Difficult Tracheal Intubation

Looking to the Past to Determine the Future

LARYNGOSCOPY began in the 1800s with indirect attempts to visualize the glottis, from Bozzini's mirror clad speculum powered by candlelight, to the singer Manuel Garcia's successful visualization of his own larynx.[1] In the 1900s, Chevalier Jackson, Miller, and Magill pioneered the era of direct laryngoscopy. In the 1960s the flexible fiberoptic bronchoscope was established as the gold standard for difficult airway management because of its ability to be manually manipulated and see around corners.[2] A careful examination of modern medical equipment reveals few vestiges of previous eras. The iron lung gave way to modern ventilators; laparoscopy transformed open surgery, and now is being transformed by robotics. Despite the rapid transformation of medicine by technological advances, laryngoscopy and airway management have remained essentially the same, until now.[3] About his invention, Bozzini's colleagues remarked, "premature conclusions were likely to be arrived concerning the instrument, perhaps even there may be an outlay of money which might afterward be regretted."[1] Little did they know that the quest to visualize the larynx would come full circle, and we would return to his design ideas more than a century later.

"What role will the direct laryngoscope play [in the future]? Will it even exist?"

In this issue of ANESTHESIOLOGY, Rosenstock *et al.*[3] compared standard fiberoptic intubation with video laryngoscopic intubation in sedated patients with anticipated difficult airway management. Their results confirm anecdotal evidence that video laryngoscopy facilitates intubation in patients with challenging airways, and can be useful in the nonanesthetized patient. The introduction of video and optically enhanced laryngoscopes designed for indirect visualization of the larynx represents a reaffirmation of the pioneers of laryngoscopy.

Rosenstock *et al.*[3] performed a multicenter randomized comparison of the McGrath® video laryngoscope (Aircraft Medical, Edinburgh, Scotland, United Kingdom) to the flexible fiberoptic bronchoscope. They tested the hypothesis that, in experienced hands, intubation with the McGrath® video laryngoscope would be faster than flexible bronchoscopy. They found no differences in intubation time and success rate. Furthermore, they established the utility of the McGrath® video laryngoscope for intubation in nonanesthetized patients, and showed that levels of discomfort were similar for both techniques. The patients in this study received topical anesthesia with lidocaine spray as well as transtracheal injection of lidocaine, and were sedated with a remifentanil infusion titrated to a Ramsay score of 2–4. Although many anesthesiologists administer sedatives during awake intubation, flexible bronchoscopy can be performed without any sedation with adequate topical anesthesia. This is because the thin fiberoptic bronchoscope can be gently manipulated around airway structures. This approach is particularly useful in patients in whom sedation may pose a significant risk of upper airway obstruction. Since distraction of airway structures (*e.g.*, tongue) may be necessary for adequate glottic visualization with video laryngoscopes, future studies should determine if video laryngoscopic intubation is possible without sedation. Nevertheless, the Rosenstock study represents a challenge to our accepted paradigm of airway management and a turning point in the thinking about the best tool to secure a difficult airway. They demonstrate that a video laryngoscope may be a useful alternative in awake intubation.

From our involvement in airway education workshops, we have observed that a relatively large number of anesthesiologists lack the commitment and desire to master fiberoptic intubation. This relates to the protracted learning curve to acquire the necessary psychomotor skills, procurement and cleaning costs, and the time pressure in the operating room. In contrast, video laryngoscopes are easy to learn, readily portable, and can be quickly readied for subsequent intuba-

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tions. In a meta-analysis, first attempt success rates were around 90%.[4]

However, we cannot yet discard our flexible bronchoscopes because they will still be required in patients with uniquely altered anatomy. For example, the video laryngoscope may not be appropriate for the patient with limitation of mouth opening (Rosenstock *et al.* excluded patients with a mouth opening of fewer than 15 mm). In addition, large upper airway or pharyngeal space-occupying lesions may preclude the use of video laryngoscopy because of a lack of space for device insertion, and it is unclear how patients without sedation will tolerate the more rigid and less compliant device. Furthermore, although the video laryngoscope may provide an excellent view of the glottic opening, indirect passage of the endotracheal tube represents a paradigm shift that requires education and practice. Despite its relative ease of use, a learning curve still exists, and poor technique may result in failed intubation, multiple attempts, and airway injury. Further research is needed to clearly define the appropriate interventions for successful endotracheal tube insertion when the view is adequate but passage is difficult. Current recommendations include tube rotation, slight withdrawal of the video laryngoscope, and reverse loading of the endotracheal tube; however, these have not been systematically examined, and recommendations will inevitably vary with each device.

There are several differently designed video and optical enhanced devices that claim superiority, and hope to be crowned the gold standard of airway management. At this point in time, save for a few outliers, there are few significant clinically important differences between these devices. The most important factors for success will be knowledge of the limitations, and practice, practice, practice. Subsequent randomized studies in larger numbers of patients may help, but ultimately it will be comfort and consensus that determines their use.

The next logical step in the evolution of the video laryngoscope will be for use in patients with normal airway anatomy as a replacement for direct laryngoscopy. The required hand-eye coordination is readily attained, and their use in routine airway management continues to expand. As acquisition costs decrease over time, these devices will become increasingly popular. Just as the next generation of anesthesiologists will wonder how we ever inserted an intravenous catheter without ultrasound guidance, they will also wonder how we acquired the arm strength required to use the direct laryngoscope.

The journey started by Bozzini and Garcia continues today. As we insert an airway device and advance a breathing tube into the trachea, so too do we advance history. As this evolution continues, we wonder and speculate what lies ahead. What role will the direct laryngoscope play? Will it even exist? What new technology lies in our future? Will we use light or sound to guide tracheal intubation? When will the flexible fiberoptic bronchoscope no longer be crowned the king of the hill?

John E. Fiadjoe, M.D., Ronald S. Litman, D.O., Departments of Anesthesiology and Critical Care Medicine, The Children's Hospital of Philadelphia, Perelman School of Medicine at the University of Pennsylvania, Philadelphia, Pennsylvania. fiadjoej@email.chop.edu

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