

Recommendations and measures for minimally invasive surgery and endoscopic interventions during the COVID-19 pandemic

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ABSTRACT

The new severe acute respiratory syndrome Coronavirus 2 (SARS-CoV-2), which broke out in Wuhan province of China in December 2019, was declared as a pandemic in March 2020. Within the scope of combating the pandemic, all non-urgent non-cancer-related elective procedures were halted worldwide. Due to concerns that the virus transmission is primarily via droplets and contact, as well as airborne transmission during aerosol-generating procedures, minimally invasive surgery and endoscopy have led to concerns that there may be procedures that carry the risk of virus transmission. The aim of this article is to report clinical recommendations and scientific studies in order to assist surgeons and endoscopists dealing with minimally invasive surgery.

Keywords: COVID-19; endoscopy; surgery; measures; minimally invasive surgery; precautions.

Introduction

SARS-CoV-2, having been identified to be a new type of coronavirus, is an infectious RNA virus causing acute respiratory syndrome. Having been identified in December 2019 in the city of Wuhan in China, it was named COVID-19.^[1,2] People infected with COVID-19 may be asymptomatic, as well as symptoms such as fever, cough, dyspnea, extensive muscle pain, etc. may occur.^[3] After the virus had spread worldwide, the current situation was declared by the World Health Organization (WHO) as a pandemic on March 11, 2020.^[4]

It has been reported that more than 3300 healthcare workers in China have been infected with COVID-19, while in It-

aly, 20% of those who are infected were healthcare workers and approximately 50 deaths consist of doctors.^[5] With the data reported in this process, the protection of health workers is of great importance along with the treatment of the disease.

Although virus infection is known to be mainly through droplet and contact, there is evidence that transmission through air may also occur during aerosol generating processes. In addition, the reports stating that COVID-19 has been detected in feces suggests that it may also be transmitted through the fecal-oral route.^[6,7]

Minimally invasive surgery and endoscopic procedures have become frequent procedures due to their advantag-



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es such as short hospitalization, rapid recovery after surgery, and less bleeding.^[8] After the COVID-19 pandemics, non-emergency non-cancer elective procedures have been stopped worldwide.^[9] In parallel, procedures such as minimally invasive surgery and endoscopy, as well as procedures that carry the risk of virus transmission, have been restricted due to the concern that virus transmission through air may occur during aerosol-producing procedures.

It has been recommended to postpone elective situations during the pandemic, except for diseases that require emergency intervention during the pandemic. For malignancies, primarily non-surgical (neoadjuvant therapies or endoscopic interventions) treatment is recommended for appropriate patients.^[9] In line with this information, in this article, it has been aimed to determine the measures to be taken for the protection of healthcare workers in the group of patients infected with COVID-19 or in patients with high suspicion during minimally invasive surgery and endoscopic procedures.

Measures to be Taken During Endoscopic Procedures

Because of the higher risk of virus transmission in asymptomatic COVID-19 positive patients, upper gastrointestinal procedures should be limited, if possible.^[10-12] Endoscopic procedures should be planned in cases requiring emergency endoscopy, such as gastrointestinal bleeding, perforation and management of leaks, foreign body and biliary sepsis. Routine endoscopic screenings as well as endoscopic procedures planned for gastrointestinal neoplasia should be postponed during the pandemic for cases such as endoscopic mucosal resection, endoscopic submucosal dissection and urgent cases such as suspected cancer.^[13]

It is thought that the risk of contamination will increase due to the distance between the patient and the endoscopy team during endoscopic procedures. In the SARS outbreak in 2003, it had been reported that transmission could occur at a distance of 6 feet (about 1.83 m).^[14] While taking biopsy samples, it can be said that not only the upper gastrointestinal system (GIS) but also lower GIS endoscopy poses a risk due to the risk of fecal-oral transmission.^[6,7]

