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ORIGINAL ARTICLE

Device stability and quality of ventilation of classic laryngeal mask airway *versus* AIR-Q and I-gel at different head and neck positions in anesthetized spontaneously breathing children

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ABSTRACT

BACKGROUND: Since its introduction into clinical practice, the use of laryngeal mask airway (LMA) has been dramatically increasing. We aimed to investigate the clinical performance of single use LMA classic, AIR-Q and I-gel at different head and neck positions and during the operative procedure in pediatric elective day case surgery.

METHODS: One hundred sixty-eight generally anesthetized spontaneously breathing children (2-9 years) were randomized to receive either LMA classic (N.=56), I-gel (N.=58) or AIR-Q (N.=54). The oropharyngeal leak pressure (OLP), exhaled tidal volume (TV), peak inspiratory pressure (PIP), ventilation score and fiberoptic glottis view score were assessed at neutral position then at maximum flexion, extension and left rotation. Afterwards, the ventilation and fiberoptic view scores were assessed in neutral position at fixed time-points until end of surgery.

RESULTS: Compared to neutral position, maximum neck flexion increased OLP (P=0.000) and compromised the ventilation leading to increased PIP, decreased TV, worsening of ventilation score and fiberoptic glottis view. OLP mildly decreased with extension and left lateral rotation with mild effect on ventilation parameters (P<0.05). At all neck positions, the OLP was higher (P=0.000) and ventilation parameters were better with I-gel (P=0.000). Gradual worsening of ventilation score and fiberoptic view grade was recorded intraoperatively with the three devices, with the least deterioration observed in I-gel group (P=0.000).

CONCLUSIONS: Having the highest increase in OLP at neck flexion, the I-gel LMA exhibited the best ventilation parameters and fiberoptic view grade at different head and neck positions and throughout the intraoperative period.

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KEY WORDS: Anesthesia; Child; Laryngeal masks; Ventilation.

Since its introduction into clinical practice by Dr. Archie Brain in 1988, the use of laryngeal mask airway (LMA) has been dramatically increasing.[1] It has been modified to suit various applications in the operative theatre and during emergencies.[2-4] Compared to endotracheal intubation, the LMA is easier to insert[2] and is associated with faster recovery from anesthesia[5] and decreased incidence of airway complications such as postoperative sore throat, coughing, gagging, stridor, dysphagia and hoarseness of voice.[6, 7] The increased application of LMA has prompted its use in surgeries requiring various head and neck positions.[8] In contrast to endo-

tracheal tube, the change in head and neck position greatly affects the ventilation when using an LMA device.[8]

Changes in the position of the head and neck alter the shape of the pharynx leading to changes in the oropharyngeal leak pressure and the quality of ventilation through the LMA in both the adult and pediatric population.[8-10] However, having a large occiput and a relatively cephalically placed glottis, the ventilation in children is more compromised due to poor alignment of the pharyngeal–laryngeal axes during flexion of the head and neck.[11] Their hanging epiglottis covers the laryngeal inlet during flexion and the cuff of the LMA compresses the narrow laryngeal inlet both decreasing the delivered tidal volume.[10] Different changes occur during extension and lateral rotation.[8-10]

We aimed to investigate the clinical performance of the three commonly used LMAs in our institution for day case pediatric surgery namely; the single use LMA classic, the AIR-Q and the I-gel. Our primary endpoint was to compare the oropharyngeal leak pressures at different head and neck positions; the neutral, flexion, extension and left lateral position. Our secondary objectives were to assess the fiberoptic glottis view grading, ventilation quality, exhaled tidal volumes and peak inspiratory pressure at different head and neck positions and during the operative period.

Materials and methods

Ethical considerations

This randomized clinical trial was approved from the Medical Ethics Committee, faculty of medicine, Assiut university, Assiut, Egypt, registered before patient enrollment in the ClinicalTrials.gov trial registry (identifier: NCT02757820) and followed the regulations and amendments of Helsinki Declaration. A written informed consent was obtained from the patients' legal guardians.

