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Case Report

Percutaneous Retrieval of Embolised Left Atrial Appendage Occluder With the Novel ŌNŌ Retrieval Basket

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Embolisation of a left atrial appendage occluder (LAAO) is associated with significant complications and mortality. Retrieval of an embolised device often necessitates surgical intervention because a standardised percutaneous approach is not yet established. An 83-year-old patient presented with progressive dyspnoea 6 months after LAAO implantation. Echocardiography revealed embolisation of the occluder into the left ventricular outflow tract (LVOT), where it became entrapped in a biological valve prosthesis, causing severe aortic stenosis. Percutaneous retrieval of the LAAO was performed using the novel ŌNŌ retrieval basket. This case represents the first European application of the ŌNŌ retrieval basket, demonstrating its feasibility and safety.

Occlusion of the left atrial appendage (LAA) has become an established therapeutic approach for patients with atrial fibrillation (AF) considered to be unsuitable for long-term oral anticoagulation.[1] Although occlusion of the LAA is safe and associated with high procedural success, unexpected complications, such as device embolisation, do occur.[2] Recently published data from a multicentre registry demonstrates that embolisation of an LAAO causes major complications in 62.9% of patients. More precisely, the primary outcome, comprising bailout surgery, cardiogenic shock, stroke, transient ischemic attack, and death, occurred in 43.5% of the cohort.[3] These findings underscore the urgent need for major advancement regarding percutaneous retrieval techniques of embolised LAAO. The present case represents the first European application of the novel and not yet CE certified ŌNŌ retrieval basket (ŌNŌCOR) for percutaneous retrieval of an embolised LAAO (Watchman FLX 24 mm; Boston Scientific) from the LVOT. The ŌNŌ retrieval basket is currently FDA approved and available for doctors in the United States, Qatar, and Saudi Arabia. Therefore, our case was performed under compassionate use regulations.

A multimorbid 83-year-old man presented with progressive dyspnoea (New York Heart Association [NYHA] functional class III) and vertigo 6 months after implantation of an LAAO to avoid anticoagulation in persistent AF and concomitant angiodysplasia with a history of significant gastrointestinal bleeding. He underwent surgical aortic valve implantation (Perimount 23 mm; Edwards Lifesciences) in 2016 and suffered from heart failure with reduced ejection fraction due to ischemic cardiomyopathy.

Echocardiography showed embolisation of the formerly implanted LAAO in the LVOT entrapped under the biological aortic valve prosthesis (Fig. 1, A and C) thereby creating a symptomatic severe low-flow–low-gradient aortic valve stenosis (peak aortic valve velocity 3.6 m/s, mean pressure gradient 30 mm Hg, aortic valve area 0.8 cm^2) in the presence of impaired left ventricular ejection fraction of 35% (Fig. 1, A-D). Considering both age and comorbidities, the surgical risk (EURO II score of 9.4%) was prohibitive, and the heart team recommended a nonsurgical solution.

With the patient under general anaesthesia, percutaneous LAAO retrieval was guided by transesophageal echocardiography and fluoroscopy. A 20-F 33-cm-long DrySeal sheath (Gore Medical) was placed in the left axillary artery to ensure adequate reach of the 100-cm-long ŌNŌ retrieval device. A cerebral protection system (Sentinel; Boston Scientific) was introduced via the right radial artery. Subsequently, the retrieval system, composed of a 7-F Raptor grasping device (Steris Healthcare), the ŌNŌ, and the Destino twist deflectable steerable 13.8-F guiding sheath (Oscor Medical

