TECHNICAL NOTE

A comparison of the TruView EVO2 and macintosh laryngoscope blades

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INTRODUCTION

Intubation is one of the basic procedures of anesthesia. The reported frequency of difficult intubations is between 1.5% and 13%, which is a problem that requires a prompt solution.[1] Although the likelihood of a difficult intubation can be estimated from preoperative measurements and scoring systems, obtaining direct access to the glottis during preoperative direct laryngoscopy can be difficult.[2] The Mallampati test, which has a reported sensitivity of 50% and specificity of 100%, is a frequently used tool for the bedside prediction of the preoperative risk of a difficult intubation.[3] This figure clearly allow room for surprises during a laryngoscopy and explain why guidelines have been issued for difficult intubations. Better laryngoscopes have been developed to overcome anatomical obstacles.[3] For example, in contrast to a direct laryngoscopy, the development of new, indirect laryngoscopes has enabled intubation with an optic apparatus, which does not require the use of the oral, pharyngeal and tracheal axes. In addition, other laryngoscopy devices, such as the GlideScope, Pentax, and TruView, have aimed to improve laryngeal exposure through the use of optical apparatuses, lenses, and cameras that target anatomical obstacles.[4-6] The TruView EVO2 (Truphatek International Ltd., Netanya, Israel) has previously been reported to provide a better laryngeal appearance through the use of its optical system, which provides a 42-degree deflection view through a 15-mm eyepiece. In addition, the TruView EVO2 reduces the problems associated with lens blurring by using a continuous O_2 flow system (4-5 L/min) attached to the laryngoscope.[6-8] In the present study, we compared the quality of the laryngoscopic exposures produced by the TruView EVO2 with that of Macintosh blades, which have traditionally been used for laryngoscopy.

MATERIALS AND METHODS

Between January 1, 2009, and January 30, 2009, a total of 185 ASA I-II consecutive patients who underwent an operation in the general surgery operating room were enrolled into this cross-sectional study. The study was approved by the Institutional Review Board of the Cerrahpasa Medical Faculty and was performed in accordance with the Declaration of Helsinki. Written informed consent was obtained from each participant before his or her entry into the study. Patients who had increased intracranial pressure, cervical spine injury, or head and neck pathology, were ASA III-IV, or were undergoing rapid sequence induction were excluded from the study. After a preoperative anesthesia evaluation, demographic data and Mallampati scores were recorded. The patients were placed in a supine position with their head on a 7-10 cm pillow. The arterial blood pressure, heart rate, and oxygen saturation were noninvasively monitored in the operating room, and anesthesia was induced with propofol (2-3 mg/kg), fentanyl (2-4 μg/kg) and atracurium besylate (0.5 mg/kg). Neuromuscular blockade was checked with a peripheral nerve stimulator, and two successive laryngoscopies were performed on the same patient; the first procedure used a Macintosh blade, and the second procedure used TruView EVO2. Reventilation was performed between the two procedures, and the Cormack-Lehane score was measured after each laryngoscopy. Intubation was performed after the second laryngoscopy with TruView blades. If the attempts with Macintosh and TruView blades failed, laryngoscopy was repeated with the Macintosh blade. The maneuvers to ease the intubation were recorded, and the laryngeal view was evaluated using the Cormack-Lehane classification as follows: grade I (the glottis was fully exposed), grade II (the glottis was partially exposed), grade III (only the epiglottis was exposed), and grade IV (the epiglottis was not exposed). Each patient was assessed and scored by an experienced anesthesiologist. All of the intubations were performed by three anesthetists with at least 5 years of experience with the Macintosh and at least 6 months of experience with the TruView EVO2.

Statistical analysis

Statistical analyses were performed using SPSS (version 15.0) for Windows. The sample size was calculated from the difference in the Cormack-Lehane scores (one grade) of the groups based on preliminary data.[8] The Cormack-Lehane scores for the two devices were compared using the Wilcoxon signed-rank test. A p-value <0.05 was considered to be statically significant, and the results are given as medians. A power calculation showed that our study population was large enough to detect differences with 80% power at the 2-sided 5% significance level.

RESULTS

A total of 217 patients were consecutively assessed for their eligibility. Thirty-two patients were excluded from the study: 19 patients were ASA III-IV, 8 patients had head or

Table 1 - Baseline and demographic characteristics of the patients.

Parameter	n = 185
Demographical characteristics	
Age (mean ± SD) (years)	45.5 ± 17.0
Male	104 (56.2%)
Female	81 (43.8%)
BMI (mean ± SD) (kg/m^2)	25.7 ± 3.8
Predicted ease of intubation	
Mallampati score	
1	99 (53.5%)
2	72 (38.9%)
3	14 (7.6%)
4	0 (0%)

neck pathology, 2 patients had a history of cervical spine injury, and 3 patients had undergone rapid sequence induction. One hundred eighty-five patients were included in the present study; 104 (56.2%) patients were male, and 81 patients were female (43.8%). The mean age was 45.5 ± 17.0 years (range, 16 to 89 years). The baseline and demographic data of the patients are shown in Table 1. Most of the patients had low (1 or 2) Mallampati scores (92.4%), and none of the patients had a Mallampati score >3.

All but 4 patients could be intubated using the TruView EVO2. There were anatomical or functional problems in 3 patients: 1 case of an abnormally long uvula, 1 case of retrognathia, and 1 case of limited neck movement. The fourth patient with intubation failure had both high predicted possibility of difficult intubation and had a big tongue (Table 2). A stylet was used for each intubation to ease laryngeal entry. The external manupilation was performed in 23 of all patients for the intubation.

