Comparison of intubating conditions using video laryngoscope and conventional macintosh laryngoscope in patients undergoing elective surgeries under genral anaesthesia

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Abstract

Background: There is no doubt that adequate airway management plays an important and crucial role in the anaesthetic care of patients during planned and urgent surgeries. Intubation is a famous medical procedure in which healthcare provider inserts a tube through patient's mouth or nose and then places down into their airway/windpipe commonly known as trachea. This tube can connect to a machine that deliver oxygen and other gasesand functionally keeps the trachea open for smooth passage of air. **Material and methods:** This study was a prospective observational study was conducted on 100 patients undergoing elective surgery under general anesthesia with endotracheal intubation. Patients belonging to ASA physical status I and II, aged 18-50 years, of either gender scheduled for elective surgery, patients with Mallampati grade 1 or 2, inter incisor distance > 5cm, thyromental distance at least 6.5cm, neck circumference less the 38 cm male and 35 cm for female, free neck mobility, undergoing elective surgeries were included in this study.

Result: The study found that mean duration of intubation in group I was significantly smaller compared to group II (17.8 vs 28.5) sec, p-value <0.0001*. First attempt intubation was successful in 90% in group I compared to 70% in group II and two intubation attempts were needed in 10% of patients in group I compared to 30% in group II. Evidently, the difference was significant with a p-value of 0. 012*. Cormack-Lehane (CL) score 1 in 58% of patients, followed by 38% with CL score 2 and only 4% patients had CL score 3. However; in group II, CL score 2 was observed in majority of patients (48%), followed by 30% with CL score I and 22% patients with CL score 3. With a p-value of .004*, the difference was statistically significant. The grade 2 ease of intubation was observed in (78%) patients in group I

compared to 26% in group II and grade I ease of intubation was observed in 22% in group I compared to 74% in group II. Evidently; the difference between the groups was statistically significant with a p-value of <0.001*We observed that majority of patients (78%) in group I had IDS 2, followed by 14% with IDS 1, and 8% with IDS O. On the other hand, majority of patients (52%) in group II had IDS, followed by 26% with IDS 2 and 22% with IDS 1. Evidently, the difference between the groups was statistically significant with a p-value of <0.001*.

Conclusion: The present study demonstrated patients intubated with the help of videolaryngoscopy had shorter intubation times, lower intubation difficulty score (IDS), better glottis views, higher first-success rates, better ease of intubation and lower grades of Modified Cormack Lehane Grade compared to patients, who were intubated with Macintosh laryngoscopy.

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Introduction

The art of clinical airway management dates as old as medicine itself.[1] For instance, there is an evidence that the tracheostomy operation was performed on Egyptian tablets dating back to 3,600 BC, while reference to the procedure can be found in ancient Hindu scriptures dating from 2000 BC.[2] It is also said that Alexander the Great (356-323 BC) saved a soldier from suffocation by making a tracheal incision using the tip of his dagger.[3]The next important development in clinical airway management was thus of direct laryngoscopy, which allowed visualization of the glottic structures. The credit of the discovery of laryngoscopy in England goes to Manual Garcia (1805-1906), who described how he performed autolaryngoscopy through the use of a dental mirror in combination with a second, larger mirror used to direct sunlight into his mouth.[4] Further advances were made by Sir Ivan Whiteside Magill who introduced the awake blind nasal technique as a method of tracheal intubation.[5] He also devised the Magill forceps and the Magill laryngoscope blade.The Macintosh laryngoscope (MCL) has been the 'gold standard' device for direct laryngoscopy and tracheal intubation since its invention by Forager in the 1940s.[6]In practice, high forward and upward force is applied on the laryngoscope handle to visualize glottis by aligning oral, pharyngeal, and laryngeal axes.In the last decade multiple video laryngoscopes have been introduced into clinical practice and have become more common.[7]Video laryngoscopes may allow a wider viewing angle and make alignment of the oral, pharyngeal and tracheal axes unnecessary.[8]Moreover, their ease of use, short learning curves and flexibility make them potential substitutes for conventional direct laryngoscopy.[9] Undoubtedly, video laryngoscopes may be very helpful in making the things easier but due to their expensive cost and a concern over the loss of airway skills, opponents assail it .The present study has been objectively framed to compare the intubating conditions using the video laryngoscope and the conventional Macintosh laryngoscope in patients undergoing elective surgeries under general anesthesia.

