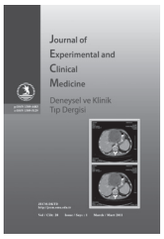
Journal of Experimental and Clinical Medicine
Deneysel ve Klinik Tıp Dergisi



Clinical Research

Assesment of Macintosh laryngoscope and Truview EVO2 video-laryngoscope with respect to hemodynamic and intubation quality in patients with presumptive difficult intubation

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ARTICLE INFO

Article History
Received 24 / 02 / 2011
Accepted 13 / 03 / 2011

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Keywords:
Intubation
Airway
Macintosh laryngoscope
Truview EVO2
Video-Laryngoscope
Hemodynamics

ABSTRACT

This study aims to compare Macintosh laryngoscope and Truview EVO2 video- laryngoscope with respect to the quality of glottic image, the success rate of intubation and their impact on the duration of intubation, hemodynamic responses and also related complications in patients with expected difficult intubation according to the Mallampati scoring system. Sixty patients in ASA I-II group ranging from 18-65 years of age were included in the study. Patients were randomly divided into two groups of 30 cases as group M (the group intubated with Macintosh laryngoscope) and Group V (the group intubated with Truview EVO2 video-laryngoscope). C-L (Cormack-Lehanne) score detected during intubation, duration of intubation, neck extansion needs, the success of intubation, complications, and antihypertensive requirement were recorded. Preoperatively, before induction, after induction, immediately after intubation, after intubation, 1st, 2nd, 3rd, 4th and 5 minute heart rate, systolic artesial pressure, diastolic arterial pressure, mean arterial pressure, peripheral oxygen saturation were recorded. There was a significant difference between both groups as for the quality of glottic images obtained. C-L III score was rated for 1 patient in Group M, and 10 patients in Group V ($p<0.05$) . Duration of intubation was 23 secs in Group M, and 42 secs in Group V, respectively ($p<0.05$). During intubation neck extension was significantly higher in Group M ($p<0.05$). Bleeding complication was observed in one patient's mouth during intubation in Group M while no complications were observed in Group V ($p>0.05$) . Number of attempts of intubation, hemodynamic parameters and need for antihypertensive showed no significant difference between the two groups ($p>0.05$). Truview EVO2 video-laryngoscope may be preferred to Macintosh blade laryngoscope because of better glottic and orafaringeal image acquisition in patients expected with difficult intubation and providing successful intubation in patients with contraindicated neck extension.
J. Exp. Clin. Med., 2011; 28:4-7

1. Introduction

Since the introduction of laryngoscope into clinical practice, all efforts have been targeted to perfect the shape of laryngoscope blade in order to provide better view of glottis and laryngeal structures and also to increase the success rate of endotracheal intubation. Despite these modifications, even in patients without any anticipated difficult intubation with normal anatomic structure, tracheal intubation may not be successful at all attempts (Gal et al., 2005).

To overcome difficult intubation, fiber optic bronchoscope, rigid laryngoscope (Shikani, Bullard, Wu scope), video-laryngoscope (Mac videoscope, Airtraq) and intubation styles can be used. In addition, retrograde intubation, crychotomy, emergency tracheostomy can be applied to provide a airline in cases that can not be intubated. In patients that airline can not be achieved, transtracheal jet ventilation, tube exchange catheterization or insufflation of oxygen through an elastic bougie (gum elastic bougie) are the short term solutions which can be resorted in cases of emergency (Chartes et al., 1996).

With conventional laryngoscopes such as Macintosh laryngoscope in order to be able to see the range of glottal opening, proper alignment of oral, pharyngeal and tracheal axes is required, while with video-laryngoscope image of the glottis can be retrieved without this requirement (Miceli et al., 2008). Truview EVO2 (Truphatek International Ltd., Netanya, Israel) video-laryngoscope is a modification of the Macintosh type. A lens system that transfers the image is attached to the distal part of the Macintosh blade and this lens gives a 40- degree viewing angle and images transported to the tip of the upper side of the blade to facilitate laryngoscopy. A camera can be mounted to the tip of the instrument

so as to record and magnify the image of vocal cords. While the lens and camera system of Truview EVO2 provides easier viewing of larynx, the absence of a groove for the insertion of an endotracheal tube, is perhaps the biggest disadvantage of this device.

