VOLUME - 10, ISSUE - 08, AUGUST- 2021 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper

Anaesthesiology

EVALUATION OF MCGRATH® VIDEO-LARYNGOSCOPE IN ANTICIPATED DIFFICULTINTUBATION – A COMPARISON TO MILLER LARYNGOSCOPE

Dr Niranjan Gaur	Jaipur Golden Hospital.
Dr Priyanka Dhankhar*	Consultant Anaesthesia, Sikar. *Corresponding Author
Dr Manoj Kumar Burania	MS Orthopedics, Medical Officer, Govt. S K Hosoital Sikar.

ABSTRACT

Background- Present study was conducted for evaluation of the Mcgrath® videolaryngoscope in comparison to the Miller laryngoscope in anticipated difficult intubation scenario.

Methods- The prospective, randomized, clinical trial was carried out in Department of Anaesthesiology at Jaipur Golden Hospital,Rohini, New Delhi-85 after obtaining informed written consent from thepatient and approval by the institutional ethical committee.

Results- The mean tracheal intubation time was lesser in MG group (21.43 seconds) as compared to ML group (24.31 seconds). The difference in tracheal intubation time was statistically significant (P = 0.003).Second attempt was required in 7.50% of the patients in MG group as compared to 17.50% patients in ML group. The difference was not statistically significant between both the groups (P > 0.05)

Conclusion-The Cormack and Lehane grades were better using McGrath® videolaryngoscope than Miller straight blade laryngoscope in patients with anticipated difficult airways.Success rate was 100% with McGrath® videolaryngosope.

KEYWORDS : Atlanto-Occipital joint extension, Cormack and Lehane grade, Intubation, Thyro-Mental distance

INTRODUCTION

Despite numerous parameters to predict difficult airway, there remain unanticipated difficult intubations.[1] Both the American Society of Anaesthesiologists (ASA) and the Difficult Airway Society's guidelines suggest that initial techniques to overcome a poor laryngoscopic view or a difficult tracheal intubation include the use of an introducer or gum-elastic bougie and/ or an alternative laryngoscope.[2,3]Awake fiberoptic intubation of trachea is the gold standard in difficult airway scenario.

There are many varieties of laryngoscopes available, each claiming improved laryngoscopic views, but there is no single satisfactory design to suit all patients.[1]Many studies compared videolaryngoscopes with conventional Macintosh laryngoscope and concluded that videolaryngoscopes are better devices in difficult airway scenario as they do not need alignment of oro-pharyngeal-laryngeal axes.[4-8]

Thus, videolaryngoscopes were compared with Macintosh laryngoscope and straight blade laryngoscopes were also compared with Macintosh laryngoscope.With the best of our knowledge only one study was available in the literature, by I Ng et al[1], in 2011, which compared McGrath® videolaryngo scope with Henderson straight blade laryngoscope in 80 adult patients with anticipated difficult airway judged by Mallampati class≥3. Primary aim of theirstudy was laryngoscopic view. Intubation time, number of attempts, ease of intubation and complications were also recorded.

The McGrath® videolaryngoscope provides both direct and video visualisation along one line of sight in a compact, cord free portable unit. The Mcgrath® videolaryngoscope have become popular, allowing a better view of larynx and may be potentially useful in difficult tracheal intubations.[4-8]Straight blades are normally designed with a slight curve at tip, which is used to elevate the epiglottis directly.[9] The improved glottic view obtained by straight blade laryngoscope is a consequence of reduced tongue compression as compared tomacintoshlaryngoscopic technique. This leads both to an improved line of sight and to a reduced risk of backward displacement of tongue & epiglottis.[10]The most commonly used straight blade laryngoscope is Miller's laryngoscope.

The primary aim of this study is to compare the laryngeal views in terms of Cormack and Lehane gradeduring laryngoscopy and tracheal intubation with the Mcgrath® Videolaryngoscope and the Miller laryngoscopein patients with predictors of difficult intubation score of 2-5. Secondarily we are also comparing intubation time, number of attempts, hemodynamic response to laryngoscopy and intubation and associated complications, if any, between the two groups .

Methodology

The prospective, randomized, clinical trial was carried out in Department of Anaesthesiology at Jaipur Golden Hospital,Rohini, New Delhi-85 after obtaining informed written consent from thepatient and approval by the institutional ethical committee.

80 adult patients with predictors of difficult intubationscore of 2-5, of both sexes, aged between 21-60 years, posted for elective surgery requiring general anaesthesia and endotracheal intubation.