Methods

After obtaining approval from Institutional ethics committee, a prospective observational study was conducted on 100 patients from March 2020 to August 2022 undergoing elective surgery under general anesthesia with endotracheal intubation. Written informed consent will be obtained from all patients. Patients belonging to ASA physical status I and II, aged 18-50 years, of either gender scheduled for elective surgery, patients with Mallampati grade 1 or 2, inter incisor distance > 5cm, thyromental distance at least 6.5cm, neck circumference less the 38 cm male and 35 cm for female, free neck mobility will be included in study. Patients with known history of difficult

intubation, patients having respiratory diseases with decrease baseline oxygen saturation on room air (COPD/asthma), pregnant females, patients with cervical trauma or fractures, and patients with an anticipated difficult airway was excluded from the study.

Patients will be allocated into two groups, each comprising 50 patients.

1. Group I- Patients undergoing general anesthesia with endotracheal intubation using video laryngoscopy.
2. Group II- Patients undergoing general anesthesia with endotracheal intubation using conventional Macintosh laryngoscope.

All laryngoscopy and intubation procedures were performed by a single investigator. The same investigator preoperatively recorded patient's characteristics and make an airway assessment, which will include modified Mallampati score and thyromental distance. On arrival in the operating room an I/V line will be secured with an 18/20 G I/V cannula and the patients will be connected to the ECG monitor and all minimum mandatory monitoring including non-invasive blood pressure, mean arterial pressure, oxygen saturation and end tidal carbon dioxide was done at regular intervals. All the patients will be subjected to same anesthesia protocol. Patients of both groups will receive Inj. Glycopyrrolate (100µg), and Inj. Fentanyl (2µg/kg) as premedication 5 minutes before Induction of anesthesia, which does not have any Interaction with other Inducing agents. All the patients received fluid as per requirement. All the patients were pre oxygenated with 100% oxygen through a face mask for three minutes, then general anesthesia was induced with intravenous administration of propofol 2 mg/kg, and rocuronium 0.45-0.6 mg/kg. Systolic BP, diastolic BP, mean arterial pressure (MAP), and heart rate (HR) will be recorded at numerous intervals as follows: baseline, after induction of anesthesia, immediately after intubation, one three and five minutes after intubation. An assistant was made the time keeper. All the patients were intubated with cuffed PVC endotracheal tube. In Group I video laryngoscope was introduced along the midline of the tongue, and the endotracheal tube was inserted from the right angle of the mouth and brought to the center along with the tongue. Once the best glottic view is obtained on the screen, the endotracheal tube was then inserted into the patient's mouth from the right side till the cuff and the black horizontal line on endotracheal tube crosses the vocal cords. Immediately after insertion of the endotracheal tube, an assistant inflated the cuff with air. In group II the laryngoscope of an appropriate size was used to displace the epiglottis anteriorly and to visualize the vocal cords. The endotracheal tube was inserted till the cuff and the black horizontal line on endotracheal tube crosses the vocal cords and the cuff was inflated

Statistical Methods: The recorded data was compiled and entered in a spreadsheet (Microsoft Excel) and then exported to data editor of SPSS Version 20.0 (SPSS Inc., Chicago, Illinois, USA). Continuous variables were expressed as Mean±SD and categorical variables were summarized as frequencies and percentages. Graphically the data was presented by bar and line diagrams. Student's independent t-test or Mann-Whitney U-test, whichever feasible, was employed for comparing continuous variables. Chi-square test or Fisher's exact test, whichever appropriate, was applied for comparing categorical variables. A P-value of less than 0.05 was considered statistically significant.

