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EDITORIAL

Videolaryngoscopy in anesthesia and perioperative medicine: innovations, challenges, and best practices

Direct laryngoscopy has been described as a diagnostic method since the mid-18th century.[1] Still, it was only around 1914, due to the World War I, that direct laryngoscopy was incorporated into anesthetic practice.[2] In the 1930s, although several laryngoscopes were already described in the literature, only about 7% of surgical patients were submitted to direct laryngoscopy for orotracheal intubation.[2] The conventional laryngoscope blades most used nowadays were developed in 1941 (Miller)[3] and 1943 (Macintosh).[2] After 80 years of the description of these blades for direct laryngoscopy, they are still widely used, differently from other technologies adopted in the anesthesia practice.

Anesthesiology is a medical specialty that depends on new technologies. Most of the time, anesthesiologists are considered early adopters of these new technologies, especially new devices. Although the first video laryngoscope was commercially available almost two decades ago, it remains a subject of considerable debate among anesthesiologists, especially when compared to direct laryngoscopy.[4]

Despite debates on the superiority of the video laryngoscope in relation to direct laryngoscopy, enough evidence can prove it, even though there is a low standardization of clinical outcomes.[5] The video laryngoscope is also better to train residents and fellows since it is possible to share the image of the laryngoscopy with more than one operator. However, opinions on whether video laryngoscopes should become the primary device for all tracheal intubations, regardless of anticipated difficulty, remain divided.

The most extensive systematic review published until now, including a total of 222 RCTs (with 26,149 participants), showed that video laryngoscopes of any design likely reduce rates of failed intubation in adults with moderate-certainty evidence.[6,7] The findings indicated higher rates of successful intubation on the initial attempt and improved glottic views across several patient groups and settings. Among the various types of video laryngoscopes, those featuring hyperangulated designs are notably advantageous in lowering the incidence of esophageal intubation. This attribute contributes to enhanced rates of successful intubation, particularly in cases involving individuals with challenging airways.[6]

Further systematic reviews and meta-analyses of randomized clinical trials in adults investigated the use of video laryngoscopes compared to direct laryngoscopy. The authors identified advantages in the use of videolaryngoscopy, such as reduced intubation difficulty[8] and improved glottic visualization.[9] Still, they found equivalence regarding the time for tracheal intubation.[10] Likewise, a substantial systematic review encompassing 7044 adult participants demonstrated a lower incidence of intubation failures when employing a video laryngoscope in comparison to direct laryngoscopy. Furthermore, the utilization of a video laryngoscope resulted in fewer instances of unsuccessful intubations among participants with a challenging airway.[11] A greater proportion of laryngoscopies performed using a video laryngoscope achieved a clear view of most of the glottis. Additionally, fewer laryngoscopies with a video laryngoscope yielded no view of the glottis, highlighting the user-friendliness of this device. The authors of the study concluded that video laryngoscopies could potentially mitigate the frequency of failed intubations, particularly among patients with challenging airways. This technique enhances the visual assessment of the glottis and may also contribute to a reduction in laryngeal or airway trauma. Furthermore, the group employing video laryngoscopes exhibited higher rates of successful first-attempt intubation compared to direct laryngoscope, particularly among trauma and obstetric patients with anticipated difficult airways.[12,13]

Finally, a recent randomized controlled trial that allocated 2495 patients comparing the use of McGrath® video laryngoscope (Medtronic, Dublin, Ireland) with the direct laryngoscope, showed a significantly higher first-attempt intubation success rate (987/1053, 93.7% vs. 848/1039, 81.6%; $p < 0.001$).[14] Subgroup analyses showed that the first-attempt tracheal intubation success was significantly higher with the video laryngoscope 610/659 (92.6%) than

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with direct laryngoscope 530/687 (77.1%; $p < 0.001$) among trainees, leading to a relative risk for unsuccessful first-pass intubation of 3.07 (95%CI 2.27—4.16) with direct laryngoscope compared with video laryngoscope. First-attempt tracheal intubation success among consultants was also significantly higher with the video laryngoscope 377/394 (95.7%) than with direct laryngoscope 318/352 (90.3%; $p < 0.001$), with a relative risk for unsuccessful first-attempt intubation of 2.37 (95%CI 1.30—4.32).

The use of video laryngoscope as a first attempt intubation in pediatric patients has also been evaluated. The VISI trial was a multicenter study that compared direct laryngoscopy and video laryngoscopy in infants.[15] The authors demonstrated that video laryngoscopy with a standard blade improves the first attempt success rate and reduces complications compared to direct laryngoscopy, especially in infants under 6.5 kg of weight. Another important trial from Riva et al also evaluated the first-attempt success rate of infants intubation with video laryngoscopes compared to direct laryngoscope under apneic oxygenation.[16] They also demonstrated that video laryngoscopy with standard blades combined with supplemental oxygen in neonates and infants might increase the success rate of first-attempt tracheal intubation compared to direct laryngoscopy with supplemental oxygen.