The study involved children of either sexes (age 2-9 years, weight 15-30 kg) of American Society of Anesthesiologists (ASA) physical status I-II who were scheduled for elective outpatient surgery under general anesthesia in which airway management with LMA would be appropriate. Excluded from the study patients with active respiratory illness (cough, fever, rhinorrhea) on the day of anesthesia, potentially difficult airway, history of neck, respiratory, or digestive tract pathology and patients with gastroesophageal reflux, gastrointestinal stenosis or stricture.

Randomization

A random number sequence created by an internet website (www. random.org) was used for patients' allocation. The random number sequence was kept in sealed opaque envelopes that were opened the day of the surgery by an independent physician not involved in the study. Patients were randomly assigned to three groups (of 60 subjects each) to be anesthetized using either Classic LMA TM (Teleflex Medical, Wayne, PA, USA; group LMA classic), I-gel LMA (Intersurgical Ltd., Wokingham, UK; I-gel group) or AIR-Q ILA (ILA™, Cookgas LLC, Mercury Medical, Clearwater, FL, USA; AIR-Q group).

Study protocol

Patients were premedicated with oral midazolam (0.1 mg/kg) administered 30 minutes before induction of anesthesia. Routine monitoring included; ECG, pulse oximetry, non-invasive blood pressure, end tidal carbon dioxide and temperature. Standardized anesthetic protocol consisted of an inhalational induction with 8% sevoflurane in 70% oxygen/air mixture followed by intravenous access, then the administration of lidocaine 0.5 mg/kg, and propofol 2-3 mg/kg. Manual ventilation of the lungs continued until the heart rate was at least 20% lower than pre-propofol values. Adequate anesthetic depth was confirmed by the lack of a motor response to jaw thrust. A supplementary dose of 1 mg/kg propofol was administered if the depth of anesthesia was considered insufficient for device placement. Before placement, each device was lubricated with a thin film of water-based lubricant applied to the back, sides and front of the mask. A standard midline insertion technique was used for all devices, according to the manufacturer's recommendations. Study investigators experienced with the use of supraglottic airway devices (over 500 insertions with the LMA Unique) performed all the insertions. Size selection was

based on the patient's weight and according to manufacturer's recommendations for each type of the three investigated LMAs.

The child was placed in the anatomical 'sniffing position' and the device was directed posteriorly against the hard palate and advanced with continuous gentle pressure until resistance was felt. Manipulations such as jaw thrust or slight twisting of the device in the oropharynx were performed as required to aid insertion. The initial airway quality was evaluated with manual ventilation by adjusting APL valve to 15 cmH_2O and by the ventilation score.[12] It consists of three criteria; no leakage with an airway pressure of 15 cm H_2O, bilateral chest excursions with a peak inspiratory pressure of 20 cmH_2O, and a square wave capnogram, with each item scoring zero to one point and the total score is from zero to three. Thus, if all three criteria were satisfied, the ventilation score was three. Next, the airway device was taped, and the head was fixed in a neutral position. The time for successful insertion (in seconds) was recorded from the moment the laryngeal mask airway was picked up by the fingers until the first capnography upstroke after insertion. Insertion was considered failed if the device could not be successfully placed within three attempts, lacked a square-wave capnographic tracing, resulted in airway obstruction (diagnosed by oxygen desaturation <90%, abnormal thoracoabdominal movements, or obstructive noises), or there was inadequate ventilation (an inability to generate 7-10 mL/kg tidal volumes). Then, a muscle relaxant was given, endotracheal intubation was performed and the case was considered as failure to insert the device. The intra cuff pressure of the LMA classic and AIR-Q was adjusted using an aneroid cuff pressure gauge (Shiley™ Pressure Control, Covidien, Germany) and was limited to 40 cmH_2O. It was also checked after each change in head and neck position.

After confirming the correct placement of the device inserted, the exhaled tidal volume (TV), peak inspiratory airway pressure (PIP), the oropharyngeal leak pressure (OLP), fiberoptic glottic view score and ventilation score were recorded with the head and neck in the neutral position. Then the position of head and neck was changed to the maximal flexion (45° from neutral), maximal extension (up to 45°) and maximal left lateral rotation. These parameters were recorded 1 minute after each position.

