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Videolaryngoscopy – making intubation more successful

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Securing a patent airway in patients undergoing general anesthesia is routinely performed using direct laryngoscopy with a Macintosh laryngoscope blade. However, successive intubation attempt to pass the vocal cords can have a tremendous impact on patient outcome. A good laryngeal view is often a prerequisite, if not a guarantee, for successful intubation. There are numerous difficulties associated with intubation which can have an important effect on patient morbidity or mortality such as : 1) difficult laryngoscopy (obtaining a non-optimal view of the glottis entrance or no view of the vocal cords at all) ; 2) difficult intubation (for which extra tools, such as a gum elastic bougie, stylet, Bonfils, Trachlight, fiberoptic intubation, intubating laryngeal mask, ... are required) ; and 3) failed intubation.

Previously the paradigm for safe intubation has been built on the foundations of adequate preoperative measurement of a patient's airway. The plethora of metrics for intubation difficulty (i.e., Mallampati, Cormack Lehane grade, BMI, mouth opening, dentition, thyromental or sternomental distances, protruding teeth, overbite, limited neck movement, are, however, usually very disappointing in predicting difficult cases of intubation. Preoperative metrics that indicate a difficult airway are not necessarily correct, while patients deemed to have 'normal' airways are not precluded from possibly difficult intubations. Therefore, the ubiquitous assessment of preoperative metrics of a potentially difficult airway by anaesthesiologists, is incomplete at best, but, furthermore, less relevant regarding videolaryngoscopy.

The recent introduction of videolaryngoscopes incorporating optics in the tip of the intubation blade has proven advantageous qua improved viewing of the glottis (Fig. 1). Further, it is assumed in literature that there are fewer traumas to the patient, with faster intubation times, even in problematic cases (Table 1). Since videolaryngoscopy facilitates indirect vision of the vocal cords, and it is no longer required to visualize the glottic entrance directly, less force is needed to lift the jaw. This has the advantage that less forces are exerted on the

Fig. 1. — Example of a new videolaryngoscope (C-Mac™, Storz, Tuttlingen, Germany).

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Table 1

Suggested advantages of videolaryngoscopes

CLINICAL – Airway management	TECHNICAL	OTHER APPLICATIONS
∞ Both direct (naked-eye) and indirect (video-assisted) larygoscopy possible	∞ Integrated video display monitor, laryngoscope and cable	∞ Diagnostic tool
∞ Improved viewing of glottic entrance and surroundings	∞ LED lighting further improves better viewing of glottis	✓ better view results in more diagnoses of cysts and tumours
✓ near perfect view of glottic entrance and surroundings	∞ Anti-fogging	✓ other specialists can use it as diagnostic tool (e.g. ENT)
✓ viewpoint closer to vocal cords	∞ AC power and DC Lithium-ion battery power	
✓ wider angle of view	∞ Colour LCD display with CMOS chip	∞ Teaching/ educational tool
✓ better viewing without excessive angulation of laryngoscope blade	∞ Robustness (stainless steel)	✓ no more "look over the shoulder"
✓ better view of passage of endotracheal tube between vocal cords	∞ Heat resistant blade (stainless steel)	✓ both anaesthesiologist and resident can simultaneously see intubation
✓ better evaluation of exact depth of tube insertion	∞ Portable	✓ recording possible for education purposes
✓ better view of passage gastric tube into oesophagus	∞ Still images and video capturing	✓ documented monitoring of tracheal intubation possible
✓ reduction in dental damage	∞ SD-card MPEG/JPEG	
∞ Ease of intubation is facilitated	∞ Reusable (immersable, HDL, Steris)	
✓ less attempts	∞ Different sizes of blades fit on videolaryngoscope	
✓ shorter intubation time		
✓ seldom need for extra tools		
✓ usually no need for external manipulation trachea/ cricoid		
∞ Intubation in (predicted) difficult situations		

maxillary incisors, relative to classical direct laryngoscopy, irrespective of anaesthesiologist experience, patient characteristics, or common metrics of intubation difficulty. This potentially results in less trauma to teeth during intubation.

Videolaryngoscopes are potentially superior even for easier patients, but are most beneficial for use with difficult-to-intubate patients (1). Especially in patients where preoperative metrics do not indicate a difficult airway and the anaesthesiologist is confronted with an unexpectedly difficult intubation the videolaryngocope can be superior to direct classic laryngoscopy.

Despite the clear advantages over classic direct laryngoscopy, there are differences in patient outcome between the commercially available videolaryngoscopes, Differences exist (e.g. successful intubation, first pass success, intubation time, use of extra tools) between the different devices. To overcome certain deficits certain manufacturers advocate using a styletted endotracheal tube, which may in itself have disadvantages. Further studies should investigate strategies for optimizing the ergonomic design of the blades for videolaryngoscopes. The integration of the videolaryngoscope blade and endotracheal tube geometry is the most pressing point for further development.

Conclusion

Successful laryngoscopy and subsequent intubation depends on the patient's characteristics and position during intubation, the intubator's skills, the technique used and the intubation tools. Besides placing the patient in an optimal position, we cannot change the patient's anatomy. The plethora of methods to predict difficult intubation conditions yield inclusive results. We, therefore, should focus our attention to technical or procedural improvements, especially the design of better laryngoscopes. Indirect videolaryngoscopy is one such improvement, as it offers a better viewpoint of the glottic entrance, often unachievable with direct classical techniques. Videolaryngoscopy is shown to have promising features. We believe that videolaryngoscopy will become standard for all intubations, not only those predicted to be 'difficult'. Consequently, the 'Difficult Airway Algorithm' guidelines have to be adjusted according to the development of the introduction of new tools in our practice, such as videolaryngoscopy.

References

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