EDITORIAL

Maximizing first pass success when intubating the critically ill patient: use a stylet!

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Tracheal intubation is one of the most commonly performed procedures in the intensive care unit (ICU) [1]. In a recent prospective observational study (INTUBE study) including 2964 patients across 29 countries, adverse event occurred after intubation in 45.2% of patients, including cardiovascular instability in 42.6%, severe hypoxemia in 9.3%, and cardiac arrest in 3.1% [2]. A significantly higher mortality was noted in those who experienced a peri-intubation adverse event compared to those who did not. Critically ill patients therefore represent the highest risk patients to intubate. Factors that contribute to increasing the risk of complications include the complex environment, varying levels of airway operator skills, and, most importantly, the critical illness of the patient [3, 4].

Many critically ill patients that require tracheal intubation have a physiologically difficult airway. These physiological derangements, most notably cardiovascular instability and hypoxemia, are often exacerbated during airway management and the initiation of invasive mechanical ventilation, resulting in the development of serious adverse events [5]. This baseline physiologic risk is further exaggerated when more than one attempt at tracheal intubation is required [2, 6, 7]. Moreover, a study including 650 patients undergoing emergency tracheal intubation showed difficult intubation to be an independent predictor of mortality [8]. Therefore, the goal

of tracheal intubation, especially in critically ill patients, is to achieve first pass success without adverse events. A recent prospective observational study in 1513 emergency tracheal intubations showed that first pass success without adverse events was reduced to a similar extent in patients with anatomically and physiologically difficult airways, highlighting the importance of physiological optimisation along with the use of tools to overcome anatomical difficulty [9]. Several reviews and guidelines provide recommendations to achieve these targets, to enhance patient safety [3, 4, 10–14].

Difficulty in either visualizing the glottic opening or delivery of the tracheal tube to the laryngeal inlet may affect first pass success. Various devices and tools such as videolaryngoscopes, stylets, and tracheal tube introducers (bougies) have been proposed to improve first pass success [3, 4, 10, 11]. First pass success was 79.8% in the INTUBE study [2]. Similarly, a large emergency department registry of 17,583 emergency intubations demonstrated a first pass success of 85%, despite an increasing use of videolaryngoscopy [15]. These findings highlight the opportunity for further efforts to improve first pass success. However, in a recent meta-analysis comparing videolaryngoscopy with direct laryngoscopy that included nine randomized-controlled trials with over 2000 critically ill patients, the use of a videolaryngoscope did not improve first pass success, even when evaluating the studies according to the experience of the operator [16]. There was heterogeneity in the studies included and some were of low quality. Thus, while the routine use of a videolaryngoscope for tracheal intubation in ICU remains controversial, it clearly improves glottic visualization as compared with direct laryngoscopy making it an important tool for difficult airway management [17].

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Future trials will better define the role of a videolaryngoscope in the ICU.

Bougies and stylets are simple, inexpensive tools conventionally used to facilitate tracheal intubation when there is a poor laryngeal view or when there is inability to pass the tracheal tube through the vocal cords, when the initial attempt at tracheal intubation fails. A randomized trial compared the use of a bougie with a tracheal tube and a stylet for tracheal intubation in patients with at least one difficult airway characteristic in the emergency department [18]. There was a significantly higher first pass success in the bougie group. The generalizability of these findings is limited, since this was a single-center study with operators very experienced with the use of a bougie. Nevertheless, the results of this trial, along with the STYLETO trial, provide a strong rationale for the routine use of these devices for tracheal intubation in the critically ill.

A stylet is commonly used to rescue a difficult tracheal intubation. The effect of routine use of stylet on first pass success has never been studied in critically ill patients. Jaber et al. conducted the STYLETO trial, a large randomised clinical trial in 999 patients in 32 intensive care units in France, comparing tracheal intubation using a tracheal tube with or without a stylet when performing direct laryngoscopy [19]. The primary endpoint was the proportion of patients with first pass success and the secondary outcome was the proportion of patients with complications related to tracheal intubation. There were 501 patients included in tracheal tube + stylet group and 498 (50%) in tracheal tube group. First-attempt intubation success occurred in 392 patients (78.2%) in the tracheal tube + stylet group and in 356 (71.5%) in the tracheal tube alone group (absolute risk difference, 6.7; 95% CI 1.4–12.1; relative risk, 1.10; 95% CI 1.02–1.18; $p=0.01$). Between patients in the tracheal tube + stylet group as compared to the tracheal tube group, there was no difference in the incidence of complications (38.7% versus 40.2%, $p=0.64$) or the serious adverse events (4.0% and 3.6%, $p=0.76$).

This trial provides a clear cut answer to a simple question: Is the use of tracheal tube + stylet during tracheal intubation with a direct laryngoscope associated with higher rates of first-attempt intubation success? The STYLETO trial showed that among critically ill adults undergoing tracheal intubation, using a stylet increases the frequency of first pass success. However, traumatic injuries reported with stylet use may question the routine use of a stylet during the first attempt at intubation without any anticipated difficulty [20]. Although the study was underpowered to assess safety outcomes, there was no difference in the complications,

serious adverse events, or traumatic injuries between both the groups. Taken together, this finding supports the routine use of a stylet with a tracheal tube during tracheal intubation in critically ill patients when using a direct laryngoscope. The large number of patients included from multiple centers and inclusion of both experienced and inexperienced operators improves the generalizability of the results obtained.

The study included tracheal intubations performed using a direct laryngoscope. This may be a limitation considering the increasing use of videolaryngoscopes in ICU. Moreover, stylets are usually preferred over a bougie during videolaryngoscope use, due to their ability to pre-shape the tracheal tube, making it easier to deliver them into the laryngeal inlet. However, since this study was performed using direct laryngoscopes, these results should be cautiously extrapolated to Macintosh videolaryngoscopes. Another potential limitation is that the authors used first pass success as their primary outcome, considering the high incidence of complications during tracheal intubation in the critically ill, first pass success without adverse events may be a better endpoint [1, 9].

Of note is the fact that 75% of the first attempts at tracheal intubation were not performed by expert operators. Therefore, one may suppose that expert operators may not need to use a stylet. However, the subgroup analysis showed no effect of the experience of the operator on the incidence of first pass success. It is interesting to note that despite a higher first pass success, the use of a stylet was not associated with reduced time for tracheal intubation. Finally, it should also be noted that the full sample size of 1040 was not reached, as a few patient randomised did not complete the trial, though this was equal between the groups.

The results of this study have the potential to change airway management practice in critically ill patients. Conventionally, a stylet is used with tracheal tube when the first attempt at tracheal intubation fails. The results of the STYLETO trial, showing an increased first pass success with the use of a stylet without any increased risk of complications, provide a strong rationale for the routine use of a stylet with a tracheal tube during tracheal intubation in critically ill patients.

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