Original Article

Comparison of Glidescope and McGrath Video Laryngoscope for Intubation and Adverse Events by Anesthetic Residents

Thavat Chanchayanon MD[1], Laortip Saewong MD[1]

[1] Department of Anesthesiology, Faculty of Medicine, Prince of Songkla University, Songkhla, Thailand

Objective: To compare the intubation time, intubation attempt and adverse events between Glidescope and McGrath laryngoscope.

Materials and Methods: A prospective randomized trial, was performed with 40 patients between the ages of 18 – 65 who had The American Society of Anesthesiologist Physical Status (ASA) I – III, and were scheduled for elective surgery. Patients were randomly allocated to one of two groups: A Glidescope group, or a McGrath group, established by using computer-generated numbers. Tracheal intubation was attempted by first year anesthetic residents, who had minimum of 3 to 6 months of experience in performing standard tracheal intubation. The operator recorded intubation time, number of attempts, complications and vital signs.

Results: Intubation time was significantly shorter for the Glidescope when compared to the McGrath laryngoscope (26.8 vs. 55.1 second, respectively, $p = 0.011$). The number of intubation attempts as well as the number of complications were not significantly different between the two groups.

Conclusion: Study results demonstrated that intubation time in the Glidescope group was less than the McGrath group, as performed by first year anesthetic residents, who had 3 to 6 months experience in performing standard tracheal intubations in patients with normal airways.

Keywords: Intubation time, Videolaryngoscope, Anesthetic resident

J Med Assoc Thai 2018; 101 (6): 803-7
Website: http://www.jmatonline.com

Tracheal intubation is a potentially life-saving procedure used in diverse clinical situations. However, problems with intubation may cause serious complications which may be life-threatening. Death or permanent brain damage, resulting from difficult tracheal intubation, accounted for more than one third of adverse respiratory events within the American Society of Anesthesiologists[1]. Standard tracheal intubation via direct laryngoscopy, performed by inexperienced medical personnel, bears a high failure risk[2].

In several studies looking at the success rate of tracheal intubation via direct laryngoscopy performed by medical support staff, medical students, and novice anesthesic residents, revealed that the initial success rate varied between 35% and 65%[3-7]. Videolaryngoscope (Glidescope and Mcgrath) is now widely accepted as an airway management technique that may be easier for inexperienced practitioners to learn[8-11].

From the article by Parichehr et al[2] demonstrated that in personnels with no, or only minimal experience in tracheal intubation (such as: medical students and nurses), the success rate of intubation could be significantly increased with the aid of a video assisted technique (Glidescope). Additionally, this does not require any more time than a direct laryngoscopy. From the article by D.C. Ray et al[12] compared the McGrath videolaryngoscope and Macintosh laryngoscope by studying the performance of 25 medical students with no previous experience of performing tracheal intubation using an easy intubation scenario in a manikin. It was found that the overall success rate of tracheal intubation was significantly higher than using the McGrath. However, intubation times were similar for both laryngoscopes. From the article by Woo Jae Jeon et al[13], demonstrated that the Glidescope reduced intubation time in comparison to the McGrath in patients with normal airways. The above tracheal intubation was attempted by an anesthesiologist with

Correspondence to:

Chanchayanon T. Department of Anesthesiology, Faculty of Medicine, Prince of Songkla University, 15 Kanjanavanich Road, Hatyai, Songkhla 90110, Thailand.
Phone: +66-74-451651, **Fax:** +66-74-281656
Email: cardiacpsu@gmail.com

How to cite this article: Chanchayanon T, Saewong L. Comparison of glidescope and McGrath video laryngoscope for intubation and adverse events by anesthetic residents. J Med Assoc Thai 2018;101:803-7.

extensive experience using these two devices. The present study aimed to demonstrate the difference in this two devices by comparing the intubation time, intubation attempt and adverse events between Glidescope and McGrath laryngoscope in Anesthetic resident.

Materials and Methods

After being approval from the Institutional Ethics Committee, patients between the ages of 18 - 65, who had The American Society of Anesthesiologists physical status I – III, and were scheduled for elective surgery under general anesthesia with tracheal intubation were enrolled in the present study. The patients, who had the following problems: BMI more than 29 kg/m^2, risk of aspiration, probable difficult intubation, cervical spine injury and airway pathology were excluded. Informed consent was obtained from the patients. The intubators were first-year anesthetic residents, who had experience in performing standard tracheal intubation of a minimal period ranging from 3 to 6 months, in patients with normal airway, and all residents received manikin training with both techniques, obtaining success at least once for each technique.

Patients were randomly allocated into two groups, (Glidescope group and McGrath group) by using a computer-generated randomization table, which was enclosed and sealed in opaque envelopes. In the operating room, demographic data and airway assessment were recorded by intubators. After standard monitorings were applied, the patients were pre-oxygenated by 100% oxygen via tight anesthetic face mask for 5 minutes. Anesthesia was induced by propofol (2 mg/kg) and fentanyl (1.2 mcg/kg) intravenously. In order to maintain oxygenation, the patients' lungs were ventilated with 100% oxygen using a standard face mask. Once, full neuromuscular blockade was achieved for four minutes after a 0.15 mg/kg dose of cisatracurium, tracheal intubation was attempted with the devices, as assigned by the group assignment. The intubator recorded ease of visualization of glottis structures based on the classification described by Cormack and Lehane. Any attempt that lasted for more than 120 seconds, or was associated with peripheral oxygen saturation of less than 92%, the intubation was halted.

