

## ARTYKUŁ ORYGINALNY / ORIGINAL PAPER

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***Comparison of direct laryngoscopy with videolaryngoscopy for endotracheal intubation performed by last year medical students – a pilot data*****Lukasz Szarpak<sup>1,2</sup>, Kurt Ruetzler<sup>3</sup>, Halla Kaminska<sup>4</sup>,  
Marek Dabrowski<sup>5</sup>, Tomasz Klosiewicz<sup>6</sup>, Karol Bielski<sup>1,2</sup>,  
Wojciech Wieczorek<sup>7</sup>, Jerzy Robert Ladny<sup>8</sup>**<sup>1</sup> Lazarski University, Warsaw, Poland<sup>2</sup> MEDITRANS The Voivodship Emergency Medical Service and Sanitary Transport, Warsaw, Poland<sup>3</sup> Department of General Anesthesiology, Cleveland Clinic, Cleveland, OH, USA<sup>4</sup> Department of Children's Diabetology, School of Medicine in Katowice, Medical University of Silesia in Katowice, Poland<sup>5</sup> Chair and Department of Medical Education, Poznań University of Medical Sciences, Poznan, Poland<sup>6</sup> Department of Medical Rescue, Poznań University of Medical Sciences, Poznan, Poland<sup>7</sup> Department of Anaesthesiology and Intensive Therapy, School of Medicine with the Division of Dentistry in Zabrze, Medical University of Silesia, Katowice, Poland<sup>8</sup> Department of Emergency Medicine and Disaster, Medical University Bialystok, Bialystok Poland**Abstract**

**Background.** Endotracheal intubation in Poland is still determined as the golden standard of airway management during cardiopulmonary resuscitation. The most common method used in intubation is direct laryngoscopy. However, it requires a person who presents adequate knowledge and skills. The videolaryngoscopy might be good alternative. The purpose of this study was to compare the efficacy of endotracheal intubation in normal airway conditions using a standard Macintosh laryngoscope with a UEScope® video laryngoscope performed by students in their last year of medical education. **Material and methods.** 32 students of the last year of medicine participated in the study. We prepared cardiopulmonary arrest simulation. We used standard Macintosh laryngoscope and UEScope® videolaryngoscopy to maintain airway patency. The order of the participants as well as the method of intubation were randomized. The time of the procedures, the effectiveness of the first attempt as well as the Cormack-Lehane epiglottis visualization classification system were assessed. **Results.** Median intubation time differed between 28 s [IQR; 25-37] for UEScope® and 37.5 s [IQR; 31-45] for Macintosh laryngoscope. The efficacy of the first trial for UEScope® was 93.7% and was higher than for the Macintosh Laryngoscope - 84.4% ( $p = 0.045$ ). There was no statistically significant difference between UEScope® and Macintosh laryngoscope in the Cormack-Lehane scoring scale. **Conclusions.** In simulated cardiopulmonary resuscitation, last year medical students had higher efficacy of the first intubation, shorter duration of the procedure when intubation was performed with the UEScope® than with the Macintosh laryngoscope. *Anestezjologia i Ratownictwo* 2018; 12: 237-241.

**Keywords:** endotracheal intubation, emergency medicine, cardiopulmonary resuscitation, efficiency

## Introduction

The ability of airway management is one of the basic skills of healthcare providers [1]. There are many types of airway devices available today, ranging from the simplest oropharyngeal (OPA) or nasopharyngeal (NPA) tubes, through various supraglottic airway devices (SAD) to endotracheal tubes and endotracheal intubation (ET) [2,3]. The last method - endotracheal intubation is considered by many scientific societies as the golden standard for airway management in many clinical situations, including cardiopulmonary resuscitation in patients with sudden cardiac arrest (SCA). Endotracheal intubation, apart from the fact that has many benefits, including the possibility of asynchronic ventilation, end-tidal carbon dioxide (EtCO<sub>2</sub>) monitoring, or providing ventilation with positive pressure, is also at high risk for potential complications. These complications include, inter alia, broken or knocked out teeth, soft tissue damage and bleeding, dislocation of arytenoid cartilage, epiglottis or tracheal disruption, and unrecognized insertion of the tube into the oesophagus. Medical students learn tracheal intubation during either anaesthesia or emergency medicine course. While endotracheal intubation using standard Miller or Macintosh blades requires formation of appropriate techniques and skills, numerous studies have indicated that videolaryngoscopy might be good alternative for this exacting technique.

The aim of this study was to compare the efficacy of endotracheal tracheal intubation using standard Macintosh blade with UEScope® videolaryngoscope, performed by last year medical students.

