Salvage Lung Retransplantation: En-Bloc Double Lung with Bronchial Artery Revascularization For Bronchial Dehiscence Related to Short Telomeres

Authors: James J. Yun MD PhD, Shinya Unai MD, Marie M. Budev DO MPH, Bala Anandamurthy MD, Francisco Almeida MD, Jason Turowski MD, Ken R. McCurry MD, Gosta Pettersson MD PhD

Affiliations:
1. Heart, Vascular, and Thoracic Institute, Cleveland Clinic, Cleveland, Ohio USA
2. Respiratory Institute, Cleveland Clinic, Cleveland, Ohio USA
3. Anesthesia Institute, Cleveland Clinic, Cleveland, Ohio USA

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Corresponding author:
James J. Yun, MD PhD
Heart Vascular and Thoracic Institute, Cleveland Clinic
J4-1, 9500 Euclid Avenue
Cleveland, OH USA 44195
Email: yunj@ccf.org
Office Phone (216) 445-7845
Fax: (216) 448-0377
ORCID #: https://orcid.org/0000-0003-2533-4253
Twitter: @JamesJYunMDPhD
Central Message

En-bloc double lung transplantation (DLTx) with bronchial artery revascularization (BAR) ensures normal airway healing (1). En-bloc DLTx retransplant with BAR was performed to salvage a patient with untreatable airway dehiscence after bilateral sequential LTx for interstitial lung disease (ILD) associated with short telomere syndrome. Donor lungs from a donation after cardiac death (DCD) donor were treated with ex vivo lung perfusion (EVLP). The patient subsequently also recovered from COVID-19 pneumonia. This is the first case of urgent en bloc DLTx with BAR using a DCD donor treated with EVLP.

Words: 89
Central Picture Legend:

Successful tracheal healing after urgent en bloc double lung transplant with BAR
**Introduction**

Cleveland Clinic and Texas Children’s Hospital offer lung transplantation (LTx) with bronchial artery revascularization (BAR) (1,2). Successful BAR is associated with normal airway healing, lower early biopsy rejection grade, and fewer pulmonary and bloodstream infections vs. non-BAR patients, but more reoperations for bleeding (1). Short telomeres are associated with airway complications after lung transplant (3). We present a case of salvage double LTx with BAR which successfully rescued bilateral bronchial dehiscence with broncho-pulmonary artery fistula in a patient with interstitial lung disease and short telomeres.

The Institutional Review Board (IRB) of Cleveland Clinic approved the study protocol and publication of data. The patient(s) provided informed written consent for the publication of the study data.

**Case Presentation**

53 year old male with short telomere syndrome (1st percentile), celiac disease, tobacco history, sleep apnea, and sinusitis diagnosed with idiopathic pulmonary fibrosis (IPF) underwent bilateral sequential LTx, using lungs from donation-after-cardiac-death (DCD) donor.

Bilateral bronchial necrosis, with right-sided dehiscence on day 14 required repeated bronchoscopy and stenting for necrotic debris and stenosis. Left bronchial stenosis dilatation day 92 caused brisk bleeding from a broncho-left pulmonary artery fistula, urgently managed with right lung intubation, left bronchial blocker, covered stent, left main pulmonary artery coiling, and veno-venous extracorporeal membrane oxygenation (VV-ECMO) established with percutaneous dual-lumen jugular vein cannulation. Over 4 days, bleeding ceased and VV-ECMO was weaned. Patient remained intubated, neurologically intact with preserved end organ function, and was listed for urgent retransplant with en-bloc DLTx and BAR.

**Methods**

The patient provided written consent for this case report. IRB review was not required according to institutional Cleveland Clinic guidelines.
DCD donor was identified after 10 days. Bilateral upper lobe edema prompted ex-vivo lung perfusion (EVLP); the lungs improved over 3 hours. A right intercosto-bronchial artery (RIBCA) and one left bronchial artery (LBA) were identified (3,4). Recipient was opened via sternotomy, left internal thoracic artery (LITA) harvested, and cardiopulmonary bypass initiated with aortic and bicaval cannulation. Significant pleural adhesions noted. After bilateral pneumonectomies, main bronchi were dissected out and trachea divided one ring above carina. Donor lungs were passed into respective pleural spaces. Anastomoses were performed in the following sequence: trachea, BAR, pulmonary veins, and pulmonary artery (5). Under cardioplegic cardiac arrest, LITA was anastomosed to LBA and RICBA orifices, therefore both identifiable bronchial arteries were revascularized with the LITA. Patient weaned from cardiopulmonary bypass with good cardiac/lung function and LITA flow.

