

## Comprehensive Evaluation and Comparison of Laryngoscopy using Truview Videolaryngoscope with Macintosh Laryngoscope: A Hospital Based Study.

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**Abstract :** The Truview laryngoscope is a newly introduced videolaryngoscope with optical apparatus which provides a better glottic view. The study was planned to compare and evaluate the outcome of laryngoscopy using Truview laryngoscope and Macintosh laryngoscope for endotracheal intubations in patients in routine surgeries. We compared the findings of Truview laryngoscopy and Macintosh laryngoscopy in 60 patients undergoing general anaesthesia. Patients were divided into two groups of 30 each randomly. The two laryngoscopic views and intubating conditions were compared in terms of Cormack and Lehane grades, total time of intubation which was further divided into time taken for laryngoscopy and intubation considering the ease of intubation, attempts at intubation, haemodynamic response and soft tissue damage during laryngoscopy was studied. Truview laryngoscope provided a better laryngoscopic view than the Macintosh laryngoscope as confirmed by improved Cormack and Lehane grades. Also, the total time taken for intubation was similar with both the blades. **Conclusion:** Truview laryngoscope does have an extra benefit over Macintosh laryngoscope with respect to better laryngoscopic view and it takes almost similar time for intubation. Further, due to the learning curve with a new technique and equipment, there is a need for more exposure and expertise.

### INTRODUCTION

The Macintosh laryngoscope has been the most widely used device for intubation since its invention by Foregger in the 1940s<sup>1</sup>. Since the introduction of laryngoscope into clinical practice, all efforts have been targeted to achieve perfection in attaining 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<sup>2</sup>. Better laryngoscopes have been developed to overcome anatomical obstacles<sup>1</sup>.

Truview video-laryngoscope is a modification of the Macintosh laryngoscope. 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 are transported to the tip of the upper side of the blade to facilitate laryngoscopy. A camera can be mounted to the top of the instrument so as to record and magnify the image of vocal cords<sup>3</sup>.

The Truview laryngoscope provides a midline entrance and may lead to difficulties with manipulation of tongue which may require more skill and experience of an anesthesiologist. Conversely, the continuous oxygen flow system that is incorporated into the Truview laryngoscope cleans away any secretions and prevents fogging of the prism at tip of laryngoscope, which can speed up intubation and improves Cormack and Lehane grading by one or more grade when compared with Macintosh laryngoscope in patients with anticipated difficult airway<sup>4</sup>.

Therefore, the present study was planned to determine whether Truview laryngoscope can be used routinely for endotracheal

intubation in place of Macintosh laryngoscope in patients with normal distribution of airway characteristics. The primary aim of this study was to assess the improvement in Cormack and Lehane grading and the total time taken for intubation *i.e.*, time taken for laryngoscopy and the time taken for intubation. The secondary aim was to assess the ease of intubation, haemodynamic response and soft tissue trauma, if any.

### MATERIALS AND METHODS

Following the Institute's Ethical committees approval, a written informed consent was taken from the patient during the hospital based study which was conducted in 60 ASA I and II patients of age 18-65 years. Patients with cervical spine injury, with uncontrolled hypertension and cardiovascular disorder, and with raised intracranial pressure were excluded.

The patients were distributed randomly in two groups of 30 patients each according to laryngoscope used for intubation. Patients in Group I were intubated with Macintosh laryngoscope and patients in Group II were intubated with Truview laryngoscope. All patients were subjected to a thorough pre-anaesthetic checkup and airway evaluation. Premedication was given and patient was advised to fast for 8 hours prior to surgery. Intraoperatively haemodynamic responses (heart rate, systolic and diastolic blood pressure, mean arterial pressure and peripheral oxygen saturation) were continuously monitored and recorded before and after laryngoscopy and at an interval of 3, 5 and 10 minutes after intubation. All the patients were kept in neutral position *i.e.*, no flexion of neck or extension at atlanto-occipital joint. After preoxygenation with 100% oxygen, anaesthesia was induced with intravenous Fentanyl 0.5 µg/kg followed by Propofol 2.5 mg/kg. After confirming face mask ventilation adequacy, succinylcholine 1.5 mg/kg was given. After 30 seconds, laryngoscopy was performed according to the group allocated. The size of the blade depended upon weight of the patient. Size 3 blade of Macintosh laryngoscope and medium sized blade of Truview laryngoscope for patient's weight up to 50 kg and size 4

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blade of Macintosh laryngoscope and large sized blade of Truview laryngoscope for patient having weight more than 50 kg. At the time of laryngoscopy in both the groups, visualisation of laryngeal inlet was graded using Cormack and Lehane grades:

CORMACK AND LEHANE GRADING	
Grade 1	Complete glottis visible.
Grade 2	Anterior glottis not seen.
Grade 3	Epiglottis seen but not glottis.
Grade 4	Epiglottis not seen.

