

Tracheotomy in the era of COVID-19 pandemic

Chwee Ming Lim MRCS(Edin) ^{1,4}, Lu Hui Png MRCS(Edin)¹, Sewa Duu Wen (MRCP)²,
Jolin Wong(MBBS)³, Shin Yi Ng (FCCP)³, Song Tar Toh MRCS (Edin)^{1,4}

¹Department of Otorhinolaryngology-Head and Neck Surgery, Singapore General Hospital

²Department of Internal Medicine, Singapore General Hospital

³Department of Surgical Intensive Care, Singapore General Hospital

⁴Surgery ACP, Duke-NUS Graduate Medical School

Corresponding authors

Chwee Ming Lim, Department of Otorhinolaryngology-Head and Neck Surgery

Email : lim.chwee.ming@singhealth.com.sg

Shin Yi Ng, Department of Surgical Intensive Care

Email : ng.shin.yi@singhealth.com.sg

Address:

20 College Road, Academia Building

Singapore 169856

Tel: +65-63264488

Abstract

Objective

To establish a workflow for performing tracheotomy in chronically ventilated COVID-19 positive patients

Design

Review of best practices by a team of intensivists and surgeons on minimizing transmission of COVID-19 virus to healthcare professionals in the ICU setting

Setting

Tertiary academic hospital

Data Synthesis

Institutional review of the optimal indications and timing of performing tracheotomy; transfer of patients and surgical workflow of optimizing safety to healthcare professionals is presented.

Results

The optimal timing of tracheotomy in chronically ventilated COVID-19 positive patients is unclear. We adopted a policy of planning for elective tracheotomy when mechanical ventilation is anticipated beyond 7 days. Two consecutive negative pharyngeal swabs for COVID-19 virus should be obtained prior to elective tracheotomy. With proper protection, either percutaneous or open tracheotomy can be safely performed in COVID-19 positive patients with minimal risks to healthcare professionals.

Conclusion

With these measures in place, our team successfully performed tracheotomy in one COVID-19 positive patient at our institution without viral transmission to our healthcare professionals.

Keyword

COVID-19, Coronavirus, tracheotomy, pandemic, healthcare professionals=

Introduction

The recent worldwide pandemic of coronavirus disease 2019 (COVID-19) has led to an urgent need to prioritize healthcare resources, especially the intensive care units (ICUs)^{1,2}. Of all COVID-19 patients, 19.6% develop acute respiratory distress syndrome and 12.3% require invasive mechanical ventilation². These critically ill patients may require prolonged intubation beyond 28 days and may eventually require a tracheotomy³.

Methods

A team of ENT surgeons and intensivists reviewed the standard operating protocol on performing tracheotomy among COVID-19 positive patients at our institution. These recommendations were made based on previous knowledge and experiences during the SARS epidemic⁴; as well on current knowledge of COVID-19 mode of transmission and infective risks to healthcare professionals⁵.

Results

1. Timing and indication

The benefits of an early tracheotomy (within 7 days of intubation) for COVID-19 positive patient are uncertain. In ICU populations, no consistent patient centric benefits have been demonstrated in early versus late tracheotomies. Significant proportions of patients

randomised to the late groups will not require a tracheotomy in the end. Therefore, our team elects to confirm two consecutive negative pharyngeal swabs for COVID-19 virus before consideration for tracheotomy. Generally, our policy is to prepare the ENT team for tracheotomy when the pulmonary function of these ventilated patients has not shown improvement beyond 7 days. A good surrogate for clinical improvement would be the patient's tolerance for reducing requirements for oxygen support and positive end-expiratory pressure (PEEP). The ideal ventilatory setting prior tracheotomy are FiO₂ of ≤60% and PEEP of ≤10 cmH₂O.

2. Transfer to operating room

We have designated an isolation operating room (OR) for COVID-19 positive patients⁶. This OR is physically located in a separate building away from the main ORs where elective surgeries are performed. The anaesthetic and surgical teams don full personal protective equipment including an N95 respirator, eye protection, gown, gloves, and cap, and a powered air-purifying respirator (PAPR). The lay-out of this OR and the work-flow for patient movement is presented in Figure 1.

The alternative of performing a percutaneous or open tracheotomy at negative pressure ICU isolation bed is appealing; as it avoids transfer of patients and thus reduces viral transmission. Percutaneous tracheotomy should be adopted only by highly proficient intensivists; and in carefully selected patients. Patients with easily palpable anatomical landmarks (eg thyroid notch, cricoid cartilage and trachea) are potential candidates for percutaneous tracheotomy. Surgical cautery may be brought to the bedside for haemostasis, conferring an advantage over a percutaneous tracheotomy.

3. Surgical workflow

We recommend an experienced ENT surgeon (Consultant level) to lead the surgery, assisted by a junior faculty who is familiar with surgical steps of tracheostomy. This arrangement will facilitate the procedure to be completed in an expedient fashion. Additionally, verbal communication between surgeons may be hindered with the additional layers of PPE and PAPR protection and having experienced surgeons is important.

Secondly, a “runner” is on standby (with full PPE) at the patient holding area to help with delivering of any urgent need of surgical instruments when required. Nevertheless, it is prudent for the surgical team to ensure that all the required instruments (including a full complement of various tracheotomy tubes) are present before transferring the patient into the main operating room. Lastly, before making an incision onto the trachea, the anaesthesiology team will withhold ventilation at end expiration for several seconds, so as to avoid inadvertent spillage of bronchial secretions out of the trachea. Positive pressure ventilation is only restarted on bronchoscopic confirmation of trachea access.

Anaesthesiology considerations will be focused on reducing aerosolization during circuit disconnections as well as surgical entry into the trachea. If ventilatory requirements are low, the procedure can be performed with the transport ventilators and in-situ HEPA filters with anaesthesia delivered by total intravenous anaesthesia technique. This will prevent any

aerosolization of airway secretions. An alternative would be to disconnect the circuit at end expiration with the HEPA filter still connected to the patient endotracheal tube.

Our team conducted simulation on these infection control measures on patients requiring tracheotomy. These rehearsals enabled the team to streamline and consolidate the infection control processes before the actual COVID-19 positive patient was scheduled for tracheotomy. With these measures in place, our team successfully performed tracheotomy on one COVID-19 positive patient without any viral transmission to our healthcare professionals.

Conclusion

Tracheotomy is an aerosol-generating procedure which can potentially transmit the COVID-19 virus to healthcare professionals. Therefore, a systematic protocol of performing this adjunctive life-saving procedure needs to be carefully executed in order to maximize patient safety and minimize viral transmission.

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Figure 1

Schematic diagram showing the operating room lay-out and patient work-flow

Figure 2

Operative team performing tracheotomy with full personal protection equipment and powered air-purifying respirator