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Original Research Article

Nasotracheal Intubation Using Two Laryngoscope Blades Truview and Mccoy: A Comparative Study to Evaluate a Videolaryngoscope for Cases of Orofacial Malignancies

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ABSTRACT

Background: In the recent years, a number of videolaryngoscopes have been developed to facilitate tracheal intubation; however studies for nasotracheal intubation with these are limited. Patients with head, face and neck cancers require nasotracheal intubation to avoid interference in the surgical territory and for post-operative airway management. An attempt has been made to compare Truview and McCoy for nasotracheal intubation which will aid the anaesthesiologist in choosing an appropriate device for securing the airway in such patients.

Methods: We studied 60 subjects presenting for oncology surgeries of head, face and neck requiring nasotracheal intubation. They were randomly assigned to undergo nasotracheal intubation using either a Truview (n=30) or McCoy (n=30) laryngoscope blade. Characteristics and consequences of airway management were evaluated. The primary outcomes were the intubation difficulty score (IDS) and time taken for intubation (TTI). Secondary outcomes were the Cormack and Lehane (CL) grading, successful placement of endotracheal tube (ETT), trauma and hemodynamic stability.

Results: The Truview reduced the IDS, hadlower CL grading & reduced incidence of airway trauma, compared with McCoy. There were no differences in duration of tracheal intubations, number of attempts, need for optimization manoeuvres, success rates and the haemodynamic changes between the two devices tested.

Conclusions: We found good intubating conditions provided by Truview for nasotracheal intubation in the form of lower IDS and CL grade as compared to McCoy.

Keywords: Airway management, Intubation, Laryngoscopes.

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INTRODUCTION

Patients of head, face & neck cancers usually have multiple difficult intubation factors like inadequate mouth opening, restricted cervical spine mobility due to post radiation fibrosis, altered airway anatomy due to previous surgery and uncontrolled haemorrhage from the tumor and its aspiration.[1] Despite a number of factors identified to predict difficult intubation preoperatively, none is capable of predicting all difficult intubation.[2] Consequently ,many potential difficult intubations remain unrecognized until the induction of anaesthesia. Flexible Fibreoptic intubation is the gold standard in the management of difficult airway. It is included in the American Society of Anesthesiologists Difficult Airway Algorithm for the anticipated difficult airway, as well as the 'unanticipated canventilate but cannot intubate' scenario (CategoryB3-B evidence).[3] Howeverit has a major drawback, especially in developing countries where lack of monetary reserves to purchase the equipment and the inability to train specialists preclude its utility.[4]

Nasotracheal intubation (NTI) in an unanticipated difficult airway highlights important aspects of safe airway management which has prompted, in part the development of novel laryngoscope blades like Truview and McCoy, which aim to reduce the difficulty of laryngeal visualization and intubation.

The Truview video laryngoscope (Truphatek Israel) is a relatively new addition to equipment available for airway management in difficult situations.[5] In the educational setting, the fact that both the trainee and the instructor can simultaneously see what ishappening is of enormous teaching benefit.[6] It has the advantage of being portable, economical and a short learning curve.

The McCoy laryngoscope(Penlon) is based on the standard Macintosh blade with a hinged tip that is operated by a lever mechanism which allows for elevation of the epiglottis while reducing the amount of force required and increases the likelihood of successful intubation.[7]

We have evaluated the use of these two laryngoscope blades for NTI. The primary outcomes ofintubation difficulty score (IDS) and time taken for intubation (TTI) and secondary outcomesCormack and Lehane (CL) grading, successful placement of endotracheal tube (ETT), trauma and haemodynamic stability were studied with the aim of assessing the usefulness of videolaryngoscope for NTI for normal airways as compared to direct laryngoscopes.

METHODS

After obtaining an approval from the Ethics Committee and written, informed consent from all the 60 patients of either sex, aged between 18 and 65 years, belonging to ASA physical status class I or II, undergoing elective surgery for head, neck and face neoplasia requiring NTI under general anaesthesia were included in the study. Patients who had an anticipated difficult airway, Mallampati Class III or IV, thyromental distance less than 6.5 cm, inter-incisor distance less than 3 cm, cervical spine injury, risk of regurgitation, emergency surgery and body mass index (BMI)>30 kg m^{-2} were excluded from the study. All patients underwent a preanaesthetic evaluation and were randomized into two groups with 30 patients each; group T -using Truview & group M-using McCoy laryngoscope blade by sealed envelope method.

