Long-Term Utilization, Experience, and Outcomes of COVID-19 Positive Donors for Heart Transplantation.

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Introduction

In early 2021, the ISHLT discouraged the use of COVID-19 + donor hearts due to concerns over SARS-CoV-2 transmission and viral-mediated cardiac injury.

Since then, emerging evidence have reported safe use of COVID-19 + hearts with similar rates of 30-day survival, acute graft failure, and respiratory causes of death compared to recipients of COVID-19 – hearts.

As COVID-19 transitions from a pandemic to an endemic respiratory virus, we must continue to evaluate COVID-19 + donors for heart transplantation (HT) to increase the donor pool and ensure safe and effective outcomes to the recipients.

We aim to analyze the long-term utilization and outcomes of COVID-19 + donors for HT and test the hypothesis regarding the impact of increased experience (with time) on recipient outcomes after COVID-19 + donor HT.

Methods

Identified adult patients (≥ 18yo) listed for first-time HT in the US from 1/1/2020 to 9/30/2024.

Recipients were stratified based on their matched donor COVID-19 status: COVID-19 + vs. –.

COVID-19 positivity was defined as having a positive nucleic acid test (NAT) or antigen test within 7 days of organ donation/death/HT.

Groups were then 3:1 nearest-neighbor propensity score matched (PSM) without replacement.

Era based comparisons were made to assess the impact of increased experience with COVID-19 + donor HT: 1/1/2020 – 12/31/2021 vs. 1/1/2022 – 9/30/2024.

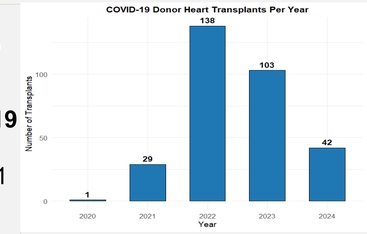
30-days, 1- and 2-year survival (based on Kaplan-Meier method), rates of primary graft dysfunction (PGD), and other complications were compared.

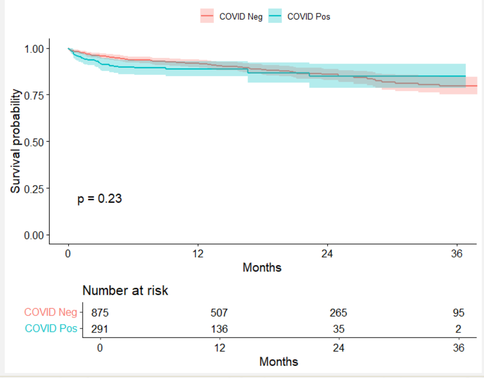
Multivariate Cox proportional hazard models for mortality risk based on donor COVID-19 status.

Results

A total of 10,956 HT recipients were identified → 313 (2.9%) with COVID-19 + donor hearts.

We matched **293** recipients of **COVID-19 +** donor hearts to **879** recipients of **COVID-19 –** donor hearts. All SMD <0.1 demonstrated ideal matches.





3-year landmark survival was comparable between recipients of COVID-19 + and COVID-19 – donor hearts (**p=0.23**). Donor COVID-19 + status was not significantly associated with the risk of mortality (**HR 1.01. p=0.6**).

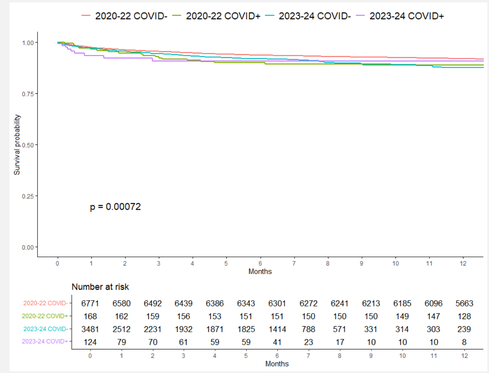
Outcomes	COVID -, N = 879[1]	COVID +, N = 293[1]	p-value[2]
Cumulative KM Survival Estimates, % (95% CI)			
30 days	98.01% (97.08% - 98.95%)	95.22% (92.72% - 67.79%)	**0.04**
1 year	91.82% (89.85% - 93.83%)	88.75% (84.87% - 92.80%)	**0.02**
2 years	85.81% (82.83% - 88.89%)	84.84% (78.58% - 91.61%)	0.2
Acute Rejection, n (%)	142 (16%)	37 (13%)	0.15
LOS, mean (SD)	23.42 (30.01)	23.50 (22.68)	>0.9
Pacemaker, n (%)	10 (1.1%)	2 (0.7%)	0.7
Stroke, n (%)	34 (3.9%)	9 (3.1%)	0.5
Dialysis, n (%)	109 (12%)	49 (17%)	**0.04**
Airway Dehiscence, n (%)	3 (0.4%)	0 (0%)	>0.9
PGD at 24 Hours, n (%)	16 (1.8%)	16 (5.5%)	**0.01**
PGD at 72 Hours, n (%)	8 (0.9%)	10 (3.4%)	**0.006**
Treated Rejection within 1 Year, n (%)	88 (10%)	20 (6.8%)	0.10
Re-Transplant, n (%)	2 (0.2%)	0 (0%)	>0.9
Hospitalized for Infection, n (%)	122 (17%)	27 (13%)	0.09
Hospitalized for Rejection, n (%)	40 (5.7%)	10 (4.6%)	0.5

