Epicardial Cardioverter Defibrillator Implantation due to Post-Fontan Ventricular Tachycardia

Abstract

Long-term survival of patients submitted to a Fontan procedure is reduced because of arrhythmias. Late post-Fontan ventricular tachycardia is extremely rare, but it can be fatal. Consequently, the implantation of an implantable cardioverter defibrillator may be required. The implantation of such a device after a Fontan operation can be rather difficult due to anatomic reasons that exclude transvenous approach. Epicardial ICD implantation is a treatment option for these patients. Transatrial approach, shock ICD coils placement in azygos vein or directly in the pericardium are possible alternatives. We hereby present a successful epicardial implantable cardioverter defibrillator implantation in a post-Fontan 39-year-old man suffering from ventricular tachycardia.

Keywords: Epicardial defibrillator, Fontan operation, implantable cardioverter defibrillator; ventricular arrhythmia

Introduction

In case of single-ventricle, Fontan operation is the surgical treatment of choice. Either early or late post-Fontan arrhythmias are frequently observed, but ventricular arrhythmias are rare, although fatal.[1] The latter may be amenable to cardioversion by an implantable cardioverter defibrillator (ICD).[2] However, the implantation of such a device after a Fontan operation can be rather difficult due to anatomic reasons that exclude transvenous approach. As a result, alternative methods for ICD implantation are required.[1]

Hereby, we present a 39-year-old patient in whom an epicardial ICD was implanted due to post-Fontan ventricular tachycardia.

Case History

A 39-year-old man was admitted to our emergency department due to palpitations. There was a history of a double inlet left ventricle operated in two stages. A bidirectional Glenn shunt or hemifontan operation through an intra-atrial lateral tunnel (ILT) had been performed 14 years later. Ventricular tachycardia (VT) with a 40% ejection fraction was detected. Provided that there was limited venous access for ICD implantation, epicardial implantation via median sternotomy and under general anesthesia was decided.

After troublesome harvesting of the epicardial surface of the heart due to stiff adhesions between the pericardial cavity and retrosternal space, a wide extent of the univentricular heart was exposed. Two unipolar epicardial pacing leads with spherical electrodes for pacing and sensing were secured by sutures [Figure 1a]. An epicardial defibrillation patch (model 6921 Medtronic, Minneapolis, MN) was secured to the surrounding tissue in a halo shape [Figure 1b]. Finally, a 6-cm incision was made in the left upper abdominal quadrant and a subcutaneous pocket to admit the defibrillator was created [Figure 2]. The postoperative course was uneventful and postoperative pain was controlled with paracetamol only. A consent publication form was asked and signed by the patient.

Discussion

Long-term survival of patients having been treated with a Fontan procedure is undermined because of arrhythmias. The frequency of arrhythmias after Fontan operation increases over time. The most common late post-Fontan arrhythmias are intra-atrial re-entrant tachycardia and sinus bradycardia. Late post-Fontan VT is extremely rare, but it can be fatal in post-Fontan patients.[1] Sudden
cardiac death, mainly because of ventricular arrhythmias, is a leading cause of death in patients with congenital heart disease.\textsuperscript{[2]} According to Oechslin’s \textit{et al.} multi-center cross-sectional study, 3.5\% of patients suffered from VT after a Fontan procedure.\textsuperscript{[3]} VT probably arise from surgical scars or pre-Fontan longstanding cyanosis and volume overload producing arrhythmogenic areas.\textsuperscript{[1]} The conventional transvenous approach for ICD implantation may be rather difficult in patients with congenital heart disease.\textsuperscript{[1,4]} After a Fontan operation has been performed, transvenous ICD implantation is either anatomically excluded due to tricuspid atresia or is not indicated because of non-functional right ventricle (presence of double inlet left ventricle). So, alternative methods are required.\textsuperscript{[1]} Epicardial ICD implantation is a treatment option for these patients, although it is associated to high operative risk due to the need for extensive harvesting of epicardial surface from firm adhesions. Moreover, it can be only performed under general anesthesia which adds more to the perioperative risk. However, the immediate postoperative course is usually uneventful requiring simple, usual analgesics for pain control. Transatrial approach, shock ICD coils placement in azygos vein or directly on the pericardium are possible alternatives.\textsuperscript{[4]} Finally, a wearable cardioverter-defibrillator can serve as a bridge before the application of a more permanent solution.\textsuperscript{[5]}

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\textbf{Declaration of patient consent}

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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\textbf{Conflicts of interest}

There are no conflicts of interest.

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