Performance of the PneuX System: A Bench Study Comparison With 4 Other Endotracheal Tube Cuffs

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**Abstract**

**BACKGROUND:** Cuff design affects microaspiration, a risk factor for pneumonia. We questioned whether the PneuX low-volume fold-free cuff design would prevent cuff leakage and maintain the same tracheal wall pressure as high-volume, low-pressure (HVLP) cuffs.

**METHODS:** We evaluated 4 HVLP-cuffed endotracheal tubes (ETTs), Hi-Lo (polyvinyl chloride [PVC]), Microcuff (polyurethane [PU]), SealGuard (PU + tapered), and TaperGuard (PVC + tapered), and the PneuX with its dedicated tracheal seal monitor. In Part 1, we determined tracheal wall pressure using each cuff's capacity to support water columns across recommended intracuff pressures. In Part 2, we evaluated the tracheal seal monitor function at recommended settings. In Part 3, we compared leakage volumes of all ETTs during 30 min of simulated mechanical ventilation or during 8 h if no leak occurred. Parts 1 and 3 were performed with/without lubrication and PEEP.

**RESULTS:** In Part 1, PneuX cuffs exerted an average tracheal wall pressure of 27.4 ± 2.4 cm H2O at the recommended intracuff pressure of approximately 80 cm H2O. Tracheal wall pressure did not differ among HVLP cuffs (19.6 ± 1.4 to 29.5 ± 1.4 cm H2O). In Part 2, preinflation intracuff pressure affected the time to obtain tracheal seal monitor pressure attainment (*P* < .01). The tracheal seal monitor generated average calculated tracheal wall pressure of 33.4 ± 1.2 cm H2O. In Part 3, PneuX ETT showed no leak across 8 h for all trials. Overall, leakage volume was lower with PU (*P* < .01) and PneuX (*P* < .01) than with PVC cuffs, regardless of shape, and lower with lubrication and/or PEEP (all *P* < .01). In each HVLP cuff, lubrication alone eliminated leak at an intracuff pressure of ≤30 cm H2O.

**CONCLUSIONS:** The PneuX cuff generally exerted acceptable tracheal wall pressure, but the tracheal wall pressure monitor allowed pressures exceeding 30 cm H2O in some trials and was the only ETT to prevent leak in all tests. For HVLP cuffs, leak was reduced by PU and PEEP and eliminated by lubrication.