

A COMPARATIVE STUDY BETWEEN MCGRATH MAC VIDEO LARYNGOSCOPE AND THE DIRECT MACINTOSH LARYNGOSCOPE FOR GLOTTIC VIEW IN PAEDIATRIC PATIENTS: A ONE YEAR HOSPITAL-BASED RANDOMIZED CONTROLLED TRIAL

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Abstract

Title: A Comparative Study Between Mcgrath Mac Video Laryngoscope and The Direct Macintosh Laryngoscope for Glottic View in Paediatric Patients: A One Year Hospital-Based Randomized Controlled Trial. **Background and Objectives:** Video-laryngoscope has begun to gain popularity in the new era of perioperative-medicine due to its magnified and clear views of the larynx. Video-laryngoscope is still in its infancy in paediatrics due to the scarcity of studies comparing it to the standard direct laryngoscope. [1] We compared glottic view by POGO scoring, intubation time and ease of intubation between the McGrath video-laryngoscope and Macintosh laryngoscope in children aged 2-12 years. **Methods:** 60 children undergoing elective surgery under general anaesthesia who satisfied the inclusion criteria were recruited for the study with 30 patients in each group [Group A- Macintosh and Group B- McGrath MAC]. The glottic-view was assessed based on percentage of glottic opening score, intubation time and ease of intubation were evaluated and compared between the groups. **Results:** In this study, there was no measurable difference in patient characteristics across both groups. The majority of the patients were in the age group of 8-11 years. The percentage of glottic view with McGrath MAC was superior to glottic view noted with Macintosh direct laryngoscope of 94.7% vs. 91.2%[p=0.045]. The time taken for intubation [p=0.44] and the ease of intubation [p=0.207] using McGrath Video laryngoscope and Macintosh group were similar and statically insignificant. **Conclusion and Interpretation:** In paediatric patients with a similar time to intubation and ease of intubation, we conclude that, as compared to direct conventional laryngoscopes, video laryngoscopes provide a superior visual quality in terms of improved and magnified glottic view, with modest benefits in terms of time to intubation and ease of intubation.

Keywords: McGrath, Macintosh, Percentage of Glottic Opening, Ease of Intubation.

INTRODUCTION

Predicting a difficult airway in children is not possible occasionally, hence, managing airway in the paediatric age group requires careful evaluation and experienced execution. To successfully intubate the trachea, direct laryngoscopy requires

alignment of all three axes (oral, pharyngeal, and laryngeal), which is not always possible in paediatric airways. Failure to intubate on the first attempt is still a major cause of perioperative morbidity and mortality.^[1]

Children's airway anatomy is unique and comparatively difficult, with decreased respiratory reserve due to increased oxygen consumption and decreased FRC. As a result, in children, the time spent on laryngoscopy and intubation is more important.^{[2][3]}

Video laryngoscopes (McGrath) allow for indirect glottic visualisation without the need to align the oral, pharyngeal, and tracheal axes. Previous research has shown that video laryngoscopes increase the time required for intubation.^[4] As a result, we conducted this study with the primary goal of comparing the glottic view by POGO scoring and the secondary goal of comparing the time required for intubation and the ease of intubation between the McGrath video laryngoscope and the Macintosh laryngoscope in young children aged 2-12 years undergoing elective surgery under general anaesthesia.

METHODOLOGY

Between January 2021 and December 2021, a one-year randomised controlled study was carried out at KLES Dr. Prabhakar Kore Hospital and Medical Research Centre, Nehru Nagar, Belagavi, after the approval of the institutional review board and the ethical committee.

The inclusion criteria for our study were age between 2-12 years, ASA I-II patients, patients undergoing elective surgery requiring endotracheal intubation under general anaesthesia. Patients with a difficult airway and those requiring rapid sequence intubation were excluded from the study.

After obtaining the parental written informed consent, and having met inclusion and exclusion criteria, a total of 60 children undergoing elective surgeries requiring endotracheal intubation were included in the study. *Inj. Glycopyrrolate* 0.01 mg/kg and *Inj. Ketamine* 5.0 mg/kg by intramuscular route, secured intravenous access using 22Gz or 24Gz IV cannula, and IV fluids were started. Standard monitoring devices were attached in the operation theatre (ECG, SpO₂, non-invasive blood pressure). Patients were pre-oxygenated for 5 minutes.