In cases requiring an intervention, the patient, for whom an endoscopic procedure has been planned, should first be classified for risk for COVID-19. Since patients can apply with the gastrointestinal manifestations of COVID-19, all emerging endoscopic procedures in the current setting should be considered as high risk (Fig. 1).^[15,16] The patient's complaints during arrival, the presence of symptoms that may be associated with COVID-19 infection (fever, cough, dyspnea), a history of contact with a COVID-19 positive persons, and whether they had been in high-risk areas should be questioned. In case of suspicious situations, the patient's fever should be measured, and an examination should be carried out using imaging methods to determine whether there are signs of pneumonia. After identifying the risk groups, endoscopy should be planned by wearing personal protective equipment (PPE). For the low-risk group (no symptoms, no contact history, no travel history), the recommended surgical mask, bonnet, safety glasses, disposable aprons and gloves are recommended for the staff. If the upper GIS endoscopy is to be performed for the medium risk group (there are either symptoms but no contact and travel history, or no symptoms but a contact and travel history), it is recommended to approach the patient like the high-risk case if an upper GIS endoscopy will be performed and like a low risk case if a lower GIS

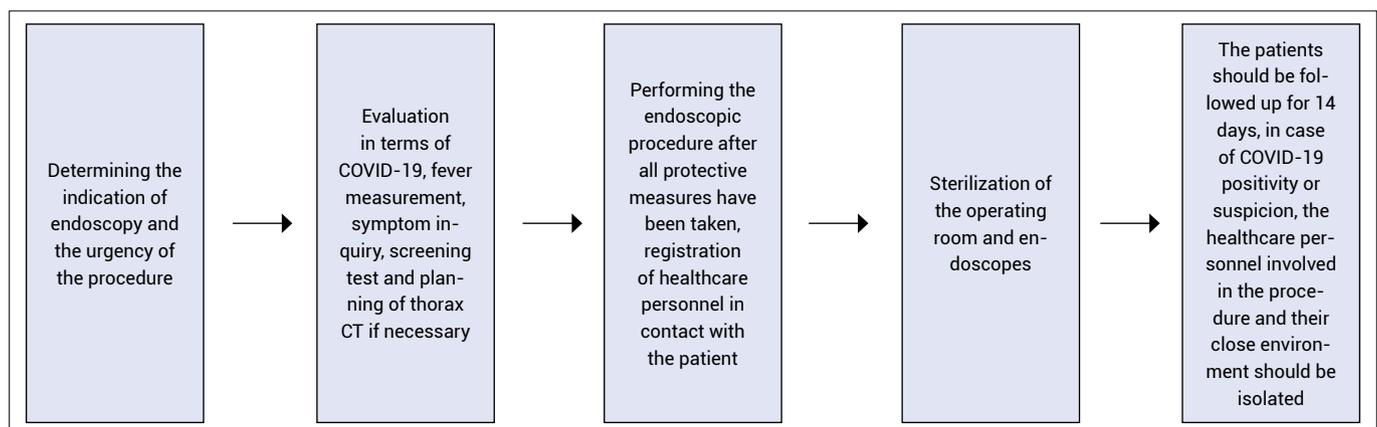


Figure 1. Evaluation scheme for emergency endoscopic procedures during COVID-19 pandemic.

endoscopy will be performed. It is recommended to use N95 or FFP2/FFP3 masks, bonnets, goggles or visors, impervious overalls, double gloves or barrier gloves for the high-risk group (symptoms, contact and travel history) and positive cases.^[17] It should be avoided to remove the caps from the endoscopes during the endoscopic procedure, since fluid and/or air can be released by doing this.^[15] Endoscopic procedures such as endoscopic mucosal resection (EMR) and endoluminal procedures, which have a higher process duration than diagnostic procedures and have a risk of closer contact, should be avoided until better knowledge is available about the aerosolization properties of the virus.^[11,13,15]

After alcohol-based hand disinfection, bonnets, aprons, masks, safety glasses, and shields and gloves should be put on, respectively. After the procedure, the first gloves should be removed after the alcohol-based hand disinfection over the gloves. After removal, hand disinfection should be done again and after putting on clean gloves, aprons, safety glasses or visor, mask should be removed respectively. Finally, gloves that had been put on again must be removed.^[18]

