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A COMPARATIVE STUDY OF McGRATH MAC VIDEO LARYNGOSCOPE AND MACINTOSH LARYNGOSCOPE FOR ORO-TRACHEAL INTUBATION IN NORMAL AIRWAY.

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ABSTRACT **Background-** Oro-tracheal intubation is practiced for oxygenation & ventilation along with inhalational anesthetic delivery and in emergency conditions for securing airway. The objective of our study was to evaluate and compare the intubations by McGrath VL and Macintosh laryngoscope. **Methodology-** A prospective, observational study in 80 patients undergoing elective surgical procedures with normal airway. All patients were premedicated and pre-oxygenated with 100% O2 for five minutes and induced with inducing agent inj. Propofol 2mg/kg and neuromuscular blocking agent inj. Succinyl choline 1.5 mg/kg. Patients were divided into 2 groups for Macintosh Laryngoscope and McGrath VL. We have noted TTI, number of intubation attempts, C-L grade, POGO score, modification of positioning, the requirement of external laryngeal pressure manipulation and complications during and after intubations. Haemodynamic parameters were monitored and recorded. **Observation & Results-** Time to intubate in McG VL Group (38.92 ± 11.07) was significantly shortened than Mac L Group (57.95 ± 10.37)(). Percentage of glottic opening was better in McGrath Video Laryngoscope group (McG VL) than Macintosh laryngoscope group (Mac L). Incidence of complications were less in McG VL Group than Mac L group. **Conclusion-** The study concluded that McGrath MAC Video laryngoscope is better than Macintosh laryngoscope for oro-tracheal intubation in normal airway as it provides earlier time to intubate, significantly superior glottic view, more first attempt success rate without any complications and stable vitals.

KEYWORDS : Macintosh laryngoscope, McGrath MAC video laryngoscope, Oro-tracheal intubation.

INTRODUCTION

The Endotracheal intubation is commonly practiced in patients undergoing major surgery to secure and maintain the airway for inhalational anesthetic agent delivery during maintenance of anaesthesia. It is also important in critical care and emergency conditions for oxygenation and ventilation. Endotracheal intubation for purpose of providing anesthesia was first described by William Mac Ewan in 1878, when he passed a tube from mouth into the trachea using fingers as a guide in conscious patient. Macintosh laryngoscope is one of the conventional direct laryngoscopes with a curved blade and is most commonly used to facilitate the endotracheal intubation. However, incidence of failed intubation with Macintosh is 1 in 2000 in elective setting, 1 in 300 in obstetrics setting, 1 in 50-100 in emergency department and intensive care units. The risk of esophageal intubation with Macintosh laryngoscope is estimated to be 52 in 10,000[1]. McGrath Mac video laryngoscope device allows indirect viewing through a video display equipped with blade tip camera retaining same curved blade structure of Macintosh laryngoscope[2]. McGrath video laryngoscope improves intra-oral field exposure, increase the efficiency in glottic visualization for both standard and difficult airway management causing minimal airway trauma without the need for aligning three airway axes[3]. This study was planned with the aim to determine whether the McGrath MAC video-laryngoscope facilitates better and faster airway securance than direct Macintosh Laryngoscope. The objective of the study was to assess total time to intubate, glottis exposure and intubation attempts.

MATERIAL AND METHODS

The present prospective, comparative study was conducted in the Department of Anesthesiology at a tertiary care hospital after approval from the Institutional Ethics Committee.

This study was carried out in 80 adult patients admitted in department of general surgery, gynecology and orthopedics with the age in the range of 18-60 years weighing 40-70 Kg posted for elective surgery under general anesthesia after obtaining a valid, written informed consent.

Inclusion Criterias:

Patients who were of either sex, aged 18-60 years with body weight between 40-70kg, ASA class 1, 2, Patients with Mallampatti grade I and II on airway assessment and with adequate mouth opening of more than two fingers, Patient willing to undergo surgery under general anesthesia.

2) Exclusion Criteria-

Patients who were having difficult airway, pre-existing cervical spine injury, not willing for GA, bleeding diathesis, cardiovascular, liver and respiratory diseases were excluded from the study.