All patients were premedicated with oral diazepam 10 mg and ranitidine 150 mg, 2hours prior to surgery. In the operating room standard monitors were attached and intravenous (IV) access obtained and an IV infusion was started. The circuits and laryngoscopes were checked and difficult airway cart was kept ready.A single use preformed Ring Alair Edwyn (RAE) tube was lubricated and kept ready. Right nostril was prepared by topical application of oxymetazoline 0.5% and lubrication with lignocaine 2% jelly. Patients were pre oxygenated with 100%O_2 with face mask for three minutes. Anaesthesia was induced with glycopyrrolate 4 ug/kg, fentanyl 2 µg/kg and propofol 2 mg/kg. IV succinylcholine 1.5 mg/kg facilitated NTI performed with either laryngoscope blade. All intubations were performed by the same anaesthetist who was experienced with 100 intubations using Truview. After successful intubation and confirmation of ETT placement by capnograph, anaesthesia was maintained with oxygen, nitrous oxide, isoflourane and injection vecuronium 0.1 mg/kg.

No other medications were administered or procedures performed during the 5 minute (min) haemodynamic data collection period after NTI.

View of the larynx with both the blades was recorded based on CL grading without application of any external pressure. When required external laryngeal optimal manipulation (ELOM) and Magills forceps were used to facilitate NTI. The degree of difficulty in intubation based on IDS score (Appendix 1), TTI**,** number of intubationattempts and the rate of successful placement of ETT in the trachea was noted.

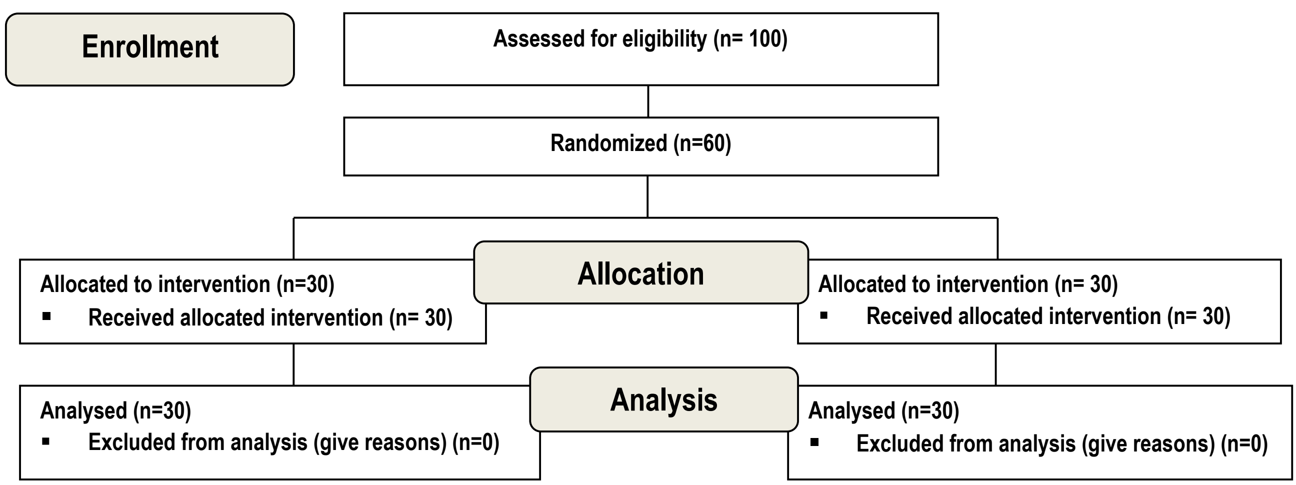
The TTI was defined as the time taken from removal of face mask until evidence obtained of the presence of CO_2 in the exhaled breath after intubation. A failed intubation attempt was defined as an attempt in which the trachea is not intubated or which required more than 60 seconds to perform. Inaddition, airway trauma seen as presence of blood on the blade or in the hypopharynx was noted. All the data was recorded by another observer for all the cases.

APPENDIX 1

VARIABLES	SCORES
No. of attempts at intubation	n-1
No. of operators attempting intubation	n-1
No. of alternative intubation techniques used	0= not applied
Cormack and Lehane grade of laryngoscopy (1/2/3)	Grade-1
Increased lifting pressure required	0=normal;1=increased
External pressure applied on larynx	0=not applied;1=applied
Position of vocal cords at intubation	0=abduction/not visualized,1=adduction

IDS	Degree of difficulty
0	Easy
1-5	Slight difficult
5-15	Moderate to major difficulty
Infinity	Impossible to intubate

CONSORT 2010 Flow Diagram



Statistical data

A pilot study to select the sample size and evaluate the primary outcomes IDS and TTI with the use of the two laryngoscope blades for NTI was conducted.

