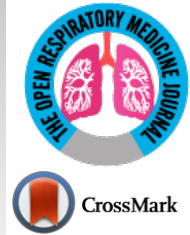




The Open Respiratory Medicine Journal

Content list available at: <https://openrespiratorymedicinejournal.com>



EDITORIAL

Is it Time to Replace Direct Laryngoscopy with Video Laryngoscopy in Airway Management in Training Facilities?

Salim Surani^{1,*} and Joseph Varon^{2,3,4}

¹Texas A&M University, Corpus Christi, Texas, USA

²Professor of Acute and Continuing Care The University of Texas Health Science Center at Houston, Houston, TX-7703030, USA

³The University of Texas Medical Branch at Galveston, Galveston, TX-77555, USA

⁴United Memorial Medical Center/United General Hospital Houston, Texas, USA

Keywords: Airway management, Education, Intubation, Video laryngoscopy, DL, EI.

Endotracheal Intubation (EI) remains an essential procedure to protect the airway and maintain means for oxygenation and ventilation in acutely ill patients as well as those undergoing general anesthesia during surgical procedures [1 - 3]. Outside the operation room, it carries significant hazard, as it is frequently performed by inexperienced healthcare providers and often physicians-in-training [4 - 6]. In some institutions, midlevel providers and respiratory therapists also manage the airway in emergency circumstances. This has led to a significant risk of complications when airway management is performed outside the confines of the operating room.

For decades, clinicians have used Direct Laryngoscopy (DL) to manage the airway using Miller (straight) or McIntosh (curved) blades [7]. Unfortunately, with conventional laryngoscopes utilizing either one of these blades, visualization of airway structures may be challenging and intubation may be delayed. The consequences of failed intubation may be deadly. For example, the time it takes to stop in chest compression during cardio-pulmonary resuscitation while trying to intubate the patients prevents forward flow, especially in an era of paradigm shift (*i.e.*, high-quality compression with minimal intervention in compression has been emphasized) [8, 9]. In addition, failed intubation leads to significant decreases in oxygen saturation and inadvertent esophageal intubation can be devastating and have catastrophic consequences.

The major challenges with DL are the inability of the trainer to visualize the process in real time to guide the trainee, resulting in a higher rate of failed first intubation, esophageal

intubation and complications [4, 10, 11]. In recent years, Video Laryngoscopy (VL) for airway management has become popular. Several studies have supported its use for physician-in-training education [4, 7, 8, 10].

The main questions that arise, as video laryngoscopes are becoming more available such as if they increase the success of first attempt at intubation, better glottis visualization, esophageal intubation prevention, availability in medical floors and in ambulances, does it decrease the degree of desaturation, dysrhythmias? In addition, issues such as cost, operator experience and lack of training to intubate with DL rather than VL need to be considered.

As difficult airways and inexperienced operators remain common, Buis and colleague in a systematic review analyzed success rate and complications of airway management using DL [11]. These investigators found that the incidence of difficult airway in the emergent situations to be 20 times higher when compared to the elective setting. They also noted that trainees should perform more than 50 EI to be qualified to perform such therapeutic intervention independently. How can this be compared to VL? Okamoto and co-workers compared the VL with DL for EI in the Emergency Department (ED) [11]. This study analyzed 9694 EI in the ED and found that the first attempt success rate was higher in VL group when compared to DL group (78% vs. 70%; p-value <0.001). In addition, the VL group had a lower rate of esophageal intubations and a higher rate of initial Glottis visualization (p-value 0.01) [12].

Others have found conflictive results, For example, Jiang and coworkers suggest that VL, when compared with DL, does not improve EI in the emergency and critical patients [13]. The

* Address correspondence to this author at the Texas A&M University, Corpus Christi, Texas, USA; E-mail: srsurani@hotmail.com

Table 1. Advantages of direct laryngoscope vs. video laryngoscope.

	Direct-Laryngoscope Advantages	Video-Laryngoscope Advantages
Availability	X	
Cost	X	
Increase first attempt visualization of cords among trainee		X
Increase first attempt in experience	X	X
Operator experience and training	X	
Multiple attempt success rate		X
Decrease rate of esophageal intubation among trainee		X

investigators analyzed systematically 12 studies including 2583 patients and found that prehospital intubation success rate was worse when “experienced operators” used the VL [13].

Interestingly, Baek and colleagues found that success rate for EI on first attempt was higher with VL when compared to DL, but VL did not decrease the EI-related complications [4]. A Cochrane database analysis suggested a decrease in the failed intubation with VL, especially among the patients with difficult airways [14]. In this analysis, the authors suggest that currently, there is not enough evidence to prove that VL reduces the number of intubation attempts, time required for EI, or the hypoxemia and other respiratory-related complications.

Similarly, the data is unclear as to whether VL assists the experienced operator. It is clear that VL improves the glottic visualization, but the question remains if better visualization translates to improved first attempt EI? Some studies have also shown lower attempt rates and complications with VL when compared with DL [15]. Hwang and collaborators, studied the benefits of a commercially available VL (C-MAC) as a training tool for trainees. They found that overall unadjusted odds ratio for the first pass was (CI 1.28-3.22, $p < 0.01$), multiple attempts were (CI 0.15-0.93, $p = 0.03$), first EI success rate was 69% (79% in C-MAC VL *versus* 65% in the DL group), and multiple attempts at EI being 4% in the C-MAC VL group and 9% in the DL group. The overall complication rate was 4% in the C-MAC VL group *versus* 14% in the DL group (CI 0.13-0.63; $p < 0.01$). These result suggest that C-MAC VL can be used as an effective tool for improving the success rate for the EI among trainees (Table 1) [15].

