

A PROSPECTIVE OBSERVATIONAL STUDY COMPARING CONVENTIONAL MACINTOSH LARYNGOSCOPE WITH MCGRATH VIDEO LARYNGOSCOPE FOR COMPARING THEIR HEMODYNAMIC RESPONSE TO ENDOTRACHEAL INTUBATION

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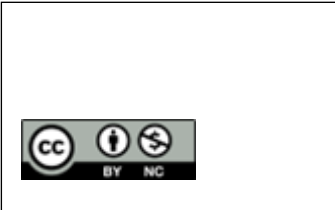
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Abstract

Background: McGrath video laryngoscope is claimed to be better than conventional Macintosh laryngoscope in terms of hemodynamic profile during endotracheal intubation. The prevention of aggravated sympathoadrenal response provoked by laryngoscopy and endotracheal intubation is an important issue for anaesthesia practice. This prospective observational study was done to compare the hemodynamic changes using Conventional Macintosh Laryngoscope and McGrath Video Laryngoscope during endotracheal Intubation. **Materials and Methods:** About 500 patients were observed in this study aged between 18-65 years of age of either sex with American Society of Anesthesiologists (ASA I-II) status, requiring general anesthesia for various surgical procedures who required endotracheal intubation. These patients were categorized into two groups: 1. Group CL (conventional Macintosh laryngoscope): Included patients where conventional laryngoscope was used. 347 patients were observed in this group. 2. Group MG (McGrath MAC videolaryngoscope): Included patients where McGrath MAC videolaryngoscope was used. A total of 153 patients were observed in this group. A standard anaesthesia technique was used in all the selected patients with entropy monitoring for depth of anesthesia. Intubation time, number of intubation attempts, need for stylet, additional manipulation, glottic view (Cormack-Lehane) and traumatic complications caused by intubation procedure and occurrence of sore throat postoperatively were also studied. Hemodynamic variables (HR,SBP,DBP) at baseline and following induction were also statistically compared in this study. 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). **Result:** The parameters studied were hemodynamic parameters (HR, SBP, DBP) cormack-lehane grade, intubation time, number of intubation attempts, additional manipulation, traumatic complication and postoperative sore throat. Hemodynamic parameters showed significant difference between the groups post intubation, being more pronounced with Macintosh laryngoscope. P value in SBP, HR and DBP was statistically significant. Intubation time was less in MG group (18.2+4.47s) as compared to CL group (26.8+5.41s) and the difference was significant (p-value <0.001). Statistically no significant difference was found between the groups as far as no. of intubation attempts and traumatic complications were considered (p value=0.359 and 0.884 respectively). Glottic view in MG group was better than CL group (p-value =0.006). 97.4% patients in MG group were intubated using stylet making the difference statistically significant (p-value <0.001). Additional manipulations were required in CL group in the form of BURP, BOUGIE, or both (p-value =0.001). Sore throat was observed in CL rather than in MG group (p-value<0.001). **Conclusion:** This prospective observational study was done to



compare hemodynamic response to endotracheal intubation using conventional Macintosh laryngoscope and McGrath video laryngoscope. Following intubation, hemodynamic variables were statistically significant in Macintosh laryngoscope as compared to McGrath video laryngoscope leading to the conclusion that McGrath video laryngoscope is better than conventional Macintosh laryngoscope in terms of hemodynamic changes during endotracheal intubation.

INTRODUCTION

Laryngoscopy and endotracheal intubation are an integral part of anaesthetic management. Infact, most of the advances made by our specialty can be attributed to manage the airway. The first known description on the surgical procedure of intubation was given in the 1020 by Ibn Sīnā in “The Canon of Medicine” in order to facilitate breathing.^[1,2]

Like all the interventional procedures, laryngoscopy and endotracheal intubation are associated with various undesirable effects.^[3]

During laryngoscopy, the stimulation of supraglottic area leads to an increase in the plasma catecholamine concentration due to activation of the sympathoadrenal system.^[4] The transition of the endotracheal tube through the vocal cords and inflation of the tube cuff at infraglottic region is also responsible for the phenomenon, but this contribution is less important than the abnormal force administered during laryngoscopy to the base of tongue to lift the epiglottis.^[5] Thus, following laryngoscopy and endotracheal tube intubation, pathophysiological undesired effects, such as an increase in heart rate and intravascular, intraocular and intracranial pressure as well as rhythm disturbance and bronchoconstriction frequently occur.^[6]

Reflex changes in cardiovascular system are most marked after laryngoscopy and intubation and lead to average increase in blood pressure by 40 - 50% and heart rate by 20.^[7]

Due to the cardiovascular changes in the advanced age and the effects of poor blood circulation/blood stasis on the pharmacokinetics of drugs, there is usually a minimum 50% risk of cardiac ischemia in patients over 70 years of age.^[8-10]

The anesthesiologist is required to secure an open airway and maintain respiration and pulmonary ventilation during surgery. Tracheal intubation is among the safest, commonest methods for maintaining an open airway.^[11]

Hemodynamic changes vary among patients and may be exaggerated in certain population. Although healthy and young patients generally tolerate these responses well, patients with limited coronary reserve may experience myocardial ischaemia, acute heart failure or serious arrhythmia.^[12]

