Late atrial tachycardia originating from donor pulmonary vein in a double lung transplant recipient

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Introduction

Atrial arrhythmia (AA) early after lung transplantation is common. However, outside of these early events, late AA is rather infrequent. We present an unusual case of atrial tachycardia (AT) arising from the anastomotic region of the postsurgical left common pulmonary vein in a double lung transplant (DLT) recipient.

Case report

A 67-year-old white man with a history of end-stage idiopathic pulmonary fibrosis underwent a DLT in 2005, roughly 9 years prior to onset of his tachycardia. He had no prior history of arrhythmias or any other structural heart disease, but he experienced several episodes of palpitations resulting in multiple hospitalizations in the months leading up to his arrhythmia treatment. Electrocardiogram revealed a narrow-complex long RP tachycardia at 140 beats per minute (Figure 1). Transthoracic echocardiogram demonstrated normal atrial size and preserved ejection fraction. He failed initial management with rate-controlling agents and antiarrhythmic drugs. He underwent several cardioversions, which were unsuccessful at maintaining normal sinus rhythm. Therefore, the patient was referred for electrophysiological study (EPS) and ablation.

At baseline, the patient was in normal sinus rhythm with a cycle length of 854 ms. Tachycardia was induced with rapid atrial pacing. EPS confirmed the presence of a 1:1 AT. With 3-dimensional electroanatomical mapping using a PentaRay catheter (CARTO 3 version 4 software; Biosense Webster, Irwindale, California), the tachycardia was mapped to the posterior superior segment of the left common vein in an area of anastomotic scar (Figure 2). This region was remarkable for low-amplitude, mid-cycle potential, which is marked in the electrogram. The ablation site was based on early local activation signal. Coincidentally at that site, a discrete low-amplitude signal was noted that appeared to couple to local atrial activation potential. Radiofrequency ablation terminated this tachycardia immediately in this location. A second tachycardia was induced with a cycle length of 278 ms with variable atrioventricular block and eccentric coronary sinus activation. Repeat electroanatomic mapping of the tachycardia identified the tachycardia to be originating from a more inferior exit near the same region (Figure 3A). Double potentials were identified and low-voltage nearly continuous electrograms were identified at this region. These areas were targeted for ablation and were anchored to the previous ablation site and its surrounding scar (Figure 3B). Tachycardia again terminated. Postablation the patient had no inducible AAs with programmed electrical stimulation at baseline as well as on varying doses of isoproterenol. The patient has remained free of recurrent arrhythmia. He is closely followed as an outpatient and is free of antiarrhythmic medication.

Discussion

AAs are frequent early in the postoperative period following lung transplantation. Orrego et al[1] reported early postoperative incidence of atrial arrhythmias up to 25% and atrial fibrillation 18%. There is limited literature on long-term incidence, pathophysiology, and management of AAs in lung recipient patients. See et al[2] reported that late AA was extremely rare, occurring in a total of 4 patients in a single-center study of 127 patients. During lung transplantation, a cuff of donor atrial tissue surrounding the pulmonary vein is anastomosed with the left atrium of the recipient, creating an electrical and surgical block between the pulmonary veins and the atrial tissue. Given the presence of surgical pulmonary vein block, atrial fibrillation in DLT recipients is uncommon. In the study by Lee et al,[3] incidence of late AA following DLT was 0.5% compared to 12% in single lung transplant. Scar-related reentry has also been described in a variety of postsurgical or ablation procedures, including

KEYWORDS Atrial arrhythmia; Tachycardia; Lung transplant; Electrophysiological study; Radiofrequency ablation

ABBREVIATIONS AA = atrial arrhythmia; **AT** = atrial tachycardia; **DLT** = double lung transplant; **EPS** = electrophysiological study

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KEY TEACHING POINTS

- Atrial arrhythmia after double lung transplant is common. Atrial fibrillation is rarely encountered in double lung transplants but is rarely reported in late cases owing to creation of electrical block along the anastomosis between the donor pulmonary vein and recipient left atrium.
- Presence of the heterogeneous scar in these patients may allow for micro- and macroreentrant atrial arrhythmia, even relatively late. Conduction across anastomotic lines may be explained through bridging myocardium.
- Electrophysiological study and careful mapping is essential in localizing the site of origin and appropriate treatment.

surgically corrected congenital heart disease, heart transplant Maze procedure, and post–single lung transplant involving the pulmonary vein/left atrial anastomosis.[1,4,5] The surgical anastomosis site around the region of scar and fibrosis may predispose to areas of slow conduction and provide a suitable substrate for macroreentry, and resulting in AAs after DLT.[3,6]

Our patient had prolonged, low-amplitude double potentials arising from the anastomotic area of the left pulmonic vein, suggesting slow transit of atrial activity near, and possibly transiting, the anastomotic scar. The origin of AAs originating from the donor pulmonary vein and conduction across the suture line is rarely reported.[6,7] Conduction across the suture line could occur through growth of bridging myocardium.[6] Heterogeneous conduction properties would be expected in a milieu of postoperative scar, new tissue ingrowth, and donor and recipient native tissue. Conservative management with a combination of pharmacotherapy and electrical cardioversion is reasonable.[1,3] Patients who fail to respond to initial therapy may be suitable for ablation with these discussion points in mind.

