

CASE REPORT

A migrating pacemaker

C P Gale, G P Mulley

Postgrad Med J 2005;81:198–199. doi: 10.1136/pgmj.2004.022178

A deceased 79 year old man with a permanent cardiac pacemaker was due to be cremated, but the pacemaker generator was not detectable by palpation. A hand held metal detector to locate the device so that it could be extracted before cremation.

About half of all crematoriums in the UK have experienced pacemaker explosions. These may cause structural damage and injury.¹ In an attempt to prevent pacemaker explosions in UK crematoriums, statutory questions on the cremation form ask the attending physician if the deceased had an artificial cardiac pacemaker and if so, whether it has been removed.²

Despite these questions, some pacemakers are not removed before cremation. There are several possible explanations for this. Firstly, the doctor signing the form may mistakenly report that there is no pacemaker in the body. Secondly, cremation forms may not be completed adequately (in one survey, nearly 50% of forms presented to a crematorium were completed insufficiently for the staff to proceed without further inquiry,³ in another study, 6% of cremation forms had incorrect or incomplete details of pacemaker or radioactive implants, with over 25% of forms being unsatisfactorily completed⁴). Thirdly, the coroner's form E does not contain the questions about pacemakers. With the coroner's certificate now accounting for up to a third of disposals,⁵ it may be that omission of the statutory questions result in some pacemakers remaining in situ. Fourthly, it is possible that only one pacemaker is removed from a body that contains two or more devices, although this is unusual.

CASE REPORT

Another reason for non-removal of a pacemaker became apparent when a body of a man in our hospital mortuary was being prepared for cremation. The 79 year old man had died of a type II respiratory failure. The medical notes stated that the body contained a VVI cardiac pacemaker, inserted in 2003 for symptomatic bradycardia. Despite a thorough external examination of the body, we failed to identify the characteristic mass of the pacemaker box. The medical notes were re-examined and a recent electrocardiogram showed an intermittent left bundle branch block pattern following ventricular pacing spikes.

We used a commercially available MD-3003 hand held metal detector (J W Electronics, Dolgellau)—similar to those used at airports⁶ to scan the thorax of the body—which was placed on a non-metallic surface (fig 1). We ensured that the detector was kept close to the skin to minimise the chance of a false negative result. It produced a signal over the left sixth intercostal space in the mid-axillary line. On superficial dissection, we found the pacemaker box in this site. The migrated box was removed uneventfully, the cremation form completed, and the body released for cremation.

DISCUSSION

Pacemakers may migrate in the subcutaneous tissue, making detection by palpation difficult. This may explain why some pacemakers remain in bodies that are cremated. Pacemakers may also be placed in the epigastric region at the time of cardiac surgery and will not be immediately apparent. It is important that doctors are aware of the implantation sites of pacemakers (fig 2) as well as their potential to migrate through the subcutaneous tissue. Pacemakers are the commonest active implantable medical device in the UK (over 17 000 pacemakers are implanted annually, giving a pacemaker prevalence of 250 000). Elderly patients now represent an increasing proportion of the paced population,⁷ so the prevalence of pacemakers in those who have died will increase. Doctors who sign cremation forms must provide accurate information because pacemaker explosions are potentially distressing and costly for the crematorium owner (and may lead to legal proceedings against funeral directors, physicians, and health authorities). This is important because at present, mortuary staff in the UK do not routinely use hand held metal detectors, and inconsistencies in the documentation have been noted.^{3 4}

The MD-3003 is a hand held metal detector, powered by a 9 volt battery and is designed for use in the security industry. It signals the presence of metal by means of a red and green light emitting diode and speaker that emits a high pitched tone. Hand held metal detectors are able to identify many types of metallic objects but are less dependable for objects that are as small as a needle.^{8 9} The device is easy to use, safe, and requires minimal training. We have found that false positive results are commonly generated when the body is placed on a standard metallic mortuary trolley, although our preliminary findings suggest that using metal detectors has a good negative predictive value.



Figure 1 The MD3003 hand held metal detector. The device is swept over the body after it has been placed on a non-metallic surface.

