CASE REPORT

An unusual intracardiac electrogram showing cause for false electrical discharge from an ICD

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SUMMARY

We describe a rare case of inappropriate implantable cardioverter defibrillator (ICD) therapy due to false sensing of electromechanical interference from diathermy as 'ventricular fibrillation (VF)'. This occurred during surgical removal of sternal wires under general anaesthesia. Postsurgical interrogation of ICD revealed the intracardiac electrogram showing the mechanical interference sensed as 'VF' by ICD and subsequent shock delivery.

BACKGROUND

This case highlights the importance of care of implantable cardioverter defibrillator (ICD) patients before and after surgery. It emphasises the easy steps to deactivate an ICD before emergency or elective operations where diathermy usage is intended. It is also important to recognise the pattern in postsurgical care of ICD patients so that they are not subjected to unnecessary medications or investigations. It is a teaching and learning intracardiac electrogram.

CASE PRESENTATION

We describe a 78-year-old Caucasian man with a dual chamber ICD who had an inappropriate shock therapy triggered by diathermy (figure 1) usage during surgical removal of sternal wires, under general anaesthesia. The ICD was implanted following a myocardial infarction and scar-related ventricular tachycardia (VT) 3 years before. Unexpected inappropriate shocks in themselves can cause various problems and complications in relation to surgery itself and anaesthesia apart from being a hazard to medical personnel and medical equipment around the patient.¹ Though inappropriate shock therapy due to diathermy usage is a well-known theoretical risk, it is rare and has not been reported in medical literature before.

A 78-year-old Caucasian man had an inappropriate shock during surgery to remove sternal wires. This was not recognised during the operation and it was perceived as inadequate anaesthesia making patient jerk to the diathermy. Hence more medications were administered to sedate the patient further. On postsurgical ICD interrogation we found mechanical interference from diathermy sensed as ventricular fibrillation (VF) by the ICD resulting in shock. There is a risk of electromagnetic interference in ICD patients from emergency radio handsets, various electronic article surveillance security systems and diathermy electrodes, though such problems are rarely seen in real-life practice.² VT/VF detection is possible in ICD

patients with diathermy usage due to false sensing of electrical interference and can result in inappropriate shock.² To prevent this it is a standard practice before elective surgery to programme an ICD to 'monitor only' mode.³ Prior to emergency or elective surgery with intended diathermy usage, a magnet can be placed over the ICD box. This very simple manoeuvre results in deactivation of arrhythmia detection and hence defibrillation functions of the ICD. In this situation it is imperative to attach remote pads to an external defibrillator for the purpose of manual shock therapy in case the patient suffers VT or VF.⁴ Other general precautions are to keep the diathermy cables away from the ICD site.⁴ It is advisable to have ICDs interrogated following procedures using diathermy in order to ensure whether the correct parameters are maintained.²

Inappropriate cardioverter defibrillator discharge continues to be a major problem in clinical practice.⁵ As more ICDs are being implanted, health-care professionals in general and anaesthetists in particular, involved with patients undergoing emergency as well as elective surgery should be aware of the perioperative measures to prevent inappropriate shocks. Also cardiologists and cardiac physiologists must be aware of the unusual intracardiac electrograms and be able to identify the clinical problem with ICD for proper adjustments in ICD settings.

For any patient with a bradycardia pacemaker, possible effects of electromagnetic interference can be loss of atrioventricular synchrony resulting in haemodynamic compromise of the patient especially in patients with impaired left ventricular function and inappropriate inhibition of bradycardia pacemakers resulting in either asystole or very slow underlying complex bradycardia with serious effects.⁶ Other theoretical risks are rapid pacing induced by radiofrequency signal and overheating of pacing lead tip.⁶

INVESTIGATIONS

- ▶ Routine postoperative interrogation of ICD by a cardiac electrophysiologist.
- ▶ Sometimes chest X-ray can demonstrate lead displacement or lead damage or fracture.

DIFFERENTIAL DIAGNOSIS

Ventricular fibrillation due to other causes.

TREATMENT

Care is needed to deactivate ICDs of their function of giving a shock, before intended diathermy usage in elective or emergency operations.

To cite: Mohammed I, Ratib K, Creamer J. *BMJ Case Rep* Published online: [please include Day Month Year] doi:10.1136/bcr-2013-010202

Figure 1 Intracardiac electrogram showing artefact due to radiofrequency noise from diathermy (between horizontal arrows) incorrectly detected as ventricular fibrillation and subsequent delivery of 36 J shock (vertical arrow).

OUTCOME AND FOLLOW-UP

Lifelong follow-up in ICD monitoring clinic.

DISCUSSION

ICD shock secondary to false sensing of mechanical interference from electrocautery is a described and recognised association in standard textbooks and literature but this type of complication has not been published before in medical literature.

Acknowledgements We would like to acknowledge Andrew Sargeant (cardiac electrophysiologist).

Contributors IM was responsible for case selection and writeup. KR helped in formatting images and correcting the manuscript. JC was involved in support and guidance.

Competing interests None.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

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Learning points

- Implantable cardioverter defibrillators (ICDs) are more common than before in all types of medical and surgical patients.
- Preoperative and postoperative ICD care is important to prevent any untoward harm to patients and medical personnel caring for these patients.
- It is more important during emergency operations to be aware of potential problems with ICDs and be aware of easy to prevent management steps.

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