Conclusion

This case is a rare presentation of AT originating from the donor pulmonary veins after lung transplantation with conduction crossing the anastomosis line. EPS,

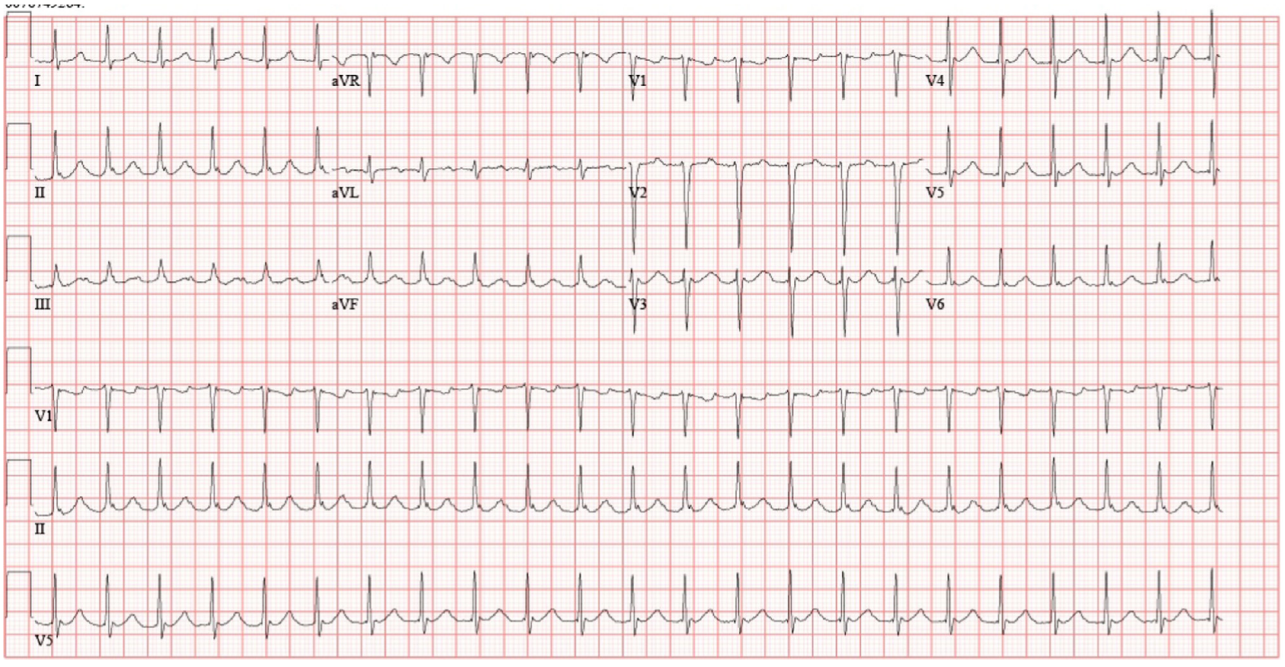

Figure 1 A 12-lead electrocardiogram revealing long RP atrial tachycardia.

