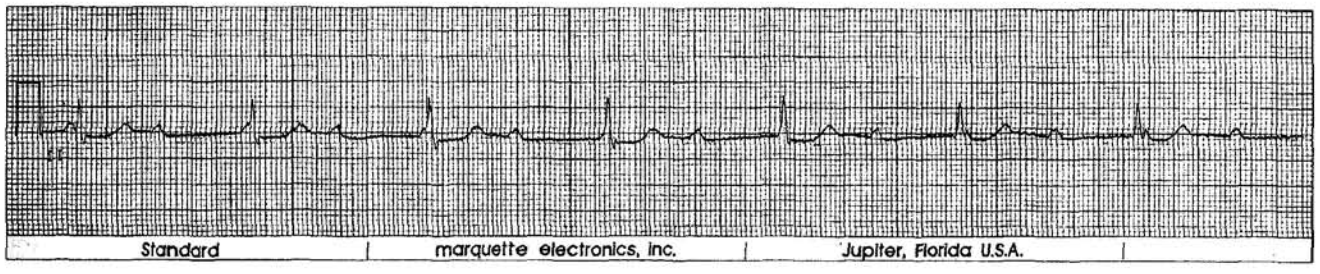
A Man With Dizziness

Clinical History:

This 76-year-old gentleman had all along independent activities of daily living. He presented with dizziness in recent three months and the following ECG was obtained (**Figure 1**).

Figure 1



What was the diagnosis?

A. Sinus bradycardia

B. First degree heart block

C. Wenckebach phenomenon

D. Second degree type II block

E. Complete heart block

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Answer : E. Complete heart block

Sinus bradycardia is sinus rhythm with heart rate less than 60/minute. First degree atrioventricular (A-V) block is defined as a prolongation of A-V conduction time (P-R interval) to greater than 200 ms. In Wenckebach phenomenon (second degree type I block), the P-R interval may begin with normal limits but is usually somewhat prolonged; then with each successive beat, the P-R interval gradually lengthens until finally an impulse fails to reach the ventricles and a beat is dropped, and the sequence is repeated.[1] In second degree type II block, some appropriately timed P waves fail to conduct to the ventricles. For those conducted beats, the P-R intervals are constant. In third degree heart block (complete heart block), the atrial and ventricular rates are regular but dissociated. The P waves fail to conduct to the ventricles.

In **Figure 1**, the atrial rate is regular and around 83/minute. The ventricular rate is also regular, about 43/minute. The P-R intervals are not constant, and there is dissociation between the atrium and ventricle. Therefore, the diagnosis should be complete heart block, with a narrow QRS complex suggesting an escape rhythm from high up in the A-V junction.

Question 2: Figure 2 was the ECG of the same patient after an invasive cardiological procedure. What was the procedure?

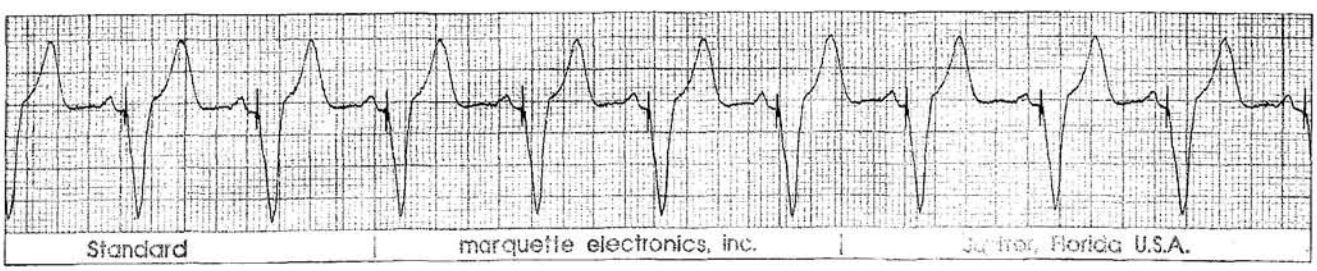
A. Cardiac catheterization
B. Radiofrequency ablation
C. Percutaneous transluminal coronary angioplasty
D. Permanent cardiac pacing
E. Pericardiocentesis

Answer: D. Permanent cardiac pacing

The management of this patient should begin with a search of a reversible cause of heart block. Medications such as β-blocker and calcium channel blocker, commonly used for hypertension, may lead to heart block, particularly one with an escape rhythm with normal QRS complexes. It is also important to exclude the use of alpha-methyldopa, a still commonly used antihypertensive agent that is associated with A-V block. Clinical and biochemical features of hypothyroidism should be excluded. With a history of dizziness for 3 months, acute myocardial infarction is unlikely, but it is worth performing a 12 lead ECG to rule out infarct. Idiopathic or degenerative A-V block is the diagnosis in this gentleman.

There is no medication which is reliable to maintain an adequate heart rate. Therefore, a permanent pacemaker was implanted. **Figure 2** shows the post-pacing ECG. A pacing spike is seen before each QRS complex implying the ventricular contractions are paced and in this case, by a dual chamber permanent pacemaker. Besides the right ventricular pacing lead, an atrial lead was also inserted into the right atrial appendage. The atrial lead can sense intrinsic atrial activities, and after the programmed A-V delay, ventricular contraction will be initiated by the ventricular pacing lead. Dual chamber cardiac pacing maintains A-V synchrony, and improves cardiac haemodynamics compared with just ventricular pacing. Retrospective studies also suggest that maintenance of A-V synchrony also decreases the morbidity and mortality of patients with sick sinus syndrome.[2]

Figure 2



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Another feature of permanent cardiac pacing is rate adaptive capability, that is, the pacing rate can be automatically adjusted by an implantable sensor when patients exercise. It should be noted that, although A-V synchrony enhances the cardiac output by augmenting the stroke volume by 20-30% during exercises, this increase is relatively small compared with the three- to four-fold increase achieved by an increase in rate. Therefore, the ability to increase rate, especially at higher levels of exertion, is the most important determinant of cardiac output and exercise capacity, and this may be even more important in patients with impaired left ventricular function.[3] This rate adaptive function is now available as an added function to dual chamber pacemaker (dual chamber rate responsive pacemaker)

Patients with permanent pacemaker should not undergo magnetic resonance imaging examination as the strong electromagnetic field will interfere with the pacemaker function. If they use mobile phones, it is recommended that the phones be better placed on the opposite side of the permanent pacemakers. ■

References

1. Marriott HJL. Atrioventricular block: conventional approach. In: *Practical Electrocardiography*. Williams and Wilkins, Maryland 1988; pp362-379.
2. Hayes DL, Holmes DR. Jr. Haemodynamics of cardiac pacing. In: Furman S, Hayes DL. Holmes DR. Jr, editors. *A Practice of Cardiac Pacing*. Futura, New York 1993;pp195-218.
3. Lau CP. Haemodynamic basis of rate adaptive pacing: rate modulation versus AV synchrony. In: *Rate Adaptive Cardiac Pacing*. Futura, New York 1993;pp31-49.