Video Laryngoscopy: Positives, Negatives, and Defining the Difficult Intubation

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In this month's issue of *Anesthesia & Analgesia*, the article entitled "Challenging the traditional definition of a difficult intubation: what is difficult?", by Bradley et al,[1] offers the readership a valuable service by making 3 important points. First, the authors, in contrasting video laryngoscopy with conventional laryngoscopy, point out that video laryngoscopy provides better tracheal intubation rates, better laryngeal views, decreased incidents of failed intubations, decreased rates of airway trauma and hoarseness, successful rescue after failure with conventional laryngoscopy,[2] and therefore some argue video laryngoscopy should be a new standard of care.[3] Second, and as a consequence of the first point, the disparity in performance between video laryngoscopy and conventional laryngoscopy creates a central question. Is a "difficult intubation" a "difficult intubation" if video laryngoscopy succeeds where conventional laryngoscopy fails? Third, they point out the obvious importance of conveying intubation details to the next caregiver. Certainly, the next anesthesia provider will perform better in the future with an accurate knowledge of what happened in the past.

However, the article has several limitations with respect to describing the use and success of video laryngoscopy. These limitations include (1) the impact of the preoperative airway evaluation findings on the likely success of video laryngoscopy; (2) the marked disparities in video laryngoscopy design that exist; (3) the availability of video laryngoscopy; and (4) the lack of experience with video laryngoscopy. Until these limitations are addressed, it is not possible to address the issue of the impact of video laryngoscopy on the definition of "difficult intubation."

First, and most importantly, the Bradley et al[1] view of intubation is from a rear-view mirror, looking back at what happened rather than looking forward to what will happen in the future. What will happen in the future, in the absence of detailed information from the past, is mainly dependent on the preoperative evaluation. Common sense tells us that the presence of pathology, such as a very large mass, hematoma, or abscess within the sightline or along the line of insertion of the laryngoscope blade or endotracheal tube, major edema, any significant amount of any oropharyngeal/laryngopharyngeal fluid (ie, blood, gastric fluid, pus), major airway distortion secondary to mandibular and/or maxillary fracture, or a very compromised cervical spinal cord foreshadow difficulty with video laryngoscopy. Specific retrospective analysis of intubations using video laryngoscopy found the most likely predictors of failed Glidescope (Verathon, Bothell, WA) intubation were the presence of a surgical scar in the oropharynx, history of neck irradiation, or presence of a neck mass.[4]

Absent pathology, specific anatomical configurations point to a predictably difficult video laryngoscopy and intubation. A prospective study identified, in descending order of statistical correlation, multiple Glidescope intubation attempts and lengthier intubation times with the following stand-alone individual airway characteristics; limited prognathic ability, high Cormack and Lehane grade during conventional laryngoscopy, short sternothyroid distance, high oropharyngeal class, small mouth opening, and reduced manubriomental distance in extension.[5] Obviously, there are innumerable combinations of anatomical configurations, such as high oropharyngeal classification plus low mandibular space length,[6] and a thyromental distance <6 cm, limitation in the range of motion of the cervical spine, high oropharyngeal classification, limited mouth opening, plus limited prognathic ability (El-Ganzouri risk index)[7] that diminish likelihood of success with video laryngoscopy. Furthermore, reduced interincisor distance plus reduced cervical range of motion, as simulated by the application of cervical collars, are associated with video laryngoscopy failure rates ranging from 2% to 63%.[8]

Second, where we find 2 standardized direct laryngoscope blade designs (Macintosh and Miller) with a standardized sizing system, there is no such standardization among video laryngoscopies. Currently, approximately 14 different designs permeate clinical practice. Video laryngoscopy classification systems are broadly based on blade geometry (Macintosh-like versus hyperangulated) and presence or absence of an incorporated conduit (channeled versus non-channeled), and the various class permutations may not be appreciated by the clinician. Macintosh-like blades function well for teaching and allow for versatility in use (direct versus indirect laryngoscopic views). Hyperangulated video laryngoscopy blades may shine in difficult laryngoscopies where a Macintosh-like video laryngoscopy blade has

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failed, though hyperangulated blades may present an easily obtained grade 1 view (easy video laryngoscopy) yet require multiple attempts to actually pass the endotracheal tube into the trachea (difficult video laryngoscopy intubation). Channeled video laryngoscopies necessitate a grade 1 view with the glottis centralized on the video screen. Clinical performance of channeled devices is equally dependent on matching the internal diameter of the channel and the outer diameter of the endotracheal tube.[9] Within any taxonomic class, significant variations of blade design (shape, dimensionality, curvature, and camera positioning) further impact performance (ie, a large overbite or small interincisor distance impair insertion of large, bulky blades). Estimation of design efficacy rates varies based on the study referenced. In 1 randomized controlled trial of simulated difficult airways, first attempt success rates among devices varied broadly, from 98% with the McGrath (Medtronic, Minneapolis, MN), 95% (C-MAC D-Blade; Karl Storz, Tuttlingen, Germany), 87% (KingVision; Ambu, Columbia, MD), 85% (Glidescope and Airtraq [Teleflex, Wayne, PA]) to 37% (A.P. Advance; Venner Medical Ltd, Singapore).[8] Other studies document differing success rates of 88%–93% for the C-MAC, up to 100% for the Glidescope and Airtraq, and 69% for the McGrath Macintosh blade.[8]

