

An unusual ‘rite of passage’ for an ablation catheter during left ventricular tachycardia ablation – a case report

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Introduction

Ventricular perforation during radiofrequency ablation of ventricular tachycardia is a recognized serious complication that carries high morbidity and mortality. Perforation is often associated with local intramyocardial injury due to excess heat induced by catheter, ‘steam pop’. The complication usually requires emergency surgical repair.

Case presentation

We present a case, when the catheter found its way into the epicardium during left ventricular (LV) electroanatomic mapping without any serious complication. Angiography through the ablation catheter confirmed the diagnosis of LV coronary sinus fistula.

Discussion

Contrast injection through the irrigation port of the ablation catheter is a useful way of delineating anatomical anomalies during electrophysiology procedure.

Keywords

Ventricular tachycardia • Catheter ablation • Left ventricular coronary sinus fistula • Case report

Learning points

- Cardiac anatomical anomalies such as ventriculo-coronary fistulae are more common in patients with a history of congenital heart disease and/or past cardiac surgical procedure.
- Contrast injection through the irrigation port of the ablation catheter is a useful way of delineating anatomical anomalies during electrophysiology procedure.

Introduction

Radiofrequency ablation is the treatment of choice for drug refractory ventricular tachycardia (VT). Ventricular perforation is a recognized serious complication that carries high morbidity and mortality. It is often associated with local intramyocardial explosion due to excess heat induced by catheter during radiofrequency ablation and requires emergency surgical repair.^{1,2} We, however present a case when the ablation catheter found its way into the epicardium during left ventricular (LV) electroanatomic mapping (EAM) without any serious complication.

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Timeline

Day	Events
1	Patient with ventricular tachycardia received catheter ablation
4:05 p.m.	Ablation catheter is easy to manipulate near the target area (the basal left ventricle wall)
4:10 p.m.	Ablation catheter position appeared to be extracardiac and contrast injection via the irrigation port of the catheter confirmed pericardial staining
4:13 p.m.	An emergency pericardial puncture was ready
4:14 p.m.	Transoesophageal echocardiography and transthoracic echocardiography did not demonstrate pericardial effusion, which is consistent with no change in haemodynamics
4:30 p.m.	Catheter was cautiously pulled back and further contrast injection through the central lumen demonstrated that a small draining vein from endocardium to epicardium had been intubated
4:35 p.m.	Patient remained haemodynamically stable and transoesophageal echocardiography remained unremarkable after sheaths removed
4:40 p.m.	Decision was made to stop and no ablation was performed
2	The asymptomatic patient was discharged as repeated transthoracic echocardiography was unchanged

Case presentation

A 60-year-old man with repaired tetralogy of Fallot (TOF) and mitral valve (MV) repair for endocarditis as well as an implantable cardioverter-defibrillator for secondary prevention *in situ* was admitted with haemodynamic compromising monomorphic VT despite Bisoprolol 5 mg. His cardiovascular examination showed a mid-sternotomy scar and when in sinus rhythm the auscultation showed normal heart sounds with no murmurs. His jugular venous pressure was not raised with a blood pressure measured at 110/60 mmHg. His respiratory examination was unremarkable. A 12-lead electrocardiography documentation of the monomorphic VT (*Figure 1*) demonstrated a right bundle branch block QRS morphology, transition in lead V₄ with south-west axis, suggesting a VT exit from the LV lateral wall.³ Patient underwent VT ablation with three-dimensional (3D) EAM under general anaesthesia. The initial 3D-EAM of the LV was performed using the Orion catheter. After completion of the initial mapping, an ablation catheter was used for further point-by-point mapping at sites of interest. An irrigated 4-mm tip bidirectional steerable catheter (IntellaNav OI, Boston Scientific, Natick, MA, USA) was positioned in the LV for EAM via a steerable bidirectional sheath (Agilis, St. Jude Medical Inc., St. Paul, MN, USA) following an antero-grade approach via a transseptal puncture.

The catheter moved freely within the LV until it became stuck. Fluoroscope suggested an extracardiac position. Contrast injection via the irrigation port of the catheters confirmed pericardial staining (*Figure 2A*), but it only became apparent on further withdraw of the catheter that the catheter was inside a coronary vein (see *Figure 2C* and see [Supplementary material online, Video S1](#)). Transthoracic echocardiography confirmed the intubation of basal LV wall with the

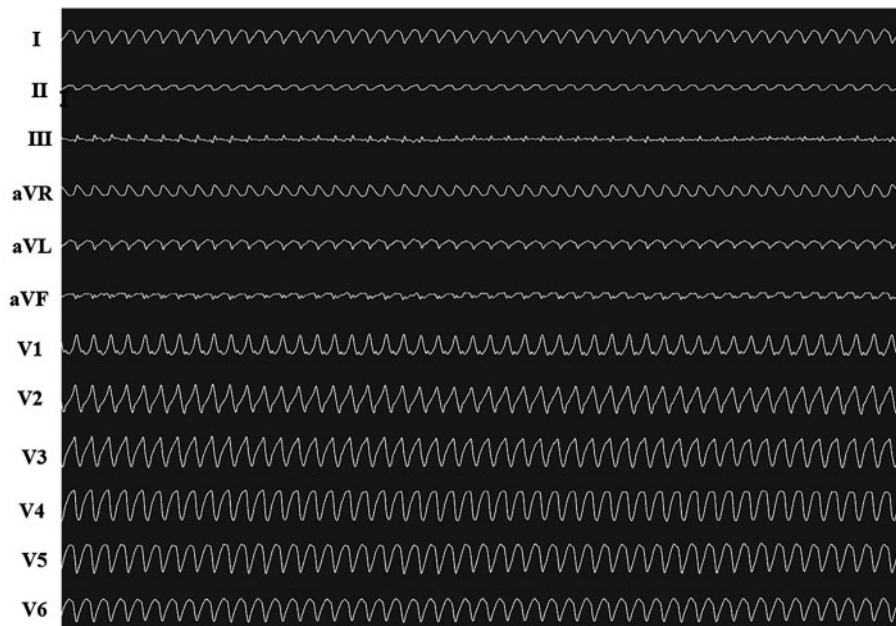


Figure 1 A 12-lead electrocardiography suggested that the ventricular tachycardia (VT) exit located in the lateral wall of left ventricle.

