ORIGINAL ARTICLE

# Resuming Elective Laparoscopic Surgery during COVID-19 Pandemic: Our Experience and Challenges Faced

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## Abstract

**Background:** SARS-CoV-2 virus infection was detected and discovered in Wuhan, China, in December 2019, and it was declared a pandemic by WHO in March 2020. Since then a lot of changes were noticed in surgical practice. Various recommendations were released by eminent surgical associations all over the world. This study was designed to study and analyze the findings and experience after resuming elective minimal invasive surgery during the pandemic.

**Materials and methods:** This observational study was conducted at St Joseph's Hospital, Ghaziabad, from May 2020 to May 2021. Various preoperative and postoperative findings were noticed and analyzed. The presence of SARS-CoV-2 virus was also analyzed in endotracheal aspirate and surgical smoke.

**Observation and results:** A total of 287 cases underwent surgery. Most commonly performed surgery was laparoscopic cholecystectomy. The positivity rate for SARS-CoV-2 during preoperative work-up was 2.87%. Slightly more than 5% of cases in postoperative period had COVID-19-like symptoms. None of those patients were found positive on RT-PCR, and X-ray/CT findings were also suggestive of early postoperative changes only. Presence of SARS-CoV-2 virus was not detected in either endotracheal aspirate or surgical smoke. Neither surgery team nor OT staff had infection during this period. There was no mortality, and only 1 patient was found to be infected 2 weeks after discharge.

**Conclusion:** Minimal invasive surgery for elective cases can be safely performed by taking precautions like PPE and smoke evacuation system during the COVID-19 pandemic. There is no evidence of transmission of infection through endotracheal aspirate or surgical smoke.

**Keywords:** COVID-19 pandemic, Minimal invasive surgery, SARS-CoV-2.

*World Journal of Laparoscopic Surgery* (2022): 10.5005/jp-journals-10033-1507

## Introduction

SARS-CoV-2 virus is a lipid-enveloped virus from the Coronaviridae family that was first detected in Wuhan, China, and was responsible for the COVID-19 pneumonia outbreak around the globe, which was finally declared a pandemic by WHO in March 2020.[1–3] Since the outbreak of pandemic, lot of changes were brought in surgical practice. Non-emergency and elective cases were postponed immediately as per the recommendations by reputed eminent surgical associations. There was a state of confusion and uncertainty among surgeons regarding their own safety and overall patient care.[4–8] There was clear evidence of high mortality and morbidity among patients suffering from SARS-CoV-2 undergoing surgical procedures.[4] During this crisis, cases like cholelithiasis, hernia, and other benign conditions were put on hold from the declaration of pandemic and implementation of lockdown in the nation.[5–8] Only emergency procedures were performed. In Asian countries like India, where there were no proper guidelines and protocols were available initially as well as testing centers and resources were also limited. Planning and conducting elective minimal invasive surgeries was difficult, and hence, at our institute, it was decided to hold all elective laparoscopic procedures till further recommendations.[9] In late April and May, recommendations by the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES), European Association for Endoscopic Surgeons (EAES), Endoscopic and Laparoscopic Surgeons of Asia (ELSA), and Association of Surgeons of India (ASI) were released, and with availability of reverse transcription-polymerase chain reaction (RT-PCR) tests and personal protective equipment (PPE) kits, it was decided to resume elective laparoscopic surgery in a phased manner.[10–12] Another challenge faced was the reports and studies on surgical smoke, abdominal fluid, and aerosol generation during surgery to be a potential source of infection and subsequently increasing risk of transmission. However, there were lot of studies that demonstrated no evidence of any potential risk of transmission from surgical smoke. However other studies also recommended the use of smoke evacuation devices.[13–17]

This study is done to analyze the challenges faced, various preoperative and postoperative parameters, results, and overall experience while resuming elective laparoscopic surgery during COVID-19 pandemic.

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**How to cite this article:** Goel A, Bansal R, Kothari S, *et al*. Resuming Elective Laparoscopic Surgery during COVID-19 Pandemic: Our Experience and Challenges Faced. World J Lap Surg 2022;15(2): 145–148.

