Acta Clin Croat (Suppl. 1) 2023; 62:149-153
doi: 10.20471/acc.2023.62.s1.20

Case Report

# COMBINED USE OF VIDEOLARYNGOSCOPE AND BONFILS INTUBATION ENDOSCOPE AS RESCUE OPTION FOR DIFFICULT AIRWAY MANAGEMENT: A CASE REPORT

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SUMMARY – Difficult airway management poses a great challenge for clinicians, especially if it is unanticipated. Numerous guidelines and a wide array of devices constitute the anesthesiologist's armamentarium for managing the airway. When the use of individual devices fails, the use of combination techniques is advised. We present a case of difficult intubation in a 50-year-old male patient scheduled for aortic valve replacement. He had no prior history of difficult airway management, and no abnormalities were detected on preoperative airway assessment. Body mass index was 29 kg/m2. After the separate use of direct laryngoscopy, videolaryngoscopy and a BONFILS intubation endoscope (BIE) had failed, we resorted to a combination technique, combining videolaryngoscopy and BIE. While the videolaryngoscope provided the space needed for BIE and visual guidance through copious secretions, the BIE served as a stylet for endotracheal tube guidance, leading to successful intubation. Since the technique requires costly equipment, experience in handling it and at least two operators, it is more appropriate as a rescue measure than an elective procedure. Given the potentially disastrous outcomes of failed intubation, mastering advanced airway management techniques remains of vital importance, and the combination technique is one of them.

Key words: *Airway management; Anesthesia; Aortic valve; Body mass index; Intubation, intratracheal; Laryngoscopy; Optical devices*

## Introduction

According to a meta-analysis including 50760 patients without anatomic abnormalities of the airway, who were scheduled to undergo general anesthesia, the overall incidence of difficult intubation using direct laryngoscopy was 5.8% (95% confidence interval [CI] 4.5-7.5). Difficult intubation was defined as Cormack-Lehane (CL) grade 3 or higher[1].

Since direct laryngoscopy requires alignment of the oral, pharyngeal and laryngeal axes in order to provide a view of the laryngeal inlet, videolaryngoscopy was devised in an attempt to bypass this requirement and visualize the glottis independent of the line of sight. According to multiple studies comparing the two techniques in patients with a predicted difficult airway, videolaryngoscopy offers improved visualization of the larynx and a higher rate of successful intubations[2,3]. Bearing this in mind, videolaryngoscopy would be a

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logical alternative in cases when direct laryngoscopy fails.

Although CL grades 3 or 4 on direct laryngoscopy can be improved to CL grades 1 or 2 with videolaryngoscopy, the improved laryngeal view may not always be matched with successful intubation[4]. So, what would be the alternative?

According to the 2022 American Society of Anesthesiologists (ASA) Practice Guidelines for Management of the Difficult Airway, it is strongly recommended that if difficulty is encountered with individual techniques, combination techniques may be performed[5].

In this case report, we describe management of an unanticipated difficult airway using a videolaryngoscope (VL) in combination with a rigid intubation endoscope, BONFILS intubation endoscope (BIE; Karl Storz, Tuttlingen, Germany) after the separate use of direct laryngoscopy, VL and BIE had failed.

## Case Report

A 50-year-old male patient with acute endocarditis of the severely stenotic bicuspid aortic valve was scheduled for aortic valve replacement. Except for arterial hypertension, he did not have any other comorbidities. There was no prior history of difficult airway management. On preoperative examination performed by a different anesthesiologist, Mallampati score was estimated as class II. Body mass index (BMI) was 29 kg/m$^2$ (92 kg, 178 cm). Mouth opening was adequate. No significant abnormality was detected on dental inspection and neck mobility was fully preserved. On arrival in the operating room, the patient was hemodynamically stable without the need for vasopressor or inotropic support. There were no signs of respiratory distress nor the need for oxygen supplementation. Pulse oximetry, end-tidal carbon dioxide, electrocardiogram and invasive blood pressure monitoring through the left brachial artery cannulation were implemented. After preoxygenation with 100% oxygen, general anesthesia was induced by administering intravenous midazolam 0.05 mg/kg, sufentanil 0.3 mcg/kg, etomidate 0.2 mg/kg, and rocuronium 1 mg/kg. The patient was placed in a sniffing position and the first intubation attempt was made using direct laryngoscopy with the curved (Macintosh No. 4) blade, upon which CL grade 3 was scored. Even though we performed displacement of the larynx using the BURP (backward, upward and rightward pressure on the larynx) and BACK (simple backward pressure on the larynx) maneuver, the CL grade remained the same. The degree of difficulty was confirmed by two experienced anesthesiologists. Blind attempt at passing the endotracheal tube (ETT) through the glottis failed. The second attempt was made by means of videolaryngoscopy using Medcaptain VL VS-10 Series (Medcaptain Medical Technology Co., Shenzhen City, Guangdong, China) with the curved blade size M4, which led to improvement in glottic visualization up to the CL grade 1. Despite the visualization improvement achieved, the ETT could not be positioned in front of the laryngeal inlet. During the next attempt, the anesthesiologist combined a tracheal tube introducer, also known as bougie, with the VL, but without success. The fourth attempt was made using the BIE, combined with the jaw-thrust maneuver. Glottic visualization was, however, impaired due to the limited jaw thrust, excessive secretions, and fogging of the lens. In the fifth and final attempt, the anesthesiologist combined the VL and BIE. With the VL kept in position by another anesthesiologist, the BIE was preloaded with the ETT size 8.5 with a deflated cuff and brought into position in front of the laryngeal inlet, guided only by looking at the VL screen. With the BIE in the correct position, the ETT was finally passed through the glottis, as confirmed by auscultation, inspection and capnography.

