

Image Diagnosis: aVR, the Forgotten Lead

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The 12-lead electrocardiogram has been referred to as an “11-lead study” on the basis of the false assumption that lead aVR yields only limited information. As this area is already covered by other leads (I, aVL, V₅, V₆), aVR was only used to confirm correct arm lead placement and was assumed to reflect only reciprocal changes from the lateral portion of the heart. As a result, the unpaired lead aVR has been largely ignored and has been coined the “forgotten lead.”¹ In reality, aVR is an informative lead that also reflects the right ventricular outflow tract and the basal portion of the interventricular septum. Analysis of aVR’s individual waveforms should be performed in concert with all other leads because it can provide critical information in the management of a number of medical conditions.

The ST segment in lead aVR is used in the assessment of narrow complex tachyarrhythmia. Ho et al² reported the presence of ST elevation in aVR has a 71% sensitivity and a 70% specificity of distinguishing atrial ventricular reciprocating tachycardia (such as Wolff-Parkinson-White) from atrial ventricular nodal reentrant tachycardia. In addition, aVR morphology can also be used to distinguish wide complex supraventricular tachycardia from ventricular tachycardia. For example, in 2008 Verecke et al³ reported a 98% sensitivity in differentiating wide complex supraventricular tachycardia from ventricular tachycardia based solely on the analysis of aVR morphology (Figure 1).

The presence of a prominent R wave in aVR is a critical finding in sodium channel blocker poisonings, such as with tricyclic antidepressants.⁴ Liebelt

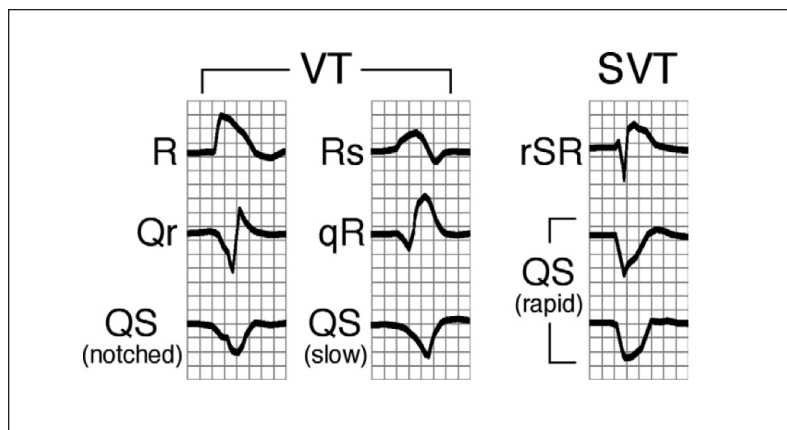


Figure 1. aVR criteria from Verecke et al¹ suggestive of ventricular tachycardia: 1) presence of R wave; 2) presence of R wave or Q wave > 40 msec; 3) presence of a notch on the descending limb of the negative QRS complex; 4) voltage change in the first (V₁) and last (VT) 40 msec is V₁/VT < 1.

¹ Reprinted from Verecke A, Duray G, Szénási G, Altemose GT, Miller JM. New algorithm using only lead aVR for differential diagnosis of wide QRS complex tachycardia. *Heart Rhythm* 2008 Jan;5(1):89-98, with permission from Elsevier. Available from: www.sciencedirect.com/science/article/pii/S1547527107009435.

et al⁴ concluded that an R wave amplitude > 3.0 mm is more sensitive than QRS interval as a predictor of seizures and ventricular dysrhythmias (Figure 2).

Finally, aVR is a valuable lead in the management of acute coronary ischemia. Although aVR ST-segment elevation may be an abnormal variant in supraventricular tachycardia, bundle branch blocks, left ventricular hypertrophy, or right ventricular hypertrophy, in the presence of other ischemic changes aVR ST-segment elevation is a sensitive indicator of left main, left anterior descending, or triple vessel disease.⁵⁻⁹ Barrabés et al⁶ and Kosuge et al⁷ have reported aVR ST-segment elevation to be an independent risk factor for increased morbidity and mortality. Therefore, the presence of aVR ST-segment elevation, in conjunction

with other ischemic changes, should be considered an ST-segment elevation myocardial infarction equivalent and warrants immediate interventional reperfusion^{6,7,10} (Figure 3). ♦

Disclosure Statement

The author(s) have no conflicts of interest to disclose.

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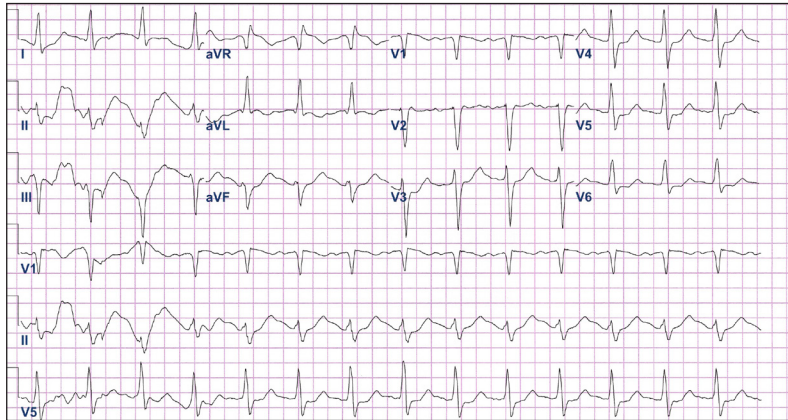


Figure 2. 12-lead electrocardiogram with a sinus rhythm characterized by a widened QRS complex, deep S wave in lead I, and prominent R wave in lead aVR. These findings are consistent with cardiotoxicity resulting from tricyclic antidepressant poisoning. Patient was intubated, treated with sodium bicarbonate, and discharged to a psychiatric facility 1 week later.

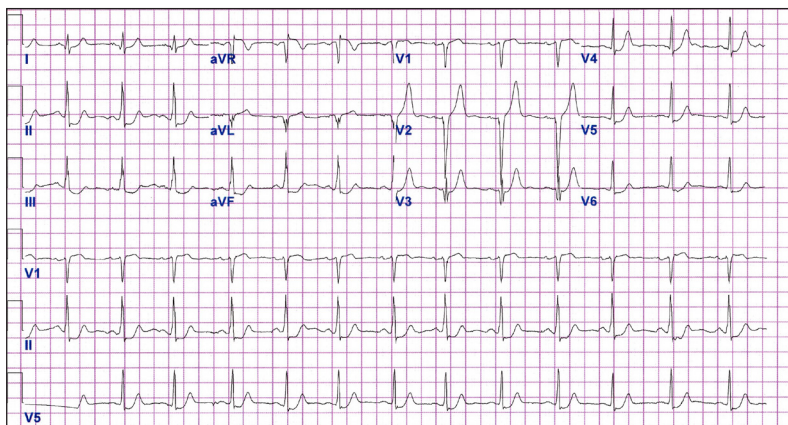


Figure 3. 12-lead electrocardiogram from a 33-year-old man with history of hypercholesterolemia, who presented to the Emergency Department with 5 hours of anterior chest pressure associated with diaphoresis and shortness of breath. Electrocardiogram demonstrates ST elevation in aVR, hyperacute septal T waves, and ST depressions in inferior and lateral leads. The patient was taken emergently to the cardiac catheterization laboratory where he was found to have left anterior descending artery occlusion with plaque rupture, and TIMI-0 flow. He underwent successful thrombus aspiration and subsequent angioplasty with bare metal stent placement to the mid left anterior descending coronary artery.

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