The American Society for Gastrointestinal Endoscopy (ASGE) stated that endoscopic interventions should be performed in negative pressure endoscopy rooms in cases of transmission risk.^[19] In hospitals without these rooms, rooms in the operation theater reserved for endoscopic procedures can be used. Room cleaning after the procedure should include cleaning of all surfaces with disinfectants in accordance with routine standards. Cleaning of devices and surfaces with neutral detergents and disinfectants with viricidal effect, 0.05% sodium hypochlorite or 70% ethanol is effective in killing the virus. Endoscopic equipment used during procedures performed on COVID-19 positive or suspicious patients should be cleaned separately from other endoscopic equipment.^[12,15,18,20–22] During this cleaning period, the room should be left empty for 30 minutes to an hour. In the absence of negative pressure chambers, it is recommended to ventilate the room for at least one hour.^[18,19]

As a result, to minimize virus spread, endoscopic procedures of the gastrointestinal tract should be performed with minimal number of medical staff, following the infection control protocols, provided that they are limited to situations requiring emergency endoscopic intervention. After the procedure, the patients should be followed up for 14 days, in case of COVID-19 positivity or suspicion

should be isolated in their home. If they develop symptoms such as fever, sore throat and shortness of breath, a Covid-19 PCR test should be performed.

Measures to be Taken During Minimally Invasive Surgery

While making the decision for a surgery, it is recommended to postpone elective surgeries and to perform surgery for emergency cases. During the admission to the hospital, the symptoms of COVID-19 should be questioned and the level of risk should be determined like in endoscopic procedures. The Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) recommends that informed consent forms should cover the risk and possible consequences of COVID-19 exposure for patients scheduled for surgery. If it is easily accessible and practical, surgical patients are recommended to be tested for COVID-19 before surgery.^[14] It is not recommended to wait for the test results of these patients who are planned to undergo emergency surgery. Suspicious and COVID-19 positive patients are operated by following the same procedures. It is recommended that a thorax computed tomography (CT) examination should take place in the last 24 hours before surgery.^[9]

The American Collage of Surgeons (ACS) has, to help decision-making regarding surgical procedures, classified the cases according to the emergency situation into conditions such as hemorrhagic shock, intestinal obstruction, ulcer perforations, mesenteric ischemia (Emergency), which may be life-threatening or can cause organ loss if the operation is delayed, diseases such as acute appendicitis, acute cholecystitis, diverticulitis that can be treated using alternative methods such as non-operative local, percutaneous or antibiotherapeutical methods (Urgent) and cases requiring surgical procedures, but can be postponed for months without the threat of life or any organ damage (Elective). ACS has proposed a way to follow during the pandemic according to this classification. Accordingly, emergency surgical procedures should be applied by taking the necessary precautions. Alternative methods should be tried primarily in other procedures, and elective surgeries should be postponed.^[23]

There are not many publications in the literature about possible risks of the surgical team through inhalation from patients infected with the virus during laparoscopy. The presence of aerosols and cell-sized fragments in caustery fumes formed during surgery has been revealed.^[8,24] It has been shown that particle concentrations in smoke

are higher in laparoscopic surgery than in open surgery and cells can be carried as aerosols through the smoke produced by cauterization in the pneumoperitoneum produced during laparoscopy.^[8,25,26] There is an association between pneumoperitoneum pressure and the amount of cells in the aerosol. It has been reported that when the pneumoperitoneum pressure is high, the number of cells transported in the aerosol also increases.^[8,27] Therefore, additional safety measures are required for laparoscopic procedures during the pandemic. After all protective measures are taken, laparoscopic procedures should be done by creating a low pressure pneumoperitoneum. Low CO₂ pressure during laparoscopic surgery can be achieved even by using a deep neuromuscular block.^[8] For patients who are predicted, suspected or verified to be COVID-19 positive, the operation room should be properly filtered and ventilated and, should be, if possible, different from the rooms used for other emergency surgery patients. If present, negative pressure chambers should be considered (Fig. 2).^[15,28]

