COMPARISON OF LARYNGEAL VISUALISATION AND EASE OF INTUBATION BETWEEN MACINTOSH AND MEDAN VIDEO LARYNGOSCOPE

Swati Agarwal[1], Sanjot Ninave[2]

[1]Postgraduate Trainee, Department of Anaesthesia, Jawaharlal Nehru Medical College.
[2]Professor, Department of Anaesthesia, Jawaharlal Nehru Medical College.

ABSTRACT

BACKGROUND

Orotracheal intubation is the most common method used to secure and maintain airway. Macintosh laryngoscope is the most popular device used for intubation. Video laryngoscopy is a recent development that attempts to improve the success of tracheal intubation. Therefore, we compared Macintosh and Medan video laryngoscope during routine intubation by anaesthetists experienced with Macintosh, but novice to video laryngoscope.

The aim of the study is to evaluate the laryngeal visualisation and ease of intubation with Macintosh and video laryngoscope.

MATERIALS AND METHODS

The study included 60 subjects of age group 18-50 years with apparently normal airway, randomly allotted in 2 groups of 30 each. The parameters like C-L grade, ease of intubation, time to intubation and number of attempts were recorded.
Statistical Analysis- Statistical analysis was done by using Student's unpaired t-test and Chi-square test and $p<0.05$ is considered as level of significance.

RESULTS

Glottic visualisation assessed using Cormack-Lehane grading was significantly better with video laryngoscope (90%, Grade I views) as compared to Macintosh blade (60%, Grade I views). The ease of intubation was found to be comparable between the two. The mean time to intubation was more with video laryngoscope (33.9s) than with Macintosh laryngoscope (22.63s).

CONCLUSION

The video laryngoscope may not be advantageous over Macintosh laryngoscope for intubations performed in apparently normal airway in elective surgeries.

KEYWORDS

Intubation, Macintosh, Medan Video Laryngoscope, Laryngeal Visualisation, Ease of Intubation.

HOW TO CITE THIS ARTICLE: Agarwal S, Ninave S. Comparison of laryngeal visualisation and ease of intubation between Macintosh and Medan video laryngoscope. J. Evid. Based Med. Healthc. 2017; 4(94), 5829-5832. DOI: 10.18410/jebmh/2017/1174

BACKGROUND

Airway management is the primary responsibility of the anaesthesiologists to secure, preserve and protect it during induction, maintenance and recovery from anaesthesia. Most anaesthesia mishaps occur at the time of induction of anaesthesia.[1] Orotracheal intubation is the most common method used to secure and maintain airway. The reported frequency of difficult intubations is between 1.5% and 13%, which is a problem that requires a prompt solution.[2] Although, the likelihood of a difficult intubation can be estimated from preoperative measurements and scoring systems obtaining direct access to the glottis during preoperative direct laryngoscopy can be difficult.[3] Glottic view during laryngoscopy can be classified using Cormack-Lehane grading.[4] Glottic view can be improved by external manipulation of larynx using Backward, Upward, Rightward Pressure (BURP). The need for external manipulation, the number of attempts and change of laryngoscopic blades are indicators of difficulty encountered during laryngoscopy and intubation.[5]

In 1943, Sir Robert Reynolds Macintosh invented the curved laryngoscope blade. It is the most popular device used to facilitate orotracheal intubation and constitutes a gold standard.