In patients with head injury, cerebral autoregulation is disturbed and increase in heart rate and blood pressure may result in increase in cerebral blood flow and therefore rise in intracranial pressure.^[13]

The prevention or reduction of this aggravated sympathoadrenal response provoked by laryngoscopy and endotracheal intubation is an important issue for anaesthesia practice. This practice concerns a group of medication to blunt the response, but the choice of an alternative intubation laryngoscope can also be significant. Alternative laryngoscopes are used to facilitate laryngoscopy and to improve the glottic view in case of difficult airway. These laryngoscopes can provide this ameliorating effect with suspension and distension force, which will probably result in less haemodynamic changes during laryngoscopy.^[14]

Macintosh Laryngoscope

Rigid laryngoscopes are manufactured either as a single piece or a separate detachable blade and handle. In the latter case, the light source is either a lamp attached to the blade or a lamp in the handle with a light guide in the blade.^[15-21]



For a detachable handle and blade, the light source is energized when the blade and handle are locked in the operating position. A hook-on (hinged, folding) connection between the handle and blade is most commonly used. The handle is fitted with a hinge pin that fits into a slot on the base of the blade. This allows the blade to be quickly and easily attached or detached. A single-piece laryngoscope has a switch on the handle that controls power to the lamp. Standards covering rigid laryngoscopes include the American Society for Testing and Materials (ASTM) F-965 and F-1195 and the international Standards Organisation (ISO) 7376.^[22-36]

Videolaryngoscopy is becoming a widely accepted airway management technique. There are several potential advantages over direct laryngoscopy including better views of the larynx particularly in

patients with limited cervical spine motion and for educational purpose.^[36-43]

Both experienced and inexperienced intubators find video- laryngoscopy easier and quicker than direct laryngoscopy in a difficult airway model.^[44,45]

Using video laryngoscope may result in less neck movement than when using a conventional laryngoscope. It allows the anesthesia provider to maintain a distance from the patient during intubation and this could make it useful in patients who have infectious diseases. Positioning the monitor over the patient's chest allows the intubator to work and observe in one axis.^[46]

The McGrath® MAC videolaryngoscope: Designed and manufactured by Aircraft Medical, Edinburgh, UK): The device incorporates a light source (LED) and miniature camera (camera) to view the larynx during the procedure of laryngoscopy. The image is displayed on an LCD screen (screen) contained within a monitor mounted to the handle of the device.^[47]

A McGrath® MAC 3.6V battery (battery unit) mounted within the handle powers the screen, camera, and LED. The McGrath® disposable laryngoscope blade (blade) covers the camera and LED assembly (CameraStick™) to prevent direct patient contact. McGRATH® blades are supplied sterile and are singleuse.^[48-52]

Laryngoscope Assembly

SIZE: 180mm x 68mm x 110mm
Weight: 0.200kg

Power: Proprietary 3.6V Lithium Battery, giving 250 minutes of use typically Protection: IPx7
Light source: High intensity LED.

Display: 2.5" LCD colour display

Camera: CMOS



Entropy is a useful monitor for assessing the depth of anaesthesia. Entropy displays a high degree of specificity and sensitivity in assessing the consciousness during anesthesia.^[16] The Datex Ohmeda S/5 entropy module collects a one channel raw biosignal, consisting of both the electroencephalogram (EEG) and electromyogram (EMG) from the fronto temporal region of the

patient's head. As entropy detects EMG activation as a possible result of nociceptive stimulation during inadequate anaesthesia, use of the response state entropy difference has been proposed as a tool for titrating analgesics during anaesthesia.^[20]

MATERIALS AND METHODS

This study was carried in the Department of Anaesthesia in ENT and General Surgery, Government SMHS Hospital, an associated hospital of Government Medical College, Srinagar after getting approval from the Institutional Ethical Committee and obtaining written informed consent from all patients. The patients between ages 18-65years with American Society of Anesthesiologists (ASA I-II) status, requiring general anesthesia with endotracheal intubation were included and Patients with ASA status >2, a history or suspect of difficult airway (Mallampati >2, intraoral lesion, mouth opening <3cm, thyromental distance <6cm), hypertension, diabetes mellitus and treatment known to affect blood pressure or heart rate was excluded.^[53-68]

Patients requiring more than two attempts to achieve successful intubation and those in whom the entropy level exceeds 60 at any stage during study period were excluded from the statistical analysis of data. The study was performed in accordance with the principles of the Declaration of Helsinki.

