

## Comparison of Macintosh Blade with Trueview Blade During Laryngoscopy and Intubation Under General Anaesthesia.

Ovaise Malik<sup>1</sup> Wasim Mohammad Bhat<sup>2\*</sup>

<sup>1</sup>Lecturer department of anaesthesia, SKIMS Medical College Bemina, Srinagar, J & K, India

<sup>2</sup>Lecturer department of anaesthesia, SKIMS Medical College Bemina, Srinagar, J & K, India

### Abstract:

**Background:** The Truview laryngoscope has an optical accessory, a different blade angle and an oxygen flow apparatus attached to the device which provides a better glottis view.

**Aim:** The study was done to compare the laryngoscopic view and intubation characteristics of conventional Macintosh laryngoscope with Truview video laryngoscope.

**Materials and Methods:** In the study, 60 patients undergoing general anaesthesia were included to compare the findings of Truview laryngoscopy and Macintosh laryngoscopy. Patients were divided into two groups of 30 each in a randomized, prospective fashion. Comparison between the two different laryngoscopic views and intubation conditions was done in terms of Cormack and Lehane grades, total time of intubation, ease of intubation, attempts at intubation, hemodynamic response and soft tissue damage during laryngoscopy.

**Results:** As confirmed by improved Cormack and Lehane grades, the Truview blade provided a better laryngoscopic view than the Macintosh blade. Total time taken for intubation was similar with both the blades. There was no difference observed between the two groups in attempts at intubation, ease of intubation and soft tissue damage during laryngoscopy.

**Conclusion:** Truview laryngoscope does have an extra benefit over Macintosh laryngoscope with respect to better laryngoscopic view though it takes similar total time for intubation. Further, there is a need for more exposure to overcome learning curve of a new technique as with the use of a Truview laryngoscope.

**Key words:** Cormack and Lehane, intubation, Macintosh laryngoscope, Truview laryngoscope.

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### I. Introduction

Since its invention by Foregger<sup>(1)</sup> in 1940, Macintosh laryngoscope remains the most widely used device for intubation. Use of Macintosh laryngoscope has been conventionally accepted as the first choice for tracheal intubation. 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 make endotracheal intubation more successful. 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>. To overcome these normal anatomical difficulties, modification and advancement has been done in the newer laryngoscopes.

Truview (Truphatek International Ltd., Netanya, Israel) is a fiber optic device which enables an indirect view of the vocal cords. It has an optical apparatus which provides a 42 degree angled deflection view and this provides a better visualization of larynx in patients with limited neck extension. A camera can be mounted to the tip of the instrument so as to record and magnify the image of vocal cords<sup>(3)</sup>. The Truview may require more skills and expertise at the part of the anaesthesiologist because of midline entrance leading to difficulty in manipulation of tongue. The in-built continuous oxygen flow system in the device helps in cleaning away the secretions and prevention of fogging of the prism. These factors decrease the intubation time in comparison with Macintosh.

The present study is targeted to determine whether Truview laryngoscope can be used routinely for endotracheal intubation in place of Macintosh laryngoscope in patients irrespective of airway characteristics. The study was primarily aimed to assess the comparison of two devices in terms of Cormack and Lehane grading and total time taken for intubation. The secondary aim was to assess the ease of intubation and the hemodynamic response and soft tissue trauma.

## **II. Material and Methods**

Following Institute Ethical Committee approval and written informed consent, computerized randomized study was conducted in 60 ASA I and II patients of age 18-65 years with MP grade I to IV. Patients with cervical spine injury, uncontrolled hypertension, cardiovascular disorder, and with raised intracranial pressure were excluded.

The patients were distributed using a computer generated block randomization schedule in two groups of 30 patients each to decide the intubation technique to be used from amongst the two employed in the study. All patients were subjected to a thorough pre-anaesthetic checkup and airway evaluation. Premedication was given and patients were advised to be fasting for 8 hours prior to surgery. Patients in group I were intubated with Truview laryngoscope and patients in group II were intubated with Macintosh laryngoscope. Intraoperatively haemodynamic response (heart rate, systolic and diastolic blood pressure, mean arterial pressure and peripheral oxygen saturation) were continuously monitored and recorded before and after intubation and at an interval of 3, 5 and 10 minutes after intubation.

After pre-oxygenation with 100% oxygen, anaesthesia was induced using intravenous fentanyl 1 microgram/kg body weight followed by intravenous propofol 2.5 mg/kg body weight. After confirming the mask ventilation adequacy, neuromuscular blockade was achieved by intravenous succinylcholine 1.5 mg/kg body weight and intubation attempted after 30 seconds of I/v succinylcholine.

All the intubations were performed by the same anaesthesiologist. The size of the blade was dependent upon weight of the patient. Size 3 of Macintosh blade and Medium sized blade of Truview were used for patients with weight up to 50kg and size 4 of Macintosh blade and large sized Truview blade for patients with weight more than 50 kg.

