



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.

4. Francis N, Dort J, Cho E, et al. SAGES and EAES recommendations for minimally invasive surgery during COVID-19 pandemic. *Surg Endosc.* 2020;34:2327–2331.
5. Barberis A, Rutigliani M, Belli F, Ciferri E, Mori M, Filairo M. SARS-CoV-2 in peritoneal fluid: an important finding in the Covid-19 pandemic. *Br J Surg.* 2020;107:e376.
6. Coccolini F, Tartaglia D, Puglisi A, et al. SARS-CoV-2 is present in peritoneal fluid in COVID-19 patients. *Ann Surg.* 2020;272:e240–e242.
7. Chen N, Zhou M, Dong X, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *Lancet.* 2020;395:507–513.
8. Fabbri N, Righini E, Cardarelli L, Di Marco L, Feo CV. Risks of COVID-19 transmission in blood and serum during surgery A prospective cross-sectional study from a single dedicated COVID-19 center. *Ann Ital Chir.* 2020;91:235–238.

Nicolò Fabbri, MD*, Antonio Pesce, MD, PhD, Carlo
Vittorio Feo, MD, FACS
Department of Surgery, Delta Hospital, Azienda USL Ferrara,
University of Ferrara, Italy

Stefano Pizzicotti, MD
Laboratory Division of the S Anna Hospital, University of Ferrara, Italy
Twitter: @stefanopizzicotti

* Corresponding author.

E-mail address: n.fabbri@ausl.fe.it (N. Fabbri);
Twitter: @NicolFabbri9, @antonio55428390, @Carlo_V_Feo

Accepted 27 January 2021

<https://doi.org/10.1016/j.surg.2021.01.044>
0039-6060/© 2021 Elsevier Inc. All rights reserved.

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) RNA in peritoneal fluid of coronavirus disease 2019 (COVID-19) patients—Prevalence and significance



To the Editor:

We read the manuscript entitled Peritoneal swab test for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) patients in abdominal surgery: Is it a reliable practice?¹ with great interest.

The authors suggest that intraperitoneal presence of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) might remain undetected. In our study,² peritoneal fluid was sampled in syringes at the procedural beginning and/or end and analyzed in the virology laboratory on site. We expected to enable detection of intraperitoneal viral RNA via reverse transcriptase–polymerase chain reaction (RT-PCR). Our findings are in line with the majority of literature data reporting its absence in intraperitoneal fluid. In a series of 10 peritoneal dialysis (PD) patients, quantitative RT-PCR tests and additional analyses performed on PD effluent demonstrated absence of infective viral particles along with undetectable viral RNA.³

Surgery carries a high risk of morbidity and mortality, and only emergency procedures should be performed during acute coronavirus disease 2019 (COVID-19) infections. Consequently, patients amenable to analysis of intraperitoneal SARS-CoV-2 presence are rare. Intraperitoneal viral RNA detection was reported in 4 COVID-19 patients only. Intraperitoneal swab testing,^{4,5} intraoperative fluid sampling,⁶ and PD effluent⁷ enabled SARS-CoV-2 RNA detection by RT-PCR. The PD effluent remained SARS-CoV-2 positive, associated with peritoneal membrane malfunction (PD failure).⁷ Viral peritoneal cavity contamination could indeed be owing to increased peritoneal permeability during serositis or transmural bowel inflammation,

representing an advanced COVID-19 stage. We cannot yet say whether high pathogenicity results from specific virus strains, mutations, host immune, or circulatory reactions. The detection of intraperitoneal SARS-CoV-2 RNA should lead to sequencing studies, in order to gain insight on whether specific strains or mutations resulted in a virulence involving a breach of the peritoneal barrier.

While research in COVID-19 is ongoing, comparison with feline coronavirus provides additional insight. In case of inflammation, feline coronavirus can leak from the bloodstream into effusions, entailing positive intraperitoneal testing.⁸ Similarly, to feline infectious peritonitis (FIP), the infection of macrophages could favor disease progression and explain dysregulated immune responses in COVID-19.⁹ Antiviral drugs used in FIP are strong COVID-19 treatment candidates.

