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CASE REPORT
Other

Percutaneous extraction of a large device-related thrombus on a Watchman™ device: a case report

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Background Left atrial appendage occlusion devices are commonly used to prevent stroke in patients with persistent atrial fibrillation who are unable to tolerate anticoagulation. However, certain patient- and device-related characteristics increase the risk for the development of a device-related thrombus (DRT). The presence of a DRT increases the risk of stroke and should be treated. Management of DRT lacks consensus but is mostly focused on anticoagulation. In patients with large thrombi that need to be managed urgently, percutaneous extraction may be a viable option.

Case summary In this report, we describe the successful management of a DRT via percutaneous thrombus extraction technology in an 81-year-old woman with a large thrombus attached to a WATCHMAN™ device. The patient initially presented with shortness of breath, and on imaging a pedunculated thrombus was detected. The thrombus was extracted using a Penumbra Lightning 12™ (Penumbra Inc., Alameda, CA, USA) catheter with a Sentinel™ (Boston Scientific, Marlborough, MA, USA) cerebral embolic protection device. The patient had no neurologic sequelae and was started on anticoagulation.

Discussion Percutaneous thrombectomy can be safely performed to extract large left atrial occlusion DRT that require urgent management, without any neurologic sequelae. We believe this can be used in patients with a large DRT who would not be adequately managed with anticoagulation and in whom surgery is not feasible.

Keywords Atrial fibrillation • Device-related thrombus • Watchman • device • Sentinel™ • cerebral protection device • Percutaneous extraction • Case report

ESC Curriculum 5.3 Atrial fibrillation • 5.1 Palpitations

Learning points

- Device-related thrombi (DRTs) are a common occurrence with left atrial appendage occlusion (LAAO) devices and increase the risk of systemic embolization and stroke. Once risk factors of DRTs are identified, aggressive imaging based follow-up is necessary.
- Off label use of the vacuum assisted catheter aspiration with cerebral protection can be safely used to remove a LAAO DRT.

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Introduction

Left atrial appendage occlusion (LAAO) devices are an important tool in the stroke prevention armamentarium in patients with atrial fibrillation (AF).[1] When a large thrombus is identified on an LAAO device, urgent management is necessary. Intravenous anticoagulation with heparin is not always feasible or effective.[2] This report demonstrates successful percutaneous extraction of a left atrial (LA) thrombus attached to a Watchman™ (Boston Scientific Inc., Maple Grove, MN, USA) device using thrombus extraction technology with cerebral protection.

Timeline

Time	Events
2011	Persistent atrial fibrillation detected, patient started on warfarin.
2017	Major G.I. bleed.
June 2017	WATCHMAN™ procedure.
July 2017	6 mm peri-device leak, no device-related thrombus (DRT), warfarin discontinued.
April 2021 Day 1 Presentation	Patient presents with dyspnoea and a DRT. Started on heparin
Day 4 Procedure	Thrombus size unchanged Percutaneous extraction of thrombus performed, anticoagulation resumed.
May 2021 follow-up	Patient tolerating oral anticoagulation

Case presentation

An 81-year-old female with persistent AF since 2011, presented with dyspnoea and an elevated brain natriuretic peptide. Her medical history is significant for type II diabetes mellitus, chronic kidney disease, morbid obesity, and hypertension. On examination, she had an irregularly irregular pulse, no apex pulse deficit, and a paradoxically split second heart sound from a left bundle branch block. There was no murmur, gallop, or tumour plop heard.

The echocardiogram demonstrated a large, mobile, pedunculated thrombus (10 mm × 15 mm) attached to a 30 mm Watchman™ device which was implanted 4 years prior to index hospitalization (*Figure 1*, *Video 1*). The indication for the device was a relative contraindication to long-term anticoagulation given a history of a life-threatening gastrointestinal bleed. After implantation, anticoagulation was discontinued, and the patient was treated with dual antiplatelet therapy for 6 months followed by monotherapy with aspirin. Imaging at 45 days post-implantation showed a 6 mm peri-device leak adjacent to the coumadin ridge which was decided not to be treated by the operators. At presentation, her $CHADsVASC_2$ score was 5 and HAS-BLED score was 4, and she was on daily aspirin for stroke prevention.

The patients' presentation was not attributable to the thrombus but because of the high perceived risk of systemic embolization given its large size and mobility; intravenous heparin with therapeutic anti-Xa levels for anticoagulation was started. The thrombus was unchanged in appearance at 4 days and the heart team decided to intervene. Given her age and co-morbidities; an open surgical intervention was felt to be inferior to a transcatheter intervention.

