



TRACHEOSTOMY AND TRACHEOSTOMY CARE DURING THE COVID-19 PANDEMIC

COVID-19 Pandemisi Sırasında Trakeostomi ve Trakeostomi Bakımı

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Abstract

Covid-19 pandemic is a global health problem that affects the whole world and can progress with asymptomatic or viral symptoms of pneumonia or cause severe acute respiratory failure. SARS-CoV-2 has spread much more widely and quickly than other viruses and has caused a significant number of life losses globally. Tracheostomy is a surgical procedure that is frequently performed by ENT and head & neck surgeons with various indications, and its implementation can facilitate weaning patients from mechanical ventilation, thereby potentially increasing the availability of beds in the intensive care unit (ICU). Since tracheostomy causes a large amount of aerosol formation, it is a serious risk process for the spread of covid-19 infection even if personal protective equipment (PPE) is used both during surgery and postoperative care. There is not enough experience on how to perform tracheotomy in Covid-19 patients. Therefore, the surgical procedure and indications for tracheostomy should be revised during the covid-19 pandemic process. We aim to provide authoritative guidance for healthcare providers and healthcare systems by synthesizing our experience with tracheostomy, available evidence, and information in the literature data during the current COVID-19 pandemic.

Keywords: COVID-19, pandemia, tracheostomy, tracheostomy care.

Öz

Covid-19 pandemisi tüm dünyayı etkisi altına alan, asemptomatik veya viral pnömoni semptomlarıyla seyredebileceği gibi ciddi akut solunum yetmezliğine de neden olabilen global bir sağlık problemidir. SARS-CoV-2, diğer virüslerden çok daha geniş ve hızlı bir şekilde yayılmıştır ve küresel olarak ciddi sayıda hayat kaybına yol açmıştır. Trakeostomi, KBB ve baş-boyun cerrahları tarafından çeşitli endikasyonlarla sıkça gerçekleştirilen cerrahi bir prosedürdür ve bu prosedürün uygulanması hastaları mekanik ventilasyondan ayırmayı kolaylaştırabilir ve böylece yoğun bakım ünitesindeki (YBÜ) yatakların kullanılabilirliğini potansiyel olarak artırabilir. Trakeostomi yüksek miktarda aerosol oluşumuna neden olduğu için hem cerrahi sırasında hem de cerrahi sonrası bakım sırasında kişisel koruyucu ekipman (KKE) kullanılsa bile covid-19 enfeksiyonu yayılımı için ciddi risk oluşturan bir işlemdir. Covid-19 hastalarında trakeotominin nasıl yapılması gerektiği konusunda yeterli deneyim mevcut değildir. Bu yüzden covid-19 pandemisi sürecinde trakeostomi cerrahi prosedürü ve endikasyonları yeniden gözden geçirilmelidir. Mevcut COVID-19 pandemisi sırasında trakeostomi ile ilgili deneyimlerimizi, mevcut kanıtları ve literatürdeki bilgileri sentezleyerek sağlık hizmeti sağlayıcıları ve sağlık sistemleri için yetkili rehberlik sağlamayı amaçlıyoruz.

Anahtar Kelimeler: Covid-19, Pandemi, tracheostomy, tracheostomy care.

INTRODUCTION

The COVID-19 pandemic is a global health problem that affects the whole world and can present asymptotically or with symptoms of viral pneumonia or cause severe acute respiratory failure. It is easily transmitted from person to person through droplet and contact¹. SARS-CoV-2 has spread much more widely and quickly than other viruses and has resulted in a significant number of loss of lives at the global scale. The COVID-19 outbreak has led to an abnormal increase in the number of severe

patients in need of mechanical ventilation. Therefore, healthcare professionals have been forced to make critical decisions about the care of patients with COVID-19.

