Per-cutaneous dilatation tracheostomy (PCTD) in COVID-19 patients and steps to prevent Aerosolisation: A Case Series.

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Abstract

* COVID 19 patients with severe respiratory failure may require prolonged mechanical ventilation. Placement of a tracheostomy tube often becomes necessary for such patients. * The steps of tracheostomy procedure and post tracheostomy care of these patients can be classified as aerosol generating. * We performed percutaneous dilation tracheostomy in three clinically challenging COVID-19 patients in our ICU. * We developed guidelines aiming to minimise aerosolisation during and after the tracheostomy procedure to safeguard healthcare workers. Percutaneous tracheostomy was performed by a team of three experienced anaesthetists and an ICU nurse. * The decision of surgical or percutaneous tracheostomy should be dependent on the experience of the tracheostomy performer, health-care worker safety, resource availability, and patient-centred care. We believe our modified strategic approach for PCDT offers an extra level of safety to healthcare workers.

Cases descriptions:

All tracheostomies were percutaneous.

Case 1: A 54-year-old morbidly obese male, known hypertensive and diabetic, presented with a short history of severe respiratory distress and persistent hypoxemia not responding to oxygen therapy and required intubation and ventilation. Multiple attempts to wean the patient off the ventilator failed. After a multidisciplinary discussion PCDT was performed after 31 days of intubation.

Case 2: A 60-year-old morbidly obese male and known case of HTN & DM presented with severe hypoxemia, hypotension and required urgent intubation and mechanical ventilation. Following multiple failed weaning trials from the mechanical ventilator, the decision was made to proceed for tracheostomy at Day 27.

Case 3: A 64-year-old female, with the background history of HTN, DM, severe cervical ankylosing spondylitis and limited neck mobility, presented with severe hypoxemia and ARDS. The patient required intubation and ventilation. After multiple failed attempts to wean, the decision to proceed with PCDT was also made at Day 27.

Procedure: Percutaneous tracheostomy was performed with the number of people in the operating room restricted to four; three experienced anaesthetists (one bronchoscopist, one operator and one assistant) and an ICU nurse. Every member of the team had proper personal protective equipment. To decrease the airway secretions and reduce the risk of aerosolization, each patient received 2 aliquots of 200mcg glycopyrrolate intravenously, 60 minutes and 30 minutes prior to the procedure. Patients received 100% Fio2 ten minutes prior to the start of the procedure which was continued till the end of the procedure. After ensuring full muscle relaxation and adequate sedation, the patients' position was optimised by neck extension and by the placement of a rolled towel under the shoulders. A neck ultrasound was performed to visualise the positions of the trachea, tracheal rings and blood vessels. 5 ml of Local anaesthetic (2 % lignocaine with

1/200000 adrenaline) was infiltrated at the site of incision. Ventilator was then put on standby and a brief bronchoscopy was performed using a swivel connector attached to an endotracheal tube. The endotracheal tube was pulled back till the cuff was visualised at the glottis. Ventilation was then resumed.

PCDT was performed with guidewire dilator technique following a stepwise approach starting with puncture of the anterior tracheal wall, seldinger technique, dilatation and cannula positioning. Ventilation was paused during the insertion of the dilator and insertion of the tracheal tube. All steps were monitored by bronchoscopy. The assistant covered the tracheostomy site during dilation of tracheostomy stoma insertion site to minimise aerosolization. The position of the tracheostomy tube was confirmed with bronchoscope, chest rise and capnography and the endotracheal tube was subsequently removed with clamp still on. We ensured minimum gas flows and PEEP during performance of per cutaneous tracheostomy.

Case 1 required placement of a PORTEX® UniPerc® Adjustable Flange Extended-Length tracheostomy Tubes as the Portex percutaneous tracheostomy tube didn't have enough length to reach the trachea, as patient was morbidly obese. The other two patients were successfully managed with Portex® ULTRAperc® tracheostomy tube.

