



Tracheotomy in patients with COVID-19

Hakan Kara^{id}, Can Doruk^{id}, Bora Başaran^{id}

Department of Otorhinolaryngology Head and Neck Surgery, Istanbul University, Istanbul Faculty of Medicine, Istanbul, Turkey

ABSTRACT

Coronavirus disease 2019 (COVID-19) has become a public health problem by quickly evolving into a global pandemic. Although the disease causes mild to moderate symptoms in large parts of society, severe respiratory distress develops in a significant portion. These patients need to be treated in the intensive care unit, and some of them also need invasive mechanical ventilation due to respiratory failure. Prolonged mechanical ventilation can bring out a need for tracheotomy in these patients. However, tracheotomy is a high-risk procedure in terms of transmission due to the high potential of aerosol generation. Therefore, some recommendations about the measurements to be taken and personal protective equipment (PPE) use were published. Until now, we performed tracheotomy in six patients with COVID-19 in our center and all these procedures were performed at the bedside. During these procedures, standard and enhanced PPE, including a powered air-purifying respirator, were used. No sign of the infection was seen in any member of the team who performed the procedures. In conclusion, the tracheotomy procedure in the patients with COVID-19 seems to be safe in terms of the transmission risk to the healthcare workers, based on articles published during the severe acute respiratory syndrome epidemic and our experiences. However, we still need data collection and documentation to establish the timing and benefit of tracheotomy in these patients.

Keywords: COVID-19, tracheotomy, transmission.

The World Health Organization (WHO) declared that the outbreak of novel coronavirus 2019 was a public health emergency of international concern on January 30th, 2020. Then, the disease was named as Coronavirus disease 2019 (COVID-19) on February 11th, 2020. During this period, there was no confirmed case announced in Turkey. At last, the WHO declared the outbreak as a pandemic after spreading more than 100 countries on March 11th, 2020. It was a day after the first confirmed case seen in Istanbul province of Turkey. Then, the disease spread rapidly and was seen in all provinces of the country as of April 1st, 2020.

As the infection spread rapidly, the transmission risk to healthcare workers (HCWs) became one of the most critical concerns worldwide. More than 10% of all patients were HCWs in Italy.^[1] In China, a total of 3,387 HCWs corresponding to 4.4% of total cases were affected by the COVID-19 as of February 24th, 2020.^[2] In addition, the Republic of Turkey, Ministry of Health reported that 7,428 of a total of 117,589 cases were HCWs on April 29th, 2020.^[3]

The safety precautions with adequate personal protective equipment (PPE) were suggested to effectively prevent HCWs from becoming

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Correspondence: Hakan Kara, MD. İstanbul Üniversitesi İstanbul Tıp Fakültesi Kulak Burun Boğaz Anabilim Dalı, 34093 Fatih, İstanbul, Türkiye.
e-mail: dr.hakankara@hotmail.com

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infected.^[2] However, the nosocomial spread of the infection, particularly among otolaryngologists, was seen during the early period of the outbreak.^[4] Therefore, lots of commentaries suggesting precautions for otolaryngological procedures have been published recently.^[4-10] Among these procedures, one of the most concerning one is an open tracheotomy due to the high risk of aerosol generation. Although the WHO has suggested that transmission of severe acute respiratory syndrome coronavirus 2 (SARS-COV-2) between individuals is primarily seen through respiratory droplets and closed contacts, they have also stated that airborne transmission may be possible in some conditions, such as endotracheal intubation, bronchoscopy, or tracheotomy.^[11]

During the SARS epidemic in 2003, 23 tracheotomies from different clinics were documented.^[10] Tay et al.^[10] reviewed these articles recently and reached the following five essential results for preventing transmission during the procedure:

1. Standard PPE (including an N95 mask, surgical cap, gloves, surgical gown, and goggles) with enhanced PPE measures (face shields, powered air-purifying respirator [PAPR]) are adequate.
2. Bedside tracheotomy reduces the risk of transmission which may arise from patient transportation.
3. Providing complete paralysis, stopping ventilation before entering the trachea, and not using the suction would reduce the aerosol generation.
4. The team should consist of experienced members. The steps of the procedure should be specified previously, as PPE and PAPR may affect communication between the team members.
5. Waste disposal and decontamination of reusable equipment should be performed carefully after the procedure.

