ORIGINAL RESEARCH PAPER
Volume - 12 | Issue - 06 | June - 2023 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

COMPARISON OF MCGRATH VIDEO LARYNGOSCOPE WITH CONVENTIONAL MACINTOSH LARYNGOSCOPE FOR ENDOTRACHEAL INTUBATION IN NEONATAL PATIENTS WITH NORMAL AIRWAY: A PROSPECTIVE RANDOMIZED COMPARATIVE STUDY.

Anaesthesiology

Dr. Jayesh. C.Vasava* MD Anaesthesia, HOD, Department of anesthesiology, Medical college and S.S.G. hospital, Vadodara *Corresponding Author

Dr. Akshar Patel 3rd year Resident, Department of Anesthesiology, Medical college and S.S.G. hospital, Vadodara

Dr. Prabhat Parmar 3rd year Resident, Department of Anesthesiology, Medical college and S.S.G. hospital, Vadodara

Dr. Neha Cheraya MD Anaesthesia, Ex Assistant Proffessor, Department of Anesthesiology, Medical college and S.S.G. hospital, Vadodara

Dr. Akshay Pandya 3rd year Resident, Department of Anesthesiology, Medical college and S.S.G. hospital, vadodara

ABSTRACT

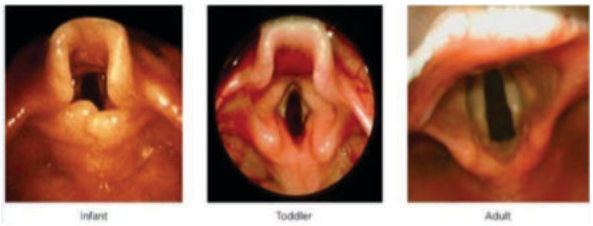
Introduction: Video laryngoscope have attained prime importance in securing airway in children in present era. Magnified view, maintenance of an effective distance from patients and high success rate have contributed to their efficacy .Video laryngoscope is a better alternative for the purpose of tracheal intubation without the need for alignment of pharyngeal, laryngeal and oral axes as we needed in conventional method. **Aim:** The primary aim of this study was to compare intubation time using McGrath video laryngoscope and Macintosh laryngoscope in neonatal patients with normal airway. **Methods:** It was a prospective randomized clinical study. 60 patients of age up to 28 days, of either gender and ASA I, II & III scheduled for elective or emergency surgery were included. Patients with difficult airway, URTI, H/o convulsion were excluded. They were randomly devided into 2 groups of 30 patients each-Group-G (intubation using McGrath video laryngoscope) and Group-M(intubation using Macintosh laryngoscope) using sealed enveloped method. The parameters observed were Glottic exposure time,intubation time, Number of attempts, optimization maneuvers, vital parameters and complications. **Result:** The mean time to glottic exposure and intubation was shorter in Group-G versus Group-M(statistically highly significant with P value < 0.01) resulting in decrease number of attempts and lesser trauma.

KEYWORDS

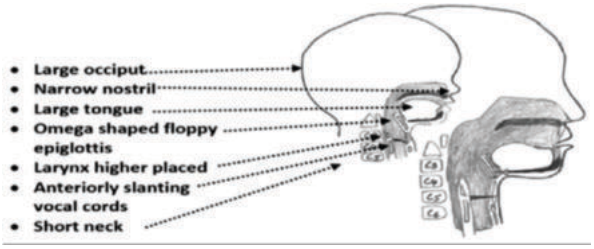
Mc Grath video laryngoscope, Tracheal intubation, Neonates.

1. INTRODUCTION :

A good airway management technique is an essential skill for the anaesthetists taking care of the children for surgery. The difficult airway is an important contributor to both patient morbidity and mortality.Securing a patent airway in paediatric patients undergoing general anaesthesia is routinely performed using direct laryngoscopy with a Macintosh or Miller laryngoscope blade, which is gold standard. However, this method has several limitations. A good laryngeal view is often a prerequisite for successful intubation which required morning sniffing position for alignment of the oro–pharyngo –laryngeal axes. There is also increased risk of trauma and noxious stimulation. As we know pediatric airway is different and difficult compare to adult airway as a result of specific features of paediatric anatomy such as Large occipital, Narrow nostril, Large tounge, Omega shaped floppy epiglottis, High placed larynx, Anterior slanting vocal cord and short neck.(1) (Figure 1 & 2)