METHODOLOGY-

Detailed pre-anesthetic evaluation of the patients was performed by an anesthesiologist a day before the surgery. Preliminary investigations done in the form of Complete blood count, Blood grouping & Rh typing, HIV, HBsAg, Random blood sugar, Bleeding time, Clotting time, Coagulation profile, Liver function tests, Kidney function tests, Electrocardiography (ECG), Chest X-ray postero-anterior (PA) view were noted. Special investigations according to the patients for further evaluation, if required.

Pre-operatively, airway parameters like interincisor distance, Modified Mallampatti grade, Hyo-Mental distance, Thyro-mental distance, Sterno-mental distance along with neck mobility were also assessed and noted.

All patients were kept nil by mouth for 8 hours. All patients were given Tab. Pantoprazole 40 mg & tab. Alprazolam 0.5mg orally a day prior to surgery and on the day of surgery in the morning. The patients were allocated to one of two groups of Macintosh laryngoscopy or McGrath MAC video laryngoscopy of 40 patients each.

Group M (Macintosh laryngoscopy): Intubation done with Macintosh laryngoscope.

Group McG (McGrath MAC video Laryngoscopy): Intubation done with McGrath MAC video Laryngoscopy.

An Intravenous access was secured with 18G intravenous cannula. Ringer lactate was started for fluid therapy. Thereafter, intravenous fluids were calculated and given as per body weight requirement and blood loss. In operation theatre, multipara monitoring device with ECG, pulse rate, non-invasive blood pressure, Spo2 was attached to patient and baseline parameters were noted. Standard monitoring included SpO2, non-invasive blood pressure, ECG with heart rate, temperature and measurement of end-tidal carbon dioxide and anesthetic gas monitoring was done in all patients. Patients were positioned in Sniffing position with a ring pillow below head.

In Premedication,Patient received Inj. Pantoprazole 40 mg IV and Inj. Glycopyrrolate 4 mcg/kg, Inj. Midazolam 3 mcg/kg, Inj. Fentanyl 2

mcg/kg, 5-10 mins before induction. All patients were pre oxygenated with 100% O2 for 5 minutes with the fresh gas flow 6-8 liters/minute with a face mask connected to closed circuit. Patients were induced with Inj. Propofol 2ml/kg, Inj. Succinyl Choline 1.5 mg/kg as a neuromuscular blocking agent.

A blade no. ¾ (size 3 for female, Size 4 for male) of Macintosh and McGrath MAC video-laryngoscope were used for intubation. Polyvinyl chloride endotracheal tubes of appropriate size were used for intubation. Intubation was done only by qualified anesthesiologist with at least 2 years of Anaesthesia experience trained in using airway devices. This is to keep uniformity in assessment. Maximum three attempts were allowed with either change in position, maneuvers, or gadgets. Further management of general anesthesia as per standard protocol and as per the need of the patient and procedure. It was left to the discretion of senior anesthesiologist.

The occurrence of adverse events or potential laryngoscopy related complications were recorded and treated if required, including Procedural -Lip trauma, Dental trauma, Mucosal bleeding, Bronchospasm/ laryngospasm, SpO2 fall (%) <95 /<90, EtCO2 rise (mmHg) Upto 35 />35 and Post-operative -Sore throat, Pharyngeal laceration, Lip edema, Laryngospasm/ bronchospasm.

During intubation, various parameters were noted along with hemodynamic monitoring**.**

Time Taken For Successful Tracheal Intubation:
It was the Time required to intubate the patient- from opening of mouth till 1st capnograph on monitor with visible chest rise. This was recorded as follows
A) Mouth opening to glottis view (sec).
B) Mouth opening to placement of endo-tracheal tube (sec).
C) Mouth opening to confirmation of Co2 waveform (sec).

Modified Cormack Lehane (MCL) grading[4]:
On laryngoscopy, the view of vocal cords was seen and noted according to **Modified Cormack Lehane (MCL) grading by Cook and Fremantle:** .

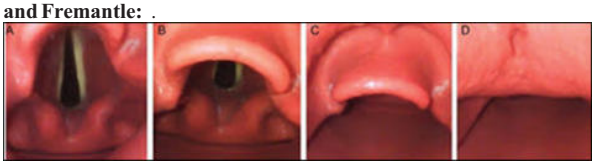


Figure (1) Depicts Cormack Lehane Grade

Grading Criteria:
1-Full view of vocal cords.
2a- Partial view of vocal cords.
2b- Arytenoids and epiglottis visible.
3a- Only epiglottis is visible, but liftable.
3b- Epiglottis not liftable.
4- Both epiglottis and glottis not visible.

