

Peri-operative anaesthetic management of patients with corona virus

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Abstract

When using anaesthesia during the COVID-19 pandemic, regional anaesthesia should be the preferable choice over general anaesthesia. As well as numerous advantages in preventing postoperative problems, the proper localised approach may maintain respiratory function and minimise aerosolization and airway instrumentation to prevent virus transmission. When choosing whether or not to provide regional anaesthesia to a patient at this moment, the first step is to check the patient's COVID-19 status (positive, negative, PUI). It's important to remember that as soon as the virus spreads far enough in the population, it's safe to presume that every patient has the new virus. As a result, all patients should wear a surgical mask while being transported around the hospital and throughout the periprocedural time to avoid the spread of droplet. A surgical mask, gown, double-gloves, and shoe coverings should all be worn by healthcare workers in the same way. While N95 masks and powered air-purifying respirators (PAPR) may be utilised, the danger of transmission during the case, the conservation of PPE for aerosolizing procedures, and the impairment of vision, movement, and team communication should be considered while using them. Obtaining verbal or digital permission is preferable; one-time use plastic covers may be used to safeguard devices when consent is acquired digitally. In the operating room, one suggestion is to evaluate, block, and recover the patient to reduce the risk of cross contamination (OR). As neuraxial anaesthesia does not produce aerosols, it is not contraindicated in the presence of COVID-19 infection. In the early phases of the neuraxial technique planning, look for signs of thrombocytopenia and rule it out. Any pre-procedural sedation should be weighed against the possibility of respiratory function being compromised by the operation, which should be performed by a competent physician. Because of this, epidural blood patches should only be used for the most severe and disabling instances to prevent viremic blood from being injected into the epidural area.

Keywords: Corona virus, Peri-operative, anaesthetic.

1. Introduction

These enclosed, positive single-stranded big RNA viruses may infect both humans and a broad variety of animals, including birds, reptiles, and mammals. It was thought that coronaviruses were so named because of their spherical shape, which had a core shell and surface projections resembling the solar corona. Corona viruses have four subfamilies: alpha, beta, gamma, and delta. Beta corona viruses have the potential to inflict life-threatening illness and even death, while alpha corona viruses only produce minor symptoms or no symptoms at all. [1]

It was pneumonia [2] that revealed a SARS-CoV2-related illness, COVID19, as the first clinical symptom.

Whenever feasible, regional anaesthesia may be the best option for delivering anaesthesia care since it avoids the use of aerosol-generating techniques and offers a safe alternative anaesthetic care plan. Regional anaesthesia may save time and money by eliminating the need for sedatives and hypnotics throughout the epidemic, and is thus less resource demanding than general anaesthesia [3].

There is a risk of COVID19 transmission during tracheal intubation and extubation while using general anaesthesia with airway intervention. In comparison to individuals who are not exposed to tracheal intubation, the chances of transmitting an acute respiratory infection to a healthcare worker are 6.6 times higher.

2. Corona viruses

Corona viruses are enveloped, positive single-stranded large RNA viruses that infect humans, but also a wide range of animals. Coronaviruses were first described in 1966 by Tyrell and Bynoe, who cultivated the viruses from patients with common colds [5]. Based on their morphology as spherical virions with a core shell and surface projections resembling a solar corona, they were termed corona viruses (Latin: corona = crown). Four subfamilies, namely alpha-, beta-, gamma- and delta corona viruses exist. While alpha- and beta-coronaviruses apparently originate from mammals, in particular from bats, gamma- and delta-viruses originate from pigs and birds.

The initial clinical sign of the SARS-CoV-2-related disease COVID-19 which allowed case detection was pneumonia. More recent reports also describe gastrointestinal symptoms and asymptomatic infections, especially among young children [6]. Observations so far suggest a mean incubation period of five days [12] and a median incubation period of 3 days (range: 0–24 days) [2]. The proportion of individuals infected by SARS-CoV-2 who remain asymptomatic throughout the course of infection has not yet been definitely assessed. In symptomatic patients, the clinical manifestations of the disease usually start after less than a week, consisting of fever, cough, nasal congestion, fatigue and other signs of upper respiratory tract infections.

The infection can progress to severe disease with dyspnoea and severe chest symptoms corresponding to pneumonia in approximately 75% of patients, as seen

by computed tomography on admission [2]. Pneumonia mostly occurs in the second or third week of a symptomatic infection. Prominent signs of viral pneumonia include decreased oxygen saturation, blood gas deviations, changes visible through chest X-rays and other imaging techniques, with ground glass abnormalities, patchy consolidation, alveolar exudates and interlobular involvement, eventually indicating deterioration. Lymphopenia appears to be common, and inflammatory markers (C-reactive protein and proinflammatory cytokines) are elevated.

