



# Guidelines for Surgical Tracheostomy and Tracheostomy Tube Change During the COVID-19 Pandemic: A Review Article

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**Abstract** The novel corona virus disease (COVID-19) has unfolded into a pandemic and is continuing to propagate at a frightening speed. The aim of this article is to share our protocol for performing a safe surgical tracheostomy in this COVID-19 era. Tracheostomy procedures have a high risk of aerosol generation. To standardize institutional safety measures with tracheostomy, we advocate using a dedicated tracheostomy protocol applicable to all patients including those suspected of having COVID-19. We also did explore the current literature and recommendations for tracheostomy in patients with COVID-19 and studied the previous data from severe acute respiratory syndrome coronavirus 1 (SARS-CoV-1), the virus responsible for the SARS outbreak of 2003. We have prepared a protocol for performing a safe surgical tracheostomy in patients affected by COVID-19. Surgeons who might be involved in performing the tracheostomies should become familiar with these guidelines.

**Keywords** Tracheostomy · Surgical airway · Aerosol generating procedure · COVID-19 pandemic

## Pre Requisites, Risk Statement and Indication

- Aim of the protocol is to reduce the risk of viral exposure and also to prevent PPE (Personal Protective Equipment) depletion [1].

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- The benefit of performing early tracheostomy in critically ill COVID-19 patients are unclear from available data [1].
- 14–20% patients with COVID-19 may require ET (Endotracheal) intubation and ventilator support [2–5].
- Indication: For prolonged ventilation and subsequent weaning/airway access when intubation is unsuccessful [5].
- Increased risk of laryngotracheal stenosis not significantly reduced in patients with early tracheostomy (< 10 days) [1, 5, 6].
- Ventilator associated pneumonia and overall mortality—no improvement with early tracheostomy [1, 7–11].
- Prefer open over percutaneous tracheostomy.
- Aerosolized viral particles can transmit for upto 3 h or more [1, 12].
- There is no anticipated timing for viral clearance and critically ill patients may have significantly longer positive testing (upto 2–3 weeks) [1, 13].
- Decision should be taken only after discussion with the senior anesthetist and surgical team.

## Skilled Team

- Limit number of personals involved [1].
- Single dedicated team performing all tracheostomies on weekly basis.
- An experienced Anesthetist and an experienced surgeon should be doing the procedure.
- The operating team should be limited to: one surgeon, one assistant, one anesthetist, one anesthesia technician and one scrub nurse.

- Patient related records to be computerized (to reduce exposure to fomites in the form of paper, file etc.)—if digitalization not feasible, then all paper work and file writing to be undertaken by a person not involved in the above said group (outside Operation Theater).

### Patient Status

- Tracheostomy can be considered in patients with stable pulmonary status but should not take place sooner than 2–3 weeks from intubation and preferably with negative COVID-19 test and falling inflammatory markers [1].
- Avoid tracheostomy during periods of respiratory instability or heightened ventilator dependence [1].
- Trial extubation should be staved off till the patient is COVID-19 negative.

### Location

- Negative pressure ICU with adjacent waiting rooms. Tracheostomy done bedside (avoids unnecessary transport and connection and disconnection of ventilator circuits). ICU bedside tracheostomy is preferred only if infrastructure is available [14].
- If in Operation theater—dedicated area and dedicated route for patient transport should be arranged [14].

### OT Preparation

- Last case in the list if elective tracheostomy.
- Separate OR (Operating Room) for aerosol generating procedures.
- Locker for keeping valuables including mobile phone and jewellery prior to entering OT (Operation Theatre). All OT communications via intercom lines/separate OT mobile phone.
- Donning and doffing areas.
- Proper training for donning and doffing (should be supervised).
- For doffing there should be an intermediate area and shower area.
- Decrease temperature in OT—keeping in mind the people wearing PPE [1].
- Ideally negative pressure OT room.
- N 95 masks must [1].
- No reuse of PPE (Requires better data regarding safety of reuse of PPE) [1].

- PPE recommended: N95 mask, surgical cap, goggles, surgical gown, gloves, face shields to powered air purifying respirators (PAPRs) [14].
- Closed circuit suction with viral filter.

### Transfer

- Dedicated route for transport.
- Transfer ventilator should wait in the OR and patient should be transferred as soon as possible after surgery to the ICU.

### Anesthetic Considerations in OT

- Complete muscle paralysis for already intubated patient/monitored anesthesia care (MAC) with local infiltration.
- Advance endotracheal (ET) tube cuff safely below the intended tracheotomy site (to avoid cuff rupture) and hold respirations while incising trachea.
- Muscle relaxation to be given prior to incising the trachea [5, 14].
- Transnasal humidified rapid insufflation ventilatory exchange (THRIVE), jet ventilation and PPV without a cuffed tracheal tube are strongly discouraged [15].
- Minimize bag masking [15].
- Anesthesia circuit and ventilator circuit should be closed circuit with viral filter at patient end and machine end.
- There should be no ET tube disconnection. Clamp ET tube in case of accidental disconnection.

