

Comparison of intubation performance between four different laryngoscope blades used by novice medical students during child resuscitation

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Asphyxia is a major cause of cardiac arrest in children, (1-3) therefore restoring the airway and ensuring adequate oxygenation of the patient are essential life-saving procedures. (3,4) According to the 2010 guidelines of the European Resuscitation Council (ERC), the gold standard for airway management during resuscitation for both adults and children is endotracheal intubation (ETI). (1)

We hypothesized that there was no difference in intubation effectiveness between the examined laryngoscope blades. In the current study, we compared the effectiveness of the laryngoscope with Macintosh, Miller, Seward and Wisconsin blades, in child resuscitation with uninterrupted chest compressions.

This study has been approved by the Institutional Review Board of the International Institute of Rescue Research and Education (Approval

10.2014.01.12, September 5rd, 2014). One hundred and nine medical students with no prior experience in tracheal intubation participated in this prospective, randomized, crossover study. The study was conducted from September to November 2014. All of the students participating in the study received 60 minutes of training in basic and advanced airway management, including airway anatomy and physiology and tracheal intubation. After watching demonstration videos, participants were allowed 30 minutes to practice until they could use each device correctly. Each participant had to intubate a SimJunior Trainer (Laerdal Medical AS, Stavanger, Norway), with each tested device in turn. The order in which the devices were used was randomized (figure 1). Laryngoscopy was performed with a size 2 Macintosh blade, a size 2 Miller blade, a size 1 Seward blade and a size 2 Wisconsin blade. A Lucas-2 device (Physio-Control, Redmond, WA, USA) was used for chest compression. After each device, the participant took a 10 minute rest and then performed intubation using the next device. The participants were not allowed to watch each other to avoid learning through observation.

The primary endpoint of the study was defined as the time from the insertion of a device blade into the patient's mouth to the first manual ventilation of the mannequin's lungs, while the secondary endpoint was the success rate of blind tracheal intubation. An intubation attempt was considered unsuccessful if the trachea was not intubated, when the esophagus was intubated with visible inflation of the stomach bag, or when the intubation attempt lasted longer than 60 s. After three unsuccessful intubation attempts, intubation was categorized as "failed" and was excluded from the time calculations. Finally, participants completed a questionnaire assessing their views on the four laryngoscopic blades using a Cormack-Lehane scale. (5) Quantitative data are presented as mean and standard deviation.

Times needed to successful intubation were compared using the Wilcoxon signed rank test. McNemar's test was used to detect possible differences in success rates for ETI. For all statistical analysis, the R statistical package version 3.0.0 for Windows was used. $P < 0.05$ was considered statistically significant. For comparisons of Cormack-Lehane grade, a one-way analysis of variance with a post hoc (Scheffé's) test was

used. Results are shown as means \pm standard deviation (SD) or absolute numbers and percentages.

The primary endpoint, the time to first effective ventilation, was achieved fastest when using the Miller blade (36.7 \pm 8.4s) and was slower with all other blades (Macintosh, 40.3 \pm 11.7s [p=0.093]; Seward, 44.6 \pm 9.3s [p=0.58]; Wisconsin, 41.3 \pm 16.5s [p=0.082]) (table 1). There was no statistical significant difference in effectiveness of first intubation and overall intubation attempts. The median Cormack-Lehane scale was lowest for the Wisconsin blade (1.9 points (pt.)) compared to the other blade types (Macintosh, 2.9 pt. [p=0.034]; Miller, 2.1 pt. [p=0.076]; Seward, 3.0 pt. [p=0.026]).

Table 1. Time to and Success of Intubation.

Type of laryngoscope blade	Time to intubation (s) [mean(SD)]	Tracheal intubation attempts			
		First	Second	Third	Failed
Macintosh	40.3 \pm 11.7	54.1%	72.5%	76.1%	23.9%
Miller	36.7 \pm 8.4	53.2%	73.4%	75.2%	24.8%
Seward	44.6 \pm 9.3	51.4%	60.5%	70.6%	29.4%
Wisconsin	41.3 \pm 16.5	56.9%	69.7%	74.3%	25.7%

We conclude that no statistical differences were observed in time to intubation, first intubation attempt or overall ETI effectiveness among the examined laryngoscope blades. More studies are required to confirm these results.