(Figure 1)



(Figure 2)

As a result, even the most experienced practitioner will experience difficult direct laryngoscopy (CormarkLehane grade ¾ laryngelview)in 1.5-8.5% of cases.(2) The introduction of the technology of video laryngoscopy has provided anaesthesiologists with all-inclusive view of the airway.Several studies, and case reports demonstrate the successful use of video laryngoscopy among paediatric patients.Video laryngoscope is a learning tool in the operating room during act of intubation. Anaesthesiologists need to learn to intubate on the monitor, as it is an indirect intubation method.Some video laryngoscopes have the extra modality of recording still images or video clips, which may be helpful if one wants to discuss the procedure afterwards.(3) There are numerous technical benefits. Video laryngoscopes give user a better view of the larynx.Camera on distal end gives increased field of view and this increased field of view is augmented by the capacity to see around the corner and gain a view of structures that are beyond the reach of Macintosh blade(4)This improved view of larynx is seen with minimal neck manipulation and there is less chances of noxious stimulus and trauma.McGrath video laryngoscopes is a recently introduced video laryngoscope available with non- channeled blades. Being relatively innascent stages of development, its use in paediatric age groups is still in emerging stages. Therefore, we decided to compare the McGrath VL and Macintosh laryngoscope for their usefulness for intubation in neonatal patients.

2.MATERIALS AND METHODS:

After taking permission from Scientific and Ethical Research Committee of Government Medical college and SSG Hospital, Vadodara (CTRI/2022/04/041925) a Prospective randomized controlled trial was carried out during the period of January 2022 to December 2022.Minimum 60 patients (30 per Group) were taken to estimate difference of mean intubation time of 3 sec with SD 4 sec at 95% confidence and 80% power. Total 60 neonatal patients (age up to 28 days), ASA I , II & III of eighter gender , posted for elective and emergency surgery under general anaesthesia requiring Endotracheal intubation were selected.

Patients with difficult airway , History of convulsion ,URTI (upper respiratory tract infection), Preexisting laryngeal or tracheal pathology, Patient's parents/guardian not willing for participation were excluded from the study.

Detailed pre-anaesthetic check-up was done for all patients undergoing this study. The patient's age, gender, weight, ASA status was noted. All systems were examined including airway examination. Basic laboratory investigations was conducted including Complete hemogram. After thorough pre-anesthetic evaluation all the patients falling in the inclusion criteria were selected. The procedure was explained to patient's guardian including benefits and complications of each and written informed assent had been taken. Patient was kept nil by mouth (NBM) for minimum 2-4 hours (clear fluids-2hrs, breast milk-4 hrs) and secure IV line.

Grouping And Randomization

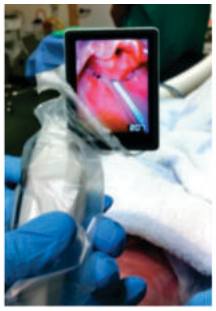
The study population was randomly allocated into two groups (30 per group) by sealed envelope method .

1) Group G-In which McGrath video laryngoscope was used for endotracheal intubation.

2) Group M- In which Macintosh laryngoscope was used for endotracheal intubation.

Cylinders and circuits of anaesthesia machine with sevoflurance vaporiser were checked, laryngoscope with Macintosh blade size 0, McGrath video laryngoscope with paediatric blade no. 1, Jackson-Rees breathing circuit, oxygen masks size 1, 2, 3, endotracheal tubes of size 2.5mm to 4.0 mm size, Guedel's oropharyngeal airway and malleable stylet were kept ready. Drugs, Multipara monitor and Stopwatch were kept ready before induction.For McGrath video laryngoscope, neonatal non-channeled blade no. 1 was mounted on the handle containing battery. The performance of the device was checked by watching the clarity of the image on monitor. For Macintosh laryngoscope, appropriate sized neonatal blade no. 0 was mounted on the handle.The performance of the device was checked by adequate intensity of the light. Appropriate size of ET tube with stylet will be kept ready.(figure 3)

(Figure 3)



(Figure 4)

(Figure 5)

(Figure 4 : McGrath MAC 1 blade in in situ in a 2.4-kg neonate and the videolaryngoscopic view obtained (note nasogastric tube visible on the screen). Published with the written consent of the child's parents/guardians, ref :(5))