**Source of support:** Nil

**Conflict of interest:** None

## Materials and Methods

This observational study was conducted at St Joseph's Hospital, a tertiary care center for a period of 1 year from May 2020 to May 2021. Total 301 patients reported in OPD for minimal invasive surgery, out of which 287 cases were enrolled and underwent laparoscopic surgery, which included laparoscopic cholecystectomy, laparoscopic hernia repair (inguinal and ventral), laparoscopic appendectomy, ovarian cystectomy, salpingectomy, total laparoscopic hysterectomy, diagnostic laparoscopy, and others. All emergency laparoscopic surgeries, cases converted to open, and cases unfit for general anesthesia and laparoscopic surgery were excluded from the study. All patients after screening for fever, cough, cold, and other common symptoms of SARS-CoV-2 infection were seen in OPD and worked up for surgery. Due to precaution in the form of PPE kits, masks, and gloves were taken in OPD during patient examination. A thorough history of any recent contact with infected personnel was also sought. Apart from all relevant investigations and pre-anesthetic clearance, all patients underwent RT-PCR for SARS-CoV-2 at least 24–48 hours prior to surgery, and only those patients who reported negative were admitted a day before surgery. Only 1 attendant was allowed with the patient. Any patient whose RT-PCR report came positive was advised home isolation for 2 weeks and was referred to a physician for management of SARS-CoV-2 infection. These cases were taken up after 4–6 weeks for surgery after getting clearance from a physician, pulmonologist, and anesthetist with a negative RT-PCR report and normal X-ray of the chest. Total of 14 cases were declared unfit due to cardiorespiratory contraindications. All surgeries were performed in modular operation theater with proper air circulation, adequate space, and negative pressure ventilation. The operating surgeon, assistant, scrub nurse, anesthetist, and floor nurse all wore PPE, double gloves, face shield, and N95 masks. We used a low-cost smoke evacuation device in which smoke was evacuated from a single port through intravenous infusion set into a suction jar filled with 1% hypochlorite solution after passing through an HME filter. All cases were done under general anesthesia. Samples of endotracheal aspirate and evacuated surgical smoke (swab from HME filter) were sent for RT-PCR in all cases. All patients in postoperative period were kept in close observation. Any incidence of fever, cough, fall in oxygen saturation level, and other findings were duly noticed. Various preoperative and postoperative parameters were analyzed. Patients were followed up for 1 month in OPD as well as telephonically.

Statistical analysis was performed using Statistical Package for the Social Sciences (SPSS) for Windows (version 24.0), and data were organized using Microsoft Office 2010 software. Categorical variables were described as frequency (percentage), and mean ± standard deviation was used for continuous parameters.

## Observation and Results

A total of 301 patients were worked up from OPD and 287 underwent surgery over a period of 1 year. The mean age of the patients was 43.56 years. Out of 287, around 60% were female patients. Surgery most frequently performed was laparoscopic cholecystectomy (194 cases) followed by appendectomy and hernia repairs. A total of 15 gynecological cases were done, and 10 diagnostic laparoscopies were done. Total 8 cases were found positive for SARS-CoV-2 infection during work up. They underwent surgery after a gap of 4–6 weeks. None of the infected cases was found unfit for surgery, and all of them recovered well in home isolation only. Presence of SARS-CoV-2 virus was not detected in either endotracheal aspirate or surgical smoke.

In total, 14 (4.87%) patients had fever postoperatively, and 13 had associated cough. All these patients underwent chest X-rays, and half of them had either pleural effusion or pneumonia. Two patients required a CT scan of the chest. Eleven patients had fall in saturation <90% post-operatively and required $O_2$ support; however, only 4 of them had real breathing discomfort. These patients were managed conservatively and recovered well without a need for intubation and mechanical ventilation. In total, 17 patients had sore throat which resolved with steam and rest. Due to these symptoms, RT-PCR was conducted on 16 patients, and none of the reports were positive. The mean duration of stay was around 2.32 days, and most of the patients were discharged after 24 hours. In follow-up after 2 weeks, 12 patients had wound infections, and 2 developed fever and cough, out of which 1 was found positive for SARS-CoV-2 infection and managed conservatively. None of the healthcare workers, whether surgeons, OT staff, or ward nursing staff contracted infection during the entire period (Table 1).

## Discussion

COVID-19 pandemic emerged as a global threat and created a state of uncertainty and confusion among the surgeons all over the world. The patient's overall safety and own safety was the prime concern. The SARS-CoV-2 infection is transmitted by respiratory droplets, which can be airborne and remain suspended in the air for a significant period. Viral load is seen highest in respiratory secretions. Aerosol-generating procedures like bronchoscopy, laryngoscopy, endoscopy, and endotracheal intubation carry a higher risk of transmission of infection.[3,4] Many previous studies had shown the presence of Human Papilloma Virus (HPV), Hepatitis B virus (HBV), and Human immunodeficiency virus (HIV) in the surgical smoke, which raised a theoretical concern of the presence of SARS-CoV-2 infection in the surgical smoke created during almost all laparoscopic surgeries.[14–17] Laparoscopic surgery is a closed system. Pneumoperitoneum is created through a trochar, and evacuation is also done in a controlled manner through another trochar. We used a low-cost smoke filtration and evacuation during this pandemic. However, almost all the recent studies on COVID-19 had clearly indicated that there is no such evidence of transmission through surgical smoke.[18,19] Our study clearly showed that in patients who were asymptomatic and had negative RT-PCR reports prior to surgery, the SARS-CoV-2 virus was not detected in endotracheal aspirate or surgical smoke.

