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Videolaryngoscopy post COVID-19

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Due to the COVID-19 pandemic, airway management guidelines in many countries have recommended videolaryngoscopy be used as a first line for all patients requiring intubation [1–3]. Although videolaryngoscopes appear to have been widely available prior to the COVID-19 pandemic, their use in many centres was constrained by having a few devices located in the main theatre areas [4]. It is plausible that the availability of videolaryngoscopes will have increased in many centres as a consequence of the pandemic and the new guidance. This paper is set to evaluate the impact of the COVID-19 pandemic on the use of videolaryngoscopes in future practice.

Between 2011 and 2018 the World Health Organisation recorded almost 1500 epidemic events in various countries [5]. The evidence indicates these diseases are part of a new era of potentially high impact and rapidly spreading outbreaks, which are becoming increasingly difficult to manage [5]. We may well see another viral pandemic so it is difficult to overstate the importance of lessons learnt from COVID-19 for future practice [6].

A wealth of research exists on the performance of various videolaryngoscopes when used in patients with a challenging airway, with benefits including an improved laryngeal view, improved first pass success rate and lower incidence of the need for external laryngeal manipulation [7–9]. These benefits become increasingly relevant when dealing with COVID-19 patients, where intubation poses a high risk of transmission to healthcare providers involved in the procedure and where time to securing the airway is critical to the wellbeing of the patient [1,3,10]. Evidence supports videolaryngoscopes as a rescue device when difficult intubation is encountered and direct laryngoscopy has been unsuccessful [11]. As most difficult intubations are unanticipated, routine use of a

videolaryngoscope eliminates the delay in changing equipment when a difficult intubation does occur and trains providers for the critical event. This saves precious time when oxygenation is paramount [12]. We should keep in mind that oxygenation takes priority over any intervention [13] and that oxygenation is the primary reason for intubation. Videolaryngoscopes are most effective device for achieving this goal in this group of patients.

Recent research indicates specific advantages for videolaryngoscopy in COVID-19 patients [2,14]. Improved first attempt success rates, increased mouth to mouth distance, the ability to use drapes or boxes over the patient, and improved visibility when wearing personal protective equipment (PPE) are some of the advantages over direct laryngoscopy [2,14]. Awake tracheal intubation using flexible or video laryngoscopes in the suspected or confirmed COVID-19 patient is a challenging undertaking due to the risk of aerosolization of viral particles. In these patients, there are some key modifications, including: appropriate sedation, topicalization, and avoidance of high flow nasal oxygen [15]. In centres where staff from other speciality areas have been drafted into the intensive care unit to assist with increased patient load, videolaryngoscopy might improve familiarity and understanding of intubation by displaying the procedure on a monitor [16]. This provides an opportunity for the intubation team to observe the process of tracheal tube placement making it a team process, changing it from 'I intubate, to we intubate' [17]. However, it should be stressed that in all circumstances, the most experienced provider should perform intubation. Videolaryngoscopy may also decrease the incidence of requiring assistance in intubation, meaning fewer people need be exposed to this aerosol generating procedure reducing staff exposure to infection and conserving PPE [18,19].

Given the risk of future pandemics or other respiratory infectious diseases, it is essential to future proof our practice and training curriculum. Formally integrating training in videolaryngoscopy, could play a crucial part in our preparedness to deal with future challenges [20]. Videolaryngoscopy requires fewer

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attempts to achieve proficiency, and evidence shows that novices found videolaryngoscopy easier to use than direct laryngoscopy [21,22]. This could mean that the most experienced intubators available could gain skills and expertise with videolaryngoscopy and be confident in its use in the event of another highly contagious pandemic.

In the past, the cost of videolaryngoscopes may have been considered prohibitive, affecting availability and use. However, many centres had access to COVID-19 emergency funds and purchased videolaryngoscopes, increasing the accessibility of these devices to a wider range of hospital staff. Practitioners in low resource areas have reported improvising makeshift videolaryngoscopes, by using a traditional Macintosh laryngoscope and attaching a fibre optic camera [23]. Others have discussed the possibility of using 3D printing to cater for the increased demand for single use blades for videolaryngoscopes [24]. The outcome of this increased funding and the improvisation is very likely wider availability and more frequent use of videolaryngoscopes worldwide. This seems to be in keeping with the trend of many national guidelines recommending videolaryngoscopes as a primary intubation device.

