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CASE REPORT
Other

Snare and track (SNACK) technique: a novel approach for successful placement of an intracardiac echocardiogram catheter in the left atrium: a case report

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Background Placing an intracardiac echocardiogram (ICE) catheter in the left atrium allows for excellent visualization of the left atrial appendage to guide left atrial (LA) appendage occlusion (LAAO). Nonetheless, it requires a separate septal puncture or a unique set of skills to navigate the ICE through a previously prepared septal puncture, which can be challenging.

Case summary This report describes a novel method to insert an ICE in the left atrium through a single septal puncture utilizing a snare technique. A 76-year-old male underwent LAAO by ICE guidance. After obtaining a standard atrial septal puncture, we were unable to advance the ICE into the left atrium. Therefore, we used a loop snare to grasp the ICE catheter-tip in the right atrium and direct it into the left atrium via the prepared septal puncture by tracking a pigtail wire that we routinely place as part of the procedure. Afterward, the left atrial appendage was successfully occluded with a Watchman device (Boston Scientific, Galway, Ireland), and the patient was discharged home without complications.

Discussion The described technique could be a helpful tool for ICE placement to the left atrium in a controlled fashion, especially when challenging anatomy is encountered.

Keywords Case report • Intracardiac echocardiogram • Snare • Left atrial appendage occlusion

ESC Curriculum 2.2 Echocardiography • 5.3 Atrial fibrillation

Learning points

- The intracardiac echocardiogram is commonly used to guide left atrial appendage occlusion.
- The insertion of intracardiac echocardiogram (ICE) catheter to the left atrium can be challenging; therefore, the need for a reliable way for this task is evident.
- Using a snare catheter could facilitate the placement of ICE catheter to the left atrium.

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Introduction

The use of an intracardiac echocardiogram (ICE) catheter for guiding left atrial (LA) appendage occlusion (LAAO) was first described in 2007, which involved placing the ICE in either the right atrium, right ventricular outflow tract, or coronary sinus.[1] However, the poor visualization of the LAA from these locations has made the LA a favourable location for an ICE to guide LAAO with superior imaging given its adjacency. Nonetheless, placing the ICE catheter in the LA can be challenging and time-consuming. Therefore, a reliable technique is needed for this task. We report the first use of the snare and track (SNACK) technique for successful placement of an ICE into the LA.

Case description

A 76-year-old male was evaluated for LAAO due to excessive bruising and frequent falls. The patient had history of paroxysmal atrial fibrillation and took 5 mg of apixaban b.i.d. for anticoagulation. His calculated CHA2DS2VASc and HAS-BLED scores were 4 and 2, respectively. His medical history was also significant for non-ischemic cardiomyopathy with a biventricular implantable cardioverter-defibrillator, non-obstructive coronary artery disease, hypertension, and chondromyxoid fibroma of the ilium. A pre-procedural transoesophageal echocardiogram (TEE) assessment revealed a broccoli shaped LAA measuring 22 mm in the largest diameter of the ostium without evidence of thrombosis.

Procedure

Two accesses were obtained in the right common femoral vein with 16 French Performer Check-Flo and 10 French Flexor Check-Flo introducers (Bloomington, IN, USA). Boluses of unfractionated heparin were given to maintain an activated clotting time above 250 s throughout the procedure. A 10 French AcuNav ultrasound catheter (Mountain View, CA, USA) was introduced into the right atrium through the 10 French introducer, as shown in *Figure 1*. Then, we advanced an eight French Mullins introducer sheath (Plymouth, MN, USA) via the 16 French Introducer over a 0.032′ Amplatz Extra Stiff Wire (Bloomington, IN, USA) into the superior vena cava. The Amplatz Extra Stiff wire was removed, and a NRG® RF transseptal needle (Baylis, Montreal, Quebec, Canada) was placed inside a Mullins sheath to perform a septal puncture with ICE guidance.

After crossing the atrial septum, the NRG RF transseptal needle and dilator were removed and a 0.025′ ProTrack pigtail wire (Baylis, Montreal, Quebec, Canada) was placed into the LA, as shown in *Figures 2* and *3*. The Mullins catheter was exchanged for a 14 French double-curved Watchman access sheath (Boston Scientific, Galway, Ireland), which was advanced over the ProTrack wire to the LA, dilating the atrial septum. It was then pulled back into the right atrium to allow the ICE to be advanced to the left atrium, via the prepared septal puncture, but this manoeuvre was unsuccessful despite multiple attempts. Therefore, we decided to snare the ICE using a new technique.

