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Tracheostomy Management during the COVID-19 Pandemic

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Abstract

The ongoing coronavirus disease 2019 pandemic has led to unprecedented demands on the modern health care system, and the highly contagious nature of the virus has led to particular concerns of infection among health care workers and transmission within health care 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 those within health care 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.

Keywords

COVID, coronavirus, tracheostomy, laryngectomy, airway, safety

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Coronavirus disease 2019 (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.[1,2] Otolaryngologists and providers caring for patients with a tracheostomy or laryngectomy are at increased exposure risk due to aerosolized particles from these open airways.[3,4] This increased risk has been recognized in the publication of guidelines regarding minimizing exposure during intubation and airway procedures[1,5-7]; however, there is scant literature to provide guidance to hospital systems about the postoperative and floor management of open airways.[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 presymptomatic patients, suggesting a high risk of viral shedding among presymptomatic patients.[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 patients with an open airway, not only the known or suspected COVID-19 cases.

Open Airway Management

We define open airways as 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.[3] While not necessarily eliminating the possibility of aerosolization, relatively simple measures may dramatically reduce droplet spread and provide protection to the health care workforce.

For patients with a tracheostomy, partial closure can be achieved most easily with a tracheostomy cap or Passy-Muir valve in those 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

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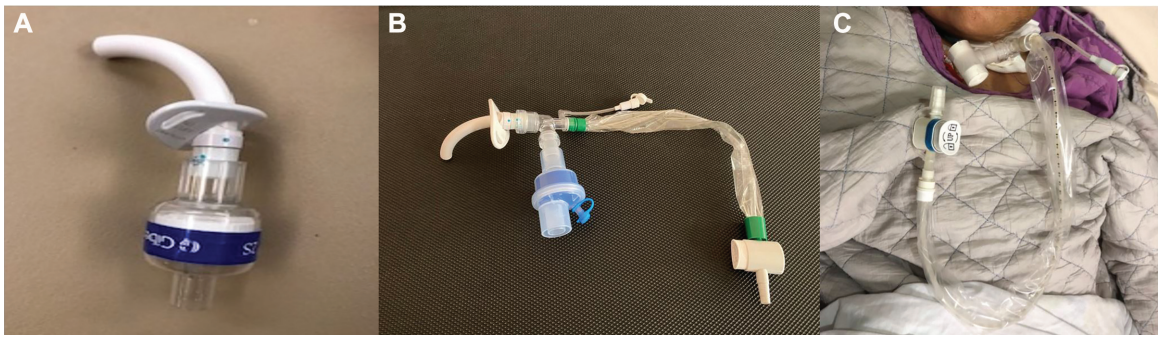

Figure 1. Methods of closing the tracheostomy circuit. (A) A heat moisture exchanger can be connected directly to a tracheostomy. (B, C) An in-line suction can be added for safer suctioning.

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** and **1C**). Oxygen therapy can then be delivered via a nonhumidified tracheostomy 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 setup can be combined with a closed in-line suction if the necessary supplies are available (**Figure 3**).

In patients with a laryngectomy, 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 aforementioned tracheostomy adaptations can also be employed. For open airways in the outpatient setting or if these 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 with 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 may be appropriate, such as continuous pulse oximetry and telemetry. They may 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.

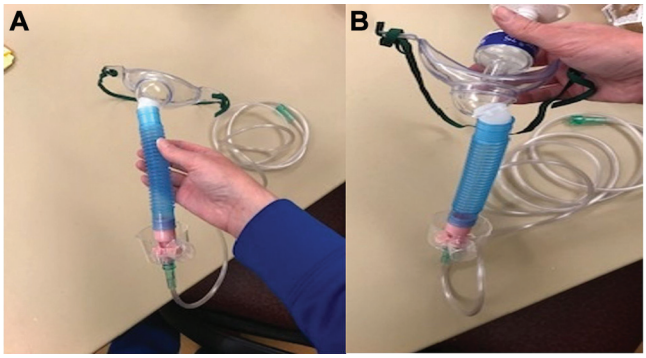

Figure 2. If oxygen therapy is needed, it can be connected to (A) the tracheostomy mask, which can then be connected to (B) the heat moisture exchanger.

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

Conclusion

The rapid spread of COVID-19 has presented massive challenges to health care institutions, and our adaptations must be equally rapid despite inadequate information and resources. These guidelines of open airway management are elements of a prudent strategy to protect the health care 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 institutions.

Author Contributions

Richard A. Goldman, study design, data analysis and interpretation, drafting, final approval, agrees to be accountable for all aspects of work; **Brian Swendseid**, study design, data analysis and interpretation, drafting, final approval, agrees to be accountable for all aspects of work; **Jason Y. K. Chan**, interpretation of data, revising work, final approval, agrees to be accountable for all aspects of work; **Michelle Lewandowski**, interpretation of data, revising work, final approval, agrees to be accountable for all aspects of work; **Jacqueline Adams**, interpretation of data, revising work, final approval, agrees to be accountable for all aspects of work; **Monica Purcell**, interpretation of data, revising work, final approval, agrees to be accountable for all aspects of work; **David M. Cognetti**, interpretation of data, revising work, final approval, agrees to be accountable for all aspects of work

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