

A comparison of McCoy, TruView, and Macintosh laryngoscopes for tracheal intubation in patients with immobilized cervical spine

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ABSTRACT

Background: Cervical spine immobilization results in a poor laryngeal view on direct laryngoscopy leading to difficulty in intubation. This randomized prospective study was designed to compare the laryngeal view and ease of intubation with the Macintosh, McCoy, and TruView laryngoscopes in patients with immobilized cervical spine.

Materials and Methods: 60 adult patients of ASA grade I-II with immobilized cervical spine undergoing elective cervical spine surgery were enrolled. Anesthesia was induced with propofol, fentanyl, and vecuronium and maintained with isoflurane and nitrous oxide in oxygen. The patients were randomly allocated into three groups to achieve tracheal intubation with Macintosh, McCoy, or TruView laryngoscopes. When the best possible view of the glottis was obtained, the Cormack-Lehane laryngoscopy grade and the percentage of glottic opening (POGO) score were assessed. Other measurements included the intubation time, the intubation difficulty score, and the intubation success rate. Hemodynamic parameters and any airway complications were also recorded.

Results: TruView reduced the intubation difficulty score, improved the Cormack and Lehane glottic view, and the POGO score compared with the McCoy and Macintosh laryngoscopes. The first attempt intubation success rate was also high in the TruView laryngoscope group. However, there were no differences in the time required for successful intubation and the overall success rates between the devices tested. No dental injury or hypoxia occurred with either device. **Conclusion:** The use of a TruView laryngoscope resulted in better glottis visualization, easier tracheal intubation, and higher first attempt success rate as compared to Macintosh and McCoy laryngoscopes in immobilized cervical spine patients.

Key words: Anesthesia: general, cervical immobilization, equipments: Macintosh laryngoscope, McCoy laryngoscope, TruView laryngoscope, technique: tracheal intubation

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INTRODUCTION

Tracheal intubation must be performed with utmost care in patients with cervical spine fractures or other cervical pathology to prevent cord damage. The use of semi-rigid cervical collar or manual in-line stabilization of the cervical spine to prevent neck movements may result in poor laryngeal view on conventional laryngoscopy

leading to difficulty in intubation.^[1,2] Several options have been mentioned by various authors for intubation in such patients, like direct laryngoscopy with the aid of a gum elastic bougie, Airway Scope, McCoy laryngoscope, C-Trach, Intubating Laryngeal Mask Airway and Bullard laryngoscope have been used with different success rate.^[3-5]

The McCoy laryngoscope (Penlon) is designed to elevate the epiglottis with its hinged tip and requires less neck movement during laryngoscopy.^[6] It is frequently used to facilitate tracheal intubation when the view of the glottic opening is restricted.^[7] The TruView EVO2 (Truphatek International Ltd, Netanya, Israel) is a modified laryngoscope that expands the angular view of the larynx and adjacent structures with the help of an optical system view tube which consists of prisms and lenses, thereby facilitating intubation.^[8,9]

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DOI:

10.4103/1658-354X.130705

The advantage of McCoy and TruView laryngoscopes over conventional laryngoscope has been demonstrated in direct comparison studies.^[10-12] However, relative efficacies of these devices in comparison with the Macintosh laryngoscope have not been compared in cervical injury patients. Therefore, this randomized, prospective study was planned to compare the effectiveness of Macintosh, McCoy, and TruView laryngoscopes for ease of intubation in patients with immobilized cervical spine.

MATERIALS AND METHODS

After approval from hospital ethics committee and written informed consent, 60 adult ASA grade I-II patients of cervical trauma undergoing elective cervical spine surgery requiring tracheal intubation as part of anesthesia were enrolled. Patients with increased risk of pulmonary aspiration, history of difficult intubation, or anticipated airway difficulties were excluded. They were randomly assigned to three groups based on the device used for laryngoscopy. In group M patients Macintosh laryngoscope was used, in group MC McCoy laryngoscope was used, and in group TV TruView laryngoscope was used for laryngoscopy during tracheal intubation. Randomization was based on computer-generated codes that were concealed in sequentially numbered opaque envelopes. Manual in-line stabilization of head and neck was applied in all cases during intubation to prevent neurological damage.

