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Lessons from clinical practice during COVID-19 pandemic



The novel coronavirus 2019 (COVID-19) has been associated with a novel strain of coronavirus (SARS-CoV-2). This is a single-stranded ribonucleic acid encapsulated corona virus and is highly contagious. The transmission of this virus is predominantly via

contact, droplets, and aerosol [1]. During this unprecedented event of COVID-19, there are a lot of innovative ideas generated in response to the situation. This novel virus has had a devastating impact on our industries, social lives, and personal grooming

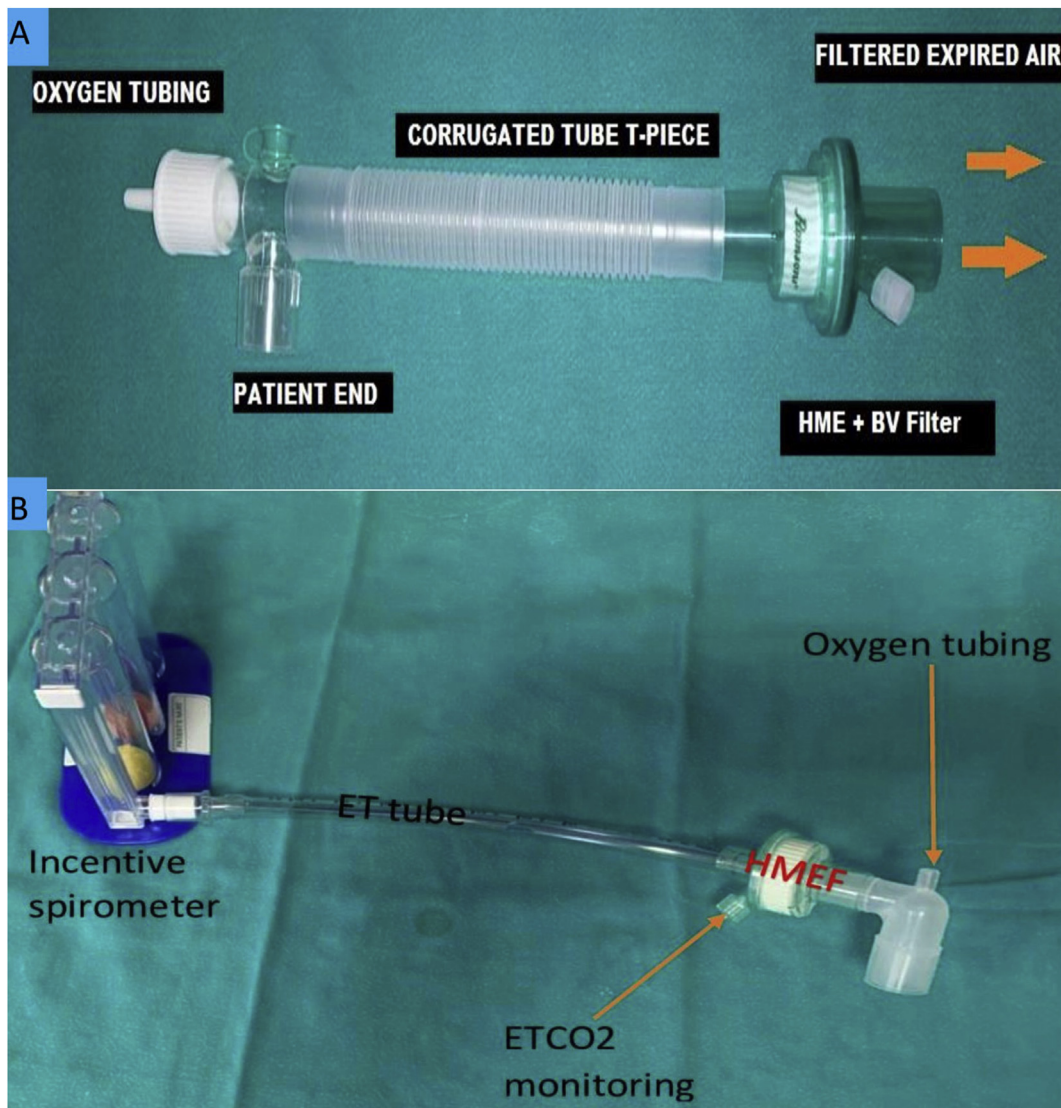


Fig. 1. (a) A modified T-Piece assembly. (b) Modified incentive spirometer.

standards, but it is also prompting an outpouring of creativity in other areas. We modified a T-piece assembly to be used for providing spontaneous breath trial and Incentive spirometer to be used in tracheostomized COVID-19 patients.

A T-piece is a very useful piece of equipment used during successful weaning of patients from mechanical ventilation. If a patient is ready to breathe spontaneously, a screening test, called a spontaneous breathing trial (SBT), is usually performed and this test is typically done by disconnecting the patient from the ventilator and attaching a T-piece to the endotracheal tube [2]. This T-piece system consists of three main parts: T-tube, mixing tube, and Venturi valve.

During this COVID-19 pandemic if a patient is requiring a T piece trial, we made a very simple assembly by connecting the heat and moisture exchangers and anti-viral filter (Romsons International, Noida, India) to the distal end of the mixing tube to filter the exhaled carbon dioxide (Fig. 1a). These HMEs in combination with antiviral Filter are widely used during general anaesthesia. The moisture exchange component passively humidifies the inspired air, and the filter component reduces the risk of viral and bacterial cross contamination between patients [3]. Heat moisture exchange filter may decrease the resistance to airflow but to increase its efficiency the surface area of these HMEs is increased mainly by pleating. The filtration in these HMEs is achieved for larger particles ($>0.3 \mu$) by inertial impaction and interception and for smaller particles it is achieved via Brownian diffusion [4].

We made yet another very simple modification in incentive spirometry as an important tool for providing lung expansion, improvement in lung function and in prevention of pulmonary complication [5]. It expands collapsed alveoli and improves chest wall function. Commercially available spirometers cannot be used by tracheostomized patients because the mouth piece of the spirometer incompatible to the tracheostomy tube. The patient's end of commercial incentive spirometers have a 'rectangular' cross-section which cannot fit to the circular end of a tracheostomy tube. Here we describe a modification of incentive spirometer (La-med Healthcare Pvt. Ltd, Faridabad, Haryana) using an Endotracheal tube (size 8 mm), Heat & moisture exchange filter (HME + antiviral filter, Medisafe International), and "Cobb" connector with oxygen port (Fig. 1b). This assembly enables us to use incentive spirometer in tracheostomized patients along with end tidal carbon dioxide (ETCO₂) monitoring. Goldstein et al. had developed a customised incentive spirometer for tracheostomized patients and concluded that incentive spirometry in tracheostomized patients was well tolerated with no complications [6]. However they haven't applied a heat moisture exchange filter to protect the aerosol spread during incentive spirometry in patients having infectious diseases. This modification becomes useful during incentive spirometry of patients infected with COVID-19 or other infectious diseases.

We may conclude that prudence should anyway always be adopted when combining new devices, despite this could be due to limited resources available during the pandemic, and that similar solutions do not exclude the correct use of PPE [7].

Declaration of competing interest

Nil.

Acknowledgement

Written informed consent for publication obtained from the patient parents.

Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.tacc.2020.06.008>.

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