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Airway Management

(Abstracts and Case Report/ Series)

Contents

A Study Comparing Lightwand and Glidescope in Difficult Tracheal Intubation Involving Cadavers with a Cervical Spine Collar

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Introduction: Restricted mouth opening can result in difficulty with tracheal intubation by direct laryngoscopy and the inability to secure an airway with tracheal intubation when needed is associated with significant morbidity and mortality. The American society of anesthesiologists (ASA) practice guidelines recommend video laryngoscopes and the Lightwand (LW) as alternative intubation devices as neither of them requires direct visualization of the glottis.

Objectives: The goal of this pilot study was to compare the performance of Glidescope® (GS) and the new prototype LW device in a simulated restricted mouth opening with cervical spine collars in cadavers.

Methods: Research Ethics Board approval was obtained from the local REB (Nova Scotia Health Authority, Halifax, Nova Scotia, Canada) and four clinical grade cadavers were obtained for this study. Six staff anesthesiologists were recruited and watched an instructional video on the prototype LW device prior to being randomized to one of four cadavers with cervical collars in place. They were asked to perform tracheal intubation with each intubation device while being recorded on video. All videos were reviewed offline by an independent investigator to determine the time-to-intubation (TTI), the number of attempts, the time to airway management (TAM) or successful device insertion into the trachea and the success rate of tracheal intubation. After each intubation, the participant used a visual analog scale (VAS) to report the subjective degree of difficult intubation using the intubation device.

Results: Overall, there were no significant differences between the LW and the GS across all outcomes. Linear Mixed Models were used to analyze the data. There was no effect of device on TTI (95% CI [-13.4, 16.7], p=0.841) and TAM (95% CI [-13.8, 15], p=0.933). In terms of self reported VAS scores, there was no different between devices (95% CI [-10.8, 13], p=0.859).

Conclusion: The results of our study suggest GS and LW are similarly effective in intubating cadavers with a cervical spine collar. LW relies on transillumination of the anterior neck soft tissue and is a significantly smaller device designed to be malleable, allowing for adjustments such as the degree of tip deflection. While these features might make the LW a better device to use in patients with a small mouth opening as compared to a video laryngoscope, a large clinical study is necessary to determine its utility in patients with limited mouth opening.

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Awake Videolaryngoscopy in the Management of Acute Angioedema

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Introduction: Awake videolaryngoscopy has emerged as a viable alternative to awake fibreoptic intubation in the management of the anticipated difficult airway. In the elective setting, awake videolaryngoscopy is associated with shorter time to intubation compared to awake fibreoptic intubation, without any significant difference in failure rate, patient satisfaction or incidence of adverse events (1). However, little evidence exists to guide the use of awake videolaryngoscopy in the emergency setting.

We describe a case of successful tracheal intubation using awake videolaryngoscopy in a patient presenting with acute angioedema.

Case Presentation: Patient consent was obtained for publication of this case.

A 75-year-old woman presented to a regional emergency department with tongue swelling, drooling, periorbital oedema and stridor shortly after consuming prawns. She had a background history of hypertension, treated with an ACE inhibitor. She was treated with nebulised adrenaline, hydrocortisone and promethazine before being transferred to a tertiary hospital for emergent airway management. Fibreoptic nasoendoscopy revealed significant supraglottic swelling.

A nasal awake fibreoptic intubation was planned initially. Glycopyrrolate premedication was given. The nares were topicalised with Co-Phenylcaine Forte (5% lignocaine with 0.5% phenylephrine) and a 6.0 nasopharyngeal airway inserted. The nasopharynx and oropharynx were topicalised with 4% lignocaine using a mucosal atomiser device and DeVilbiss atomiser. Optiflow Transnasal Humidified Rapid-Insufflation Ventilatory Exchange (THRIVE) was applied and titrated to patient comfort.

The airway plan was changed when mouth opening sufficient to allow insertion of a laryngoscope blade was noted. A McGrath videolaryngoscope with Mac 4 blade was inserted while in the semi-recumbent position. A grade 2b view of the glottis was visualised on videolaryngoscopy. A grade 4 direct laryngoscopic view was noted at the time. The cords were sprayed with 4% lignocaine and a gum elastic bougie inserted to facilitate passage of a size 7.0 endotracheal tube. After confirmation of tracheal tube placement, general anaesthesia was induced.

The procedure was well tolerated by the patient, and no sedation was required.

