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EDITORIAL

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Videolaryngoscopy: towards a new standard method for tracheal intubation in the ICU?

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Tracheal intubation is one of the most common and hazardous procedures in the intensive care unit (ICU). In fact, about 20 % of ICU patients experience severe hypoxemia, which in the worst case leads to death [1–3]. Other common complications are esophageal intubation, aspiration, and bronchial intubation, among others [1–5]. The problems associated with tracheal intubation in the ICU can be divided into two categories. The first comprises complications due to the removal of sympathetic tone by sedative drugs, such as propofol, which cause cardiovascular depression that may worsen the detrimental effects of pre-existing hypoxemia. The second category consists of complications due to any delay in the correct placement of the endotracheal tube, which can lead to aspiration and/or severe hypoxemia and cardiovascular deterioration, such as arrhythmias, hypotension, and cardiovascular collapse.

Most patients who need tracheal intubation and artificial ventilation in the ICU are, in contrast to those requiring these procedures in the operating room, circulatory or respiratory compromised [1–3]. Thus, the intubation procedure needs to be smooth and expedient.

Tracheal intubation has traditionally been achieved by direct laryngoscopy. The most frequently used laryngoscope was introduced in 1943 by Sir Robert Macintosh—10 years before the first ICU was opened by the anesthesiologist Bjorn Ibsen in Copenhagen (December 1953) [6]. The Macintosh laryngoscope has been the standard of care for tracheal intubation for over 70 years, albeit it is sometimes replaced by rigid or flexible fiberoptic intubation in cases of difficult intubation. However, during the last decade a variety of videolaryngoscopes have been introduced. To date, most studies on these instruments have taken place in the operating room, the emergency room, or the prehospital setting [7, 8]. The larynx and glottis are easier to visualize with these instruments, but intubation may take longer due to potential difficulties in passing the tube into the trachea [7, 8].

To our knowledge five recent studies have evaluated the application of videolaryngoscopes in the ICU [9–13]. The study by De Jong et al. [9] from the Montpellier group reported in this issue of *Intensive Care Medicine* is the first to evaluate the McGrath Mac (Aircraft Medical, Edinburgh, Scotland), a videolaryngoscope with a Macintosh-like blade that allows intubation using conventional direct laryngoscopy or indirect (video) laryngoscopy. The results reported by these authors are in agreement with those from other studies, i.e., it is easier to visualize the glottis using the videolaryngoscope and fewer intubation attempts are required. However, De Jong et al. provide no information on whether the actual intubation time is shorter. In their recent randomized control trial, Yeatts et al. found that a shorter time was needed to insert an endotracheal tube when a conventional direct laryngoscopy was performed [14]. In the ICU, where patients are often in cardiorespiratory distress, reducing the length of the interval when a patient is without adequate ventilation/oxygenation is probably more important

than the time it takes to visualize the glottis. Indeed, in that same study Yeatts et al. found that a videolaryngoscope (Glidescope®; Verathon Medical, Bothell, WA) was associated with longer intubation times in trauma patients and with a longer hypoxemic time and higher mortality in head trauma patients. These results agree with those of the ICU study by Griesdale et al. [10] who found that intubation using the Glidescope® videolaryngoscope resulted in lower oxygen saturation. On the other hand, De Jong et al. [9] showed a significant reduction in the incidence of difficult laryngoscopy and/or difficult intubation with the McGrath videolaryngoscope (4 vs. 16 %) in ICU patients.

The multivariate analysis performed by De Jong et al. [9] revealed that difficult intubation was associated with direct laryngoscopy using the Macintosh technique, Cormack III-IV in that the glottis cannot be visualized and the inexperience of the operator. In their study the majority of the operators in both groups were inexperienced which may have affected the results. Indeed, it has been shown that the number of intubation attempts is highly related to the lack of expertise [8]. However, this situation reflects the reality in many ICUs. In two recent studies with a similar design to that of De Jong et al., the respective authors made similar observations using the Glidescope®, i.e., that in non-experienced hands videolaryngoscopes were beneficial, with fewer intubation attempts and a reduced risk of esophageal intubation [12, 13]. In this context, devices such as the McGrath Mac or C-MAC® (Karl Storz, Culver City CA) are an interesting development because they allow ICU clinicians to become familiar with indirect video laryngoscopy while keeping conventional direct laryngoscopy as an option.

De Jong et al. [9] found no differences in mortality or major complications between the use of conventional laryngoscopes and the videolaryngoscopes. This result is to be expected since the study was probably underpowered in this regard. In fact, most of the complications, such as cardiorespiratory deterioration, are mainly dependent on the patient's underlying condition and on the type and amount of anesthetics used. However, this study underscores the fact that tracheal intubation is hazardous by demonstrating a 14–16 % rate of life-threatening complications independent of the type of laryngoscope used.

The study by De Jong et al. [9] was not randomized but was a prospective collection of data before and after the introduction of videolaryngoscopes. The pilot study by Griesdale et al. [10] is the only ICU study to date that is randomized. However, it included few patients and the providers were trained in the use of the device for only for 1 h on a manikin before participating in the study [10]. Future ICU studies should aim for a randomized design with adequate power and attempt to address the issue of the level of training and the intensivist's familiarity with the device under study.

The Montpellier group has previously proposed and implemented a bundle for intubation care in their ICU that includes, among others, the use of two operators, fluid loading, preoxygenation and, importantly, rapid detection of tube position by capnography [15]. Including the use of videolaryngoscopy in this bundle, as described by De Jong et al. [9] might further improve the safety of tracheal intubation. If future well-designed randomized controlled studies show a benefit, videolaryngoscopy could become a new standard for tracheal intubation in the ICU, particularly in teaching institutions where tracheal intubations often are performed by non-experts. However, the introduction of videolaryngoscopy in the ICU must always be accompanied by formal training programs in difficult airway management and manikin training with the specific device.

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Conflicts of interest Dr. Dhonneur works as a consultant for Prodol™ and LMA™. Dr. Larsson has no conflict of interest to declare.

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