

Azygos Vein Lead Implantation: a Therapeutic Option for Elevated Defibrillation Threshold

Luiz Eduardo Montenegro Camanho^{1,2}, Antonio Carlos Botelho da Silva¹, Marco Antonio Teixeira¹, Luiz Antonio Inácio Oliveira Junior^{1,2}, Eduardo Benchimol Saad², Marcelo da Costa Maia¹

Hospital São José do Avai¹, Itaperuna, RJ; Hospital Pró-Cardíaco², Botafogo, RJ – Brazil

The evaluation of the defibrillation threshold (DFT) during the implantation of a cardioverter-defibrillator (ICD) is an important stage of the procedure, as a high DFT can be found in up to 16% of patients. We report a patient with idiopathic dilated cardiomyopathy (DCM) submitted to a biventricular ICD implantation. During the procedure, the patient showed a high DFT and showed to be resistant to usual therapeutic modalities. We opted for the azygos vein defibrillation lead implantation, with good resolution.

Introduction

ICD implantation is a well-established therapeutic option to prevent cardiac SD in patients at risk¹. Recent data suggest that, during implantation, 6% to 16% of patients show high DFT². Such a condition is defined when the DFT value is < 10 joules in relation to the maximum generator load. Given this situation, the available strategies would be the repositioning of the electrode in the right ventricle (RV), changing the shock vector or the implantation of an additional defibrillation electrode. The defibrillation lead implantation in the azygos vein is a therapeutic option, with a small number of cases having been reported in the literature^{3,4}.

Case Report

The patient was a 37-year-old male with a history of idiopathic DCM and NYHA functional class III (NYHA) despite optimized drug therapy. He had a history of syncope without prodrome. The basal echocardiogram (ECG) showed sinus rhythm with complete LBBB (QRS: 180 ms) and a PR interval of 190 ms. The ECG showed severe LV systolic dysfunction with grade III diastolic dysfunction, LA: 45 mm, LVEF 17% (Simpson), LVEDD: 90 mm, LVESD: 83 mm, moderate MI, with signs of intraventricular dyssynchrony by tissue Doppler and delay in the contraction of the posterolateral wall of the

left ventricle (LV). The 24-hour Holter monitoring showed episodes of nonsustained ventricular tachycardia. Thus, he was referred for implantable cardioverter-defibrillator resynchronization (Concerto - Medtronic).

The procedure was started with an incision in the left chest region and by making a subcutaneous pocket. Soon after that, three left axillary vein punctures were performed. The defibrillation lead was positioned in the mid RV septal region. The coronary sinus was cannulated and an angiogram was performed, demonstrating the presence of a posterolateral branch, where the left ventricular electrode was positioned. The atrial lead was then positioned in the anterior wall of the RA. A defibrillation test was carried out through induction (shock on T) of ventricular fibrillation (VF) with a shock of 15, 25 and 35 J, without success, requiring external defibrillation (ED) with biphasic 200 J shock.

We chose to reposition the electrode in the inferior wall of the RV. A new defibrillation test was performed, without success, being necessary to use ED with 200 J. A new defibrillation test was performed with a reversed shock vector, once again without success. Given the impossibility of reversion with maximum load after several attempts, we decided to implant the electrode in the azygos vein. The axillary vein puncture was performed with a JL catheter, identified the azygos vein ostium, which is easily cannulated with a long 10 F sheath and a slight increase in the time of procedure (Figure 1).

A double defibrillation electrode – “coil” (Sprint Four - Medtronic) – was introduced into that vein and positioned posteriorly to the heart (Figure 2). The “coil” at the tip of the electrode of the RV, the distal “coil” of the azygos vein and the generator were programmed to perform a new test. Through VF induction, reversal was achieved only with 35 J. The patient showed stable improvement and was discharged after 36 hours. After 3 months of implantation, the patient has appropriate therapy (shock) by rapid ventricular tachycardia (VF zone).

Keywords

Defibrillators implantable; cardiomyopathy dilated; azygos vein; electrodes implanted

Discussion

Although it represents an effective therapy, the experience with ICD use has shown cases of SD due to ineffective defibrillation¹. The evaluation of the DFT has become a usual procedure during ICD implantation, with the DFT being defined as the lowest amount of energy delivered by the ICD to successfully resolve two episodes of induced VF. This can be measured by several techniques, and, ideally, there must be a safety margin of 10 J for

