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Elective Tracheostomy During Mechanical Ventilation in Patients Affected by COVID-19: Preliminary Case Series From Lombardy, Italy

Mario Turri-Zanoni, MD[1], Paolo Battaglia, MD[1], Camilla Czaczkes, MD[1], Paolo Pelosi, MD[2,3], Paolo Castelnuovo, MD[1], and Luca Cabrini, MD[4,5]

Abstract

The COVID-19 outbreak poses continued struggles due to the unprecedented number of patients admitted to intensive care units and the overwhelming need for mechanical ventilation. We report a preliminary case series of 32 patients with COVID-19 who underwent elective tracheostomies after a mean intubation period of 15 days (range, 9-21 days). The procedure was performed with percutaneous (10 cases) and open (22 cases) surgical techniques. Neither procedure-related complications nor viral transmission to health care workers was observed. Our preliminary experience supports the safety of tracheostomy, provided that appropriate protocols are strictly followed. The postoperative care is still debated, and, prudentially, our protocol includes tracheal tube change not before 2 weeks after tracheostomy, with cuff deflation and decannulation deferred until confirmation of negative SARS-CoV-2 test results. This is the first case series to report on such a rapidly evolving issue and might represent a source of information for clinicians worldwide who will soon be facing the same challenges.

Keywords

coronavirus pandemic, COVID-19, intensive care unit, personal protective equipment, tracheostomy.

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The coronavirus disease 2019 (COVID-19), caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has rapidly spread worldwide with critical outbreaks in northern Italy. Airways management represents one of the most critical aspects of supportive therapy, and prolonged mechanical ventilation is often required.[1] Elective tracheostomies in this setting can be risky for patients, due to severe hypoxemia, and for the health care team, due to the high potential for viral transmission during this aerosol-generating procedure. Several COVID-19–related recommendations and guidelines about safety protocols in tracheostomy have been published over the last few weeks,[2-4] but no case series are available yet. Clinical data can be drawn only from the 2003 SARS epidemic,[5-7] when patients requiring tracheostomy were treated exclusively with the open surgical technique, as described by the largest case series, involving 15 infected patients from Singapore.[6] To date, the appropriateness of tracheostomy in infected patients is still debated in terms of indications, techniques, and timing.

We report our preliminary single-center experience on tracheostomy in patients with SARS-CoV-2, emerging from the hardest-hit Italian region, Lombardy.

Methods

The study was approved by the Insubria Board of Ethics and included all consecutive patients admitted to the intensive care units of a tertiary care teaching hospital during the first month of the outbreak, who underwent elective tracheostomy for prolonged mechanical ventilation. A dedicated team was created. The number of providers participating in the procedure was limited to the strictly essential members. Tracheostomies were arranged in groups of 2 or 3 per session, to minimize personal protective equipment usage. Health care workers wore water-resistant gowns, caps, boots, double gloves, goggles, and FFP3 masks providing protection against droplet-based transmission, with full-face transparent shields on top.[2-4]

Percutaneous dilatational tracheostomy (PDT) was performed at the bedside by the most skilled intensivists. When PDT was contraindicated, open surgical tracheostomy (OST) was performed by 2 experienced otolaryngologists in a

[1]Division of Otorhinolaryngology, Department of Biotechnology and Life Sciences, University of Insubria, Varese, Italy
[2]Anesthesiology and Intensive Care Unit, University of Genoa, Italy
[3]San Martino Policlinico Hospital, Genoa, Italy
[4]Anesthesiology and Intensive Care Unit, University of Insubria, Varese, Italy
[5]Azienda Ospedaliera Ospedale di Circolo e Fondazione Macchi, Varese, Italy

