CASE REPORT

Left ventricular free wall perforation and left atrial dissection: unusual complication of radiofrequency catheter ablation for Wolf-Parkinson-White syndrome

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SUMMARY

A 70-year-old woman with Wolf-Parkinson-White syndrome developed cardiac tamponade while undergoing radiofrequency catheter ablation for left posterolateral accessory pathway from the ventricular side below the mitral valve, requiring emergency surgery. During surgery, the patient was found to have perforation of the left posterior free wall as well as left atrial dissection. The patient died despite emergency measures. This case was remarkable because radiofrequency catheter ablation resulted in two very rare complications occurring at the same time in a patient.

BACKGROUND

Radiofrequency catheter ablation (RFCA) is considered to be a relatively safe procedure. This is the first case report in which perforation of the left ventricular (LV) posterolateral free wall as well as left atrial dissection occurred at the same time in one patient.

CASE PRESENTATION

A 70-year-old woman was transferred to our emergency room for treatment of cardiac tamponade as a result of complications from attempted RFCA for Wolff-Parkinson-White (WPW) syndrome with episodes of orthodromic atrioventricular reciprocating tachycardia (AVRT). At the previous facility, based on the 12-lead ECG and mapping of the intracardiac ECG, a left posterolateral accessory pathway was identified and an orthodromic AVRT utilising the pathway as a retrograde limb was easily inducible (figure 1A–D). RFCA was performed from the ventricular side below the mitral valve and a δ wave disappeared 4 s after the initiation of the RF current (7 Fr 4 mm tip EPT catheter and Maestro Cardiac ablation system, Boston Scientific). Ablation was continued for 30 s with a temperature control mode of 55°C/35 watts. The operator noticed that the power output was not high enough, so an additional attempt was made to ascertain success. While further attempts were made, the patient became hypotensive, and echocardiography findings were consistent with cardiac tamponade. Perforation of the heart was suspected and an emergency pericardiocentesis was performed. Two pigtail catheters were inserted for drainage, and the drained blood was then returned to the patient via the venous sheath in the right

femoral vein. Blood transfusion was also performed, and the patient was transferred to our hospital for emergency surgical treatment as the previous facility was not equipped.

On arrival to our emergency room, blood pressure was 60–70 mm Hg with persistent bleeding from the heart, and the patient was immediately taken to the operating room.

TREATMENT

After femoro-femoral bypass was established, the chest was opened and pericardium entered. A 2 cm linear perforation was discovered at the posterior LV free wall along the posterior atrioventricular groove. This appeared to be consistent with the site where the catheter was manipulated, and RF current was applied. Haemostasis was established by suture closure with felt patches.

OUTCOME AND FOLLOW-UP

Weaning the patient from cardiopulmonary bypass was difficult despite correction of tamponade physiology. A transesophageal echocardiogram (TEE) was obtained and revealed a linear structure in the posterior wall of the left atrium consistent with a dissection of the left atrial wall (figure 2A). A false lumen was large and obstructed the true lumen of the left atrium. The atrial surface of the left atrium was intact. The dissected left atrial wall was repaired by suture (figure 2B).

The postoperative course was complicated with sepsis and multiorgan failure. On fourth postoperative day, TEE was repeated, revealing recurrence of left atrial dissection (figure 3A). An abnormal blood flow was identified, which drained from the left ventricle into the false lumen via the entry site located close to the site of ventricular perforation (figure 3B and video 1). The patient's haemodynamic condition further deteriorated because of decreased LV filling due to the enlarged false lumen of the left atrium (the false lumen was a blind end and received continuous high pressure from the left ventricle, resulting in impaired filling of the left atrium), decreased LV performance due to prolonged time required for surgery, septic state and so on. Repeat surgery was contemplated but was deferred because the patient's condition was felt to be too precarious for surgery. The patient died on the ninth postoperative day.

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Figure 1 (A) Twelve-lead ECG showing type A Wolff-Parkinson-White (WPW) syndrome with posterolateral accessory pathway. (B) Intracardiac ECG showing continuous atrioventricular electrogram at the mid-portion of the coronary sinus and distal ablation catheter indicating left posterolateral accessory pathway. Right anterior and left anterior oblique views of the catheter position at the ablation site (C and D). HRA, high right atrium; His, his bundle; Abl, ablation catheter; CS, coronary sinus. Small p and d: proximal and distal.

