ORIGINAL

AceScope™ monitor program revision does not facilitate tracheal intubation in novice physicians : A manikin simulation study

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Abstract : Whether the difference in video laryngoscope view affects the success of endotracheal intubation in beginners is unknown. In the current study, we aimed to investigate whether the revision of the monitor program in a Macintosh-type video laryngoscope, AceScope™, enhances the endotracheal tube intubation skill in novice physicians. Participants with no experience performing tracheal intubation were assigned to the pre- (n=15) and post-program revision (n=16) groups. Each participant performed tracheal intubation twice using the assigned version of the AceScope™ video laryngoscope on an immobilized airway setting in the manikin. We assessed the intubation success rate, intubation time, frequency of dental injury, numerical rating scale (NRS) of easiness, and the Cormack & Lehane (CL) classification. The intubation success rate did not differ between the pre-program revision (93%) and post-program revision (100%) groups. The median intubation times were not different between pre- (39 seconds) and post- (31 seconds) groups. The frequency of dental injury, the NRS of easiness, and the CL classification were similar between the two groups. The program revision of the AceScope™ video laryngoscope did not alter the intubation success rate and median intubation time in novice physicians. Improving the video laryngoscope's monitor view does not enhance solely beginners' intubation conditions. J. Med. Invest. 73 : 32-35, February, 2026

Keywords **:** *Intubation, novice physician, program, video laryngoscope*

INTRODUCTION

Video laryngoscopes are standard airway management tools for clinicians worldwide (1-3). However, whether video laryngoscopy adds some advantages for novice practitioners, including the learning process, has been unclear. Even a video laryngoscope, such as McGrath MAC™ (Covidien Japan, Tokyo, Japan), which proved excellent quality in a randomized controlled trial (4) could not improve the first-attempt endotracheal intubation success rate in novice physicians despite providing the better visualization of the glottic view (5). One of the reasons for the disappointing results is the difficulty of advancing an endotracheal tube to the glottis with the use of a video laryngoscope monitor view for beginners. Indeed, a previous study documented the frequent need for a bougie application on intubation using McGrath MAC™ video laryngoscope by novice physicians (5). These results suggest that using an endotracheal tube guide may become a strategy for novice physicians to secure the intubation technique using a video laryngoscope.

AceScope™ (ACE Medical, Seoul, Korea) has a similarly shaped curved blade compared with existing Macintosh-type video laryngoscopes, including the McGrath MAC™ laryngoscope. The remarkable difference between the two scopes is that the AceScope™ video laryngoscope can employ a blade with a tube guide channel (Figure 1a). Thus, the AceScope™ video laryngoscope features indicate that using a blade with a tube guide channel may help novice physicians improve endotracheal intubation success. We found that the laryngeal view via the early version of the AceScope™ video laryngoscope existed somewhat in the corner of the monitor (Figure 1b, 6). Ace Medical (Seoul, Korea), the AceScop™ laryngoscope provider, recently revised the display program built into it, resulting in an improved scope view (Figure 1c, 7). However, whether the scope view difference between the pre-and post-revision of the program affects the endotracheal intubation success using the scope is unknown.

Therefore, we aimed to examine in the current study whether the monitor program revision in a video laryngoscope equipped with a tube guide channel blade accelerates the endotracheal tube intubation skill in novice physicians. For this purpose, we employed a manikin simulation study to determine whether the AceScope™ programs before and after the revision facilitate tracheal intubation time as well as the success rate in novice physicians.

METHODS

We implemented the current study from July 2023 to July 2024 at the Department of Anesthesiology, Seirei Mikatahara General Hospital, Hamamatsu, Japan, after the Clinical Research Review Board approval (approval number : 23-15). Also, this study was registered in the University Hospital Medical Information Network Clinical Trials Registry (UMIN000056008). The procedures in the current study followed the "Declaration of Helsinki" and the ethical standards of the responsible committee on human experimentation. Thirty-one novice physicians participated in this study. We obtained written informed consent from all participants before beginning the study. Novice physicians were first-year hospital residents and had no experience

