

ECG INTERPRETATION AND DIGOXIN TOXICITY

To the Editor:

I read with interest the article by Al Chekakie and colleagues¹ entitled, "A 93-year-old woman with an abnormal electrocardiogram," which described an elderly woman with junctional rhythm and complete right bundle branch block (demonstrated by electrocardiogram [ECG]) as a result of digoxin toxicity. Digoxin is a medication commonly encountered in clinical practice and may lead to significant toxicity, particularly among the elderly. This case highlights the need to evaluate medications with a low therapeutic index in susceptible individuals. In this case, the ECG was characteristic of digoxin exposure. However, there is an additional feature of this ECG that I feel warrants further discussion. The case patient's ECG demonstrated a characteristic scooping of the ST segment. The changes in repolarization caused by inhibition of the Na⁺, K⁺-ATPase pump commonly cause down-sloping of the ST segment, which is known as "digitalis effect." This is important because ST-segment scooping can occur without digoxin toxicity. Identifying this finding alone should not prompt the physician to treat the patient for digoxin toxicity. Furthermore, this finding may provide insight into a patient's medication use or, rarely, into a plant exposure containing a cardiac steroid. This point was emphasized by a case presented by Newman and colleagues in a patient who had mistakenly eaten foxglove (*Digitalis purpurea*).²

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References

1. Al Chekakie MO, Alkotob ML, Underwood D, Nielsen C. A 93-year-old woman with an abnormal electrocardiogram. *Hosp Physician* 2005;41(6):23–5, 40.

2. Newman LS, Feinberg MW, LeWine HE. A bitter tale. *N Engl J Med* 2004;351:594–9.

In response:

We thank Dr. Daubert for his interest in our article. Digoxin does indeed have a number of effects on ventricular repolarization; the earliest effect is a decrease in the amplitude of the T wave and shortening of the QT interval. The more classic finding of digoxin effect is sagging of the ST segment when the QRS complex is predominantly positive¹; in addition, the T wave may also become diphasic. However, these ST- and T-wave changes are not always present, and they can have no relation to serum digoxin level or toxicity.² Arrhythmias and other toxic effects of digoxin can occur in the absence of these changes.² Secondary T-wave changes can also occur in right bundle branch block, and the T-wave vector is usually opposite the QRS vector. The secondary ST segment and T-wave changes in left ventricular hypertrophy and bundle branch block may simulate or mask digoxin effects on repolarization. In our patient, recognizing the rhythm change and depressed conduction with increased automaticity on the ECG was the key to identifying digoxin toxicity.

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2. Chou T. Effects of drugs on the electrocardiogram. In: Electrocardiography in clinical practice. 4th ed. Philadelphia: Saunders; 1996:503–30.

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