Limited Cumulative Center Experience with Ex-vivo Lung Perfusion is Associated with Inferior Outcomes After Lung Transplantation

Objective: Ex-vivo lung perfusion (EVLP) allows for prolonged preservation and evaluation/resuscitation of donor lungs. Data from specialized centers have demonstrated comparable outcomes between transplanting EVLP lungs and conventionally selected lungs. We evaluated the influence of center experience with EVLP on lung transplant outcomes.

Methods: From the United Network for Organ Sharing database, 9708 isolated adult lung transplants were identified (3/1/2018-3/1/2022), including 553 (5.7%) patients who received donor lungs after EVLP. Using the inflection point from the restricted cubic spline analysis, the total center volume of EVLP lung transplants during the study period was dichotomized into high (>15 cases) and low (1-15 cases). Adjusted comparisons of 1-year mortality were performed using multivariable Cox regression.

Results: Forty-one centers performed EVLP lung transplants (Figure 1A), including 26 low-volume and 15 high-volume EVLP centers (median volume 3, IQR 1-5 vs. 23, IQR 18-29 cases, p<0.001). Recipients at low-volume EVLP centers (n=109) had similar lung allocation scores (LAS) (39.8, IQR 34.9-48.6 vs. 38.9, IQR 34.7-53.2) and baseline comorbidities compared to those at high-volume centers (n=444) (all p>0.10). Low-volume centers had numerically more donation after circulatory death (DCD) donors (37.6% vs. 28.4%, p=0.06) with a lower P/F ratio (P/F ratio<300: 24.8% vs. 9.7%, p<0.001), and numerically they used more EVLP lungs perfused by external perfusion centers (30.3% vs. 27.5%, p=0.06). After EVLP lung transplants, low-volume centers had higher rates of extracorporeal membrane oxygenation requirement at 72 hours (24.8% vs. 15.5%, p=0.02) and inferior 1-year survival (77.6%, 95% CI 68.0-84.7 vs. 87.3%, 95% CI 83.5-90.2, Figure 1B, p=0.008), with a hazard ratio (HR) of 1.61 (95% CI 1.02-2.59) after adjusting for recipient age, race, LAS, pre-transplant dialysis, DCD donor, and annual lung transplant volume per center. When compared to non-EVLP lung transplants, outcomes of EVLP lung transplants were significantly worse at low-volume centers (adjusted HR 2.17, 95% CI 1.49-3.17) but similar at high-volume centers (adjusted HR 0.99, 95% CI 0.70-1.41).

Conclusion: Increasing center EVLP experience is associated with improved outcomes of lung transplantation using EVLP-perfused allografts. Organized transfer of knowledge to low-volume centers may help improve outcomes and broaden the adoption of EVLP.

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1A. EVLP Utilization Across Transplant Centers (3/1/2018-3/1/2022)

- EVLP
- No EVLP

1B. EVLP Lung Transplant Survival Stratified by Center EVLP Volume

Unadjusted HR 1.96, 95% CI 1.21-3.18
Adjusted HR 1.61, 95% CI 1.02-2.59
Logrank p=0.0077