In the authors’ experience, VL aid’s significantly in successful first EI attempts among trainees. However, the readers must be cautioned that, as in any other electronic devices, a variety of problems may occur when using VL. For example, battery and light source issues are frequently noted. Another concern would be to just provide training to use VL. When the trainee is confronted with DL, he/she may have difficulties getting successful EI. However, based on currently available, experience, and common logic, the authors raise the question for regulatory agencies to consider improving the training process by utilizing VL/C-MAC VL or similar equipment for the first 25 EI before proceeding with the EI *via* the DL. We would also suggest to evaluate this methodology of using only VL or similar equipment for the initial training phase so live guidance and feedback can be provided to the trainee.

REFERENCES

- [1] Kim SY, Park SO, Kim JW, *et al.* How much experience do rescuers require to achieve successful tracheal intubation during cardiopulmonary resuscitation? *Resuscitation* 2018; 133: 187-92. [http://dx.doi.org/10.1016/j.resuscitation.2018.08.032] [PMID: 3017 2693]
- [2] Soar J, Nolan JP, Böttiger BW, *et al.* European Resuscitation Council Guidelines for Resuscitation 2015: Section 3. Adult advanced life support. *Resuscitation* 2015; 95: 100-47. [http://dx.doi.org/10.1016/j.resuscitation.2015.07.016] [PMID: 2647 7701]
- [3] Link MS, Berkow LC, Kudenchuk PJ, *et al.* Part 7: Adult Advanced Cardiovascular Life Support: 2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. *Circulation* 2015; 132(18)(Suppl. 2): S444-64. [http://dx.doi.org/10.1161/CIR.0000000000000261] [PMID: 2647 2995]
- [4] Baek MS, Han M, Huh JW, Lim CM, Koh Y, Hong SB. Video laryngoscopy *versus* direct laryngoscopy for first-attempt tracheal intubation in the general ward. *Ann Intensive Care* 2018; 8(1): 83. [http://dx.doi.org/10.1186/s13613-018-0428-0] [PMID: 3010 5607]
- [5] Simpson GD, Ross MJ, McKeown DW, Ray DC. Tracheal intubation in the critically ill: a multi-centre national study of practice and complications. *Br J Anaesth* 2012; 108(5): 792-9. [http://dx.doi.org/10.1093/bja/aer504] [PMID: 2231 5326]
- [6] Griesdale DE, Bosma TL, Kurth T, Isac G, Chittock DR. Complications of endotracheal intubation in the critically ill. *Intensive Care Med* 2008; 34(10): 1835-42. [http://dx.doi.org/10.1007/s00134-008-1205-6] [PMID: 1860 4519]
- [7] Scott J, Baker PA. How did the Macintosh laryngoscope become so popular? *Paediatr Anaesth* 2009; 19(Suppl. 1): 24-9. [http://dx.doi.org/10.1111/j.1460-9592.2009.03026.x] [PMID: 1957 2841]
- [8] Sakles JC, Chiu S, Mosier J, Walker C, Stolz U. The importance of first pass success when performing orotracheal intubation in the emergency department. *Acad Emerg Med* 2013; 20(1): 71-8. [http://dx.doi.org/10.1111/acem.12055] [PMID: 2357 4475]
- [9] Mosier J, Chiu S, Patanwala AE, Sakles JC. A comparison of the GlideScope video laryngoscope to the C-MAC video laryngoscope for intubation in the emergency department. *Annals of emergency medicine* 2013; 61(4): 414-20 e1. [http://dx.doi.org/10.1016/j.annemergmed.2012.11.001]
- [10] Smith CM, Yeung J. Airway management in cardiac arrest-Not a question of choice but of quality? *Resuscitation* 2018; 133: A5-6. [http://dx.doi.org/10.1016/j.resuscitation.2018.10.009] [PMID: 3033 6234]
- [11] Buis ML, Maissan IM, Hoeks SE, Klimke M, Stolker RJ. Defining the learning curve for endotracheal intubation using direct laryngoscopy: A systematic review. *Resuscitation* 2016; 99: 63-71. [http://dx.doi.org/10.1016/j.resuscitation.2015.11.005] [PMID: 2671 1127]
- [12] Okamoto H, Goto T, Wong ZSY, Hagiwara Y, Watase H, Hasegawa K. Comparison of video laryngoscopy *versus* direct laryngoscopy for intubation in emergency department patients with cardiac arrest: A multicentre study. *Resuscitation* 2019; 136: 70-7. [http://dx.doi.org/10.1016/j.resuscitation.2018.10.005] [PMID: 3038 5385]
- [13] Jiang J, Ma D, Li B, Yue Y, Xue F. Video laryngoscopy does not improve the intubation outcomes in emergency and critical patients - a systematic review and meta-analysis of randomized controlled trials. *Crit Care* 2017; 21(1): 288.

- [14] [http://dx.doi.org/10.1186/s13054-017-1885-9] [PMID: 29178953]
Lewis SR, Butler AR, Parker J, Cook TM, Smith AF. Videolaryngoscopy *versus* direct laryngoscopy for adult patients requiring tracheal intubation. *Cochrane Database Syst Rev* 2016; 11 [http://dx.doi.org/10.1002/14651858.CD011136.pub2] [PMID: 27844477]
- [15] Hwang SY, Lee SU, Lee TR, *et al.* Usefulness of C-MAC video laryngoscope in direct laryngoscopy training in the emergency department: A propensity score matching analysis. *PLoS One* 2018; 13(12):e0208077 [http://dx.doi.org/10.1371/journal.pone.0208077] [PMID: 30540813]

© 2019 Surani and Varon.

This is an open access article distributed under the terms of the Creative Commons Attribution 4.0 International Public License (CC-BY 4.0), a copy of which is available at: (<https://creativecommons.org/licenses/by/4.0/legalcode>). This license permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.