Airway leak pressure was determined by closing the adjustable expiratory pressure-limiting (APL) valve and setting the fresh gas flow rate to 3 L/min. The airway pressure at which an audible leak was detected at the mouth and auscultated by placing the stethoscope over the patient's neck just lateral to the thyroid cartilage was recorded as the oropharyngeal leak pressure (OLP).[10] Airway pressures were not allowed to exceed 35 cmH_2O. When measuring oropharyngeal leak pressure, auscultation over the epigastrium was performed to detect the presence or absence of gastric insufflation.

The anatomical position of the device in relation to the glottis was investigated by inserting a fiberoptic laryngoscope. Before fiberoptic evaluation, 1mg/kg of propofol was administered to the patients. The breathing system was disconnected and the fiberoptic laryngoscope (11301BNX, diameter 5.5 mm; length 65 cm; Karl Storz, Tuttlingen, Germany) was inserted through the device to evaluate the glottic view. Oxygen was administered through the suction port throughout the procedure. Fiberoptic images were recorded using a digital camera and were stored on a personal computer for grading by an independent anesthetist. Fiberoptic images were graded with Brimacombe score that ranges from one to five; (grade1= only larynx seen, grade 2=larynx and epiglottis posterior surface seen, grade 3=larynx and epiglottis tip of anterior surface seen, <50%visual obstruction of epiglottis to larynx, grade 4=epiglottis down folded and its anterior surface seen, >50% visual obstruction of epiglottis to larynx and grade 5, *i.e.* epiglottis down folded and larynx cannot be seen directly).[13]

Device performance through the intraoperative period was assessed by the fiberoptic glottic view score and the ventilation score with the head and neck in the neutral position at 1 min (baseline), 15 min, 30 min, 45 minutes after insertion, and at the end of surgery. All patients were maintained with at least 2% sevoflurane in 50% oxygen/Air. No neuromuscular blocking drugs were administered, and the patient was left spontaneously breathing. At the end of the opera-

tion, the inhalation agent was discontinued, and the airway device was removed upon observing sufficient spontaneous ventilation and protective airway reflexes.

Perioperative adverse events were treated and recorded such as coughing and breath holding, laryngospasm, bronchospasm, gastric insufflations, desaturation (SpO_2<90%) and blood tinged mask.

Statistical analysis

Calculation of sample size

The primary outcome was the oropharyngeal leak pressure (OLP) at different head and neck positions. Secondary outcomes were the exhaled tidal volume, PIP, ventilation score and fiberoptic bronchoscopic glottis view score in each head and neck position.

Sample size calculation was based on the data of a previous study that compared the I-gel LMA in different head and neck positions using the oropharyngeal leak pressure as a primary endpoint.[14] In this study, the mean OLP in the neutral position was 23.2 (95% CI: 21.9-24.4) cmH_2O, 27.6 (95% CI: 26.3-28.8) cmH_2O with maximum flexion and 19.6 (95% CI: 18.3-20.8) cmH_2O with maximum extension. Using G*Power software 3.1.9.2 with ANOVA: Repeated measures, within factor F-test assuming effect size of 15% change in the OLP (of 3.5 cmH_2O) in the different head and neck positions compared with the neutral position, a minimum of 50 patients per group were required for a type I error of 0.05, and a power of 0.9 with Correlation set at 0.60 for all within factor measures. Sixty patients were enrolled in each group to compensate for the dropouts.

Data analysis

Date entry and analysis were done using IBM SPSS v. 22 (Statistical Package for Social Science). Data normality was tested with the Kolmogorov-Smirnov test. Data presented as mean and standard deviation with 95% confidence interval or absolute and percent frequencies. Student's *t*-test, Paired samples *t*-test, ANOVA test and Bonferroni *post-hoc* multiple comparison test were used for analysis of the normally distributed continuous data. Chi-squared test or Fisher's Exact test were used to analyze frequency variables as appropriate. A P value <0.05 was considered statistically significant (Table I).

