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SARS-CoV-2 is present in peritoneal fluid in COVID-19 patients.

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Abstract:

Background: The excretion patho-mechanisms of SARS-CoV-2 are actually unknown. No certain data exist about viral load in the different body compartments and fluids during the different disease phases.
Material and methods: Specific real-time reverse transcriptase–polymerase chain reaction targeting three SARS-CoV-e genes were used to detect the presence of the virus.
Results: SARS-CoV-2 was detected in peritoneal fluid at a higher concentration than in respiratory tract.
Conclusion: Detection of SARS-CoV-2 in peritoneal fluid has never been reported. The present paper represents the very first positive result describing the presence of the virus in peritoneal fluid during an emergency surgical procedure in a COVID-19 sick patient. This paper thus represents a warning for increasing the level of awareness and protection for surgeon especially in emergency surgical setting.

Keywords: Coronavirus, COVID-19, emergency, surgery, management, virology, management, safety, protection,

ARTICLE

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Actual pandemia posed several safety issues especially for those categories not directly involved in airway management. In fact, thousands of health care workers have been infected and died amid the ongoing coronavirus outbreak. Actually, they must be among the best protected people. They face long hours, changing protocols, potential medical supply shortages, and pose at risk their own personal health and that of their loved ones (1).

Ultra-specialistic branches of health system providing a unique service that cannot be performed by other medical disciplines should be even more secured. Critically ill and injured patients, in fact, will continue to need emergent care (1).

The lack of precise data about viral load in the different body compartments and fluids forced health care workers to work in a situation of uncertainty and unsafety. The excretion patho-mechanisms of SARS-CoV-2 are actually mostly unknown.

SARS-CoV-2 RNA has been found in blood and feces of COVID-19 patients (2, 3). The presence in peritoneal fluid has never been demonstrated. The present paper is the very first one showing that SARS-CoV-2 is present in peritoneal fluid.

The patient in whom the virus was detected was a 78 years old man who came to the hospital from his house for abdominal pain associated to alteration of the alvus. At the admission, associated to the signs and symptoms of intestinal occlusion, he presented fever, cough and mild respiratory symptoms with O2 saturation of 92% maintained with an O2 therapy at 2lt/min with nasal cannula. No information about his infectious state did exist. His medical history was positive for arterial hypertension, type II diabetes insulin dependent, atrial fibrillation, mild chronic renal insufficiency, asymptomatic abdominal aortic aneurysm (maximum diameter 5 cm) and previous open appendectomy (20 years ago). Thoraco-abdominal Ct-scan showed bilateral pneumonia and intestinal occlusion due to a small bowel volvulus with no signs of gut ischemia. The respiratory nasal swab was positive for SARS-CoV-2. He was admitted with a diagnosis of intestinal mechanical obstruction due to small bowel volvulus associated to SARS-CoV-2 pneumonia. He was operated and at the laparotomy free reactive clear fluid was found. No perforation nor bowel ischemia were present. The volvulus was due to an omental band attached to the right iliac fossa. Two swabs were obtained from peritoneal fluid and sent for SARS-CoV-2 detection. Adhesiolysis was performed without intestinal resection. The subsequent abdominal cavity exploration showed the whole bowel vital and viable; no colonic diverticula nor other evident pathological findings were found. After the intervention the patient was sent awake to the COVID medical ward. His respiratory condition after the intervention remained stable. 98% O2 saturation was maintained with a Venturi mask with FiO2 of 35%, gradually diminished up to a complete independency from O2 therapy. The postoperative period was uneventful, and the patient was discharged at home in post-operative day 10. Two respiratory nasal swabs collected 24 hours apart and performed before discharge were negative.

