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The Technique and Justification for Minimally Invasive Surgery in COVID-19 Pandemic: Laparoscopic Anterior Resection for Near Obstructed Rectal Carcinoma

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Abstract

Introduction: The recent COVID-19 pandemic outbreak has made surgeons change and take on newer strategies and safe exercises. All elective cases have been put off, but oncology cases need to be done to prevent progression of the disease. There is concern about minimally invasive surgery due to aerosol formation. Here we discuss how we have dealt with this in our colorectal surgery department taking into account current evidence about the danger of viral transmission during laparoscopic surgery.
Discussion: We report a case of 28 years old female patient with carcinoma rectum. The patient had near total intestinal obstruction. She was operated on utilizing laparoscopic anterior resection. The air seal (CONMED, Utica, NY) and high-efficiency particulate air (HEPA) filter was utilized for safe gas evacuation. There is no evidence against laparoscopic surgery, which suggest viral transmission. One should take utmost precautions using N95 masks and personal protective equipment (PPE). Air filtration products like aerosol, HEPA filters will be of great aid in safe evacuation of gases.
Conclusion: At present, there is no solid evidence to suggest viral transmission through surgical smoke. We believe due to effective smoke containment, less blood loss, and less postoperative stay, laparoscopy will be a non-inferior option than open surgical procedure. We advise taking all precautions for operating room staff to lessen the danger of transmission.

Keywords: COVID-19, laparoscopic surgery, colorectal, coronavirus

Introduction

A novel coronavirus COVID-19 pandemic has caused havoc all over the world. This has not only caused a global health problem but also caused great strain on already poor health infrastructure in many countries. There is no doubt it will lead us to rethink and formulate new strategies while treating other diseases. There are many concerns such as poor availability of resources, the safety of health care workers, and so on.[1] As elective surgeries have been held back or postponed everywhere, emergency and oncology procedures cannot be postponed for an uncertain time. There has been a concern of safety during the laparoscopic procedure due to aerosol generation, CO_2 leakage. Many have advised going for open procedures instead of laparoscopic procedure. We try to address whether these concerns are worth and how we can make this safer for health care workers. In this study we present a case of near obstructed rectal carcinoma that was operated with laparoscopic anterior resection, taking complete precaution to decrease the risk of transmission.

Case Presentation

A 28-year-old female patient presented with symptoms of bleeding per rectum. On per rectal examination, growth was palpable at approximately 10 cm from the anal verge. On colonoscopy examination, tumor was involving

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A video demonstrating this technique is available online.

rectosigmoid area 15 cm from the anal verge and nonnegotiable. It was diagnosed as moderately differentiated adenocarcinoma on biopsy. The serum carcinoembryonic antigen (CEA) level was 8.14 ng/mL. Contrast-enhanced computed tomography scan of the thorax and abdomen showed no evidence of systemic metastases. On magnetic resonance imaging scan of the pelvis, there was circumferential lesion involving upper one-third of the rectum, the circumferential margin was free along with subcentimeter sized mesorectal lymph nodes. After a multidisciplinary team discussion, the patient was planned for upfront laparoscopic anterior resection.

Considering the current emerging COVID pandemic situation in India, all precautions were taken to decrease exposure to operating room (OR) staff. All OR staff used personal protective equipment (PPE) including N95 masks and eye-protecting visors. Cautery settings were placed at 20 (valleylab diathermy machine). All ports were inserted snuggly and taking care to avoid any periportal air leak. Harmonic use was limited as much as possible to avoid aerosol generation. For smoke evacuation, we used the airseal filtration system (CONMED, Utica, NY). Tubing from airseal was applied to one port and high-efficiency particulate air (HEPA) filter was applied to another port. Airseal safe evacuation mode was selected for the procedure.

Laparoscopic anterior resection was done in a standard manner. The detailed technique is shown in the Supplementary Video S1, Laparoscopic anterior resection for nearly obstructed carcinoma rectum during COVID 19 pandemic. All gas was evacuated before extracting specimen. Insufflator was turned off only after the port that was used for inflation was closed to prevent gas going into the insufflator tubing.

Discussion

A few studies have found blood-borne viral DNA in surgical plume generated by electrosurgery, laser, etc., which could be potential biohazard to surgeons.[2–4] But at present, no evidence indicates that energy sources used in laparoscopy increase the risk of transmission. Also, the closed space of pneumoperitoneum limits the exposure of surgical smoke compared with open surgery. Up till now, there is no strong evidence that suggests transmission of viral diseases through surgical smoke such as hepatitis B and human immunodeficiency virus (HIV) during laparoscopic surgery. There are many disadvantages of open laparotomy procedure such as increased stay at the hospital, increased ICU stay, increased utilization of resources, more pulmonary complications, and more blood products requirement. Also, hospitals are dangerous places where there are more chances of COVID-19 exposure. We consider it is illogical to abandon laparoscopy for the open procedure, as in laparotomy even with a suction device, one cannot completely evacuate the smoke generated by electrocautery.

Despite lack of evidence against laparoscopic surgery, Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) in their guidelines have strongly recommended that consideration should be given to viral transmission and all protective measures are strictly employed.[5] All operative room staff should use PPE that includes face shields, N95 mask, gloves, and gowns. Great care should be exercised by anesthetists while performing intubation and extubation to minimize exposure. Barrier enclosures made up of plastic or acrylic as suggested by some authors would decrease risk considerably.[6]

Various techniques during surgery have been advised to decrease risk. The port incision should be as small as possible to decrease leakage around ports. Pneumoperitoneum pressure settings should be the lowest possible without hampering working space for surgery. Electrosurgery settings should be set at the lowest level to decrease smoke formation. Once ports are placed, they should not be vented often. During desufflation, all gas should be captured by the ultrafiltration system. If there is no desufflation mode available on the insufflator, one should close the port valve that has been used for insufflation first before turning off the insufflator. This decreases the risk of contaminated gas going inside the insufflator tubing. The specimen should be retrieved only after complete desufflation of gas.

Use of filtration is an effective measure to remove virus particles from the air. COVID-19 virus size ranges from 70 to 75 nm (0.070–0.07 μm). HEPA filters have the efficacy of 99.97% in removing particles >0.03 μm diameter. Ultra-low particulate air (ULPA) filters can filter virus particles >0.05 μm size.

There are many smoke evacuation products available in the market that can be used to evacuate gas safely. Airseal has an ULPA filter that removes particle size >0.01 μm. Other products, for example, mega vac plus (Ethicon) and pneumoclear (stryker), can also be used for this purpose. One can find a detailed description on the SAGES website.[7]

Minimally invasive surgery is well accepted at our institution. In our audit, laparoscopic surgery is related to low conversion rates, less blood loss, and less morbidity.[8] Also, laparoscopic resection for beyond and extended total mesorectal excision is performed with good short-term outcomes.[9,10] Owing to complete lockdown, when there is a shortage of blood supply, laparoscopic surgery will be advantageous as it gives minimal blood loss, decreased ward stay, and minimum intervention by staff for dressing and monitoring.

Conclusions

There is no strong evidence available yet that indicates danger of transmission of COVID-19 virus during laparoscopy nor will it be available in the foreseeable future any soon. Considering the highly contagious nature of the virus, it will be always prudent to take all precautions to decrease the risk. At Tata Memorial Centre, Mumbai, India, we have done 12 laparoscopic colorectal cancer procedures using airseal and a HEPA filter since March 30, 2020. We believe that whatever theoretical risk of transmission is present, using laparoscopy even if there is risk, it will be very minimal if all precautions are taken.

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Supplementary Data

Supplementary Video S1

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