COMPARISON OF OUTCOME BETWEEN CONVENTIONAL AND VIDEO LARYNGOSCOPE IN PREDICTED DIFFICULT INTUBATION

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ABSTRACT

Background: Endotracheal intubation is the mainstay of airway management in general anaesthesia. Failure to intubate the trachea, often known as difficult intubation, is always a possibility. To overcome difficult intubation, different methods of instrumental support were developed. Some authors recommend video laryngoscopy as one of the techniques that may overcome difficult intubation.

Methods: From March 2018 to September 2019, a comparative cross-sectional study was conducted at BSMMU, Dhaka in the department of anesthesia, analgesia, and intensive care medicine. A total of 60 patients with predicted difficult intubation who were scheduled for elective surgery under general anaesthesia with endotracheal intubation were selected for the study. Prediction of difficult intubation was assessed by modified Mallampati class III and IV or thyromental height <50 mm. Time, success rate of endotracheal intubation and number of attempts was recorded.

Results: Time taken from visualization of glottis for insertion of ETT was 12.8±2.3 sec in conventional laryngoscope which was significantly lower in video laryngoscope (15.0±3.6) (p =0.006). Time taken to visualize the glottis was 13.2±1.7 sec in conventional laryngoscope and 13.2±4.0 sec in video laryngoscope (p>0.05). Total time for tracheal intubation was 49.0±6.4 sec in conventional laryngoscope and 53.2±9.9 sec in video laryngoscope (p>0.05). Intubation with first attempt by video laryngoscope was (30/30; 100%) as compared with conventional laryngoscope (27/30; 90%) (p>0.05).

Conclusion: It is evident from the study that intubation with video laryngoscope in comparison to conventional laryngoscope might provide better outcome in terms of ease of intubation and number of attempts during intubation for patients undergoing elective surgery under general anaesthesia.

Keywords: Thyromental height, Modified Mallampati classification, Difficult intubation, Conventional or Macintosh laryngoscope, Video laryngoscope.

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INTRODUCTION

Endotracheal intubation is the most common method of airway management in general anaesthesia. An anaesthesiologist may have difficulty in intubating, which may cause ventilation issues. The patient may suffer catastrophic consequences if a difficult intubation is not handled properly. A difficult airway to control accounts for 1.5% to 20% of all anesthesia-related deaths. The mortality rate associated with anesthesia is influenced by the incapacity to treat these troublesome airways.[1]

As a result, anticipating difficult intubation is critical. Many airway evaluation tests and approaches are used to anticipate difficult intubation. The gold standard for determining difficulties in endotracheal intubation is Cormack and Lehane.[2] However, practicing in the pre-anaesthetic check-up room or during the bedside assessment is not possible. Modified Mallampati test, thyromental height test or both are common methods for evaluating difficult larynges copy among the various tests. According to recent studies, the thyromental height test is more reliable than commonly used purely anatomical parameters in predicting difficult intubation.[3] Modified Mallampati test is a simple, non-invasive procedure that can be performed routinely in the pre-anaesthesia checkup room.

Endotracheal intubation (ETI) is traditionally done with a conventional laryngoscope, which includes distorting, compressing and manipulating anatomical structures to get a sufficient glottic view. Video laryngoscope is a slower intubation approach than conventional Macintosh laryngoscope when managing regular airways due to visual attention in two areas, difficult tube passage and lack of competence.[4]

A conventional Macintosh laryngoscope provides a limited view of the airway structures, which may be obscured during attempt to intubate the trachea, resulting in endotracheal tube (ETT) slip into the oesophagus.[5] With video laryngoscopes the pharyngeal, tracheal, and oral axes do not need to line up in order to provide a wide-angle view.[6] While a laryngeal view cannot be achieved with direct laryngoscopy, video laryngoscopy often overcomes this barrier and prevents intubation failure. Video laryngoscopes have been shown to have a better outcome when intubating patients with difficult airways.[7] The video laryngoscope is expensive, scarce, complex, and requires an experienced anaesthesiologist during intubation.[8] However, due to its higher success rate and better view of the glottis, video laryngoscopy is superior and more beneficial than conventional Macintosh laryngoscopes.[9]

The purpose of this study was to facilitate endotracheal intubation for the patients with predicted difficult intubation.

