



# Kalp ve Akciğer Nakil Olgularında COVID-19

Yasemin TEZER TEKÇE



# Sunumda

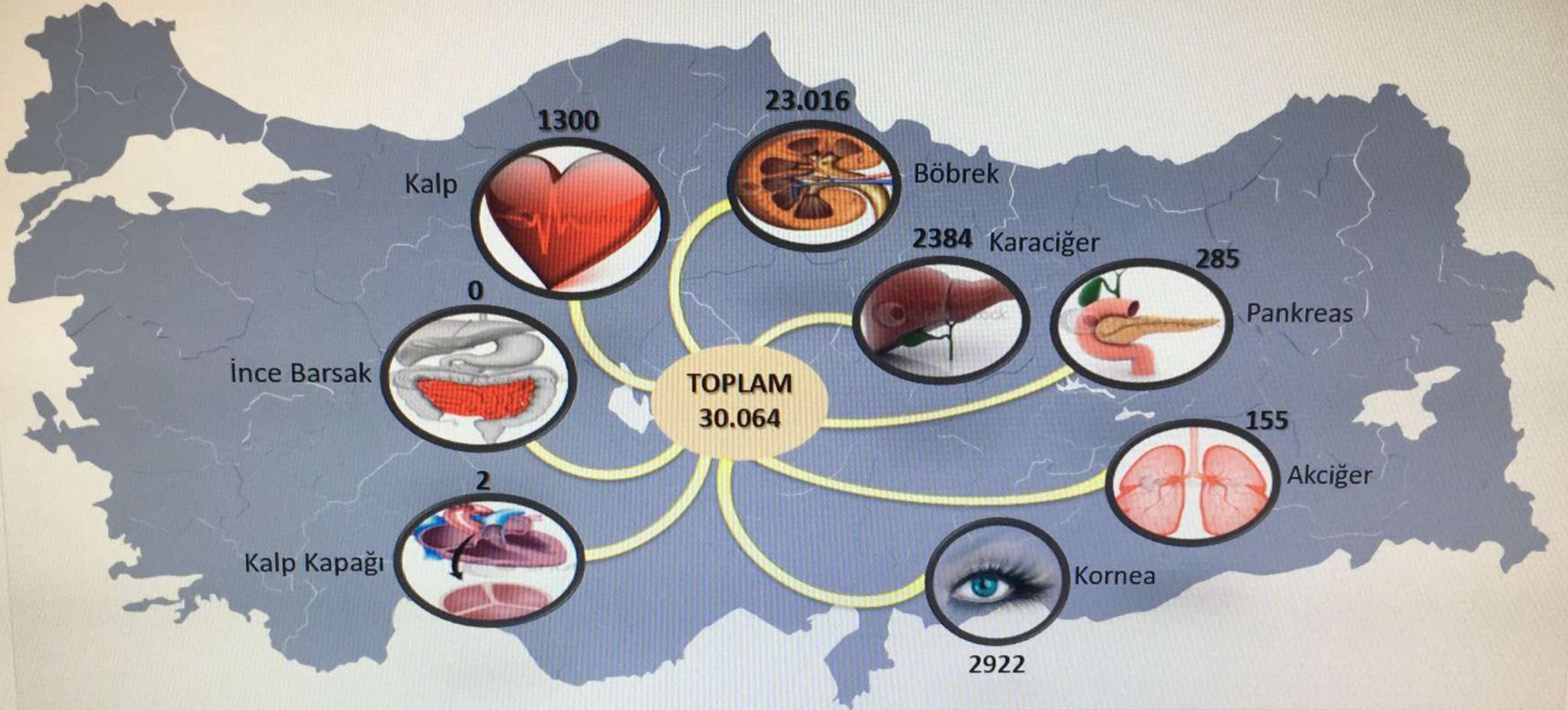
- COVID-19 döneminde bekleme listesi ve kardiyotorasik nakil sayılarında deęişiklik oldu mu?
- Alıcı-verici hazırlık da ne deęiřti?
- Kalp nakil alıcılarında COVID-19 nasıl seyretti
- Akcięer nakil alıcılarında COVID-19 nasıl seyretti,
- COVID-19 fibrotik sekelli hastalarda akcięer nakli bir umut olur mu?
- Nakil alıcılarında ařılama önerileri ve breakthrough enfeksiyonlar

# COVID-19 ve SOT

- COVID-19 pandemisi SOT'de tüm pratiđi büyük ölçüde deđiřtirdi.
- Pandeminin ilk zamanlarında acil nakiller dıřında olan operasyonlar pek çok merkezde ertelendi.
- Kadaverik donör sayısı belirgin azaldı.
- Kardiyotorasik transplantlar, ise virusun esas hedefindeki organ olduđundan ve immünsüpresiflerin en fazla ve yoğun şekilde kullanıldıđı nakiller olmasından dolayı çekinceler daha fazla



# BEKLEYEN HASTA (01.11.2021 tarihi itibariyle)



## COVID-19 pandemic and worldwide organ transplantation: a population-based study

Olivier Aubert\*, Daniel Yoo\*, Dina Zielinski\*, Emanuele Cozzi\*, Massimo Cardillo, Michael Dürr, Beatriz Dominguez-Gil, Elisabeth Coll, Margarida Ivo Da Silva, Ville Sallinen, Karl Lemström, Karsten Midtvedt, Camilo Ulloa, Franz Immer, Annemarie Weissenbacher, Natalie Vallant, Nikolina Basic-Jukic, Kazunari Tanabe, Georgios Papatheodoridis, Georgia Menoudakou, Martin Torres, Carlos Soratti, Daniela Hansen Krogh, Carmen Lefaucheur, Gustavo Ferreira, Helio Tedesco Silva Jr, David Hartell, John Forsythe, Lisa Mumford, Peter P Reese, François Kerbaul, Christian Jacquelinet\*, Serge Vogelaar\*, Vassilios Papalois\*, Alexandre Loupy\*

### Summary

**Background** Preliminary data suggest that COVID-19 has reduced access to solid organ transplantation. However, the

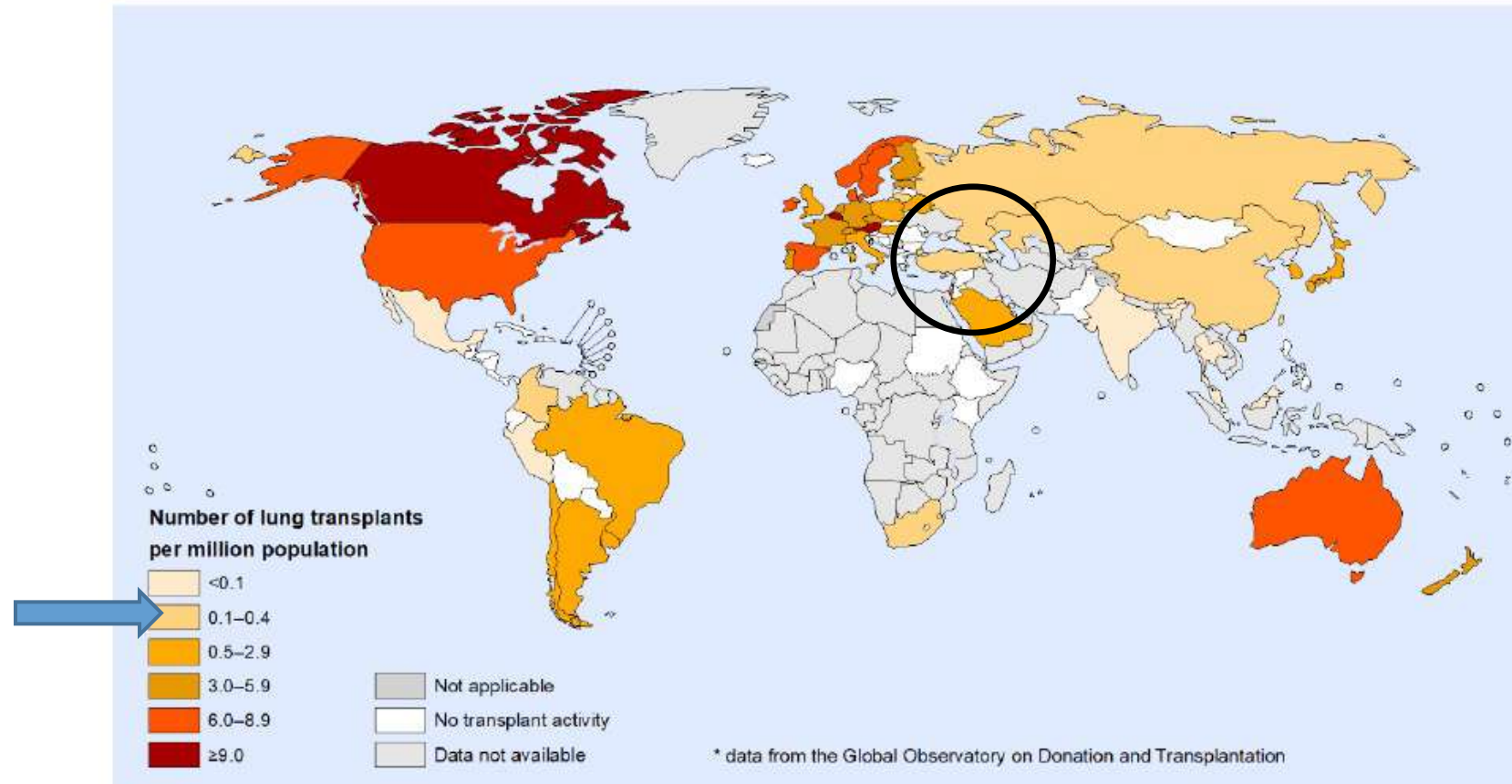


Lancet Public Health 2021; 6:e370-38

**Findings** Transplant activity in all countries studied showed an overall decrease during the pandemic. Kidney transplantation was the most affected, followed by lung, liver, and heart. We identified three organ transplant rate patterns, as follows: countries with a sharp decrease in transplantation rate with a low COVID-19-related death rate; countries with a moderate decrease in transplantation rate with a moderate COVID-19-related death rate; and countries with a slight decrease in transplantation rate despite a high COVID-19-related death rate. Temporal trends revealed a marked worldwide reduction in transplant activity during the first 3 months of the pandemic, with losses stabilising after June, 2020, but decreasing again from October to December, 2020. The overall reduction in transplants during the observation time period translated to 48 239 waitlisted patient life-years lost.

Bekleme listesindeki yaklaşık 50000 hasta kaybı...

## Lung transplantation activities, 2017\*



The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

Data Source: Global Observatory on Donation & Transplantation. Map Production: Information Evidence and Research (IER)  
World Health Organization



World Health  
Organization

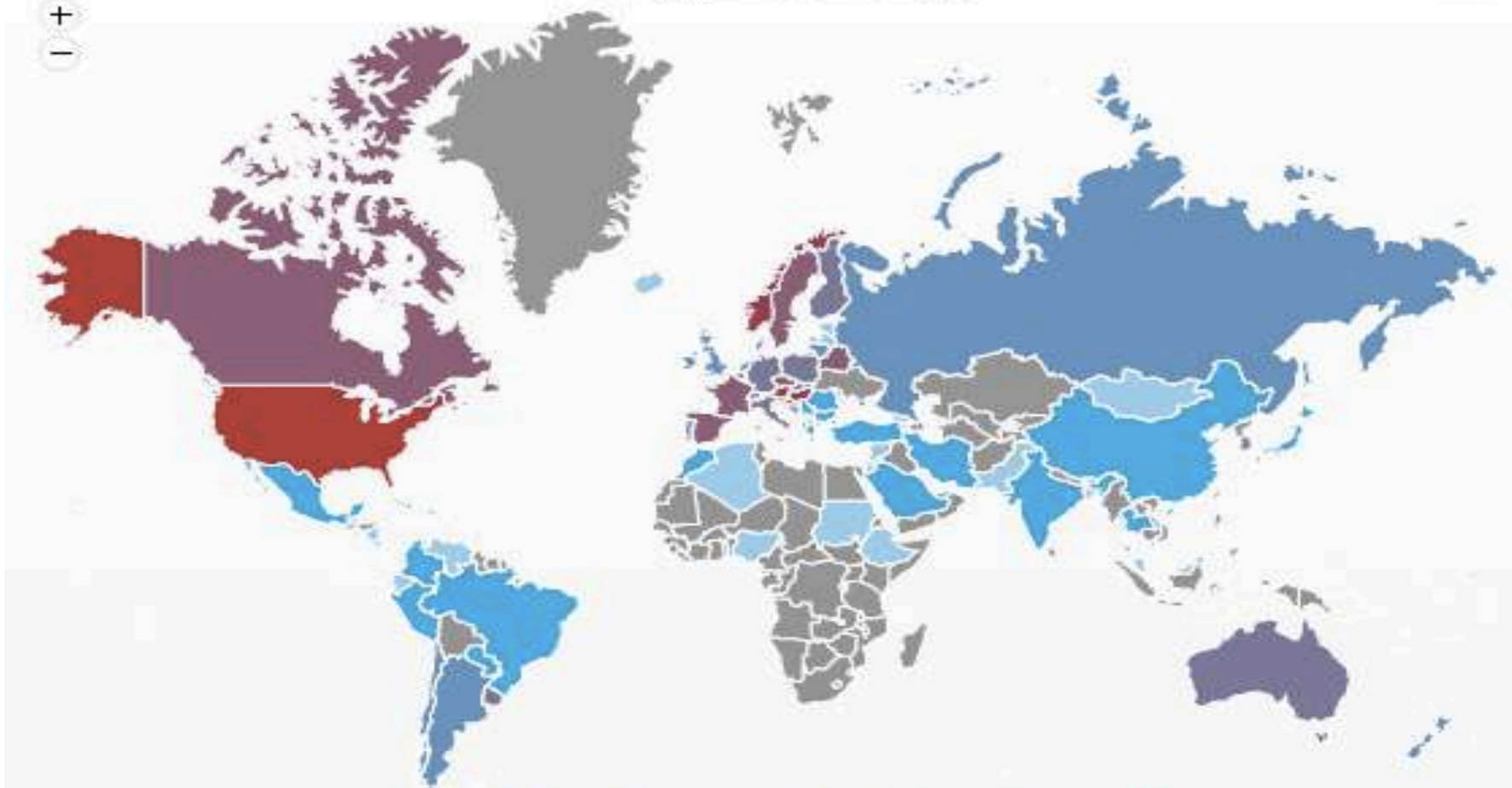
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TOTAL RATE (PMP) TOTAL HEART  
GEOGRAPHIC AREA: GLOBAL YEAR: 2019



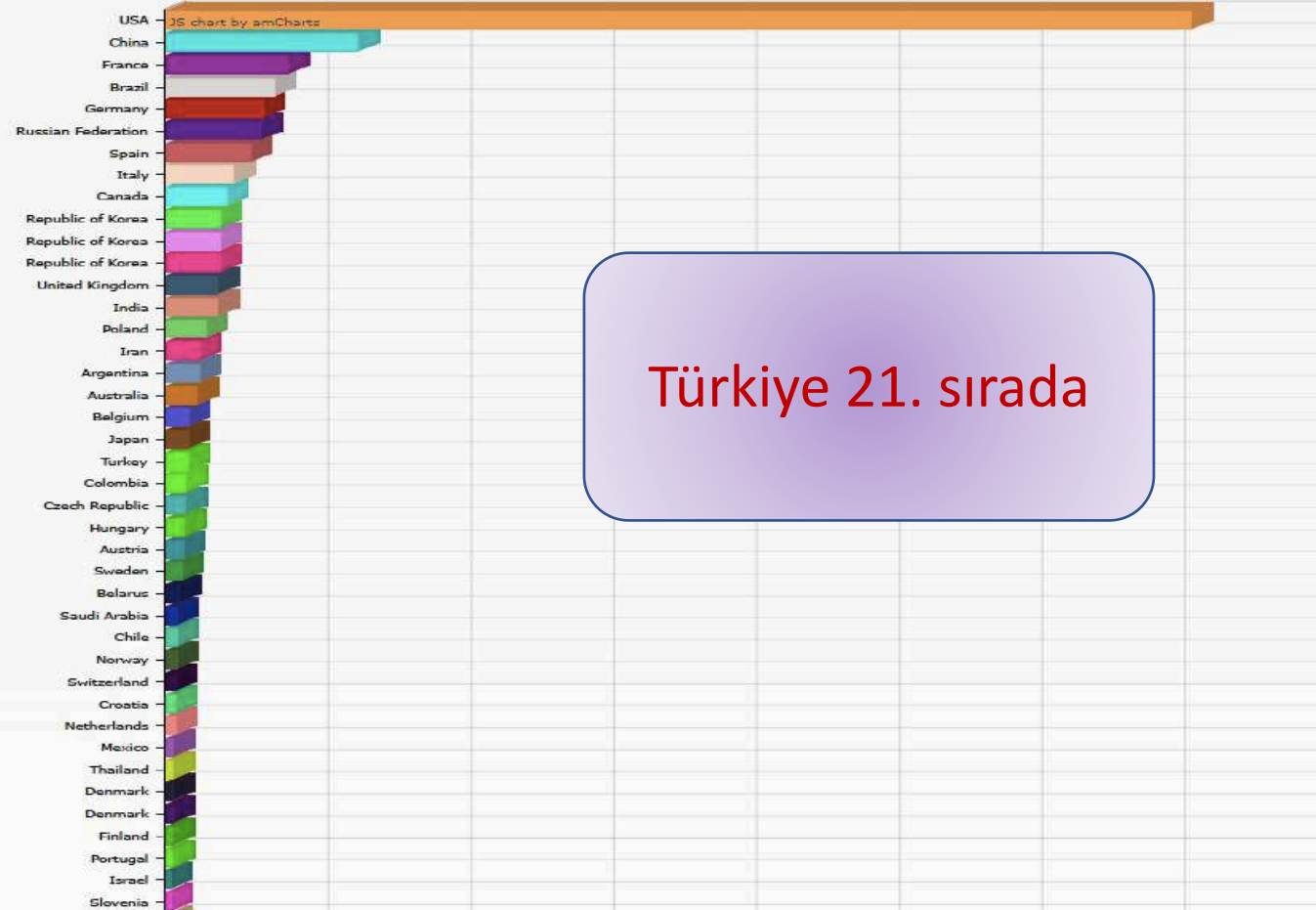
### Total Rate (pmp) Total Heart (Global,2019)

