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COMPARISON OF LARYNGOSCOPIC VIEW USING MODIFIED CORMACK LEHANE GRADING WITH MACINTOSH BLADE LARYNGOSCOPE VERSUS TRUPHATEK TRUVIEW PCD-R VIDEO LARYNGOSCOPE

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ABSTRACT

Background: Video laryngoscope has been designed using optical principle to provide better view of objects situated more anterior to straight line of vision. **Aims and objective:** To determine the effectiveness of Truphatek Truview PCD-R video laryngoscope in comparison with Macintosh laryngoscope. **Materials and method:** This study was conducted in 350 patient of aged 18 to 60 years ASA 1 and 2 grade scheduled for elective surgery undergo general anesthesia needing endotracheal intubation and evaluate for difficult intubation parameters i.e. Mallampati grading, Thyromental distance, interincisor distance. Each airway was assessed individually with Truphatek Truview PCD-R video laryngoscope and with Machintosh blade laryngoscope. **Results:** Our results have shown definite improvement in laryngeal view as compared to Macintosh blade. 156 (44.57%) showed improvement in glottic view by I or II Cormack and Lehane grade when assessed with Truphatek Truview PCD-R video laryngoscope. **Conclusion:** Truphatek Truview PCD-R video laryngoscope, overall, provided a statistically significant better view of glottis as scored by the Cormack and Lehane grade and can be considered an alternate intubation device, especially in difficult intubation conditions.

KEYWORD: Intubation, Machintosh blade laryngoscope, Truphatek Truview PCD-R video laryngoscope.

INTRODUCTION

The history of tracheal intubation techniques dates back to 18th century. Herhold and Rafn[1] in 1769 used the techniques of tracheal intubation for resuscitating drowning patients for first time. Sir Willam Macewen[2] (1848-1924) was the first physician to intubate trachea for the purpose of administering anesthesia. Endotracheal intubation is required to provide a patent airway when patients are at risk for aspiration, when airway maintenance by mask is difficult and for prolonged controlled ventilation.[3] Difficult intubation often arises unexpectedly. As even the most thorough preoperative assessment of the airway will fail to detect some difficult intubations, every anaesthesiologist should have a predetermined strategy for dealing with this situation. Incidence of failed intubation in previous reports range between 1 in 250 to 1 in 750 cases.[4,5,6,7]

The anaesthesiologist is the person solely responsible for airway management of the patient undergoing a surgical procedure. Airway management and endotracheal intubation are fundamental skills for the safe conduct of anaesthesia. Difficulty may be encountered in mask ventilation, laryngoscopy or intubation. Anaesthesia in a patient with a difficult airway can lead to direct airway trauma and morbidity from hypoxia and hypercarbia.[8] Management of the difficult airway sometime involves the increased application of physical force to the patient's airway than in normal, which can cause direct airway trauma. Much of the morbidity specifically attributable to managing a difficult airway comes from an interruption of gas exchange[9,10,11] (hypoxia and hypercapnia), which may cause brain damage and cardiovascular activation and depression. Directly mediated reflexes laryngo-vagal [airway spasm, apnea, bradycardia, dysrhythmia or hypotension] and laryngo-spinal [coughing, vomiting or bucking] render the final causes of morbidity. Intubating a patient with an unanticipated difficult airway can be quite challenging when the expertise of experienced senior anaesthesiologist may not be immediately available. Problems in managing "difficult intubation" may also arise in the peripheral hospitals where other aids to intubation in the form of laryngeal mask airways, lighted styles, and bougie or fiber optic bronchoscope may not be available, or the expertise to use these aids may be

lacking. Endotracheal intubation in the unanticipated difficult airway situation can quickly turn into a matter of life and death. In this scenario any device which can aid successful intubation is a boon to the anaesthesiologist. All anaesthesiologists should be skilled in at least one alternative devices and technique of tracheal intubation under vision. They include- McCoy blade laryngoscope, Truphatek Truview PCD-R video laryngoscope[12], Airtraq, Combitube, Fibreoptic bronchoscope.

