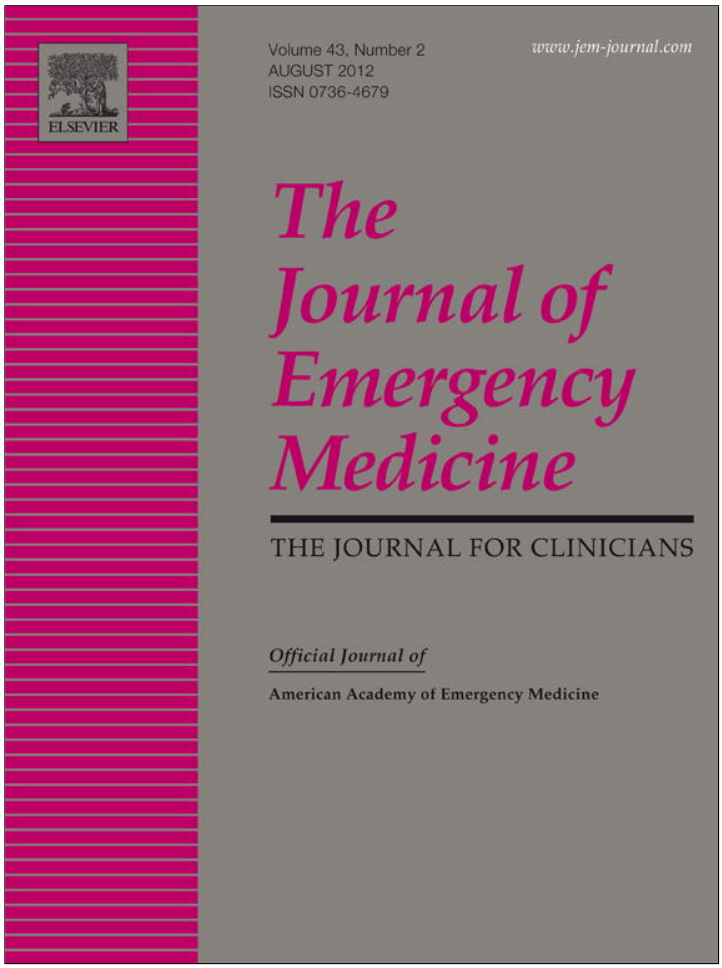

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LEWIS LEAD ENHANCES ATRIAL ACTIVITY DETECTION IN WIDE QRS TACHYCARDIA

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□ **Abstract—Background: The differential diagnosis of wide QRS tachycardia is a challenge for the emergency physician. The major tool is the electrocardiogram (ECG), even though the sensitivity and specificity may be variable, depending on presentation. Additional leads could be used to improve the diagnostic accuracy of the ECG. Objective: To document the use of the Lewis lead in improving the diagnostic accuracy of the ECG in wide QRS tachycardia. Case report: A 52-year-old woman with rheumatoid arthritis, in treatment with methotrexate, was admitted with progressive dyspnea that evolved to acute respiratory distress and shock at arrival. Pneumonia was diagnosed as the infection and she received antibiotics, and respiratory and inotropic support. She was also using amiodarone for more than 10 years, but she couldn't state the reason. On cardiac monitoring, wide QRS tachycardia was detected and ventricular tachycardia was considered on the differential diagnosis. The standard 12-lead ECG was complemented with the Lewis lead, obtained with higher speed and amplitude, demonstrating atrioventricular concordance and excluding ventricular tachycardia. The patient was treated for septic shock, and she died 2 days later. Conclusion: The Lewis lead is a simple and easy strategy to enhance atrial activity detection in wide QRS tachycardia. © 2012 Elsevier Inc.**

□ **Keywords—wide QRS tachycardia; Lewis lead; electrocardiography; ECG; diagnosis**

INTRODUCTION

The differential diagnosis of wide QRS tachycardia is a challenge for the emergency physician (1). The diagnosis is further complicated when there are other conditions that could be responsible for the clinical presentation. In this situation, it is critical to determine the role of wide QRS tachycardia in accounting for the unstable condition (2). The major tool for solving this dilemma is the electrocardiogram (ECG), even though the sensitivity and specificity may be variable depending on the presentation (1). Additional leads could be used to improve the diagnostic accuracy of the ECG, as demonstrated in this case report (1,3,4).

