

Tracheostomy during COVID-19 Pandemic: Viewpoint

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Introduction

The wrath of corona virus disease 2019 (COVID-19) pandemic is likely to be with us for some time. So many healthcare organizations and committees, especially those concerned with surgical disciplines and anesthesia and critical care, have formulated specialty-specific guidelines for best practices in managing COVID-19 and non-COVID patients during the pandemic. Viral particles are known to get encapsulated in globs of mucus, saliva, and water, causing known transmission through both direct contacts via droplets (more than 5 µm) or aerosols (less than 5 µm) and indirect contact via fomite and airborne contagion.¹ Physicians from almost all specialties are exposed to this contagious virus in some way or the other. A study analyzing physician deaths from COVID-19 found that general practitioners and emergency room doctors comprise 42% of all deaths and otorhinolaryngologists and anesthesiologists comprise 4% and 2% deaths, respectively.² Therefore, it is important for all physicians, especially those dealing with oral, nasal, and pharyngeal secretions and airway directly, to follow strict guidelines during any such procedure.

Patients with neurological disease may develop COVID-19 infection, or neurological symptoms can be the first manifestation of COVID-19.³ Neuroanesthesiologists in particular handle patients suffering from chronic neurological disease as well as neurosurgical patients who often require tracheostomy. With the spread of COVID-19 infection in the community, it is difficult to demarcate hospitals to COVID and non-COVID areas, and all areas of the hospital should take due precautions during patient handling. Tracheostomy is an aerosol-generating procedure and poses a high-risk of viral transmission to all those involved in the care of the patient, including doctors, nurses, paramedical staff, and family members. We reviewed the literature and various guidelines for tracheostomy during the COVID-19 pandemic and present a viewpoint on the same.

Who Needs Tracheostomy?

Approximately 20 to 30% of patients with COVID-19 require intensive care management.^{4,6} Invasive mechanical ventilation is required in around 3 to 17% of patients.⁷ Noninvasive methods of ventilation are avoided due to high risk of transmission and early intubation is recommended.⁸ The major indication for tracheostomy in patients is prolonged intubation to reduce the risk of long-term airway complications like subglottic and laryngeal stenosis. Other indications include limited resources like a short supply of ventilators.^{4,9} An emerging evidence suggests that COVID-19 may also cause laryngeal edema.¹⁰ The airway edema along with poor respiratory effort and inability to clear secretions in critically ill COVID-19 patients can lead to extubation failure, reintubation or emergency tracheostomy, resulting in a high risk of exposure to all those involved in patient care. Tracheostomy is not indicated in patients requiring high fractions of inspired oxygen (FiO₂), have high ventilator requirements, and those who require prone positioning as part of their ventilatory strategy.^{4,11} The benefits and risks of tracheostomy may vary on an individual basis and should be considered after analyzing the patient profile and discussion with family members. Considerations also vary depending on the center's requirements, stage of the pandemic at the place, and experience and expertise of the care provider team.

When to do Tracheostomy?

There is no fixed statement in the literature regarding the timing of tracheostomy during the current pandemic. A consensus being followed is that elective tracheostomy may be deferred till viral shedding has ceased. The anti-viral antibodies can be detected in both respiratory secretions and blood 7 days after onset of symptoms of COVID-19 and detectable in 90% of patients after 12 days of onset of

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symptoms.¹² The patient may still shed virus during an antibody response, but it does not necessarily imply active infection. True infectivity during this period can only be assessed by viral culture in cells *in vitro*.⁴ In early studies from Wuhan, the median duration of viral shedding was found to be 20 days but can be longer in the critically ill patients.⁵

