

SARS-CoV-2 asymptomatic and symptomatic patients and risk for transfusion transmission

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Accepted Article

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This article has been accepted for publication and undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process which may lead to differences between this version and the Version of Record. Please cite this article as doi: 10.1111/trf.15841

Abstract

Oral swabs, sputum and blood samples from 18 patients with SARS-CoV-2 infection were examined using real-time reverse transcription polymerase chain reaction (RT-PCR) testing. Whereas oral swabs or sputum from the lower respiratory tract were tested RT-PCR positive in all patients, RNAemia was neither detected in 3 patients without symptoms nor in 14 patients with flu-like symptoms, fever or pneumonia. The only patient with RNAemia suffered from acute respiratory distress syndrome (ARDS) and was artificially ventilated in an intensive care unit. Risk for SARS-CoV-2 transmission through blood components in asymptomatic SARS-CoV-2 infected individuals therefore seems negligible but further studies are needed.

Introduction

As of March 2020, the SARS-CoV-2 pandemic that originated in Wuhan, Hubei Province, China, is quickly spreading in many countries of the world.

Huang et al. ¹ reported RNAemia in 6 of 41 symptomatic Wuhan patients (15%) with laboratory-confirmed SARS-CoV2 infection. Zhang et al. ² showed for 15 Wuhan patients diagnosed with viral pneumonia caused by SARS-CoV-2 that shedding may occur through multiple routes (respiratory, fecal–oral or body fluids); six out of the 15 patients (40%) were blood positives. In addition, Kim et al. ³ reported on intermittently positive blood RT-PCR (real-time reverse transcription polymerase chain reaction) results in 2 SARS-CoV-2 patients in South Korea with mild and moderate symptoms.

In Germany, blood donors have to be at least 18 years old and should not be older than 65 years of age. In addition, volunteers will not be admitted to blood donation if they show signs and symptoms of an infection (e.g. fever, flu-like symptoms). With these requirements and the additional donor screening, a high national safety standard with regard to the prevention of transfusion-related viral infections has been achieved in recent years ⁴.

However, with respect to the safety of blood donation, the questions arise whether Corona virus disease 2019 (Covid-19) can be transmitted through blood and how long SARS-CoV-2 positive patients with minimal symptoms have to be deferred from blood donation.

Patients and methods

We report on molecular detection of SARS-CoV-2 in 18 patients 2 of whom were infected in China and evacuated to Germany on February 1⁵. In 16 patients, the transmission in Germany is most likely⁶. Information on the patient population was published elsewhere^{5,6} and SARS-CoV-2 testing targeting the E and RNA-dependent RNA polymerase gene was performed as previously described by Corman et al.⁷. In patients with minor symptoms, laboratory tests were carried out during the two-week quarantine period, in those with severe symptoms, tests were done during inpatient treatment.

Results

Twelve of the 18 patients were males and six females. Three patients were asymptomatic, seven presented with flu-like symptoms, five had flu-like symptoms as well as fever, two suffered from pneumonia, and one patient needed artificial respiration because of acute respiratory distress syndrome (ARDS) (Table 1). Three of the 18 patients fulfilled the requirements for blood donation in Germany. Whereas oral swabs or sputum from the lower respiratory tract were tested RT-PCR positive in all patients, RNAemia was only detected in one out of eight serum/plasma samples taken from the patient with ARDS.

Discussion

We presented data on 18 SARS-CoV-2 infected patients, 3 patients without specific symptoms and 15 with symptoms of different severity. SARS-CoV-2 genomes were only detected in one of 77 blood samples examined. The patient with RNAemia suffered from ARDS and was artificially ventilated in

an intensive care unit. In asymptomatic patients who are eligible for blood donation as well as patients with flu-like symptoms and fever, no SARS-CoV-2 RNA could be detected in the blood or serum despite a clearly positive result in all throat swabs.

Our findings are in line with published data⁸ and confirm that SARS-CoV-2 infection may go without noticeable manifestation of clinical symptoms. Furthermore, Chen et al.⁹ detected SARS-CoV-2 genome in the blood of 6 out of 57 Chinese patients and found RNAemia to be associated with a more severe clinical picture. In addition, detectable serum SARS-CoV-2 RNAemia was found to be closely linked to an elevated interleukin 6 (IL-6) level in critically ill Covid-19 patients¹⁰.