CASE REPORT

A 52-year-old woman with rheumatoid arthritis, being treated with methotrexate, was admitted with progressive dyspnea 1 day earlier, evolving to acute respiratory distress and shock. Pneumonia was diagnosed as the infection and she received antibiotics, and respiratory and inotropic support. She was also using amiodarone for more than 10 years, but she couldn't state the reason. On cardiac monitoring, a high cardiac rate (150 beats/min) with wide QRS was detected on an ECG (Figure 1). Previous ECGs were unavailable, and ventricular tachy-

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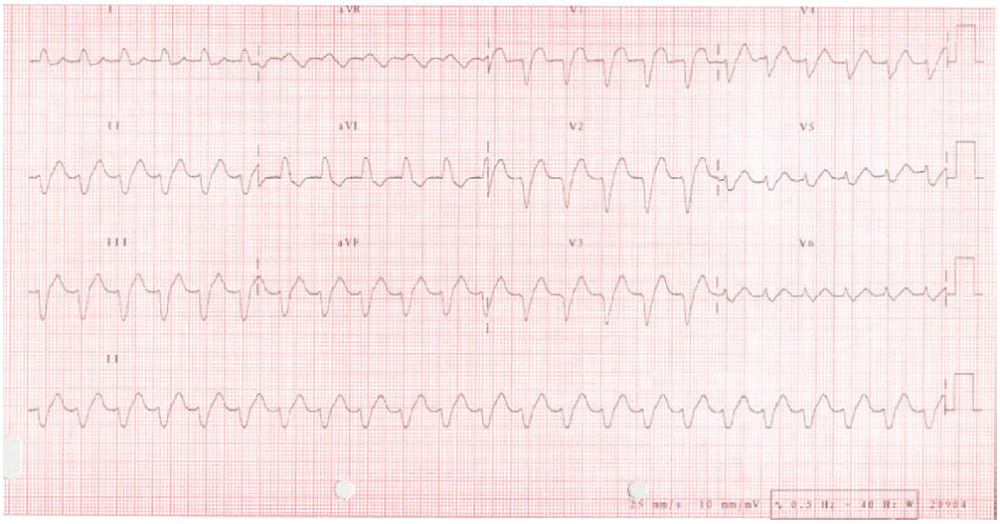

Figure 1. Admission standard 12-lead electrocardiogram showing a wide QRS tachycardia.

cardia was considered in the differential diagnosis. The standard 12-lead ECG was complemented with the Lewis lead, obtained with higher speed and amplitude (Figures 2, 3), demonstrating atrioventricular concordance and excluding ventricular tachycardia. The patient was treated for septic shock, and she died 2 days later.

DISCUSSION

The differential diagnosis of wide QRS tachycardia is challenging. Even though ECG criteria have been proposed to identify ventricular origin, this is discouraged when the patient is unstable, and used only with caution in stable conditions (5). When there is doubt, wide QRS tachycardia should prompt specialist consultation or be considered ventricular tachycardia and treated accordingly (6).

In the present case, a separate issue complicated the problem even further. Septic shock could be responsible for the unstable condition of the patient. On the other hand, the fact that the patient was using amiodarone raised the possibility of ventricular tachycardia as well. Treating the wide QRS tachycardia as ventricular tachycardia in this case would mean inappropriate cardioversion, and this probably would have been done if the atrioventricular concordance was not documented using the Lewis lead with the ECG.

Even though the use of ECG criteria is discouraged, atrioventricular dissociation is considered the most specific criterion and could be extremely reliable if identified (1,5). Using alternative ECG leads for better classification of atrial activity has been proposed (2,3,7). Of these, the Lewis lead is easy to obtain in comparison with saline-filled central venous catheter or esophageal leads (3). Employing the Lewis lead involves changing the limb electrodes, placing the right arm electrode in the second intercostal space and the left arm electrode in the fourth intercostal space, both to the right of the sternum, as demonstrated in Figure 2. Increasing the amplitude and the speed, as demonstrated in Figure 3 (see non-filled arrow on the top), could also be of help.

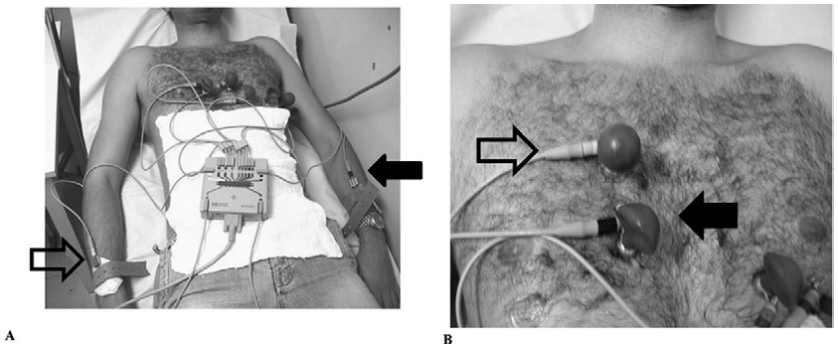

Figure 2. (A) Conventional right (open arrow) and left (full arrow) arm electrodes. (B) The same electrodes positioned in the second (open arrow) and fourth (full arrow) intercostal position to obtain Lewis lead.