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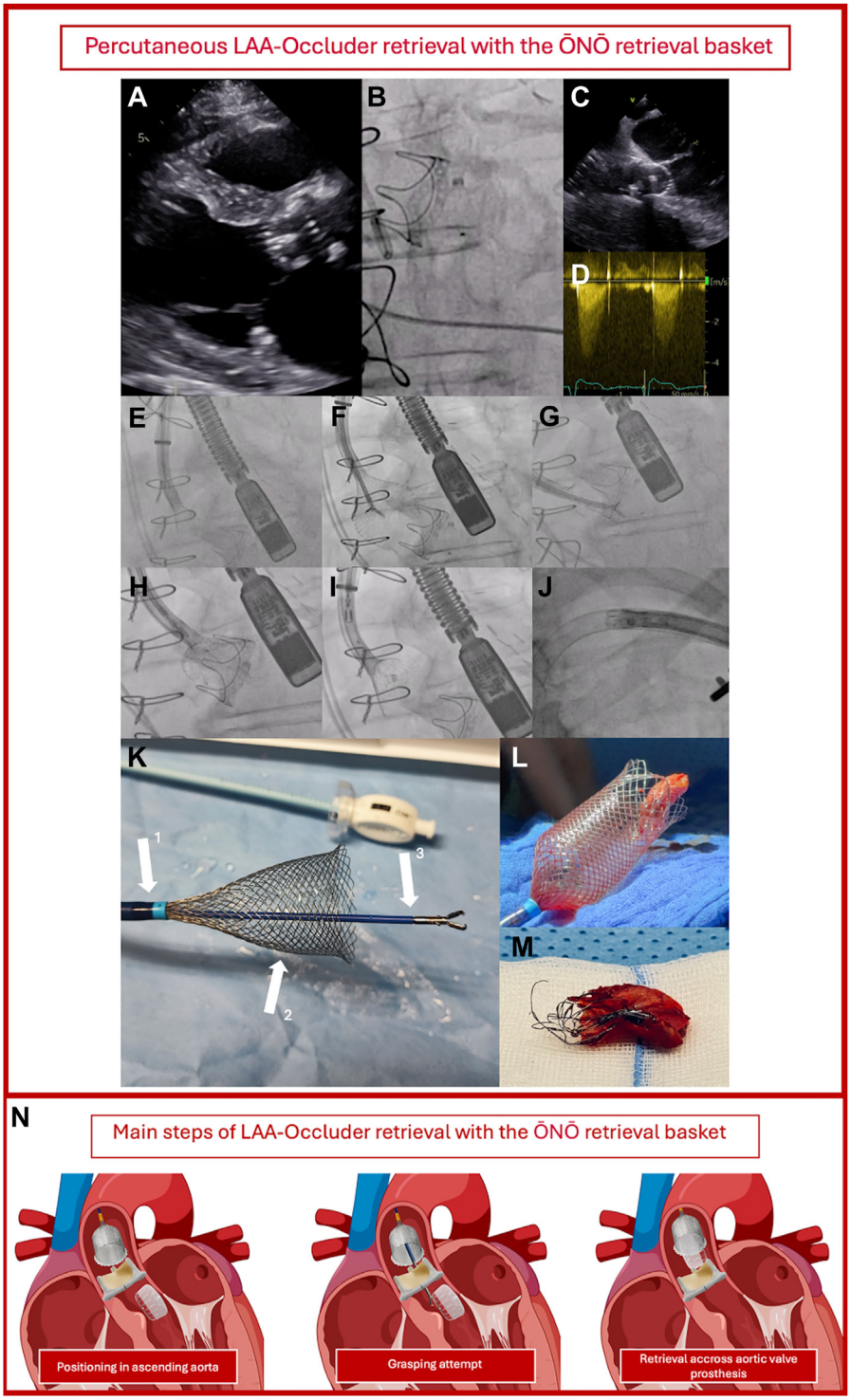

Figure 1. Percutaneous left atrial appendage occluder retrieval with the ŌNŌ retrieval basket. (**A**) Transthoracic echocardiography, (**B**) intra-procedural angiography, and (**C**) transesophageal echocardiography, showing embolisation of the Watchman Flx Device into the left ventricular outflow tract in front of the biological aortic valve prosthesis. (**D**) Severely increased transvalvular gradients in a patient with reduced left ventricular ejection fraction. (**E**) Delivery of the ŌNŌ retrieval basket and the Raptor grasping device through the Destino twist deflectable steerable 14-F guiding sheath (**arrow no. 1 in K**), all inside a 20-F Dry Seal Flex Introducer sheath. (**F**) Positioning of the ŌNŌ retrieval basket in the ascending aorta. (**G**) Grasping attempt of the dislocated Watchman device. (**H, I**) Retrieval of the grasped Watchman device traversing the aortic valve prosthesis into the ŌNŌ retrieval basket. (**J**) Retraction of the whole system (Watchman device, grasping device, and ŌNŌ basket) into the 13.8-F sheath. (**K**) Mounted system comprising the ŌNŌ retrieval basket (**arrow no. 2**) and the Raptor grasping device (**arrow no. 3**) before use. (**L**) Retrieval of the Watchman Flx device inside the ŌNŌ retrieval basket. (**M**) Retrieved Watchman Flx device. (**N**) Main steps of the left atrial appendage occluder retrieval.