Tracheostomy is a surgical procedure that is frequently performed by ENT and head and neck surgeons with various indications, and its implementation can facilitate weaning patients from mechanical ventilation, thereby potentially increasing the availability of beds in the intensive care unit (ICU). Since tracheostomy causes a large amount of aerosol formation, it poses a

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serious risk for the spread of COVID-19 infection even if personal protective equipment (PPE) is used both during surgery and postoperative care^{2,3}. Aerosol-generating procedures have been identified as a leading cause of viral transmission in superinfections in hospitals in Hong Kong, China and Canada during the 2003 SARS outbreak⁴. Therefore, infection reports on aerosol-generating procedures have also emerged during the current pandemic⁵. There is not enough experience on how to perform tracheostomy in COVID-19 patients. For this reason, surgical procedure and indications for tracheostomy should be reconsidered in this COVID-19 pandemic process. We aim to provide authoritative guidance for healthcare providers and healthcare systems by synthesizing our experience with tracheostomy, available evidence, and literature data during the current COVID-19 pandemic.

Decision-Making for Tracheostomy

The decision of tracheostomy, often a life-saving procedure, has become a critical decision that should be considered well during the COVID-19 pandemic. This decision should be made in a way to ensure the safety of the team performing the procedure at the maximum level while providing a safe airway to the patient². Pandemic preparations were already available for fatal and easily transmitted respiratory infections during the influenza A H5N1 virus epidemic. We hope that careful implementation and management of tracheostomy also during this pandemic will help reduce the effect of COVID-19. Nearly 10% of patients who must be hospitalized in the ICUs need mechanical ventilation and tracheostomy⁶. The main indication for tracheostomy is to save the patient from prolonged mechanical ventilation by minimizing complications from the translaryngeal endotracheal tube. Surely, tracheostomy may be needed in cases of airway

obstruction, decreased removal of secretions due to disease-related weakness, difficulty in coughing or to avoid failed extubation caused by combinations of all these. Deciding on tracheostomy during the COVID-19 outbreak is mainly based on current practice standards; however, the evidence basis for the timing of tracheostomy is not important in those with critical illness⁷. Even among non-COVID-19 patients requiring tracheostomy after a long period of mechanical ventilation, at least half do not survive more than 1 year, and less than 12% can live independently at home in the 1-year period⁸. Similarly, tracheostomy may not always be beneficial for patients with COVID-19, and the procedure and tracheostomy care increase the risk of SARS-CoV-2 infection for healthcare professionals. In this regard, patients and / or their relatives should be explained that tracheostomy often implies additional healthcare services, which require long-term functional dependence and rehabilitation.

During the 2003 SARS epidemic, a comparison was made between healthcare professionals performing and not performing aerosol-generating procedures, and higher rates of SARS transmission were observed in those performing tracheal intubation and tracheostomy compared to those performing non-invasive ventilation and manual ventilation before intubation⁴. After the symptoms begin, the viral load typically decreases within the next 3-4 days⁹. In most patients, PCR results of samples from the lower respiratory tract remained positive for SARS-CoV-2 up to 39 days even after samples from the upper respiratory tract became negative¹⁰. When should be the best time to perform the tracheostomy procedure? Based on the local data and published case series of centers treating COVID-19 patients around the world, the 10-21th days of hospitalization in the ICUs or the

16-30th days from the onset of symptoms corresponds to the time interval in which the lowest levels of SARS-CoV-2 RNA detectable by PCR and the highest level of total antiviral antibodies are observed. This time interval is suitable for performing tracheostomy^{11,12,13-17}. Further studies are surely needed to identify the immune response to SARS-CoV-2 and to determine the viral load produced by various aerosol-generating procedures in critically ill patients, immunocompromised patients and those with comorbidities.

