Atrial Flutter Following Orthotopic Heart Transplant Successfully Treated By Catheter Ablation

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ABSTRACT. We present a 26-year-old man with a history of dilated cardiomyopathy due to non-compact cardiomyopathy and functional class IV symptomatic heart failure who underwent a conventional Lower and Shumway orthotopic heart transplantation 3 years prior. He was hospitalized for grade 3A transplant rejection. Admission electrocardiogram showed atrial flutter (AFL) with variable atrioventricular conduction. A counterclockwise AFL with circular movement around the tricuspid annulus of the donor right atrium (dA) and a cycle length of 246 ms were diagnosed. Isthmus-dependent AFL was confirmed by entrainment technique.

During radiofrequency delivery, interruption of AFL was observed and the dA went into sinus rhythm. The receptor right atrium (rA) persisted in sinus rhythm dissociated from the dA, demonstrating bidirectional block between the two atria.

We continued performing radiofrequency lesions up to the level of the anastomosis. After that, bidirectional block at the cavotricuspid isthmus was verified by pacing. After 6 months of follow-up, the patient remained in sinus rhythm, with no arrhythmia recurrence.

KEYWORDS. atrial flutter, radiofrequency catheter ablation, orthotopic heart transplant.

Introduction

The development of supraventricular arrhythmias is a common finding in patients after heart transplantation, with a reported prevalence between 5% and 44%. The most common arrhythmias in this clinical setting are atrial fibrillation and atrial flutter (AFL) originating from the donor right atrium (dA). These arrhythmias are observed especially beyond the year of transplant. Radiofrequency catheter ablation of the AFL has proven to be the first-line therapy in patients with and without underlying heart disease. However, there are few reports in the literature about its effectiveness in patients following cardiac transplantation. This report describes a patient with post heart transplantation typical AFL, successfully treated with radiofrequency catheter ablation.

Case report

A 26-year-old man with a history of dilated cardiomyopathy due to non-compact cardiomyopathy and functional class IV symptomatic heart failure underwent a conventional Lower and Shumway orthotopic heart transplantation 3 years prior. Two and a half years later, he was hospitalized for grade 3A transplant rejection. Admission electrocardiogram (ECG) showed atrial flutter (AFL) with variable atrioventricular conduction (Figure 1). After discharge, the patient was referred to our outpatient clinic for electrophysiological study and catheter ablation.

Three catheters were transvenously inserted as follows: a 20-electrode catheter around the tricuspid annulus, a quadripolar catheter for the His region, and a 4-mm ablation catheter for radiofrequency delivery. Intracardiac recordings showed a counterclockwise AFL with circular movement around the tricuspid annulus of the donor right atrium (dA), and a cycle length of 246 ms (Figure 2a). Isthmus-dependent AFL was confirmed by the entrainment technique. In Figure 2a, it can be seen that the suture line behaves as an electrical barrier between the two atria, with the
receptor right atrium (rA) being in sinus rhythm, dissociated from the dA. The Halo catheter was then repositioned along the suture line. We made a line of radiofrequency ablation in the cavotricuspid isthmus of the dA, starting from the tricuspid valve and pulling back the ablation catheter toward the rA and the inferior vena cava of the recipient (Figure 3). During radiofrequency delivery, interruption of AFL was observed, and the dA went into sinus rhythm (Figure 2b). The rA persisted in sinus rhythm dissociated from the dA, demonstrating bidirectional block between the two atria. A progressive prolongation of the AFL cycle length (from 246 ms to 330 ms) was observed before conversion to sinus rhythm. We continued performing radiofrequency lesions up to the level of the anastomosis. After that, bidirectional block at the cavotricuspid isthmus was verified by pacing. After 6 months of follow-up, the patient remained in sinus rhythm, with no arrhythmia recurrence.

**Discussion**

Rhythm disturbances originating in the dA are the most prevalent arrhythmias in patients who receive a heart transplant. Although it is assumed that the rA remains electrically isolated from the dA, any atrial tachycardia or AFL in the rA may propagate toward the dA (via an electrical connection at the interatrial anastomosis) and may cause a clinical arrhythmia.\(^2\)\(^7\) However, in our patient, the atrial anastomosis was identified as an electrical barrier, showing dissociation of the dA and rA from the beginning of the procedure.

Reports from the literature on post-transplant typical AFL refer only to counterclockwise flutter, as in this case.\(^3\)\(^,\)\(^8\) There are no data about clockwise AFL in this kind of patient. The fact that in both native and transplanted hearts the AFL circuit has a prevailing counterclockwise fashion suggests that the posterior anatomical barrier may not be a determinant for its origin and maintenance.

Several authors have reported that transplant rejection is a predisposing factor for the development of AFL.\(^3\)\(^,\)\(^4\)\(^,\)\(^8\)\(^,\)\(^9\) In addition, the orthotopic cardiac transplantation with bivacal anastomosis is associated with less incidence of atrial arrhythmias than the interatrial anastomosis used in the Lower and Shumway technique.\(^3\)\(^,\)\(^10\) The clinical picture of our patient is consistent with these findings.

Despite the interatrial anastomosis generating a larger anatomic cavotricuspid isthmus, a significant portion of it belongs to the rA, which is not necessary for the maintenance of the AFL (Figure 3). The suture line constitutes the posterior barrier of the circuit in these patients, making the “electric” isthmus smaller than in native hearts. Therefore, it is not necessary to continue the radiofrequency line beyond the anastomosis. This feature contributes to a shorter ablation procedure with fewer radiofrequency lesions.\(^3\)\(^,\)\(^8\)

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**Figure 1:** Electrocardiogram shows atrial flutter with variable atrioventricular conduction and incomplete right bundle branch block.

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\(^2\) D Di Toro, C Hadid, A Stewart-Harris, et al.

\(^3\) The Journal of Innovations in Cardiac Rhythm Management, October 2010
Figure 2: (a) This tracing shows a counterclockwise activation sequence in the donor right atrium from the coronary sinus to Halo proximal and then to the Halo distal (arrow). (b) During radiofrequency delivery the atrial flutter is interrupted. The receptor right atrium is dissociated; we observed P waves blocked in the surface lead (asterisk).
This case demonstrates the effectiveness of radiofrequency ablation for the treatment of AFL occurring after heart transplantation.

References