Regular Tachycardia With Abnormal QRS Axis

Rajin Choudhury, MD
Mattias Duytschaever, MD, PhD
Sébastien Knecht, MD, PhD
Yves Vandekerckhove, MD
Rene Tavernier, MD, PhD

ECG CHALLENGE

A 32-year-old woman with unremarkable medical history presented with hemodynamically stable, regular tachycardia of 150 bpm (Figure 1). What is the most likely diagnosis?

Please turn the page to read the diagnosis.

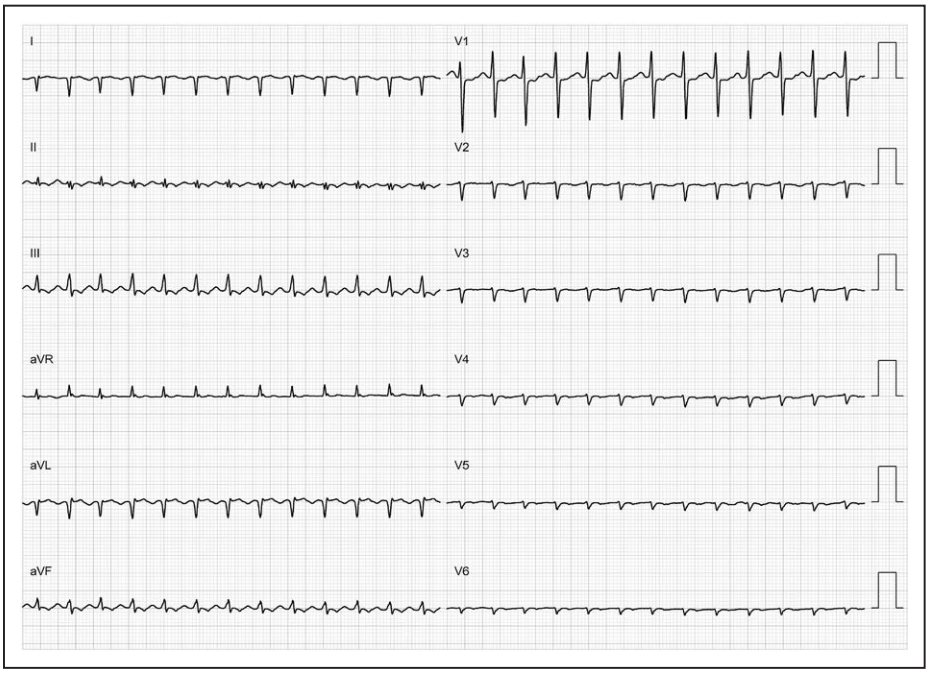

Figure 1. ECG: tachycardia.

Correspondence to: Rene Tavernier, MD, PhD, Department of Cardiology, AZ Sint Jan Bruges, Ruddershove 10, 8000 Bruges, Belgium. E-mail rene.tavernier@azsintjan.be

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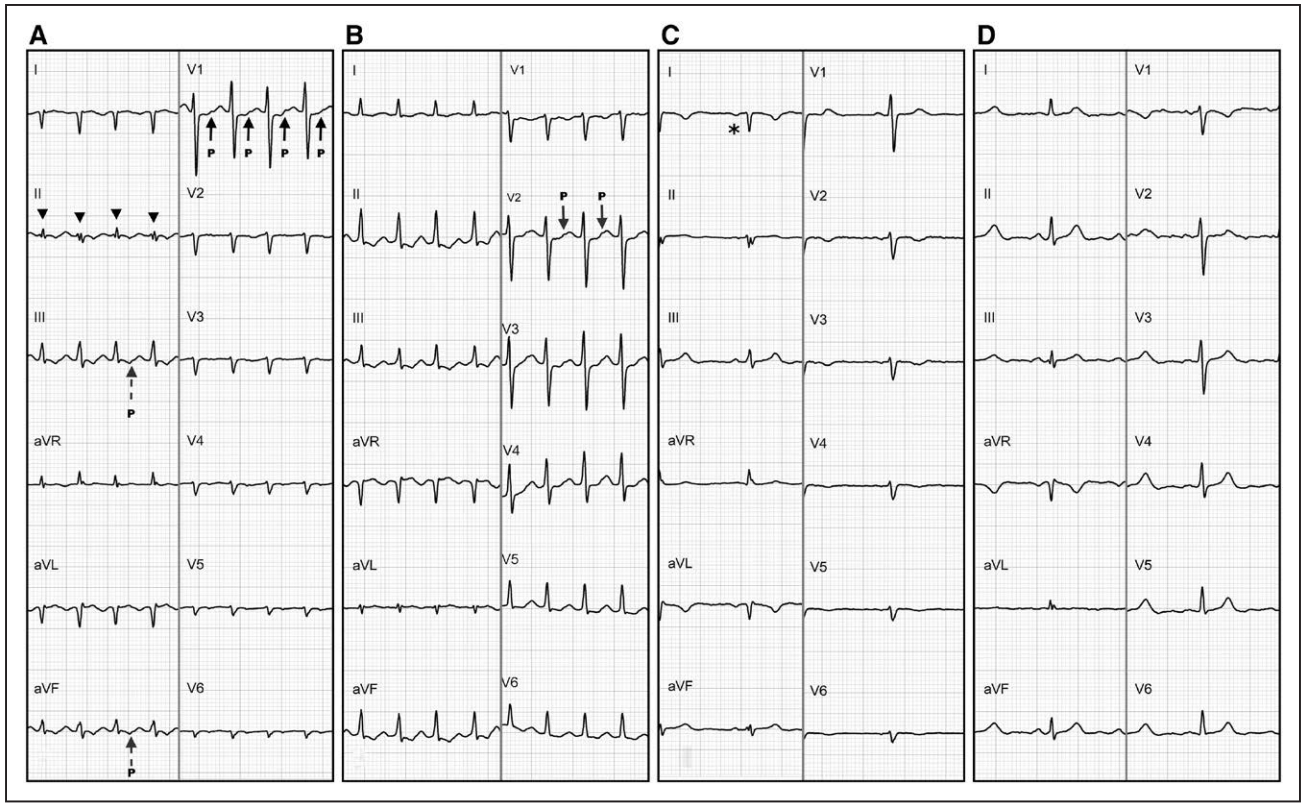

