Narrow QRS Tachycardia with Group Beating

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A 50-year-old man with a history of syncope has had exertional dyspnea for nearly three months and paroxysmal noctural dyspnea for six weeks. On his first visit to the Cardiology Clinic an electrocardiogram (ECG) was obtained (Figure 1).

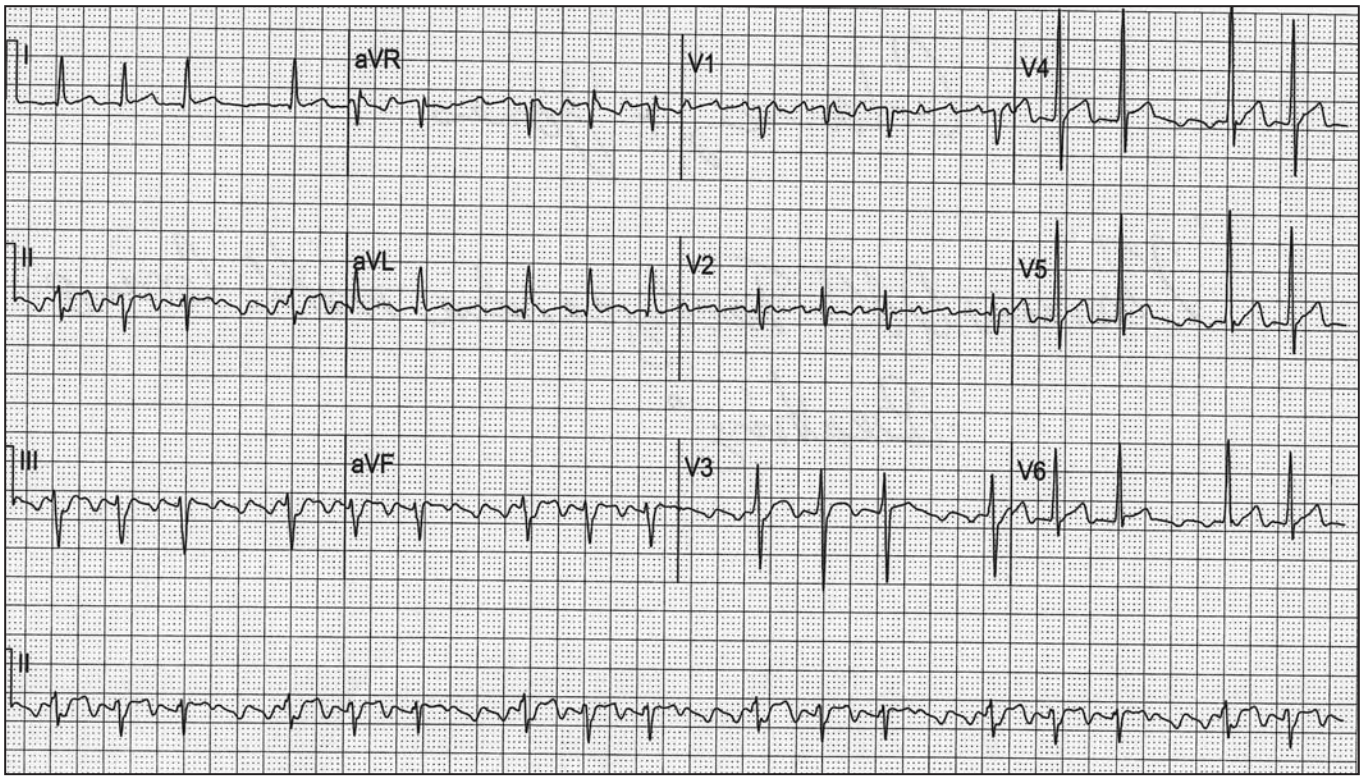

Figure 1. Electrocardiogram obtained in the clinic. See text for explication.

What is your diagnosis?
Explication is on the following page.

ECG of the Month
Presentation is on the previous page.

DIAGNOSIS: *Atrial flutter with atrioventricular block at 2 levels: 2:1 above and 4:3 type I block (Wenckebach) below (Figure 2), left axis deviation.*

The atrial rate is 275/minute with a pattern of typical counterclockwise flutter: positive P (ie, flutter waves–F waves) in lead V_1 and a sawtooth pattern with negative F waves in leads II, III, and aVF. Every other flutter wave fails to be conducted to the ventricles. The alternate flutter waves are conducted in a pattern of 4:3 type I block (Wenckebach) with progressive lengthening of the F-R interval before the non-conducted F wave. The combination of 2:1 block and 4:3 block gives an overall conduction ratio of 8:3, a repetitive pattern of 3 QRSs and a pause (group beating), and a ventricular rate of 103/minute.

