



Comparison of McGrath videolaryngoscope with Macintosh laryngoscope for endotracheal intubation in normal population – a randomized controlled study.

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ABSTRACT

Background

The McGrath™ MACVideo laryngoscope is a newly developed video laryngoscope that significantly improves laryngeal view and facilitates endotracheal intubation in difficult airways [1]. The aim of this study was to compare the McGrath video laryngoscope with the Macintosh laryngoscope in patients with normal airways in terms of intubation time, glottic view, Cormack – Lehane grading, hemodynamic stability, post – op complications.

Methods

A total of 250 patients requiring orotracheal intubation, were randomized using closed enveloped method to either having intubation with the McGrath video laryngoscope or the Macintosh laryngoscope. The primary outcome was to see laryngoscopy view in terms of Glottic view time. Secondary outcomes included intubation time, Cormack and Lehane grading system, number of successful intubations, hemodynamic parameters during intubation and post-operative complications.

Results

Glottic view time and intubation time were significantly lower in McGrath group compared to Macintosh group ($p < 0.05$). There was no significant difference ($p > 0.05$) in no. of grade 1 or 2 laryngoscopic view, success rate of intubation, post-operative complication. Hemodynamic parameters were significantly more stable with McGrath Videolaryngoscope compared to Macintosh laryngoscope.

Conclusion

Time taken for intubation (in sec) was less with McGrath video laryngoscope as compared to Macintosh laryngoscope.

Keywords

General anaesthesia, McGrath MAC video laryngoscope, Macintosh laryngoscope

I. INTRODUCTION

As anaesthesiologist rapid, flawless and non-traumatic intubation is the cobblestones of putting patient under anaesthesia. Since 80 years the gold standard of intubation has been Macintosh direct laryngoscope. But with the advancement of science and technology a new invention was bound to happen and hence came the birth of videolaryngoscope in the year of 1998 with the Glidescope[2]. As the years have passed so have more and more new video laryngoscopes being introduced in the market, one of them being the McGrath MACvideo laryngoscope.

McGrath MACvideo laryngoscope is a newly introduced non-channelled video laryngoscope aimed to provide an ease of intubation in patients with difficult airway.[1] The McGrath MAC video laryngoscope combines line-of-sight video from its portrait display with the familiar Macintosh technique[2]. So you retain your traditional laryngoscopy skills. A single-button functionality and minute-by-minute battery indication are other advantages. Also, it has one handle with multiple blade options from paediatric to adult patients and for routine to extreme airways.

The main aim of the study being comparing Macintosh laryngoscope with McGrath video laryngoscope in terms of intubation time, glottic view, Cormack – Lehane grading, hemodynamic stability, post – op complications.

II. METHOD

After getting permission from The Institutional Ethics Committee for Human Research- PG Research (IECHR-PGR) on 14/10/2019 (No.IECHR –PGR/91-19) the trial was conducted from January 2020 onwards with a total of 250 patient belonging to ASA 1 and 2 category in the age group of 18 to 60 years of age. The study was in accordance with the declaration of the Helsinki (2000). The patients were randomly divided in two groups of group V (for video



laryngoscope) and group M (for Macintosh) with closed enveloped method. After thorough pre-anesthetic evaluation all the patients falling in the inclusion criteria will be selected and informed written consent was taken from the patient. Trolley preparation, Cylinders and circuits to be checked, airway equipment and drugs were kept ready before induction. Patient was kept NBM for 8 hours. After taking patient inside the operation theatre, multipara monitor will be attached and baseline vital parameters will be noted. Difficult airway cart was kept ready [3-4]. Both the scoped were prepared along with appropriate size ET tube with stylet [5].

Premedication:

Inj. Glycopyrrolate 5mcg/kg IV (5 minutes before induction)

- Inj. Dexmedetomidine 2mcg/kg IV (5 minutes before induction)
- Inj. Ondansetron 0.1 mg/kg IV (5 minutes before induction)

Grouping of Patients:

The study population were randomly allocated into two groups by using sealed envelope method. Group V - in which McGrath video laryngoscope was used for endotracheal intubation and Group M -in which conventional Macintosh laryngoscope was used for endotracheal intubation.

Induction:

Preoxygenation with 100% Oxygen for 3min. Inj. Xylocard 1 mg/kg IV followed by Inj. Propofol 2 mg/kg IV till loss of eye lash reflex then Inj. Suxamethonium Chloride 2 mg/kg IV given after check ventilation. Intubation done by respective devices after disappearance of fasciculation. Inj. Vecuronium bromide 0.1 mg/kg loading dose

Maintenance:

O₂ +N₂ O (50:50) with sevoflurane and vecuronium bromide 0.02 mg/kg

Reversal:

At the end of surgery N₂ O and anaesthetic agent were stopped before 10 minutes and patient were ventilated with 100% oxygen. Reversal of residual

neuromuscular block was done once patient starts spontaneous breathing, with following agents-

Inj. Neostigmine - 50 mcg/kg IV

Inj. Glycopyrrolate - 10 mcg/kg IV

During this period patient were ventilated with 100% oxygen with fresh gas flow of 4-6 litres/min. Patient were extubated when regular spontaneous breathing pattern become established and patient were able to open the eyes on command. Patient were then shifted to post Anaesthesia care unit (PACU).