Cardiopulmonary bypass time was 270 minutes, cardiac arrest 78 minutes. Cold ischemic time pre-EVLP 287 minutes, post-EVLP 450 minutes. 1389 ccs of cell saver and 7 units of red cells were given intraoperatively. Primary graft dysfunction scores were 2 at 24 hours, 1 at 48 hours, and 0 at 72 hours. No postoperative bleeding noted and pressors weaned off day 2. Patient self-extubated day 6, was on room air day 8, and discharged to rehabilitation on day 35. Successful BAR was confirmed with angiography (Video 1) and bronchoscopy confirmed normal airway healing (Video 2). Spirometry was normal.

Covid-19

Seventeen months after retransplant, readmitted with severe COVID-19 pneumonia, despite completing vaccination and booster series. Treatment included decadron, remdesivir, tracheostomy, and mechanical ventilation with paralysis and proning. Weaned after 30 days and discharged home after 63 days. Fourteen months after recovery currently on room air, FVC 4.09 (78%), FEV1 3.22 (79%).

Comments and Conclusions

The only alternative to deal with the bronchial anastomotic complications and fistula to the pulmonary artery was en-bloc DLTX with tracheal anastomosis and BAR. Short telomere syndrome is associated with high rates of bronchial dehiscence and stenosis (9.5-14%) after non-BAR lung transplantation (3) and transplanted lungs in these patients, in addition to patients
with other intractable mainstem bronchial or bronchus intermedius airway problems, may require BAR. Normal airway healing permitted recovery to hospital discharge, and from severe COVID-19 pneumonia.

Words: 631

References


Figure 1

Figure 1A: Bronchoscopy showing R mainstem bronchus airway ischemia and anastamotic dehiscence POD 17

Figure 1B: Bronchoscopy showing R mainstem bronchial stent in place POD 17
Figure 1C: Bronchoscopy showing L mainstem bronchial ischemia, airway necrosis, and dehiscence POD 37

Figure 1D: Bronchoscopy showing L mainstem bronchial stent in place POD 37
Figure 1E: Bronchoscopy showing L mainstem airway with endovascular coils visible after urgent pulmonary artery coiling POD #92
Figure 1F: Chest X Ray at Time=0 hours (Arrival to ICU)

Figure 1G: Chest X Ray at Time=72 hours
Videos:

Video 1
BAR angiogram showing patent LIMA to BAR anastomosis POD #25 after LTx with BAR.

Video 2
Bronchoscopy video demonstrating tracheal anastomosis POD #25 after LTx with BAR; anastomosis is healthy in appearance without evidence of airway ischemia.
Figure 1A: Bronchoscopy showing R mainstem bronchial ischemia, airway necrosis, and dehiscence POD #17

Figure 1B: Bronchoscopy showing R mainstem bronchial stent in place POD #17

Figure 1C: Bronchoscopy showing L mainstem bronchial ischemia, airway necrosis, and dehiscence POD #37

Figure 1D: Bronchoscopy showing L mainstem bronchial stent in place POD #37

Figure 1E: Bronchoscopy showing L mainstem airway with endovascular coils visible after urgent pulmonary artery coiling POD #92
Figure 1F: Chest X Ray at Time=0 Hrs postoperatively (Arrival to ICU)

Figure 1G: Chest X Ray at Time=72 Hrs postoperatively
Figure 2A: BAR Angiogram POD #25 after en bloc LTx with BAR showing patent LIMA->BAR anastomosis
Figure 2B: Bronchoscopy POD #25 after en bloc LTx with BAR showing well healed tracheal anastomosis