Anesthetic management of bilateral lung transplantation from donor lungs managed by the Organ Care System: a case report

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Introduction: Hypothermic storage solutions are the most commonly utilized method of preservation for transportation of donor lungs. However, the duration of “cold ischemia” can predispose to ischemia-reperfusion injury and can be associated with primary graft dysfunction and decreased long term survival. Normothermic ex vivo perfusion methods have been developed to improve long term outcomes. We present the first Organ Care System lung transplantation in the United States and its associated anesthetic management.

Case Presentation: A 57 year-old male with systemic sclerosis and nonspecific interstitial pneumonia with the development of pulmonary arterial hypertension presented for bilateral lung transplantation. Preoperative transthoracic echo revealed a left ventricular ejection fraction of 65%, with right ventricular systolic pressure between 109-116 mmHg. The patient was brought to the operating room where a radial arterial line was placed, and induction of general anesthesia, intubation, and placement of a right internal jugular central line and pulmonary artery catheter proceeded uneventfully. Inhaled nitric oxide was prior to incision. The donor lungs arrived on the OCS, which utilized a low-potassium dextran solution for perfusion via a pulsatile pump. Ventilation of the donor lungs was performed by the OCS with 5 cm H2O end-expiratory pressure and 6 mL/kg of donor bodyweight at 10 breaths a minute (See Figure 1). For explantation from the OCS, the lungs were arrested and flushed with a cold solution. Anastomosis of the lungs and weaning from cardiopulmonary bypass (CPB) proceeded uneventfully. First arterial gases post-CPB with a FiO2 of 21% showed a PaO2 56 mmHg and a PaCO2 of 33 mmHg. After chest closure, the patient was transported to the ICU intubated and in stable condition. He had an uncomplicated postoperative course, with extubation on post-operative day 1 and discharge home 10 days after surgery.

Discussion: While normothermic ex vivo perfusion strategies have been successful for lung transplantation in the past, the Organ Care System is the first portable system. A pilot study of 12 patients in Europe has demonstrated successful transplantation using the OCS, and our case reports the first lung transplantation using the OCS in the United States. It is well-established that prolonged ischemic time is an independent risk factor for primary graft dysfunction. As the OCS maintains normothermic perfusion and ventilation in the donor lungs, ischemic time is minimized and lung injury is decreased, allowing for improved initial and long-term graft function as well as overall patient outcomes. While still under evaluation in the United States, the OCS may allow for transplantation from remote harvest locations as well as from potentially marginal donors, providing an increased pool of donor lungs for an extensive recipient waiting list.