Percentage of glottic opening[4] (POGO SCORE):
On laryngoscopy, in patients of both the groups, the opening of glottis was noted and percentage of glottis opening was graded according to **POGO score**.

Grading criteria of POGO score:
I – 81-100 % (when the entire glottis was visible).
II – 61-80% (when 61-80% of glottis was visible).
III – 41-60% (when 41-60% of glottis was visible).
IV – 21-40 % (when 20-40% of glottis was visible).
V - 0-20 % (when less than 20% of glottis was visible).

Use of Optimization maneuvers:
During laryngoscopy and intubation, optimization maneuvers such as BURP, OLEM and Repositioning of patient for successful endotracheal intubation was done and noted.

BURP: Backward, Upward, Rightward Pressure.

OELM: Optimal External Laryngeal Manipulation.

Repositioning Of Patient: A "ramped" position was achieved by arranging blankets underneath the patient's upper body and head until horizontal alignment was achieved between the external auditory meatus and the sternal notch.

Use of adjuncts devices-
On laryngoscopy, in patients of both the groups, the use of adjuvant devices like Bougie, Stylet, if required was noted. Rescue devices like Laryngeal mask airway, Fibre-optic bronchoscope were also kept ready as a part of difficult airway cart in case of failure to intubate by either of the device.

Number Of Intubation Attempts:
Number of intubation attempts was noted with each subsequent attempt defined as reinsertion of the laryngoscope blade into the mouth in both the groups.

While 3 attempts were permitted with the selected laryngoscope, if the intubating anesthesiologist felt it clinically appropriate to abandon the test laryngoscope and use an alternative device, then this was deemed acceptable.

A failed intubation attempt was defined as an attempt in which trachea was not intubated, or where the device was abandoned and another device utilized and it was noted. These patients were excluded from the study.

Ease Of Intubation:
The ease of intubation was assessed as good, excellent and not-satisfactory in both the groups.

Good Intubation: Intubation done with optimization maneuvers and/ adjuncts.

Excellent Intubation: Intubation done without optimization maneuvers and / adjuncts.

Not satisfactory: Failure to intubate, more than 3 intubation attempts required.

Upper Airway Injuries And Complications:
In both the groups, the upper airway injuries and complications like lip trauma, dental trauma, mucosal bleeding of mouth, bronchospasm, laryngospasm, fall in SpO2, and rise in EtCO2 were noted and treated accordingly. In the post-operative period, patients were observed for sore throat, pharyngeal laceration, lip edema, vocal cord edema, laryngospasm and bronchospasm and treated, if required.

If oxygen saturation went below 95%, mask ventilation was resumed during intubation. In case of difficult mask ventilation, high flow nasal oxygen was supplemented during mask ventilation and Intubation.

Intra-operative Maintenance Of Anaesthesia-
Anaesthesia was maintained on O2+N2O (50:50) with sevoflurane 1-2% concentration and Inj. Vecuronium 0.02mg/kg as muscle relaxant. Analgesia was supplemented with Inj. Paracetamol 1gm IV slowly over 20 minutes. Inj. Ondensetron 4mg iv slowly was given as antiemetic agent. After completion of surgery patients were reversed with inj. Neostigmine 0.05mg/kg and inj. Glycopyrrolate 0.04mcg/kg. An extubation was done after return of adequate respiratory efforts and airway reflexes after complete reversal from muscle relaxants.

Post-operative Period:
The patients were shifted to recovery room for further monitoring. In the post-operative period, patients were observed for sore throat, pharyngeal laceration, lip edema, vocal cord edema, laryngospasm and bronchospasm and treated, if required.

Statistical Analysis:
Data were collected data was entered into Microsoft excel spreadsheet. Tables and charts were generated with the help of Microsoft word and Microsoft excel software.

Data were collected, tabulated, code then analyzed using Statistical software STATA version 14.0 Continuous variables (demographic, haemodynamic and other parameters) were presented Mean± SD. Categorical variables (quantitative data) were expressed in frequency and percentages. Categorical variables (qualitative data) were compared by performing chi-square test. For small numbers, Fisher exact test was used where applicable. Hemodynamic parameters were compared by performing independent t-test. Analysis of quantitative

data between the two groups was done using student unpaired t- test. Analysis of quantitative data between the single group was done using student paired t- test. Association between quantitative variables was assessed by chi-square test.

