



# Advantages of Laparoscopy in Times of COVID-19: Should Laparoscopy be Given Priority during A Pandemic?

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## Abstract

**Background:** Selection of laparoscopy over the traditional open approach during times of pandemic has been in question. Although very little evidence supports viral transmission through laparoscopy or open approach, a potential risk of transmission is still present. Therefore, modifications to surgical practices have been suggested in order to minimize the risk of viral transmission through surgical procedures.

**Objective:** Concern on potential risk of viral transmission during laparoscopic surgeries have raised many questions among surgeons worldwide. Several benefits of laparoscopy will be discussed in detail and the safety of laparoscopy relative to the traditional open approach will be speculated based on these benefits. Furthermore, important safeguards that have to be implemented in the operating room in times of pandemic will be discussed.

**Conclusion:** Despite the lack of evidence on the transmission of COVID-19 during laparoscopy, a potential risk remains. However, the known benefits of laparoscopy could be advantageous over the open approach and minimize the risk of occupational exposure on the surgical staff. Despite very little evidence that suggest viral transmission, it is important to implement modifications in the operating room to further reduce the risk of viral transmission.

**Keywords:** Laparoscopy; COVID-19; Pandemic; Occupational exposure

## Introduction

COVID-19 has deeply affected all aspects of medicine and surgeons are no exception for the increased precaution and concern for the risk of viral transmission. Although different surgical associations and institutions have provided surgical guidelines to optimize the use of laparoscopy and robotic techniques during a pandemic, the validity of these guidelines remain in question among many surgeons worldwide. While the American College of Surgeons suggests avoidance of laparoscopy in general [1], Eastern Association for the Surgery of Trauma and Society of American Gastrointestinal and Endoscopic Surgeons suggest only a potential risk for aerosolization of viral particles and do not limit the use of laparoscopy as long as ventilation device is co-used [2,3]. Alternatively, Societa Italiana Chirurgia in Italy suggests that there is no risk for aerosolization of the virus and does not recommend addition of restrictions or modifications in the use of laparoscopy and robotic techniques [4]. Although a unanimous consensus has

not been met regarding the safety of laparoscopic and robotic techniques during a pandemic, a vast majority of the societies take into account the potential transmission risks and suggest implementation of changes during surgical and post-surgical management.

The theoretical risk of viral transmission with the use of laparoscopy has been proposed based on the evidence of COVID-19 virus RNA in the stool and gastrointestinal mucosa of infected individuals [5,6]. Although no evidence suggests the possibility of viral transmission from a gastrointestinal source [6], it is theorized that the heated volume of gas in the pneumoperitoneum during a laparoscopic procedure may subsequently lead to a significant aerosolization of the virus. It is possible for the aerosolized viral particles within the insufflated intraperitoneal cavity to be released through the trocars valves during the exchange of instruments, increasing the transmissibility of the virus to surgical personnel present in the operating room.

Although a few studies have been conducted to determine the viral transmissibility through surgical procedures, no studies have been able to suggest definitive viral transmission during a surgical procedure, whether open or laparoscopic. Most, if not all, of the studies that investigated surgical viral transmission evaluated viral transmission through blood exposure [7,8]. These studies have reported that although the risk of occupational transmission is very low, the risk is not zero and appropriate changes should be implemented in the operating room in order to further mitigate the risk. Occupational exposure to aerosolized virus during a laparoscopic or robotic surgical procedures has not been extensively studied and warrants further investigation in order to clearly establish a guideline for such scenarios. This review aims to identify the advantages of laparoscopy during time of pandemic and to evaluate different modifications in the operating room to minimize the risk of viral transmission.

### Advantages of Laparoscopy

First and foremost, laparoscopic procedures have a clear advantage over open procedures in terms of recovery speed. Decreased length of hospital stay protects both the patient and the surgical team from a prolonged exposure to the novel COVID-19 in both directions. Although modifications in the operation room were suggested based on the theoretical risk of viral aerosolization, it is unclear whether this risk outweighs the risk of viral transmission during an extended stay at the hospital bed. Therefore, it is necessary to further investigate and compare these risks to determine a relatively safer approach to surgical care during times of pandemic.

Laparoscopy creates a self-contained surgical environment and allows minimal spillage of fluids or tissues that could contain viral RNA. Blood transmission has been well established as a common source of viral transmission and is potentially a bigger threat than aerosolized viral particles. During the acquired immunodeficiency syndrome (AIDS) epidemic back in the 1990s, laparoscopic procedures were strongly recommended over open approach when operating on known carriers of the human immunodeficiency virus (HIV) [9,10]. A comprehensive surgical decision making has to be made prior to the surgical procedure to assess the risk conveyed by the spillage of bodily fluids.