Video laryngoscopy is a recent development that attempts to improve the success of tracheal intubation.[6] The end of the blade is equipped with a video camera enabling the operator to visualise the glottis indirectly on a video screen. Video laryngoscopes allow a wide viewing angle and make the alignment of the oral, pharyngeal and tracheal axis unnecessary. Currently, several different types of video laryngoscopes are available each with a different blade shape, user interface and geometry and tube insertion strategy.[7] Some previous reviews have indicated an advantage when using video laryngoscopy, but a need remains for evidence-based review of the efficacy of video laryngoscopy above that of direct laryngoscopy.[8]

Financial or Other, Competing Interest: None.
Submission 27-10-2017, Peer Review 29-11-2017,
Acceptance 13-12-2017, Published 15-12-2017.
Corresponding Author:
Dr. Swati Agarwal,
#202, Datta Residency, JNMC Campus,
Sawangi, Wardha, Maharashtra-442001.
E-mail: swati_agrwl@yahoo.com
DOI: 10.18410/jebmh/2017/1174

We have used Medan video laryngoscope, which has been made recently available in our rural hospital to compare it with Macintosh laryngoscopes in terms of laryngeal visualisation and ease of intubation in apparently normal airways by anaesthetists inexperienced to video laryngoscope.

MATERIALS AND METHODS

Following ethical approval by the Institutional Ethical Committee, 60 patients, patients between 18-50 years of age of either sex, ASA grade 1 and 2 undergoing elective surgery under general anaesthesia were included. In the preoperative evaluation, demographic data such as age, sex, weight and height of the patient were noted, airway characteristics were noted (Mallampati grade, inter-incisor distance, thyromental distance and sternomental distance). Patients with ASA grade III and grade IV, Mallampati grade III and IV, edentulous patient, facial anomalies, pathology in neck, pregnant patients, diabetic patients and patient's refusal to give consent) were excluded from the study.

Patients were assigned to two groups using 'chit in the box' method. A total of 60 chits were made with 30 labelled as 'Macintosh' and 30 as 'video' and put in a box. After mixing, a chit was picked up by the subject and not replaced in the box. This ensured equal allocation of the subjects to both the groups.

After confirming the NBM status, intravenous line with 18G cannula was secured and Lactated Ringer's solution was started. After attaching all monitors, baseline reading of Heart Rate (HR), Blood Pressure (BP), Oxygen Saturation (SpO2) and Electrocardiogram (ECG) were noted. Pre-anaesthetic medication (Inj. Glycopyrrolate 0.2 mg, Inj. Midazolam 1 mg, Inj. Fentanyl (2 ug/kg) was given followed by preoxygenation with 100% O2 for 3 minutes. Induction was done with Inj. Propofol 2 mg/kg bodyweight. After confirming that patient could be ventilated through bag and mask, Inj. Vecuronium 0.1 mg/kg bodyweight was given intravenously and patient was ventilated for 3 minutes manually on bag and mask with Bain's circuit.

The laryngoscopy and intubation was carried out in classical intubating position with Macintosh blade and in neutral position with video laryngoscope by an anaesthesiologist trained in using Macintosh laryngoscope, but inexperienced to video laryngoscope. A shaped stylet was inserted into the tracheal tube for intubations with the Medan video laryngoscope as recommended and was not considered as an additional intubation aid, because the view of the glottis is indirect. When a Macintosh laryngoscope was used, the use of a stylet or bougie was at the discretion of the anaesthetist.

The C-L grade on the first attempt (without external laryngeal pressure), the ease of intubation (as subjectively assessed as easy, intermediate and difficult), time to successful tracheal intubation (defined as the interval from insertion of the laryngoscope blade into the mouth to inflation of the tracheal tube cuff), number of attempts and use of laryngeal pressure were recorded. After failure of 3 attempts at intubation with the assigned laryngoscope, the case was excluded from the study.

Statistical analysis was done by using descriptive and inferential statistics using Student's unpaired t-test and Chi-square test and software used in the analysis were SPSS 22.0 version and GraphPad Prism 6.0 version and $p < 0.05$ is considered as level of significance.

RESULTS

Sixty patients were successfully recruited and there were no dropouts. Patients' characteristics and preoperative airway features of the two groups are reported in Table 1. Both groups were comparable with respect to age, height, weight, and sex distribution.

