EAS Journal of Anaesthesiology and Critical Care
Abbreviated Key Title: EAS J Anesthesiol Crit Care
ISSN: 2663-094X (Print) & ISSN: 2663-676X (Online)
Published By East African Scholars Publisher, Kenya

OPEN ACCESS

Volume-2 | Issue-6 | Nov-Dec-2020 | DOI: 10.36349/easjacc.2020.v02i06.003

Original Research Article

Performance of McGrath Mac Video Laryngoscopy by Anesthesia Residents in Patients with a Potentially Difficult Airway

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Article History
Received: 05.11.2020
Accepted: 18.12.2020
Published: 30.12.2020

Journal homepage:
https://www.easpublisher.com

Quick Response Code

Abstract: McGrath Mac Video laryngoscopy is a very useful device in the management of difficult airway. Since the blade is of much familiar MacIntosh type, learning to use McGrath Mac Video laryngoscopy is easier. This device has been experimented both in experienced anaesthesia providers and in novices, in terms of first attempt success rate of tracheal intubation, ease of visualisation of glottis and intubation. In our clinical research, we studied how well the anaesthesia residents can use the McGrath Mac Video laryngoscope in patients with predictors of difficult airway. The Mean±SD time to laryngoscopy 22.34±4.87 seconds in Macintosh group Vs 38.83±4.96 seconds in McGrath group, whereas for intubation 29.1±6.47 seconds in Macintosh group Vs 57.97±9.54 seconds in McGrath group. We concluded that the time to laryngoscopy and tracheal intubation is statistically longer with McGrath Mac Video laryngoscopy as compared to Macintosh direct laryngoscopy. The occurrence of sore throat and airway injury is less with McGrath Mac Video laryngoscopy.

Keywords: Difficult airway, McGrath Video laryngoscope, anaesthesia residents.

INTRODUCTION

McGrath Mac video laryngoscope provides an enhanced view of glottis and is a useful tool while intubating a difficult airway. Because of its similarity with the much familiar Macintosh blade, learning to use McGrath Mac video laryngoscope is easier.

We hypothesised that anaesthesia providers with limited experience in McGrath MAC video laryngoscope can successfully use it in patients with anticipated difficult airway to improve first attempt success rate.

This study was designed to compare Macintosh laryngoscopy and McGrath video laryngoscopy performed by anesthesiology residents, for the first attempt intubation of a difficult airway.

METHODOLOGY

The study was designed to be a prospective, randomized, controlled, and patient blinded study. Institutional Ethical Committee approval was obtained for conducting this research work. Participants of this study were the consented patients scheduled for elective surgery under general anaesthesia at Government Mohan Kumaramangalam Medical College and Hospital, Salem during the period of January 2018 to August 2019.

Anaesthesia providers who participated in the study were anesthesiology residents, under the supervision of qualified experienced anesthesiologists. All the anesthesia residents who participated in this study received an introduction and demonstration of McGrath MAC video laryngoscope and were trained on adult intubating mannequin. All of them had performed at least 50 successful airway intubations with conventional laryngoscope and had the minimum of one year experience in handling direct laryngoscope. Caregivers could not be blinded to the intervention.

Sample size was calculated based on results from pilot study conducted on ten consented patients. The total sample size needed was fifty-eight (N=58), for the power of the study to be 90%.

The study participants were randomly allocated to one of two groups (n=29 for each group namely, group Macintosh (DL), and group McGrath (IDL) by drawing sequentially numbered sealed opaque envelopes that contained a computer randomization code with 1:1 allocation ratio before general anaesthesia.

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Group-DL: Intubation has done using direct laryngoscopy with Macintosh blade.
Group-IDL: Intubation has done using indirect video laryngoscopy with the McGrath MAC blade.

Inclusion Criteria

Patients undergoing elective surgery under GA with the orotracheal tube, aged 18-65 years of both gender, with American Society of Anaesthesiologists physical status class I-II who had any one of the following predictors of airway difficulty like 1) Modified Mallampati class 3 or more, 2) Thyromental distance less than 6 cm, 3) Limited neck extension, and 4) BMI- 30kg/m2 or more.

Exclusion Criteria

Patients with American Society of Anaesthesiologists physical status class III and above, emergency surgeries, inter-incisor distance less than 3cm, pregnancy, and with risk of gastric regurgitation.

Assessment and Preparation

All patients were assessed in pre-assessment clinic by either anaesthesia residents or experienced anaesthesiologists well before surgery. Careful history taking, general and systemic examinations as well as investigations were done to rule out any severe comorbidity. BMI calculations were made. A meticulous airway assessment was done to find out the patients with difficult airway by giving main attention to airway indices Modified Mallampati airway classification, Neck movements and Thyromental distance.

Blinding and Masking

The patient remained blinded about the laryngoscopic technique until the postoperative follow up. The study team and the anaesthesia team came to know about the choice of laryngoscope just prior to premedication. The McGrath MAC Video laryngoscope, blade no 3, 4, adult malleable stylet and McIntosh Laryngoscope were made available at the operating room where the study was conducted. An independent observer (not the anaesthesia provider) will note the time for glottis visualization and intubation, along with hemodynamic response at various intervals.

