Our Experience of Tracheostomy in COVID-19 Patients

Prasun Mishra¹ · Prashant Jedge² · Maitri Kaushik¹ · Purva Artham¹ · Sagun Kumari¹

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Abstract Tracheostomy in patients with COVID-19 requires significant decision making and procedural planning. Use of tracheostomy can facilitate weaning from ventilation and potentially increase the availability of much needed intensive care unit (ICU) beds, however this being a high aerosol generating procedure it does put the health care worker to risk of transmission. Here we present our experience and protocols for performing tracheostomy in COVID-19 positive patients. Eleven tracheostomies were performed in COVID-19 patients over a period of 2 months (May–June 2020) at this tertiary care hospital dedicated to manage COVID patients. All patients underwent open surgical tracheostomy, the specific indication, preoperative protocols, surgical steps and precautions taken have been discussed. Tracheostomy was done not before 10 days after initiation of mechanical ventilation. Patient's cardiovascular vitals should show recovery with some spontaneous effort. There should be reduction in need for FiO₂ and ventilator requirements. Of total 11 tracheostomies

performed only one patient had post procedure bleeding which was controlled conservatively. We have summarized our experience in performing tracheostomies in 11 such patients. Our guidelines and recommendations on tracheostomy during the COVID-19 pandemic are presented in this study. We suggest tracheostomies to be done after 10 days of intubation with precautions and given indications with the idea of early weaning off of patient from ventilator and more availability of ICU beds which is already overwhelmed by patient load.

Keywords COVID-19 · Tracheostomy · SARS-COV2 · ICU

Introduction

In the month of December 2019, pneumonia cases were identified in the Hubei province of China [1]. The China Centre for Disease Control and Prevention discovered and named this virus novel coronavirus 2019 [2]. This disease caused by novel coronavirus was later declared as a public health emergency and a pandemic by WHO [3].

Over last 6 months due to spread of this pandemic of COVID-19, healthcare systems worldwide have been facing unprecedented challenges. This challenge is most for the intensive care unit to manage due to sudden surge in critically ill patients.

Reports show that 5–15% of patients with COVID-19 are critically ill and need mechanical ventilation [2, 4, 5]. Quite a few of these patients need extended period of ventilation. Tracheostomy is a common procedure in such critically ill patients who need prolonged period of mechanical ventilation. Use of tracheostomy can facilitate

✉ Prasun Mishra
entprasun@gmail.com

Prashant Jedge
prashantjedge@gmail.com

Maitri Kaushik
maitri.kaushik@gmail.com

Purva Artham
purvaartham@gmail.com

Sagun Kumari
sagunkumari7@gmail.com

¹ Department of ENT, Bharati Vidyapeeth Medical College, Khatraj, Pune, Maharashtra 411056, India

² Department of Critical Care Medicine, Bharati Vidyapeeth Medical College, Pune, India

weaning from ventilation and potentially increase the availability of intensive care unit (ICU) beds.

Tracheostomy is a highly aerosol-generating procedure, and health-care workers are at risk of infection during the procedure and subsequent care [6].

It is well known that aerosol-generating procedures are a leading cause of viral transmission during previous SARS outbreak in 2003 and also in the current pandemic [7, 8]. Certain specific precautions need to be considered in performing surgical tracheostomy in such scenario.

In spite of 7 months of the disease, information and literature available on this is sparse. We report our experience of tracheostomy in the management of COVID-19 patients who underwent surgical tracheostomy and suggest few modifications and protocols to be followed in performing this procedure.

Methodology

This is a series of 11 surgical tracheostomies performed at this tertiary care teaching hospital which is also a dedicated center to treat COVID-19. All the patients were tested COVID-19 positive by RT PCR, were admitted in ICU and needed intubation for mechanical ventilation. This study was over a period of 2 months (May–June 2020).

Indication for Tracheostomy

The important indications for tracheostomy in ICUs have always been for the facilitation of long term mechanical ventilation and to reduce the complications associated with endotracheal tube and weaning off from ventilation. Besides these, it's required for actual or threatened airway obstruction, laryngeal edema (which may be an emerging feature of COVID-19) or unsuccessful extubation due to weakness, poor cough, tenacious secretions or a combination of these factors [6].

The Indication for tracheostomy in COVID-19 patients followed in this institute were little different from routine indications. An early tracheostomy would help in better patient management and benefits thereof, though it would put the health care worker at high risk of infection transmission and prone ventilation may be compromised. A delay in performing tracheostomy might reduce the risk of staff for infection, however extended period of endotracheal intubation will lead to more cumulative effects of sedation, ventilator associated pneumonia, poor pulmonary hygiene, longer ICU stay besides laryngeal complications of prolonged intubation.

Studies have predicted a little residual risk of infectivity beyond 10 days after symptom onset [9].

Thus in this institute tracheostomy was done not before 10 days after initiation of mechanical ventilation and was carried out after 10 days in those patients who are expected to have requirement of prolonged ventilation. Patient's cardiovascular vitals should show recovery and some spontaneous effort should have started. There should be reduction in need for fractions of inspired oxygen (FiO_2), ventilator requirements, and prone positioning as part of their ventilation strategy. The decision for tracheostomy was a combine decision on case to case basis by opinion of critical care specialist and the ENT surgeon. Safety of the health care staff was also considered in decision making.

