First recognized episode of atrioventricular reciprocating tachycardia 10 hours after coronary artery bypass grafting in a 42-year-old man

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Figure 1. Electrocardiogram recorded 10 hours after coronary artery bypass graft operation shows a ventricular rate of 208 beats/min, a wide (0.12 sec) QRS complex with a left bundle branch block pattern, and negative retrograde P waves in leads II, III, and aVF with an R-P interval (0.13 sec) less than the P-R interval (0.16 sec). This is orthodromic atrioventricular reciprocating tachycardia utilizing a posteroseptal accessory pathway and demonstrating rate-related left bundle branch block. See text for further explication.

A 42-year-old man with diabetes mellitus, systemic arterial hypertension, dyslipidemia, a history of cigarette smoking, and a myocardial infarct 10 years earlier had no history of arrhythmia. He underwent coronary arteriography because of exertional dyspnea. The left anterior descending coronary artery was 75% narrowed in its proximal portion. The left circumflex artery was totally occluded proximally, and the right was 90% narrowed in its mid-portion. The ejection fraction on left ventriculography was 40%. Four weeks later when the patient returned for operation, his left ventricular ejection fraction was normal (>55%) by echocardiogram. The left anterior descending artery was bypassed with the left internal mammary artery, and the right, with a reversed saphenous vein.

Some 10 hours postoperatively, the patient developed a regular wide-QRS tachycardia at a rate of 208 beats/min (*Figure 1*). With intravenous amiodarone, sinus rhythm returned. Because of ST-segment shifts suggesting inferoposterior injury on the first postoperative electrocardiogram 8 hours earlier, the initial diagnosis was ventricular tachycardia, and this seemed to be supported by a higher than usual postoperative rise in troponin I with a peak of 11.84 ng/mL (reference, <0.09) the morning after

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Figure 2. Electrocardiogram recorded 6 days after operation shows a rate of 122 beats/min, a narrow (0.08 sec) QRS complex, and negative retrograde P waves in leads II, III, and aVF, with a R-P interval (0.09 sec) less than the P-R interval (0.40 sec). This is orthodromic atrioventricular reciprocating tachycardia utilizing a posteroseptal accessory pathway. Because the rate is slower than in Figure 1, the rate-related left bundle branch block is no longer seen. See text for further explication.

Figure 3. Electrophysiologic study. The premature ventricular complex affects the timing of the SVT, which allows the left bundle to conduct. Shortening of the VA interval as seen here and on the 12-lead electrocardiogram confirms a diagnosis of atrioventricular reciprocating tachycardia using a left-sided accessory pathway.

operation. However, a perfect left bundle branch block pattern, as seen here, with a sharp, clean downstroke of the S wave to its nadir less than 0.07 seconds from the onset of the QRS is typical of aberrant ventricular conduction of a supraventricular complex and distinctly unlike ventricular ectopy (1).

Aside from a brief episode of atrial fibrillation immediately after cessation of the regular wide-QRS tachycardia, the postoperative course was smooth, and the patient went home on the

fourth postoperative day. Two days later, however, he had five further episodes of an identical wide-QRS tachycardia with rates of approximately 190 beats/min, and each of these responded with a return to sinus rhythm after intravenous adenosine. After the administration of amiodarone, the runs of tachycardia were briefer, the rate was slower, and rate-related left bundle branch block was seen less frequently (*Figure 2*). An echocardiogram showed mild left ventricular dilatation with a normal ejection fraction.

Both with rate-related left bundle branch block and without aberrant conduction, the electrocardiograms indicate orthodromic atrioventricular reciprocating tachycardia utilizing a bypass tract. The R-P interval is less than the P-R interval but is long enough that the P wave is distinctly separated from the preceding QRS, unlike the superimposition that occurs with atrioventricular nodal reentrant tachycardia (2). Also, aberrant ventricular conduction is more common with atrioventricular reciprocating tachycardia than with atrioventricular nodal reentrant tachycardia (3). Furthermore, the inverted P waves in leads II, III, and aVF are typical of a posteroseptal pathway (*Figures 1 and 2*) (4). Also typical of a left-sided accessory pathway is the longer R-P interval, 0.13 seconds, when left bundle branch block is present than when intraventricular conduction is normal, 0.09 seconds (*Figures 1–3*) (5). Ventricular preexcitation with a short P-R interval and a wide QRS complex with a delta wave was never seen during sinus rhythm or tachycardia in this patient. Thus, the accessory pathway only conducts retrogradely, i.e., from the ventricles to the atria, and is termed a concealed pathway (6).

An electrophysiologic study revealed a posteroseptal accessory pathway, and this was ablated.

There undoubtedly have been hundreds, if not thousands, of patients with accessory pathways who have undergone coronary artery bypass graft operations. We are unaware, however, of any whose first recognized arrhythmia utilizing the accessory pathway was in the first few postoperative hours.

1. Kindwall KE, Brown J, Josephson ME. Electrocardiographic criteria for ventricular tachycardia in wide complex left bundle branch block morphology tachycardias. *Am J Cardiol* 1988;61(15):1279–1283.

2. González-Torrecilla E, Almendral J, Arenal A, Atienza F, Atea LF, del Castillo S, Fernández-Avilés F. Combined evaluation of bedside clinical variables and the electrocardiogram for the differential diagnosis of paroxysmal atrioventricular reciprocating tachycardias in patients without pre-excitation. *J Am Coll Cardiol* 2009;53(25):2353–2358.

3. Wellens HJJ, Conover MB. *The ECG in Emergency Decision Making*. Philadelphia: W.B. Saunders Company, 1992:93.

4. Wellens HJJ, Conover MB: 83.

5. Kerr CR, Gallagher JJ, German LD. Changes in ventriculoatrial intervals with bundle branch block aberration during reciprocating tachycardia in patients with accessory atrioventricular pathways. *Circulation* 1982;66(1):196–201.

6. Wellens HJJ, Conover MB: 81.