After taking patient inside the operation theatre, multipara monitor attached and baseline vital parameters were noted in the form of heart rate (ECG), RR , SPO2 .Pre-medications in all patients were given with Inj. Glycopyrrolate 5 mcg/kg IV, and Inj. Inj.Paracetamol 5-15 mg/kg IV given 5 min. before induction. The patients were pre-oxygenated for 5 minutes through face mask and all patients were induced with increasing concentrations of sevoflurane starting from 1% with 100% O2 with 6 litres/min flow using Jackson-Rees circuit. The sevoflurane concentration was increased by 1% every 2 to 3 breaths. Intubation done After achieving loss of reflexes, loss of muslce tone and no response to pain. Tracheal intubation was confirmed by the square wave capnography. Maintance of the anesthesia done by using O2 + sevoflurane and Atracurium bromide 0.3-0.5 mg/kg I.v.loading dose followed by maintenance dose of 0.01 mg/kg I.v. At the end of surgery anesthetic agent to be stopped before 10 mins and patient to be ventilated with 100% oxygen. Reversal of residual neuromuscular block to be done, once patient starts spontaneous breathing, with Inj.

Neostigmine - 50 mcg/kg and Inj. Glycopyrrolate 10mcg/kg IV. During this period patients were ventilated with 100% oxygen with fresh gas flow of 2-4 liters/min. Patient were extubated when regular spontaneous breathing pattern became established and fulfilled extubation criteria .Than patient were shifted to post anaesthesia care unit (PACU) .Following parameters were studied :

1) Glottic exposure time: The time from introduction of laryngoscope from teeth/gum till visualization of glottis
2) Intubation time : The time from insertion of the blade between the teeth until the first effective ventilation confirmed by capnography.
3) Optimization maneuvers required for intubation : like rotation of tube, slight withdrawal or advancement of scope or external laryngeal pressure.
4) No. of attempts of device insertion (maximum 2) defined as each time the device was removed past the gum or teeth
5) Vital parameters: Hemodynamic parameters like heart rate, Spo2 noted.
6) Complications:

- Laryngospasm to be treated with O2.
- Bronchospasm to be treated with bronchodilator if required.
- Tachycardia (>140 beats per minute)
- Bradycardia (<100 beats per minute) to be treated with inj. Atropine 10mcg/kg or inj. Glycopyrrolate 5mcg/kg.
- Desaturation under 95% to be treated with oxygen by mask if not intubated.
- Oesophageal intubation to be treated with extubation and oxygenation.
- Oropharyngeal trauma (Injury to teeth, tongue, tonsillar pillars) to be treated by putting gauze piece and compression.
- A failed intubation attempt was defined as one where the patient could not be intubated despite optimising manoeuvres or where the procedure took longer than 120 seconds to complete. In case of failure, those cases were excluded from the study.
- Mean and Standard deviation values were taken out. Statistical analysis of the data for the various parameters was done using student's 't' test for all continuous variables and chi-square test was used for qualitative (nonparametric) data using MedCalc software. The significance of statistical analysis was judged by p value.The p value < 0.05 was considered as significant and p value <0.01 was considered as highly significant

3. RESULT:

All 60 patients included in the study were analysed. In both the groups, all demographic data like age, sex, weight and ASA status, were comparable. (Table 1).

Table:1 Demographic Data

Parameters	Group-G	Group-M	P Value
Age(Days)	12.67±8.78	5.86±6.12	<0.05
Gender (M:F)	20:10	23:07	>0.05
Weight(kg)	3.027±1.08	2.87 ± 1.02	>0.05
ASA grading ASA I:II:III	4:11:15	5:13:12	>0.05

- Table 2 shows that the difference between glottic exposure time in two groups was statistically significant (p<0.0001), as glottic exposure time in Group G was (11.02±1.03) secs which was lesser than Group M (13.96±0.96).The difference between intubation time in two groups was statistically significant (p<0.0001), as intubation time in Group G was (18.83±0.96) secs which was lesser to intubation time observed in Group M(22.56±1.47) secs. Optimization maneuverswas required in 7/30 (23.33%) patients in Group G and 11/30 (36.66%) patients in Group M. which was comparable between both the groups with P value being >0.05. Number of attempts of device insertion inGroup G were significantly less withonly {2(6.66%)} patients requiring second attempt of device insertion while rest {28(93.33%)} patients were intubated in the firstattempt. In Group M, {9(26.66%)}patients requiring second attempt of device insertion while {21(73.33%)} (p<0.05) were intubated in first attempt itself.There were 2 cases of minor oropharyngeal trauma in Group G, while there were 6 cases of minor oropharyngeal trauma in group M, which was comparable between both the groups with P value being >0.05. Before and after induction, the mean pulse rate ,and mean oxygen saturation were comparable in both the groups.

