Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

post-transplant hospital length of stay. Median time post-transplant was 212 days for the C cohort and 154 days for the NC cohort; survival was 100% for both groups at follow up.

Conclusion: For patients with COVID-19 ARDS, ECMO is a useful bridge to transplant to mitigate complications associated with prolonged mechanical ventilation. These preliminary data suggest prolonged periods of ECMO pre-transplant do not result in significant adverse events post-transplant. Additional analyses of graft function and survival at 6 and 12 months are ongoing.

	COVID-19 (n = 7)	nonCOVID-19 (n = 11)
Age (y)	47.1 ± 10.0	55.4 ± 9.3
LAS at transplant	88.4 ± 1.1	88.2 ± 2.6
Total duration ECMO (d)	85.4 ± 53.5	14.5 ± 12.9
Total ischemia time, L lung (min)	317.5 ±162.3	296.4 ± 69.9
Total ischemia time, R lung (min)	381.7 ± 162.5	367.4 ± 74.0
Total LOS (d)	100.6 ± 23.4	81.4 ± 36.1
Post-transplant LOS (d)	49.6 ± 13.1	54.1 ± 28.4
Post-transplant ICU LOS (d)	39.7 ± 71.7	13.0 ± 6.8

Table 1. Comparison of baseline characteristics and outcomes of COVID-19 vs nonCOVID-19 lung transplant recipients. Values shown are average ± standard deviation.

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A Comparison of Short-Term Morbidity and Mortality Among Inpatient Lung Transplant Recipients Transplanted for COVID-19 and Other Restrictive Lung Diseases

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Purpose: Patients with respiratory failure (RF) who are hospitalized at the time of lung transplant (LTx) have higher post-LTx morbidity and mortality than those who are well enough to remain at home. Complications may be even worse in patients transplanted for COVID-19 (C19), as they are commonly critically ill having endured prolonged mechanical ventilation, ECMO support, myopathy, malnutrition, and superimposed infections. In a retrospective cohort study, we compared inpatient lung transplant recipients (LTxRs) transplanted for C19 vs. other underlying restrictive lung diseases (RLDs)

Methods: After IRB approval, patients who underwent inpatient LTx between 1/1/2014 and 8/31/2021 were categorized by indication: C19 or RLD. We excluded LTxRs <18 years old, a primary indication for LTx other than UNOS disease group D, and redo LTx. Primary outcomes were postoperative morbidity and 90-day survival.

Results: Out of 163 inpatient LTxRs, 141 met inclusion criteria: 11 (7.8%) with C19 and 130 (92.2%) with RLD. LTxRs with C19 were younger, had a longer pre-LTx hospital stay, and more likely needed pre-LTx mechanical ventilation and ECMO support. LTxRs with C19 were also more likely to have severe adhesions intraoperatively and their chest was more commonly left open after LTx due to a perceived risk of ongoing bleeding. In addition, LTxRs with C19 had a higher prevalence of PGD3 at 72 hours and longer post-LTx hospital stays and trended toward longer post-LTx mechanical ventilation and need for inpatient rehabilitation. The 2 groups had similar 90-day survival (C19, 100% vs. RLD, 95.4%, p=0.472), however, LTxRs with C19 had a higher incidence of acute cellular rejection and DSA production (>2,000 MFI) within 6 months of transplant.

Conclusion: LTxRs with C19 are typically sicker and have more post-LTx complications than LTxRs with RLD hospitalized at the time of LTx. However, 90-day survival is comparable and high in both groups. Long-term follow-up is needed.

Table 1. Baseline characteristics and perioperative and follow-up outcomes by study groups