P value:

>0.05	Non-significant
<0.05	Significant
<0.001	Highly significant

RESULTS

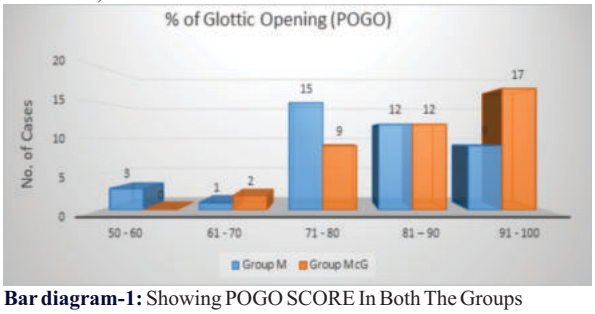
80 adult patients included in the study were comparable concerning age, weight, height, BMI, ASA class, airway assessment parameters and duration of surgery(p>0.05).

Table No. 2: Distribution Of Study Population According To Total Time To Intubate (in seconds)

Parameters (in seconds)	Group – M		Group - McG		p-value
	Mean	SD	Mean	SD	
a) MO to Glottic View	29.80	6.72	18.82	6.40	<0.0001,HS
b) MO to placement of ETT	44.05	8.82	28.90	9.45	<0.0001,HS
c) Mo to ETCO2 wave form	57.95	10.37	38.92	11.07	<0.0001,HS
Total Time to Intubate	57.95	10.37	38.92	11.07	<0.0001,HS

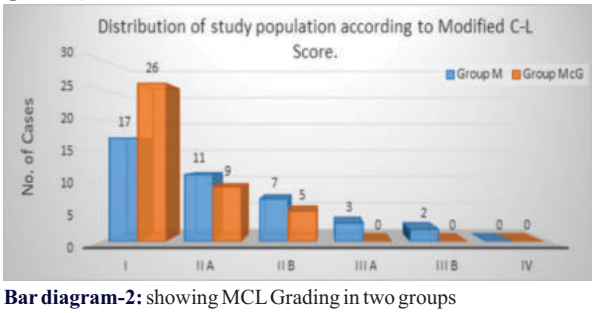
The mean±SD total time to intubate was significantly earlier in Group McG(McGrath) than in Group M(Macintosh)(*p*-value <0.0001)(HS)**.**

- The mean±SD POGO score was better in McGrath VL group (90.87 ± 9.46%) than Macintosh L group (85.5 ± 11.75 %) (*p*= 0.0271).



Bar diagram-1: Showing POGO SCORE In Both The Groups

The McGrath video laryngoscope (65%) provided more Grade-I laryngoscopic views than the Macintosh laryngoscope (42.50%). The McGrath was superior to Macintosh in Cormack–Lehane grade (p=0.021).



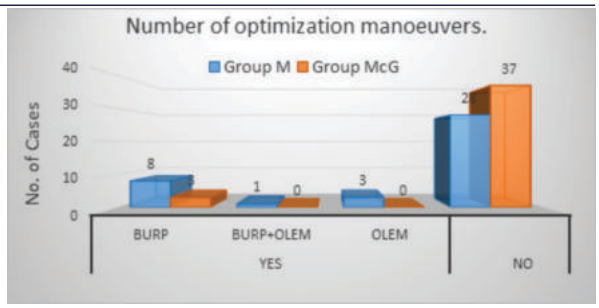
Bar diagram-2: showing MCL Grading in two groups

Table No. 3: Distribution Of Study Population According To Adjuvant Airway Device-

	Group - M		Group - McG		p-value
	No. of Cases	%	No. of Cases	%	
No	26	65.00	35	87.50	0.018, S
Yes-B	13	32.50	2	5.00	
Yes-S	1	2.50	3	7.50	

The requirement of adjuvant airway device was more in Macintosh L(35%) than McGrath VL(12%)(p-0.018).

The number of patients requiring optimization manoeuver were more in Macintosh Group (12 patients, 30%) than McGrath Group (3 patients, 7.50%) which was statistically significant was statistically significant (*p* = 0.020, S).