The real-time reverse transcriptase–polymerase chain reaction (RT-PCR) used to detect the SARS-CoV-2 RNA genome in peritoneal fluid and nasal swabs detects three targets, namely RNA-dependent RNA polymerase (RdRP), nucleoprotein (N) and envelope (E). The assay was performed according to the WHO guidelines (4) and Corman et al. protocols (5) (fig.1). This method amplifies the number of copies of three targets at levels detectable by the instrument. Although qualitative, the method allows to infer the amount of the viral RNA genome based on the threshold at which the amplified signal become detectable. The nasal swab and the respiratory fluid were collected one day apart. Interestingly, the nasal swab contained less SARS-CoV-2 RNA virus compared to the viral fluid that scored positive in two targets out of three. Further, the peritoneal fluid remained positive and at levels comparable to the nasal swab when retested 10-fold diluted. This indicates that the viral load in the peritoneal fluid was higher compared to the upper respiratory material and suggests

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that the surgical operation was indeed a procedure at risk of infection. Viral isolation, which would have provided stronger evidence of infectivity, could not be performed.

This new result poses an important warning for the safety of the operating staff and requests an immediate update of the rules to protect surgical teams. All surgical procedure in fact, may potentially provoke aerosolization of the virus and the infection of the personnel. Either laparoscopic or open surgical procedures may result in gas/vapor forming maneuver. Electro-cautering, advanced coagulation and cutting devices produce gas and vapor that aerosolize the peritoneal fluid and consequently the virus. Previous studies demonstrated activated corynebacterium, human papillomavirus (HPV), hepatitis B virus (HBV) and human immunodeficiency virus (HIV) in surgical smoke (2).

Data from the literature showed as no defined direct relation exists between viremia and the severity of clinical picture. Patient conditions seems to be influenced more by the host response to the infection that can be approximatively calculated using hematic level of IL-6 (6). However, in presence of mild to moderate symptoms is less likely to detect a positive viremia than in critically ill patients (6). If we hypothesize the same mechanism for the other body fluids the greater the viremia, the higher the risks. As no information exist about the virus passage to peritoneal cavity and fluids, present data may suggest that potentially all people even those with mild to moderate respiratory symptoms by SARS-CoV-2 could present viral load in peritoneal fluid thus increasing the exposure and contagion risks for the entire surgical staff.

Peritoneal fluid contamination with blood of feces may interfere with the virus detection. In present case no contamination with faces or blood was present. The skin was adequately prepared with two preps with alcoholic solution lasting at least two minutes so the potential viral contamination from skin was significantly reduced.

Due to the lack of convincing data, scarce definitive instructions exist to prevent the potential contagion deriving from peritoneal fluid to the surgical staff. Few protocols have been recently published to direct and help doctors and surgeons in their daily practice (7).

This present paper represents a warning for increasing the level of awareness and protection for surgical staff especially in emergency surgery situations even in absence of intestinal perforation or ischemia. SARS-CoV-2, in fact is present in peritoneal fluids and it potentially aerosolizes to the environment.