All patients underwent a thorough pre-operative examination, including history, general physical examination and necessary investigations. After entering the operating room, all patients were cannulated with 18G IV canula, sedated with midazolam 0.05mg/kg and monitored with ECG, non-invasive blood pressure, peripheral oxygen saturation and entropy. Baseline systolic blood pressure (SBP), HR and SpO2 values were recorded as T0. Standard anaesthetic technique including propofol 23mg/kg and fentanyl 1.5 mcg/kg was applied to all patients. Entropy level of 45-55 was targeted and maintained during anaesthetic induction and the entire study period. When this level was obtained, 0.5mg/kg atracurium was administered to facilitate endotracheal intubation. Patients were ventilated by a facemask with 100% oxygen for 3 mins following neuromuscular blockage, and second measurement was performed as T1 at this point.^[69-73]

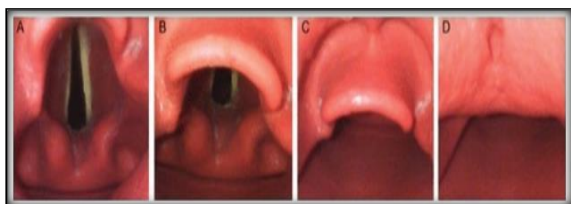
Patients were randomly allocated to the CL (conventional Macintosh laryngoscope) and MG (McGrath videolaryngoscope) groups. The ETT (endotracheal tube) size for female and male patients was predetermined as 7.0mm and 7.5mm respectively. Size 3 and 4 laryngoscope blades were used for female and male patients, respectively. Intubation time was defined as the interval starting with the entrance of the blade to the mouth and ending with the passage of the tip of endotracheal tube through the vocal cords. Intubation stylet was

used if requested by the anaesthesiologist in case of intubation failure at the first attempt. All intubation procedures were performed by experienced anaesthesiologists. Succeeding hemodynamic measurements were performed immediately after intubation (T2) and for 5 min in 1-min intervals (T3, T4, T5, T6 and T7). The study period got completed at the 5th min after endotracheal intubation. Patients were assessed for sore throat at the second postoperative hour using an established 4-point scale.^[74]

Accordingly to this system, sore throat was graded as:

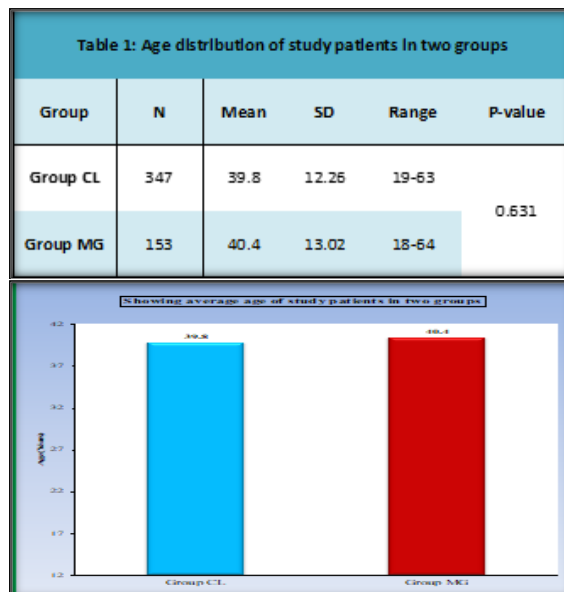
- None – 1
- Mild - Less severe than with a cold – 2
- Moderate - obvious to an observer – 3
- Severe – Aphonia – 4

Cormack-Lehane laryngoscopic views were graded according to 4 grades classified as [Figure] based on the view obtained at laryngoscopy:^[75] Grade I, the glottis is completely visible Grade II, only the posterior commissure is visible Grade III, only the tip of the epiglottis is visible; and Grade IV, no glottic structures are visible.



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. For intra-group analysis of data, paired t-test was used. Graphically the data was presented by bar and line diagrams. A P-value of less than 0.05 was considered statistically significant. All P-values were two tailed.

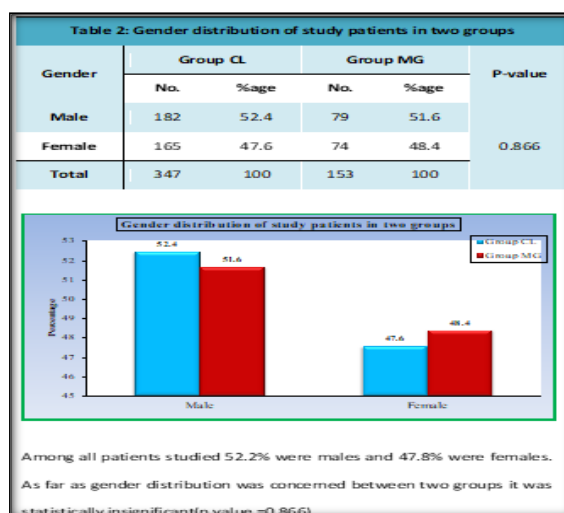
RESULTS

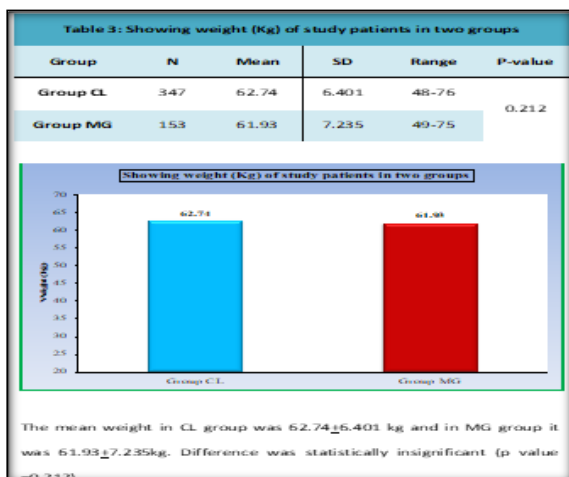


Patients between ages 18-65 years of age of either sex with ASA I-II status, requiring general anesthesia with endotracheal intubation were included in our study. Total of about 500 patients were included in this study as per our inclusion and exclusion criteria.

