


Tracheostomy in COVID-19 Patients in India's Largest COVID Hospital: Our Experience

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ABSTRACT

Objective: To describe our experience of performing open tracheostomy for coronavirus disease-2019 (COVID-19) patients using available equipment and supplies at our institution.

Materials and methods: The present study is a narrative review and sharing of experiences of healthcare workers in performing tracheostomies in COVID-19 patients. Twenty-one surgical tracheostomies performed on COVID-19 patients over a period of 9 months (April–December 2020) were considered for the study at a tertiary care teaching hospital and the largest dedicated center to treat COVID-19 patients.

Results: There were 14 males and 7 females with severe SARS-CoV2 infection requiring long-term intubation from April to December 2020. The mean age was 49 years. Open surgical tracheostomy was performed in all the patients. The specific indications, contraindications, timing, preoperative protocols, surgical steps, and precautions taken have been discussed. Intubation time range was 5–14 days. Our experience on tracheostomy during the COVID-19 pandemic are presented in this study.

Conclusion: Tracheostomy is an aerosol-generating procedure which is a trade-off between healthcare worker's safety and patient care along with proper use of available resources and so there is a need for sharing of experience from various centers.

Keywords: Coronavirus disease-2019, Tracheostomy, Tracheostomy timing.

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MAIN POINTS

- No COVID infection was transmitted to the healthcare workers during the surgical procedure.
- Open tracheostomy wearing PPE kits in COVID patients is a challenging task.
- Extreme care and planning is needed to prevent the transmission of virus to healthcare workers as open tracheostomy is a high aerosol generating procedure.

INTRODUCTION

In December 2019, a surge in pneumonia cases was identified in the Hubei province of China.¹ The China Center for Disease Control and Prevention identified and named this virus as a novel coronavirus 2019. The disease caused by the novel coronavirus was declared a public health emergency and a pandemic by the World Health Organization (WHO) after 1 month.²

Due to spread of coronavirus disease-2019 (COVID-19) pandemic, healthcare systems around the world have been facing unprecedented challenges since 9 months. To manage the intensive care unit (ICU) because of the sudden increase in critically ill patients is challenging.

Tracheostomy is an intervention performed very frequently by ENT surgeons around the world, ensuring the airway quickly, with very clear and reproducible steps.³ Tracheostomy produces high aerosol which puts healthcare workers at risk of infection during the procedure.^{2,4}

Nevertheless, the role of tracheotomy in critically ill patients with COVID-19 is yet unknown, and there is no clear indication of the timing of tracheotomy after orotracheal intubation (OTI) in these patients. Indeed, tracheostomy offers several other advantages,

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such as reducing sedative and paralytic medical support, facilitating airway suctioning and clearance of secretions, and preventing tracheal stenosis.^{3,5}

COVID-19 viral infection is highly contagious, and thus there is a high potential of healthcare workers getting infected while operating on these patients. Tracheostomy in COVID-19-infected patients requires meticulous decision-making and pre-procedure planning.

In spite of 9 months of the disease progression worldwide, information and literature available on performing tracheostomy in COVID-19 patients is sparse. Considering the safety of healthcare

workers, this article aims to report our experience of performing tracheostomy during the management of COVID-19 patients. We have also shared few modifications to standard tracheostomy procedures to be followed in performing the procedure safely for COVID-19 patients

MATERIALS AND METHODS

In this prospective cohort study, we performed 21 surgical tracheostomies at our hospital which is also a largest dedicated center to treat COVID-19 patients. This study was done over a period of 9 months (April–December 2020). Institutional Ethical Clearance from the institute and associated hospital was not needed for the study. Written informed consent was taken from every patient before performing tracheostomy procedure.

Indications for Tracheostomy

The most common indication of doing tracheostomy in ICU is for prolonged ventilation. This remains same in COVID-19-associated pneumonia with additional benefit in poor cough reflex, tenacious secretions, respiratory muscle weakness and threatened airway obstruction.²

It decreases sedation requirements, avoids pressure-induced trauma to the trachea, and may also reduce the severe physical deconditioning associated with prolonged mechanical ventilation. The role and timing of tracheostomy is unclear for patients requiring critical care for COVID-19 disease.⁶

Contraindications for Tracheostomy

- The contraindication for performing tracheostomy in COVID-19 patients remains same as for a routine tracheostomy, such as deranged coagulation profile, pneumothorax, and difficult surgical access to trachea.
- Non-availability of standard recommended protection equipment remains an absolute contraindication owing to very high infectivity rate of COVID-19.
- Avoidance of tracheostomy in COVID-positive patients is warranted in recovering patients who need high fractions of inspired oxygen, have high ventilator requirements and need for proning to improve oxygenation as treatment strategy.⁷
- High Sepsis-related Organ Failure (SOFA) assessment score indicates very poor prognosis and patient is unlikely to benefit from tracheostomy.²

