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Implantation of single lead cardioverter defibrillator with floating atrial sensing dipole in a pregnant patient without using fluoroscopy

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ABSTRACT

In this case report, we look into the implant procedure of a single-lead ICD with floating atrial sensing dipole in a pregnant woman, without using fluoroscopy. This system benefits the proper positioning of the lead. This is possible thanks to the simultaneous display of both the atrial and ventricular dipoles on the electro-anatomical mapping system. This technique may be taken into consideration for the few rare cases where fluoroscopy is absolutely contraindicated.

1. Case report

A 38-year-old woman, in her 24th week of pregnancy, had a sudden cardiac arrest. Ventricular fibrillation (VF) was documented, and electrical defibrillation was performed by an emergency unit to restore the sinus rhythm. She had neither family history of sudden death, nor significant previous diseases. Physical examinations showed that the woman and the fetus were doing well. Blood analysis did not show electrolyte disturbances. The electrocardiograph (ECG) was normal, as was the cardiac magnetic resonance imaging. The examinations that were carried out showed only a mitral valve prolapse with a mild mitral regurgitation.

An implantable cardioverter defibrillation (ICD) therapy, for secondary prevention of sudden death, was scheduled; the procedure was guided by the non-fluoroscopy electro-anatomical mapping system EnSite™ Velocity™ (St. Jude Medical, St. Paul, MN, USA). An 8-Fr valve sheath was placed in the left subclavian vein. A single deflectable quadripolar electrophysiology catheter was used for catheter manipulation and geometric reconstruction of the right atrium (RA) and of the right ventricle (RV). After the creation of the ICD pocket, a Linox Smart S DX ^{ProMRI} lead (BIOTRONIK SE & Co, Berlin, Germany) was inserted through the left subclavian venous sheath. This is a single-coil screw-in lead capable of atrial bipolar sensing, thanks to two electrode rings mounted 150 mm from the tip. The ventricular pace-sense and the atrial sense dipoles were connected to the EnSite™ Velocity™ system junction box, in order to simultaneously display the lead tip and the atrial dipole in the electro-anatomical map (See Fig. 1). The lead was then moved to the RV apex. After a satisfy measurement of the electrical parameters (See Fig. 2), the lead was fixed with the active system. The fixing of the tip to the myocardial tissue was confirmed by the decrease and subsequent stabilization of the pacing ventricular impedance, after the tightening of the screw (mean value 620 Ω). The pacing threshold was 0.5 V at 0.4 ms, the mean ventricular and atrial sensing were 5.4 and 4.4 mV, respectively. The visualization of the atrial dipole, in the electroanatomical map at the level of the high right atrium, confirmed an appropriate bend of the lead shaft. The procedure lasted 2 hours; a quick fluoroscopy, lasting only 4 seconds, was performed, in order to confirm that the screw had been extracted properly. The patient was discharged 2 days after the implant, and she completed the pregnancy uneventfully.

2. Discussion

Conventional methods for the implantation of devices require fluoroscopic guidance. The non-fluoroscopy technique may have an

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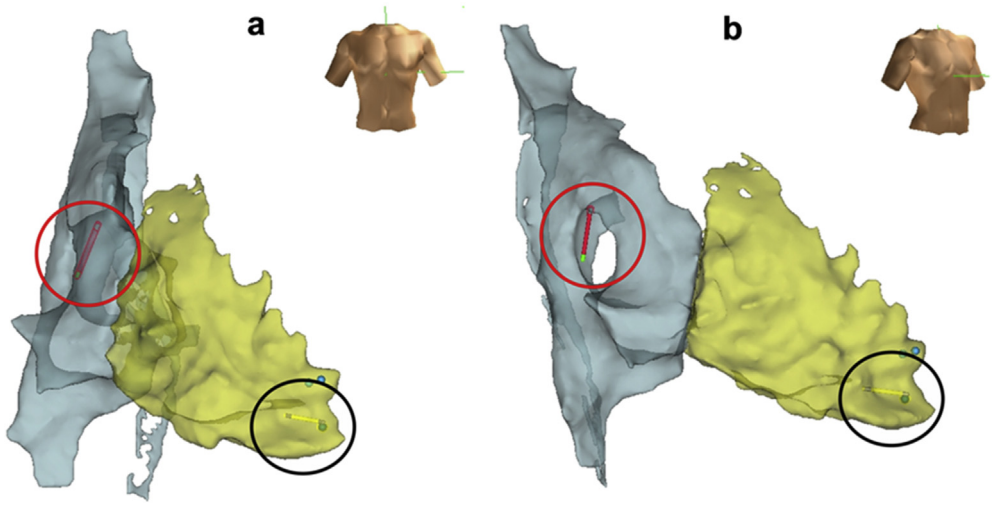

Fig. 1. Three-dimensional reconstruction of the right heart structures in AP view (panel a) and in RAO view (panel B). Blue structure represents right atrial, inferior vena cava, and superior vena cava. Yellow structure represents right ventricle (RV). The implantable cardioverter defibrillator ventricular lead tip can be seen in the black circle, near the apex of the RV; the floating atrial dipole of the lead is visible in the red circle, in the right high region of the atrium.

