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Non-exposure procedure to aerosols during a tracheostomy under biosafety isolation in SARS CoV-2

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A tracheostomy performed on patients infected with SARS CoV-2 is one of the procedures with the highest risks of aerosolization. Safety recommendations for carrying out this procedure are not suitable for implementation in every hospital. Despite the use of Personal Protection Equipment, the suit leaves the submental area unprotected, and even the face mask may not provide a full seal. The use of additional biosafety isolation equipment increases safety, thus preventing exposure to infecting particles and allowing the surgeon to perform the technique with the use of the available equipment; it reduces the risks of further trans-surgical complications and increases the possibilities of handling them in case they arise.

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Introduction

A tracheostomy is one of the procedures presenting the highest risks for particle aerosolization. About 5% of patients infected with SARS CoV-2 will require mechanical ventilatory support and potentially a tracheostomy.

Recommendations in the available literature include postponing the procedure for as long as possible and performing it with the use of the adequate equipment.1,2 Some of the most important guidelines for performing a tracheostomy in patients diagnosed or identified as suspicious of being infected with SARS CoV-2 are as follows:

- Limit the number of participants in order to avoid any unnecessary exposure during the surgical procedure.1
- If the SARS CoV-2 test is negative, follow the standard procedure.1,2
- Wear the Personal Protection Equipment recommended by the World Health Organization.1,2
- In order for the procedure to be safe, quick and effective, it should be performed by a highly specialized surgical team. Additionally, it is strongly recommended

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that these surgical professionals do not participate in more than 2 procedures a day/week.²
• Perform the procedure after the second or the third week of intubation, ideally after a negative SARS CoV-2 test.³
• Prefer the percutaneous tracheostomy over the open tracheostomy, with negative pressure, at the patient’s bedside in the Intensive Care Unit and avoid, to the largest extent possible, moving the patient to the operating room.³⁴

Bertroche et al. have recently described a technique consisting of applying negative pressure and a cover that may function as a barrier in order to limit the propagation of aerosols during the tracheostomy.⁵

Objective

Describe how to create a biosafety isolation environment for performing a tracheostomy in a patient infected with SARS CoV-2.

Method

In order to carry out the procedure, the surgical team should consist of 4 (four) participants: an anesthesiologist, a surgeon, an assistant and a circulating nurse.
1. The patient is positioned in the Rossier position for the standard surgical field preparation.
2. The anesthesiologist prepares the preventive equipment for the advanced manipulation of the airway (laryngoscope or video-laryngoscope, Guedel cannula, laryngeal mask, syringe, orotracheal tube, guide, Yankauer aspirator) and places it adjacent to the patient’s head.
3. An acrylic box (with 2 windows, through which the anesthesiologist manipulates the orotracheal tube) is placed next to the commissure of the mouth, thus making sure that the area of the neck and jaw is clear.
4. A Mayo tray with the necessary equipment for carrying out the surgery is placed around the area of the abdomen. If a percutaneous procedure is to be performed, 2 tables should be considered: the equipment for the percutaneous tracheostomy is placed on the proximal table, while the distal table should contain the equipment for the open procedure. This, in case a change to the open technique is necessary; isolation is thus preserved once the surgery has started.
5. An isolation field is created using a 1.40 m x 2.20 m sterile crystal rubber, placed alongside the patient. Accurate sealing must be verified. The caudal portion should run along the Mayo tray stands, and sealed at the lateral edges of the stretcher, thus creating a biosafety isolation field (Figure 1).
6. The surgeon and the assistant must wear a disposable surgical gown or scrub, as well as sterile surgical gloves attached to the sleeves.
7. The surgeon and the assistant make two 5-cm incisions at the upper lateral portion of the rubber; these will serve as entry ports through which they will insert their hands and arms, up to the upper part of the elbow (at this level, the rubber field should be tight and the separation between the “entry ports” should allow hands and arms to move freely; Figure 2).
8. The tracheostomy procedure is carried out as usual (Figure 3).
9. Once the surgery is completed, the surgeon and his assistant take out their hands and arms from the rubber field without removing the fasteners that fix the surgical gown and the scrub to the field. Thus, the disposable gown and scrub remain attached to the rubber field without breaking the seal.

10. The rubber is withdrawn by folding it inwards; it is then disposed of in the biological/infectious hazardous waste container.

### Discussion and conclusions

Due to the evolution of the disease itself, a tracheostomy is not a common procedure with these patients; protective measures are to be implemented in order to reduce the production of drops and aerosols and to prevent the risk of infection for healthcare personnel involved in the procedure.

Complementing what Bertroche, J.T. et al., and Foster P. et al. have proposed, an alternate room should be available duly prepared for reintubation in case of accidental extubation or failure to intubate during the tracheostomy procedure, such as a false way or damage to the pneumo-blocking system: all of which may lead to unforeseen additional exposure of the personnel when attempting to solve the abovementioned contingencies.

Based on the mentioned scenario, we propose a safe, affordable and easy-to-implement methodology for carrying out tracheotomies in patients affected by SARS-CoV-2. The risk of contact with secretions and aerosolized particles resulting from either the tracheostomy itself or the “bent down” posture adopted by the surgical team within the surgical field that leaves the area under the chin exposed is decreased.

As has been recommended and with the purpose of performing the procedure safely, it is suggested that the technique be practiced in advance in order for

### Results

In our experience (15 procedures), despite implementing the techniques described for reducing aerosolization, we have observed the presence of splashed drops suspended on the internal surface of the isolation field. We may infer that, by using this biosafety model, there is no exposure of the surgical team involved in the procedure, since macro-particles (drops) and microscopic particles (aerosols) remain along the internal surface of the isolation field. The surgical team is not infected.
healthcare personnel to get thoroughly familiar with the procedure.

Some of the advantages observed with this methodology are listed in Table 1.

Disclosure

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Supplementary material

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.otot.2020.06.003.

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