Since there is currently no recognized external standardization of the SARS-CoV-2 RT-PCR methods, a direct comparison of the results of Chinese and German studies is not possible. Of note, RNAemia is not equivalent to infectiousness, i.e. despite the presence of RNA it is unknown whether blood can harbor intact viruses that are able to infect tissues and, when transfused, can cause hematogenous transmission.

Hitherto, similarly to the other two coronaviruses that have emerged over the past 20 years (SARS, the Severe Acute Respiratory Syndrome Coronavirus^{11,12} and MERS-CoV, causing Middle East Respiratory Syndrome¹³, no hematogenous transmissions have been documented for SARS-CoV-2.

Due to a lack of evidence indicating a risk for transfusion transmission of SARS-CoV-2, the American Association of Blood Banks (AABB), the Food and Drug Association (FDA), and the Centers for Disease Control and Prevention (CDC) are not recommending any action by blood collection establishments at this time (March 3, 2020)¹⁴. Our data support this recommendation.

Conclusion

Among 18 patients with RT-PCR confirmed SARS-CoV-2 infection included in our study only one critically ill individual had RNAemia. Based on these limited data, there is no measurable risk for SARS-CoV-2 transmission through blood components in asymptomatic SARS-CoV-2 infected individuals. As no cases of transmission due to transfusion of blood products have been reported for

SARS, MERS-CoV and SARS-CoV-2, and considering that patients with symptoms of infectious disease will not be admitted to blood donation in Germany, the risk for transfusion transmission of SARS-CoV-2 is supposed to be negligible. However, well-powered studies are needed to further evaluate the potential risk of hematogenous transmission and to determine the appropriate referral time for blood donation of recovered SARS-CoV-2 patients.

Conflict of interest: The authors declare that they have no conflict of interest.

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Table 1. Molecular detection of SARS-CoV-2 in 18 patients with asymptomatic or symptomatic infection

Patient*	Age	Oral swab**/sputum	Blood [#]				No symptoms	Symptoms ^{##}			
			Number of tests performed	Whole Blood qRT-PCR Ct	Serum qRT-PCR Ct	Plasma qRT-PCR Ct		Flu-like +/-	Fever +/-	Pneumonia +/-	Art. ventilation ARDS +/-
01	x	30.10	1		1 x neg.		+	-	-	-	-
02	x	24.39	7	4 x neg.	3 x neg.		+	-	-	-	-
03	x	30.25	7	4 x neg.	3 x neg.		- [§]	-	-	-	-
04	x	32.13	6		6 x neg.		-	+	-	-	-
05	x	31.67	7		7 x neg.		-	+	-	-	-
06	x	20.06	1		1 x neg.		-	+	-	-	-
07	x	24.14	2		2 x neg.		-	+	-	-	-
08	x	27.21	1		1 x neg.		-	+	-	-	-
09	x	28.46	7		7 x neg.		-	+	-	-	-
10	x	17.44	1		1 x neg.		-	+	-	-	-
11	x	15.35	5	2x neg.	3 x neg.		-	+	+	-	-
12	x	37.32	8		8 x neg.		-	+	+	-	-
13	x	31.05	1		1 x neg.		-	+	+	-	-
14	x	28.43	2	1x neg.	1 x neg.		-	+	+	-	-
15	x	39.1	3		2 x neg.	1 x neg.	-	+	+	-	-
16	x	34.8	2			2 x neg.	-	+	+	+	-
17	x	pos. ^{§§}	8		4 x neg.	4 x neg.	-	+	+	+	-
18	x	22.6	8		4 x neg.	3 x neg. 1 x pos. [§]	-	+	+	+	+

+ present; - absent; *qRT-PCR* quantitative reverse transcriptase polymerase chain reaction; *Ct* cycle threshold; *ARDS* acute respiratory distress syndrome

*16 patients infected in Germany, 2 patients infected in China

** Minimum value (max. viral load)

[#] RNA-NAT-test, method of RdRP (RNA-dependent RNA polymerase gene)-Gene testing according to Corman et al. ⁶

^{##} Symptoms at the time of testing

[§] Mild rash on chest and legs, minimal inflammation on throat examination; afebrile and normal vital signs during hospital observation⁴

^{§§} SARS-CoV-2 RNA (23.600 copies/ml) was only detected in sputum from the lower respiratory tract.

[§] Low level detection of SARS-CoV-2 RNA (179 copies/ml) in one plasma sample.