The COVID-19 pandemic brought the videolaryngoscope increasingly into mainstream anaesthetic practice. This is a prime opportunity to consolidate the newfound resources and expertise by using a videolaryngoscope as a routine intubation device for all patients. Skills degrade over time [25], therefore, routine use of videolaryngoscopes could enable skill maintenance and re-enforcement. In the context of routine videolaryngoscope use, practice makes permanent.

Despite a high proportion (92%) of hospitals surveyed by Cook and Kelly [4] having videolaryngoscope access, fewer than a third reported regular use. This may suggest that availability of these devices is not the sole hurdle to embracing routine use, rather, this may require a culture change and an adjustment in attitudes. Multiple centres have already transitioned to routine use of videolaryngoscopes both in the UK and in Europe [26–28]. A study of several thousand cases in a Swiss university hospital have found that routine use of videolaryngoscopy, in addition to other interventions, have significantly reduced the incidence of adverse airway events [29]. These examples demonstrate that though there may be some resistance or reservations within anaesthetic departments, a transition to routine videolaryngoscopy is certainly achievable and may stand to benefit both patients and healthcare staff.

With the risk of future pandemics in mind, videolaryngoscopes are a safer and more efficient device to use in critically ill patients, where timely intubation can be lifesaving. These devices have been the primary intubation devices in many centres during the COVID-19 pandemic. It is important that we use the experience and resources acquired during the pandemic to further establish videolaryngoscopes as our primary intubation device. Our preparedness to deal with similar global challenges in the future depends on it. We echo the sentiment of Gibbins et al. that “it is possible that airway management will have been changed forever” [14] with the COVID-19 pandemic. We should not miss this opportunity to embrace this new pandemic influenced role on the use of videolaryngoscopy and to implement its use as a routine intubation device for all patients.

Declaration of competing interest

None.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.tacc.2020.09.006>.

