Performance evaluation of two closed suction catheter systems

Technical Bulletin

Executive Summary

Endotracheal suction helps to remove secretions from the artificial airways of mechanically ventilated patients, using open suction catheters or closed suction catheters. An open suctioning technique involves disconnecting the patient from the ventilator, whereas a closed suctioning technique requires attachment of a sterile, closed, in-line suction catheter to the ventilator circuit without disconnecting the patient from the ventilator. Closed suctioning is suggested for adults with high positive end-expiratory pressure (PEEP), or at risk for lung derecruitment, and for neonates.[1, 2, 3]

Medline ClearPro™ and Avanos (Halyard) Turbo-Cleaning closed suction catheter systems were evaluated for flow rate and suction performance testing using distilled (DI) water, 0.75% hypromellose solution (to simulate human saliva), and 1.5% hypromellose solution (to simulate human body secretions that were more viscous than human saliva).[4,5]

Medline ClearPro™ Closed Suction Catheter System

- Contains isolated cleaning chamber for rapid catheter irrigation.
- Contains pressure wiper seal for PEEP maintenance and catheter decontamination.
- Free of di(2-ethylhexyl)phthalate (DEHP), known to cause reproductive and developmental side effects on animal models and humans in vitro and in vivo.[6]

Closed suction catheter on a patient with an endotracheal tube (L) and a tracheostomy tube (R).

Materials

- Hypromellose solutions (0.75% and 1.5%) and DI water.
- The testing apparatus consisted of:
  - Vacuum pump
  - Y-connector with suction tubing
  - Manometer and timer
  - Suction canister
  - Closed suction catheter

Testing Apparatus Set-up

- The base connection of the Y-connector with suction tubing was secured to the vacuum pump and manometer, and the suction canister was secured at the split connections.
- Suction tubing was secured to the patient port of suction canister.
- The closed suction catheter was secured to the suction tubing that was connected to the patient port of suction canister.

Methods

- A beaker was filled with 500 ± 10ml of test fluid (DI water, 0.75% hypromellose solution, or 1.5% hypromellose solution).
- Both Medline ClearPro™ and Avanos (Halyard) closed suction catheters were used to suction the three fluids.
- Number of catheters per manufacturer used = 20 per test fluid condition.
- Suction catheter was inserted into the beaker.
- Vacuum pump and timer were started simultaneously. Vacuum pressure of 13 ± 3.0 inHg was applied.
- If the catheter was suctioning fluid, flow rate (ml/sec) was calculated as:

$$\text{Flow Rate} = \frac{\text{Volume of Fluid}}{\text{Time to Suction Fluid}}$$

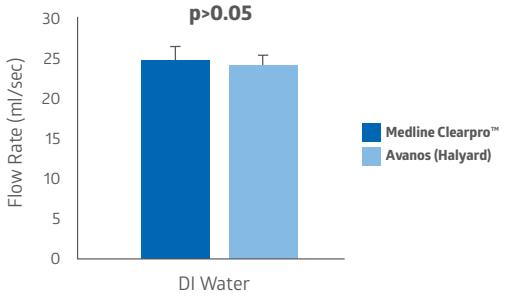
Results

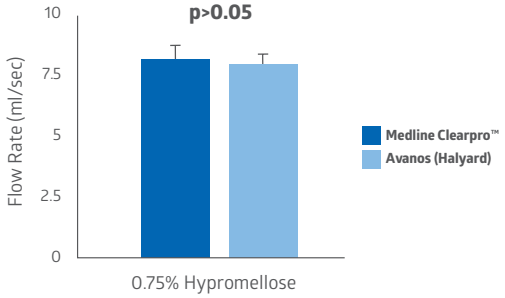
Performance evaluation parameters - Flow rate and suction performance

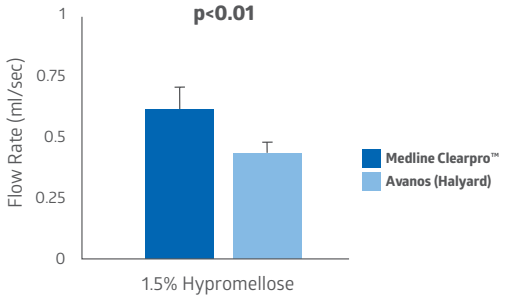
- **Flow rate**[5]: There was no statistically significant difference in flow rates of both suction catheters while suctioning DI water and 0.75% hypromellose solution, whereas a modest increase in flow rate was recorded when Medline's ClearPro™ closed suction catheter system was used to suction 1.5% hypromellose solution (graphs on the right).
- **Suction performance**[5]: Both of the suction catheters successfully met the suction performance criterion with DI water and the two hypromellose solutions (0.75% and 1.5%).

Conclusion

This study demonstrated similar efficacies of Medline ClearPro™ and Avanos (Halyard) Turbo-Cleaning closed suction catheter systems in suctioning fluids with viscosities representative of human airway secretions.







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