

Performance characterization of a new tracheostomy tube with subglottic suction port

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Introduction

There is evidence that secretions draining from the upper airways can collect on the top of the tracheostomy tube cuff and become a risk for tracheal aspiration resulting in infections.¹ Reports in the literature describe posterior tracheal wall injury from the subglottic suction port.^{2,3} A new tracheostomy product (Shiley™ flexible evac tracheostomy tubes with TaperGuard™ cuff technology, Medtronic Boulder USA) has a suction port just above the cuff intended for evacuation of secretions collecting on top of the cuff. The new tracheostomy cannula has the suction port located in the lateral wall of the tube body.

Objectives

The purpose of this study was to characterize the suction performance and tracheal wall injuries in an animal model during mechanical ventilation.

Methods

Sixteen porcine models underwent tracheostomy and received the Shiley™ flexible evac tracheostomy tube with TaperGuard™ cuff technology. Eight animals (Group 1) had normal secretion viscosity (500 centipoise) liquid and 8 animals (Group 2) had thick simulated mucous (5000 centipoise) liquid infused at 3 mL/hour on top of the cuff. The subglottic space was suctioned every 15 minutes for the 4-hour duration of the study using the subglottic suction port. The suction method was 3 cycles of 15 seconds on and 10 seconds off at 100 cmH₂O negative pressure (Ohio Medical Push-To-Set™ Vacuum Regulator, OHIO Medical, Gurnee, USA).⁴

Fluoroscopic images and data collection were performed through 4 hours following placement of the device. At the completion, the trachea was removed with the Shiley™ flexible evac tracheostomy tube in situ and the site of the suction lumen exposed. Changes in the tracheal wall were assessed through macroscopic observations and given scores of 0-4 where 0 is no injury and 4 is necrosis.⁵

Results

Both groups had equal amounts of secretions infused on top of the cuff (Group 1: 12.1 mL; Group 2: 11.9 mL [p < 0.29]) and in both groups secretion was recovered (Group 1: 10 mL; Group 2: 8 mL [p < 0.33]). For damage to the trachea from the suction port, Group 1 had one animal scored as 2 (Figure 2) and three as 1 (Figure 1), and Group 2 had three animals scored as 1. No secretions were seen below the cuff in any group.

Conclusions

The suction lumen was patent during the entire experiment. The suction performance was similar between the groups with slightly less recovery of the 5000 centipoise fluid. Most animals in both groups had no tracheal injury (0) or mild erythema (1) at the site of the suction port. One animal in Group 1 had edema (2) at the site of the suction port. The suction port in the lateral wall allows for adequate removal of subglottic secretions. Only clinical studies will completely elucidate the long-term effect of the new design.



Figure 1. The tip of the forceps points to tracheal injury rated as mild erythema.

