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Coronavirus Disease-2019: Modified Underwater Seal Chest Drain System



To the Editor:

Coronavirus disease 2019 (COVID-19) is an acute respiratory disease caused by a novel coronavirus (severe acute respiratory syndrome coronavirus 2 [SARS-CoV-2]), transmitted mostly through respiratory droplets, direct contact with infected persons, and through contaminated surfaces/objects. Even though the virus survives on environmental surfaces for a varied period of time, it is easily inactivated by chemical disinfectants. In this COVID-19 pandemic situation, our top priority every day should be the prevention of transmission of infectious diseases to patients and to protect healthcare workers.

COVID-19 remains viable in aerosol form and is transmitted by droplets.¹ As such, we are facing problems in patients who require chest tube drainage for pneumothorax, especially in cardiothoracic and pulmonary medicine wards and critical care units. There may be a high risk of aerosolization in cases of pneumothorax with active air leak and in COVID-19 patients with an intercostal drainage tube in-situ requiring high positive end-expiratory pressure mechanical ventilation. The need for the use of an intercostal drain in any COVID-19–positive patient always will increase the risks of aerosolization from the chest drain and, in particular, the chest drain bottle. This may represent an under-recognized means of viral spread, which may put patients and healthcare professionals at

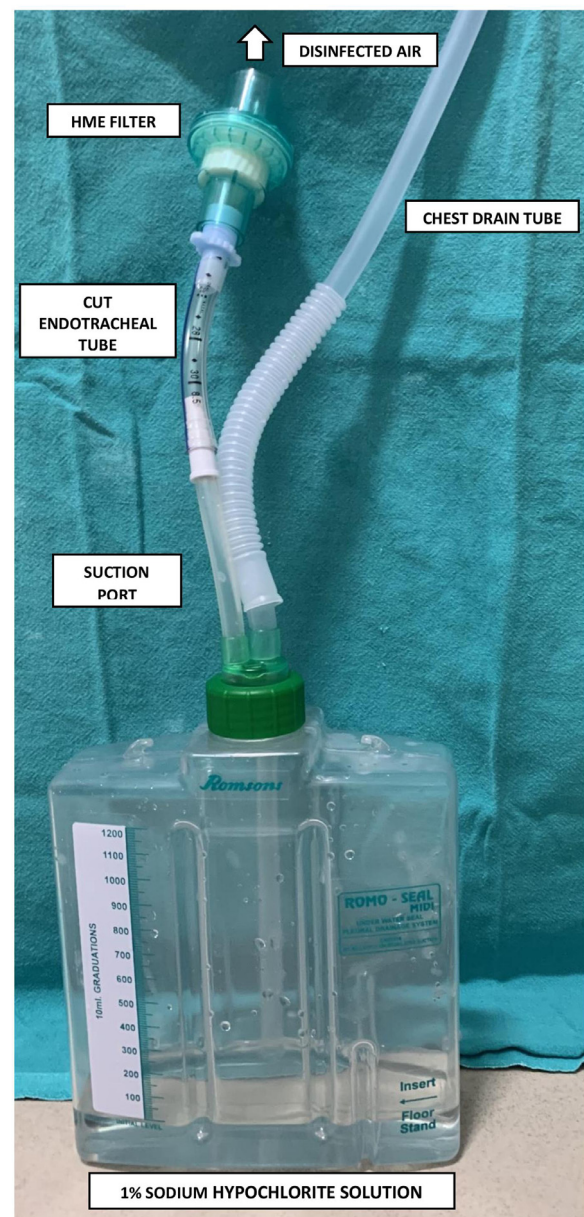


Fig 1. Modified underwater seal drainage system. HME, heat and moisture exchanger.

risk of infection. When air leaks into a chest drain bottle, it causes the fluid inside to bubble, and the aerosolization that likely is to occur inside the drain bottle then then escapes through the suction port or safety valve, potentially becoming an important mode of viral transmission. Therefore, to overcome this potential mode of transmission, we modified a underwater seal system (Romo Seal; Romsons Disposable Medical Devices, New Delhi, India) by attaching the heat and moisture exchanger filter with a cut endotracheal tube to the unit that is open to the atmosphere. In addition, we filled the chest drain bottle with 100 mL of 1% sodium hypochlorite solution in place of water (Fig 1). In COVID-19 patients with a chest drain and persistent air leak, the British Thoracic Society² recommends strategies to minimize droplet exposure via the chest drain circuit, such as connecting it to wall suction or a digital drain circuit. The British Thoracic Society also advises reducing the frequency of intercostal chest drain drainage to twice weekly. However, attaching the chest drain to the wall suction compromises mobilization of the patient.

There are several advantages of using sodium hypochlorite solution in an underwater seal drain, including the following:

1. The prevention of aerosolization that likely occurs inside the drain bottle and may escape through the suction port or safety valve.
2. If the safety valve is connected with wall suction, there is always potential risk of increasing intrathoracic pressure, which is minimized by using this hypochlorite solution.
3. Because the pleural fluid is presumed to be disinfected by sodium hypochlorite, it reduces the chance of viral transmission during its disposal.

Conflict of Interest

None.

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Percutaneous Dilatational Tracheostomy in Coronavirus Disease 2019 Extracorporeal Membrane Oxygenation Patients: A Case Series



To the Editor:

THE coronavirus disease 2019 (COVID-19) pandemic has devastated the world. About 15% of infected patients need intensive care.¹ A small proportion of these patients could benefit from extracorporeal membrane oxygenation (ECMO).² Performing a tracheostomy on these patients is considered to be a high-risk aerosol-generating procedure, with implications for staff safety.³ Guidelines to mitigate the risks associated with tracheostomy in COVID patients⁴ have not reported actual experience but delay of the procedure.⁵ The risk of bleeding also is greater in patients on ECMO who require tracheostomy.⁶ Nevertheless, tracheostomy can facilitate tracheal toilet, reduce sedative requirements, and decrease the duration of mechanical ventilation.

Case Series

At the start of the COVID-19 surge, we established a prospective tracheostomy database. In addition, we modified the procedure to reduce risk of aerosol spread to staff, as described in the following: (1) all procedures are performed in the patient's own intensive care unit (ICU) isolation room; (2) minimization of staff present (operator, bronchoscopist, nurse) and minimization of the number of operators as recommended by Tay et al.⁷; (3) use of disposable bronchoscopy equipment on a single trolley; and (4) discontinuation of mechanical ventilation during tracheostomy.

We performed 38 percutaneous tracheostomies in mechanically ventilated patients on ECMO during 8 weeks of the COVID-19 pandemic in our institution (March 27-May 15, 2020) (Table 1). We are 1 of the 5 designated ECMO centers in the United Kingdom and admitted more than 40 patients supported with ECMO during the COVID-19 pandemic. The decision to perform tracheostomy was made by the duty day intensivist. The average time of tracheal intubation before tracheostomy was 11.66 days. All procedures were successful.

Complications and Safety

Complications were minimal. No immediate complications, such as pneumothorax or tracheostomy malposition, were observed. No transfusion of blood products was required for tracheostomy bleeding, but 2 patients needed additional skin sutures to stop skin bleeding. We asked medical staff to report any sickness after the procedure, and to date there have been no reports of sickness or sick leave among medical staff relating to the tracheostomies.

Procedure

The percutaneous dilatational method was used for all tracheostomies, which were performed at the bedside in an ICU with isolation rooms. A preprepared trolley with all equipment