



## SPECIAL ARTICLE COVID-19

## Tips and Pearls for Tracheostomy during the Covid-19 Pandemic

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**Abstract**

The number of critically-ill coronavirus disease 2019 (Covid-19) patients requiring mechanical ventilation is on the rise. Most guidelines suggest keeping the patient intubated and delay elective tracheostomy. Although the current literature does not support early tracheostomy, the number of patients undergoing it is increasing. During the pandemic, it is important that surgeons and anesthesiologists know the different aspects of tracheostomy in terms of indication, procedure, tube care and complications. A literature search was performed to identify different guidelines and available evidence on tracheostomy in Covid-19 patients. The purpose of the present article is to generate an essential scientific evidence for life-saving tracheostomy procedures.

**Keywords**

- ▶ Covid-19
- ▶ tracheostomy
- ▶ ventilation
- ▶ health care worker
- ▶ PPE

**Introduction**

The purpose of the present article is to provide information about different aspects of tracheostomy during the coronavirus disease 2019 (Covid-19) pandemic in terms of indications, procedure, tube care and complications. Currently, in India, 4.16% of Covid-19-positive patients are critically ill, requiring ventilator support.<sup>1</sup> The mortality rate among those patients is higher than 85%. The risk of viral transmission versus the complications resulting from prolonging translaryngeal intubation should be balanced. The present paper will serve as an essential scientific evidence guide to healthcare workers (HCWs) who are susceptible to exposure to severe acute respiratory syndrome coronavirus 2 (SARS-Cov-2) during life-saving tracheostomy procedures. Many guidelines have been made during the pandemic. The present paper aims to collect the general guidelines and evidence on tracheostomy in the Covid-19 pandemic.

**Materials and Methods**

A literature search was performed with terms such as *tracheostomy, tracheotomy, Covid-19, SARS-CoV2, tracheal intubation, percutaneous tracheostomy, surgical tracheostomy* and *guidelines* in the PubMed, EMBASE, OVID, Scopus and Google Scholar databases. All articles were scrutinized and shortlisted by the authors. The articles on guidelines and with data on tracheostomy in Covid-19 patients were included in this manuscript.

**Indications for Tracheostomy**

The decision to perform tracheostomy in Covid-19 patients is taken by a multidisciplinary team, which includes the anaesthesiologist, otorhinolaryngologist and physician in charge. There is limited high-quality data to guide the optimal timing of tracheostomy in these patients. Factors like availability of

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health resources, potential risks and benefits to the individual patient and HCWs should be considered during the decision.<sup>2</sup>

### Timing of Tracheostomy

Most guidelines suggest performing elective tracheostomy after a negative Reverse Transcriptase Polymerase Chain Reaction (RT-PCR) test. It may not be optimal to wait for a negative Covid-19 test before submitting the patient to tracheostomy. The University of California, San Francisco (UCSF), Covid-19 Clinical Working Group recommends that the tracheostomy should ideally be performed when the patient is Covid-19-negative (the patients should have two negative Covid-19 PCR tests before surgery).<sup>3</sup> The Covid-19 Tracheostomy Task Force of the University of Pennsylvania Health System recommends not to perform tracheostomy before 21 days of intubation, for prolonged ventilation.<sup>4</sup> The exact timing of tracheostomy in Covid-19 patients is still unclear. After a case-by-case multi-disciplinary evaluation, considering the availability of hospital resources, the clinical condition of the patient, and the need for tracheostomy, the decision can be made.

Early tracheostomy is believed to decrease the need for sedation, to provide better pulmonary toileting, and to promote early weaning, reducing the morbidity and mortality of the patients.<sup>5</sup> However, the TracMan randomized trial<sup>6</sup> could not demonstrate any added benefits in performing early tracheostomy in patients requiring prolonged ventilation. Most societies recommend postponing tracheostomy beyond 2 to 3 weeks. Balancing the pros and cons, Mcgrath et al.<sup>7</sup> suggested considering tracheostomy in a window of 10 to 21 days. The current literature does not support early tracheostomy, as it does not improve any clinical parameters; instead, it can pose a high risk of Covid-19 infection to HCWs.<sup>7</sup>

