The limitations of our study were mainly related to its retrospective design and the low number of procedures with NOACs. Experience with apixaban in our study was limited, primarily because the drug only became available recently.

According to our experience in daily clinical practice, ambulatory cardioversion of AF with NOACs is a procedure that is at least as safe as the usual pattern of using VKAs.

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REFERENCES

1. Pérez-Villacastín J, Pérez Castellano N, Moreno Planas J. Epidemiología de la fibrilación auricular en España en los últimos 20 años. Rev Esp Cardiol. 2013;66:561–5.
2. Camm AJ, Lip G, de Caterina R, Savelieva I, Atar D, Honhloser SH, et al. Actualización detallada de las guías de la ESC para el manejo de la fibrilación auricular de 2012. Rev Esp Cardiol. 2013;66. 54.e1-e24.
3. Nagarakanti R, Ezekowitz MD, Oldgren J, Yang S, Chernick M, Aikens TH, et al. Dabigatran versus warfarin in patients with atrial fibrillation: an analysis on patients undergoing cardioversion. Circulation. 2011;113:131–6.
4. Piccini JP, Stevens SR, Lokhnygina Y, Patel MR, Halperin JL, Singer DE, et al. Outcomes after cardioversion and atrial fibrillation ablation in patients treated with rivaroxaban and warfarin in the ROCKET AF trial. J Am Coll Cardiol. 2013;61:1998–2006.
5. Flaker G, Lopes RD, Al-Khatib SM, Hermosillo AG, Hohnloser SH, Tinga B, et al. Efficacy and safety of apixaban in patients after cardioversion for atrial fibrillation: insights from the ARISTOTLE Trial (Apixaban for Reduction in Stroke and Other Thromboembolic Events in Atrial Fibrillation). J Am Coll Cardiol. 2014;63:1082–7.
6. Yadlapati A, Groh C, Passman R. Safety of short-term use of dabigatran or rivaroxaban for direct-current cardioversion in patients with atrial fibrillation and atrial flutter. Am J Cardiol. 2014;113:1362–3.

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Totally Subcutaneous Implantable Cardioverter-defibrillator in a Child With Complex Congenital Heart Disease and Infection in a Previous Transvenous System

Implante de un desfibrilador totalmente subcutáneo en un niño con cardiopatía congénita compleja e infección del sistema endovenoso previo

To the Editor,

A 9-year-old boy, weighing 24 kg and measuring 130 cm in height, was referred to us for implantation of a totally subcutaneous implantable cardioverter-defibrillator (ICD). He underwent surgery for *truncus arteriosus* type I at age 20 days, with closure of the ventricular septal defect, truncal valvuloplasty and placement of a right ventricle-to-pulmonary artery Contegra® conduit. At age 3 years, the patient required reintervention. A mechanical aortic prosthesis was implanted and the conduit was changed. At age 8 years, he had a sudden cardiac death episode while playing football, and was successfully resuscitated by emergency teams. The prosthesis was working correctly, the conduit showed no stenosis and left ventricular function was normal. An electrophysiological study was carried out, with induced ventricular fibrillation. It was decided to implant a single-chamber defibrillator in the left infraclavicular position (Energen™ DAI Boston Scientific Inc.;

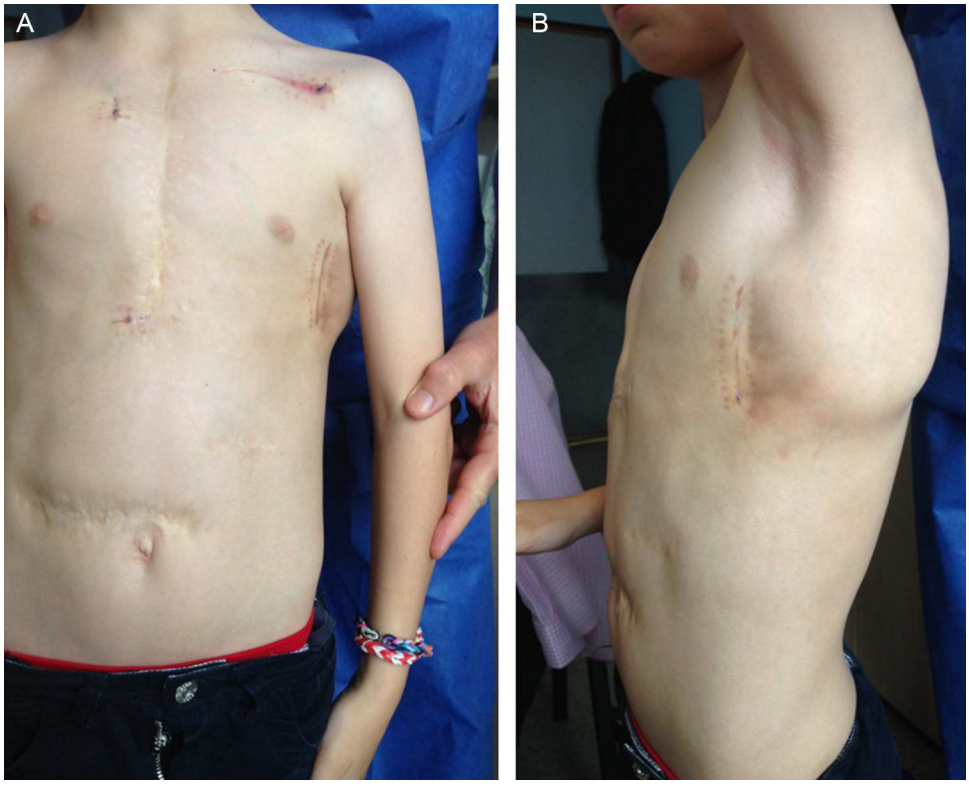

Figure 1. Photograph from front (A) and side (B), showing the position of the subcutaneous electrode and generator, 1 month postimplantation.