Throughout the procedure, the bag-valve-mask ventilation was adequate and there were no drops in pulse oximetry readings. I-gel supraglottic airway (Intersurgical, Wokingham, Berkshire, United Kingdom) was only briefly inserted while necessary equipment was being prepared. The hemodynamic stability was preserved as well. There were no short-term or long-term complications. Informed consent was obtained from the patient presented in this study.

Postoperatively, we performed detailed airway assessment involving so far studied bedside predictors of difficult intubation, and the results are presented in Table 1. It is worth emphasizing that in comparison to preoperative assessment, the postoperative airway assessment revealed a Mallampati class III, as seen in Table 1 and Figure 1.

*Table 1. Postoperative airway assessment*

| Screening test | Cut-off value for difficult intubation | Measured value |
|---|---|---|
| Mallampati score[6] | ≥Class III | **Class III** |
| Interincisor gap[7] | <4 cm | 4 cm |
| Thyromental distance[1] | <6 cm[#] | 9.5 cm |
| Sternomental distance[1] | <12.5 to 13.5 cm | 15.5 cm |
| Thyromental height[8] | <5 cm | 7.5 cm |
| NC/TM[9] | >5.0 | 4.4 |
| Upper lip bite test[7] | Class III | Class II |
| Wilson risk score*[1] | ≥2 | **4** |
| M-TAC score[10] | ≥4 | 3 |

[#]Cut-off value varied from 4.0 to 7.0 cm; NC/TM = neck circumference to thyromental distance ratio; M-TAC = a combination of Mallampati score, thyromental distance, anatomic abnormality and cervical mobility; *includes head and neck movement, jaw movement, receding mandible, prominent maxillary incisors, and body weight.

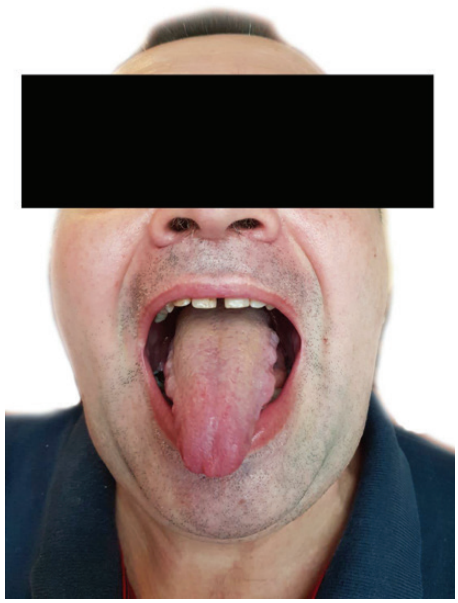

*Fig. 1. Performing Mallampati evaluation, without phonation.*

## Discussion

While the VL usually improves glottic visualization, it does not completely eliminate difficulties in positioning and passing the ETT through the glottis, as also seen in our case[2]. The BIE, which was used next, requires creating space for the instrument in the oropharynx and lifting the epiglottis, usually by means of the jaw-thrust maneuver. In cases where the jaw-thrust maneuver proves insufficient, a laryngoscope can be used to achieve the same goal[11]. In our case, since glottic visualization through the BIE was poor, we resorted to the VL to create the space needed for BIE and improve visualization.