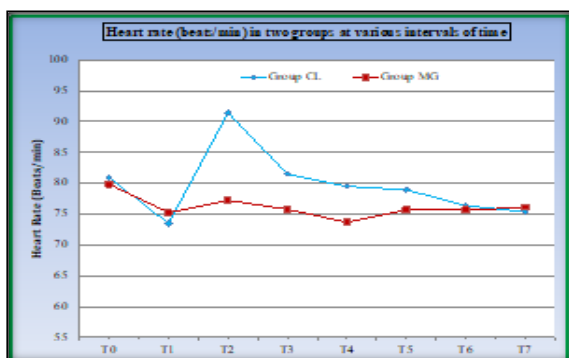
For statistical purpose only, these patients were categorized into two groups:

1. Group CL (conventional Macintosh laryngoscope): Included patients where conventional laryngoscope was used (Macintosh) 347 patients were observed
2. Group MG (McGrath[®] MAC videolaryngoscope): Included patients where McGrath[®] MAC videolaryngoscope was used. 153 patients were observed.





Hemodynamic parameters (HR, SBP, DBP) were comparable in both the groups. Baseline heart rate of all patients (T0) was recorded. Mean heart rate in CL was 80.92+8.70 bpm and in MG was 79.84+8.80 bpm. Difference between them was insignificant (p value 0.202).



Results show decrease in the heart rate after induction (T1) in both the groups but difference between the groups was not statistically significant. At T2 (After intubation) heart rate increased in both the groups but statistically significant in CL group (p value <0.001) as compared to MG group. Similarly at T3, T4 and T5 heart rate remained on higher side in CL and statistically significant than MG (p value <0.001). At T5 and T6 heart rate decreased in both groups and returned towards T1 but statistically no significant difference between the groups (Table 4).

Table 4: Comparison based on heart rate (beats/min) in two groups at various intervals of time

Time Interval	Group CL		Group MG		P-value
	Mean	SD	Mean	SD	
T0	80.92	8.70	79.84	8.80	0.202
T1	73.46	8.74	75.24	8.77	0.165
T2	91.45	8.78	77.24	8.72	<0.001*
T3	81.52	8.79	75.79	9.80	<0.001*
T4	79.50	7.74	73.68	8.89	<0.001*
T5	78.94	8.80	75.71	8.93	<0.001*
T6	76.38	8.92	75.68	9.00	0.422
T7	75.39	8.95	76.12	8.87	0.404

*Statistically Significant Difference (P-value<0.05)

Baseline systolic blood pressure (SBP) of all patients was recorded. Mean SBP in CL was 126.84+8.36 mmHg and in MG was 127.28+9.45 mmHg. Both the groups were comparable as far as baseline SBP was concerned but the difference was insignificant (p value 0.598).

In both groups at T1 SBP decreased from baseline but not statistically significantly (p value =0.153). At T2 (after intubation) SBP increased statistically significantly with respect to T1 in CL as compared to MG.

Similarly at T3, T4, T5 SBP remained on higher side and statistically significant with respect to T1 in CL as compared to MG (p-value <0.001, <0.001, <0.001 respectively).

At T6 and T7 SBP returned to around T1 in both the groups but was statistically insignificant (p value 0.078 and 0.275 respectively) [Table 5].

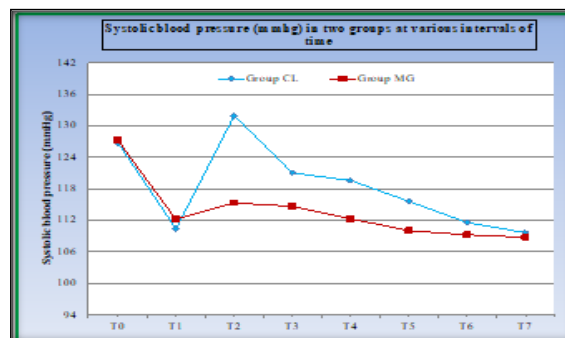


Table 5: Intra-group changes in heart rate (beats/min) in Group CL and Group MG

Time Interval	Group CL			Group MG		
	Mean	Diff	P-value	Mean	Diff	P-value
T0	80.92	-	-	79.84	-	-
T1	73.46	-7.46	<0.001*	75.24	-4.60	<0.001*
T2	91.45	17.99	<0.001*	77.24	2.00	0.391
T3	81.52	8.06	<0.001*	75.79	0.55	0.784
T4	79.50	6.04	<0.001*	73.68	-1.56	0.518
T5	78.94	5.48	<0.001*	75.71	0.47	0.793
T6	76.38	2.92	0.319	75.68	0.44	0.807
T7	75.39	1.93	0.417	76.12	0.88	0.719

