The Internet Journal of Anesthesiology
Volume 32 Number 2

Comparison Of Glidescope® And Miller Blade Laryngoscopy With Respect To Pogo Scores In The Pediatric Airway

E Abraham, K Henry, C Pierce, K Poteet-Schwartz

Citation

E Abraham, K Henry, C Pierce, K Poteet-Schwartz. *Comparison Of Glidescope® And Miller Blade Laryngoscopy With Respect To Pogo Scores In The Pediatric Airway*. The Internet Journal of Anesthesiology. 2013 Volume 32 Number 2.

Abstract

Introduction:

Laryngoscopy and endotracheal intubation are crucial goals of airway management especially in pediatric patients. In pediatrics, it has generally been regarded that a straight blade (i.e., “Miller blade”) be implemented for laryngoscopy. However, the GlideScope® video laryngoscope is an airway tool that is often used as well. Research in adults has shown the GlideScope® confers equal or superior glottic views compared to curved blade. However, using curved blades in pediatrics has been shown to be less effective in the control of the epiglottis, which may result in poorer visualization of the glottic structures compared to its straight (i.e., “Miller”) blade counterpart. In an effort to begin to determine if the GlideScope® should be used as a modality, this research compared the percentage of glottic opening (POGO) scores between Miller blade and GlideScope® in children having endotracheal intubation.

Methods:

Observations were made on 50 pediatric patients (age = 6 months - 4 years) undergoing general anesthesia with endotracheal intubation. Prior to intubation, the anesthesiologist visualized the airway using both the Miller blade and the GlideScope®, and gave a POGO score. Visualization order was randomly assigned. Agreement between the Miller blade and GlideScope® POGO scores was determined using Lin’s concordance correlation coefficient (CCC).

Results:

Four outliers were excluded after data collection due to the significant discrepancy in agreement (>40% difference in POGO scores). The mean POGO score of those remaining (n = 46) was 84.8 ± 18.3 and 92.8 ± 15.0 for the Miller blade and GlideScope®, respectively. The concordance correlation suggests strong agreement, with a coefficient value of 0.69 (95% CI-0.55, 0.84; p<0.001). The mean difference between measurements is 4.8% (± 11.9). The Bland-Altman limits of agreement suggest that the GlideScope® measurement will be within -18.6% and 28.2% of the Miller blade POGO score 95% of the time.

Discussion:

Results show strong agreement between measurements of visualization of the glottic opening between the Miller blade and the GlideScope®. The limits of agreement are within a clinically acceptable range. Thus, it appears that it is acceptable for a clinician to use either the Miller blade or the GlideScope® as a modality to assist with intubation® in pediatric patients with normal airways.

BACKGROUND AND SIGNIFICANCE

The Glidescope® has revolutionized management of the adult difficult airway. However, there are significant differences between the pediatric and adult airway. For example, the infant larynx is more superior in the neck and the epiglottis is shorter and angled more over the glottis. Due to such characteristics it has generally been regarded that a straight, or traditional, blade (i.e., “miller blade”) be implemented for laryngoscopy. Another option, is the Glidescope®, which mimics a curved blade (i.e., “macintosh blade”). We have 2 models in our institution, the Glidescope® GVL and Cobalt Glidescope® which are both curved blades. The newer Cobalt Glidescope® has disposable blades which are longer and narrower than the reusable Glidesocpe® GVL. A meta-analysis using 17 trials and a total of 1,998 patients suggested there was no difference between Glidescope and direct larynogoscopy regarding successful first-attempt intubation and time to intubation but there was significant heterogenecity in these outcomes. (1) The studies which compare the Glidescope® with macintosh blades in pediatric patients also show little improvement in intubation performance but possibly better glottic views. (2,3,4,5) There have been studies comparing the glidescope and miller laryngoscopy in pediatric patients using the Cormack and Lehane classification, which is broadly used to describe laryngeal view during direct laryngoscopy. These studies also suggest that the Glidescope® may not decrease intubation time or attempts when compared with the standard laryngoscopy on pediatric patients with normal airways. (6,7,8).

