Bilateral pneumonectomies to treat uncontrolled sepsis in a patient awaiting a lung transplant

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Central Message

This case teaches us a lot about the effect of septic lungs on sepsis and about a creative use of dual extracorporeal membrane oxygenation systems, performed without complications. Bravo!

See Article page e67 in the April 2017 issue.

The case report from Dr Cypel of the Toronto lung transplant team¹ in the April 2017 issue of the *Journal* is most remarkable for its description of the effect of emergency bilateral pneumonectomies on a 32-year-old woman with sepsis and end-stage cystic fibrotic lung disease. Cypel and colleagues¹ performed the pneumonectomies in an attempt to control blood culture–positive septic shock caused by *Pseudomonas aeruginosa*. The patient's caregivers believed that her prognosis was grave because of her acute renal failure, her need for inotropes and vasopressors, and failure of venovenous ECMO at 7.0 L/min to support her respiration adequately. As Claudius reminds us, "Diseases desperate grown by desperate appliance are relieved" (*Hamlet*, Act IV, Scene 3). Cypel and colleagues¹ therefore pushed for the unique remedy of complete removal of the patient's lungs, the source of her infection. The patient was weaned from vasoactive support even before she left the operating room after the pneumonectomies. She showed progressive improvement during the next 6 days, at which time a successful bilateral lung transplant was performed. Four months after transplant, the patient is able to ambulate with normal, spontaneous ventilation on room air. She continues to require dialysis.

Most in the field would have delisted this candidate for transplant for fear of a poor outcome. Even if an emergency donor could be found, few would have predicted that bilateral pneumonectomies with tailored antibiotics could so rapidly control the systemic infection in this morbidly ill woman. The success of this approach undoubtedly also relates to the Toronto lung transplant team's extensive experience and broad expertise in both preoperative and postoperative care strategies. It is also certainly fortunate that a timely bilateral transplant could be performed before thoracic contraction, bronchial dehiscence, or empyema could occur within the empty pleural spaces.

In addition to the procedure itself, the Toronto team also reports the use of simultaneous dual ECMO systems to maintain the lungless patient. The first system included a typical centrally cannulated venoarterial ECMO circuit

with venous draw from the right atrium and arterial return to the ascending aorta. Because of the lack of an outflow from the left and right main pulmonary arteries, which had been stapled closed, there was concern that the right ventricle and pulmonary arteries would distend with blood, leading to ventricular failure. There was no pulmonary or tricuspid valvular insufficiency. A second, pumpless ECMO system (Novalung iLA; XENIOS AG, Heilbronn, Germany) was therefore added between the right pulmonary artery and the left atrium. Blood was driven from the pulmonary arteries across a low-resistance oxygenator into the left atrium by passively using the right ventricle as the "pump." The second ECMO system prevented excessive right ventricular afterload as a result of the stapled pulmonary arteries and eliminated static blood within the pulmonary arteries. At the flow rate used (2.5 L/min), the pressure drop between the inlet and outlet of the low-resistance oxygenator was likely no more than 15 mm Hg. This scheme worked to perfection for them. Pumpless, low flow through the novalung to the systemic circulation risks embolic complications. To counter this tendency, the Toronto team was careful to target 2.5 L/min through the novalung and the venoarterial ECMO system.

I do wonder whether a simpler approach might have been possible. During bilateral lung transplants, I often support the lungless patient on cardiopulmonary bypass or venoarterial ECMO with a multiholed right atrial venous draw catheter placed across the tricuspid valve. A pulmonary arterial vent could have been connected to the venous line. If the pulmonary artery was full, this might be a simplified solution. Furthermore, the

assumed stasis of right ventricular and pulmonary arterial blood would surely have led to thrombosis of static blood.

Reference

1. Cypel M, Waddell T, Singer LG, del Sorbo L, Fan E, Binnie M, et al. Bilateral pneumonectomy to treat uncontrolled sepsis in a patient awaiting lung transplantation. *J Thorac Cardiovasc Surg*. 2017;153:e67-9.