Out of the above Truphatek Truview PCD-R video laryngoscope is a simple and relatively cost effective device which promises to be an alternative to Macintosh laryngoscope. The adequacy of the laryngeal view obtained is a major factor in determining the difficulty of intubation. Hence this study was conducted to compare the glottic view by direct laryngoscope with Macintosh laryngoscope versus Truphatek Truview PCD-R video laryngoscope.

MATERIAL AND METHODS

After getting approval from the institutional ethical committee, the study was conducted on 350 patients either of any sex posted for elective surgery under general anaesthesia in Department of Anaesthesiology, Netaji Subhash Chandra Bose Medical College, Jabalpur M.P.

Inclusion criteria: The following patients were included for the study-

1) Adults aged 18-60 years scheduled to undergo elective surgery under general anaesthesia.
2) Adults belonging to American Society of Anaesthesiologists (ASA) physical status 1 and 2.
3) Thyromental distance >=6 cm
4) Interincisior gap >3 cm

Exclusion criteria: The following patients were excluded from the study-

1) Patients with known history of sensitivity and contraindications to drugs used.
2) History of significant cardiac, respiratory, renal, hepatic or central nervous system diseases (ASA 3 and above).
3) Patients with unstable cervical spine and presence of connective tissue diseases.
4) Patients of diabetes Mellitus with possibility of cervical spine involvement and decreased Atlanto-Occipital movement (rule out by prayers sign and thumb print sign).
5) Acromegalic patients.
6) Patients with epiglottitis, burn patients with neck contracture, patients with craniofacial abnormality and buck teeth.
7) Thyromental distance<6cm, Hyomental distance < 6cm, Sternomental distance < 12.5 cm, Interincisor distance < 5 cm.
8) Receeding mandible, Mcrognathia, Loose teeth.

The adequate required sample size was estimated using following formula:

$$n= z^2pq/ d^2$$

Where-
n=Sample size
z=1.96 (considering 0.05 alpha, 95% confidence limits and 80% beta)
p= assumed probability of occurrence of results
q= 1-p
d= Marginal error (precession)

To calculate the adequate required sample size we have taken assumption that 30-40 % probability of difference between the two methods with 5% absolute precession would be targeted. This accumulates 350 by using above given formula. Therefore, minimum 350 subjects were adequate numbers. ($n=z^2pq/d^2$ p= 0.40, q=0.60, d= 0.05)