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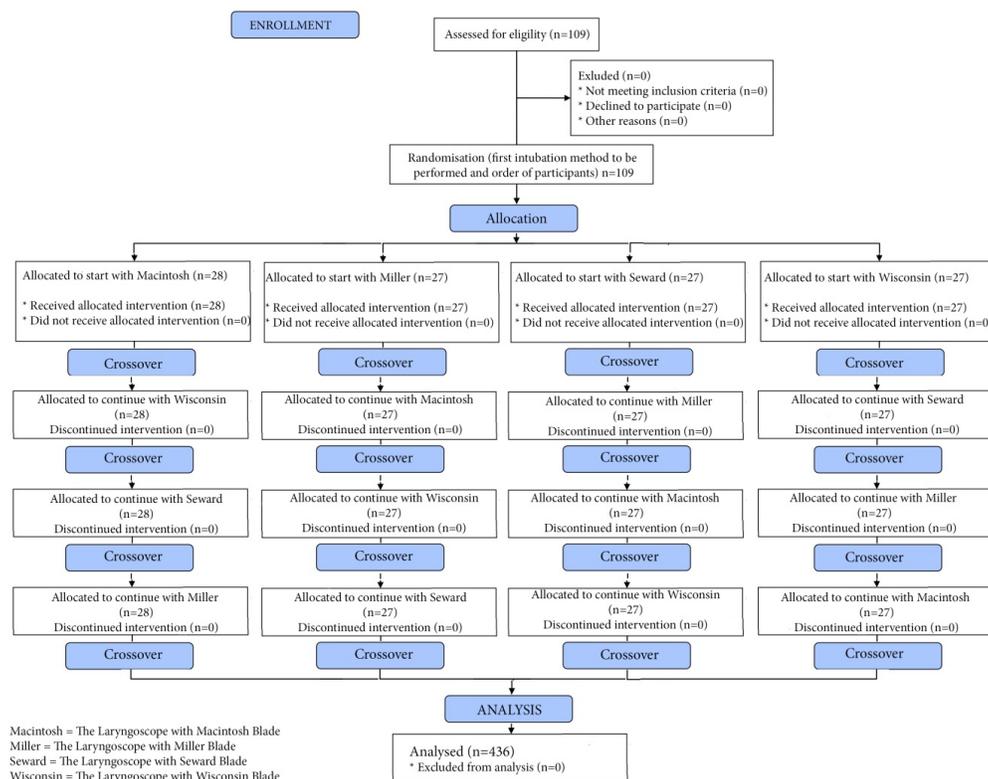
References

1. Biarent D, Bingham R, Eich C, López-Herce J, Maconochie I, Rodríguez-

Núñez A, Rajka T, et al. European Resuscitation Council Guidelines for Resuscitation 2010 Section 6. Paediatric life support. Resuscitation 2010; 81(10):1364-88. doi: 10.1016/j.resuscitation.2010.08.012.

2. Gonzalez LP, Braz JR, Módolo MP, de Carvalho LR, Módolo NS, Braz LG. Pediatric perioperative cardiac arrest and mortality: a study from a tertiary teaching hospital. *Pediatr Crit Care Med* 2014;15(9):878-84. doi: 10.1097/PCC.000000000000248.
3. Sakurai Y, Tamura M. Efficacy of the Airway Scope (Pentax-AWS) for Training in Pediatric Intubation. *Pediatr Int* 2015;57(2):217-21. doi: 10.1111/ped.12490.
4. Szarpak L, Czyzewski L, Kurowski A. Can BONFILS Intubation Endoscope be an alternative to direct laryngoscopy for pediatric tracheal intubation during resuscitation? *Am J Emerg Med* 2015;33(2):293-4. doi: 10.1016/j.ajem.2014.10.052. doi:10.1016/j.ajem.2014.10.052.
5. Cormack RS, Lehane J. Difficult tracheal intubation in obstetrics. *Anesthesia* 1984;39:1105-11.

Figure 1. Flow chart of design and recruitment of participants according to CONSORT statement.



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