How do you interpret the T-wave inversions after ablation?

Wolff-Parkinson-White syndrome and diverticulosis of the heart?

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Case presentation

A 77-year-old woman with a history of short palpitations lasting seconds, syncope, and one (undocumented) episode of tachycardia lasting 2 hours was referred for electrophysiologic testing. Her 12-lead ECG is shown below (fig. 1). There was no evidence of structural heart disease based on echocardiography. The patient was taking flecainide and a β-blocker.

Questions

- What does the ECG in figure 1 show?
- Are there ECG clues with regard to the location of the accessory pathway?
- How do you interpret the T-wave inversions after ablation (fig. 3)?

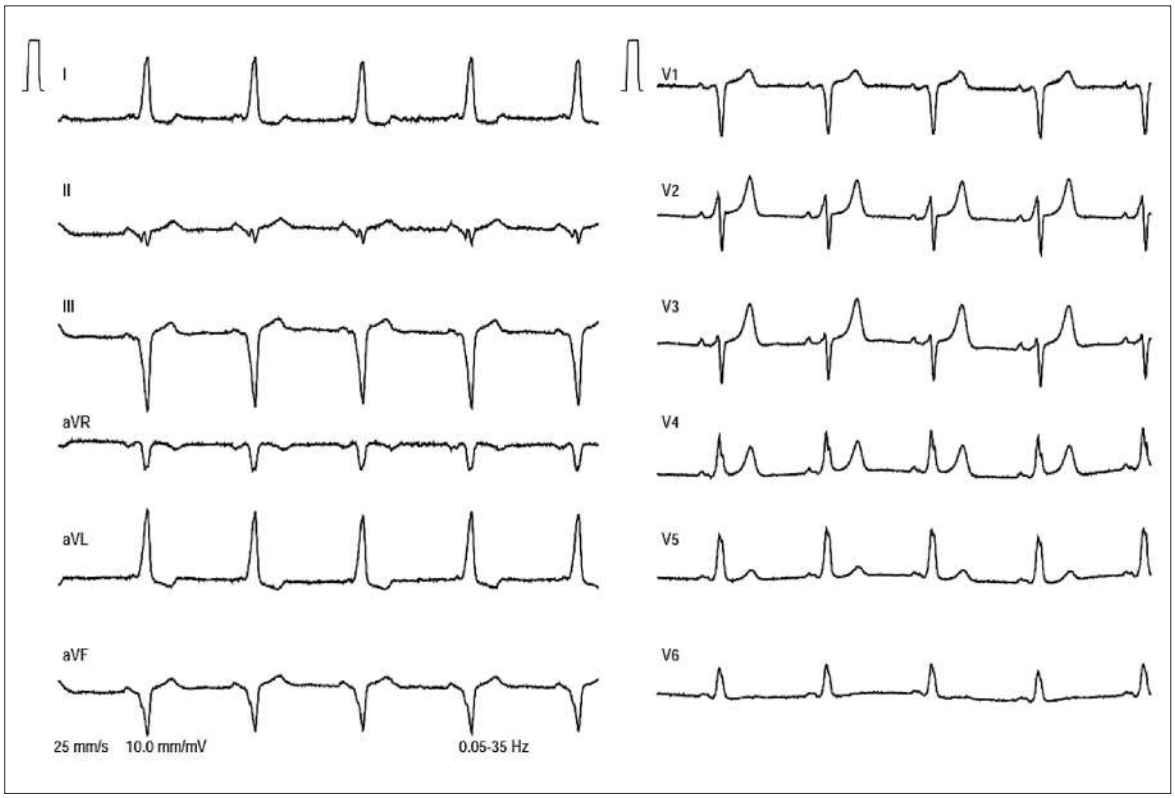

Figure 1: 12-lead ECG showing a negative delta wave in leads II, III, aVF and a transition in the precordial leads between V1 and V2.

Comment

The ECG (fig. 1) showed sinus rhythm with pre-excitation and negative delta waves in leads II, III and aVF and a transition in the precordial leads between V1 and V2 consistent with an antegradely conducting right posteroseptal accessory pathway.