Table : 2 Intubation Parameters

Parameters	Group G	Group M	P value
Glottic exposure time (sec)	11.02+1.03	13.96+0.96	< 0.0001
IntubationTime (sec)	18.83+0.96	22.56±1.47	<0.0001
Optimization maneuvers			
Required	7 (23.33%)	11(36.66%)	>0.05

Not required	23 (76.66%)	19(63.33%)	>0.05
Number. of Attempts			
First	28 (93.33%)	21 (70%)	<0.05
Second	2 (6.66%)	9 (30%)	<0.05
Orophareyngeal trauma			
None	28	24	
Trace	2	6	
Heavy	0	0	
Percentage	6.6%	25%	>0.05

4. DISCUSSION:

Laryngoscopy has come a long way since the advent of the first laryngoscope some 120 years ago. Commonly used laryngoscope required for tracheal intubation is the one described by Macintosh in 1943.Though direct laryngoscopy remains the gold standard for this purpose, this needs morning sniffing position just to align the oral, pharyngeal and laryngeal axis in a single line for proper visualization of glottis and results in noxious stimulation like rise in pulse and blood pressure.

Video laryngoscope has the advantage that there is no need for morning sniffing position and intubation can be done in a neutral position which can be beneficial in patients with cervical spine injuries (6). There is no need to apply force in vallecula for the view of glottis and thus, the chances of noxious stimulation gets reduced, so does the less chances of haemodynamic disturbances. It offers indirect (on screen) and superior visualisation of glottic structures as the lens of the camera is closer to the glottic opening. An increased viewing angle, from 15 to 80 degrees not only gives better image quality but helps in teaching and research and allows documentation of images for clinical review.(4)

With the development of the first video laryngoscope (Glidescope) in 2001 and easy availability of various other video laryngoscopes which involve the use of video and optical technology, they are now preferred in the adult population. In pediatric population also, video laryngoscopes are now being used widely.

Most video laryngoscopes are available with either channelled or non channelled blades. McGrath video laryngoscope has only non channelled blades for both adult and paediatric patients. Channelled video laryngoscopes provide the advantage of a dedicated passage for directing the endotracheal tube, removing the need for the stylet to direct the tube towards the glottic opening. However, there are certain situations where a channel may not be helpful and one needs a non channelled type of device. The non channelled blade has lesser thickness than channelled blade as there is no dedicated passage for endotracheal tube and hence it requires smaller mouth opening for insertion of the blade and can be helpful for intubation in patients with restricted mouth opening as well as it has more room for manoeuvring for oral and nasotracheal intubation. It, however, requires a stylet to direct the endotracheal tube towards the glottic opening which may prolong the time required for tracheal intubation compared to the channelled devices.

Kim JE et al evaluated the usefulness of the McGrath VL and compared it with Macintosh laryngoscopy in children with expected normal airway during endotracheal intubation, by comparing the time to intubation and difficulty of intubation. They found no difference in Time To Intubation between either groups (25.0 [22.8–28.3] s vs. 26.0 [24.0–29.0] s,P = 0.301). The incidence of grade I glottic view was significantly higher in the McGrath group than in the Macintosh group (95% vs. 74%, P = 0.013). Median IDS was also lower in the McGrath group (0 [0–0] vs. 0 [0–1], P = 0.018). There were no significant differences in success rate on intubation or haemodynamics between the two groups.

