DEM Journal Club

Article Appraisal

Article: The Impact of a Soiled Airway on Intubation Success in the Emergency Department when using the Glidescope or the Direct Laryngoscope, Sakles et al, Acad Emerg Med 2017

Date of Journal Club: March 20, 2018

Resident Reviewer Name(s) and Residency Affiliation: Trevor Skutezky (PGY-3, Vancouver Site) and Daniel Ting (PGY-4, Kelowna Site), FRCP Program

Faculty Methodology/Bio-statistics Resource Person: Riyad Abu-Laban (with thanks to David Barbic)

Background and Study Objective(s):

Intubation is a common Emergency Department (ED) procedure. Achieving visualization of the airway anatomy can be problematic in patients who have airway contamination (commonly referred to as “soiling”). Contaminants may include inhaled debris, vomit, blood or other material.

Direct Laryngoscopy (DL) is frequently touted as superior to Video Laryngoscopy (VL) in the soiled airway given the potential that airway debris can obstruct the camera and impede successful intubation, particularly with devices like the Glidescope that cannot be used for direct laryngoscopy. Previous studies have found a significant increase in adverse events after even a single intubation attempt.

The objective of this study was to compare first-pass success between clean and soiled airways stratified by the intubating device used (VL versus DL).

Study Design:

This was a single-centre, prospective observational study undertaken over a 9-year period using a registry database in an academic, tertiary care setting. The study looked at adult patients (18 or older) who underwent rapid-sequence intubation (RSI) in the ED by EM Residents using either VL or DL. VL exclusively involved the Glidescope since that was the only VL device available for the entire study period.

Selection of the device was at the discretion of the EM Resident doing the intubation; there was no randomization to groups as this was an observational study. Following the intubation, the EM Resident completed a data abstraction form that provided details of the intubation process as well as patient factors. One of the key data points was whether the airway was clean (no blood or vomitus in airway) or soiled (blood or vomitus in airway). Residents were instructed to use Yankauer suction to clear any airway soilage prior to intubation attempts.

The primary outcome was proportion of first-pass success; secondary outcomes were the ultimate success with initial device used, and when using the Glidescope, the degree of lens contamination.

A multivariate analysis was performed to control for known potential confounders; these included age, sex, trauma status, indication for intubation, reason for device selection, paralytic and induction agents used, and operator experience. Statistical significance was defined as a two-sided alpha of <0.05. The study was powered for the number of covariates fit in multivariate analysis based on an expected first-pass success rate of 80%.

Results:

Over the study period, 3307 intubations were undertaken by EM Residents; of these, 1985 met inclusion criteria. Of these cases, 1395 and 590 were deemed clean and soiled, respectively.

When using VL, the first-pass success was lower in the soiled group (249/306; 81.4%) than in the clean group (586/644, 91.0%; difference = 9.6%; 95% confidence interval [CI] = 4.7%–14.5%). Similarly, when using DL, the first-pass success was lower in the soiled group (186/284, 65.5%) than in the clean group (569/751, 75.8%; difference = 10.3%; 95% CI = 4.0%–16.6%).

The soiled airway was associated with a decreased first-pass success in both the VL cohort (adjusted odds ratio [aOR] = 0.4; 95% CI = 0.3–0.7) and the DL cohort (aOR = 0.6; 95% CI = 0.5–0.8).

Rates of first-pass success were higher in the VL group despite the airways in that group having more difficult airway characteristics. In the VL group, 52% of the airways had >1 difficult airway characteristic, whereas in the DL group, this rate was 29%. Difficult airways were recorded as the reason for VL selection in 49% of cases, compared to 2% in the DL group. Patients with upper gastrointestinal bleeds were intubated successfully by VL in 13/14 cases and by DL in 12/24 cases.

Validity of Results:

The general sentiment of Journal Club attendees was that the authors went to significant efforts to reach valid conclusions, within the confines of the weaknesses of their study design. The data abstraction forms objectively defined a number of variables, such as first pass success and degree of camera soilage in VL. The multivariate analysis addressed the effect of known potential confounders. The overall first-pass success rate in this study was 80% (1590/1985), thus the study was adequately powered for the primary outcome. It was noted that the overall rate of first-pass success was slightly lower than the 85-90% reported in other studies, possibly because the operators were EM Residents with less airway experience. In particular, their experience might be less with DL as the rates for first pass success even in clean airways was only 75%, and the lower rates of first-pass success with DL drove the overall success rates lower.

Three noteworthy weaknesses of the study were addressed by the authors in the limitations section:
First, device selection was not randomized, and it is logical to assume selection bias played a role in anticipated soiled airways causing DL to be preferentially selected for the most severely soiled airways. This bias could have systematically decreased the success rate in the soiled airways for the DL group. The authors attempted to addressed this by looking at the p-value of the interaction between the presence of a soiled airway and device selection and found no statistically significant association (p = 0.272), however this finding does not exclude the potential of this issue. Furthermore, the number of intubations done in soiled airways was actually higher using VL than DL, whereas among clean airways, DL was more common than VL. If people were commonly selecting DL for the soiled airways (and assuming they were able to predict this prior to laryngoscopy), one would expect there to be more use of DL than VL in soiled airways.

Second, the degree of airway soilage and whether or not soilage was active were not measured. One would expect the degree of soilage of the airway to correlate with lens contamination. In this study, only 15 instances (1.8%) of moderate or severe lens contamination were noted in the VL group, which could mean that the chance of lens contamination is actually quite low, or it could mean that only very few airways intubated with VL had severe soilage. There was a general consensus amongst Journal Club attendees of the latter, specifically that many subjects had a single episode of vomiting or a small amount of blood present from trauma. It remains possible that DL confers an advantage to intubation in the severely soiled airway, and the results of this study do not exclude that possibility (which admittedly would only be a small subset of patients).

Finally, it was noted that the VL group included a greater proportion of trauma versus medical patients. The suggestion was put forward that it is conceivable that a significant number of this group were likely patients in C-Collars with a small amount of oropharyngeal blood (thus technically "soiled", but not significantly so from a practical perspective impacting the use of VL).

Finally, the potential for a conflict of interest of the authorship team was noted, as the lead author serves as a consultant for Verathon, the manufacturer of the Glidescope. It was surprising to Journal Club attendees that this was not more explicitly noted in a COI section of the paper, and noteworthy that as a result only 1 sharp-eyed person in the Journal Club attendee group identified this potentially significant issue in the affiliations information at the bottom of Page 1.

Generalizability of Results:

The sentiment among Journal Club attendees was that there are aspects of this study findings that are generalizable to our setting. Glidescope and DL are devices that are commonly used in British Columbia. EM Residents may have less experience than other operators, and in current training programs are significantly experienced with VL. As such, the results may not be generalizable to operators with either more airway experience, specifically with more experience and training using DL. The question of potential airway soilage in VL may not be relevant to operators who use VL with a standard geometry blade (in particular the C-MAC, which is widely used in our settings), since these devices can be used for either VL or DL. Finally, it was noted that the technique for VL use in the study involved pre-suctioning a suspected soiled airway as well as keeping the VL anterior along the base of the tongue upon insertion to prevent lens contamination. This method was not felt to be consistently practised locally, and as such the lens soilage rates in our context could be higher than reported.

The Bottom Line:

The results of this study suggest the risk of lens contamination using VL in soiled airways is likely lower than widely assumed, and may be offset by the increased first-pass success rate for VL on difficult airways. In a situation where VL with a standard geometry blade is not available, or when a hyperangulated blade is needed, the results of this study suggest the Glidescope can be considered a first line airway device for the majority of situations that are predicted or known to have airway soilage.