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First results of investigations of SARS-CoV-2 RNA in human corneal tissue

We report on the results of a recent investigation (Bayyouf et al., *Cornea*, 2020, preliminary accepted) that suggests the absence of severe acute respiratory syndrome coronavirus 2 RNA (SARS-CoV-2 RNA) in human corneal tissues of coronavirus disease 2019 cadaveric donors (COVID-19 donors). Although a selection bias for severe inpatient disease and a small donor pool (10 donor eyes) need to be cited as limitations, we consider this study to be timely and relevant to the literature—not least in view of continuing eye bank activities and, as the most obvious reason, the concern related to transplantation of infected tissue.

Current guidelines of the eye bank associations, the European Center for Disease Control and Prevention, and the US Centers for Disease Control and Prevention

The guidelines of the eye bank associations (e.g., Eyebank Association of America) do not currently include an explicit recommendation for testing of postmortem tissue for SARS-CoV-2 RNA. This is in line with the fixed procedure of the European Center for Disease Control and Prevention (ECDC) and its US counterpart, the US Centers for Disease Control and Prevention (CDC), in such cases. There are currently no data

available demonstrating the frequency of positive detection of SARS-CoV-2 RNA in the pharyngeal cavity by means of reverse transcriptase polymerase chain reaction (RT-PCR) in relation to the time of death. However, experience gained from the other two coronavirus epidemics, i.e., severe acute respiratory syndrome coronavirus 1 (SARS-CoV-1) and Middle East respiratory syndrome coronavirus (MERS-CoV), suggests that this may be the case post mortem.

Possibility of transmitting SARS-CoV-2 via tissue transplantation

The present study showed that SARS-CoV-2 RNA could not be detected in bulbar conjunctiva, anterior chamber fluid, or corneal tissue (endothelium, stroma, and epithelium) from COVID-19 cadaveric donors using RT-PCR. Therefore,

one can conclude that the risk of SARS-CoV-2 transmission via conjunctival and corneal tissue from deceased donors is very low. However, further and larger studies are needed to confirm these results. The findings are of great relevance for the collection, processing, and transplantation of tissue.

Other factors that could have an effect on the RT-PCR test result also need to be taken into consideration. These include the duration of COVID-19 disease, the time of postmortem sample collection, the method used for sample collection, testing capacities in some regions, and, not least, the pending validation of RT-PCR testing for cadaveric donors. Therefore, negative results need to be interpreted with caution.

The current standpoint is that viruses that primarily affect the respiratory tract cannot be transmitted via transplanta-

Abbreviations

ACE-2	Angiotensin-converting enzyme-2
CDC	Centers for Disease Control and Prevention
COVID-19	Coronavirus disease 2019
ECDC	European Centre for Disease Prevention and Control
EEBA	European Eye Bank Association
GAEBA	The Global Alliance of Eye Bank Associations
MERS-CoV	Middle East respiratory syndrome coronavirus
RT-PCR	Reverse transcriptase polymerase chain reaction
SARS-CoV-1	Severe acute respiratory syndrome coronavirus 1
SARS-CoV-2	Severe acute respiratory syndrome coronavirus 2
WHO	World Health Organization

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tion—whether this is the transplantation of cells, tissues, or tissue-based products (via fda.gov: Updated Information for Human Cell, Tissue, or Cellular or Tissue-based Product [HCT/P] Establishments Regarding the Coronavirus Disease 2019 Pandemic) [1]. In addition, there have been no reports published on SARS-CoV-1, MERS-CoV, or other coronavirus transmission via the transplantation of ocular tissue [2, 3].

The exclusion of SARS-CoV-2 RNA in corneal tissue carried out in our study strengthens the position of eye banks in their continued adoption of the above-mentioned standpoint. Furthermore, this also tends to have a positive effect on public opinion, which should assume that it is safe to transplant corneal tissue from donors whose postmortem donor tissue tested negative using a validated test. The current recommendations of the European Eye Bank Association (EEBA) and the Global Alliance of Eye Bank Associations (GAEBA) are based on the assumption that the risk of SARS-CoV-2 transmission is classified as low, not least since there have been no documented cases to date of transmission via blood transfusion or tissue/cell transplantation [4, 5].

With regard to potential future studies at other centers, we would like to refer the reader to the general recommendations on handling of postmortem tissue from COVID-19 patients. The ECDC guidance is similar to that of the US CDC and the World Health Organization (WHO). This guidance is set out in the ECDC Technical Report “Infection prevention and control for COVID-19 in healthcare settings—first update, 12 March 2020” [6]. The reader is explicitly referred to the WHO recommendations (“World Health Organization Interim Guidance for Collection and Submission of Postmortem Specimens from Deceased Persons Under Investigation [PUI] for COVID-19, 19 February 2020”; cited on 11.03.2020; available in full and concise detail at [7]).

Conclusion

Based on the current unavailability of a validated SARS-CoV-2 test for post-mortem tissue, in order to exclude any

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Erste Ergebnisse zu Untersuchungen der menschlichen Hornhaut auf SARS-CoV-2-RNA

Zusammenfassung

Die ersten Untersuchungen von humanen Hornhäuten von COVID-19 (Coronavirus Disease 2019/Coronaviruserkrankung 2019)-Spendern legen nahe, dass keine SARS-CoV-2 („severe acute respiratory syndrome-coronavirus-2“/schweres akutes respiratorisches Syndrom-Coronavirus-2)-RNA vorhanden ist. Derzeit wird nicht empfohlen, eine routinemäßige Testung von postmortalen Spendergeweben auf

SARS-CoV-2-RNA durchzuführen. Dies begründet sich u. a. in den Faktoren, die das RT-PCR („reverse transcription polymerase chain reaction“/Reverse-Transkriptase-Polymerasekettenreaktion) Testergebnis beeinflussen können.

Schlüsselwörter

RT-PCR · Gewebegewinnung und -verarbeitung · COVID-19 · Hornhaut · Gewebespende

First results of investigations of SARS-CoV-2 RNA in human corneal tissue

Abstract

Preliminary investigations of human corneal tissues from coronavirus disease 2019 (COVID-19) cadaveric donors indicated that no severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) RNA is present. Current eye banking guidelines do not recommend any type of routine testing for SARS-CoV-2 RNA in post-mortem donor tissue. This is partly based

on factors that can influence the test results of the reverse transcription polymerase chain reaction (RT-PCR).

Keywords

RT-PCR · Tissue procurement and processing · COVID-19 · Cornea · Tissue donor

possibility of transmission via tissue transplantation, donor tissue should still not be collected from COVID-19 donors, including suspected cases of COVID-19 infection, for transplantation.

Practical conclusion

- The risk of transmission of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) via transplantation is currently classified as low.
- No cases of SARS-CoV-2 transmission via blood transfusion or tissue/cell transplantation have been documented to date.
- All test results for postmortem tissue should be interpreted with caution since a validated reverse transcription polymerase chain reaction test is not available as yet.

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Compliance with ethical guidelines

Conflict of interest. T. Bayyoud, T. Iftner, K.U. Bartz-Schmidt, J.M. Rohrbach, M. Ueffing, M. Schindler, and S. Thaler declare that they have no competing interests.

For this article no studies with human participants or animals were performed by any of the authors. All studies performed were in accordance with the ethical standards indicated in each case.

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