



Preanaesthetic airway assessment may extend to glottis visualisation: An evaluation of intubation difficulty scale at laryngoscopy by two different blades

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Abstract

Aim: Possibility of encountering difficulty at intubation cannot be ruled out at every preanesthetic evaluation. The present study was aimed to compare the intubation difficulty scale for macintosh and truviv laryngoscope blades in elective surgical patients which were deemed to have normal airway assessment.

Methods: Sixty patients of ASA I/II with normal airway based on certain parameters were divided in two groups A and B. A were intubated with macintosh and B with Truviv blade.

Laryngeal view was assessed by Cormack Lehane grades and percentage of glottis opening score. The intubation difficulty was assessed based upon seven variables of Intubation Difficulty Scale (IDS) and compared between the two groups. IDS was primary while POGO and CL score were secondary outcome. The two groups were statistically evaluated by applying unpaired t test for parametric data and chi square test for categorical data. $P < 0.05$ was significant.

Results: Cormack and Lehane grade 1 in 22 patients (73.3%) for group A and 27 patients (90%) in group B were recorded. The mean IDS for group A and B was 1.30 ± 0.92 and 0.20 ± 0.50 respectively.

Conclusions: Evaluation of airway can be assumed to complete at pre anaesthetic check up. There are multiple factors which can influence the outcome of intubation difficulty scale. One such can be the design of the blade.

Keywords: Intubation difficulty scale (IDS), Percentage of glottis opening (POGO) score and Cormack and Lehane grades (CL grade).

Introduction

Despite advancement in airway assessment by various tools at our disposal such as comprehensive history, examination and exhaustive investigations, there always remain possibility of encountering a situation of unanticipated difficult laryngoscopy and intubation failure with incidence remaining as high as 8.5% of general anesthesia¹⁻⁴.

There are various tests to evaluate difficult intubation such as Mallampati score system, adequate mouth opening determined by inter incisor gap, thyromental distance, jaw protrusion, sternomental distance, cervical spine mobility, horizontal length of the mandible, neck circumference, hyomental distance, Wilson risk score and EL-Ganzouri risk system but these tests have low sensitivity, specificity and positive

predictive value when assessed individually. Therefore multivariate assessment is more effective and informative when applied in combination and have high predictive value⁵⁻⁸. Even at times this may prove to be insufficient in determining difficult laryngoscopy and intubation.

Adnets intubation difficulty scale (IDS) is an objective tool to quantify difficulty involved at laryngoscopy, intubation and determine various intricacy involved at the time of intubation. Based on the IDS, this study was designed to evaluate differences between conventional macintosh and truview blade for intubating conditions and hemodynamic responses during routine elective surgery.

Methods

After approval from institutional ethical committee and informed consent, this prospective randomized study was conducted on two groups of American Society of Anaesthesiologist (ASA) Grade I/II patients of either sex between 18-60 years, scheduled to undergo elective surgical procedures. Sixty patients were enrolled in this trial. Those with ASA status III and IV, modified Mallampati Grade ≥ 3 , thyromental distance < 6.5 cm, inter incisor distance < 4 cm, cervical spine injury, temporomandibular joint ankylosis and more than two failure insertion attempts were excluded from the study.

All patients were assigned to one of the two groups of thirty patients each, using computer-generated random number assignment in a sealed opaque envelope that was opened just before entry in the study.

- Group A (n = 30): Intubation with conventional laryngoscope
- Group B(n = 30): Intubation with Truview laryngoscope

All patients enrolled in study underwent airway assessment with Mallampati grading, inter incisor gap and extent of neck movement.

All patients were nil per oral before scheduled surgery and an intravenous access was established in operation theatre and were given aspiration

prophylaxis with intravenous ranitidine 50 mg and metoclopramide 10 mg. Standard monitoring included heart rate, electrocardiogram, non-invasive blood pressure, end-tidal carbon dioxide(etCO₂), and arterial oxygen saturation. After premedication with midazolam 0.05 mg/kg and fentanyl 2.0 mcg/kg, induction was achieved with propofol 2.0 mg/kg and vecuronium 0.1 μ g/ kg.

After complete suppression of train of four(nerve TOR 272 neuromuscular monitor of Fisher and Paykel Healthcare) an adult lubricated cuffed PVC endotracheal tube size 7.0-8.0 was inserted orally into the trachea with either Macintosh laryngoscope blade number 3 or Truview adult laryngoscope blade. The laryngeal view was classified by CORMACK LEHANE GRADING(CL)⁹.

Grade 1 Visualization of entire glottis aperture.

Grade 2 Visualization of posterior aspect of glottis aperture.

Grade 3 Visualization of tip of epiglottis.

Grade 4 Visualization of soft palate.

POGO Score (Percentage of glottic opening visible)¹⁰.

Grade 1(76-100%), 2(51-75%), 3(26-50%), 4(0-25%)

(No external laryngeal pressure to be applied to improve the score)

Tip of orotracheal tube was gently maneuvered and advanced under vision into trachea.