Because the atrioventrucular conduction system has a longer refractory period than atrial muscle, 1:1 atrioventricular conduction with atrial flutter is rare and occurs only when the flutter rate is slow or when an accessory atrioventricular pathway exists. Conduction of flutter waves to the ventricles usually is in even ratios (2:1, 4:1, etc.), and this has long suggested two levels in the atrioventicular junction with different conduction properties.[1,2] Irregular conduction to the ventricles in atrial flutter often results from a fixed conduction ratio at one level (usually the upper one) and Wenckebach periodicity at the other level (usually the lower one).[2] Many examples of this have been reported,[2,3] and examples of block at three atrioventricular levels have been described infrequently.[2,4] As pointed out by Castellanos et al, although the concept of multilevel horizontal functional dissociation is convenient for didactic purposes, it may be a simplistic description of a much more complex atrioventricular physiology.[4]

This patient has never had symptoms or signs of coronary arterial disease. He has had untreated high blood pressure for years and has had a fast heart rate for an unknown period of time. He drinks at least 72 ounces of beer (= 3.6 ounces of absolute alcohol) per day. He was seen at two other facilities before coming to our clinic, where his neck veins were elevated (estimated mean right atrial pressure of 15 mmHg). An intermittent third heart sound was heard at the cardiac apex. An echocardiogram revealed left atrial and left ventricular cavities at the upper limit of normal, borderline left ventricular hypertrophy, and a left ventricular ejection fraction of 25% without segmental wall-motion abnormalities. Mild mitral and tricuspid regurgitation were present, and the pulmonary arterial systolic pressure was estimated to be 35-40 mmHg. Thus, the patient has a cardiomyopathy, possibly due to untreated hypertension and/or alcohol. His atrial flutter with a rapid ventricular response could be either a cause or the result of his cardiomyopathy.

Transesophageal echocardiography showed no left atrial clot, and he was cardioverted with an external biphasic direct-current shock. For anticoagulation he is receiving aspirin rather than warfarin sodium because of the alcohol problem.

REFERENCES

1. Ashman R, Hull E. *Essentials of Electrocardiography*, 2nd edition. New York: Macmillan; 1941.
2. Pick A, Langendorf R. *Interpretation of Complex Arrhythmias*. Philadelphia: Lea & Febiger; 1979:391-409.
3. Schamroth L. *The Disorders of Cardiac Rhythm*. London: Blackwell Scientific Publications; 1971:51-52, 476-477.
4. Castellanos A, Diaz J, Interian A Jr, et al. Wenckebach's period or alternating Wenckebach's periods during 4:1 atrioventricular block? *J Electrocardiol* 2005; 38:157-159.

This **ECG of the Month** is presented by the Sections of Cardiology, Departments of Medicine, Louisiana State University School of Medicine in New Orleans, and the Medical Center of Louisiana in New Orleans. **Dr. Glancy** is a professor and **Dr. Jones** is a fellow in the Section of Cardiology, Department of Medicine, Louisiana State University Health Sciences Center, New Orleans.

CME Information

Target Audience

The September/October ECG of the Month is intended for cardiac electrophysiologists, general cardiologists, critical care physicians, general internists, and emergency room physicians.

Educational Objectives

After reading this article, the healthcare provider should be able to recognize atrial flutter on the electrocardiogram and appreciate the fact that some of its patterns of atrioventricular conduction may be explained by block at more than one atrioventricular level. Estimated time to complete this activity is one-half (.5) hour.

Credit

The LSMS Educational and Research Foundation designates this educational activity for a maximum of one -half (.5) *AMA PRA Category 1 Credit™*. Physicians should only claim credit commensurate with the extent of their participation in the activity.

Disclosure

Dr. Glancy discloses that he is editor of this journal.
Dr. Jones has nothing to disclose.