#Statistically significant difference with respect to T0; *Statistically significant difference with respect to T1 (P-value<0.05)

As far as intra group changes are concerned heart rate (T1) decreased in both the groups from the

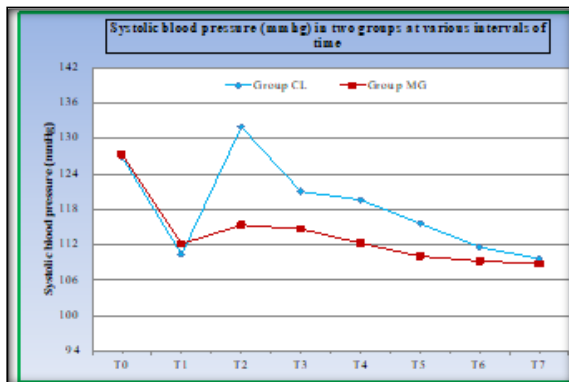
baseline heart rate and decreased statistically significantly (p value <0.001). In CL group: At T2 heart rate significantly increased from baseline (p value <0.001). At T3, T4 and T5 heart rate remained increased with respect to T1 and the difference is statistically significant (p value <0.001, <0.001, <0.001 respectively). At T6 and T7 heart rate decreased and returned towards T1 but the difference was not found statistically significant (p value 0.319 and 0.417) respectively. In MG group from T2–T7 heart rate did not show any statistically significant difference at any measurement time and showed a stable profile through the entire study period.

Table 6: Comparison based on SBP (mmHg) in two groups at various intervals of time

Time Interval	Group CL		Group MG		P-value
	Mean	SD	Mean	SD	
T0	126.84	8.36	127.28	9.45	0.598
T1	110.38	8.31	112.19	9.51	0.153
T2	131.94	8.38	115.34	8.48	<0.001*
T3	121.03	8.31	114.70	9.56	<0.001*
T4	119.58	8.42	112.29	9.50	<0.001*
T5	115.63	7.48	110.07	10.73	<0.001*
T6	111.62	8.58	109.27	9.70	0.078
T7	109.66	7.51	108.78	9.87	0.275

*Statistically Significant Difference (P-value <0.05)

Baseline systolic blood pressure (SBP) of all patients was recorded. Mean SBP in CL was 126.84±8.36 mmHg and in MG was 127.28±9.45 mmHg. Both the groups were comparable as far as baseline SBP was concerned but the difference was insignificant (p value 0.598).



In both groups at T1 SBP decreased from baseline but not statistically significantly (p value =0.153). At T2 (after intubation) SBP increased statistically significantly with respect to T1 in CL as compared to MG. Similarly at T3, T4, T5 SBP remained on higher side and statistically significant with respect to T1 in CL as compared to MG (p-value <0.001, <0.001, <0.001 respectively). At T6 and T7 SBP returned to around T1 in both the groups but was statistically insignificant (p value 0.078 and 0.275 respectively).

Table 7: Intra-group changes in SBP (mmHg) in Group CL and Group MG

Time Interval	Group CL			Group MG		
	Mean	Diff	P-value	Mean	Diff	P-value
T0	126.84	-	-	127.28	-	-
T1	110.38	-16.46	<0.001*	112.19	-15.09	<0.001*
T2	131.94	21.56	<0.001*	115.34	3.15	0.297
T3	121.03	10.65	<0.001*	114.70	2.51	0.318
T4	119.58	9.20	<0.001*	112.29	0.10	0.925
T5	115.63	5.25	<0.001*	110.07	-2.12	0.418
T6	111.62	1.24	0.552	109.27	-2.92	0.321
T7	109.66	-0.72	0.685	108.78	-3.41	0.239

#Statistically significant difference with respect to T0;
*Statistically significant difference with respect to T1 (P-value<0.05)

As far as intra-group changes in SBP is concerned, at T1 (after induction) SBP decreased significantly from baseline (T0) in both the groups (p value <0.001).

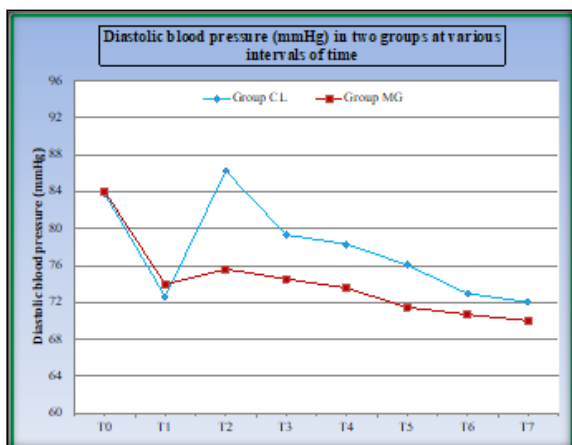
In CL group, at T2 (after intubation) SBP increased significantly with respect to T1 (p value <0.001). In CL group at T3, T4, T5 SBP remained on higher side significantly with respect to T1 (p value <0.001, <0.001, <0.001). At T6 and T7 SBP returned towards T1 and difference was statistically insignificant (p value 0.552 and 0.685 respectively). In MG group SBP at T1 decreased significantly from T0 (p value <0.001) At T2 (after intubation) SBP increased but was statistically insignificant with respect to T1 (p value 0.297). From T3 –T7 SBP showed more or less stable profile and no statistically significant difference was noted (p value 0.297, 0.318, 0.925, 0.418, 0.321, 0.239 respectively).

