Letter to the Editor

Early percutaneous tracheotomy in coronavirus disease 2019 (COVID-19) and infection in healthcare personnel: a cohort study

Antonio Rosano MD, Enrico Martinelli MD, Federica Fusina MD, Alessandro Morandi MD, Michele Bertelli MD, Elena Malpetti MD, Pierluigi Ferretti MD, Carmine R. Militano MD, Marco Mari and Giuseppe Natalini MD

1Department of Anesthesia and Intensive Care, Fondazione Poliambulanza Istituto Ospedaliero, Brescia, Italy and 2Department of Information and Communications Technology, Fondazione Poliambulanza Istituto Ospedaliero, Brescia, Italy

To the Editor—Early tracheotomy is associated with shorter intensive care unit (ICU) stay compared to late tracheotomy, and this procedure could therefore be useful in a context of severely limited resources like the one observed during the novel coronavirus disease 2019 (COVID-19) pandemic. Nevertheless, tracheotomy in COVID-19 patients is considered risky for healthcare workers. In absence of evidence, guidelines and recommendations advise avoiding or delaying tracheotomy in COVID-19 patients.

In this study, we assessed whether early percutaneous tracheotomy was associated with an increased risk of severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) infection for healthcare staff. Data were collected in patients admitted to the ICU of Fondazione Poliambulanza hospital in Brescia (Italy) from February 20, 2020, to May 5, 2020. Two cohorts of healthcare workers were identified: (1) the exposed cohort included doctors and nurses who participated in the early percutaneous tracheotomy procedure as first operator, fiberoscopist, instrumental or anesthesia nurse and (2) the nonexposed cohort included staff on duty in the COVID-19 ICU who never participated in the procedure.

Infection of staff by SARS-CoV-2 was identified using a positive reverse transcriptase real-time polymerase chain reaction (PCR) test from a nasopharyngeal swab or in presence of IgM or IgG for SARS-CoV-2 in the serum (antibody test). The observation period after the last tracheotomy was 30 days. A nasopharyngeal swab was mandatory if body temperature (measured before each work shift) was >37.5°C and in staff complaining of symptoms compatible with COVID-19 or who had been absent due to illness. Moreover, all healthcare personnel were invited to undergo blood testing for SARS-CoV-2 (both Abbott SARS-CoV-2 IgG chemiluminescent microparticle immunoassay, Abbot Laboratories, Chicago, IL, and Coretest COVID-19 IgM/IgG Ab Test, Core Technology, China) as a surveillance measure. Staff infections were considered to be related to the exposure if the timing of the infection was subsequent to the first exposure. Data on SARS-CoV-2–infected staff were anonymized.

Patients were evaluated for percutaneous tracheotomy after the first 3 days of mechanical ventilation if weaning from mechanical ventilation could not be reasonably completed within the following 7 days. All tracheotomies were performed at the bedside with a percutaneous single-dilator technique and were guided by fiberoptic bronchoscopy. The involved personnel comprised 2 doctors (first operator and fiberoscopist) and 2 nurses (the instrumental nurse and the anesthesia nurse who assisted with airway management for fiberoscopy). The first operator was always a senior doctor, well experienced in percutaneous tracheotomy. The operator and instrumental nurse were equipped with a sterile surgical gown over the disposable protective gown, surgical gloves on disposable protective gloves, filtering face piece 3 (FFP3) respirator, surgical mask, visor, and cap. The doctor performing the fiberoscopy and the anesthesia nurse were protected by a disposable protective gown, double nonsterile gloves, FFP3 respirator, surgical mask, visor, and cap. Ventilation was never paused during the procedure.

The study outcome was to compare the rate of infection with SARS-CoV-2 between the cohort of staff exposed and the cohort not exposed to the tracheotomy procedures.

Data are shown as mean (standard deviation), median (IQR, first–third quartile), or frequency (percentage). Frequencies were compared using the Fisher exact test. Data management and statistical analyses were performed using R version 3.6.1 software (R Foundation for Statistical Computing, Vienna, Austria).

The protocol was approved by Brescia’s ethics committee.

We performed 121 early percutaneous tracheotomies on the 181 patients admitted to the ICU with COVID-19. Most patients were male (n = 93, 77%), and the median age was 64 years (SD, 9). Hospital mortality was 45.5%. Tracheotomy was performed on median day 6 (IQR, 5–7) of ICU stay.

