

# An Asymptomatic Man With an Abnormal ECG

## ECG CHALLENGE

A 76-year-old man presented for a routine health evaluation. He reported no symptoms and the cardiovascular physical examination was within normal limits. He takes amlodipine for hypertension. He was referred for a cardiology evaluation after the following ECG was performed.

Please turn the page to read the diagnosis.

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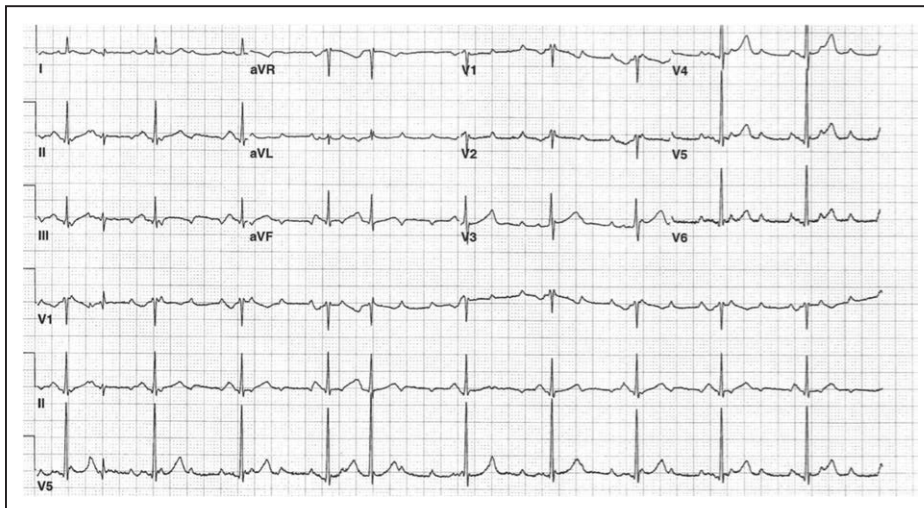
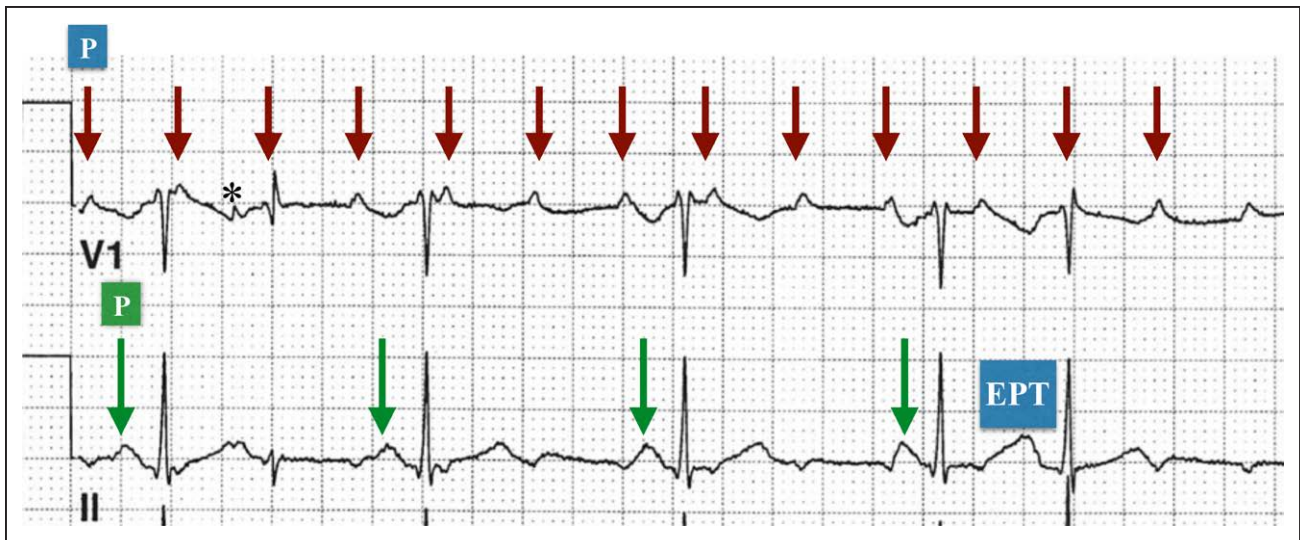


Figure 1. Initial ECG in an asymptomatic man with hypertension.

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**Figure 2. Atrial dissociation.**

Two dissociated and independent atrial rhythms are present on the same ECG. **Top**, A rapid atrial rhythm with red arrows tracking the P waves. **Bottom**, an independent basic rhythm (normal sinus rhythm) with green arrows tracking the P waves. The rapid atrial rhythm never conducts to the ventricles. Two ectopic premature beats are present: the first one (asterisk) conducts with aberrancy. The second one (EPT) overlaps on the T wave. Neither are related to the rapid atrial rhythm. EPT indicates ectopic P + T wave complex.