We found that the quality of glottic visualisation was better in video laryngoscope. Cormack and Lehane grade 1 view was obtained in 18 (60%) patients with Macintosh laryngoscope and in 27 (90%) patients with video laryngoscope as compared to Cormack and Lehane grade 2 view observed in 11 (36.67%) patients with Macintosh laryngoscope and 3 (10%) patients in video laryngoscope. Only 1 (3.33%) patient in group M had Cormack-Lehane grade 3 view, while none of the patients in group V had grade 3 view. On comparing the laryngeal visualisation, the view of the glottis was significantly better with video laryngoscope than with Macintosh ($p < 0.05$).

	Macintosh Laryngoscope (Group M)	**Medan Video Laryngoscope (Group V)**	**P-value**
Age	33.73 ± 9.69	33.20 ± 9.70	0.83, NS
Gender			
Male	10 (33.33%)	16 (53.33%)	0.11, NS
Female	20 (66.67%)	14 (46.67%)	
Weight (kg)	60.66 ± 9.91	59.52 ± 9.57	0.65, NS
Height (inches)	5.38 ± 0.23	5.48 ± 0.22	0.12, NS
ASA 1/2	20/10	24/06	0.24, NS
Mallampati grade; 1/2	8/22	4/26	0.19, NS
Inter-incisor distance	4.32 ± 0.26	4.44 ± 0.15	0.052, NS
Thyromental distance	7.09 ± 0.36	7.20 ± 0.47	0.35, NS
Sternomental distance	14.02 ± 1.17	13.53 ± 1.03	0.10, NS

Table 1. Demography and Airway Assessment Data of Patients

Assessment of ease of intubation (Table 2) with Macintosh was easy in 24 (80%) patients, intermediate in 5 (16.67%) patients and difficult in 5 (3.33%) patients, and with video laryngoscope, the ease of intubation was easy in 23 (76.67%) patients, intermediate in 4 (13.33%) patients and difficult in 3 (10%) patients. The difference was found to be statistically insignificant (P=0.568). The video laryngoscope in spite of giving a better view of glottis was not found to be better than Macintosh laryngoscope in terms of ease of intubation, but is rather comparable with it.

In our study, successful intubation on first attempt was seen in 24 (80%) patients with Macintosh and 25 (83.33%)

patients with video laryngoscope. There was no case of failed intubation. On comparing first attempt success between the groups, it turned out to be statistically insignificant.

	Macintosh Laryngoscope (Group M)	Medan Video Laryngoscope (Group V)	P-value
Cormack and Lehane grade 1/2/3/4	18/11/1/0	27/3/0/0	0.025, S
Number of intubation attempts 1/2/3	24/6/0	25/2/3	0.08, NS
External laryngeal manipulation; yes/no	12/18	04/26	0.020, S
Ease of tracheal tube insertion	24/5/1	23/4/3	0.568, NS
Time to intubation	22.63 ± 2.87	33.90 ± 5.99	0.0001, S

Table 2. Intubating Characteristics and Performance of the Video Laryngoscopes and the Conventional Macintosh Laryngoscope. Values are Number or Mean (SD)

On comparing the time of intubation between two groups, Group M had mean time to intubation of 22.63 seconds and Group V had mean duration of 33.90 seconds. The difference in time to intubation between the two groups was found to be statistically significant.

CL Grade	Number of Attempts			Total	א2-value	p-value
	One	Two	Three			
Group M						
Grade I	18 (60%)	0 (0%)	0 (0%)	18	12.95	0.015, S
Grade II	6 (20%)	5 (16.67%)	0 (0%)	11		
Grade III	0 (0%)	1 (3.33%)	0 (0%)	1		
Total	**24 (80%)**	**6 (20%)**	**0 (0%)**	**30**		
Group V						
Grade I	24 (80%)	2 (6.67%)	1 (3.33%)	27	11.93	0.0026, S
Grade II	1 (3.33%)	0 (0%)	2 (6.67%)	3		
Grade III	0 (0%)	0 (0%)	0 (0%)	0		
Total	**25 (83.33%)**	**2 (6.67%)**	**3 (10%)**	**30**		

