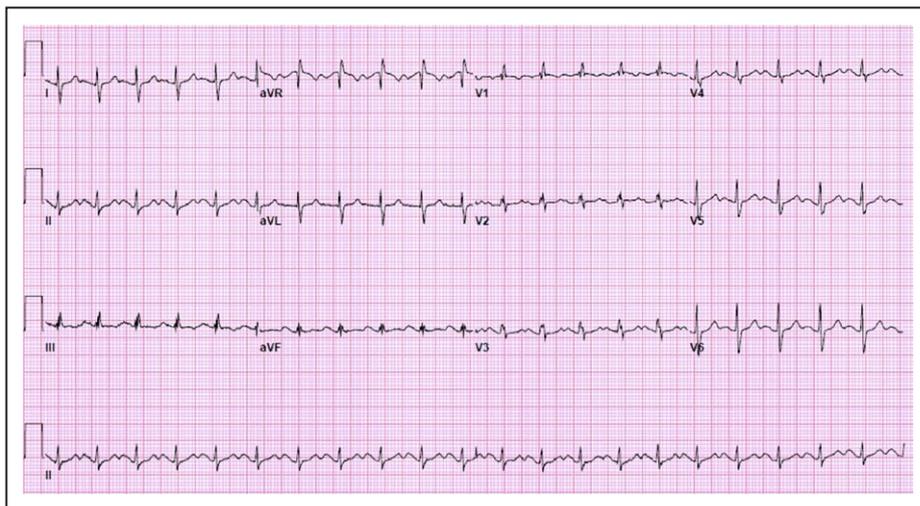


Not Just Another Notch

ECG CHALLENGE

A 21-year-old woman without prior cardiac history presented to the emergency department with palpitations. On telemetry she was noted to have a paroxysmal supraventricular tachycardia with no discernible P waves. She was given 6 mg of intravenous adenosine with prompt conversion to normal sinus rhythm. Thirty minutes after termination of her arrhythmia, she was found to have the following ECG (Figure).

What findings are present on this ECG? What conditions are associated with the findings present on this ECG?



Please turn the page to read the diagnosis.

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RESPONSE TO ECG CHALLENGE

The ECG shows sinus tachycardia at 128 bpm with right-axis deviation at 95° and incomplete right bundle-branch block. In leads III and aVF, a fragmented QRS complex is prominent (Figure 1).



The ECG is an important diagnostic tool in structural heart disease. The right-axis deviation and fragmented QRS complex in this case were suggestive of an atrial septal defect (ASD). Additional findings suggestive of an ASD are right atrial enlargement and right ventricular hypertrophy, although these were not present in our patient.

Previous studies have investigated the fragmented or notching on the ascending branch or at the zenith of the R wave in the inferior leads, also known as a crochetage pattern. First described in a case series in 1958, the crochetage pattern is found in at least 1 inferior lead in 73% of patients with ASD.¹ In later studies, it has been found to positively correlate with both left-to-right shunt severity and larger shunt size. The number of inferior leads manifesting a crochetage pattern affects the sensitivity and specificity of this finding in secundum-type ASDs. In fact, the sensitivity and specificity for predicting the presence

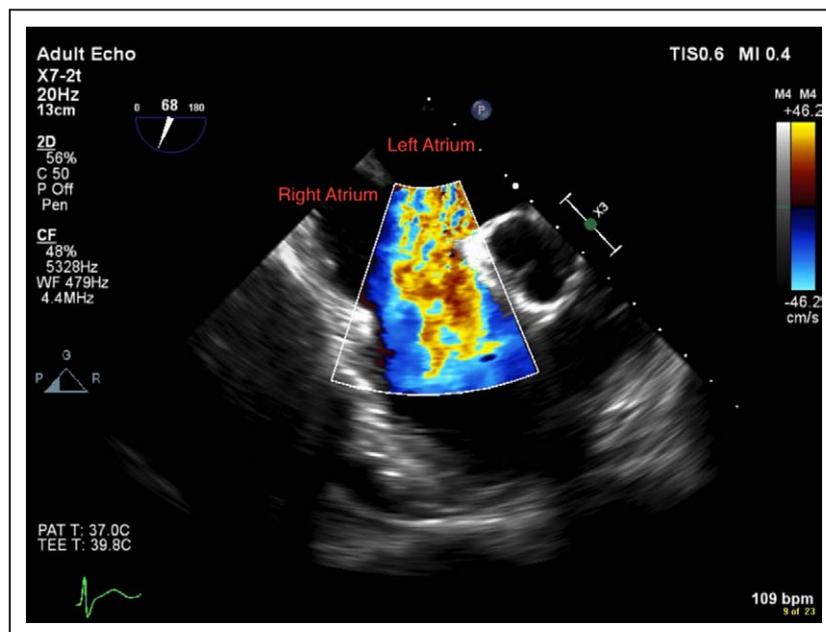
of an ASD were 73% and 92%, respectively, if present in 1 lead, and the specificity approaches 100% if present in all 3 inferior limb leads.² The exact mechanism behind the crochetage pattern remains unknown. Interestingly, within 10 to 15 days of ASD repair, the majority (53%) of pa-

tients with a crochetage pattern in at least 1 inferior leads have resolution of this ECG finding.² The crochetage pattern (marked by red arrows in Figure 2) added both sensitivity and specificity to the ASD diagnosis in this case.

There are 3 major types of ASDs: ostium primum, sinus venosus, and ostium secundum defects. Classically, the ECG in ostium primum demonstrates left-axis deviation or extreme right-axis deviation and first-degree atrioventricular block, whereas inverted P waves are associated with sinus venosus defect. Ostium secundum defects are the most common ASD and typically show mild right-axis deviation.³

HOSPITAL COURSE

The patient was admitted for workup of her supraventricular tachycardia and possible undiagnosed ASD. She



initially underwent cardiac magnetic resonance imaging, which showed normal right and left ventricular ejection fraction, interventricular septal flattening, right atrial and right ventricular dilation, and a probable ASD. Qp:Qs calculated by phase-contrast flow was 2.8:1.

She underwent a right-sided heart catheterization with normal cardiac output and a step-up in oxygenation from the superior vena cava (68%) and inferior vena cava (75%) to the right atrium (85%). Pulmonary vascular resistance was slightly elevated at 1.7 Woods units. Transesophageal echocardiogram identified a large ASD, ostium secundum type, with a fenestrated aneurysmal interatrial septum (Figure 2).

As part of her pre-ASD closure evaluation, she underwent an electrophysiology study, followed by successful catheter ablation of typical atrioventricular nodal reentrant tachycardia and right atrial flutter to reduce the risk of atrial arrhythmias after ASD closure.^{4,5} The patient was placed on metoprolol to prevent atrial fibrillation with rapid ventricular response. The patient later underwent successful surgical patch repair of the secundum ASD and has had no further episodes of palpitations or atrial arrhythmias.

DISCLOSURES

None.

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