Source: GDOT (<http://www.transplant-observatory.org>)



No data 0 0.01-1.02 1.02-3.04 3.04-5.47 5.47-7.29 7.29-9.11 9.11-10.93

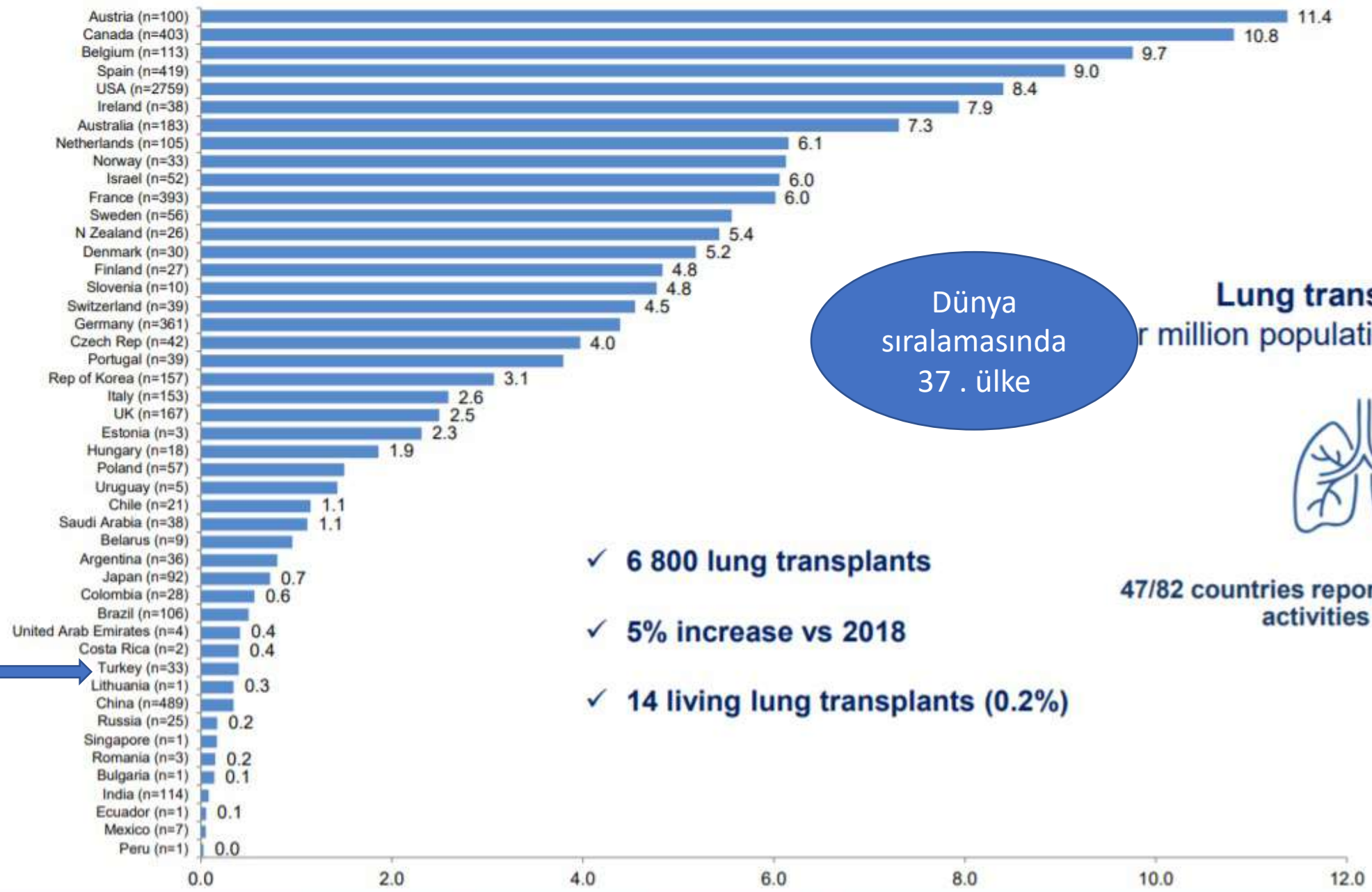
Total Heart (Global.2019)  
Source: GODT (<http://www.transplant-observatory.org>)



Türkiye 21. sırada







Dünya sıralamasında 37 . ülke

**Lung transplants**  
per million population (pmp). 2019



- ✓ 6 800 lung transplants
- ✓ 5% increase vs 2018
- ✓ 14 living lung transplants (0.2%)

47/82 countries reported lung transplant activities in 2019

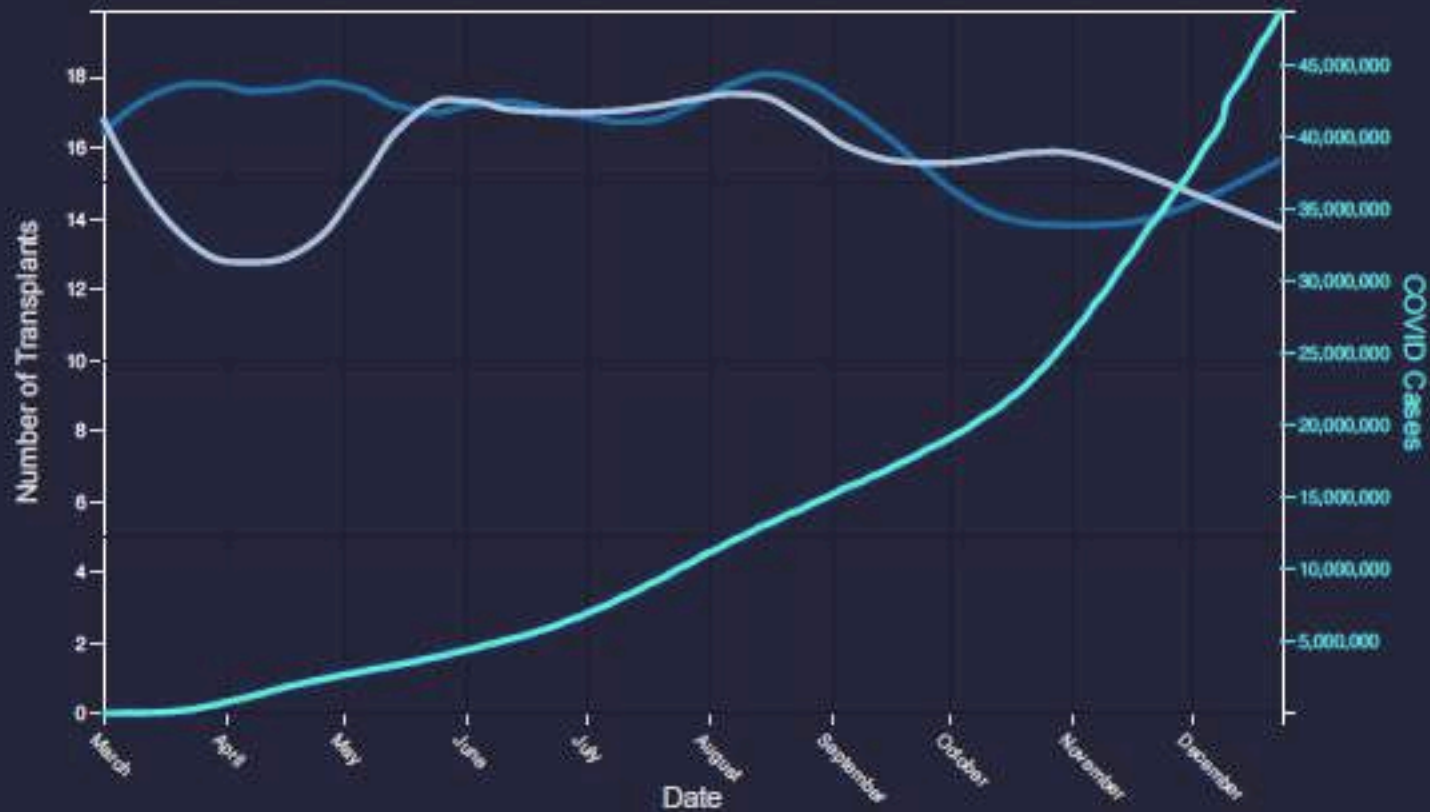
YILLAR	BÖBREK			KARACİĞER			KALP	KALP KAP.	AKCİĞER	KALP-AKC.	PANKREAS	İNCE BARSAK	KADAVRADAN NAKİL SAYISI TOPLAMI	CANLIDAN NAKİL SAYISI TOPLAMI	TOPLAM NAKİL SAYISI
	Donör		Toplam	Donör		Toplam									
	Canlı	Kadavra		Canlı	Kadavra										
2010 ÖNCESİ	6.753	2.381	9.134	1.720	1.168	2.888	322	316	11	4	103	10	4.315	8.473	12.788
2010	2.107	388	2.495	489	208	697	87	18	3	0	29	3	736	2.596	3.332
2011	2.433	520	2.953	624	281	905	95	1	5		26	2	930	3.057	3.987
2012	2.383	525	2.908	736	265	1.001	61	5	25	2	6	5	894	3.119	4.013
2013	2.359	585	2.944	959	289	1.248	63	1	32	0	4	2	976	3.318	4.294
2014	2.298	626	2.924	892	320	1.212	78	2	33	0	9	5	1.073	3.190	4.263
2015	2.534	670	3.204	871	345	1.216	89	0	30	0	7	6	1.147	3.405	4.552
2016	2.636	782	3.418	1.004	392	1.396	69	0	22	0	6	5	1.276	3.640	4.916
2017	2.648	693	3.341	1.087	359	1.446	77	0	42	0	0	2	1.173	3.735	4.908
2018	3.008	858	3.866	1.150	438	1.588	91	0	43	0	4	0	1.434	4.158	5.592
2019	3.048	803	3.851	1.345	431	1.776	84	0	33	0	3	4	1.358	4.393	5.751
2020	2.250	249	2.499	1.191	129	1.320	21	0	11	0	1	2	413	3.441	3.854
2021 (01.11.2021)	2.494	236	2.730	1.124	111	1.234	19	0	17	0	0	2	385	3.618	4.003
<b>TOPLAM</b>	<b>36.951</b>	<b>9.316</b>	<b>46.267</b>	<b>13.192</b>	<b>4.736</b>	<b>17.927</b>	<b>1.156</b>	<b>343</b>	<b>307</b>	<b>6</b>	<b>198</b>	<b>48</b>	<b>16.110</b>	<b>50.143</b>	<b>66.253</b>

line graphs

bubble charts

### Transplant rates v. cases

- ORGAN:
  - All
  - Kidney
  - Liver
  - Lung
  - Heart
- DONOR TYPE:
  - Deceased
  - Living & Deceased
- COUNTRY/REGION:
  - Global
- PERIOD:
  - 2019 and 2020

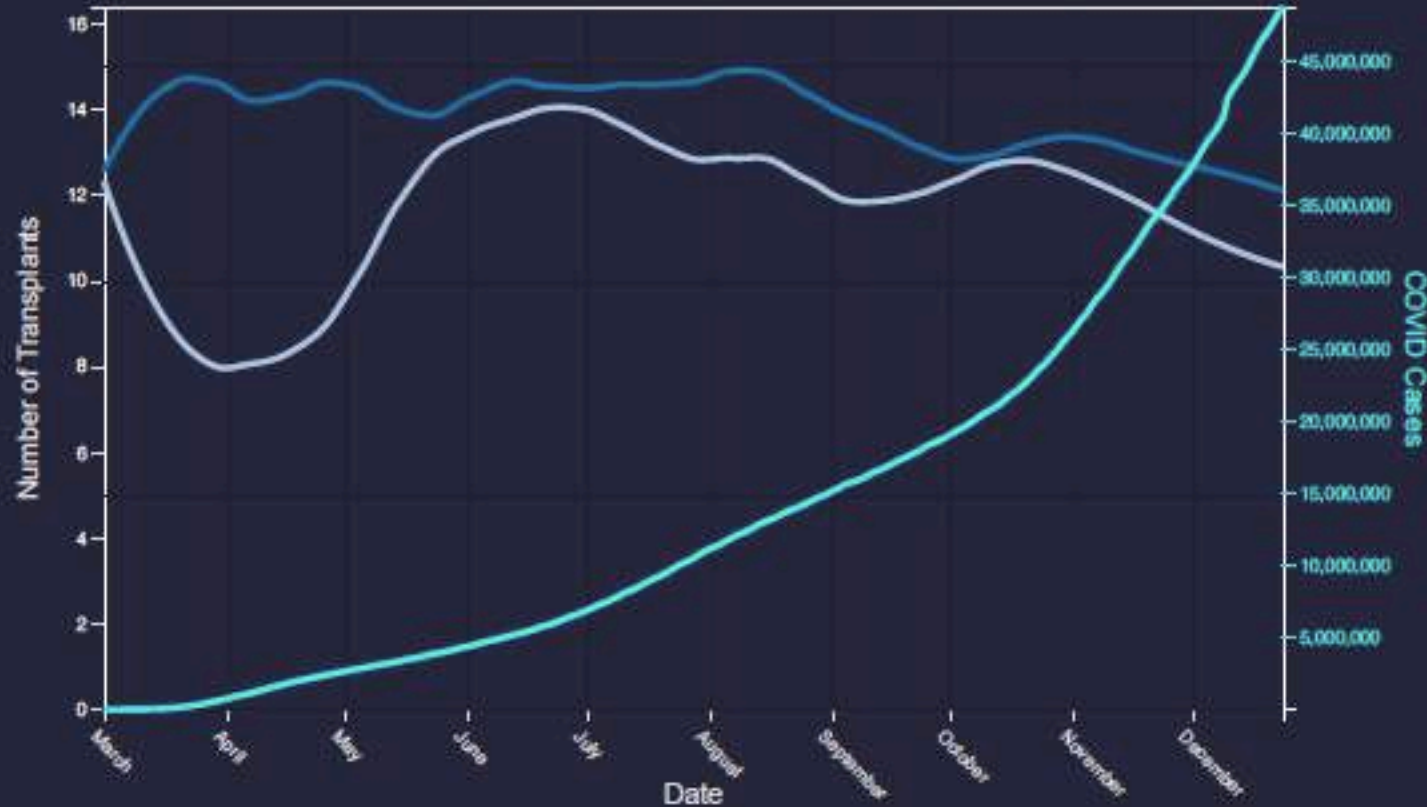


LOESS smoothed 14-day moving average from the first 100 cases to the end of follow-up.

line graphs bubble charts

### Transplant rates v. cases

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- PERIOD:
  - 2019 and 2020



LOESS smoothed 14-day moving average from the first 100 cases to the end of follow-up.

## SUMMARY

Select country

Turkey

From Year:

2020

[View](#)

Data presented in absolute number and rate per million inhabitants (pmp)  
(-): Data Not Available or Not Applicable

	Turkey	Europe	Global
ACTUAL DECEASED DONORS (DD)	172 (2.04)	10,481 (12.37)	36,202 (4.76)
ACTUAL DD AFTER BRAIN DEATH (DBD)	172 (2.04)	8,907 (10.51)	28,137 (3.7)
ACTUAL DD AFTER CIRCULATORY DEATH (DCD)	(-)	1,574 (1.86)	8,065 (1.06)
TOTAL KIDNEY TRANSPLANTS	2,498 (29.63)	21,929 (25.88)	86,409 (11.37)
DECEASED KIDNEY TRANSPLANTS	249 (2.95)	16,019 (18.9)	55,774 (7.34)
LIVING KIDNEY TRANSPLANTS	2,249 (26.68)	5,910 (6.97)	30,638 (4.03)
TOTAL LIVER TRANSPLANTS	1,320 (15.66)	9,228 (10.89)	34,366 (4.52)
DECEASED LIVER TRANSPLANTS	129 (1.53)	7,590 (8.96)	25,576 (3.36)
LIVING LIVER TRANSPLANTS	1,189 (14.1)	1,631 (1.92)	8,152 (1.07)
HEART TRANSPLANTS	21 (0.25)	2,513 (2.97)	8,190 (1.08)
LUNG TRANSPLANTS	11 (0.13)	1,878 (2.22)	6,007 (0.79)
PANCREAS TRANSPLANTS	1 (0.01)	593 (0.7)	1,984 (0.26)
SMALL BOWEL TRANSPLANTS	2 (0.02)	40 (0.05)	165 (0.02)
TOTAL ORGAN TRANSPLANTS	3,853 (45.71)	36,181 (42.7)	137,121 (18.04)

Data presented in absolute number and rate per million inhabitants (pmp)  
(-): Data Not Available or Not Applicable

	Turkey	Europe	Global
ACTUAL DECEASED DONORS (DD)	499 (6.01)	13,490 (16.92)	41,860 (6.88)
ACTUAL DD AFTER BRAIN DEATH (DBD)	499 (6.01)	11,335 (14.22)	32,861 (5.4)
ACTUAL DD AFTER CIRCULATORY DEATH (DCD)	(-)	2,155 (2.7)	8,999 (1.48)
TOTAL KIDNEY TRANSPLANTS	3,663 (46.54)	28,329 (35.54)	107,540 (17.67)
DECEASED KIDNEY TRANSPLANTS	808 (9.73)	20,476 (25.69)	65,868 (10.83)
LIVING KIDNEY TRANSPLANTS	3,055 (36.81)	7,853 (9.85)	41,672 (6.85)
TOTAL LIVER TRANSPLANTS	1,776 (21.4)	10,818 (13.57)	39,968 (6.57)
DECEASED LIVER TRANSPLANTS	432 (5.2)	9,027 (11.32)	28,977 (4.76)
LIVING LIVER TRANSPLANTS	1,341 (16.16)	1,774 (2.23)	9,987 (1.64)
HEART TRANSPLANTS	84 (1.01)	2,883 (3.62)	9,266 (1.52)
LUNG TRANSPLANTS	33 (0.4)	2,357 (2.96)	7,151 (1.18)
PANCREAS TRANSPLANTS	3 (0.04)	769 (0.96)	2,508 (0.41)
SMALL BOWEL TRANSPLANTS	4 (0.05)	39 (0.05)	146 (0.02)
TOTAL ORGAN TRANSPLANTS	5,763 (69.43)	45,195 (56.7)	166,570 (27.38)

