

# Atrial Flutter Following Cardiac Transplantation Successfully Treated with Catheter Ablation

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## SUMMARY

Supraventricular arrhythmias are frequently found during follow-up of patients undergoing cardiac transplantation. Radiofrequency catheter ablation of atrial flutter has proved to be the treatment of choice in patients with and without underlying heart disease; however, there are few reports of the efficacy of this technique after cardiac transplantation.

We describe the case of a 26-year old male patient who developed atrial flutter during the follow-up of cardiac transplantation. The electrophysiology study revealed the presence of a typical, counterclockwise atrial flutter in the isthmus of the donor's right atrium. The recipient right atrium was in sinus rhythm with dissociation of electrical activity. Radiofrequency energy was delivered at the level of the right atrio-atrial suture line of the isthmus and the atrial flutter was interrupted. Both right atria remained in sinus rhythm, dissociated by bidirectional block at the level of the anastomosis.

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**Key words >** Atrial Flutter - Transplantation - Catheter Ablation

**Abbreviations >**

<b>AFL</b> Atrial flutter	<b>rRA</b> Recipient right atrium
<b>dRA</b> Donor right atrium	<b>ECG</b> Electrocardiogram

## BACKGROUND

Supraventricular arrhythmias are frequently found during follow-up of patients undergoing cardiac transplantation, with prevalence between 5% and 44%. (1, 2) Atrial fibrillation and typical atrial flutter (AFL) originating in donor right atrium (dRA) are the most common arrhythmias, especially one year after transplantation. (3, 4) Radiofrequency catheter ablation of AFL has proved to be the treatment of choice in patients with and without underlying heart disease; however, there are few reports of the efficacy of this technique after cardiac transplantation. (2, 3, 5, 6) We describe the case of a patient who developed a typical AFL after cardiac transplantation who was successfully treated with radiofrequency catheter ablation.

## CASE REPORT

A 26-year old male patient with a history of dilated cardiomyopathy due to noncompaction of the myocardium and class IV heart failure underwent cardiac orthotopic cardiac transplantation 3 years ago using the technique described by Lower and Shumway. Two years and a half later he was hospitalized due to grade 3A rejection; the ECG at admission showed AFL with

variable atrioventricular (AV) conduction (Figure 1). After discharge the patient was referred to our outpatient clinic to undergo electrophysiology study and catheter ablation.

A halo catheter was introduced via the femoral vein and positioned around the tricuspid annulus. A quadripolar catheter, which was positioned in the His bundle, and a 4-mm tip ablation catheter were introduced through the same route. The intracardiac electrograms show a counterclockwise AFL circuit around the tricuspid valve annulus of the donor right atrium (dRA) with a cycle length of 246 ms (Figure 2 A). The isthmus dependence of the AFL was confirmed using the entrainment technique. The same figure shows an electrically silent area in the anastomotic suture line between the donor and recipient RA. The recipient RA (rRA) in sinus rhythm is electrically dissociated from the donor dRA. The halo catheter was repositioned along the suture line and a radiofrequency linear lesion was created at the cavotricuspid isthmus of the dRA, starting from the tricuspid valve and continuing to the recipient RA and inferior vena cava (Figure 3). During the procedure, the AFL reverted to sinus rhythm in the dRA (See Figure 2 B). Post-ablation, dissociated sinus rhythm was present in the donor and the recipient RA as an evidence of bidirectional conduction block across

both atria. The AFL cycle progressively increased (from 246 ms to 330 ms) before the arrhythmia reverted. The radiofrequency ablation line was completed from the isthmus to the level of the anastomosis and bidirectional conduction block across the cavotricuspid isthmus was demonstrated. After 6 months of follow-up the patient remained in stable sinus rhythm and no recurrences were reported.

## DISCUSSION

Heart rhythm abnormalities are common in the transplanted heart, especially in the dRA. Although the rRA is in theory electrically isolated from the dRA, any tachyarrhythmia or AFL originated in the rRA may be conducted to the dRA across an electrical connection at the level of the right atrio-atrial anastomosis, resulting in a clinical arrhythmia. (2, 7) Yet, in the present case the atrio-atrial anastomosis behaved as an electrical barrier as both atria were dissociated since the beginning of the procedure.