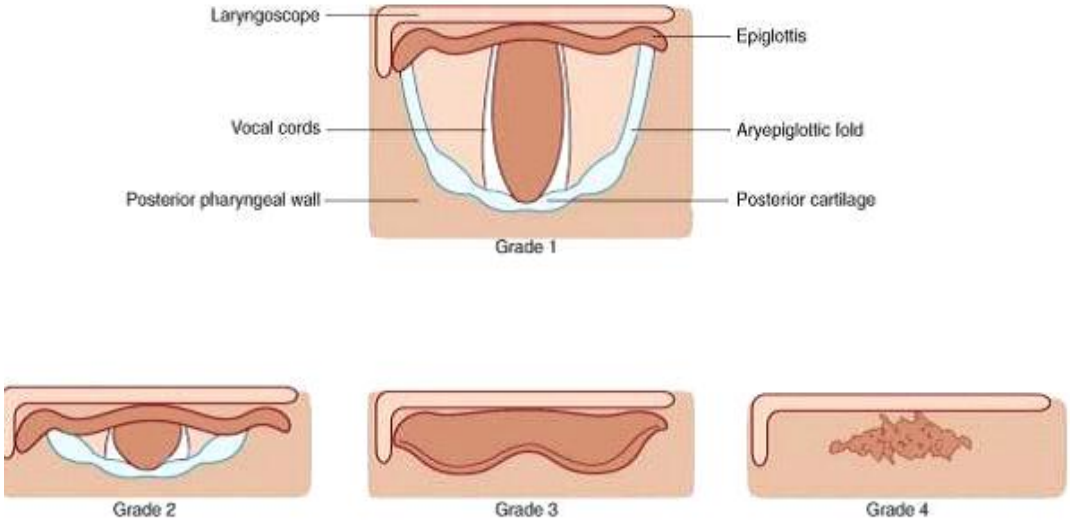
Method

350 ASA 1 and 2 patients of either sex in age group 18-60 years scheduled to undergo general anaesthesia needing endotracheal intubation were included in the study and evaluated for difficult intubation parameters (Mallampati grading, Thyromental distance, Interincisior distance). All the patients were kept fasting for 8 hours, pre-medicated with oral midazolam (5mg for patients less than 50 kg and 10 mg for patients more than 50 kg and oral ranitidine 150 mg on the previous night). After shifting the patients to O.T, intravenous access was secured and routine monitoring devices such as ECG leads, non-invasive BP cuff and pulse oximetry probe was connected to the patients.

After pre-oxygenation with 100% oxygen for 3 minute with a close fitting mask, inj. Fentanyl 2mg /kg was given over 30sec, injection propofol 2mg/kg with preservative free lignocaine (2%) 1ml added was given for induction of anaesthesia followed by injection vecuronium 0.1 mg /kg body weight and ventilation done for 3.5 minutes.

Each airway was assessed individually with Truphatek Truview PCD-R video laryngoscope as well as with Macintosh blade laryngoscope. To reduce bias, total patients were divided into two halves. To one half, first video laryngoscopy was done which was followed by Macintosh blade laryngoscopy with an intervening interval of 30 seconds with positive pressure ventilation. To the other half Macintosh blade laryngoscopy was done first, followed by video laryngoscopy. The laryngoscopic view was graded by an experienced anaesthesiologists who was blinded to pre-operative airway assessment. Data using Cormack and Lehane grading and the laryngoscope was then removed. In each group trachea was intubated with appropriate size endotracheal tube. Anaesthetic maintenance was done with isoflurane/sevoflurane at 1.2 MAC with O_2 and N_2O at (33:66) at 5 lit/min. Patient was ventilated via Bain's circuit on controlled ventilation.

Laryngoscopic view obtained was compared according to modified Cormack and lehane grading



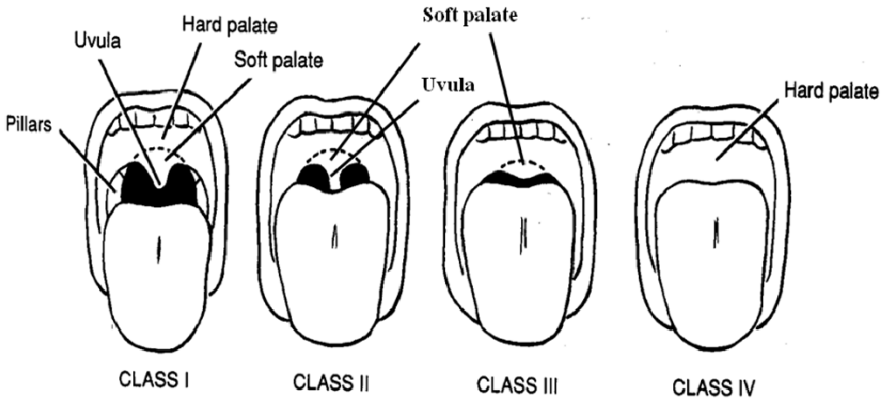
Grade I: Visualization of the entire laryngeal aperture.
Grade IIa: Visualization of parts of the laryngeal aperture.
Grade IIb: Visualization of only arytenoids.
Grade IIIa: Visualization of only the epiglottis.
Grade IIIb: Visualization of only the epiglottis adherent to posterior pharyngeal wall.
Grade IV: Visualization of only the soft palate.

The anaesthesiologist evaluated the difficulty in performing the intubation on a scale of 1 to 3, with 1=easy, 2=intermediate and 3=difficult.

Intubation time was noted from the time of introduction of Truphatek Truview PCD-R video laryngoscope in first half of group and Macintosh blade laryngoscope in second half of group, into the mouth till pilot balloon cuff was inflated.