For mapping and ablation, a nonirrigated 4-mm tip ablation catheter was placed at the right septal region. The earliest ventricular activation was found in a posteroseptal position. Radiofrequency energy (settings: 50 W, temperature limit at 60 °C) was delivered and pre-excitation was eliminated (average power

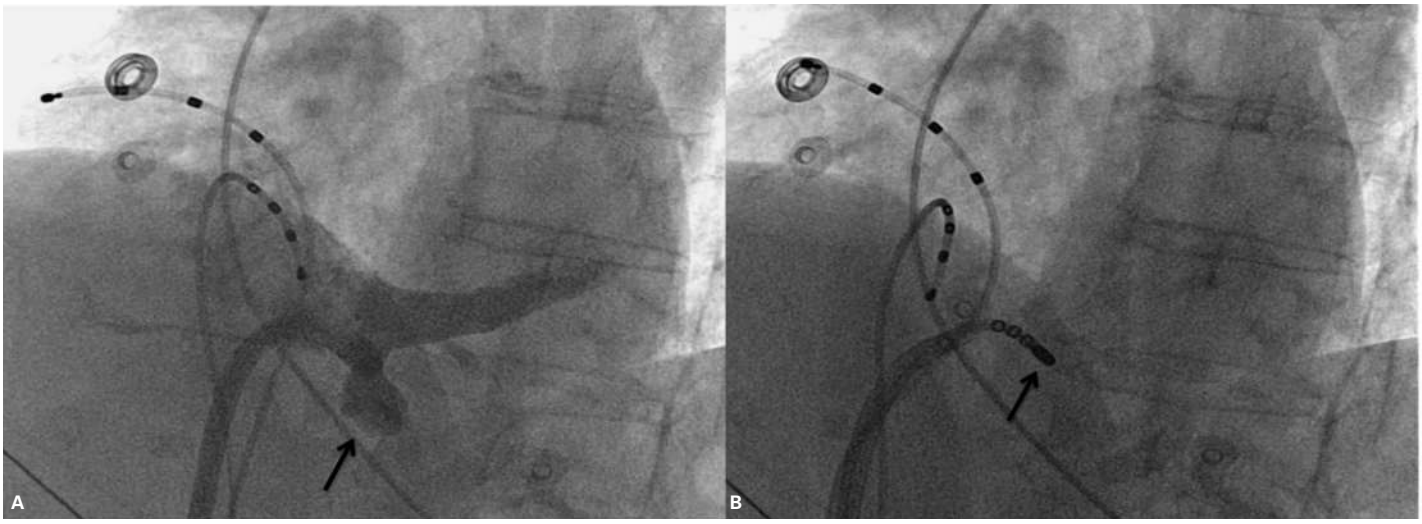

Figure 2: A. Coronary sinus angiogram (left anterior oblique view) showing the coronary sinus diverticulum (arrow) in the middle cardiac vein. **B.** Left anterior oblique view showing the ablation catheter at the neck of the diverticulum.

38 W, starting impedance 116 Ω). Because of acute recovery of conduction after a waiting period of 30 minutes, we proceeded to coronary sinus angiography, which showed a diverticulum in the middle cardiac vein (fig. 2A). The accessory pathway was then ablated successfully at the neck of the diverticulum with the nonirrigated-tip ablation catheter and the same power settings (fig. 2B). The ablation site was approximately 5–10 mm from the first ablation site. The starting impedance was slightly higher at 132 Ω and the average power reached was 34 W. Impedance was closely monitored, but did not increase during ablation. The ECG after ablation revealed sinus rhythm, absence of delta waves and negative T waves in leads II, III, and aVF (fig. 3).

