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Clinical Notes

Quest for an Ideal Intubating Device

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The first scientific report of tracheal intubation and artificial respiration is attributed to Vesalius, who in 1543 performed this in animals.[1] The first perioperative use of tracheal intubation was described by Macewen in 1880 to prevent aspiration during the removal of a tumor from the base of the tongue. However, regular perioperative use of tracheal intubation in anesthetized patients started only in the early 1900s.[2] Until then, even oral surgery was performed without a definitive airway, thus predisposing patients to the risk of aspiration. As the use of tracheal tubes and intubation gained popularity, a proportional need to develop equipment that could help in placing a tracheal tube into the trachea arose. In 1913, Chevalier Jackson reported a high rate of success for the use of direct laryngoscopy as a means to intubate the trachea.[3]

The development of a rigid, curved laryngoscope by Macintosh in 1943, made the process of intubation simpler and less traumatic as it could now be performed under direct vision. Development of anesthetic drugs that rendered the patient unconscious within seconds and muscle relaxants that facilitated intubation made direct laryngoscopy and intubation the most followed technique for the establishment of a definitive airway.[4] However, as the technique gained popularity, its limitations also came to the fore.

A limited mouth opening (<25 mm) or an anteriorly placed glottis were commonly encountered situations where direct laryngoscopy and intubation was rendered difficult if not impossible.[5,6] This resulted in the development of several alternatives to facilitate tracheal intubation; such as intubating laryngeal mask airway (ILMA), lightwand, fiberoptic bronchoscope (fiberscope), and video/optical laryngoscopes (such as Airtraq, Glidescope, retromolar scope, bullard laryngoscope etc).[7-16] While some of these devices permit visualization of the larynx prior to intubation; some, such as lightwand /intubating laryngeal mask airway are semi-blind or blind techniques. Despite manifold advances in the development of airway gadgets and a vast range of available devices, only a few prove useful in patients with limited mouth opening where nasal intubation is required. In my opinion, an ideal intubation device should be versatile enough to aid in securing a definitive airway by both oral and nasal routes, especially in situations that result in failure to intubate with direct laryngoscopy. A plausible exception where even such an ideal intubation device may fail would be in the presence of an infraglottic pathology that prevents the advancement of a tracheal tube beyond the glottis.

Among airway devices that are available for tracheal intubation; only fiberscope and lightwand stand out to be useful in both routes of intubation. Both these devices have been proven to be immensely beneficial in a wide range of difficult airway situations across the globe; although each has its own merits and demerits.[8,17] Both techniques necessitate mounting of an appropriate sized tracheal tube over the device prior to the initiation of the intubation process. Both devices have also been found to be useful in overcoming difficult intubation when used along with other airway devices.[8,18,19]

A fibreoptic guided intubation involves visualization of the glottic structures, passage of the fiberscope into the trachea and then railroading the tracheal tube into the trachea over the fiberscope. In addition, it allows oxygen insufflation during intubation attempts. While the flexible nature of the fiberscope makes it a handy and useful device for securing the airway in patients with intraoral pathology such as tumors or distorted anatomy of the larynx; the distorted anatomy itself may result in failure to railroad a tracheal tube despite having the fiberscope in the trachea.[8] Further, fiberscopes are expensive, fragile, demand meticulous maintenance and sterilization, and can still be rendered useless in the presence of blood or secretions.[20]

A lightwand on the other hand, relies on a semi-blind technique that uses the principle of trans-illumination of the soft tissues of the anterior neck to guide the tip of the tracheal tube into the trachea. The superficial location of the trachea in relation to the oesophagus is taken advantage of by this technique.[21] In view of the semi-blind nature of this technique, lightwand guided intubation is not affected by the presence of blood or secretions in the oral cavity. The semi-rigid nature of the lightwand stylet enhances chances for successful advancement of the tracheal tube into the glottis. However, being a semi-blind technique, it is unsuitable for use in patients with altered laryngeal anatomy or intraoral tumors.[22] Also, the necessity to locate a "well circumscribed glow" in the mid-neck as a marker for identification of the trachea makes it less useful in patients with a thick neck or a mass in the mid-neck.[23]

In my experience, I have found the flexible fiberscope and the lightwand to be the most versatile of all airway gadgets meant for endotracheal intubation when direct laryngoscopy and intubation

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is either a failure or not an option. Both these devices are known to have a relatively long learning curve. However, once mastered, like swimming or cycling; the art cannot be forgotten. If a lightwand could be incorporated with an optical visualization stylet, the inherent drawbacks related to this technique may be overcome, making it the ideal intubating device.

Despite these advantages, the quest for an ideal intubation device will continue. Supraglottic devices such as laryngeal mask airway and equipment suitable for emergency infraglottic access will persist to play an important role in difficult airway situations and should be readily available. However, more important than developing an ideal intubation device, would be to develop oneself into an "ideal intubator" capable of handling any difficult airway scenario through repeated practice and proficiency with a range of available airway devices.

It is always better to be prepared for an eventuality and not have one than… vice versa.

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