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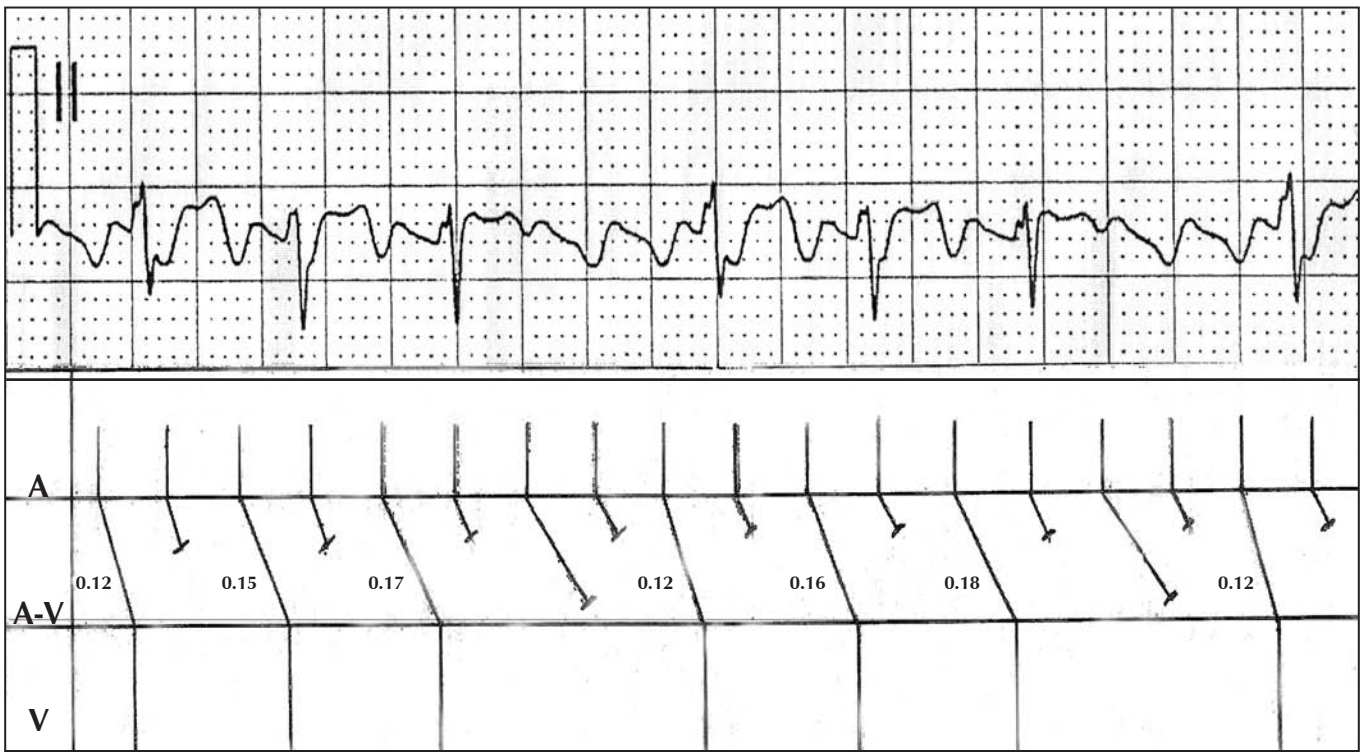

Figure 2. The magnified first portion of the lead II rhythm strip from Figure 1 with a ladder diagram to show how two levels of atrioventricular block, with 2:1 block above and 4:3 Type I block (Wenckebach) below, explain the pattern of conduction. The numbers indicate the time in seconds from the nadir of the flutter waves to the beginning of the corresponding QRS complexes and show progressive lengthening before the non-conducted flutter waves. A, atria; A-V, atrioventriular junction; V, ventricles.

CME QUESTIONS

Read the preceding CME article and complete the registration, evaluation, and answer form on page 285 to earn CME credit. Mail or fax the registration, evaluation, and answer form to the LSMS Educational and Research Foundation. Answers must be postmarked or faxed prior to September 30, 2008. Participants must attain a minimum score of 75% to receive credit. LSMS members may also go online at http://www.lsms.org. Click on the *Journal* logo and then click on the *Journal* CME link. Complete the interactive answer sheet for each CME article.

Choose the one answer that is most correct for each question.

1. True or False:
   Typical counterclockwise atrial flutter has positive P waves (ie, flutter waves) in lead V_1 and negative flutter waves in the inferior leads.

2. True or False:
   Conduction of flutter waves to the ventricles is usually in odd ratios (1:1, 3:1, 5:1, etc).

3. Which of the following conditions is not a well recognized cause of cardiomyopathy?
   a. Untreated high blood pressure of long standing.
   b. Excessive alcohol consumption.
   c. Arrhythmias with persistently rapid ventricular rates.
   d. Psoriasis.

4. True or False:
   In patients with atrial flutter and apparent atrioventricular block at 2 levels, type 1 block (Wenckebach) usually occurs at the upper level.