Variable	Inpatient LTx for C19 (n=11)	Inpatient LTx for RLD (n=130)	p-value$^{\Omega}$
Baseline			
Male sex	9 (81.8)	108 (71.1)	0.444
Age (years)†	47 (42.5, 56.7)	61.6 (54.8, 67.8)	**0.009**
Body mass index at listing (kg/m^2)†	28.9 (25.3, 30.2)	26.1 (22.6, 29.7)	0.358
Lung allocation score†	84.5 (46.5, 88.5)	76.5 (52.8, 86.9)	0.643
Duration from initial hospitalization to LTx (days)†	100 (85, 121)	15 (9, 22)	**<0.001**
Pre-transplant			
Mechanical ventilation before LTx	10 (90.0)	57 (37.5)	**0.001**
Life support (vasopressors) before LTx	7 (70.0)	63 (41.4)	0.077
ECMO	8 (72.7)	42 (27.6)	**0.002**
Dialysis between listing and LTx	1 (9.1)	4 (2.6)	0.230
mPAP (mmHg)†	25.5 (22, 36.5)	26 (20, 34)	0.877
PCWP (mmHg)†	11 (8, 16)	10 (6, 14)	0.453
Cardiac output (L/min)†	7.35 (6.3, 8.7)	5.5 (4.8, 6.7)	**0.012**
Intraoperative			
CPB/ECMO	7 (63.6)	65 (58.0)	0.719
Bleeding	2 (18.2)	35 (31.3)	0.367
Severe adhesions	8 (72.7)	33 (29.5)	**0.004**
Ischemia time, right lung (minutes)†	250.5 (214, 368)	275 (216, 318)	0.944
Ischemia time, left lung (minutes)†	221.5 (170, 297)	241 (203, 306)	0.737
Perioperative			
Duration of mechanical ventilation			0.082
<48 hours	0 (0.0)	63 (41.4)	
48 hours – 5 days	3 (27.3)	25 (16.4)	
>5 days	8 (72.7)	60 (39.5)	
Ventilator support, duration unknown	0 (0.0)	3 (2.0)	
Unknown	0 (0.0)	1 (0.7)	
Chest left open	8 (72.7)	11 (37.9)	**0.049**
Inhaled nitric oxide at 72 hours post-transplant	4 (40.0)	13 (10.3)	**0.006**
Dialysis prior to discharge	2 (18.2)	14 (9.3)	0.339
30-day readmission	2 (20.0)	34 (31.8)	0.432
Discharge disposition			0.076
Home	0 (0.0)	52 (34.2)	
Skilled nursing facility	0 (0.0)	3 (2.0)	
Acute rehabilitation	11 (100.0)	92 (60.5)	
Death	0 (0.0)	5 (3.3)	
Duration of hospital stay (days) †	47 (26, 61)	23 (14, 39)	**0.002**
Blood products transfused during first 2 weeks, total†	11 (8, 17)	8 (2, 25)	0.613
Packed red blood cells	5 (3, 8)	3 (1.5, 6)	0.134
Fresh frozen plasma	4 (2, 8)	3 (0, 5)	0.132
Platelets	2 (1, 2)	1 (0, 2)	0.342
Follow-up outcomes			
ACR grade A2 in 6 months	4 (40.0)	11 (10.3)	**0.017**
De novo DSA>2000 MFI in 6 months	7 (63.6)	15 (18.5)	**0.001**
ACR events in 6 months, total†	1 (0, 1)	0 (0, 1)	0.143
≥1-year outcomes			
De novo DSA >2000 MFI within 1 year	N/A	17 (11.2)	N/A
ACR events, total†	N/A	0 (0, 1)	N/A

Data expressed as count (percentage) unless otherwise specified; †, data expressed as median (interquartile range); Ω, unavailable data was excluded from analysis. ACR, acute cellular rejection; C19, COVID-19; CPB, cardiopulmonary bypass; DSA, donor-specific antibodies; ECMO, extracorporeal membrane oxygenation; LTx, lung transplant; MFI, mean fluorescence intensity; mPAP, mean pulmonary arterial pressure; N/A, not available; PCWP, pulmonary capillary wedge pressure; RLD, restrictive lung disease.

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Airway Complications After Lung Transplant for Post Coronaviral Disease (COVID-19) Acute Respiratory Distress Syndrome (ARDS) Related End Stage Lung Disease: Single Centre Experience

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Purpose: Severe COVID-19 ARDS related end stage lung fibrosis with irreversible changes is a newer indication for lung transplantation with acceptable survival rate. Airway complication post lung transplant is a major source of morbidity and mortality with incidence as high as 25 to 49 percent. Patients with end stage COVID-19 fibrosis are likely to be clinically deconditioned with long duration of extracorporeal oxygenator (ECMO) support, high burden of sepsis and prolonged respiratory support which may affect the airways post lung transplantation.

Methods: This is a retrospective observational study after obtaining institutional ethical clearance. We reviewed electronic medical data of patients who underwent lung transplantation for post COVID-19 ARDS related fibrosis. We evaluated the incidence and type of airway complications and the various therapeutic interventions applied for its management.

Results: Between May 2020 and September 2021 our centre performed 23 bilateral lung transplants for end stage COVID-19 ARDS related fibrosis. 22 patients were on ECMO support with mean duration of 50.9 days before transplantation. All patients underwent lung transplantation with central Veno-Arterial ECMO support with mean organ ischaemia time of 360± 154 minutes. The incidence of airway complication in our study group was 56%. We observed anastomotic narrowing in 3(13%), distal airway narrowing in 4(17%) and sloughing/coating of anastomotic site in 5(22%) patients. Nonspecific inflammatory polypi around the bronchial anastomotic site were noticed in 4(17%) and mild airway anastomotic dehiscence in 2 subjects. 8(34%) patients required serial bronchoscopy and balloon

dilatation; 2 among them mandated additional cautery usage. 2 cases underwent polypectomy, further 4 subjects needed bronchial stent placement. 5 (21%) recipients were discharged with Tracheostomy while rest were successfully decannulated in the ward.

Conclusion: We observed a high incidence of airway complications in post lung transplant for COVID-19 ARDS related fibrosis. Early detection, timely management and serial follow up is of paramount importance in this subset of patients.

