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CORONARY, PERIPHERAL, AND STRUCTURAL INTERVENTIONS

HOW WE DID IT

Step-by-Step ICE-Guided Aspiration Thrombectomy

Gastrointestinal Bleeding Patient With Device-Related Thrombus on Watchman FLX

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ABSTRACT

OBJECTIVES Device-related thrombus (DRT) remains a significant complication in the field of left atrial appendage occlusion (LAAO). In patients who have difficulty tolerating long-term anticoagulation, treatment options are limited. We present a step-by-step intracardiac echocardiography (ICE)–guided AngioVac (AngioDynamics) challenging case in a 71-year-old woman with a gastrointestinal bleeding tendency and a highly mobile thrombus on a Watchman FLX device (Boston Scientific).

KEY STEPS We obtained a 26-F DrySeal (Gore Medical) venous access, a 15-F extracorporeal membrane oxygenation cannula arterial access, and a 3-dimensional ICE access. We performed a challenging transseptal crossing using an Agilis medium curl catheter (Abbott) and an electrified Astato wire (Asahi Intecc Medical) as a result of a severely hypertrophic lipomatous septum. We snared the ICE catheter across the interatrial septum (IAS) with a 35-mm gooseneck snare in the inferior vena cava. We used a balloon-assisted technique to bring the F-18 AngioVac system across the IAS. The helicoptering technique with a J-wire assisted with suction of the DRT.

POTENTIAL PITFALLS Currently, there are no data to support which post-LAAO antithrombotic regimen predicts DRT. For patients who are unable to tolerate long-term anticoagulation, treatment options are limited. To our knowledge, this is the first reported ICE-guided LAAO thrombus aspiration.

TAKE-HOME MESSAGES ICE-guided aspiration thrombectomy of LAAO thrombus is feasible in high-risk patients who cannot tolerate long-term oral anticoagulation and to reduce the risk of clot embolization. (JACC Case Rep. 2025;30:103219) 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/).

Device-related thrombus (DRT) is a significant concern that can affect the success of left atrial appendage occlusion (LAAO). Previous studies have shown that the incidence of DRT of LAAO is approximately 3% to 4%. DRT was associated with a notable increase in the risk of ischemic stroke or systemic embolization, as observed in the PROTECT AF (Watchman Left Atrial Appendage System for

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ABBREVIATIONS AND ACRONYMS

AF = atrial fibrillation

DRT = device-related thrombus

IAS = interatrial septum

ICE = intracardiac echocardiography

IVC = inferior vena cava

LAAO = left atrial appendage occlusion

TEE = transesophageal echocardiogram

Embolic Protection in Patients With Atrial Fibrillation) and PREVAIL (Prospective Randomized Evaluation of the Watchman Left Atrial Appendage Closure Device in Patients With Atrial Fibrillation VERSUS Long-Term Warfarin Therapy) trials.[1-4] Management of DRT primarily involves the resumption of anticoagulation.[5] However, for patients who are unable to tolerate anticoagulation, treatment options remain challenging.

CASE SUMMARY

We present the case of a 71-year-old woman with DRT on a 20-mm Watchman FLX device (Boston Scientific). Her significant medical history included atrial fibrillation (AF) with a CHA_2DS_2-VASc score of 5 and a HASBLED score of 4, recurrent gastrointestinal bleeding, chronic obstructive pulmonary disease treated with long-term oxygen therapy, chronic kidney disease, diabetes mellitus, coronary artery disease, obesity (body mass index, 45 kg/m^2), and heart failure with preserved ejection fraction. After an uncomplicated LAAO procedure, she was discharged on apixaban, 5 mg twice daily. A 45-day surveillance transesophageal echocardiogram (TEE) revealed a highly mobile thrombus measuring 0.7 cm × 1 cm, adherent to the device (**Figures 1A and 1B**, Video 1), with no peridevice leak. The patient reported compliance with her anticoagulation regimen. She was then transferred to our center (Center for Structural Heart Disease, Henry Ford Health System, Detroit, Michigan, USA) for evaluation. On arrival, there was concern about active esophagitis and a drop in hemoglobin levels to 9 g/dL from a baseline value of 11 g/dL. After a multidisciplinary discussion, percutaneous aspiration thrombectomy was recommended in view of the risk of DRT embolization, the patient's high surgical risk, and her poor candidacy for long-term continuation of anticoagulation.

