

# Electrocardiographic diagnosis of acute myocardial infarction in patients with implanted pacemakers

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*The electrocardiographic diagnosis of myocardial infarction in patients with various implanted pacemakers is discussed. Primarily the diagnosis depends upon the configuration of spontaneously conducted beats. If there is no spontaneous activity, the electrocardiographic diagnosis is either missed or a method of shorting out the pacemaker must be employed.*

*A case report demonstrates the use of the magnet test on a patient with a fresh myocardial infarction and an implanted ventricular triggered pacemaker.*

The electrocardiographic confirmation of acute myocardial infarction is difficult in patients with implanted pacemakers if the pacemaker stimulus distorts the QRS complex.

In patients with asynchronous or ventricular inhibited pacemakers spontaneously conducted beats are undistorted. Such beats therefore may show the appropriate infarction pattern.

Ventricular triggered pacemakers distort every beat except those conducted during the refractory period of the pacemaker. Nevertheless, beats distorted by the pacemaker stimulus may show an infarction pattern, as demonstrated in this case report. Spontaneously conducted beats with undistorted QRS complexes may be obtained by converting the ventricular synchronous pacing to asynchronous pacing. Ventricular triggered pacemakers have a magnetic switch which can be closed by placing a magnet on the skin overlying the pacemaker. The amplifier function is shorted out and the pacemaker reverts to fixed rate pacing (Fig. 1 (3b) and Fig. 2).

Center, Berger, and Tarjan (1971) have suggested a method of shorting out implanted unipolar pacemakers. Two hypodermic needles are placed in contact with the pacemaker; one with the ground plate and the other with the set screw of the connector. A jump wire is connected to the needles. The current is shunted away from the electrode and the pacemaker stimuli disappear. The technique is simple, but has the potential hazard of destroying the boot or lead sleeve. We, therefore, prefer initially to search for spontaneously conducted beats.

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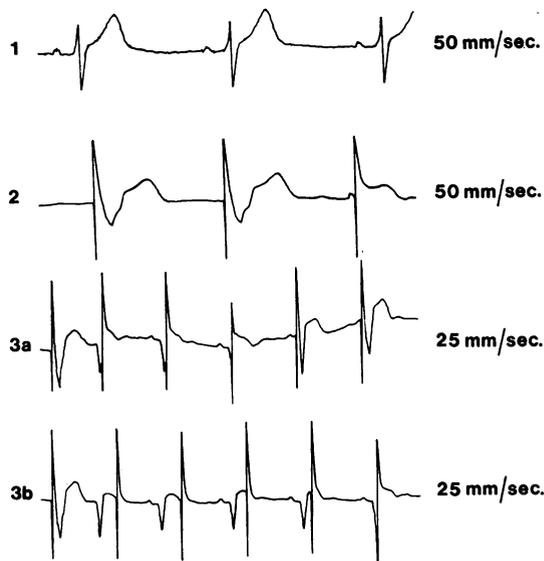
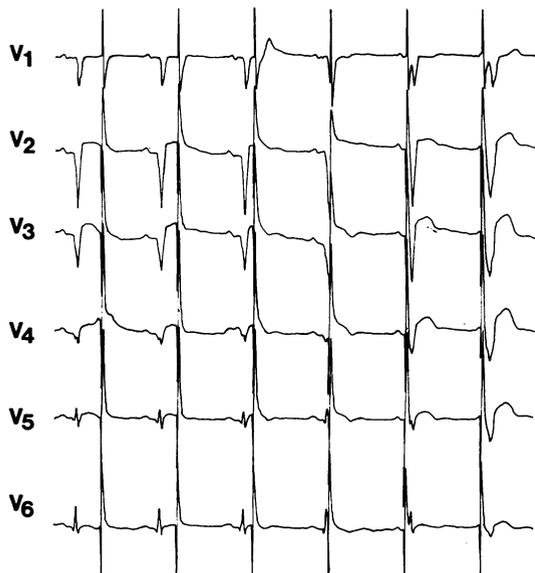


FIG. 1 (1) After first infarction, before implantation of pacemaker; (2) after implantation of pacemaker; (3a) after second infarction; (3b) after second infarction using the magnet (all recordings from lead V<sub>2</sub>).

## Case report

A 52-year-old man had a diaphragmatic myocardial infarct in September 1970. He developed intermittent sinoatrial block and atrial fibrillation. In August 1971 he experienced one episode of syncope and a ventricular triggered pacemaker<sup>1</sup> was implanted. In October 1971 he had a second myocardial infarct. The electrocardio-

<sup>1</sup> Type of unit.



25 mm/sec.

FIG. 2 After second infarction using the magnet (leads V1-V6).

gram showed QRS complexes indicating fresh antero-septal infarction. This is evident in both the distorted pacemaker complexes (Fig. 1 (3a), second, third, and

fourth beat) and more clearly in the undistorted complexes obtained by the magnet (Fig. 1 (3b) and Fig. 2).

### Discussion

By making a thorough search for spontaneously conducted beats it is often possible to make an electrocardiographic diagnosis of a fresh myocardial infarct in patients with implanted pacemakers. This is facilitated by the use in an intensive care unit of continuous electrocardiographic monitoring.

In patients with ventricular triggered pacemakers the magnet test can isolate the spontaneously conducted beats from the pacemaker stimulus and thus facilitate the diagnosis.

This implies the same hazard as in fixed rate pacemakers if the pacemaker stimulus hits the heart in the vulnerable phase. The danger of producing serious arrhythmias should be minimal because the magnet can be withdrawn immediately causing the pacemaker to revert to ventricular triggered pacing again. Facilities for resuscitation including defibrillation should be available. If no spontaneous activity is detected, the technique suggested by Center *et al.* (1971) may be used.

### Reference

Center, S., Berger, R. A., and Tarjan, P. (1971). The diagnosis of acute myocardial infarction in patients with permanent pacemakers. *Archives of Internal Medicine*, 127, 932.

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