The laryngoscopic views obtained during direct laryngoscopy with Macintosh blade laryngoscope and Truphatek Truview PCD-R video laryngoscope were compared using Cormack and Lehane grading. Data was analyzed using SPSS version17 and MS-excel. Paired t-test and Chi-square test was used to analyze the data. P value of <0.05 was considered to be statistically significant.

Difficult intubation parameters (Mallampati grading, Thyromental distance, Interincisor distance):
Mallampati grading-
Mallampati[13] III/Samsoon[4] IV – relatively large tongue, uvula not visible



- Class I - Soft palate, fauces, uvula, pillars
- Class II – Soft palate, fauces, uvula
- Class III – Soft palate, uvular base
- Class IV - Hard palate only

Thyromental distance
Distance < 6 cm.

Interincisior distance
Less than two finger breadths or less than 3 cm.

Macintosh Laryngoscope

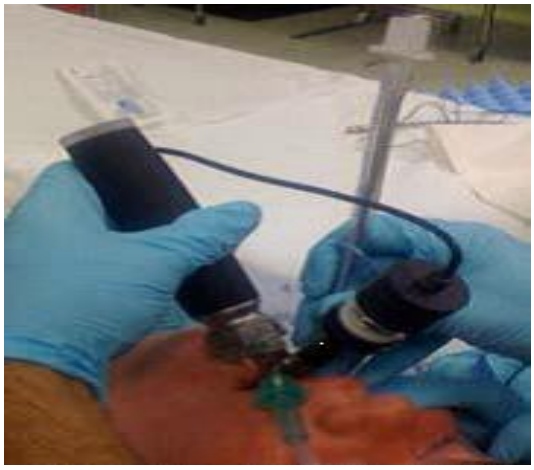


Fig 3: Intubation using Truview PCD-R

Truphatek Truview Pcd-R Video Laryngoscope

Fig 1: Truview PCD-R

Fig 2: Truview blades and Performed, styletted ETT

RESULTS

Table 1- Demographic profile of the study group

Parameters	Minimum	Maximum	Mean	Std.Deviation
Age	18	60	32.75	7.96
Weight	42	90	59.78	8.82

The mean (SD) of patients age and weight are 32.75 years (7.96) and 59.78 kg (8.82) respectively.

Table 2: Sex distribution.

Sex	Frequency	Percent
Male	185	52.9
Female	165	47.1
Total	350	100

Table 3- ASA physical status

ASA Physical status	Frequency	Percent
Status 1	332	94.9
Status 2	18	5.1
Total	350	100

Table 4: Airway assessment.

Parameters	Minimum	Maximum	Mean	Std. deviation
TM distance in cm	6	12	8.11	0.95
Interincisor distance in cm	3.8	5.9	4.58	0.39

Table 5- Mallampati class

Grade	Frequency	Percent
I	326	93.1
II	21	6.0
III	3	0.9
IV	0	0
Total	350	100

Table 6: Cormack and Lehane grading by Macintosh.

Grading	Frequency	Percent
I	178	50.85
IIa	108	30.85
IIb	43	12.30
IIIa	21	6
IIIb	0	0
IV	0	0
Total	350	100

Table 7- Cormack and Lehane grading by Truview PCD-R video Laryngoscope

Grading	Frequency	Percent
I	331	94.59
IIa	8	2.28
IIb	8	2.28
IIIa	3	0.85
IIIb	0	0
IV	0	0
Total	350	100

Table 8- Cormack and Lehane grade Macintosh vs. Cormack Lehane grade by Truview PCD-R video laryngoscope cross tabulation

Macintosh Blade Laryngoscope Grading	Truview PCD-R Video Laryngoscope			Total
	Grade I	Grade IIa	Grade IIb	
Grade I	178 (50.85%)	0	0	178 (50.85%)
Grade IIa	100 (28.57%)	8 (2.28%)	0	108 (30.85%)
Grade IIb	35 (10%)	0	8 (2.28%)	43 (12.28%)
Grade IIIa	18 (5.14%)	3 (0.85%)	0	21 (6%)
Total	331	11	8	350

DISSCUSION

Truphatek Truview PCD-R video laryngoscope is an improved version of Truview EVO2 laryngoscope with an integrated optical lens system and unique blade tip angulation that provides optimal angle of vision allowing better view of the glottis via the prismatic lens without having to align oral, pharyngeal and laryngeal axes. Therefore, potentially a better view of objects situated anterior to straight line of vision is expected. The current study was conducted to compare the vocal cord view with Macintosh blade laryngoscope versus Truphatek Truview PCD-R video laryngoscope.