Results

From June 2016 to April 2018, 186 patients were eligible for this study. One hundred and eighty patients were enrolled in the three groups (N.=60). Twelve patients discontinued the intervention because of arterial desaturation. Finally, 168 patients were subjected to statistical analysis (LMA classic group N.=56, I-gel group N.=58, and AIR-Q group N.=54) (Figure 1). The patients' demographic characteristics and clinical data showed no significant differences between groups (Table II). The supraglottic devices investigated were inserted successfully from the first attempt in all patients. The mean insertion time in I-gel group was 10.9±1.4 (95% CI: 10.3-11.2 s) *vs*. 13.7±1.1 s (95% CI: 13.4-13.9 s) and 14.8±1.2 s (95% CI: 14.5-15.2 s), in LMA classic and AIR-Q groups, respectively (P=0.000) (Table II).

In the neutral position, the oropharyngeal leak pressure was higher in I-gel group (24.5±1.8

TABLE I.—*Power analysis.*

We performed the analysis[1]	*A priori*
on the primary outcome	Oropharyngeal leak pressure (OLP) cmH_2O
based on the two-tailed statistical test	ANOVA: repeated measures
and accepting the cutoff for significance (α)	P≤0.05
and a power (1–β) of	0.90
We evaluated the variability of the primary outcome (standard deviation) as	The original study reported the primary outcome in mean and 95% CI of23.2 (21.9-24.4) cmH_2O
based on data taken from	Jain *et al*.[14]
We considered as clinically relevant a difference of	The calculated 15% difference in the OLP was 3.5 cmH_2O (approximated to 4 cmH_2O)
The needed sample size was	50 per group

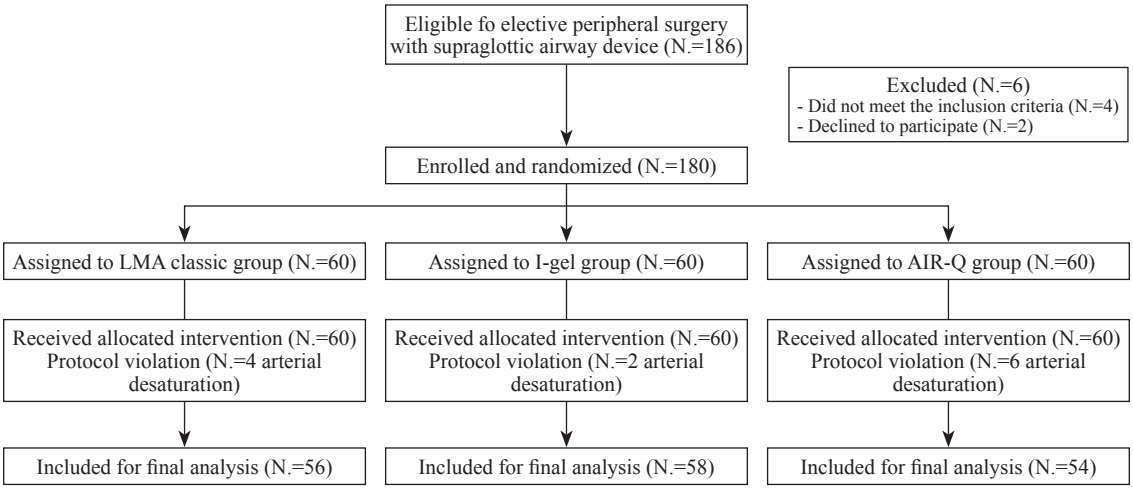

Figure 1.—Participant flow diagram.

cmH_2O, 95% CI: 23.9-24.9 cmH_2O), compared with LMA classic (22.4±1.3 cmH_2O, 95% CI: 22.1-22.8 cmH_2O) and AIR-Q group (21.6±1.3 cmH_2O, 95% CI: 21.2-21.9 cmH_2O) (P=0.000). During flexion, the OLP pressure increased in the three groups with the highest increase recorded in the I-gel group patients (P=0.000). It decreased in the three groups during extension and left lateral rotation (Figure 2). The PIP in the neutral position was lower in I-gel group (14.8±0.7 cmH_2O, 95% CI: 14.6-15.0 cmH_2O) compared with LMA classic group (15.5±0.7 cmH_2O, 95% CI: 15.3-15.7 cmH_2O) and AIR-Q group (15.7±0.9 cmH_2O, 95% CI: 15.4-15.9 cmH_2O), (P=0.000). It significantly increased during flexion and decreased during extension and left lateral rotation in the three groups with the lowest PIP values in I-gel group (P=0.000) (Table III). The exhaled tidal volume significantly decreased during flexion with minimal change during extension and left rotation in the three groups. The highest values were recorded in the I-gel group compared with the LMA classic and AIR-Q groups in all head and neck positions (P=0.000) (Figure 3).