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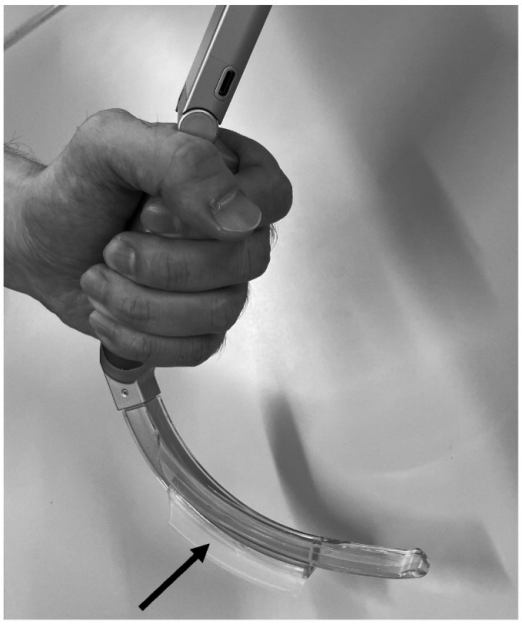
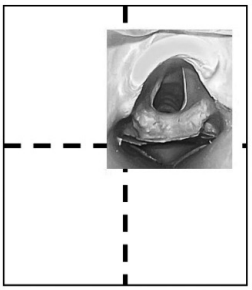
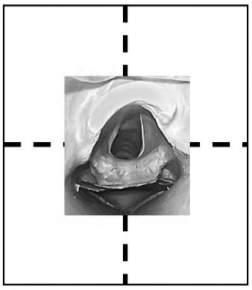


a. AceScope™ equipped with a blade that installs a tube guide channel



b. The monitor view before the program revision



c. The monitor view after the program revision

Figure 1. a. AceScope™ (ACE Medical, Seoul, Korea) is a video laryngoscope equipped with a blade that installs a tube guide channel indicated by a black allow. b and c. The schematic difference of the AceScope™ monitor views between pre- and post-revision of the program. Please note that the laryngeal view of the pre-revision displayed on the AceScope™ monitor exists in the upper right corner (b) and that the view of the post-revision on the monitor exists in the center (c). We newly drew figures b and c using information from reference 7.

performing tracheal intubation.

Study design

All enrolled novice physicians implemented endotracheal intubation procedures in the AirSim™ airway training system (Nihon Light Service, Inc. Tokyo, Japan) using AceScope™ video laryngoscope equipped with the Ace Blade 3TM (ACE Medical, Seoul, Korea) disposable blade with a tube guide channel and a SealGuard Evac™ endotracheal tube (internal diameter 7.0 mm ; Covidien Japan, Tokyo, Japan, 6, 7). The participants had a training session guided by two trained anesthesiologists (AK and HK) for 5 minutes before the measures using AceScope™ video laryngoscope. After completion of the intubation training, participants were assigned to the pre- (n=15) and post-program revision (n=16) groups. Each participant performed tracheal intubation twice using the assigned version of the AceScope™ video laryngoscope on an immobilized airway setting with a cervical collar placed around the neck of the manikin, resulting in reduced neck extension and mouth opening. We assessed the intubation success rate, intubation time, frequency of dental injury (audible teeth click), laryngeal view, and physician's numerical rating scale (NRS) of easiness. We defined intubation time as the duration from picking up the video laryngoscope to placing it back on the table after completing the intubation. An investigator (AK) verified whether the trachea was intubated on the video laryngoscope monitor. Failed intubation was determined as a case where the trachea was not intubated or where the duration of the procedure exceeded 120 seconds. Each participant was further asked to grade the laryngeal view obtained by referring to an illustration of the Cormack & Lehane classification on a scale from 1 to 4 after each intubation attempt and to rate the ease of the device on NRS from 1 (extremely easy) to 10 (extremely difficult).

Statistics

Statistical analysis was performed using IBM SPSS™ Statistics ver. 27 (IBM Japan Inc., Tokyo, Japan). Data are shown as median and IQR for continuous variables, while the Mann-Whiney U test performed the group comparisons. Categorical variables are given the number of cases (%), whereas the χ^2 test performed the group comparisons. Differences were considered to be statistically significant when P was < 0.05. We also used IBM SPSS™ Statistics ver. 27 for the power calculation. Assuming a 12-second intubation time difference between groups is clinically significant, we calculated that 23 times intubation trials by novice physicians per group would be needed to have 80% power at a 2-sided α level of 0.05 when SD was 14 seconds (8). Enrolled intubation trials by novice physicians increased to allow for potentially incomplete data collection.

