The patient had a tined ventricular lead model 1346T (Medtronic, Inc, Minneapolis, MN, USA). Extraction of the lead was assisted by a laser eximer sheath (Spectranetics Corporation, Colorado Springs, CO, USA). The ventricular lead was cut and cannulated with size no. 2 locking stylet1 (Spectranetics Corp.). The 14-French laser sheath was advanced to the RV tip with lysis of adhesions, but the tip began to unravel and could not be pulled into the sheath once the lead was freed. The lead and sheath were retracted to the SVC/RA junction where the tip was again adherent to surrounding tissue. Further use of laser and mechanical sheaths led to lead removal except for its most distal tined electrode2,3 which remained in the SVC for 1 min before spontaneously migrating several centimetres cephalad.

Through the venous entrance in the left shoulder, attempts to localize the tined lead tip by positioning a 6-French deflectable catheter close to it failed. Through a 14-Fr sheath in the right femoral vein, a deflectable catheter could be positioned near the tined lead tip. Venous dye injection revealed the tip had entered the azygous vein at its junction with the SVC (Figure 1A (open arrow) and Supplementary material online, video).

Numerous attempts were made to retrieve the lead tip using three-wire snare catheters, EN Snare (Angiotech, Inc., Vancouver, BC, Canada), of various sizes. These unsuccessful attempts resulted in pushing the mobile lead tip further into the azygous (Supplementary material online, video).

Through the right femoral venous access site, an 8-Fr Mullins sheath over a 7-Fr Blazer II deflectable ablation catheter (Boston Scientific Inc., Minneapolis, MN, USA) was used to cannulate the azygous vein. A wire-based embolic distal protection device, FilterWire EZ (Boston Scientific, Natick, MA, USA) was advanced through Mullins sheath in the collapsed form, past the lead tip (Figure 1B), and deployed (Figure 1E). The expanded base was well apposed to the azygous vessel wall, and the open FilterWire was withdrawn toward the SVC junction with movement of the lead tip confirming its location inside the basket (Figure 1C and D). The device was collapsed and withdrawn through the femoral access site. Inspection revealed an intact tined RV tip.

Discussion

The FilterWire EZ basket catheter was designed to provide distal protection during coronary interventions in saphenous vein graphs or carotid procedures by filtering and catching debris. To our knowledge, this is the first report of the use of this tool for the retrieval of an embolized lead fragment during an extraction procedure. Additionally, this fragment was recovered from deep into the azygous vein, an unusual location not previously reported. It remains unclear how the fragment migrated against blood flow from the SVC/RA junction to the opening of the azygous vein at the SVC. Creative use of these types of catheter-based devices may yield successful results in similar situations.

Supplementary material

Supplementary material is available at Europace online.

Conflict of interest: none declared.

References


Abbreviation

ECC: Extra-corporeal circulation
LASER: Lesion Ablation System for Endocardial Repair
LV: Left ventricle
RV: Right ventricle
SVP: Superior vena cava
Appendix

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Abrupt gap formation in a linear lesion on the mitral isthmus

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Recently, a novel linear multielectrode mapping/ablation catheter was developed. We present a case in which mitral isthmus line ablation was undertaken with this catheter and showed conduction recovery at the same site on the line. Mapping with this multielectrode catheter along the whole lesion allowed recording of abrupt conduction resumption.

A 67-year-old male patient was referred for catheter ablation of drug-resistant symptomatic paroxysmal atrial fibrillation. Dilatation of the left atria was revealed by echocardiography, heart function was otherwise normal, and he had no significant co-morbidities.
The procedure was performed under conscious sedation. A steerable quadripolar catheter (Xtrem, ELA Medical, Le-Plessis-Robinson, France) was positioned in the coronary sinus (CS), and a steerable sheath (12.6F, Channel, BARD Electrophysiology, Lowell, MA, USA) was advanced in the left atria after transseptal catheterization. Pulmonary vein (PV) isolation was performed using a decapolar circular ablation catheter (PVAC, Ablation Frontiers, Inc., Carlsbad, CA, USA) delivering duty-cycled radiofrequency (RF) (multichannel GENius RFgenerator, Ablation Frontiers, Inc.). Following PV isolation, mitral flutter was induced. A mitral isthmus line was therefore created using an esapolar RF duty-cycle linear ablation catheter (TVAC, Ablation Frontiers, Inc.) using a 1:1 ratio (50% bipolar and 50% unipolar RF). The ablation was performed in temperature control, with a maximal temperature of 65°C, the power was limited to 45 W on the tip, 20 W on the ring electrodes for 90 s duration. Linear ablation was attempted during sinus rhythm, and CS/left atrial appendage (LAA) differential pacing was used to check for linear block after each lesion. After two applications using all electrodes (average power 12–18 W, average temperature 50–62°C), bidirectional conduction block was obtained (Figure 1A). However, 17 min after the last RF application, conduction resumption of mitral isthmus line was observed. A long-lasting fragmented potential (*) was observed over the middle and top segments of the line. RF, radiofrequency; LAA, left atrial appendage; CS, coronary sinus.