Transfer of patients from the clinic to the designated operating room should be done by the shortest and fastest way. It is recommended that stretchers and even elevators used for these patients be separate. The transfer should be carried out by the ward nurses by wearing PPE, which includes N95 mask, goggles or a shield, overalls, gloves and boots. Patients should wear medical masks in each case.^[22,29]

Only those considered basic personnel should participate in the surgical case, and if there is no emergency, room staff should not be exchanged. Operating room staff should all use appropriate, suitable aprons and face shields. These measures should be used in all surgical

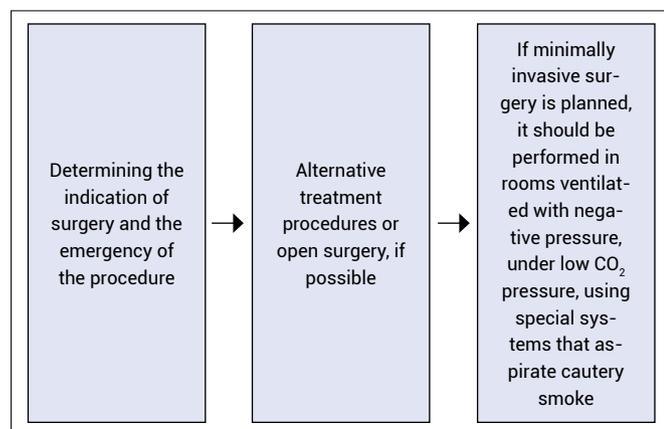


Figure 2. Evaluation scheme for emergency laparoscopic procedures during COVID-19 pandemic.

procedures during the pandemic, regardless of the known or suspected COVID status.^[15]

The operating room should be located far away from other rooms in the operating theater and reserved for these patients. It is recommended that this room is a negative pressure chamber. The anesthesia device should only be used within this room and only for patients with suspected/positive COVID-19. A separate filter should be placed in the anesthesia device and this filter and the soda-lime should be replaced after each patient.

The whole team, who keep two meters distance to the patient during anesthesia induction and wake-up, must wear an electric air purifying respirator together with the PPE. It is recommended that all medicines and equipment to be used during anesthesia are taken from the anesthesia cart and placed in a separate tray. The purpose of the tray is to reduce contamination of the anesthesia cart. The equipment to be used during intubation should be preferred to be for single use. In order to prevent intubation several times, the patient should be intubated by choosing the method with the highest probability of success. A lung protective ventilation strategy should be applied with a small tidal volume to reduce lung damage due to ventilation during anesthesia. Induction should be planned so that Tidal Volume is 4–8 mL/kg, inspiratory plateau pressure less than 30 cm H₂O and PEEP level less than 8 cm H₂O according to the patient's ideal body weight.^[30]

Care should be taken to keep the minimum number of personnel required in the operating room. A member of the team should be placed outside the operating room to supply the materials that will be needed, to transport blood gas and frozen examination samples. This person must wear PPE when entering the operating room. The surgical team should wear standard sterile surgical clothing after putting on the PPE.^[9,29]

With the pandemic, different ideas have been put forward regarding the type of surgery to be selected for the protection of healthcare workers. It is thought that the gases used for laparoscopy might have an aerosol effect, that is, particles can spread in the air and thus the transmission may increase. It has been reported that it is important to control the gas outlet due to the increase of viral load in the gas used. Chinese surgeons have reported that if these suggestions cannot be followed strictly, laparoscopic surgery should be avoided and that also they therefore prefer

open surgery. However, there are also opinions that minimally invasive surgery should be preferred during this period, after taking the necessary precautions due to shorter hospital stays and low complication rates.^[15]

Electrosurgical devices should be used at the lowest possible setting for the desired effect. Since the use of monopolar electrosurgery, ultrasonic dissectors and advanced bipolar devices can lead to particle aerosolization, the use of these devices should be minimized. If possible, monopolar diathermy pens with smoke evacuation devices should be used. Surgical equipment used during procedures performed on COVID-19 positive or suspicious persons should be cleaned separately from other surgical equipment.^[15,28,31,32]