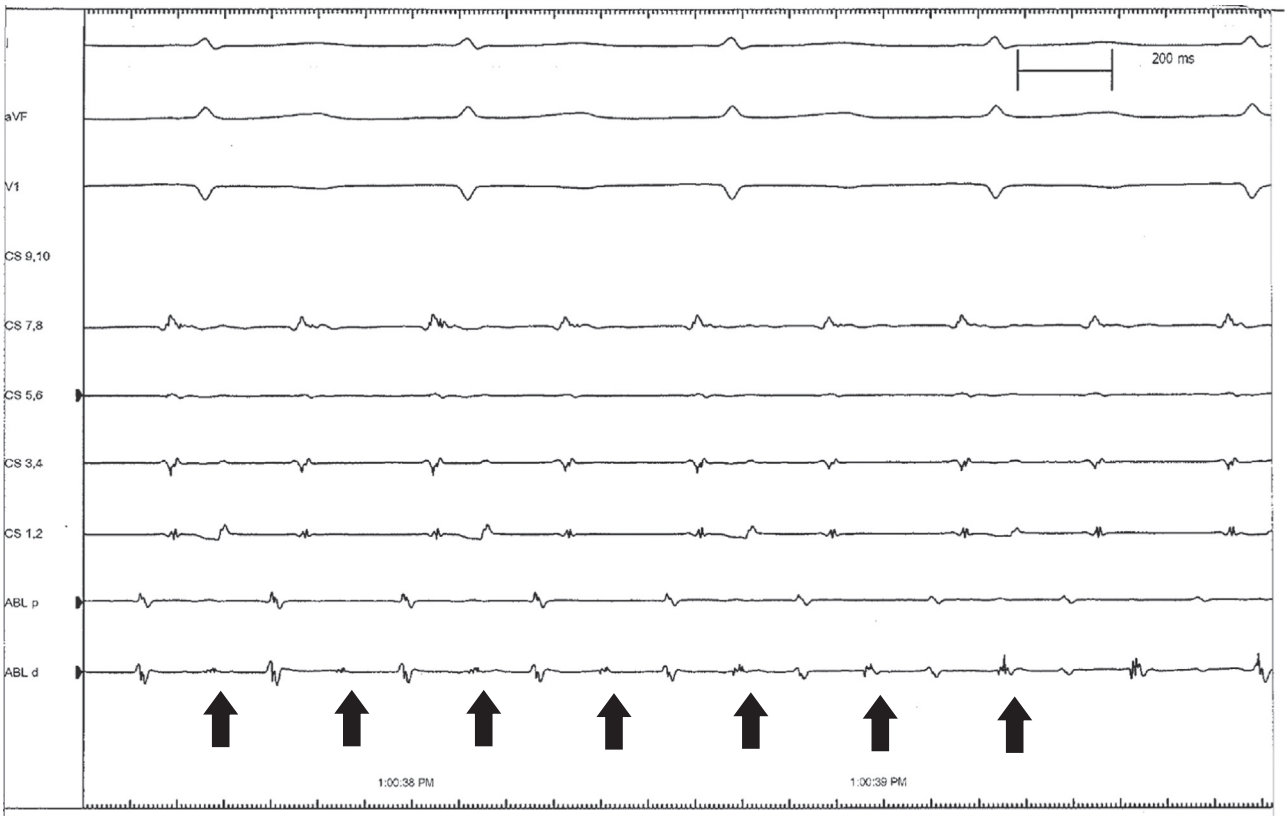

Figure 2 Electrogram revealing the mid-cycle potential.

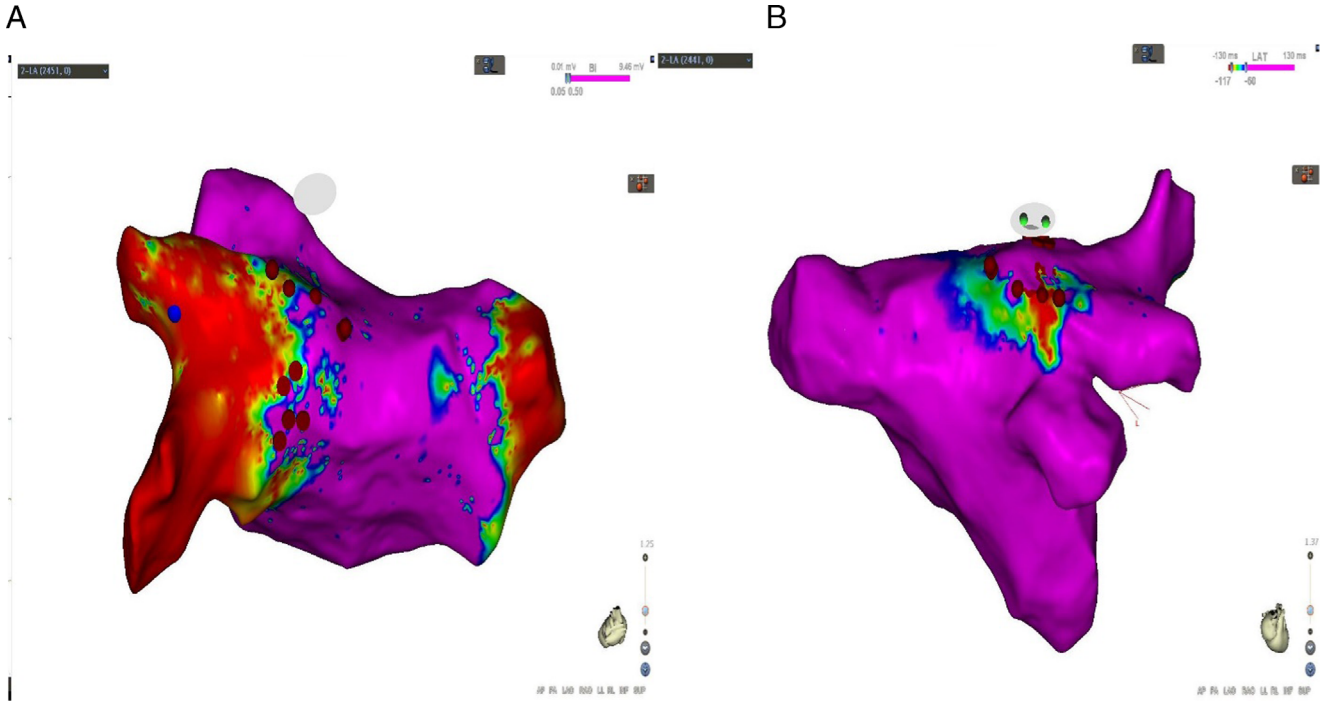

Figure 3 **A:** Activation sequence: Activation map of left atrial pulmonary vein anastomosis showing origin of atrial tachycardia. **B:** Voltage mapping: A bipolar voltage recording showing heterogeneous scar in the left pulmonary vein area.

electroanatomic mapping, and catheter ablation were critical in appropriate treatment.

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