“Fog of War” aptly describes the many uncertainties that characterized the early days of the COVID-19 pandemic. Carl von Clausewitz, who is credited with the term, observed in 1832 that, “A sensitive and discriminating judgment is called for; a skilled intelligence to scent out the truth.” In von Clausewitz’s era, decisions around tracheostomy were fraught; the procedure was perilous and reserved primarily for asphyxia and acute respiratory obstruction. Mackenzie, commenting on tracheostomy in 1830, noted “The question always arises in the mind of the young [clinician] whether the symptoms are sufficiently urgent to render the operation necessary.” In 1833, Trousseau reported the outcomes of 215 tracheostomies performed for diphtheria; only 47 of the patients survived. Although the safety of tracheostomy has improved and its indications have evolved, many of the same vexing questions remain nearly 200 years later: When is the right time to perform tracheostomy? In which patients? How does tracheostomy affect outcomes?

These longstanding questions relating to tracheostomy have asserted themselves with renewed vigor during the SARS-CoV-2 pandemic. Concerns of viral transmissions, uncertain clinical course of illness, and severe ICU capacity strain have all added complexity to decision-making. Tracheostomy is not without risk, but it can reduce the morbidity of prolonged translaryngeal intubation, alleviate the cumulative effects of sedation, and allow swifter rehabilitation, which includes hastening walking, talking, and eating. Early in the pandemic, performing tracheostomy before 14 days raised questions of risk of transmission to health-care professionals and of benefit for patients; yet, proactive approaches to tracheostomy also offered the possibility of accelerating weaning from ventilation and thereby addressing scarcity of equipment, personnel, and hospital or ICU beds. Although guidance documents and international protocols have proliferated, significant questions remained.

In this issue of CHEST, Hernández et al shed new light on the outcomes of early tracheostomy in their study of outcomes of patients with COVID-19 who were admitted to ICUs in Spain. Although previous studies have reported on cohorts of patients with COVID-19 respiratory failure that required tracheostomy, risk of bias has limited many analyses. Retrospective studies are inherently susceptible to bias because of differences in the groups being compared, lack of randomization, or systematic confounders in how patients were selected for treatment, with both known and unknowable factors affecting outcomes. Furthermore, single institution studies are difficult to generalize. In this study, the authors compared aggregate data from admissions in 15 ICUs, analyzed with a propensity-matching approach that improves considerably on the methods and rigor of prior studies.

Patients were classified based on receiving tracheostomy at <7 days, 8 to 10 days, and 11 to 14 days after intubation. The investigators found that early tracheostomy significantly reduced ICU capacity strain during the initial surge. Approximately one-third (n = 682) of the 1939 patients in the study underwent tracheostomy, and 56% (n = 382) received...
the procedure within 14 days. Earlier tracheostomy was associated with increased ventilator-free days and bed-free days and was attributed mainly to a reduction in duration on mechanical ventilation. The surge conditions heavily influenced decisions of when to perform the procedure and on which patients, although patient-specific factors undoubtedly also informed these decisions. The reduced weaning time with early tracheostomy likely arises from a variety of factors, which include not only changes in pulmonary hygiene and reduced airway resistance but also reduction in sedative requirements and in rate of pulmonary infection. A meta-analysis comparing early vs late tracheostomy placement demonstrated lower ventilator-associated pneumonia and shorter durations of ventilation and ICU stay in patients with early tracheostomy.11

What are the strengths of this study? It is the largest experience to date providing detailed analyses of clinical course and outcomes of tracheostomies performed in patients with COVID-19, and it is arguably the best controlled. The authors mitigated bias arising from nonrandom assignment to early or late tracheostomy with propensity matching. Scores were calculated with the use of age, sex, comorbidities, Acute Physiology and Chronic Health Evaluation scores, treatments, and numerous other covariates. They then applied a 1:1 nearest-neighbor matching protocol without replacement and a caliper that limited difference permitted between matched subjects. The analysis excluded potential posttracheostomy confounders and evaluated the course of COVID-19, including extubation, weaning and decannulation failure, length of stay, ICU readmission, and death. Collectively, these measures significantly reduced risk of bias. Propensity matching cannot account for unknown factors that influence allocation or treatment, such as prognostic factors identified by clinicians or teams, but the approach materially improves on prior cohort studies.

An important question is whether these data are generalizable to the present pandemic or to future ones. In these ICUs, the sheer volume of patients whose condition required mechanical ventilation often drove decision for early tracheostomy, at least in patients who were predicted to be unlikely to be extubated. These systemic stresses manifest differently depending on acuity of surge, per capita availability of ICU beds, and a myriad of other factors. The findings may also differ in resource-restricted countries, particularly in severe surges.5 Experience from the current pandemic suggests that approaches to ARDS need not deviate markedly from established best practices, aside from the safety precautions relating to personal protective equipment and protocols to minimize aerosolization. Patients with COVID-19-ARDS benefit from approaches of prone ventilation and lung-protective tidal volumes, similar to other patients with ARDS, and they also benefit from a proactive approach in timing of tracheostomy.

Downstream of acute outcomes, the timing of tracheostomy may also have implications for survivorship,12 although long-term outcomes are seldom captured systematically. Post-ICU syndrome includes physical, cognitive, and/or mental health impairments that are barriers to resuming a meaningful life. The finding that tracheostomy accelerated weaning is notable because shorter duration of ventilation may alleviate frailty and need for prolonged rehabilitation. Prolonged translaryngeal intubation also has consequences for the airway. Pressure-induced damage to mucosal and cartilaginous structures of the larynx causes permanent scarring that affects breathing, speaking, and swallowing; subglottic or tracheal stenosis often leads to lasting impairment. The current research, conducted in the setting of the ongoing COVID-19 pandemic, represents important progress in understanding the role for tracheostomy and can inform future efforts in tailoring timing to improve patient outcomes.

References