The passage of the ports of the laparoscopy device should be as small as possible to allow passage of the ports on one hand, and not to allow leakage around the ports on the other hand. CO₂ insufflation pressure should be kept at a minimum. It has been stated that appropriate filtering can be done by using smoke aspirators (ULPA = ultra low particulate air) produced to prevent camera fogging by smoke and reducing the visual field associated with it.^[15,33,34]

Before the skin is closed, all air (pneumoperitoneum) in the abdomen should be safely evacuated with a filtration system. After the air in the abdomen is completely evacuated, trocars and surgery specimen should be removed.^[15]

During laparoscopic surgery, in order to reduce the aerosol effect, it is recommended to prevent the gas outflow from trocars, to make smaller incisions to prevent gas leakage from the incisions made, to use gas filters, to work at the minimum intraabdominal pressure that can be applied. In addition, it is recommended to aspirate all the air inside the abdomen without leakage before removing the specimen, changing from laparoscopic to open surgery and closing the incision.^[15,33,35]

It has been stated that robotic surgery can be preferred for minimally invasive surgery due to its advantages such as low intra-abdominal pressure (up to 5 mmHg), less personnel requirement, and less tool use.^[35,36]

After the operation, the patient should be fully awakened in the operating room and patients who do not need intensive care should be transferred from the operating room to the ward. Patients in need of intensive care should be transferred to the intensive care unit following the same

procedures. Gloves and aprons should be removed in the operating room and hand disinfection should be carried out. After leaving the operating room, glasses, shield, bonnet and mask should be removed, and then hand disinfection should be carried out. Finally, it is recommended to remove the uniform and take a shower in the dressing room.^[9,29]

When cleaning the operating room, all waste should be collected in a separate collection area, all surfaces and cables should be cleaned with appropriate disinfectant materials. All medicines in the medication tray should be considered contaminated and disposed. Evaporating disinfectants can be used for cleaning the room. It is recommended that patients should not be admitted to the room for one hour in order to perform a complete cleaning.^[9,29]

Consequently, minimally invasive surgery should be preferred restrictedly during the COVID-19 pandemic. Due to the higher risk of virus spread than during open surgery, it can be performed by following infection control protocols, provided that it is limited to selected cases.

Conclusion

During the pandemic, healthcare workers are at high risk in a hospital environment where it is not easy to comply with general measures such as contact isolation and social distance. It is extremely important to protect healthcare professionals from the COVID-19 infection. There is also an increased risk during endoscopy and surgical interventions due to close contact with the patient. Throughout this period, the necessity of such transactions, which pose a risk to healthcare professionals, should be evaluated and the timing should be decided well. Non-emergency or postponable interventions should not be carried out during this period. In case of malignancy that is not suitable for postponement and in cases requiring emergency endoscopic or surgical intervention, interventions should be carried out after all necessary precautions are taken to protect healthcare workers. During and after laparoscopic surgery, the gas used for abdominal insufflation should be aspirated and the protective measures described should be followed with high precision to minimize the risk of possible particle dispersion in the air in the operating room.