350, ASA 1 and 2 patients aged between 18-60 years scheduled to undergo elective surgery under general anaesthesia were included for the study. The mean age of the patient in our study was 32.75 years. Weight of the patients ranged from 42-90 kg with an average of 59.78 kg. Both male and female were adequately represented and 94.9% of the patient belonged to the ASA physical status 1, and 5.1% of the patient to ASA physical status 2.

Preoperative airway assessment, in sitting position, showed a thyromental distance ranging with a minimum of 6 to maximum of 12 cm. Mean thyromental distance was 8.11 cm. Interincisor distance varied from 3.8 cm to 5.9 cm, with an average of 4.58 cm. 93.1% of patients in our study had Mallampati[13] class I, 6.1% of patients were Mallampati class II and 0.9% of patients had Mallampati class III. No patient belonged to Mallampati class IV.

In our study, all patients were successfully intubated using Macintosh blade laryngoscope or Truphatek Truview PCD-R video laryngoscope. Of these, 97.14% were intubated in first attempt (easy and intermediate intubation). 178 (50.85%) patients had grade I Cormack and Lehane view with Macintosh blade laryngoscope as compared to 331 (94.57%) patients with Truphatek Truview PCD-R video laryngoscope. 108 (43.57%) patients had grade IIa Cormack and Lehane[14] view with Macintosh blade laryngoscope, out of these 100(28.57%) patients had upgraded Cormack and Lehane grade I view, and only 8(2.28%) patients had grade IIa view with Truphatek Truview PCD-R video laryngoscope. 43 (12.28%) patient had grade IIb Cormack and Lehane view with Macintosh blade laryngoscope, out of these 35 (10%) patients had upgraded Cormack and Lehane grade I view and only 8 (2.28%) patients had Cormack and Lehane grade IIb view with Truphatek Truview PCD-R video laryngoscope. There was definitive improvement in the vocal cord view with Truphatek Truview PCD-R video laryngoscope. 156 cases (44.57%) showed improvement in glottis view by I or II Cormack and Lehane grading when assessed with Truphatek Truview PCD-R video laryngoscope. 3 (0.85%) cases of Cormack and Lehane grade IIIa by Macintosh blade laryngoscope showed grade IIa view by Truphatek Truview PCD-R video laryngoscope. 18 (5.14%) cases of Cormack and Lehane grade IIIa with Macintosh blade laryngoscope

showed grade I view by Truphatek Truview PCD-R video laryngoscope which was clinically significant ($p<0.0001$). The Truphatek Truview PCD-R video laryngoscope overall provided a statistically significant better view of glottis as scored by the Cormack and Lehane grading.

Regarding ease of intubation, it was considered to be easy in 298 (85.1%) patients, intermediate in 42 (12%) patients, and difficult in 10 (2.91%) patients. Ease of intubation was graded by using 'Intubation Difficulty Scale' (IDS)-

PARAMETERS	**POINTS**
1. Number of supplementary attempts	1 point each
2. Number of supplementary operators	1 point each
3. Number of alternative techniques	1 point each
4. Lifting force applied	Normal =0 points Increased=1 points
5. External laryngeal pressure applied	None=0 points Any= 1 points
6. Vocal cord mobility	Abduction =0 points Adduction = 1 points
7. Cormack and Lehane Grade minus 1	0-3 points

IDS score=sum of points.