Table 8: Comparison based on DBP (mmHg) in two groups at various intervals of time

Time Interval	Group CL		Group MG		P-value
	Mean	SD	Mean	SD	
T0	83.77	5.76	84.02	6.62	0.671
T1	72.63	5.77	73.95	6.80	0.458
T2	86.26	5.71	75.61	6.27	<0.001*
T3	79.34	5.81	74.55	6.71	<0.001*
T4	78.30	5.83	73.56	6.65	<0.001*
T5	76.08	5.94	71.49	6.61	<0.001*
T6	72.95	6.03	70.70	6.56	0.172
T7	72.04	5.92	70.03	6.77	0.218

*Statistically Significant Difference (P-value<0.05)

Baseline diastolic blood pressure (DBP) of all patients was recorded. In both groups at T1 DBP decreased from baseline but not statistically significantly (p value =0.458).

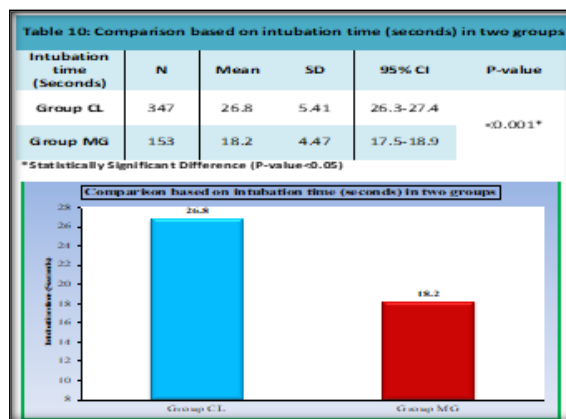


At T2 (after intubation) DBP increased statistically significantly with respect to T1 in CL as compared to MG (p value <0.001). Similarly at T3, T4, T5 DBP remained on higher side and statistically significant with respect to T1 in CL as compared to MG (p value <0.001, <0.001, <0.001 respectively). At T6 and T7 DBP returned to around T1 in both the groups but was statistically insignificant (p value 0.172 and 0.218 respectively).

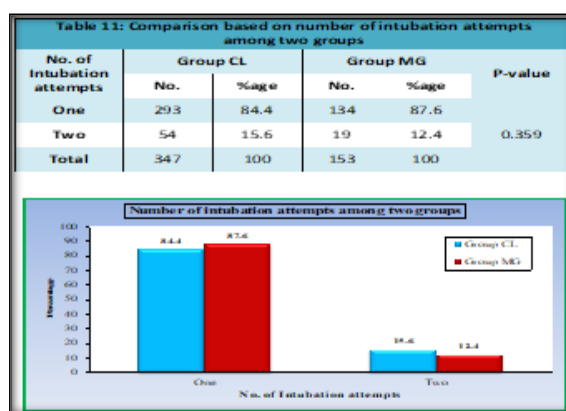
Time Interval	Group CL			Group MG		
	Mean	Diff	P-value	Mean	Diff	P-value
T0	83.77	-	-	84.02	-	-
T1	72.63	-11.14	<0.001*	73.95	-10.07	<0.001*
T2	86.26	13.63	<0.001*	75.61	1.66	0.487
T3	79.34	6.71	<0.001*	74.55	0.60	0.751
T4	78.30	5.67	<0.001*	73.56	-0.39	0.614
T5	76.08	3.45	0.006*	71.49	-2.46	0.311
T6	72.95	0.32	0.837	70.70	-3.25	0.297
T7	72.04	-0.59	0.763	70.03	-3.92	0.091

#Statistically significant difference with respect to T0;
*Statistically significant difference with respect to T1 (P-value<0.05)

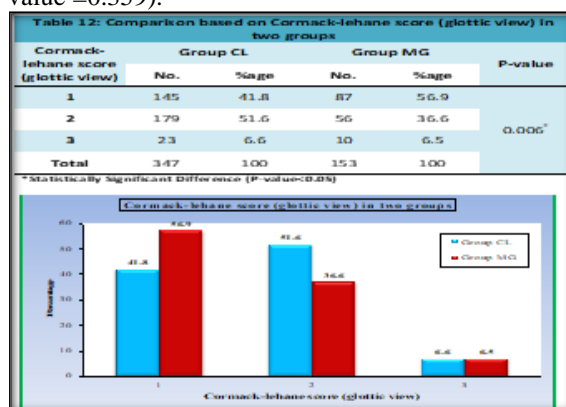
As far as intra-group changes in DBP is concerned, at T1 (after induction) DBP decreased significantly from baseline (T0) in both the groups (p value <0.001). In CL group, at T2 (after intubation) DBP increased significantly with respect to T1 (p value <0.001). In CL group at T3, T4, T5 DBP remained on higher side significantly with respect to T1 (p value <0.001, <0.001, <0.006). At T6 and T7 DBP returned towards T1 and difference was statistically insignificant (p value 0.837 and 0.763 respectively). In MG group DBP at T1 decreased significantly from T0 (p value <0.001). At T2 (after intubation) DBP increased but was statistically insignificant with respect to T1 (p value 0.487). From T3 –T7 DBP showed more or less stable profile and no statistically significant difference was noted (p value, 0.751, 0.614, 0.311, 0.297, 0.091 respectively).