MATERIALS AND METHODS

Between March 2018 and September 2019, patients in the department of Anaesthesia, Analgesia, and Intensive Care Medicine of BSMMU participated in this comparative cross-sectional study. The patients were selected from the department of General Surgery, Urology, Orthopaedics Surgery, Ophthalmology and Obstetrics & Gynaecology. A total of 60 patients with predicted difficult intubation were selected by assessment of modified Mallampati classification and thyromntal height test undergoing elective surgery under general anaesthesia. Airway assessment was done for the selection of patients having predicted difficult intubation. Patients were divided into two groups, each with 30 patients (Group A and Group B). A traditional Macintosh laryngoscope was used to intubate patients in Group A, while a video laryngoscope was used for Group B patients. Observations were made by assessing parameters during intubation.

Participants in the study had to be over eighteen years old, male or female, classified as grade I or II by the American Society of Anaesthesiologists (ASA), scheduled for elective surgery under general anesthesia with a risk of difficult intubation, have a modified Mallampati class III or IV, or have a thyromental height of less than 50 mm.

Patient with emergency surgery, history of neurological disorder, history of cardiovascular disease, anatomical or congenital airway disease, pregnancy were excluded from the study.

PROCEDURE OF INDUCTION AND ENDOTRACHEAL INTUBATION

Before the day of surgery all patients were assessed in pre-anaesthetic checkup room. The patient was assigned to either direct laryngoscope or video laryngoscope tracheal intubation via computer-generated numbering once the procedure was explained and consent was obtained. None of the patients received pre-anaesthetic medication. All patients were kept fasting at least 6 hours before surgery. Intubation was performed by the researcher. Patients were pre-oxygenated in the supine (Sniffing) position with a pillow height 8-10 cm with 100% oxygen via a face mask for 3 minutes. After the implementation of standard monitoring (end tidal capnography, or EtCO2, non-invasive blood pressure, electrocardiography and pulse oximetry, or SpO2). In order to maintain an open intravenous vascular access, fluid infusion was started. Intravenous fentanyl (2 mg/kg) and propofol (2 mg/kg) were used to induce anesthesia. After verbal cues failed to elicit a response, mask ventilation using 100% oxygen was started and succinylcholine (2 mg/kg) was administered until complete relaxation. Endotracheal intubation was carried out when patients were judged to be sufficiently relaxed with succinylcholine at the resolution of fasciculation or after 90 seconds. In order to perform endotracheal intubation, the endotracheal tube's inner diameter was 7 mm for females and 8 mm for males. Following intubation, the tube cuff was inflated with cuff pressure control so that the pressure was 25 mm of Hg. After intubation, mechanical ventilation (O_2=100%, tidal volume=7-10 mg/kg, frequency=14 breaths/min, positive end expiratory pressure=0) was initiated.

In both groups, the number of successful endotracheal intubations, the number of attempts, and the length of the intubation procedure were noted. Duration of intubation procedure in difficult intubation was identified by Cormack-Lehane grading. Difficult cases were intubated by external laryngeal manipulation, stylet and gum elastic bugie.

A pre-made data collection sheet was used to collect the data. The Statistical Package for Social Sciences (SPSS version 24.0) was used to analyze all of the data that had been gathered after being input into a computer. Descriptive statistics (frequency, mean, and SD), the Chi-Square test, and the unpaired t-test were used to analyze the data. The association (relationship) between two qualitative attributes was measured using the chi-square test and Fisher's exact test, and the continuous data between the two study groups was compared using the unpaired t-test. The level of significance set at 5% and $p<0.05$ was considered statistically significant. Data was presented by tables, graphs and diagrams.