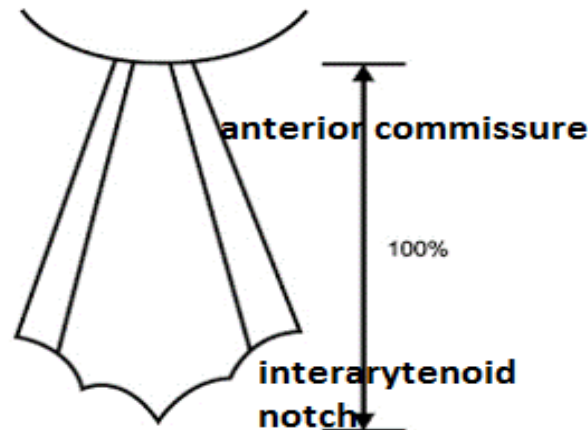
Anaesthesia was induced with *Inj. Fentanyl* 2.0 mcg/kg *Inj. Propofol* 2.0mg/kg and *Inj. Atracurium* 0.5 mg/kg following pre-oxygenation for 5 minutes with 100% oxygen. After 3 minutes with adequate ventilation, laryngoscopy and intubation was performed using Macintosh laryngoscope (Group A) and McGrath MAC video-laryngoscope (Group B) with a blade size of 2 or 3. Tracheal tubes of adequate size were used for intubation.

All Patients were randomly assigned to undergo laryngoscopy in one of the two groups-

- 1) GROUP A- Patients who had a Macintosh laryngoscope size used for laryngoscopy and endotracheal intubation.
- 2) GROUP B- Patients who had a McGrathMAC video laryngoscope used for laryngoscopy and endotracheal intubation.

The following parameters were assessed during intubation-

Percentage of glottis opening (POGO) was scored with each laryngoscope. POGO score of 100% denotes visualisation of entire glottis from anterior commissure of vocal cords to interarytenoid notch. 0% - If no part of the glottic opening was visualised.



Intubation time and ease of intubation were also assessed. Intubation time was defined as the time the laryngoscope was introduced into patient's oral cavity till the confirmation of placement of endotracheal tube by capnography. Ease of intubation was scored as follows^[5]

- 0= Failure to intubate
- 1= Fair (use of external laryngeal manoeuver and stylet plus intubation time >90sec)
- 2= Moderate (use of external laryngeal manoeuver and stylet to intubate trachea and intubation time <90sec)
- 3= Good (intubation successful within 90 sec, no need for use of external laryngeal manoeuver and stylet to secure airway)

STATISTICAL ANALYSIS

The minimum sample size formula based on percentage was

$$n = \frac{z_{\alpha}^2 P(1-P)}{d^2}$$

Where P is the percentage of success and d is the likely percentage difference.

z_{α} is linked with the level of significance. For 5% level of the significance $z_{\alpha} = 1.96$.

Ref:^[5] With percentage of success in the first attempt, $P = 85\%$ and $d = 15\%$ of $P = 12.75\%$, the total sample size was 30 and to improvise the efficacy of this study, the sample size in each group was taken as 30, hence making the total sample size 60.

All nominal data were analysed using chi-squared contingency tables. Student's 't' test was used to compare POGO scores and time taken to intubate between two laryngoscopes. Linear regression method was used to compare ease of intubation

between two laryngoscopes. Data are (mean \pm standard deviation) unless otherwise specified. $P < 0.05$ was considered statistically significant.

RESULTS

Total of 60 paediatric patients undergoing elective surgeries requiring endotracheal intubation were randomly allocated to undergo laryngoscopy with McGrath videolaryngoscope or with Macintosh laryngoscope. POGO score, intubation and ease of intubation were assessed.

In our study demographic data was as follows –

Table 1: Gender distribution

Gender	Group A		Group B	
	No.	%	No.	%
Male	19	63.3	22	73.3
Female	11	36.7	8	26.7
Total	30	100	30	100

