Strengths and Limitations of Airway Techniques

Richard M. Cooper, MSc, MD, FRPCP[a,b,*]

KEYWORDS

• Airway management • Laryngoscopy • Tracheal intubation • Video laryngoscopy
• Supraglottic airways • Tracheal extubation • Complications • Extubation

KEY POINTS

- Face mask ventilation and direct laryngoscopy fail in a significant number of patients, in some of whom it is predictable; however, many are not, necessitating transition to a backup plan.
- A supraglottic airway may restore effective oxygenation.
- Fiberoptic and video laryngoscopes (VLs) may provide good laryngeal exposure that is not possible by direct laryngoscopy.
- VLs are available in channeled and nonchanneled configurations.

INTRODUCTION

Until recently, airway management choices were limited; a patient could be managed by face mask ventilation or intubated using direct laryngoscopy. The options available at present are far greater: face mask and supraglottic airway (SGA) devices, tracheal intubation (blindly, via an SGA, using a flexible endoscope, a lightwand, ferromagnetic intubation, direct laryngoscopy, video laryngoscopy, and an optical stylet), and a surgical airway. In addition, extubation strategies should be considered for the patient with a difficult airway. Within each of these categories, there are numerous varieties of devices and techniques. Practice guidelines have been developed by expert committees representing national or specialty societies, recommending strategies to be implemented under specific or general circumstances.[1–4] These guidelines are discussed elsewhere in this article. Unfortunately, few of the recommendations are evidence based and rely largely on expert opinion.[5] Absent such

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[a] Department of Anesthesia, University of Toronto, Toronto, Ontario, Canada; [b] Department of Anesthesia and Pain Management, Toronto General Hospital, 200 Elizabeth Street, 3EN-421, Toronto, Ontario M5G 2C4, Canada
* Department of Anesthesia, University of Toronto, Toronto, Ontario, Canada.
E-mail address: richard.cooper@uhn.ca

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evidence, the best option for a clinician is to gain familiarity with a least a few devices and techniques, selected from a range of categories. However, it is not the device that manages the airway but rather the judicious clinician with prior experience using a familiar device. Regular use of alternative techniques increases the likelihood that the clinician understands the limits of their utility in his/her own hands. It also results in superior performance when time is limited. A detailed discussion of the wide range of devices and techniques is beyond the scope of this article but may be found elsewhere.[6–8]

FACE MASK VENTILATION/OXYGENATION

Preoxygenation before airway interventions may forestall the development of desaturation, with some strategies being more effective than others.[9] Fundamentally, the purpose of airway management is to provide a patent airway able to transport oxygen to the alveoli. If controlled ventilation is required, positive pressure ventilation requires a tight-fitting device. It may be possible to achieve this with a face mask, although for longer periods, an SGA or tracheal tube (TT) is generally used. If the patient is at increased risk of regurgitation or aspiration, a TT is a more appropriate choice. If a TT cannot be placed and ventilation by face mask or SGA is unsuccessful, spontaneous ventilation (and an unobstructed airway) must be promptly restored or an invasive airway must be established. It is important to refrain from unproductive strategies and be cognizant that repeated efforts may compromise one's ability to ventilate a patient with a device that previously worked well. Furthermore, it may be more appropriate to focus on oxygenation rather than on ventilation; a measure of the former is readily available, in real time, continuous and objective, whereas the latter may be subject to wishful thinking.

Limitations of the Face Mask

Oxygenation by face mask is an essential skill for any airway practitioner, yet it is deceptively challenging, requiring a reasonable fit of the mask to the face. Partial airway obstruction may be relieved by insertion of an oropharyngeal or nasopharyngeal airway. The mandible should be pulled into the mask rather than the mask being forced onto the face. If the mask cannot be properly applied with 1 hand, 2-handed mask application can be used. Mechanical ventilation using an anesthesia gas machine or an assistant may be of considerable help. In a study of 1502 patients, face mask ventilation was found to be difficult in 5% and impossible in 1 patient.[10] Risk factors included male gender, age greater than 55 years, body mass index greater than 26 kg/m^2, beard, lack of teeth, and a history of snoring, criteria that apply to a large proportion of the adult population. Difficult face mask ventilation is sometimes overlooked in the belief that the situation is improving or will improve when intubation is achieved. It may be more appropriate to rely on an objective, although frequently a late sign of impending difficulty, a decline in oxygen saturation. Another study reviewed the documentation of nearly 180,000 adults undergoing general anesthesia. It found that mask ventilation was inadequate to maintain oxygenation (by a single provider) or impossible in 5% of patients (whereas the combination of difficult or impossible mask ventilation and difficult laryngoscopy occurred in 0.4% patients or approximately 1 in every 250 cases).[11] Unfortunately, this retrospective study, which did not prescribe management protocols, was not designed to determine how many of these patients might have benefitted from receiving (rather than being denied) neuromuscular blockade. The incidence of difficulty depends on the definition used, operator skill, case mix, and clinical setting (**Box 1**).[2]

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