In a recent editorial from Hansel and El-Boghdadly, a trial sequential analysis was performed, estimating a sample size of 1502 participants to answer the questions about first-attempt success and failed intubation.[5] This trial sequential analysis indicates that the necessary sample size to address these inquiries had already been attained by 2015. Consequently, future investigations and meta-analyses comparing the risk and benefit profiles of video laryngoscopy and direct laryngoscopy in adult populations are unlikely to yield altered outcomes.

Although the use of video laryngoscopes has proven to be a safe approach for the management of difficult airways in experienced hands, information is sparse for novices.[5] This is true not only in theatre, where anesthesiologist residents conduct airway management, but also in emergency and intensive care departments, where undergraduate students and residents play a particular role in managing emergency airways.

Many manikin simulation studies have compared video laryngoscopes and direct laryngoscopes both for difficult and non-difficult airway scenarios. Furthermore, when comparing direct laryngoscopy with video laryngoscopy in manikin airway simulations by inexperienced hands (i.e. providers who are not confronted daily with airway management), video laryngoscopes with hyperangulated blade seemed to be better than direct laryngoscopes with Macintosh blades, especially for difficult airway.[17] Malito et al, in a randomized trial comparing video laryngoscopy and direct laryngoscopy in manikin scenarios, demonstrated improved visualization of anatomical structures and higher success rate on the first attempt intubation for undergraduate medical students.[18] Kee et al, in a randomized clinical trial, showed that training medicine residents with video laryngoscopes instead of direct laryngoscopes had similar transfer of skills for difficult intubation using manikin scenarios; however, it lacks confirmation in a real clinical setting.[19]

Currently, outcomes from randomized clinical trials comparing direct laryngoscopy versus video laryngoscopy are based on time to view, time to intubation, Cormack and Lehane classification, and the percentage of glottic opening (POGO) score. Time to intubation is of utmost importance because it diminishes hypoxic time and adverse events.[5] It is also important to note that, in untrained hands, prolonged intubation could increase airway trauma. Furthermore, all healthcare providers on the front-line management of emergency airways must be trained with both devices — not only the novice but also all the senior professionals who, for cultural reasons, adopt only direct laryngoscopy.

New video laryngoscopes have reached the market in recent years, providing growing scientific evidence regarding critical clinical outcomes. Several studies with these devices have demonstrated higher intubation success rates on the first attempt in patients with difficult airway predictors, as well as better glottic visualization (Cormack and Lehane classification) by the operator.[5,14,20,21] Video laryngoscopes also provide better ergonomics for the operators when compared to conventional laryngoscopes.[22]

Regarding thoracic surgery, recent studies show a longer time to achieve tracheal intubation when using video laryngoscopes compared to direct laryngoscopes to perform tracheal intubation with double-lumen cannulas. On the other hand, there was an increased rate of success when video laryngoscopes were used.[23,24] Besides, numerous advantages have been substantiated, including elevated success rates in achieving intubation on the initial attempt among patients with difficult airway predictors, as well as improved visualization of the glottis by operators employing video laryngoscopes.[14] Furthermore, there is evidence showcasing a reduction in direct trauma to the airway through the use of the novel devices. However, it is worth noting that despite these benefits, there has been no observed reduction in postoperative subjective discomfort when compared to the conventional technique.[23]

Colak et al showed less adrenergic stimulation during airway manipulation (mean and diastolic blood pressure) with the use of a video laryngoscope when compared to direct laryngoscopes.[25] In the same study, there was no difference in the morphology and duration of the QTc interval between the two methods. In this context, researchers also evidenced a decreased rate of nociception when employing video laryngoscopes.[26]

In patients with cervical immobilization, a recent clinical trial demonstrated that a channeled video laryngoscope obtained faster tracheal intubation with a higher success rate in relation with the flexible fiberscope. Rates of direct trauma during airway handling were not statistically significant between methods.[27] A recent work has shown the non-inferiority of the video laryngoscope compared to the bronchoscope to perform awake intubation.[28] Still on this subject, another randomized controlled trial highlighted that when using a video laryngoscope, there was a notable increase in the mobilization of C1/C2, but not of C3, in comparison to a flexible fiberscope.[29] In the context of thyroid surgeries, findings from a randomized clinical trial indicate that video laryngoscopes offer improved patterns of neurological monitoring for the recurrent laryngeal nerve. This enhancement can likely be attributed to the precise positioning of the monitoring equipment.[30]

In conclusion, it is imperative to recognize that further research is necessary to comprehensively compare video

laryngoscopy and direct laryngoscopy considering factors such as the number of intubation attempts, the occurrence of hypoxia or respiratory complications, and the duration of intubation. Despite certain unanswered questions, the existing evidence substantiates the safety and efficacy of video laryngoscopes in comparison to direct laryngoscopes. Subsequent investigations should be focused on establishing standardized clinical outcomes to address additional inquiries in this domain. Quoting the editorial by Hansel and El-Boghdadly, "we can no longer claim there is any uncertainty as to which is better, and we should strive to offer our patients the best there is".[5]

Conflicts of interest

The authors declare no conflicts of interest.

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