Catheter Ablation of Focal Atrial Tachycardia Originating From a Donor Heart After Bicaval Orthotopic Heart Transplantation Guided by a Noncontact Mapping System

Hitoshi Minamiguchi,1 MD, Hiroya Mizuno,2 MD, Masaharu Masuda,1 MD, Yasushi Sakata,1 MD, Shunsuke Saito,3 MD, Shinsuke Nanto,2 MD, Yoshiki Sawa,3 MD, and Issei Komuro,1 MD

Summary

A 19-year-old man who underwent bicaval orthotopic heart transplantation for idiopathic dilated cardiomyopathy complained of palpitations 2 weeks after the heart transplantation. An ECG revealed paroxysmal atrial tachycardia (AT) with a cycle length of 260 ms and the P wave morphology of the AT was similar to that during sinus rhythm. Echocardiography showed normal contraction. No rejection, vasculopathy, or infection was observed. An electrophysiologic study and catheter ablation guided by a noncontact mapping system were performed due to drug refractory AT. The AT was induced spontaneously by isoproterenol infusion. The activation sequence of the AT exhibited a focal pattern, and the breakout site of the AT into the donor right atrium was just 12 mm below the breakout site of the donor sinoatrial node. Radiofrequency catheter ablation eliminated this AT and resulted in an improvement in the symptoms. (Int Heart J 2012; 53: 146-148)

Key words: Atrial tachycardia, Bicaval orthotopic heart transplantation, Catheter ablation, Noncontact mapping system

Orthotopic heart transplantation is an established and effective therapy for end-stage heart disease. The bicaval anastomosis method better preserves normal right atrial anatomy and function, may minimize any sinoatrial (SA) node trauma, and minimizes the tachyarrhythmia events. However, we present here an interesting case in which paroxysmal focal AT originating from the donor RA was observed without any rejection, vasculopathy, or infection during the subacute phase after bicaval orthotopic heart transplantation and was successfully ablated guided by a noncontact mapping system.

Case Report

A 19-year-old man underwent a bicaval orthotopic heart transplant for idiopathic dilated cardiomyopathy. He had received immunosuppressant drugs and steroid therapy. He began complaining of palpitations 2 weeks after the transplant. An ECG revealed paroxysmal atrial tachycardia (AT) (Figure 1). The AT exhibited a sudden onset with physical activity and sudden termination. The morphology of the AT exhibited positive P waves in leads II, III, and aVF and was biphasic in lead V1. Echocardiography revealed normal contractions and there were no signs of rejection, vasculopathy, or infection. An electrophysiologic study and catheter ablation were performed due to AT refractory to drugs such as bisoprolol and verapamil. The AT was not induced by programming stimulation, however, an AT with a cycle length of 260 ms was spontaneously induced during isoproterenol infusion and was consistent with the clinical AT. The P wave of the AT was similar to that during sinus rhythm and overdrive atrial pacing and infusion of adenosine transiently suppressed the tachycardia (Figure 2). An Ensite Array was inserted into the right atrium (RA) and its geometry was created. The AT terminated while creating the RA geometry, however, the virtual activation sequence of the AT was recorded by the noncontact mapping system. The acti-
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Vibration sequence of the AT exhibited a focal pattern and the breakout site of the AT into the donor RA was just 12 mm below the breakout site of the SA node. Radiofrequency (RF) ablation was performed at the breakout site into the donor RA with a power setting of 25W and temperature setting of 50°C (Figure 3). After the RF ablation, the clinical AT could no longer be induced by isoproterenol infusion or programmed stimulation. His palpitations disappeared and he was discharged from our hospital. No AT recurrence has been observed during a 1-year follow-up period.

Discussion

Supraventricular arrhythmias are frequently encountered after an orthotopic heart transplantation. Their frequency was reported to be 12% to 17% of all orthotopic heart transplantation patients studied and 2.3% in the pediatric orthotopic heart transplantation population. Most of previously reported supraventricular tachycardias had a reentry mechanism involving substrates such as scars and pre-existing accessory pathways, or a dual atrioventricular nodal physiology in donor hearts. There are several reports of focal AT ablation after biatrial orthotopic heart transplantation. In most of these patients, the focal AT originated from the recipient atrium across the suture line. The bicalval anastomosis method better preserves normal right anatomy and function, and may minimize any SA node trauma or arrhythmic events in the donor heart. However, we experienced an interesting case of a focal AT originating from the donor RA. In general, focal AT originating from the donor RA has rarely been observed, except for in cases with an atrial insult such as rejection or ischemia. This case, however, had normal contraction and no signs of rejection including any cell-mediated immunity or humoral immunity, vasculopathy judged by coronary angiography and an intravascular ultrasound analysis, or infection.

The P wave morphology of the AT was similar to that during sinus rhythm, so the AT origin was thought to be near the SA node. For the following reasons, the clinical and electrophysiological features were most consistent with a mechanism involving abnormal automaticity. 1) The AT was drug resistant, 2) had a sudden onset and sudden termination, 3) was not induced by programming stimulation and was spontaneously induced by isoproterenol infusion, and 4) overdrive atrial pacing and adenosine infusion transiently suppressed the tachycardia.

Denervation of a transplanted heart leads to a loss of autonomic nervous system function, so inappropriate atrial tachycardia was most likely not the cause of this tachycardia. It is unclear whether or not this donor had a history of tachyarrhythmia during his lifetime, however, such an arrhythmogenicity may be concealed before cardiac transplantation and may appear after transplantation. The 3D mapping system has also been useful in patients after orthotopic cardiac transplantation and radiofrequency ablation can eliminate any AT successfully.

Acknowledgment

The authors wish to thank Mr. John Martin for editing the manuscript.

References