RESULTS

Table-I: Comparison of demographic profile of the study subjects (n=60)

Parameter	Group A	Group B	p-value
Age (years)	45.9±15.56	47.5±15.5	[a]0.692
Gender			
Male	16(53.3)	15(50.0)	[b]0.796
Female	14(46.7)	15(50.0)	
BMI in kg/m^2 (Mean±SD)	23.4±4.2	22.9±2.6	[a]0.576
ASA grading			
ASA I	23(76.7)	24(80.0)	[b]1.000
ASA II	7(23.3)	6(20.0)	

Data were expressed as frequency following percentage and mean ± SD.
a. Unpaired t-test and b. Chi-Square test was done to measure the statistical significance.

Group A patients intubated by conventional Macintosh laryngoscope and Group B patients by video laryngoscope.

Table-I shows that in Group A mean age was 45.9 years, BMI 23.4, ASA grade 1 was 76.7% and ASA grade II was 23.3%.In Group B mean age was 47.5 years, BMI 22.9, ASA grade 1 was 80% and ASA grade II was 20%.

Table-II: Comparison of distribution of the study subjects according to diagnostic value (n=60)

Diagnostic findings	Group A	Group B	p-value
Thyromental height (mm)	46.1±13.0	48.9±5.2	0.293
Modified Mallampati score	2.5±0.6	2.5±0.5	0.113
Cormack- Lehane score	2.7±0.6	2.5±0.7	1.000

Data were expressed as mean ± SD, Unpaired t test was done to measure the level of significance.

Table-II reveals that Thyromental height in Group A was 46.1±13.0 mm and Group B was 48.9 ±5.2 mm. Modified mallampati score in Group A was 2.5±0.6 mm and in Group B was 2.5±0.5 mm. Cormack- Lehane score in Group A was 2.7±0.6 and in Group B was 2.5±0.7. The differences were not statistically significant ($p > 0.05$) between two groups.

Table-III: Comparison of the patients with predicted difficult intubation according to modified Mallampati classification and thyromental height (n=60)

	Group A	Group B	p-value
Only Modified Mallampati class III & IV	12(40.0)	14(46.7)	0.806
Only Thyromentalheight<50mm	13(43.3)	12(40.0)	
Both Modified Mallampati class III & IVand Thyromentalheight <50mm	5(16.7)	4(13.3)	

Table-III shows that only modified Mallampati class III & IV was 12(40%) in Group A and 14(46.7%) in Group B. Only thyromental height <50 mm was found 13(43.3%) patients in Group A and 12(40%) in Group B. Both modified Mallampati and thyromental height patients were found 5(16.7%) in Group A and 4(13.3%) in Group B ($p > 0.05$).

Table-IV: Comparison of distribution of the study subjects according to Cormack & Lehane grading without application of BURP maneuver (n=60)

Cormack &Lehane grading	Group A	Group B	p-value
Grade I & II	7(23.3)	9(30.0)	0.559
Grade III & IV	23(76.7)	21(70.0)	

Table-IV shows that Cormack & Lehane grade I & II was found 7(23.3 %) in Group A and 9(30.0 %) in Group B ($p > 0.05$). Grade III & IV was found 23(76.7%) and 21(70.0 %) in Group A and Group B respectively ($p > 0.05$).

Table-V: Comparison of distribution of the study subjects according to intubation parameters (n=60)

Intubation parameters	Group A	Group B	p-value
Time taken to visualize glottis (Sec)	13.2±1.7	13.2±4.0	0.967
Time taken from visualization of glottis to insertion of endotracheal tube (Sec)	12.8±2.3	15.0±3.6	0.006
Total time taken for tracheal intubation (Sec)	49.0±6.4	53.2±9.9	0.053

Data were expressed as mean ± SD; Unpaired t test was done.

Table-V reveals that total time for tracheal intubation was 49.0 ± 6.4 sec in Group A and 53.2± 9.9 sec in Group B which was not found statistically significant (p>0.05). Time taken from visualization of glottis to insertion of ETT was 12.8±2.3 sec in Group A and 15.0±3.6 sec in Group B which was significantly higher in Group B (p =0.006).