This study aims to compare Macintosh laryngoscope and Truview EVO2 video-laryngoscopes with respect to the quality of glottic image, the success rate of intubation and their impact on the duration of intubation, hemodynamic responses and also related complications in patients with expected difficult intubation according to the Mallampati scoring system.

2. Materials and Methods

This study was performed on patients undergoing elective surgery in Ondokuz Mayis University School of Medicine, Department of Anesthesiology and Reanimation after obtaining the local ethics committee approval and written and verbal informed consent of the patients. Sixty patients in ASA I-II group ranging from 18-65 years of age were included in the study. Patients were randomly divided into two groups of 30 cases each using a computer-based randomization method. Pregnant women, patients with gastroesophageal reflux, delayed gastric emptying, serious respiratory and cardiovascular disease, limited nuchal ROM, kyphoscoliosis and those who had undergone or scheduled for an intraoral and neck surgery, or cases where intubation was not successful despite three attempts were not included in the trial.

During preoperative examination, age, sex, body weight, dental condition, tiromental distance, neck movements of the patients with Mallampati score III-IV were recorded. For premedication all patients received 5 mg diazepam po, 40 mg famotidine po at 10:00 PM, and 1 hour before surgery. Intubation was performed using a Macintosh blade laryngoscope in Group M, and a Truview EVO2 video-laryngoscope in group V. In both groups, induction of anesthesia was maintained with 2-3 mg / kg /IV propofol and fentanyl 1µg/kg/IV, and as a muscle relaxation with vecuronium 0.1 mg / kg /IV. In accordance with the standard practice, after achievement of adequate depth of anesthesia and muscle relaxation, all intubations were performed by the same anesthetist. In Group M; the intubations were performed under the guidance of the standard Macintosh laryngoscope without the use of style. Intubations were performed with a Truview EVO2 video- laryngoscope which was functionally pre-tested with all components mounted to the hilt of laryngoscopes including an oxygen line delivering oxygen at a rate of 10 L/min, and a digital camera attached to the ocular piece. For better control of the endotracheal tube tip, the style was used in this group (Fig. 1).

Fig. 1. Truview EVO₂ and Macintosh laryngoscope blades.

Heart rate (HR), systolic arterial pressure (SAP), diastolic arterial pressure (DAP), mean arterial pressure (MAP), peripheral oxygen saturation (SpO2) were recorded before and after induction, immediately after intubation, and at 1., 2., 3., 4. and 5. minute- post- intubation. End-tidal carbon dioxide (ETCO2) were recorded immediately after the intubation, and at 1., 2., 3., 4., and 5 minute- post-intubation.

Time interval between orotracheal placement of a laryngoscope blade to the attainment of the end tidal CO2 value was recorded as the duration of intubation. For the evaluation of vocal cords during intubation, Cormack and Lehanne Scoring System (C-L) was used. Number of unsuccessful attempts of intubation (if any), complications encountered during intubation (bleeding, lacerations, dental injury, etc.), and the neck extension need during intubation were recorded. When the baseline value of SAB increased $\geq$ 20 %, glyceryl trinitrate at a dose of 1µc/kg iv was instituted. Mann-Whitney U test was used for comparison of the data obtained from measurements between the groups, and Wilcoxon test was used for intra-group comparisons. For comparison of numerical data obtained, the chi-square test was used. $p<0.05$ was considered as statistically significant.

3. Results

Demographic characteristics and ASA physical status of the groups are shown in Table 1. In terms of these features, any statistically significant difference was not found between two groups ($p>0.05$).

Table 1. Comparing of demographic characteristics and ASA clas sification according to the groups.