Based on a previous report by Lange et al[8] and assuming a likely difference in mean time for intubation of 10s with a SD of 12s between groups, a prioripower analysis revealed that a group size of 24 was needed to detect a difference with a power of 0.8, at anα-level of 0.05.

To minimise the impact of data loss, we planned to enrol 30 patients in each group in the study. Statistical analysis was performed using Student's t-test and chi-square test for comparing data between groups using Graphpad Prism 7.0. A value of *P*<0.05 was considered statistically significant.

Table 1: Demographic data of patients

VARIABLE	TRUVIEW	McCOY	*P*
AGE(years) ±SD	**54**±7.73	**55.7±6.85**	**0.371[NS]***
WEIGHT(kilogram) ±SD	**56±7.58**	**58.73±6.2**	**0.132[NS]***
GENDER (%)			
FEMALE	**10(33.33)**	**11(36.66)**	
MALE	**20(66.66)**	**19(63.33)**	
ASA Grade (%)			
I	**4(13.33)**	**5(16.66)**	
II	**26(86.66)**	**25(83.33)**	

NS*-non significant

Table 2: Preoperative airway assessment parameters

VARIABLE	TRUVIEW	McCOY	*P* VALUE
MALLAMPATI CLASS (%)			P=1.000[NS]*
0	0	0	
1	8(26.66)	7(23.33)	
2	22(73.34)	23(76.66)	
THYROMENTAL DISTANCE (mm) ±SD	62.60±3.09	63.04±2.85	0.568[NS]*
INTERINCISOR DISTANCE(mm) ±SD	33.97±2.32	34.07±2.01	0.859[NS]*

NS *-non significant

Table 3: Assessment of intubation parameters

VARIABLE	Truview	McCOY	*P* value
Cormack And Lehane grade (%)			<0.0001[S]†
1	23(76.66)	0	
2	7(23.33)	23(76.66)	
3	0	7(23.33)	
Intubating Time±SD(seconds)	35.26±3.5 0	35.30±3.34	0.964[NS]*
Airway Trauma (%)	4(13.33)	4(13.33)	
Other Manoeuvers (%)	7(23.33)	7(23.33)	
Failed Intubation	0	0	
IDS			<0.0001 [S]†
0	23	0	
1-5	7	30	

NS*-non significant, S†-significant

RESULTS

Demographic data included variables of gender, age and weight which were comparable between the two groups (Table 1). Preanaestheticairway assessment parameters were also comparable (Table 2).

The CL grading of laryngeal views and IDS score in both the groups showed a highly significant statistical difference (P<0.0001).

Difference in TTI was not statistically significant and almost similar for both the groups.(Table 3)

100% successful intubation rate was noted in both the groups.(Table 3)

Pulse and mean arterial pressure increased from their pre-intubation values with both the blades without any significant difference between the two groups and returned to near pre-intubation values by 5 minutes in both the groups (Fig 1 and 2).

DISCUSSION

There are a few differences in the anatomical alignment of the airway axes with direct and indirect laryngoscopes which affects the passage of nasally introduced ETT. Direct laryngoscopy, which requires elevation of the laryngoscope blade, moves the larynx upward and lengthens the distance between the glottic orifice and the posterior pharyngeal wall. Under such circumstances, the Magill forceps often is used to direct the nasally introduced tube into the glottic orifice. In contrast, an anatomically shaped laryngoscope, which provides a non–line-of-sight view, often, maintains the airway in its original configuration. An anatomically shaped blade involves minimum movement of the larynx from the original position and allows easy entry of the tube tip through the glottic inlet.[9] A study with the glidescope video laryngoscope shows that anterior airway distortion and cervical spine movement during laryngeal visualization were less with the Glidescope than with the Macintosh laryngoscope.[10]

Although many studies have reported the role of Glidescope[11] and Airtraq[12] videolaryngoscopes for NTI, there is a paucity of published research on the role of Truview video laryngoscope in NTI and so this study was undertaken to compare Truview with McCoy laryngoscope blade for routine NTI.

U.S. Raveendra and colleagues evaluated Truview laryngoscope for NTI in 50 patients undergoing orthognathic procedures. Ninety four percent (94%) patients were successfully intubated nasally with the laryngoscope and CL grade I was obtained in 86% cases. They also reported 50% intubations in <43 seconds. The study demonstrated the suitability of Truview laryngoscope for NTI.[13]

In our study, all sixty (100%) patients were successfully intubated nasally with either of the blades in first attempt only.