Table-VI: Comparison of distribution of the study subjects according to events during difficult intubation in two groups (n=60)

Events	Group A	Group B	p-value
Number of attempts			
Single	27(90.0)	30(100)	[a]0.237
Double	(10)	0(0.0)	
Use of gum elastic bougie	1(3.3)	0(0.0)	[a]1.000
External laryngeal manipulation	23(76.7)	21(70.0)	[b]0.113
Failed intubation	1(3.3)	0(0.0)	[a]1.000

[a]Fisher's Exact test and [b]Chi-Square test was done.

Table-VI shows that during intubtion gum elastic bougie was used for one patient in Group A and gum elastic bougie not required in Group B. 23(76.7%) patients were intubated by external laryngeal manipulation in group A and 21(70.0%) in Group B. A failed intubation was observed in Group A and the patient was managed by bag mask ventilation.

DISCUSSION

In the current study, Group A's mean age was 45.9 years, while Group B's mean age was 47.5 years. According to Mingir et al the mean age of Groups A and B was 46.6 and 48.3 years, respectively, which is similar to the current study.[10] According to Jung Bauer et al group A's mean age was 54.2 years, while group B's mean age was 56.8 years. The current study's mean age is higher.[11] The current study yielded a mean age of less than forty years, which is lower than that of Goksu et al.[12]

The male to female ratio in both groups was nearly the same in this study, which is in line with the research done by Jafra et al.[13] Thirteen male patients outnumber female patients, with no statistically significant difference between the two groups, according to Erdivanli et al.[7]

In this study, modified Mallampati classes III and IV comprised 17 and 18 instances in Groups A and B, respectively, out of 60 cases, thyromental height was less than 50 mm in 26 cases.

In this study, difficult intubation rate was higher in Group A (76.7%) than Group B (70.0%). Chandrashekaraiah et al found difficult intubation 13.3%in conventional laryngoscope and 6.7% in video laryngoscope.[14] Jungbauer et al found 18.0% in conventional laryngoscope and 5% in video laryngoscope.[11] Similarly, Mingir et al found 47% in Group A and 50% in Group B.[10] Jungbauer et al found 36 patients in Group A and 10 patients in Group B were difficult to intubate.[11] In this study, percentage of difficulty is more in both groups due to only predicted difficult cases were included for the study.

Intubation time of the present study was comparatively higher in video laryngoscope group. Erdivanli et al showed video laryngoscope having longer glottic view and intubation time.[7] Another study by Kamewad et al showed that duration of laryngoscopy and intubation by Pantex video laryngoscope was higher than conventional laryngoscope.[15] A study conducted by Erdivanli et al showed by using king vision video laryngoscope, visualization of glottis and intubation time was longer compared to Macintosh laryngoscope.[7] In the current study time taken for visualization of glottis to insertion of endotracheal tube is significantly higher in video laryngoscope. It is due to visual attention in two different places and difficult tube passage during intubation.

In this study, successful endotracheal intubation is higher by using video laryngoscope (30/30, 100%) than conventional laryngoscope (29/30, 96%). Mingir et al used TruView EVO2 video laryngoscope and Macintosh laryngoscope where intubation success rate was 90.0% in both groups.[10] Jungbauer et al studied over 200 patients where 92.0% successful intubation was done by Macintosh laryngoscope and 99.0% by video laryngoscope.[11] Hodgetts et al compared success of endotracheal intubation in 90 patients with C-MAC video laryngoscope and conventional laryngoscope where success of endotracheal intubation is 100% in both group.[16] Xue et al revealed success rate of intubation was 94% by video laryngoscope.[17] Erdivanli et al showed that first pass intubation success rate was more in video laryngoscope than conventional laryngoscope.[7] In this present study, 90% patients were intubated by conventional laryngoscope by single attempt with one failed intubation. The more success rate of intubation by video laryngoscope was due to better visualization of glottis by and alignment of three axes not required for endotracheal intubation.