If patient's had high respiratory SOFA (Sepsis related organ failure assessment) score, tracheostomy was avoided, as these patients would be too sick to benefit from further interventional procedure [10].

Pre-operative Workup

After the decision to go ahead with Tracheostomy, a video consent of the patient's relative was obtained and was recorded. Since most of the patients are on therapeutic/prophylactic dose of heparin, a coagulation profile is done and if it is in the acceptable range, the anticoagulation is stopped as per the current guidelines. LMWH was stopped 12 h prior to procedure and unfractionated heparin (UFH) is stopped 6 h prior to procedure to minimize bleeding.

The team included an ENT surgeon experienced in performing tracheostomy, an assistant to the main surgeon, an ICU physician to completely paralyze the patient and look after the ventilation aspects and extubation, a nursing staff and a support staff. Adequate complete PPE kit was ensured for the entire health care team. We used enhanced PPE with eye protection, fluid-repellent disposable surgical gown and gloves. All used a well-fitting N95 mask with an additional fluid shield.

All aseptic precautions were taking during preparation for the procedure. Sterile surgical gown, cap and mask over the complete PPE along with double surgical gloves were used to ensure asepsis during the procedure.

Before starting the procedure team members were assigned with their roles clearly to avoid any communication gap and chaos. This could happen as communication becomes difficult with use of PPE kit and double mask. Oral and endotracheal suction was done to minimize the aerosol generation during procedure.

The Procedure

Open surgical tracheostomy was preferred as percutaneous tracheostomy involved more extensive airway manipulation and increased the exposure to aerosolized secretions [11, 12], besides most of these patients being on heparin, had a chance of significant bleeding necessitating surgical control.

Tracheostomy being an aerosol generating procedure the ideal set up for this procedure would be a dedicated COVID Theatre which operates under negative pressure. The reverse laminar flow is estimated to exchange 90% of air (removing the generated aerosol) in 6 min [13, 14].

However the present center had its limitation in transporting a COVID-19 positive patient to OT and tracheostomy was done bedside in ICU itself. It was done in a separate side room of the ICU. No one else other than the team members were kept around. Before the procedure all the surgical steps were discussed by the ENT surgeon and the ventilator precautions was discussed by the critical care specialist with the entire team.

Steps

Patient was completely paralyzed by a muscle relaxant. Neuromuscular monitoring is useful to ensure adequate paralysis during tracheostomy. After giving extension position, surgical site was cleaned with povidone iodine solution. Local infiltration was done with 2% lignocaine with adrenalin, to reduce local ooze. Vertical incision was preferred to keep the procedure quick and bloodless. No use of diathermy was done. Careful but quick dissection was done layer wise and trachea was identified.

Trachea is confirmed by aspiration of air in a saline filled syringe and a cut is given on trachea. This step is critical as this can damage the endotracheal cuff and lead to more aerosol generation. So the endotracheal tube was pushed further down to avoid this. Trachea was identified and a round chunk of cartilage removed.

At this stage ventilation was totally paused for a while, endotracheal tube partially withdrawn and adequate size tracheostomy tube inserted, cuff inflated and ventilator connected. Ventilation was started and confirmed by EtCO₂ and Tidal volume graphs. Auscultation is generally avoided. The endotracheal tube is carefully removed under cover of a plastic sheet to avoid aerosol spread and immediately discarded in a closed container. It is essential to secure the position on tracheostomy tube to prevent its dislodgement as that can lead to high exposure among the supporting health care nursing staff.

Our Experience

A total of 11 tracheostomies were done in COVID-19 positive patients over 2 month's period. Eight were male and 3 were female. Nine patients were more than 50 years of age. One was 42 and 1 patient was 45 years of age. All the patients had one or more comorbidities in the form of diabetes mellitus, renal disease, and cardiac problems besides pneumonia.

The indication for tracheostomy in all these patients was pneumonia needing prolonged intubation and was difficult to wean off. Two patients were given extubation trial and had to be re-intubated before being considered for tracheostomy.

Tracheostomy was done with all the above precautions. All patients tolerated the procedure well. One patient had profuse ooze a day after surgery, which was controlled by pressure dressing and stopping heparin for 2 days.

Conclusion

COVID-19 infection is a disease with guidelines evolving on a regular basis. There is a lack of specific experience and data on performance of tracheostomy in COVID-19 patients.

Tracheostomy being an aerosol generating procedure is a tradeoff between health-care 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 and specific guidelines followed respectively.

We have summarized our experience in performing tracheostomies in 11 such patients. Our guidelines and recommendations on tracheostomy during the COVID-19 pandemic are presented in this study.

We suggest tracheostomies to be done after 10 days of intubation with precautions and given indications with the idea of early weaning off of patient from ventilator and more availability of ICU beds which is already overwhelmed by patient load.

We support the idea that COVID-19 pandemic management needs proper planning and foresight and this study adds to that especially in planning tracheostomy in ICU patients.

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

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