Patients were fasted for solids for at least 8 h before surgery and received oral alprazolam 0.25 mg at night before surgery. Anesthesia was induced with fentanyl 2 µg/kg and propofol 2-3 mg/kg till loss of verbal response and maintained with isoflurane in 60% nitrous oxide and oxygen. Muscle relaxation was achieved with vecuronium 0.1 mg/kg. After 3 min of controlled ventilation, laryngoscopy was performed with Macintosh, McCoy, or TruView laryngoscopes (according to the group assigned) and the best possible view of the glottis was obtained. Oxygen was connected to the TruView blade and a flow rate of 6 L/min was kept to prevent fogging. After achieving best possible view of the glottis, two different anesthesiologists were asked to report (the mean values of the two were used for analysis) the vocal cord visualization using the Cormack-Lehane grading (grade 1-4)^[13] and the percentage of glottic opening (POGO) score (0 to 100%, 100 = full view of glottis from anterior commissure to the inter-arytenoid notch, 0 = even inter-arytenoid notch is not seen). If adequate glottic view for intubation was not seen to the viewers, manipulations were performed as recommended in the instruction manual of the device. The endotracheal cuffed tube of appropriate size (7.5 and 8.5 mm internal diameter for women and men, respectively)

was advanced into the trachea under direct vision. Finally, the scope was removed and the respiratory circuit was connected. The adequacy of ventilation was confirmed by chest auscultation and capnography. If the first intubation attempt failed, a next attempt was made after mask ventilation for 1 minute. In each group, tracheal intubation was considered a failure if it could not be accomplished in three attempts. All intubations were performed by an experienced anesthesiologist whose previous experience included more than 20 intubations with each laryngoscope.

The number of intubation attempts, the number of optimization maneuvers required (use of stylet, laryngeal manipulations) to aid tracheal intubation, the duration of successful attempt (defined as the time from insertion of the laryngoscope to confirmation of intubation by capnography), and the intubation success rate were recorded. The intubation difficulty score^[14] (IDS 0 = easy, IDS 1-5 = slight difficulty, IDS >5 = major difficulty in intubation) was calculated (primary outcome). The incidence of esophageal intubation, mucosal trauma, or dental injury was recorded. The heart rate (HR), ECG, oxygen saturation (SpO₂), and mean arterial pressure (MAP) were recorded at the baseline, post induction, just after tracheal intubation and at 1, 3, and 5 min post intubation. Any episode of hypotension (MAP <20% of baseline), bradycardia (HR <40 bpm), hypertension (MAP >20% of baseline), cardiac arrhythmia, or hypoxemia (SpO₂ <90%) was noted.

Statistical analysis

Normally distributed data was compared using one-way analysis of variance (ANOVA). The non-parametric data were analyzed using Kruskal-Wallis analysis of variance followed by the Mann-Whitney U-test for intergroup differences. The comparisons of heart rate and blood pressure were made using repeated measures ANOVA. A pair-wise comparison of the mean values was performed by the paired *t*-test with Bonferroni correction. Qualitative or categorical variables were described as frequencies and compared with the chi-squared test or the Fisher exact test whichever was applicable. All statistical tests were two sided and were performed at a significance level of $\alpha = 0.05$. Sample size was calculated at 95% significance level and 80% power, assuming the difference of 2 in the mean intubation difficulty score.

RESULTS

The groups were similar with respect to demographic data and ASA physical status [Table 1]. The intubation difficulty score were significantly less in the TruView group as compared with other groups ($P < 0.001$).

Eleven patients had easy intubation (IDS score = 0) in the TruView laryngoscope group as compared to only 5 patients in the Macintosh group and 7 patients in the McCoy group [Figure 1]. The Cormack-Lehane glottic view and the POGO scores were better with TruView and McCoy laryngoscopes as compared with the Macintosh laryngoscope [Figures 2 and 3]. The first attempt success rate was 95% in the TruView laryngoscope group while 84% in the Macintosh group and 91% in the McCoy group. However, the overall success rate was comparable among the groups [Table 2]. There were no significant differences in the time required for successful intubation and the number of intubation attempts between the devices tested.