So far, combined use of VL and BIE was tested in patients with anticipated difficult airway and CL grade 3 or 4 on videolaryngoscopy. A study by Pieters *et al*. showed significant improvement in CL grading score when the BIE was added to the VL, leading to successful intubation in all but one patient[12]. In comparison to the aforementioned study, we achieved satisfactory glottic visualization (CL grade 1) using only VL and introduced BIE solely due to the inability to position the ETT in front of the laryngeal inlet. In our case, VL secured visualization and BIE served as a stylet for ETT guidance.

While the combination technique can be used electively in an anticipated difficult airway, the necessary equipment is costly and not always readily available. Furthermore, it requires at least two operators, one to manage the BIE and one to manage the VL. It is therefore more appropriate as a rescue measure, when the separate use of the VL and BIE fails.

Experience in handling the advanced equipment is also needed. It is, therefore, important to note our

anesthesiologist's limited experience in handling the aforementioned device, which may have influenced intubation success using solely the BIE.

The Medcaptain VL we used also comes with an angulated M3D blade for difficult intubation. Since glottic visualization was satisfactory using the M4 blade and the ETT guidance was the issue, we do not believe the angulated blade would have facilitated the intubation attempt.

Our case of difficult airway was unanticipated, based on the flawed and incomplete preoperative examination, emphasizing the need for thorough and detailed airway assessment as a basis for preparation for difficult airway management. Although they are tests of low sensitivity, the Mallampati and Wilson risk score managed to predict difficult laryngoscopy in this patient[1]. However, taking low sensitivity of individual bedside predictors of difficult intubation[1] into account, expecting the unexpected and mastering different airway management techniques remains of vital importance, which is where the combination technique can certainly find its place.

## Conclusion

The overall incidence of difficult intubation using direct laryngoscopy has been reported to be 5.8%, and even up to 15.8% in obese patients[1]. Consequently, each intervention which could improve successful intubation may be welcome in these situations. Bearing in mind that every technique has its own pros and cons, one must always have an alternative ready.

The combined use of a VL and BIE represents an easy to learn airway rescue technique and it does not require additional external maneuvers, giving the airway operator a valuable alternative intubation option in patients with difficult airway and high BMI.