Mailing Address: Luiz Eduardo Montenegro Camanho •
Rua Soares Cabral, 47/402, Laranjeiras. Postal Code 22240-070,
Rio de Janeiro, RJ - Brazil
E-mail: luizemc@cardiol.br, lecamanho@globo.com
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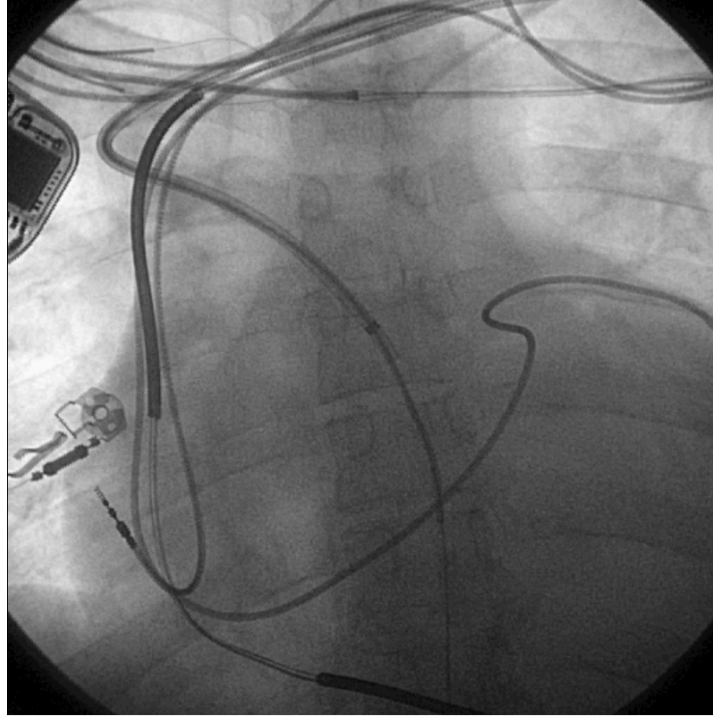


Figure 1 – Azygos vein cannulation.

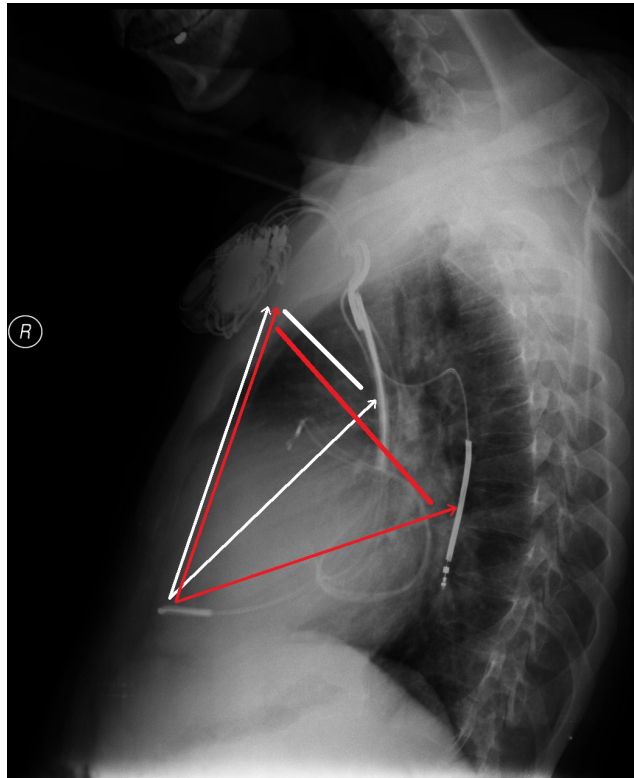


Figure 2 – Chest x-ray in profile (red arrows show a greater amount of "ventricular mass" with the electrode placed in the azygos vein, compared with the conventional lead position).

Case Report

defibrillation⁵. There are few published data that support the real need to obtain an adequate DFT, although it is desirable to achieve a satisfactory margin of safety.

Birnie et al.⁶ published a series of 19,067 patients submitted to ICD implantation, showing that 35 of these patients had prolonged cardiac arrest or cerebrovascular accident, of which 9 died or had neurological sequelae, representing a rate of complications of 0.18%. These data raise the concern of the need for routine defibrillation testing. The discussion focus on patients undergoing ICD implantation for primary prevention of SD related to LV dysfunction (patients with MADIT-II or SCD-HeFT criteria)⁷. For this profile of patients, it is particularly difficult to justify potentially lethal complications, although they are rare.

Several factors are associated with a high DFT, including large body surface area, nonischemic dilated cardiomyopathy, functional class III / IV (NYHA), reduced ejection fraction, previous therapy with amiodarone, implant on the right side, ischemia and hypoxia^{8,9}.

In 2004, Cesario et al.³ described the first case of implantation of an azygos vein defibrillation lead. The

improvement in defibrillation efficacy is likely to occur due to a posterior displacement of the shock vector, encompassing a larger myocardial mass. Cooper et al.⁴, in turn, published a series of nine cases of ICD implant positioning the defibrillation “coil” in azygos vein, being successful in 90% of implants.

We believe that the choice of implanting a defibrillation lead in the azygos vein should always be considered for cases with high DFT, as it is a technically feasible and safe procedure with a high probability of reducing DFT.

Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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Study Association

This study is not associated with any post-graduation program.

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