Heparin was used for intraprocedural anticoagulation with a targeted activated clotting time of >250 s. The procedure was carried out under embolic protection with a Sentinel™ (Boston Scientific, Marlborough, MA, USA) device. After obtaining transeptal access

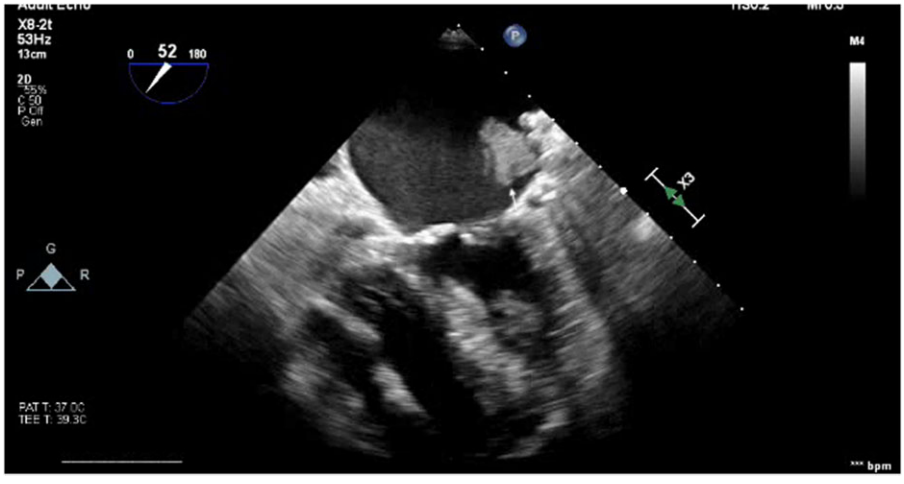


Figure 1 Intraprocedural transoesophageal echocardiography showing the large pedunculated thrombus(arrow) (10 mm × 15 mm) on the Watchman™ device.

The Penumbra Lightning 12™ aspiration catheter (Penumbra Inc., Alameda, CA, USA) was advanced into the left atrium to aspirate the thrombus. It is a 12-Fr catheter with a large 0.131-inch lumen designed for thrombus engagement and removal. It is indicated in the treatment of pulmonary embolism. The aspiration component is motorized with a microchip that detects when the device is in contact with thrombus vs. in contact with blood. It provides audio-visual feedback allowing for minimized blood loss and maximum extraction of the thrombus. The combination of this intelligent aspiration system and large lumen was chosen as it struck the right balance between device profile and suction capability.

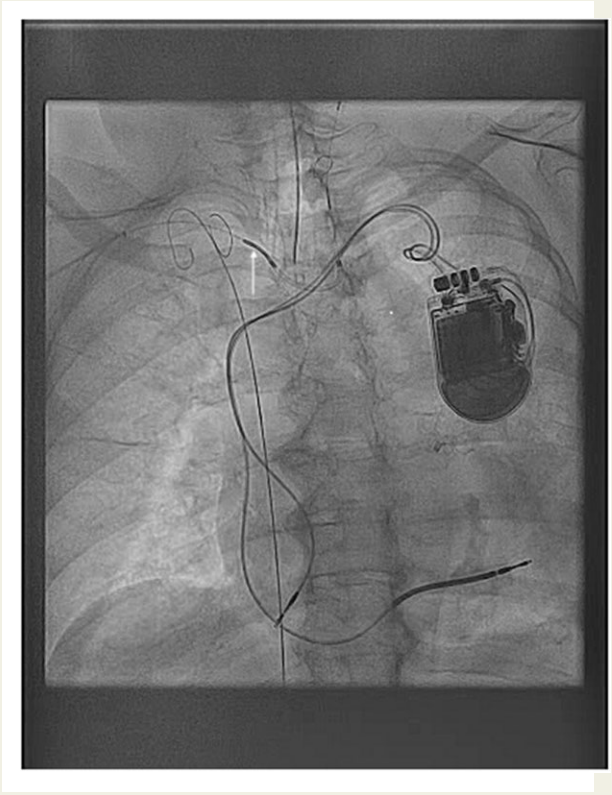


Figure 2 Fluoroscopy imaging showing the Sentinel™ cerebral protection system (arrow) and cardiac defibrillator.

The Sentinel™ was delivered via the right radial artery and positioned with one filter in the innominate and the second in the left carotid artery (*Figure 2*). Targeted transeptal access was obtained in the posterior and inferior portion of the interatrial septum similar to an approach for implantation of a Watchman™ device. The septum was punctured using a SL1™ sheath (St. Jude Medical, St Paul, MN, USA) and a Brockenbrough™ needle (St. Jude Medical, St Paul, MN, USA). The aspiration catheter was delivered to the LA appendage through a 12-Fr Medtronic Flex Cath™ Delivery Sheath (Medtronic Inc., Santa Rosa, CA, USA). The delivery system was coaxially advanced to the LA appendage and suction was applied over 3–5 min, successfully macerating the thrombus (*Figure 3*, *Video 2*). *Figure 4*, *Video 3* illustrates the Watchman™ within the left atrium without the large thrombotic attachment noted in *Figure 1*. *Figure 5* is the post-procedure documentation of the thrombotic debris illustrating its large size. The Sentinel™ was removed, and no debris was identified in it.