Like other viruses, SARS-CoV-2 infects lung alveolar epithelial cells using receptor-mediated endocytosis via the angiotensin-converting enzyme II (ACE2) as an entry receptor 1. Artificial intelligence predicts that drugs associated with AP2-associated protein kinase 1 (AAK1) disrupting these proteins may inhibit viral entry into the target cells [5]. Baricitinib, used in the treatment of rheumatoid arthritis, is an AAK1 and Janus kinase inhibitor and suggested for controlling viral replication. Moreover, one in vitro and a clinical study indicate that remdesivir, an adenosine analogue that acts as a viral protein inhibitor, has improved the condition in one patient. Chloroquine, by increasing the endosomal pH required for virus-cell fusion, has the potential of blocking viral infection and was shown to affect activation of p38 mitogen-activated protein kinase (MAPK), which is involved in replication of HCoV-229E [7].

Clinical trials presently registered at ClinicalTrials.gov focus on the efficacy of remdesivir, immunoglobulins, arbidol hydrochloride combined with interferon atomisation, ASC09F+Oseltamivir, ritonavir plus oseltamivir, lopinavir plus ritonavir, mesenchymal stem cell treatment, darunavir plus cobicistat, hydroxychloroquine, methylprednisolone and washed microbiota transplantation [8].

3. Patients and staff protection

Healthcare professionals working in anaesthesia and critical care departments, anaesthesia units, intermediate care units and critical care units face an elevated risk of covid-19 exposure [9]. In order to protect them during this pandemic, strict safety measures should be implemented. These measures should be carried out all throughout the patient's healthcare pathway: preanaesthetic assessment, operating theatres, recovery rooms, intermediate care units and critical care units. These safety measures will be implemented directly by providing healthcare professionals with adequate PPE, but also indirectly by supplying patients with the right equipment.

Administrative measures (patient information, preoperative laboratory testing, check-up modalities, anaesthesia modalities, dedicated healthcare pathways, patient and surgery selection), which also help protecting staff members, will be detailed in the following/other chapters. Staff members should apply strict social and physical distancing measures when not caring for patients (team rounds, discussions about

patients, hand-offs, breaks, meals. . .): they must keep at least 1 to 2 meters apart from one another, especially during times when wearing a mask is not possible.

During this COVID-19 pandemic, every patient could potentially be contaminated and should therefore protect other patients and hospital staff by applying alcohol-based hand gel and wearing a surgical mask type II or IIR [9]. By blocking large droplets, surgical masks protect staff members from droplet and contact transmission.

There is a great risk of becoming infected during airway management. Therefore, strict safety measures should be applied during aerosol-generating procedures, such as bag mask ventilation, endotracheal intubation, open/endotracheal suctioning and extubation. The use of a respirator filtering face piece mask (FFP) type 2 is recommended by the French Society of Hospital Hygiene (SF2H) and the French-Speaking Society of Infectious Disease for all healthcare professionals manipulating the airway. Respirators are tight fitting masks, designed to create a facial seal that protect the person wearing them from droplets and airborne particles inhalation.

During this COVID-19 pandemic, applying enhanced safety measures for the paediatric population is justified due to the existence of a significant proportion of possibly asymptomatic COVID+ children (up to 16% depending on the series) and the likely difficulty in complying with social distancing and safety measures (difficulty of continuous wearing of the surgical mask) by children¹⁰. These findings imply that anaesthesia staff should wear a surgical mask type II/IIR, protective goggles (or a face shield) and gloves when performing any procedure with a high-risk of transmission, and particularly when examining the oral cavity during anaesthesia consultation.

4. Benefit and risk of operating, and patient information

The circulation of SARS-CoV-2 in the population and the existence of asymptomatic carriers affect the risk-benefit ratio of performing a planned surgical procedure during the COVID-19 pandemic and require rigorous evaluation. This consideration must integrate three types of criteria related to the patient, the pathology and the procedure.

During the preanaesthetic consultation, detailed information must be provided to the patient and/or his/her legal representative about the perioperative strategy decided regarding his specific situation in the context of COVID-19 pandemic. The message must be clear, objective and based on the currently available data, while trying to be reassuring for the patient and/or his legal representative. This message must be given orally during the consultation but also disseminated through a document (established and validated by each structure), which can be given to the patient and/or his legal representative during the

preoperative consultation (surgical or preanaesthetic). This information must appear in the medical record. In the appendix, based on current data, we propose examples of model documents. In the event of cancellation or postponement of the intervention, it is essential to keep in touch with the patient, mostly through the surgical teams, and to reassess the possible alternatives and the feasibility of the procedure according to the evolution of the circumstances. If the decision of postponement or cancellation of the surgery is taken by the patient, it must be recorded in the medical record.