In CL group mean intubation time was 26.8+5.41s and in MG it was 18.2+4.47s. Intubation time was more in CL group than MG and the difference was statistically significant (p value <0.001).

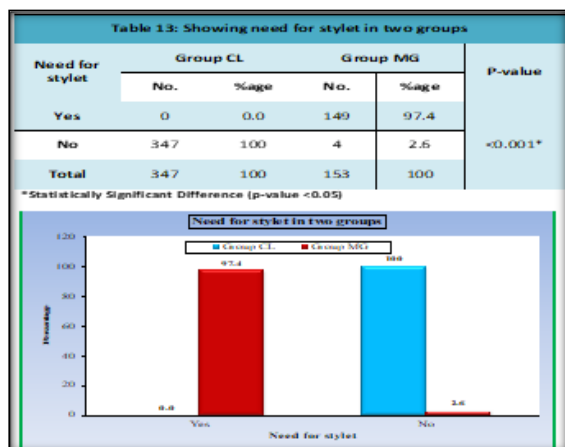


As patients who required 3 or more attempts were excluded, we only observed patients who required one or two attempts. In CL group 84.4% patients required one attempt and 15.6% required two attempts and in MG group 87.6% were intubated in first attempt and 12.4% in second attempt. Statistically no significant difference was found between the groups as far as no. of attempts was considered (p value =0.359).

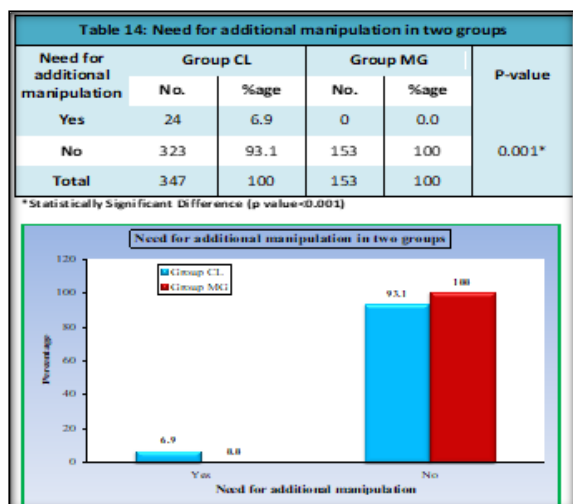


About 41.8% patients in CL group were observed to view grade 1 cormack-lehane score, 51.6% grade two and 6.6% grade 3 while in MG group 56.9% grade 1, 36.6% grade 2 and 6.5% grade 3. Both the

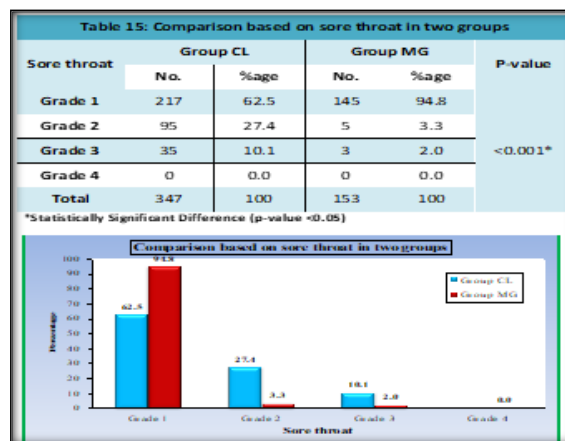
groups were comparable and difference was significant (p-value = 0.006).



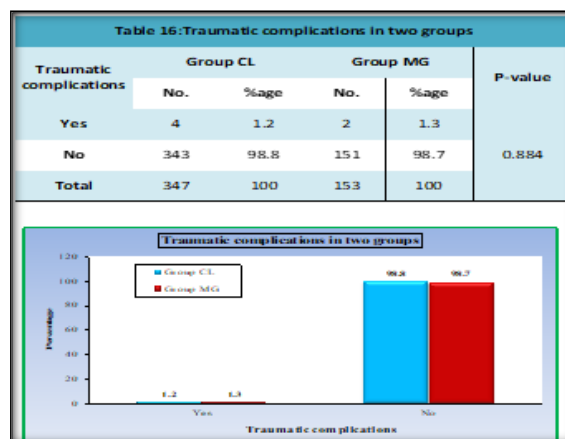
Among all patients in MG group 97.4% patients required stylet for intubation while in CL none required stylet. The difference between group is significant statistically (p value <0.001).



Additional manipulation included BURP (Backward Upward Rightward Pressure), use of gum elastic bougie or both. In CL group 6.9% required additional manipulation. Among 6.9%, 4% required BURP, 1.7% needed gum elastic bougie and 1.2% needed both BURP and bougie while in MG no additional manipulation was required and the difference was statistically significant (p-value =0.001).