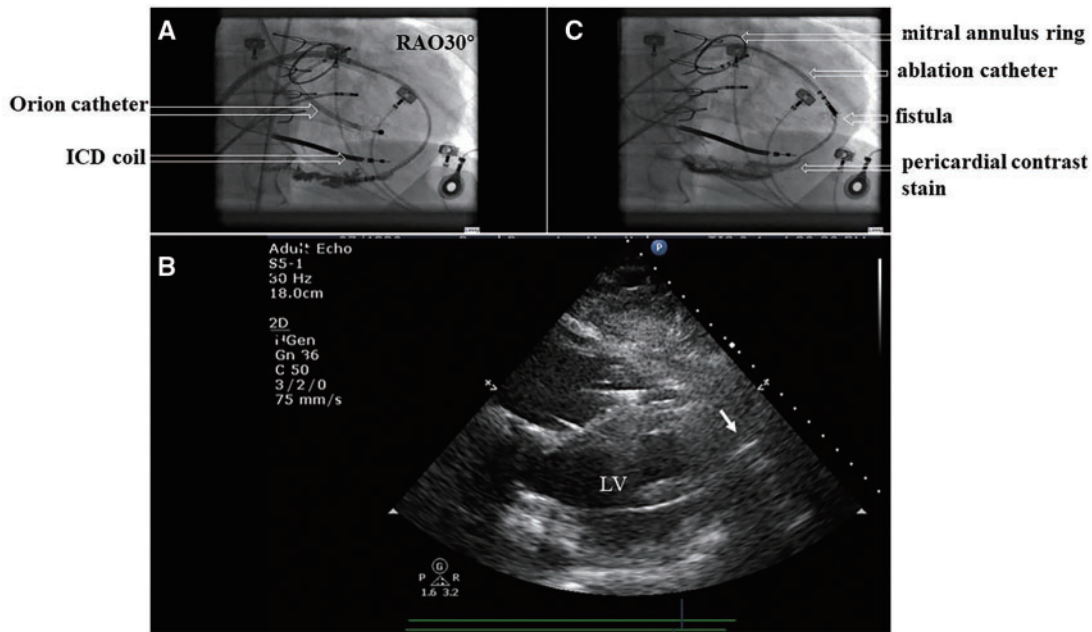


Figure 2 (A) Mapping catheter position appeared to be extracardiac and dye injection confirmed pericardial staining; (B) transthoracic echo (TTE) showed that the catheter tip (white arrow) penetrated the left ventricle wall and went outside the heart; (C) Catheter was pulled back and further contrast injection demonstrated that a small draining vein from endocardium to epicardium had been intubated. LV, left ventricular; ICD, implantable cardioverter defibrillator; RAO, right anterior oblique.

catheter tip which then exited into the epicardial space (Figure 2B). The catheter was removed without any further sequelae. Subsequently the patient's Bisoprolol was increased and underwent a VT provocation test at 5-month follow-up with a negative result.

Discussion

Left ventricular coronary sinus fistula is an extremely rare anomaly. To the best of our knowledge, the global report does not exceed 10 cases, most of which are secondary to iatrogenic procedures, such as repeated MV replacement,^{4–6} catheter ablation,⁷ arterial switch surgery, found in myocardial infarction,⁸ or corrective complex congenital heart disease surgery.⁹ Given the history of TOF and only single MV replacement procedure, our patient's anomaly may be congenital. Such anatomical anomalies have been raised by incidental findings of abnormal colour Doppler jet on echocardiogram and subsequently confirmed with cardiac catheterisation.^{4,7,9} The specificity of our case is that the discovery of this anomaly is made with an ablation catheter. The preoperative colour Doppler echocardiography did not report any abnormalities. We suspected the fistula given the catheter's position on fluoroscope and confirmed it through angiography via the ablation catheter. Similar to reported congenital cases,^{9,10} the fistula in the present case originated from the posterolateral aspect of the free LV wall and ended in the lateral aspect of the coronary sinus.

This is the first case to be detected by injecting contrast through an ablation catheter, but this situation may be encountered again as VT ablation is increasing in patients with structural heart disease.^{1,2} During the ablation procedure, angiography through the ablation catheter is necessary to confirm the diagnosis and avoid unnecessary

operations when you find that the catheter is outside the heart if conditions permit, especially in patients with a history of congenital heart disease and/or surgical procedures.

Fistulae can be treated surgically⁵ or conservatively⁴ depending on the patient's age, degree of pulmonary hypertension, and other comorbidities. Given no pulmonary hypertension and asymptomatic status of our patient, a conservative approach was taken.

Supplementary data

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

Consent: The author/s confirm that written consent for submission and publication of this case report including image(s) and associated text has been obtained from the patient in line with COPE guidance.

Conflict of interest: none declared.

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