Methods to Prevent Aerosolization

Studies^{4,8–10} reveal various methods to prevent aerosolization:

- Open tracheostomy is thought to result in less exposure to COVID-19 virus when compared with percutaneous tracheostomy; hence, it is a preferred choice among the two.
- Continuous oral and endotracheal suction minimize aerosol generation during the procedure.
- Powered air purifying respirator (PAPR) personal protective equipment (PPE) is more effective than conventional PPE in preventing aerosol transmission.
- A negative flow hood using Yankauer suction tube, poole tip suction, and electrocautery suction device over the operative field is an effective way to reduce aerosol dispersion.
- The anesthesia machine can be paused of ventilation before the trachea is entered.
- A modified filtered T piece device that allows patients to be on tracheostomy collar without aerosolization.

Table 1: Demographic details of COVID-19 patients that underwent open tracheostomy

S. No.	Demographic details	Tracheostomy patients (n = 21)
1.	Age	20–77 years
2.	Gender	Males – 14 Females – 7
3.	Comorbidities	Diabetes mellitus – 18 Hypertension – 11 Chronic kidney disease – 2 Malignancy – 1 Tuberculosis – 1
4.	Average time of intubation	5–14 days
5.	Total COVID-19 patients admitted	15,000
6.	Patients in ICU	1,386
7.	Total tracheostomies done	21

Statistical Analysis

The present study focuses on sharing the experience of healthcare workers on performing tracheostomy in COVID-19 patients, hence no specific statistical tests were used. The demographic details of the patients were tabulated.

RESULTS

The age of the patients ranged between 20 and 77 years. All the patients who were tested COVID-19 positive by RT-PCR and having pneumonia, were admitted in ICU. Well-informed written consent was taken before the procedure in all the cases. The average time of intubation before tracheostomy was in a range of 5–14 days. Demographic details of these patients and their comorbidity status are given in Table 1. Most of the patients undergoing the procedure were males (14 patients) reflecting higher disease severity in the group. A total of 14 patients were observed with more than one comorbidity.

The indications for tracheostomy followed in our institution was based on a combined opinion of critical care team and ENT team on case-to-case basis. Early tracheostomy was advocated but not done in less than 5 days of OTI. Tracheostomy was done on day 5 of intubation in one patient owing to frequent endotracheal tube obstruction due to copious secretions and crusting. Few procedures were delayed for a maximum till 14 days owing to factors, such as low hemoglobin level, bleeding tendency, sepsis, etc.

Out of 21 tracheostomies, 20 patients succumbed to COVID-19-associated pneumonia while 1 patient was weaned off from ventilator after 35 days and was decannulated at day 40 after a successful decannulation trial.

PREOPERATIVE WORKUP

Once definitive decision was made for performing the tracheostomy, a well-informed written consent used to be obtained from patient's relatives. Patient's recent blood investigations, such as hemoglobin level, electrolytes, coagulation profile, and vitals were evaluated. ENT team consisted of a well-experienced operating surgeon and a skilful assistant well acquainted with the procedure. A critical care specialist was needed for monitoring vitals, need for analgesia,

1. Patient was positioned with adequate neck extension using shoulder roll.
2. 5 mL of 2% lignocaine with adrenaline in a concentration of 1:200000 was locally infiltrated.
3. A vertical incision was made 3-finger breath above sterna notch.
4. Subcutaneous tissue, strap muscles were separated, thyroid gland retracted up, pretracheal fascia was incised and trachea was exposed.
5. D-shaped stoma was created at level of 2nd and 3rd ring of trachea. Continuous suction was applied.
6. Cough of endotracheal (ET) tube deflated and ET tube was slowly removed till only tip is visible.
7. Tracheostomy tube was inserted, cuff inflated and ventilator connected.
8. ET tube is completely withdrawn.
9. Ventilation was started and confirmed by EtCO₂ and tidal volume graphs.
10. The tracheostomy tube was secured with ties and aseptic dressing was applied around the stoma.

Fig. 1: Stepwise illustration of open tracheostomy procedure done at our institution

sedation, muscle relaxation, and for extubation. A staff nurse and a supporting staff well familiar with the procedure completed the team.

All the team members used personal protective kits with sealed eye protecting goggles and additional face shields. Double surgical gloves were used during the surgery. Well-fitting N 95 masks were used which ensured a seal around the nose and mouth. All team members also practiced sign language to be used intraoperatively in case communication is difficult inside PPE to avoid confusion. All aseptic precautions were taken using povidone iodine and surgical sheets.

