



Using the SaCo video Laryngeal mask airway in four different scenarios – Case series[☆]

Jakub Werner^{a, b}, Jan Bruthans^{c, d, *}, Martin Lukeš^c, Katka Tošenovská^c,
Eliška Vobrubová^c, Pavel Michálek^c

^a Department of Anesthesiology and Intensive Care Medicine, University Hospital Hradec Králové, Czech Republic

^b Medical Faculty, Masaryk University, Brno, Czech Republic

^c Department of Anesthesiology and Intensive Care, General Teaching Hospital, Czech Republic

^d Department of Biomedical Technology, Faculty of Biomedical Engineering, Czech Technical University in Prague, Czech Republic

ARTICLE INFO

Article history:

Received 4 April 2023

Received in revised form

6 May 2023

Accepted 10 May 2023

Handling Editor: Robert Greif

Keywords:

Supraglottic device

Intubation

Bronchoscopy

Difficult airway

ABSTRACT

Supraglottic devices (SAD) evolved from simple tools for airway management to devices for multiple uses. The video laryngeal masks include a dead-end channel for a dedicated camera and therefore provide a direct vision capability not only for introduction but also when inserting the tracheal tube throughout the SADs.

Our retrospective consecutive formal case series presents the first thirty uses of SaCoVLM™ video laryngeal mask in our institution. We have used the SaCoVLM™ successfully for airway maintenance, as a conduit in intubation (both elective and in anticipated difficult airway scenarios), and also as a conduit in bronchoscopy, esophagoscopy, and endobronchial ultrasound bronchoscopy. We believe we are the first authors to use this device in the last-mentioned usage. We were able to introduce the SaCoVLM™ and achieve sufficient ventilation in all 30 patients in our case series. Of the 20 cases when the device was used as a conduit to introduce additional devices, we recorded only one failure.

The SaCoVLM™ has the potential to become a versatile device in all the above-mentioned four different scenarios.

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1. Introduction

Since their introduction in the 1980's supraglottic devices (SAD) have undergone a thorough development and nowadays in some countries, over half of all general anesthetics are managed with SADs [1]. Three different sealing mechanisms evolved in various SADs – cuffed perilaryngeal sealers, cuffed pharyngeal sealers, and uncuffed anatomically preshaped sealers [2]. Another important feature is the introduction of additional channels. The SADs of the so-called “first generation” were seen as simple airway devices, whereas the “second generation” introduced a drainage channel for gastric content [3] and allowed intermittent positive pressure ventilation even during laparoscopic procedures [4]. This group of

SADs is still widely evolving with newer devices being introduced [5]. Still, a blind introduction of a first or second-generation SAD might be challenging as 40 to 60% of all SADs might not be aligned properly [6].

The term “third-generation” SAD is still not unambiguously accepted as some authors use it to denote the presence of a self-energizing sealing cuff (Baska) [7], whereas others employ it for devices that introduce yet another channel used for a reusable patient-isolated camera [8]. For the latter group, the term video laryngeal mask (VLM) is also used. Placing such a device under direct vision significantly improves the correct position of the SAD as the increased oropharyngeal leak pressure demonstrates [9]. Earlier SADs were already used as a conduit for elective fiberoptic intubation using a bronchoscope [10], but VLMs provide the same service faster and without the necessity to use the fibroscope [11].

LMA CTrach (The Laryngeal Mask Co., Singapore) was the first SAD equipped with a camera. Introduced in 2005 the device was abandoned lately due to its unsteady performance. The initial clinical evaluation of the TotalTrack VLM (MedComflow S.A., Spain)

[☆] This research was presented in part at EAC Congress, Antalya 2022.

* Corresponding author. Department of Anesthesiology and Intensive Care, General Teaching Hospital in Prague, U Nemocnice 499/2, CZ, 12808 Praha, Czech Republic

E-mail address: jan@bruthans.cz (J. Bruthans).