Postmortem autopsy was performed, which revealed a large false lumen at the posterior wall of the left atrium (figure 4). An entry site was identified at the ventricular aspect of the posterior wall below the mitral valve, which communicated into the false lumen of the left atrium.

DISCUSSION

Left atrial dissections or haematomas are uncommon entities, and are primarily associated with mitral valve surgery, non-penetrating trauma, infective endocarditis complicated with the rupture of a microaneurysm, myocardial infarction and RFCA of atrial tachycardia or fibrillation.¹⁻⁴ Rarely, they occur spontaneously without any underlying conditions or procedures.⁵ RFCA is a relatively safe procedure, but has been known to be

associated with some complications, including valvular injury, access site haematoma or injury, tamponade or perforation. Greene *et al*⁶ reported that the incidence of perforation and death was 1 of 116 patients who underwent left free wall accessory pathway ablation. The incidence of left atrial dissection as a complication of RFCA is very rare although there have been a few case reports. Ucar *et al*² reported a case of atrial septal and left atrial haematoma as a result of manipulation to insert the catheter into the left atrium via patent foramen ovale for the treatment of left atrial tachycardia. The dissected intimal layer disappeared in 10 days and the haematoma completely resolved in 3 months. Ramakrishna *et al*³ reported a case of left atrial dissection that was discovered 4 months after initial RFCA for atrial fibrillation. An endocardial flap due to dissection persisted for 7 months but did not preclude a successful second attempt. Sah *et al* reported a case of left atrial haematoma after RFCA

Figure 2 (A) An intraoperative transoesophageal echocardiogram showing large false lumen located in the posterior wall of the left atrium indicating dissection. (B) After suture repair of the dissection, the size of the false lumen became much smaller. F, false lumen; LV, left ventricle. Larger arrows indicate an intimal flap. Smaller arrows indicate mitral valve leaflets.

Figure 3 (A) Transoesophageal echocardiogram obtained at bedside on fourth postoperative day indicating the recurrence of the left atrial dissection. (B) Colour Doppler image revealed communication from the left ventricle and the false lumen. F, false lumen; LV, left ventricle.

Video 1 Colour Doppler image clearly revealed abnormal blood flow from the left ventricle into the false lumen of the left atrium.

was performed in the coronary sinus for the treatment of atrial tachycardia originating from the coronary sinus.⁴ In these cases reported by Ucar *et al*² and Ramakrishna *et al*,³ the left atrial wall was directly approached either mechanically or electrically. However, in the present case, left atrial dissection and perforation of the posterior free wall of the left ventricle occurred at the same time following 'below the mitral valve' approach. The operator did not feel any adherence of the catheter and did not

Figure 4 The postmortem heart was vertically cut and opened. Larger arrows indicate the repaired site of the posterior wall of the left ventricle (felt patches are visible). A large F was identified at the posterior wall of the left atrium (LA). A probe (smaller arrows) was inserted below the mitral valve through the entry site communicating to the F. Ao: aorta, F: false lumen, LA, left atrium; LV, left ventricle.

hear any 'pop'; the RF was applied in the usual manner. There was no malfunction of the catheter or RF generator. The previous facility is a well experienced, large volume centre performing more than 200 cases of RFCA each year. This case was their first experience of cardiac tamponade among more than 500 cases of RFCA for WPW syndrome. Although the pathophysiology of the present case was not known, we postulate that either direct mechanical force and/or RF energy damaged the posterior wall of the left ventricle and the adjacent left atrial wall simultaneously, resulting in the perforation of the ventricular wall and dissection of the atrial wall.

Learning points

- ▶ Left atrial dissection is a rare entity and is associated with mitral valve surgery, trauma, myocardial infarction, infectious endocarditis and catheter ablation.
- ▶ Left atrial dissection associated with catheter ablation is very rare and is caused by radiofrequency (RF) current application or catheter manipulation in the atrium for the treatment of atrial fibrillation or tachycardia.
- ▶ This case was remarkable because two very rare complications of RF ablation, namely, a perforation of the free wall and a left atrial dissection, occurred at the same time in the same patient.

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Contributors KH is main author. TT is an EP specialist in our hospital. HY performed surgical treatment. TS is an electrophysiologist in the previous facility.

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