PROCEDURAL STEPS

Given her underlying medical conditions, conscious sedation and intracardiac echocardiography (ICE) (VeriSight, Philips) were chosen to guide the procedure. Full heparin was administered. Bilateral Sentinel cerebral embolic protection devices (Boston Scientific) were deployed to achieve full cerebral protection. Two preclosed percloses (Abbott) were deployed on the right femoral vein and artery, and each access was upsized to a 26-F DrySeal Gore Sheath (Gore Medical)

TAKE-HOME MESSAGE

- ICE-guided aspiration thrombectomy of an LAAO thrombus is feasible in high-risk patients who are unable to tolerate long-term oral anticoagulation and to reduce the risk of embolization.

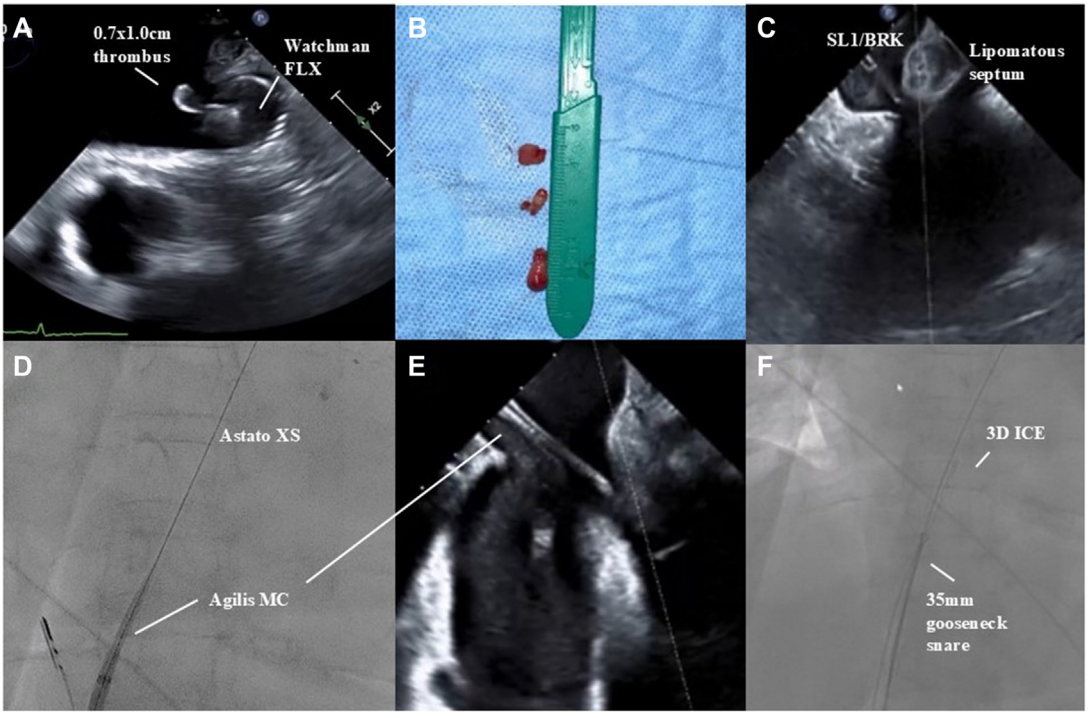
and a 15-F extracorporeal membrane oxygenation cannula to establish the AngioVac (AngioDynamics) circuit. A 3-dimensional ICE catheter was inserted through the left femoral vein through an 11-F × 25 cm Pinnacle sheath (Terumo).

Initially, SL1/BRK (Abbott) and VersaCross (Boston Scientific) systems were used for attempted transseptal crossing. However, in view of the significant lipomatous hypertrophy of the septum, we were unable to reach the fossa of the interatrial septum (IAS) despite multiple attempts, and the transseptal crossing proved challenging (**Figure 1C**). Subsequently, an Agilis medium curl catheter (Abbott) was advanced, successfully tenting the IAS under ICE guidance, and an electrified Astato XS 20-mm wire (Asahi Intecc Medical) was able to traverse the septum at 50 W (**Figures 1D and 1E**). This wire was then exchanged for a 0.014 inch × 300 cm Grand slam wire (Asahi Intecc Medical) over a Turnpike LP 135-cm microcatheter (Teleflex).