The patient had no neurological symptoms or major clinical sequelae after the procedure and was started on apixaban. At 1-month follow-up, she continues to tolerate oral anticoagulation without any side effects.

Discussion

The 2020 European Society of Cardiology Guidelines states that 'LAA occlusion may be considered for stroke prevention in patients with AF and contraindications for long-term anticoagulant treatment

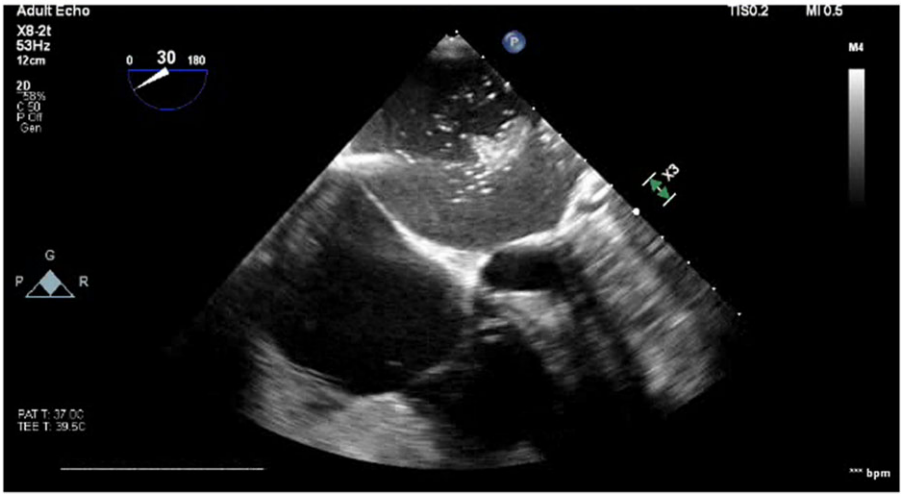


Figure 3 Transoesophageal echocardiography imaging showing dissolution of thrombus material.

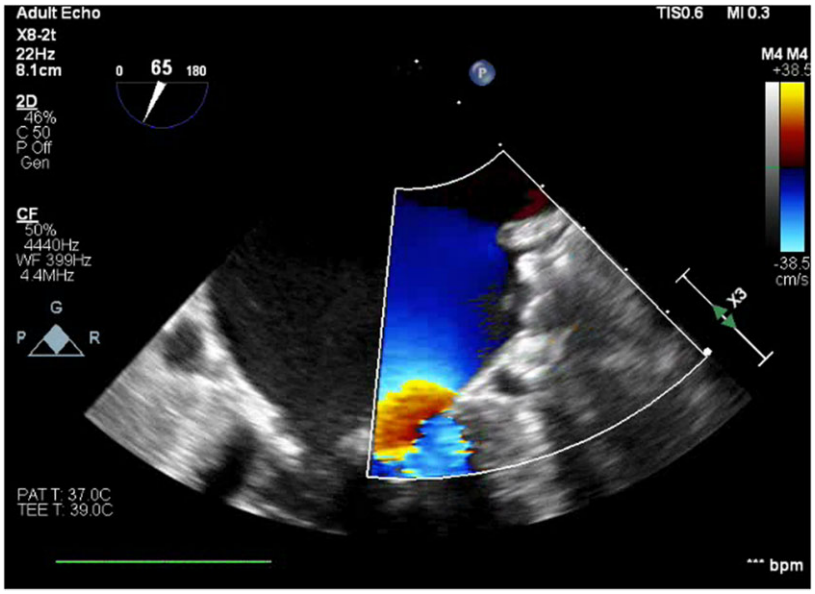
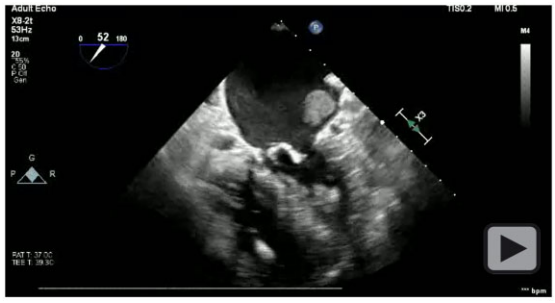
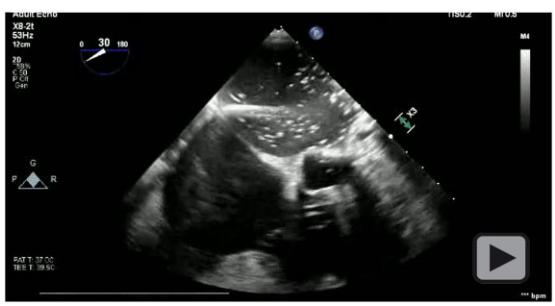


Figure 4 Transoesophageal echocardiography imaging showing left atrium post-successful extraction of thrombus.

