

Complications associated with the use of the GlideScope® videolaryngoscope

[Complications suite à l'utilisation du vidéolaryngoscope GlideScope®]

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Purpose: Two cases are presented wherein the GlideScope® videolaryngoscope (GVL) facilitated laryngeal exposure and successful endotracheal intubation, but resulted in pharyngeal injury.

Clinical features: GlideScope® videolaryngoscopy was performed in two female patients, whose airways were anticipated to present difficulties for direct laryngoscopy. In the first case, following induction of anesthesia, moderate difficulty was encountered in directing the endotracheal tube (ETT) into the patient's larynx. In the second case, minimal difficulty with the GVL was experienced, and no problems were identified with airway instrumentation until the drapes covering the patient's face were removed. In both instances, the ETT had passed through the right palatopharyngeal arch, requiring suturing in the first patient, and electrocautery in the second patient.

Conclusion: There have been no previously published reports of injuries related to GlideScope® laryngoscopy, but perforation of the palatopharyngeal arch occurring in two patients demonstrates a rare but potentially important complication of the GVL. Strategies to minimize this complication are considered.

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Objectif : Sont présentés deux cas dans lesquels l'utilisation du vidéolaryngoscope GlideScope® (GVL) a facilité l'exposition laryngée et l'intubation endotrachéale, mais a eu pour conséquence un traumatisme pharyngé.

Éléments cliniques : La vidéolaryngoscopie avec le GlideScope® a été effectuée sur deux patientes chez qui on anticipait une laryngoscopie directe difficile. Dans le premier cas, suite à l'induction de l'anesthésie, une difficulté modérée a été rencontrée à orienter la sonde endotrachéale (SET) vers le larynx de la patiente. Dans le second cas, peu de difficultés ont été rencontrées avec le GVL,

et aucun problème n'a été identifié lors de l'instrumentation des voies aériennes jusqu'à ce que les champs qui couvraient le visage de la patiente soient enlevés. Dans les deux cas, la SET avait traversé l'arche palato-pharyngée droite, nécessitant des points de suture chez la première patiente et une électrocautérisation chez la seconde.

Conclusion : Il n'existe pas d'articles déjà publiés rapportant des blessures suite à une laryngoscopie avec le GlideScope® ; toutefois, une perforation de l'arche palato-pharyngale, survenue chez deux patientes, illustre une complication rare du GVL, mais potentiellement importante. Nous présentons certaines stratégies pour diminuer la gravité de cette complication.

FOLLOWING introduction of any new technique or procedure into clinical practice, it is important to re-examine the early experience to assess its benefits and complications. Since its commercial introduction in 2002, there have been numerous testimonials detailing the contribution of the GlideScope® videolaryngoscope (GVL; Verathon, Bothell, WA, USA) to airway management. All of these reports have indicated that the device has provided comparable or superior laryngeal visualization in both routine¹⁻⁵ and difficult airways.^{1,2,5-9} This report describes two recent complications associated with this device and represents the first published report of complications involving the GVL. Permission to publish these cases was obtained from the University Health Network Research Ethics Board.

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Case 1

A 57-yr-old female with hemifacial microsomia presented for facial scar revision. Her small mouth and limited cervical extension led the anesthesiologist to believe that direct laryngoscopy would be difficult, however mask ventilation was not expected to present a problem, and the patient was not at increased risk of aspiration. Following *iv* induction of anesthesia, bag mask ventilation was easily achieved and GlideScope® laryngoscopy provided good laryngeal exposure. The anesthesiologist had difficulty directing the styletted endotracheal tube (ETT) to the larynx. After two unsuccessful attempts, the otolaryngologist performed the intubation using the GVL. The anesthesiologist then performed laryngoscopy using a Macintosh #3 blade obtaining a Cormack-Lehane grade 4 view.¹⁰ In addition, he observed that the ETT had dissected the right palatopharyngeal arch. There were no associated injuries and the bleeding was minimal. The dissection was surgically repaired with two sutures, the facial scar revision proceeded uneventfully, and the patient was discharged home the following day without further incident.