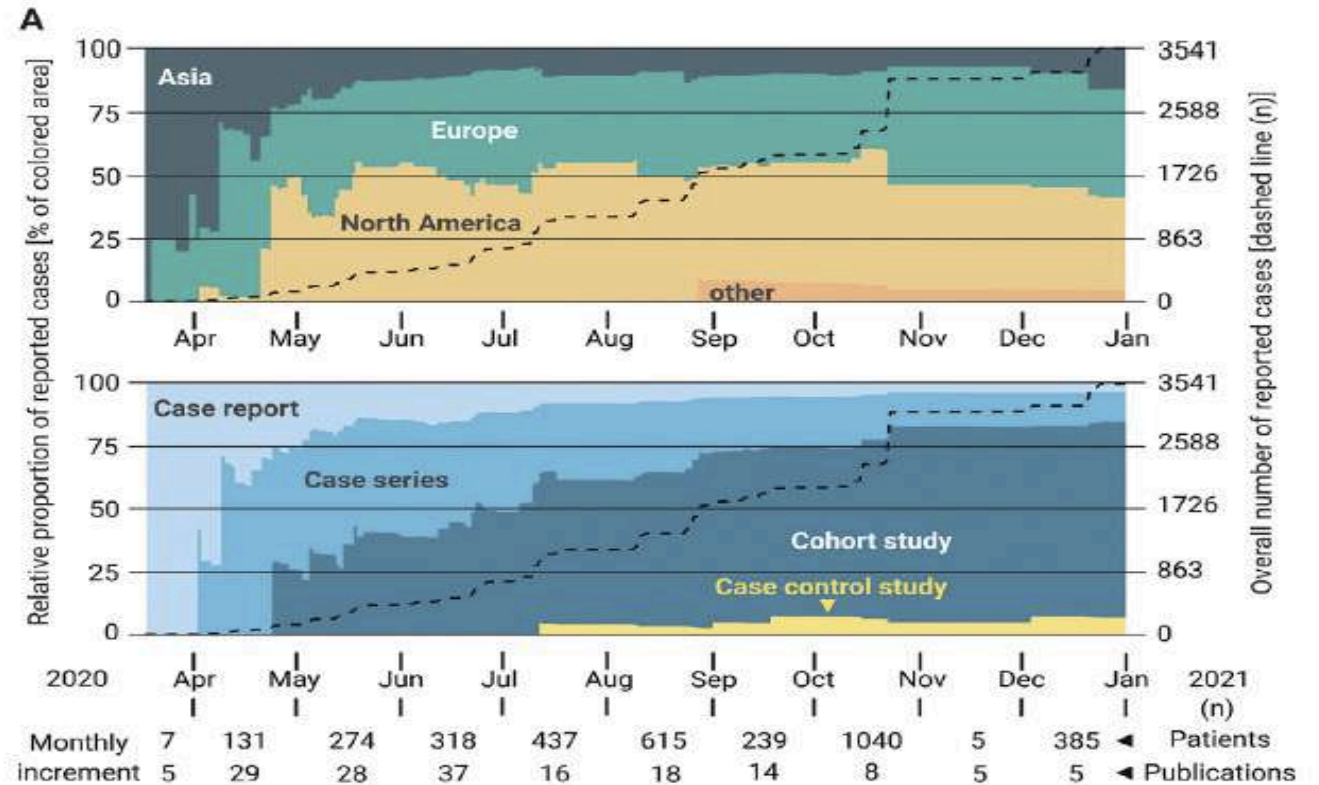
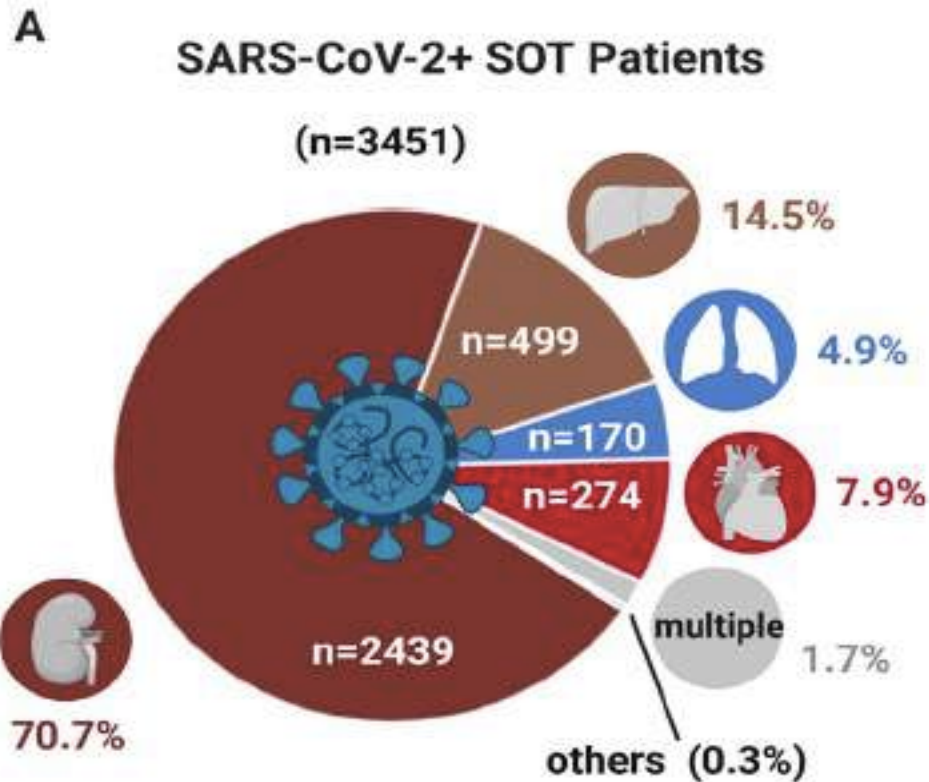
**TÜRKİYE GENELİ**  
**(01.11.2021)**

	<b>KALP</b>	<b>AKCİĞER</b>	<b>KARACİĞER</b>	<b>BÖBREK</b>
<b>NAKİL</b>	<b>19</b>	<b>17</b>	<b>1.234</b> <b>(111 Kadavra)</b>	<b>2.730</b> <b>(236 Kadavra)</b>
<b>BEKLEYEN HASTA</b>	<b>1300</b>	<b>155</b>	<b>2.384</b>	<b>23.016</b>



# SARS-CoV-2 in Solid Organ Transplant Recipients: A Structured Review of 2020

Markus Quante<sup>a</sup>, Linda Brake<sup>a</sup>, Alexander Tolios<sup>b,c,d</sup>, Andrea Della Penna<sup>a</sup>, Christoph Steidle<sup>a</sup>, Magdalena Gruendl<sup>e</sup>, Anna Grishina<sup>f</sup>, Helene Haeberle<sup>g</sup>, Martina Guthoff<sup>h,i,j</sup>, Stefan G. Tullius<sup>k</sup>, Alfred Königsrainer<sup>a,l</sup>, Silvio Nadalin<sup>a</sup>, and Markus W. Löffler<sup>a,l,m,n,\*</sup>



# 100 donörden akciğer kullanım oranı

[SS-045]

## Akciğer nakli için donör değerlendirilmesi: 206 donörün analizi

Alkın Yazıcıođlu, Yeşim Arslan, Mahmut Subaşı, Erdal Yekeler  
Türkiye Yüksek İhtisas Eğitim ve Araştırma Hastanesi, Göğüs Cerrahisi ve Akciğer Nakli Kliniği, Ankara.

**GİRİŞ:** Akciğer nakli (LuTx) için donör seçimi yapılan naklin başarısında önemlidir. Serimizde kabul edilebilir uygun donör oranı %15,0 olarak bulunmuş olup dünya ortalamasının altındadır.

**MATERYAL-METOD:** Mart 2013–Aralık 2014 tarihleri arasında LuTx için sunulan 206 erişkin donör yaş, cinsiyet, beyin ölümü nedeni, Bölge Koordinasyon Merkezi (BKM), entübasyon süresi, kan gazı analizleri, red veya kabul oranları ve red nedenleri açısından değerlendirildi.

**BULGULAR:** Değerlendirilen 206 donörün 136'sı (%66,0) erkek; 70'i (%34,0) bayan olup ortalama yaş 41,4 (16–68) yılı olarak hesaplandı. Donörler en çok İzmir BKM'den olup (n=47, %22,8) bunu Ankara BKM (n=37, %17,9) izledi. En sık beyin ölümü nedeni intrakraniyal patolojilerdi (n=188, %91,3). Donörlerin ortalama entübasyon süresi 4,07 gün (1–20) olarak hesaplanmış olup kan gazı analizinde parsiyel oksijen basıncı ortalama 237,4 mmHg (45–695) olarak tespit edildi. Donörlerden 11'i (%5,3) LuTx için kabul edildi. Reddedilen 195 donörün en sık red nedeni düşük kan gazı (n=149, %76,4), uzun entübasyon süresi (n=66, %33,8), donörde enfeksiyon bulguları (n=43, %22,0), donörün sigara geçmişi (n=38, %19,5) ve ileri donör yaşı (n=37, %19,0) idi (Tablo 1).

206 donörün 53'ünün (%25,7) PaO2/FiO2 oranı 300 mmHg'nin üzerindeydi; bunlardan 11'i alıcılara kabul edildi. Kalan 42 donörden 22'sinde, red nedenleri birden çok neden içermekte olup; donörde enfeksiyon bulguları (n=11, %50), uzun entübasyon süresi (n=8, %36,4), sigara hikayesi (n=7, %31,8) ve travma bulguları (n=3, %13,6) olarak sıralandı.

Reddedilen donörlerin 20'sinin hem PaO2/FiO2 oranı 300 mmHg'nin üzerindeydi hem de diğer standart donör kriterlerinin tamamını karşılıyordu. Bu gruptaki donörlerin red nedenleri ise uygun boyutta alıcı olmaması (bekleme listesinin dar olması), alıcıda enfeksiyon bulguları; alıcının uzak mesafede olması (n=13, %65,0), ekip yetersizliği (n=5, %25,0) olarak sıralandı (Tablo 2).

**TARTIŞMA:** LuTx için reddedilen donörlerde en sık neden düşük kan gazı oldu, bunu uzun entübasyon süresi takip etti. Sunulan 206 donörden sadece 53'ünün (%25,7) parsiyel oksijen basıncı 300 mmHg'nin üzerinde olup, **31 (%15,0) donör nakil için uygun kriterler taşıymaktaydı**. Bizim serimizdeki %15,0'lik uygun donör varlığı dünya ortalamasının (%27,0) altında olup, bu noktada donör bakımının önemi ortaya çıkmaktadır. Uygun donör olarak kabul edilen 31 olgudan 11 donör alıcılara nakledilmiş, ancak bütün donör kriterlerini karşılayan 20 donöründe red edildiği görülmüştür. Bu gruptaki en fazla red nedeni uygun alıcı olmaması, alıcıda enfeksiyon bulguları ve alıcının uzak mesafede olması nedeni ile nakil yapılamamasıdır. LuTx bekleme listesi mümkün olduğunca geniş tutulmalı; her kan grubundan her ebat alıcı nakil için listelenmelidir. Ülkemizde LuTx için Erzurum ve Diyarbakır BKM'den çok az donör çıkmakta olup (Toplam n=7, %3,4) toplumsal bilinçlenme sağlanmalıdır. Toplamda sunulan 206 donörün 11'inin akciğerleri alıcılar için kullanıldığından akciğer kullanım oranı %5,3 olarak hesaplanmış olup gelişmiş ülkelerin altındadır.

**Anahtar Kelimeler:** Akciğer nakli, donör, beyin ölümü, kan gazı

**Sunum Detayları:** SSO-08: SÖZLÜ SUNUM OTURUMU-8

**Tarih ve Saat:** 18.10.2015 / 13:30 - 14:30

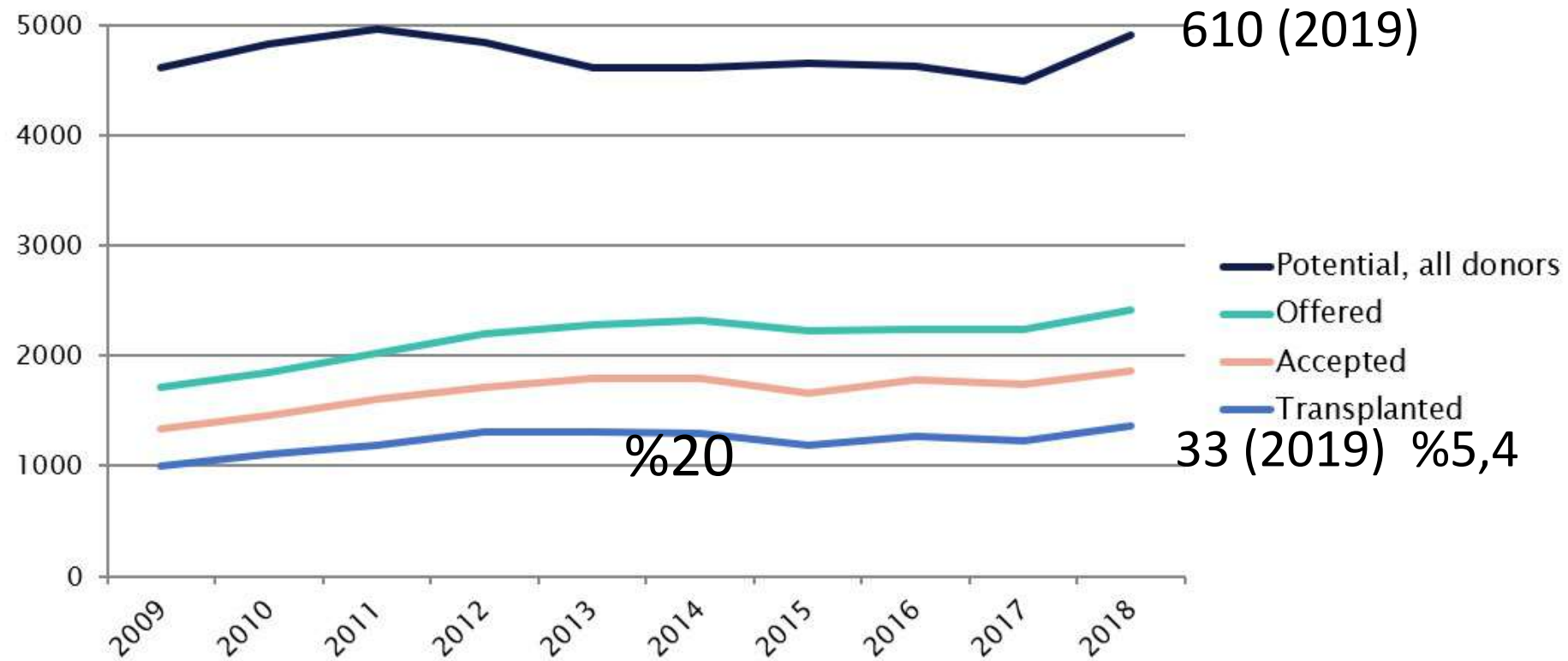
**Salon:** SALON T8

- ❖ ISHLT uygun donör Akciğer %27
- ❖ US 24% (#10'286)
- ❖ Eurotransplant 32% (#1'942)
- ❖ UK 14% (#1'574)
- ❖ Canada 34% (#649)
- ❖ Australia 39% (#503)
- ❖ Switzerland: 22% (#145)
- ❖ Çalışmamızda uygun akciğer %15,0
- ❖ 2018'de 2169 beyin ölümü,
- ❖ 598 donör
- ❖ 43 akciğer nakli %7,1



# Donör havuzu ve akciğer kullanımı

## Donor allocation in Eurotransplant zone



# COVID-19 Pandemisinde Alıcı ve Verici Hazırlanması

# DONÖR

Donör maruziyet

Donör Klinik

# ALICI

Ayaktan

Yatan

## DONÖR Maruziyet

Kategori 0	Donör, <b>son 21</b> gün içinde CDC yüksek risk alanına (seviye 2-3) gitmemiş ve hapis? veya doğrulanmış vaka ile <b>hiçbir teması</b> olmamıştır
Kategori1	Donör, <b>önceki 21 günde</b> CDC <b>yüksek riskli alan</b> (seviye 2-3) olarak kabul edilen bir alandaydı ve <b>maruziyetler bilinmiyor</b>
Kategori 2	Donör, <b>son 21 günde</b> COVID-19 için bir <b>PUI ile doğrudan korunmasız</b> temas kurdu.
Kategori 3	Donör, <b>son 28 günde doğrulanmış bir COVID-19 vakasıyla doğrudan korunmasız temas</b> kurdu.