Abbreviations

MIDCAB	minimally invasive direct coronary artery bypass
SAD	supraglottic device
VLM	video laryngeal mask

was published in 2015 [12]. At present, there are further types of VLMs available on the market, such as SaCoVLM™ (Zhejiang UE Medical Corp, PRC) and SafeLM™ VLMS (Magill Medical Technology, PRC) [13]. We have obtained the SaCoVLM™ and started using it to gain initial experience with the device. During our first thirty cases, we have used it successfully not only for basic airway maintenance and as a conduit for elective intubation but also in difficult airway management and as a conduit for interventional bronchology and esophageal procedures. This case series presents these four different scenarios of using the SaCoVLM™ SAD.

2. Methods

This is a retrospective consecutive formal case series incorporating the first thirty uses of SaCoVLM™ SADs in our institution.

Single-use SaCoVLM™ is delivered in sizes 3, 4, and 5 from which we had the latter two variants at our disposal. The SaCoVLM™ resembles other widely used SADs with an inflatable cuff. It includes a ventilation channel, a gastric drainage channel (to the left), and a separate dead-end video channel (to the right side of the ventilation channel). It also features a cleaning line that opens near the end of the video channel. Through this cleaning line, saline or air can be introduced with a syringe to clear salivation or other debris blocking the vision (Fig. 1).

Through the video channel, a reusable flexible electronic camera (focal length 7mm, angle 90°) with an integrated light source is introduced and locked firmly with the SAD. The cable from this camera is then connected via a cable to the screen with an integrated battery. Videos and photographs captured from the camera can be stored in the screen unit for further use (Fig. 2). The SaCoVLM™ can be introduced as any other SAD, the main difference being the direct vision capability throughout the introduction and the whole time it is placed in the hypopharynx. A drainage channel can be used to introduce a drainage tube when necessary.

The study protocol and data collection procedure were approved by the Ethical Committee of General University Hospital (No. 26/22 S-IV, 4/3/2022, head: Dr. Zbynek Sklenar). SaCoVLM™ features a valid CE Certificate of Conformity, therefore we did not need any additional permission to use the device in our institution. We extracted all data for this retrospective case series from patient anesthetic records and their medical notes.

3. Results

Our first thirty cases consist of 13 females and 17 males, average age of 58.6 (SD ± 9.2) years, and a median of 57.5 years undergoing general surgery, gynecology, urology, vascular surgery, cardiac surgery, and interventional bronchology procedures.

All SaCoVLM™ in our study were introduced by various anesthesiologists of our department, all of them consultants to guarantee experience both in airway management and also with various SADs. Induction in all patients was performed using Propofol (up to 2 mg per kilogram of body weight) and Sufentanyl, the dosing was left on the anesthesiologists' consideration in line with the various cases the SAD was used in. Neuromuscular blocking was used only in patients where SaCoVLM™ was used as a conduit for intubation



Fig. 1. The SaCoVLM™.

(9 cases, that is 30% of our sample).

The size of the SaCoVLM™ was chosen according to the patient's body weight (size 4 in body weight 50–70 kg and size 5 in body weight over 70 kg). Using the camera of the SAD we were able to see the entire vocal cords area in 24 cases (80%) (Fig. 3). In 5 cases (16.6%) we obtained a partial view of the vocal cords while the epiglottis was visible, in 1 patient (3.3%) we only saw the epiglottis after two repositionings. We did not experience a case in which we were not able to recognize any anatomical structures.

The SaCoVLM™ was used in 10 patients (33.3%) for basic airway maintenance (using SaCoVLM™ singly as a SAD). In a further 7 patients (23.3%) after the SAD introduction, a tracheal tube was inserted via the SAD to electively intubate the patient (Fig. 4). One of these patients (No. 24) could not be intubated through the device despite good ventilation and sealing due to epiglottis downfolding.



Fig. 2. The SaCoVLM™ with video camera partly introduced in the video channel with the monitor connected.



Fig. 3. Coverage of the glottis with the SaCoVLM™ as seen through the flexible bronchoscope inserted through the breathing channel.

Twice (6.6%) we have used SaCoVLM™ as a conduit for intubation in an anticipated difficult airway scenario. One of these cases was a patient (No. 6) with a limited mouth opening of 2.5 cm and Mallampati 3 grade with a limited understanding. The second patient (No. 8) had undergone very difficult videolaryngoscopic intubation for a previous urological procedure and this time required tracheal intubation with a bronchial blocker insertion for MIDCAB cardiac procedure. Eleven times (36.7%) the SAD was used for airway maintenance and fibroscope/probe conduit in bronchoscopy, esophagoscopy (Fig. 5), and endobronchial ultrasound bronchoscopy.