Results

The average age of patients in Group I was (33.8±8.38) years compared to (32.9±7.95) years in group II. However; with a p-value of 0.583, the difference was statistically **insignificant.**The majority of patients in both the groups were females, accounting for difference was statistically **insignificant.**

Duration of intubation

The mean duration of intubation in patients of group I was 17.8 secs and group II was 28.5sec,

hence duration of intubation in group I was **significantly** less, p-value <0.0001* as shown in table 1

Table 1: Comparison of duration of intubation (sec) in two groups

Group	N	Mean	SD	Range	P-value
Group I	50	17.8	4.82	16.4-19.1	<0.001*
Group II	50	28.5	6.00	26.8-30.2	

***Statistically Significant Difference (P-value<0.05)**

Number of intubation attempts

Thefirst attempt intubation was successful in 90% in group I compared to 70% in group II and two intubation attempts were needed in 10% of patients in group I compared to 30% in group II. Evidently, the difference was significant with a p-value of 0. 012* as shown in table 2.

Table 2: Comparison of number of intubation attempts among two groups

Intubation Attempts	Group I		Group II		P-value
	No.	%age	No.	%age	
One	45	90	35	70	0.012*
Two	5	10	15	30	
Total	50	100	50	100	

***Statistically Significant Difference (P-value<0.05)**

Cormack-Lehane (CL)score

In group I, Cormack-Lehane (CL)score 1 was observed in 58% of patients, followed by 38% with CL score 2 and only 4% patients had CL score 3. However; in group II, CL score 2 was observed in majority of patients (48%), followed by 30% with CL score I and 22% patients with CL score 3. With a p-value of .004*, the difference was statistically significant as shown in table 3.

Table 3: Comparison based on Cormack-Lehane score in two groups

Cormack-Lehane score	Group I		Group II		P-value
	No.	%age	No.	%age	
1	29	58	15	30	0.004*
2	19	38	24	48	
3	2	4	11	22	
Total	50	100	50	100	

***Statistically Significant Difference (P-value<0.05)**

Ease of intubation

The grade 2 ease of intubation was observed in (78%) patients in group I compared to 26% in group II and grade I ease of intubation was observed in 22% in group I compared to 74% in group II. Evidently; the difference between the groups was statistically significant with a p-value of <0.001 as shown in table 4:

Table 4: Ease of intubation in two groups

Ease of Intubation	Group I		Group II		P-value
	No.	%age	No.	%age	
Grade 1	11	22	37	74	<0.001*
Grade 2	39	78	13	26	
Total	50	100	50	100	

***Statistically Significant Difference (P-value<0.05)**

Intubation difficulty score (IDS)

The majority of patients (78%) in group I had IDS 2, followed by 14% with IDS 1, and 8% with IDS O. On the other hand, majority of patients (52%) in group II had IDS, followed by 26% with IDS 2 and 22% with IDS 1. Evidently, the difference between the groups was statistically **significant** with a p-value of <0.001* as shown in table 5

Table 5: Intubation difficulty score (IDS) in two groups

Intubation difficulty score (IDS)	Group I		Group II		P-value
	No.	%age	No.	%age	
0	4	8	26	52	<0.001*
1	7	14	11	22	
2	39	78	13	26	
Total	50	100	50	100	

***Statistically Significant Difference (P-value<0.05)**

Discussion

Airway management remains a vital primary skill for anaesthesiologists. We aimed at comparing the effectiveness of direct laryngoscopy using the conventional Macintosh blade with indirect laryngoscopy using video laryngoscope with regard to intubation success rate,number of intubation attempts, visualization of the laryngeal view, intubation difficulty score, duration of tracheal intubation ,and hemodynamic stability. In the present study; we have comprehensively analyzed patient's data on the basis of socio-demographic characteristics, clinical aspects and the success rate of two techniques.

