CASE REPORT

Cardiac arrest from the use of diathermy during total hip arthroplasty in a patient with an external pacemaker

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We report a case of cardiac arrest in an 84-year-old man during total hip replacement. This was caused by the use of cutting diathermy in association with a temporary external cardiac pacemaker. He was successfully cardioverted with a single DC shock.

Although interference with pacemaker function in this manner has been previously recognised, we wish to alert others to the hazards of using diathermy in such patients and highlight simple measures which can be used to prevent this complication.

Case report

An 84-year-old man with severe osteoarthritis of his right hip was admitted to hospital in preparation for hip arthroplasty. Surgery had been postponed on two previous occasions because of heart dysrhythmia and renal impairment. On admission, an electrocardiogram demonstrated first degree heart block with left bundle branch block, so temporary external cardiac pacing was advised. A pacing wire was introduced via the right subclavian route and was connected to a Devices E4164® external pulse generator (APC Medical, Welwyn Garden City).

The following day he underwent total hip arthroplasty with the pacemaker set on demand pacing before induction of anaesthesia. The diathermy plate was placed on the contralateral thigh, thus ensuring an adequate distance between diathermy plate and pacing lead. A standard Liverpool approach was used with the patient in the left lateral position. Coagulation diathermy used on superficial bleeding points produced no pacemaker disturbance, but when cutting diathermy was used to separate the abductors the patient developed ventricular fibrillation. He was repositioned on his back and successfully cardioverted with a single 200 J DC shock. The hip replacement was completed without use of diathermy and without further complications. The patient was monitored on the intensive care unit overnight, and the pacing wire removed the next day.

He made a satisfactory recovery and was discharged 2 weeks later, but was readmitted 4 weeks after operation with a pulmonary embolus for which he was successfully anticoagulated.

Discussion

In 1961 it was reported that ventricular fibrillation could be caused by 'microshock', in some instances implicating pacing leads in deaths from this dysrhythmia (1).

Surgical diathermy has been known to interfere with the operation of external pacemakers (1–3,5). This is caused by artefactual signals from diathermy interfering with non-competitive (demand) pacemakers. The diathermy signal may block the inhibition amplifier causing the pacemaker to stimulate when not required, thus risking ventricular fibrillation (2).

However, fixed-rate pacemakers are seldom affected by interference but can be influenced by high-frequency currents such as cutting diathermy (3,5). If the fields are strong the pulse generator can either be forced into a runaway condition or to a complete stop. When the field is removed the pulse generator resumes normal operation (3).

The source of the microshock currents in association with intracardiac leads have been investigated by others (1) and the results form the basis of current safety codes set out by the International Electrotechnical Commission (standard IEC 60122 1991) (4).

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We present this case to caution the belief that fixed-rate pacemakers are relatively safe when diathermy is used. The addition of a simple two-stage LC filter to the front end of a Devices E4164 pacemaker has enabled diathermy to be used in complete safety (6). We propose that every surgical unit which carries out any surgical procedures on patients with external pacemakers should have available a pacemaker unit which has been modified in this way.

Electrosurgical accidents, though rare, are always possible and the majority of them can be prevented by careful technique and the availability of a pacemaker fitted with a filter.

We wish to thank Dr J J Nightingale for his expedient resuscitation of this patient who without him would not have survived.

References


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