They thus, concluded that McGrath VL provides better laryngeal views and lower IDS but similar intubation times and success rates when compared with the Macintosh laryngoscope in children with normal airway.(7)

Ross M et al used a new size-1 blade for the McGrath MAC videolaryngoscope (Aircraft Medical, Edinburgh, UK) to facilitate intubation in neonate. The videolaryngoscope blade was passed to the right of the tongue and inserted into the vallecula to depress the hypoepiglottic ligament and lift the epiglottis. The direct laryngoscopy view was scored before scoring the indirect video image. They concluded that the video laryngoscopy view was improved over that obtained under direct laryngoscopy. As with any anterior and cephalad larynx, it was concluded that facilitating intubation in this age group was best achieved with a preloaded stylet inside the tracheal tube, with the greatest advantage of this new small videolaryngoscope blade being in the magnification of the view of the laryngeal inlet. There is a further advantage in the demonstration and training of neonatal intubation. The device emulates the traditional Macintosh laryngoscope in both design and the application of an appropriately sized blade to a standard handle.(5)

Ray DC et al observed that novices achieved a higher overall rate of successful tracheal intubation, avoided oesophageal intubation and produced less dental trauma when using the McGrath. The view at laryngoscopy was significantly better with the McGrath. Intubation times were similar for both laryngoscopes and became shorter with practice.

There was no difference in participants' rating of overall ease of use for each laryngoscope.(8)

These studies presented conflicting results and with use of video laryngoscopes still being in their nascent stages in neonatal age group made us conduct this study in our hospital.

So, we undertook this study to evaluate and compare the efficacy of Macintosh laryngoscope and McGrath video laryngoscope with a non channeled paediatric blade for glottic exposure time, intubation time, number of attempts of device insertion, optimization manoeuvres, and complications in neonatal patients in the age group up to 28 days.

- In our study , the demographic data were comparable in both the groups with respect to age, gender, weight and ASA physical status as shown in the Table 1.
- The difference between mean glottic exposure time in both the groups was statistically significant (the mean glottic exposure time was 11.02 $\pm$1.03 seconds in group G, while it was 13.96 $\pm$ 0.96 seconds in group M, .($p < 0.0001$) Table 2) as in group G no tongue displacement was required, hence the blade could be inserted quickly in the midline. This factor helped in reducing time to the best glottic view when compared with the Macintosh laryngoscope. In consensus with our study, Kim JE et al and Ross M et al reported that time to the best glottic view was shorter with McGrath Video-laryngoscope when compared with direct laryngoscopy.(7) and (5) , (Table 2).
- The difference between total duration of intubation in two groups was also statistically significant (time required for intubation in Group G was 18.83$\pm$ 0.96 sec and in Group M, it was 22.56 ±1.47 sec.($p < 0.0001$) Table 2) . Ray DC et al, Su YC et al and Kim JE et al also found comparable intubation time while using both of these scopes .(8), (9) and (6). Sun Yu et al and Giraudon A et al however, found shorter time to intubation using direct laryngoscopy while Orliaguet GA et al found McGrath video laryngoscope superior to direct laryngoscopy while comparing intubation time.(10) and (11), (12). (Table 2).
- Optimization maneuvers (ROTATION OF TUBE , WITHDRAWAL OR INSERTION OF SCOPE OR EXTERNAL LARYNGEAL PRESSURE) was required less in Group G (7/30) as compared to Group M.(11/30). (Table 2)
- The mean pulse rate (HR) and oxygen saturation was comparable in both the groups at every period. We did not encounter any episode of bradycardia, tachycardia and desaturation while our study.
- There were 2 cases of minor oropharyngeal trauma in Group G, while there were 6 cases of minor oropharyngeal trauma in group M, showing no significant difference between both the groups with P value being >0.05. Kim JE et al also showed lesser trauma while using McGrath video laryngoscope as compared to conventional Macintosh scope similar to the findings of our study.(7) (Table 2)
- There were no other significant complications like laryngospasm, bronchospasm, or esophageal intubation seen in either of the two groups.

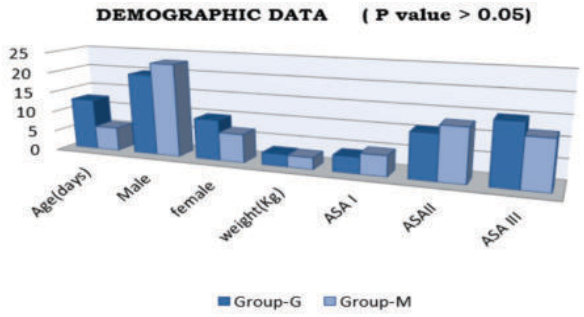
5. CONCLUSION

We conclude from our study that statistically lesser time was taken for glottic exposure and intubation in Group G (intubation done using

