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COVID and Perioperative Considerations

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ABSTRACT

Coronavirus (COVID) pandemic has affected the majority of people worldwide. Patients with COVID infection might require emergent or elective surgeries. COVID-related perioperative considerations to reduce infection spread include changing the workflow to include protective gear for patients and health-care personnel, COVID-dedicated operating rooms, and appropriate perioperative management of the patient with or presumed COVID infection. COVID-specific changes to operating room environment are done. Disinfection guidelines are followed. Anesthesia considerations pertaining to pre-operative optimization of patient's condition and prevention of spread of infection to others are foremost.

Keywords: Coronavirus, Perioperative, Anesthetic

INTRODUCTION

The first case of coronavirus (COVID) was reported in Wuhan, China, in December 2019, and in February 2020, it was declared a pandemic. Since then, the disease has witnessed an erratic pattern with peak rise in cases and spread on one hand and relatively slower spread and fewer cases on the other. A new variant COVID BF is emerging presently across the globe.

TRANSMISSION

The most common mode of transmission is through aerosol or droplet formation. Coughing and sneezing can usually disperse heavy droplets for up to two meters.

TIMING OF SURGERY

Decision-making for elective and semi-emergent surgeries depends on the phase of the pandemic wave, patient's clinical condition, availability of COVID-appropriate medical infrastructure, and proper training of personnel for COVID-related practices to prevent infection spread. During COVID peak, only emergent and urgent invasive procedures should be conducted to reduce the spread of infection, along with rational use of workforce and resources. Elective surgeries should be deferred during the peak phase as it can increase morbidity and mortality due to the high risk of disease transmission. The trough phase of COVID is reportedly the safest period to resume elective surgeries. Recent guidelines from the Association of Anesthetists recommend a 7-week wait time for vaccinated patients and patients suspected to have an omicron infection.[1]

COVID SPECIFIC CHANGES TO THE OPERATING ROOM ENVIRONMENT

Institutions should organize separate and well-marked areas for receiving COVID patients. The center for disease control guidelines should be followed for donning and doffing personal protective equipment (PPE). The designated areas should have separate entry and exit points. COVID positive or suspected patients should be attended with proper precautions, including wearing appropriate PPE, that include N95 mask, face shield, goggles, or powered air-purifying respirators, gloves, water-resistant gowns, and shoe covers.[2] All personnel should strictly adhere to the institutional hand hygiene, contact precautions, and waste disposal guidelines.

In the OR, minimal required personnel should be allowed to enter to limit disease spread. Only necessary equipment should be kept inside OR to avoid contamination. All confirmed COVID cases should be operated in an airborne infection isolation room (AIIR). In resource-limited scenarios, the existing operating rooms should be converted to AIIR, which requires modifying a room's ventilation to maintain negative pressure and an adequate seal.[3]

To prevent the spread of COVID infection, the existing OR should be converted into a closed, non-circulatory system (100% once-through system). The air supply to the ORs should provide a minimum of 12 air changes/hour to remove aerosolized pathogens.[4,5] The ideal position of the room air extracting duct in the OR should ideally be above the patient's head. Exhaust fans can be installed to expel the infected air. Exhaust air can be expelled out, preferably through a HEPA filter.[6] HEPA filters of H13 (EN1822-1) filter class or equivalent are recommended. In case the HEPA filter is unavailable, chemical disinfection is a viable option.

DISINFECTION OF OPERATING ROOM

Chemical disinfection of the exhaust air from the OR is achieved by bubbling the exhaust air through a "diffused air aerator tank" (preferably non-metallic material) holding a 1% sodium hypochlorite solution.[7] If chemical disinfection is employed, the aeration tank should be placed in an unpopulated outdoor space.

Another option is to expel the exhaust air into the atmosphere through an upward plume at a height of 3 meter above the tallest point of the building, thereby lowering the viral load concentrations to insignificant levels by dilution. Ultraviolet radiation applied for 15 min or heating the exhaust air to 75°C for 45 min are other viable methods of reducing the viral load in the exhaust air.[6] The exhaust discharge of COVID OR should be well away from other air intake points and populated places.

DISINFECTION OF THE ANESTHETIC EQUIPMENT

At the end of the procedure, the soiled airway equipment should be placed in a dedicated plastic bag to reduce environmental contamination.[8] High-touch surfaces in the anesthesia work area should be cleaned and disinfected. Disposable equipment such as breathing circuits, face masks, and tracheal tubes should be discarded.

Sterilization of respirators can be done with ultraviolet-C light with wavelength 100–280 nm. The contact period advised is 62 min–4.3 h/side for respirators and 20 min/side for face shields. The face shield can be re-sterilized up to a maximum of 20 times.[9] There is no evidence to support changing the soda-lime in between cases if it is not depleted, as it is highly alkaline and virucidal, apart from being protected by the presence of heat and moisture exchangers filters.

COVID remains active in the air for 2–3 h and on different surfaces for varying periods, even up to 3 days.[10] The OR should remain closed for 19 min after a COVID-positive case to allow for settling down of aerosolized particles. Then, the OR should be cleaned using a virucidal solution. A 5000 ppm of sodium dichloroisocyanurate for surface cleaning and 1000 ppm for floors is advised. The reusable equipment should be cleaned with >70% alcohol. Smaller reusable items should be immersed in a disinfectant solution such as 1% sodium hypochlorite immediately after use.[11]

TEMPERATURE AND HUMIDITY

The OR temperature should be 24–30°C with 40–70% relative humidity.[12] In humid conditions, the temperature is set closer to 24°C for de-humidification, and in dry conditions, the temperature is kept around 30°C.

