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THE ROLE OF TRACHEOTOMY IN WEANING FROM MECHANICAL VENTILATION IN PATIENTS WITH COVID-19

COVID-19 HASTALARINDA MEKANİK VENTİLASYONDAN AYRILMADA TRAKEOTOMİNİN ROLÜ

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ABSTRACT

Objective: Significant numbers of COVID-19 patients require invasive mechanical ventilation support during their treatment. Prolonged mechanical ventilation causes a tracheotomy need in some of those patients.

The study aimed to assess the possible benefits of tracheotomy in patients with COVID-19 and its effect on clinical outcomes.

Material and Method: Six patients with COVID-19 who underwent an open tracheotomy in our institution were retrospectively reviewed. Its effect on the prognosis, the effectiveness of the safety precautions, and personnel protective equipment (PPE) utilization during the tracheotomy procedures was evaluated.

Results: Mean intubation period before a tracheotomy was 21 days (range,14-28). All patients were male with a mean age of 62. Five of them died postoperatively. One patient was discharged and decannulated. None of the airway team members were infected after the procedures.

Conclusion: Tracheotomy in COVID-19 patients is a safe procedure when appropriate PPE measures are taken. Our data do not support the contribution of tracheotomy to accelerating ventilator weaning in patients with COVID-19.

Keywords: COVID-19, Tracheotomy, Mechanical ventilation

ÖZET

Amaç: COVID-19 hastalarının önemli bir kısmına, tedavileri sırasında invazif mekanik ventilasyon desteği gerekir. Uzun süreli mekanik ventilasyon, bu hastaların bazılarında trakeotomi ihtiyacını ortaya çıkarır.

Çalışmada, COVID-19 hastalarında trakeotominin olası faydalarını ve klinik sonuçlar üzerindeki etkisinin değerlendirilmesi amaçlandı.

Gereç ve Yöntem: Kurumumuzda açık trakeotomi yapılan altı adet COVID-19 hastası retrospektif olarak incelendi. Trakeotomi işlemleri sırasında güvenlik önlemlerinin etkinliği, kişisel koruyucu ekipman (KKE) kullanımı ve işlemin prognoza etkisi değerlendirildi.

Bulgular: Trakeotomi öncesi ortalama entübasyon süresi 21 gündü (aralık, 14-28). Tüm hastalar erkekti ve ortalama yaş 62 idi. Hastaların beşi ameliyat sonrası dönemde öldü. Bir hasta taburcu edildi ve dekanüle edildi. İşlemlerden sonra havayolu ekibinin hiçbir üyesi enfekte olmadı.

Sonuç: COVID-19 hastalarında trakeotomi, uygun KKE önlemleri alındığında güvenli bir işlemdir. Verilerimiz, COVID-19'lu hastalarda trakeotominin hastaları mekanik ventilatörden ayırmayı kolaylaştırdığını desteklemedi.

Anahtar Kelimeler: COVID-19, Trakeotomi, Mekanik ventilasyon

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INTRODUCTION

Coronavirus disease 2019 (COVID-19), caused by SARS-CoV-2, has rapidly spread worldwide and caused critical effects on the healthcare system. It has been reported that 6-25% of the affected patients need to be treated in intensive care units (ICU) (1-3). Among them, most of the patients are followed by invasive mechanical ventilation. Besides, 10% of those patients required prolonged (more than 14 days) ventilation support (3). Performing tracheotomy to these patients brings out the concern of infection transmission risk to healthcare providers. Although human-to-human transmission of the SARS-CoV-2 primarily occurs through respiratory droplets and close contacts, airborne transmission can be seen during some clinical procedures that are likely to create aerosols (4). Among these, open tracheostomy is one of the most concerning procedures for an otolaryngologist. Therefore, some brief reports and guidance making suggestions about the surgical procedure and personal protective equipment (PPE) utilization were published during the early period of the outbreak (5-9). More knowledge has started to accumulate after recent case series were published regarding tracheotomy in COVID-19 patients (2, 3, 10, 11).

Herein, we report our experience of tracheotomy during the COVID-19 pandemic.

MATERIAL AND METHOD

Our institute was declared as an 'Pandemic Hospital' by the Ministry of Health, a week after the first case was seen in Turkey. Therefore, our department reorganized its working system accordingly and created an airway team consisting of three experienced surgeons for the possible need for tracheotomy in COVID-19 patients. The indications for tracheotomy in COVID-19 patients were determined with joint decisions made by anesthesiologists and our airway team together. These indications are (a) prolonged mechanical ventilation (more than 14 days), (b) facilitating weaning from mechanical ventilation, (c) pulmonary toilet for those with secondary bacterial pneumonia, (d) reducing death space in those with hypoxia despite endotracheal intubation and (e) patients with life expectancy. All tracheotomies were performed by two surgeons among our airway team according to the tracheotomy guidelines for COVID-19 (7-9).