References

- [1] D.J. Brewster, et al., Consensus statement: safe Airway Society principles of airway management and tracheal intubation specific to the COVID-19 adult patient group, *Med. J. Aust.* 16 (2020).
- [2] T. Cook, et al., Consensus guidelines for managing the airway in patients with COVID-19: guidelines from the difficult airway society, the association of anaesthetists the intensive care society, the faculty of intensive care medicine and the royal college of anaesthetists, *Anaesthesia* 75 (6) (2020) 785–799.
- [3] M. Sorbello, et al., The Italian coronavirus disease 2019 outbreak: recommendations from clinical practice, *Anaesthesia* 75 (6) (2020) 724–732.
- [4] T.M. Cook, F.E. Kelly, A national survey of videolaryngoscopy in the United Kingdom, *Br. J. Anaesth.* 118 (4) (2017) 593–600.
- [5] Global Preparedness Monitoring Board, *A World at Risk: Annual Report on Global Preparedness for Health Emergencies*, World Health Organisation, Geneva, 2019.
- [6] A. De Jong, et al., Airway management for COVID-19: a move towards universal videolaryngoscopy? *The Lancet Respiratory Medicine* 8 (6) (2020) 555.
- [7] P. Niforopoulou, et al., Video-laryngoscopes in the adult airway management: a topical review of the literature, *Acta Anaesthesiol. Scand.* 54 (9) (2010) 1050–1061.
- [8] G. Serocki, et al., Management of the predicted difficult airway: a comparison of conventional blade laryngoscopy with video-assisted blade laryngoscopy and the GlideScope, *Eur. J. Anaesthesiol.* 27 (1) (2010) 24–30.
- [9] B.M.A. Pieters, et al., Videolaryngoscopy vs. direct laryngoscopy use by experienced anaesthetists in patients with known difficult airways: a systematic review and meta-analysis, *Anaesthesia* 72 (12) (2017) 1532–1541.
- [10] K. El-Boghdady, et al., Risks to Healthcare Workers Following Tracheal Intubation of Patients with COVID-19: a Prospective International Multicentre Cohort Study, *Anaesthesia*, 2020.
- [11] M.F. Aziz, et al., First-attempt intubation success of video laryngoscopy in patients with anticipated difficult direct laryngoscopy: a multicenter randomized controlled trial comparing the C-MAC D-blade versus the GlideScope in a mixed provider and diverse patient population, *Anesth. Analg.* 122 (3) (2016) 740–750.
- [12] F.E. Kelly, T.M. Cook, Seeing is believing: getting the best out of videolaryngoscopy, *Br. J. Anaesth.* 117 (suppl_1) (2016) i9–i13.
- [13] M. Sorbello, A. Afshari, S. De Hert, Device or target? A paradigm shift in airway management: implications for guidelines, clinical practice and teaching, *Eur. J. Anaesthesiol.* 35 (11) (2018) 811–814.
- [14] J.L.J. Yek, et al., Perioperative considerations for COVID-19 patients: lessons learnt from the pandemic, *Korean J Anesthesiol* (2020).
- [15] I. Ahmad, et al., Awake tracheal intubation in a suspected COVID-19 patient with critical airway obstruction, *Anaesthesia Reports* 8 (1) (2020) 28–31.
- [16] F. Rubulotta, et al., Technologies to optimize the care of severe COVID-19 patients for healthcare providers challenged by limited resources, *Anesth. Analg.* 131 (2) (2020) 351–364.
- [17] L. Jones, et al., C-MAC[®] videolaryngoscopy: the anaesthetic assistant’s view, *J. Perioperat. Pract.* 28 (4) (2018) 83–89.
- [18] M.F. Aziz, et al., Comparative effectiveness of the C-MAC video laryngoscope versus direct laryngoscopy in the setting of the predicted difficult airway, *Anesthesiology* 116 (3) (2012) 629–636.
- [19] C.H. Maharaj, et al., Evaluation of the Airtraq and Macintosh laryngoscopes in patients at increased risk for difficult tracheal intubation, *Anaesthesia* 63 (2) (2008) 182–188.
- [20] M. Gibbins, F.E. Kelly, T.M. Cook, Airway management equipment and practice: time to optimise institutional, team, and personal preparedness, *Br. J. Anaesth.* 125 (3) (2020) 221–224.
- [21] L. Szarpak, Laryngoscopes for difficult airway scenarios: a comparison of the available devices, *Expert Rev. Med. Dev.* 15 (9) (2018) 631–643.
- [22] Y. Lu, H. Jiang, Y.S. Zhu, Airtraq laryngoscope versus conventional Macintosh laryngoscope: a systematic review and meta-analysis, *Anaesthesia* 66 (12) (2011) 1160–1167.
- [23] J. Saoraya, K. Musikatavorn, J. Sereyotin, Low-cost videolaryngoscope in response to COVID-19 pandemic, *Western Journal of Emergency Medicine: Integrating Emergency Care with Population Health*, 2020.
- [24] A.V. John, S.C. John, C. Lambert, Development and testing of a low cost videolaryngoscope in a resource limited setting, *Annals of Global Health* 83 (1) (2017) 4–5.
- [25] C.A. Graham, Advanced airway management in the emergency department: what are the training and skills maintenance needs for UK emergency physicians? *Emerg. Med. J.* 21 (1) (2004) 14.
- [26] T.M. Cook, et al., Universal videolaryngoscopy: a structured approach to conversion to videolaryngoscopy for all intubations in an anaesthetic and intensive care department, *Br. J. Anaesth.* 120 (1) (2018) 173–180.

- [27] P. Cortellazzi, et al., Predictive value of the El-Ganzouri multivariate risk index for difficult tracheal intubation: a comparison of Glidescope A® videolaryngoscopy and conventional Macintosh laryngoscopy, *Br. J. Anaesth.* 99 (6) (2007) 906–911.
- [28] A. De Jong, et al., Implementation of a combo videolaryngoscope for intubation in critically ill patients: a before-after comparative study, *Intensive Care Med.* 39 (12) (2013) 2144–2152.
- [29] Pedersen, T., et al., Improving patient safety in anesthesia through optimization of airway-management strategies: a prospective before-and-after study on airway-management-related events. Personal correspondence. Currently reviewed for publication in the *British Journal of Anaesthesia*.