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Letter to the Editor

LETTER TO THE EDITOR

Can SARS-CoV-2 be found in the effluent from peritoneal dialysis patients?

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Peritoneal dialysis (PD) patients represent a vulnerable population for coronavirus disease 2019 (COVID-19) [1, 2]. Approximately 300 000 patients are currently treated by PD worldwide, which produces large amounts of care-related waste including peritoneal effluent. PD drained fluid has previously been identified as a potential source of contamination with hepatitis B virus (HBV) [3], hepatitis C virus (HCV) [4] and human immunodeficiency virus (HIV) [5]. The question regarding the contagiousness of spent peritoneal dialysate by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) during the current COVID-19 pandemic is still debated. In order to investigate this concern, we performed a systematic review of currently available literature.

Since the start of the pandemic, seven studies (three cases series and four cases reports) have reported peritoneal dialysate testing ($n = 52$ in 28 patients) for the presence of SARS-CoV-2 using reverse transcriptase–polymerase chain reaction (RT-PCR) (Table 1) [6–12]. Only one report analysed the presence of viable viral particles with cytopathic studies [7]. The effluent was tested throughout the clinical course from 0 to 41 days after diagnosis. Most reports involved mild-to-moderate COVID-19 in chronic PD patients, but two studies [7, 9] were performed during acute PD in critical ill patients.

None of the PD effluent from the 10 patients in whom cytopathic studies were performed was found positive [7]. Identification of SARS-CoV-2 RNA was reported in only 1 (3.6%) of the 28 patients [11]. In this single case, PCR assay was positive 1 month after COVID-19 diagnosis; unfortunately, viral culture or cytopathic analysis was not performed, and the cycle threshold for the PCR was not mentioned.

Peritoneal dialysate effluent from PD patients might theoretically become infective for some viruses either via the catheter, by intra-luminal or peri-luminal routes after touch contamination, or via haematogenous diffusion or viral translocation across injured intestinal loops. Dialysate contamination had indeed been described in PD patients infected by small viruses such as HBV [3], HCV [4] and HIV [5] who had systemic infection and high viral load, but not during the SARS pandemic in 2003 [13] nor during the Middle East Respiratory Syndrome (MERS) outbreak in 2012. Similarly, the lack of SARS-CoV-2 documentation within spent dialysates, has reviewed here, might thus be accounted for, on one hand, by the scarcity of intact virus circulation in blood (even though SARS-CoV-2 RNA has been detected in serum or plasma from infected patients [14]), and on the other hand, by a virion size larger than the peritoneum pores diameter. It is also unlikely that RT-PCR assays have missed identifying viral RNA in peritoneal effluent, as fluid centrifugation is commonly performed to enhance their sensibility [6].

A word of caution should however be mentioned. As a prolonged presence of SARS-CoV-2 RNA has been described in faecal samples [15], viral RNA might be found within the dialysate effluent in PD patients with severe enteric peritonitis, because of transmural translocation. In this context, viral RNA was found on peritoneal fluid from three COVID-19 patients, not on PD, but in whom an open abdominal surgical procedure was performed. Coccolini *et al.* [16] first reported positive RT-PCR (RdRP, N and E sequences) on intraperitoneal swabs from a 78-year-old male during surgically treated ileal volvulus and from a 71-year-old female who underwent subtotal colectomy for severe colitis with ulceration and bleeding, respectively [17]. Intraoperative fluid sampling was also found positive in a 73-year-old female with small bowel resection due to an incarcerated umbilical hernia and concomitant loop necrosis [18]. In these studies, viral isolation was not performed.

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Table 1. Prevalence of SARS-CoV-2 RNA in the peritoneal effluent of PD patients

Authors [Ref.]	Study design	Number of patients	Sample collected	COVID-19 status at time of procedure	Time from diagnosis to specimen collection	Test performed—target	Limit of detection—amplification	Outcome of the test
Candellier *et al.* [6]	Case series	3	11	Positive on NP swabs and compatible finding at CT-chest	0, 3, 4 and 7 days for each patient	RT-PCR—E and RdRp sequences	6.6 copies per reaction—40 CT	All negative
El Shamy *et al.* [7]	Case series	10[a]	10	Positive on NP swabs	NA	RT-PCR—cytopathic studies with cell fractions and supernatants recovered from PD effluent	Five copies per reaction	All negative—absence of viral particle
Gelaidan *et al.* [8]	Case report	1	1	Positive on NP swabs	1 day	RT-PCR—N2 sequences	NA	Negative
Nagatomo *et al.* [9]	Case report	1[a]	1	Positive on NP swabs	14 days	RT-PCR	NA	Negative
Sadioglu *et al.* [10]	Case report	1	2	Positive on NP swabs	3 and 4 days	RT-PCR NA	NA	All negative
Vischini *et al.* [11]	Case report	1	1	Compatible finding at CT-chest. Initial NP swab was negative, second NP swab was positive 1 month after diagnosis	1 month	RT-PCR NA	NA	Positive—NP swab and peritoneal dialysate remained positive 40 days after diagnosis
Wang *et al.* [12]	Case series	11	26	Three patients still positive on NP swabs, eight patients were no longer positive on NP swabs	Mean: 15 ± 11 days (median 14; range 1–41)	RT-PCR—N, ORF1ab and S sequences	10 copies per reaction—40 CT	All negative

CT, cycle threshold; CT-chest, computed tomography scan of the chest; NP, nasopharyngeal; NA, not available. [a]Patients with acute kidney injury treated by acute PD.

To date, strong evidence of intraperitoneal contamination of PD patients by SARS-CoV-2 is lacking as no direct viral culture is available and as viral RNA was found in the PD effluent of only one patient. Still, the presence of RNA does not imply infectivity [19]. The risk of viral transmission by PD effluent thus remains , at most, very low. Imposing special disposal procedures, such as the instillation of hypochlorite in the drainage bags, is probably not necessary. Nevertheless, it still seems prudent to drain spent PD effluent into a toilet that needs to be disinfected thereafter.

CONFLICT OF INTEREST STATEMENT

None declared.

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