We used the percentage of glottic opening score (POGO) that was found to be more reliable between observers (9) and compare the correlation between the glottis visibility of the Glidescope® to direct laryngoscopy with a miller blade in healthy pediatric patients. Evaluation of this airway tool (i.e., the Glidescope®) in the pediatric airway is paramount to determine its true utility, especially when faced with failed laryngoscopy. This will help us begin to determine if the Glidescope® should be used as a rescue modality in this patient population, or whether other airway interventions should be utilized.

METHODS

After receiving IRB approval, we used 50 subjects that met the following criteria: Children between 6 months and 4 years of age scheduled to undergo general anesthesia with endotracheal intubation with no known history of airway abnormalities. The patients were ASA 1 or 2 with no emergency surgeries, and with no history of congenital syndromes.

Routine standard of care for general anesthesia with endotracheal intubation was followed. The patient received a premed based on the anesthesia attending's discretion. The patient was brought back into the operating room and mask induction was performed using sevoflurane and nitrous oxide and intravenous access obtained. Weight based appropriate induction does of muscle relaxant plus narcotic of choice was administered.

The glottis opening was visualized by utilizing both the Glidescope® and the miller laryngoscope. Blade size for Cobalt Glidescope® was weight based (manufacture recommendations). Miller blade was chosen based on age: <1 = miller 1; age ≥ 1 = miller 2. To minimize bias, the use of the airway modalities was performed in a randomized fashion. (e.g., visualize using the Glidescope® then by using the miller blade, or vice versa,). This randomization schedule was done by the statistician prior to study start. The POGO score was recorded after the use of each modality. Laryngoscopy was performed by pediatric anesthesia fellows or attending pediatric anesthesiologists.

The criterion validity of the miller blade was evaluated by calculating the correlation between the Miller blade and Glidescope® measurements using the POGO score. The distribution of POGO scores was tested for normality using the Shapiro-Wilk test and was further described by histograms and QQ-plots. The Wilcoxon rank-sum test and two-tailed unpaired Student t-test were used to assess the equivalency of the non-normally distributed continuous data. Statistical significance was set at a p value < 0.05. Box and Whisker plots were used to visualize the dispersion of measurements and more specifically to check for the presence of outliers.

Agreement between the Miller blade and Glidescope was determined using Lin's concordance correlation coefficient (CCC). The CCC is a measure of deviation from perfect concordance and takes into consideration both the degree of variation between the measurements, as well as the accuracy in terms of the shift between the points. A scatter plot was generated to illustrate graphically the relationship between the two measures. Furthermore, the line of perfect concordance and a line fitted to the data are provided to allow for comparisons to be drawn related to the CCC. To further measure the agreement between the devices, Bland-Altman limits of agreement are calculated and the corresponding plots produced, which offer an interpretation of the bias through comparing the differences of the scores. Additionally, paired plots were constructed to illustrate the discrepancy and also the direction of the differences between measurements.

Special consideration is given to the presence of outliers. To address this problem, various methods were employed to determine which measurements to exclude from the analysis. Exclusion criterion consisted of rejecting measurements with a difference greater than 20%, 30% and 40%, as well as using a multiple of the interquartile range for both the ratio and the difference between measurements. Agreement measures were then compared using the select data to evaluate the impact of irregular data points. Data was analyzed using Stata® 11.2 (College Station, TX).

RESULTS

For the study group (n=50), the mean age and weight were 22.1 ± 13.0 months (range: 6-47) and 11.6 ± 3.0 kilograms (range: 5.4-17.8), respectively. The cobalt Glidescope® was used first in 64% of the subjects (n=32). The cobalt Glidescope® size was 2.5 in 68% (n=34) of subjects and 2.0 in 32% (n=16) of subjects. The miller blade size was 2.0 in 80% (n=40) of subjects and 1.0 in 20% (n=10) of subjects.