## Material and methods

The study protocol was approved by the Institutional Review Board of the Polish Society of Disaster Medicine (Approval no. 11.04.2017.IRB). 32 last year medical students took part in the study. Participation in the study was voluntary. All participants declared, that were able to perform endotracheal intubation using Macintosh laryngoscope. The study was designed as a prospective, single-center, randomized, cross-sectional, simulation study. Prior to the study, participants completed a short tutorial on intubation using either Macintosh laryngoscope or UEScope® (Zhejiang UE Medical Corp., Zhejiang, China; Figure 1). Then they could perform

endotracheal intubation using both devices (5 minutes for each laryngoscope). At the end of the training session participants were asked to perform the procedure in a patient during cardiopulmonary resuscitation. The order of participants and intubation methods were random (Figure 2). The Advanced Skill Trainer training manikin (Laerdal, Stavanger, Norway) was used to simulate a patient with SCA. During the study we assessed the efficacy of the first attempt, the time of procedure measured from laryngoscope-in-hand moment to first ventilation, the degree of visualization using Cormack-Lehane scale. In addition, we assessed the ease of procedure using a 100-degree visual-analogue scale (VAS; 1 = very easy; 100 = very difficult).



Figure 1. Videolaryngoscope UEScope®

All analyses were performed using Statistica 13.2 EN for Windows (StatSoft, Tulusa, OK, USA). Percentages were used for qualitative variables and median with interquartile range (IQR) for quantitative variables. The occurrence of normal distribution was confirmed by the Kolmogorov-Smirnov test. All statistical tests were 2-sided. Nonparametric tests were used for the data that did not have a normal distribution. In order to compare the time needed to achieve a sufficient glottis view, and first successful ventilation was measured the Wilcoxon test for paired observations was used to determine the statistical difference for each group. The McNemar test was used to evaluate the differences in success of intubation. The Cormack-

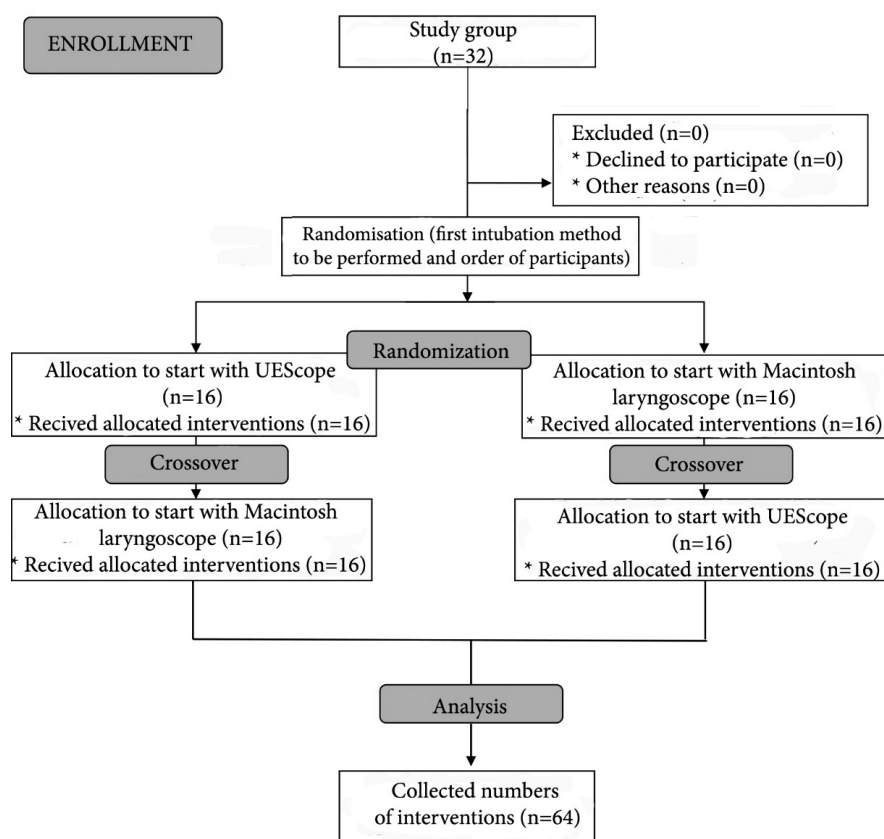


Figure 2. The flowchart presenting the study design and participants recruitment according to CONSORT statement

Lehane scale, and VAS score were all evaluated using the Stuart-Maxwell test. A P-value < 0.05 was considered as significant.

## Results

32 last year medical students took part in the study. The individuals have already passed the course in anaesthetics as well as in emergency medicine. All participants in the study were able to perform endotracheal intubation using laryngoscope with Miller or Macintosh blades.

Nearly all participants performed intubation successfully at first attempt using UEScope® (93.7%). First intubation success rate using Macintosh laryngoscope was lower and obtained 84.4% ( $p = 0.045$ ).

