



Left Ventricular Lead Implantation for detection of ventricular arrhythmias in Patient with Implantable Cardioverter Defibrillator and low R Wave in Right Ventricle

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ABSTRACT

Introduction

Dilated cardiomyopathy (DCM) is a disease characterised as left ventricular (LV) or biventricular dilatation with impaired systolic function. Regardless of underlying cause patients with DCM have a propensity to ventricular arrhythmias and sudden cardiac death. Implantable Cardioverter Defibrillator (ICD) implantation for these patients results in significant reduction of sudden cardiac death^[1-3]. ICD devices may be limited by right ventricle (RV) sensing dysfunction with low RV sensing amplitude. We present a clinical case of patient with DCM, implanted ICD and low R wave sensing on RV lead.

Keywords: DCM, ICD, LV

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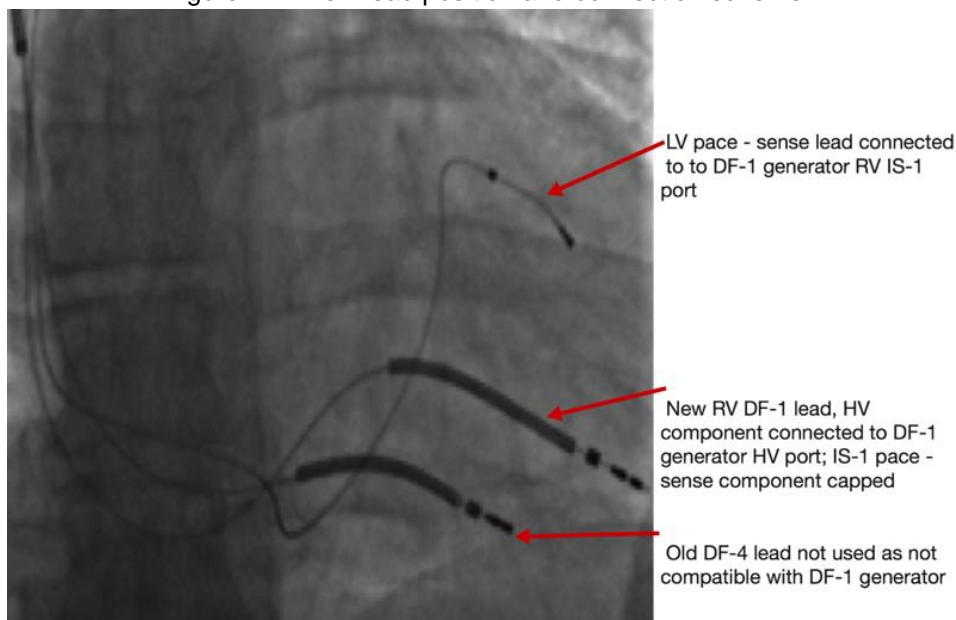
Case report

The clinical case is of a 54-year-old man with non-ischaemic DCM, left ventricular ejection fraction (LVEF) ~20-25%.

He had a background history of Permanent atrial fibrillation and non-sustained ventricular tachycardia (VT). A single chamber ICD (Biotronik Iforia 5 VR-T DF-4) with dual-coil lead (Protego ProMRI SD 65/18) was implanted. At implantation despite multiple lead repositions R wave amplitude was 3.6mV at best, and pacing threshold 0.8V, lead impedance 484 Ω , shock impedance 42 Ω . After ICD implantation repeatedly low R wave amplitude of 2.0-2.9 mV were measured. In 2017 the patient was admitted for elective lead replacement and ICD generator box change. On admission R wave had dropped to 1.3mV, pacing threshold 0.8V, lead impedance 507 Ω , shock impedance 59 Ω . After opening the pocket; lead, device and connections were reviewed. Neither connection problems nor lead dislocation were found. A new DF4 lead (Biotronik Protego ProMRI S 65) was implanted.

Despite R wave mapping with multiple lead repositions, it was not possible to improve R wave amplitude, which remained at 2.0 mV. Due to incompatibility issues, the new DF-4 lead was replaced with a DF-1 lead (Biotronik Protego DF1 ProMRI S 65). DF-1 Lead was implanted into the RV apex. A bipolar pace-sense lead (Biotronik Sentus ProMRI OTW BP L-85) was placed into the posterolateral vein of Coronary Sinus. LV R wave sensing measured 12.4 mV, pacing threshold 0.7 V, lead impedance 808 Ω . A new generator (Biotronik Intica 5 VR-T DF-1) was implanted. The HV-1 component of the new DF-1 lead was connected to the HV-1 port of the new DF-1 generator. RV pace-sense component of DF-1 lead was capped and not used. LV lead was connected to IS-1 port of DF-1 generator, the usual connection port for RV pace – sense function. Therefore the LV lead is now used for pacing if required, and most importantly sensing and detection of ventricular arrhythmias. New lead position and connection scheme is shown in Figure 1.

Figure N.1. New lead position and connection scheme



Note, Biotronik Biventricular ICD generators do not allow detection of ventricular arrhythmias through the LV lead plugged in to LV IS-1 port.

Follow-Up

Two weeks after procedure LV and RV lead positions were stable. LV R wave measures

14.1mV, pacing threshold 1.3V, lead impedance 751 Ω ; RV shock impedance 59 Ω ;

Six weeks after procedure patient felt well. LV R wave measured 16.3mV, pacing threshold 1.0V, lead impedance 765 Ω ; RV shock impedance 71 Ω . These values are more than adequate for

pace-sense function and appropriate management of arrhythmias.

Discussion

The indications for ICD implantation for patients with DCM have a class I A recommendation [4-5]. But ICD device implantation can be complicated by poor R wave sensing in the dilated myopathic right ventricle. It is recommended to have R Wave >5 mV at the time of lead implantation [6]. An adequate R wave amplitude during VF is crucial to avoid undersensing during arrhythmic episodes and proper function of ICD [7].

A recent study shows that during the follow-up period baseline R wave amplitudes <2.5 mV may lead to high risk of delayed detection of VF [8]. Our patient was at high risk of undersensing ventricular arrhythmias and consequently, failure to deliver appropriate therapy. New ICD lead implantation failed to show any improvement in R wave sensing despite multiple repositions in the RV. The alternative may be implantation of an epicardial lead. As an alternative, before choosing surgery, we implanted an additional lead into the coronary sinus for the purpose of arrhythmia detection and pacing modalities, if required. LV dilatation and low R wave amplitude could be a limiting factor using this technique. LV lead dislocation from the posterolateral vein into more proximal coronary sinus or right atrium could result in failure to sense and detect ventricular arrhythmias. Another consequence of this potential lead dislocation into the atrium could be inappropriate sensing of high rate atrial arrhythmias with subsequent inappropriate detection and delivery of shock therapy. However, lead dislocation has decreased with advances in lead technology and improving operator experience. One case of successful LV lead implantation for pace-sense modalities in patient with arrhythmogenic right ventricular dysplasia and low R wave sensing in RV was reported [9]. Further studies are required to establish indications for this technique.

Conclusion

Low R wave sensing in patients with CMP is a common problem which may be difficult to solve when extensive myocardial muscle damage

results in poor electrical activity. Lead implantation into the coronary sinus for the purpose of ventricular arrhythmia detection may be a good alternative to high risk epicardial lead implantation and associated high infection risk with open-chest surgery.

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