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ADVANCED

CASE REPORT: CLINICAL CASE

Percutaneous Retrieval of a Left Atrial Appendage Closure Device

The Device Waltz

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ABSTRACT

Embolization of a device in patients undergoing percutaneous left atrial appendage closure is an uncommon complication. We present an illustrative case of successful percutaneous retrieval of an embolized LAmbre device (Lifetech Scientific, Shenzhen, China) that was achieved with a combination of a snaring technique and forceps grasping and by using a steerable guiding catheter. (**Level of Difficulty: Advanced.**) (J Am Coll Cardiol Case Rep 2021;3:766–71)

HISTORY OF PRESENTATION

An 83-year-old man with congestive heart failure resulting from severe biventricular dysfunction (left ventricular ejection fraction of 29%), severe functional mitral regurgitation, permanent atrial fibrillation (AF) treated with direct oral anticoagulant therapy (apixaban 2,5 mg twice a day), stage IV renal failure, chronic anemia secondary to erosive gastroduodenitis, and a previous ischemic stroke with intraparenchymal hemorrhagic evolution was scheduled for elective left atrial appendage (LAA) occlusion. His CHA_2DS_2-VASc (congestive heart failure, hypertension, age ≥75 years [doubled], diabetes mellitus, prior stroke or transient ischemic attack or thromboembolism [doubled], vascular disease, age 65 to 74 years, sex category) risk score was 7, with a 9.6% annual risk of stroke, whereas a his HAS-BLED (hypertension, abnormal renal or liver function, stroke, bleeding history or predisposition, labile international normalized ratio, elderly (>65 years), drugs or alcohol) score of 5 indicated a high risk of bleeding. During the physical examination on admission, the patient was alert and eupneic, without signs of pulmonary congestion and with only mild lower extremity edema, as well as stable renal and hematologic parameters.

LEARNING OBJECTIVES

- To recognize factors that can predict the risk of device embolization starting from a detailed echocardiographic assessment of the anatomy of the LAA.
- To manage device dislodgment with a combination of a snaring technique and forceps grasping.
- To recommend the importance of having the complete arsenal of appropriate retrieval devices always available in the catheterization laboratory.

PAST MEDICAL HISTORY

At the beginning of September 2020, the patient was hospitalized for a new acute episode of melena with

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endoscopic evidence of active erosive gastroduodenitis.

DIFFERENTIAL DIAGNOSIS

On the endoscopic examination, oncological diseases were excluded, and results of the search for *Helicobacter pylori* were negative.

INVESTIGATIONS

The patient underwent transesophageal echocardiography (TEE), which showed a bilobed LAA, in the absence of atrial or LAA thrombosis and with normal flow velocity on Doppler interrogation.

MANAGEMENT

The procedure of LAA closure was carried out with the patient under general anesthesia. Adequate anticoagulation with heparin throughout the procedure (activated clotting time [ACT] >250 s) was maintained by periodic ACT testing. A depth of the LAA of 31 mm and a landing zone width of 22 mm were measured on TEE (**Figures 1 and 2**). After transseptal puncture and delivery sheath insertion across the septum, a 24/30-mm LAmbre (Lifetech Scientific, Shenzhen, China) device was first released, but it appeared to be of inadequate size and therefore was replaced with a 28/34-mm LAmbre device that appeared correctly positioned on simultaneous TEE and fluoroscopy guidance. After assessment of device stability through a vigorous tug test for 3 min under echocardiographic and fluoroscopic guidance, a push-and-pull maneuver (Video 1), and effective appendage closure through echocardiographic color Doppler evaluation with no evidence of residual leaks, the device was released (Video 2). Immediately after this maneuver, sudden collapse of the device into the left atrium (LA) occurred, with a chaotic twisting motion and a tendency to wedge into the mitral valve orifice (Videos 3 and 4), prevented by the wide profile of the device and the strong backflow pushing as a result of severe mitral regurgitation flow (Video 5). After ensuring the patient's hemodynamic and respiratory stability, the delivery sheath was replaced with a steerable 14-F Fustar Introducer (Lifetech Scientific), with 90° deflectable tip to be selectively advanced and oriented toward the rotating LAmbre device (Video 6). An Amplatz Goose Neck (Medtronic, Minneapolis Minnesota) was then advanced to capture the device and firmly block it against the catheter tip (Video 7). A Catcher device (Osypka AG, Rheinfelden, Germany) was then advanced to incarcerate within its forceps some umbrella's claws and partially retrieve the stretched device into the guiding catheter. The system was then dragged through the interatrial septum into the right atrium and then was fully captured into the guiding catheter, without any damage to the surrounding heart structures (**Central Illustration**, Videos 8 and 9). TEE excluded any pericardial effusion or valvular or myocardial structural compromise. The device and transseptal guiding sheath could be redrawn without further complications (**Figure 3,** Video 10).