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**Figure 1** (A) Complete mitral isthmus line block was created using a multielectrode ablation catheter. The five bipolar TVAC recordings show local potentials on the mitral isthmus line. LAA pacing results in a proximal to distal CS activation pattern (arrow) and double potentials separated by 178 ms on the line. Fluoroscopic image in the anteroposterior projection shows the catheter position. (B) During distal CS pacing, double potentials and 136 ms conduction delay were observed on the line (1st, 2nd beat). However, 17 min after the last RF application, conduction resumption of mitral isthmus line was observed. A long-lasting fragmented potential (*) was observed over the middle and top segments of the line. RF, radiofrequency; LAA, left atrial appendage; CS, coronary sinus.

Achieving complete mitral isthmus linear block is challenging. Previous reports showed that the majority of conduction gaps in the mitral isthmus line are located in the upper segment of the line (close to the junction between the left inferior PV and the LAA).
Specifically, initial positive forces in leads V5 and V6 of the VT support the epicardial origin of the dysrhythmia. Noted to be distinct with subtle morphology differences in the QRS complexes between the VT and the paced rhythm (that the observed rhythm was paced, the pacemaker was programmed to 130 bpm at follow-up and the 12-lead morphology was of the chest tube and insertion of a pliable pleural drain in the same rib space to remove the stimulus. To rule out the possibility the wide complex rhythm but it consistently reinitiated (by a left-sided pneumothorax and transient fluid responsive hypotension. Post-operatively, the patient had mild pleuritic chest pain and tenderness was noted at the site of tube insertion, but no haemodynamic instability, abnormal chest wall motion, or shortness of breath was present. A 12-lead ECG performed confirmed a wide complex tachycardia at 130 bpm with a leftward and superior axis, demonstrating concordance in the precordial leads (Figure 1C). Repositioning of the chest tube would momentarily terminate the wide complex rhythm but it consistently reinitiated (Figure 1B, #). Sinus rhythm was immediately restored only by the removal of the chest tube and insertion of a pliable pleural drain in the same rib space to remove the stimulus. To rule out the possibility that the observed rhythm was paced, the pacemaker was programmed to 130 bpm at follow-up and the 12-lead morphology was noted to be distinct with subtle morphology differences in the QRS complexes between the VT and the paced rhythm (Figure 1C). Specifically, initial positive forces in leads V5 and V6 of the VT support the epicardial origin of the dysrhythmia.

Conflict of interest: none declared.

References

CASE REPORT

Ventricular tachycardia following tube thoracotomy

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Arrhythmias provoked by tube thoracotomy are a rare complication. We report a ventricular tachycardia after chest tube insertion for a device-related pneumothorax. Sinus rhythm was restored only by removal of the chest tube and insertion of a pliable pleural drain. Identification of the chest tube as an arrhythmic trigger following tube thoracotomy is essential in definitive management of refractory arrhythmias.

Case presentation

An 87-year-old man with no history of ischaemic heart disease, left ventricular dysfunction, or arrhythmia was implanted with a single-lead right ventricular permanent pacemaker for symptomatic sinus pauses associated with syncope. The procedure was complicated by a left-sided pneumothorax and transient fluid responsive hypotension. Post-operatively, the patient had mild pleuritic chest pain and a sinus tachycardia at 130 bpm. A chest tube was inserted via an anterior approach given the patient’s marked kyphosis. Upon chest tube insertion, no blood or fluid was returned and low suction (5 mmHg) was applied. Inferior positioning of the chest tube towards the apex of the right ventricle was seen on chest X-ray (Figure 1A) and the patient’s tachycardia began to resolve (Figure 1B, *).

However, the patient soon developed a wide complex tachycardia at 130 bpm, prompting reassessment (Figure 1B, VT). Chest wall tenderness was noted at the site of tube insertion, but no haemodynamic instability, abnormal chest wall motion, or shortness of breath was present. A 12-lead ECG performed confirmed a wide complex tachycardia at 130 bpm with a leftward and superior axis, demonstrating concordance in the precordial leads (Figure 1C). Repositioning of the chest tube would momentarily terminate the wide complex rhythm but it consistently reinitiated (Figure 1B, #). Sinus rhythm was immediately restored only by the removal of the chest tube and insertion of a pliable pleural drain in the same rib space to remove the stimulus. To rule out the possibility that the observed rhythm was paced, the pacemaker was programmed to 130 bpm at follow-up and the 12-lead morphology was noted to be distinct with subtle morphology differences in the QRS complexes between the VT and the paced rhythm (Figure 1C). Specifically, initial positive forces in leads V5 and V6 of the VT support the epicardial origin of the dysrhythmia.