Anaesthesia Provider

Definition of limited experience with McGrath MAC video laryngoscope was “the anesthesia resident who had attended a lecture and demonstration of McGrath MAC video laryngoscopy on manikin, Intubated Manikin (Laerdal intubation trainer) three times using McGrath MAC video laryngoscope and intubated two consented patients with no validated predictors of difficult airway under the supervision of an experienced anaesthesia provider.

The primary outcome of the study was the time to Laryngoscopy and intubation.

The secondary outcomes were Likert scale for ease of intubation, and sore throat.

Hemodynamic changes during intubation and the complications of laryngoscopy and intubation such as bleeding, injuries and sore throat are observed and analysed.

Statistical Methods

Time to Laryngoscopy and intubation were considered as primary outcome variables. Likert scale, sore throat was considered as secondary outcome variables. Study group (Direct laryngoscopy Vs In Direct laryngoscopy) was considered as Primary explanatory variable.

For normally distributed Quantitative parameters the mean values were compared between study groups using independent sample t-test (2 groups).

Categorical outcomes were compared between study groups using Chi square test /Fisher's Exact test (If the overall sample size was < 20 or if the expected number in any one of the cells is < 5, Fisher's exact test was used).

P value < 0.05 was considered statistically significant. IBM SPSS version 22 was used for statistical analysis.

Both the groups were comparable in terms of gender distribution, and anthropometric measures, with the difference being statistically insignificant (p-value >0.05).

The Mallampati score of the participants between the two groups were comparable, with the difference being statistically insignificant (p-value >0.05).

Table 1: Comparison of modified Mallampati score between group (N=58)

Modified Mallampati Score	Group		Chi square	P value
	Direct Laryngoscopy (N=29)	In Direct Laryngoscopy (N=29)		
1	8 (27.59%)	7 (24.14%)	0.337	0.953
2	8 (27.59%)	10 (34.48%)		
3	11 (37.93%)	10 (34.48%)		
4	2 (6.9%)	2 (6.9%)		

The mean of Time to Laryngoscopy in seconds was 22.34 ± 4.84 in Direct Laryngoscopy group, it was 38.83 ± 4.96 in In Direct Laryngoscopy group, and the mean difference (16.48) between two groups was statistically significant. (p value <0.05). The mean of Time to Intubation in seconds was 29.1 ± 6.47 in Direct Laryngoscopy group, it was 57.97 ± 9.54 in In Direct Laryngoscopy group, and the mean difference (28.86) between two groups was statistically significant (p value <0.05).

Table 2: Comparison of mean of parameter between study group (N=58)

Parameter	(Mean± SD)	Mean difference	95% CI		P value
			Lower	Upper	
Time to Laryngoscopy in seconds					
Direct Laryngoscopy	22.34 ± 4.84	16.48	13.90	19.06	<0.001
In Direct Laryngoscopy	38.83 ± 4.96				
Time to Intubation in seconds					
Direct Laryngoscopy	29.1 ± 6.47	28.86	24.57	33.15	<0.001
In Direct Laryngoscopy	57.97 ± 9.54				

One out of 29 patients in direct laryngoscopy had blood staining on blade, and esophageal intubation. Three out of 29 patients in direct laryngoscopy had sore throat. None of the 29 patients in indirect laryngoscopy had blood staining on blade, sore throat, or esophageal intubation. The difference in heart rate, blood pressure between the two groups was statistically insignificant.

DISCUSSION

The McGrath MAC Video laryngoscope manufactured by Aircraft Medical, Edinburgh, United Kingdom is a handy Video laryngoscope that consists of a handle with battery inside, a steel blade core called Camera Stick, and a LCD monitor (2.5 inch size) fixed to the handle. The lithium-ion battery pack in McGrath MAC provides approximately 250 minutes of power for use. The McGrath MAC VL is fully immersible for high-level disinfection. The McGrath MAC does not have any connection port to external monitor to transfer the images.

McGrath MAC video laryngoscopes are provided with McIntosh blades of size 3 and 4. These blades are not hyper angulated blades as seen with McGrath Series 5. As McGrath MAC video laryngoscope have Mcintosh blades, can be used both for direct and indirect video laryngoscopy.

Mulcaster *et al.,* reported that novices performing direct laryngoscopy with Macintosh blade requires a median of 47 uses before achieving a success rate of 90%. They also found that median of 35 trails of intubation may result in the success rate of 80%.

Savoldelli et al. conducted a manikin study to compare the learning curve and efficacy of various indirect laryngoscopes (Glidescope, McGrath video laryngoscopes and Airtraq optical laryngoscope) and Macintosh laryngoscope. Sixty anaesthesia providers were asked to intubate the manikin swiftly five times in a row with each laryngoscope. There is no difference in time take to visualise the vocal cords at the fifth attempt among the four laryngoscopes. However, ETT manipulation to intubation is shorter with Macintosh laryngoscope than other laryngoscopes. Indirect laryngoscopes provided the better laryngeal view and less dental trauma than Macintosh laryngoscope.

CONCLUSION

In our study the time for laryngoscopy and tracheal intubation were longer in McGrath video laryngoscope than in Macintosh direct laryngoscope. The complications like airway injury and sore throat were less with McGrath video laryngoscope.

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