The timing of tracheostomy in critical care units has been debated before the COVID era. There have been raging debates with some meta-analysis alluding to early tracheostomy for prevention of ventilator-associated pneumonia and shortening of ICU stay, while others stating no significant difference in outcomes with regard to timing.¹¹ Even during the COVID-19 pandemic, early tracheostomy does not result in a shorter duration of invasive mechanical ventilation or improvement in hypoxia. If the patient meets weaning targets like FiO₂ less than 40%, positive end-expiratory pressure (PEEP) < 8, PaO₂/FiO₂ > 200, and pressure support < 8 cmH₂O, extubation could be reached between 7 and 14 days and tracheostomy should be postponed. Guidelines from the COVID-19 Tracheostomy Task Force, a working group of the Airway Safety Committee of the University of Pennsylvania Health System, recommends that tracheostomy should not be performed in COVID-19 patients before 21 days solely for prolonged ventilator dependence. It may be done before 21 days if the patient requires increased pulmonary toilet or high levels of sedation.⁷ It is evident from the available literature that early tracheostomy hardly improves any clinical parameter and instead can pose a high risk of SARS-CoV-2 transmission. Tracheostomy can be delayed up to 10 days of invasive mechanical ventilation when viral shedding is reduced.¹³ Most studies hence favor delayed tracheostomy in the COVID-19 era.^{6,9}

COVID-19 Testing before Tracheostomy

Airway procedures, like tracheostomy, are high aerosol-generating, and most guidelines recommend testing all patients requiring elective tracheostomy 48 hours before surgery.^{7,9,14} In case of emergency tracheostomy (imminent airway obstruction with unknown COVID-19 status), the patients should be suspected to be COVID-19 positive.¹⁴ American Academy of Otolaryngology and Head-Neck Surgery recommends that all surgical procedures should only be undertaken after ascertaining the COVID-19 status, unless emergent. The term “emergent” comprises any tumor obstructing the airway, causing significant bleeding, or resulting in acute or impending neurological change. It also includes salivary glands or deep neck abscesses. With increasing ability to test patients more quickly with rapid tests, patients with urgent and even emergent surgical needs may be able to be assessed for COVID-19 positivity.¹⁵ The interpretation of these guidelines however should be tailored to individual infrastructure, needs, and stage of the pandemic. Need for due protection like adequate personal protective equipment (PPE), masks and eye protection in airway procedures can however not be overemphasized.

Percutaneous Dilational Tracheostomy versus Open Surgical Tracheostomy

Percutaneous dilational tracheostomy (PDT) involves repeated dilations of the airway and this may result in higher exposure to aerosols. PDT under bronchoscopic guidance results in increased aerosolization via bronchoscopy port. There may be repeated connection and disconnection from the ventilatory circuit in patients requiring high ventilatory settings. Albeit the proposed “modifications” for percutaneous tracheostomy during the pandemic, general consensus favors open surgical tracheostomy over PDT.^{7,16}

Location and Personnel

The operation can be performed either bedside in ICU or the operation room (OR). Both should have negative pressure ventilation.^{7,9} Bedside procedure may give limited surgical access but possesses the advantage of limiting repeated disconnections and requirement of manual ventilation during transport of patient.⁹ OR should have a well-demarcated area for performing surgery and dedicated routes for entry and exit of the patient and medical staff. The personnel in ICU should be kept to a minimum while performing a tracheostomy. Only experienced anesthetists, experienced surgeons, assistants, and scrub nurses should be present in the demarcated area.^{9,14,16} Trainees should be avoided until necessary.⁶ If PDT is performed, two people should be present if performing without bronchoscopy (one to manage ventilator/endotracheal tube and one highly experienced proceduralist). If performing with bronchoscopy, one additional person can be present.⁷ As stated earlier, open surgical tracheostomy is favored over PDT during the current pandemic. Therefore, an experienced surgeon should be the one carrying out open surgical tracheostomy in case the COVID-19 status of the patient is unknown.