It remains unclear whether viral RNA detection is equivalent to presence of contagious virus.⁷ The majority of articles on intraperitoneal coronavirus detection concern FIP, where RT-PCR performed on effusions has a high specificity, and a RT-PCR assay was developed to identify actively replicating virus by detecting its mRNA.⁸

Systematic transdisciplinary sampling in nephrological/surgical/gynecologic and autopsy settings is needed to assess the overall viral prevalence in peritoneal fluid and to discriminate between infectious material versus shedding of noninfectious viral particles. Cross-sectional data in the COVID-19 patient population are much needed to achieve a proper risk quantification for viral transmission during both laparoscopic and open surgical approaches. Based on 4 patients with intraperitoneal RNA detection, as opposed to millions of SARS-CoV-2 infections worldwide, we cannot encourage to perform open surgery instead of laparoscopy. Confirmation of effluent contagiousness was suggested before imposing specific procedures, as the dissemination risk during PD seems very low.¹⁰ Transmission factors during surgery can be multifactorial, notably ventilation-associated factors in addition to peritoneal access-related ones, underlining the importance of general precautions recommended by surgical societies.

Funding/Support

This work was supported by French state funds managed within the “Plan Investissements d’Avenir” and by the ANR (reference ANR-10-IAHU-02).

Conflicts of interest/Disclosure

The authors declare that they do not have any conflicts of interest.

References

1. Fabbri N, Pesce A, Feo V, Pizzicotti S. Peritoneal swab test for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) patients in abdominal surgery: Is it a reliable practice? *Surgery.* 2021;169:1558–1559.
2. Seeliger B, Philouze G, Benotmane I, Mutter D, Pessaux P. Is the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) present intraperitoneally in patients with coronavirus disease 2019 (COVID-19) infection undergoing emergency operations? *Surgery.* 2020;168:220–221.
3. El Shamy O, Vassalotti JA, Sharma S, et al. Coronavirus disease 2019 (COVID-19) hospitalized patients with acute kidney injury treated with acute peritoneal dialysis do not have infectious peritoneal dialysis effluent. *Kidney Int.* 2020;98:782.
4. Coccolini F, Tartaglia D, Puglisi A, et al. SARS-CoV-2 is present in peritoneal fluid in COVID-19 patients. *Ann Surg.* 2020;272:e240–e242.
5. Barberis A, Rutigliani M, Belli F, Ciferri E, Mori M, Filairo M. SARS-CoV-2 in peritoneal fluid: an important finding in the Covid-19 pandemic. *Br J Surg.* 2020;107:e376.

6. Rimini E, Atzori G, Viotti A. COVID-19 in the peritoneal fluid: does this evidence oblige to introduce new rules? 2020. Available from: <https://www.researchgate.net/deref/http%3A%2F%2Fdx.doi.org%2F10.21203%2Frs.3.rs-28579%2Fv1>.
7. Vischini G, D'Alonzo S, Grandaliano G, D'Ascenzo FM. SARS-CoV-2 in the peritoneal waste in a patient treated with peritoneal dialysis. *Kidney Int.* 2020;98:237–238.
8. Felten S, Hartmann K. Diagnosis of feline infectious peritonitis: a review of the current literature. *Viruses.* 2019;11:1068.
9. Paltrinieri S, Giordano A, Stranieri A, Lauzi S. Feline infectious peritonitis (FIP) and coronavirus disease 19 (COVID-19): are they similar? *Transbound Emerg Dis.* 2020. <https://doi.org/10.1111/tbed.13856>. Accessed January 27 2021. [e-pub ahead of print].
10. Candellier A, Scohy A, Gillet N, et al. Absence of SARS-CoV-2 in the effluent of peritoneal dialysis patients. *Perit Dial Int.* 2020;40:499–503.

Barbara Seeliger, MD, PhD*, Patrick Pessaux, MD, PhD
IHU-Strasbourg, Institute of Image-Guided Surgery, France

Department of General, Digestive and Endocrine Surgery, University
Hospital of Strasbourg, France

* Corresponding author.

E-mail address: barbara.seeliger@ihu-strasbourg.eu (B. Seeliger).

Accepted 8 February 2021

<https://doi.org/10.1016/j.surg.2021.02.025>
0039-6060/© 2021 Elsevier Inc. All rights reserved.

A stitch in time saves nine!



We were pleased to read the article by Pereira Rodriguez et al¹ regarding the challenges faced by the authors in implementing the small bites technique in midline elective laparotomy wounds. We posit that similar issues have plagued us in conducting a multicenter trial across 3 institutes in India, which evaluates the efficacy of the small bites technique exclusively in emergency laparotomies.

Midline laparotomy closure has been a rite of passage for surgical trainees. The closure technique is usually passed on by senior trainee surgeons to the junior trainee surgeons in the wee hours of the night, when most emergency cases are operated. It is usually learned by word-of-mouth and the large bite technique has been hardwired into the operating hands of surgeons of the past decade. Changing this practice would require stern pedagogy.