There was substantial difficulty delivering equipment across the IAS, thus prompting serial dilatation of the septostomy by using 1.5-mm Takeru balloons (Terumo), followed by 2.0-, 3.0- and 4.0-mm NC Emerge balloons (Boston Scientific). The Grand Slam wire was then exchanged for a 0.018 inch × 300 cm Steelcore wire (Abbott) over a Quick-Cross microcatheter (Philips).

A further septostomy was performed using a 6.0-mm Saber balloon (Cordis), with balloon tracking of the Agilis catheter into the left atrium. Then, an Amplatz superstiff wire (Boston Scientific) was advanced into the left upper pulmonary vein, followed by septostomy using 8.0- and 14.0-mm Armada balloons (Abbott) (**Figures 2A and 2B**). However, there was persistent difficulty in crossing the ICE catheter across the IAS into the left atrium. Thus, a 35-mm gooseneck snare (Medtronic) was advanced through the right femoral vein DrySeal sheath through a Judkins right 4.0 guiding catheter (Merit Medical), positioned parallel to the stiff wire in the inferior vena cava (IVC), to assist tracking the ICE catheter across the IAS into the left atrium after it was snared in the IVC (**Figure 1F**, Video 2).

FIGURE 1 Imaging and Treatment of Device-Related Thrombus



(A) A transesophageal echocardiogram showed a device-related thrombus on a Watchman device (Boston Scientific). (B) Thrombus. (C) Intracardiac echocardiography (ICE) depicted the lipomatous septum with the SL1/BRK transseptal system (Abbott). (D) Fluoroscopic and (E) intracardiac echocardiographic images illustrated the use of an electrified Astato XS 20-mm wire (Asahi Intecc Medical) with the Agilis MC (medium curl) catheter (Abbott) to cross the interatrial septum. (F) A 35-mm gooseneck snare assisted intracardiac echocardiographic device crossing of the interatrial septum. 3D = 3-dimensional.

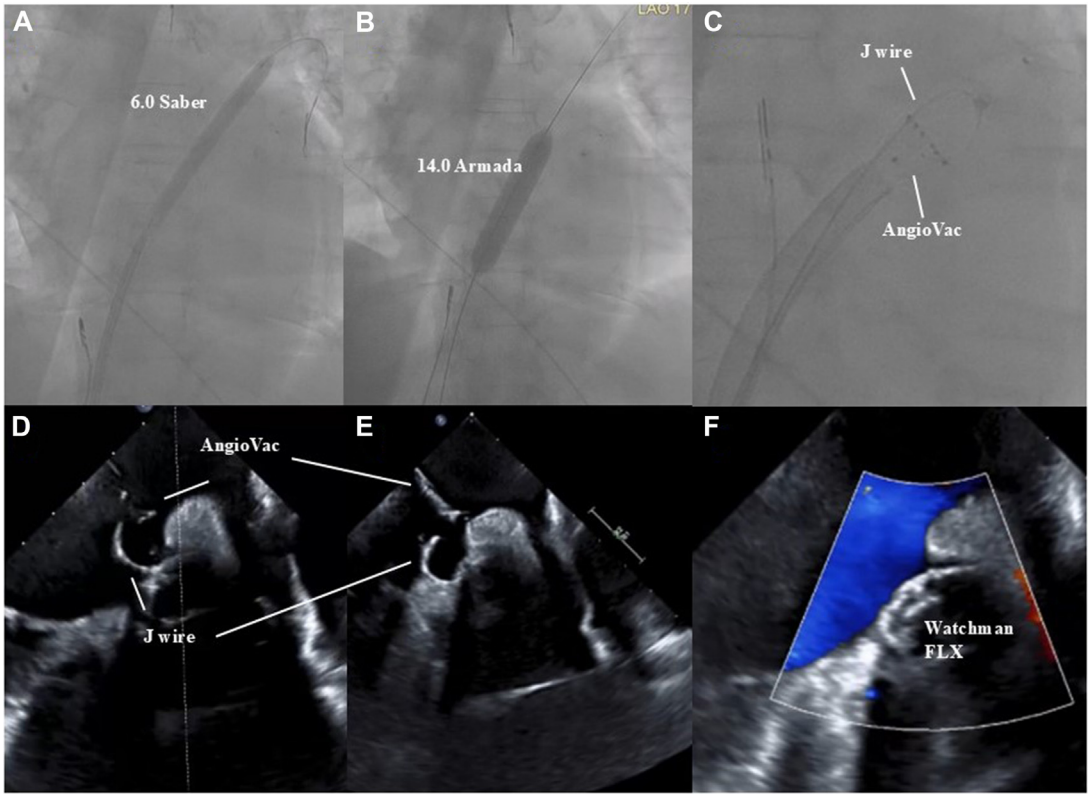
Subsequently, the F-18 AngioVac was advanced to the left atrium through the right femoral venous DrySeal sheath across the IAS by using a balloon-assisted technique with the 14-mm Armada balloon (Video 2), and a 15-F arterial cannula was connected to set up the circuit. The thrombus on the LAAO device was visualized under the ICE catheter. The F-18 AngioVac was advanced to the Watchman FLX device, and aspiration thrombectomy commenced at approximately 4 L/min. Because of residual thrombus, a "helicoptering" technique using the J-wire was used to facilitate thrombus detachment (**Figures 2C to 2E**, Video 3). After multiple suction attempts, there was no residual thrombus attached on the Watchman device visible on ICE (**Figure 2F**), and the AngioVac was removed. Protamine was given at the end of the procedure.