	Group M N (%)	Group V n (%)	*P*
Gender			
Female	11 (%36.7)	14 (%46.7)	*0.432*
Male	19 (%63.3)	16 (%53.3)	
ASA			
I	11 (%36.7)	11 (%36.7)	*1.0*
II	19 (%63.3)	19 (63.3)	
Age(year)	50.7±10.59	46.0±14.84	*0.446*

There was a significant difference between both groups as for the quality of glottic images obtained. CL III score was rated for 1 patient in Group M, and 10 patients in Group V ($p<0.05$) . Duration of intubation was 23 secs in Group M, and 42 secs in Group V, respectively ($p< 0.05$)(Table 2).

Table 2. Comparing of the duration of intubation, anesthesia and surgery according to the groups.

	Group M Avg± SD	Group V Avg ± SD	*P*
Intubation time (sec)	23.1±11.12	42.7±15.20	***0.001***
Anesthesia time (min)	105.6±45.6	109.5±51.4	*0.842*
Surgery time (min)	97.3±44.1	101.1±50.8	*0.929*

All intubations were performed successfully in both groups and no significant difference was found between the two groups in terms of the number of intubation attempts ($p<0.05$) (Table 3).

Table 3. The comparison between the groups, the number of intubation attempts.

	Group M n %	Group V n %	*P*
Number of attempt			
I	26(%86.7)	27(%90)	
II	4(%13.3)	3(%10)	*0.690*
III	0	0	

During intubation neck extension was required in 27 (90%) patients in Group M and 1 (3.3%) patient in Group V ($p< 0.05$). While one patient with oral bleeding was observed as a complication in Group M, any complication was not noted in Group V ($p> 0.05$).

Hemodynamic parameters showed no significant difference between two groups ($p> 0.05$). Preoperative intra-group percentage changes in HR, SAP, DAP, MAP and peripheral SpO2 values were not significantly different from corresponding postoperative values (Table 4). SpO2 values at 2 minutes after tracheal intubation were significantly higher in Group V ($p<0.05$).

Table 4. Comparison of intragroup percentage changes in preop erative HR, SAP, DAP, MAP and peripheral SpO2 values with corresponding postintubation values.

	Group M Avg ± SD	Group V Avg ±SD	*P*
HR (%)	12.5±17.3	6.7±14.2	*0.277*
SAP (%)	2.1±14.4	1.0±18.4	*0.267*
DAP (%)	5.8±20.2	4.7±21.0	*0.971*
MAP (%)	2.3±14.6	3.5±19.5	*0.690*
SpO_2 (%)	1.9±1.7	1.7±1.8	*0.576*

4. Discussion

An endoscopic system was mounted on the standard laryngoscope blade to develop a video-laryngoscopy. Video-larygoscope produces perfectly clear and expandable video images of the airway. In recent years, an increasing number of studies associated with video-laryngoscope use have been encountered in the literature.

In a study related with glottic visualisation during difficult intubation, Enomoto et al. used Airway Scope (Pentax Corporation, Tokyo, Japan) video-laryngoscope and Macintosh blade laryngoscope in 203 patients undergoing general anesthesia with limited neck extension because of nuchal stabilization, and evaluated all views as C-L grade I in the Video Group and C-L grade III in 21 patients in the Macintosh Group (Enomoto et al., 2008). In another study, Malik et al. arrived at similar conclusions (Malik et al., 2008). Sun et al. in their study of 200 elective surgery cases, reported that they got much better glottic images with Glidescope (Saturn Biomedical System Inc., Burnbaby, Canada) video-laryngoscope when compared with the Macintosh laryngoscope blade (Sun et al., 2005). Miceli et al. prepared 3 airline model scenarios (normal airline, limited neck extension, swollen tongue) for 12 anesthetists and better glottic images were obtained with Truview EVO2 video-laryngoscope in comparison with the Macintosh laryngoscope blade (Miceli et al., 2008). In a comparative study, Singh et al. found that TruView EVO2 and Macintosh laryngoscope provided better laryngoscopic views than conventional laryngoscope in patients having one or more than one anticipated obstacles to easy intubation (Singh et al, 2009). This study also showed that video-laryngoscope is superıor over Macintosh layngoscope blade in glottic imaging as assesed by C-L scores.

