CASE REPORTS

P-Wave Rejection in a Transplanted Heart

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Background: Heart block can occur at multiple levels in patients with prior cardiac transplant. This diagnosis is usually ascertained using the surface electrocardiogram.

Results: A 24-year-old man with prior cardiac transplant presented with apparent complete atrioventricular nodal block and junctional escape on the surface ECG. During pacemaker implantation, we demonstrated sinus rhythm in the recipient atrium, block across the atrioatrial anastomosis, and sinus arrest with intact AV nodal conduction in the donor atrium.

Conclusion: This case illustrates an unusual presentation of sinus arrest occurring 2 years after heart transplantation that appeared to be complete heart block.

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Following cardiac transplant, patients can exhibit several different conduction abnormalities, which include bundle branch block,¹ atrioatrial block at the native-donor anastomosis,² and rarely second- or third-degree atrioventricular (AV) block.³ We describe a case of apparent complete AV nodal block 2 years following heart transplantation that resulted from sinus rhythm in the residual recipient atrium with exit block at the atrioatrial anastomosis and sinus arrest in the donor heart.

CASE REPORT

A 24-year-old man underwent orthotopic cardiac transplantation nearly 3 years previously for refractory heart failure and dilated cardiomyopathy. Batrial anastomosis was utilized for connecting the recipient circulatory system to the donor heart. The postoperative course was characterized by acute cellular rejection and chronic cellular and vascular rejection based on prior coronary angiography and serial myocardial biopsies, likely a result of nonadherence with antirejection therapies. During a recent hospital admission, he required plasmapheresis, photopheresis, thymoglobulin, and intra-

venous immunoglobulin therapy to treat ISHLT Grade 3A cellular rejection and vascular rejection. The patient's baseline, posttransplant electrocardiogram (ECG) demonstrated sinus rhythm with right atrial enlargement, first-degree AV block, and right bundle branch block with left anterior fascicular block (Fig. 1). During an admission for volume overload and heart failure exacerbation, an ECG demonstrated an accelerated junctional rhythm with dissociated P waves (Fig. 2). Because of the apparent symptomatic AV block, a pacemaker lead (Medtronic model no. 3830, Medtronic Corp., Minneapolis, MN, USA) was inserted from the left axillary vein into the right atrium. Mapping in the right atrium established that the surface P waves originated from the native portion of the right atrium. The native atrial activity could be suppressed by overdrive pacing, with exit block across the atrioatrial anastomosis. The donor portion of the right atrium did not exhibit electrical activity. Extensive mapping of the donor atrium was required to identify a location with an adequate pacing threshold. An adequate atrial pacing site was finally located just inferior to the coronary sinus ostium, demonstrating atrial capture with

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Figure 1. Electrocardiogram at baseline demonstrating intact AV conduction.

Figure 2. Electrocardiogram demonstrating apparent complete AV nodal block.

Figure 3. Electrocardiogram demonstrating atrial pacing, ventricular tracking, and dissociated P waves.

conducted QRS complexes and entrance block into the native right atrium with persistence of surface ECG P waves. The reduction in PR interval with atrial pacing results from the lead location near the AV node. Insertion of a dual chamber pacemaker programmed to AAIR resulted in ventricular activation through the donor AV node (Fig. 3). A heart biopsy was performed indicating only ISHLT Grade I rejection. The patient's symptoms improved markedly following device implantation with restoration of AV synchrony, making this the likely culprit for the clinical deterioration. After 18 months of pacemaker follow-up, there remains no evidence of recovery of sinus node function despite continued immunosuppressive therapy and lack of further transplant rejection to date.

DISCUSSION

Atrioatrial conduction block is a well-documented phenomenon in patients with cardiac transplant, leading to the appearance of two dissociated P-wave morphologies on surface ECG. In the present case, atrioatrial conduction block in association with donor sinus arrest masqueraded as complete AV nodal block on surface ECG, leading to an inaccurate diagnosis. The mechanism for sinus arrest in this case was

due to acute chronic rejection of the transplanted heart leading to atrial fibrosis. The atrial fibrosis appeared to be extensive at the time of pacemaker implant as demonstrated by the inability to locate viable myocardium for adequate pacing thresholds. As expected, the residual recipient atrium was unaffected by this process and therefore the complete heart block diagnosis was made from the surface ECG. After intracardiac electrograms were obtained, it became obvious that the AV node was unaffected by the rejection. In retrospect, careful analysis of the echocardiogram demonstrated loss of donor atrial contractility that was present on prior studies. Therefore, in patients with prior cardiac transplant, interatrial conduction block with late donor sinus arrest should be considered as an unusual cause of AV dissociation and rejection.

REFERENCES

1. Marcus GM, Hoang KL, Hunt SA, et al. Prevalence, patterns of development, and prognosis of right bundle branch block in heart transplant recipients. *Am J Cardiol* 2006;98:1288-1290.
2. Cooper JA, Saeed IM, Moazami N, et al. Lost P's, but not yet forgotten. *Circulation* 2007;115:e41-e42.
3. Cui G, Kobashigawa J, Margarian A, et al. Causes of atrioventricular block after heart transplantation. *Transplantation* 2003;76:137-142.