### Precautions to Be Taken During the Surgical Procedure of Tracheostomy<sup>3,8-15</sup>

- All tracheostomies should preferably be performed in intubated patients with complete paralysis.
- Awake tracheostomies should be discouraged to avoid the risk for HCWs, unless warranted.
- In difficult airways, if intubation fails, supraglottic airway devices can be used until a permanent airway is established.
- The procedure should preferably be performed in an operating room with negative pressure ventilation.
- Preoperative planning with proper communication with the staff and anesthesiologist should be performed.
- All team members should get sensitized about the essential steps and precautions to be taken during the procedure preoperatively.
- The procedure must be performed by an experienced surgical team.
- The number of team members in the operative room must be restricted. The roles of each member should be well-defined.
- A transparent interface can be used in addition to personal protective equipment (PPE) to reduce the exposure.<sup>16</sup> ▶ **Figs. 1**



**Fig. 1** Side view of the tracheostomy performed for a Covid-19-positive patient in a tracheostomy box.



**Fig. 2** Frontal view of the setup of the operating room setup for the tracheostomy.

and 2 show the setup for tracheostomy. ▶ **Fig. 3** shows the minimum PPE requirement.

- The use of electrocautery should be minimized, as it may lead to aerosolization.
- Ventilation should be stopped just before the incision to the trachea.
- The time interval of discontinuity in the circuit should be minimized. This time interval starts from the time of incision on trachea to the time circuit is connected to the tracheostomy tube after inserting the tracheostomy tube.
- The Endotracheal tube should be clamped before withdrawal.
- Open tracheostomies should be preferred to percutaneous tracheostomies. As multiple sequential airway dilators are used in percutaneous tracheostomies and more chance of airway manipulation is there, the risk for health care workers might be more in comparison to open tracheostomies. Moreover, it may be challenging to execute percutaneous tracheostomy in obese patients. There are more chances of injuring the tracheal wall in percutaneous tracheostomy, as it is a blind procedure. The surgeon can select the procedure as per their expertise.



**Fig. 3** The minimum requirement regarding PPE: N95 mask (may be aided with an extra triple layered mask as seen in the figure), fluid-resistant gown with hood (double gown), face shield, goggles, and boot cover.

- An operating room with negative pressure ventilation can be designated close to the Intensive Care Unit (ICU) to avoid contamination via transportation.
- In case an awake tracheostomy is necessary, the procedure must be performed by an experienced surgical team, under the presence of a critical care specialist, with complete neuromuscular blockade at least before opening the stoma.

### Posttracheostomy care<sup>9,11–14,17</sup>

- The first tube change must be delayed as long as 14 days, unless warranted.
- The tracheostomy tube should receive adequate care. An inline closed-system suctioning should be used to avoid discontinuity in the circuit. Tube suctioning should be performed at least once every two hours.
- Any procedures for a tracheostomized Covid-19 patient should be performed after wearing full PPE.
- The tracheostomy tube should be changed while wearing the proper PPE despite the negative Covid-19 status of the patient.
- After every treatment, hand hygiene should be performed with soap and water or with a handrub antiseptic solution containing ethanol and chlorhexidine.
- If the patient is on a ventilator, it is advisable to sedate the patient, preferably with a neuromuscular block. Thus, the risk of coughing and aerosol generation during the tube change can be reduced.
- Proper donning and doffing of the PPE should be followed, as well the protocols.
- All disposable material that is in contact with the patient must be disposed off properly.
- If possible, it is better to use a negative pressure room for tube care/change.
- The availability of the tracheostomy box in addition to PPE for tube change is always an adjunct.

### Anesthesiologist's Perspective

The decision to perform a tracheostomy is taken by a common consensus of all the clinicians taking care of the patient on long-term ventilation due to Covid-19. The aerosol generation at the time of the procedure and during the removal of the endotracheal tube is maximum. That is why we prefer to perform such procedures under sedation and paralysis. The tracheostomy box designed to carry out the procedure seems to add to the safety of HCWs. It provides extra protection during aerosol generation to both the anaesthesiologist and otorhinolaryngologist, besides the use of the recommended PPE<sup>18</sup> (minimum of N95 mask, double gloves, impervious disposable gown with hood, goggles, face shield, boot cover). Open tracheostomy is preferred, although percutaneous tracheostomy is not contraindicated.<sup>19</sup> As the patient is received from the ward and taken to the operating room, all of the safety checklists are performed. The patient is induced and maintained with anesthetic agents along with complete muscle paralysis. The anesthesiologist holds the endotracheal tube from the head-end side and even assists the surgeon during tracheostomy. As the surgeon confirms the trachea is ready for insertion of the tube, the anaesthesiologist pulls the endotracheal tube from the oral cavity after suctioning and deflation. After attaching the anesthesia breathing circuit to the tracheostomy tube, the position of tube is confirmed by looking for consistent capnography on the monitor. Depending on the preprocedure status of the patient and the treatment plan, reversion of the effects of the anesthetic agents and muscle relaxants may be performed.