# Donör Klinik

Kategori 0	SARS-CoV-2 için <b>asemptomatik</b> , <b>negatif</b> RT-PCR ve COVID-19 için CT'de <b>belirtileri olmayan</b>
Kategori 1	SARS-CoV-2 için <b>negatif</b> RT-PCR ile <b>sempptomatik</b> (ASYE, ateş, anozmi) ve COVID-19 <b>belirtileri olmayan</b> CXR ve CT
Kategori 2	SARS-CoV-2 için <b>negatif</b> RT-PCR ile <b>sempptomatik</b> (ASYE, ateş, anozmi) ve <b>COVID-19 ile ilgili CXR veya CT</b>
Kategori 3	SARS-CoV-2 için <b>pozitif</b> RT-PCR ile <b>sempptomatik</b> (ASYE, ateş, anozmi) ve COVID-19 ile <b>ilgili CXR veya CT</b>

## AKCİĞER DIŐI DONÖRLERDE COVID-19 RİSK SINIFLAMA

Risk kategorisi	Maruziyet kategorisi	Klinik kategori	Karar
Düşük	0-3	0	Kabul etmek
Orta	0-3	1-2	Düşünün (negatif SARS-CoV-2 RT-PCR ise, COVID-19 belirtileri olmayan ve risk / faydaya dayalı CT )
Yüksek	0-3	3	Reddet

## AKCİĞER DONÖRLERİ İÇİN COVID-19 RİSK SINIFLAMA

Risk kategorisi	Maruziyet kategorisi	Klinik kategori	Karar
Düşük	0-1	0	Kabul etmek
Orta	2	0	Göğüs ve bronkoskopinin BT görüntülemesinde COVID-19 belirtileri yoksa, duruma göre düşünün.
Orta - yüksek	3	0	Durum bazında düşünün; Nakil adayı risk / fayda hususları nakli desteklemediği sürece muhtemelen reddedilir
Yüksek	0-3	1-3	Reddet

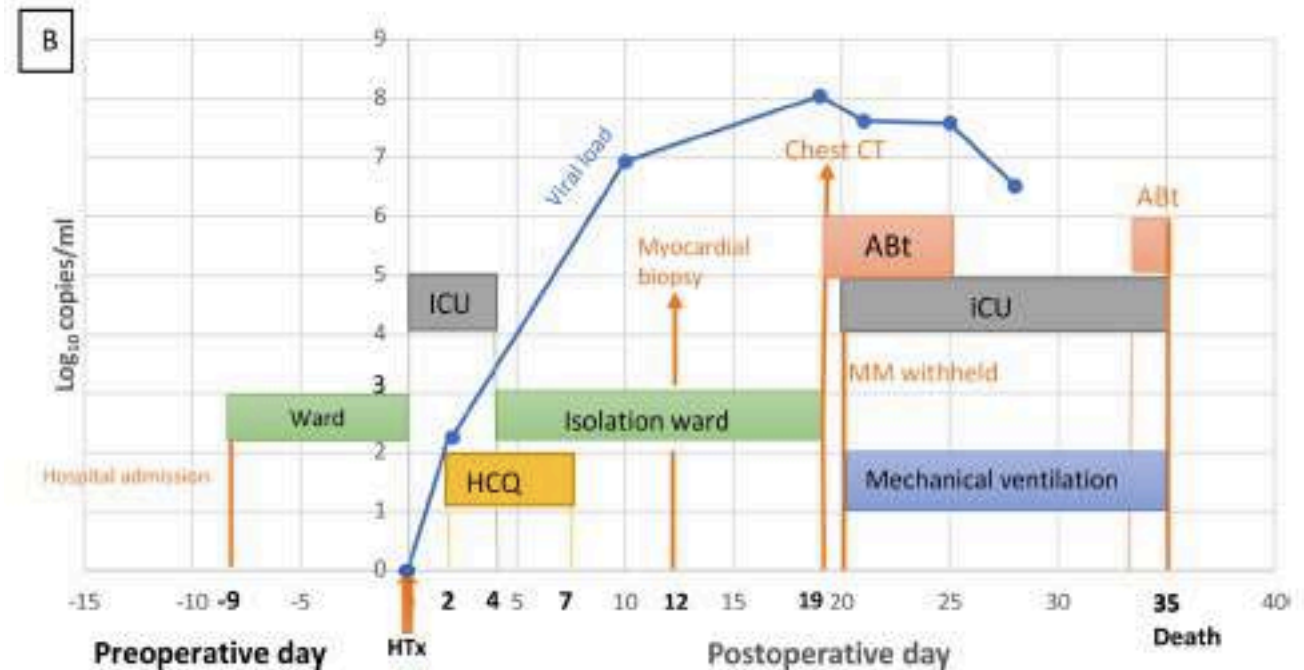
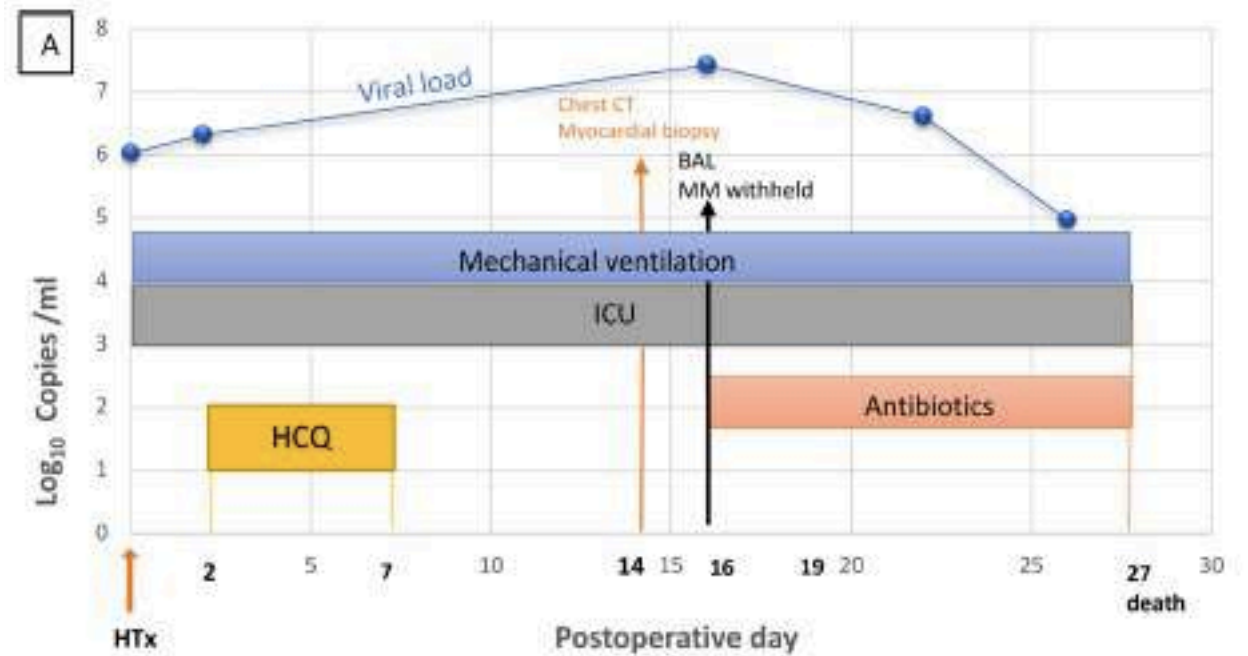
CASE REPORT

Open Access



# Clinical course and challenging management of early COVID-19 infection after heart transplantation: case report of two patients

- Mart 2020 acil kalp Tx olan COVID-19 açısından preop asemptomatik ve N/F PCR negatif olan 2 hasta(biri perioperatif PCR (+))
- Postoperatif erken dönem COVID PCR + ve mortal
  - Bx :Miyokard endotel hücrelerinde viral partikül, myositte(-)





CASE REPORT

## Donor to recipient transmission of SARS-CoV-2 by lung transplantation despite negative donor upper respiratory tract testing

Daniel R. Kaul<sup>1</sup>  | Andrew L. Valesano<sup>1</sup> | Joshua G. Petrie<sup>2</sup> | Rommel Sagana<sup>3</sup> |

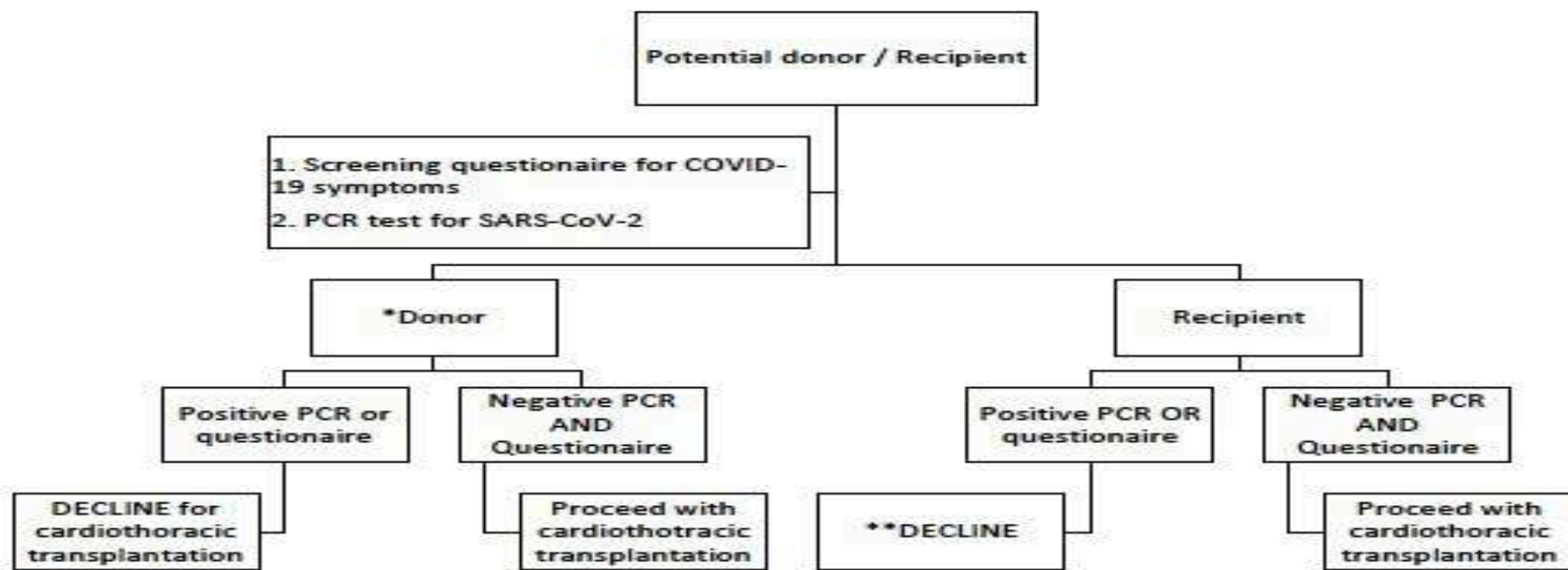
- Donör hikayesinde SARSCoV2 enf desteklememekte
  - Donör N/F son 48 saatte SARS CoV2 PCR (-)
  - Postop 3.gün alıcıda ateş, N/F PCR (-), BAL PCR (+)
- Nakil cerrahlarından birinde de 5. gün sonunda PCR pozitifliği
- Donörden daha önce alınan BAL PCR tekrar çalışıldığında PCR (+)
  - Filogenetik analiz eşleşti
  - Donör başka bir organ naklinde kullanılmamış



## Guidance from the International Society of Heart and Lung Transplantation regarding the SARS CoV-2 pandemic

REVISED: February 1, 2021

Figure 1. Screening pathway for donor and recipient screening at time of organ offer.



□

\*consider CT chest for donor and decline if concerning for COVID-19

\*\* Exceptions can be made on a case-by-case basis as noted in Table 2

- Recommend deep respiratory sample in lung donor for SARS-CoV-2 testing
- N-95 mask or equivalent plus face shield in operating room for lung transplant
- Current data does not suggest a change in induction or maintenance immunosuppression



# ISHLT

A Society that Includes Basic Science, the Failing Heart, & Advanced Lung Disease

## Guidance from the International Society of Heart and Lung Transplantation regarding the SARS CoV-2 pandemic

REVISED: February 1, 2021

### WAITLISTED CANDIDATE

Exposure to confirmed or suspected case of COVID-19 within past 14 days	May be considered for transplant if: Asymptomatic AND >7 days since exposure AND One negative SARS-CoV-2 PCR test AND High risk of mortality without organ transplantation  If above criteria not met, recommend avoiding cardiothoracic transplant within the 14-day incubation period.
Previous symptomatic COVID-19	Clinical resolution AND >21 days from onset of symptoms* AND one negative SARS-CoV-2 PCR test AND lack of COVID-19 related end-organ damage  *time period may be shortened to at least 14 days in candidate with high risk of mortality without transplant if other criteria are met  If PCR remains positive after resolution of illness > 28 days from initial diagnosis may be considered for cardiothoracic transplant if high risk of waitlist mortality
Candidate with asymptomatic positive SARS-CoV-2 PCR	May be considered for cardiothoracic transplant if: >14 days since diagnosis unless high risk of mortality without organ transplantation AND one negative SARS-CoV-2 PCR test within 72 hours of transplant  If PCR remains positive in an asymptomatic patient > 28 days from initial diagnosis may be considered for cardiothoracic transplant if high risk of waitlist mortality

**Bekleme Listesindeki Alıcılar;  
Nakil ne zaman;**

**Son 14 günde COVID-19 maruziyeti:**  
asemptomatik, 7 günden fazla süre,  
1 negatif PCR, Yüksek mortalite riski

**Önce geçirilmiş COVID-19**

Klinik iyileşme, semptom başlamasından bu yana 21 günden fazla süre ; 1 negatif PCR ve end organ hasarı olmaması

**Aseptomatik PCR pozitif Alıcı;**

Tanı konmasından bu yana 14 günden fazla süre, 1 negatif PCR son 72 saatte, yüksek mortalite riski,

**28 günden daha uzun PCR pozitifliği olan yüksek riskli hastalar**



# ISHLT

A Society that Includes Basic Science, the Failing Heart, & Advanced Lung Disease

## Guidance from the International Society of Heart and Lung Transplantation regarding the SARS CoV-2 pandemic

REVISED: February 1, 2021

DONOR	
Exposure to confirmed or suspected case of COVID-19 within past 14 days	Organ may be considered for cardiothoracic transplant if: Donor has been asymptomatic AND >7 days since exposure AND at least one negative *SARS-CoV-2 PCR test AND CT chest negative for pulmonary infection AND potential candidate with high risk of mortality without organ transplantation  *Deep respiratory specimen recommended for lung donors
Donor with prior confirmed COVID-19	May be considered for cardiothoracic transplant if: Clinical resolution of symptoms due to COVID-19 AND >21 days from onset of symptoms AND no significant pulmonary disease due to COVID-19 (for e.g. required intubation) AND at least one negative *SARS-CoV-2 PCR AND  CT scan of the chest negative for evidence of pulmonary infection/chronic lung injury AND lack of other COVID-19 related end-organ damage  *Deep respiratory specimen recommended for lung donors

### Donör Değerlendirmeleri;

#### Son 14 günde COVID\_19 maruziyeti;

Donör asemptomatikse, 7 günden fazla süre, 1 negatiflik PCR, toraks CT de tutulum yok ise, bekleme listesinde mortalitesi yüksek hasta ise

(AC tx'de derin solunum örnekleri önerilir.)

#### Öncesinde Konfirme COVID-19 Donör;

Klinik iyileşme, semptom başlangıcından bu yana 21 günden fazla süre, aşikar AC enf bulgusu olmaması, en az 1 negatif PCR, Toraks CT tutulum olmaması, COVID-19 ilişkili end organ tutulum olmaması



# ISHLT

A Society that Includes Basic Science, the Failing Heart, & Advanced Lung Disease

## Guidance from the International Society of Heart and Lung Transplantation regarding the SARS CoV-2 pandemic

REVISED: February 1, 2021

### LUNG TRANSPLANT LISTING FOR COVID-19 RELATED RESPIRATORY FAILURE

May consider lung transplant in carefully selected patients based on the following criteria:  
Severe lung injury has been present for > 28 days AND markers of irreversibility noted on imaging and ventilatory studies AND  
Single organ disease from SAR-CoV-2 AND  
Two negative SARS-CoV-2 PCR tests 24-48 hours apart (including deep respiratory specimen), AND  
otherwise considered to be a candidate based on the transplant center's local policies

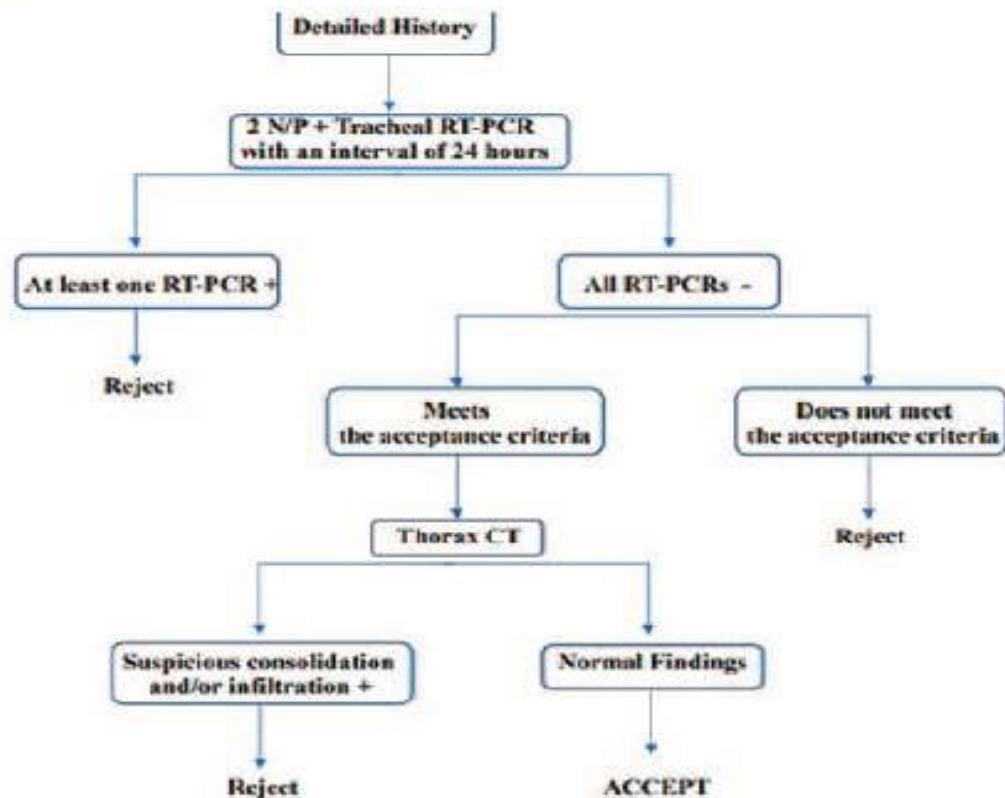
### COVID\_19 ilişkili solunum yetmezliği nedeniyle AC tx listesindeki hasta

28 günden daha uzun süren akciğer hasarı, görüntüleme ve ventilasyon testlerinde irreversible olması, COVID-19'a bağlı tek organ hastalığı, son 24-48 saatte 2 PCR negatifliği, lokal yönetmelikler