The most commonly performed elective minimally invasive procedure during this pandemic was laparoscopic cholecystectomy. Study by Manzia et al.[5] also stated that gall stone disease was most commonly postponed surgery during the pandemic. This clearly indicates that cholecystectomy is the most commonly performed elective surgery. It was observed that with proper history taking and screening in OPD, only 2.78% of cases were found positive for SARS-CoV-2 in preoperative work up. All of them were operated after 4 weeks, and none of them had any postoperative complications. However, it was found somewhat challenging to convince patients for RT-PCR test, especially when asymptomatic; however, with proper counseling, RT-PCR test was done for everyone.[9] We cannot rely entirely on RT-PCR results, so history of symptoms and recent travel to an infected zone play a major role during preoperative evaluation. Very few patients had COVID-19-like symptoms in postoperative period, but none of the patients were found to be

**Table 1:** Clinical parameters, preoperative, and postoperative findings

| *Clinical parameters and findings* | *Number (Percentage) of patients underwent surgery (N = 287)* |
|---|---|
| Mean age (years) | 43.56 |
| Gender | |
| Male | 114 (39.72%) |
| Female | 173 (60.28%) |
| Surgery performed | |
| Laparoscopic cholecystectomy | 194 (67.59%) |
| Laparoscopic appendectomy (Interval) | 41 (14.28%) |
| Laparoscopic hernia repair | |
| Ventral | 12 (4.18%) |
| Inguinal | 14 (4.87%) |
| Diagnostic laparoscopy | 10 (3.48%) |
| Laparoscopic orchiectomy | 1 (0.34%) |
| Laparoscopic ovarian cystectomy | 6 (2.09%) |
| Laparoscopic salpingectomy | 4 (1.3%) |
| Total laparoscopic hysterectomy | 5 (1.7%) |
| Preoperative findings | |
| SARS-CoV-2 detected with symptoms | 3 (1.04%) |
| SARS-CoV-2 detected (asymptomatic) | 5 (1.7%) |
| Average duration from detection of SARS-CoV-2 infection to surgery (days) | 34.46 |
| Postoperative findings | |
| Fever(>100°F) | 14 (4.87%) |
| Cough | 9 (3.13%) |
| Dry | 4 (1.39%) |
| With expectoration | 17 (5.92%) |
| Sore throat | 4 (1.39%) |
| Breathing difficulty | 11 (3.83%) |
| Fall in $O_2$ saturation level <90% | 11 (3.83%) |
| Requirement of $O_2$ | 0 |
| Requirement of intubation and ventilator support | 2 (0.69%) |
| Prolonged ICU stay | 16 (5.57%) |
| RT-PCR conducted | 0 |
| Positive | 15 (5.22%) |
| X-ray chest conducted | 8 (2.78%) |
| Normal study | 5 (1.74%) |
| Pleural effusion | 4 (1.39%) |
| Unilateral | 1 (0.34%) |
| Bilateral | 2 (0.69%) |
| Pneumonia | 2 (0.69%) |
| Computed tomography (CT) scan of chest | 0 |
| Mortality average duration of stay (days) | 2.32 |
| Follow-up findings (within 1 month) | |
| Wound infection | 12 (4.18%) |
| Fever with cough and sore throat | 2 (0.69%) |
| Detection of SARS-CoV-2 by RT-PCR | 1 (0.34%) |
| Mortality | 0 |
| Presence of SARS-CoV-2 | |
| Endotracheal aspirate | 0 |
| Surgical smoke | 0 |
| SARS-CoV-2 transmission among OT team and ward staff (Healthcare workers) | 0 |

positive on RT-PCR testing. The findings in X-ray of these patients can be linked to otherwise known complications of minimal invasive surgery in the early postoperative period. Only 1 patient was found positive for SARS-CoV-2 infection after discharge from the hospital. There was no mortality recorded during this period. The rate of transmission among operating surgeons, anesthesia team, OT staff, and other hospital staff was almost negligible when all recommendations were duly followed. Precautions in form of patient screening, testing, and use of PPE kits, N95 masks along with the use of low-cost smoke filtration devices helped us not to get infected and safely performed elective laparoscopic procedures.[20–22] Use of PPE kits and RT-PCR tests for all cases has increased the cost of surgery, and it's an extra monetary burden on patients.[22] Patient's overall safety is the major concern while performing elective surgeries in this pandemic. All necessary precautions and screening helped in treating the patients who were simply ignored due to the global spread of this horrible disease. COVID-19 pandemic emerged as a global crisis. Elective surgeries should not be neglected. Ensuring safe and cost-effective surgery is a real challenge. Minimal invasive surgery for elective cases can be safely performed by taking adequate precautions like PPE and a low-cost smoke evacuation device. There is no evidence of transmission of infection by surgical smoke.

## Acknowledgments

The protocol for the study was approved by the Ethical Committee of the institute. Since this is an observational study, human subjects were not directly involved. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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