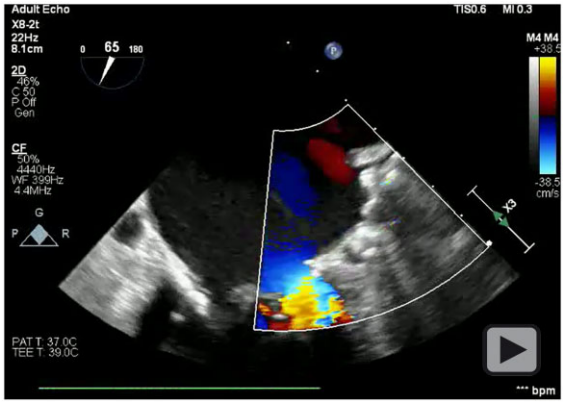
Figure 5 Thrombus retrieved post-procedurally.



Video 1 Intraprocedural transoesophageal echocardiography video showing large pedunculated thrombus on Watchman™ device.



Video 2 Intraprocedural transoesophageal echocardiography video showing Penumbra Lightning 12™ Catheter on thrombus and dissolution of the thrombus.



Video 3 Intraprocedural transoesophageal echocardiography colour Doppler video showing the left atrium post-successful extraction of the thrombus.

(e.g. intracranial bleeding without a reversible cause)' (Class of recommendation IIb, level of evidence B).[1] Up to 3–4% of patients with a LAAO device may develop a device-related thrombus (DRT). This is associated with an increased risk of ischaemic stroke/systemic embolism.[3]

In PROTECT AF, PREVAIL, CAP, AND CAP2, which included 1739 patients that received a Watchman™ device;[3] DRT after LAAO occurred at a rate of 3.7%. The presence of a DRT was associated with a higher risk of all cause stroke/systemic embolism (RR 3.55, $P < 0.001$) and ischaemic stroke/systemic embolism (RR 3.22, $P < 0.001$). There may be a causative relationship between the presence of a DRT and occurrence of a stroke given the temporal relationship between them.[3]

Aminian *et al.*,[4] analysing the incidence of DRT on the AMPLATZER™ Amulet (Abbott, Plymouth, MN, USA) occlusion device using data from the prospective Amulet Observational Study found that patients with a DRT were at a higher risk of ischaemic stroke compared to patients without a DRT (hazard ratio 5.27, 95% CI 1.58–17.55, $P = 0.007$).

Factors implicated in DRT occurrence include a hypercoagulable state, persistent AF, chronic renal insufficiency, older age, history of stroke/transient ischaemic attack, lower left ventricular ejection fraction, and a sub-optimal device implantation.[3,4] In this case, the presence of 6 mm peri-device leak and discontinuation of anticoagulation might have caused a DRT.

Genotype-guided anti-thrombotic therapy post-implantation may reduce incidence of both DRT and thrombo-embolic events in comparison to standard dual anti-platelet therapy.[5] When DRTs occur experts recommend aggressive anticoagulation and closer follow-up without specifics.[2] This approach was not feasible.

While a similar approach to the presented case has been used to debulk vegetations from the right atrium,[6] this has not previously been used to manage a large left-sided DRT. This could be a viable alternative for managing LAAO DRT in patients in whom anticoagulation may not be tolerated or sufficient for thrombus resolution.

Risks of this approach are systemic embolization and shattering of the thrombus. This might be mitigated by placement of a cerebral protection device.[7] In this case, no debris was captured in the filter.

Conclusions

Device-related thrombi may be a complication of LAAO device implantation, especially in the case of sub-optimal device positioning with a peri-device leak, and may present even years after index procedure. In such patients at risk of embolization due to a large mobile thrombus, catheter aspiration with simultaneous cerebral protection may be a feasible treatment approach.

Lead author biography

Rhea Vyas, M.B.B.S. completed her undergraduate medical degree and internship training from Seth G.S. Medical College and King Edward Memorial Hospital, Mumbai, India. She has a keen interest in preventive and interventional cardiology and cardiac arrhythmias.

Supplementary material

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

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

Consent: The authors confirm that 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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