In CL group 62.5% had no sore (grade 1) throat after being observed at second postoperative hour, 37.5% complained of sore throat in which 27.4% had grade 2 and 10.1 had grade 3 sore throat while in MG group only 5.3% had sore throat in which 3.3% had grade 2 and in 2% had grade 3 sore throat and the difference was statistically significant (p-value <0.001).



Traumatic complications associated were recorded as blood-tinged secretions, injury to lips. In CL group 1.2% patients had traumatic complication while in MG 1.3% patients were noticed to have traumatic complications but the difference between groups was insignificant statistically (p-value =0.884).

DISCUSSION

Laryngoscopy and endotracheal intubation are an integral part of anaesthetic management.^[1,2] During laryngoscopy, the stimulation of supraglottic area leads to an increase in the plasma catecholamine concentration due to activation of the sympathoadrenal system.^[4]

The prevention or reduction of this aggravated sympathoadrenal response provoked by laryngoscopy and endotracheal intubation is an important issue for anaesthesia practice. This practice concerns a group of medication to blunt the response, but the choice of an alternative intubation

laryngoscope can also be significant. Alternative laryngoscopes are used to facilitate laryngoscopy and to improve the glottic view in case of difficult airway. These laryngoscopes can provide this ameliorating effect with suspension and distension force, which will probably result in less haemodynamic changes during laryngoscopy.^[14] Taking all this into consideration we conducted a study in which we observed hemodynamic response to endotracheal intubation using conventional Macintosh laryngoscope and McGrath video laryngoscope. Type of video laryngoscope we used was McGRATH® MAC videolaryngoscope. The physical characteristics including age, gender and weight of all the patients in both the groups in our study were comparable.

Hemodynamic parameters were studied (HR, SBP, DBP). In our study HR, SBP, DBP all increased in CL post intubation as compared to MG group. A probable reason for increased hemodynamic parameters in Macintosh laryngoscope is that it requires forced alignment of the oral and pharyngeal axes in order to view the glottis. This maneuver stimulates supraglottic regions and the oral tissue and induces the patient's sympathetic response. It is considered to be a primary cause of an excessive hemodynamic response when the direct laryngoscopy technique is used. In contrast, the McGRATH video laryngoscope does not require this manipulation.^[61]

Better glottis view in videolaryngoscope is that during direct laryngoscopy, the larynx is viewed from outside the oral cavity. The distance between the vocal cords and the laryngoscopist's eye is substantial (30–40 cm). This reduces the angle of view to 15° with a classic laryngoscope. During videolaryngoscopy, the digital camera and light source are mounted very close (2–3 cm) to the tip of the videolaryngoscope and close to the larynx. The laryngoscopist obtains a much wider angle of view as captured on the camera monitor.^[77] Many times we would encounter fogging of screen of McGrath videolaryngoscope which was not encountered in other videolaryngoscope available in the department.

In our study we observed that despite better laryngeal view, there was still difficulty in advancing tracheal tube through vocal cords without stylet while using McGrath videolaryngoscope. Shippey B et al (2007),^[48] conducted a study and sorted out two reasons for this problem.

According to them during direct laryngoscopy, a straight line of sight is created by aligning oral, pharyngeal and laryngeal axes, allowing passage of the tracheal tube in a straight line, while using the McGrath videolaryngoscope these axes are not aligned, and the tip of the tracheal tube must therefore pass around a relatively acute angle to enter the larynx. They believe that less space is created for tube insertion when using the McGrath, as the pharyngeal tissues are not displaced as far

anteriorly as during direct laryngoscopy. So mounting the tube onto a stylet and angling the distal tip upwards by 60–70° at the proximal end of the cuff overcomes these problems, and allows easier insertion of the tube into the larynx. According to Shippey B et al (2007),^[48] using a stylet and correctly shaping the tracheal tube is mandatory to assist tracheal intubation with the McGrath®, as with other videolaryngoscopes.

Since McGrath provided better visualization of the glottis less additional manipulation were required.

The reason for traumatic complications in Macintosh could be because of force exerted (to align axes) while laryngoscopy⁸⁰ but our results did not show any statistically significant difference between

Macintosh and McGrath videolaryngoscope as far as traumatic complications are concerned.

CONCLUSION

With the dawn of videolaryngoscopy, airway management has changed dramatically. Videolaryngoscopy not only provides better glottic view as compared to direct laryngoscopy but also decreases intubation time. As glottic view is better, optimization maneuvers are less required. Since there is no need to align all the axes to view laryngeal inlet, less manipulations (like head extension, neck flexion) which are stressful and lead to increased pressor response are required.

This study also shows that Videolaryngoscope (McGrathr MAC) proved to be better than conventional laryngoscope (Macintosh) as far as hemodynamics, Cormack-Lehane grade, intubation time, additional manipulation and postoperative sore throat is concerned.

Limitations

1. In our study we did not include patients with difficult airway, pregnant females, pediatric age group.
2. In our study invasive blood pressure was not used which is more accurate.
3. Patients were only observed for 2hrs postoperatively for any complication caused by laryngoscopy.

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