The average successful intubation time using UEScope® and Macintosh laryngoscope are presented in Figure 3. From our data, we can see, that the time of procedure, was 28 s [IQR, 25-37] when UEScope®

was used and it was significantly lower then when the students used Macitnosh laryngoscope (37.5 s [IQR; 31-45];  $p < 0.001$ ).

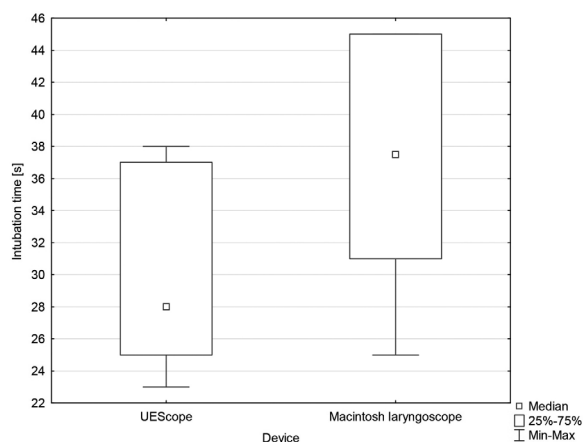


Figure 3. Median intubation time using two laryngoscopes

Table I. Cormack-Lehane grade

Cormack-Lehane grade	Macintosh laryngoscope	UEScope videolaryngoscope	p-value
Grade I	10 (31.6%)	14 (43.6%)	0.065
Grade II	21 (65.3%)	18 (56.4%)	
Grade III	1 (3.1%)	-	
Grade IV	-	-	

There was no statistically significant difference between UEScope® and Macintosh laryngoscope in the Cormack-Lehane scoring system (table I).

According to VAS score, the easiest endotracheal intubation was achieved using the UEScope® (21 points) followed by the by Macintosh laryngoscope (37 points). There was a statistically significant difference in the assessment of UEScope® and Macintosh laryngoscope ( $P = 0.039$ ).

## Discussion

Endotracheal intubation may be a challenge for healthcare providers [4,5]. In Polish hospitals, endotracheal intubation set is required – and this form of airway management is considered a golden standard in cardiopulmonary resuscitation of both adults and children. Moreover, numerous studies indicated that medical staff perform intubation with insufficient efficacy, which translates into either unsecured airway or delayed chest compressions.

The European Resuscitation Council guidelines for resuscitation recommends that intubation should be performed by the most experienced provider, and that intubation should be performed during chest compressions or with interruption that allow insertion of the tube between the vocal cords [6]. Because of limited practice of tracheal endotracheal intubation among participants, in our scenario chest compressions were stopped to allow the students perform the procedure.

Observing intubation times with either the UEScope® (28 s) laryngoscope or the Macintosh laryngoscope (37.5 s), it can be clearly stated that in case of real resuscitation, this interruptions would be unacceptable, and could result in a dramatic reduction in patients' chance of survival. All guidelines highlight to the need to minimize chest pains.

Hirabayashi and Seo, in their study compared direct laryngoscopy and videolaryngoscopy, and demonstrated that use of videolaryngoscopy may reduce the time to secure the airway and incidence of failed

tracheal intubation by non-anaesthesia residents [7]. Acknowledgment of these conclusions can be found in our study, where the efficacy of a first endotracheal intubation attempt using a UEScope® videolaryngoscope was 93.7% and direct laryngoscopy was 84.4%.

The prevalence of videolaryngoscopy in this area can be imposed by the fact that the direct laryngoscopy teaching curve is at least 50 tracheal intubation [8]. Aghamohammadi et al. showed that the routine intubation by using videolaryngoscopy is significantly faster than direct laryngoscopy when intubation is performed by inexperienced students [9]. Butchart and Young also confirmed this relationship [10]. Moreover, as indicated by Hirabayashi et al. [11], videolaryngoscope can reduce the incidence of incidental esophageal intubation by less experienced providers. In our study, the degree of visualization of the epiglottis based on the Cormack-Lehane scale was comparable for both Laryngoscopes. However, in the case of difficult airway as indicated by numerous studies [12,13], including Healy et al. [14], the videolaryngoscopes resulted in a better than the Macintosh visualization of the glottis.

This simulation research has also some limitations. We performed it in advanced patient simulator, however, this choice was intentional and dictated to the fact that during resuscitation it would be impossible to conduct randomized cross-over studies without potential harm to the patient. Another limitation is the use of only two laryngoscopes, but they represent two different techniques of tracheal intubation. Macintosh laryngoscope is a direct laryngoscopy representative, and UEScope® is one of the latest types of videolaryngoscopy.

## Conclusions

In case of simulated cardiopulmonary resuscitation, students of the last year of medical education presented higher efficacy of the first attempt and shorter time of the procedure when performed it with a UEScope® laryngoscope than when used Macintosh blade.

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