

DEVELOPMENT, CHARACTERIZATION, AND INITIAL ASSESSMENT OF CAPNOGRAPHY-GUIDED INTUBATION

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INTRODUCTION

A unique hollow intubation stylet, which connects to suction and allows for the immediate measurement of the partial pressure of aspirated carbon dioxide, has been developed and is currently being assessed. This device appears to be potentially useful, as an aid for endotracheal intubation, in situations in which the glottis may be difficult to visualize secondary to the presence of tumor or aberrant anatomy.

METHODS

The stylet is a hollow yet malleable plastic tube the distal end of which fits inside of standard endotracheal tubes. Using readily-available components, its proximal end is connected to a mainstream capnograph and suction. With an applied suction of 180 mmHg, a turbulent airflow of 0.5 liters/second is generated with a corresponding Reynolds number of 9,375.

After IRB approval and informed consent, preliminary results, on 12 intubations, have shown that this device immediately differentiates between tracheal and esophageal intubations.

RESULTS

Esophageal intubations were consistently associated with aspirated CO₂ (aspCO₂) partial pressures of < 5 mmHg while tracheal intubations were associated with aspCO₂ partial pressures of > 5 mmHg.

Specifically, aspCO₂ from tracheal intubations had a mean partial pressure of 23.25 mmHg with a standard deviation of 14.01 mmHg. Whereas esophageal intubations had a mean aspCO₂ partial pressure of 2.25 mmHg with a standard deviation of 2.06 mmHg ($P = 0.0036$).

These aspCO₂ partial pressures were obtained and observed immediately during the intubation process; as the tracheal tube was placed into either the trachea or esophagus. False negative readings were obtained from two patients due to copious pulmonary secretions obstructing the mainstream capnograph.

DISCUSSION

Thus, used in this manner, this device may be helpful in the management of difficult intubations. Furthermore, identification of correct tracheal tube placement appears to be faster than conventional methods utilizing side stream or colorimetric capnography. In addition, esophageal intubations are potentially identifiable without stomach insufflation.

Continued engineering development and patient-based assessment, of capnography-guided intubation, using this apparatus, is ongoing.

REFERENCES

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