Maximum 2 attempts with the selected laryngoscope were allowed. Failed intubation was defined as more than 2 attempt in which patient could not be intubated even with optimization manoeuvre > 120 secs required to perform the procedures Optimization manoeuvres required to perform intubation were noted.

In case of failure of McGrath Videolaryngoscope, the patient were excluded from the study and were be intubated with alternate device.

Intubation time, Glottic view, Cormack and Lehane grading, No. of attempts of device insertion /intubation, Optimization manoeuvres required for intubation, Hemodynamic parameters and complications were noted.

III. RESULTS

Statistical analysis for various parameter were calculated using MEDCALC software. Students unpaired t test was used to compare quantitative data like age, weight, glottic exposure time, intubation time and vital parameter. Comparison of proportion like Cormack lehane grading, intubation attempts, gender, manoeuvres required and complication rates was done by chi square test. Results expressed in mean + SD. Significance of p value judged by pvalue of > 0.05 is non-significant. pvalue of < 0.05 is significant. pvalue of < 0.001 is highly significant. Both group were comparable on the basis of age, weight, ASA gradings and airway parameters. The Glottic exposure time in Group V was 15.05 ± 5.14 sec and in Group M, it was 14.2 ± 7.64 sec. The difference between glottic exposure time in two groups was statistically significant (p<0.05). (Table no. 1)



GLOTTIC EXPOSURE TIME:

Glottic exposure time	Group V Mean±SD (sec)	Group M Mean±SD (sec)	P Value
	12.05 ± 5.14	14.2 ± 7.64	<0.05

Table no. 1 – Glottic exposure time

The Intubation time in group V was 25.31 + 8.93 sec and in group M was 29.61 + 17.64 sec. The difference between intubation time in two group was statistically significant (p < 0.05). (Table no. 2)

INTUBATION TIME:

Intubation time	Group V Mean±SD (sec)	Group M Mean±SD (sec)	P Value
	25.31 ± 8.93	29.61 ± 17.64	< 0.05

Table no. 2 – intubation time

The difference between Cormack and Lehane grading was statistically not significant (p<0.05) in both the group. Number of Attempts of device insertion with McGrath video laryngoscope and Macintosh laryngoscope were comparable in both the groups (p >0.05). Second attempt required in 16% of patient in both the groups. In group V 47/125 (37.6%) require any optimization manoeuvre as compared to Group M in which 55/125 (40.4%) require any optimization manoeuvre. In group V patients baseline pulse was 82.1±3.87 bpm, after 1 minute of intubation it became 85.07±2.38 bpm and came near baseline at 5 minutes after intubation (81.5±4.29 bpm), where as in group M patients baseline pulse was 81.53±4.40 bpm, after 1 minute of intubation it became 90.8±6.41 bpm and came near baseline at 5 minutes after intubation (85.83±5.19 bpm). In group V patients baseline mean arterial pressure was 74.63±7.60 mmHg, after 1 minute of intubation it became 68.03±4.15 mmHg and at 5 minutes after intubation it became 67.03±4.64 mmHg, where as in group M patients baseline mean arterial pressure was 72.9±3.64 mmHg, after 1 minute of intubation it became 73.03±4.15 mmHg and at 5 minutes after intubation it became 72.36±3.09 mmHg. The oxygen saturation was comparable in both the groups. There were 18 case of minor oropharyngeal trauma in Group V, while there were 17 cases in group M (p>0.05). There were 3 cases of sore throat in group V and 2 cases of sore throat in group M (p>0.05). (Table no. 3)

COMPLICATIONS:

Complication	Group V	Group M	P Value
Trauma in posterior pharyngeal wall, Tonsillar pillar, minimal bleeding.	18	17	>0.05
Sore throat	3	2	>0.05
None	104	106	>0.05