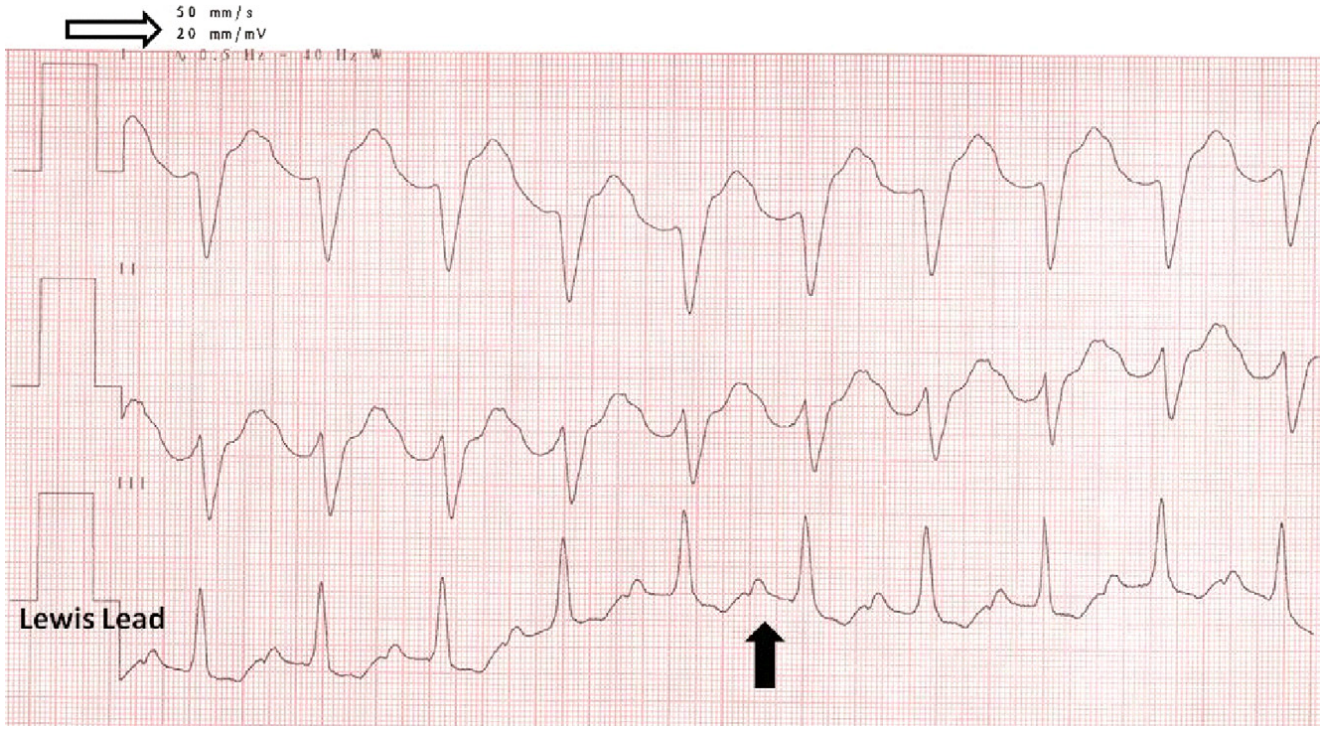

Figure 3. Lewis lead obtained with a speed of 50 mm/s and 2N amplitude (open arrow on the top). The full black arrow points to the P wave.

There are few data regarding the diagnostic accuracy of the Lewis lead for wide QRS tachycardia. Madias found no difference in the amplitude of P waves recorded by standard 12-lead ECG and the Lewis lead, but the patients were in sinus rhythm and did not have wide QRS tachycardia (3).

Obtaining tracings with higher velocity and amplitude could be useful to demonstrate atrioventricular dissociation in supraventricular tachycardia (8). There are no data available for using wide QRS tachycardia. In the present case, recording at higher velocity and amplitude was performed, and no atrioventricular dissociation was found. Only when we applied the same techniques with the Lewis lead did we find atrioventricular concordance (Figure 3).

CONCLUSION

The Lewis lead is a simple and easy strategy to enhance atrial activity detection in wide QRS tachycardia.

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