Laparoscopic procedures, especially robotic surgeries, allow surgeons to carry out surgical procedures remotely. This feature not only minimizes the risk of viral transmission from the patient to the staff but also minimizes viral transmission between the operative staff. Open procedures require surgical staff to work in a closer proximity to each other and the patient. Closer proximity imposes a greater risk of viral transmission when the surgical candidate is a known carrier of the virus. Distancing between the surgeon and the patient is the key to decreased viral transmission rate. Hence, laparoscopic procedures can be advantageous over traditional

open approach and provide a safer surgical environment for the operative staff.

The well-established benefits and advantages of laparoscopic procedures can still come into effect during the current pandemic. Laparoscopy may even offer other benefits to this specific situation in terms of safety and decreased viral transmissibility. Although it may not be possible to completely mitigate the risk of viral transmission through laparoscopy, addition of safety precautions and implementing changes to the operating room during these times might further minimize the risk of occupational viral transmission. Laparoscopy, with appropriate changes and precautions, might have an advantage over the open approach during a pandemic. Laparoscopy and robotic techniques should be further investigated in order to provide the patients with the safest surgical method.

### Modifications and changes in the Operating Room

Although the risk of viral transmission has not been fully established, surgical procedures in a unknown domain with a highly transmittable virus requires proper precautions in order to minimize the risk. Different surgical associations have suggest different guidelines with appropriate modifications to the use of laparoscopy. These guidelines have been established to mitigate the potential risk despite the lack of clear evidence of transmission. However, the safety precautions recommended by these societies are based on the principles of viral infection and do indeed limit the exposure of the surgical staff to the contagious virus.

The Eastern Association for the Surgery of Trauma and the Society for American Gastrointestinal and Endoscopic Surgeons currently recognize the potential aerosolization of the viral particles within the peritoneal cavity and recommend use of smoke evacuators in the operating room [2,3]. As mentioned previously, trocar valves are prone to a small amount of gas leak during exchange of instruments, which could release the aerosolized viral particles into the open air. Use of smoke evacuator could minimize the amount of intraperitoneal air released to the operating room and minimize the risk of occupational exposure to viruses. The most important use of a smoke evacuator would take place in the latter part of a laparoscopic procedure. The largest volume of intraperitoneal air is released during the desufflation. Therefore, use of a smoke evacuator to desufflate would lower the risk of transmission by a significant degree.

Changes in the insufflation pressure can be used along with smoke evacuators to minimize the amount of gas leak. Although patients' peritoneal cavities are traditionally insufflated using a CO2 pressure of 12-15 mmHg, several studies have demonstrated that laparoscopy can be performed with lower insufflation pressures [11,12]. Use of lower insufflation pressure will decrease the amount of aerosolized viral particles released to the operating room by lowering the inside to outside pressure gradient. Furthermore,

use of lower insufflation pressure is also beneficial for the patients as lower levels of postoperative pain and subsequently improved quality of life have been reported without affecting the quality of surgical procedure [13]. Decreasing the insufflation pressure should be considered, especially during a pandemic, in order to minimize the potential risk of transmission to the surgical staff. Furthermore, the added benefits of lowering postoperative pain could contribute to a decreased length of patients' hospital stays.

Lastly, it is important to implement changes in the hospital policy to promote distancing between staffs. University hospitals and teaching hospitals encourage the participation and presence of students in the operating room. Although first handed experience is an important aspect of medical education, patients' safety as well as the students' safety should be prioritized during times of a pandemic. Only staff members that are essential to a surgical procedure should be present in the operating room and the students' access to the operating room should be limited.

## Conclusion

Despite very little evidence to support viral transmission through laparoscopic or open approach, it is recommended to make appropriate modifications to surgical practices in order to minimize surgical staff exposure to aerosolized viral particles. Although a small percentage of surgical societies recommend against the use of laparoscopy during a pandemic, the recommendations are based on potential risk that has not fully been confirmed. It is therefore important for the surgeons to make a comprehensive surgical decision making and weigh the risks and benefits of a laparoscopic surgery. Based on the vast number of benefits of laparoscopy, which even seem to mitigate risk of viral transmission, laparoscopy should be considered with priority in times of a disease outbreak over the traditional open approach. However, it is very necessary to implement some changes in the surgical procedure in order to minimize the potential risk of viral transmission since the risk is not an absolute zero. Further studies should be conducted in order to accurately determine the transmissibility of viruses through laparoscopic procedures and robotic techniques and other safeguard changes in the operating room should be explored in order to further minimize the risk of occupational exposure of surgical care providers.

## Declarations

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Not applicable

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## Authors' Contributions

All authors contributed equally to this manuscript.

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