Lung transplantation from donation after brain death (DBD) donors on extra-corporeal support. A case series from the ESTS Lung Transplantation Working Group

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OBJECTIVES

In recent years, the use of extracorporeal membrane oxygenation (ECMO) support is increasing in critically ill patients. Lung recovery from donors on ECMO may counteract the donor pool shortage. However, this kind of donor remains a major challenge when assessing organ donor quality, namely the lung; also, in this setting pulmonary grafts could suffer from flow diversion. There is very little evidence in literature about outcomes in case of donors supported by ECMO. Aim of this study was to analyse data on procurement, transplantation and outcomes in lung recipients from donors after neurological determination of death (DBD) on ECMO.

METHODS

Members of the ESTS Lung Transplantation Working Group were invited to collect data of patients transplanted with organs from DBD-ECMO donors. Data were gathered in a single anonymized database and described by basic statistics.

RESULTS

Seven patients were transplanted with grafts from DBD-ECMO donors by 3 European centres (September 2013-October 2019). The table reports procurement, transplantation and outcome variables. All donors were supported with ECMO for cardiovascular reasons; the median duration of the support was 50 hours. Most donors had a clear chest x-ray and 6 out of 7 never smoked. Four recipients needed a bridge to transplant. Six recipients had bilateral transplantation; 30-day mortality was nil. Median follow-up was 9 months. Two patients died 2 and 42 months after surgery, respectively; the first one, a particularly complex case, underwent single lung re-transplantation after prolonged ECMO bridge.

CONCLUSIONS

In our multicentre case series, the outcomes of using DBD-ECMO donors seem encouraging, despite the high prevalence of complex recipients and the challenging assessment of donor lungs. Our results advocate a more systematic consideration of DBD-ECMO as potential donors, although these findings need to be confirmed in larger series compared to standard donors.

Donor	
ECMO indication	
Cardiac arrest	5
Cardiogenic shock	2
Acute respiratory distress	0
Bridge to organ retrieval	0
ECMO type, veno-arterial	7
ECMO duration (median, hours)	50 (40-79)*
Sex, male	6
Age (mean, years)	49 (10)
BMI (mean, Kg/m^2)	28 (4)
Cause of brain death	
Anoxia	4
Trauma	0
Vascular	2
Other	1
Mechanical ventilation (median, days)	2 (2-4)
Smoking habit, never smoker	6
Chest X-ray	
Clear	4
Minor opacity	2
Opacity £1 lobe	0
Opacity >1 lobe	1
Secretions at bronchoscopy	
None	5
Minor	0
Moderate	2
Major	0
Medical history, previous cardiac surgery	4
Organs retrieved	
Only lung	2
Lung+abdominal organs	5
Lung+heart	0
Lung+heart+abdominal organs	0

Transplantation	
Machine perfusion evaluation	
Yes, EVLP	3
Not used	1
Not known	3
Cold ischemia time (mean, minutes)	
First lung	367 (163)
Second lung	556 (184)*
Type, bilateral	6
Intraoperative ECMO [VA/VV]	4 [2/2]
Recipient	
Sex, male	4
Age (mean, years)	38 (14)
Indication	
Cystic fibrosis	3
COPD	2
Interstitial lung disease	1
Pulmonary vascular disease	1
Bridge to transplantation	
Yes, ECMO [VA/VV]	3 [1/2]
Yes, MV	1
Bridge duration (median, days)	17 (4-59)
$PGD_{(72h)}$ grade 3	3
Post-operative MV duration (median, days)	2 (1-4)
Post-operative ECMO [VA/VV]	3 [1/2]
Post-operative ECMO duration (median, days)	4 (2.5-13)*
ICU stay (median, days)	5 (4-21)
Hospital length of stay (mean, days)	35 (0.13)
30-days mortality	0
Best FEV1 (median, %)	97 (89-105)*
Airway complications	0
CLAD	3
Re-transplantation	0

ECMO, extra-corporeal membrane oxygenation; BMI, body mass index; EVLP, ex-vivo lung perfusion; VA, veno-arterial; VV, veno-venous; COPD, chronic obstructive pulmonary disease; MV, mechanical ventilation; $PGD_{(72h)}$, primary graft dysfunction in the first 72 hours after transplantation; ICU, intensive care unit; FEV1, forced expiratory volume in the 1st second; CLAD, chronic lung allograft dysfunction, *one missing data; °re-transplantation