5. Preoperative assessment and decision regarding surgery

To improve the completeness of symptom collection and repeatability in medical evaluation, adoption of a standard questionnaire is recommended. It's a useful technique for getting detailed information from a big group of people. The information gathered is measurable and traceable with little difficulty. Acceptability, reliability, and validity are the most important features of a questionnaire of this kind. For the greatest majority of patients, questions must be clear and based on verified items to be comprehended. There are many symptoms associated with SARS-CoV-2, therefore the questionnaire should focus on the most common (fever, dry cough) and/or most evocative (anosmia, ageusia, etc.) without discounting any of the more unique ones described in the literature. The questionnaire should check for both of these. There is a sample questionnaire for adults and children that distinguishes between significant and mild symptoms.

Anaesthesia, surgical, and patient hazards must be considered together in the event of a COVID-19 pandemic for the assessment of particular perioperative risk. A crucial part of the pre-anesthetic consultation in the present pandemic setting and for the first few months after the lockdown was lifted is looking for typical and/or evocative signs of SARS-CoV-2 infection. Preoperative COVID-19 status assessment is guided by the presence of major (i.e. frequent or characteristic) and/or minor (i.e. more inconsistent and/or less specific) symptoms, and then an estimate of the benefit/risk balance of continuing or delaying surgery is made, taking into account the risk of contamination for medical staff and other patients within the care structure. Postponing or cancelling a planned intervention has repercussions that must be evaluated against the integration of these various risks. [11]

Those anaesthesiologists and nurses who will be in close proximity to the patient in the PAC consultation room should wear surgical mask and disposable gowns, single-use gloves, and goggles or reusable face visors.

Instead of using a mirror or a mobile phone in front of the patient, put the front camera of your cell

phone in a transparent zip-lock bag to avoid exposing yourself to AE.

It is necessary to adhere to the biomedical waste management guidelines. Disinfecting the patient chair, exam area, and any non-disposable medical equipment on a regular basis is essential.

When these basic precautions are implemented into our regular practise, the risk of transmission from patient to patient and from HCW to HCW may be significantly reduced. These procedures should be updated on a regular basis and made accessible to all healthcare professionals at the facility through the internet. Preanaesthetic consultations should make use of emerging telemedicine technology [13].

6. Anaesthesia Management For Emergency Trauma Surgery and Acute Care Cases During the COVID-19 Pandemic

6.1. Choice of Anaesthesia Method

The choice of anaesthesia for patients with suspected or confirmed COVID-19 should be determined by the patient's overall status, trauma condition, and the necessity for necessary surgical treatment. Whenever possible, regional anaesthesia is recommended for surgical procedures [14].

6.2. Anaesthesia Induction and Endotracheal Intubation

During the COVID-19 outbreak, all patients scheduled for emergent surgery should wear masks without an air outlet before being intubated, if possible. Anaesthesiologists should pay special attention to the airway evaluation, because cervical spine injury, airway injury, and difficult airway are common in trauma patients.

6.3. Anaesthesia Monitoring

Mild trauma patients may only require basic noninvasive monitoring, including electrocardiogram, blood pressure, pulse oxygen saturation, Etco₂, body temperature, and urine output. COVID-19 may cause pneumonia of varying degrees; thus, lung compliance, airway pressure, oxygen index, and arterial blood gas should be monitored closely.

6.4. Anaesthesia Management

Emergency trauma patients should be treated promptly to avoid hypothermia, acidosis, and coagulative dysfunction. Surgical hemostasis, body temperature monitoring and preservation, volume resuscitation, coagulative monitoring and management, and thromboprophylaxis should be implemented as needed.

6.5. Damage Control Surgery

COVID-19 can cause immune dysfunction, which presents as overall immunosuppression.[15] The rate of severe infection secondary to trauma can be predicted to increase in COVID-19 patients. If COVID-19 patients are complicated with secondary

infections, sepsis and multiple organ dysfunction syndrome (MODS) may occur; thus, emergency surgery should follow the principles of damage control. Surgical manipulation should be minimized, and surgical duration should be shortened.

6.6. Fluid Management

Perioperative systolic blood pressure (SBP) and mean arterial blood pressure (MAP) should be maintained within 80–90 and 50–60 mm Hg, respectively, in emergency trauma patients. For patients with craniocerebral injury, SBP should be maintained at 100–110 mm Hg during resuscitation.[16] Goal-directed fluid therapy is recommended to avoid either hypovolemia or hypervolemia.

6.7. Respiratory Management

Acute respiratory distress syndrome is one of the main clinical manifestations in severe COVID-19 patients, and pulmonary contusion is common in emergency trauma patients. Perioperative lung-protective ventilation strategy is recommended to reduce the risk of ventilator-associated lung injury. During surgery, lung compliance, airway pressure, oxygen index, and arterial blood gas should be monitored closely, to provide guidance for optimal ventilator settings.

