Underwater-seal evacuation of surgical smoke in laparoscopy during the COVID-19 pandemic: A feasibility report of a simple technique

Editor

Policymakers and healthcare providers had to revise traditional surgical practice during the COVID-19 pandemic. The safety of laparoscopy is questioned by surgical societies. Few studies reported the detection of SARS-CoV-2 RNA in peritoneal fluid. The use of energy devices aerosolizes particles in the abdomen ranging in size from <0.1 - 6.5 microns. Thus, opponents of laparoscopy base their attitude on the potential risk of aerosol-viral transmission to the medical staff.

On the other hand, proponents of laparoscopy argue from the absence of any evidence of the infectivity of viral RNA found in surgical smoke. Safety precautions during laparoscopy include (1) low-pressure pneumoperitoneum, (2) reduce unnecessary changing of instruments, (3) minimize utility of energy-based devices and cauterization, (4) strict control on port venting, (5) controlled evacuation of pneumoperitoneum using a smoke evacuation/filtration system, or by connecting ports to air-filters.

Opponents of laparoscopy find these precautions resource-demanding. They increase the complexity of the procedure, operative time, and any breach in the process can increase the potential risk of viral transmission. Regarding the dissemination of surgical smoke during laparotomy, this can be overcome by exploration using scalpel and scissors with minimal use of energy-based devices. However, the same criticism goes for the later technique as it is time-consuming and requires unique expertise. Also, any surgical practice during the COVID-19 pandemic requires special modifications for infection-control, and any breach can result in a higher risk of infection. Moreover, the utility of laparotomy in some situations is not as easy and effective as it sounds, as in superobese patients and deep pelvic surgeries.

This article presents a simple, cheap, and theoretically-sound method to achieve controlled evacuation of pneumoperitoneum. The technique depends on connecting the valve of one or more ports to an intravenous line tube, and the end of the tube is immersed underwater in a container (Fig. 1). This technique was tested with cautery and energy-based devices during four laparoscopic procedures. There was no fogging or

Fig. 1 Two ports are connected by two intravenous-line tubes to underwater seal
haziness of vision. Rapid evacuation of pneumoperitoneum could be achieved easily at the end of the procedure by opening two ports.

Carbon dioxide (CO2) is a non-combustible gas, and its aqueous solution is safe. CO2 is already used as a PH buffer for chlorinated water in swimming pools4. SARS-CoV-2 is an uncoated virus that is less stable in water, and higher water temperature leads to a reduction in viral load5. The water used can be boiled or treated by suitable disinfectants, if available, to help reduce and deactivate the viral load. Wastewater should be treated according to the institutional infection-control policy. According to the WHO, there is no evidence of transmission of SARS-CoV-2 through sewerage-systems or wastewater5.

This technique has many advantages; all it takes is an intravenous line tube and a container with heated water inside. It is cheap, and the container can be reused after proper sterilization. It is not dependent on air-filters that represent a very valuable resource during the COVID-19 pandemic. It requires no active suction connected to the ports, and thus there is no excess risk of bowel injury during evacuation. Rapid evacuation of pneumoperitoneum, which may be required during conversion for management of bleeding, can be achieved by evacuation of gas through multiple ports at the same time. The efficacy of the technique can be enhanced by treating water with disinfectants safe to be mixed with CO2, modifying the temperature of the water, and increasing the distance between the container and medical personnel. There is a need for further studies to report the feasibility, efficacy, and suggestions to enhance the effect of the technique.

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DOI: 10.1002/bjs.11987

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