Regional pericarditis following uncomplicated catheter ablation procedure: a case report

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Abstract

Background

Acute post-ablation pericarditis is the most common complication of epicardial ablation of ventricular arrhythmias (VA), while regional pericarditis following an initially uneventful endocardial catheter ablation (CA) procedure is a rare and elusive diagnosis.

Case summary

We report a case of a 66-years old Russian female who developed chest pain accompanied by ECG changes – biphasic T waves in V1-V4 leads after an initially uncomplicated premature ventricular complex (PVC) CA procedure. After examination and investigations, including transthoracic echocardiography (TTE), cardiac magnetic resonance imaging (CMR) and cardiac computed tomography (CCT), she was diagnosed with regional pericarditis, which occurred even though the ablation was uneventful with the limited number of radiofrequency applications. Furthermore, the diagnosis was difficult due to normal body temperature and the absence of pericardial effusion and myocardial abnormalities on TTE, findings that are not characteristic of pericarditis.

The patient’s last office visit was in six months after the procedure. Neither patient had any complaints, nor there were any changes on ECG and TTE.

Discussion

Regional post-ablation pericarditis is a relatively rare type of postcardiac injury syndrome (PCIS). The varying severity of the PCIS clinical course makes the diagnosis of post-ablation pericarditis initially difficult, especially in patients undergoing an uneventful catheter ablation procedure. Non-invasive imaging modalities as cardiac magnetic resonance imaging (CMR) and cardiac computed tomography (CCT) should be considered initially in elusive cases of PCIS.

Keywords: post-ablation pericarditis, regional injury, cardiac magnetic resonance, radiofrequency ablation, premature ventricular complex, case report
Learning points

1. Post-ablation cardiac injury syndrome may occur after a routine, uneventful shot-wise catheter ablation procedure.
2. The localized character of the injury limits the systemic manifestations of postcardiac injury syndrome and makes the diagnosis of regional pericarditis elusive.
3. Non-invasive cardiac imaging modalities such as cardiac magnetic resonance imaging and cardiac computed tomography help distinguish an initial diagnosis of regional pericarditis and avoid the performance of unnecessary emergency invasive procedures.
| Date               | Event Description                                                                                                                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| September 2019     | Detection of frequent, symptomatic, monomorphic premature ventricular complexes on the 24-hours ECG monitoring                                                                                                    |
| May 25 2020        | Uneventful shot-wise radiofrequency ablation of right ventricular outflow tract premature ventricular complexes                                                                                                |
| May 27 2020        | The patient developed chest pain. ECG revealed – biphasic T waves in V2-V4 leads. Transthoracic echocardiography did not reveal any signs of pericardial effusion or local myocardial abnormalities.                                 |
| May 27 2020        | Cardiac magnetic resonance imaging showed local accumulation of pericardial fluid in front of the right ventricular outflow tract anterior wall, adjacent edema, and pericardial contrast enhancement and the diagnosis of local post-ablation pericarditis was confirmed. Non-steroid antiinflammation drug therapy was started. |
| June 1 2020        | Chest pain and ECG changes regression. However, cardiac computed tomography revealed a loculated pericardial effusion anterior to the right ventricle on the length of 2.5cm and a 7 mm separation of pericardial layers.                             |
| Six months after ablation | Normal ECG, no episodes of chest pain or discomfort                                                                                                           |
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Introduction
Catheter ablation (CA) of ventricular arrhythmias is a safe and effective treatment option, especially for patients with frequent, symptomatic premature ventricular complexes (PVC) originating in the ventricular outflow tracts [1]. The rate and pattern of the procedure-related complications vary broadly depending on the CA approach, access, underlying heart disease [2-4]. Acute post-ablation pericarditis is the most common complication of epicardial CA[5], while pericarditis following the uneventful endocardial CA is relatively rare and difficult to diagnose. Cardiac magnetic resonance imaging (CMR) and cardiac computed tomography (CCT) allow better visualization of the heart and pericardium and should be considered in elusive cases[6-7]. We present a regional pericarditis case after successful uneventful right ventricular outflow tract (RVOT) PVC ablation.

**Case summary**

A 66-years-old Russian female was referred to our clinic for dull oppressive non-radiating retrosternal chest pain occurring on the second day post ablation. The patient had undergone an uneventful RVOT radiofrequency ablation two days earlier for frequent (>22000 per day), drug-resistant (bisoprolol, sotalol, propafenone) PVC due to frequent symptoms of skipped beats, palpitations accompanied by dizziness, lightheadedness, and exertional dyspnea. The patient also reported a history of well-controlled arterial hypertension (treated with the combination of enalapril and hydrochlorothiazide) and diabetes mellitus (treated with metformin), class 1 obesity (BMI 33kg/m²).

Activation and pace mapping techniques were used to localize the PVC source. The earliest focal endocardial activation was detected in the RVOT anteroseptal wall 1cm below the pulmonary valve. Power-controlled, open-irrigated tip radiofrequency applications were performed in this area leading to PVC elimination. The temperature was limited to 44°C, the power output was 40W, and the total RFA duration was 300 seconds.
On readmission, the physical examination was unremarkable: the blood pressure was 125/80 mmHg, heart rate 75 beats per minute, respiratory rate 18, oxygen saturation 100% on room air. Heart sounds were muffled, without any heart murmurs (including pericardial rub); the second sound was accentuated in the aortic area during cardiac auscultation. Lungs were clear to auscultation with no crackles or wheezes.