The laryngeal view obtained with the use of Truview was CL grade I in 23 (76.66%) patients. In contrast, the CL grade II and III laryngeal view was obtained in Group M and had a highly significant statistical difference.The higher CL grade was seen in Group M inspite of patients having no anticipated difficult airway and the preoperative assessment parameters (Table 2) showing no significant differences between the two groups .

The optical view tube of the Truview video laryngoscope enables the operator to see glottic structures not visualized during direct laryngoscopy, culminating in an improved CL grade. A number of clinical[14,15] and manikin[16,17] studies support improved glottic view with Truview. In a study by G.St. Mont et al. comparing Macintosh and Airtraq laryngoscopes for nasal intubation for easy and difficult airways, the research workers observed that the Airtraq significantly improved the view obtained of the glottis in the easy intubation group with no difference in the need for optimizingmaneuvers, which is similar to our own observations.[12]

The difficulty of intubation was assessed with the IDS score (Appendix 1).

The IDS score, developed by Adnet and colleagues, is a quantitative scale incorporating multiple indices of intubation difficulty that more objectively quantifies the complexity of tracheal intubations.[18] In our study, the IDS score was lower for Truview with a *P* value of less than 0.0001, which showed that it is highly significant. Hence the intubation was easy with Truview. Puchner and colleagues reported that IDS score was significantly lower with the Airtraq and GlideScope than with the Macintosh laryngoscope (mean ± SD: A 0.1 ± 0.3, G 0.3 ± 0.6, M 0.8 ± 1.0; P = 0.013). Numeric rating scale (NRS) also showed a similar preference for indirect over direct laryngoscopy (A 0.9 ± 0.7, G 1.1 ± 0.6, M 1.9 ± 1.1; P = 0.001) for routine NTI.[19]

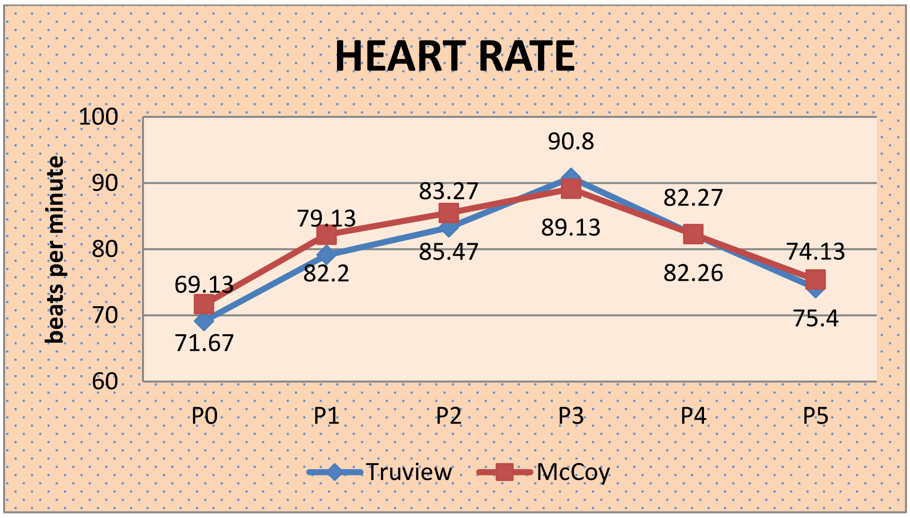


Fig 1: Graph representing the changes in heart rate(minute) during nasotracheal intubation with each device. 5 minutes prior to intubation (P0), every minute post intubation (P1), (P2),(P3),(P4),(P5)upto 5 minutes. The data is given as mean.