RESULTS

Six patients with confirmed COVID-19 have undergone a bed-side open tracheotomy in our institution until now. All patients were male, and the mean age of the patients was 62.2 (range:43-78). The mean number of days followed up as intubated before tracheotomy was 21 (range 14-28). Half of the patients required changing of the tracheotomy cannula postoperatively (one for air leakage five days after the procedure, one for decannulation 12 days after the procedure, and one for obstruction by dried secretions 20 days after the procedure). As of June 12, five patients have died, one patient was discharged home and decannulated. The average life span after tracheotomy of patients who died was 28.2 days (range: 7-43). The only patient, who was healed and discharged, stayed in hospital 33 days after the tracheotomy. He was decannulated two weeks after treatment completion. He was weaned from mechanical ventilation two days after the procedure. None of the remaining five patients could be weaned from ventilation support during their ICU stay. Patients' information and outcomes are given in Table 1.

No complication during the procedures or early postoperative period was observed. None of the team members developed any sign of the infection after the procedures.

DISCUSSION

There are few publications reporting about performing tracheotomies during the severe acute respiratory syn-

Table 1: Patients' information and outcomes

Case no	Gender	Age	Comorbidities	Intubation period (before tracheotomy) (days)	Post-tracheotomy period (days)	Outcome
1	M	67	Diabetes	14	43	Died
2	M	60	RHD, history of stroke without any sequelae	24	33	Discharge
3	M	62	Diabetes, atrial fibrillation, hypertension	21	36	Died
4	M	78	Diabetes, hypertension	24	41	Died
5	M	43	-	28	7	Died
6	M	63	Diabetes, COPD, lung cancer	15	14	Died

M: Male, RHD: Rheumatic heart disease COPD: Chronic obstructive pulmonary disease

drome (SARS) outbreak in 2003, and Tay et al. reviewed them to generate a baseline knowledge for approaching COVID-19 patients who need a tracheotomy (6). They suggested that tracheotomy is a safe procedure when appropriate measures, including PPE, are taken. Cui et al. performed tracheotomy on six patients with COVID-19 (10). Three of them for prolonged intubation, one for preventing aspiration pneumonia (in a patient with cerebral infarction), one for tracheal bleeding, and one for repeated attempts of extubation and re-intubation. The majority of their patients did not benefit from tracheotomy (two of them died, two patients were still in a coma). Recently, a paper reported that no healthcare workers were infected after tracheotomies in 32 patients with COVID-19. The average age of their cases was 62, which is the same as ours. The pre-tracheotomy mean intubated period was 15 days. Twenty-two of their cases were open tracheotomy, while ten were percutaneous. Open tracheotomies were performed in a negative pressure operating theatre (11). Unfortunately, our hospital does not have any negative pressure operating rooms or ICU rooms. Therefore, we preferred bed-side tracheotomy to minimize the risk of transmission during patient transportation. Fifteen percent of their patients died, and 25% were healed and discharged (11). Broderick et al. performed tracheotomy in 10 patients with COVID-19 (3). All patients were male,the same as our cases. The mean age was 57.3. They defined four criteria for tracheotomy indication in COVID-19 patients, including (a) intubation for close to 14 days or more, (b) FiO_2< 40%, positive end-expiratory pressure (PEEP) below 15, (c) apyrexial, cardiovascularly stable, reducing inflammatory markers, and (d) tracheostomy requirement for weaning. The outcomes of their cohort were quite successful. Six out of 10 patients were discharged from ICU, and all of them were decannulated. The average decannulation time was 16 days (3).

In our case series, only one patient was permanently weaned from mechanical ventilation until today. Unfortunately, the remaining five patients died. Five out six patients continued to stay in the ICU more than two weeks after the tracheotomy procedure in contrast to the idea that was suggested earlier that critically ill patients are likely to be recovered or died within a short period (5). Even our healed patient stayed 33 more days in the hospital postoperatively. Mattioli and colleagues also suggested that COVID-19 related acute respiratory distress syndrome often requires prolonged intubation (2). Considering the long stay in the ICU of the patients, tracheotomy may be helpful to prevent the complications of prolonged endotracheal intubation. However, we observed no benefit of tracheotomy to survival of patients and weaning from the ventilator in our cases. Therefore, we suggest case-by-case decision making, considering each patients' individual clinical status and life expectancy. Tracheotomy can be delayed as long as possible to wait for viral load reducing, hence transmission risk can be decreased.

A critical problem we encountered in our first case was that an excessive purulent discharge came out from the trachea just after the tracheal incision. We had to use suction at this point. Even though the suction was open for a short period, it might have generated significant amounts of aerosols that may have carried viral particles. We suggest performing endotracheal aspiration by a closed tracheal suction system with a viral filter before the procedure to minimize suction needs during the procedure. It is mentioned that the need for a pulmonary toilet is less in COVID-19 than bacterial pneumonia (5). However, considering the high incidence of ventilator-associated pneumonia (VAP) (1.4%) (12) within patients in the ICU, secondary bacterial pneumonia can bring out the indication of a pulmonary toilet. All patients in our case series had developed secondary bacterial infections during the pre-tracheotomy period. Therefore, we considered a pulmonary toilet as a possible indication in our institution.