CONCLUSION

It is clear that for patients undergoing elective surgery under general anesthesia, intubation with a video laryngoscope yields better results than with a conventional laryngoscope in terms of ease of intubation and number of attempts during intubation.

REFERENCES

1. Nurullah M, Alam MS, Hossen M et al. Prediction of difficult airway by thyromental height test-a comparison with modified mallampati test. Bangladesh Journal of Medical Science 2018;17(3):455–61.

2. Cormack RS, Lehane J. Difficult tracheal intubation in obstetrics. Anaesthesia 1984; 39(11): 1105‐11.

3. Palczynski P, Bialka S, Misiolek H et al. Thyromental height test as a new method for prediction of difficult intubation with double lumen tube. PLoS One 2018; 13(9): e0201944.

4. Aziz MF, Dillman D, Fu R et al. Comparative effectiveness of the C-MAC video laryngoscope versus direct laryngoscopy in the setting of the predicted difficult airway. The Journal of the American Society of Anesthesiologists 2012; 116(3):629‐36.

5. Channa AB. Video laryngoscopes. Saudi journal of anaesthesia 2011; 5(4):357.

6. Paolini JB, Donati F, Drolet P. Video-laryngoscopy: another tool for difficult intubation or a new paradigm in airway management? Canadian Journal of Anesthesia/Journal canadiend'anesthésie 2013; 60(2):184–91.

7. Erdivanli B, Sen A Batcik S et al. Comparison of King Vision video laryngoscope and Macintosh laryngoscope: a prospective randomized controlled clinical trial. Revista Brasileira de Anestesiologia 2018; 68: 499-506.

8. Cooper RM, Pacey JA, Bishop MJ et al. Early clinical experience with a new videolaryngos cope (GlideScope®) in 728 patients. Canadian Journal of Anesthesia 2005; 52(2):191–8.

9. Hoshijima H, Denawa Y, Tominaga A et al. Videolaryngoscope versus Macintosh laryngoscope for tracheal intubation in adults with obesity: a systematic review and meta-analysis. Journal of clinical anesthesia 2018; 44: 69-75.

10. Mingir T, Kitapcioglu D Turgut N et al. The Accuracy of Tests Used to Predict Difficult Airway and a Comparison of Macintosh Laryngoscope to Video Laryngoscope for Intubation. Kuwait Medical Journal 2015; 47(3).

11. Jungbauer A, Schumann M, Brunkhorst V et al. Expected difficult tracheal intubation: a prospective comparison of direct laryngoscopy and video laryngoscopy in 200 patients. British journal of anaesthesia 2009; 102(4): 546–50.

12. Goksu E, Kilic T, Yildiz G et al. Comparison of the C-MAC video laryngoscope to the Macintosh laryngoscope for intubation of blunt trauma patients in the ED. Turkish journal of emergency medicine 2016; 16(2): 53–6.

13. Jafra A, Gombar S, Kapoor D et al. A prospective randomized controlled study to evaluate and compare GlideScope with Macintosh laryngoscope for ease of endotracheal intubation in adult patients undergoing elective surgery under general anesthesia. Saudi journal of anaesthesia 2018; 12(2): 272.

14. Chandrashekaraiah M, Shah V, Pandey V et al. Evaluation of ease of intubation using C-MAC Vs Macintosh laryngoscope in patients with the application of manual inline axial stabilization-A randomized comparative study. Sri Lankan Journal of Anaesthesiology 2017; 25(1).

15. Kamewad AK, Sharma VK, Kamewad SM et al. Hemodynamic response to endotracheal intubation: direct versus video laryngoscopy. Int J Res Med sci 2016; 4: 5196-250.

16. Hodgetts V, Danha RF, Mendonca C et al. A randomized comparison of C-MAC videolaryngscope versus macintosh laryngoscope for tracheal intubation. J AnesthClin Res 2011; 2(9): 9.

17. Xue FS, Li HX, Liu YY et al. Current evidence for the use of C-MAC videolaryngoscope in adult airway management: a review of the literature. Therapeutics and Clinical Risk Management. 2017; 13: 831.