ABBREVIATIONS AND ACRONYMS

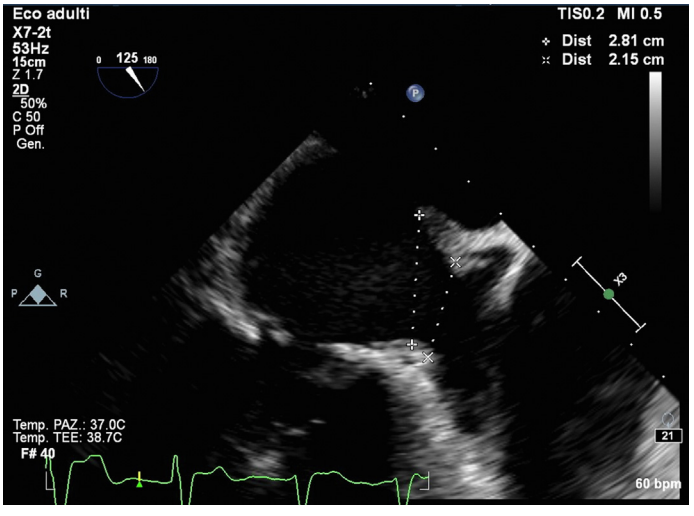
ACT = activated clotting time
AF = atrial fibrillation
LA = left atrium
LAA = left atrial appendage
TEE = transesophageal echocardiography

DISCUSSION

LAA closure has emerged as an alternative therapeutic approach to oral anticoagulation for stroke prevention in selected patients with nonvalvular AF (1,2). Device embolization is an infrequent complication of LAA closure, with an average reported rate of <4% (3). We report for the first time an efficacious percutaneous retrieval of a LAmbre LAA occlusion device, which embolized in the LA immediately after its release.

LAmbre is a self-expanding LAA occluder highly adaptable to different LAA morphologies. The distal umbrella of the LAmbre LAA occluder comprises 8 claws with individual stabilizing hooks attached to facilitate anchoring to the LAA wall. The unique design of the LAmbre device limits the possibility that the

FIGURE 1 Ostium and Landing Measure of Left Atrial Appendage in 2 Transesophageal Projections



The **+dotted line** represents the measure of the ostium; the **x dotted line** represents the measure of the landing zone.

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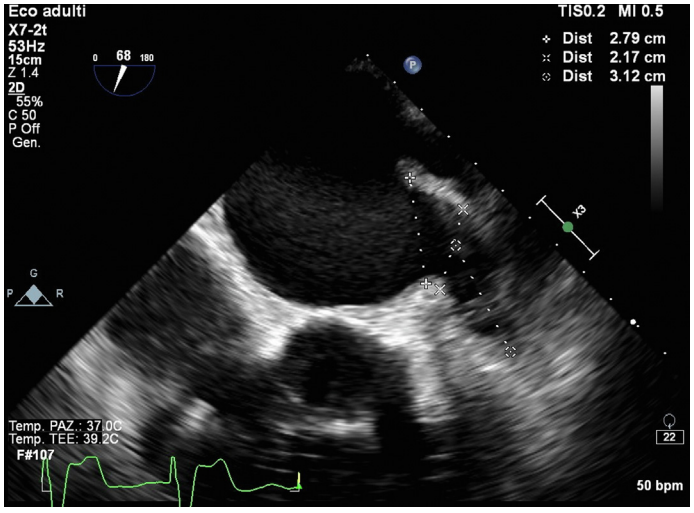
FIGURE 2 Ostium and Landing Measure of Left Atrial Appendage in 2 Transesophageal Projections



The + **dotted line** represents the measure of the ostium; the **x dotted line** represents the measure of the landing zone; the **dashed circle dotted line** represents the left atrial appendage length.

device can easily become displaced. However, in case of dislocation, percutaneous retrieval of the device may be challenging. In a healthy canine model, the dislodged LAA occluders have been retrieved using forceps, when the devices were located in the LA and aortic vessels, whereas device dislodgment in the left ventricle could quickly lead to death resulting from cardiogenic shock before any attempt to retrieve the device could be made, and it is associated with a higher rate of surgical retrieval (4).

To our knowledge, this is the first published human report of successful percutaneous retrieval of a LAmbre device located in LA. The reasons for device dislocation are not entirely clear. Indeed, periprocedural device dislocation may be caused by improper device selection (device undersizing or oversizing), incorrect device positioning, too vigorous tug test, acute conversion from AF to sinus rhythm, and vigorous contraction of the LAA (5–7).