Bar diagram-3: Showing Optimization Manoeuver Required In Two Groups

Table No. 4: Distribution Of Study Population According To Number Of Attempts-

	Group - M		Group - McG		p-value
	No. of Cases	%	No. of Cases	%	
I	28	70.00	39	97.50	0.001,HS
II	12	30.00	1	2.50	

Successful intubation done with McGrath VL(97.50%) in first attempt was statistically highly significant than Macintosh L (70%) (P=0.001)

COMPLICATIONS:

2 (5%) patients each in Macintosh L had sore throat and lip injury. Bronchospasm, laryngospasm, bradycardia, hypotension, Vocal cord edema, injury to teeth, pharyngeal laceration, mucosal injury was not seen in any patient of both the groups.

DISCUSSION

Tracheal intubation considered to be the "GOLD STANDARD" of airway management during administration of general anaesthesia and critical care settings[5]. Video laryngoscopy used in the operating room supports the first-attempt success of airway intubation. McGrath MAC video laryngoscope has enhanced optics, increased durability and intelligent battery management and therefore offers advantages as a stand-alone unit, without separate power units, screens or cables[6]. Considering all this in mind, the present study was designed to evaluate and compare Macintosh Laryngoscope and McGrath MAC Video Laryngoscope for Oro-tracheal Intubation.

INTUBATION IN SECONDS

Total Time for intubation- The mean±SD total time for intubation was significantly earlier in McGrath Group (38.92 ± 11.07 seconds) than in Macintosh Group (57.95 ± 10.37 seconds) (*p*-value <0.0001) (HS)**.**

In a study conducted by **Yumul R, Elvir-Lazo(2016)[7], Total Time to Intubate**- The mean±SD TTI total time to intubate was 70 ± 43 seconds in group M and 62 ± 31 seconds in Group McG (McGrath). The mean±SD total time for intubation was significantly earlier in Group McG (McGrath) than in Group M(Macintosh)(*p*-value <0.05)(S)**.**

In a study by Toker M, Altıparmak B, Karabay A (2019)[8] found that the mean±SD TTI total time to intubate was 40.1±5.4 seconds in Group M (Macintosh)and 34.7±5.2 seconds in Group McG (McGrath) which was significantly earlier in Group McG (McGrath) than in Group M (Macintosh) (*p*<0.0001)(S)**.**

In a study conducted by **Roh G. U, Kwak H. J., et al (2019)[9],** they observed that, the mean±SD TTI total time to intubate was 57 ±23 seconds in Group M (Macintosh) and 45±18 seconds in Group McG (McGrath) which was significantly earlier in Group McG (McGrath) than in Group M(Macintosh) (p<0.013) (HS).

In a study conducted by **Aiji B, Kazuya Sobue et. al., (2017)[10],** they observed that, the mean±SD TTI total time to intubate was 36.5 ± 8.9 seconds in Group M(Macintosh) and 26.8 ± 5.7 seconds in Group McG (McGrath), and 36.4 ± 11 seconds in Group Airway Scope. The mean±SD total time for intubation was significantly earlier in Group McG (McGrath) than in Group M(Macintosh)(*p*<0.01)(S)**.**

The findings from our study regarding total time for intubation were similar with the studies of **Yumul R, Elvir-Lazo O, (2016)[7], Toker M, Altıparmak B, Karabay A (2019)[8], Roh G. U, Kwak H. J., et al**

(2019)[9] and Aiji B, Kazuya Sobue et. al., (2017)[10].

Distribution of study population according to percentage (%) of Glottic Opening (POGO)

In our study, the mean± SD POGO score was 85.5 ± 11.75 % in Group M (Macintosh) and 90.87 ± 9.46% in Group McG (McGrath). The % of glottis opening was significantly better in McGrath group than Group M (Macintosh) (p=0.0271)(S). Probably because, McGrath Video-laryngoscope allow a wide viewing angle and make alignment of the oral, pharyngeal, and tracheal axes unnecessary.[11,12]

In a study conducted by **Arici S, Karaman S, (2014)[13],** they observed that, The Mean±SD POGO Score was 84.37 ± 17.10 % in Group M (Macintosh) and was 94.50 ± 8.82% in Group McG (McGrath) which was significantly better with McGrath group than Macintosh Group ($p < 0.002$).