IDS Score	**Degree of difficulty**
0	Easy
>0 but< =5	Intermediate
>5	Difficult

Our study results are similar to Malik et al[15], who reported that the Truview evo2 reduced the Intubation difficulty scale score, enhanced the Cormack and Lehane glottic view, and reduced the number of optimization maneuvers, when compared with Macintosh laryngoscope. Ranju Singh et al[16] compared Truview infant evo2 laryngoscope with Miller blade in neonates and infants. They reported that Truview evo2 laryngoscope overall provided a statistically better view of glottis as scored by Cormack and Lehane grade. The number of attempts at laryngoscopy was comparable in the two groups. Ishwar singh et al[17] reported improvement in 46 cases (92%) improvement in glottic view by I or II Cormack and Lehane grade while assessed with Truview evo2 when compared to Macintosh blade laryngoscope. Lieberman[18] and colleagues reported that the Truview evo2 optical laryngoscope significantly improved the laryngeal view grades while using significantly less force. Case reports exist which attest to successful use of Truview evo2 laryngoscope in patients with difficult airways in whom laryngoscopy with the Macintosh blade laryngoscope failed.

In our study average intubation time with Truphatek Truview PCD-R laryngoscope was 50.26 sec and by Macintosh blade laryngoscope it was 38.53sec. Although Truphatek Truview PCD-R video laryngoscope improved the glottic view, the oropharyngeal and laryngeal axes are not aligned, therefore, by inexperienced hands, the intubation takes a longer time. This has been a consistent finding in many other studies.[19,20] We opine that the difference was 7.36 sec in between both laryngoscopic procedure ($p<0.0001$). The time difference showed that Truview required significantly more time than Macintosh blade. The participating anaesthesiologists were very experienced with standard Macintosh blade laryngoscope, while they had limited experience with Truphatek Truview PCD-R video laryngoscope. This may be a potential source of bias in the recorded difference in intubation time and anaesthesiologist's evaluation of intubation difficulty. Like our study, other studies claimed better intubating condition with Truphatek Truview PCD- R video laryngoscope in patients at low risk for difficult intubation, but at the cost of longer intubation time.

One of the problems of intubation with Truphatek Truview PCD-R video laryngoscope is fogging of the lens situated at the distal end of the optical tube which may blur the vision very often unless it is well taken care of . We successfully overcame this difficulty by use of continuous flow of oxygen by the oxyport at 5 to 10 liter/min.

Throughout the trial we did not observe any airway trauma with Truphatek Truview PCD-R. In our study, though we conducted direct laryngoscopy with both Macintosh blade laryngoscope and Truphatek Truview PCD-R video laryngoscope, the effects of laryngoscopy and tracheal intubation on the mean arterial pressure and on heart rate were relatively modest.

There are many types of video laryngoscopes available which include the Glidescope[21] (Saturn Biomedical System Inc., Burnaby, Canada) and the AWS[22] (Airwayscope – Pentax Corporation, Tokyo, Japan) but none is as inexpensive as Truview PCD-R video laryngoscope.

The Truphatek Truview PCD-R video laryngoscope is designed to provide indirect laryngoscopy with continuous oxygen insufflation, which may be helpful for some patient who has poor pulmonary function. The capability of the optic laryngoscope blade to facilitate tracheal intubation in the difficult intubation case and the benefit of oxygen insufflation were not assessed in our study. We used Macintosh blade laryngoscope with

curved blade size 3 and Truphatek Truview PCD-R video laryngoscope with adult size blade in all the patients.

Even today Macintosh blade laryngoscopy is considered to be the gold standard for intubation. So there is a need for comparing the efficacy of intubation with Truphatek Truview PCD-R video laryngoscope with the former with regards to success rate, time required, and optimization of the position, ease of intubation, complication and haemodynamic changes. Moreover, it will be useful only if these findings are tested in actual difficult airway situations.

CONCLUSION

The Truphatek Truview PCD-R video laryngoscope has been designed using optical principle to provide better view of objects situated more anterior to straight line of vision. It is deemed to be useful in situation where conventional laryngoscopy fails to get desired laryngeal view. This is concluded that Truphatek Truview PCD-R video laryngoscope, overall, provided a statistically significant better view of glottis as scored by the Cormack and Lehane grade and can be considered an alternate intubation device, especially in difficult intubation conditions.

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