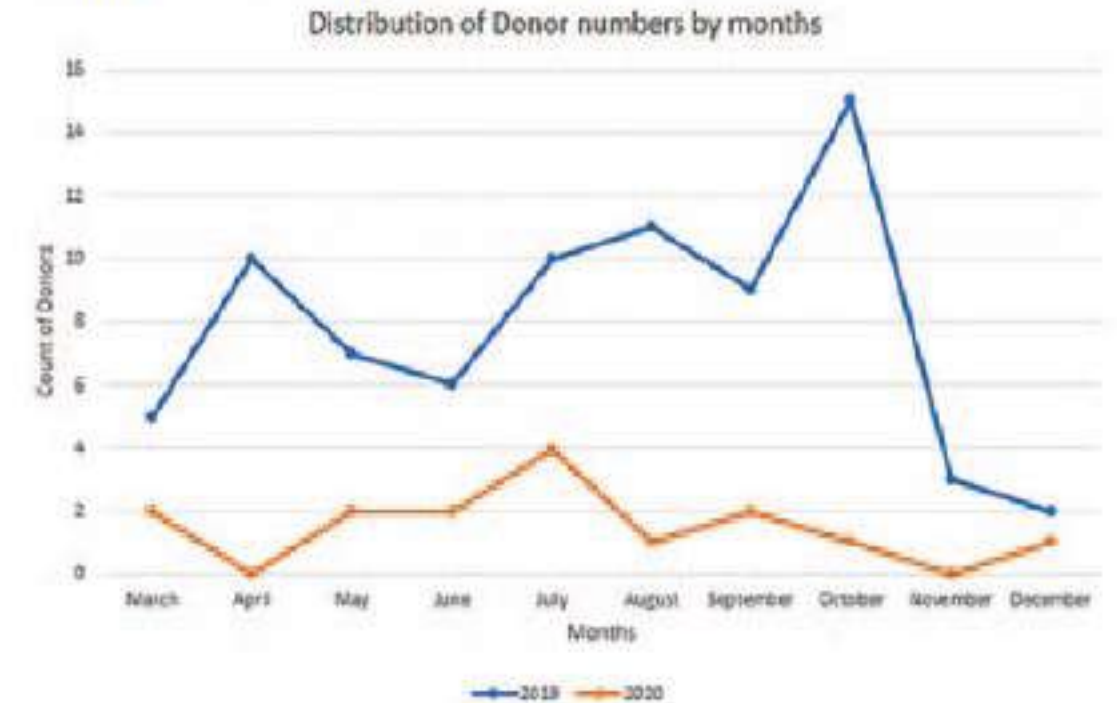
# Donor Lung Evaluation and Lung Transplantation in the COVID-19 Era

Mehmet Furkan Sahin,<sup>1</sup> Muhammet Ali Beyoglu,<sup>1</sup> Sinan Turkkan,<sup>1</sup> Yasemin Tezer Tekce,<sup>2</sup> Alkin Yazicioglu,<sup>1</sup> Erdal Yekeler<sup>1</sup>

**Figure 1.** Donor Organ Evaluation Algorithm for Lung Transplants During the COVID-19 Period at Our Center



**Figure 2.** Number of Donors Presented to Our Center Between March 11 and December 31: 2019 Compared With 2020



## Donor Lung Evaluation and Lung Transplantation in the COVID-19 Era

Mehmet Furkan Sahin,<sup>1</sup> Muhammet Ali Beyoglu,<sup>1</sup> Sinan Turkkan,<sup>1</sup> Yasemin Tezer Tekce,<sup>2</sup>  
Alkin Yazicioglu,<sup>1</sup> Erdal Yekeler<sup>1</sup>

**Table 4. Measures Taken in Lung Transplant Management in Our Center During the Pandemic Period**

- Detailed COVID-19 questions in donor evaluation
- Evaluation of SARS-CoV-2 RT-PCR tests from donor tracheal aspirates and nasopharyngeal swabs in 24-h intervals
- Thorax CT evaluation on presentation day for accepted donors
- Evaluation of SARS-CoV-2 RT-PCR tests from BAL samples collected by FOB by procurement teams
- Management of procurement process with minimum personnel, all using appropriate personal protective measures
- Transplants to recipient candidates performed only if RT-PCR test results from nasopharyngeal samples are negative for SARS-CoV-2
- Use of N95 filtering facepiece respirators and surgical masks by operation team in recipient surgeries
- Exclusion of procurement team from recipient transplant operations, to reduce potential higher risk of exposure
- Follow-up with patients in isolated intensive care and wards where only transplant patients are present
- Evaluation of SARS-CoV-2 RT-PCR tests from BAL samples collected by FOBs from the recipients' intensive care period
- Evaluation of SARS-CoV-2 RT-PCR tests from nasopharyngeal, conjunctival, and rectal swab samples every second day during the intensive care period
- Evaluation of thorax CT between postoperative days 10 to 15
- Regular RT-PCR tests screens for SARS

- Ayrıntılı hikayede COVID-19 sorgulaması
- Donör DTA ve N/F PCR sonuçları
- Sunum günündeki Toraks CT
- Harvestde BAL SARS CoV2 PCR
  - Alıcı; N/F PCR negatifliği
- PostTx YBÜ takiplerinde alıcı BAL PCR
- Alıcı Post tx 2. günden sonra N/F, konjonktiva, rektal
  - Post Tx 2. hft toraks CT
- BAL süreyans örneklerinde PCR

## The pandemic provides a pathway: What we know and what we need to know about using COVID positive donors

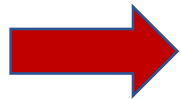
Reference	Donor information	Organ transplanted	Recipient fully vaccinated	Recipient with prior COVID-19 infection	Recipient serostatus at the time of transplant	Recipient develop COVID-19?	Recipient receive COVID-19 therapy?	Graft outcome
Puodziukaite <sup>1</sup>	Mild symptoms, NPS+ CT values <sup>†</sup> = 32.0; 33.8	Kidney	No	Yes	IgG +	No	No	Good
Meshram <sup>2</sup>	Donor with critical COVID-19 infection; NPS - at the time of organ procurement	Kidney	No	Yes	IgG+	No	No	Good
		Kidney	No	No	NR	No	No	Good
de la Villa <sup>3</sup>	Mild COVID infection 2 months prior NPS+ CT value <sup>†</sup> = 30, Plasma PCR -	Kidney	No	Yes	NR	No	No	Good
		Heart	NR	No	IgG-	No	No	NR
Frattaroli <sup>4</sup>	No history of COVID-19 symptoms NPS+ CT value <sup>‡</sup> = 40.2	Liver	NR	Yes	IgG+	No	No	NR
		Kidney	No	NR	NR	No	No	Good
Sigler <sup>5</sup>	COVID-19 infection during terminal hospitalization; NPS - at the time of organ procurement	Kidney	No	NR	NR	No	No	Good
		Liver	Yes	NR	NR	No	No	Good
		Heart	No	No	IgG-	No	Remdesivir + casirivimab/imdevimab	Good
Koval <sup>11</sup>	NPS+ IgG+	Kidney	No	NR	IgG-	No	Remdesivir	Good
		Kidney	Yes	NR	IgG-	No	Remdesivir	Good
		Kidney	No	No	NR	No	No	Good
		Kidney	No	No	NR	No	No	Good
	NPS+ CT values <sup>†</sup> = 40; 38	Kidney	No	Yes	NR	No	No	Good
		Kidney	No	No	NR	No	No	Good
		Kidney	No	No	NR	No	No	Good
	NPS+	Kidney	No	No	NR	No	No	Good





## The pandemic provides a pathway: What we know and what we need to know about using COVID positive donors

Reference	Donor information	Organ transplanted	Recipient fully vaccinated	Recipient with prior COVID-19 infection	Recipient serostatus at the time of transplant	Recipient develop COVID-19?	Recipient receive COVID-19 therapy?	Graft outcome
		Kidney	No	Yes	NR	No	No	Good
	NPS+	Kidney	No	Yes	NR	No	No	Good
		Kidney	No	No	NR	No	No	Good
	NPS+, CT values <sup>†</sup> = 31, 41	Kidney	No	No	NR	No	No	Good
		Kidney	No	No	NR	No	No	Good
Hong <sup>12</sup>	Mild symptoms NPS4.2 log copies/ml	Partial Liver	No	No	NR	No	Lopinavir + ritonavir followed by hydroxychloroquine	Not reported
Manzia <sup>13</sup>	No known symptoms BAL+, CT values <sup>‡</sup> = 24; 27; 24	Liver	No	Yes: Recipient+ on BAL and NP swab	IgG+	Recipient already NPS+ at the time of transplant	No	Good
Dhand <sup>14</sup>	Early mild-moderate COVID-19, NPS+ CT value <sup>§</sup> : 38.5; 40.5	Heart	NR	NR	NR	No	casirivimab/imdevimab	Good
		Liver	Yes	NR	NR	No	casirivimab/imdevimab	Good
Kaul <sup>6</sup>	NPS- BAL+ CT values <sup>¶</sup> = 8.5; 9.5	Lung	NR	NR	NR	Yes	Remdesivir and convalescent plasma	Attributable death
Perlin <sup>15</sup>	NPS+	Kidney	NR	NR	IgG-	No	No	Delayed graft function
		Kidney	NR	NR	IgG-	No	No	Good
Ngueyn <sup>16</sup>	NPS+	Partial Liver	NR	NR	IgG-	No	Convalescent plasma	Good
Kumar <sup>7</sup>	NPS- BAL+	Lung	NR	NR	NR	Yes	Two courses Remdesivir + methylprednisolone	Prolonged stay in intensive care unit with new oxygen requirement
		Liver	NR	NR	NR	No	No	Good
		Kidney	NR	NR	NR	No	No	Non-attributable mortality
		Kidney	NR	NR	NR	No	No	Good
	NPS- BAL+	Kidney	NR	NR	NR	No	No	Good



# SOT alıcılarında COVID-19 nasıl seyretti?

Received: 27 May 2021 | Revised: 31 August 2021 | Accepted: 7 September 2021  
DOI: 10.1111/ajt.16840

**BRIEF COMMUNICATION**

AJT

## Changing trends in mortality among solid organ transplant recipients hospitalized for COVID-19 during the course of the pandemic

Madeleine R. Heldman<sup>1</sup> | Olivia S. Kates<sup>1</sup> | Kassem Safa<sup>2</sup> | Camille N. Kotton<sup>2</sup> | Sarah I. Georgia<sup>2</sup> | Julia M. Steinbrink<sup>3</sup> | Barbara D. Alexander<sup>3</sup> |

Mart-Haziran 2020 ile Temmuz-Aralık 2020

ABD çok merkezli gözlemsel çalışma, COVID-19 enf tanısı alan hastalar 28 gün izlem

1616 SOTR nın 1435 i COVID-19 tanısı (%88). 973'ü (%67) hospitalize  
571 ilk dönem, 402 ikinci

**%11 Kalp , %7'si AC alıcısı ( ilk dönem daha fazla bu riskli nakil grp)**

İki dönem arasında kaba mortalite %19'dan %13'e düşmüş.

Erken tanı, sağlık kuruluşlarına ulaşım, steroid, remdesivir ve HFO2 kullanımı,  
immunsüpresiflerin kullanımı

# Kalp alıcılarında COVID-19

Clinical Research in Cardiology (2020) 109:1531–1539  
<https://doi.org/10.1007/s00392-020-01722-w>

ORIGINAL PAPER



## COVID-19 among heart transplant recipients in Germany: a multicenter survey

- Pandeminin ilk ayında, Almanya'dan çok merkezli gözlemsel çalışma
  - 19 kalp alıcısı %78 de komorbidite (+)
- 8/21 (%38) mekanik ventilatör ihtiyacı → bunlarda mortalite %87
- Mortalitenin en sık nedeni sağ kalp yetmezliği, aritmi ve TE olaylar
  - Mortal seyredenlerde BNP değeri yüksekliği

COVID RAPID REPORTS

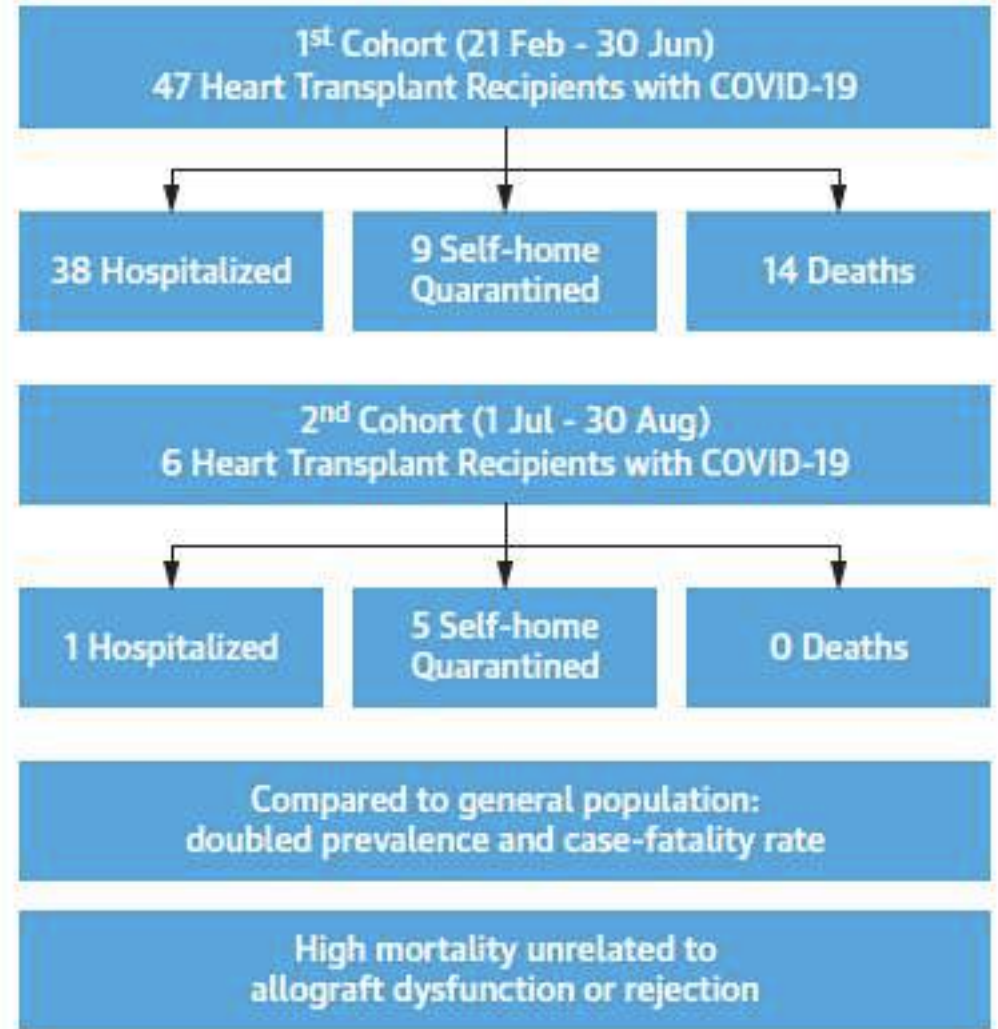
## COVID-19 in Heart Transplant Recipients

A Multicenter Analysis of the Northern Italian Outbreak



**RESULTS** To date, 38 patients required hospitalization while 9 remained self-home quarantined and 14 died. Compared to the general population, prevalence (18 vs. 7 cases per 1,000) and related case fatality rate (29.7% vs. 15.4%) in heart transplant recipients were doubled. Univariable analysis showed older age ( $p = 0.002$ ), diabetes mellitus ( $p = 0.040$ ), extracardiac arteriopathy ( $p = 0.040$ ), previous PCI ( $p = 0.040$ ), CAV score ( $p = 0.039$ ), lower GFR ( $p = 0.004$ ), and higher NYHA functional classes ( $p = 0.023$ ) were all significantly associated with in-hospital mortality. During the follow-up two patients died and a third patient has prolonged viral-shedding alternating positive and negative swabs. Since July 1st, 2020, we had 6 new patients who tested positive for SARS-CoV-2, 5 patients asymptomatic were self-quarantined, while 1 is still hospitalized for pneumonia. A standard therapy was maintained for all, except for the hospitalized patient.

### CENTRAL ILLUSTRATION SARS-CoV-2 in Heart Transplant Recipients: A Multicenter Analysis in Northern Italy



Bottio, T. et al. *J Am Coll Cardiol HF.* 2021;9(1):52-61.

# Akciğer alıcılarında COVID-19

Received: 30 June 2020 | Revised: 7 October 2020 | Accepted: 9 October 2020  
DOI: 10.1111/ajt.16364

ORIGINAL ARTICLE

AJT

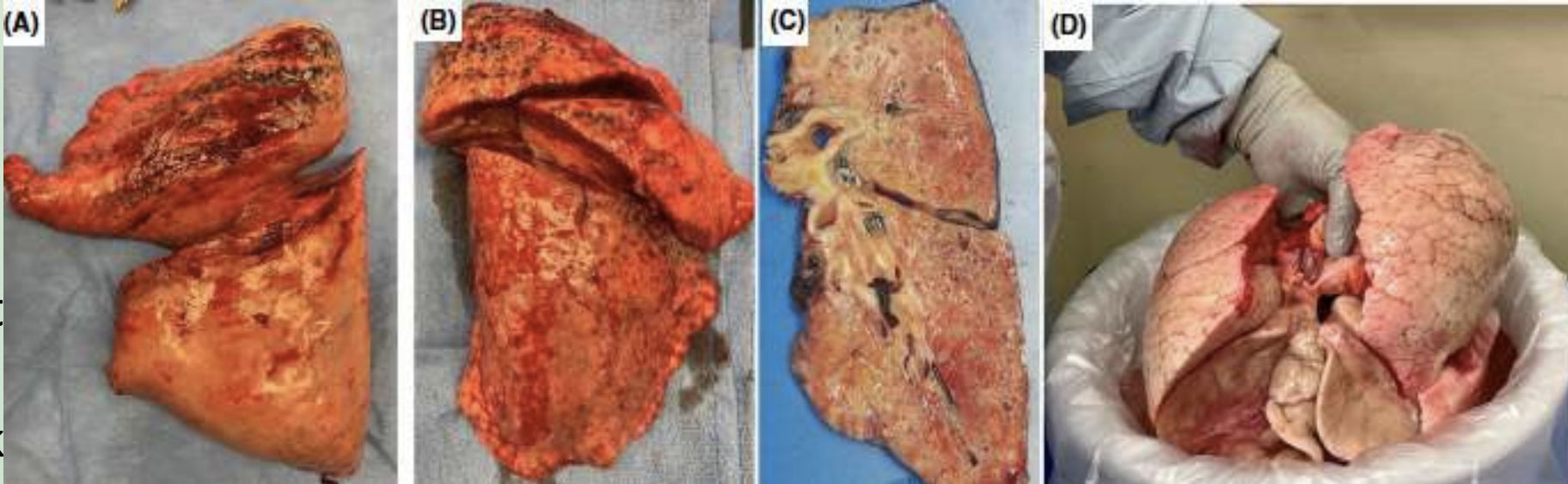
## COVID-19 in lung transplant recipients: A multicenter study

- İspanya'dan çok merkezli retrospektif gözlemsel çalışma
  - Mart 2020-28.Nisan.2020, 44 akciğer alıcısı
    - Nakilden sonra median 4.2.yıl
    - %84 solunum ve O2 desteği
      - 17 (%39 ) mortalite,

\*\*Mortal seyredenlerde;

hastaneye başvuruda, solunum parametreleri ve radyoloji daha kötü, D dimer, IL-6 ve LDH seviyeleri daha yüksek

## Lung donation following SARS-CoV-2 infection



- COV
  - Int
- Basilik

y kadın  
resini  
pulse

ST

Rutin IS : Tacro + MMF + prednisolon

RNAaskop eksplant ve donor;(-), eksplant ciddi fibrosis bulgular  
35. Günde SARS Cov 2' rekürrens YOK ; solunum fizyoterapisi

## Post-infection pulmonary sequelae after COVID-19 among patients with lung transplantation

Luke D. Mahan<sup>1</sup> | Isaac Lill<sup>1</sup> | Quinn Halverson<sup>1</sup> | Manish R. Mohanka<sup>1</sup> |



- 1.Mart 2020-15.Şubat.2021 arası,
- **54 hasta PCR (+)**
- ABD ,yüksek volümlü tek merkez
- solunum fxn önemli azalma sonlanım noktası(>%10; FVC ; FEV1 farklı zamanda spirometre ölçümü ile )
- Ayaktan takip edilen **4 hastanın 3'ü bamlavimab; hospitalizasyon(-)**
- 45 hastada akut enfeksiyon bulgusu+
- Malignansi ile takipten çıkan hastalarla beraber toplamda **44 hasta** çalışmayı tamamlamış

- Kalıcı ve önemli fonksiyon kaybı sadece 18 hasada (%40.9)
- CT bulguları %65.9 (29/44)
- Buzlu cam , retiküler bant, nodül, konsolidasyon
- CLAD kriterleri (COVID-19 enfeksiyonundan sonra yeni CLAD insidansı) 3/44 (%5.6)
- Solunum fxn azalanlar ile azalmayan gruplar arasında hiçbir parametre istatistik olarak anlamlı çıkmadı.