In a study conducted by **Toker M , Altıparmak B, Karabay A (2019)[8],** they observed that**,** the mean± SD POGO score was 90% (86.75-92%) in Group DL (Macintosh) and was 94.5% (90–96%) in Group VL (McGrath) which was significantly better with McGrath group than Group DL (Macintosh) ($p =< 0.001$).

In a study by **Tomasz Gaszynski (2020)[14]** they observed that the mean± SD POGO scores was 96.66 ± 7.24% in Group McG (McGrath) and was 81.66 ± 22.8% in Group I(I-View) which was significantly better with Group McG (McGrath) than Group I ($p = 0.0132$).

In a study conducted by **Yumul R, Elvir-Lazo O, (2016)[7],** they observed that, the mean± SD POGO scores (% of glottis opening) Score was 57 ± 41 % in Group M(Macintosh) and was 91 ± 11% in Group McG(McGrath) which was significantly better with McGrath group than Group M (Macintosh) ($p < 0.001$)(HS).

Sargin M, Uluer M, (2016)[15] observed that **t**he Mean± SD POGO Score was 60.80 ± 35.49 % in Group M (Macintosh) and was 84.67 ± 19.39 % in Group McG (McGrath) in normal airway patients which was significantly better with McGrath group than Group M ($p < 0.001$)(HS).

Piepho T, Weinert K, (2011)[16] observed that the Mean± SD POGO Score was 40.8 + 28.6 % in Group M (Macintosh) and was 85.2 + 14.7 % in Group McG (McGrath) which was significantly better with McGrath group than Macintosh group ($p< 0.001$).

The findings, from our study, regarding percentage of glottis opening Score (POGO Score) was similar to findings from studies conducted by **Arici S, Karaman S, (2014)[13], Toker M, AltıparmakB, Karabay A(2019)[8], Tomasz Gaszynski (2020)[14], Yumul R, Elvir-Lazo O,(2016)[7], Sargin M, Uluer M, (2016)[15] and Piepho T, Weinert K, (2011)[16].**

Distribution of study population according to Modified Cormack Lehane Grade C-L Score

In our study, McGrath video laryngoscope provided significantly better glottis view by Cormack Lehane Grading than Macintosh Laryngoscope (p=0.021) More number of the patients in Group McG (McGrath) had MCL Grade I (65%) as compared to Group M (Macintosh) (42.5%).

In a study **by Kaur G, Gupta S., (2020)[17]** they observed on statistical analysis, the difference between MCL Grading of McGrath MAC and Macintosh groups, was highly significant (p = 0.002) implying better glottis view by McGrath MAC VL.

In a study conducted by **Toker M, AltıparmakB, Karabay A (2019)[8],** they observed that CL grade I was significantly more in Group McG (McGrath) than Group Macintosh. Considering the difference in MCL grade I versus the other grades, the difference was statistically significant between Group M(Macintosh) and Group McG (McGrath) (p-value=0.003) (S).

In a study conducted by **Roh G. U, Kwak H. J., et al (2019)[9],** they observed that CL grade I was significantly more in Group McG (McGrath) than Group Macintosh. Considering the difference in MCL grade I versus the other grades, the difference was statistically significant between Group M(Macintosh) and Group McG (McGrath) (p-value=0.001) (S).

In a study conducted by **Aiji B, Kazuya Sobue et. al., (2017)[10],** they observed that, CL grade I was significantly more in Group McGrath than Group Macintosh. Considering the difference in MCL grade I versus the other grades, the difference was statistically significant between Group M(Macintosh) and Group McG (McGrath) (p-value<0.05) (S).

In a study conducted by **Yumul R, Elvir-Lazo O, (2016)[7],** they observed that, CL grade I was significantly more in Group McGrath than Group Macintosh. Considering the difference in MCL grade I versus the other grades, the difference was statistically significant between Group M(Macintosh) and Group McG (McGrath) (p-value<0.05) (S). The McGrath was superior to Macintosh in Cormack–Lehane grade p< 0.001).

In a study conducted by **Sargin M, Uluer M, (2016)[15],** they observed that, CL grade I was significantly more in Group McGrath than Group Macintosh. Considering the difference in MCL grade I versus the other grades, the difference was statistically significant between Group M(Macintosh) and Group McG (McGrath) (p-value<0.001) (S).