Delaying tracheostomy in COVID-19 patients decreases the risks for healthcare professionals; however, such delay-related translaryngeal intubation time causes complications such as prolonged mechanical ventilation and ICU stay. Although tracheostomy is a procedure at risk of infection transmission, extubation with a low probability of success also carries the same risk. Recovered patients in need of ventilator support can be transferred to low-intensity services with minimal sedation, easier care, and transfer opportunities through tracheostomy. Although tracheostomy is beneficial for carefully selected patients who have recovered from COVID-19-associated pneumonia, we do not recommend tracheostomy, unless required, in patients who still need a large amount of inspired oxygen, have high ventilation requirements, and may require prone positioning as a part of their ventilation strategy¹⁸. Providing adequate PPE to ensure the safety of the healthcare team during the treatment of COVID-19 patients in the ICUs is among the most important measures to be taken by the healthcare team. High quality intensive care service planned according to the characteristic pathophysiology can reduce the need for tracheostomy in the acute respiratory distress syndrome associated with COVID-19¹⁹. In the light of case series and literature data, we

recommend that tracheostomy be delayed until at least the second week of mechanical ventilation and performed only in patients with a tendency to recover. However, during the pandemic, tracheostomy should be delayed until the COVID-19 status is determined by PCR test in all patients without complete or near-complete airway obstruction and the need for emergency tracheostomy^{20,21}.

The decision of tracheostomy should be made with a multidisciplinary approach together with the surgeon and anesthesiologist in COVID-19 PCR-positive patients, and if elective tracheostomy is possible, it should be delayed until the patient's test result turns negative. Elective tracheostomy should not be performed in clinically suspected COVID-19 patients until the clinical suspicion is eliminated even if their COVID-19 PCR test results are negative. All patients with unknown COVID-19 status and requiring emergency tracheostomy should be considered COVID-19-positive cases, and the surgical procedure should be performed accordingly^{2,21-23}.

Surgical Procedure

Healthcare professionals performing tracheostomy should take into consideration the additional issues regarding the infectivity of SARS-CoV-2. The tracheostomy procedure should ideally be performed in negative-pressure operating rooms and using powered air-purifying respirators (PAPR), if possible. If not possible, it should be performed in rooms where the doors are closed, and no entry and exit are allowed during the procedure²³.

The number of people in the team required for the tracheostomy procedure should be minimized as much as possible. The team should consist of an experienced surgeon, an experienced anesthesiologist and an experienced surgical

nurse. Creating the surgical team with the most experienced personnel significantly reduces the risk of transmission and exposure^{21,24}.

We strongly recommend that all personnel present during the procedure have complete personal protective equipment consisting of FFP3 / N99 or FFP2 / N95 mask, protective goggles, full-face shield, impermeable gown, bonnet, and double gloves. Besides, the presence of PAPR in PPE will minimize the risk of transmission. Since team members will have difficulty in communicating during the use of personal protective equipment, it will be beneficial to use devices such as Bluetooth headsets to discuss and plan the surgical stages of tracheostomy in advance or to communicate^{21,25}.

Prior to surgery, at least two non-fenestrated, cuffed tracheostomy cannulas of different sizes should be available. Whichever technique is used, careful selection of the tracheostomy tube and meticulous evaluation after insertion is essential to minimize the risks of subsequent displacement, especially in obese patients²⁶. The tracheostomy procedure should always be performed under neuromuscular blockade, which results in deep sedation and complete paralysis in order to prevent the patient from coughing^{2,23}. We recommend that the surgical team continue to perform tracheostomy using the techniques and equipment they are familiar with and confident of. Percutaneous tracheostomy is more likely to cause aerosol formation compared to surgical approaches. Therefore, surgical tracheostomies should generally be preferred to percutaneous tracheostomies during the SARS outbreak^{27,28}. We recommend attempting preoxygenation followed by apnea in a patient in the supine position before tracheostomy in the intensive care unit. Rapid desaturation during these attempts can delay tracheostomy by predicting a similar response during

tracheostomy. The tolerance of apnea should not replace the multidisciplinary clinical judgment regarding the risks and benefits of performing tracheostomy in a particular patient¹⁸.

