Prehospital Glidescope video laryngoscopy for difficult airway management in a helicopter rescue program with anaesthetists

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The objective of this study was to analyze the prehospital use of a Glidescope video laryngoscope (GSVL) due to anticipated and unexpected difficult airway in a helicopter emergency medical service setting in which emergency physicians (EP) are experienced anesthetists. Retrospective observational study and survey of the experiences of EP were conducted for more than a 3-year period (July 2007–August 2010). In 1675 missions, 152 tracheal intubations (TI) were performed. GSVL was used in 23 cases (15%). A total of 17 patients presented with multiple traumas, including nine with cervical spine immobilization, three with burns, and three with nontraumatic diagnoses. Eight patients experienced previously failed TI with conventional laryngoscopy (five by nonhelicopter emergency medical service EP). In two patients, the EP required two attempts with GSVL to obtain a successful TI. Since the introduction of the GSVL, no other backup airway device was necessary. GSVL may be a valuable support instrument in the prehospital management of difficult airways in emergency patients. *European Journal of Emergency Medicine* **18:282–284 © 2011 Wolters Kluwer Health | Lippincott Williams & Wilkins.**

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Introduction

Compared with conventional devices, video laryngoscopy (VL) has been shown to provide higher success rates in the primary approach to difficult airway situations. In particular, compared with direct laryngoscopy, VL may be superior in patients with immobilized cervical spines because the establishment of linear oral, pharyngeal, and tracheal pathways to visualize the glottis is no longer necessary [1,2].

Apart from numerous manikin studies and clinical trials that have provided promising results, only limited data are available regarding the prehospital use of VL. Recent studies suggest that a more widespread use of these devices, not only as a backup for intubating difficult airways but also as a standard tool, would increase the safety of prehospital airway management [3–6].

After the introduction of the Glidescope video laryngoscope (GSVL; Verathon Inc., Bothell, Washington, USA) into our Anaesthesia Department in 2005, a mobile Glidescope (Glidescope Ranger) was introduced to our helicopter emergency medical service (HEMS) in the summer of 2007, as an addition to the existing airway management equipment. This equipment includes conventional bag valve masks, laryngoscopes with Macintosh blades, laryngeal mask airways, larynx tubes, and cricothyrotomy sets.

The emergency physicians (EPs) are all board-certified anesthetists with a mean professional experience of 12 years in anesthesia and 10 years in emergency medicine, and they all attend two-to-three 24-h shifts per month in the HEMS.

The aim of this study was to evaluate the prehospital use of GSVL by experienced EPs in an HEMS setting.

Methods

We evaluated the prehospital use of GSVL in a physician-staffed HEMS setting over a period of 3 years (July 2007–August 2010).

The medical HEMS databank was screened to identify missions in which tracheal intubation was performed using GSVL. In addition, all 18 HEMS EPs were asked to report their experiences with this device in the field. All EPs were board-certified anesthetists and were familiar with the use of fiberoptic intubation devices and GSVL in daily practice at the hospital (major hospital providing most surgical specialties including otolaryngology). They were free to choose the GSVL in the HEMS without a rigid protocol.

Results

During the observational period, the HEMS team performed 1675 primary missions at the scenes of

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Table 1 Prehospital tracheal intubation variables using Glidescope video laryngoscopy

Diagnosis	Anticipated difficult airway/ unexpected difficult airway	Previously failed TI attempt using a conventional laryngoscope	More than one attempt using GSVL	GSVL outdoor	GSVL vehicular ambulance	GSVL indoor
Multiple trauma including severe head and face injuries	13[a]/4	6[b]	1[c]	5	12	0
Burns including inhalation injury	2[d]/1	2[e]	1[e]	1	1	1
No trauma	3[f]/0	0	0	0	0	3
Total	18/5	8	2	6	13	4