The ease of intubation was evaluated as per Adnet's IDS (Intubation difficulty scale) based on 7 variables:¹¹

N1: Number of intubation attempts >1 (Every Additional attempt add 1 points), N2: Number of operators >1 (Each Additional operator add 1 point), N3: Number of alternative techniques used (Each alternative technique get 1 point that are repositioning of head and neck and use of metal stylet, N4:Glottis exposure(Cormack and Lehane Grade minus one)(Apply Cormack grade for 1st attempt), N5: Lifting force required during Laryngoscopy (0–Normal,1increased), N6: Necessity for laryngeal pressure (Sellick's Maneuver add no point) (0–Not applied,1– Applied)

and N7:Vocal Cord mobility(0-Abduction, 1-Adduction).

IDS was primary while POGO and CL score were secondary outcome.

Tube was fixed with adhesive tape and after securing connection to the breathing circuit, anaesthesia was maintained on oxygen, air and isoflurane at 1-1.5 MAC. After surgery, neuromuscular block was reversed with iv neostigmine 2.5mg and iv glycopyrrolate 0.5mg.

Patients were shifted to PACU for post operative monitoring. Vitals including heart rate (HR), mean arterial pressure), peripheral oxygen saturation (SpO₂), end tidal Carbon Dioxide (Et CO₂) were monitored (Datex Cardio Cap, CM lead).

Sample size

The preliminary sample size for this study was calculated based on previous study with initial success rate of 92% and allowable error of 8% of 92(i.e. 8.6%) indicated that a minimum sample size of 57.11 were sufficient to detect a significant difference between the two group for IDS parameter. A sample size of 60 patients was decided to ensure a level of significance of 5% with suitable power. Assuming a drop rate of 10%, a final sample size was decided to be 66 patients.

Statistical Analysis

On completion of the study, the data collection and results was analyzed by software SPSS (Statistical package for the social sciences) version 20. Mean and standard deviation was calculated and compared between the groups for demographic data and IDS. For categorical data chi square test and for parametric data, unpaired t test was applied. A P value of less than 0.05% was considered significant.

Results

Of 66 patients enrolled in the study, four patients were excluded due to more than two insertion attempts and two refused to enter into study. There was no difference in the parameter for demographic profile between the two groups including the airway assessment by interincisor gap and the thyromental distance. (Table 1)

Table 1: Demographic profile and airway assessment.

Variables	MIT group	AIB group	P
Age (years)	31.42±8.96	28.87±11.54	0.37
Weight (kg)	46.93±2.51	46.8±2.64	0.74
Male:female	17:13	19:11	0.46
Inter incisor gap (cm)	6.15±0.6	74.95±0.49	0.21
Thyromental distance (cm)	7.31±0.54	7.11±0.45	0.10

Data as Mean±SD P< 0.05 statistically significant

The glottis visualization assessed by CL grades revealed that grade 1 was higher in the group B indicating it was easier to obtain near complete view by truview blade in 27 patients while 22 patients were recorded for grade 1 for truview group. Grade 2 was on the contrary was observed in 7 patients in macintosh group while only 3 patients were observed in truview group. Significantly more number of patients fell in the higher grades in the macintosh group A(Table 2).Only one patient was in group A whereas there grade 3 was not observed in group B. Grade 4 was not seen in any patient in either group.

Table 2: Comparison of Cormack and Lehane grade

Grade	Group A	Group B
GRADE 1	22 (73.3%)	27 (90%)
GRADE 2	7 (23.3%)	3 (10%)
GRADE 3	1 (3.3%)	0
GRADE 4	0	0

The POGO score was categorised into 4 groups based on percentage of visualization of glottis during laryngoscopy. Near complete glottis visualization of grade 1 was more in group B compared to group A. whereas higher grades of 3 and 4 were more in group A. The comparison was observed to be statistically significant between the two groups (table 3).

Table 3: Comparison of Percentage of Glottic opening (POGO) score

Grade	Group A	Group B	P
Grade 1	22(73.3%)	25(83.3%)	0.002
Grade 2	1(3.3%)	3(10%)	
Grade 3	6(20%)	2(6.6%)	
Grade 4	1(3.3%)	0	

P< 0.05 is statistically significant

There was significant difference for the average IDS which was statistically higher for macintosh group compared to truviv group owing to more manoeuvres, attempts and use of intubation aid.(Table 4,5) The lifting force, laryngeal manoeuvre and the lower grades were responsible for higher IDS for the group A compared to group B.

Table 4: Average Intubation Difficulty Scale (IDS)

Groups	Mean IDS Scale	P
Group A	1.30±0.92	0.043
Group B	0.20±0.50	

Data as Mean±SD P< 0.05 statistically significant

The individual parameter for the IDS is being depicted in table 5. There were differences between the two groups for these parameters for the two groups which resulted in higher score of IDS for group A compared to group B. These parameters indicate the degree of difficulty encountered during laryngoscopy and intubation which is higher for macintosh group compared to truviv group.

