Post-cardiac injury syndrome triggered by radiofrequency ablation for AVNRT

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Abstract

Background: Post-cardiac injury syndrome (PCIS) is an inflammatory condition following myocardial or pericardial damage. In response to catheter ablation, PCIS most frequently occurs after extensive radiofrequency (RF) ablation of large areas of atrial myocardium. Minor myocardial injury from right septal slow pathway ablation for atrioventricular nodal reentrant tachycardia (AVNRT) is not an established cause of the syndrome.

Case presentation: A 62-year-old women with a 6-year history of symptomatic narrow-complex tachycardia was referred to perform an electrophysiological study. During the procedure AVNRT was recorded and a total of two RF burns were applied to the region between the coronary sinus and the tricuspid annulus. Pericardial effusion was routinely ruled out by focused cardiac ultrasound. In the following days, the patient developed fever, elevated inflammatory and cardiac markers, new-onset pericardial effusion, characteristic ECG changes, and complained of pleuritic chest pain. An extensive workup for infectious, metabolic, rheumatologic, neoplastic, and toxic causes of pericarditis and myocarditis was unremarkable. Cardiac magnetic resonance imaging showed no signs of ischemia, infiltrative disease or structural abnormalities. The patient was diagnosed with PCIS and initiated on aspirin and low-dose colchicine. At a 1-month follow-up visit the patient was free of symptoms but still had a small pericardial effusion. After three months of treatment the pericardial effusion had resolved completely.

Conclusions: Inflammatory pericardial reactions can occur after minor myocardial damage from RF ablation without involvement of structures in close proximity to the pericardium.

Keywords: Radiofrequency ablation, Inflammation, AVNRT, Post-cardiac injury syndrome

Background Post-cardiac injury syndrome (PCIS) is an inflammatory reaction to myocardial or pericardial damage and constitutes a rare but important complication of radiofrequency (RF) catheter ablation [1, 2]. Serious clinical sequelae include massive pericardial effusion with delayed cardiac tamponade, pleural effusion, and hypoxemia [2]. Most frequently, PCIS is reported after ablation of large areas of atrial myocardium in close proximity to the pericardium [2–6]. Here, we describe a unique case of PCIS after right septal ablation for atrioventricular nodal reentrant tachycardia (AVNRT).

Case presentation A 62-year-old female with a 6-year history of paroxysmal narrow-complex tachycardia was referred for an electrophysiological study. On admission, the patient was asymptomatic and her routine clinical assessment and physical examination were unremarkable. During her electrophysiology study, sustained typical AVNRT was induced and RF ablation was performed with a non-irrigated Navistar ablation catheter (Biosense Webster) using three-dimensional electroanatomic guidance. A total of two RF burns were applied to the region between the coronary sinus and tricuspid annulus. The first RF burn (35 W [W], 12...
Ohm impedance drop during 50 s) showed good junction response but more than 2 echo beats persisted after the energy application. A second burn (35 W, 11 Ohm impedance drop during 60 s) resulted in successful slow pathway ablation (Fig. 1). Pericardial effusion was ruled out by postprocedural focused cardiac ultrasound which is routinely performed at our centre. During the next days, the patient developed a low-grade fever of 38 degrees Celsius, mild tachycardia, leucocytosis, elevated cardiac markers, and complained of chest pain on inspiration. Creatinine kinase (CK) was elevated at 168 U/L and high sensitivity cardiac Troponin T at 294 pg/mL. A new-onset circumferential pericardial effusion was detected on echocardiography and the electrocardiogram (ECG) showed diffuse saddle-shaped ST segment elevations (Fig. 2). An extensive workup for infectious, metabolic, rheumatologic, neoplastic, and toxic causes of pericarditis and myocarditis was unremarkable. Gadolinium-enhanced cardiac magnetic resonance imaging showed no signs of ischemia, infiltrative disease or structural abnormalities. According to current clinical practice guidelines [1] a diagnosis of post-cardiac injury syndrome (PCIS) was made and the patient was started on aspirin and low-dose colchicine. Within three days of treatment, symptoms and ECG changes resolved, the pericardial effusion was reduced, and the patient could be discharged home. One month later, the patient still showed a small pericardial effusion and was continued on aspirin and colchicine. At a 3-month follow-up, the patient was doing well and the pericardial effusion had resolved completely.