Inclusion Criteria:

1) ASA Grade I and II Patients, 2) Adult patients of both sexes between 21-60 years age, 3) Difficult airway as per cumulative PDI score between 2 to 5 (mentioned later).

Exclusion Criteria:

1) Patients with an oropharyngeal or laryngeal mass. 2) Head injury or cervical spine trauma, 3) Head and neck pathology-like thyroid swelling, any mass (like big lipoma) in back of neckor scalp which hampers the extension of neck, 3) Risk factors for gastric aspiration like Gastro esophageal reflux disease, hiatus hernia, 4) Patients with anticipated difficult bag and mask ventilation, 5) Morbid obesity, 6) PDI score of 0-1 and 6-8, 7) Pregnancy, 8) Inter incisor distance less than 3.5cms.

Patients divided randomly into 2 groups of 40 each.

- Group 1 : McGrath® videolaryngoscope group (MG group) (n=40)
- Group 2 : Miller straight blade laryngoscope group (ML group) (n=40)

All the patients under study population were evaluated for the predictors of difficult intubation

1. Modified Mallampatti test in sitting position with fully protruded tongue.
2. Thyro-mental distance (TMD) is the distance (in cm) from mentum to thyroid notchwhile patient's neck is in full extension.
3. Atlanto-occipital joint extension in degree was recorded by measuring the angular distance traveled by occlusion surface of the upper incisors while achieving full extension from neutral position. Goniometry was done by plastic caliper type goniometer.

Total PDI score of 8 predicted maximum difficulty and score of 0 indicated nodifficulty. We included cases with PDI score of 2 to 5. PDI score of 0 to 1 and 6 to 8 were excluded.

All patients underwent routine pre-anaesthetic check-up and investigated as per institutional protocol. Patients were kept eight hours of fasting and given oral alprazolam 0.5mg with sip of water one hour prior to surgery. Difficult intubation cart kept ready along with flexible fiberoptic bronchoscope (Olympus BF Type P20D). All the patients were preoxygenated with 100% oxygen for three minutes and then induced with propofol (2,6-diisopropyl phenol) intravenously (iv) till the loss of verbal command. Patients were then assessed for bag and mask ventilation and those whom could not be ventilated were excluded from the study.Patient were then given fentanyl citrate 1.5mcg/kg iv and muscle relaxation was achieved with succinylcholine 1.5mg/kg iv and laryngoscopy wascarried out after 60 seconds.

The patients were then allocated randomlyto tracheal intubation either with the McGrath® Videolaryngoscope (MG group) or Miller's laryngoscope (ML group).Tracheal intubation was done with a styletedPortex® Profile Soft Seal® cuff tracheal tube of appropriate size, by an experienced anaesthesiologist, with the allotted laryngoscopes. The Optishape™stylet used, within endotracheal tube, was provided along with Truview® EVO_2videolaryngoscopeby Truphatek® International Ltd. Israel.

External laryngeal manipulation or aid such as- backward, upward and rightward pressure (BURP) manoeuvre was taken forendotracheal intubation whenever required. After successful tracheal intubation, in all the patients, anaesthesia was maintained with Isoflurane (1-chloro-2,2,2-trifluoroethyl difluoromethyl ether) in a mixture of oxygen and nitrous oxide in 40:60 ratio. Muscle relaxation was achieved with vecuronium bromide. Surgery was allowed to start 5 minutes after tracheal intubation.

Time taken for intubation was noted (Time from passing the tip of the laryngoscope blade through the incisor gap till appearance of capnographic tracing).

More than two attempts for endotracheal intubations was termed as failed intubation. Brief bag and mask ventilation done between first and second attempt when first attempt failed. No attempt of intubation was more than one minute. In case of intubation failure that is when the second attempt also failed, with the particular laryngoscope, tracheal intubation was done using flexible fiberoptic bronchoscope (Olympus BF Type P20D).Complications and Hemodynamic parameters wererecorded with both the techniques.

RESULT

Table: 1 Demographic Profile Of Cases.