### Discussion

The debate on timing and indication for tracheostomy in critically-ill Covid-19 patients is still ongoing, even after one year of pandemic. The many studies published until now are retrospective analyses with contrasting results: some are in favor of early tracheostomy, whereas others are not. The Queen Elizabeth Hospital Birmingham Covid-19 airway team conducted a prospective study on Covid-19 patients, and found that 30-day survival rates were high among patients who were tracheostomized as compared with those non-tracheostomized. They found that the ICU stay was relatively shorter among tracheostomized patients.<sup>20</sup> In a retrospective analysis, Kwak et al.<sup>21</sup> found that the median length of stay among patients who underwent early tracheostomy was shorter when compared with that of patients who underwent late tracheostomy. But one surgeon involved in the procedures contracted the infection.

On the contrary, a study from Italy by Volo et al.<sup>22</sup> found that early tracheostomy, scores > 6 on the Sequential Organ Failure Assessment (SOFA) and levels > 4 on the D-dimer are associated with an increased risk of death in critically-ill Covid-19 patients. This study recommended to postpone tracheostomy in critically-ill patients with SOFA scores > 6 and D-dimer levels > 4, and to consider tracheostomy after 2 weeks. In a study conducted in Japan, Nishio N et al.<sup>23</sup> also recommended to consider tracheostomy after 2 to 3 weeks after tracheal intubation in critically-ill patients.

None of the studies have balanced the long-term effects. However, more prospective studies are required to establish the timing, indication, safety and efficacy of tracheostomy in critically-ill Covid-19 patients.

## Conclusion

Various precautions to be taken during tracheostomy and tracheostomy care have been highlighted in the present article. The timing of tracheostomy in critically-ill Covid-19 patients is still unclear. As per the available literature pertaining to the timing and indication, more prospective studies are required to establish the efficacy of early tracheostomy in Covid-19 patients.

## Summary of Important Points

1. It is better to delay the procedure until the RT-PCR test is negative.
2. The procedure must be performed in a controlled setting (negative pressure ventilation room) with the team wearing PPE.
3. However, the risk and benefits to the patients and HCWs should be considered before attempting tracheostomy.
4. Proper PPE should be worn for regular tracheostomy care (tube change, suctioning), as these procedures are highly aerosol-generating.
5. The patient should be paralyzed during the tracheostomy and insertion of the tube to reduce aerosol generation.

### Declarations

The authors have no conflict of interests to declare.

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The institutional Ethical Committee approved the present study.