Table 5: Individual parameter of Intubation Difficulty Scale

Parameters	Group A	Group B
No of attempts	26/4	30/0
No of operators	28/2	30/0
Intubation aid	23/7	29/1
Glottis exposure	22/7/1/0	27/3/0/0
Lifting force	22/8	30/0
Laryngeal manoeuvre	23/7	28/2
Vocal cord position	28/2	30/0

No of attempts (1st/2nd), No of operators (1/2), Intubation aid (No stylet/stylet), Glottis exposure (CL grade-1)(0/1/2/3), Lifting force (normal/increased), Laryngeal manoeuvre (Not Applied/applied), Vocal cord position (Abduction/Adduction)

Discussion

The true assessment of airway is not complete until the time of laryngoscopy and intubation when it can be more easily is distinctly defined by intubation difficulty score advocated by Adnet.

The grading system by Cormack and Lehane is applied in routine practice. The Kohli and Karnik¹² compared Truviv and Macintosh laryngoscope for tracheal intubation in 200 patients undergoing elective surgeries and randomized these into two groups: Macintosh and Truviv. Their observation was that Truviv showed better results for glottis view by Cormack and Lehane grading system 90% for grade I, 10% for grade II versus 61% for grade I, 38 % for grade II and 1% for grade III with Macintosh blade. This study appears to be quite similar to ours for Cormack and Lehane grading.

Similar results have also been reported by Kulkarni and Timanaykar¹³ who compared the glottis visualization with different laryngoscope blade in 120 patients undergoing elective cancer surgeries for Cormack and Lehane grading system. In this study grade I view was obtained most often (87%) with Truviv laryngoscope and 13% for grade II whereas only 63 % patients in grade I & 33 % patients in grade II and 4% in grade III were observed with Macintosh laryngoscope blade. In addition to the CML grading POGO score was included by Ochroch as a measure of laryngeal view which has been reported by studies to be more sensitive than CML grading and has shown intra and inter group observer reliability¹⁴. The POGO score of our study was similar to that of other study¹⁵.

The IDS score is applicable for reproducible quantities to estimate intubation difficulty during laryngoscopy. Dwivedi and Shukla¹⁶ compared Truviv and Macintosh laryngoscope for endotracheal intubation in 150 patients. The mean IDS score for Truviv was 0.75±0.5 and for Macintosh 1.76±0.26. More optimization maneuvers were utilized in Macintosh group compared to truviv group 16 versus 7 respectively in this study. Whereas in our study 22 optimization

maneuvers were utilized in Macintosh group which accounts for higher IDS compared to Dwivedi study. The IDS score observed by Arpita Saxena¹⁷ study where Truview laryngoscope (TRU) was compared with Macintosh laryngoscope (ML) in the airway management of elective surgical patients in 140 patients. During this prospective cross over study IDS score for MAC group was 0.68 ± 1.03 and for TRU was 0.32 ± 0.71 . The ease of intubation was also assessed subjectively during study besides the use of Intubation Difficulty Score. Their results showed lower intubation difficulty score but more difficulty in using TL on subjective assessment and vice versa for ML. The paradoxical results of two variables comparing the ease of intubation could be partly due to a peculiar technique for intubation with TL and partly due to need for more expertise with it. The TL technique for intubation is an indirect manner, seeing the tube through the lens as the tip of the tube is advanced through the visual optical field. The paradoxical results as described above can only be attributed to maneuvers requiring a good eye-hand coordination and expertise. The lower Intubation difficulty score in patients intubated with Truview laryngoscope can be attributed to improvement in glottis view and non requirement of laryngeal pressure and lifting force during intubation in our study.

Besides this, the lower IDS in our study for the Truview laryngoscope can also be attributed to its design. Incorporation of prism provided unmagnified refraction of 42 degree in the line of sight along with an integrated optical lens system and unique blade tip angulation provides a better laryngoscopic view of larynx via the lens¹⁸. Thus this unique feature of truview blade henceforth lowers the IDS where as Macintosh blade can provide a maximum view of 30 degree anterior view structures at its tip. It therefore requires greater lifting force and yet adequate glottis view is not guaranteed.

The difference in the glottis visualization by the two laryngoscope blade can be explained by mechanics involved with Macintosh blade, the curvature of the visual "hill" interrupt the line of sight called "crest

of hill" effect¹⁹. The Macintosh Laryngoscope used during intubation requires the alignment of oral, pharyngeal and laryngeal axis which in turn requires a lifting force while Truview laryngoscope does not require alignment of these axis to view glottis & therefore lifting force is not applied.

The mean blood pressure were better controlled and fewer airway related complications were seen with Truview laryngoscope.

There were few imitations in this study. It was not feasible to blind the study. However the data analyst was blinded to group allocation. This study was validated only for PVC cuffed tubes & not to others such as flexometallic or RAE. Furthermore this study was not a cross over trial nor can we comment on improvement of Cormack and lehane grading with new laryngoscope device such as Airtraq, McGrath or C- Mac video laryngoscope which were not included.

This study approves that no airway assessment is complete until the time of laryngoscopy which is the real time when design of laryngoscope blade and skill of the performer can greatly effect the final outcome of achieving safe and effective airway.

Declarations

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Conflict of interest: none

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