Europace Advance Access published September 27, 2010

CASE REPORT doi:10.1093/europace/euq338

Spontaneous explosion of implantable cardioverter-defibrillator

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Received 29 June 2010; accepted after revision 16 August 2010

The implantable cardioverter-defibrillator (ICD) has revolutionized the treatment of patients at risk for sudden cardiac death due to ventricular arrhythmias. Repeated studies have shown them to increase overall survival rates in patients with cardiomyopathy and left ventricular dysfunction. We report a novel serious adverse event in the first documented case of an explosion in an already implanted device in an out-of-hospital environment.

Introduction

Since its approval in 1985, the implantable cardioverter-defibrillator (ICD) has revolutionized the treatment of patients at risk for sudden cardiac death due to ventricular arrhythmias. The safety and efficacy of ICD implantation to prevent sudden cardiac death have been proved in several landmark studies.[1–3] Having performed a literature search on the issue, we report what we believe to be the first case of an ICD explosion in a patient in an out-of-hospital environment.

Case presentation

We report the case of a 46-year-old patient with a medical history including permanent atrial fibrillation, dilated cardiomyopathy, and chronic heart failure NYHA class III. Echocardiography displayed a left ventricular ejection fraction of 25% with moderate mitral regurgitation and moderate pulmonary hypertension. He underwent insertion of a single chamber ICD (Biotronik Lumax 340 VR-T) for primary prevention of sudden cardiac death, with placement of the device pre-pectorally on the left side. Review at 2 weeks indicated that five inappropriate ICD shocks had been administered due to atrial fibrillation and a fast ventricular response. This was corrected by ICD reprogramming during follow-up, and no further inappropriate shocks were reported.

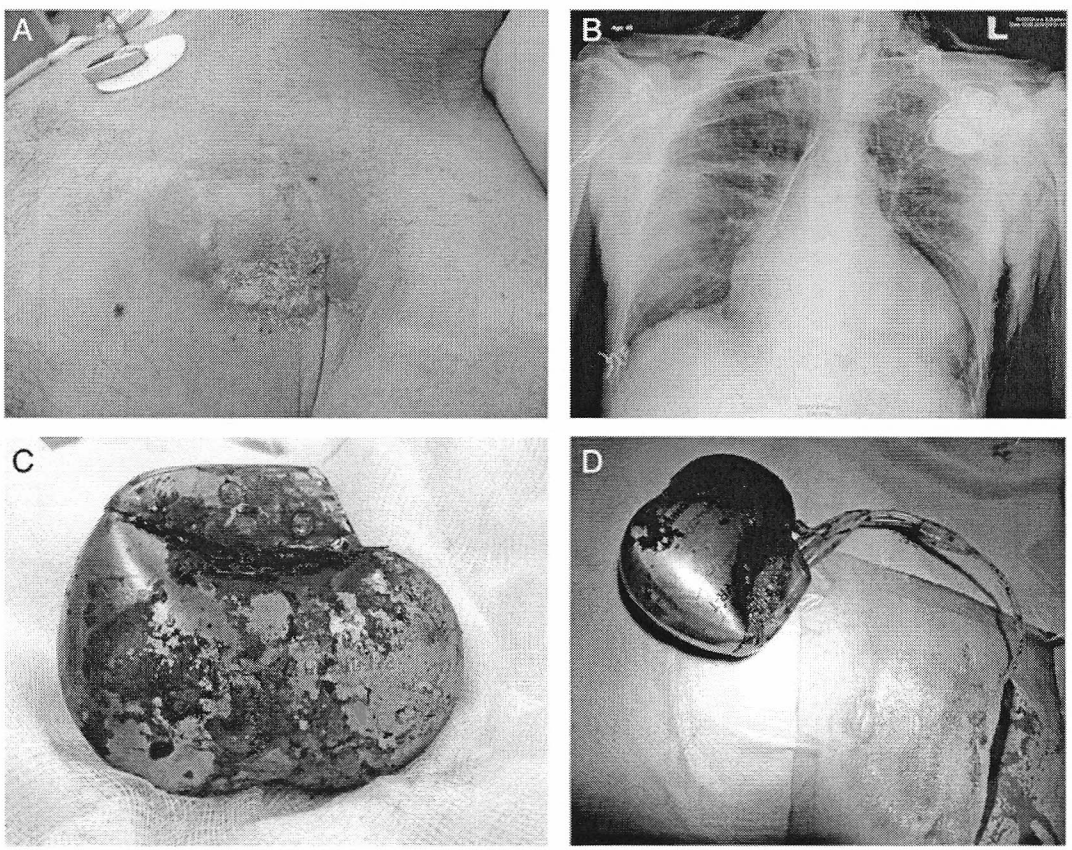

Figure 1 Patient's thorax (*A*), chest X-ray (*B*), extracted ICD (*C* and *D*).

The patient was admitted as an emergency case 2 weeks later due to the ICD exploding *in situ*, described by the patient as a loud 'pop'. The patient immediately collapsed without losing consciousness. On admission he was alert and haemodynamically stable but with a 4 × 4 cm grey–yellow necrotic area with surrounding erythema overlying the ICD site. There was palpable subcutaneous emphysema bilaterally extending into the neck, throughout the left thoracic wall, and down the left arm to the level of the elbow.

Chest radiography displayed signs of pneumomediastinum and deformity of the ICD box (*Figure 1*). A subsequent ultrasound of the left thorax identified a small pneumothorax. Interrogation of the ICD was not possible. The ICD was removed under sedation within 5 h of the event.

Examination of the extracted ICD showed marked deformity with doubling of the anterioposterior diameter and a lateral V-shaped deformity. Burnt necrotic tissue was observed on the surface of the ICD and along the internal aspect of the pectoral pocket.

Consequent thorough non-destructive and destructive analyses of the device by the manufacturer proposed that the battery had overheated, causing a lithium reaction, with a resultant increase in pressure within the battery. The battery housing would have been forced open causing the reported audible sound and the disfigurement of the ICD. Further tests deemed the battery design to be state-of-the-art without any indication of a design limitation.

Conclusion

Overall there are over 250 000 devices implanted per year with this type of battery, without any serious complications due to the battery failure. Clinicians implanting ICD devices should be aware of this possible complication, and further investigation and improvement of batteries used in these devices are required.

Conflict of interest: none declared.

References

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