Procedures

To reduce aerosolization during the procedure, few reports suggested open surgical tracheostomy is a safer alternative compared with the standard percutaneous dilatational tracheostomy (PDT) technique which is supported by others.^{7,8,11}

In our institution, open surgical tracheostomy was done at the bedside which was shielded with curtains. [Figure 1](#) shows stepwise illustration of the procedure done at our institution.

Precautions for Surgical Team

- Decision to proceed with surgery should be thoroughly discussed with critical care team with proper risk stratification of the patient profile.
- Anticoagulants should be stopped before the recommended time interval to minimize intraoperative and postoperative bleeding.
- Adequate recommended protection should be ensured on the line of COVID-19 protocol before starting the procedure.
- Clear visibility should be ascertained after donning.
- Mode of communication should be established and rehearsed preoperatively.
- Backup operation theater should be ready to manage tracheostomy-related complications with efficient transportation to operation theater in cases done bedside in ICU.
- After opening the trachea, finger should be put over the stoma, ET tube should be pulled with bulb deflated till only tip is felt.

DISCUSSION

Comorbidity remains the most important factor in determining the severity of COVID-19 with most common being diabetes mellitus. More than one comorbidity added to the problem was

an important determinant in deciding ICU care and subsequent need for tracheostomy.

As COVID-19 treatment protocol includes anticoagulation as prophylaxis, even after taking adequate measures as stopping anticoagulants before recommended time period, generalized oozing from wounds was longer and needed meticulous hemostasis.

Few incidences of air leaks caused fogging of goggles and shields leading to difficulty in performing procedure were also reported by the team members.

Maximum aerosol generation occurs at the time of entering the trachea so ventilator pause for a brief duration of time can potentially reduce aerosol generation.

Continuous suction after tracheal stoma creation by one dedicated team member remains crucial to minimize exposure.

Ensuring communication with emergency sign language proved to be beneficial and imparted confidence among team members.

Securing the tracheostomy tube is crucial as inadequately tied tubes may leak or come out leading to panic thereby threatening patients' life along with healthcare workers safety.

Following our safety precaution guidelines, none of our ICU attending ENT surgeons got COVID-19 infection.

Timing of Tracheostomy

Chao et al. originally recommended deferring tracheostomy beyond 21 days of intubation and recommended open surgical tracheostomy over PDT.⁸ Early guidelines from the UK and national bodies suggested a cautious approach to tracheostomy in patients with COVID-19 avoiding before 10 days of intubation, allowing for a sufficient decline in viral load.^{6,12} Reports now suggest, when COVID-19 overwhelms capacity in ICUs, early timing of tracheostomy may accelerate ventilator weaning and free-up critical equipment, staff, and units. Updated guidelines now recommend that timing of tracheostomy consider scarcity of ventilators and other ICU resources.^{6,7,9}

McGrath et al. suggested that tracheostomy be delayed until at least day 10 of mechanical ventilation and considered only when patients are showing signs of clinical improvement.⁷

Due to tracheostomy being at the intersection of patient benefit versus healthcare worker risk, the timing of doing this procedure in COVID-positive intubated patient still remains inconclusive and needs more data and demand extensive research in this field.

The present study was done to share the unique experiences of healthcare workers in doing common procedure like tracheostomy (open tracheostomies), which was done in daily practice and our limitations include small sample size (no sample size estimation and power analysis was done) and data on percutaneous tracheostomies done in ICU could not be availed.

CONCLUSION

Tracheostomy is an aerosol-generating procedure with a fine line between healthcare worker's safety and patient care along with proper use of available resources and so there is a need for sharing of experience from various centers in order to devise a common protocol to improve patient benefit and healthcare workers safety. COVID-19 pandemic management needs proper planning and understanding and this study adds to that especially in planning tracheostomy in ICU patients. With proper planning and following guidelines, the chances of COVID-19 infection could be reduced in healthcare workers and also reduces surgical challenges during the procedure, thus safeguarding patient safety.

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AUTHOR CONTRIBUTIONS

Ravi Meher: Conceived and Designated the Analysis, Collected the Data; Vikas Kumar: Collected the data, contributed data or analysis tools, performed the analysis, wrote the Paper; Vikram Wadhwa: Conceived and designated the analysis, contributed data or analysis tools; Ishwar Singh: Conceived and designated the analysis, contributed data or analysis tools; Praveen Kumar Rathore: Conceived and designated the analysis, contributed data or analysis tools; Munisha Agarwal: Conceived and designated the analysis, contributed data or analysis tools.

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