TABLE II.—*Patients demographic, clinical data and postoperative adverse effects.*

Characteristics	LMA classic group (N.=56)	I-gel group (N.=58)	Air-Q group (N.=54)	P value
Mean age, years	5.1±1.5	5.5±1.6	4.8±1.3	0.079
Range	2.9-8.1	2.9-8.3	2.8-8.0	
Weight, kg	21.1±4.9	22.8±4.6	20.9±4.5	0.052
Height, cm	106.7±8.7	109.8±9.0	106.4±8.4	0.055
ASA Class I/II	56/0	58/0	54/0	–
Mallampati Class I/II	45/11	49/9	44/10	
TMD, cm	4.9±0.7	5.1±0.7	4.9±0.7	0.345
Mouth opening, cm	3.8±0.6	4.0±0.6	3.8±0.5	0.133
Anesthesia time, min	70.9±8.2	71.8±7.3	72.6±6.9	0.434
Operation time, min	58.7±7.4	59.3±6.9	59.7±7.5	0.708
Insertion time, s	13.7±1.1	10.9±1.4	14.8±1.2	0.000
95% CI	13.4-13.	10.5-11.2	14.5-15.2	
Adverse effects				
Gastric insufflation	14 (25%)	7 (12.1%)	12 (22.2%)	0.187
Blood tinged mask	22 (39.3%)	8 (13.8%)	22 (40.7%)	0.002
Cough	9 (16.1%)	0 (0.0%)	11 (20.4%)	0.002

Data presented as mean±SD with 95% confidence interval, absolute frequency and percentages.
ASA: American Society of Anesthesiologists; TMD: thyromental distance.
P<0.05: significant difference between groups.

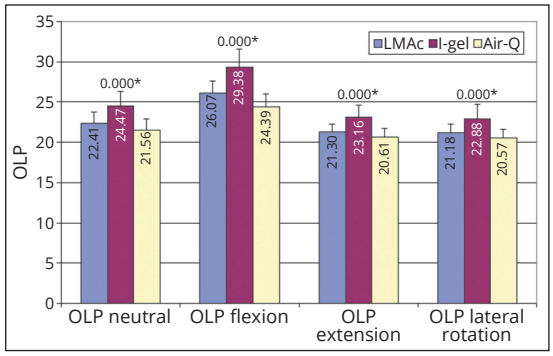

Figure 2.—The oropharyngeal leak pressure (OLP) during different head and neck positions. Data presented as mean±SD. The vertical axis represents the OLP in cmH_2O. P<0.05; significance between groups.

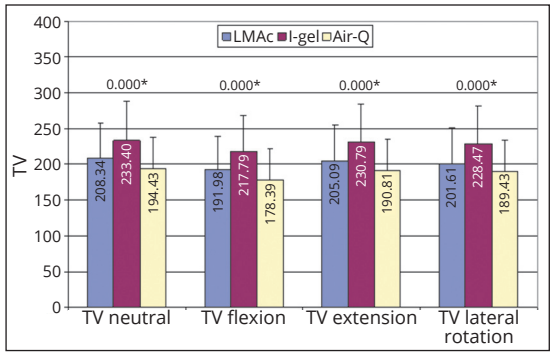

Figure 3.—The exhaled tidal volume (TV) during different head and neck positions. Data presented as mean±SD. The vertical axis represents the exhaled tidal volume in mL. P<0.05; significance between groups.