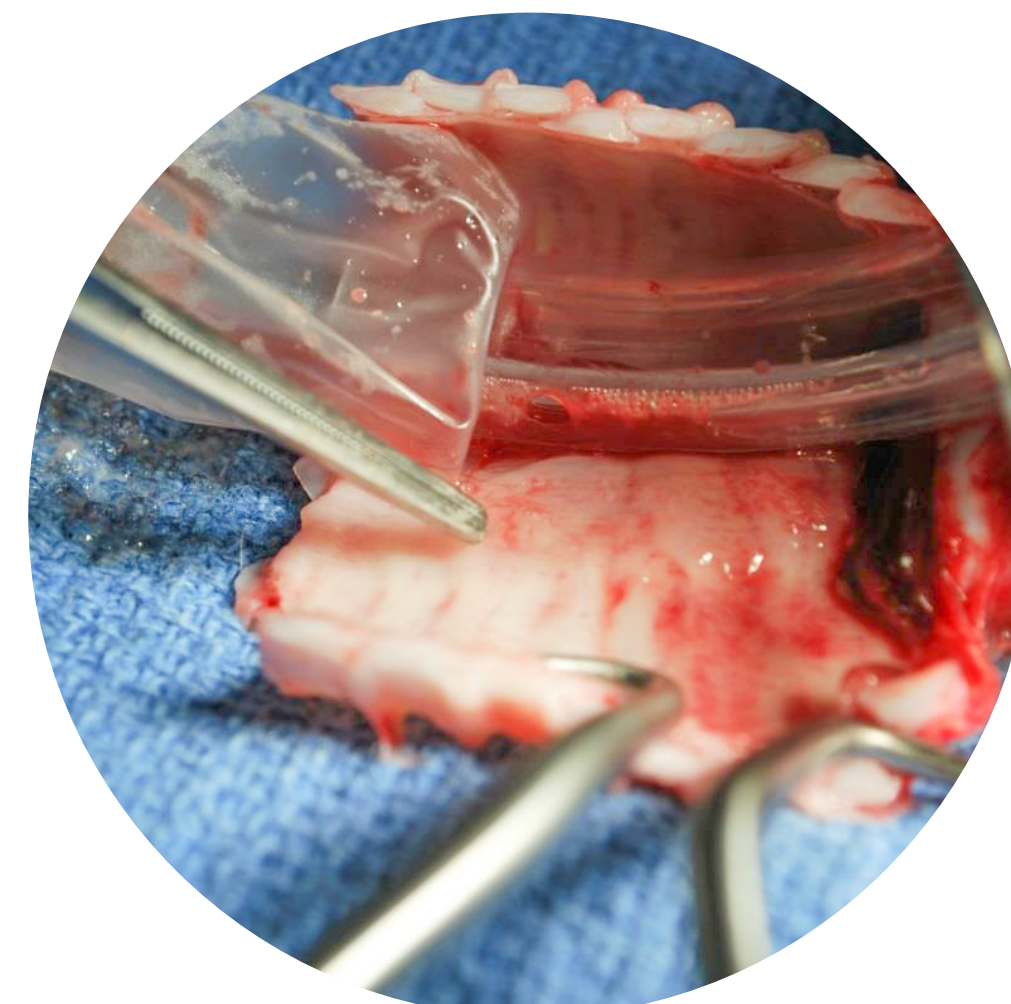
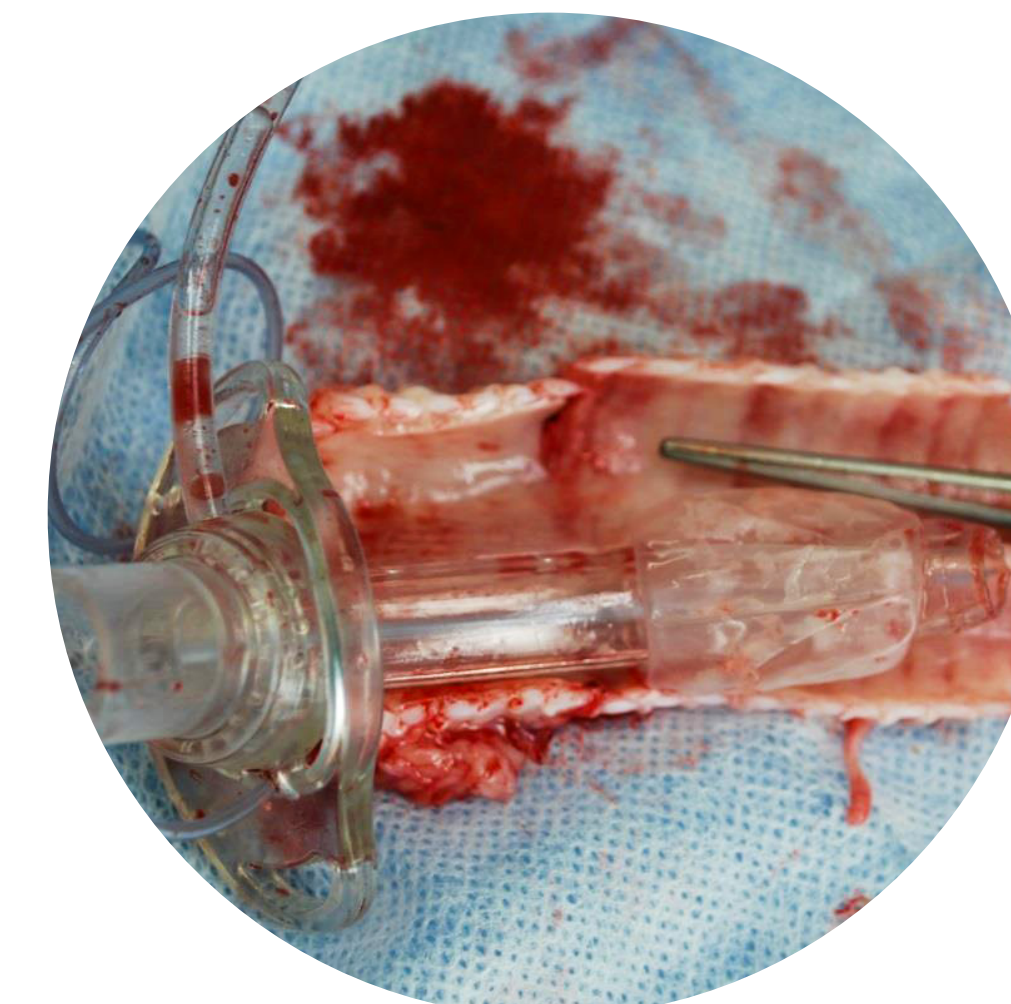


Figure 2. The tip of the forceps points to tracheal injury rated as edema.



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