ORIGINAL ARTICLE

# Post-infection pulmonary sequelae after COVID-19 among patients with lung transplantation

Luke D. Mahan<sup>1</sup> | Isaac Lill<sup>1</sup> | Quinn Halverson<sup>1</sup> | Manish R. Mohanka<sup>1</sup>



Variable	Post-infection spirometry decline > 10%		Odds ratio (95% CI)	p-value
	Yes (n = 18)	No (n = 26)		
Age	58 (20–70)	60.5 (21–72)		.33
BMI at diagnosis (Kg/m <sup>2</sup> )	26.4 (17–40)	28.1 (20–39)		.4
Male gender	72.2%	76.9%	0.78 (0.2–3.1)	.74
Caucasian	55.6%	65.4%	0.66 (0.19–2.27)	.54
Transplant Indication (%)				.13
Restrictive	83.3	61.5		
Obstructive	5.6	23.1		
Suppurative	11.1	3.8		
Vascular		11.5		
Bilateral Transplant	88.9%	69.2%	3.56 (0.66–19.3)	.16
Time since transplant (months)	48 (10–100)	39 (5–139)		.26
Baseline FEV <sub>1</sub> before the infection (L)	2.01 (0.99–4.32)	2.38 (0.49–4.7)		.59
Baseline FVC before the infection (L)	2.79 (2.06–4.53)	3.03 (1.24–5.21)		.61
Diabetes mellitus	33.3%	57.7%	0.37 (0.11–1.28)	.14
Co-morbid renal dysfunction <sup>†</sup>	44.4%	46.2%	0.93 (0.28–3.1)	1.0
Established pre-infection CLAD	27.8%	26.9%	1.04 (0.27–4.02)	1.0
Duration of symptoms at diagnosis (days)	2.5 (0–10)	3 (1–7)		.93
Lower respiratory tract symptoms at presentation	83.3%	61.5%	3.13 (0.72–13.6)	.18
Spirometry (FEV <sub>1</sub> or FVC) decline of >10% at presentation	42.9% (n = 14)	31.6% (n = 20)	1.63 (0.39–6.82)	.72
Opacities on chest radiograph at presentation	77.8%	46.2%	4.08 (1.06–15.8)	.06
Opacities consistent with COVID-19 on CT chest	93.3% (n = 15)	83.3% (n = 24)	2.8 (0.28–27.8)	.63
Hospitalization	100%	84.6%		.13
Lymphocyte count (× 10 <sup>3</sup> /dL)				
At diagnosis	1.42 (0.76–2.94)	1.22 (0.4–2.71)		.41
Lowest during admission	0.25 (0–0.78)	0.28 (0–0.94)*		.273
At hospital discharge	0.41 (0.23–2.45)	0.89 (0–2.24)*		.014
Lymphocyte counts < 0.6 × 10 <sup>3</sup> /dL at discharge from hospital	72.2%	22.7%*	8.84 (2.1–37.1)	.003
Ferritin (ng/ml)				
At diagnosis	200 (15–1336)	200 (36–1637)		.67
Highest during admission	620 (64–3373)	212 (40–3614)*		.06
At hospital discharge	349 (56–2232)	113 (22–2627)*		.04
Ferritin levels > 150 ng/ml/L at discharge from hospital	72.2%	31.8%*	5.57 (1.42–21.9)	.02
Lymphocyte counts < 0.6 × 10 <sup>3</sup> /dL and Ferritin levels > 150 ng/ml at discharge from hospital				.001
None	None	54.5%*		
Either	50%	40.9%*		
Both	50%	4.5%*		

İstatiksel olarak anlamlı olmasa da;

- Restriktif AC hastalığı obstrüktif olana göre,
- Kabul değerlerine karşı, Taburculuktaki absolu lenfosit düşüklüğü (AUC;600/dl) ve ferritin yüksekliği (150ng/ml)

Variable	Post-infection spirometry decline > 10%		Odds ratio (95% CI)	p-value
	Yes (n = 18)	No (n = 26)		
D-dimer (mcg/ml)				
At diagnosis	0.43 (0.25–1.29)	0.92 (0.17–32.6)		.17
Highest during admission	0.97 (0.17–32.8)	0.66 (0.09–6.0)*		.63
At hospital discharge	0.52 (0.17–6.28)	0.6 (0.17–5.77)*		.77
C-reactive protein (mg/L)				
At diagnosis	5.0 (0.4–59.4)	5.25 (0.03–37.4)		.95
Highest during admission	38.9 (6.1–256.4)	35 (2.2–116.6)*		.6
At hospital discharge	3.6 (0.4–23.4)	4.2 (0.4–17.9)*		.46
Lactate dehydrogenase (U/L)				
At diagnosis	216 (145–341)	200 (124–376)		.87
Highest during admission	301 (350–789)	290 (199–600)*		.87
At hospital discharge	269 (151–556)	239 (156–600)*		.34



## Post-infection pulmonary sequelae after COVID-19 among patients with lung transplantation

Luke D. Mahan<sup>1</sup> | Isaac Lill<sup>1</sup> | Quinn Halverson<sup>1</sup> | Manish R. Mohanka<sup>1</sup>

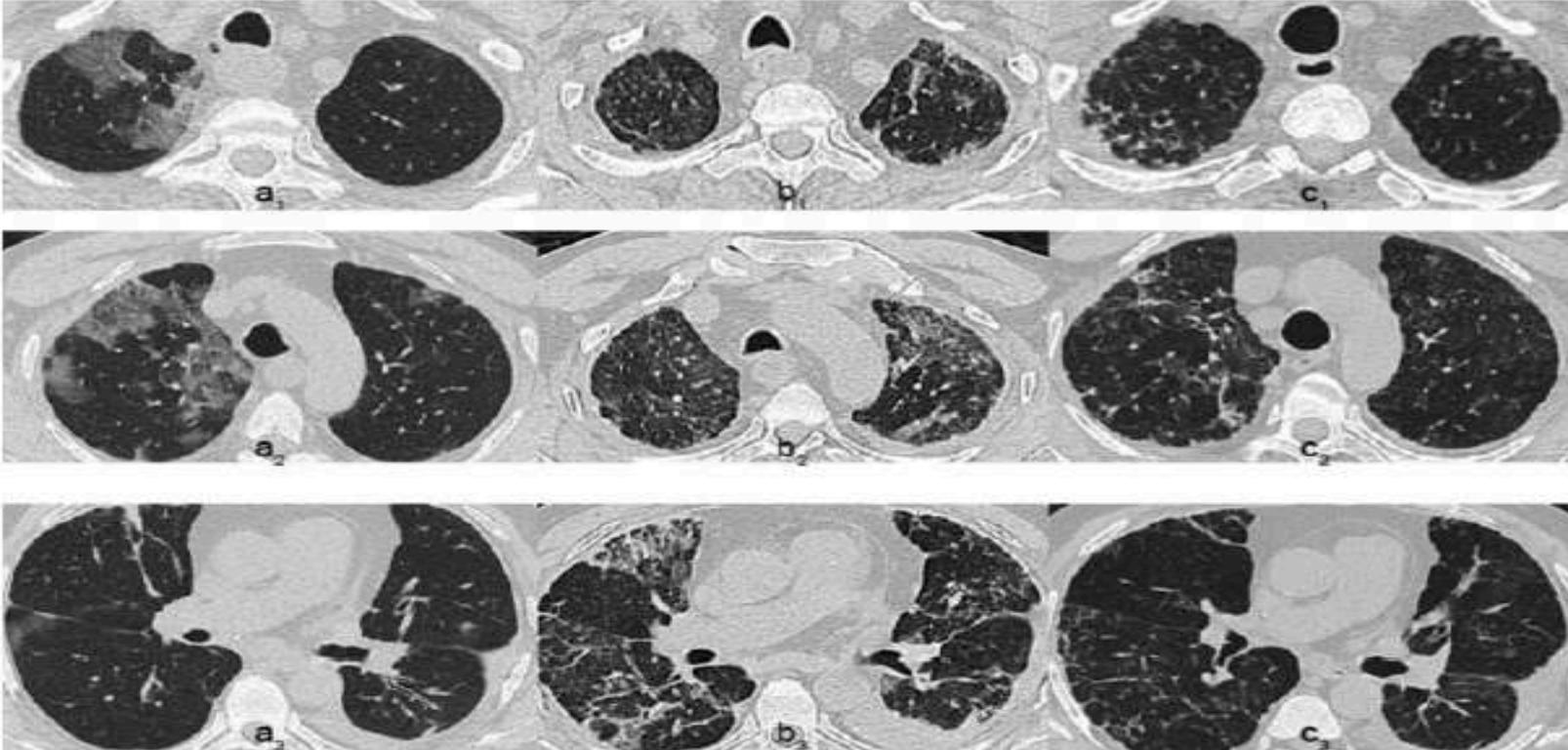


Variable	Post-infection spirometry decline >10%		Odds ratio (95% CI)	p-value
	Yes (n = 18)	No (n = 26)		
Monoclonal antibody†	22.2%	7.7%	3.42 (0.55–21.2)	.2
Remdesivir	83.3%	84.6%	0.91 (0.18–4.66)	1.0
Need of ICU admission	27.8%	6.9%	7.02 (1.02–48.7)	.034
Need of ventilator support	16.7%	3.8%	5.0 (0.48–52.53)	.29
Need for readmission	44.4%	27.3%*	2.13 (0.57–8.0)	.33
Cumulative length of hospital stay (days)∞	10 (2–49)	10 (4–12)		.62
Post-COVID-19 pulmonary opacities∞	77.8%	57.7%	4.76 (0.51–44.4)	.2
Karnofsky score at the last follow up visit				.49
≤40%	11.1%	19.2%		
50–70%	66.7%	50%		
≥80%	22.2%	30.8%		

CLAD gelişen RAS fenotipindeki hastaların gelişmeyenlerle radyolojik olarak ayırımı mümkün değil.

## COVID-19 in a Lung Transplant Patient: Rapid Progressive Chronic Lung Allograft Dysfunction

*Sinan Turkkan,<sup>1</sup> Muhammed Ali Beyoglu,<sup>1</sup> M. Furkan Sahin,<sup>1</sup> Alkin Yazicioglu,<sup>1</sup>  
Hülya Yiğit Ozay,<sup>2</sup> Yasemin Tezer Tekçe,<sup>3</sup> Funda Demirag,<sup>4</sup> Erdal Yekeler<sup>1</sup>*



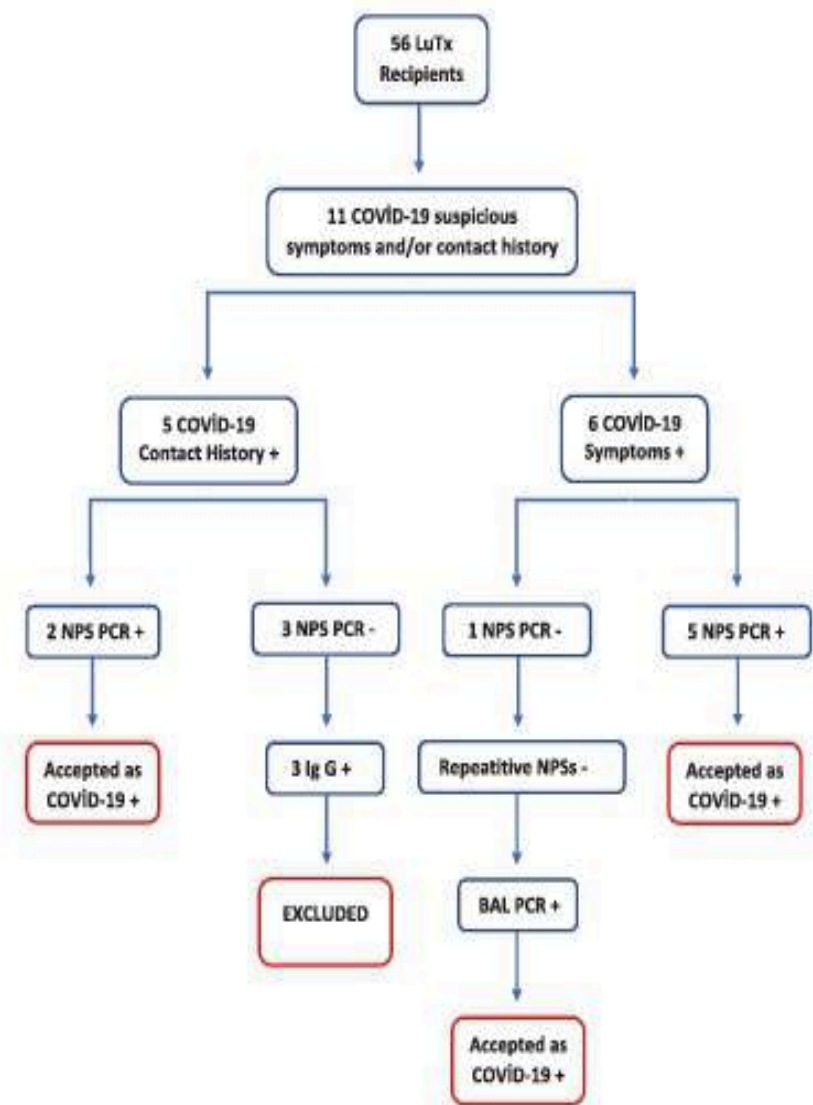
Tekrarlanan N/F, tükrük ,  
konjonktiva, rektal SARS CoV2  
PCR negatif;  
BAL SARSCoV 2 PCR +

## COVID-19 in lung transplant recipients: A single-center experience

Sinan Turkkan<sup>1</sup> | Muhammet Ali Beyoglu<sup>1</sup> | Mehmet Furkan Sahin<sup>1</sup> | Alkin Yazicioglu<sup>1</sup> | Yasemin Tezer Tekce<sup>2</sup> | Erdal Yekeler<sup>1</sup>

Mart 2020-Mart 2021 arasında AC TX alıcılarında

Parameters	Mild (n = 3)	Moderate (n = 2)	High severity (n = 3)	Total (mean, range, median)
Leucocytes (x10 <sup>3</sup> /ml)	4.7 (4.1-5.7)	3.0 (2.3-3.7)	6.0 (1.7-9.4)	4.8 (1.7-9.4; 4.3)
Lymphocytes (x10 <sup>3</sup> /ml)	1.2 (1.0-1.4)	1.4 (1.4-1.4)	1.3 (0.2-2.9)	1.3 (0.2-2.9; 1.3)
% Leucocytes	68.8 (62.7-74.3)	60.5 (55.6-65.5)	80.3 (72.5-86)	71.0 (55.6-86.0; 71.5)
%Lymphocytes	18.7 (12.6-22)	29.8 (25.3-34.4)	13.5 (8.6-22.1)	19.5 (8.6-34.4; 21.7)
Lowest % lymphocytes	16.4 (10.2-22)	8.35 (6.1-10.6)	4.8 (3.2-6.6)	9.1 (3.2-22; 8.3)
Fibrinogen (g/L)	3.82 (2.22-5.16)	2.58 (2.03-3.13)	4.73-4.14 (4.03-6.03)	3.8 (2.0-6.0; 4.1)
D-dimer (mg/L)	0.6-0.6 (0.5-0.7)	0.6 (0.3-0.9)	0.9 (0.6-1.4)	0.7 (0.3-1.4; 0.7)
LDH (U/L)	339 (234-525)	383 (234-532)	374 (300-485)	363 (231-532; 318)
Ferritin (µg/L)	15 (12-18)	21 (10-32)	101.6 (23-146)	53 (10-146; 23)
IL-6 (at admission) (pg/L)	6.26 (5.9-6.9)	9.75 (8.9-10.6)	40.2 (19.9-64.4)	21.9 (6.9-64.4; 15.2)
IL-6 (maximum) (pg/L)	11 (6.9-14.3)	46.6 (38.0-55.3)	112 (36.4-235)	64.3 (6.9-235.0; 38.0)
CRP (g/L)	36.6 (6-91)	20.5 (12-29)	75.3-100 (18-108)	47.1 (6-108; 18)
Procalcitonin (µg/L)	0.033 (0.02-0.05)	0.03 (0.03-0.03)	0.17 (0.03-0.47)	0.08 (0.02-0.47; 0.04)
Initial chest X-ray	no	no	Bilateral infiltration (3)	



Cases	Age	Indication	Immunosuppressive therapy	Time after tx (months)	Co-morbidity	Initial Sypmtoms	Severity	Time after COVID-19 (days)	Medication for COVID-19	Outcomes
1	56	COPD	Tac+ Eve+ MMF+ CS	53	Low GFR, HT	Cough, dyspnea	High	240	Fav+Hqn+ (PS, after detecting ACR)	ACR, CLAD, oxygen dependency for 24 h/day
2	49	IPF	Tac+ MMF+ CS	25	DM, HT	Cough, dyspnea, fever, Chills, shivering	High	150	Fav+SA+PS	Recovered
3	48	Bronchiectasis	Tac+ MMF+ CS	29	DM, HT	No	Modarate	145	Fav+SA+PS	Recovered
4	52	H-X	Tac+ Eve+ MPA+ CS	82	DM	Smell disfunction	Mild	142	Fav	Recovered
5	53	COPD	Tac+ Eve+ CS	26	DM, HT	Cough, dyspnea	High	60	Fav+SA+PS	Loss of FEV <sub>1</sub> value by %30, decreasement in 6-MWT
6	38	Bronchiectasis	Tac+ MMF+ CS	22	HT	Fever, Chills, shivering	Modarate	55	Fav+SA	Recovered
7 (re-infection)	56	COPD	Tac+ Eve+ MMF+ CS	60	HT, Low GFR	No	Mild	52	Rem	Recovered
8	41	Bronchiectasis	Tac+ MMF+ CS	11	DM	Fever, Chills, shivering	Mild	20	Fav	Recovered

Tanı konar konmaz MMF kesildi

Streoid artımı ve kliniğine göre pulse steroid uygulandı.