The patient was extubated 8 days later. Testing confirmed ACE inhibitor induced angioedema.

Discussion: We present the first case report of awake videolaryngoscopy in the management acute angioedema. Awake videolaryngoscopy has several potential

advantages over fibreoptic intubation including a wider view of the airway, no limitation of endotracheal tube diameter, and the ability to use adjuncts such as the gum elastic bougie. Videolaryngoscopy is an easier skill to learn and maintain (2).

Our case highlights the value of videolaryngoscopy as an alternative to fibreoptic intubation in carefully selected patients in the emergency setting.

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Canadian Emergency Physician Attitudes Toward Endotracheal Intubation for Aspiration Prophylaxis

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Introduction: Emergency patients with decreased level of consciousness often undergo intubation purely for airway protection from aspiration. However, the true risk of aspiration is unclear and intubation poses risks. Anecdotally, experienced emergency physicians often defer intubation in these patients while others intubate to decrease the perceived clinical and medicolegal consequences. No literature exists on the intubation practices of emergency physicians in these cases.

Methods: Ethics approval was obtained from the local REB. An online questionnaire was circulated to members of the Canadian Association of Emergency Physicians. Participants were asked questions regarding two common clinical cases with decreased level of consciousness: (1) acute, uncomplicated alcohol intoxication and (2) acute, uncomplicated seizure. For each case, providers' perceptions of aspiration risk, the standard of care, and the need for intubation were assessed.

Results: 128 of the 1546 Canadian physicians contacted (8.3%) provided responses. Respondents had a median of 15 years of experience, 88% had CCFP-EM or FRCPC certification, and most worked in urban centers. When intubating, 98% agreed they were competent and 90% agreed they were well supported. A minority (17.4%) considered GCS<8 an independent indication for intubation. For the alcohol intoxication case, 88% agreed that aspiration risk was present but only 11% agreed they commonly intubate. Only 17% agreed intubation was standard care, and only 0.8% felt their colleagues always intubate such patients. For the seizure case, 65% agreed aspiration risk existed but only 3% agreed they commonly intubate, 1% felt colleagues always intubated, and 5% agreed intubation was standard of care. Additional factors felt to compel intubation (394 total) and support non-intubation (366 total) were compiled and categorized; the most common themes emerging were objective evidence of emesis or aspiration, other standard indications for intubation, head trauma, co-ingestions, co-morbidities and clinical instability.

Conclusion: It is acceptable and standard practice to avoid intubating a select subset of intoxicated and post-seizure emergency department patients despite aspiration risk. Most physicians do not view the dogma of "GCS 8, intubate" as an absolute indication for intubation in these patients. Future research is aimed at identifying key factors and evidence supporting intubation for the prevention of aspiration, as well as the development of a validated clinical decision rule for common emergency presentations.

Comparing a Prototype Lightwand vs Glidescope for Tracheal Intubation in Soiled Cadaver Airways

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Introduction: Soiled airways have been negatively associated with endotracheal intubation success rates by direct or videolaryngoscopy.[1] Transtracheal illumination techniques are a proposed alternative as they do not require visualization of the glottis. This pilot study compared the performance of a prototype lightwand device (LW) with the Glidescope® (GS) in a cadaver airway model with simulated oropharyngeal bleeding.

Methods: Ethics approval was obtained from the local REB. This randomized control trial used clinical grade cadavers, approved for medical teaching and research purposes at QEII/Dalhousie University Skills Centre. To simulate an active oropharyngeal bleed, expired packed red blood cells were continuously instilled through each cadaver's nostril. Six Anesthesia staff were recruited and block randomized to intubate the trachea of the cadavers. An orientation video to the LW was provided prior to the study. The primary outcome measure was Time-to-Intubation (TTI), and the secondary outcome measures included Time-to-Airway-Management (TAM), number of attempts, and subjective degree of difficult intubation (DDI) by visual analog scale (VAS). Using power analysis, a sample size of 17 intubations was estimated to be adequate for each device (34 intubations total). 48 intubations were recorded and reviewed. Linear Mixed Models were used to analyze the data.

Results: Overall, the LW offered comparable performance regarding average TTI (95% CI [-17.2, 4.74], p=0.273) and TAM (95% CI [-19, 4.51], p=0.234). The DDI was the only outcome that was significantly different. On average, participants rated the LW device (mean = 26.5 mm) higher than the GS (mean = 16 mm) on their VAS (95% CI [-19.4, -1.54], p=0.027). Of note, a loose right maxillary central incisor was observed after one GS intubation attempt.