## References


1. Shiga T, Wajima Z, Inoue T, Sakamoto A. Predicting difficult intubation in apparently normal patients: a meta-analysis of bedside screening test performance. Anesthesiology. 2005 Aug;103(2):429-37. doi: 10.1097/00000542-200508000-00027. PMID: 16052126.
2. Aziz MF, Dillman D, Fu R, Brambrink AM. Comparative effectiveness of the C-MAC video laryngoscope *versus* direct laryngoscopy in the setting of the predicted difficult airway. Anesthesiology. 2012 Mar;116(3):629-36. doi: 10.1097/ALN.0b013e318246ea34. PMID: 22261795.
3. Jungbauer A, Schumann M, Brunkhorst V, Börgers A, Groeben H. Expected difficult tracheal intubation: a prospective comparison of direct laryngoscopy and video laryngoscopy in 200 patients. Br J Anaesth. 2009 Apr;102(4):546-50. doi: 10.1093/bja/aep013. Epub 2009 Feb 20. PMID: 19233881.
4. Kaplan MB, Hagberg CA, Ward DS, Brambrink A, Chhibber AK, Heidegger T, Lozada L, Ovassapian A, Parsons D, Ramsay J, Wilhelm W, Zwissler B, Gerig HJ, Hofstetter C, Karan S, Kreisler N, Pousman RM, Thierbach A, Wrobel M, Berci G. Comparison of direct and video-assisted views of the larynx during routine intubation. J Clin Anesth. 2006 Aug;18(5):357-62. doi: 10.1016/j.jclinane.2006.01.002. PMID: 16905081.
5. Apfelbaum JL, Hagberg CA, Connis RT, Abdelmalak BB, Agarkar M, Dutton RP, Fiadjoe JE, Greif R, Klock PA, Mercier D, Myatra SN, O'Sullivan EP, Rosenblatt WH, Sorbello M, Tung A. 2022 American Society of Anesthesiologists Practice Guidelines for Management of the Difficult Airway. Anesthesiology. 2022 Jan 1;136(1):31-81. doi: 10.1097/ALN.0000000000004002. PMID: 34762729.
6. Lee A, Fan LT, Gin T, Karmakar MK, Ngan Kee WD. A systematic review (meta-analysis) of the accuracy of the Mallampati tests to predict the difficult airway. Anesth Analg. 2006 Jun;102(6):1867-78. doi: 10.1213/01.ane.0000217211.12232.55. PMID: 16717341.
7. Seo SH, Lee JG, Yu SB, Kim DS, Ryu SJ, Kim KH. Predictors of difficult intubation defined by the intubation difficulty scale (IDS): predictive value of 7 airway assessment factors. Korean J Anesthesiol. 2012 Dec;63(6):491-7. doi: 10.4097/kjae.2012.63.6.491. Epub 2012 Dec 14. PMID: 23277808; PMCID: PMC3531526.
8. Carvalho CC, Santos Neto JM, Orange FA. Predictive performance of thyromental height for difficult laryngoscopies in adults: a systematic review and meta-analysis. Braz J Anesthesiol. 2021 Jul 9:S0104-0014(21)00271-2. doi: 10.1016/j.bjane.2021.06.015. Epub ahead of print. PMID: 34252454.
9. Kim WH, Ahn HJ, Lee CJ, Shin BS, Ko JS, Choi SJ, Ryu SA. Neck circumference to thyromental distance ratio: a new predictor of difficult intubation in obese patients. Br J Anaesth. 2011 May;106(5):743-8. doi: 10.1093/bja/aer024. Epub 2011 Feb 24. PMID: 21354999.
10. Ambesh SP, Singh N, Rao PB, Gupta D, Singh PK, Singh U. A combination of the modified Mallampati score, thyromental distance, anatomical abnormality, and cervical mobility (M-TAC) predicts difficult laryngoscopy better than Mallampati classification. Acta Anaesthesiol Taiwan. 2013 Jun;51(2):58-62. doi: 10.1016/j.aat.2013.06.005. Epub 2013 Jul 21. PMID: 23968655.
11. Wu CN, Ma WH, Wei JQ, Wei HF, Cen QY, Cai QX, Cao Y. Laryngoscope and a new tracheal tube assist lightwand intubation in difficult airways due to unstable cervical spine. PLoS One. 2015 Mar 24;10(3):e0120231. doi: 10.1371/journal.pone.0120231. PMID: 25803435; PMCID: PMC4372550.
12. Pieters BM, Theunissen M, van Zundert AA. Macintosh blade videolaryngoscopy combined with rigid Bonfils intubation endoscope offers a suitable alternative for patients with difficult airways. Anesth Analg. 2018 Mar;126(3):988-94. doi: 10.1213/ANE.0000000000002739. PMID: 29256937.

Sažetak

## KOMBINIRANA UPORABA VIDEOLARINGOSKOPA I INTUBACIJSKOG ENDOSKOPA BONFILS KAO MOGUĆNOST ZBRINJAVANJA OTEŽANOGA DIŠNOG PUTA: PRIKAZ SLUČAJA

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Otežani dišni put predstavlja velik izazov za kliničare, pogotovo ako je neočekivan. Anesteziolozima su na raspolaganju brojne smjernice i široka paleta pomagala za zbrinjavanje dišnoga puta, a kad pojedinačne tehnike zakažu, savjetuje se primjena kombiniranih tehnika. Predstavljamo slučaj otežane intubacije kod pedesetogodišnjeg muškarca kod kojega je planirana zamjena aortnog zalistka. Anamnezom nisu utvrđene ranije otežane intubacije. Prijeoperacijska procjena dišnoga puta bila je bez osobitosti. Indeks tjelesne mase iznosio je 29 kg/m$^2$. Nakon neuspješne pojedinačne primjene direktne laringoskopije, videolaringoskopije i intubacijskog endoskopa BONFILS (BIE) primijenili smo kombiniranu tehniku kombinirajući videolaringoskop i BIE. Dok smo videolaringoskopom osigurali potreban prostor za plasiranje BIE i poboljšali prikaz kroz obilan sekret, BIE nam je poslužio kao vodilica za endotrahealni tubus, što je dovelo do uspješne intubacije. Budući da tehnika zahtijeva skupu opremu, iskustvo u njenoj primjeni te barem dva anesteziologa, prikladnija je kao izvanredna mjera nego kao redovni postupak. S obzirom na potencijalno katastrofalne posljedice neuspješne intubacije ovladavanje naprednim tehnikama zbrinjavanja dišnoga puta ostaje od ključne važnosti, a kombinirana tehnika jedna je od njih.

Ključne riječi: *Zbrinjavanje dišnog puta; Anestezija; Aortni zalistak; Indeks tjelesne mase; Intubacija, intratrahealna; Laringoskopija; Optički uređaji*