Four outliers were excluded after data collection due to the significant discrepancy in agreement (>40% difference in POGO scores). The mean POGO score of those remaining (n = 46) was 84.8 ± 18.3 and 92.8 ± 15.0 for the Miller blade and GlideScope®, respectively. (Table 1)

When excluding outliers, all concordance correlation coefficients indicate strong agreement. By omitting measures that have a POGO score discrepancy of more than 40% the Bland-Altman limits of agreement suggest that the Glidescope® measurement will be within -18.6% and 28.2.0% of the Miller blade POGO score 95% of the time. The concordance correlation suggests strong agreement, with a coefficient value of 0.69 (95% CI-0.55, 0.84; p<0.001). (Table 2)

Table 1

Descriptive statistics: Glidescope has a higher mean and similar range to the Miller blade.

	Miller Blade POGO	Glidescope POGO
Mean (%)	84.8 ± 18.3	92.8 ± 15.0
Range (%)	30 to 100	25 to 100
Median (%)	90	100
Interquartile Range (%)	75-100	90-100

Table 2

Summary of agreement under different conditions for outliers.

Data Included	Number of Observations	Concordance Correlation	95% CI	95% Bland-Altman LoA	Avg. % Difference (Std. Dev)
All	50	0.49	0.30 – 0.68	-23.2 – 39.2	8.0 (16.0)
Diff > 40%	46	0.69	0.55 - 0.84	-18.6 - 28.2	4.8 (11.9)
Diff > 30 %	44	0.77	0.65 - 0.89	-17.1 - 24.2	3.5 (10.5)
Diff > 20%	36	0.75	0.60 - 0.90	-10.1 – 14.0	1.9 (6.1)
Within IQR (diff)	45	0.63	0.48 – 0.79	-16.5 – 27.3	5.4 (11.2)
Within IQR (ratio)	41	0.70	0.55 – 0.85	-14.9 -21.7	3.4 (9.3

DISCUSSION

Our results show strong agreement between measurements of visualization of the glottic opening between the miller blade and the GlideScope®. This suggests that the glottic views between the Glidescope is similar to the glottic views of direct laryngoscopy with a miller blade. This does not tell us if there will be any improvement with the time to intubation or decreased amount of trauma with using the glidescope over the conventional direct laryngoscopy.

The straight blade (Miller blade) has conventionally been used for neonates and infants because it is better to elevate the base of the tongue from the field of view during laryngoscopy, and facilitate visualization of an infant's larynx. This study supports that the curved blade of the Glidescope® can provide similar views of the glottis as the straight miller blade. The effective use of the Glidescope® in pediatric patients has been debated. A lot of the studies were comparing curved blades to the glidescope on older pediatric patients which had similar results. Generally, the studies indicate that there may be about the same intubation performance between the Glidescope® and direct larygoscopy (2,3,4,5,) The newer Cobalt Glidescope® which has a narrower and longer disposable blades were compared with the miller laryngoscopy and shown to perform as well as the miller laryngoscope. (6.7) One study which did look at infants and neonates comparing the Glidescope® to direct laryngoscopy with miller blade seemed to indicate faster time to best view with the Glidescope® but similar intubation times and success rates.(7) There was an advantage of using the Glidescope® GVL compared to direct laryngoscopy with macintosh blade in pediatric patients with difficult airway in one study. (10) This study was mainly in older pediatric patients with weights greater than 40kg.