In a study comparing the influential factors on the the duration of intubation, Miceli et al. compared Macintosh laryngoscope blade with Truview EVO2 video-laryngoscope.

Each intubation scenario were repeated 10 times for each anesthetist, and the authors found that duration of intubation was prolonged withTruview EVO2 (Miceli et al., 2008). In another study in 200 patients scheduled for elective surgery, Glidescope video-laryngoscope or Macintosh blade laryngoscope were used and the investigators found intubation time as 30 secs in the Macintosh and 46 secs in the Video Group (Sun et al., 2005). It was stated that although the time required for intubation was prolongted with Glidescope video-laryngoscope, still it could facilitate difficult intubation. In a study performed by non-anesthetists, Shimada et al. compared video-laryngoscope and Macintosh laryngoscope in nasotracheal intubation, and stressed that they could secure the airway within a shorter time with Glidescope video-laryngoscope (Shimada et al., 2010). Maruyama et al. compared intubation times and success rates in intubations realized using Airway Scope or Macintosh laryngoscope blades in 13 elective surgery planned patients, and they found no significant difference between two laryngoscopes in terms of intubation times and success rates (Maruyama et al., 2008). In our study carried out by one person with experience of 4 years in laryngoscopic interventions, the results obtained after a trial period of 10 cases indicated longer duration of intubation with Truview EVO2 video-laryngoscope than Macintosh laryngoscope blade despite preventive measures for unnecessary time loss before laryngoscopy. It was thought that despite better images were obtained with video-laryngoscope and the use of style, relatively longer duration of intubation was associated with the difficulty in positioning of the endotracheal tube.

In a study examining the success rates of intubation, Enomoto et al., (2008) considered all of the 99 intubations performed with Airway Scope video-laryngoscope, and 93 of 104 intubations in the Macintosh Group as successful interventions. In a study comparing the video- larygoscopy with conventional laryngoscopy in 18 pediatric patients with a history of difficult or failed intubations, it was emphasized that video-laryngoscopy enhanced larygoscopic image substantially relative to direct laryngoscopy (Armstrong et al., 2010). In a preliminary study that compared the intubation success rates among adult patients undergoing elective surgery under the guidance of Macintosh or Truview EVO2 laryngoscopes, Carlino et al., (2009) asserted that all patients were intubated at the first attempts with Truview EVO2 laryngoscopes which resulted in a lower frequency of complications, and stressed that video-laryngoscopes should be considered as useful devices for elective intubations in anesthesia education. In a study conducted with internists which compared Macintosh laryngoscopy with Glidescope video-laryngoscopy, four scenarios were tested on mannequins. It was found that intubation with Glidescope video-laryngoscope was not more succesful relative to the Macintosh type and the necessity of specific training programmes for the development of the operative skills was emphasized (Rodriguez-Nunez et al., 2010). Maruyama et al. compared intubation success rates obtain with video-laryngoscopes or Macintosh laryngoscope blades in13 patients scheduled for elective surgery and found

no significant difference between the two groups (Maruyama et al., 2008). In our study no significant difference was detected between the two laryngoscopes in terms of success rates. This finding suggested that rating the degree of intubation difficulty with Mallampati scores alone is not satisfactory in Mallampati III-IV cases, and in patients with presumptive difficult intubations diverse out-of-range outcomes will be anticipated. As a result, video laryngoscopy provides better operative conditions and glottic images for an intubation, but this finding can not guarantee easy and successful tracheal tube placement.

In a study examining the effects of neck extension on intubation, Maruyama et al., (2008) compared neck extension need, intubation time and success rates in intubations performed by Airway Scope or Macintosh laryngoscope in 13 patients undergoing elective surgery. In conclusion, their patients required greater number of neck extensions with Airway Scope® and no statistically significant difference was found in terms of intubation times and success rates between two laryngoscopes. In this study, unlike many other studies done previously, more neck extension was needed for examinations with Airway Scope video-laryngoscopes which were manufactured as an alternative to be used in difficult intubation cases with limited extension. In a study done on difficult airway built mannequins, Darshane et al., (2010) stressed that Truview EVO2, Glidescope video-laryngoscopes displayed similar features as Macintosh laryngoscopes and caused similar difficulties in challenging airways. In our study neck extension need in the Video group was required in a significantly lesser number of patients. This finding suggests that improved glottic view obtained with video-laryngoscope is associated with a reduction of this need.

