

# Long-term and Short-term Outcomes of Solid Organ Transplantation From Donors With a Positive SARS-CoV-2 Test

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Utilization of organs from donors with coronavirus disease 2019 (COVID-19) is increasing,<sup>1-3</sup> but long-term outcome data regarding these transplants are limited. To date, no cases of transmission of SARS-CoV-2 have been reported from a positive donor to a negative recipient in nonlung transplantation.<sup>4</sup> To address this knowledge gap, we present our data regarding donor and recipient characteristics, long-term, and short-term outcomes of solid organ transplantation when using organs from a donor with a positive SARS-CoV-2 polymerase chain reaction (PCR) test from upper respiratory tract and/or lower respiratory tract (COVID+ donor) at the time of organ recovery. All adult recipients who underwent transplantation of organs from COVID+ donors with at least 30-d follow-up between the period of March 2021 and February 2022 were included in the analysis. The study was approved by our Institutional Review Board. Donor, recipient characteristics, and outcomes are summarized in Table 1. Organs from 12 COVID+ donors were transplanted into 14 recipients (5 livers, 3 hearts, and 6 kidneys). Donors had a mean age of 34 (range: 13–65) y and were hospitalized for a mean 6 (range: 1–18) d before organ recovery. The first positive SARS-CoV-2 PCR test was on mean 12 (range: 1–80) d and last positive test was on mean 2 (range: 1–3) d before organ recovery. During the terminal hospitalization of donors, 3 (25%) had new onset symptoms suggestive of COVID-19, 1 (8%) had resolved symptoms, 2 (17%) were asymptomatic, and 6 (50%) had unknown

symptoms. Cycle threshold (Ct) values were available for 9 (75%) of the donors with a Ct value of the last positive PCR test ranging from 22 to 42. None of the donors had critical COVID-19, and all had good function of the transplanted organ along with no other identified indirect complication related to COVID-19. The recipients were followed for mean 165 (range: 30–367) d posttransplant. Recipients had no clinical or molecular evidence of transmission of SARS-CoV-2 from the donor, regardless of their vaccination status. Clinical graft-rejection before discharge was noted in 1 (8%) liver recipient, which improved with increase in immunosuppression. Delayed renal-graft function (DGF), as defined by need for hemodialysis within 1 wk of transplant, was seen in 1 (17%) kidney transplant recipient. Excellent graft function was noted in all 13 of 13 (100%) recipients during 1-mo follow-up and in 7 of 7 (100%) recipients with >6-mo of follow-up (Table 1). These short-term and long-term outcomes regarding graft outcomes were comparable to recipients of COVID-negative donors in our institution during the study period (kidney DGF rate, 30%; liver rejection rate, 11%).

A positive COVID test can signify a potentially false positive test to various stages of COVID-19 in the donor.<sup>4</sup> A careful review of clinical, radiological evidence, and Ct values from the PCR test by a dedicated group of transplant team can help determine the risk of infectivity of the donor<sup>1</sup> and then the donor organ is matched with a carefully selected recipient. Two recipients developed COVID-19 11 mo after the initial transplantation, thus highlighting the need for continuous counseling regarding safe practices, need for complete vaccination of the recipient and all household contacts, and/or use of pre-exposure prophylaxis in selected high-risk recipients.<sup>5</sup>

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**TABLE 1.** Patient characteristics and outcomes of solid organ transplantation from donors with a positive SARS-CoV-2 test