A 25-mm ev3 Amplatz GooseNeck snare (Plymouth, MN, USA) was placed inside a seven French multipurpose guide, which was then advanced over the ProTrack wire inside the doubled curved sheath into the right atrium. Here, the snare was opened, and the tip of the ICE catheter was easily snared by advancing it inside the loop of the snare, as shown in *Figure 2* and Supplementary material online, *Video S1*.

The ICE and multipurpose catheter were advanced simultaneously as one unit into the LA by tracking the ProTrack wire. The snare was then released and removed along with the seven French Multipurpose guide. The double-curved Watchman access sheath was reintroduced into the right atrium beside the ICE catheter, as shown in *Figures 2* and *3*. After obtaining measurements of the LAA and ruling out clots with the ICE, we placed the Watchman sheath in the LAA over a pigtail catheter, and then successfully deployed a 27-mm Watchman device (Boston Scientific, Galway, Ireland), as shown in *Figure 3* and Supplementary material online, *Video S2*.

Next, using ICE imaging at the mid_left atrium and mitral inflow positions, we confirmed that the device deployment was satisfactory without complications. All catheters and sheaths were removed, and haemostasis in the right common vein was achieved by placing a mattress suture. The patient tolerated the procedure well and was discharged home on 5 mg of apixaban b.i.d., which was subsequently substituted 1 month later with aspirin 81 mg and Plavix 75 mg when the postprocedural TEE showed that the device was in a good position, with trivial peridevice leak (1.7 mm) and no device-related thrombosis. The antiplatelet regimen was later simplified to only aspirin 81 mg daily 6 months after the device implantation, which was the latest follow-up with the patient with no reported procedure-related complications.

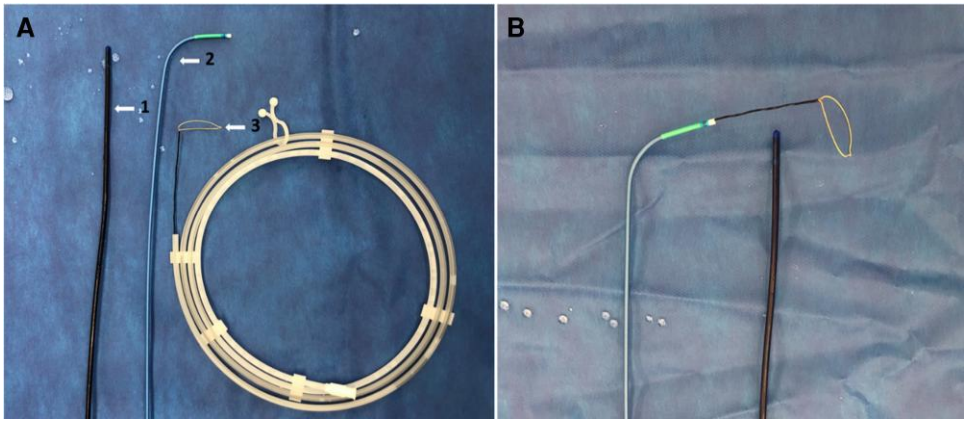

Figure 1 (*A*) 1. 10 French AcuNav ultrasound catheter, 2. 7 French multipurpose guide catheter, 3. 25 mm ev3 Amplatz GooseNeck snare. (*B*) ev3 Amplatz GooseNeck snare inside a 7 French multipurpose guide before introducing the guide into the 16 French Check-Flo introducer over a ProTrach wire.