It is concluded that the video-laryngoscope Truview EVO2 may be preferred to Macintosh blade laryngoscope because of better glottic and orafaringeal image acquisition in patients with anticipated difficult intubation which enable successful intubation in patients in whom neck extension is contraindicated.

REFERENCES

Armstrong, J., John, J., Karsli, C. 2010. A comparison between the GlideScope Video Laryngoscope and direct laryngoscope in paediatric pa tients with difficult airways - a pilot study. Anaesthesia. 65, 353-357.

Carlino, C., Pastore, J.C., Battistini, G.M., Cancellieri, F., De Caria, D., Ruggieri, N., Bordone, G., Bellato, V., 2009. Training resident anesthesiologists in adult challenging intubation comparing Truview EVO2 and Macintosh laryngoscope: a preliminary study. Minerva Anestesiol. Chartes, P. 1996.What future is there for predicting diffucult intubation. Br. J. Anaesth. 77, 309-331.

Darshane, S., Ali, M., Dhandapani, S., Charters, P., 2010. Validation of a model of graded difficulty in Laerdal SimMan: functional compari sons between Macintosh, Truview EVO2, Glidescope Video Laryngoscope and Airtraq. Eur. J. Anaesth.28, 175-180.

Enomoto, T., Asai, T., Arai, T., Kamishima, K., Okuda, Y., 2008. Pentax-AWS, a new videolaryngoscope, is more effective than the Macintosh laryngoscope for tracheal intubation in patients with restricted neck movements Br. J. Anaesth. 100, 544-548.

Gal, T.J., 2005. Airwya management. In: Miller RD.,ed. Miller's Anesthesia. 6th ed. Philadelphia: Elsevier Chuchill Livingstone, 1617-1652.

Malik, M.A., Maharaj, C.H., Harte, B.H., Laffey, J.G., 2008. Comparison of Macintosh, Truview EVO', GlideScope and Airwayscope laryngoscope use in patients with cervikal spine immobilization. Br. J. Anaesth. 101, 723-730.

Maruyama, K.,Yamada, T., Kawakami, R., Hara, K., 2008. Randomized cross-over comparison of cervical-spine motion with the AirWay Scope or Macintosh laryngoscope with in-line stabilization: a video-fluoroscopic study. Br. J. Anaesthesiology. 101, 563-567.

Miceli, L., Cecconi, M., Tripi, G., Zauli, M., Della Rocca, G., 2008. Evaluation of new laryngoscope blade for trakeal intubation, Truview EVO2: amanikin study. Eur. J. Anaesth. 25, 446-449.

Rodriguez-Nunez, A., Oulego-Erroz, I., Perez-Gay, L., Cortinas-Diaz, J., 2010. Comparison of the GlideScope Videolaryngoscope to the standard macintosh for intubation by pediatric residents in simulated child airway scenarios. Pediatr. Emerg. Care. 26, 726-729.

Shimada, M., Hirabayashi, Y., Seo, N., 2010. [Nasotracheal intubation using GlideScope videolaryngoscope or Macintosh laryngoscope by novice laryngoscopists]. Masui. 59, 1318-1320.

Singh, R., Singh, P., Vajifdar, H., 2009. A comparison of Truview infant EVO2 laryngoscope with the Miller blade in neonates and infants. Pediatr. Anaesth. 4, 338-342.

Sun, D.A., Warriner, C.B., Parsons, D.G., Klein, R., Umedaly, H.S., Moult, M., 2005. The GlideScope Video Laryngoscope: randomized clinical trial in 200 patients. Br. J. Anaesth. 94, 381-384.