Tekrarlayan bir hastaya remdesivir verilebildi. Hiçbir hastanın IL bloker ihtiyacı olmadı

Ortalama 108 günlük takip sürecinde sekonder bakteriyel ve fungal enfeksiyon görülmedi.

İki hastanın (birinde CLAD gelişti) ciddi solunum fonksiyonlarında gerileme gözlemlendi.

# Covid 19 ve nakil merkezi

Post-covid fibrozis O2 bağımlı hasta

Erken dönem covid, MV ve ECMO

Timing of listing:

- Decline in FVC  $\geq 10\%$  during 6 months of follow-up (note: a 5% decline is associated with a poorer prognosis and may warrant listing).
- Decline in DLCO  $\geq 15\%$  during 6 months of follow-up.
- Desaturation to  $< 88\%$  or distance  $< 250$  m on 6-minute-walk test or  $> 50$  m decline in 6-minute-walk distance over a 6-month period.
- Pulmonary hypertension on right heart catheterization or 2-dimensional echocardiography.
- Hospitalization because of respiratory decline, pneumothorax, or acute exacerbation.



# Covid



## Erken dö

- İkincil c
- Multi-d  
olmaya
- Kan kül  
enf. par
- Kanama
- Nöroloj
- Korone  
???
- EKO op

## Consensus document for the selection of lung transplant candidates: An update from the International Society for Heart and Lung Transplantation

Lorriana E. Leard, MD,<sup>a</sup> Are M. Holm, MD, PhD,<sup>b</sup> Maryam Valapour, MD, MPP,<sup>c</sup> Allan R. Glanville, MBBS, MD,<sup>d</sup> Sandeep Attawar, MBBS, MS, MCh,<sup>e</sup> Meghan Aversa, MD,<sup>f</sup> Silvia V. Campos, MD,<sup>g</sup> Lillian M. Christon, PhD,<sup>h</sup> Marcelo Cypel, MD, MSc,<sup>f</sup> Göran Dellgren, MD, PhD,<sup>i</sup> Matthew G. Hartwig, MD, MHS,<sup>j</sup> Siddhartha G. Kapnadak, MD,<sup>k</sup> Nicholas A. Kolaitis, MD, MAS,<sup>a</sup> Robert M. Kotloff, MD,<sup>l</sup> Caroline M. Patterson, MD,<sup>m</sup> Oksana A. Shlobin, MD,<sup>n</sup> Patrick J. Smith, PhD, MPH,<sup>j</sup> Amparo Solé, MD, PhD,<sup>o</sup> Melinda Solomon, MD, MSc,<sup>p</sup> David Weill, MD,<sup>q</sup> Marlies S. Wijsenbeek, MD, PhD,<sup>r</sup> Brigitte W.M. Willemse, MD, PhD,<sup>s</sup> Selim M. Arcasoy, MD, MPH,<sup>t</sup> and Kathleen J. Ramos, MD, MSc<sup>k</sup>

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#### RISK FACTORS WITH HIGH OR SUBSTANTIALLY INCREASED RISK:

- Candidates with these conditions may be considered in centers with expertise specific to the condition.
- We may not have data to support transplanting patients with these risk factors or there is substantially increased risk based upon the currently available data, and further research is needed to better inform future recommendations.
- When more than one of these risk factors are present, they are thought to be possibly multiplicative in terms of increasing risk of adverse outcomes.
- Modifiable conditions should be optimized when possible.

1. Age > 70 years
2. Severe coronary artery disease that requires coronary artery bypass grafting at transplant
3. Reduced left ventricular ejection fraction < 40%
4. Significant cerebrovascular disease
5. Severe esophageal dysmotility
6. Untreatable hematologic disorders including bleeding diathesis, thrombophilia, or severe bone marrow dysfunction
7. BMI > 35 kg/m<sup>2</sup>
8. BMI < 16 kg/m<sup>2</sup>
9. Limited functional status with potential for post-transplant rehabilitation
10. Psychiatric, psychological or cognitive conditions with potential to interfere with medical adherence without sufficient support systems
11. Unreliable support system or caregiving plan
12. Lack of understanding of disease and / or transplant despite teaching
13. *Mycobacterium abscessus* infection
14. *Lomentospora prolificans* infection
15. *Burkholderia cenocepacia* or *gladioli* infection
16. Hepatitis B or C infection with detectable viral load and liver fibrosis
17. Chest wall or spinal deformity expected to cause restriction after transplant
18. Extracorporeal life support
19. Retransplant <1 year following initial lung transplant
20. Retransplant for restrictive CLAD
21. Retransplant for AMR as etiology for CLAD

(continued on next page)

## First lung transplant in Wuhan for a critical and elderly COVID-19 patient

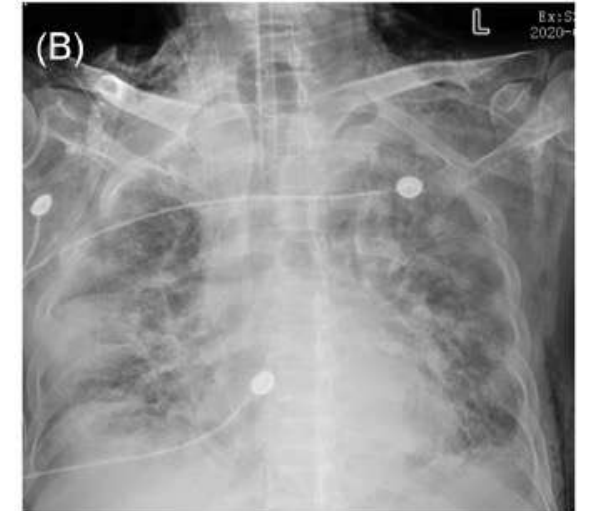
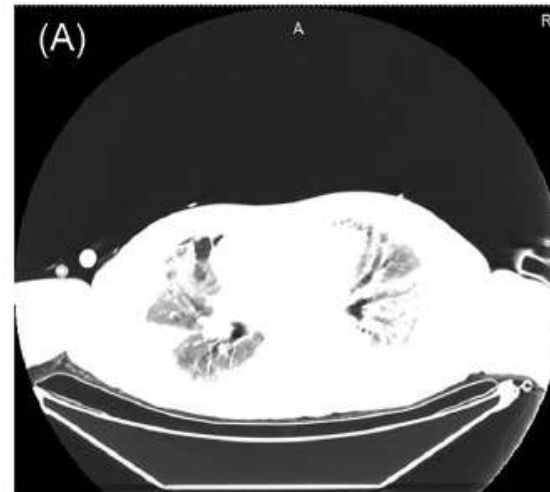
Bo Wang<sup>1</sup> | Jie Huang<sup>1</sup> | Micheal Hsin<sup>2</sup> | Jingyu Chen<sup>3</sup> | Huiqing Lin<sup>1</sup>

<sup>1</sup>Department of Thoracic Surgery, Renmin Hospital of Wuhan University, Wuhan, Hubei Province, China

<sup>2</sup>Department of Cardiothoracic Surgery, Queen Mary Hospital, Hong Kong, China

<sup>3</sup>Wuxi Lung Transplant Center, Wuxi People's Hospital Affiliated to Nanjing Medical University, Wuxi, Jiangsu, China

- 65 yaşında erkek hasta
- Şubat 2020 de PCR +
- 62 gün MV
- 63 gün V-V ECMO
- DLuTX
- İleri derecede miyopati, multiorgan yet. EX

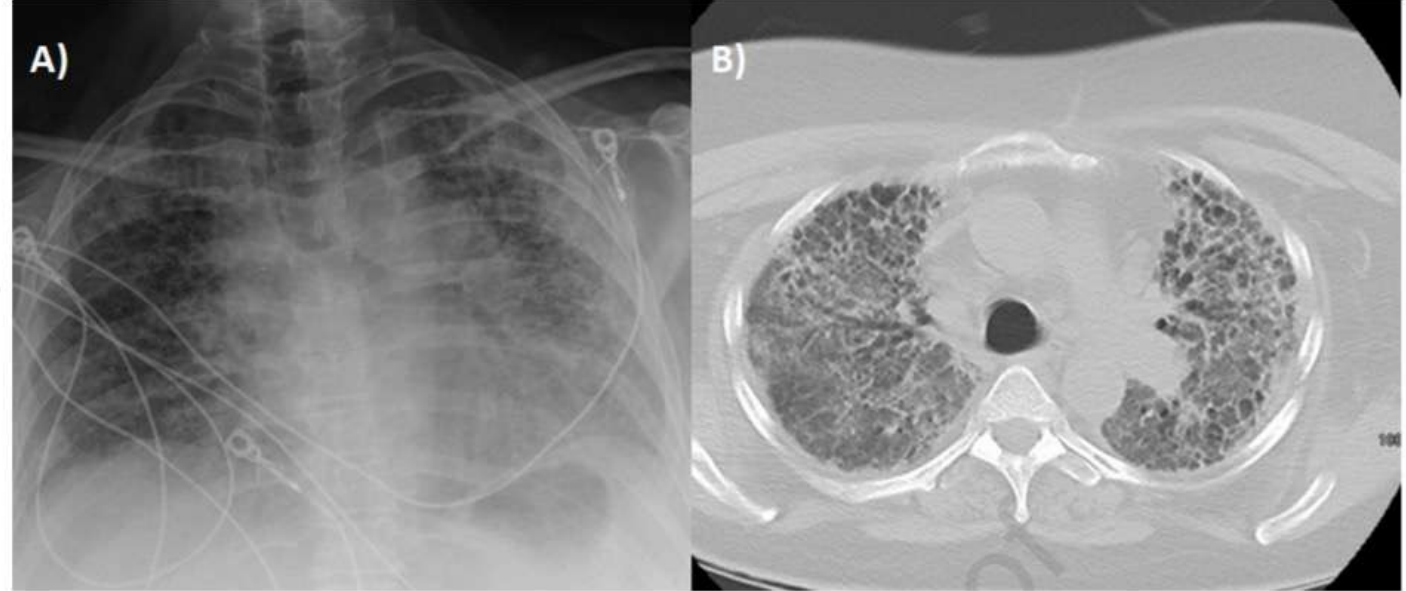




## Successful Lung Transplantation for Severe Post COVID-19 Pulmonary Fibrosis

[David J. Hall, MD,<sup>1</sup>](#) [Jeffrey J. Schulte, MD,<sup>2</sup>](#) [Erik E. Lewis, MD,<sup>1</sup>](#) [Swaroop R. Bommareddi, MD,<sup>1</sup>](#) [Charles T. Rohrer, MD,<sup>2</sup>](#) [Samir Sultan, DO,<sup>3</sup>](#) [James D. Maloney, MD,<sup>1</sup>](#) [Malcolm M. DeCamp, MD,<sup>1</sup>](#) and [Daniel P. McCarthy, MD, MBA, MEM<sup>1,\\*</sup>](#)

- 52 yaşında kadın hasta
- Temmuz 2020 ded PCR +
- Ağustos 2020 de PCR negatif
- Ekim 2020 ye kadar HFNC %100 O2 desteği BIPAP
- V-V ECMO ve 24 h sonra DLuTX
- 24 gün taburcu



Case Reports > Ann Thorac Surg. 2021 Nov 5;S0003-4975(21)01840-3.

doi: 10.1016/j.athoracsur.2021.10.003. Online ahead of print.

## Living-Donor Lung Transplantation for Post-COVID-19 Respiratory Failure

Akihiro Ohsumi<sup>1</sup>, Jumpei Takamatsu<sup>2</sup>, Itsuki Yuasa<sup>1</sup>, Satona Tanaka<sup>1</sup>, Yojiro Yutaka<sup>1</sup>, Masatsugu Hamaji<sup>1</sup>, Daisuke Nakajima<sup>1</sup>, Kazuhiro Yamazaki<sup>3</sup>, Miki Nagao<sup>4</sup>, Hiroshi Date<sup>5</sup>

### Journal Pre-proof

Living-Donor Lung Transplantation for Post-COVID-19 Respiratory Failure

Akihiro Ohsumi, MD, PhD, Jumpei Takamatsu, MD, Itsuki Yuasa, MD, Satona Tanaka, MD, PhD, Yojiro Yutaka, MD, PhD, Masatsugu Hamaji, MD, PhD, Daisuke Nakajima, MD, PhD, Kazuhiro Yamazaki, MD, PhD, Miki Nagao, MD, PhD, Hiroshi Date, MD, PhD

PII: S0003-4975(21)01840-3

DOI: <https://doi.org/10.1016/j.athoracsur.2021.10.003>

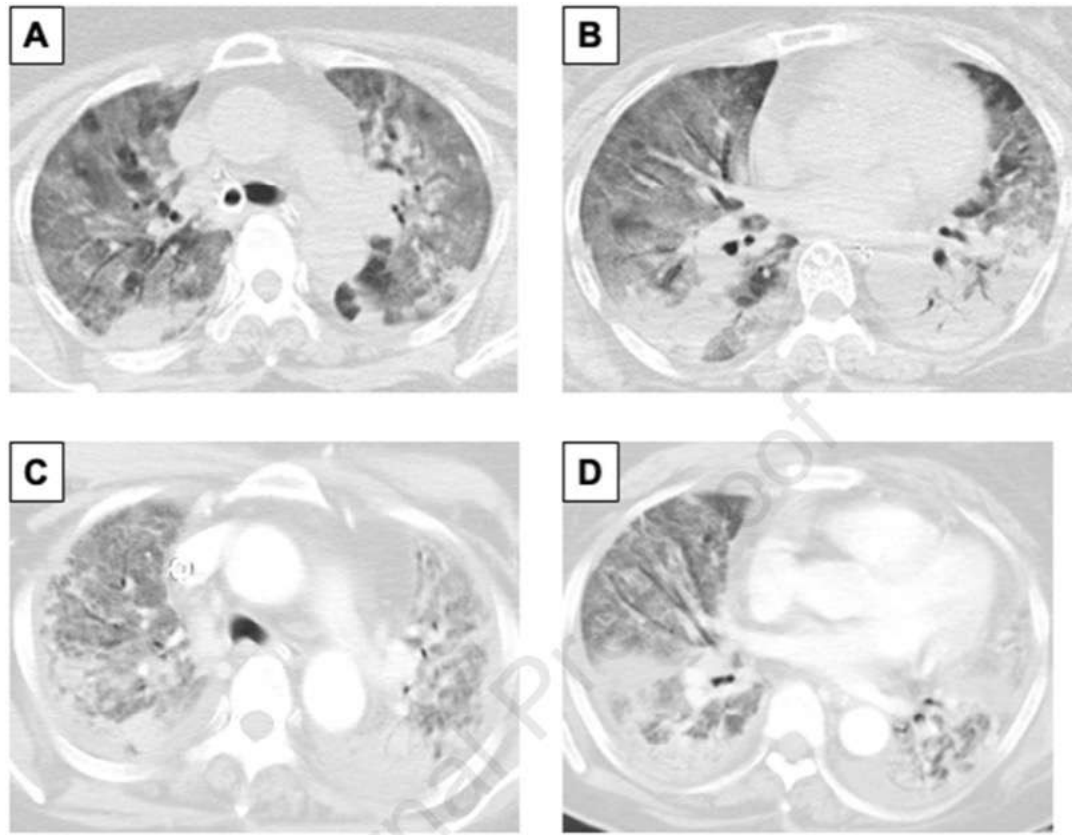
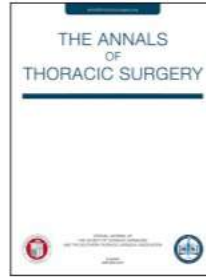
Reference: ATS 35718

To appear in: *The Annals of Thoracic Surgery*

Received Date: 11 September 2021

Revised Date: 27 September 2021

Accepted Date: 14 October 2021



- 57 yaşında kadın hasta
- ECMO ile takipte iken Bilateral Living Donor Lobar Lung Tx
- Post-pop 2 ay MV takip 4 ay taburcu