In addition, the British Association of Otolaryngology-Head and Neck Surgery published a tracheotomy guidance during the COVID-19 pandemic.^[5] They recommended establishing a COVID-19 airway team responsible

for preparing themselves and the other staff of the clinic for performing tracheotomies in safe conditions. Although the recommended PPE requirements are not different from the standard PPE measures mentioned above, we consider that some of their recommendations are quite beneficial and contributing to the baseline knowledge gained from the SARS epidemic. Therefore, we highly suggest reviewing the article entitled "Framework for open tracheostomy in COVID-19 patients".^[12]

On the other hand, the American Academy of Otolaryngology-Head and Neck Surgery cited examples of studies from China, indicating that most of the patients who became critically ill due to COVID-19-related pneumonia experienced respiratory failure and died; therefore, they recommended avoiding tracheotomy in patients with COVID-19, particularly if the patient's respiratory status was not stable.^[13] Besides, Cui et al.^[9] reported that four of their six patients with COVID-19 did not benefit from tracheotomy. Moreover, mucus and secretion production during COVID-19-related pneumonia does not seem to be as much as seen in classical bacterial pneumonia.^[4] The main problem in COVID-19 patients is interstitial lung disease or acute respiratory distress syndrome; therefore, it is not classified and treated similar to classical pneumonia.^[14] Hence, the tracheotomy need for a pulmonary hygiene is not considered in COVID-19 patients.^[4]

In our clinic, we encountered 12 elective open tracheotomy cases during the COVID-19 pandemic until now. Six of them were hospitalized due to other medical conditions. However, we requested polymerase chain reaction (PCR) testing of these patients, which were found to be negative. In our opinion, it is of utmost importance to identify the infection status of the patient to avoid taking unnecessary measurements. For instance, we prefer to perform a bedside tracheotomy in COVID-19-positive patients to avoid transmission risk during the patient transfer. However, bedside tracheotomy can lead to some difficulties which may adversely affect the success of the surgery. Therefore, recognizing the COVID-19 status of the patient reduces the number of patients undergoing unnecessary

Table 1. Our clinical practice for tracheotomy in COVID-19 patients

1. The surgical team meets with the anesthesia team a day before the procedure. They determine all steps of the procedure and the role of every team member.
2. The team consists of two experienced surgeons and two experienced anesthesiologists (one responsible for the patient and one for the anesthesia machine).
3. Standard and enhanced PPE measures are taken.
4. The widest diameter, cuffed, non-fenestrated tracheotomy cannula is used. The cuff is controlled for any leakage before the procedure.
5. The anesthesiologist provides complete paralysis of the patient.
6. Pre-oxygenation is performed, and ventilation is stopped after the tracheal exposition.
7. The anesthesiologist clamps the ETT and pushes it forward so that the cuff of the ETT remains below the tracheal incision line.
8. The trachea is incised with utmost care not to injury the cuff of the ETT. A tracheal window is opened, and Bjork flap is sutured to the skin.
9. The circuit is detached from the ETT and attached to the tracheotomy cannula. The cuff of the clamped ETT is deflated and drawn back.
10. The tracheotomy cannula is inserted, and its cuff is inflated promptly. Then, ventilation is started again.
11. Tracheotomy cannula is stitched to the skin to avoid decannulation.
12. Each team member applies the doffing PPE procedure carefully after the procedure.

PPE: Personal protective equipment; ETT: Endotracheal tube.

Note: Diathermy and suction are not used, especially after the tracheal window is opened.

bedside procedures in our institution. However, the false negativity of PCR testing can be a concern. We suggest evaluating medical history of the patient along with physical examination and imaging findings and PCR testing as a whole to overcome this problem, and a second PCR testing may be requested for these patients. We recommend that the standard PPE measures must be taken for all tracheotomy procedures during the pandemic, as some patients may be asymptomatic carriers or the test may give a false negative result. Enhanced PPE must be reserved only for positive cases. The other six cases were confirmed positive patients. The tracheotomy indication of our first COVID-19-positive case was prolonged intubation (~15 days) and pulmonary hygiene. The pulmonary hygiene is not an expected indication in COVID-19 patients, as mentioned above. Nevertheless, a secondary bacterial infection, ventilatory-associated pneumonia, was added to the clinical presentation, bringing out a need for pulmonary hygiene. An excessive purulent tracheal discharge was obtained after the tracheal incision and, consequently, we had to use suction during the operation.

Fortunately, we were fully equipped, and none of the team members developed any symptoms within 21 days after the procedure. We took the advantage of our first experience, and we started to routinely use closed suction-system via a viral filter (through the endotracheal tube) before entering the trachea to reduce aerosol generation. Of note, we have shared our tracheotomy recommendations on the website of the Turkish Association of Otolaryngology-Head and Neck Surgery.^[15] The fundamental recommendations and our clinical practice are summarized in Table 1.

In conclusion, there are no available data currently to decide the appropriate timing for tracheotomy in COVID-19 patients. Besides, the benefit of the tracheotomy for the management of these patients has not been fully understood, yet. Therefore, we suggest that anesthesiologists and otolaryngologists should cautiously decide which patients need a tracheotomy. The risk-benefit assessment based on the estimated prognosis of the patients should be made. Furthermore, the outcomes of patients undergoing tracheotomy and the transmission status of HCWs performing the procedures should be documented rapidly.

Only by this way, the role of tracheotomy would be elucidated in the management of COVID-19 patients. Finally, we need to gain this knowledge, since the pandemic seems to continue for a while.

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