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Doctoral dissertation: ASSESSMENT OF THE EFFECTIVENESS OF ENDOTRACHEAL INTUBATION WITH THE USE OF A VIE SCOPE® LARYNGOSCOPE IN THE CONDITIONS OF SIMULATED EMERGENCY AIRWAY MANAGEMENT

Summary

INTRODUCTION

Emergency medical teams often intervene in patients who, because of cardiac arrest or unconsciousness, require respiratory device protection. Tracheal intubation is the gold standard of airway protection in both pre-hospital and inpatient settings. Due to the widespread availability, it is most often performed with standard Macintosh or Miller laryngoscopes. However, emergency intubation performed in an emergency medicine setting differ significantly from intubation performed in an operating theater setting. Time pressure, severe weather, or difficult airways may reduce the effectiveness of this procedure. As showed by many authors, the effectiveness of the first intubation attempt with the use of a Macintosh laryngoscope is from 57.6% to 89.94%. Hence, the search for alternative methods of intubation is a key element of research conducted in the world in device protection of airway patency.

Purpose

The common goal of the series of studies included in the monothematic publication cycle was to evaluate the effectiveness of various techniques for endotracheal intubation, with particular emphasis on the new Vie Scope® laryngoscope under simulated rescue endotracheal intubation.

MATERIAL AND METHODS

The presented doctoral dissertation comprises a series of four studies. Three studies compare the new Vie Scope® Laryngoscope with a standard Macintosh Blade Laryngoscope under different intubation conditions. The fourth paper is a meta-analysis comparing intubation using the AirTraQ canal laryngoscope with the Macintosh laryngoscope. Of the studies included in the monothematic publication cycle, three are full-text papers and one is a research letter to the editor published in The American Journal of Emergency Medicine.

The first study, designed as a systematic review and meta-analysis, compared the effectiveness of intubation with the AirTraQ laryngoscope and the Macintosh blade laryngoscope. It is a kind of introduction to endotracheal intubation with the use of Vie Scope® discussed in the dissertation. Because of the lack of research on this type of laryngoscope, I decided it to analyze the effectiveness of the AirTraQ laryngoscope, which is the most widely used canal laryngoscope in the world.

The aim of the second study was to compare the effectiveness of endotracheal intubation with the Vie Scope® laryngoscope. A Macintosh laryngoscope was used as the gold standard of intubation. 42 paramedics taken part in the study, tasked with performing endotracheal intubation in two research scenarios: a) tongue edema scenario; b) manual stabilization of the cervical spine scenario.

The aim of the third study was to evaluate the effectiveness of intubation of a pediatric patient with the use of the Vie Scope® laryngoscope. The study involved 42 paramedics who had at least two years of experience in the conditions of medical rescue teams. The study participants were asked to perform a randomized cross intubation in the following three research scenarios: a) normal airway; b) tongue edema; c) continuous chest compression.

42 paramedics also took part in the fourth study, which aimed to compare intubation with the Vie Scope® laryngoscope and the Macintosh laryngoscope. This study was a pioneering study in using the Vie Scope® laryngoscope in intubation conditions of a patient suspected of having an infectious disease. During the study, medical personnel wore personal protective coveralls to protect against infectious aerosols.

RESULTS

The first study included 17 studies. The effectiveness of the first intubation attempt using the AirTraQ canal laryngoscope was 85.6%, and the Macintosh laryngoscope with 68.4%. AirTraQ

intubation was also associated with a shorter intubation time (MD = -3.19; 95% CI: 9.33, 2.95; $P = 0.31$).

In the second study in the adult tongue edema scenario, the duration of intubation using direct laryngoscopy was 55s (IQR; 46-109) and was statistically longer than with Vie Scope® - 30.5s (IQR; 26-35; $P < 0.001$) with the effectiveness of the first intubation attempt of 95.2% and 64.3%, respectively ($P < 0.001$). In the scenario with manual cervical stabilization, intubation using the Vie Scope® compared to the Macintosh laryngoscope was statistically significantly more effective ($P < 0.001$) both in terms of the duration of the procedure and the effectiveness of the first intubation attempt.

The third study analyzing the effectiveness of intubation performed with the Vie Scope® laryngoscope showed the total effectiveness of this method of intubation at the level of 100% regardless of the research scenario. The effectiveness of the first attempt was 100% for normal airways, 98% for tongue swelling, and 91% for chest compression. The intubation time for individual scenarios was respectively: 27s (IQR; 24–34), 27s (IQR; 25–37) and 29s (IQR; 25–40).

In the fourth study, during intubation in a PPE, a statistically significant reduction in the duration of the first intubation attempt was demonstrated with the Vie Scope® laryngoscope compared to the Macintosh laryngoscope (28.5s and 44s, respectively; $P < 0.001$). The effectiveness of the first intubation attempt with the devices tested was varied and amounted to 92.9% and 50.0%, respectively, and the total intubation efficiency was 100% and 90.5% (for Vie Scope® and Macintosh laryngoscope, respectively).

CONCLUSIONS

The conducted research allows for the following conclusions:

- AirTraq as an example of a canal laryngoscope is an alternative to direct laryngoscopy, increasing the effectiveness of the first intubation attempt, especially in terms of immobilization of the cervical spine.
- Tracheal intubation with the Vie Scope® is more effective than a Macintosh laryngoscope in securing the airway of a pediatric patient.
- Vie Scope® in the simulation test shows high effectiveness of the first intubation attempt, both in terms of normal and difficult airways.

- In the case of intubation of a patient suspected of having an infectious disease and medical personnel wearing protective suits, the use of the Vie Scope® laryngoscope significantly reduces intubation time and increases the chances of successful intubation.

