

EP CASE REPORT

Abdominal submuscular implant of subcutaneous implantable cardioverter-defibrillator in a young child

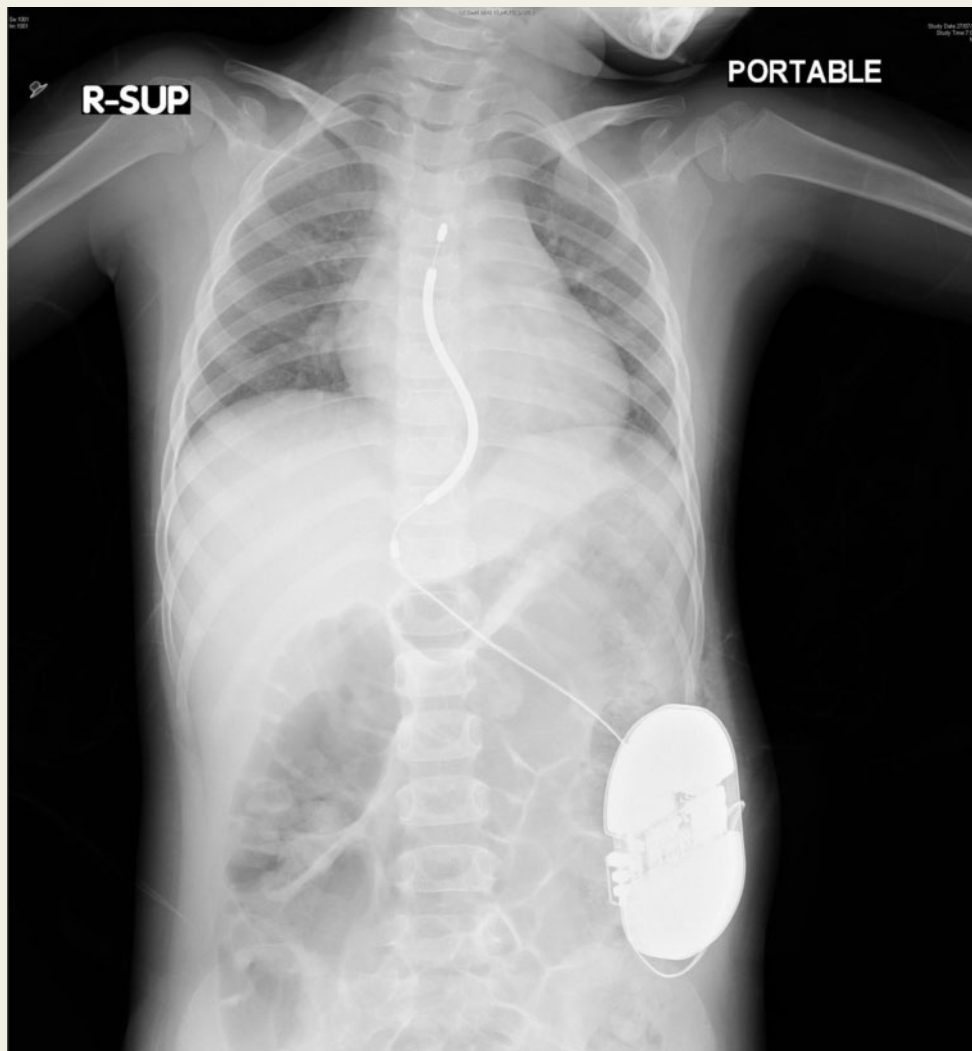
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We describe the abdominal submuscular implant of subcutaneous implantable cardioverter-defibrillator (S-ICD) in a 4-year-old girl, weighted 20 kg. She suffered from aborted cardiac arrest with documented ventricular fibrillation (VF). Her electrocardiogram (ECG) demonstrated multifocal premature ventricular ectopics, with no features of channelopathy, and magnetic resonance imaging (MRI) of her heart was normal. Adrenaline and flecainide challenge tests were refused by parents.

With parental concern over the invasiveness of epicardial lead implantation and MRI incompatibility of conventional epicardial ICD system, option of S-ICD (Boston Scientific) was explored. Pre-implantation ECG screening, using left/right parasternal and left abdominal re-



gion, demonstrated feasibility of S-ICD with 2 of 3 vectors passing the screening test. There was no indication for pacing. With the parental understanding of the unconventional approach of implantation, abdominal implantation of S-ICD was adopted.

Procedure was performed under general anaesthesia. The abdominal pocket was created between the external oblique and internal oblique muscle layers, over the left side of her abdomen. A 2 cm sub-xiphoid and vertical suprasternal incision were made. The disposable tunnelling device was thus used to create a subcutaneous tunnel for the lead from the sub-xiphoid region to the abdominal pocket. The electrode coil was implanted subcutaneously above the sternum ([Supplementary material online, Video S1](#)). Since the sternum was only 14 cm long, a slack was made to accommodate the coil, as well as allowing redundancy for growth. The coil was anchored to the fascia at the upper and lower sternal regions, and the lead was then attached to the generator (*Figure*; R-SUP, Right supine and [Supplementary material online, Figure S1](#)). Defibrillation threshold testing successfully passed using 65 J of energy.

Two-month post-implantation she had an episode of ventricular tachycardia successfully cardioverted by ICD shock. The sensing of the ventricular signals remained satisfactory.

Subcutaneous implantable cardioverter-defibrillator has marked an evolutionary change in ICD technology.¹ Prior case series of paediatric S-ICD implantation demonstrated a lower rate of reoperation and inappropriate therapy when compared to transvenous ICD system.² Lead-related complications can be reduced, and the new S-ICD system offers advantage of allowing patients to undergo future MRI scan, e.g. imaging surveillance for neurological recovery after aborted arrest, or cardiac assessment with concomitant heart condition, when compared to the traditional epicardial ICD system.

Abdominal implantation of S-ICD in children was only reported in a 3-year-old boy (13.5 kg) with hypoplastic left heart syndrome.³ The generator was implanted in the left retroperitoneal region. Our case illustrated again the feasibility of abdominal implant of this S-ICD system. Since body size of our patient is bigger, the generator could be implanted in a pocket created beneath the muscle layer within the abdominal wall. To our knowledge, this is the first reported case of submuscular abdominal implantation of the S-ICD system in a child.

Supplementary material

Supplementary material is available at *Europace* online.

References

1. Boveda S, Lenarczyk R, Haugaa K, Fumagalli S, Madrid AH, Defaye P. Implantation of subcutaneous implantable cardioverter defibrillators in Europe: results of the European Heart Rhythm Association survey. *Europace* 2016;**18**:1434–9.
2. Pettit SJ, Mclean A, Colquhoun I, Connelly D, McLeod K. Clinical experience of subcutaneous and transvenous implantable cardioverter defibrillators in children and teenagers. *Pacing Clin Electrophysiol* 2013;**36**:1532–8.
3. Reeves JG, Kim JS, Mitchell MB, McCanta AC. Implantation of the subcutaneous implantable cardioverter-defibrillator with retroperitoneal generator placement in a child with hypoplastic left heart syndrome. *Heart Rhythm Case Rep* 2015;**1**:176–9.