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Letter to the Editor

Bystander hit by leakage current from S-ICD

Dear Editor,

We read with interest the article of Petley et al. — *Leakage current from transvenous and subcutaneous implantable cardioverter defibrillators (ICDs): A risk to the rescuer?*[1] This article also supports our experience described in the article of Cmorej et al.[2]

We had presented the case of a 30-year-old man who suffered sudden out-of-hospital cardiac arrest and in whom chest compressions induced inappropriate shocks by the S-ICD (EMBLEM MRI S-ICD, Boston Scientific) with a Conditional Shock Zone programmed at 200 beats/min and a Shock Zone programmed at 230 beats/min.

Upon arrival, the paramedics verified cardiac arrest and continued resuscitation according to the 2015 European Resuscitation Council Guidelines. Initial analysis did not recommend delivering a shock due to the presence of asystole. The EMS crew asked a bystander to perform chest compressions. In the fifth minute of resuscitation, the patient suddenly received a shock from the S-ICD (Fig. 1). The bystander performing chest compressions received a shock delivered by the S-ICD. This was so unpleasant that the bystander refused to continue with chest compressions. He underwent a medical examination after this incident, which fortunately did not reveal any damage to his health. Subsequently, the EMS crew found the S-ICD device on the left side of the patient's chest in the mid-axillary line — until this accident they had not been aware of it. The patient also received several inappropriate shocks during the resuscitation.

The inappropriate shocks in the patient presented here were due to oversensing to QRS artefacts that developed during chest compression, when the Smart Pass function was inactive (function which reduces oversensing of lower frequency signals, such as T waves or the double counting of wide QRS complexes — automatically turned off in the case of a slow heart rate (<43 beats per minute) or a low amplitude (<0.5 mV)).[3] This led to an increase in the S-ICD's sensitivity and to double counting of wide QRS artefacts. With chest compressions at a rate of 100–120 per minute, the cut-off value for the Conditional Shock Zone and the Shock Zone of 200 and 230 beats per minute respectively was reached. Once this cut-off value was exceeded, the S-ICD delivered a shock. A similar experience with inappropriate shocks induced by chest compressions was published by Berkowitz et al. in 2018.[3]

The bystander in our case was kneeling on the left side of the patient and Petley et al.[1] pointed out that the bystander was exposed to higher surface voltages, which also explains why the feeling was so unpleasant. Other contributing factors were that the bystander was not wearing gloves and was sweating.

Placing a magnet over the S-ICD generator is the only acknowledged and verified method of preventing inappropriate shocks. In this case report, although the magnet (Magnet M50, Biotronic) had been placed over the S-ICD generator, this did not inhibit shock delivery.

With this letter we would like to support the findings and recommendations of Petley et al.[1] from a clinical case report.

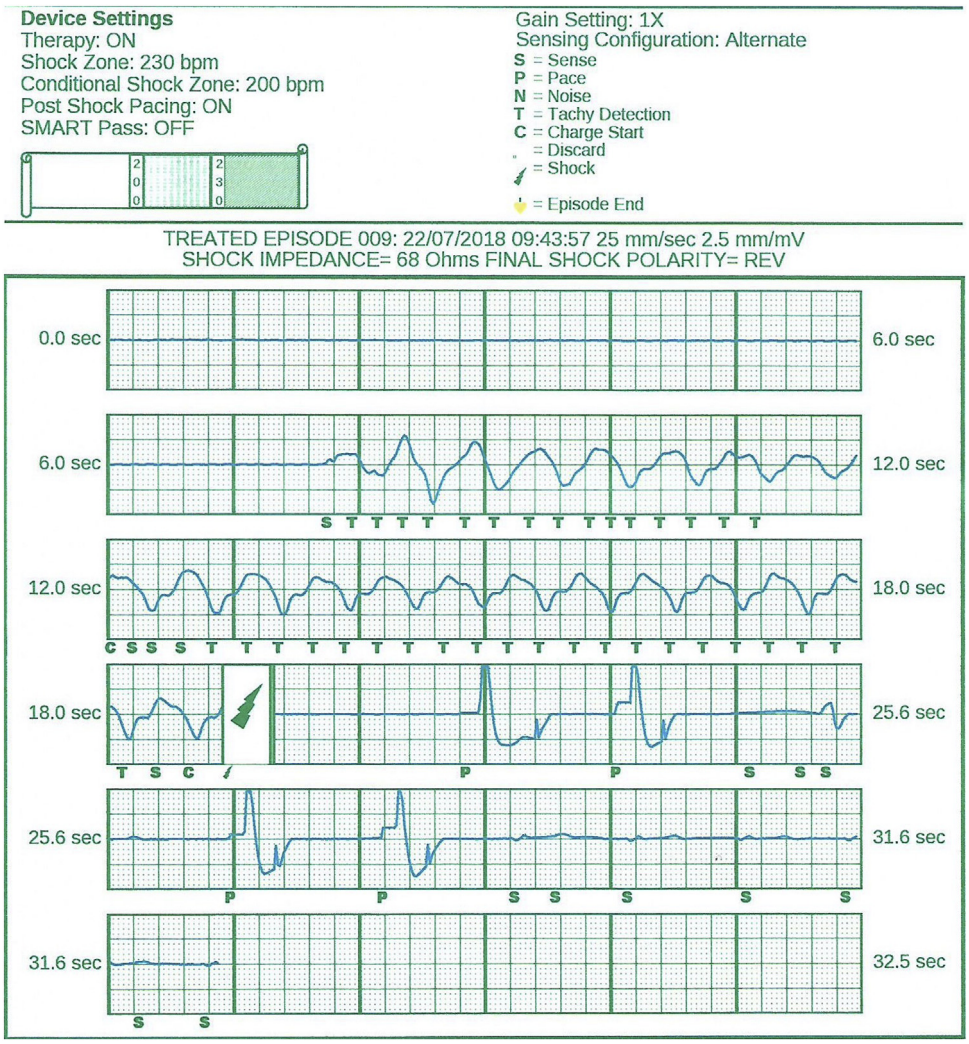

Fig. 1 – The S-ICD recording shows asystole during the rhythm analysis. This is followed by QRS artefacts induced by chest compressions and subsequent shock delivery by the S-ICD due to oversensing and double counting of wide QRS artefacts. The device then activated short-term pacing following the inappropriate shock. (Ref.: Author's archive).

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