In a study conducted by **Liu Z, Yi J, Guo W, Ma C, Huang Y (2016)[18],** they observed that, CL grade I was significantly more in Group McGrath than Group Macintosh. Considering the difference in MCL grade I versus the other grades, the difference was statistically significant between Group M(Macintosh) and Group McG (McGrath) (p-value<0.000) (S).

Wallace C, Foulds L, (2015)[19], they observed that, the difference in CL grade , the difference was statistically significant between in Group McG (McGrath) using direct view, Group McG (McGrath) using Indirect Laryngoscopy and Group M(Macintosh) with a p-value of 0.001 (S). The McGrath using indirect laryngoscope was superior to McGrath using indirect laryngoscope and Macintosh in Cormack Lehane grade (p< 0.001).

So, the findings regarding Modified Cormack Lehane grading from our study were comparable with the studies of **Kaur G, Gupta S., (2020)[17], Toker M , Altıparmak B, Karabay A (2019)[8], Roh G. U, Kwak H. J., et al (2019)[9], Aiji B, Kazuya Sobue et. al., (2017)[10], Yumul R, Elvir-Lazo O, (2016)[7], Sargin M, Uluer M, (2016)[15], Liu Z, Yi J, Guo W, Ma C, Huang Y (2016)[18] and Wallace C, Foulds L, (2015)[19].**

NEED OF AN ADJUVANT AIRWAY DEVICE DURING INTUBATION

In our study, More number of patients in group M (Macintosh) required adjuvant airway devices during intubation than Group McG (McGrath) on statistical analysis (p=0.018) (S).

In a study conducted by **Yumul R, Elvir-Lazo O, (2016)[7],** they observed that, the number of patients requiring bougie as adjuvant airway device were more in Macintosh group than McGrath group (p<0.05).

The finding from our study regarding requirement of adjuvant airway device for intubation was similar to the findings from study of **Yumul R, Elvir-Lazo O, (2016)[7].**

OPTIMIZATION MANOEUVER REQUIRED

In our study, More number of patients in Group M (Macintosh) required optimization manoeuvers during intubation than Group McG (McGrath) on statistical analysis (p=0.020) (S).

In a study conducted by **Kaur G, Gupta S., (2020)[17],** they observed that, 14 patients (35%) in Group M(Macintosh), 4 patient (10%) in Group McG and 5 patients (12.5%) in Group Trueview required optimization manoeuver. More number of patients in group M (Macintosh) required optimization manoeuvers during intubation than group McG (McGrath) on statistical analysis (p<0.05) (S).

In a study conducted by **Roh G. U, Kwak H. J., et al (2019)[9]** observed that more number of patients in Macintosh group (28 patients, 66.27%) required optimization maneuvers during intubation than McGrath group (4 patients, 10%) on statistical analysis (p<0.001) (HS).

The finding from our study regarding requirement of optimization

manoeuver was similar to the findings from studies of **Kaur G, Gupta S., (2020)[17] and Roh G. U Kwak H. J., et al (2019)[9].**

NUMBER OF ATTEMPTS FOR INTUBATION

Successful intubation done with McGrath VL in first attempt was statistically highly significant than Macintosh L (group M) (P=0.001). Failed intubation was not observed in either groups in our study. Successful intubation attempts in our study were due to familiarity, experience, and expertise for the use Macintosh laryngoscope and McGrath video Laryngoscope.

In a study conducted by **Sargin M, Uluer M, (2016)[15],** they observed that, in Group M, 43 patients (86%) were intubated in the first attempt while 7 patients (14%) required a second attempt. In Group McG (McGrath), 50 patients (100%) were intubated in the first attempt while none of the patient required a second attempt. The difference in number of successful intubation attempts was statistically highly significant between two groups with a *p*-value of 0.001 (HS).

Kasuya Y, Takahashi E, Nagai M, (2015)[20], observed that the first attempt success rate was 78.6% with DL and 92.8% with Group VL (McGrath) suggesting the first attempt success rate was significantly more in McGrath group than Macintosh group($p < 0.001$).