12 lead ECG at the time of presentation showed biphasic T waves in V1-V4 (fig.1a-b).

Transthoracic echocardiography (TTE) did not reveal any signs of pericardial effusion or local myocardial abnormalities. Complete blood count did not show any abnormal changes. The high-sensitive C-reactive protein level was 3.38mg/L (normal ranges: 1-3mg/L). The measurement of cardiac troponin level was inappropriate due to the expected post-ablation elevation of cardiac biomarkers. The CMR showed local accumulation of pericardial fluid in front of the RVOT anterior wall, accompanied by adjacent edema and pericardial contrast enhancement (fig.2). The only significant finding on CCT, performed for comprehensive coronary anatomy assessment, was loculated pericardial effusion anterior to the right ventricle on the length of 2.5cm and a 7 mm separation of pericardial layers (fig.3) which corresponds to changes detected by CMR. There were no signs of coronary artery injury significant coronary artery disease.

A non-steroid anti-inflammatory drug therapy (Diclofenac sodium 75mg/daily for injection was chosen due to reported aspirin and ibuprofen allergy) was started. Both chest pain and ECG changes regressed shortly after anti-inflammatory therapy initiation (fig.1c). Therefore, anti-inflammatory therapy was discontinued in three days. There were no adverse effects associated with the therapy; the patient did not have any complaints or symptoms and was discharged within five days.

Discussion
We reported a case of regional pericarditis occurring on the second day following an initially uncomplicated PVC RFA procedure. Regional post-ablation pericarditis is a rare type of postcardiac injury syndrome (PCIS). Immune-mediated inflammation secondary to initial cardiac injury seems the most likely mechanism of PCIS [8]. The myocardial injury itself or direct thermal injury in the pericardium initiates inflammation, leading to variable clinical presentations - from localized pericarditis, as in our case, to massive pleuropericardial effusion and cardiac tamponade[9]. Most reported PCIS cases are related to cardiac perforation [8], and PCIS, occurring after initially uncomplicated endocardial CA procedures [10-15], is predominantly associated with extended linear ablation lesions. On the other hand, the varying severity of the clinical course of PCIS (table 1) makes the initial diagnosis of post-ablation pericarditis difficult and usually requires a differential diagnosis of a coronary event. In our case, the absence of a history of coronary artery disease (negative exercise stress test two months before ablation), normal TTE data, uncomplicated course of RVOT spot-wise RFA makes the ECG changes and chest pain unlikely to be of ischaemic origin. It is also credible that iatrogenic RV perforation related to PVC ablation might be responsible for this case. However, most iatrogenic cardiac perforation cases occur intraprocedural/during the first post-ablation hours and/or after 1-2 weeks (inflammation associated cases) and present mainly with hemodynamic deterioration. So analyzing the time course and clinical pattern of the event in our patient, we discounted the possibility of iatrogenic RV wall perforation. Thus, although the limited number of radiofrequency applications, normal body temperature and the absence of pericardial effusion and myocardial abnormalities on TTE made the diagnosis of post-ablation cardiac injury less likely, we assumed that chest pain, ECG changes were due to post-ablation myocardial "edema" leading to regional pericarditis. The absence of systemic reaction was due to the localized character of the injury. Thus we suggested that the patient developed regional PCIS, and the localized character of the injury had limited the
systemic manifestations of the inflammation. CMR and CCT confirmed our assumptions. Considering the superiority of CMR in evaluating cardiac anatomy and depicting pericardium[7], these noninvasive imaging modalities should be considered initially in elusive cases of PCIS.

The patient's last office visit was in six months after the procedure. The patient did not have any complaints or symptoms, and there were no abnormalities on their ECG (fig.1d) or TTE.

**Conclusion**

The possibility of the PCIS following even a routine, uneventful CA procedure should always be considered. A thorough analysis of clinical signs and symptoms with CMR and CCT performance helps make an initial diagnosis of regional pericarditis and avoid the performance of unnecessary emergency invasive procedures.

**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 according to COPE guidance.

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Figure legends

Fig.1 Precordial leads of pre and post-ablation ECGs showing the dynamics of ECG changes in V1-V4 leads. a) Preablation ECG with biphasic T wave in I lead and positive T waves in
V2-V4 leads; b) ECG on second post-ablation day at the time of chest pain presentation revealed biphasic T waves in V1-V4; c) ECG on the seventh post-ablation day shows regression of T wave changes; d) ECG during 6-months follow-up revealed complete regression of T wave changes.

Fig. 2 CMR with gadolinium enhancement: a) cardiac short-axis view; b) long-axis 2-chamber view; c) long-axis 4-chamber view. A small local lens-like collection of pericardial fluid in front of RVOT is marked with arrows. Focal enhancement of adjacent pericardial layers is marked with an asterisk.

RV-right ventricle, LV-left ventricle, PA – pulmonary artery, RVOT – right ventricle outflow tract.—RV-right ventricle, LV-left ventricle, PA – pulmonary artery, RVOT – right ventricle outflow tract.

Fig. 3 Cardiac computed tomography, multiplanar reconstructions a) short-axis view; b) RV outflow tract view; c) long-axis 4-chamber view. Arrows indicate a small focal collection of pericardial fluid in the RV outflow tract and RV free wall. RV-right ventricle