The authors of the article have employed various training techniques like simulators, questionnaires, and prerecorded videos, which is very commendable. Similar tools have been employed by us at our institute while conducting the “Small bite continuous suture closure vs. mass closure of midline abdominal incision in emergency—A prospective, double-blind, multicentric, randomized controlled trial (SMILE trial, CTRI/2020/06/026210)”. Along with a training session, we distributed prerecorded videos of the small bites technique to the trainee residents as per the Suture Techniques to Reduce the Incidence of the Incisional Hernia trial,² and case record forms have been used to analyze the technique after doing the closure. Ours is one of the trials, apart from the one by Emile et al,³ which is studying the incidence of incisional hernia with the small bites technique exclusively in emergency midline laparotomies. Emergency midline laparotomy closure is known to have a higher incidence of incisional hernias, as high as 22%, than elective closures.⁴

We would like to highlight some issues that we have come across on reading this paper. More than 50% of the surgeons in this paper did not adhere to the suture length to wound length ratio of 4:1 as proposed by Israelsson et al.⁵ This is crucial and forms the crux of Jenkin's rule for midline abdominal closure.

The participants in this study had a mean age of more than 60 years in both the groups. Age in itself is said to be a risk factor for higher incidence of incisional hernia.⁶ The authors have compared

the “total operating time” and have not compared the time taken for abdomen closure exclusively. Also, there is no mention of the total number of stitches put in the small bites and large bites groups. In our SMILE trial, we have instructed the scrub nursing staff and the assistant to note down the number of bites. This can indirectly measure the adherence to protocol. The bites should be 5 mm apart in the small bite group and 1 cm apart in the large bite group. We maintain an online database and the hard copy of the case record form. In addition, the residents are instructed to share the case record form immediately after the surgery. Unfortunately, even after all the efforts, the compliance rate is not more than 70% in our institution. The other 2 centers are yet to recruit the case. Poor compliance of the residents and other institutes are hard to understand. Lack of confidence on the small bite technique can be one of the reasons. Only good quality publications and training sessions can help build trust on the small bite technique.

Nonetheless, the effort exerted by the authors of this paper is laudable. Incisional hernia is a major concern after midline laparotomy, and the small bites technique employed in the Suture Techniques to Reduce the Incidence of the Incisional Hernia trial has shown reduction in incisional hernia rates by half. The various training platforms and methods used in teaching the small bites technique would be very useful for other researchers trying to employ and demonstrate the skill required in small bites closure. Apart from video tutorials, use of smaller instruments, premarked sutures, and a few incentives for surgeons employing the small bites technique would help in percolating this closure skill in the surgical fraternity. We would try to enforce this technique by using the online platforms used by the authors of this paper in our institute for the SMILE trial. We are looking for other researchers to collaborate with us.

Funding/Support

The authors have not received any kind of grants, funds, incentives, salary, or support while writing this article.

Conflict of interest/Disclosure

The authors have no related conflicts of interest to declare.

References

1. Pereira Rodríguez JA, Amador-Gil S, Bravo-Salva A, et al. Small bites technique for midline laparotomy closure: from theory to practice: Still a long way to go. *Surgery.* 2021. Available from: <https://doi.org/10.1016/j.surg.2020.12.007>.
2. Deerenberg EB, Harlaar JJ, Steyerberg EW, et al. Small bites versus large bites for closure of abdominal midline incisions (STITCH): a double-blind, multicentre, randomised controlled trial. *Lancet.* 2015;386:1254–1260.
3. Emile S. A randomized controlled trial on small versus large bite closure of emergency midline laparotomy; 2019. Available from: <https://clinicaltrials.gov/ct2/show/NCT04098380>. Accessed January 23, 2021.
4. Peponis T, Bohnen JD, Muse S, et al. Interrupted versus continuous fascial closure in patients undergoing emergent laparotomy: a randomized controlled trial. *J Trauma Acute Care Surg.* 2018 Sep;85:459–465.
5. Israelsson LA, Jonsson T. Suture length to wound length ratio and healing of midline laparotomy incisions. *Br J Surg.* 1993;80:1284–1286.
6. Gianetta E, de Cian F, Cuneo S, et al. Hernia repair in elderly patients. *Br J Surg.* 1997;84:983–985.

H. Chiranjeevi, MBBS, Kumar Pankaj, MBBS, MS*
Department of Surgery, All India Institute of Medical Sciences,
Bhubaneswar, Orissa, India

* Corresponding author.

E-mail address: drpkushwaha@gmail.com (K. Pankaj);

Twitter: @aiimsbhubaneswr