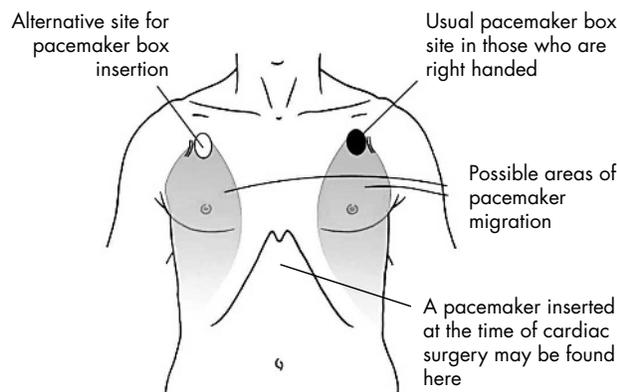


Figure 2 Pacemaker pockets. The pacemaker pocket is usually fashioned over the pectoralis muscle in the left deltopectoral groove. The pacemaker box, however, may migrate or be inserted in the right side of the thorax or epigastric area.

The use of the hand held metal detector to locate metallic objects in humans is already established. They have been used to find metallic objects in wounds,¹⁰⁻¹¹ to detect bullets after death,¹² and to disclose concealed weapons at airports and hospitals.¹³ They have been used to detect orthopaedic implants⁶ and to screen for ingested metallic foreign bodies.¹⁴ The use of hand held metal detectors to screen bodies for pacemakers before cremation may not be new. We understand they are used in some crematoriums in the USA to detect the presence of pacemakers, although there are no published reports. We suggest that the hand held metallic detector may be used to locate pacemakers that would otherwise be difficult to recover.

CONCLUSION

Some bodies contain multiple generators either for pacemakers or other implantable devices and some devices may migrate. The use of a commercially available hand held metal detector swept over the thorax of the deceased by mortuary staff and funeral directors may improve the detection of pacemakers and other implantable devices and could help prevent explosions in crematoriums.

AUTHORS' CONTRIBUTIONS

Dr C P Gale was responsible for the detection of the implanted pacemaker using a hand held metal detector and writing the article. Professor G P Mulley was responsible for reviewing the article before submission and overseeing the work.

Authors' affiliations

C P Gale, Department of Cardiology, Pontefract General Infirmary, Pontefract, UK

G P Mulley, Department of Medicine for the Elderly, St James's University Hospital, Leeds, UK

Funding: none.

Correspondence to: Dr C P Gale, Department of Cardiology, Pontefract General Infirmary, Friarwood Lane, Pontefract WF8 1PL, UK; medcpg@leeds.ac.uk

Submitted 18 March 2004

Accepted 28 May 2004

REFERENCES

- Gale CP, Mulley GP. Pacemaker explosions in crematoria: problems and possible solutions. *J R Soc Med* 2002;**95**:353-5.
- Statutory Rules and Orders. Cremation regulation, 1930 as amended by Cremation Regulation, 1979. No 1016 as amended by SI 1979 no 1138.
- Horner JS, Horner JW. Do doctors read forms? *J R Soc Med* 1998;**91**:98-106.
- Hawley C. Crisis in cremation. *BMJ* 1999;**318**:811.
- Horner S. Crisis in cremation. *BMJ* 1998;**317**:485-6.
- Kaminen S, Legge S, Ware H. Metallic orthopaedic implants and airport metal detectors. *J Arthroplasty* 2002;**17**:62-5.
- Aggrawal RK, Ray SG, Connelly DT, et al. Trends in pacemaker mode prescription 1984-1994: a single centre study of 3710 patients. *Heart* 1996;**75**:518-21.
- Sacchetti A, Carraccio C, Lichenstein R. Hand-held metal detector identification of ingested foreign bodies. *Pediatr Emerg Care* 1994;**10**:204-7.
- Evans S, Ferris BD. Airport metal detectors and orthopedic implants. The responses of arch and hand-held devices. *Acta Orthop Scand* 1993;**64**:643-4.
- Gooden EA, Forte V, Papsin B. Use of a commercially available metal detector for the localisation of metallic foreign body ingestion in children. *J Otolaryngol* 2000;**29**:218-20.
- Cakir B, Akan M, Yildirim S, et al. Localization and removal of ferromagnetic foreign bodies by magnet. *Ann Plast Surg* 2002;**49**:541-4.
- Turletti M, Tappero P. Use of a metal detector in the search for bullets during autopsy. *Panminerva Med* 1993;**35**:237-9.
- Simon HK, Khan NS, Delgado CA. Weapons detection at two urban hospitals. *Pediatr Emerg Care* 2003;**19**:248-51.
- Seikel K, Primm PA, Elizondo BJ, et al. Handheld metal detector localization of ingested metallic foreign bodies: accurate in any hands? *Arch Pediatr Adolesc Med* 1999;**153**:853-7.