Each person should wear a fluid-resistant gown (apron beneath gown if fluid-resistant gown not available), head-cover, powered air-purifying respirator (PAPR), and double gloves. If a PAPR is not available, a properly fitted N95 mask, closed eye protection, and face shield are recommended.^{6,7,14} Considerations while performing tracheostomy^{6-8,14,17} in COVID-19 era are described in ► **Table 1** and **2**.

The procedure should be performed under complete paralysis by neuromuscular blockade, as it abolishes laryngeal reflexes, increases chest compliance, facilitates laryngeal mask ventilation, optimizes tracheal intubation conditions, and increases the success rate of tracheal intubation.¹⁸ Glycopyrrolate may be used as an adjunct to intubation for suspected or confirmed COVID-19 patients to facilitate visualization and minimize suctioning, provided no contraindication for its administration exists.¹⁹

Tracheostomy Tube Change and Postoperative Care

Cuff should remain inflated and suctioning should be done only in a closed circuit. Check for any leaks in the cuff, avoid

Table 1 Precautions while performing surgical tracheostomy

Perform entire procedure under complete paralysis
Use cold instrumentation and avoid monopolar electrocautery
Use cuffed nonfenestrated tracheostomy tube Avoid piercing the cuff of the ETT while incising trachea
Advance ETT and cuff safely below the intended tracheostomy site
Maintain adequate preoxygenation (100%) for 5 minutes prior to tracheostomy
Hold ventilation while withdrawing ETT and until intratracheal placement of the tracheostomy tube and inflation of the cuff
If cuff gets ruptured, ventilation should remain withheld
Resume ventilation via tracheostomy tube only after cuff inflation
Remove ETT from the mouth and place it directly into a plastic bag for disposal
Avoid circuit disconnections and perform suction via closed circuit.
Place a HME with viral filter or a ventilator filter once the tracheostomy tube is disconnected from mechanical ventilation

Abbreviations: ETT, endotracheal tube; HME, heat moisture exchanger.

Table 2 Precautions while performing percutaneous tracheostomy

Perform entire procedure under complete paralysis
If using bronchoscope, hold the ventilation before inserting bronchoscope
After inserting bronchoscope, ventilation is resumed, and any distal airway secretions cleared from the lower tracheobronchial tree
Ventilation withheld if cuff of ETT deflated to withdraw ETT
The hypopharynx should be packed and a Yankauer suction placed in the mouth to reduce aerosols when the ETT is high with the balloon at or above the glottic aperture
After entering the airway and securing it with guidewire, a surgical sponge should be used to cover the area during insertion and removal of the dilator and tracheostomy tube
Ventilation should be held before the insertion of the dilator until the tracheostomy tube is in place, the cuff is inflated, and the tube is connected to a closed circuit
If not using bronchoscope, then consider alternative methods to determine withdrawal of the ETT above the tracheostomy site like palpation of trachea with finger (trachea become softer and more pliable as the tube is withdrawn above the proposed tracheostomy site), using Doppler over the incision site, or blind placement of needle and seeing air bubbles in fluid-filled syringe after intratracheal placement.

Abbreviation: ETT, endotracheal tube.

unnecessary suction, and make every effort not to disconnect the circuit.¹⁴ If airway edema is suspected, the use of a subglottic suction tracheal tube is encouraged.¹⁰ ENT-UK guidelines recommend first tube change 7 to 10 days after tracheostomy.¹⁴ AAO-HNS recommends that routine tube change can be delayed until COVID-19 testing is negative.¹⁷ Due precautions for change of tracheostomy care and change should be followed.

Conclusion

COVID-19 has emerged as a serious public health emergency, affecting patients infected with SARS-CoV-2 as well as caregivers. A high transmission rate of SARS-CoV-2 requires medical personnel to be extra cautious, especially those dealing with oral, nasal, pharyngeal, and airway secretions. Tracheostomy is an aerosol-generating procedure that poses a high risk of exposure to SARS-CoV-2 and hence strict guidelines must be followed before, during, and postprocedure.

Conflict of Interest

None declared.

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