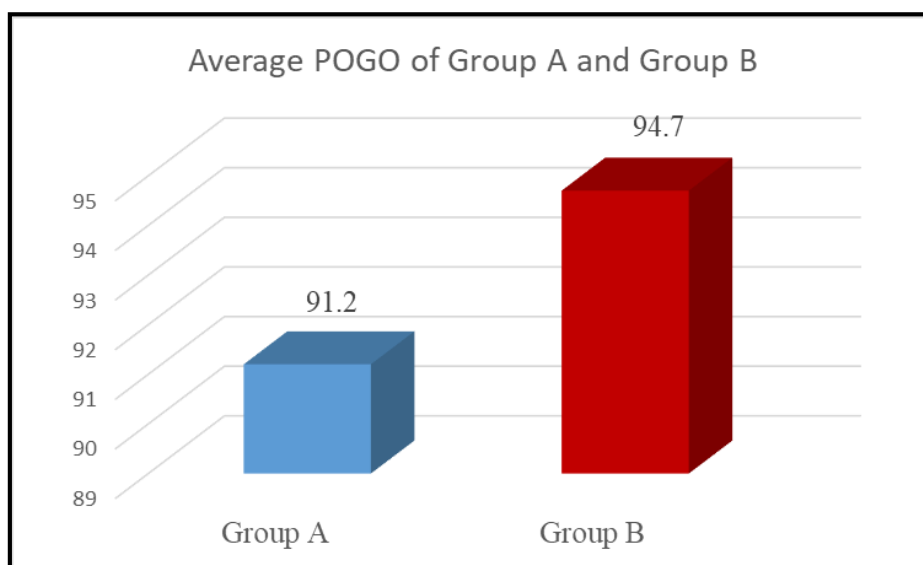
Table 2: Age distribution

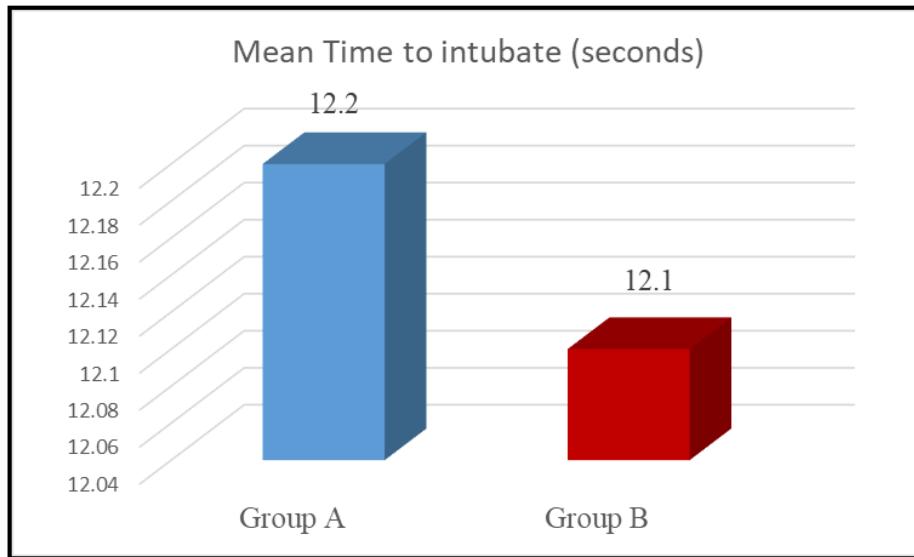
Age	Group A		Group B	
	No.	%	No.	%
2-5 years	9	30.0	8	26.7
6-9 years	13	43.3	14	46.6
10-12 years	8	26.7	8	26.7
Total	30	100	30	100

Our study had no extreme variation in gender and age distribution in both the groups.

Table 3: POGO score and Time to intubate

	POGO scores (%)	Intubation time(sec)
McGrath	91.2 \pm 9.7	12.2 \pm 3.2
Macintosh	94.7 \pm 6.6	12.1 \pm 2.3
p value	0.045	>0.05



