Usefulness of Lewis Lead for Visualizing P-Wave
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A 63-year-old man with hypertension was admitted due to acute myocardial infarction caused by left main trunk disease. Percutaneous coronary intervention was successfully performed. During rehabilitation, he once experienced atrial fibrillation. Amiodarone was initiated with anticoagulation therapy, and he recovered to sinus rhythm. After 32 days on amiodarone, electrocardiogram (ECG) abruptly showed tachycardia. Blood pressure dropped to 70/40 mmHg, but he did not have any chest pain or dyspnea. On 12-lead ECG, wide QRS tachycardia was seen (Figure 1). At the same time, Lewis lead recording was done (Figure 2). The Lewis lead was developed by Thomas Lewis to obtain the most prominent atrial activity in atrial fibrillation, and recording was done as follows: a bipolar chest lead was used, with the right arm electrode applied to the right side of the sternum at the second intercostal space and the left arm electrode applied to the right side of the sternum at the fourth intercostal space (the tracing seen in lead I was the recording of the Lewis lead; Figure 2). Lewis lead clearly visualized the P-wave independent of the ventricular wave, which implied atrioventricular dissociation.

Figure 1. Twelve-lead electrocardiogram showing wide QRS complex tachycardia. Heart rate was 155 beats/min.
We confirmed, without any doubt, the diagnosis of ventricular tachycardia. After preparing for cardioversion, i.v. lidocaine at a dose of 100mg was added, which terminated ventricular tachycardia. Final ECG showed complete recovery to sinus rhythm with narrow QRS complex. After increasing oral carvedilol to 100mg/day, ventricular tachycardia did not recur. The patient, however, died of subarachnoid hemorrhage on day 48.

When treating patients with wide QRS complex tachycardia, differentiation of ventricular tachycardia and supraventricular tachycardia is important, but is still challenging. Several ECG criteria for differentiation of wide QRS tachycardia have been advocated, but they are difficult to apply due to their complexity. Among these criteria, atrioventricular dissociation has a high specificity of 100%, but a low sensitivity of 20–30% for diagnosing ventricular tachycardia. If atrioventricular dissociation can be identified, the diagnosis of ventricular tachycardia is made.8

Recently, 2 reports focused on the usefulness of the Lewis lead for detecting the P-wave in wide QRS tachycardia.9,10 The Lewis lead was described by Sir Thomas Lewis (1881–1945) in his book, *Clinical Electrocardiography*.1 He developed this lead configuration to detect atrial oscillations present during atrial fibrillation. We used this special character of detecting atrial electrical activity to distinguish atrial from ventricular activity. As shown in the present case, the P-wave was easily visualized more precisely on the Lewis lead, compared with other leads. When dealing with wide QRS tachycardia, it is reasonable that the Lewis lead might be a useful choice to distinguish etiology. To our knowledge there have been only 2 reports on the usefulness of the Lewis lead in wide QRS complex tachycardia.9,10 One focused on detection of independent P-wave (approximately 60beats/min) in slow wide QRS complex tachycardia (approximately 120beats/min),5 and the other focused on detection of atrioventricular concordance in a relatively more rapid wide complex tachycardia (approximately 150beats/min).5 From our experience, in much more rapid wide QRS complex tachycardia (approximately 200beats/min), we were not able to obtain an absolutely independent P-wave. This is the first case of detection of atrioventricular dissociation in a relatively rapid wide QRS complex tachycardia (approximately 150beats/min). We believe that the Lewis lead might be useful in relatively slower wide QRS tachycardia.

Disclosures

The authors declare no conflicts of interest.

References