Another concern that comes up with tracheotomy is postoperative care of a tracheostomy cannula. Half of our patients required cannula changing due to a variety of causes. All cannula changing procedures were performed successfully using appropriate PPE.

There has been no defined timing for tracheotomy in COVID-19 patients yet. However, in current literature, there is a tendency to wait two or three weeks before a tracheotomy. It is not recommended to perform tracheotomy within the first ten days in terms of the fact that a surgical procedure may deteriorate patients' clinical status. Additionally, high viral load during the early period of the disease may cause a higher transmission rate.

CONCLUSION

PPE and safety precautions are of the utmost importance when performing tracheotomy in patients with COVID-19. While early results revealed that some patients might benefit from a tracheotomy in terms of facilitating weaning from mechanical ventilation, our case series did not support this data. When the high mortality rate in our case series is considered, we concluded that prolonged intubation might not be accepted as a primary indication for tracheotomy on COVID-19 patients. As the experience of tracheotomy in COVID-19 continues to be shared, the appropriate timing and the benefits of the procedure may be understood more clearly.

Ethics Committee Approval: This study was approved by the Ethical Committee of the Istanbul University, Istanbul Faculty of Medicine (Date: 29.05.2020, No: 86530).

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REFERENCES

1. Michetti CP, Burlew CC, Bulger EM, Davis KA, Spain DA. Performing tracheostomy during the Covid-19 pandemic: guidance and recommendations from the Critical Care and Acute Care Surgery Committees of the American Association for the Surgery of Trauma. Trauma Surg Acute Care Open 2020;5:e000482. [CrossRef]
2. Mattioli F, Fermi M, Ghirelli M, Molteni G, Sgarbi N, Bertellini E, et al. Tracheostomy in the COVID-19 pandemic. Eur Arch Otorhinolaryngol 2020;277:2133-35. [CrossRef]
3. Broderick D, Kyzas P, Baldwin AJ, Graham RM, Duncan T, Chaintoutis C, et al. Surgical tracheostomies in COVID-19 patients: A multidisciplinary approach and lessons learned. Oral Oncol 2020;106:104767. [CrossRef]
4. World Health Organization. Modes of transmission of virus causing COVID-19: implications for IPC precaution recommendations. https://www.who.int/publications-detail/modes-of-transmission-of-virus-causing-covid-19-implications-for-ipc-precaution-recommendations. Accessed 23 May 2020
5. Vukkadala N, Qian ZJ, Holsinger FC, Patel ZM, Rosenthal E. COVID-19 and the otolaryngologist - preliminary evidence-based review. Laryngoscope 2020;130(11):2537-43. [CrossRef]
6. Tay JK, Khoo ML, Loh WS. Surgical Considerations for Tracheostomy During the COVID-19 Pandemic: Lessons Learned From the Severe Acute Respiratory Syndrome Outbreak. JAMA Otolaryngol Head Neck Surg 2020;146(6):517-8. [CrossRef]
7. Harrison L, Ramsden J, Winter S, Rocke J HE. Tracheostomy guidance during the COVID-19 Pandemic. ENT UK. https://www.entuk.org/tracheostomy-guidance-during- covid-19-pandemic. Published 2020. Accessed 22 March 2020.
8. Canadian Society of Otolaryngology-Head and Neck Surgery. Recommendations from the CSO-HNS Taskforce on Performance of Tracheotomy During the COVID-19 Pandemic. https://www.entcanada. org/wp-content/upload. Accessed 2 April 2020.
9. Orhan KS, Keles MN, Aydemir L, Sen C. COVID Hastalarında Trakeotomi-Öneriler ve Uygulama Videosu. https://www.kbb.org.tr/haber/covd-hastalarinda-trakeotomi-oneriler-veuygu-9317. Accessed 20 May 2020.
10. Cui C, Yao Q, Zhang D, Zhao Y, Zhang K, Nisenbaum E, et al. Approaching Otolaryngology Patients During the COVID-19 Pandemic. Otolaryngol Head Neck Surg 2020;163(1):121-13. [CrossRef]
11. Turri-Zanoni M, Battaglia P, Czaczkes C, Pelosi P, Castelnuovo P, Cabrini L. Elective Tracheostomy During Mechanical Ventilation in Patients Affected by COVID-19: Preliminary Case Series From Lombardy, Italy. Otolaryngol Head Neck Surg 2020;163(1):135-7. [CrossRef]
12. Rosenthal VD, Maki DG, Jamulitrat S, Medeiros EA, Todi SK, Gomez DY, et al. International Nosocomial Infection Control Consortium (INICC) report, data summary for 2003-2008. Am J Infect Control 2010;38(2):95-104. [CrossRef]