Time taken for laryngoscopy *i.e.*, from insertion of the blade between the teeth until the best view of glottis was seen and the time taken for intubation *i.e.*, from insertion of endotracheal tube touching the angle of mouth until we checked for bilateral air entry was noted in both the groups.

Ease of intubation was graded as follows<sup>5</sup>

EASE OF INTUBATION GRADING	
Grade 1	Intubation easy
Grade 2	Intubation requiring an increased anterior lifting force and assistance to pull the right corner of the mouth upwards to increase space.
Grade 3	Intubation requiring multiple attempts and a curved stylet.
Grade 4	Failure to intubate with the assigned laryngoscope.

In case visualization of glottis and intubation failed in first attempt, laryngeal manipulation was done. If more than one attempt was required the patient was ventilated with bag and mask between the attempts. The number of attempts needed to correctly place the tube was recorded. Not more than three attempts were made with one blade. After successful intubation, the patients were mechanically ventilated for the surgical procedure. Anaesthesia was maintained thereafter as per the routine practice.

**Statistical analysis:** At the end of the study, all data was compiled and analyzed statistically using appropriate tests. Paired student's 't' test was used to compare Cormack and Lehane grading and total time taken for intubation. Chi-square test was used to compare laryngeal view, time taken for intubation and number of attempts. A p-value of <0.05 was taken as statistically significant.

**RESULTS**

The baseline demographic and haemodynamic data of the recruited patients is shown in Table 1. Where in the two groups were compared in terms of mean age, sex, mean weight, ASA grade, Mallampati view grade and mean haemodynamic parameters. After laryngoscopy, there was no difference in mean haemodynamic parameters of the two groups (Table 2).

With the use of Macintosh laryngoscope (n=30), the present study, it was observed that 5 patients had Cormack and Lehane grade I, while 17, 6 and 2 had grade II, III and IV respectively. With Truview laryngoscopy, 27 patients had Cormack and Lehane grade I and 3 had grade II, while no patient recorded grades III and IV respectively. The difference in gradings of Cormack and Lehane between Macintosh group and Truview group was found to be statistically significant (p=0.000) (Table 3).

Mean time of laryngoscopy in Group II was less as compared to Group I [11.67 ± 2.00 seconds versus 12.70 ± 2.65 seconds],

**Table 1:** Baseline demographic and haemodynamic parameters of patients in each group

Baseline characteristics	Group I (Macintosh)	Group II (Truview)
Mean (± SD) age (years)	42.4 ± 13.65	41.36 ± 13.83
Sex (M:F)	20:10	18:12
Mean (± SD) weight (kg)	63.26 ± 11.42	63.06 ± 8.83
ASA grade I/II (No.)	26/4	23/7
Mallampati view (class I/II/III/IV)	20/5/3/2	8/16/4/2
Mean ± SD heart rate (beats/min.)	80.9 ± 2.04	81.03 ± 1.93
Mean ± SD SBP (mmHg)	120.6 ± 3.03	123.3 ± 2.00
Mean ± SD DBP (mmHg)	80.8 ± 3.18	80.76 ± 2.64
Mean ± SD MAP (mmHg)	94 ± 2.11	95 ± 1.84
Mean ± SD SPO <sub>2</sub> (%)	99.73 ± 0.44	99.86 ± 0.34

**Table 2:** Mean haemodynamic parameters of patients in each group after laryngoscopy

Haemodynamic parameter	Group I (Macintosh) Mean (± SD)	Group II (Truview) Mean (± SD)	p-value
Heart rate (beats/min.)	81.4 ± 0.77	81.1 ± 0.88	0.126 <sup>o</sup>
SBP (mmHg)	123.13 ± 1.99	123.26 ± 0.82	0.737 <sup>o</sup>
DBP (mmHg)	80.23 ± 1.07	80.73 ± 1.36	0.119 <sup>o</sup>
MAP (mmHg)	94.53 ± 1.00	94.90 ± 1.09	0.182 <sup>o</sup>
SPO <sub>2</sub> (%)	99.86 ± 0.10	99.89 ± 0.11	0.817 <sup>o</sup>

*\*Non-significant*

**Table 3:** Cormack and Lehane grades in two groups after laryngoscopy and intubation

Cormack and Lehane grade	Group I (Macintosh) (n=30) No. (%)	Group II (Truview) (n=30) No. (%)	p-value
I	5 (16.67)	27 (90.00)	0.000 <sup>**</sup>
II	17 (56.67)	3 (10.00)	
III	6 (20.00)	0	
IV	2 (6.66)	0	

*\*\*Significant*

though the difference between the two was not significant (p=0.09). However, mean time for intubation in Group I was less as compared to Group II [18.50±2.40 seconds versus 18.60 ± 2.40 seconds], again the difference being not statistically significant (p=0.87). Overall, total mean time for laryngoscopy and intubation in Group II was more than Group I [31.30 ± 3.62 seconds versus 30.43 ± 3.29 seconds] and the difference between the two being not statistically significant (p=0.33) (Table 4).