	MG group (n=40)	ML group (n=40)	P-value
Age (Mean ± SD)	44.47 ± 9.36	43.38 ± 9.74	0.608
Gender (M/F)	14/26	15/25	0.816
ASA Grade (I/II)	24/16	32/8	0.051
Height	162.50 ± 7.93	163.43 ± 8.56	0.617
Weight	75.55 ± 10.96	73.13 ± 10.41	0.313
BMI	28.66 ± 4.07	27.42 ± 3.63	0.155
Inter incisor distance (in centimeters)	4.42 ± 0.27	4.43 ± 0.26	0.866

The distribution of patients according to thyro-mental distance (TMD) (in grades) was comparable between both the groups (P > 0.05).TMD grade I patients were 87.50% and 80% in MG group and ML group, respectively. TMD grade II patients were 10% and 20% in MG group and ML group, respectively. TMD grade III patients were 2.5% in MG group and none in ML group.Atlanto-Occipital Joint Extension (AOE) grade I patients were 77.50% and 72.50% in MG group and ML group, respectively. AOE grade II patients were 22.50% and 27.50% in Mg group and ML group, respectively. None of the patients had AOE grade III and grade IV, in both the groups.MMC grade II patients were 10% and 22.5% in MG group and ML group, respectively. MMC grade III patients were 77.50% and 70% in MG group and ML group, respectively. MMC grade IV patients were 12.50% and 7.50% in MG group and ML group, respectively. (table:2).

Laryngoscopic view / Glottic view was significantly better in MG group in comparison to ML group. Eighty percent of patients had CL grade-1 and 20% of the patients had CL garde-2 in MG group. In ML group 40% patients had CL grade-1, 30% patients had CL grade-2, 22.50% had CL grade-3 and 7.50% had CL grade-4. The difference in laryngoscopic view, on the basis of CL grade, was statistically significant for CL grade-1 (P = 0.0003) and CL grade-3 (P = 0.002) between both the groups. The difference was not statistically significant for CL grade-2 between both the groups (P = 0.302). Though, the difference for CL grade-4 was not statistically significant, none of the patients had CL grade-4 in MG group (P = 0.078).The overall P value for CL grade was 0.004, thus the difference was statistically significant between both the groups.

Table 2: Cormack And Lehane Grade

Cormack and Lehane grade	MG group (n=40)		ML group (n=40)		P Value
	Frequency	%	Frequency	%	
CL I	32	80.0%	16	40.0%	0.0003
CL II	8	20.0%	12	30.0%	0.302
CL III	0	0.0%	9	22.5%	0.002
CL IV	0	0.0%	3	7.5%	0.078
Total	40	100%	40	100%	0.0004

All the patients were intubated in the first or second attempt in MG group as compared to 87.50% patients in ML group. Five patients (12.50%) could not be intubated (failed intubation) even after second attempt in ML group. This difference was statistically significant between both the groups. None of the patients required optimization manoeuvre for tracheal intubation in MG group as compared to 30% of the patients who required optimization manoeuvre in ML group. This difference was statistically significant between both the groups (P = 0.002).

Table 3: Optimization Manoeuvre

Optimization manoeuvre Required or Not Required (R/NR)	MG group (n=40)		ML group (n=40)		P Value
	Frequency	%	Frequency	%	
NR	40	100.0%	28	70.0%	0.0002
R	0	0.0%	12	30.0%	
Total	40	100%	40	100%	

The mean tracheal intubation time was lesser in MG group (21.43 seconds) as compared to ML group (24.31 seconds).

The difference in tracheal intubation time was statistically significant (P = 0.003).Second attempt was required in 7.50% of the patients in MG group as compared to 17.50% patients in ML group. The difference was not statistically significant between both the groups (P > 0.05).

Table: 4.Intubation Time And Attempts

Intubation time (in seconds)		Mean ± SD	P value
MG group (n=40)		21.43 ± 3.42	0.003
ML group (n=40)		24.31 ± 4.75	
IntubationAttempts	MG group	ML group	
1	37 (92.5%)	33 (82.5%)	0.176
2	3 (7.5%)	7 (17.5%)	

DISCUSSION

The successful tracheal intubation in an anticipated difficult intubation scenario presents a significant challenge even to an experienced anaesthesiologist. Difficult intubation have prompted the development of a number of alternatives to the conventional Macintosh laryngoscope, including the Truview® EVO_2 Videolaryngoscope, McGrath® Videolaryngoscope, Airtraq®, Glidescope® etc. These laryngoscope are based on the principle of indirect laryngoscopy and do not require the alignment of oro-pharyngeal and laryngeal axes.

Eighty patients of both sexes between the age group 21-60 years belonging to ASA I and II were taken up for the study after an informed consent. There was no significant difference, between the two groups, with regard to demographic data such as, age, sex, height, weight, BMI and baseline airway assessment parameters. The patients were then allocated randomly to endotracheal intubation either with the McGrath® Videolaryngoscope (MG group) or Miller's laryngoscope (ML group). The Cormack and Lehane grade, duration of successful tracheal intubation, number of attempts for successful intubation were noted for each patients. Heart rate, Blood pressure (systolic, diastolic, mean arterial pressure) and SPO_2 were recorded before induction, after induction, immediately after laryngoscopy and intubation, thereafter, at 1 minute and 5 minutes postintubation. A standardized anaesthetic regime was followed in each patient.