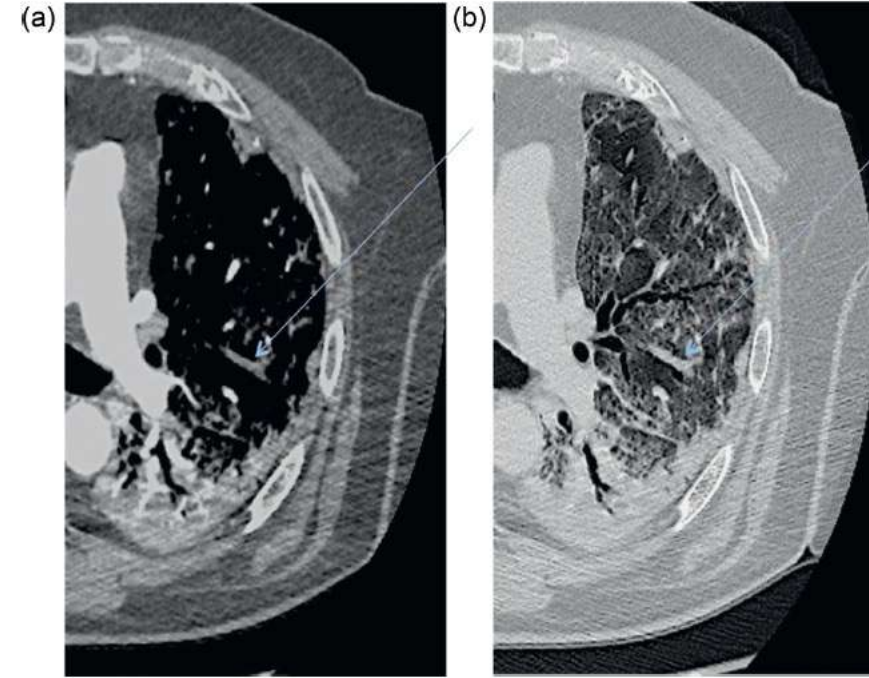
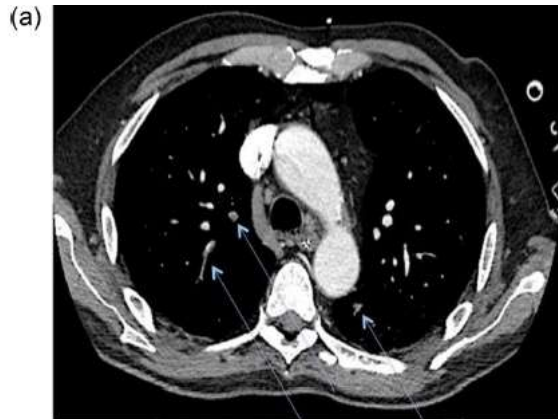




## Original Article

Pulmonary Vascular Thrombosis in COVID-19  
Pneumonia

Francesco De Cobelli, MD<sup>\*,†</sup>, Diego Palumbo, MD<sup>\*,†</sup>,  
 Fabio Ciceri, MD<sup>\*,‡</sup>, Giovanni Landoni, MD<sup>\*,§,1</sup>,  
 Annalisa Ruggeri, MD<sup>‡</sup>, Patrizia Rovere-Querini, MD<sup>\*,\*\*</sup>,  
 Armando D'Angelo, MD<sup>\*,¶</sup>, Stephanie Steidler<sup>‡</sup>, Laura Galli<sup>||</sup>,  
 Andrea Poli<sup>||</sup>, Evgeny Fominskiy, MD<sup>§</sup>, Maria Grazia Calabrò, MD<sup>§</sup>,  
 Sergio Colombo, MD<sup>§</sup>, Giacomo Monti, MD<sup>§</sup>,  
 Roberto Nicoletti, MD<sup>‡</sup>, Antonio Esposito, MD<sup>\*,†</sup>,  
 Caterina Conte, MD<sup>\*,\*\*</sup>, Lorenzo Dagna, MD<sup>\*,#</sup>,  
 Alberto Ambrosio, MD<sup>\*,\*\*</sup>, Paolo Scarpellini, MD<sup>||</sup>,  
 Marco Ripa, MD<sup>||</sup>, Marzia Spessot, MD<sup>††</sup>, Michele Carlucci, MD<sup>††</sup>,  
 Matteo Montorfano, MD<sup>\*,¶</sup>, Eustachio Agricola, MD<sup>\*,##</sup>,  
 Domenico Baccellieri, MD<sup>§§</sup>, Emanuele Bosi, MD<sup>\*,\*\*\*\*</sup>,  
 Moreno Tresoldi, MD<sup>††</sup>, Antonella Castagna, MD<sup>\*,||</sup>,  
 Gianvito Martino, MD<sup>\*,|||</sup>, Alberto Zangrillo, MD<sup>\*,§</sup>



- Covid 19 ilişkili ARDS ve pnömoni bulguları, buzlu cam alanları ile örtüşen pulmoner vasküler tromboz bulgusu, bu vakte kadar alışageldiğimiz tanımlamaları farklı boyuta taşıdı

## Extracorporeal membrane oxygenation and COVID-19: The causes of failure

Zargham Hossein Ahmadi MD<sup>1</sup> | Alireza Jahangirifard MD<sup>1</sup> |  
Behrooz Farzanegan MD<sup>2</sup> | Payam Tabarsi MD<sup>3</sup> | Zahra Abtahian MD<sup>4</sup> |  
Atefeh Abedini MD<sup>4</sup> | Mehrzad Sharifi MD<sup>1</sup> | Amir Naser Jadbabaei MD<sup>1</sup> |  
Yadollah Mafhumi RN<sup>4</sup> | Ali Moslem RN<sup>4</sup> | Marjan Sistani RN<sup>4</sup> |  
Sahar Yousefian PharmD<sup>4,5</sup> | Ali Saffaei PharmD<sup>6</sup> | Farzaneh Dastan PhD<sup>4,5</sup>

- VV ECMO takip edilen olgularda en önemli mortalite nedeni olarak Hiperkoagubilite olduğu görüldü.
  - Yedi hasta takip edilmiş ve erken veriler sunulmuş
-

## Early outcomes after lung transplantation for severe

### General criteria

- Age younger than 65 years, extended to younger than 70 years in exceptionally fit individuals
- Single-organ failure; in selected cases, multiorgan transplantation can be considered
- No malignancy or disabling comorbidities
- No dependence (alcohol, drugs, other) and not an active smoker
- Body-mass index in the range of 17–32 kg/m<sup>2</sup>, with exceptions on a case-by-case basis
- Postoperative social support available (at least one reliable primary and one secondary caregiver identified)
- Insurance approval obtained or financial support established for transplant-related care, as applicable
- Patient and caregivers agreeable to lung transplantation and willing to relocate close to the transplantation centre for a period established by the transplantation centre

Table 2: Characteristics of individual transplant recipients

- ABD 3 merkez, Avusturya 1 merkez, İtalya 2 merkez, Hindistan 1 merkez
- 12 akciğer nakli olgusu sunulmuş

### Neurocognitive status

- Patient is awake and interactive, with exceptions in selected cases if sedation wean is associated with severe hypoxaemia and haemodynamic changes
- If not awake and interactive, evidence supporting the absence of irreversible brain injury is obtained through physical assessment and brain imaging or neuropsychological consultation; an individual with medical power of attorney is identified who can make informed decisions consistent with patient's goals and consent to transplantation

acute respiratory distress syndrome; rarely, evaluation for lung transplantation can be considered earlier than 4 weeks if potentially lethal pulmonary complications develop that cannot be managed medically or through the use of extracorporeal membrane oxygenation

- Lung recovery is deemed unlikely by at least two physicians from two different specialties (surgery, critical care, or pulmonary medicine), despite optimised medical care; transplantation should not be considered if ongoing lung improvement is seen, regardless of the time elapsed

## Lung transplantation for COVID-19-associated ARDS

patient can be discharged from the ICU. At least a year, if not longer, is required before such a procedure should be considered successful.

Furthermore, there is an ethical

over whether a patient with ARDS is suitable for transplantation. Good potential for recovery, thorough evaluation before transplantation, single organ failure, and informed consent are required to ensure high success rates. In Bharat and colleagues' case series,<sup>1</sup> patients did not necessarily meet these requirements. As expected, the patients had a complicated intraoperative and postoperative course (eg, mass transfusion, continued extracorporeal support, re-thoracotomy, primary graft dysfunction, and prolonged postoperative stay in the intensive care unit [ICU]). The success of a transplantation procedure cannot solely be judged by the fact that a

transplantation for irre-

Furthermore, there is an ethical dilemma. Transplantation for irreversible pulmonary disease is characterised by a global shortage of donor organs. Patients with a good prognosis can die on the waiting list.<sup>4</sup> Consequently, recipients should be carefully selected. The organ shortage is not relieved but rather aggravated by the COVID-19 pandemic. Accepting high-urgency candidates with ARDS during the pandemic will disadvantage patients on the waiting list, increase waiting-list mortality, decrease post-transplantation survival,<sup>5</sup> and distort the discriminatory capacity of any organ allocation systems. Around

Biotest, Boehringer Ingelheim, Janssen, MSD, Pfizer, and Roche, outside the submitted work. RB received research funding from the German Center for Lung Research (Deutsches Zentrum für Lungenforschung) for the COPD and Systemic consequences-COmorbidities NETWORK (COSYCONET; grant number 82DZLI05A2) cohort study, and from the German Federal Ministry of Education and



Hop Fochy/Phanig/SPL

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mentioned by the authors. These issues should be considered carefully, as this could skew allocation systems tremendously. Given the high mortality of patients with COVID-19 on ECMO, we agree with the authors that lung transplantation should be considered an option; however, we suggest to set the LAS to 0 by default for patients with COVID-19-associated ARDS, thereby allowing rescue allocation for transplantation only.

# COVID- 19, nakil merkezi ve bakış açısı

- ❖ Bir virus enfeksiyonu ve ilk 8 hafta tercih edilmedi
  - ❖ Doku kültüründe 64. günde virüs genomları gösterildi
  - ❖ COVID-19'da hedef organ akciğer, donör süreci her zaman risk
  - ❖ Tüm solid organ nakillerinde en yüksek immunsupresif kullanılan organ
  - ❖ Devam eden viremi korkulan senaryo
  - ❖ İkincil organ hasarı en sık karşılaşılan durum
  - ❖ Bir vaskülit paterni?? ve trombo-embolik olaylar sık
  - ❖ COVID-19 başlangıcından itibaren 80' e yakın akciğer nakli yapıldı,
  - ❖ Viyana 2 yılda 24 COVID-19 olgusuna akciğer nakli yaptı, ilk 6 aylık mortalite %30
-



# COVID-19 nakil merkezi için, durum tespiti

- Beyin ölümü tespiti halen çok düşük oranda
  - Akciğer nakilleri %66 oranında düştü
  - COVID-19 hastasına nakil yapılmadı
  - COVID-19 döneminde bekleme listesindeki mortalite arttı
  - COVID-19 döneminde bekleme süresi arttı
  - Donörden akciğer kullanım oranı düşük orandayız
  - Akciğer ve kalp naklinde kadavraya bağımlıyız
-

**Table 4. Recommendations From National and International Transplantation Societies**

Society/Reference	Origin	Date	Guideline	Recommendation
British Transplantation Society [188]	UK	January 2021	Guidance on the management of transplant recipients diagnosed as having or suspected of having COVID-19	<p>Outpatients:</p> <ul style="list-style-type: none"> <li>- Stop antiproliferative agents (MMF/azathioprine)</li> <li>- Review total burden of immunosuppression and consider reduction of CNIs</li> <li>- High or increased dose steroid is NOT recommended at this stage</li> </ul> <p>Hospitalized patients:</p> <ul style="list-style-type: none"> <li>- Stop antiproliferative agents (MMF/azathioprine)</li> <li>- Consider reducing CNIs</li> <li>- Support: MMF/azathioprine)</li> </ul>
International Society of Heart and Lung Transplantation [189]	Intern			<ul style="list-style-type: none"> <li>- Stop MMF, azathioprine</li> </ul>
Transplantation Society [190]	Int			<ul style="list-style-type: none"> <li>- be</li> <li>- ntal</li> <li>- and</li> <li>- s</li> </ul>
American Ass for the Study Liver Diseases [191]				<ul style="list-style-type: none"> <li>- ed on</li> <li>- ction</li> </ul>
Canadian Society Transplantation [192]				<ul style="list-style-type: none"> <li>- ggest a</li> <li>- enhance immune</li> <li>- tients with severe</li> </ul>
American Society of Transplantation [193]	US			<ul style="list-style-type: none"> <li>- pression adjustment</li> <li>- re lacking, may vary,</li> <li>- depending on disease</li> <li>- judgment.</li> <li>- mp</li> <li>- osuppression on COVID-19</li> <li>- not currently known but decreasing</li> <li>- mmunosuppression may be considered for</li> <li>- nfectd recipients who have not had recent</li> <li>- rejection episodes.</li> <li>- Many providers have decreased or discontinued cell cycle inhibitors or reduced CNI levels, but comparative data regarding these interventions are not yet available.</li> <li>- Whether adjunctive corticosteroid therapy for patients with severe ARDS may be beneficial is</li> </ul>



İmmünsüpresifler için FARKLI ÖNERİLER....

Nasıl Koruyalım?

Until more complete data are available, we urge:

- **Pre-transplant vaccination of all SOT candidates as a priority whenever feasible.**
- **Continued SARS-CoV-2 vaccination in SOT recipients and priority for vaccination of their household members and caregivers to reduce exposure risk for these vulnerable patients.**
- **Continuation of a stable immunosuppression regimen at the time of vaccination to avoid the risk of organ rejection until more comprehensive data are available.**
- **Continued adherence of all transplant recipients to protective measures including masking and social distancing regardless of vaccination status.**



THE INTERNATIONAL SOCIETY FOR  
HEART AND LUNG TRANSPLANTATION

A Society that Includes Basic Science, the Failing Heart and Advanced Lung Disease.



05.11.2021

- **Tüm SOT alıcılarının pretx dönemde, aşılanmaları mümkün olduğunca öncelikli olmalı**
- **Birlikte yaşadıkları aile fertleri ve bakıcılarının da aşılanmalarına öncelik verilmeli.**
- **Daha ayrıntılı bilgi edinilene kadar aşılama döneminde idame immunsüpresiflerine devam edilmeli**
- **Aşılama durumuna bakılmaksızın tüm tx hastaları, koruyucu önlemler olan maske ve sosyal mesafe kurallarına uymaya devam etmelidir.**



## Transplantation Proceedings

Available online 12 November 2021

In Press, Journal Pre-proof ?



# Vaccine Breakthrough Severe COVID-19 in a Lung Recipient

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42 ay önce çift akciğer nakli olmuş 62 y erkek IPF'li hasta,  
3.Doz inaktif SARS CoV2 aşısından 7 hafta sonra COVID-19



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Commentary

Precautions after vaccinating immunosuppressed patients with mRNA-based vaccines against SARS-CoV-2: does one size fit all?

2 DOZ mRNA aşısı sonrası 658 SOT alıcısında %46,  
37 kalp alıcısında %49,  
168 akciğer alıcısının %18'de antikor cevabı?

Belatacept alanlarda aşıya karşı yanıtızsızlık oranı daha yüksek



# AŞH işlenmemiş veri

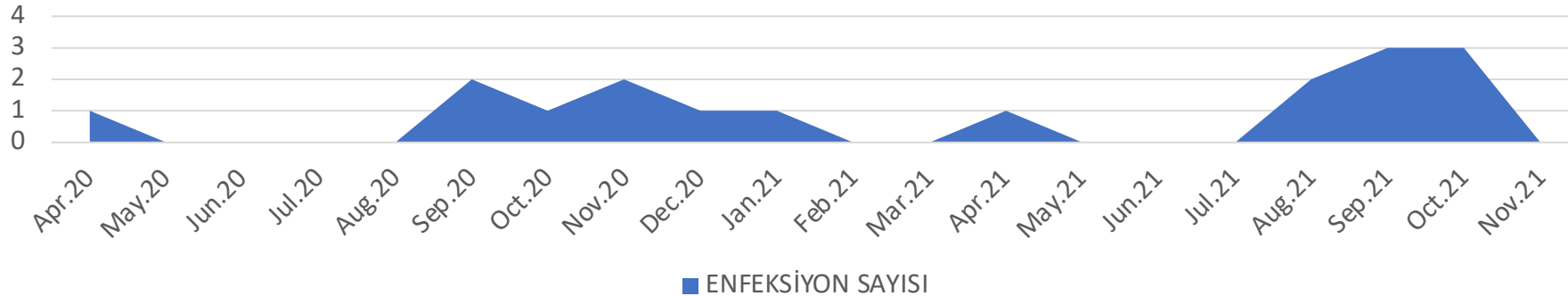
- 65 takipli kalp alıcısının 19'da COVID-19 (+)
- 20 hastanın 15'i aşı(-) dönemde, kümelenme Türkiye'de COVID-19 vakalarının pik yaptıkları dönemlerde
- 4 hasta aşı sonrası COVID-19 (+)
- Aşılı hastalardan;
  1. 2 inaktif aşı sonrası (2. dozdan 3 hafta sonra)
  2. 2 inaktif + mRNA
  3. 2 mRNA
  4. 2 mRNA
- \*\* Bir hasta COVID-19 geçirdikten 6 ay sonra başarılı kalp tx
- \*\* Bir hasta aşı (-) erken dönem (postop 1 ay) COVID -19; tb
- \*\* 3 hasta COVID-19 ex ( 2 si rejeksiyon, biri mide ca, kemoterapi)



# AŞH işlenmemiş veri

- Ac TX alıcılarının 19 da COVID-19
- 7 'si önerilen tam doz aşı, 2 si eksik doz, 10 tanesi aşısız (2'si Mart 2021 sonrası)
- 2 hasta COVID-19 nedeniyle kaybedildi.

ENFEKSİYON SAYISI





Review

# The Immunology of SARS-CoV-2 Infection and Vaccines in Solid Organ Transplant Recipients

Dominika Dęborska-Materkowska <sup>1,†</sup> and Dorota Kamińska <sup>2,\*,†</sup> 

## 6. Conclusions

All available evidence indicates that SOT recipients with moderate or severe COVID-19 illness who are on chronic immunosuppressive therapy can mount SARS-CoV-2-reactive adaptive immune responses, both humoral and cellular. However, the precise immunologic characteristics of differences between immunocompromised SOT recipients and the immunocompetent population have not yet been characterized. The magnitude of the immune response to SARS-CoV-2 infection and vaccination, including kinetics and durability, should be examined. A detailed analysis of the “net state of immunosuppression” could help identify specific recipients who have a higher risk of SARS-CoV-2 infection. Such assessments may include the evaluation of not only immunosuppressive drug levels but also TTV and CMV replication, T- and B-lymphocyte subsets, soluble CD30, stimulated intracellular ATP levels, immunoglobulin, and complement levels [166].

Controlled randomized trials on anti-COVID-19 drugs as well as vaccines should also include SOT recipients to provide evidence of their efficacy in this group of patients.

- Net immunsüpresyon!  
!!
- COVID-19 tedavi ve aşı randomize kontrollü çalışmalarına SOT hastaları da dahil edilerek daha çok ve erken veri elde edilebilir!

Teşekkürler...