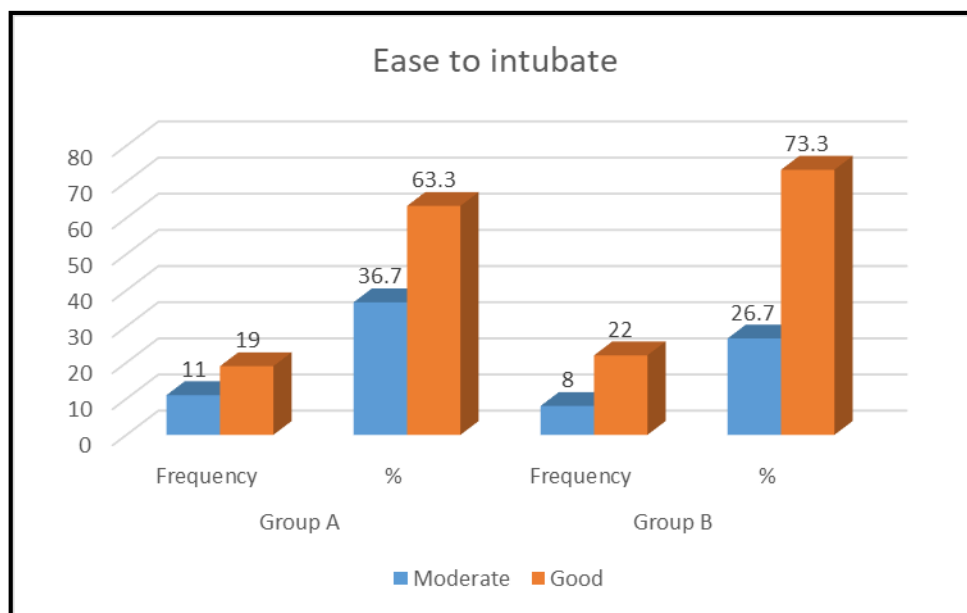


Graph 1: POGO score and Time to intubate

In our study, the POGO score was higher in McGrath (94.7 ± 6.6) as compared to Macintosh (91.2 ± 6.6) and hence was statistically significant (p value 0.045). Time to intubate was comparable between McGrath (12.1 ± 2.3 sec) and Macintosh (12.2 ± 3.2 sec) and was statistically nonsignificant ($p > 0.05$, Table 2).

Table 4: Ease of intubation

	GROUP A	GROUP B
0	0	0
1	0	0
2	11(36.7%)	8(26.7%)
3	19 (63.3%)	22(73.3%)



Graph 2: Ease of intubation

In our study ease of intubation was comparable between McGrath and Macintosh laryngoscopes.

DISCUSSION

Video laryngoscopes are newer intubation devices that contain miniature video cameras that allow the anaesthesiologist to indirectly visualise the glottis. Video laryngoscopes achieve laryngeal exposure via indirect imaging, i.e. using video cameras at the tip of the laryngoscope's blade. Because of its simplicity and accessibility, the direct laryngoscope (DL) is one of the most used instruments for airway control. However, DL requires a direct line of sight to a glottis view in a challenging patient, which is not always available. Adults have been shown to benefit from a variety of video laryngoscopes (VLs). The intubator can observe the vocal cords and glottis without aligning the oral, pharyngeal, and tracheal axis while using a VL.^[4]

In this study, the McGRATH video laryngoscope provided a better glottic view (POGO scores) than the Macintosh laryngoscope, which was clinically and statistically significant. In comparison to a Macintosh laryngoscope, the McGrath video laryngoscope has a high-resolution video camera and a light source at the blade's tip, providing a better glottic view. The intubation time and the ease with which it was done were nearly identical between the McGRATH video laryngoscope and the Macintosh laryngoscope. Because the McGrath videolaryngoscope provides an indirect view of the laryngeal inlet, the tracheal tube must be redirected more anteriorly, lengthening the intubation time.

In a similar study, **Giraudon et al.** in contrast to the results of our study found that intubation was faster with Macintosh direct laryngoscopy [$p=0.002$] than McGrath MAC video laryngoscopy. The time to best glottis view and POGO grading, on the other hand, were comparable between the two.^[6]

In paediatric patients, video laryngoscopy provided a laryngeal view equivalent to or superior to that provided by a direct laryngoscope, but at the cost of longer intubation times, according to **Kim and colleagues**. The use of video laryngoscopy is more convenient for investigators and results in a smaller change in heart rate.^[7]

Meta analysis conducted by **Yu Sun et al** concluded that videolaryngoscopes improved glottic visualization at the expense of prolonged time to intubation and increased failures.^[8]

Limitation of our study was we excluded the difficult paediatric airways. Hence further studies are needed to assess the utility of McGrath videolaryngoscope in difficult paediatric airways.

CONCLUSION

According to the findings of this study, the McGrath video laryngoscope provides superior laryngeal views with comparable time to intubate and ease of intubation to the Macintosh laryngoscope. As a result, the McGrath video laryngoscope may be a viable option for managing difficult paediatric airways.

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Pre operative photograph of Camptodactyly of Left Hand



Post operative photograph of Camptodactyly flexion contracture release



Pre operative photograph showing Dupuytren's flexion contracture of Ring finger of Left Hand



Post operative photograph after excision of fibrous contracture band



Pre operative photograph showing flexion contracture of Right Hand index finger



Intra operative photograph showing contracture release with K wire insertion



Post operative photograph showing extended index finger with K wire insertion



Pre operative picture showing Right hand index finger flexion contracture



Intra operative picture showing contracture release with STSG



Post operative picture showing contracture release with STSG uptake