Suction Performance of Airway Medix Closed Suction System Compared to Standard Closed Suction System

BACKGROUND

Mechanically ventilated patients treated in intensive care units (ICU) are most commonly ventilated through an endotracheal tube (ETT). During ventilation, secretions accumulate inside the tube and reduce its inner diameter. In order to clean the lumen of the ETT, a suction catheter is introduced inside the tube, and while suction is employed secretions are removed. However, since commonly used closed suction systems (CSSs) have a suction hole located at the tip of the catheter, air from the patient's lungs is being suctioned as well. The Airway Medix Closed Suction System (AMCSS) represents a novel technology, designed to achieve effective cleaning of ETTs by combining three powerful mechanisms: operation of saline jets, suction and balloon wiping. These features help to maintain a patent airway. In order to prevent suction of air from the patient's lungs, the tip of the AMCSS is sealed. However, the absence of that suction hole may compromise the suction efficacy while performing deep suction. In order to evaluate the performance of the AMCSS during deep suction, a comparative study was performed. In the study, the amount of removed secretions using AMCSS was compared to that removed by a commonly used CSS (KIMVENT by Kimberly-Clark). The purpose of the test was to prove AMCSS is not inferior to the common practice CSS in performing deep suction procedure.

MATERIALS AND METHODS

The AMCSS, by Biovo Technologies, includes two suction holes, located above the balloon, 3.4mm in diameter each. The KIMVENT CSS, by Kimberly Clark, includes three suction holes: two are located at the sides of the catheter close to the tip, 2.6mm in diameter, and one located at the tip, 3mm in diameter. In order to compare the suction performance of both systems, a study was designed and performed in summer 2013 by Biovo Technologies. The study included an experimental system simulating the human respiratory system, comprising an ETT, trachea, carina and two artificial lungs (Figure 1).

In addition, a measured amount of mucus simulant was placed inside the ETT to mimic secretions. The CSS patient end was connected to the respiratory system and to a ventilator. The machine end was connected to a suction pump and a measuring cell, designed to measure the amount of secretion suctioned by the system.

A suction procedure was performed an hour after placing the mucus, so the venilator had enough time to push it down to the trachea and lungs. Catheters of size 14Fr were used. The location of the ETT inside the trachea changed throughout the experiment, so the secretions were pushed to different places in the system. The procedure was performed according to the applicable instructions for use.

The suctioned secretions were collected in the measuring cell. For each CSS brand and for each location of the ETT the experiment was repeated twice.

RESULTS

Figure 2 presents the average amount of mucus collected in each location of the ETT.

The amount of mucus injected between the tip of ETT and carina was similar in both CSSs (20±0.2cc). Two suction episodes were performed using both AMCSS and KIMVENT CSS. After each episode the accumulated mucus inside the measuring cell was evaluated. It was demonstrated the amount of mucus suctioned using AMCSS is higher compared to that suctioned by KIMVENT (total average amount of 3.9±0.2g and 3.0±0.2g, respectively), regardless of the location of the ETT with respect to the carina.

CONCLUSIONS

The different configuration of the suction holes at the tip of the AMCSS does not reduce the suction performance in relation to KIMVENT CSS. The amount of secretions removed from the system was higher when using AMCSS, irrespective of the ETT position in relation to the carina. Therefore, it can be concluded that AMCSS is not inferior to KIMVENT CSS with regards to deep suction abilities.

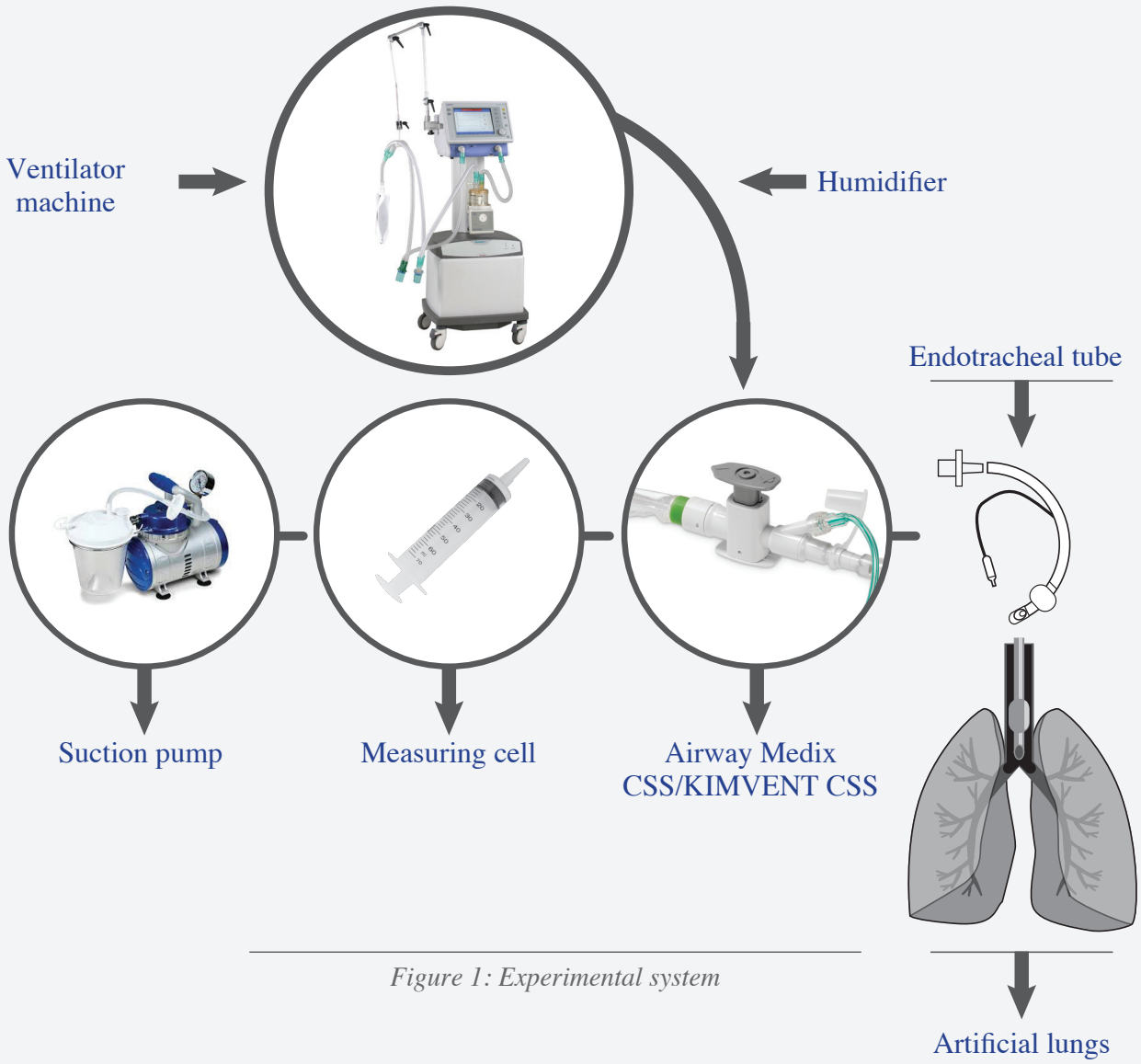

Figure 1: Experimental system

ETT location measured from the carina (cm)	Averaged amount of suctioned mucus (gr)		Relative advantage of AMCSS
	AMCSS	KIMVENT CSS	
3	3.7	2.5	148%
5	3.9	3.1	126%
7	4.35	3.4	127%

Figure 2: AMCSS vs. KIMVENT by means of suction performance

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