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Pacemaker Inhibition During Cardioplegia in Open Heart Surgery

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ABSTRACT

A 53-year-old patient underwent mitral valve replacement after implantation of permanent pacemaker. During cardioplegia in open heart surgery, we performed the inhibition of permanent pacemaker to obtain complete myocardial preservation and quiet heart, using stimulations of an external pulse generator.

This procedure is considered available, when the patient who has had a permanent pacemaker undergoes open heart surgery more safely.

With the advent of advances in technology, the pacemakers are frequently employed to treat patients who has bradyarrythmias associated with various kinds of heart diseases, including valvular diseases and congenital heart diseases[6-8]. And, as the population of the patients with a permanent pacemaker increases, the opportunities that we have of performing cardiac surgical procedures for such patients might be increasing in near future. And another causative factor of it is that cold cardioplegia technique are currently developed to attain cardiac arrest and myocardial preservation much more safely in open heart surgery than before.

We report here a case using chest wall stimulation to inhibit cardiac pacemaker activity in the patient with permanent pacemaker who underwent cardiac surgery.

CASE REPORT

A 53-year-old man was admitted to our hospital, presenting with dizziness, fatigue, palpitation and exertional dyspnea. Chest X-ray film revealed enlarged heart and pulmonary congestion. Atrial fibrillation with bradycardia was diagnosed on electrocardiogram and a temporary pacemaker was inserted immediately. For a time after implantation, a striking subjective improvement took place, and, therefore, the patient received implantation of permanent pacemaker (Cook 325T unipolar). However, a month later the symptoms reappeared. Echocardiograms

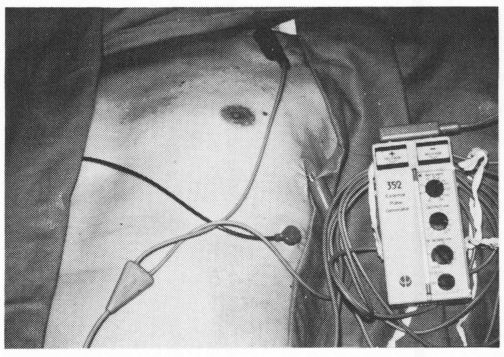

Fig. 1. This shows the way an external pulse generator inhibits the permanent pacemaker. Two electrodes were placed cutaneously on the permanent generator and the nearby site.

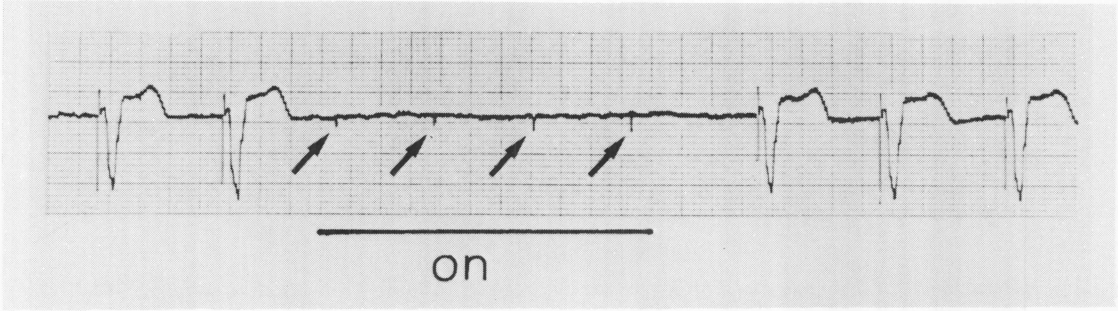

Fig. 2. The demand activity of permanent pacemaker works when the stimuli from external pulse generator (black arrows) are on at 10mA with rate 80/min.

demonstrated a curved anterior mitral leaflet that extended beyond the plane of the mitral annulus, and also cardiac angiography and catheterization showed moderate amount of mitral regurgitation. On the basis of these data obtained, the symptoms of this patient might be attributed to mitral regurgitation due to mitral valve prolapse and this case was considered to be taken as the indication for surgery.

Surgery was performed on routine cardiopulmonary bypass, lasting 80 min in combination with using cold cardioplegia. Two pacemaker leads were placed cutaneously on the permanent generator and left anterior chest wall, and thereafter they were connected to an external pulse generator (Pacesetter, Pulse Generator 352, Fig. 1). When output was set at 10mA with rate 80/min, the inhibition of permanent demand activity resulted (Fig. 2). Under such suitable conditions, this patient underwent mitral valve replacement on quiet heart without any trouble.

DISCUSSION

Cardioplegic arrest has become a popularly employed technique for accomplishing myocardial preservation during ischemic arrest in clinical perfusion[5]. In case of patients implanted with permanent pacemaker, it is supposed that electrical and mechanical activity of pacemaker may increase the possibilities for myocardial injury during cardioplegic arrest.

It has been frequently reported that permanent pacemaker function can be reversibly inhibited by electrical stimulation of the chest wall[1,2,9,10]. In other words, cutaneous electrical stimuli, those are not strong enough to influence the heart, work as electrical signals to an implanted demand pacemaker, which interpret them as originals from the heart. Then, according to Hakki's method[3], we performed the pacemaker suppression by an external electrical source under surgical procedure to have an adequate coldplegia for successful myocardial preservation. On the other hand, Tyers stated[1] that when he used an adequate coldplegia, he had not found continued cardiac activity to be a problem despite the preexistence of a cardiac pacemaker in 16 patients. But we, as Hakki also stated[3,4], performed this method not only for obtaining quiet heart, but for keeping successful myocardial preservation, eliminating a source of stimulant that may be active from the cooling to warming. This procedure is considered to be available when the patient who has already had a permanent pacemaker undergoes open heart surgery more safely.

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