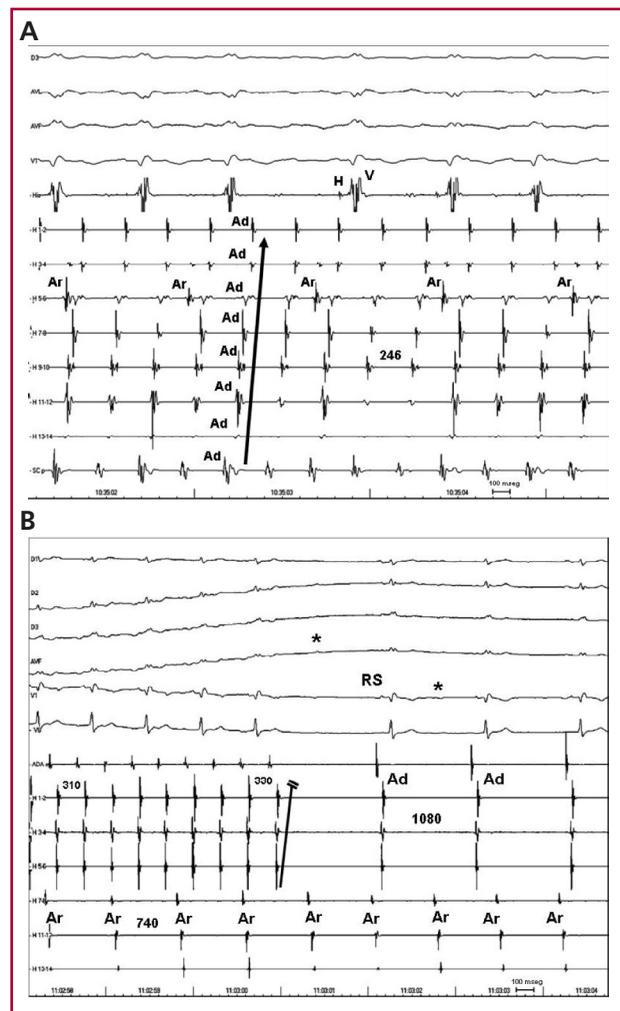
Previous studies have reported typical AFL involving a counterclockwise circuit in the transplanted heart as we found in our patient. (3, 8) Atrial flutters with clockwise circuits have not been reported in these patients. The fact that the counterclockwise circuit is more common in native hearts as well as in transplanted hearts suggests that the posterior anatomic barrier might not be a determinant to originate and maintain the circuit.

Several authors identified transplant rejection as a predisposing factor for AFL. (3, 4, 8, 9) On the other hand, orthotopic cardiac transplantation with bicaval anastomosis is associated with a lower incidence of supraventricular arrhythmias compared to conventional atrio-atrial anastomosis used in the Lower and Shumway procedure. (3, 10) The clinical picture of our patient is consistent with these findings.

Although the atrio-atrial anastomosis generates a greater cavotricuspid isthmus, an important portion of it corresponds to the rRA which is not necessary

to maintain the AFL (see Figure 3). The suture line constitutes the posterior barrier of the circuit in these patients. Therefore, the "electric" isthmus is smaller and it is not necessary to continue the radiofrequency ablation line beyond the anastomosis. In consequence, the procedure duration is shorter and less radiofrequency energy applications are needed. (3, 8)

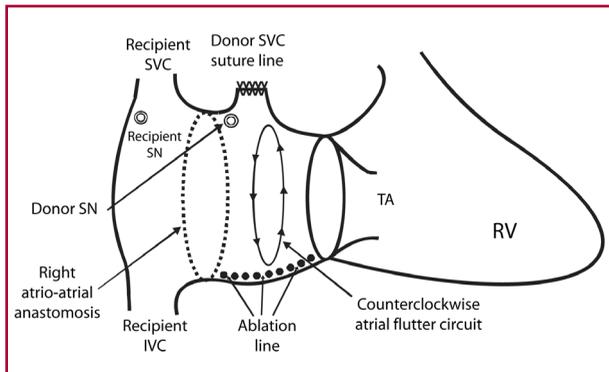
The present case demonstrates the efficacy of catheter radiofrequency ablation for the treatment of AFL after cardiac transplantation.



**Fig. 2. A.** Surface recordings (4 channels), intracardiac recording at the level of the His bundle (1 channel), potentials recorded from the halo catheter positioned around the tricuspid annulus labeled from H1-2 distally to H13-14 proximally (6 channels) and a coronary sinus ostium recording at 100 mm/s. A counterclockwise activation that originates in the dRA is observed from the atrial potential of the coronary sinus, the proximal dipoles of the halo catheter and finally the distal poles of halo catheter (arrow). **B.** Surface recordings (5 channels), high dRA recording (1 channel) and potentials recorded from the halo catheter along the anastomosis (6 channels, 3 proximally positioned in the proximal rRA and 3 distally positioned in the dRA) at a speed of 100 mm/s. The AFL is interrupted during radiofrequency energy application. The rRA remains dissociated; blocked P waves are seen in the surface recordings (\*).



**Fig. 1.** 12-lead electrocardiogram showing atrial flutter with variable AV conduction and incomplete right bundle-branch block.



**Fig. 3.** Schematic representation showing the right chambers in the orthotopic cardiac transplantation with the Lower and Sumway technique, the counterclockwise AFL circuit around the tricuspid annulus and radiofrequency lesions in the cavotricuspid isthmus. Note that radiofrequency energy was delivered from the tricuspid annulus to the level of the suture line and not beyond it to the inferior vena cava.

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