Disclosures

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References

- Li Q, Guan X, Wu P, Wang X, Zhou L, Tong Y, et al. Early Transmission Dynamics in Wuhan, China, of Novel Coronavirus-Infected Pneumonia. *N Engl J Med* 2020;382:1199–207.
- Nunoo-Mensah JW, Rizk M, Caushaj PF, Giordano P, Fortunato R, Dulskas A, et al; ISUCRS COVID-19 Participating Investigator Group. COVID-19 and the Global Impact on Colorectal Practice and Surgery. *Clin Colorectal Cancer* 2020;19:178–90.e1.
- Guan WJ, Ni ZY, Hu Y, Liang WH, Ou CQ, He JX, et al; China Medical Treatment Expert Group for Covid-19. Clinical Characteristics of Coronavirus Disease 2019 in China. *N Engl J Med* 2020;382:1708–20. [CrossRef]
- Available at: https://www.who.int/docs/default-source/coronaviruse/transcripts/who-audio-emergencies-coronavirus-press-conference-full-and-final-11mar2020.pdf?sfvrsn=cb432bb3_2. Accessed Oct 6, 2020.
- The Lancet. COVID-19: protecting health-care workers. *Lancet* 2020;395:922. [CrossRef]
- Gu J, Han B, Wang J. COVID-19: Gastrointestinal Manifestations and Potential Fecal-Oral Transmission. *Gastroenterology* 2020;158:1518–9. [CrossRef]
- Xiao F, Tang M, Zheng X, Liu Y, Li X, Shan H. Evidence for Gastrointestinal Infection of SARS-CoV-2. *Gastroenterology* 2020;158:1831–3.e3. [CrossRef]
- Angioni S. Laparoscopy in the coronavirus disease 2019 (COVID-19) era. *Gynecol Surg* 2020;17:3. [CrossRef]
- Karaca AS, Özmen MM, Uçar AD ve ark. COVID-19'lu hastalarda genel cerrahi ameliyathane uygulamaları. *Turk J Surg* 2020;36:6–10. [CrossRef]
- Ang TL. Gastrointestinal endoscopy during COVID-19 pandemic. *J Gastroenterol Hepatol* 2020;35:701–2. [CrossRef]
- Aguila EJ, Cua IH, Dumagpi JEL, Francisco CPD, Raymundo NTV, Sy-Janairo MLL, et al. COVID-19 and its effects on the digestive system and endoscopy practice. *JGH Open* 2020;4:324–31. [CrossRef]
- Furfaro F, Vuitton L, Fiorino G, Koch S, Allocca M, Gilardi D, et al. SFED recommendations for IBD endoscopy during COVID-19 pandemic: Italian and French experience. *Nat Rev Gastroenterol Hepatol* 2020;17:507–16. [CrossRef]
- Chiu PWY, Ng SC, Inoue H, Reddy DN, Ling Hu E, Cho JY, et al. Practice of endoscopy during COVID-19 pandemic: position statements of the Asian Pacific Society for Digestive Endoscopy (APSDE-COVID statements). *Gut* 2020;69:991–6.
- Wong TW, Lee CK, Tam W, Lau JT, Yu TS, Lui SF, et al; Outbreak Study Group. Cluster of SARS among medical students exposed to single patient, Hong Kong. *Emerg Infect Dis* 2004;10:269–76. [CrossRef]
- Society of American Gastrointestinal and Endoscopic Surgeons. Recommendations Surgical Response to COVID 19 Crisis. Available at: <https://www.sages.org/recommendations-surgical-response-covid-19/>. Accessed Oct 6, 2020.
- Li LY, Wu W, Chen S, Gu JW, Li XL, Song HJ, et al. Digestive system involvement of novel coronavirus infection: Prevention and control infection from a gastroenterology perspective. *J Dig Dis* 2020;21:199–204. [CrossRef]
- Sultan S, Lim JK, Altayar O, Davitkov P, Feuerstein JD, Siddique SM, et al; AGA Institute. Electronic address: ewilson@gastro.org. AGA Rapid Recommendations for Gastrointestinal Procedures During the COVID-19 Pandemic. *Gastroenterology* 2020;159:739–58.e4. [CrossRef]
- Repici A, Maselli R, Colombo M, Gabbiadini R, Spadaccini M, Anderloni A, et al. Coronavirus (COVID-19) outbreak: what the department of endoscopy should know. *Gastrointest Endosc* 2020;92:192–7. [CrossRef]
- ASGE Quality Assurance in Endoscopy Committee, Calderwood AH, Day LW, Muthusamy VR, Collins J, Hambrick RD 3rd, et al. ASGE guideline for infection control during GI endoscopy. *Gastrointest Endosc* 2018;87:1167–79. [CrossRef]
- van Doremalen N, Bushmaker T, Morris DH, Holbrook MG, Gamble A, Williamson BN, et al. Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1. *N Engl J Med* 2020;382:1564–7. [CrossRef]
- Marnie C, Peters MD. ANMF Evidence Brief: Covid-19: Cleaning and disinfection of hospital surfaces and equipment. Australian Nursing and Midwifery Federation 2020. Available at: http://www.anmf.org.au/documents/ANMF_Evidence_Brief_COVID-19-Cleaning_and_disinfection.pdf. Accessed Oct 6, 2020.
- Beilenhoff U, Biering H, Blum R, Brljak J, Cimbrow M, Dumonceau JM, et al. Reprocessing of flexible endoscopes and endoscopic accessories used in gastrointestinal endoscopy: Position Statement of the European Society of Gastrointestinal Endoscopy (ESGE) and European Society of Gastroenterology Nurses and Associates (ESGENA) - Update 2018. *Endoscopy* 2018;50:1205–34. [CrossRef]
- American College of Surgeons. COVID-19: Guidance for Triage of Non-Emergent Surgical Procedures. Available at: <https://www.facs.org/covid-19/clinical-guidance/triage>. Accessed Mar 17, 2020.
- DesCoteaux JG, Picard P, Poulin EC, Baril M. Preliminary study of electrocautery smoke particles produced in vitro and during laparoscopic procedures. *Surg Endosc* 1996;10:152–8. [CrossRef]
- Champault G, Taffinder N, Zioli M, Riskalla H, Catheline JM. Cells are present in the smoke created during laparoscopic surgery. *Br J Surg* 1997;84:993–5. [CrossRef]
- Li Ci, Pai JY, Chen CH. Characterization of smoke generated during the use of surgical knife in laparotomy surgeries. *J Air Waste Manag Assoc* 2020;70:324–32. [CrossRef]
- Ikramuddin S, Lucas J, Ellison EC, Schirmer WJ, Melvin WS. Detection of aerosolized cells during carbon dioxide laparoscopy. *J Gastrointest Surg* 1998;2:580–3; discussion 584.
- Chadi SA, Guidolin K, Caycedo-Marulanda A, Sharkawy A, Spinelli A, Queresby FA, et al. Current Evidence for Minimally Invasive Surgery During the COVID-19 Pandemic and Risk Mitigation Strategies: A Narrative Review. *Ann Surg* 2020;272:118–24. [CrossRef]