More than three attempts, or a time of more than 120 second was defined as a failure of intubation. The number of failures, number of attempts, their duration, intubation time, and events during the whole procedure were recorded. Intubation time was measured from the opening of the patient's mouth until the cuff of the tube was blocked. If failure to secure the airway occurred, then conventional difficult intubation protocols were prepared and tracheal intubation was attempted by an anesthesiologist with extensive experience.

Mean arterial pressure along with heart rate were measured and recorded in the operating room at baseline, at intubation and every minute for 5 minutes after intubation. The anesthetic nurses evaluated adverse events such as teeth or mucosal trauma and arterial oxygen desaturation <92%

In the present study, the authors used Glidescope Portable GVL® (Figure1), McGrath® Series5 (Figure2) and stylet for mounting the tube onto a stylet and angling the distal tip upwards by 60 - 70 degrees (Figure3).

Statistical analysis

The sample size was calculated using this formula:

$$n = \frac{\left(Z_{1-\alpha/2} + Z_{1-\beta}\right)^2 \left(\sigma_1{}^2 + \frac{\sigma_2{}^2}{r}\right)}{\Delta^2}$$

Where:

Group 1 was mean of intubation time in Glidescope group

Group 2 was mean of intubation time in Mcgrath group

95% confidence interval → $Z_{1-\alpha/2} = 1.99$ ($\alpha<0.01$)

90% power → $Z_{1-\beta} = 0.94$ ($\beta < 0.1$)

The number of the population required for the present study was 20 patients for each group.

Statistical analysis was performed using the R software 2.14.1. Continuous variables were presented as mean and standard deviation (SD). Categorical variables were presented as number of patients and percentages. Continuous variables were analyzed by Student t-test or Wilcoxon rank sum test. Categorical variables were analyzed by Pearson's chi-square test or Fisher's exact test. A *p*-value less than 0.05 was considered as statistical significance.

Results

Forty patients were enrolled over the periods of January to March 2016, and no data were excluded from analysis. Patient demographic data were shown in Table 1. There were no differences between the two groups in terms of; sex, age, weight, height, BMI, ASA

Figure 1. Glidescope Portable GVL®.

Figure 2. McGrath® Series 5.

Figure 3. Stylet.

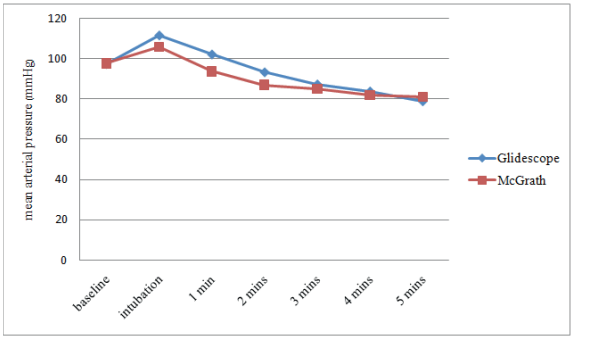

Figure 4. Mean arterial pressure data.

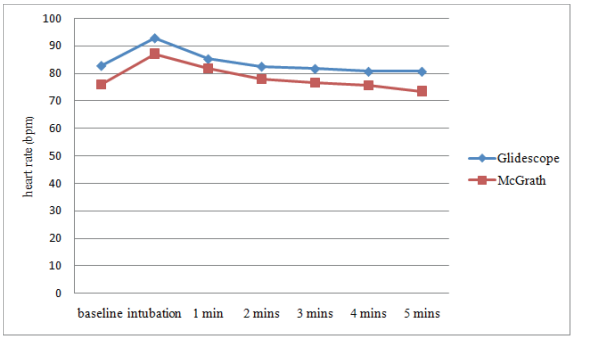

Figure 5. Heart rate data.

classification, Mallampati grading and other airway assessments.

Intubation time was significantly shorter for the Glidescope compared to the McGrath laryngoscope (26.8 vs. 55.1 s. respectively, $p = 0.011$) (Table 2). Glottic views, obtained at intubation, were similar between the two groups (Table 2). The number of intubation attempts was not significantly different between the two groups (Table 2), but more failed intubation was found in the McGrath group. The two failed attempts within the McGrath were caused by the intubation time exceeding 120 sec's, these were then performed successfully by an anesthesiologist with extensive experience.

There were no adverse events (loosing of tooth, mucosal trauma and desaturation) of both groups. Baseline hemodynamics did not differ between the two groups. There were no significant differences in MAP and HR between the groups (Figure 4 and 5).

Discussion

The present study compared the Glidescope with the McGrath in terms of intubation time and number of attempts. The results were the intubation time of the Glidescope group was less than those of the McGrath group (26.8 vs 55.1 s.), the number of attempt was not significantly different, two failed attempts with the McGrath were due to exceeding >120 seconds intubation time. The advantage may be because of the Glidescope provided an improved view of the larynx and allowed for successful tracheal intubation.