Implanters should become familiar with the percutaneous approach to retrieve dislocated devices, and they must equip their laboratory with adequate retrieval devices to be ready to address any complications. We suggest a sequential approach to overcome this complication: exchange the delivery sheath for the largest steerable sheath available, suitable for 3-dimensional orientation in the LAA cavity and able to accommodate 2 retrieval devices simultaneously; with the help of snares, the device can be immobilized and pulled toward the catheter tip; then the forceps may grasp the claws near the center position of the occluder's umbrella and pull it into the retrieval sheath. This experience adds to others in which alternative retrieval systems have been used successfully (8).

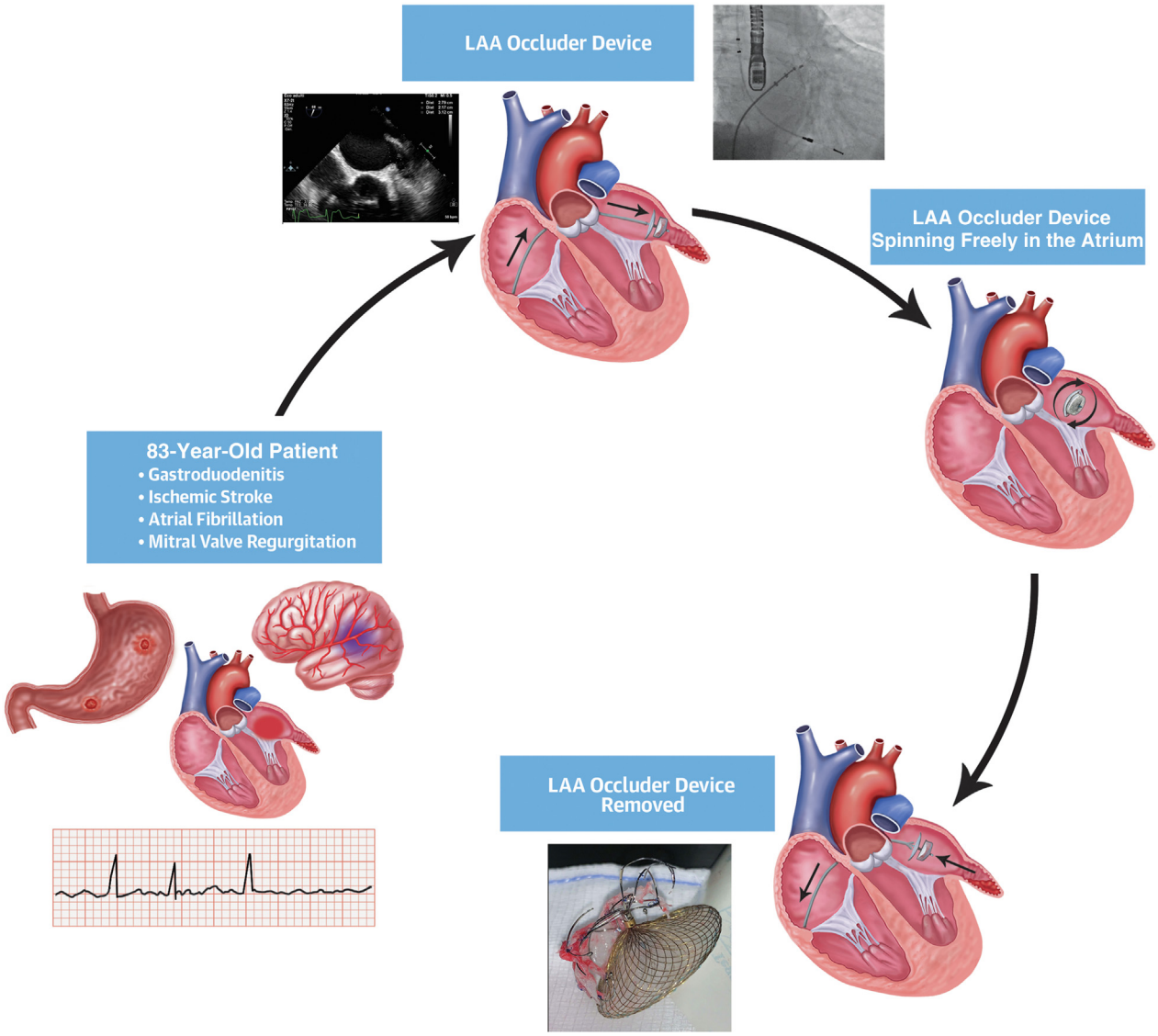
FOLLOW-UP

The patient was asymptomatic and safely discharged, to allow a stabilization of his renal function before a further attempt at LAA closure.