## RESPONSE TO ECG CHALLENGE

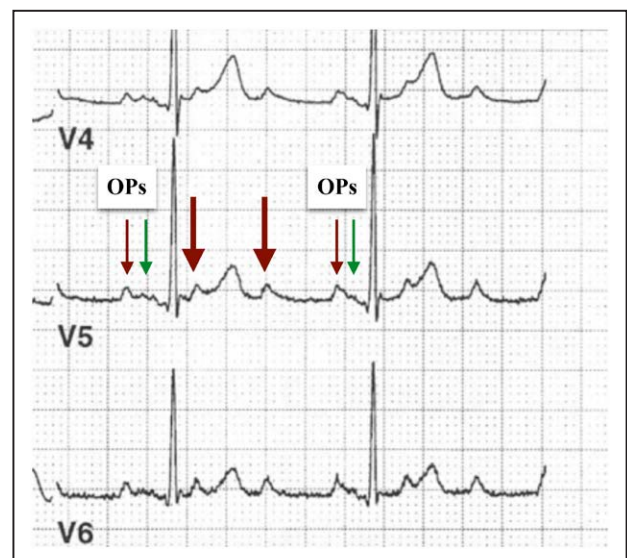
The ECG in Figure 1 shows 2 dissociated and independent atrial rhythms, a condition called atrial dissociation. An amplified view of the same ECG is shown in Figure 2, where the 2 rhythms are evident: one is a normal sinus rhythm (green arrows in lead II rhythm strip) at 60 beats/min with a QRS axis of +50 and a PR interval of 140 ms. The other is a rapid atrial rhythm (RAR) with a low-voltage P wave (red arrows in lead V1 rhythm strip) with a constant interval of 340 ms (178 beats/min). The 2 rhythms do not interfere with each other.

The second and sixth QRS complexes are premature and are preceded by ectopic atrial depolarizations not related to the RAR. The first premature QRS, with an aberrant conduction, is preceded by an ectopic atrial beat (asterisk), with a shorter interval with respect to the previous P wave of the RAR, in contrast with the constant P-P intervals of the RAR. The P wave of the RAR following the ectopic atrial beat overlaps on the conducted and aberrant QRS, and thereby is not recognizable.

The second premature QRS (sixth QRS complex) is preceded by an ectopic atrial beat, which overlaps on the previous T wave (ectopic P + T wave complex) creating a visible notch and an apparent increase in voltage; the next P of the RAR overlaps on this conducted QRS. Again, the ectopic atrial beat does not interrupt the regular rhythm of the RAR.

In summary, the present ECG shows normal sinus rhythm and premature atrial contractions. There is a normal sinus P wave (green arrows) commanding the activation of the ventricles and another type of P waves

(red arrows) representing the activation of only a confined and isolated portion of one atrium, generating a RAR. The latter has an entrant protective block, because it is not affected by the sinus activation, and also an exit block because its activation is not propagated to the rest of the atria and thereby to the ventricles. Some P waves of the RAR partially or totally overlap on the sinus P waves (Figure 3). However, they do not fuse. These findings are consistent with an ectopic, dissociated atrial rhythm.



**Figure 3. Overlapped P waves.**

Some P waves of the rapid atrial rhythm (red arrows) partially or totally overlap on the sinus P waves (green arrows). However, they do not fuse. OPs indicates overlapped P waves.

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The existence of 2 independent P waves originating from 2 different areas of the atria has been described previously and is known as atrial dissociation.<sup>1,2</sup> There are other scenarios where 2 independent P waves can be found in an ECG, such as in some patients with heart transplant. In such cases, 2 types of atrial tissue coexist: one is the remnant of the recipient's heart and the other from the donor's heart, initiating 2 different P waves that can be recorded, particularly when using additional ECG leads.<sup>3</sup> These 2 P waves correspond to an independent activation of each isolated atrial tissue.

In our patient, given the benign nature of his ECG findings and lack of symptoms, no further testing or intervention was performed.

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## DISCLOSURES

None.

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## AFFILIATIONS

From Columbia University Division of Cardiology (J.C.B., A.T.) and Division of Internal Medicine, Mount Sinai Medical Center (C.L.), Miami Beach, FL; and Division of Cardiology, University of Costa Rica School of Medicine, San Jose, Costa Rica (C.B.-P).

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## FOOTNOTES

*Circulation* is available at <http://circ.ahajournals.org>.

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## REFERENCES

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