Table 3. Correlation of CL Grading with Number of Attempts

On comparing the C-L grade with the first attempt success rate (Table 3) in group M 18 patients with C-L grade 1 and 6 patients with C-L grade 2 were intubated in the first attempt. In group V, 24 out of 27 patients with C-L grade 1 and 1 out of 3 patients with C-L grade 2 were intubated in the first attempt. This correlation was found to be statistically significant. This comparison is unique to this study as none of the previous studies on direct and video laryngoscopy to our knowledge has made such comparison.

DISCUSSION

We have found that, in patients with normal airway, video laryngoscope provided a better view of the glottis, a comparable first attempt intubation success, but had a prolong time for intubation as compared with Macintosh laryngoscope.

As with all video laryngoscope available, Medan video laryngoscope also provides an excellent view of the glottis. Jiu, Yi et al[9] found that glottic view was better with video laryngoscope than with Macintosh (grade I, 71 vs. 48, respectively). Mosier et al[10] in a study comparing tracheal intubation in ICU setting between video laryngoscopy and direct laryngoscopy with Macintosh found out that higher percentage of patients had a better glottic view with video laryngoscope (85.8%) than Macintosh (61.8%).

Ease of intubation was subjectively assessed by the anaesthetist as easy, intermediate and difficult and found to be comparable with both Macintosh and video laryngoscope. The video laryngoscope in spite of giving a better view of glottis was not found to be better than Macintosh laryngoscope in terms of ease of intubation and also for time to successful intubation. This was due to the inexperience of the anaesthetists to the use of video laryngoscope and also with the technique of intubation as it is performed in an indirect manner seeing the tube on the monitor. The tube has to be advanced blindly until its tip enters the visual field and thereafter introduced through the vocal cords. This manoeuvre requires a good eye-hand coordination and expertise. Some problems also occurred while negotiating the tube through the vocal cords.

In a study conducted by Lim T.J. et al[11] for ease of intubation with GlideScope and Macintosh laryngoscope in simulated easy and difficult intubation where the anaesthetist graded ease of intubation as easy, intermediate and difficult found that there was no difference in ease of intubation between two groups in normal airway setting, but was statistically significant in settings of difficult airway. In another study by Teoh et al,[12] they found that ease of intubation was comparable between GlideScope and Macintosh laryngoscope.

In a study by Bakshi et al[13] in which they compared the use of McGrath, Truview and Macintosh laryngoscopes for endotracheal intubation by novice and experienced anaesthesiologists and found that time to intubation was longer with the video laryngoscope than Macintosh in both NVL (novice to video laryngoscope) group and EXP (experienced in all) group. In many studies, video laryngoscope takes more time as compared to direct

laryngoscope. Few authors have suggested its use is more justifiable in difficult intubation scenarios.

On comparing first attempt success between the groups, it turned out to be statistically insignificant. Our finding is comparable with a study performed by Mills et al[14] who in their study between GlideScope and Macintosh concluded that the rate of successful first attempt intubation was not significantly different between the two groups. In a similar study by Janz DR et al,[15] they found out that despite better glottic visualisation with video laryngoscopy, there was no difference in first attempt success for intubation (direct 65.8% vs. video 68.9%).

Comparison of the C-L grade with the first attempt success rate was found to be statistically significant implying that successful first attempt intubation requires an excellent view of the glottis.

Need for external laryngeal manipulation was required more often with Macintosh laryngoscope as compared to video laryngoscope and this was found to be statistically significant. In a study by Teoh et al,[12] there was a greater need of external laryngeal pressure with Macintosh (38%) and C-Mac (31%) as compared with GlideScope (11%) or Airway scope (0%) and the difference was statistically significant. In a study by Garhwal AM et al,[16] the need for external laryngeal manipulation was more frequent in Macintosh laryngoscope (71.67%) than with video laryngoscope (6.67%).