CONCLUSIONS

This clinical case, the first described with the LAmbre device, demonstrates that it is possible to retrieve a displaced device percutaneously without major clinical consequences. This clinical case also underlines the importance for manufacturers to make every effort to design devices with a higher safety standard and to optimize methods to ensure a safer and effective procedure, thereby lowering rates of dislodgment. For the operators, it is essential to be equipped with available retrieval devices to be able to promptly address uncommon but possible procedural complications that can have very serious consequences.

CENTRAL ILLUSTRATION **Dislocated LAA Closure Device Capture**



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Schematic summary of the clinical case. LAA = left atrial appendage.

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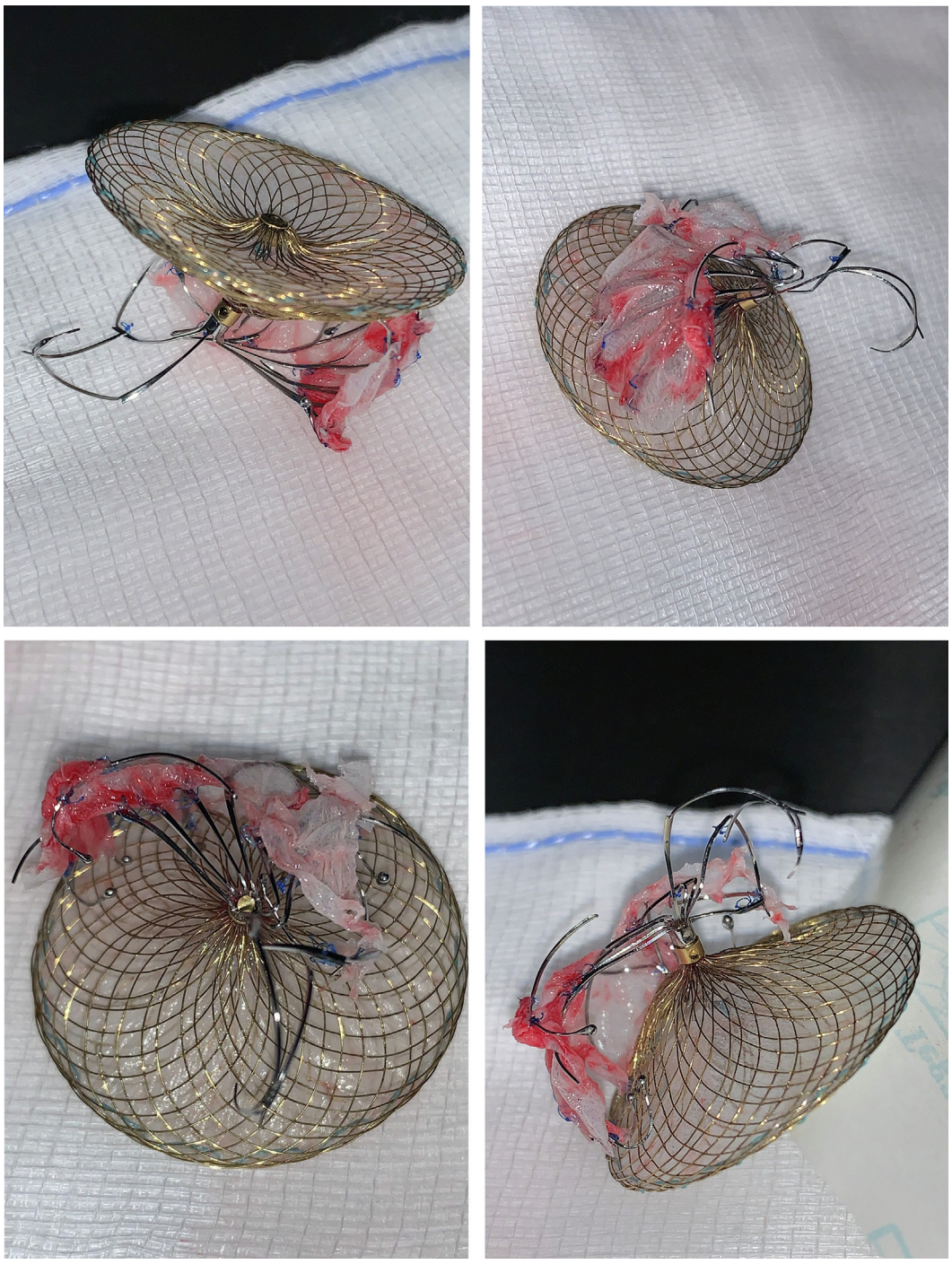
FIGURE 3 LAmbre Device (Lifetech Scientific, Shenzhen, China) After Its Retrieval



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KEY WORDS complication, device embolization, LAmbre device, snaring technique

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