**Discussion**

PCIS is an umbrella term for a variety of inflammatory pericardial reactions following damage to the myocardium or pericardium. PCIS was first described by Dressler [7] and is characterized by fever, pleuritic chest pain, pericardial effusion and elevated inflammatory markers [1]. Such inflammatory syndromes are presumed to have an autoimmunologic pathogenesis which is supported by their tendency for recurrence [1, 8]. Aside from extensive injury secondary to myocardial infarction or open surgery involving pericardiotomy, PCIS can be caused by minimal cardiac damage from pacemaker...
lead insertion \[9\], transcatheater mitral valve repair \[10\],
transcatheater aortic valve replacement \[10\], and per-
cutaneous coronary intervention \[11\] in predisposed
individuals. Overall, PCIS develops in up to 1-5% of per-
cutaneous cardiac interventions \[12\].

In response to catheter ablation, PCIS most frequently
occurs after extensive energy application during abla-
tion of large areas of left or right atrial myocardium in
close intimacy to the visceral pericardium \[2\]. Accord-
ing to a report by Li et al. \[2\], over 70% of cases due to
catheter ablation are caused by left atrial ablation for
atrial fibrillation and right atrial ablation for atrial flutter
\[2\]. Interestingly, in our patient the syndrome occurred
secondary to a very minor trauma by only two RF burns
without involvement of structures in proximity to the
pericardium supporting the concept of an underlying
immunologic reaction. The pathophysiology of PCIS
after catheter ablation is poorly understood \[2\], yet
putative triggers may include myocardial necrosis from
the RF burn leading to the release of auto-antigens \[1,
2\], mechanical trauma to the pericardium during
the procedure, and intraprocedural tachycardia in combi-
nation with an underlying substrate, such as a subclini-
cal myocarditis. While differential diagnoses, including
infectious, metabolic, rheumatologic, neoplastic, and
toxic aetiologies, were ruled out in an extensive cli-
cal workup, we acknowledge that, in order to minimize
patient risk, no confirmatory histopathological analyses
of myocardial or pericardial specimens were conducted.
A markedly shorter delay to symptom onset in patients
with PCIS after catheter ablation \[2–6, 13–15\] compared
to other cardiac injuries suggests different underlying
mechanisms and distinguishes this entity from others
within the spectrum of PCIS. In line with the literature
\[2–6, 13–15\], our patient developed PCIS within the first
week after the intervention and responded well to medi-
cal treatment with aspirin and low-dose colchicine.

Treatment of PCIS is based on anti-inflammatory
agents including aspirin, non-steroidal anti-phlogistic
drugs, corticosteroids, and colchicine \[1, 16\]. Aspirin
is recommended as a first-line treatment of PCIS while
colchicine may be considered as an add-on therapy \[1\].
Timely detection and medical therapy of PCIS commonly
leads to complete resolution of signs and symptoms and
is key to preventing long-term sequelae such as recur-
rent pericardial effusion and pericardial constriction \[1,
12\]. Given the increasing use of catheter ablation for
the treatment of cardiac arrhythmia, awareness of potential
complications is critical to guide patient care.

**Conclusions**

Inflammatory pericardial reactions can be triggered
by minor myocardial injury from right septal slow
pathway ablation in susceptible individuals. Clinical
surveillance in the postprocedural period helps to identify complications.

Abbreviations
ANRT: Atrioventricular nodal reentrant tachycardia; CK: Creatinine kinase; CS: Coronary sinus; ECG: Electrocardiogram; HRA: High right atrium; PCIS: Post-cardiac injury syndrome; PE: Pericardial effusion; RF: Radiofrequency; RV: Right ventricular apex; W: Watt.

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FAW and EHB conceived the manuscript and collected the data. FAW drafted the manuscript. MM, SW, DS, and EHB provided important intellectual content and critically reviewed the manuscript. All authors have contributed significantly. All authors read and approved the final manuscript.

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Not applicable.

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Competing interests
The authors declare that they have no competing interests.

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