Before the tracheal incision, the patient should be provided with 100% oxygenation for 5 minutes. Then, after mechanical ventilation is stopped, the intubation tube cuff should be deflated, pushed about 3 cm forward and inflated again. Closed-circuit anesthesia is ensured in this way. Making the tracheal incision following these steps minimizes the risk of perforated intubation tube cuff and aerosol formation. After the appropriate tracheal incision is made, the intubation tube should be withdrawn far enough to exceed the incision level. Before removal of the intubation tube, the suitable tracheostomy cannula should be inserted quickly, and its cuff should be inflated. Ventilation should be restarted after ensuring that the tracheostomy cannula cuff is inflated. The intubation tube should be completely removed following the confirmation of ventilation by end-tidal CO₂ measurement. A surgical mask should be worn to the patient when the intubation tube is completely removed^{21,25,29}.

The use of electrocautery and aspirator should be minimized as much as possible since it may cause aerosolization during surgery^{21,25}.

Postoperative Tracheostomy Care

All relevant healthcare professionals should be trained on tracheostomy care. Postoperative tracheostomy care should always be provided with complete personal protective equipment. As the aspiration procedure will cause a large amount of aerosol formation, only closed-circuit aspiration systems should be used².

The tracheostomy cannula cuff should not be deflated until a negative COVID-19 test result is obtained, and the risks are eliminated. Tube replacement should be delayed until the

infectivity of patients disappears³⁰. Although cannula replacement is not recommended in the early period, it should be performed properly with complete personal protective equipment when required². During the replacement of the tracheostomy cannula, ventilation should be stopped before deflating the cuff, then ventilation should be resumed after the cuff is deflated, the new tracheostomy cannula is inserted quickly, and the cuff is inflated²⁰. Humidification and disposable inner cannulas are preferred to protect against tube occlusion from respiratory secretions and to reduce the need for aspiration³¹. If an inner cannula is used, we recommend you reduce the frequency of replacement and check its condition daily. We recommend a simple heat and moisture exchanger that provides adequate humidification and does not cause aerosol formation³². Weaning from mechanical ventilation is usually managed by gradual decreases in the levels of pressure support ventilation, tube cuff deflation periods, use of vocalization strategies, cough augmentation and rehabilitation of swallowing. The aerosol generating potential of a patient undergoing tracheostomy, with positive pressure ventilatory support and a deflated cuff is similar to that of a patient receiving continuous positive airway pressure through non-invasive ventilation, although different ventilators possibly produce different maximum flows⁴. Patients infectious and clinically ready to undergo tube cuff deflation attempts should be managed by experienced personnel with complete PPE in places reserved for the treatment of COVID-19 patients. Decannulation should be considered as soon as possible and managed by a multidisciplinary tracheostomy team.

CONCLUSION AND RECOMMENDATIONS

The decision of tracheostomy should be made with a multidisciplinary approach during the COVID-19 pandemic.

Indications and stages of the surgical procedure should be reconsidered, as the tracheostomy procedure causes a significant amount of aerosol formation and provides a basis for the spread both during surgery and in the postoperative period.

Pre-creation of teams to perform tracheostomy and pre-planning the stages of the procedure will minimize possible virus exposure during the pandemic.

All elective tracheostomies should be delayed until a negative COVID-19 test result is obtained, and the clinical suspicion is eliminated for the patient.

In emergency tracheostomies where there is not enough time to perform COVID-19 test, the patient should be considered a COVID-19-positive case, and the procedure should be continued accordingly.

Only closed-circuit aspiration systems should be used during tracheostomy care.

The cuff pressure of the tracheostomy cannula should be checked periodically, and the cuff should never be deflated.

Tracheostomy care should be provided with complete personal protective equipment (N99 / FFP3 or N95 / FFP2 mask, protective goggles, full-face shield, impermeable gown, bonnet and double gloves).

Decannulation should be considered as soon as possible and managed by a multidisciplinary tracheostomy team.

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