29. Ti LK, Ang LS, Foong TW, Ng BSW. What we do when a COVID-19 patient needs an operation: operating room preparation and guidance. *Can J Anaesth* 2020;67:756–8. [CrossRef]
30. Wen X, Li Y. Anesthesia Procedure of Emergency Operation for Patients with Suspected or Confirmed COVID-19. *Surg Infect (Larchmt)* 2020;21:299. [CrossRef]
31. Yu GY, Lou Z, Zhang W. Several suggestion of operation for colorectal cancer under the outbreak of Corona Virus Disease 19 in China. *Zhonghua Wei Chang Wai Ke Za Zhi* 2020;23:9–11.
32. Zheng MH, Boni L, Fingerhut A. Minimally Invasive Surgery and the Novel Coronavirus Outbreak: Lessons Learned in China and Italy. *Ann Surg* 2020;272:e5–e6. [CrossRef]
33. SAGES. Resources for Smoke & Gas Evacuation During Open, Laparoscopic, and Endoscopic Procedures. Available at: <https://www.sages.org/resources-smoke-gas-evacuation-during-open-laparoscopic-endoscopic-procedures/>. Accessed Oct 6, 2020.
34. Mintz Y, Arezzo A, Boni L, Chand M, Brodie R, Fingerhut A; the Technology Committee of the European Association for Endoscopic Surgery. A Low-cost, Safe, and Effective Method for Smoke Evacuation in Laparoscopic Surgery for Suspected Coronavirus Patients. *Ann Surg* 2020;272:e7–e8. [CrossRef]
35. Kimmig R, Verheijen RHM, Rudnicki M; for SERGS Council. Robot assisted surgery during the COVID-19 pandemic, especially for gynecological cancer: a statement of the Society of European Robotic Gynaecological Surgery (SERGS). *J Gynecol Oncol* 2020;31:e59. [CrossRef]
36. Vigneswaran Y, Prachand VN, Posner MC, Matthews JB, Hussain M. What Is the Appropriate Use of Laparoscopy over Open Procedures in the Current COVID-19 Climate? *J Gastrointest Surg* 2020;24:1686–91. [CrossRef]