**Table 4:** Mean time for laryngoscopy and intubation in each group

Parameter	Group I (Macintosh) Mean (± SD)	Group II (Truview) Mean (± SD)	P-value
Time for laryngoscopy (seconds)	12.70 ± 2.65	11.67 ± 2.00	0.09 <sup>o</sup>
Time for intubation (seconds)	18.50 ± 2.40	18.60 ± 2.40	0.87 <sup>o</sup>
Total time for laryngoscopy and intubation (seconds)	30.43 ± 3.29	31.30 ± 3.62	0.33 <sup>o</sup>

*\*Non-significant*

Singular attempt of laryngoscopy in both Group I and Group II were successful and there was no repeat of laryngoscopy. No complications were recorded as per laryngeal manipulation, blood stain or any trauma to teeth and soft tissue in any patients in both the groups.

## DISCUSSION

With conventional laryngoscopes such as Macintosh laryngoscope in order to be able to see the range of glottic opening, proper alignment of oral, pharyngeal and tracheal axis is required, while with video-laryngoscope image of the glottis can be retrieved without this requirement<sup>6</sup>. The difference in glottic visualisation can also be explained by the mechanics of laryngoscopy with different types of blades. Literature suggests that glottis is viewed better with the straight blades while tracheal intubation is easier with the curved blades.<sup>7</sup> With the Macintosh laryngoscope, the curvature of the blade acts as a visual "hill;" interrupting the line of sight, called the "Crest of the Hill" effect<sup>8</sup>. While using Macintosh laryngoscope to achieve the same glottic view as with a straight blade, the tongue must be displaced more into the submandibular space. With Macintosh laryngoscope, the oral axis makes an angle with the laryngeal axis, masking the glottis as it is covered by the epiglottis and this interferes with glottic view. Due to the prism in Truview laryngoscope, an optical view is offered around the corner, without having to align oral, pharyngeal and laryngeal axes<sup>9</sup>.

The Truview laryngoscope may have advantages over the Macintosh laryngoscope, such as an easier glottic view. Although the optical equipment in this newer laryngoscope provides a better glottic view, it requires more skilful eye and hand coordination due to the indirect image obtained during the procedure.

The Cormack and Lehane grading system, although originally designed to compare glottic views at direct laryngoscopy<sup>10</sup>, provided a useful comparison of the direct and indirect laryngoscopic views achieved in this study. The present study demonstrated that the Truview laryngoscope improves the Cormack-Lehane score and provides a better glottic appearance than the Macintosh laryngoscope.

Barak *et al.*<sup>4</sup> reported that Truview laryngoscope produced better glottic view with less maximum force applied during intubation than when using Macintosh blade. Li *et al.*<sup>11</sup> found better glottic view with Truview laryngoscope than Macintosh blade in patients with Cormack-Lehane grade < 1. They suggested that Truview can be used in patients with anticipated difficult intubation.

In our study, intubation was easier with Truview laryngoscope and almost as easy as with Macintosh laryngoscope. All of our patients in both the groups were intubated at the first attempt. However, time taken to laryngoscopy using the Truview laryngoscope was longer than using the Macintosh blade. This may be due to the greater experience of anaesthesiologist with the Macintosh blade.

In addition, the use of the Truview laryngoscope requires the user to perform intubation in an indirect manner, seeing the tube through the lens. At first, as the anaesthesiologist is looking through the Truview lens and focuses on the vocal cords, as such does not see the tube at all. The tube needs to be

advanced blindly until its tip enters the Truview visual field. Thereafter, the tube should be introduced through the vocal cords while looking through the lens. Performing this manoeuvre requires good eye-hand co-ordination and practice. This may be another reason for the difference in duration of intubation between the groups<sup>4</sup>.

Malik *et al.*<sup>12</sup> also opined that in Truview laryngoscopy under inexperienced hands, the intubation takes a longer time. Barak *et al.*<sup>4</sup>, Li *et al.*<sup>11</sup> and Timanaykar *et al.*<sup>13</sup> findings were also consistent with the present study observation. In a manikin study<sup>6</sup>, 20 anaesthetists (12 trainees and eight consultants) compared the Truview with a conventional Macintosh size 3 blade. Though glottic view was better, Truview did not reduce the intubation time or the ease of tracheal tube placement with respect to conventional Macintosh blade.

## CONCLUSION

The present study concludes that when compared with the Macintosh laryngoscope, the Truview laryngoscope does have an extra benefit with respect to better laryngoscopic view though it takes almost similar total time for intubation. Truview blade is a useful option to be considered in the management of patient's airway. Moreover, here is a need for more exposure to overcome learning curve of new technique as with the use of a Truview laryngoscope.

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