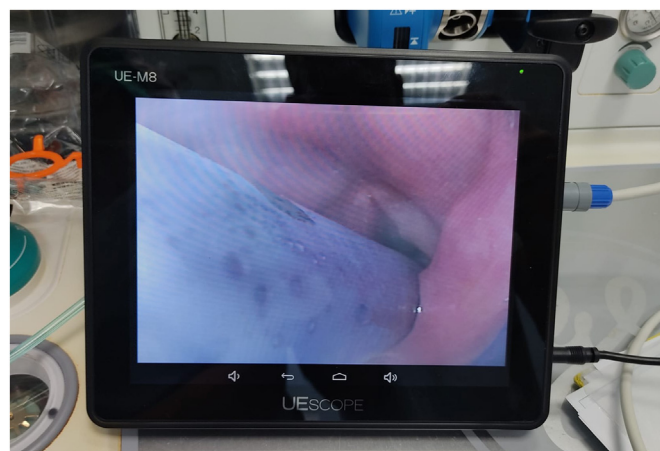


Fig. 4. Tracheal intubation through the SaCoVLM™.



Fig. 5. Insertion of a flexible endoscope through the SaCoVLM™ under direct vision into the esophagus.

In all 30 cases, we were able to introduce the SaCoVLM™ and achieve sufficient ventilation (that is ventilation without significant air leaks and with appropriate tidal volumes). Of the 20 cases where the SaCoVLM™ was used as a conduit to introduce additional devices, we were unable to do so only once in an elective intubation scenario. This situation was resolved by removing the SAD and using a videolaryngoscope for introducing the tracheal tube. In our whole sample, we recorded only complications during the procedures. We did not encounter any complications in the post-operative period, such as postoperative sore throat, swallowing difficulties, or hoarseness.

Excessive secretion of saliva causing visualization difficulties was present in 6 patients (20%), and laryngospasm was noted in one case (3.3%). We did not note any significant airway trauma associated with the device use.

The whole summary of all our cases is set out in Table 1.

4. Discussion and conclusion

VLMs are perceived as one of the new and important technologies in airway management, just as videolaryngoscopes, point-of-care ultrasound, or artificial intelligence in airway management

Table 1
Case series presentation.

Number	Sex/Age	Size	Procedure	Indication	Success	Glottis coverage	Note
1	F/57	4	Mastectomy	1	1	1	No complications
2	F/65	4	Varicose veins	1	1	1	No complications
3	F/47	4	Varicose veins	1	1	2	Excessive salivation, unclear image
4	F/56	4	Varicose veins	1	1	1	No complications
5	M/43	5	Lap.cholecystectomy	2	1	1	Easy intubation, no complications
6	M/54	5	Bariatric surgery	3	1	1	No complications
7	M/47	5	Bariatric surgery	2	1	2	One repositioning required
8	M/72	5	Cardiac, MIDCABG	3	1	1	Saliva/sputum flushed out with the saline
9	M/57	5	Bronchoscopy, EBUS	4	1	1	No complications
10	M/73	4	Bronchoscopy, EBUS	4	1	1	One repositioning required
11	F/59	4	Bronchoscopy, EBUS	4	1	2	90% of the cords visible
12	M/29	5	Lap. Inguinal hernia	2	1	1	Easy intubation, no complications
13	M/57	5	Bronchoscopy, EBUS	4	1	2	85% of the cords visible
14	M/76	5	Femoropopliteal BP	1	1	1	Excessive salivation
15	M/60	5	Bronchoscopy, EBUS	4	1	1	No complications
16	F/50	4	Bronchoscopy, EBUS	4	1	2	90% of the cords visible
17	F/54	4	Bronchoscopy	4	1	1	No complications
18	F/69	4	Breast resection	1	1	1	No complications
19	F/42	4	Breast resection	1	1	1	No complications
20	F/58	4	Broncho + esoscopy	4	1	1	Repositioning required
21	M/73	4	Broncho + esoscopy	4	1	1	No complications
22	F/72	4	Bronchoscopy, EBUS	4	1	1	Excessive salivation, suctioned
23	M/58	5	Cardiac, reoperation	2	1	1	Easy intubation, no complications
24	M/58	5	Cardiac, OPCABG	2	1/0	3	Good ventilation, no leak, failed TI, videolaryng.
25	M/47	5	Vascular, art.revision	1	1	1	No complications
26	F/78	4	Vascular, thrombectomy	1	1	1	No complications
27	F/56	4	Bronchoscopy, EBUS	4	1	1	Excessive salivation, laryngospasm
28	M/74	5	TURP, urology	1	1	1	No complications
29	M/46	5	Bariatric surgery	2	1	1	No complications
30	M/72	5	Bowel resection	2	1	1	Salivation, flushed out with the air and saline