6.8. Endotracheal Extubation

Because the asymptomatic rate of the infected COVID-19 patients is high and the incubation period of SARS-CoV-2 is long, we suggest that all the extubation should be performed in the OR, rather than in the postanaesthesia care unit. The number of HCWs in the OR should be restricted during extubation.

6.9. Thromboprophylaxis

The incidence of thrombosis among patients with multiple traumas is as high as 50%, and pulmonary embolism is the leading cause of death for patients surviving the first 3 days after trauma.[17]

6.10. Postoperative Pain Management

Multimodal analgesia is recommended, including regional block analgesia, local infiltration analgesia, opioid drugs, and nonopioid drugs.

6.11. The Prevention and Treatment of Postoperative Nausea and Vomiting

Postoperative nausea and vomiting (PONV) can produce virus-containing aerosol. Therefore, PONV should be effectively prevented. A multimodal prevention strategy is recommended, based on the presence of risk factors (female, nonsmoker, history of motion sickness, and postoperative use of opioid).[18]

7. Pediatric Airway Management in COVID-19 Patients

PeDI-C concurred that practitioners who are more vulnerable to morbidity and death as a result of exposure to COVID-19 should be shielded from exposure in the clinic. [19]

Before beginning an anaesthesia, make sure all medications and equipment are ready and easily accessible. Once the patient has entered the procedure room, doctors will save time by not having to dig through drawers and bins at the anaesthetic workstation.

When an intravenous (IV) is inserted while the patient is awake, doctors should utilise preprocedural sedatives to decrease anxiety and improve compliance.

PeDI-C members agreed that IV induction is preferable than inhalational induction due to the possibility of increased exposure to respiratory droplets and aerosols.

The PeDI-C concurred that for children with COVID-19, a cuffed tracheal tube was the best option for securing the airway. It is recommended by PeDI-C that video laryngoscopy be used to minimise the closeness of the laryngoscope to the airway during all intubations. [20] Tracheal intubation should be attempted by the most experienced laryngoscopist to reduce the amount of time spent on the laryngoscope and the number of times it is attempted.

Since there is a danger of ventilator circuit disconnection, inadvertent extubation, and unquantified aerosolization during surgical operations, PeDI-C advised that physicians wear complete protective equipment (PPE) for the duration of the operation. To catch any aerosolized viruses, PeDI-C suggested placing a transparent barrier between the patient's breathing device and his or her head. Wet cloths and gauze have also been used successfully by others. [21]

Many of the following guidelines for tracheal intubation of normal airways apply to difficult airways as well. PeDI-C members recognised the specific difficulties associated in treating difficult airways in patients with known or suspected COVID-19. In the OR, form an airway crew and examine all of the equipment.

8. Neuraxial anaesthesia and peripheral nerve blocks during the COVID-19 pandemic

Reduce the clinical workload and follow local recommendations for regular testing. When anaesthetic treatment of patients with suspected COVID19 infection is needed, neuraxial anaesthesia and peripheral nerve blocks are the best options. [22]

For COVID19–infected patients, the operating room and a separate airborne infection isolation room are the best places to offer care.

COVID19 transmission may be prevented by having patients wear surgical facemasks during surgery. In view of PPE shortages, healthcare

personnel must be protected while caring for a patient during the COVID-19 pandemic using proper PPE.

Aerosol production is dependent on the oxygen delivery method and flow rate, therefore flow rates should be maintained as low as possible to maintain saturation while reducing aerosol formation.

Reduce the quantity of equipment in the room to the bare minimum and cover it with plastic throughout the operation to keep it safe.

Even if you have COVID-19 infection, you may still have neuraxial anaesthesia despite it. In patients with suspected or confirmed COVID19, it's best to rule out thrombocytopenia before using any neuroaxial methods.

Epidural blood patch procedures should be preceded with pharmaceutical options like normal care. There should be a case-by-case discussion of complications.

To avoid the necessity for an emergency conversion to general anaesthetic, patients should undergo extensive block success testing before surgery. Viral filters should be used for respiratory monitoring if at all possible.

Before being transferred to a specific location, patients should be recovered in the operating room or an airborne infection isolation chamber.

It is recommended that the patient be closely observed in the operating room until it is determined that the patient is safe for transfer to a COVID-19 approved area of the hospital, in accordance with local standards. Extra time should be provided for donning and doffing [23] since the danger of transmission is greatest while PPE is being removed. During the process, all reusable equipment must follow institutional standards and be cleaned.

9. Conclusion

When using anaesthesia during the COVID-19 pandemic, regional anaesthesia should be the preferable choice over general anaesthesia. It may also help to minimise postoperative problems by preserving respiratory function and avoiding aerosolization or airway instrumentation, both of which can spread viruses.

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