



SARS-CoV-2 pandemic and pediatric endoscopic surgery

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The severe acute respiratory coronavirus 2 (SARS-CoV-2) also known as Coronavirus disease 2019 (COVID-19) outbreak started in December 2019 in Wuhan, China and declared as a pandemic by the World Health Organization (WHO) on 11th March 2020 [1]. The WHO statement stated that this was the first pandemic sparked by a coronavirus. With the global rise in infection and mortality, front line medical staff in many countries are being pushed to the limits in managing infected patients. The pandemic has also affected pediatric surgery and the approach to patients with minimal access surgery; as anesthetists, intensive care specialists and nurses have been channeled to manage critical patients with SARS-CoV-2, depleting their numbers for pediatric surgical procedures.

The American College of Surgeons published the “COVID-19 Guidelines for Triage of Pediatric Patients” with the aim to optimize hospital resources and preserving the health of providers [2]. This guideline though not comprehensive, has been extremely helpful as it divided the most common pathologies into three categories:

- (a) Emergency cases (life threatening if delayed).
- (b) Urgent cases (detrimental if delayed for days or weeks).
- (c) Elective cases (minimal risk to patients if delayed).

As countries around the world face huge differences in the impact of SARS-CoV-2, decisions to use this guideline should be based on (a) institutional resources and (b) the national impact that has reallocated staff to alternative roles during the present crisis. Delaying of elective procedures is also important from other aspect, as such procedures will consume valuable personal protective equipment (PPE) that are presently limited in stocks worldwide. However, the

decision to categorize patients should always be based on sound surgical judgement.

With many hospitals not having dedicated pediatric surgical operating theaters during the pandemic and sharing theaters with adult patients, the operating environment to perform procedures requires special attention [3]. An operating theater with separate access should be designated for all confirmed or suspected COVID-19 cases. The ideal situation would be to have the operating theater consisting of five interconnected rooms, of which only the waiting and anesthesia induction rooms have negative atmospheric pressures, whereas the operating theater, preparation, and scrub rooms have positive pressures. Understanding the airflow within the operating theater is crucial to minimizing the risk of infection. It is also important that the same operating theater and the same anesthesia machine solely be used for the COVID-19 cases for the entire duration of the pandemic. Besides optimal theater setup, proper PPE for the teams involved in such procedures and strict following of hospital infectious disease protocols is mandatory.

As our focus remains on minimal access procedures, the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) and European Association for Endoscopic Surgery (EAES) published a recommendation regarding “Surgical response to COVID-19 crisis” [4]. It strongly recommended, that consideration be given to the possibility of viral contamination to staff during surgery either open, laparoscopic or robotic and that protective measures are strictly employed for operating room staff safety and to maintain a functioning workforce. It further added that there may be enhanced risk of viral exposure to the teams performing endoscopic and airway procedures. The practical measures recommended specifically for endoscopic surgery were: (a) Incisions for ports should be as small as possible to allow for the passage of ports but not allow for leakage around ports, (b) CO₂ insufflation pressure should be kept to a minimum and an ultra-filtration should be used, if available and (c) all pneumoperitoneum should be safely evacuated via a filtration system before closure, port removal, specimen extraction or conversion to open. When these procedures are

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necessary, enhanced PPE should be considered as aerosol and fomite transmission of SARS-CoV-2 is plausible, as the virus can remain viable and infectious in aerosols for hours and on surfaces up to days [5].

SAGES and EAES have also published the “Resources for smoke and gas evacuation during open, laparoscopic, and endoscopic procedures” [6]. This outlines the practical measures for use of filtration during laparoscopy: (1) to safely evacuate pneumoperitoneum through port attached filtration devices, (2) once placed ports should not be vented if possible, (3) all escaping CO₂ should be captured with an ultra-filtration system using desufflation mode on insufflator (if available), (4) in absence of desufflation feature on insufflators, close the work port valve before the flow of CO₂ on the insufflator is turned off, (5) use of least dependent port for desufflation, (6) removal of specimens only after all CO₂ gas is evacuated, (7) surgical drains should be utilized only if absolutely necessary, (8) fascia closure after desufflation and (9) avoiding hand-assisted surgery. SAGES and EAES have also provided a list of commercially available products that could potentially be used to filter CO₂.

An Intercollegiate General Surgery Guidance on COVID-19 update issued jointly by the Association of Surgeons of Great Britain and Ireland, Association of Coloproctology of Great Britain and Ireland, Association of Upper Gastrointestinal Surgeons, Royal College of Surgeons of Edinburgh, Royal College of Surgeons of England, Royal College of Physicians and Surgeons of Glasgow and Royal College of Surgeons in Ireland has also advised considerable caution as laparoscopy is considered to carry some risks of aerosol-type formation and infection [7]. This level of risk has not been clearly defined and it is likely that the level of PPE deployed may be important. The guidance warrants consideration of laparoscopy only in selected individual cases where clinical benefit to the patient substantially exceeds the risk of potential viral transmission. The guidance recommends to look into appropriate non-operative treatment or open alternatives. For emergency procedures, it also recommends to treat all patients as COVID-19 positive and to add a computed tomography of thorax done in the past 24 hours in the preoperative assessment.

Clinical manifestations of SARS-CoV-2 in children are less severe than adults, but it appears that children of all ages are susceptible, with infants in particular being more vulnerable to infections [8]. Although studies have shown that there were no clinical findings or investigations suggestive of SARS-CoV-2 in neonates born to affected mothers [9], a recent publication has suggested that the vertical maternal–fetal transmission cannot be ruled out [10]. Reports are now emerging over fecal–oral transmission of SARS-CoV-2, pointing to the fact that asymptomatic children and adults may be shedding infectious virus that could be transmitted [11]. Further evidence shows that children have persistently

tested positive on rectal swabs even after nasopharyngeal testing was negative [12]. In order to maintain safety of operation room personnel, all these transmission sources and factors should be borne in mind when performing procedures in neonates, asymptomatic children or children with negative nasal swabs,

In context of COVID-19, with consideration given to (a) variations in universal access to specific filtration equipment and recommended operating room set-up, (b) concerns about reliability and speed of various available SARS-CoV-2 detection tests, (c) lack of comprehensive data regarding aerosol based virus transmission to operating room personal and (d) guidelines and recommendations from adult endoscopic societies, it would be judicious to curtail pediatric endoscopic surgery procedures during the present SARS-CoV-2 pandemic. On the other hand, sound surgical judgement with maximum precautions should be implemented in the few selected cases where benefits would outweigh risks of performing endoscopic surgery.

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