Indication: 1- maintenance of the airway during general anesthesia/no intubation, 2- a conduit for tracheal intubation/bridge for preoxygenation, 3- a conduit for intubation in difficult airway management, 4- a conduit for interventional bronchology procedure/esophageal procedure.

Success: 1- Yes, 0- No.

Glottis coverage: 1- full view of the vocal cords, 2- partial view of the vocal cords + epiglottis, 3- no view of the vocal cords, epiglottis visible, 4- difficult to recognize any anatomical structures – no view of the vocal cords nor epiglottis.

[14]. Until now, only a few studies on VLMs have been published, the majority of them in the form of case reports, although some randomized studies comparing VLM to other devices are already available [15].

Using SaCoVLM™ proved to be simple and easy both for basic airway maintenance and as a conduit for tracheal intubation. This is in accordance with previous findings [16]. When compared with fiberoptic intubation through the i-gel, direct intubation through the SaCoVLM™ is faster and also associated with a lower incidence of postoperative adverse events [11]. Still, proper positioning of any SAD is necessary to enable the introduction of the tracheal tube (as shown in our case No. 24 where epiglottis downfolding prevented us from succeeding). Other authors have also already used SaCoVLM™ in an anticipated difficult airway scenario, although their approach was different as an awake introduction of SaCoVLM™ with topical anesthesia was chosen [17]. We did not find in the literature any mention of using the SaCoVLM™ as a conduit for bronchoscopy, esophagoscopy, and endobronchial ultrasound bronchoscopy. Nevertheless, a recent case report describes a fibreoptic bronchoscope insertion through the SaCoVLM™ to intubate a patient with a giant goiter [18].

Our case series has a few limitations. Thirty cases present a limited sample of patients only and a larger group should be investigated to further corroborate our findings. Also, only skilled anesthesiologists were chosen to use this novel device. Nevertheless, we feel that even less skilled colleagues would benefit from it and find it easy to use.

In conclusion, we have successfully used the SaCoVLM™ in four different scenarios and suggest that it may be a versatile device with multiple possible uses.

Funding acknowledgment

This manuscript was funded by the Czech Ministry of Health, grant number MZCZ-DRO-VFN64165.

Ethics Committee approval and informed consent

The study protocol and data collection procedure were approved by the Ethical Committee of General University Hospital (No. 26/22 S-IV, 4/3/2022, head: dr. Zbynek Sklenar).

CRediT authorship contribution statement

Jakub Werner: Writing – original draft, Formal analysis, Data curation, Conceptualization. **Jan Bruthans:** Writing – review & editing, Writing – original draft, Resources, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Martin Lukes:** Methodology, Data curation. **Katka Tošenovská:** Investigation. **Eliška Vobrubová:** Writing – review & editing, Investigation. **Pavel Michálek:** Writing – review & editing, Resources, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: P.M. has lectured for several companies manufacturing airway devices—Intersurgical Ltd. (Wokingham, UK), AMBU Ltd. (St Ives, UK), and Intavent Orthofix Ltd. (Maidenhead, UK). P.M. is also a

member of the Editorial Board of the Trends in Anesthesia and Critical Care. J.W., J.B., M.L., K.T., E.V. do not declare any conflict of interest.

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