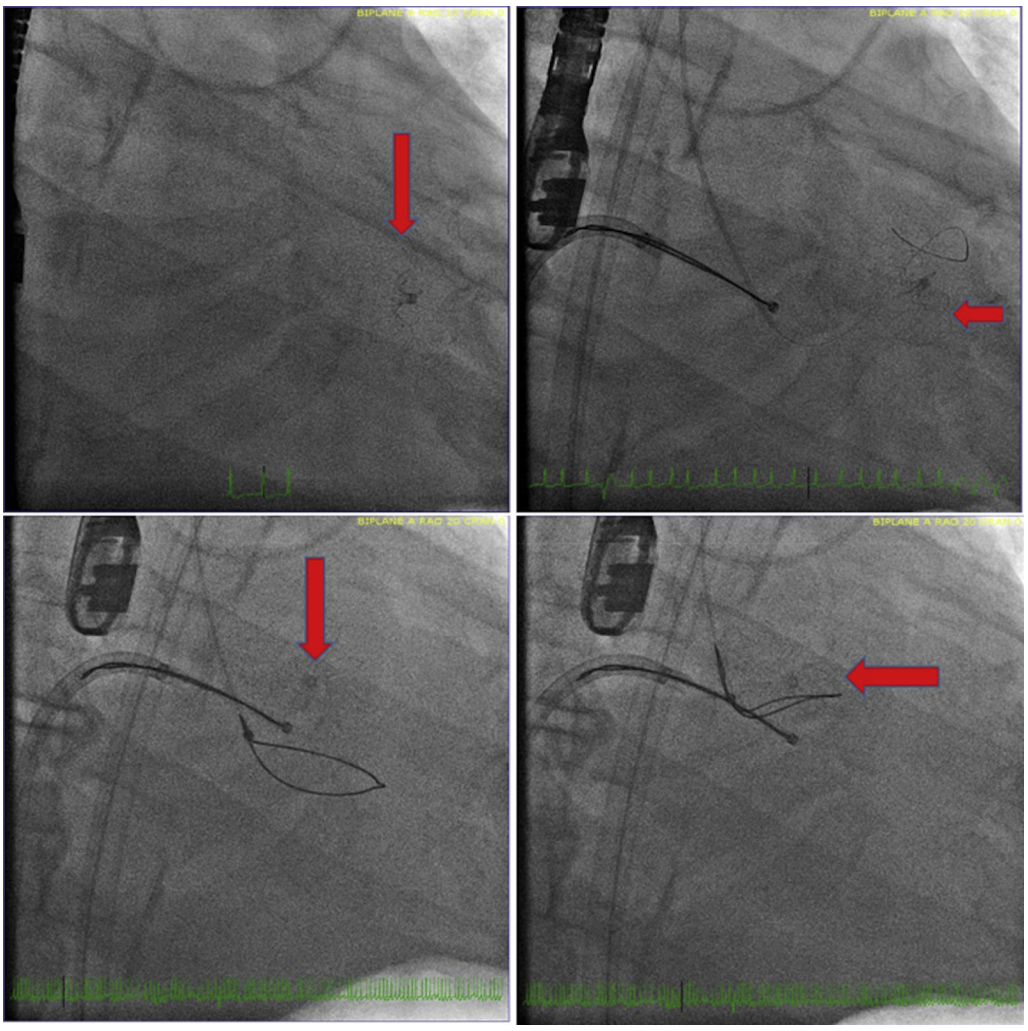
FIGURE 9 Fluoroscopy Images Showing the Watchman



Fluoroscopy images showing the Watchman in the LV **(top left)**, the attempt for transseptal retrieval **(top right)**, the use of the snare to retrieve the device through the aorta **(bottom right)**, and grabbing of the side of the device with the snare **(bottom left)**. The Watchman device is shown by the **red arrows**.

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KEY WORDS **complication, imaging, left ventricle, mitral valve, occluder, supraventricular arrhythmia**