A simplified technique for pulmonary artery aneurysm repair in a lung transplant recipient with right ventricular outflow tract obstruction

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Aneurysm of the pulmonary artery (PA) poses a technical dilemma at the time of lung transplant. Isolated reconstruction of the PA and heart–lung transplantation have been used.^{1–3} However, such options are often not appropriate in the face of right ventricular outflow tract (RVOT) obstruction, recoverable recipient right ventricular function, or unsuitable heart donors.

For the first time, we describe an en bloc RVOT–isolated lung transplant for a lung transplant recipient with congenital pulmonary valve disease and aneurysm of the PA. The rationale of this technique is to simplify repair of complex anatomy and to increase donor organ use.

CLINICAL SUMMARY

A 62-year-old man with a history of idiopathic pulmonary fibrosis, congenital pulmonic valve stenosis, and aneurysmal main and left PAs was placed on the waiting list for single left lung transplant at our institution because of se-

vere pulmonary fibrosis. Preoperative cardiac magnetic resonance imaging demonstrated a main PA diameter of 4.9×4.3 cm, a left PA diameter of 5.6×5.4 cm, and a right PA diameter of 2.3×2.2 cm (Figure 1). The pulmonic valve was dystrophic with a transvalvular peak gradient of 30 mm Hg. Biventricular systolic function was preserved and right heart catheterization revealed normal PA pressures. Pulmonary function testing revealed a total lung capacity of 42% of predicted, a room air PaO_2 of 48 mm Hg, and a diffusion capacity of 26% of predicted. Lung ventilation–perfusion scan showed a differential perfusion of 47% and 53% to the left and right lungs, respectively. When donor lungs became available, the patient underwent en bloc RVOT–isolated left lung transplant. The donor heart was not procured owing to depressed systolic function. Both lungs were assigned to our center.

The chest was entered via a median sternotomy, cardiopulmonary bypass was instituted via aorta–bicaval cannulation, and the operation was performed without cardiac arrest. The PAs were mobilized intrapericardially and extrapericardially and the left lung was removed. The donor lung was placed in the chest cavity and the donor bronchus was intussuscepted into the recipient's using a running 4-0 Maxon polyglycolic acid suture (United States Surgical Corporation, Norwalk, Conn). The left atrial cuff was then anastomosed using a running 5-0 polypropylene suture. The recipient's main PA was opened and all aneurysmal PA tissue, the pulmonary root, and part of the recipient RVOT were resected. The right ventricle was

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FIGURE 1. A and B, Preoperative cardiac magnetic resonance imaging. B, The right pulmonary artery is obscured by the left pulmonary artery. LPA, Left pulmonary artery; PA, pulmonary artery; RVOT, right ventricular outflow tract.

FIGURE 2. Completed RVOT, right pulmonary artery, left main stem bronchus, and left atrial anastomoses. RVOT, Right ventricular outflow tract; PA, pulmonary artery; MPA, main pulmonary artery.

vented to allow RVOT reconstruction on a beating heart. The donor RVOT myocardium was anastomosed to the recipient RVOT myocardium with a running 4-0 polypropylene suture in a double-layer fashion. The recipient's right PA was then anastomosed to the donor main PA in an end-to-side fashion using a running 6-0 polypropylene suture (Figure 2).

The patient was extubated on postoperative day 1 and discharged home on postoperative day 9 on room air. His only immediate postoperative complication was new-onset atrial fibrillation successfully treated with amiodarone. Six months postoperatively, transthoracic echocardiogram showed normal biventricular size and systolic function. Pulmonary valve shape, mobility, and transvalvular gradients were normal.

SUMMARY

Aneurysm of the PA in the setting of lung transplantation represents a technical conundrum. Aneurysmorrhaphy with reconstruction of the PA has been previously described.^{1,2} However, it is a complex procedure, may necessitate the use of prosthetic material, and requires

the presence of an anatomically and functionally intact PA root. Furthermore, heart–lung transplantation is indicated only in recipients of young age and with unrecoverable biventricular function. Pulmonary artery cryopreserved allografts are used for the repair of RVOT obstruction and have a 10-year survival of 50% to 90%;⁴ however, in contrast to fresh heart valves from transplanted hearts, they show severe degeneration early after implantation with loss of cell function. Most important, fresh heart valves from transplanted hearts appear to be unaffected by rejection.⁴ In our case, the donor heart was not being procured and the entire RVOT was available for harvest. Twenty-eight percent of multiorgan donors do not meet criteria for heart donation⁵ and yet the RVOT may still be safely transplanted, thereby providing a possible alternative to the issue of heart–lung block availability.

The key elements to guide PA reconstruction at the time of lung transplant are as follows: recipient age, cardiac function, integrity of the pulmonic valve, donor organ availability, and available length of donor PA or aorta for use as an interposition graft.

In conclusion, en bloc donor RVOT–lung allotransplantation is a technically efficient and effective procedure that provided good functional results in our patient and should therefore be considered as a surgical option in a lung transplant recipient with RVOT obstruction, PA aneurysm, and recoverable right ventricular function should the donor heart be unsuitable for transplantation.

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