Bradley et al[1] imply a perception of standardization in design and application that does not exist. An overly simplified classification system is unlikely to be useful, and could be dangerous, given that video laryngoscopy blades are not the same and function differently. This lack of standardization, or lack of appreciation of such, may generate assumptions that any video laryngoscopy will do for a previous "failed intubation via conventional laryngoscopy, subsequent easy video laryngoscopy," leading to unexpected difficulty with a different device. Failure of 1 airway management maneuver (eg, picking up and using the wrong video laryngoscopy blade) can contribute to the failure of the next airway management maneuver.[10]

Third, Bradley et al[1] comment on the increase in institutional video laryngoscopy availability, evidenced by a 2017 UK national survey[11] which revealed overall rising access. However, Cook and Kelly's[11] survey indicated no access to video laryngoscopy in 1 of 10 reporting hospitals, while 71% reported a handful on stock (2–5 video laryngoscopy devices), and a mere 13% reported a video laryngoscopy in every anesthetic and clinical location. Approximately 50% of intensive care units and obstetric suites and only 14% of private hospitals reported availability of video laryngoscopy devices. Overall, less than one-third reported widespread use or enthusiasm with video laryngoscopy.[11] It is likely that US institutions mirror these numbers, yet no survey has been performed to date.

Fourth, the review by Lewis et al[2] found no benefit, in terms of failed intubation rates, of video laryngoscopy over conventional laryngoscopy in the hands of inexperienced users. Additionally, expertise in conventional laryngoscopy is not fully translatable to video laryngoscopy, with numerous unappreciated procedural specifics. Variations of optimal patient positioning, methods of blade insertion, necessity of customized stylets, as well as various and unique methods of failure or traumatizing the oropharynx exist.[12] Bradley et al[1] suggest incorporation of concentrated training into residency curricula and continuing education. As overall use rises, it seems reasonable to expect video laryngoscopy training within academic institutions to grow in parallel. For a time, a similar growth of expertise within private institutions may lag, possibly secondary to separate interests and economics. Thus, the false semblance of video laryngoscopy ubiquity is equally matched by a lack of explicit training among trainees and current practitioners.

Taking all factors together, in the general population, a 2% video laryngoscopy failure rate (usually defined by intubation time >60 or 120 seconds or inability to intubate the trachea in 2 or 3 attempts) has been reported.[2] With roughly 15.6 million major surgeries conducted in the United States annually,[13] a 2% failure rate translates to approximately 300,000 failed intubations assuming video laryngoscopy use for every case. With respect to the matters we have discussed, part of the challenge to the intubating community will be to retain and pilot the video laryngoscopies success while also avoiding the lull of cozy oversimplifications and half-baked contingency plans (eg, "I will have the video laryngoscopy in the operating room" in cases of extreme difficulty that require awake intubations).

This leads us to our final point. It goes without saying that as availability of video laryngoscopy rises, we may indeed see fewer failed intubations. Video laryngoscopy use has steadily risen, yet no single device can address all issues. Notably, since introduction of the video laryngoscopy, the rate of utilization of awake intubation techniques has remained constant, indicating that the number of severe abnormalities necessitating such procedures remain unchanged.[14] Furthermore, cases from the fourth National Audit Project suggest we need to further decrease our threshold for considering awake fiberoptic intubation as a first choice, as failure to utilize awake fiberoptic intubation when clinically indicated provided the largest cohort of cases of failed airway management.[15]

In anesthesia, fads fortunately fade, hopefully after a relatively harmless run. Other times fads actually turn out to be laryngeal masks, devices which truly redefined difficult airway management. The video laryngoscope is a useful addition to the anesthesiologist's armamentarium and is well past its infancy stage. Now we must mindfully navigate this audacious teenager safely into adulthood and see where and how it fits. Until the 4 concerns mentioned herein, namely (1) under emphasis of the preoperative evaluation and the presence of obvious severe pathological and anatomical entities; (2) the wide variation in exactly what a video laryngoscopy is; (3) the wide variation in exactly where video laryngoscopies are; and (4) the wide variation in practitioner experience with video laryngoscopy are understood better, the role of video laryngoscopy with regard to a precise definition of a "difficult intubation," remains, to some extent, elusive.

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