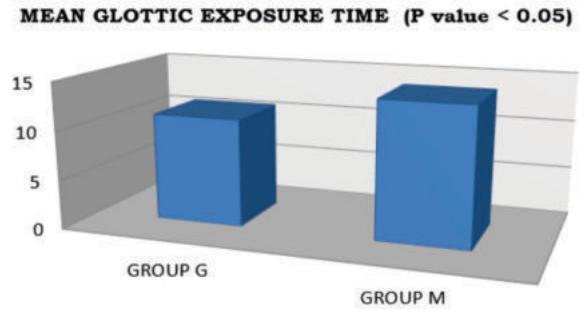
McGrathVLS) versus Group M (Intubation done using Macintosh laryngoscope)resulting in decrease number of attempts and lesser trauma.

6. Financial Support And Sponsorship
None.

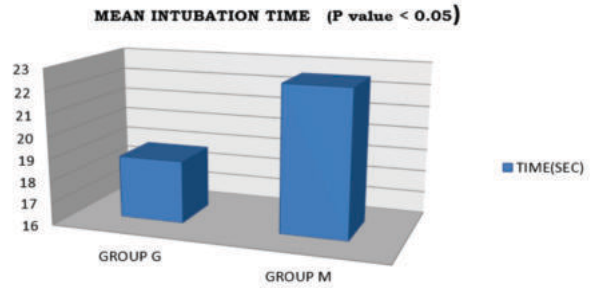
7. Conflicts Of Interest
None.
Clinical Trial Registration Number:(CTRI/2022/04/041925)



(Graph 1: Demographic Data)



(Graph 2 : Mean Glottic Exposure Time)



(Graph 3: Mean Intubation time)

REFERENCES:

1. Brambrink AM, Braun U. Airway management in infants and children. Best Pract Res Clin Anaesthesiol. 2005;19(4):675–97.
2. 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(12):1358–64.
3. Ramesh S, Jayanthi R, Archana SR. Paediatric airway management: What is new? Indian J Anaesth. 2012;56(5):448–53.
4. Moussa A, Luangxay Y, Tremblay S, Lavoie J, Aube G, Savoie E, et al. Videolaryngoscope for teaching neonatal endotracheal intubation: A randomized controlled trial. Pediatrics. 2016;137(3).
5. Ross M, Baxter A. Use of the new McGrath® MAC size-1 paediatric videolaryngoscope. Anaesthesia. 2015;70(10):1217–8.
6. Madziala M, Smereka J, Dabrowski M, Leung S, Ruetzler K, Szarpak L. A comparison of McGrath MAC® and standard direct laryngoscopy in simulated immobilized cervical spine pediatric intubation: a manikin study. Eur J Pediatr. 2017;176(6):779–86.
7. Kim JE, Kwak HJ, Jung WS, Chang MY, Lee SY, Kim JY. A comparison between McGrath MAC videolaryngoscopy and Macintosh laryngoscopy in children. Acta Anaesthesiol Scand. 2018;62(3):312–8.
8. Ray DC, Billington C, Kearns PK, Kirkbride R, Mackintosh K, Reeve CS, et al. A comparison of McGrath and Macintosh laryngoscopes in novice users: A manikin study. Anaesthesia. 2009;64(11):1207–10.
9. Su YC, Chen CC, Lee YK, Lee JY, Lin KJ. Comparison of video laryngoscopes with direct laryngoscopy for tracheal intubation: A meta-analysis of randomised trials. Eur J Anaesthesiol. 2011;28(11):788–95.
10. Sun Y, Lu Y, Huang Y, Jiang H. Pediatric video laryngoscope versus direct laryngoscope: A meta-analysis of randomized controlled trials. Paediatr Anaesth. 2014;24(10):1056–65.
11. Giraudon A, Bordes-Demolis M, Blondeau B, Sibai de Panthou N, Ferrand N, Bello M, et al. Comparison of the McGrath® MAC video laryngoscope with direct Macintosh laryngoscopy for novice laryngoscopists in children without difficult intubation: A randomised controlled trial. Anaesth Crit Care Pain Med. 2017;36(5):261–5.
12. Orliaguet GA, Blot RM, Bourdaud N, Egan M, Dogaru E, Salvi N, et al. Endotracheal intubation with the GlideScope®, the Airtraq®, the McGrath® videolaryngoscope and direct laryngoscopy: A comparative study on an infant manikin. Ann Fr Anesth Reanim.