

PREHOSPITAL CARE

Hazards of performing chest compressions in collapsed patients with internal cardioverter defibrillators

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Emerg Med J 2003;**20**:379-380

The potential dangers to the rescuer performing chest compressions on a patient with an internal cardioverter defibrillator (ICD) are described. Simple measures to avoid these are discussed.

CASE REPORT

Paramedics were called to a collapsed 75 year old man. They found him in cardiac arrest. Cardiac monitoring demonstrated pulseless electrical activity (PEA) with regular pacing spikes. They identified a device inserted in the left pectoral region. An endotracheal tube was passed and cardiopulmonary resuscitation (CPR) was started. Adrenaline (epinephrine) and atropine were administered. External pacing was started and a palpable pulse was established before transfer to hospital.

On arrival at hospital the cardiac output was lost. With the external pacing turned off, the patient was in asystole with the occasional pacing spike. CPR was restarted. After a few minutes the patient was witnessed to jolt during cardiac massage, this recurred a few minutes later. After the second episode it was suspected that the patient was fitted with an ICD and not a pacemaker. This was confirmed when literature on the device was produced by the paramedics. A second rescuer then took over the cardiac massage and after a few minutes the ICD discharged again shocking the rescuer. The rescuer had to rest for over half an hour before being able to resume work. The patient failed to respond to resuscitation attempts. After the resuscitation attempt, the paramedics reported that the patient had jolted twice while they were at the scene.

The ICD delivered five shocks during the course of CPR. It was assumed that the cardiac massage mimicked a shockable rhythm that was recognised by the ICD causing it to charge. Four of these shocks had no effect on the two paramedics and first hospital rescuer doctor who were all wearing gloves. However, the fifth shock affected the rescuer who was not wearing gloves.

When a representative of the company marketing the ICD attended the hospital to deactivate and remove the device, a print out of its final activity was produced. The timed discharges of the ICD corresponded to the times that the CPR was provided and confirmed that two shocks were delivered on scene and three in hospital. The ICD had begun to charge on a further four occasions but the charge had been dissipated when a "shockable" rhythm disappeared.

DISCUSSION

Sudden cardiac death is estimated to affect 70 000 to 90 000 people a year in Britain, with only about a 2% survival rate. According to NICE many of these patients could be saved if they had an ICD in situ (press release 29 September 2000).

ICDs were introduced into clinical practice in 1980. They are implanted via the transvenous route in a similar manner to that of a pacemaker.¹ There are several indications for treatment with an ICD, of which only one is supported by consensus. This is, in patients with a haemodynamically significant ventricular tachycardia/fibrillation (VT/VF) when:

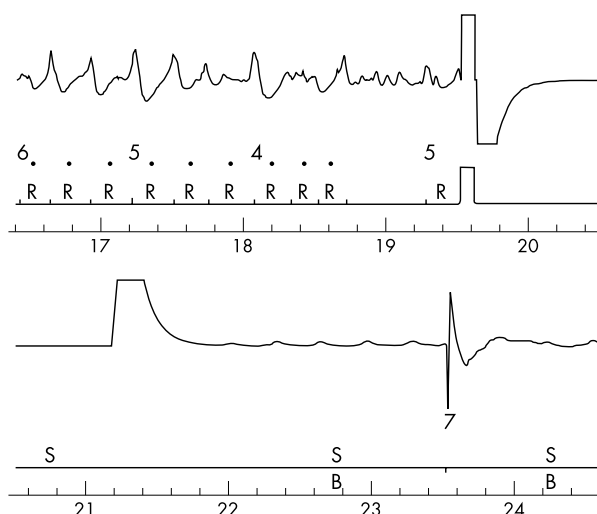


Figure 1 This figure shows the ICD recognising an abnormal rhythm, charging, and then shocking the patient.

- (1) Electrophysiological testing or ambulatory monitoring cannot be used to predict effective treatment;
- (2) No effective drugs are found to treat the arrhythmia,
- (3) Spontaneous sustained arrhythmia or continued inducibility of the arrhythmia is demonstrated by electrophysiological study, even though the patient has received the best drug, surgical, or ablative therapy.^{1,2}

Other indications for implantation include prophylactic implantation, that is, in a patient who has never suffered a ventricular arrhythmia, but who is considered to be at a significantly high risk of a sudden cardiac death.

Modern ICDs can also provide ventricular demand pacing in addition to defibrillation. For the treatment of ventricular tachycardias a step wise approach is used. Initially the ICD may attempt competitive pacing, increasing the ventricular rate in an attempt to interrupt the re-entry circuit causing the VT. If this is unsuccessful or not programmed into the particular model then synchronised cardioversion is attempted. Defibrillation occurs when a rapid ventricular rate consistent with VT is detected.¹

Inappropriate ICD discharges have been identified in the following circumstances:

- Supraventricular tachycardia rate exceeds the ICD threshold
- Atrial fibrillation/flutter with rapid ventricular response
- Environmental factors (exposure to large magnetic fields)
- Interaction with pacemaker or device, malfunction¹

A number of primary and secondary prevention trials have been carried out to look at the efficacy of ICDs in comparison to anti-arrhythmia drug treatment. All secondary prevention

trials and several primary prevention trials have demonstrated that ICDs reduce all cause mortality and SCD. NICE have released a statement that they would like the number of ICDs implanted to triple from 17 per million a year to 51 per million a year (press releases 29 September 2002 and January 2001). The number of ICDs in situ in the community is therefore likely to increase. Consequently, doctors will have greater contact with them and should be aware of their use, potential dangers, and any simple protective measures. From our single experience of CPR in a patient with an ICD the use of latex gloves spared rescuers from receiving a shock. Taping a donut magnet over ICDs will also prevent discharge. The magnet will terminate tachyarrhythmia therapy but will not affect bradycardia pacing. It is therefore recommended that they should be available in accident and emergency departments.

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Accepted for publication 26 July 2002

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