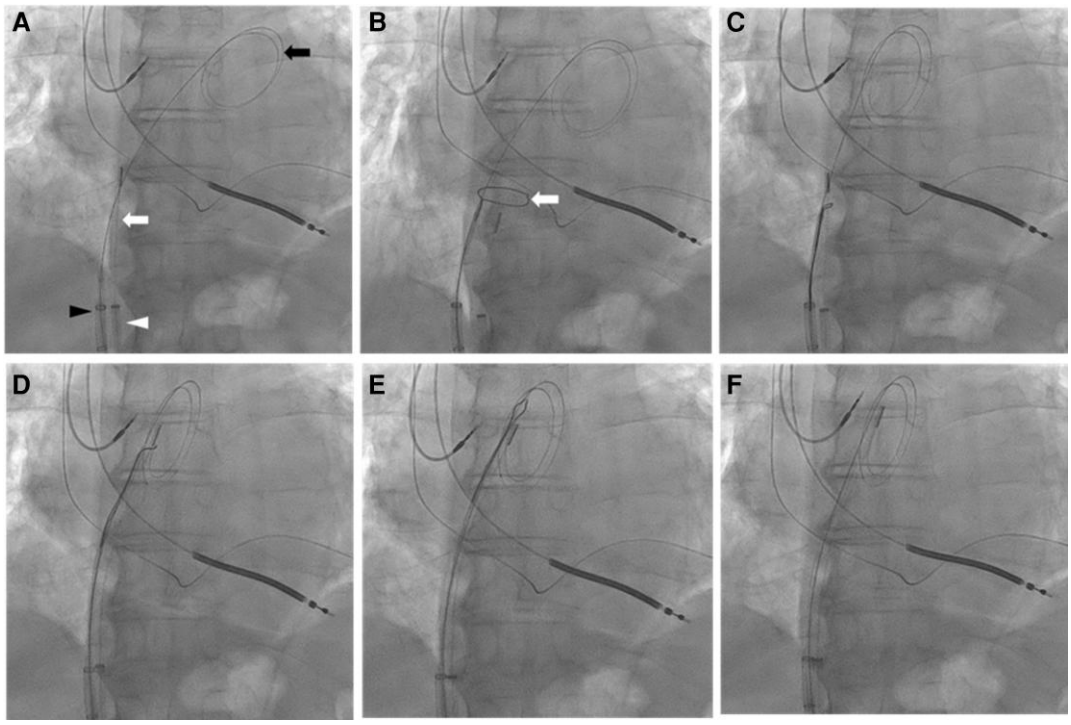

Figure 2 (*A*) ProTrack wire in the left atrium (black arrow), 10 French intracardiac echocardiogram catheter in the right atrium (white arrow), 16 French Performer Check-Flo introducer (black arrow head), and 10 French Flexor Check-Flo introducer (white arrow head). (*B*) 25 mm ev3 GooseNeck snare (white arrow) deployed prior to grasping the tip of intracardiac echocardiogram catheter. (*C*) Intracardiac echocardiogram catheter was grasped and brought closer to the multipurpose guide and ProTrack Wire. (*D*) Intracardiac echocardiogram catheter was advance with the multipurpose guide into the left atrium. (*E*) Releasing the tip of intracardiac echocardiogram catheter. (*F*) ev3 GooseNeck snare and multipurpose guide were removed.

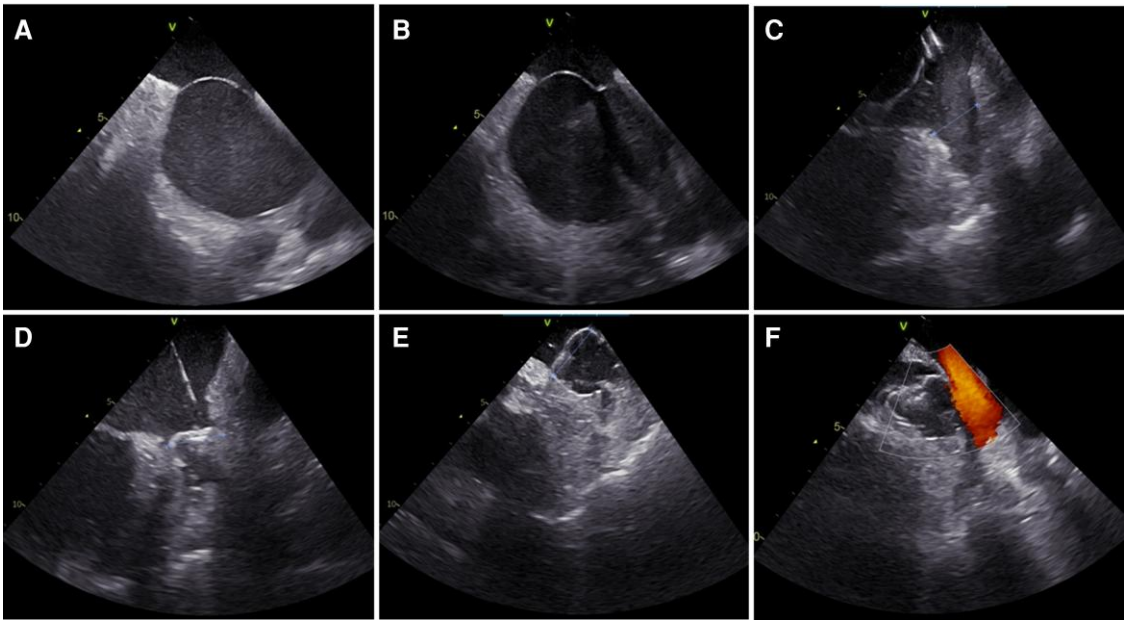

Figure 3 (*A*) Intracardiac echocardiogram catheter imaging of the atrial septum. (*B*) Intracardiac echocardiogram imaging showing Mullins catheter with NRG RF transseptal needle indenting the atrial septum prior to septal puncture. (*C*) Measuring the left atrial appendage orifice diameter with ICE catheter in the left atrium. (*D*) Measuring the compression of Watchman device from the mid-left atrium position. (*E*) Measuring the compression of Watchman device from the low-left atrium position. (*F*) Doppler imaging with using intracardiac echocardiogram catheter in the left atrium.