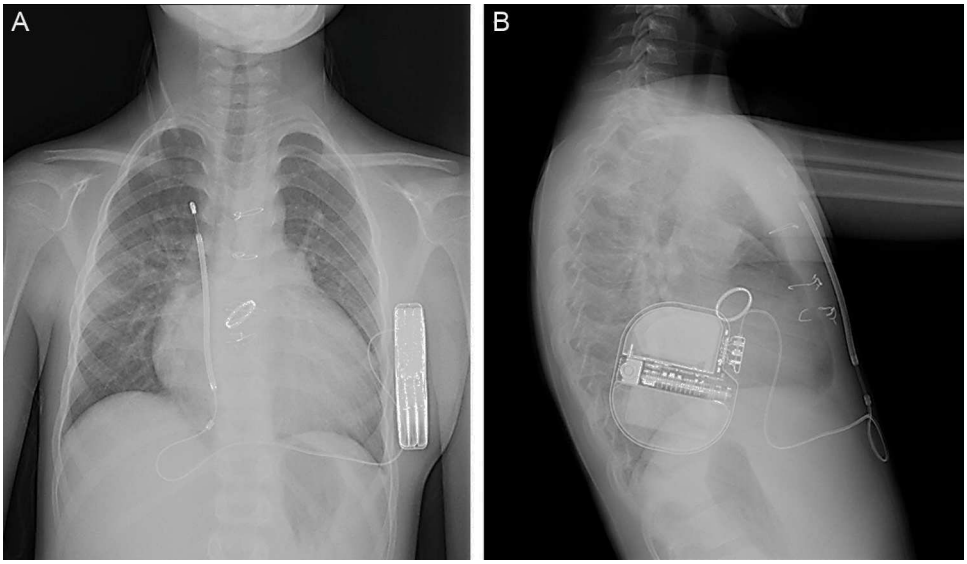

Figure 2. Posterior-anterior (A) and lateral (B) chest X-ray of the implanted device in the patient.

Natick, Massachusetts, United States) with a transvenous electrode in the right ventricular apex. The generator and electrode had to be removed 8 months later due to device infection. We therefore decided to implant a totally subcutaneous ICD system consisting of a generator and lead (Cameron Health, Boston Scientific Inc.). Beforehand, we checked that the patient was a suitable candidate in terms of TQRS morphology and body size. We performed the procedure in the electrophysiological laboratory under general anesthesia, implanting the subcutaneous ICD along the anterior axillary line, between the serratus anterior and latissimus dorsi muscles (Figure 1). We placed the subcutaneous electrode in the right parasternal region, because this is the best detection zone. A defibrillation test at 65 J was successful. We programmed a shock zone at 220 bpm and a conditional shock zone at 200 bpm. A chest X-ray before discharge showed that the electrode and generator were in the correct position (Figure 2). At the 4-month follow-up, the patient had experienced no shocks or other complications.

Subcutaneous ICD appears to be a valid alternative to the conventional transvenous system for patients not requiring pacing for bradycardia, resynchronization or antitachycardia treatment. More than 3500 devices have been implanted worldwide since they appeared in the market. Rates for successful cardioversion in ventricular arrhythmias, complications and inappropriate shocks are similar in subcutaneous ICD and conventional transvenous defibrillators alike.[1,2] Experience in pediatric patients is much more limited, as reflected in the few cases published to date.[3,4] As far as we are aware, our patient is the youngest and smallest in terms of height and weight reported to date, which made us question the suitability of subcutaneous ICD in this body size. Furthermore, the patient had complex congenital heart disease, had already undergone several surgical procedures, and had suffered an infection of a previous conventional transvenous defibrillator. The combination of these factors made this case unique. We believe that subcutaneous ICD is an excellent alternative for children with these characteristics, because it avoids the long-term complications of transvenous electrodes. A recently published case series of children and young adults[5] reported a 14% incidence of electrode failure 2 years after implantation. The failure rate increased in correlation with younger patient age. In children, there is still understandable doubt about the durability of a totally subcutaneous system. Children's physical activity and predisposition to accidents could limit the benefits of this system, causing inappropriate shocks through myopotentials triggered by external agents not described to date in transvenous systems.[6]

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REFERENCES

1. Alzueta J, Fernández JM. Registro Español de Desfibrilador Automático Implantable. IX Informe Oficial de la Sección de Electrofisiología y Arritmias de la Sociedad Española de Cardiología (2012). Rev Esp Cardiol. 2013;66:881–93.
2. Lambiase P, Barr C, Theuns DA, Knops R, Neuzil P, Johansen JH, et al. Worldwide experience with a totally subcutaneous implantable defibrillator: early results from the EFFORTLESS S-ICD Registry. Eur Heart J. 2014. Mar 26 [Epub ahead of print]. doi: 10.1093/eurheartj/ehu112.
3. Griksaitis M, Rosengarten JA, Gnanapragasam JP, Haw MP, Morgan JM. Implantable cardioverter defibrillator therapy in paediatric practice: a single-centre UK experience with focus on subcutaneous defibrillation. Europace. 2013;15:523–30.
4. 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.
5. Atallah J, Erickson CC, Cecchin F, Dubin AM, Law IH, Cohen MI, et al. Multiinstitutional study of implantable defibrillator lead performance in children and young adults. Results of the Pediatric Lead Extractability and Survival Evaluation (PLEASE) study. Circulation. 2013;127:2393–402.
6. Álvarez-Acosta L, Romero-Garrido R, Hernández-Afonso J. Descarga inapropiada de desfibrilador en un dispositivo subcutáneo secundaria a contracciones musculares repetitivas. Rev Esp Cardiol. 2014;67:496–8.

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