Chapter

Introductory Chapter: Advances in Tracheal Intubation

Kelly Lebak

1. Introduction

Tracheal intubation is one of the cornerstones of anesthesiology. To the lay person, and even our surgical colleagues, it should not be that difficult ...just put a narrow tube in the trachea; no big deal. Indeed, we as a profession make it look easy, and 95% of the time it is. The incidence of difficult direct laryngoscopy these days is only 4.9% [1] with difficult or failed intubation much lower than this at 0.33% and 0.01% respectively [2]. This book will look at four different aspects of advanced tracheal intubation including videolaryngoscopy, ultrasound use for airway management, the video-assisted intubating stylet technique, and airway management in obstetrics.

Without question, videolaryngoscopy (VL) has changed the practice of endotracheal tube (ETT) placement and the practice of anesthesiology. Much of the time, VL makes ETT placement look easy (to the lay person). First introduced in 2001 [3], it has grown ubiquitous in ETT placement. In fact, aside from "practice" or the need to "keep our skills up," do many/any of us, who grew up in the days of direct laryngoscopy (DL) or early days of VL, DL anymore? Can anyone imagine how we intubated patients with "anterior" cords atraumatically? Given all the advantages of VL including successful ETT placement in difficult airways, multiple clinicians' ability to view the airway, and documentation of airway findings, it is no wonder that VL has gained a prominent place in the American Society of Anesthesiologists Practice Guidelines of Difficult Airway Management [4]. There are still disadvantages with VL, namely the dreaded "blind zone" where injuries can occur, a bulkier design if a channeled blade is used, and increased cost compared with DL, but it has forever changed the practice of ETT placement.

VL is one of the indispensable tools in our arsenal, and ultrasound may be the next. It is commonly used by anesthesiologists for invasive line placements, nerve blocks, and point-of-care ultrasound. Not surprisingly, given its success in these realms, it is starting to be used for airway management. There is work being done using the US to predict difficult mask ventilation or intubation by measuring tongue thickness or soft tissue thickness at the vocal cords, predict proper ETT size in pediatric patients or patients with obesity, identification of airway nerves for awake fiberoptic blocks, identification of upper airway inflammation including epiglottitis and sinusitis (useful for nasal ETT placement), guidance of the ETT to the correct depth in the trachea, confirmation of ETT and supraglottic airway placement, lung ultrasound as an indirect sign of correct ETT placement, surgical airway guidance via visualization of the cricothyroid membrane and trachea, and evaluation of other pulmonary pathology including pneumothorax.

When faced with a difficult airway, anesthesiologists have multiple tools from which to choose. A lesser-known tool is a video-assisted intubating stylet (VS) which is simple, portable, and easy to use. It can be used for the Shikani technique for intubation. The Shikani optical stylet is a bendable stylet with an endoscope at the distal tip that is used to visually guide the ETT. The Shikani method of intubation uses this stylet for guidance while grasping the mandible to lift the jaw anteriorly and advances the ETT and stylet combination into the larynx with direct visualization from the stylet. This technique negates: the need for a laryngoscope, increased forces on dentition, or cervical spine extension. An endoscopic stylet was first introduced in 1979 and now multiple similar video-assisted stylets are on the market. They can be used for various ETTs including regular ETTS, laser, and double-lumen tubes. Advantages of using VS include both the ease of obtaining a superior glottic view and placing the ETT through the viewed glottis. Potential drawbacks are lens fogging and secretions obscuring the view (though not exclusive to VS). It can be combined with DL and VL which is particularly useful in difficult airways as it uses the strengths of both modalities in that DL/VL is used to open the airway and lift the epiglottis allowing the VS to sneak under the epiglottis and obtain an optimized glottic view. Due to its many advantages, VS can not only be in the anesthesiologist's arsenal of difficult airway tools, but also for every day and every airway use in both adults and pediatric patients.

Despite the many advances to manage airways that our specialty has seen over the last several decades, airways in pregnancy (particularly in parturients) still elude us. Indeed, the incidence of failed intubation in pregnancy has not changed in 40 years. Airway complications are the leading causes of anesthesia-related maternal mortality with an incidence of failed intubation at 1 in 390 [5]. Multiple physiologic and anatomical changes put obstetric patients at risk for airway complications including airway changes due to edema particularly during labor and delivery, reduced functional residual capacity to closing capacity and increased oxygen demand resulting in faster onset of hypoxemia at induction, increased gastric pressure and relative incompetence of the lower esophageal sphincter, prolonged gastric emptying time during labor, pregnancy-related weight gain, and breast enlargement.

We must mitigate those changes with what we have until technology can be developed to magically (or at least competently) intubate during pregnancy 100% of the time. At this time in our arsenal, we can: do a preanesthetic airway assessment (sometimes under the duress of time), have an induction plan and multiple backup plans, be familiar with algorithms for difficult airways in pregnancy, premedicate to reduce pH and reduce gastric volume, perform rapid sequence inductions or positive pressure ventilation with cricoid pressure likely with VL and a relatively smaller, cuffed endotracheal tube with an introducer, and lastly, consider a second generation supraglottic airway and proceed with surgery if unable to intubate. In the case of "can't intubate, can't oxygenate," laryngospasm should be quickly ruled out, and then proceed with either a tracheotomy or cricothyrotomy.

All four of the following chapters highlight the advances, successes, and continued challenges that we face with tracheal intubation. The hope that we have with this book is that with widespread education and new technology eventually we can make ETT placement look easy 100% of the time.

DOI: http://dx.doi.org/10.5772/intechopen.110146

Author details

Kelly Lebak
MetroHealth Medical Center, Cleveland, Ohio, USA

*Address all correspondence to: kellylebak@gmail.com

IntechOpen

References

[1] Heinrich S, Birkholz T, Irouschek A, Ackermann A, Schmidt J. Incidences and predictors of difficult laryngoscopy in adult patients undergoing general anesthesia: A single-center analysis of 102,305 cases. Journal of Anesthesia. 2013;**27**(6):815-821. DOI: 10.1007/s00540-013-1650-4 Epub 2013 Jun 9

[2] Schroeder RA, Pollard R, Dhakal I, Cooter M, Aronson S, Grichnik K, et al. Temporal trends in difficult and failed tracheal intubation in a regional community anesthetic practice. Anesthesiology. 2018;**128**:502-510. DOI: 10.1097/ALN.0000000000001974

[3] https://das.uk.com/content/2015-das-medal-john-a-pacey

[4] Apfelbaum JL, Hagberg CA, Connis RT, Abdelmalak BB, Agarkar M, Dutton RP, et al. 2022 American Society of Anesthesiologists Practice Guidelines for Management of the Difficult Airway. Anesthesiology. 2022;**136**:31-81. DOI: 10.1097/ALN.0000000000004002

[5] Kinsella SM, Winton AL, Mushambi MC, Ramaswamy K, Swales H, Quinn AC, et al. Failed tracheal intubation during obstetric general anaesthesia: A literature review. International Journal of Obstetric Anesthesia. 2015;**24**(4):356-374