Our data supported the findings of previous studies by experienced anesthesiologists, using the Glidescope and McGrath[13] by showing that Glidescope reduced intubation time in comparison with the McGrath.

The study of Van Zundert et al[14] reported by using a styletted ETT with the Glidescope and the McGrath increased first pass success rates in healthy adult patients. The study by Sun et al[15] found that there was a first-pass success rate of 94%, when using the Glidescope with a styletted ETT. Similarly, Shippey et al[16] reported a first pass success rate of 93% when using the McGrath with a styletted ETT. They believed that mounting the tube onto a stylet and angling the distal tip upwards by 60 - 70 degrees, at the proximal end of the cuff allowed easier insertion of the tube into the larynx. They also accessed that using a stylet, and correctly shaping the tracheal tube was mandatory to assist tracheal intubation with the McGrath. In the

Table 1. Patient demographic data

Patient characteristics	Glidescope group (n = 20)	Mcgrath group (n = 20)	*p*-value
Sex, n (%)			0.5
• Male	8 (40)	5 (25)	
• Female	12 (60)	15 (75)	
Age (year), mean (SD)	46.1 (12.4)	42.9 (10.4)	0.375
Body weight (kg), mean (SD)	58.2 (9.2)	61.4 (12.1)	0.352
Body height (cm), mean (SD)	158.4 (11.3)	162.1 (7.8)	0.235
BMI (kg/m^2), mean (SD)	23.2 (2.7)	23.3 (3.9)	0.915
ASA, n (%)			1
• I	3 (15)	3 (15)	
• II	12 (60)	12 (60)	
• III	5 (25)	5 (25)	
Mallampati, n (%)			0.747
• I	8 (40)	8 (40)	
• II	12 (60)	12 (60)	
Thyromental distance, mean (SD)	3.5 (0.7)	3.5 (0.5)	0.796
Interincisor gap, median (IQR)	3 (3,3)	3 (3,3)	0.696
Motion of neck, n (%)			1
• Yes	40 (100)	40 (100)	
• No	0 (0)	0 (0)	
Dental assess, n (%)			0.605
• Good	17 (85)	17 (85)	
• No upper teeth	3 (15)	1 (5)	
• No lower teeth	0 (0)	1 (5)	
• No teeth	0 (0)	1 (5)	
Upper lip bite test, n (%)			0.32
• Grade 1	14 (70)	11 (55)	
• Grade 2	5 (25)	9 (45)	
• Grade 3	0 (0)	0 (0)	
• Can not evaluate	1 (5)	0 (0)	

Table 2. Intubation data

Intubation data	Glidescope group (n = 20)	Mcgrath group (n = 20)	*p* value
Intubation time, mean (SD)	26.8 (13.9)	55.1 (45.3)	0.011
Intubation attempt, n (%)			0.231
• 1 attempt	20 (100)	17 (85)	
• 2 attempts	0 (0)	1 (5)	
• 3 attempts	0 (0)	0 (0)	
• > 3 attempts	0 (0)	2 (10)	
Cormack and Lehane classification, n (%)			0.407
• Grade 1	18 (90)	15 (75)	
• Grade 2	2 (10)	5 (25)	
• Grade 3	0 (0)	0 (0)	
• Grade 4	0 (0)	0 (0)	

present study, the authors used the styletted ETT, and found the first-pass success rate of the Glidescope and McGrath was 20/20 (100%) and 17/20 (85%), respectively.

The study of Woo Jae Jeon et al[13] demonstrated that hemodynamic responses to orotracheal intubation using a Glidescope and a McGrath were similar. The study of Xue et al[17] demonstrated that hemodynamic responses to orotracheal intubation using a Glidescope and a Macintosh direct laryngoscope were similar, and that the Glidescope had no special advantages over the Macintosh direct laryngoscope in attenuating these responses. In our study, there were no significant differences in MAP and HR between the groups.

The present study had several limitations. There may have been bias, as it was impossible to blind the anesthesiologist to the device being used. Secondly, in the presented hospital the Glidescope have been often used first. Finally, the authors did not collect data about the resident physicians' previous experiences of performing tracheal intubation. In the future the authors recommend to collect these data.

Conclusion

The results of the present study demonstrated the intubation time in the Glidescope group was less than that of the McGrath group, when performed by first year anesthetic residents, having a minimum of 3 to 6 months of experience performing standard tracheal

intubation on patients with normal airway.

What is already known on this topic?

Glidescope reduced intubation time in comparison with the Mcgrath in patients with normal airways and tracheal intubation was attempted by an anesthesiologist with extensive experience using these two devices.

What is this study add?

Glidescope reduced intubation time in comparison with the McGrath, performed by first year anesthetic residents, who had experience of performing standard tracheal intubation at least 3-6 months, in patients with normal airway.

Acknowledgement

The authors would like to express sincere thank to Dr. Maliwan Oofuvong for guiding on research methodology and statistical analysis.

Potential conflicts of interest

The authors declare no conflict of interest.

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