Title: Tracheostomy Management During the COVID-19 pandemic

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Abstract:

The ongoing Coronavirus Disease 19 pandemic has led to unprecedented demands on the modern healthcare system and the highly contagious nature of the virus has led to particular concerns of infection among healthcare workers and transmission within healthcare facilities. While strong data regarding the transmissibility of the infection are not yet widely available, preliminary information suggests risk of transmission among asymptomatic individuals, including within healthcare facilities. We believe that the presence of a tracheostomy or laryngectomy stoma poses a unique risk of droplet and aerosol spread particularly among patients with unsuspected infection. At our institution guidelines for the care of open airways were developed by a multidisciplinary open airway working group and here we review those recommendations to provide practical guidance to other institutions.
Introduction:

Coronavirus Disease 19 (COVID-19) is caused by a highly contagious virus (SARS-CoV-2) and is spread from person-to-person via droplets, contact and aerosolized particles.\textsuperscript{1,2} Otolaryngologists and providers caring for tracheostomy and laryngectomy patients are at increased exposure risk due to aerosolized particles from these open airways.\textsuperscript{3,4} This increased risk has been recognized in the publication of guidelines regarding minimizing exposure during intubation and airway procedures,\textsuperscript{1,5-7} however there is scant literature to provide guidance to hospital systems about the post-operative and floor management of open airways.\textsuperscript{8} A study within a nursing facility in Washington demonstrated that segregating patients by symptoms failed to identify half of those infected and quantitative studies showed similar levels of viral RNA among symptomatic and pre-symptomatic patients, suggesting a high risk of viral shedding among pre-symptomatic patients.\textsuperscript{9} Based on these findings and the endemic presence of COVID-19 in our community, a prudent approach to tracheostomy management was developed and applied to all open airway patients, not only the known or suspected COVID-19 cases.

Open Airway Management:

We define open airways as patients with laryngectomy stomas or tracheostomies, with careful attention paid to those not connected to a closed ventilatory circuit. In these cases, we have adopted methods to create a closed system as described by Chan et al.\textsuperscript{3} While not necessarily eliminating the possibility of aerosolization, relatively simple measures may dramatically reduce droplet spread and provide protection to the healthcare workforce.

For tracheostomy patients, partial closure can be achieved most easily with a tracheostomy cap or Passy-Muir valve in patients who can tolerate them, although this may be uncommon in the inpatient setting. An attached tracheostomy heat moisture exchanger (HME) may also provide a simple solution as a droplet barrier. A variety of HME appliances are commercially available but may not be locally available at
individual institutions or may be out of stock due to supply shortages. Additionally, in a hospital setting, patients may require frequent suctioning and HMEs may become quickly soiled and obstructed by secretions.

A variety of improvised systems can be devised to address these issues with supplies that are readily available at most institutions. An HME from an anesthesia circuit can be adapted to a tracheostomy if tracheostomy HMEs are unavailable (Figure 1a). A closed in-line suction system can be attached to the tracheostomy tube prior to the HME and such a system will allow a safer means of suctioning without frequent opening of the airway. This would also prevent the HME from becoming soiled as quickly as without the in-line suction system (Figure 1b,c). Oxygen therapy can then be delivered via non-humidified trach collar (Figure 2). In the setting of pandemic respiratory infection, humidification and nebulization therapy should be limited to the extent possible and additional precautions with their use may be warranted. If humidified oxygen therapy is deemed necessary, it can be delivered via T-piece attachment with a viral filter on the expiratory limb and this set-up can be combined with a closed in-line suction if the necessary supplies are available (Figure 3).

In laryngectomy patients, an adhesive base plate or silicone laryngectomy tube with an attached HME cassette provides similar benefit and is well tolerated. A cuffed tracheostomy tube in the stoma with the above tracheostomy adaptations can also be employed. For open airways in the outpatient setting or if the above systems are not tolerated, a surgical mask over the airway or a tracheostomy mask/collar will provide some protection.

Reusable inner cannula tracheostomy tubes should be avoided in the inpatient setting when possible. The inner cannulas require regular cleaning using a brush which poses the risk of aerosolizing respiratory particles. The use of disposable inner cannulas is preferred since they can be discarded and replaced.

Some caution is warranted in deploying these systems since some patients may become intolerant or the system may become obstructed. If patients are unable to demonstrate an ability to remove the system
safely, then additional monitoring such as continuous pulse oximetry and telemetry may be appropriate. They may also create additional torque on the tracheostomy tube, which could increase the risk of accidental disconnection, pressure ulcer, or even decannulation. Commercially available ties designed to stabilize a ventilator circuit or an additional cloth tie around the neck and closure system can help reduce this risk.

Additional personal protective equipment and isolation precautions may be warranted in the management of open airways in a respiratory infection pandemic but specific recommendations should be determined at an institutional level and are beyond the scope of this communication.

Conclusion:

The rapid spread of COVID-19 has presented massive challenges to healthcare institutions and our adaptations must be equally rapid despite inadequate information and resources. The above guidelines of open airway management are elements of a prudent strategy to protect the healthcare workforce based on evolving information. Otolaryngologists have been on the forefront of identifying these risks and will need to be leaders in shaping the response within their respective institutions.
Figure 1 – Methods of closing tracheostomy circuit. An HME can be connected directly to a tracheostomy (1A). An in-line suction can be added for safer suctioning (1B,C).

Figure 2 – If oxygen therapy is needed, it can be connected to the tracheostomy mask (A), which can then be connected to the HME (B).

Figure 3 – Oxygen therapy and in-line suctioning can be combined in this tracheostomy setup.
References


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Figure 3

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