### Pre-OP

- Time-out before starting procedure—ensure that all the required equipments are ready, all personals are ready.
- Begin GA/incision only when full surgical set ready and surgeon, assistant and staff scrubbed and draped [avoids confusion, decreases skin to skin time].
- A range of cuffed non-fenestrated sets of tracheostomy tubes to be kept ready in OR and to be replaced after surgery.
- Two separate high power closed circuit suction with viral filter.

### OT Room Setup

- Limit traffic in the OT.

- Limit patient movement within the OT [16].
- Limit the number of OT staff inside for essential purposes only [17].
- Only selected equipment and drugs should be brought into the OT to reduce the number of items that need cleaning or discarding following the procedure [18].
- Single use equipment should be selected where possible [19].
- Anesthetic monitors, machine surfaces are covered with plastic wrap to decrease the risk of contamination and to facilitate cleaning.
- The patient should be reviewed, induced, and recovered within the OR itself to restrict contamination to just one room [20].

### Surgical Procedure

- Disposable equipments to be used whenever feasible.
- Avoid cautery (risk of aerosol generation), prefer cold instruments and knot tying [1].
- After anterior tracheal wall exposed—ventilator stopped and patient paralyzed [5, 14].
- Take tracheal swab on tracheotomy.
- Avoid tracheal suction (risk of aerosolisation) [1].
- Choose cuffed, non fenestrated tracheostomy tube of appropriate size [1].
- Insert tube with suction aid (closed continuous suction).
- To reduce time in contact with aerosolized secretions—complete paralysis of patient to prevent coughing; stopping mechanical ventilation just before entering trachea; reducing use of suction during the procedure [14].

The procedure for elective tracheostomy is performed as follows: [5]

1. Complete paralysis of the patient is necessary before incising the trachea to ensure that there is no coughing or any other movement.
2. Stop mechanical ventilation before tracheotomy.
3. Withdraw the endotracheal tube to just above the tracheotomy site.
4. Tracheotomy is performed under direct vision without movement of patient; tracheostomy tube is inserted, followed by inflation of the balloon.
5. Connect the tracheostomy tube to ventilator, and when adequate ventilation is confirmed, suture the tracheostomy tube to skin, in addition to tracheostomy tube strapping.
6. Remove the endotracheal tube.
7. Return all instruments to the trolley.

8. Remove the face shield, outer pair of gloves, gown and shoe cover in the intermediate area.
9. Leave the intermediate area with the standard precautionary protection equipment including cap, goggles, and N95 masks and proceed to shower area, where all the protective equipment is removed.

The procedure for emergency tracheostomy is performed as follows: [5]

1. Patient and the surgical team prepared for cricothyroidotomy. The skin incision should be made down to the cricothyroid membrane.
2. Complete paralysis of the patient is necessary to ensure that there is no coughing or any other movement.
3. Immediate incision of the cricothyroid membrane is performed with insertion of a cuffed tracheostomy tube of the appropriate size.
4. Connect the tube inserted through the cricothyroidotomy to the mechanical ventilator and wait until the patient's condition has stabilized on mechanical ventilator. Stitch the flange of the tube to neck skin.
5. Perform a separate incision for a tracheostomy.
6. Identify anterior wall of the trachea, and stop mechanical ventilation before tracheotomy.
7. Tracheotomy is performed under direct vision with the patient paralyzed to avoid any movement; tracheostomy tube is inserted, followed by inflation of the balloon.
8. Connect the tracheostomy tube to a mechanical ventilator. When adequate ventilation is confirmed, suture the tracheostomy tube to skin, in addition to tracheostomy tube strapping.
9. Remove the tube inserted through the cricothyroidotomy, and close the wound.
10. Return all instruments to the trolley.
11. Remove the shoe covers, outer pair of gloves, surgical gown, and plastic facial shield in the intermediate area.
12. Leave the intermediate area with the standard precautionary protection equipment including cap, goggles, and N95 masks and proceed to shower area, where all the protective equipment is removed.

- Emergency tracheostomy should be avoided as much as possible because the procedure will inevitably be performed under less optimal conditions than in the elective situation. Every attempt should be made to gain access to the airway through endotracheal intubation. In the case of patients for whom difficulty of endotracheal intubation is expected, the surgeon should be

notified in advance. An experienced surgeon would then put on the appropriate protective apparel and be mindful of the need to carry out the cricothyroidotomy followed by tracheostomy if intubation is proved to be unsuccessful.

## Post Procedure

- Post procedure fumigation of the operating room.
- Increased risk of virus exposure in team who performs suctioning, dressing changes and other post tracheostomy care [1].
- Delay routine post OP tube changes until COVID-19 testing is negative [1].
- Cuff to remain inflated and check for leaks.
- Make every effort not to disconnect the circuit.
- Only closed in line suctioning with viral filter should be used.

## Compliance with Ethical Standards

**Conflict of interest** All authors declare that they have no conflict of interest.

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