

Increasing the Safety of Percutaneous Dilatational Tracheostomy in COVID-19 Patients

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Percutaneous dilatational tracheostomy (PDT) remains an important procedure in critically ill patients with a respiratory failure requiring prolonged mechanical ventilation with nearly 10% of the patients ending up having a tracheostomy. PDT has become the standard of care in the intensive care unit (ICU); however, there have been some concerns over it during this pandemic as it is an aerosol-generating procedure with a risk of viral transmission to the healthcare personnel.¹ As the pandemic overwhelms intensive care capacities and strains the healthcare systems, performing early tracheostomy for patients with prolonged ventilation to facilitate ventilator weaning, reducing ICU length of stay, and easing pressure on healthcare resources are ever more pertinent.²

There are limited data regarding the safety and the timing of tracheostomy in COVID-19 patients, but data from previous severe acute respiratory syndrome (SARS) epidemic suggest that it can be performed safely. However, we must remember that the infectivity of coronavirus is quite high, although the mortality is low compared with the SARS (2.3 vs 11%).

Recent evidence suggests that there is not much difference in the safety of open vs PDT in the ICU, but the best strategy during this pandemic is to not deviate from the current practice that the clinicians are used to.³ It is considered that PDT involves more extensive airway manipulation, bronchoscopy, serial dilations of trachea, and the need for repeated connection and disconnection from the ventilator circuit. Thus, the likelihood of aerosol generation is increased compared with an open surgical approach.⁴ There is no evidence suggesting superiority of either technique in minimizing infectivity, but the open surgical technique was preferred in the SARS outbreak.⁵ Recent experience in patients with COVID-19 infection suggests that PDT may be preferred in order to reduce aerosol production.⁶ This may help in dispelling fears associated with performing the procedure and encouraging to maintain the consistent standards.⁷

Due to scarcity of data, the benefits of early tracheostomy in critically ill COVID-19 patients are unclear. According to the SARS outbreak data, the need for mechanical ventilation was associated with 46% mortality.⁴ The earlier data from United States of severe COVID-19 patients requiring mechanical ventilation reported very high mortality of nearly 88% in ventilated patients, which highlights the question whether there was any benefit in offering them tracheostomy.

In a multicenter trial looking at early vs late tracheostomy, it was observed that nearly 55% of patients in the late tracheostomy group did not undergo tracheostomy. Hence, committing patients to early tracheostomy could lead to procedures in patients who may actually not need it.⁸ There is general consensus that performing tracheostomy should be avoided in patients requiring high oxygen or ventilatory requirements and also in those who need rescue ventilatory strategies such as proning.

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Current evidence supports early tracheostomy in a selected group of patients such as traumatic brain injury, but there is no consensus regarding the timing of tracheostomy in patients with COVID-19-associated respiratory failure.⁹ The literature also does not clearly suggest reduction in a ventilator-associated pneumonia or any mortality benefit with early tracheostomy. On the contrary, the incidence of laryngotracheal stenosis due to prolonged intubation is quite low and not significantly reduced in patients with early tracheostomy.¹⁰

It has been observed that the nasopharynx and trachea have a high viral load during the acute stages of illness. In view of this, many studies suggest delaying tracheostomy for at least 2–3 weeks with an intent to balance the expected prognosis of a patient with a risk to the healthcare worker (HCW).¹¹ In their study, Chao et al. did not have any HCW affected with infection, but suggested performing tracheostomy after 3 weeks of intubation and also recommended open surgical tracheostomy over PDT, while New York Head and Neck Society suggested delaying the procedure for at least 2 weeks.¹² Angel et al. demonstrated that a modified PDT technique could be safely performed at a mean of 10.6 days with no incidence of infection transmission to HCWs.

Various studies have shown most patients do not have viral shedding beyond 21 days from symptom onset, and antibody response that inhibits the infectivity may typically be detected in majority of patients by 12 days after symptom onset.¹⁴ Although PCR may detect viral RNA even up to 30 days, it does not necessarily indicate infectivity in the presence of antibodies.¹⁵ However, the value of viral load and the antibody response for judging infectivity and transmission risks need further evaluation.⁵

In certain patients, it may be reasonable to consider early tracheostomy for even before 14 days, if the patient has favorable respiratory mechanics and the procedure may facilitate their

recovery in terms of an improved tracheal toilet, ventilator synchrony, and need for sedation.

Thus, given the high mortality rate of the disease and the lack of proven benefit of the procedure with concerns for the healthcare exposure, standard recommendation would be to consider tracheostomy after 14 days of ventilation.

A preoperative testing using viral PCR for performing tracheostomy is not routinely recommended; however, it may be done in few select cases to determine the viral clearance.¹⁶

PDT in COVID-19 patients can be safely performed in negative-pressure rooms with appropriate protection by the team with highest level of experience dedicated to routinely performing the procedure. It is also suggested to maintain minimal personnel and use a closed circuit and an in-line suction during ventilation.¹⁷

Various measures described that are crucial to limit exposure to aerosolized secretions during the procedure are complete muscle paralysis to prevent coughing, providing FiO₂ 100%, and stopping mechanical ventilation just before opening the trachea.^{18,19}

There are various measures to reduce the aerosol generation during the procedure. In this issue of IJCCM, Gunchan et al., report the results of the bedside PDT using apnea technique, with the mean apnea time of 1.83 minutes and no healthcare worker showing postprocedure symptoms of the infection.²⁰ The fact that the operators were experienced with more than 100 PDTs emphasizes the need for experienced personnel doing the procedure safely. Other method described is covering the tracheostomy site with transparent plastic sheet, which was also practiced by these authors.²¹ Generally, it is considered that the surgical tracheostomies are done above the inflated endotracheal tube (ETT) cuff, whereas in the percutaneous approach, the trachea is entered below the ETT as the tube is withdrawn, thus increasing the risk of aerosol generation.²² To mitigate this risk, few authors have suggested advancing ETT cuff well below the intended tracheotomy site and continuing apnea while incising the trachea. Another technique suggested is to insert the bronchoscope from the side of the ETT into the glottis and position it above the tracheostomy insertion site, and the ETT cuff thus will help to confirm the tracheal puncture and avoid cuff rupture, eventually reducing aerosol generation.

PDT is an aerosol-generating procedure with risk to healthcare personnel; however, it can be safely performed with proper patient selection, timing of procedure, experienced operator, and using various precautionary methods that may decrease the risk of transmission.

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