Conclusion: This pilot study examined both video laryngoscopy and the LW technique in a simulated bleeding airway model. The results of this study showed that the prototype LW and GS have a comparable likelihood of successful airway management in patients with oropharyngeal bleeding. While the results suggested a higher DDI for LW, it should be noted that all staff participating in the study were experienced in the use of the GS, but not the LW device. It is unclear if the prototype LW is less likely to cause dental trauma - further investigation is warranted.

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Language Modification to Reduce Anxiety for Awake Intubation in High School Students

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Introduction: Discussion of a potential awake intubation during the pre-admit consultation can provoke anxiety. After recognising that occasionally the word “awake” specifically provoked anxiety, we decided to investigate other descriptions that could be less intimidating and/or anxiety-provoking, but still accurate. We hypothesised that focusing on the sedation and the local anesthesia could reduce anxiety, much as it does in dental practice.

Methods: Local ethics approval was obtained for the study which, as an anonymous survey, did not involve patient records. Surveys were distributed to students to determine their comfort level with a proposed awake intubation. The survey and individual component questions were voluntary and uncompensated. Potential participants were provided a link to participate on their mobile device. The survey also included demographic questions and distractor questions.

The respondents were randomised to receive different surveys; both scenarios described identical surgical procedures and post-op care, but they described the awake intubation with different descriptors. In the sedated/freezing description group (group SFD), the description focussed on the sedation. In the control group (group AIF), the intubation used the word “awake” and described the procedure and local anesthesia.

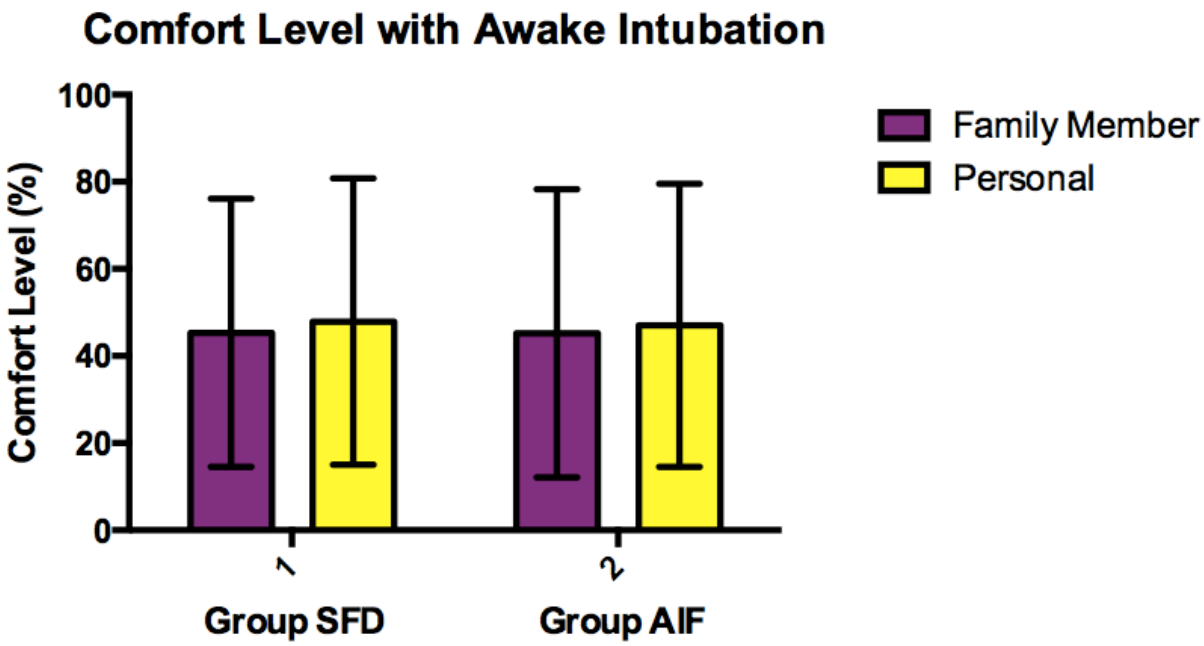
Respondents were queried with respect to their comfort/anxiety the procedure for a family member and for themselves personally. Respondents scored their comfort level on a linear virtual slider (0% = great anxiety, 100% = complete comfort). Multiple responses were not permitted.

