SHORT COMMENTARY

Videolaryngoscopy versus direct laryngoscopy in obese surgical patients. Step by step toward more convincing evidence

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The incidence and prevalence of obesity has increased worldwide [1]. Accordingly, anesthesiologists will care for an increasing number of obese patients in their clinical practice and should be prepared to provide optimal management [2].

Obesity is associated with clinical features that may increase difficulty in airway management [2]. Difficult mask ventilation has been reported in 8.8% of obese patients, and 11% of those patients are morbidly obese. Incidence of difficult intubation showed a wider variability, ranging from 3.3% to 16.7% of patients [2]. Common predictors for difficult airway management in obese patients include body mass index [3], Mallampati score ≥ 3 [3,4], obstructive sleep apnea [5], increased neck circumference [4,6] and neck circumference to thyromental distance ratio [7].

Difficult or failed intubation may lead to serious adverse events for patients, and inadequate airway planning and judgment errors were contributors to patient harm [8-10]. Different Airway Societies recommended not only to establish a clear and appropriate management strategy when managing obese patients, and to follow guidelines if difficulties occur, but also to ensure the availability of appropriate airway equipment to improve the visualization of the glottis and thereby facilitate tracheal intubation [11,12].

Different meta-analyses showed an overall advantage of videolaryngoscopy over Macintosh direct laryngoscopy for tracheal intubation in adult patients [13,14] and in obese patients [15-17]. However, the conclusions of meta-analyses involving obese patients suffered from several limitations (e.g., paucity of studies and data available, risk of bias, heterogeneity across the studies observed) [15-17], due to which some authors do not suggest routine use of videolaryngoscopes in obese patients [15]. However, convincing evidence that videolaryngoscopy outperforms Macintosh direct laryngoscopy for many outcomes in orotracheal intubation in adult patients has been recently provided [14]. It appears appropriate to review the results of different meta-analyses [15-17], with the aim to provide a comprehensive evaluation and a reliable suggestion for clinicians approaching airways in obese patients.

Videolaryngoscopy significantly improves glottic visualization compared with Macintosh direct laryngoscopy [15-17]. Improving the glottic view should increase first-attempt intubation success and reduce intubation failure, as observed in the general population of patients [14]. In obese patients, despite a trend in favor of all videolaryngoscopes, C-MAC and Airtraq compared with the Macintosh laryngoscope were shown to significantly increase first-attempt intubation success, but, to date, only C-MAC has reduced the likelihood of intubation failure in obese patients [16,17]. The difference in this outcome compared to the general population of patients [14] likely comes from a combination of several factors, including characteristics of patients, devices and users.

Obesity is associated with various clinical features including fat deposition in tissues surrounding the upper airway, in the neck and at the occipitus, as well as the presence of pharyngeal tissue inflammation. These features lead to upper airway narrowing, reduced size of the submandibular space, limitation of head extension, and, ultimately, difficulty with laryngoscopy [2,18]. The increased amount of pre-tracheal neck soft tissue seems most likely to impair laryngoscopy by reducing the anterior mobility of pharyngeal structures [19]. Consequently, obese patients with neck circumference >40 cm [4,6] or neck circumference to thyromental distance ratio >5 should be considered for potential difficult laryngoscopy [2,4,7]. The
head-elevated laryngoscopy position enhances airway patency, facilitates alignment of oral, pharyngeal and laryngeal axes of the airway [20], and reduces the risk of difficult laryngoscopy in obese patients [2,18]. Videolaryngoscopy improves laryngeal visualization without the need to align three airway axes, thereby overcoming the possible limitations imposed by obesity [13-15]. However, the alteration of upper airways and soft tissue structures, as well as the limited tissue mobilization and head extension, for fat deposition and tissue inflammation may predispose inadequate conditions for tracheal intubation in obese patients even with videolaryngoscopy [2,15-17].

Airtraq and GlideScope both employ a "hockey-stick"-shaped laryngoscope blade, which increases the glottic view without a need to align the three airway axes. However, in a manikin study with a difficult laryngoscopy scenario, GlideScope performed less well than Airtraq, mainly due to the difficulty encountered by participants in advancing the tube toward the glottic opening, as GlideScope is devoid of a tracheal tube channel to guide the tracheal tube toward the glottis [21]. On the other hand, C-MAC and McGrath are shaped like the Macintosh blade with the addition of a micro-camera at the tip of the blade that allows the three airway axes to be aligned into a straighter line, and they offer the unique benefit of both direct and indirect laryngoscopy in a single intubation attempt [21]. However, compared with McGrath, C-MAC features some aspects that make tracheal intubation easier and faster by experienced users in a clinical setting with obese patients [23].

Videolaryngoscopy is a complex skill that requires extensive practice to achieve expertise, even in those trained in direct laryngoscopy. Comparing videolaryngoscopy with Macintosh direct laryngoscopy in the general population of patients, the likelihood of intubation failure was less common with personnel experienced in both devices (OR 0.32, P=0.04), but there was no evidence of a difference in failed intubations when personnel were inexperienced with a videolaryngoscope [13]. This highlights the importance of training to make the best use of devices. It has been demonstrated that, despite experience in direct laryngoscopy, physicians will only reach a 90% probability of performing an optimal videolaryngoscopy on their 76th attempt [24]. Videolaryngoscopes with hyperangulated blades may be more difficult to manipulate and require more training [14]. Training is also required when using videolaryngoscopy in combination with adjuncts (e.g., introducers, bougies, optical/video stylets, flexible intubation scope) that may be helpful for a successful intubation [12]. A randomized controlled trial comparing a GlideScope combined with a flexible bronchoscope reported a greater first attempt success rate with the combination technique than with a videolaryngoscope alone (91% vs. 67%; P = 0.0012; absolute risk reduction 24%) [25].

Videolaryngoscopy compared with Macintosh direct laryngoscopy should reduce the intubation time by improving the glottic visualization [15]. However, only Airtraq was shown to significantly reduce intubation time in obese patients [16,17], as in the general population of patients [14], Airtraq features a conduit that acts as the housing for the smooth placement and insertion of the endotracheal tube into the trachea once the glottis has been visualized, without using tracheal guide instruments. Videolaryngoscopes without a tracheal tube channel often require a stylet in order to obtain bending of the tube and to facilitate passage through the vocal cords. Advancement through the vocal cords may be slightly delayed if the endotracheal tube collides with the anterior surface of the subglottic trachea, and further maneuvers (e.g., removing the stylet, rotating the endotracheal tube, applying cricoid manipulation) are required for the final tracheal intubation, thus making the intubation time longer [15]. Increasing the safe apnea period by adopting the reverse Trendelenburg position, pre-oxygenation and apneic oxygenation may be a way to minimize the impact of time on successful intubation [2,26]. A prolonged safe apnea period may be two minutes or more, as observed in clinical practice [26] or considering predicting models for oxygen desaturation after anesthesia induction [27]. Intubation time with videolaryngoscopy, even with videolaryngoscopes without a tracheal tube channel, is generally within the limits of a prolonged safe apnea period in properly managed obese patients [26,27].

As observed in the general population of patients, videolaryngoscopy outperforms the Macintosh direct laryngoscope in airway management after anesthesia induction in obese patients when used by experienced operators. All videolaryngoscopes showed benefits in improving airway management [15-17], but only C-MAC appears to reduce intubation failure when compared with the Macintosh laryngoscope [16,17]. Further studies exploring videolaryngoscope performance are necessary. Step by step, we are moving toward strong evidence of the best approach to airways in obese patients.

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The authors contributed equally to the work.

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