The Future of Lung Transplant

New Technology Aims to Expand Lung Donor Pool

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Currently, there are approximately 1,345 people listed for a lung transplant in the United States. Lung transplant is the last treatment option for patients with end-stage lung disease, such as cystic fibrosis, pulmonary fibrosis, chronic obstructive pulmonary disease (COPD) and pulmonary hypertension. Unfortunately, there are far more organ recipients than there are donated organs available. This is particularly true in lung transplant where only about 20-30% of donor lungs are utilized for lung transplant (Cypel et al., 2011). Potential organ donors can often be intubated for an extended period of time, which makes the lungs susceptible to damage from mechanical ventilation, infection, blood clots, and pulmonary edema. This results in a scarcity of viable lung transplant organs and, consequently, an approximate 30% waitlist mortality rate for lung transplant recipients (Garijo & Roscoe, 2020).

There have been many strategies trying to counteract the imbalance of available organs and recipients, one of which is the utilization of ex vivo lung perfusion (EVLP). EVLP is a technology developed to expand the lung donor pool (Garijo & Roscoe, 2020). EVLP mimics in vivo physiologic conditions by warming the donor lungs to near normal body temperature while continuing ex vivo lung perfusion and ventilation (Cypel et al., 2011). The lung transplant program at UC San Diego has been utilizing EVLP since early 2019 with the XVIVO Perfusion SystemTM (XPSTM), the first FDA approved device for EVLP. XPSTM is a closed circuit system that flushes the donor lungs with STEEN SolutionTM, which helps to preserve the lungs and eliminate waste products (Figure 1). The XPSTM system is valuable in that it can safely maintain the donor lungs outside of the body, thus enabling the transplant team to perform additional testing, including x-rays, CT scans, bronchoscopies, and arterial blood gases. This testing provides the surgeon and lung transplant team the opportunity to reassess the transplant suitability of the donor lungs.

The utilization of EVLP is a huge advancement in lung

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Figure 1.

transplantation. Due to the nature of organ transplantation, lungs are often retrieved before they have recovered from brain death or ventilator-associated injuries (Cypel et al., 2011). Currently, EVLP provides lung transplant teams the opportunity to continue to assess questionable and marginal lungs prior to placing them in a recipient (Van Raemdonck, Neyrinck, Cypel, & Keshavjee, 2015). In addition, one of the priorities of lung transplant is to minimize graft ischemic time. Prolonged graft ischemic time has been associated with post-transplant ischemia-reperfusion injury, primary graft failure, and increased risk of bronchiolitis obliterans syndrome (chronic rejection) (Hayes, Hartwig, Tobias, & Tumin, 2016). EVLP may help to reduce cold ischemic injury and time constraints, potentially allowing transplantation to become a more planned procedure (Van Raemdonck et al., 2015). This addition of time could potentially help a transplant recipient who requires longer travel time to the hospital, a crossmatch prior to transplantation, or would benefit from additional therapy or treatment prior to transplant. Finally, current research in lung transplantation focuses on utilizing EVLP to repair damaged donor lungs and make them transplantable (Van Raemdonck et al., 2015). This is an exciting prospect as it potentially enables lung transplant teams to use EVLP to repair injured lungs and convert unacceptable donor lungs to transplantable lungs, therefore maximizing the utilization of donor lungs while reducing waitlist mortality.

REFERENCES:

1. Cypel, M., Yeung, J. C., Liu, M., Anraku, M., Chen, F., Karolak, W., ... Keshavjee, S. (2011). Normothermic Ex Vivo Lung Perfusion in Clinical Lung Transplantation. New England Journal of Medicine, 364(15), 1431–1440. https://doi.org/10.1056/NEJMoa1014597

2. Hayes, D., Hartwig, M. G., Tobias, J. D., & Tumin, D. (2017). Lung Transplant Center Volume Ameliorates Adverse Influence of Prolonged Ischemic Time on Mortality. American Journal of Transplantation, 17(1), 218–226. https://doi.org/10.1111/ajt.13916

3. Moreno Garijo, J., & Roscoe, A. (2020). Ex-vivo lung perfusion: Current Opinion in Anaesthesiology, 33(1), 50–54. https://doi.org/10.1097/ACO.0000000000000804

4. Van Raemdonck, D., Neyrinck, A., Cypel, M., & Keshavjee, S. (2015). Ex-vivo lung perfusion. Transplant International, 28(6), 643–656. https://doi.org/10.1111/tri.12317

5. [Photograph of XPSTM The flexible comprehensive EVLP platform] (2020). Retrieved from https://www.xvivoperfusion.com/products/xps/