Results: The survey was distributed to 1011 people, and was returned by 387, for a response rate of 38%. The average age was 16+/-1 years old. Of those who provided their gender, 55% identified as female, 45% male, 0.5% other. Demographics were similar between the two groups.

In group SFD, respondents rated their comfort level at 45.3% +/- 30.8% (mean +/- SD) for a family member and 47.9% +/- 32.9% for themselves personally. In group AIF, respondents scored their comfort level at 45.2% +/- 33.1% for a family member and 47.0% +/- 32.5% for themselves personally. See figure. There was no significant difference between the groups based on the descriptions of the intubation ($p = 0.95$, $p = 0.79$) nor whether it was a family member or themselves undergoing the procedure ($p = 0.48$)

Interpretation: Using less intimidating language did not reduce the anxiety provoked when considering awake intubation in this population. It is possible that other aspects of the surgical description had a greater contribution to perceived anxiety than the awake intubation description.

The response rate was impressive for a survey study. Application of the study to the general Canadian population could be limited by the young age of the respondents, who might be more or less comfortable with awake intubation than the general population.



McKay Airway: Exploratory Study of a Novel Oral Airway for Bag-Mask Ventilation

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Introduction: We studied a new oral airway device, the McKay Airway (MA). It is designed for easy maintenance of jaw-thrust for first responders who perform bag-mask ventilation (BMV) infrequently, and may not perform it well.1,2 Objective was to compare learners' time to achieve exhaled tidal volume (VE) >300ml using MA versus using a Guedel oropharyngeal airway (OPA) for BMV on anesthetized patients.3

Methods: Ethics approval was obtained from the local REB. We used a repeated-measures unblinded clinical trial with blinded randomization of airway use order. Anesthesiologists' decision to intervene and comments were recorded. Consenting BMV participants were naïve learners scheduled in the operating rooms to be taught airway management. Patients were consenting adults booked for elective surgery under general anesthesia. Excepted were those with loose incisors, temporomandibular joint disorders, reflux, or whom the attending anesthesiologist felt participation put them at added risk. For patients with missing teeth, we padded the MA surface with 1cm thick stick-on sponge.

Following normal preoxygenation, induction of anesthesia, and BMV by the attending anesthesiologist as needed to assure high oxygen saturation, an opaque envelope was opened to randomly choose which airway to use first. We mimicked a self-inflating BMV device with the anesthetic machine by setting the Adjustable Pressure Limiting valve to >30cm water pressure and using the oxygen flush to keep the reservoir bag filled between breath attempts. With airways in place, learners applied the mask with their left hand, squeezing the bag with their right approximately every 3s. We timed from first squeeze until VE exceeded 300ml, then changed to the other airway.

Results: We recruited 34 female and 20 male patients, and obtained data for 51. One obese patient had severe succinylcholine fasciculations with rapid profound desaturation and the anesthesiologist took over immediately and intubated; for two the anesthesiologist misunderstood the experiment. Continuous data were analysed with Wilcoxon's Signed Rank test, incidences with Chi Square. MA allowed ventilation ~2 breaths sooner than OPA (Hodges-Lehmann median difference: 6s [95% CI 5 to 6.3s]; range: OPA 5 to 78s; MA 2 to 49s; $p = 0.02$). Comments: 16 preferred the MA, 2 the OPA ($p = 0.02$ compared to equal preferences), and 15 had no preference.

Overall the second attempt was faster, as learners became more familiar with BMV technique, suggesting that there is a learning effect. The second trial was faster than the first 31[25 to 37] times compared to only 20[16 to 24] times when the first trial was faster ($p = 0.047$). Despite this, when used first, the MA was faster than the OPA 30%

of times compared to 11% when OPA was used first (p = 0.04), suggesting that MA is easier to learn.

Conclusion: Further studies are warranted.