Table no. 3 – table of complications

IV. DISCUSSION

Since last 120 years (1943) Macintosh Laryngoscopy was used as a main method for endotracheal intubation [1]. Though direct laryngoscopy remains the gold standard for this purpose, this needs morning sniffing position for proper visualization of glottis and results in noxious stimulation like rise in pulse and blood pressure [6]. In many high risk patients this hemodynamic instability could lead to complications like hypoxia, hypotension/hypertension, arrhythmia, sudden cardia arrest. The Macintosh laryngoscope blade is made of stainless steel which leads to more airways trauma when undue pressure is applied for obtaining proper vision. Video laryngoscopes are at the top of the list of devices developed for the purpose of smooth intubation. We studied one such intubation device: the McGrath® MAC video laryngoscope. The McGrath video laryngoscope is designed to provide a better laryngeal view than that obtained by direct laryngoscopy with a Macintosh laryngoscope. It also provides that with a high-resolution video camera placed within an angulated single-use blade of adjustable length [2]. McGrath comes with 4 different sizes of disposable blades which are made of medical grade plastics helpful in proper vision and less traumatic intubation. Blades being thinner in width than normal laryngoscope blade require less mouth opening and helps to intubate people with difficult airways [7]. The Main issue with this blades are fogging and blood and secretions obscuring the view [8]. It takes a short duration of time to learn how to use the laryngoscope as well as how to advance tube into the trachea as the view is indirectly produced in a screen via a camera rather than directly as seen via incubators eye. McGrath was selected by many novice student as a preferred video laryngoscope for learning intubation and hence it was selected as the video



laryngoscope to be used in our study [9] [10]. The two groups were comparable to each other with respect to age, gender, weight, and ASA physical status and Airway parameters. According to the study done by Bakshi S G et al 2019 [11] on McGrath and Macintosh laryngoscopes glottic view time was better with McGrath videolaryngoscope ($p < 0.05$). These results were comparable with our study. According to study done by Woo Jae Joen et al 2011[12] while comparing McGrath verse Glidoscope showing both the videolaryngoscope have same glottic exposure time. These results differ from our findings but since in there study both video laryngoscopes were used difference in the results can be expected. According to study done by Bakshi SG et al 2019[11] Mehmet Sargin et al 2016 [2] compared McGrath with Macintosh laryngoscopes, intubation time was similar in both the devices. These results differed from our in which intubation time is less with McGrath video laryngoscope as compared to Macintosh laryngoscope. According to study done by JiYoung Lee et al 2017 [12] intubation time were similar between pentax and McGrath videolaryngoscope. Similarly, according to a study done by Woo Jae Joen et al 2011[13] intubation time was similar between McGrath and Glidoscope. All these studies had used 2 different video laryngoscopes, hence difference obtained in our results could be expected. On contradictory intubation time was more with McGrath as compared to Airtaq videolaryngoscope. In contrast to that Cormack lehane grading was better with McGrath as compared to Airtaq as stated in study done by Li wan et al 2016 [14] and better with McGrath as compared to Macintosh as stated in a study done by Zijialiu et al 2016 [15] which was statistically non-significant in our study. Number of Attempts of device insertion with McGrath video laryngoscope and Macintosh laryngoscope were comparable in both the groups, intubation was done in first attempt in around 80% patients and second attempt of intubation was required in around 16% patients in both the groups. The data are significantly insignificant ($p > 0.05$). Similar results were seen in study done by Bakshi S G et al 2019 [11] using McGrath and Macintosh laryngoscopes, on the contradictory number of attempts required were higher with McGrath according to study done by Mehmet Sargin et al 2016 [2]. Successful first attempt intubation rate where higher with McGrath as compared to Airtaq as stated in a study done by Li Wan et al 2016 [14]. According to study done by Bakshi SG et al 2019 [11], optimization manoeuvre required were less for intubation with McGrath video laryngoscope as compared to Macintosh

laryngoscope. Similar results were obtained with our study. As per the study done by Mehmet Sargin et al 2016[2] on McGrath and Macintosh laryngoscopes, no significant difference was seen in hemodynamic parameters. This result differed from results obtained from our study. As per the study done by Mehmet Sargin et al 2016[2], on McGrath and Macintosh laryngoscopes no significant difference was seen in hemodynamic parameters. There results deferred from results obtained in our study. As compared to study done by ZiJia Liu et al 2016 [15] on McGrath and Macintosh laryngoscopes Mean arterial pressure was significantly lower with McGrath video laryngoscopes. There results were comparable with our study. As per the study done by Mehmet Sargin et al 2016 [2], no significant difference was seen in hemodynamic parameters. As per Bakshi S G et al 2019 [11], who compared McGrath with Macintosh laryngoscopes, there were no difference in the complication rates. These results were comparable with our study. On the contradictory to this complication rates were slightly higher with McGrath as compared to Airtaq as seen in study by Li Wan et al 2016 [14].

V. CONCLUSION

The following conclusion can be drawn from our study that glottic exposure, intubation time and optimization manoeuvres required were less using McGrath video laryngoscope as compared to Macintosh. Vital parameters were more stable with McGrath video laryngoscope as compared to conventional laryngoscope. There was no significant difference in demographic parameters, attempts of intubation and complications between both the groups. Thus, we conclude from our study that in anatomically normal airways McGrath Video Laryngoscope had faster time for viewing glottis, intubation and more hemodynamic stability and it is equally suitable alternative to Macintosh laryngoscopy. Our study was done in fairly smaller group but the same results can be extrapolated to a larger population. Because of its similarity with conventional laryngoscope, the learning curve is quite less making it useful for novice students also to learn this device.

Conflict of interest

Nil

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Nil

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