Figure 2. Analysis of the ECG.
During tachycardia (**A**) and sinus rhythm (**C**) with conventional electrode positioning. *Note the negative P wave in lead I during sinus rhythm. During tachycardia (**B**) and sinus rhythm (**D**) with modified electrode positioning (reversing limb leads V_1 and V_2 while placing other chest electrodes symmetrically on the right chest in the usual intercostal spaces) showing "normalization" of the electrocardiographic characteristics. ▼Note beat-to-beat variation in QRS amplitude during tachycardia, also called electric alternans.

RESPONSE TO ECG CHALLENGE

The ECG (Figure 1) shows a QRS complex with extreme axis deviation (+160°) that is usually seen during ventricular arrhythmias (fascicular) with a structurally normal heart. However, a narrow QRS complex (90 ms) suggests a supraventricular tachycardia without aberrancy.

Supraventricular tachycardia with an abnormal axis can be caused by underlying heart disease, but a positive QRS in lead aVR and a negative lead I suggest limb lead reversal,[1] in which case, normal R-wave progression in the precordial leads during supraventricular tachycardia is expected. The present ECG recorded a progressive decrease in R-wave amplitude from V_1 to V_6. A right-axis deviation with absent R-wave progression in the precordial leads is typically observed in mirror-image dextrocardia.[2]

During tachycardia, negative P waves in the inferior leads (Figure 2, interrupted arrows) are identified 120 ms from the beginning of the QRS complex, as is seen during either a slow-slow atypical atrioventricular nodal reentrant tachycardia or a posteroseptal bypass tract–mediated atrioventricular reentrant tachycardia.[3] In both arrhythmias, the ventricular activation precedes the atrial activation that is directed from inferior to superior (hence negative P waves in inferior leads). Electric alternans (beat-to-beat variation in QRS amplitude during tachycardia, beats 1–6) in the absence of pericardial effusion is usually a result of beat-to-beat changes in calcium fluxes into the ventricular myocardium and once again can be observed in both atrioventricular nodal reentrant tachycardia and atrioventricular reentrant tachycardia. Electric alternans disappeared once the tachycardia stopped.

In summary, the ECG is suggestive of an atypical form of atrioventricular nodal reentrant tachycardia or orthodromic atrioventricular reentrant tachycardia in a patient with mirror-image dextrocardia. During cardiac electrophysiological study (gastric air bubble noted on the right side indicating the presence of both dextrocardia and situs inversus), a right-sided posteroseptal bypass tract was diagnosed and successfully ablated (Figure 3).

Although there have been reports of atrioventricular nodal reentrant tachycardia and manifest accessory pathway in a patient with mirror dextrocardia, orthodromic atrioventricular reentrant tachycardia in a pa-

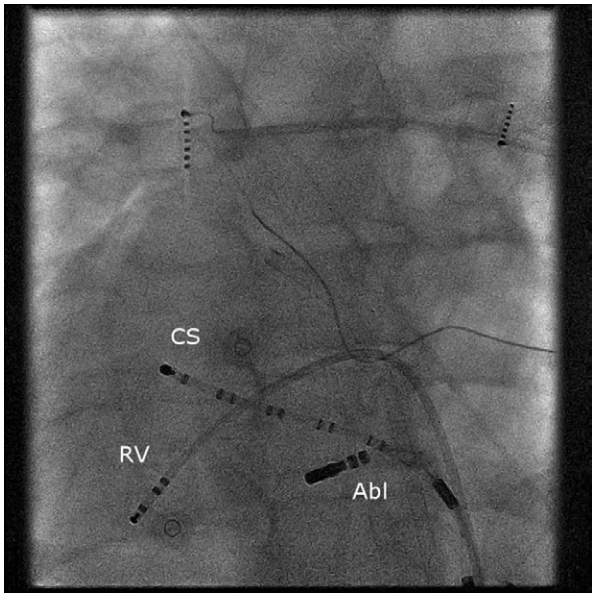

Figure 3. Fluoroscopic image of catheter positioning during the electrophysiology study in mirror-image dextrocardia.
Abl indicates ablation; CS, coronary sinus; and RV, right ventricle.

tient with mirror-image dextrocardia and situs inversus totalis has rarely been reported.

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DISCLOSURES

None.

AFFILIATIONS

Department of Cardiology, AZ Sint-Jan Brugge-Oostende AV, Belgium (R.C., M.D., S.K., Y.V., R.T.). Department of Cardiology, University Hospital Ghent, Belgium (M.D.).

FOOTNOTES

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