devices), was positioned in the ascending aorta (Fig. 1E). The ŌNŌ was opened (Fig. 1F) to protect the ascending aortic wall, and the Raptor forceps traversed the aortic valve prosthesis. Traversal of the Raptor forceps over the Perimount prosthesis was performed in closed position, the forceps was then opened immediately after passing below the aortic valve ring, and immediate grasping of the dislocated LAAO was achieved (Fig. 1G). Cautious retrieval of the grasped Watchman device, followed by closing of the ŌNŌ and retraction of the retrieval system was accomplished without any difficulties (Fig. 1, H-J). The grasped Watchman device was securely held by the ŌNŌ basket throughout the entire retrieval process, ensuring excellent safety (Fig. 1L) and illustrating the substantial radial force exerted by the ŌNŌ basket, as evidenced by the device`s deformation (Fig. 1M). Occluder removal could be performed with the 13.8-F sheath, leaving the 20-F sheath in place for a potential bail-out transcatheter aortic valve replacement. However, damage of the aortic valve prosthesis was ruled out, with neither valvular insufficiency nor stenosis. The main steps of the described procedure are summarised and schematically depicted in Figure 1N. The patient was discharged without any adverse events and reported immediate functional improvement (NYHA functional class I).

Embolisation of an LAAO is a rare but potentially detrimental complication after occlusion of the LAA, especially when embolising the LVOT causing sudden increase in afterload to a compromised left ventricle. Retrieval of an embolised LAAO from the left ventricle often requires surgery because a standardised percutaneous retrieval technique is still lacking. In addition, percutaneous retrieval with a snare or bioptome catheter may cause further embolisation or even harm to delicate structures like vascular walls or heart valves, and often requires a second attempt, which involves using an alternative percutaneous approach or transition to salvage surgery.[3,4] Conversely, the distally flared ŌNŌ retrieval basket (Fig. 1K) allows easy incorporation of embolised devices as withdrawing the catheter back into the retrieval sheath increases inward radial force, ensuring proper alignment and compression of the retrieved LAAO, as first been shown by Hermann et al.[5] Those authors reported the first transfemoral application of the ŌNŌ device for the retrieval of an LAAO from the LVOT. Unlike in our case, that LAAO was transported using a Raptor device through the patient's native aortic valve. Subsequently, the LAAO was manoeuvreed unprotected and only with the Raptor forceps into the descending aorta, where it was then transferred into the ŌNŌ basket.[5] By doing so, the authors left the main advantage of the nitinol basket, that is, protecting surrounding fragile structures such as the aortic wall from potential damage by the retrieved device, largely unused. However, to provide optimal protection in the ascending aorta, a transaxillary approach, as applied in our case, is essential owing to the device's limited length of only 100 cm.

In summary, the ŌNŌ device optimally prevents further damage and recurrent embolisation.

The described case emphasises feasibility and safety of a percutaneous retrieval technique using the novel ŌNŌ retrieval basket, even in the setting of a LAAO caught in a biological aortic valve prosthesis.

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Ethics Statement

Our institution does not require ethics approval for reporting individual cases, provided that the patient has given written informed consent for publication.

Patient Consent

The authors confirm that patient consent forms have been obtained for this article.

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Supplementary Material

To access the supplementary material accompanying this article, visit the online version of the *Canadian Journal of Cardiology* at www.onlinecjc.ca and at https://doi.org/10.1016/j.cjca.2024.08.276.