In total, 145 ICU staff members (58 doctors and 85 nurses) participated in the care of COVID-19 patients, and 91 of these (63.6%) were in the exposed cohort. Overall, 132 staff members (92%) underwent serological testing to detect SARS-CoV-2 IgM/IgG.

In total, 15 healthcare workers (11.4%) were infected with SARS-CoV-2, without a significant difference between doctors and nurses (9.3% vs 12.8%; P = .59). Table 1 summarizes the comparison between the rates of SARS-CoV-2 infection in workers exposed and not exposed to tracheotomy procedures. Exposed staff did not have an increased rate of infection compared to nonexposed staff, neither when considered as an entire group nor when the analysis was stratified by the role that staff members played in.
the tracheotomy procedures. In the same study period, 37 of 37 doctors (100%) in the exposed cohort also performed tracheal intubation in COVID-19 patients in the ICU or operating room, compared with 17 of 21 of doctors (81%) in the cohort not exposed to tracheostomy ($P = .01$).

Our findings indicate that early percutaneous tracheotomy did not expose healthcare personnel to an increased risk of SARS-CoV-2 infection. Doctors in the cohort of those exposed to tracheotomy had a higher frequency of involvement in tracheal intubation procedures in COVID-19 patients, but the infection rate for this cohort did not increase.

Table 1. Comparison Between the Rate of SARS-CoV-2 Infection in Workers Involved and Not Involved in Tracheotomy Procedures

| Characteristic                              | Frequency/Total (%) | $P$ Value$^a$ |
|--------------------------------------------|---------------------|---------------|
| Exposed to tracheotomy with any role       | 7/91 (7.7)          | 55            |
| Not exposed to tracheotomy procedure       | 6/52 (11.5)         |               |
| Subgroups                                  |                     |               |
| Exposed to tracheotomy as first operator   | 0/6 (0)             | 1             |
| Not exposed to tracheotomy as first operator | 13/137 (9.5)     |               |
| Exposed to tracheotomy as fiberoscopist    | 0/35 (0)            | .04           |
| Not exposed to tracheotomy as fiberoscopist | 13/108 (12)        |               |
| Exposed to tracheotomy as instrumental nurse | 4/24 (16.7)     | .23           |
| Not exposed to tracheotomy as instrumental nurse | 9/119 (7.6)   |               |
| Exposed to tracheotomy as anesthesia nurse | 5/44 (11.4)         | .54           |
| Not exposed to tracheotomy as anesthesia nurse | 8/99 (8.1)   |               |

$^aP \leq .05$ was considered statistically significant.

In conclusion, early percutaneous tracheotomy, even when performed in COVID-19 patients, appears to be safe for healthcare workers when personal protective equipment is used.

Acknowledgments. The authors wish to thank Claudia Baresi for her help.

Financial support. No financial support was provided relevant to this article.

Conflicts of interest. All authors report no conflicts of interest relevant to this article.

References

1. Hosokawa K, Nishimura M, Egi M, Vincent J-L. Timing of tracheotomy in ICU patients: a systematic review of randomized controlled trials. *Crit Care* 2015;19:424.
2. Mecham JC, Thomas OJ, Pirgousis P, Janus JR. Utility of tracheostomy in patients with COVID-19 and other special considerations. *Laryngoscope* 2020;130:2546–2549.
3. McGrath BA, Ashby N, Birchall M, *et al.* Multidisciplinary guidance for safe tracheostomy care during the COVID-19 pandemic: the NHS National Patient Safety Improvement Programme (NatPatSIP). *Anaesthesia* 2020;75:1659–1670.
4. Sommer DD, Engels PT, Weitzel EK, *et al.* Recommendations from the CSO-HNS task force on performance of tracheotomy during the COVID-19 pandemic. *J Otolaryngol Head Neck Surg* 2020;49:23.
5. Tran K, Cimon K, Severn M, Pessoa-Silva CL, Conly J. Aerosol-Generating procedures and risk of transmission of acute respiratory infections to healthcare workers: a systematic review. *PLoS One* 2012;7:e35797.
6. Rosano A, Martinelli E, Fusina F, *et al.* Early percutaneous tracheostomy in coronavirus disease 2019. *Crit Care Med* 2020. doi: 10.1097/CCM.0000000000004752.
7. Mattioli F, Fermi M, Ghirelli M, *et al.* Tracheostomy in the COVID-19 pandemic. *Eur Arch Otorhinolaryngol* 2020;277:2133–5.
8. Higgins KM, Punthakee X. Meta-analysis comparison of open versus percutaneous tracheostomy. *Laryngoscope* 2007;117:447–454.