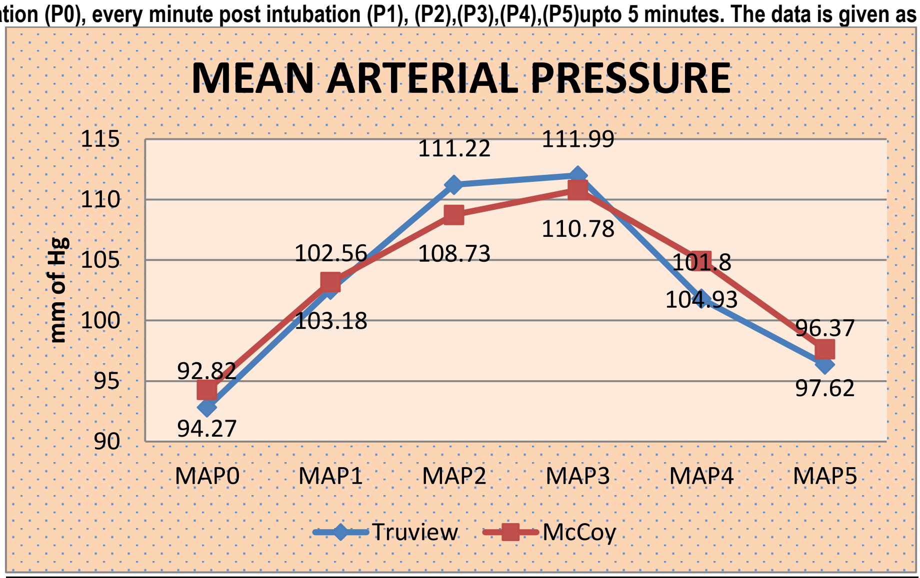


Fig 2: Graph representing the changes in mean arterial pressure (mm of Hg) during nasotracheal intubation with each device. 5 minutes prior to intubation (MAP0), every minute post intubation (MAP1),(MAP2),(MAP3),(MAP4),(MAP5) upto 5 minutes post –intubation. The data is given as mean.

In our study, the TTI was similar for both the groups Truview (45.65+_3.2 seconds) and McCoy (45+_3.17 seconds) which was also observed by G.St. Mont et al.[12] However a study by Joneset al. with Glidescope video laryngoscope (GVL) and direct laryngoscopy (DL) for NTI found that the median TTI was 23.2 s faster with the GVL (43.5 s, interquartile range IQR: 39.8-67.3) than with DL (66.7 s, IQR: 53.8-89.9), P = 0.0023. NTI was easier with the GVL than with DL (Visual Analogue Scale 10 mm, IQR: 5.5-18, vs. 20 mm, IQR: 10-32, P = 0.0041).They concluded that, compared with DL, the GVL had superior performance characteristics when used for nasotracheal intubation. The GVL had a clear role in routine NTI.[11]

Laryngoscopy and intubation are associated with increase in pulse and mean arterial pressure secondary to sympathetic discharge.

A laryngoscopy technique requiring lesser lifting force would proportionally reduce the sympathetic discharge and hence changes in haemodynamic parameters. The cardiovascular response to laryngoscopy and intubation was same for both the groups. There was no significant difference in increase in pulse and mean arterial pressure in both the groups noted upto 5 minutes post intubation. Since the McCoy blade also requires lesser lifting force than the Macintosh blade, similar to the Truview may explain the reason for no statistically significant difference being found in the vital parameters in between the two study groups. This was also noted by NeerjaBharti et al.[20]

Evidence of trauma was determined by presence or absence of blood/mucosal bleeding noted on laryngoscope blade. There were no between-group differences in the incidence of complications, including the appearance of blood on the laryngoscope blade, or of minor lacerations on the airway.

Truview is designed with a port for continuous oxygen insufflation (flow rate of 4-6 L min^{-1}), which in our study was used to prevent fogging of the lens. The capability of the optic laryngoscope blade to facilitate tracheal intubation in difficult intubation case and the benefit of oxygen insufflation were not assessed in this study.

LIMITATION OF THE STUDY

This study was carried out by experienced user of each device. The results seen may differ in the hands of less experienced users.

It is impossible to blind the anaesthesiologist to the device being used, thus there is a potential bias. However the possibility of bias has been reduced by involving the same two anaesthetists in the study and defining robust endpoints for observations.

CL grading is widely used in clinical practice, the appropriateness of using this grading with indirect laryngoscopes is open to question.

To be clinically relevant, results have to be tested in target populations i.e. in those with restricted mouth opening and/or limited neck mobility whereas our study population had normal airway. However, this study may form the basis for research in the role of Truview in difficult airway requiring NTI. Nasal route enables intubation when inter incisor gap is limited and also permits more maneuvers than oral route.[21] Video laryngoscopes now find a place in the difficult airway algorithm with (Category A1-B) evidence.[3]

CONCLUSIONS

We found good intubating conditions provided by Truview for NTI. Thus, our study demonstrates the suitability of the Truview laryngoscope for routine NTI. It may also be used as a rescue device foremergency difficult airway management, provided users are familiar with the device. Economically, this is one of the cheapest available video laryngoscopes in the market. When nasal intubation is required a plan of airway management must be formulated to keep as many options open as possible so that the airway can be safely secured.

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