HIGH-RISK PROCEDURES

Procedures such as bronchoscopy, tracheostomy, tracheobronchial surgeries, lung surgeries, orthopedic, and dental surgeries involving high-speed drilling and laparoscopic surgeries and anesthetic procedures such as awake fiberoptic intubation, bag and mask ventilation, intubation, and extubation, suctioning, and cardiopulmonary resuscitation (CPR) produce a large quantity of aerosols which remain in the atmosphere for 10 min. Therefore, the OR staff should take all necessary steps to minimize exposure.[13]

PERIOPERATIVE PATIENT ASSESSMENT

For elective cases, besides evaluating the comorbidities, the pre-anesthetic evaluation should focus on COVID-specific symptoms such as the history of fever, cough, and breathing difficulties, along with travel and contact details pertinent

to COVID. Elderly, pregnant ladies, and patients with comorbidities such as diabetes, hypertension, cardiac or lung pathology, malignancy, immune-compromised state, and post-COVID patients may have higher perioperative complications requiring ICU stay.[12]

Physical examination should focus on cardiorespiratory reserve assessment, especially in post-COVID patients undergoing surgery. Apart from assessing vitals, special tests such as breath-holding time, metabolic equivalent of task, 6-min walk test, and spirometry can be helpful to assess cardiopulmonary reserve. The main objectives of pre-operative assessment are to identify high-risk patients, optimize them to reduce perioperative risk, and select the appropriate anesthetic plan.[14]

Pre-operative investigations include reverse transcription-polymerase chain reaction for detecting COVID before elective or emergency surgeries. For emergency cases, a rapid antigen test for COVID can be considered. Special investigations such as echocardiography, pulmonary function test, and computerized tomography scan of the thorax can be done to evaluate underlying pathology. In COVID-positive patients, there can be lymphopenia or high neutrophil-lymphocyte ratio, platelet abnormality, coagulopathy, glucose intolerance, renal or hepatic dysfunction, consolidation or ground-glass opacities in chest x-ray, arrhythmia, signs of the right heart failure/strain, or ischemic changes in the electrocardiogram.

ANESTHETIC PLAN

Anesthetic plan should focus on environmental safety to reduce the spread of infection. Standard ASA monitoring should be used for all cases, with special monitoring at the discretion of the anesthesiologist. COVID-infected patients should be transferred to OR bypassing the pre-operative waiting area. Airway manipulation should be minimized in cases of active or presumed COVID-positive patients to reduce the spread of infection. Regional anesthesia is preferred over general anesthesia.[15]

A COVID-positive patient undergoing a regional block should wear an N95 mask. Oxygen, if required, can be given through a nasal cannula under cover of the facemask. The anesthesiologist performing the block should wear a sterile gown over the PPE to administer the nerve block.

A tight-fitting face mask should be used for pre-oxygenation. Placement of wet gauze around the facemask may help reduce leaks during mask ventilation.[16] The circuit should have a heat and moisture exchanger filter attached to the patient's end as well as anesthesia machine's end. A closed circuit with low anesthesia gas flow should be used to prevent the spread of infection. A closed airway suction system is preferable to decrease aerosol production. The anesthesia gas scavenging system should be functional in the operating room.

Rapid sequence induction can be employed in COVID-positive or suspected patients to avoid mask ventilation and facilitate faster tracheal intubation. The use of supraglottic airway devices should be avoided as the inconsistent seal can perpetuate infection. The most experienced anesthesiologist should secure the airway to decrease the duration of exposure during laryngoscopy. A video-laryngoscope is preferred to facilitate faster endotracheal intubation.[4] Intravenous lidocaine can be used to suppress airway reflexes during laryngoscopy.

During extubation, only the required personnel should be present in the OR. All measures to decrease the secretions or coughing during extubation should be excercised.[17] A N−95 mask should be placed over the nasal cannula after extubation. Lowest oxygen flow possible should be used to minimize aerosol generation. A portable tent system with HEPA filter may be used for additional protection wherever available.[9]

CPR

CPR involves a series of events that increase the risk of aerosol generation, including chest compressions, suctioning, mask ventilation, and intubation. CPR should be performed after donning PPE and with minimal manpower. The recommended time for code activation to donning PPE is 4 min.[18] Early intubation is advised, during CPR, for reducing the spread of aerosols. However, until the patient is intubated, oxygen can be instituted using a bag-mask with a HEPA filter and a tight seal to maintain airway patency and ventilation. During intubation, chest compressions should be withheld temporarily to reduce aerosolization. The use of mechanical CPR devices to deliver automated compressions is preferred.

CONCLUSION

COVID is a highly contagious disease, posing a considerable burden to the health-care system. Every facet of perioperative care should be tailored to prevent the spread of infection. Strict adherence to contact and infection control guidelines, judicious use of health-care resources, and adequate pre-operative planning are essential for safe perioperative care during the COVID pandemic.

Declaration of patient consent

Patient's consent not required as their identity is not disclosed or compromised.

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Conflicts of interest

There are no conflicts of interest.

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