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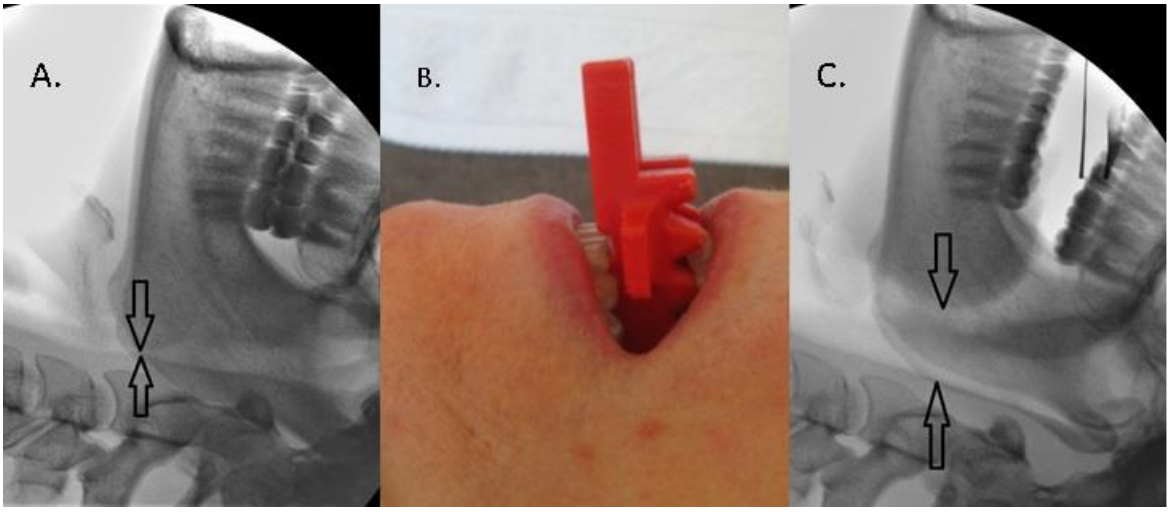

Somatosensory Evoked Potentials Monitoring During Intubation in a Patient with Unstable Cervical Spine

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Introduction: Airway management is the most critical aspect of anesthesia for patients with unstable cervical spine. The best monitor of spinal cord integrity during intubation is an awake patient who can report neurological symptoms to the anesthesiologist, thus preventing irreversible damage to the spinal cord.[1] In case of patient refusing awake intubation, somatosensory evoked potentials (SSEP) monitoring provides a valuable alternative technique to reliably detect spinal cord injury during airway manipulation. The use of SSEP monitoring for intubation has never been previously described.

Case Presentation: The patient gave consent for publication of this case. A 63-year-old female with breast cancer presented for mastectomy and breast reconstruction. Past medical history was significant for rheumatoid arthritis involving the joints of the hands, feet, and cervical spine. She had no neurological symptoms. Medications included methotrexate and tramadol. Physical examination revealed an obese female with weight 73 kg, height 143 cm, and BMI 35 kg/m2. She had a Mallampati class III airway and severely restricted neck extension. Pre-operative cervical spine radiographs showed a widened gap between the odontoid and anterior ring of C1. Cervical spine MRI (A) confirmed marked atlantoaxial subluxation shown as separation between the anterior arch of C1 (red arrow) and the dens (purple arrow). The plan was to perform an awake fiberoptic intubation. Despite extensive discussion, the patient adamantly refused.

Neurosurgical consultation was obtained and electrophysiologic monitoring was recommended as an alternative to assess spinal cord integrity. In the operating room, the neck was placed in neutral position with a rigid cervical collar to provide support and immobilization in all planes of neck motion. Stimulating electrodes were placed over the median, ulnar and tibial nerves. SSEPs were recorded from scalp electrodes over the somatosensory cortex. Baseline recordings of latency, rate and amplitude of the evoked components were noted. Anesthesia was induced with fentanyl and propofol. Once bag-mask ventilation was assured, rocuronium was administerd and the trachea intubated with a flexible bronchoscope. The neck was maintained in neutral position throughout ventilation and intubation (B). SSEP monitoring did not detect any signs of neurological injuries. Maintenance of anesthesia was achieved with 0.5 MAC inhalational anesthesia, propofol infusion 50-125 mcg/kg/min, and standard doses of opioids and muscle relaxants. Boluses of medications were avoided to maintain a steady state for optimal SSEP readings. Surgery and recovery were uneventful.

Discussion: SSEP monitoring has long been used during neurosurgical procedures to detect and prevent spinal cord injury.[2] Reliable, safe, and readily available, it allows assessment of sensory pathways and global functioning of the spinal cord. For patients with unstable cervical spine such as our patient with rheumatoid arthritis refusing

awake intubation, SSEP monitoring should be considered as a valuable modality for monitoring during airway manipulation under general anesthesia.

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