CoPilot VL®: A clinical evaluation case series

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Background

Since video laryngoscopy was introduced over 10 years ago, a multitude of studies have been published evaluating effectiveness of the technique.[1-5] Many studies have demonstrated improved laryngeal views with video laryngoscopes, but the question remains whether improved laryngeal views translates to improved intubation success.[6,7] Currently available devices either limit the user to intubating with a stylet or using a device with an endotracheal tube channel.

Figure 1 The CoPilot VL® video laryngoscope

The CoPilot VL® video laryngoscope was designed to facilitate intubation by incorporating a novel bougie (endotracheal introducer) guide channel, or "bougie port". Once a view of the vocal cords is obtained, the bougie port is designed to guide the endotracheal tube introducer up and through the vocal cords. This provides the clinician the option of using either a stylet or an endotracheal tube introducer (bougie). Moreover, the technique could be changed from the stylet to the bougie and vice versa mid-procedure should the need arise.

This case series describes the glottic view practitioners obtained during laryngoscopy and evaluates the intubation success using a rigid stylet and/or the proprietary bougie port.

Methods

This prospective, observational study was conducted at Hillcrest Medical Center in Tulsa, Oklahoma after approval of the study protocol by the Department of Anesthesiology. Patients 18 years and older presenting for general anesthesia requiring orotracheal intubation were included. Types of surgical procedures included general surgery, gynecological, ear-nose-throat and orthopedic surgeries. Obstetrical patients and patients meeting the criteria for rapid sequence induction were excluded from the study.

Anesthesia providers performing laryngoscopy and intubation in the study included Certified Registered Nurse Anesthetists, physician Anesthesiologists and Student Registered Nurse Anesthetists. Prior to the study, each provider was required to have performed a minimum ten intubations using any commercially available video laryngoscope. Each provider completed device specific training on the CoPilot VL®, performed a minimum of 3 intubations using the bougie port

with a bougie and 3 intubations using the rigid stylet inserted within the endotracheal tube.

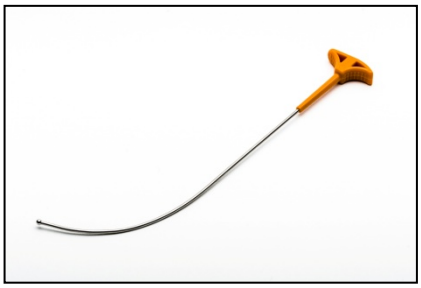

Figure 1 The CoPilot VL® rigid stylet

Figure 2 The CoPilot VL® disposable sheath with bougie

Data recorded for each subject included age, gender, American Society of Anesthesiologists (ASA) classification reference, height, weight, thyromental distance, Mallampati score, mouth opening, cervical spine range of motion and history of any difficult intubation. [8-10]

Standard monitors (electrocardiogram, pulse oximetry, noninvasive blood pressure and skin temperature) were applied and patients were pre-oxygenated with 100% oxygen for 3-5 minutes prior to induction of anesthesia. Selection of induction drugs and doses were at the discretion of individual practitioner. Neuromuscular blockers were administered to all subjects in the study for induction, laryngoscopy and intubation. Cormack/Lehane (C/L) grade views, success of intubation and time to intubation were recorded. [11] Time to intubation began when the disposable sheath was introduced into patients' mouth and ended when end-tidal carbon dioxide was detected by mass spectrometry. Intubation times were recorded by a Registered Nurse. When using the bougie port, the bougie was loaded into the sheath prior to introducing the sheath into the patients' mouth. Data collected post-intubation from the laryngoscopist included presence or absence of fog, clinicians' perception of ease of use and any patient complications noted at the time of intubation. Data were recorded by the intubating clinician on a data collection form designed for this case series.

In the first phase of the series, 48 patients were intubated using the proprietary rigid stylet within an endotracheal tube. The second phase consisted of 46 patients intubated using the CoPilot bougie and the CoPilot VL® bougie port.

Data were collected between November 2012 and February 2013.

Table 1

Patient Characteristics	
Age (yr)	50 ± 18
Gender (male/female)	41/53
Height (cm)	168.8 ± 11.6
Weight (kg)	88.7 ± 23.3
Body mass index (BMI)	30.9 ± 7.6
Mallampati score (I/II/III)	65/27/2
Thyromental distance <3 (fingerbreadths)	10
Reduced mouth opening (<3 cm)	8
Reduced neck ROM	14

Values are mean ± standard deviation

Results

Data were collected on 94 patients with successful tracheal intubation on all patients. Eleven providers used the CoPilot VL® during the course of the case series, including one physician Anesthesiologist, nine Student Registered Nurse Anesthetists, and two Certified Registered Nurse Anesthetists. C/L grade view 1 was obtained in 96% of patients, and a C/L grade 2 view was obtained in 4%. One minor tongue laceration was reported. The endotracheal cuff was torn during intubation on one patient. The endotracheal tube was exchanged using a bougie. No significant adverse outcomes were reported.

Average time to intubation with the styleted endotracheal tube was 30 sec ± 8 sec (n=47). Time to intubation was not documented on 3 records. Average time to intubation using the bougie port was 37 sec ± 13 sec (n=39). Time to intubation was not documented on 3 records.

Use of the CoPilot VL® was noted to be "easy" or "very easy" on 98% of provider evaluations. There were 5 reports of a dark image on the display. There were no reports of fog.

Table 2

Evaluation	Yes	No
Was the ETT easy to place?	82	0
Was the device easy to use?	94	0
Did the device function as expected?	92	1
Was the light bright enough?	88	5
Were there any problems with fog?	0	92

Discussion

Many studies of video laryngoscopes have demonstrated significantly enhanced laryngeal views when compared to direct laryngoscopy. The mean time to intubation with a styleted endotracheal tube using the CoPilot VL® in this case series was 30 ± 8 sec. In a study comparing the Glidescope® to direct laryngoscopy, mean time to intubation was 46 seconds.[12] The CoPilot VL® provides excellent C/L views with the ability to quickly and successfully secure the airway.

C/L grade 1 views were obtained in 96% and grade 2 views in 4% of the patients in this study. Reported C/L views using the Glidescope® were 88% grade 1 and 12% grade 2 in a demographically similar patient population .[13,14] The time to intubation is also similar to other studied devices.[15-18]

One study patient provided a letter from an anesthesia provider describing a previous failed intubation with direct laryngoscopy. With the CoPilot VL®, a C/L grade 1 view was obtained and the patient was intubated utilizing the bougie port in 32 seconds.

Limitations to this observational case series include lack of randomization, nonconsecutive enrollment and sample size. Data collection was consistent, prospective and participants adhered to a standard protocol. Randomized, controlled studies in multicenter patient populations are needed to further evaluate the benefits of utilizing the CoPilot VL® for routine laryngoscopy and intubation.

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