Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Additional information: The e-Appendix can be found in the Supplemental Materials section of the online article.

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COUNTERPOINT:

Tracheostomy in Patients With COVID-19
Should We Do It Before 14 Days? No

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Timing of Tracheostomy

As a matter of fact, in the multi-society consensus statement published in *CHEST* in June 2020, the writing panel could not find any evidence for recommending a specific tracheostomy timing in patients with coronavirus disease 2019 (COVID-19)-related respiratory failure.[1] Even before this pandemic, tracheostomy's optimal timing has been debated and required consideration of many factors, including goals of care preferences, expected outcomes, and the likelihood of prolonged mechanical ventilation. Published literature uses variable definitions, with authors using 7, 10, 14, and even 21 days as cutoffs for early and late tracheostomy.[2-4] There is no clear evidence of better outcomes with early rather than late tracheostomy in these critically ill medical patients. Studies are mixed in terms of proving a shorter duration of mechanical ventilation or ICU length of stay. Furthermore, the current published literature does not support a mortality benefit or a clear reduction in the

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incidence of ventilator-associated pneumonia.[1,3] There is a lack of guidance for tracheostomy timing from prior viral pandemics. Based on early reports of high mortality ranging from 49% to 65% amidst concerns of infectivity to health care workers (HCWs) caused by aerosol-generating procedures in COVID-19,[5,6] some consensus statements and surgical societal recommendations suggested that tracheostomy be performed >21 days or until the COVID-19 polymerase chain reaction testing was negative or not at all.[7] Since then, we have developed a better understanding of viral replication, infectivity, viral shedding, use of personal protective equipment, and aerosols reducing techniques while performing tracheostomy. There has been an evolution of specific therapeutics as well as predictors of mortality in this disease. We highlight factors to support delaying tracheostomy until days 10 through 14.

Safety of Patients and HCWs

Literature suggests that laryngeal injury with endotracheal intubation could occur as early as 24 hours.[8] Therefore, early tracheostomy is unlikely to prevent this complication. Tracheostomy can lead to other areas of airway injury, such as the site of insertion, location of the cuff (possibly hyperinflated to prevent aerosol generation), and the tip of the tube, because of the curvilinear nature of the tracheostomy tube in contrast to an endotracheal tube. Periprocedural complications include tracheal wall injury, infection, pneumothorax, malposition or obstruction of the tracheostomy tube, accidental decannulation, loss of airway, and death. Bleeding may occur when patients are receiving anticoagulation for COVID-19-related thrombosis.[9] Late complications include a surgical scar, granulation tissue, tracheal stenosis, and tracheomalacia. Patients with COVID-19 and ARDS who require proning in the first 2 weeks of care are considered at higher risk for accidental decannulation. Tracheostomy would not be desirable during that timeframe. Such patients may also require high positive end-expiratory pressures and F_{IO_2} and may be unable to tolerate the periods of apnea required to perform the tracheostomy by using recommended aerosol minimizing techniques. The safety of HCWs performing tracheostomy has also been concerning. Regarding the transmission of viral illness during an aerosol-generating procedure, the peak of infectivity is days 1 to 5 of symptom onset, with a decline in replication-competent virus after day 10s to 15, which would suggest that delaying tracheostomy would pose less risk to HCWs in addition to wearing personal protective equipment and using aerosol-reducing techniques in a negative pressure room.[10] These facts also provide evidence-based assurance to all levels of care providers involved in tracheostomy aftercare.

Outcomes

The claim that early tracheostomy leads to faster liberation from mechanical ventilation and decannulation challenges whether tracheostomy was even necessary for those patients. It also raises the question of whether daily sedation holiday and spontaneous breathing trials are being consistently performed in the intubated patients with COVID-19 related to respiratory failure. In a recently published experience from a high-volume center performing early tracheostomy, a significant percentage of patients were decannulated before discharge.[11] This does not mean that early tracheostomy leads to this positive outcome; it could mean that tracheostomy was performed prematurely for a variety of factors. In another center, investigators implemented machine learning to determine the optimal timing of tracheostomy in COVID-19, identifying it to be between days 13 and 17, with emphasis that in the first 12 to 14 days, patients either demonstrated successful liberation from the ventilator or did not survive.[12] These findings further suggest that performing tracheostomy >10 to 14 days would provide a more clear declaration of the patient's projected survival and need for prolonged mechanical ventilation, thus avoiding the early performance of a procedure that later proves unnecessary. In certain centers, during the first surge of COVID-19, as the number of patients requiring mechanical ventilation increased, tracheostomy was sometimes performed as early as day 2 post-intubation in an attempt to improve ICU capacity.[13] However, tracheostomy placement may not uniformly translate to de-escalation of care because of other comorbidities and organ failure.

There are also challenges associated with the placement of COVID-19 patients with a tracheostomy in long-term facilities or even within the hospital outside of the ICU. These settings require complex care delivery by providers who may not have expertise in tracheostomy aftercare, specifically in COVID-19 patients, which could be a barrier to both downsizing and optimizing a decannulation pathway. The high volume of tracheostomy patients creates unexpected consequences, given the limited availability and capacity of long-term care and skilled nursing facilities. Multidisciplinary tracheostomy aftercare, including education of the

patient, the family, and the medical providers, is required. Limited goal-directed follow-up as an outpatient, primarily because of decreased access during the pandemic, may result in patients living with a tracheostomy for an unnecessarily extended timeframe. Living with a tracheostomy could be complicated by chronic pain with coughing and activities of daily living, increased anxiety associated with breathing through a device, the stress of managing the tracheostomy tube, suctioning, dealing with potential adverse events, sleeplessness due to airway discomfort, lack of autonomy, and speech and swallowing difficulties. This stigma leads to social withdrawal and mental health issues during an era when individuals are already experiencing isolation.

In conclusion, increasing data support that delaying tracheostomy in patients with COVID-19-related respiratory failure makes sense for the following reasons: 1) avoidance of a procedure that ultimately may prove to be unnecessary or not indicated because of either successful extubation or death; 2) avoidance of exposure of HCW to an aerosol-generating procedure during a period of high infectivity; 3) lack of uniform evidence that early tracheostomy results in faster discharge from the ICU or reduction in mortality in COVID-19 patients; and 4) avoidance of logistical challenges with tracheostomy aftercare, discharge planning, and disposition.

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Rebuttal From Drs Brenner, Feller-Kopman, and De Cardenas

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We commend our colleagues on a cogent counterpoint[1] that illuminates both hobgoblins and hard truths about tracheostomy that have shaped our journey from the first wave of the pandemic to the present.

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