CSI, cervical spine immobilization; GSVL, Glidescope video laryngoscopy; HEMS, helicopter emergency medical service.
[a]$n=9$ CSI, $n=2$ CSI, and severe facial destruction, $n=2$ severe facial destruction without CSI.
[b]$n=4$ TI by non-HEMS staff, $n=2$ by HEMS.
[c]$n=1$ requiring two GSVL attempts without previous attempt with conventional laryngoscope (blurred view because of massive bleeding).
[d]$n=2$ massive facial burns and oral swelling.
[e]$n=1$ by non-HEMS staff, $n=1$ by HEMS requiring two subsequent GSVL attempts (sunlight reflection in outdoor use).
[f]$n=1$ gastrointestinal bleeding, $n=1$ cardiac failure, and $n=1$ respiratory insufficiency (each presenting with morbid obesity).

accidents, in which 152 tracheal intubations were performed by the HEMS team. GSVL was used for tracheal intubation because of anticipated or unexpected difficult airways by 13 of the 18 HEMS EPs in 23 of these cases (15% of tracheal intubations; Table 1).

A total of 17 patients presented with multiple trauma and severe head or face injuries; these included nine patients with established cervical spine immobilization, three with major burns and inhalation injury, and three with nontrauma-related issues (gastrointestinal bleeding and cardiac failure including morbid obesity and respiratory insufficiency).

Eight patients experienced previously failed intubation attempts using conventional devices with Macintosh blades (one patient experienced two failed attempts). In two patients, the EP needed two attempts with the GSVL to achieve successful tracheal intubation. In the first case, massive traumatic destruction of the maxillomandibular anatomy was the cause of the failed intubation, whereas in the second case, the view of the monitor was impaired by sunlight reflection.

GSVL was used in five cases under open sky, 14 inside a vehicular ambulance, and four intubations were performed indoors.

No fatalities were caused by failed airway management and the confirmation of correct tracheal tube positioning was done by capnography and frequent chest auscultations in every patient.

Since the introduction of GSVL in this prehospital setting, no other backup device or technique, such as laryngeal mask airway, larynx tube, or surgical approaches, was needed for the management of difficult airways.

Discussion

In the observational period, the prehospital use of GSVL was effective and successful. Previous studies have shown a steep learning curve for performing successful intubation maneuvers with a GSVL [7]. In a comparative study of 615 consecutive prehospital patients, 315 were intubated using GSVL. The time to intubate was significantly shorter, and the number of intubation attempts was significantly lower in the GSVL group [3]. However, in this study, we did not investigate the time to successful intubation.

The difference between GSVL and conventional direct laryngoscopy with Macintosh blades is that the GSVL blade should be introduced using a medial approach, whereas the conventional approach is from the lateral right side of the mouth. The introduction of the GSVL blade requires a smooth and careful movement to avoid iatrogenic injuries of the upper airway because, in most cases, there may not be direct visualization [8].

Owing to the oropharyngeal anatomy, a rigid guide wire/stylet should be inserted inside the tube to provide an angle of approximately 90° to facilitate its tracheal placement [7,9].

For EPs and paramedics who are familiar with direct laryngoscopy, the medial introduction of the GSVL blade and the curved tube may be uncommon and requires training; however, most studies have suggested that the GSVL blade is very comfortable to handle [3–7].

Numerous VL devices have recently become available. Although all of these devices have different strengths and weaknesses, they all use a similar technique. Results of comparison tests between VL devices suggest that there is little difference in the practicability and ease of use [2,4,5].

There are, however, some limitations in the use of VL. For instance, outdoor use may be associated with direct sunlight reflection, which impairs the required viewing of the monitor. Another possible limitation could be the fogging up of the camera lens during the insertion of the VL. The GSVL provides a prewarmed lens that avoids temperature-related blurred view, whereas other VL devices may use de-mister substances for the prevention of fogging.

Limitations

There are important limitations of this study. First, the retrospective nature of this study could have influenced the data collection. There was no rigid protocol for the use of the GSVL in this setting and therefore no

randomization of patients. Further limitations of this study were the low patient number and the experience of the HEMS physicians that is not comparable to nonanesthetists settings.

Conclusion

The GSVL could be a valuable support instrument in the prehospital management of difficult airways in emergency patients.

Acknowledgements

Conflicts of interest

There are no conflicts of interest.

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