The effects of laryngoscopy on heart rate and blood pressure were transient. The heart rate and mean arterial pressure increased after intubation in all groups but returned back to base line within 5 min after intubation in each group. The increase in heart rate and mean arterial pressure was less with TruView and McCoy laryngoscopes as compared to the Macintosh laryngoscope. No episode of hypoxia was reported. There were no between-group differences in the incidence of complications. Mucosal trauma occurred in two patients in Macintosh group and one patient in McCoy group. One patient had esophageal intubation in the Macintosh group. No incidence of dental injury or severe airway laceration was reported with either device.

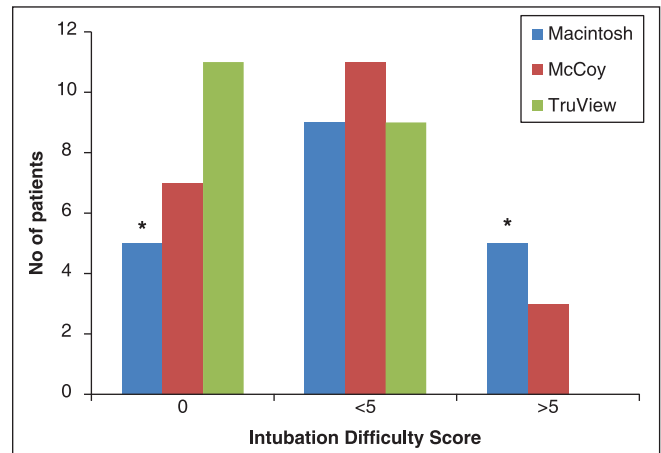


Figure 1: Intubation difficulty score, **P* < 0.01, a comparison between Macintosh and TruView groups

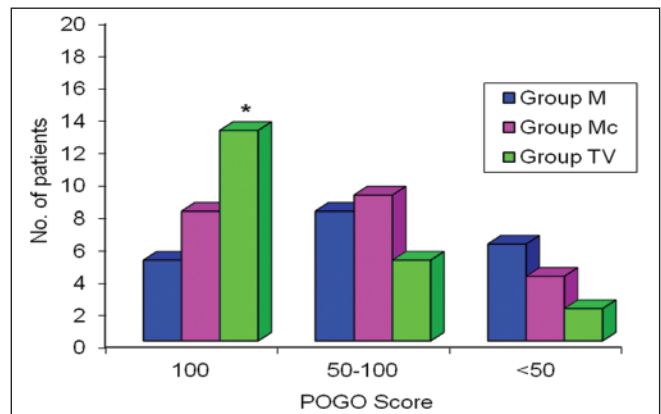


Figure 2: Cormack-Lehane Laryngoscopic view, **P* < 0.001, a comparison between Macintosh and TruView groups

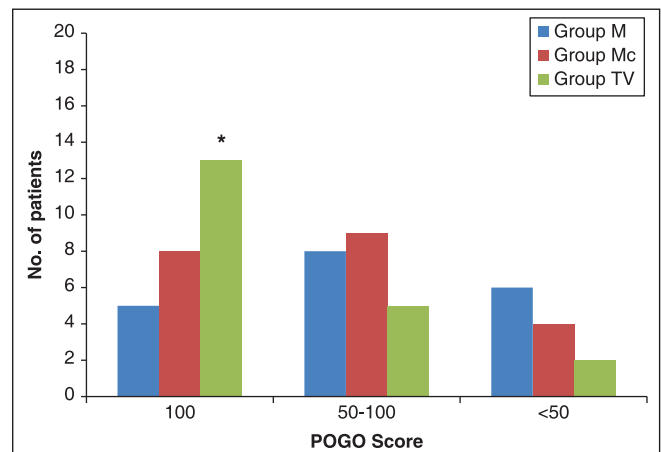


Figure 3: Glottic view: POGO Score, **P* < 0.001, comparison between Macintosh and TruView groups