A subsequent diagnostic gastrointestinal workup was performed and showed esophagitis only. The patient was prescribed a high-dose proton pump inhibitor. Because she had no further drop in hemoglobin, the consensus was to challenge with warfarin and aspirin. Follow-up TEE at 3 months showed complete resolution of the DRT, the warfarin was then discontinued, and the patient was kept on a regimen of aspirin alone.

POTENTIAL PITFALLS

Recent review has shown that DRT after LAAO is rare, but it is associated with adverse clinical outcomes and is not easy to manage. Independent predictors of DRT include previous stroke, renal disease, and permanent AF, whereas implant depth is the most consistent procedural risk factor. Currently, there are no data to support which post-LAAO antithrombotic regimen predicts DRT, and there is no clear classification of DRT. The resumption of anticoagulation remains the current standard of care on the diagnosis of DRT.[5] For patients unable to

FIGURE 2 Aspiration Thrombectomy in Device-Related Thrombus



(A and B) Septostomy with a 6.0-mm Saber balloon (Cordis) and a 14.0-mm Armada balloon (Abbott). (C to E) AngioVac (AngioDynamics) with a helicoptering technique. (F) The final intracardiac echocardiographic imaging showed resolution of the device-related thrombus.

tolerate anticoagulation, treatment options are limited. Previous case reports of aspiration thrombectomy with AngioVac were described in the arterial circulation and the atrial appendage.[6-8] To our knowledge, this is the first report of ICE-guided LAAO thrombus aspiration. In patients who are unable to tolerate or have contraindications to TEE and general anesthesia, ICE-guided aspiration thrombectomy may be a feasible approach for patients with thrombus on an LAAO device, and this technique may potentially lower the risk of stroke or systemic embolization. Serial monitoring and follow-up are essential because long-term data remain unavailable. Current experience is based on individual center expertise.

CONCLUSIONS

DRT on the LAAO device is a rare but significant complication. This case demonstrates that ICE-guided aspiration thrombectomy is a feasible approach to reduce thrombus burden in a timely fashion in high-risk patients who are unable to tolerate long-term oral anticoagulation.

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Dr Lee has served as a consultant for Edwards Lifesciences; and has served as a proctor for Abbott. Dr O'Neill has served as a consultant to Edwards Lifesciences; and has received research support from Edwards Lifesciences. Dr Frisoli has served as a proctor for Edwards Lifesciences, Abbott, Boston Scientific, and Medtronic. Dr Villablanca has served as a consultant for Edwards Lifesciences, Medtronic, Shockwave, Abiomed, and Angiodynamics. All other authors have reported that they have no relationships relevant to the contents of this paper to disclose.

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KEY WORDS AngioVac, device-related thrombus, intracardiac echocardiography, helicoptering, snaring, Watchman FLX

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