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Right-sided implantation of a subcutaneous implantable cardioverter defibrillator in a young patient with *situs inversus*

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Abstract

Implantable cardioverter defibrillators (ICD) are widely used for the treatment of patients with increased risk of sudden cardiac death. Here, we report a case of implantation of a subcutaneous ICD in a patient with dextrocardia and *situs inversus* after cardiac arrest. In conclusion, the right-sided implantation of a subcutaneous ICD is a feasible and safe procedure in patients with anatomical variations and may reduce long-term complications, as compared to transvenous ICDs.

Introduction

Dextrocardia in the presence of *situs inversus* is a rare congenital condition. With more than 30 years of experience and growing evidence, ICDs are the most effective therapy to prevent sudden cardiac death in patients at high risk. Entirely subcutaneous ICDs provide a feasible and safe alternative to

the conventional transvenous devices. We describe the case of a young patient with *situs inversus* who received a right-sided S-ICD for secondary prevention.

Case report

A 42-year old man with known *situs inversus* was transferred to our emergency department after successful cardiopulmonary resuscitation (CPR) and electrical defibrillation. The 12-lead ECG on admission showed unspecific signs of myocardial injury. Coronary artery disease was excluded by angiography, and there were no relevant electrolyte abnormalities (Fig. 1, Fig. 2). By echocardiography and MRI, the left ventricular ejection fraction was confirmed to be preserved. Furthermore, there were no signs of chamber dilatation, hypertrophy, wall motion abnormalities, vitia or (sub)acute myocarditis. Ajmalin-testing did not reveal Brugada-pattern, also there was no induction of cardiac arrhythmias under physical stress testing. Finally, there were no signs of drug abuse. In summary the cause of the cardiac arrest in the young patient remained unexplained. With the given indication for an ICD-implantation and the lack of need for atrial or ventricular pacing, the decision for a subcutaneous device was made with the consent of the patient. The screening electrodes were placed mirror-inverted to the common configuration, the patient passed the supine as well as the sitting position for all 3 vectors. A right-sided subcutaneous device (Boston Scientific, Marlborough, MA, USA) was implanted without any complications. In a subsequent system test with induction of VF, sinus rhythm was restored with the first shock delivering 65 Joules.

Discussion

ICDs are the most effective therapy to prevent sudden cardiac death in patients at high risk [1]. The invasive implantation as well as the permanent presence of extraneous material in transvenous devices is associated with potential complications such as infection, lead perforation, pericardial tamponade and lead failure [2]. With the development of entirely S-ICDs, a safe and effective alternative is available. Due to the current guidelines, the situation of an inadequate vascular access (e. g. by anatomical abnormalities) raises the class of recommendation (COR) from IIa to I – but this is neither exclusive nor specific for congenital disorders [1].

In the present case, the decision for a subcutaneous device was made with respect to the young age of the patient and the missing indication for atrial or ventricular pacing. The implantation of vascular ICD-systems in patients with *situs inversus* has been



Figure 1. Initial ECG showing ventricular fibrillation.

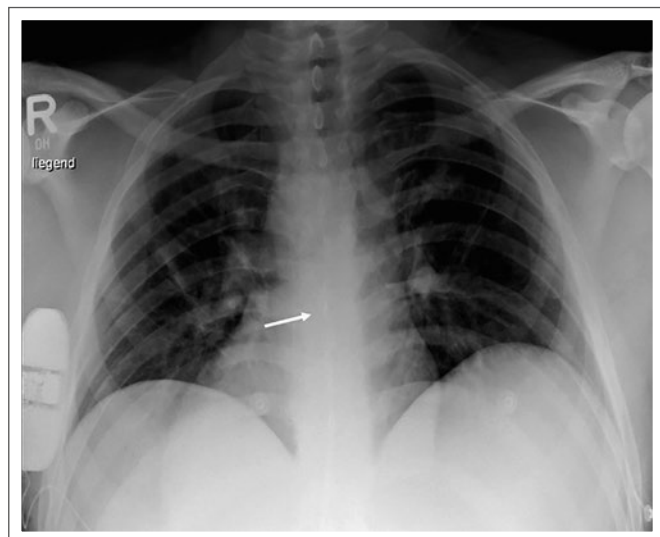


Figure 2. Chest x-ray p. a. view in supine position. Dextrocardia *situs inversus* with right-sided S-ICD in position.

reported [3]. In 2015 Ceresnak et al. described the case of a young patient with tetralogy of Fallot, dextrocardia and recurrent episodes of ventricular tachycardia, who was in need for an S-ICD after explantation of a formerly implanted transvenous ICD [4]. González-Cordero et al. recently presented the case of a 68-year-old patient with *situs inversus*, ischemic and dilated cardiomyopathy and reduced ventricular ejection fraction under guideline-directed medical treatment [5]. In both cases, the devices were implanted with the pulse generator in the right axillary region and the defibrillation electrode parallel to the right sternal border. Sensing through the devices after implantation was acceptable, in both reports as well as in our case, restoration of sinus rhythm after induced VF was successful after delivering one 65 Joule discharge. Complications or device dysfunction during the follow-up periods were not described. These reports conform to the studies of our current case.

To the best of our knowledge, we present the first case of a patient with isolated *situs inversus*, survived cardiac arrest and S-ICD implantation in secondary preventive intention. With this report, we expand the still minor amount of experience regarding the alternative of right-sided S-ICD implantation in patients with congenital malformations.

■ Conclusion

Right-sided implantation of a S-ICD is a feasible and safe procedure in patients with anatomical variations and may, compared

to transvenous ICD, reduce long-term complications. In *situs inversus*, providers have to be aware of the special anatomical situation for diagnostic and implantation maneuvers. Further reports are desirable to increase the body of evidence.

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