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„EVALUATION OF THE USE OF SUPRAGLOTTIC AIRWAY DEVICES FOR AIRWAY MANAGEMENT IN EMERGENCY MEDICINE CONDITIONS”

INTRODUCTION

The ability to protect airway patency and assist breathing in patients with impaired breathing or lack of air flow should be one of the key skills that medical personnel possess. Due to the widespread accessibility of respiratory protection, the gold standard is endotracheal intubation based on direct laryngoscopy. However, as many researchers point out, the effectiveness of this method in out-of-hospital settings as well as in-hospital emergency department is inadequate; moreover, direct laryngoscopy performed by an inexperienced person may carry the risk of a large number of potential complications. In addition, in the case of cardiopulmonary resuscitation, the procedure for endotracheal intubation should be carried out without interrupting chest compressions, or only with a short interval in the compressions that allows the insertion of the endotracheal tube between the vocal folds. An alternative to direct laryngoscopy may be supraglottic ventilation devices that allow for fast protection of the airway patency during uninterrupted chest compressions. In addition, certain models allow inserting the endotracheal tube into the ventilation duct, and thus implementing endotracheal intubation blindly. However, as in the case of each procedure, training in this method of endotracheal intubation is an important element, as well as searching for the most effective method of airway patency protection, which will allow complete isolation of the airways with high effectiveness of the first trial and relatively short duration of the procedure.

AIM

The common goal of the series of studies included in the monothematic cycle of publications was the assessment of the use of supraglottic devices for ventilation in conditions of airway patency in selected emergency states.

MATERIAL AND METHODS

Of the four studies included in the monothematic publication cycle, one was conducted based on the author's questionnaire, while the other three were conducted on the basis of medical simulation using adult and pediatric simulators. All simulation studies were prospective, randomized, cross-sectional studies.

The first study was based on the author's questionnaire and aimed at assessing the knowledge and attitudes of final-year medical students regarding the use of supraglottic devices for ventilation in conditions of airway patency during cardiopulmonary resuscitation. Eighty-two respondents took part in the survey. The questionnaire included both questions regarding knowledge of supraglottic ventilation devices, as well as attitudes towards their use.

In the second study, 42 trainee doctors participated in an experimental, randomized, cross-sectional simulation, during which the efficacy of endotracheal intubation performed using the blind method with the use of the larynx mask as a guide for the endotracheal tube was evaluated.

Participants of the study performed intubation of an adult during simulated cardiopulmonary resuscitation in two scenarios: Scenario A included intubation when chest compressions were interrupted during intubation, while scenario B included continuous chest compressions using a mechanical chest compression system.

The third study was also conducted based on the use of medical simulation. The study was prospective, observational, randomized, and cross-headed. One-hundred thirty-four doctors participating in the study took part in the training module in the field of emergency medical services conducted as part of the medical specialization. The participants of the study had to perform endotracheal intubation blindly using the iGEL and Air-Q laryngeal masks. The reference point was the use of endotracheal intubation using a laryngoscope with a Macintosh blade. Endotracheal intubation was performed under the conditions of simulated cardiopulmonary resuscitation in three research scenarios: Scenario A - normal airway without chest compressions; Scenario B - normal airway with continuous chest compressions; Scenario C - difficult airways with continuous chest compressions.

Fifty-six students of their final year of medicine participated in the fourth study. The study was also designed as a prospective, observational, randomized, cross-sectional study.

The participants of the study performed endotracheal intubation during a simulated cardiopulmonary resuscitation of a pediatric patient. For this purpose, a patient simulator representing a 5-year-old boy was used. The participants performed intubations with and without chest compressions.

Intubation was conducted on the basis of blind intubation using the AMBU® AuraGain laryngeal mask, while the reference method was direct laryngoscopy using a laryngoscope with a Macintosh blade.

RESULTS

In a study assessing knowledge and attitudes to the use of airway ventilation devices, 63.4% of respondents participated in theoretical classes on supraglottic ventilation devices during the study and 52.4% of participants in the study declared practical training in the use of this method of respiratory protection. 81.7% of respondents would use supraglottic ventilation devices as a method of securing an airway during cardiopulmonary resuscitation of an adult, and 71.9% in the case of resuscitation of a pediatric patient. 47.5% of people think that the use of supraglottic ventilation devices during resuscitation allows for asynchronous resuscitation, while the remaining 52.5%, despite a positive leak test, would use the standard resuscitation technique of 30 chest compressions and 2 rescue breaths.

In the case of the study evaluating the effectiveness of endotracheal intubation using the iGEL device, the effectiveness of the first attempt to protect the airway patency with the iGEL device was 100%, both in the case of with and without chest compressions. The effectiveness of the first "blind" intubation attempt was 80.9% during Scenario A, and 73.8% during Scenario B ($p = 0.056$). The median duration of the intubation procedure during Scenario A was 29.5s (IQR, 24-41) and was slightly lower than in Scenario B - 31s (IQR, 23-45.5, $p = 0.318$).

In the third study comparing the effectiveness of blind intubation using iGEL and Air-Q laryngeal masks as a guide for the tracheal tube and standard intubation using a Macintosh blade laryngoscope, the effectiveness of the first intubation attempt in Scenario A was 81%, 75 % and 72%, and the intubation time was 19s (IQR, 16-25), 23s (IQR, 16.5-31) and 24.5s (21-32) respectively. In the case of scenario B, the effectiveness of both the first intubation and intubation tests for iGEL, Air-Q and direct laryngoscopy was different and amounted to 79.9% vs. 74.6% vs. 41.8%, and 18.5s (IQR; 17-27) vs. 20.5s (IQR; 18-32) vs. 41.5 (IQR, 35-49).

During intubation in Scenario C conditions, the effectiveness of the first intubation attempt for iGEL, Air-Q and direct laryngoscopy was 73.9% vs. 64.9% vs. 23.1%, and the intubation time was 19.5s (IQR, 17.5-27.5) for iGEL, 22s (IQR, 19.5-35) for Air-Q and 49.5s (IQR; 44-67) for direct laryngoscopy.

In the fourth study comparing blind intubation using the AMBU® AuraGain mask as a guide for the endotracheal tube and intubation based on a Macintosh blade with the conditions of scenario A (without chest compressions), the efficacy of the first intubation test for the tested devices was 48.2% and 28.6%. The median time was 30s (IQR, 22-43) and 32s (IQR, 27-41,5), respectively. The total efficacy for both intubation techniques was 100%. During intubation under scenario B (with chest compressions), the efficacy of the first intubation trial was 33.9% for AMBU, and 5.4% for MAC, and the total intubation efficiency was 73.2% and 46.2%, respectively. The median intubation time was 32s (IQR, 22-45) for intubation using the AMBU mask and 47s (IQR; 33-57) for direct laryngoscopy.

CONCLUSIONS

The conducted research indicates the necessity to introduce obligatory training in the use of pendular ventilation devices as a method of airway protection during cardiopulmonary resuscitation. The research also indicates insufficient effectiveness of tracheal intubation based on direct laryngoscopy performed by doctors who do not have specialization in anesthesiology or emergency medicine. In the conducted studies, endotracheal intubation during which ventricular ventilation devices are used as a specific guide for the endotracheal tube, was associated with shorter time of the procedure and higher efficiency of the first intubation attempt. The participants of the intubation tests using the supraglottic ventilation devices indicate that the intubation procedure is easier to perform compared to intubation using a laryngoscope with a Macintosh blade.