Discussion

The rapid evolution of structural heart interventions has fuelled interest in using an ICE for procedural guidance. Despite the lack of prospective randomized trials comparing the efficacy and safety of ICE and TEE in LAAO, enthusiasm for the use of ICE is largely driven by some of its advantages, such as limiting the personnel needed by forgoing the use of a dedicated imager, mitigating the need for general anaesthesia, and shortening the recovery time compared with TEE. Furthermore, there are multiple retrospective reports demonstrating the safety of its use.[2–4]

Although, the ICE has been used to guide LAAO from right-sided locations of the heart, the visualization of the LAA from these locations is often inadequate.[2] Therefore, an increasing number of operators prefer to introduce the ICE to the LA through either a separate septal puncture, or by passing it through a previously prepared septal puncture. However, using a separate septal puncture adds time and complexity to the procedure, and using a previously prepared septal puncture can be challenging due to the wide variation of anatomy, as in patients with rotated hearts, an aneurysmal, or lipomatous septum, or a tortuous inferior vena cava that diverts the ICE away from the atrial septum. In addition to the adherent difficulty of navigating the ICE catheter in a three-dimensional space toward a small septal puncture with fluoroscopy guidance. *Table 1* summarizes the advantages and disadvantages of the common current techniques.

To overcome some of these challenges, operators may consider further dilation of the septum with a larger dilator or balloon to smooth the navigation of ICE through the septum or using a long-braided sheath to counter the effect of the tortuous vasculature on ICE manipulation or to choose a different technique such as a double transseptal puncture. Nevertheless the need for a reliable way to insert the ICE in the left atrium is evident.

This report has described a novel method that facilitates ICE placement into the LA by simply advancing it inside a large snare loop. The snare guides the tip of the ICE catheter to the septal puncture by tracking a pigtail wire, which is routinely placed in the LA as part of the procedure.

Albeit this is the first report of using a snare to guide ICE placement, the utility of snares in other structural procedures has been reported previously. They have mostly been used in transcatheter aortic valve procedures to divert a non-deflectable delivery system away from a heavily calcified aorta or to facilitate crossing of the aortic valve especially when a horizontal aorta is encountered.[5–7]

Nonetheless, a few points should be factored in when an operator considers this technique. First, the operator should be proficient in using snare catheters; second, be vigilant for the risk of equipment's entanglement; and third, consider the additional cost of using a snare and guiding catheter. Lastly, the current commercial ICE catheters are only capable of monoplane imaging which may not be optimal for achieving a precise landing zone and device sizing, so a careful pre-procedural imaging is often necessary.

In conclusion, the presented technique could be beneficial, especially when challenging anatomy is encountered. It helps avoid excessive ICE manipulation or an uncontrolled catheter advancement to the LA and mitigates the need for a second septal puncture. However, the technique's reproducibility remains to be seen when it is applied in more patients with operators of different levels of experience.

Lead author biography

Dr Akram Kawsara is trained in cardiovascular and structural heart disease. Currently, he is working at West Virginia University as the associate director of the Structural Heart Disease and the Interventional Cardiovascular Fellowship programmes.

Supplementary material

Supplementary material is available at *European Heart Journal—Case Reports* online.

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Table 1 A summary of the two common techniques for intracardiac echocardiogram placement in the left atrium

Technique	Technique description	Advantages	Disadvantages
Single transseptal puncture.	Standard septal puncture followed by careful manipulation of ICE while advancing it to the left atrium then reintroducing the guiding sheath via the same septal puncture.	(1) Fewer steps (2) Reduces the risk associated with the second septal puncture.	(1) Uncontrolled advancement of ICE to the left atrium. (2) Potential failure of ICE placement in the left atrium in patients with challenging anatomies. (3) Larger residual iatrogenic atrial septal defect.
Double transseptal puncture.	Two standard septal punctures to accommodate ICE and guiding sheath separately.	(1) Less interaction between the ICE and guiding sheath. (2) Easier manipulation of the ICE in the left atrium. (3) Smaller residual iatrogenic atrial septal defect.	(1) More steps. (2) Adds risk associated with the second septal puncture.

Slide sets: A fully edited slide set detailing this case and suitable for local presentation is available online as Supplementary data.

Consent: A written consent for submission and publication of this case report including images and associated text has been obtained from the patient in line with COPE guidance.

Conflict of interest: None declared.

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