CONCLUSION

The video laryngoscope may not be advantageous over Macintosh laryngoscope for intubations performed in apparently normal airway in elective surgeries by anaesthesiologists inexperienced in using video laryngoscope. However, the enhancement of glottic visualisation may prove beneficial in the emergency department and intensive care units where there is a high incidence of unpredicted difficult intubations.

REFERENCES

[1] Cheney FW, Posner KL, Caplan RA. Adverse respiratory events infrequently leading to malpractice suits. A closed claims analysis. Anesthesiology 1991;75(6):932-939.

[2] Crosby ET, Cooper RM, Douglas MJ, et al. The unanticipated difficult airway with recommendations for management. Can J Anaesth 1998;45(8):757-776.

[3] Henderson JJ, Popat MT, Latto IP, et al. Difficult airway society guidelines for management of the unanticipated difficult intubation. Anaesthesia 2004;59(7):675-694.

[4] Cormack RS, Lehane J. Difficult tracheal intubation in obstetrics. Anaesthesia 1984;39(11):1105-1111.

[5] Kulkarni AP, Tirmanwar AS. Comparison of glottis visualisation and ease of intubation with different laryngoscope blades. Indian J Anaesth 2013;57(2):170-174.

[6] Satava RM, Gooden SM. The impact of video endoscopy on surgical training. Am Surg 1989;55(5):263-266.

[7] Paolini JB, Donati F, Drolet P. Video-laryngoscopy: another tool for difficult intubation or a new paradigm in airway management? Canadian Journal of Anesthesia 2013;60(2):184-191.

[8] Niforopoulou P, Pantazopoulos I, Demestiha T, et al. Video-laryngoscopes in the adult airway management: a topical review of the literature. Acta Anaesthesiol Scand 2007;54(9):1050-1061.

[9] Liu ZJ, Yi J, Guo WJ, et al. Comparison of McGrath series 3 and Macintosh laryngoscopes for tracheal intubation in patients with normal airway by inexperienced anesthetists: a randomized study. Medicine (Baltimore) 2016;95(2):e2514.

[10] Mosier JM, Whitmore SP, Bloom JW, et al. Video laryngoscopy improves intubation success and reduces esophageal intubations compared to direct laryngoscopy in the medical intensive care unit. Crit Care 2013;17(5):R237.

[11] Lim TJ, Lim Y, Liu EH. Evaluation of ease of intubation with the GlideScope or Macintosh laryngoscope by anaesthetists in simulated easy and difficult laryngoscopy. Anaesthesia 2005;60(2):180-183.

[12] Teoh WH, Saxena S, Shah MK, et al. Comparison of three video laryngoscopes: Pentax Airway Scope, C-MAC, GlideScope vs. the Macintosh laryngoscope for tracheal intubation. Anaesthesia 2010;65(11):1126-1132.

[13] Bakshi SG, Vanjari VS, Divatia JV. A prospective, randomized, clinical study to compare the use of McGrath(®), Truview(®) and Macintosh laryngoscopes for endotracheal intubation by novice and experienced Anaesthesiologists. Indian J Anaesth 2015;59(7):421-427.

[14] Platts-Mills TF, Campagne D, Chinnock B, et al. A comparison of GlideScope video laryngoscopy versus direct laryngoscopy intubation in the emergency department. Acad Emerg Med 2009;16(9):866-871.

[15] Janz DR, Semler MW, Lentz RJ, et al. Randomized trial of video laryngoscopy for endotracheal intubation of critically-ill adults. Crit Care Med 2016;44(11):1980-1987.

[16] Garhwal AM, Bhure AR, Bhargava SV, et al. A clinical assessment of Macintosh blade, miller blade and King Vision TM video laryngoscope for laryngeal exposure and difficulty in endotracheal intubation. J Evid Based Med Healthc 2016;3(31):1380-1385.