Discussion

COVID positive patients may remain infective for periods greater than 20 days [(1)]. Delaying a tracheostomy might not reduce infectivity of such patients whereas a timely tracheostomy may allow for patients to be weaned off sedation faster and moved to intermediate care wards, freeing up ICU resources. False-negative PCR test results are an additional concern and therefore reasonable measures to protect staff and the patients should be continuously practiced [(2).]

The tracheotomies of such patients in the ICU should be meticulously planned and be performed in a negative pressure room facility wherever available. The space restraints of an ICU room and suboptimal or improper positioning in the ICU setting versus the risks involved in transferring such patients from the ICU to Operation Theatre are factors to be taken under consideration. We preferred PCDT over surgical tracheostomy as PCDT potentially reduces the risk of surgical site infection and rarely requires transfer to the theatre[(3)].

We established guidelines in advance for peri-tracheostomy care of such patients with the multi-disciplinary involvement of Anaesthesiologists, ENT surgeons, tracheostomy nurses, Speech and Language Therapists & Physiotherapists.

A multi-disciplinary team tracheostomy plan proforma was developed and each patient had a careful clinical review with tracheostomy and post tracheostomy care plan established in advance.

On the day of surgery all necessary equipment was pre-arranged into sterile packs in an anteroom of the negative pressure ICU suite.

We avoided the modified technique wherein the bronchoscope is passed by the side of the endotracheal tube [(4,)] as in our opinion this technique carries an increased risk of aerosolization.

The tracheostomy after-care of COVID-19 patients differs from routine care tracheostomy because of a high risk of transmission of infection due to Aerosolisation. Routine tracheostomy specific Aerosol Generating Procedures (AGPs) include tracheal open suctioning, tracheostomy changes and sputum induction[(5,7)] but other interventions like chest physiotherapy, inner cannula changes and nebulisation may also increase the likelihood of coughing and sputum production[(5)].

We recommend that all Tracheostomy Care related interventions in COVID-19 patients (positive, suspected or recovering) should be treated as AGPs and staff should don full PPE at all such times.

There are 7 crucial steps involved[(6)] and the frequency of each of these interventions should be reviewed and re-evaluated as needed to reduce clinical risk to the patient as well as to protect staff (Table 1).

Positive pressure ventilation also increases the potential for aerosol risks to staff [7] and staff taking care of patients receiving positive pressure ventilation should don appropriate PPE. A cuff inflated, closed system is most likely to prevent cross-contamination of staff, equipment and other patients and therefore closed in-line suction is recommended [8].

In the wards a regular Multi-disciplinary tracheostomy ward round should be done. A daily record of all tracheostomy related care/intervention/events should be maintained. All tracheostomy care interventions should be treated as AGPs. A simple face mask should be applied over the face of the patient once the cuff is deflated to minimize droplet spread.

Any tracheostomy tube change should be discussed by the clinical team to outline the potential risks versus the benefits of this AGP. The procedure should be performed with full PPEs, and preferably in a single room with negative pressure facility. Ensure availability of all emergency equipment and drugs before the start of a procedure.

All patients should be trialled on dry oxygen via HME filter as first line intervention [5]. For routine tracheal suctioning a closed, inline suction with HME filter should be preferred to reduce the risk of aerosolization [9].

Initially we proposed a simple system, for spontaneously breathing patients with tracheostomy in –situ, which had a Closed Suction Unit, HME Filter and Swedish nose for oxygen supply (fig 2). Although simple, this circuit is 'heavy' and can cause drag on the tracheostomy tube.

We eventually used a novel circuit called Kelley Circuit (fig1).The Kelley Circuit combines the ProTrach® XtraCare HME with an electrostatic filter with a closed-circuit suction system[10]. In our experience this circuit is more compact and light-weight and therefore will cause less drag.

Conclusion:

A surge of COVID-19 patients can overwhelm hospitals with a possibility of many requiring mechanical ventilation and possible tracheostomy. The decision of surgical or percutaneous tracheostomy should be dependent on the experience of the tracheostomy performer, health-care worker safety, resource availability, and patient-centred care. Proper and acceptable guidance for performance and post tracheostomy care is crucial and should be established in advance. We believe our modified strategic approach for PCDT offers an extra level of safety to healthcare workers.

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