We noted that the average age of patients in Group I was (33.8±8.38) years, compared to (32.9±7.95) years in group II. However; with a p-value of 0.583, the difference was statistically insignificant. Rajan et al, reported in their study that the average of age of patients intubated with video laryngoscopy was (49.8±16.1) years and the average age of patients who were intubated with the standard Macintosh laryngoscope was (44.6±16.9), however likewise to our study they reported a comparable age distribution between the groups.[10]In our study; there was predominance of females over males in both the groups. We observed that majority of patients, accounting for 54% in group I were females, followed by 46% males. In group II, 58% patients were females compared to 42% males. However; with a p-value of 0.687, the difference was statistically insignificant. Garg M et al compared the effectiveness of C-MAC video laryngoscope (VL) with McCoy laryngoscope in patients with an anticipated difficult airway, they also reported a predominance of females over males in both the groups, however, likewise to our study the overall gender difference between the groups was insignificant.[11]In our study the duration of intubation was assessed in two groups, the mean duration of intubation in group I was significantly smaller compared to group II (17.8 vs 28.5) sec, p-value <0.0001*. In a recent meta-analysis conducted by by Ho Hao et al, it was reported that use of a McGrath videolaryngoscope in endotracheal intubation resulted in a significantly shorter intubation times as compared with conventional Macintosh laryngoscope, which is in agreement with the present study that revealed videolaryngoscopy shortens the duration of

endootracheal intubation compared with Macintosh laryngoscope[12.]In our study, the first of attempt intubation was successful in 90% in group I compared to 70% in group II and two intubation attempts were needed in 10% of patients in group I compared to 30% in group II. Evidently, the difference was significant with a p-value of 0. 012*. Likewsie to this; Rajan et al in their study reported that majority of their patients were intubated in the first attempt in both groups, the number was lower in Macintosh intubated group (70 vs 96.7%), which is consistent with the present study[13].In our study in order to predict the rate of difficult intubation, the Cormack–Lehane classification system was utilized to describe the views of laryngeal structures via direct laryngoscopy. Videolaryngoscopy provides indirect views of the glottis, so practitioners should have good hand–eye coordination and the adequate experience required to perform videolaryngoscopies. Cormack-Lehane (CL) score 1 was observed in 58% of patients in group I, followed by 38% with Cormack-Lehan(CL) score 2 and only 4% patients had Cormack-Lehane (CL) score 3. However; in group II, Cormack-Lehane (CL) score 2 was observed in majority of patients (48%), followed by 30% with Cormack-Lehane (CL) score I and 22% patients with Cormack-Lehane (CL) score 3. With a p-value of 0.004*, the difference was statistically significant. Bijju et al in their study reported that out of 50 patients intubated with videolaryngoscopy, around 95% patients had grade 1 Cormack Lehane(CL) view thereby excluding the laryngeal manipulation because of the precisely better view compared with Macintosh laryngoscopy, these results are compatible with the present study.[14]In our study the grade 2 ease of intubation was observed in (78%) patients in group I compared to 26% in group II and grade I ease of intubation was observed in 22% in group I compared to 74% in group II. Evidently; the difference between the groups was statistically significant with a p-value of <0.001*. Tseng et al in their study, reported that compared with the Macintosh laryngoscope, the GlideScopevideolaryngoscope was also found to facilitate nasotracheal intubations with more ease and shortened intubation time in patients undergoing oromaxillofacial surgery, which is comparable with our study.[15]In our study majority of patients (78%) in group I had IDS 2, followed by 14% with IDS 1, and 8% with IDS O. On the other hand, majority of patients (52%) in group II had IDS, followed by 26% with IDS 2 and 22% with IDS 1. Evidently, the difference between the groups was statistically significant with a p-value of <0.001*. Suzuki et al in their stduy reported a significant difference in the difficulty scores among the four laryngoscopes, with the McGrath significantly easier to use than the Macintosh.[16]

Conclusion

The present study demonstrated patients intubated with the help of videolaryngoscopy had shorter intubation times, lower intubation difficulty score (IDS), better glottis views, higher first-success rates, better ease of intubation and lower grades of Modified Cormack Lehane Grade compared to patients, who were intubated with Macintoshh laryngoscopy. Moreover, the hemodynamic response to videolaryngoscopy was quite stable in comparison to Macintosh laryngoscopy. It can be used as a teaching tool for novice intubators and offers a new approach to endotracheal intubation.

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