In all the patients two successive laryngoscopies were done and intubation was performed after second laryngoscopy according to group allocated. All patients in both the groups were kept in neutral position i.e., no flexion of neck or extension at atlantooccipital joint.

In Group I- laryngoscopy was firstly done with Macintosh blade and Cormack and Lehane grading was assessed and then laryngoscopy was repeated with Truview blade, after assessment of Cormack and Lehane grade intubation was performed.

In Group II –laryngoscopy was firstly done with Truview blade and Cormack and Lehane grading was assessed, and then laryngoscopy was repeated with Macintosh blade. After assessment of Cormack and Lehane grade intubation was performed.

The view of glottis at laryngoscopy was scored in both groups with both the laryngoscopes according to Cormack and Lehane grading system.

Grade 1: complete glottis visible

Grade 2: anterior glottis not visible

Grade 3: epiglottis seen but not glottis

Grade 4: epiglottis not seen.

Time taken for intubation, i.e., from insertion of second laryngoscope into the patient's mouth till the bilateral air entry in chest is checked after placement of endotracheal tube and inflating the cuff in both the groups, was measured.

Ease of intubation was graded as follows:

Grade 1 : intubation easy.

Grade 2 : intubation requiring an increased anterior lifting force and assistance to pull the right corner of mouth upwards to increase space.

Grade 3 : intubation requiring multiple attempts and curved stylet.

Grade 4 : failure to intubate with assigned laryngoscope.

In case visualization of glottis and intubation failed in first attempt, laryngeal manipulation was done. In patients requiring more than one attempt, they were ventilated with bag and mask between the attempts. The number of attempts needed to correctly place the tube was recorded with maximum of three attempts. In such a case, alternate techniques to maintain airway were employed and those cases were excluded from the study.

After successful intubation, patients were mechanically ventilated for the surgical procedure. Anaesthesia was maintained thereafter as per the standard routine practice.

## **III. Statistical analysis**

At the end of the study, all the data was compiled and analysed statistically using appropriate tests. Paired Student '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 value of  $p < 0.05$  was taken as statistically significant.

**IV. Results**

The two groups are comparable in terms of mean age, sex, mean weight, ASA grade, Mallampati view grade and mean hemodynamic parameters. After laryngoscopy, there was no difference in mean hemodynamic parameters of the two groups, (Table 1).

**Table 1:** Mean demographic and hemodynamic parameters of patients in each group

Baseline characteristics	Group 1 (Truview)	Group 2 (Macintosh)
Mean (±SD) Age (years)	36.97±8.26	40.30±14.30
Sex (M:F)	18:12	22:8
Mean (±SD) Weight (kgs)	59.80±14.50	61.40±9.12
ASA Grade I/II (No.)	27/3	26/4
Mallampati view (Class I/II/III/IV)	12/14/3/1	14/11/4/1
Mean (±SD) Heart rate (beats/min)	90.00±14.70	92.50±1.80
Mean (±SD) SBP (mmHg)	118.77±1.22	
Mean (±SD) DBP (mmHg)	77.07±2.42	76.67±2.67
Mean (±SD) MAP (mmHg)	90.97±1.65	90.80±1.83
Mean(±SD) SpO <sub>2</sub> (%)	99.70±0.47	99.77±0.43

In Group I (Truview group), 8 (26.67%), 12 (40%), 9 (30%) and 1 (3.33%) patients had Cormack and Lehane grade I, II, III and IV respectively while performing laryngoscopy with Macintosh laryngoscope. However, when laryngoscopy was performed with Truview laryngoscope, Cormack and Lehane grade improved to grade I with 27 (90%) and to grade II with 3 (10%) patients. There were no patients with CL grade III and IV. This improvement with Truview laryngoscopy is highly significant (p=0.000) (Table 2).

**Table 2:** Comparison for C & L grading in Group I

Group I	C & L Grading (%)			
	I	II	III	IV
C & L Grading Macintosh	8 (26.67)	12 (40.00)	9 (30.00)	1 (3.33)
C & L Grading Truview	27 (90.00)	3 (10.00)	0 (0.00)	0 (0.00)
χ <sup>2</sup> -value	84.92			
p-value	0.000			
Remarks	HS			

NS: Non-significant

S: Significant

In Group II (Macintosh group), 29 (96.67%) and 1 (3.33%) patients had Cormack and Lehane grade I and II respectively while performing laryngoscopy with Truview laryngoscope. However, when laryngoscopy was performed with Macintosh laryngoscope, Cormack and Lehane grade showed less improvement with 9 (30%), 15 (50%), 5 (16.67%) and 1 (3.33%) patients with grade I, II, III and IV respectively. This difference between Truview laryngoscopy and Macintosh laryngoscopy is highly significant (p=0.000), (Table 3).