	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12		
Age (y)	29	34	32	39	65	28	50	13	20	37	32	31		
Cause of death	Anoxia	Cardiac arrest	Head trauma	Anoxia	Anoxia	Head trauma	Stroke	Anoxia	Anoxia	Anoxic brain injury	Intracranial bleed	Anoxia		
LOS (d)	18	5	4	7	6	3	9	2	7	8	4	1		
KDPI	n/a	n/a	n/a	n/a	n/a	n/a	43	23	n/a	50	33	75		
Terminal Creatinine, mg/dL	0.9	2.9	1.1	0.8	3.0	0.8	1.0	0.9	0.5	0.3	0.7	1.2		
AST/ALT, $\mu$ L	48/58	48/63	n/a	15/27	24/40	9/11	n/a	n/a	n/a	n/a	n/a	n/a		
LVEF (%)	50	n/a	70	n/a	n/a	n/a	n/a	n/a	66	n/a	n/a	n/a		
Site of positive PCR	URT, LRT	URT	URT	URT	URT	URT	URT, LRT	URT, LRT	URT, LRT	URT, LRT	URT	URT, LRT		
Last positive test to transplant (d)	1	1	1	2	3	2	3	3	3	3	1	1		
Ct value	38.5, 40.5	33.0	38.5	n/a	n/a	42.0	39.0	n/a	22.0	24.0	28.0	26.0		
Symptoms	New 1 d	Resolved	Unknown	Unknown	Unknown	Unknown	New	Unknown	New	Unknown	None	None		
<b>Recipients</b>	<b>R1</b>	<b>R2</b>	<b>R3</b>	<b>R4</b>	<b>R5</b>	<b>R6</b>	<b>R7</b>	<b>R8</b>	<b>R9</b>	<b>R10</b>	<b>R11</b>	<b>R12</b>	<b>R13</b>	<b>R14</b>
Organ	Heart	Liver	Liver	Heart	Liver	Liver	Liver	Kidney	Kidney	Heart	Kidney	Kidney	Kidney	Kidney
Follow-up (d)	367	367	320	318	230	193	153	77	58	56	52	51	40	30
Age (y)	67	54	36	65	35	59	46	61	21	57	42	58	50	61
Vaccination	No	2 doses	1 dose	No	No	2 doses	1 dose	3 doses	3 doses	No	2 doses	3 doses	3 doses	2 doses
Prior COVID	No	No	No	No	Yes	No	No	No	No	Yes	No	No	No	No
Waitlist status	Status 1 (ECMO)	MELD 18	MELD 30	Status 2 (IABP)	MELD 22	MELD 27	MELD 33	WL 4 y	WL 3 y	Status 2	WL 3 y	WL 5 y	WL 5 y	WL 3 y
CIT (min)	32	284	282	84	337	306	188	906	1166	152	975	975	1051	751
Induction	Steroid	Steroid	Steroids	Steroids	Steroids	Steroids	Steroids	ATG	ATG	ATG + Eculi- zumab	ATG	ATG	ATG	ATG
Maintenance	S+TAC+MMF	S+TAC+MMF	S+TAC	S+TAC+MMF	S+TAC	S+TAC	S+TAC	S+TAC	S+TAC+MMF	S+TAC	S+TAC+MMF	S+TAC+MMF	S+TAC+MMF	S+TAC+MMF
Treatment	C-I	C-I	C-I	n/a	C-I	C-I	C-I	n/a	T-C	T-C	T-C	T-C	T-C	T-C
LOS (d)	50	11	12	n/a	7	10	16	13	n/a	5	12	6	5	5
Organ rejection before discharge	No	No	No	No	No	No	Clinical, steroids + MMF	No	No	No	No	No	No	No
DGF	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Yes	n/a	No	No	No	No	No
Current organ function	LVEF 75%	LFTs normal	LFTs normal	n/a	LFTs normal	LFTs normal	LFTs normal	eGFR > 60	LVEF 60%	eGFR 60	eGFR > 60	eGFR > 60	eGFR > 60	eGFR = 59
Other outcomes	COVID 11 mo post-HT	COVID 11 mo post-LT	None	Died of unrelated causes	None	None	None	None	Still hospitalized	None	None	None	None	None

ALT, alanine aminotransferase; AST, aspartate aminotransferase; ATG, antithymocyte globulin; C-I, casirivimab-imdevimab; CIT, cold ischemia time; COVID, coronavirus disease; Ct, cycle threshold; DGF, delayed graft function; ECMO, extracorporeal membrane oxygenation; eGFR, estimated glomerular filtration rate; HT, heart transplantation; IABP, intraaortic balloon pump; KDPI, kidney donor profile index; LFT, liver function test; LOS, length of stay; LRT, lower respiratory tract; LT, liver transplantation; LVF, left ventricular ejection fraction; MELD, model for end-stage liver disease; MMF, mycophenolate mofetil; n/a, not applicable; PCR, polymerase chain reaction; S, steroid; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2; TAC, tacrolimus; T-C, thaxagvimab-cilgavimab; URT, upper respiratory tract; WL, waitlist.