The finding from our study regarding lesser requirement of number of attempts for intubation with McGrath laryngoscope was similar to the findings from study of **Sargin M, Uluer M, (2016)[15], Kasuya Y, Takahashi E, Nagai M, (2015)[20].**

EASE OF INTUBATION

In our study, The difference in ease of intubation in McGrath group as compared to Macintosh group was statistically significant with a p-value of <0.001(HS). 32 Patients (80%) were intubated with McGrath video laryngoscope without any optimization manoeuvres and adjuvant airway device in first attempt which suggest that ease of intubation was significantly better in McGrath group than Macintosh group.

Ease of intubation assessed in a study conducted by **Kaur G, Gupta S., (2020)[17],** they observed that, Intubation was easy in 36 (90%) patients in McGrath MAC group, 35 (87.50%) patients in Truview group and 26 (65%) patients in Macintosh group. Statistically, the difference in ease of intubation was better in McGrath MAC and Truview groups compared to Macintosh group ($P < 0.05$).

In a study conducted by **Roh G. U, Kwak H. J., et al (2019)[9],** Ease of intubation was assessed by numeric rating scale and intubation difficulty score. They observed that, the intubation ease was better in McGrath group than Macintosh group (P=0.007) (S).

The finding from our study regarding ease of intubation was similar to the findings from study of **Kaur G, Gupta S., (2020)[17]** and **Roh G. U, Kwak H. J., et al (2019)[9].**

INCIDENCE OF COMPLICATION OF INTUBATION

In our study, in group M (Macintosh), no patient had complications as bradycardia or hypotension and bronchospasm or laryngospasm or desaturation. 2 patients (5%) had a sore throat and 2 patients (5%) had a minor injury to the lips.

In Group McG (McGrath), none of the patients had complications of bradycardia, hypotension and bronchospasm, laryngospasm or desaturation. Also none of the patients had a sore throat, and minor injury to the lips. Vocal cord edema, injury to teeth, pharyngeal laceration, and mucosal injury was not seen in any patient of both the groups. The difference in both the groups was statistically insignificant (p= 0.157).

In a study conducted by **Kaur G, Gupta S., (2020)[17],** they observed that, 5 patients (12.50%) had airway trauma in Macintosh (Macintosh) group. No patient had any airway trauma in McGrath MAC group. Statistically, the difference in trauma among the groups was not significant ($p > 0.05$).

In a study conducted by **Roh G. U, Kwak H. J., et al (2019)[9],** they observed that, Bleeding in oral mucosa after intubation was seen in 15 patient (37.5%) in Group M (Macintosh) and 3 patients (7.5 %) in Group McG (McGrath).The incidence of bleeding was significantly lower in the MVL group (McGrath) than in the DL group (Macintosh) (p=0.001) (HS).

In a study conducted by **Aiji B, Kazuya Sobue et. al., (2017)[10],** they observed that, With regards to desaturation, lip bleeding and dental injury, there were no statistically significant difference among the groups. Post-operative sore throat was observed in 4 patients in Macintosh group and 1 patient in McGrath group which was statistically insignificant (P>0.05) (NS).

In a study conducted by **Yumul R, Elvir-Lazo O, (2016)[7],** they observed that, post-operative complications like transient change in voice was seen in 4 patients (13%) in Group M(Macintosh) and 3 patients (10%) in Group McG (McGrath). The incidences of minor postoperative airway complications (eg. sore throat, transient hoarseness, injury to the lip, tongue and dentition) were comparable among the treatment groups (P>0.05) (NS).

In a study conducted by **Sargin M, Uluer M, (2016)[15],**they observed that, minor complications like oropharyngeal mucosal injuries due to intubation was seen in 13 patients in Macintosh Group and 2 patients in McGrath Group. The difference was statistically significant (p=0.004) (S).

In a study conducted by **Liu Z, Yi J, Guo W, Ma C, Huang Y (2016)[47],** they observed that, airway complications were seen in 18 patients (20%) in Group M (Macintosh) and 8 patients in Group McG (McGrath). The difference was statistically significant (p=0.04) (S).
In our study, the complications in group M (Macintosh) and in Group McG (McGrath) during the study period were minimal and managed accordingly.

CONCLUSION:

We conclude that McGrath MAC Video laryngoscope is better than Macintosh laryngoscope for oro-tracheal intubation in normal airway as it provides earlier time to intubate, significantly superior glottic view by percentage of glottis opening (POGO) Score and Cormack-Lehane Grading, more ease of intubation with less requirement of optimization maneuvers and airway adjunct devices, more first attempt success rate without any complications and stable vitals.

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