The Cormack-Lehane scores were significantly better for the TruView EVO2 laryngoscopy than for the Macintosh blade. The median values of Cormack-Lehane scores for the Macintosh and TruView laryngoscopes were 1 and 2, respectively (Wilcoxon signed-rank test, $p<0.001$; 95% CI: *z*-value, -10.868; lower bound, 0.0; upper bound, 0.016). Of the 185 patients studied, 147 (79.1%) patients with a Cormack-Lehane score improved one or two grades with the TruView EVO2 blade. The 50 of all patients (26.7%) with Cormack-Lehane scores of grade 3 or 4 after a Macintosh laryngoscopy improved by at least one grade with the TruView blade. However, there was no improvement or intubation failure in 38 (20.5%) patients, including the 4 (2.2%) patients who could not be successfully intubated with the TruView EVO2 laryngoscope (Table 3, Table 4).

Table 2 - Intubation failures.

Case	Age	Gender	Mallampati score	Reason for failure
Case 1	32 y	Female	1	Long and abnormal shaped uvula
Case 2	41 y	Male	3	Big tongue
Case 3	89 y	Male	1	Limited neck movements
Case 4	65 y	Male	1	Retrognathia

Table 3 - Alteration or no change in the Cormack-Lehane grading.

Alteration or no change in Cormack-Lehane grading	Number	Percentage of total patients (%)
*4-3°	1	0.5
*4-2°	2	1
*4-1°	11	5.9
*3-2°	7	3.7
*3-1°	29	15.6
*2-1°	97	52.4

DISCUSSION

Although various types of laryngoscopes with different technical specifications and operational characteristics have been developed, Macintosh laryngoscopes remain the most widely used in anesthesiology. The newer TruView laryngoscope has an optical accessory, a different blade angle and an oxygen flow apparatus attached to the device. In the present study, we compared the TruView EVO2 and Macintosh blade laryngoscopes in the same set of patients by measuring the Cormack-Lehane scores during direct laryngoscopy. We found that the TruView EVO2 provided a better laryngeal view than the Macintosh laryngoscope and improved the Cormack-Lehane score by at least one grade. The optical system in the TruView EVO2 laryngoscope enables a greater view angle in the larynx. The median values of Cormack-Lehane scores obtained with TruView EVO2 and Macintosh laryngoscopes were 1 and 2, respectively ($p<0.001$, Wilcoxon rank-signed test). This finding agrees with the results reported by Li et al., who also found a better Cormack-Lehane score with the TruView EVO2 compared with the Macintosh blade.[6] In addition, similar results have been reported for laryngoscope blades with a built-in optic apparatus and similar design as the TruView EVO2. For example, Sun et al. compared the GlideScope video laryngoscope, which has a camera system and a 60-degree blade angle, with standard Macintosh laryngoscopes and found a better Cormack-Lehane score for the GlideScope in 68% of the cases.[4] Moreover, Maharaj et al. compared the Airtraq and Macintosh laryngoscopes in a manikin study and found a better glottic view and ease of use with the Airtraq device, particularly in scenarios with difficult intubation.[9] We observed improvements of at least one Cormack-Lehane grade in 79.1% patients (26.7% of patients who were grades 3 or 4 and 52.4% of patients who were grade 2). The TruView laryngoscope may have advantages over the Macintosh laryngoscope, such as an easier glottic view. Although the optical equipment in these newer laryngoscopes provides a better glottic view, it requires more skilful eye and hand coordination due to the indirect image obtained during the procedure. In addition, the intubation tube can only be seen by the laryngoscopist at the vocal-cord level, and some problems may occur while guiding the tube.[8] In the present study, the intubation failure rate was 2.16% (n = 4). Although the glottic view was adequate in these patients, we could not advance the tube and achieve intubation with the TruView. This may have resulted from the anesthetist's lack of familiarity with the TruView, anatomical abnormalities in the patient or an indirect view of the glottis. Cooper et al.

Table 4 - No change in Cormack-Lehane grading.

Nochanging in Cormack Lehane grading	Number	Percentage of total patient (%)
*3-3°	3	1.6
*2-2°	3	1.6
*1-1°	28	15.1
Intubation failure	4	2.2

found that the GlideScope provided a good or excellent laryngeal view compared with direct laryngoscopy; however, the intubation failure rate was higher than the studies using direct laryngoscopy.[10] The TruView provides a midline entrance and may lead difficulties with manipulation of tongue which may prolong and complicate the intubation process. Conversely, the continuous oxygen flow system that was incorporated into the TruView cleaned away any secretions and prevented fogging, which can speed up intubation.

The present study had several limitations. First, it was not a blinded study and had substantial potential for observer bias. Second, we did not randomize the order in which the two techniques were performed. The Macintosh laryngoscopy was always performed before the TruView laryngoscopy. Third, the anesthetists were more experienced with the Macintosh blade than with the newer TruView blade. Finally, we did not assess the ease of intubation, and the study did not focus on which laryngoscope should be used for difficult intubations, especially in Cormack-Lehane grade-3 and grade-4 patients.

The present study demonstrated that the TruView EVO2 improves the Cormack-Lehane score and provides a better glottic appearance than the Macintosh laryngoscope. The lower cost of the TruView compared with videolaryngoscopes is another advantage.

The major drawback of the TruView laryngoscope is the requirement of a guide in all patients. In addition, the TruView only provides indirect images, which have been associated with difficulties in guiding the intubation tube. Although the TruView improved the Cormack-Lehane scores, especially in grade-2 and grade-3 patients, the TruView did not decrease the incidence of failed intubation.

In conclusion, the TruView EVO2 appears to be better than the Macintosh blade because of its continuous O_2 insufflation system, which cleans the secretions, and its optical apparatus, which significantly improves the view of the laryngeal entry.

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