**Table 3:** Comparison for C & L grading in Group II

Group II	C & L Grading (%)			
	I	II	III	IV
C & L Grading Truview	29 (96.67)	1 (3.33)	0 (0.00)	0 (0.00)
C & L Grading Macintosh	9 (30.00)	15 (50.00)	5 (16.67)	1 (3.33)
χ <sup>2</sup> -value	97.03			
p-value	0.000			
Remarks	HS			

NS: Non-significant

S: Significant

On comparison of time taken to intubate between two groups is statistically non-significant, as the mean time taken with Truview laryngoscope was (35.13±3.61) seconds, and that of Macintosh laryngoscope was (33.73±1.84) seconds, (Table 4).

**Table 4:** Group comparison for time for Intubation

Group	Time for Intubation (Sec.)
Truview Laryngoscope	35.13 ± 3.61
Macintosh Laryngoscope	33.73 ± 1.84
p-value	0.065
Remarks	NS

NS: Non-significant

S: Significant

Intubation was successful in single attempt in all the cases and there was no repetition of laryngoscopy in both the groups. No complications were reported as per laryngeal manipulation, blood stain or any trauma to the teeth and soft tissues in any patient in both the groups.

## V. Discussion

Direct laryngoscopy using Macintosh laryngoscope is a time-tested routine maneuver in anaesthesia practice. But, failure of direct laryngoscopy to expose the glottic inlet is often associated with multiple attempts at intubation using the same device, especially in unanticipated cases, frequently leading to serious complications<sup>(4)</sup>. The Truview laryngoscope applies the optical principle of light refraction to provide a good view of an anteriorly placed larynx. An inexpensive telescope helps provide unmagnified anterior refraction of 42 degrees in the line of sight with minimal manipulation of the head, neck, instrument or soft tissues<sup>(5)</sup>.

Through the present study, we determined 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 Cormack and Lehane grading and the total time taken for intubation. The secondary aim was to assess the ease of intubation, haemodynamic response and soft tissue trauma, if any.

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

The advantages of Truview laryngoscope over Macintosh laryngoscope includes easier glottis view but at the same time requires more skillful eye and hand coordination due to the indirect image obtained during the procedure.

The Cormack and Lehane grading system, although originally designed to compare glottis views at direct laryngoscopy<sup>(10)</sup>, provided a useful comparison of the direct and indirect laryngoscopic views achieved in the study. In our study, we observed that in 43 patients with a Cormack and Lehane grade of more than I using Macintosh laryngoscope, the Cormack and Lehane grade was improved in 39 patients. In all patients with a Cormack and Lehane grade III and IV with Macintosh laryngoscope, there was an improved view with the Truview laryngoscope. So the present study demonstrated that the Truview improves the Cormack and Lehane score and provides a better glottis appearance than the Macintosh laryngoscope in both the groups.

Barak *et al*<sup>(11)</sup>, reported that the Truview laryngoscope produced better glottis view with less maximum force applied during intubation. Li *et al*<sup>(12)</sup> found better glottis view with Truview laryngoscope than Macintosh blade in patients with Cormack and Lehane grade more than I. They suggested that Truview laryngoscope can be used in patients anticipated with difficult intubation. In a Manikins study<sup>(6)</sup> also, the results were similar.

In our study, intubation was as easier with Truview as with Macintosh blade. All patients in both the groups were intubated at the first attempt and the time taken for intubation using the Truview was similar as with the Macintosh blade. This may be due to the considerable experience of anaesthesiologist with the use of Truview blade.

In addition, the use of Truview blade requires the user to perform intubation in an indirect manner, seeing the tube through the lens. At first, as the anaesthetist is looking through the Truview lens and focusses on 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 the maneuver requires a good hand eye coordination, practice and considerable experience in using Truview laryngoscope. This may be probably the reason for the difference in duration of intubation with Truview laryngoscope within the groups<sup>(11)</sup>.

Malik *et al*<sup>(13)</sup> also opined that in Truview laryngoscopy under the inexperienced hands, the intubation took longer time. Barak *et al*<sup>(11)</sup>, Li *et al*<sup>(12)</sup>, Timanayakaret *al*<sup>(14)</sup> findings were also consistent with the present study observation. In Manikin study<sup>(6)</sup>, 20 anaesthetists compared the Truphatek Truview with the conventional Macintosh size 3 blade. Though glottis view is better, Truview did not reduce the intubation time or the ease of tracheal tube placement with respect to the conventional Macintosh blade.

## VI. Conclusion

The present study concludes that when compared with Macintosh laryngoscope, the Truview laryngoscope does have an extra benefit with respect to better laryngoscopic view though it takes almost similar time for intubation. Truview blade is a useful option to consider in the management of patient's airway. Advanced laryngoscope under skilled hands can reduce the damage associated with repeated attempts in unanticipated difficult intubations. Anaesthetists should be encouraged for more exposure in use of a Truview laryngoscope

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