The hallmark of an epicardial posteroseptal accessory pathway is the presence of a steeply negative delta wave in lead II [1–3]. The delta wave in lead II was negative in our case, but not steeply negative. Nevertheless, an epicardial posteroseptal accessory pathway was

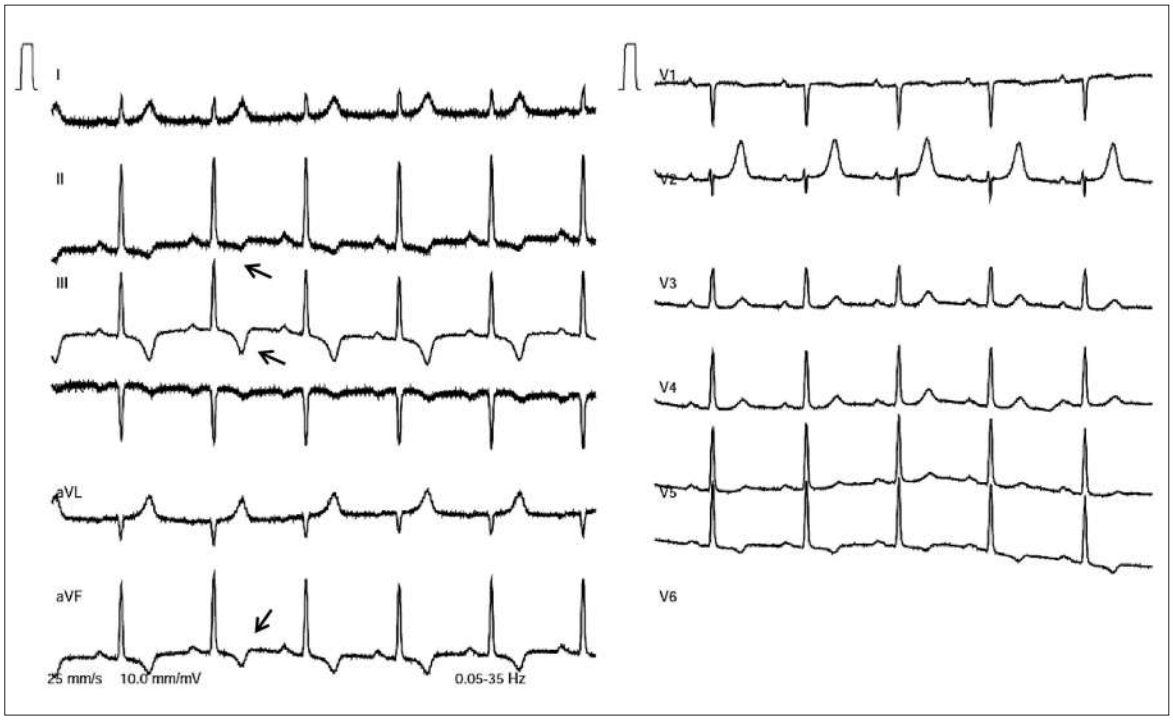

Figure 3: 12-lead ECG after ablation showing absence of delta waves and negative T waves in leads II, III and aVF (arrows).

present in our patient and searched for after acute recovery of accessory pathway conduction. Coronary sinus angiography was performed and showed a diverticulum in the middle cardiac vein.

Coronary sinus diverticula are congenital anomalies that have been identified at autopsy in patients with Wolff-Parkinson-White syndrome or sudden death [4]. The diverticula contain myocardial fibers that connect the coronary sinus myocardial coat with the ventricle and serve as an often rapidly conducting accessory pathway [2, 5]. The association of posteroseptal accessory pathways and coronary sinus diverticula may result in unsuccessful or repeated catheter ablation procedures.

The ECG after ablation shows the phenomenon known as "cardiac memory" after successful radiofrequency catheter ablation of a posteroseptal accessory pathway. The phenomenon is characterised by transient T-wave abnormalities. The QRS vector is normalised immediately upon resumption of normal ventricular activation, but the T-wave vector persists, reflecting the vector of the previously altered QRS complex during pre-excitation. This phenomenon has been described after ventricular pacing, ventricular tachycardia, intermittent bundle-branch block and after catheter ablation of accessory pathways [6]. The underlying mechanism is not well understood, and various mechanisms have been described.

In conclusion, even when the ECG does not suggest an epicardial pathway location in the coronary sinus, this possibility should be kept in mind in patients with posteroseptal accessory pathways. Especially when there is acute recovery of conduction after a successful initial ablation or resistance to ablation, coronary sinus diverticula should be searched for. Ablation within the coronary sinus is often performed using irrigated-tip ablation catheters; however, in our case, nonirrigated ablation successfully eliminated accessory pathway conduction.

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