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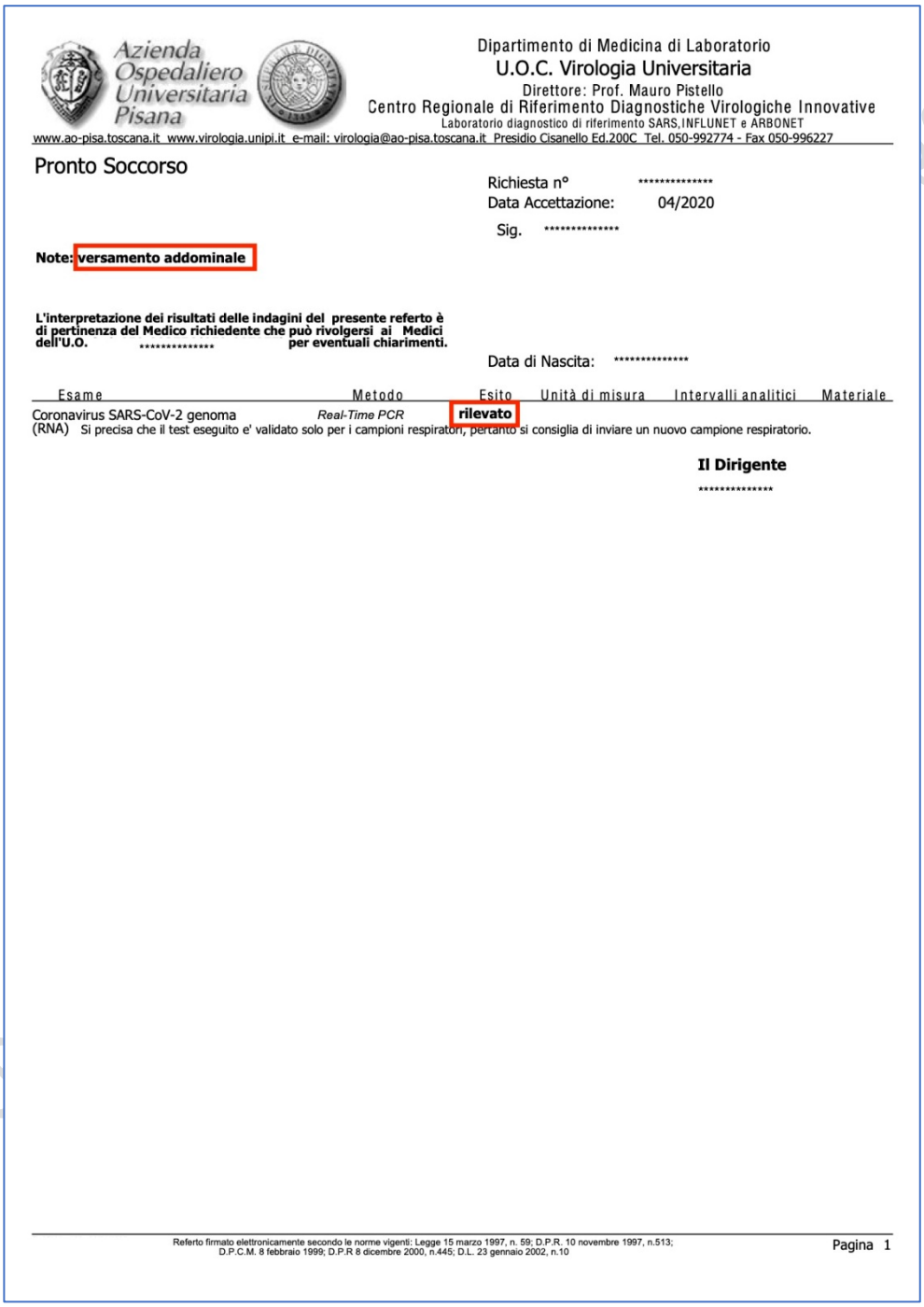
Figure legend:

Figure 1: Report of the peritoneal fluid analysis.; sensible data deleted (***) (in red squares: “versamento addominale” means: peritoneal fluid; “rilevato” means: presence of SARS-CoV-2 RNA).



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Pronto Soccorso

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Sig. **********

Note: versamento addominale

L'interpretazione dei risultati delle indagini del presente referto è di pertinenza del Medico richiedente che può rivolgersi ai Medici dell'U.O. ********** per eventuali chiarimenti.

Data di Nascita: **********

Esame	Metodo	Esito	Unità di misura	Intervalli analitici	Materiale
Coronavirus SARS-CoV-2 genoma (RNA)	*Real-Time PCR*	rilevato			

Si precisa che il test eseguito e' validato solo per i campioni respiratori, pertanto si consiglia di inviare un nuovo campione respiratorio.

Il Dirigente
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Referto firmato elettronicamente secondo le norme vigenti: Legge 15 marzo 1997, n. 59; D.P.R. 10 novembre 1997, n.513; D.P.C.M. 8 febbraio 1999; D.P.R 8 dicembre 2000, n.445; D.L. 23 gennaio 2002, n.10

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