Table 1: Demographic data

	Macintosh group (N=19)	McCoy group (N=21)	TruView group (N=20)
Age (year)	36.6±13.2	41.5±16.4	37.1±11.7
Weight (kg)	71.6±9.2	66.2±8.4	70.1±10.1
Height (cm)	173.4±11.7	170.9±9.6	159.7±13.2
Gender (Male: Female)	17:2	17:4	15:5
ASA status (I:II)	16:3	16:5	14:6

Data presented as mean±SD or number of patients

Table 2: Intubation success rate, time, and airway complications

	Macintosh group (N=19)	McCoy group (N=21)	TruView group (N=20)
Successful intubation, n (%)	19 (100)	21(100)	20 (100)
1 st attempt success rate	84%	91%	95%*
2 nd attempt success rate	97%	100%	100%
No. of attempts 1/2/3	16/2/1	19/2/0	19/1/0
Intubation time (seconds)	29.6±11.4	33.8±8.2	36.2±7.5
Esophageal intubation	1	0	0
Mucosal trauma	2	1	0

Data presented as mean±SD or number and percentage of patients, **P*<0.01, Comparison between Macintosh and TruView groups

DISCUSSION

In the present study, the TruView laryngoscope reduced the intubation difficulty score and improved the glottis view,

compared with Macintosh and McCoy laryngoscopes in patients with immobilized cervical spine. However, the time to intubation and overall success rate were not improved with either laryngoscope.

In-line stabilization of cervical spine prevents head extension and neck flexion necessary for optimal alignment of the three airway axes leading to poor exposure of vocal cords that may result in an increase incidence of Grade 3 and 4 laryngoscopic views with conventional laryngoscopy. The McCoy laryngoscope has been reported as improving the Cormack — Lehané laryngoscopic view by at least one grade in 45.1% of patients wearing a rigid cervical collar,^[10] and in 49% of patients whose neck was stabilized with manual in-line stabilization.^[11] In our study, the McCoy laryngoscope improved the laryngoscopic views and reduced the intubation difficulty score as compared with the Macintosh laryngoscope but found to be less superior than the TruView laryngoscope. Though, lifting the epiglottis with the McCoy laryngoscope improves glottic exposure, it may require some extension of cervical spine to expose the larynx. Bilgin and Bozkurt^[4] reported that McCoy requires an average intubation time of 30 s and results in a 94% first attempt success rate in patients with simulated cervical spine injury. In the present study, the intubation success rate was 91% at the first attempt and intubation time was 34 s with the McCoy blade.

A TruView laryngoscope provides an indirect view of glottis without need to align oral, pharyngeal, and tracheal axes and therefore requires no cervical spine movements. Previous studies have demonstrated that TruView improves the laryngeal view when compared with the Macintosh laryngoscope in patients with normal and anticipated difficult airways.^[12,15] TruView has been used successfully in patients with difficult airways in whom laryngoscopy with the Macintosh laryngoscope failed.^[16] We found that the Cormack-Lehané view and the glottis view (POGO score) were best with the TruView laryngoscope as compared with the other devices tested. Furthermore, the TruView laryngoscope required less number of optimization maneuvers and had reduced intubation difficulty scores. In a recent study, Joseph *et al.*^[17] also reported low intubation difficulty scores with the TruView laryngoscope than with the McCoy laryngoscope in patients with cervical spine immobilization.

In the present study, the time to intubation with the TruView laryngoscope was comparable with McCoy and Macintosh laryngoscopes. However, few studies reported an increase in time to intubation with the TruView laryngoscope due to some difficulties experienced during advancement of the tracheal tube toward the glottis.^[12,15] The main problem with the TruView laryngoscope is fogging on

the distal lens which may reduce the image quality. We used oxygen insufflation from the side port to reduce lens fogging. Blunted hemodynamic response with the TruView laryngoscope shows less laryngeal manipulations and force required during intubation, thereby reducing the potential for hemodynamic stimulation.