Corresponding Author:
Mario Turri-Zanoni, MD, Division of Otorhinolaryngology, Department of Biotechnology and Life Sciences, University of Insubria, Ospedale di Circolo e Fondazione Macchi, Via Guicciardini 9, 21100, Varese, Italy.
Email: tzmario@inwind.it

negative-pressure operating theater, except for nontransportable patients who underwent bedside OST. After preoxygenation (oxygen 100% for 2-3 minutes), mechanical ventilation was ceased during tracheal incision to minimize viral aerosolization, paying particular care not to pierce the inflated cuff. To further reduce aerosolization, complete paralysis was obtained to avoid coughing; suctioning and cautery were also minimized. A cuffed nonfenestrated tracheostomy tube was placed. Stethoscope auscultation was avoided, and confirmation of correct tracheal tube placement relied on end-tidal gas sampling and chest movements. A doffing procedure was performed by team members individually and one at a time, following a standardized sequence to avoid self-contamination and under supervision of a dedicated inspector.[2,3] Immediately afterward, the staff moved to the changing room for a shower.

Results

Of the approximately 100 mechanically ventilated patients admitted to the COVID-19 intensive care units of our institution from the last week of February to mid-April 2020, 32 underwent elective tracheostomy after a mean intubation period of 15 days (range, 9-21 days). The mean age was 62 years (range, 32-74 years), with a male:female ratio of 2:1. The technique used was PDT in 10 patients (31.2%) and OST in 22 (68.8%). Procedures were performed at the bedside in 19 (59.4%) and in a negative-pressure operating room in 13 (40.6%). No procedure-related mortality was observed, while the COVID-19–related mortality rate was 15.6% (5 of 32) with fatality occurring within a mean 7 days after tracheostomy. Neither procedure-related complications nor viral transmission to health care workers was observed after a mean follow-up of 21 days (range, 8-37 days). The first postoperative tracheostomy tube change has been performed in 11 of 32 cases so far, after a mean 14 days (range, 12-18 days). At the time of writing, 8 patients recovered from COVID-19 with negative nasopharyngeal swab results plus bronchial aspirate analysis, and decannulation has been possible in 1 of these cases.

Discussion

The tracheostomy allowed more practical mobilization of patients, lowered the incidence of unplanned extubation, reduced administration of sedative drugs, and facilitated weaning attempts, since patients not tolerating liberation from mechanical ventilation would be rapidly reconnected to the ventilator circuit. The timing of tracheostomy is yet to be defined in such critically ill patients, but early recommendations worldwide seem to suggest waiting at least 14 days of endotracheal intubation to avoid clinically futile procedures for patients and to prevent health care workers from unnecessary exposure risks.[3] In our experience, percutaneous and surgical techniques were comparable in terms of exposure risks and patients' safety, when following proper indications.[4] Postoperative care represents another open issue that should be explored in the next few months, based on gradually evolving body of available data.[3,4] In our experience, circuit disconnections were strictly avoided, and only closed in-line suctioning was used. Moreover, a heat and moisture exchanger with a viral filter was used once the tracheostomy tube was disconnected from mechanical ventilation. The first postoperative tracheostomy tube change was performed after a mean period of 2 weeks, with appropriate personal protective equipment. Prudentially, we maintained a cuffed nonfenestrated tracheostomy tube in all cases, deflating the cuff only after COVID-19 negativization. As a matter of fact, at present, there is no high-level evidence to make recommendations about cuff deflation and decannulation, which, ideally, should be performed once viral load is as low as possible and/or COVID-19 has passed.[3]

This is the first study reporting a case series on such a rapidly evolving issue and might represent a source of information for clinicians worldwide who will soon be facing the same challenges.

Ethical Approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Author Contributions

Mario Turri-Zanoni, study concept and design; writing the manuscript; **Paolo Battaglia**, study concept and design; writing the manuscript; **Camilla Czaczkes**, data collection and analysis; **Paolo Pelosi**, study concept and design; data interpretation; **Paolo Castelnuovo**, data interpretation; critical revision of the manuscript; **Luca Cabrini**, study concept and design; data interpretation.

Disclosures

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