The overall P value for all Cormack and Lehane (CL) gradeswas 0.004 between both the groups, thus we concluded that laryngoscopy was significantly better in MG group than ML group.In the similar type of study,I Ng et al[1] found 97.50% CLgrade-1 view with McGrath® videolaryngoscope but we found 80% CL grade-1 view in MG group in our study.Probably the reason for this difference was that we included three predictors of difficult intubation (thyro-mental distance, atlanto-occipital joint extension and modified Mallampati class) whereas they included only Mallampati class ≥ 3, as the criteria to predict difficult intubation. Our study sample might have had more difficult airway than their study sample.But overall they also had better laryngoscopic view in McGrath® videolaryngoscope group than Henderson group (P=0.003), which is in support to our findings. They foundCL grade-1 in 72.50% patients in Henderson group as compared to 40% patients in ML group, in our study. The reason could be the same as we might have had patients with much difficult airway than them.GL Savoldelli et al[5],J Sudrial et al[8] and T Piepho et al[11]concluded that McGrath® videolaryngoscope offered better laryngoscopic view as compared to Macintosh laryngoscope in simulated difficult airway scenario. They explained that with direct laryngoscope, it is necessary to obtain a line of sight from maxillary teeth to glottis, which was difficult to obtain in difficult airways. Using the McGrath® videolaryngoscope image of the glottis captured near tip of the blade of laryngoscope, only a few centimetres of line of sight is required and the need to align to the oral, pharyngeal and laryngeal axes is not there.[5,8,11]

Successful tracheal intubation is the ultimate endpoint of the difficult airway management.The success rate of tracheal intubation, in our study, was 100% in MG group as compared to 87.5% in ML group (P=0.02). The difference was statistically significant. Five patients had intubation failure in ML group who were intubated using flexible fibreoptic endoscope. In the literature we found out that though,laryngoscopic view was better with McGrath®videolaryngoscope, there were reported intubation failure as it is not easy to negotiate tracheal tube during indirect laryngoscopy. I Ng et al[1] had one intubation failure, out of 40, with McGrath® videolaryngoscope as they could not negotiate the tracheal tube in one CL grade-1 patient. The reason for 100% success rate in MG group, in our study, could be that probably our anaesthesiologist is much experienced with the device and use of Optishape™ stylet for tracheal intubation improved the negotiation of tube into trachea. Nevertheless, in three cases with CL grade-1 we had intubation failure in first attempt.GL Sevoldelli et al[5] concluded that McGrath®videolaryngoscopes improved intubation time and rarely failed as compared to Macintosh in difficult airway scenario.

There was a statistically significant difference with reference to intubation time (P=0.003) between the two groups. The reason behind this difference could be McGrath® videolaryngoscope have LCD screen which display clear image of glottic structures. Simultaneously it gave better laryngoscopic view in terms of Cormack-Lehane grade. In contrast to sudy by I Ng et al[1], who concluded that there was no statistically significant difference in intubation time between McGrath® videolaryngoscope (43 seconds) and Henderson laryngoscope (35 seconds).GL Savoldelli et al[5] found out that intubation time is lesser using McGrath® videolaryngoscope as compared to Macintosh laryngoscope in simulated difficult airway.P Niforpoulou et al[12] found out that McGrath® videolaryngoscopes achieve the same or a higher intubation success rate than direct laryngoscope in less intubation time.CH Jepsen et al concluded that the McGrath® videolaryngoscope is a valuable device with higher success rate and quicker performance for tracheal intubation in manikins with a simulated difficult airway as compared to flexible fibreoptic endoscope.[13]

The exposure of glottis during laryngoscopy requires the elevation of the epiglottis by a forward and upward lifting force of the laryngoscope blade which is associated with an increase in heart rate and blood pressure secondary to sympathetic discharge. This hypertensive response is directly proportional to the amount of lifting force and the duration of laryngoscopy and intubation.[14,15]In our study, heart rate, blood pressures decreased post induction, from the pre-induction value, and increased immediately afterlaryngoscopy and intubation, one minute after intubation which returned to preinduction values five minutes after intubation in both the groups. These variationsin heart rate and blood pressures,with time, were comparable between both the groups (P>0.05).WJ Jeon et al, in 2011, found no significant difference in hemodynamic parameters in his study comparing Glidescope® with McGrath® videolaryngoscope, though the intubation time was less with the Glidescope.[16]

CONCLUSION

The Cormack and Lehane grades were better using McGrath® videolaryngoscope than Miller straight blade laryngoscope in patients with anticipated difficult airways.Success rate was 100% with McGrath® videolaryngosope. Requirement of optimisation manoeuvre for tracheal intubation were significantly higher with Miller laryngoscope than McGrath® videolaryngoscope. Tracheal intubation required lesser time with McGrath® videolaryngoscopeRequirement of second attempt for intubation and hemodynamic response to intubation were comparable, in both the groups, in our study.