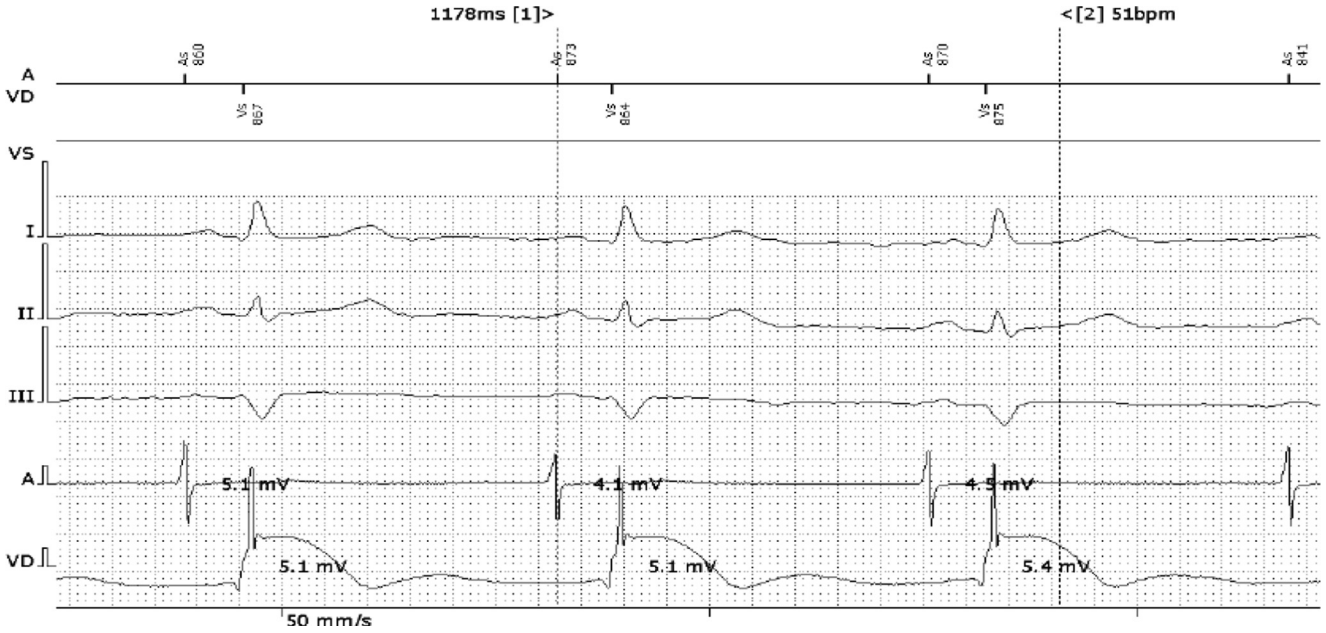

Fig. 2. Intracardiac atrial and ventricular electrograms from the Linox Smart S DX lead measured with the Pacing System Analyzer (PSA) during the implantation. First line, atrial and right ventricular annotations; second line, ECG derivation I; third line, ECG derivation II; fourth line, ECG derivation III; fifth line, atrial intracardiac electrogram from the floating dipole; last line, atrial intracardiac electrogram from the tip dipole. A = atrium; VD = right ventricle.

important impact during the implantation of cardiac resynchronization therapy (CRT) devices, where a longer radiation exposure is expected. Nevertheless, there are a few special cases where the X ray exposure has to be avoided, even if it is expected to be limited. Pregnancy is one of these cases.

There are few reported cases of ICD implantation in pregnant patients [1–3]. Abello et al. used transesophageal echocardiography, but this technique is not in wide use by most electrophysiologists [1]. Non-fluoroscopy guidance via electro-anatomical mapping was successfully used in some reported cases of ICD implantation [2–4]. The most challenging part of the procedure was assessing that lead shaft had bent correctly, even when a dual-coil lead was used. This is due to the fact that the mapping system can display the geometrical center of the proximal coil, but not its entire dimension. Therefore, the placement of the proximal coil is not accurate. As previously speculated in a study, where single-lead pacemakers were implanted without the use of fluoroscopy, the use of an atrioventricular single lead (for VDD mode of pacing) makes the procedure easier. This is because the atrial pair of electrodes allows the system to display the proximal part of the lead, which implies being able to correctly assume its trajectory using the two dipoles, so the course of the lead is deductible from the two dipoles [5].

We report a case of a single-lead ICD with a floating atrial sensing dipole implant, without the use of fluoroscopy. This system, that has proven reliable for atrial sensing [6], is convenient for the

proper positioning of the lead, thanks to the simultaneous display of both atrial and ventricular dipoles on the electro-anatomical map. This technique may be taken into consideration for the few rare cases where fluoroscopy cannot be performed.

Conflict of interest

Daniele Giacopelli is an employee of Biotronik Italia.

References

[1] Abello M, Peinado R, Merino JL, Gnoatto M, Mateos M, Silvestre J, et al. Cardioverter defibrillator implantation in a pregnant woman guided with transesophageal echocardiography. Pacing Clin Electrophysiol 2003;26:1913–4.

[2] Tuzcu V, Kilinc OU. Implantable cardioverter defibrillator implantation without using fluoroscopy in a pregnant patient. Pacing Clin Electrophysiol 2012;35:265–6.

[3] Merino JL, Peinado R, Silvestre J. Dual-chamber implantable cardioverter defibrillator implantation guided by non-fluoroscopic electro-anatomical navigation. Europace 2008;10:1124–5.

[4] Castrejòn-Castrejòn S, Pérez-Silva A, Gonzàlez-Villegas E, Al-Razzo O, Silvestre J, Doiny D, et al. Implantation of cardioverter defibrillators with minimal fluoroscopy using a three-dimensional navigation system: a feasibility study. Europace 2013;15:1763–70.

[5] Ruiz-Granell R, Ferrero A, Morell-Cabedo S, Martinez-Brotons A, Bertomeu V, Llacer A, et al. Implantation of single-lead atrioventricular permanent pacemakers guided by electroanatomic navigation without the use of fluoroscopy. Europace 2008;10:1048–51.

[6] Iori M, Giacopelli D, Quartieri F, Bottoni N, Manari A. Implantable cardioverter defibrillator system with floating atrial sensing dipole: a single-center experience. Pacing Clin Electrophysiol 2014;37:1265–73.