Our study used the POGO scale which is based upon the amount of glottic opening seen using the span from the anterior commissure to the inter-arytenoid notch as 100%. A

POGO score of 0% means none of the glottis opening is seen. POGO scores do not differentiate between epiglottis only views and laryngoscopies in which the epiglottis is not visible. POGO scores have been show to have excellent inter-rater reliability and very good intra-rater reliability among airway providers of various experience levels than the Cormack and Lehane classification . (9)

There are limitations to this study. We used pediatric anesthesia fellows or attendings who should be experts in larygoscopy and they found similar views with the Glidescope® vs miller blade. We did not inquire on their level of experience on using the Glidescope® for infants and neonates. Expertise could play a factor in proficiently using the device. We did not include difficult airways where the glidescope could be more useful. This study was only on healthy patients with normal anatomy. It appears that it is acceptable for a clinician to use the Glidescope® in pediatric airway management. This study suggests that the glottic view of the Glidescope® is comparable to the glottic view of direct largynoscopy with a miller blade on healthy pediatric patients.

References

(1) Griesdale D, Liu D, Mckinney J, Choi P. Glidescope® video-laryngoscopy versus direct laryngoscopy for endotracheal intubation: a systematic review and meta-analysis. Can J Anesth 2012; 59:41-52.

(2) Redel A, Karademir F, Schlitterlau A, Frommer M, Scholtz L, Kranke P,Kehl F, Roewer N, Lange M. Validation of the glidescope video laryngoscope in pediatric patients. Pediatric Anesthesia 2009; 19:667-671.

(3) Kim J., Na S., Bae J. et al. Glidescope video laryngoscope: a randomized clinical trial in 203 paediatric patients. British Journal of Anesthesia 2008; 101 (4): 531-4
(4)Rodriquez-Nunez A, Oulego-Erroz I, Perez-Gay L, Cortinas-Diaz J. Comparison of the GlideScope Videolaryngoscope to the Standard Macintosh for Intubation by Pediatric Residents in Simulated Child Airway Scenarios. Pediatric Emergency Care 2010; 26: 726-729.

(5)Riveros R, Sung W, Sessler D, Sanchez I, Mendoza M, Mascha E, Niezgoda J. Comparison of the Truview PCD™ and the Glidescope® video laryngoscopes with direct laryngoscopy in pediatric patients: a randomized trial. Can J Anesth 2013; 60(5):450-7.

(6)White M, Weale N, Nolan J, Sale S, Bayley G. Comparison of the Cobalt Glidescope® video laryngoscope with conventional laryngoscopy in simulated normal and difficult infant airways. Pediatric Anesthesia 2009; 19:1108-1112.

(7) Fiadjoe J, Gurnaney H, Dalesio N, Sussman E, Zhao H, Zhang X, Stricker P. A Prospective Randominzed Equivalence Trial of the Glidescope Cobalt® Video Laryngoscope to Traditional Direct Laryngoscopy in Neonates and Infants. Anesthesiology 2012; 116:622-8.

(8) Fonte M, Oulego-Erroz I, Nadkarni L, Sanchez-Santos L, Iglesias-Vasquez A, Rodriguez-Nunez A. A Randonmized Comparison of the GlideScope Videolaryngoscope to the Standard Laryngoscopy for Intubation by Pediatric Residents in Simulated Easy and Difficult Infant Airway Scenarios. Pediatric Emergency Care 2011; 27:398-402.

(9)Ochroch E, Hollander J, Kush S, Shofer F, Levitan R. Assessment of laryngeal view: percentage of glottic opening score vs Cormack and Lehane grading. Can J Anesth 1999; 46(10):987-990

(10)Lee J,Park Y, Byon H, Han W, Kim H, Kim C, Kim J. A Comparative Trial of the Glidescope® Video Laryngoscope to Direct Laryngoscope in Children with Difficult Direct Laryngoscopy and an Evaluation of the Effect of Blade Size. Anesth Analg 2013;117:176-81.

Author Information

EJ Abraham, MD
Division of Pediatric Anesthesiology Arkansas Children's Hospital University of Arkansas for Medical Sciences
Little Rock, Arkansas
EJAbraham@uams.edu

K. Henry

CD Pierce, RN

Kim Poteet-Schwartz, MD