The main limitation of this study is that the potential of observer bias exists, as it is impossible to blind the anesthesiologist to the device being used. However, we incorporated the intubation difficulty score for the assessment of ease of intubation that incorporate multiple indices of intubation difficulty and objectively quantifies the complexity of tracheal intubations. Another limitation of our study is that we did not compare the relative efficiencies of these devices with other intubation modalities which are recommended in difficult airway scenarios, such as the intubating laryngeal mask airway, the Bullard laryngoscope, Airtraq, and glidescope. Further comparative studies are needed to determine the relative efficacies of these devices.

In conclusion, a TruView laryngoscope possesses more advantages over Macintosh and McCoy laryngoscopes for tracheal intubation in patients with immobilized cervical spine.

REFERENCES

- Goutcher CM, Lochhead V. Reduction in mouth opening with semi-rigid cervical collars. *Br J Anaesth* 2005;95:344-8.
- Heath KJ. The effect of laryngoscopy of different cervical spine immobilisation techniques. *Anesthesia* 1994;49:843-5.
- Komatsu R, Kamata K, Hoshi I, Sessler DI, Ozaki M. Airway Scope and gum elastic bougie with Macintosh laryngoscope for tracheal intubation in patients with simulated restricted neck mobility. *Br J Anaesth* 2008;101:863-9.
- Bilgin H, Bozkurt M. Tracheal intubation using the ILMA, C-Trach or McCoy laryngoscope in patients with simulated cervical spine injury. *Anesthesia* 2006;61:685-91.
- Watts AD, Gelb AW, Bach DB, Pelz DM. Comparison of the Bullard and Macintosh laryngoscopes for endotracheal intubation of patients with a potential cervical spine injury. *Anesthesiology* 1997;87:1335-42.
- McCoy EP, Mirakhur RK. The Levering Laryngoscope. *Anesthesia* 1993;48:516-9.
- Uchida T, Hikawa Y, Saito Y, Yasuda K. The McCoy levering laryngoscope in patients with limited neck extension. *Can J Anesth* 1997;44:674-6.
- Li JB, Xiong YC, Wang XL, Fan XH, Li Y, Xu H, *et al.* An evaluation of the TruView EVO2 laryngoscope. *Anesthesia* 2007;62:940-3.
- Matsumoto S, Asai T, Shingu K. Truview video laryngoscope in patients with difficult airways. *Anesth Analg* 2006;103:492-3.
- Gabbott DA. Laryngoscopy using the McCoy laryngoscope after application of a cervical collar. *Anesthesia* 1996;51:812-4.
- Laurent SC, de Melo AE, Alexander-Williams JM. The use of the McCoy laryngoscope in patients with simulated cervical spine injuries. *Anesthesia* 1996;51:74-5.
- Barak M, Philipchuck P, Abecassis P, Katz Y. A comparison of the TruView blade with Macintosh blade in adult patients. *Anesthesia* 2007;62:827-31.

13. Cormack RS, Lehane J. Difficult tracheal intubation in obstetrics. *Anesthesia* 1984;39:1105-11.
14. Adnet F, Borron SW, Racine SX, Clemessy JL, Fournier JL, Plaisance P, *et al.* The Intubation Difficulty Scale (IDS); Proposal and Evaluation of a new score characterizing the complexity of endotracheal intubation. *Anesthesiology* 1997;87:1290-7.
15. Malik MA, Maharaj CH, Harte BH, Laffey JG. Comparison of Macintosh, Truview EVO2, Glidescope, and Airway scope laryngoscope use in patients with cervical spine immobilization. *Br J Anaesth* 2008;101:723-30.
16. Matsumoto S, Asai T, Shingu K. Truview video laryngoscope in patients with difficult airways. *Anesth Analg* 2006;103:492-3.
17. Joseph J, Sequeira T, Upadya M. Comparison of the use of McCoy and TruView EVO2 laryngoscopes in patients with cervical spine immobilization. *Saudi J Anaesth* 2012;6:248-53.

How to cite this article: Bharti N, Arora S, Panda NB. A comparison of McCoy, TruView, and Macintosh laryngoscopes for tracheal intubation in patients with immobilized cervical spine. *Saudi J Anaesth* 2014;8:188-92.

Source of Support: Nil, **Conflict of Interest:** None declared.