## References

- 1 Swamy R. Why ventilators, once the need of the hour, are now a last resort among doctors treating Covid [Internet]. ThePrint 2020 [cited 2020 Aug 24] ; Available from: <https://theprint.in/health/why-ventilators-once-the-need-of-the-hour-are-now-a-last-resort-among-doctors-treating-covid/463501/>
- 2 Tornari C, Surda P, Takhar A, et al. Tracheostomy, ventilatory wean, and decannulation in COVID-19 patients. *Eur Arch Otorhinolaryngol* 2021;278(05):1595–1604
- 3 Inpatient Adult UCSF. COVID-19 Interim Management Guidelines. <https://infectioncontrol.ucsfmedicalcenter.org/coronavirus>, Accessed date: 30 March 2020
- 4 Chao TN, Braslow BM, Martin ND, et al; Guidelines from the COVID-19 Tracheostomy Task Force, a Working Group of the Airway Safety Committee of the University of Pennsylvania Health System. Tracheostomy in Ventilated Patients With COVID-19. *Ann Surg* 2020;272(01):e30–e32
- 5 Piccin O, Albertini R, Caliceti U, et al. Early experience in tracheostomy and tracheostomy tube management in Covid-19 patients. *Am J Otolaryngol* 2020;41(04):102535. <https://pubmed.ncbi.nlm.nih.gov/32402693/>
- 6 Young D, Harrison DA, Cuthbertson BH, Rowan K. Effect of early vs late tracheostomy placement on survival in patients receiving mechanical ventilation: The TracMan randomized trial. *JAMA* 2012;309(22):2121–9
- 7 McGrath BA, Brenner MJ, Warrillow SJ, et al. Tracheostomy in the COVID-19 era: global and multidisciplinary guidance. *Lancet Respir Med* 2020;8(07):717–725
- 8 Sommer DD, Engels PT, Weitzel EK, et al. Recommendations from the CSO-HNS taskforce on performance of tracheostomy during the COVID-19 pandemic. *J Otolaryngol Head Neck Surg* 2020;49(01):23. Doi: 10.1186/s40463-020-00414-9
- 9 Parker N, Schiff B, Fritz M, et al. Tracheostomy Recommendations During the COVID-19 Pandemic. American Academy of Otorhinolaryngology – Head & Neck Surgery <https://www.entnet.org/content/tracheostomy-recommendations-during-covid-19-pandemic>
- 10 COVID 19: Considerations for Optimum Surgeon Protection Before, During, and After Operation. American College of Surgeons <https://www.facs.org/covid-19/clinical-guidance/surgeon-protection>
- 11 NTSP considerations for tracheostomy in the Covid-19 outbreak. <https://www.entuk.org/sites/default/files/NTSP%20COVID-19%20tracheostomy%20guidance%2020-Mar-2020.pdf>
- 12 BLA COVID-19 tracheostomy guideline. <https://www.britishlaryngological.org/sites/default/files/BLA%20Tracheostomy%20guideline%20-BLA%20April%202020%20FINAL.pdf>
- 13 Guideline ENT-UK. <https://www.entuk.org/tracheostomy-guidance-during-covid-19-pandemic>
- 14 Schultz P, Morvan JB, Fakhry N, et al; French Society of Otorhinolaryngology, Head, Neck Surgery (SFORL) French Society of Head, Neck Carcinology (SFCCF) French consensus regarding precautions during tracheostomy and post-tracheostomy care in the context of COVID-19 pandemic. *Eur Ann Otorhinolaryngol Head Neck Dis* 2020;137(03):167–169. Doi: 10.1016/j.anorl.2020.04.006
- 15 Lim CM, Png LH, Wen SD, Wong J, Ng SY, Toh ST. Tracheostomy in the era of COVID-19 pandemic Department of Otorhinolaryngology-Head and Neck Surgery, Singapore General Hospital Guideline.
- 16 Bertroche JT, Pipkorn P, Zolkind P, Buchman CA, Zevallos JP. Negative-Pressure Aerosol Cover for COVID-19 Tracheostomy. *JAMA Otolaryngol Head Neck Surg* 2020;146(07):672–674
- 17 Zahran M, Youssef A. Tracheostomy tube change during the COVID-19 pandemic: timing and safety considerations. *Egypt J Otolaryngol* 2020;36(01):31. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7685906>
- 18 Hiramatsu M, Nishio N, Ozaki M, et al. Anesthetic and surgical management of tracheostomy in a patient with COVID-19. *Auris Nasus Larynx* 2020;47(03):472–476. Doi: 10.1016/j.anl.2020.04.002
- 19 McGrath BA, Ashby N, Birchall M, et al. Multidisciplinary guidance for safe tracheostomy care during the COVID-19 pandemic: the NHS National Patient Safety Improvement Programme (NatPAT-SIP). [published online ahead of print, 2020 May 12] *Anaesthesia* 2020;75(12):1659–1670. Doi: 10.1111/anae.15120
- 20 Queen Elizabeth Hospital Birmingham COVID-19 airway team. Safety and 30-day outcomes of tracheostomy for COVID-19: a prospective observational cohort study. *Br J Anaesth* 2020;125(06):872–879. Doi: 10.1016/j.bja.2020.08.023
- 21 Kwak PE, Connors JR, Benedict PA, et al. Early Outcomes From Early Tracheostomy for Patients With COVID-19. *JAMA Otolaryngol Head Neck Surg* 2021;147(03):239–244. Doi: 10.1001/jamaoto.2020.4837
- 22 Volo T, Stritoni P, Battel I, et al. Elective tracheostomy during COVID-19 outbreak: to whom, when, how? Early experience from Venice, Italy. *Eur Arch Otorhinolaryngol* 2020;•••:1–9; Epub ahead of print. Doi: 10.1007/s00405-020-06190-6
- 23 Nishio N, Hiramatsu M, Goto Y, et al. Surgical strategy and optimal timing of tracheostomy in patients with COVID-19: Early experiences in Japan. *Auris Nasus Larynx* 2020;S0385–8146(20): 518–524. Doi: 10.1016/j.anl.2020.11.004 Epub ahead of print. PMID: 33272716; PMCID: PMC7674116. 1