REFERENCES

1) Ng I, Sim XL, Williams D, Segal R. A randomised controlled trial comparing the McGrath(®) videolaryngoscope with the straight blade laryngoscope when used in adult patients with potential difficult airways.Anaesthesia 2011; 66: 709-14.
2) Arino JJ, Velasco JM, Gasco C, Lopez-TimonedaF.Straight blades improve visualization of the larynx while curved blades increase ease of intubation: a comparison of the Macintosh, Miller, McCoy, Belscope and Lee-Fiberview blades.Can J Anaesth2003; 50: 501-6.
3) Henderson JJ, Popat MT, Latto IP, Pearce AC; Difficult Airway Society. Difficult Airway Society guidelines for management of the unanticipated difficult intubation. Anaesthesia. 2004;59:675-94.
4) Shippey B, Ray D, McKeown D. Case series: the McGrath videolaryngoscope--an initial clinical evaluation. Can J Anaesth. 2007 Apr;54(4):307-13.
5) Savoldelli GL, Schiffer E, Abegg C, Baeriswyl V, Clergue F, Waeber JL. Comparison of the Glidescope, the McGrath, the Airtraq and the Macintosh laryngoscopes in simulated difficult airways.Anaesthesia. 2008;63:1358-64.
6) Noppens RR, Möbus S, Heid F, Schmidtmann I, Werner C, Piepho T. Evaluation of the McGrath Series 5 videolaryngoscope after failed direct laryngoscopy.Anaesthesia. 2010;65:716-20.
7) Taylor AM, Peck M, Launcelott S, Hung OR, Law JA, MacQuarrie K et al. The McGrath® Series 5 videolaryngoscope vs the Macintosh laryngoscope: a randomised, controlled trial in patients with a simulated difficult airway. Anaesthesia. 2013; 68: 142-7.
8) Sudrial J, Abdi W, Amathieu R, Luis D, Jabre P, Le Roux B et al.Performance of the glottiscopes: a randomized comparative study on difficult intubation simulation manikin.Ann Fr AnesthReanim. 2010;29:347-53.
9) Huang YF, Ting CK, Chang WK, Chan KH, Chen PT. Prevention of dental damage and improvement of difficult intubation using a paraglossal technique with a straight Miller blade.J Chin Med Assoc. 2010;73:553-6.
10) Henderson JJ.The use of paraglossal straight blade laryngoscopy in difficult tracheal intubation.Anaesthesia. 1997;52:552-60.
11) Piepho T, Weinert K, Heid FM, Werner C, Noppens RR. Comparison of the McGrath® Series 5 and GlideScope® Ranger with the Macintosh laryngoscope by paramedics.Scand J Trauma ResuscEmerg Med 2011;19:4.
12) Niforopoulou P, Pantazopoulos I, Demestiha T, Koudouna E, Xanthos T. Video-laryngoscopes in the adult airway management: a topical review of the literature.Acta Anaesthesiol Scand.2010;54:1050-61.
13) Jepsen CH, Gätke MR, Thøgersen B, Mollerup LT, Ruhnau B, Rewers M et al. Tracheal intubation with a flexible fibreoptic scope or the McGrath videolaryngoscope in simulated difficult airway scenarios: a randomised controlled manikin study. Eur J Anaesthesiol. 2014;31:131-6.
14) Forbes AM, Dally FG. Acute hypertension during induction of anaesthesia and endotracheal intubation in normotensive man. Br J Anaesth. 1970; 42: 618-24.
15) Stoelting RK. Circulatory changes during direct laryngoscopy and tracheal intubation: influence of duration of laryngoscopy with or without prior lidocaine. Anesthesiology. 1977; 47: 381-4.
16) Jeon WJ, Kim KH, Yeom JH, Bang MR, Hong JB, Cho SY. A comparison of the Glidescope® to the McGrath® videolaryngoscope in patients.Korean J Anesthesiol 2011;61:19-23.