Case 2

A 72-yr-old female patient presented for aortic valve replacement and coronary artery bypass grafting. She had severe aortic stenosis, triple-vessel coronary artery disease complicated by a myocardial infarction four weeks earlier, diabetes mellitus type II, hypertension, and mild renal insufficiency. She was edentulous. Her oropharyngeal view was a modified Mallampati 3¹¹ that improved to a grade 2 view with phonation. No other predictors of difficult laryngoscopy were identified. The anesthesiologist had not previously used the GVL but was supervised by the author who has had considerable prior experience. An ETT was prepared with a malleable stylet as recommended in a previous publication.¹ The laryngoscope blade insertion was not difficult and a Cormack-Lehane grade 1 view was obtained. Two attempts were required to bring the ETT into view on the monitor. Intubation was accomplished without apparent injury or difficulty. After 142 min, the patient was weaned from cardiopulmonary bypass while receiving multiple inotropic medications and an intra-aortic balloon pump. Packed red blood cells and platelets were required to correct her blood loss and a coagulopathic state. Upon removing the surgical drapes covering her face, blood was observed in her mouth. Direct laryngoscopy was performed and the ETT was noted to have perforated her right palatopharyngeal arch. The bleeding persisted and an otolaryngologist was consulted. Electrocautery easily

controlled the bleeding. Postoperatively, mechanical ventilation of the patient's lungs was continued while she remained in the cardiac intensive care unit. Her subsequent clinical course was complex, and she died from causes unrelated to her airway injury.

Discussion

Since October 2001, the GVL has been widely and effectively used at our institution for managing both routine and complex airways. The author has personal experience using the device in over 1,600 patients without complication, and there are no previously published reports of GVL-related complications. Nonetheless, within a four-week period, two identical complications were encountered, namely the insertion of a styletted ETT through the right palatopharyngeal arch. Both of these injuries required minor surgical intervention, but neither resulted in serious patient harm.

Dental injury relating to laryngoscopy is the most common complaint against anesthesiologists.^{12,13} Injuries to the lips, buccal mucosa, tongue, epiglottis and hypopharynx are relatively common and may occur either with insertion of the laryngoscope or during its manipulation in an effort to improve laryngeal exposure.¹⁴ The maxillary incisors are particularly prone to damage during direct laryngoscopy. Potentially, such injuries might be reduced by a technique not dependent upon achieving a line-of-sight.

Closed claims analysis have generally focused upon life-threatening complications associated with airway management including injuries to the larynx, pharynx, esophagus and brain.¹⁵⁻¹⁷ More subtle laryngeal injury is probably common and may go clinically undetected, requiring sophisticated tools to identify.¹⁸ It is tempting to speculate that such injury is more likely to occur when laryngoscopy fails to reveal the laryngeal aperture, either because more force is likely to be applied to the laryngoscope, and thus the tissues and/or the ETT is introduced blindly. To that end, if GlideScope® laryngoscopy results in more predictable laryngeal visualization, such injuries may be less frequent. Similarly, if use of the GVL requires less force than conventional direct laryngoscopy to achieve a laryngeal visualization, it may result in less traction applied to the soft tissues, thereby lessening oropharyngeal injury.¹⁹

Oropharyngeal injuries can also result from the blind insertion of a Yankauer sucker,²⁰ orogastric tube, rigid temperature or TEE probes.²¹ It is important to consider the mechanism of injury associated with the GVL in these two patients. When performing videolaryngoscopy, the operator's visual attention

may be diverted from the mouth to the monitor while introducing the laryngoscope and ETT. This could potentially result in injury to the lips, teeth, tongue, pharynx or damage to the ETT cuff. Furthermore, the practitioner may be unaware of the location of the ETT until it appears on the monitor. As the laryngoscope is advanced to achieve laryngeal visualization, upward force likely stretches the tonsillar pillars, making them taut and susceptible to perforation by an advancing ETT. In these two cases, experienced laryngoscopists were unaware of any resistance as they advanced the ETT. This suggests that tube insertion and advancement must be directly observed to ensure that tissue planes are not violated.

Some operators prefer to introduce the ETT into the mouth prior to insertion of the GVL. This has the advantage of focusing attention on the insertion, and may reduce the competition between the scope and tube for space in the mouth. If the GVL is introduced before the ETT, it should be introduced into the mouth, in the midline, under visual control. The author recommends insertion of the ETT parallel to, and as close as possible to the laryngoscope blade, attempting to reproduce its course. Alternatively, it can be introduced like the Trachlight: the tip of the ETT is introduced in the midline with the proximal end oriented towards the right; the ETT is then rotated counterclockwise 90° in a horizontal plane bringing it parallel to the blade.²² Tube insertion and advancement, whenever possible, should be visually controlled. This can be achieved if the stylet is partially withdrawn once the tip of the ETT has passed the vocal folds. If any resistance is encountered, clockwise rotation will usually be associated with a loss of resistance, but no force should be required.

Previous studies have established that GlideScope® videolaryngoscopy is associated with a very high level of laryngeal exposure.^{1,4} Inexperienced users have however, encountered difficulty delivering or advancing the ETT to the glottis and into the trachea.^{1,4} With experience and training, the success rate increases.⁵ The GVL has the potential for producing a higher rate of visualized tracheal intubations. Increased safety can only be achieved if the technique is used with meticulous care.

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View from Central Park - *New York, USA*