

Enhanced Automaticity of the His Bundle

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ECG PUZZLER

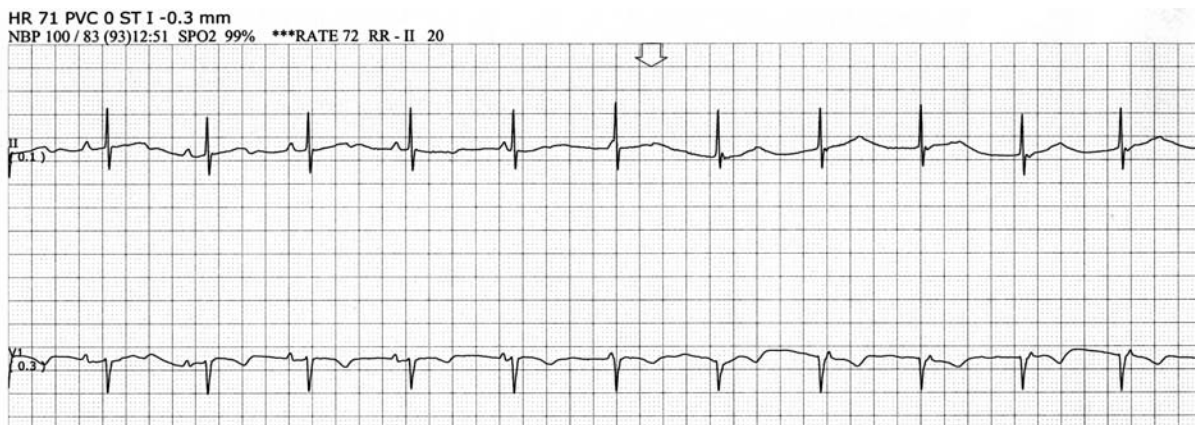
A regular feature of the *American Journal of Critical Care*, the ECG Puzzler addresses ECG interpretation for clinical practice. We welcome letters to the Editors regarding this feature.

Enhanced Automaticity of the His Bundle

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Scenario: This ECG was obtained in a 70-year-old female patient being treated for new onset atrial fibrillation on the telemetry unit. The patient has been given

several doses of digitalis for her atrial fibrillation. Currently the patient is asymptomatic.



For every ECG, we recommend you systematically examine the following 9 features (check all that apply):

1. Rate

- Normal (60-90 beats per minute)
- Bradycardia (<60 beats per minute)
- Tachycardia (>90 beats per minute)

2. Rhythm

- Regular
- Irregular

3. P waves

- One P wave for every QRS complex
- Fewer P waves than QRS complexes
- More P waves than QRS complexes

4. PR interval

- Normal (≤ 0.20 seconds)
- Short (<0.08 seconds)
- Lengthened (>0.20 seconds)

5. QRS complex duration

- Normal (≤ 0.12 seconds)
- Wide (>0.12 seconds)

6. QRS complex direction lead V_1

- Negative and ≤ 0.12 seconds (normal)
- Negative and >0.12 seconds (left bundle branch block)
- Positive and >0.12 seconds (right bundle branch block)

7. ST segments

- Normal
- Elevated (≥ 2 mm)
- Depressed (≥ 2 mm)

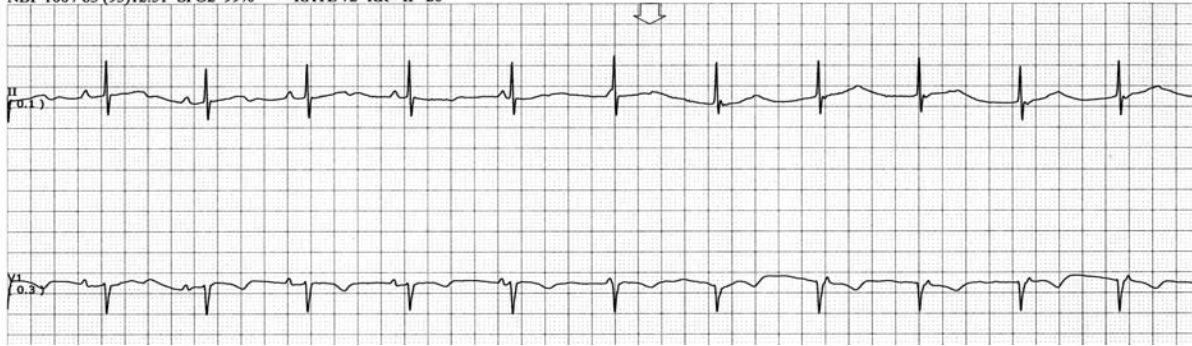
8. T Wave

- Normal
- Inverted

9. QTc

- Normal
- Lengthened (>0.47 seconds)

HR 71 PVC 0 ST I -0.3 mm
NBP 100 / 83 (93) 12:51 SPO2 99% ***RATE 72 RR - II 20



ANSWERS

1. Rate

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- Bradycardia (<60 beats per minute)
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Interpretation: Sinus rhythm transitioning to accelerated junctional rhythm with incomplete atrioventricular (AV) dissociation.

Rationale

The first 2 beats are sinus beats at a rate of 72 beats per minute (bpm), with a PR interval of 0.20 seconds. By the third beat, the PR interval begins to shorten (0.16 seconds) and continues to shorten with subsequent beats, indicating that the AV junction is assuming the pacemaker function of the heart. Because the rate is too fast for a junctional rhythm (typically <60 bpm), this rhythm is termed accelerated junctional rhythm. By the sixth beat, the P wave merges into the QRS complex and is then lost within the QRS complex. Eventually, a hint of a P wave can be seen buried in the end of the QRS's. In this case, incomplete AV dissociation is present because the P's and QRS's have no relationship to one another most of the time and there is no evidence of a retrograde

P wave (see third through sixth beats): Complete AV block is present if the P's and QRS's have no relationship. Note that the QRS's march out at a consistent rate of 72 bpm, which is not the case with the P's—a finding that rules out third-degree heart block. Thus, excitation of the ventricles is under the control of the junctional focus, and the atria are under the control of the sinus node or an atrial focus outside of the sinus node.

Nursing Actions

Enhanced automaticity of the His Bundle due to digitalis toxicity is the most common cause of accelerated junctional rhythm and is likely the mechanism for this patient's arrhythmia. This patient's vital signs and cardiac rhythm should be monitored closely. Her digitalis blood level should be checked, and digitalis should be held until the blood level is confirmed. If the dig level is high and the patient becomes hemodynamically unstable, Digoxin-fab fragments may be administered.