[1] n (%); Mean (SD)
[2] Pearson's Chi-squared test; Welch Two Sample t-test; Fisher's exact test

While 30-days (**p=0.04**) and 1-year (**p=0.02**) were significantly lower in recipients of COVID-19 + donor hearts, 2-year survival remained similar (**p=0.2**).

Recipients of COVID-19 + donor hearts experienced more frequent post-HT dialysis (**p=0.04**) and PGD at 24- (**p=0.01**) and 72-hours (**p=0.006**).

Results



More recent HTs with COVID-19 + donor hearts between 2022-2024 was associated with superior survival up to 1-year (**p<0.001**). Increased experience with COVID-19 + donor hearts between 2022-2024 was associated with decreased risk of mortality (**HR 0.8, p=0.02**).

Outcomes	2020-22 COVID+, N = 168[1]	2020-22 COVID-, N = 6,771[1]	2023-24 COVID+, N = 145[1]	2023-24 COVID-, N = 3,872[1]	p-value[2]
Cumulative KM Survival Estimates, % (95% CI)					
30 days	96.43% (93.66% - 99.28%)	97.37% (96.99% - 97.75%)	93.48% (88.89% - 98.31%)	97.04% (96.45% - 97.63%)	0.4
1 year	88.69% (84.03% - 93.61%)	91.91% (91.26% - 92.56%)	90.77% (85.06% - 96.85%)	87.58% (85.51% - 89.70%)	**<0.001**
Acute Rejection, n (%)	21 (13%)	1,176 (17%)	16 (13%)	486 (14%)	**<0.001**
LOS, mean (SD)	26.87 (26.45)	24.64 (29.24)	18.63 (14.39)	21.88 (18.43)	**0.01**
Pacemaker, n (%)	2 (1.2%)	110 (1.6%)	0 (0%)	41 (1.2%)	**0.02**
Stroke, n (%)	2 (1.2%)	270 (4.0%)	7 (5.7%)	161 (4.7%)	0.075
Dialysis, n (%)	31 (18%)	1,019 (15%)	13 (8.9%)	584 (17%)	**0.03**
Airway Dehiscence, n (%)	0 (0%)	12 (0.2%)	0 (0%)	0 (0%)	0.3
Treated Rejection within 1 Year, n (%)	19 (11%)	934 (14%)	1 (0.7%)	36 (0.9%)	**<0.001**
Re-Transplant, n (%)	0 (0%)	35 (0.5%)	0 (0%)	11 (0.3%)	0.3
Hospitalized for Infection, n (%)	25 (16%)	1,506 (23%)	2 (3.6%)	42 (2.4%)	**<0.001**
Hospitalized for Rejection, n (%)	10 (6.3%)	501 (7.7%)	3 (2.1%)	18 (1.0%)	**<0.001**

[1] n (%); Mean (SD)
[2] Pearson's Chi-squared test; Welch Two Sample t-test; Fisher's exact test

HTs with COVID-19 + hearts between 2022-2024 have resulted in fewer acute rejection events (**p<0.001**), shorter LOS (**p=0.01**), fewer pacemaker implantation (**p=0.02**), dialysis (**p=0.03**), treatment for rejection within 1 year (**p<0.001**), and hospitalizations for either infection or rejection (both **p<0.001**).

Conclusions

Nationwide, COVID-19 donor heart usage has been decreasing since peaking in 2022.

However, COVID-19 + donor hearts demonstrate robust, comparable long-term outcomes and safety profiles.

Increased experience in recent years are associated with survival benefits and lower rates of complications.

While our results are preliminary, the increased PGD and dialysis risk after COVID-19 + donor HT warrants better risk stratification and careful postoperative monitoring in select patients.

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