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CARE Score on Chest Radiograph at Diagnosis Predicts Early and Late Outcomes Among Lung Transplant Patients with COVID-19

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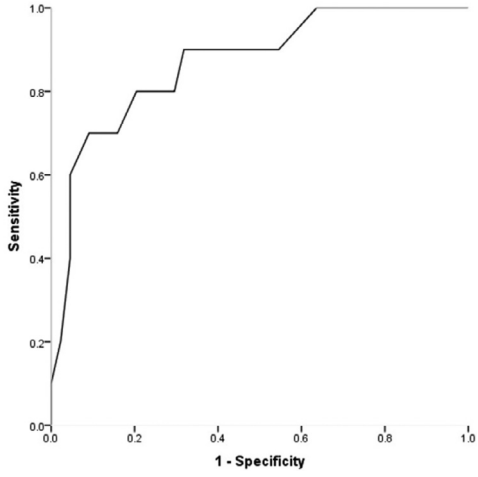
Purpose: To assess the ability of an objective radiographic scoring system to predict outcomes among lung transplant (LT) patients with Coronavirus disease 2019 (COVID-19).

Methods: We included all LT patients diagnosed with COVID-19 during a one-year period (March 2020 to Feb 2021; n=54; median age: 60, 20-73 years; M:F 37:17) in our program. Patient characteristics and laboratory values during the acute illness were reviewed. Chest radiographs at time of COVID-19 diagnosis were scored by extent of ground-glass opacity and consolidation using the CARE score (0-18 for each lung). The CARE score was calculated using only the allograft in single LT and the average of both lungs in bilateral LT. Primary outcome was six-month survival after COVID-19. Hospital complications and one-month survival were secondary outcomes.

Results: A minority of patients had a clear allograft (CARE=0, n=12, 22.2%) at presentation. The median score was 2 (interquartile range 0.5-4.625), indicating mild abnormalities. Demographics, underlying diagnosis, comorbidities, symptoms, and spirometry changes were not associated with the baseline CARE score. Baseline CARE score >5 was strongly associated with development of respiratory failure (91.7% vs 35.7%; OR, 95% CI: 19.8, 2.3-168.7; p=0.001), ICU admission (p<0.001), need for ventilator support (p<0.001), and one-month mortality (41.7% vs 2.4%; OR, 95% CI: 29.4, 2.96-333.3; p=0.001). Overall six-month survival was 81.5%. The CARE score was significantly higher among non-survivors (7.7±4.1 vs 2.2±2.7; p=0.002). Patients with a CARE score>5 at diagnosis were significantly less likely to survive at six-month follow-up (41.7%. vs 92.3%; p<0.001). The CARE score had an excellent area under the curve (86.8%, 74.4%-99.2%; p<0.001) on the Receiver operating characteristic curve for predicting six-month survival after COVID-19.

Conclusion: The CARE score at time of COVID-19 diagnosis provides useful prognostic information among patients with LT.

Figure



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Autoantibodies and Severity of COVID-19 in Lung Transplant Recipients

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Purpose: COVID-19 in lung transplant recipients (LTR) results in case-fatality rate of 10-46%. Disease severity is variable and it is unclear why certain groups of patients develop severe disease. Recent report suggests that 10% of patients with life threatening COVID-19 have auto-antibodies (AAbs) against type 1 interferons (IFN-1) but very few describe their impact in LTR. We therefore sought to identify AAbs in LTR with COVID-19 by using a customized proteomic microarray (CPM) bearing 120 antigens.

Methods: We retrieved samples collected for routine care within 3 months prior to and after diagnosis of COVID-19 of 13 LTR. IgA and IgG AAbs were analyzed using CPM. Predefined antibody score (ab-score) was used for downstream analysis. COVID severity was defined as per center for disease control guidelines. Changes in ab-scores from pre- to post-COVID were assessed via Wilcoxon signed-rank tests; association between continuous variables and AAbs using Spearman's correlation. Linear mixed-effects models were used to analyze the association between changes in AAbs pre- to post-COVID and COVID severity.

Results: Among 13 LTR COVID severity was moderate (n=6), severe (n=4) and critical (n=3). Levels of 76 IgA antibodies and 9 IgG antibodies increased between pre and post covid samples (FDR adjusted p<0.05). In exploratory analysis, antibody response over time for one IgA antibody (IgA Nucleosome) and four IgG AAbs correlated with higher COVID severity (unadjusted p<0.05). IFN lambda is an antiviral cytokine and AAbs to it correlated with COVID severity (p=0.031). Such AAbs are shown to block the ability to block SARS-CoV-2 in vitro. No significant differences were observed in antibody response in the groups who were alive (n=9) versus deceased (n=4) and three inflammatory markers, ferritin, D dimer and absolute lymphocyte count.

Conclusion: Change in antibody response of five AAbs correlated with COVID severity in a small group of LTR. The results of this study are considered exploratory and need further validation.