RESULTS

Table 1 shows demographic data and parameters before and after the monitor view revision of AceScope™. Pre- or post-program revision groups included 30 and 32 trials, respectively. The intubation success rate did not differ between pre- (93%) and post- (100%) program revision groups. Two failed intubations in the pre-revision group were due to the overtime procedures beyond 120 seconds, while no esophageal intubation was noted. The median intubation times were not different between the pre- (39 seconds) and post- (31 seconds) groups, and the frequency

Table 1. Demographic data and parameters before and after the monitor view revision of AceScope™

	Before (n = 30)	After (n = 32)	P
Female physician (%)	18 (60)	10 (31)	0.023
Intubation success (%)	28 (93)	32 (100)	0.134
Intubation time (sec)	39 (25 to 53)	31 (22 to 49)	0.254
Dental injury times (0/1/2)	29/0/1	31/1/0	0.367
Laryngeal view (1/2/3/4)	11/19/0/0	15/17/0/0	0.419
Physician NRS (1/2/3/4/5/6/7/8/9/10)	0/6/9/6/4/2/1/0/0/2	3/5/7/5/5/5/1/0/0/1	0.647

Data are shown as median (interquartile range) for continuous variables, while the Mann-Whiney U test performed the group comparisons. Categorical variables are given the number of cases (%), whereas the χ^2 test performed the group comparisons. Differences were considered to be statistically significant when P was < 0.05.

of dental injuries was the same in both groups. The laryngeal views graded using the Cormack & Lehane classification were similar between the two groups. The NRS regarding intubation easiness did not change before or after the monitor program revision.

DISCUSSION

We conducted the current manikin simulation study with a difficult airway to evaluate whether the monitor program revision of the AceScope™ video laryngoscope accelerates the endotracheal tube intubation skill for novice physicians. Before the study commencement, we anticipated that the program revision would allow the novice to obtain a broad view of tube manipulation, improving intubation conditions. Indeed, our previous study demonstrated that the monitor program revision of the AceScope™ video laryngoscope improved the monitor view (6, 7). In contrast to our expectation, the program revision did not alter the intubation success rate, median intubation time, and frequency of dental injuries. Also, the laryngeal views were similar between the pre- and post-program revision groups. Indeed, the NRS regarding intubation easiness did not change before or after the monitor program revision. Therefore, our results indicate that the monitor view improvement of the AceScope™ video laryngoscope with an endotracheal tube channel does not solely contribute to enhancing novice physicians' intubation conditions.

A previous study examined the novice physicians' intubation condition and the success rate differences between the channeled video laryngoscopes (Airtraq™ and AirwayScope™) and Macintosh direct laryngoscope (9). The results concluded that novices achieved a higher initial success rate and shorter intubation time using the two channeled video laryngoscopes in the studied condition (9). Novice physicians are more likely to require external manipulation to obtain a satisfactory view when using the C-MAC™ and Coopdech™ video laryngoscopes without an endotracheal tube channel (10). Also, the intubation success rate and intubation time difference do not differ between non-channeled video laryngoscopes (Glidescope™, McGrath MAC™, and TruView™) and Macintosh laryngoscope (9). Therefore, the above results suggest that a video laryngoscope with a tube channel, including AceScope™, may be better than non-channeled video laryngoscopes and Macintosh laryngoscopes when novice physicians employ them for endotracheal intubation.

We have to mention the limitations of the current study. First, we did not compare the studied variables in the non-channeled video laryngoscope and the conventional Macintosh laryngoscope in novice physicians since the current study focused on whether the monitor program revision accelerates the endotracheal tube intubation skill using single video laryngoscope for beginners. Second, we did not evaluate how the user's clinical experience, other than endotracheal intubation, affects the video laryngoscope with a tube channel in novice physicians. Third, the current study employed an immobilized airway setting only with reduced neck extension and mouth opening since clinicians use video laryngoscopes in patients with difficult airways. Fourth, we did not implement a comparison between novice and expert physicians in the current study setting. Fifth, in the current study, the pre-program revision group had a significantly higher proportion of female physicians (60%) than the post-program revision group (31%). It is unlikely that the gender difference affected the above study results since we did not find any parameter differences regarding intubation before and after the AceScope program revision. However, we cannot completely rule out a possible role of gender difference in the intubation skill during the AceScope use. Therefore, further studies will be required to overcome the above limitations in the current study.

CONCLUSIONS

The program revision of a tube-channel equipped Macintosh-type video laryngoscope AceScope™ did not alter the intubation success rate, median intubation time, and frequency of dental injuries in novice physicians. Therefore, our results indicate that improving the monitor view of the Macintosh-type video laryngoscope with an endotracheal tube channel does not solely contribute to the enhancement of novice physicians' intubation conditions.

CONFLICT OF INTEREST

The authors have no conflict of interest.

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