TABLE III.—*Device performance during different head and neck positions (PIP, ventilation score and fiberoptic glottic view score).*

Parameter	LMA classic group (N.=56)	I-gel group (N.=58)	Air-Q group (N.=54)	P value[1]	P value[2]	P value[3]
PIP, cmH_2O						
Neutral	15.5±0.7 (15.3-15.7)	14.8±0.7 (14.6-15.0)	15.7±0.9 (15.4-15.9)	0.000	0.507	0.000
Flexion	18.4±0.9* (18.1-18.6)	17.1±0.9* (16.9-17.4)	18.7±1.0* (18.4-18.9)	0.000	0.168	0.000
Extension	14.5±0.8* (14.3-14.7)	13.7±0.9* (13.5-13.9)	14.9±0.7* (14.8-15.2)	0.000	0.000	0.000
Lateral rotation	14.5±0.7* (14.3-14.7)	13.9±0.8* (13.7-14.2)	14.8±0.7* (14.3-15.0)	0.001	0.016	0.000
Glottic view						
Neutral	41/9/5/0/1	53/5/0/0/0	28/18/7/0/1	0.034	0.125	0.000
Flexion	7/31/8/5/5*	33/21/2/1/1*	3/17/13/16/5*	0.000	0.013	0.000
Extension	27/18/10/0/1	48/9/0/1/0	14/21/11/7/1*	0.000	0.023	0.000
Lateral rotation	18/21/9/5/3*	40/16/0/1/1*	4/16/13/17/4*	0.000	0.002	0.000
Ventilation Score (3/2/1/0)						
Neutral	56/0/0/0	58/0/0/0	48/6/0/0	–	0.012	0.011
Flexion	13/43/0/0*	45/13/0/0*	6/48/0/0*	0.000	0.093	0.000
Extension	34/22/0/0*	57/1/0/0	17/37/0/0*	0.000	0.002	0.000
Lateral rotation	17/39/0/0*	48/10/0/0*	6/48/0/0*	0.000	0.013	0.000

Data presented as mean±SD with 95% confidence interval, absolute frequency.
PIP: peak inflation pressure; P value[1]: significance between LMA classic group and I-gel group; P value[2]: significance between LMA classic group and Air-Q group; P value[3]: significance between I-gel group and Air-Q group (P<0.05).
*Intra-group significance compared to the neutral position (P<0.05).

Neck flexion induced a significant decrease in the ventilation score, more than at extension and left rotation (P=0.000). Intergroup comparison showed significantly higher ventilation scores in the I-gel group patients in all head and neck positions (P=0.000) (Table III). The fiberoptic view significantly deteriorated after neck flexion and to a milder degree after extension and left rotation in the three studied groups. I-gel group patients showed the best views at all neck positions (P=0.000) (Table III).

In terms of device performance intraoperatively, both the ventilation score and the fiberoptic view score significantly gradually deteriorated throughout the operative procedure in the three studied groups (P=0.000). The least deterioration was recorded in the I-gel group (P=0.000) (Table IV, Supplementary Digital Material 1: Supplementary Figure 1).

Adverse effects recorded in this study were; gastric insufflation (14 *vs*. 7 and 12 patients, P=0.187), blood tinged mask (22 *vs*. 8 and 22

TABLE IV.—*Device performance during the intraoperative period (ventilation score and fiberoptic glottic view score).*

Parameter	LMA classic group (N.=56)	I-gel group (N.=58)	Air-Q group (N.=54)	P value[1]	P value[2]	P value[3]
Ventilation Score (3/2/1/0)						
Baseline	56/0/0/0	58/0/0/0	54/0/0/0	–	–	–
15 min after insertion	53/3/0/0	58/0/0/0	35/19/0/0*	0.000	0.115	0.000
30 min after insertion	27/29/0/0*	57/1/0/0	10/44/0/0*	0.000	0.000	0.001
45 min after insertion	12/44/0/0*	52/6/0/0*	1/53/0/0*	0.000	0.000	0.001
At end of surgery	3/53/0/0*	34/24/0/0*	1/53/0/0*	0.000	0.000	0.618
Fiberoptic glottic view score (5/4/3/2/1)						
Baseline	44/8/3/1/0	57/1/0/0/0	38/10/5/0/1	0.012	0.011	0.537
30 min after insertion	15/19/12/6/4*	42/13/1/1/1*	4/14/6/24/6*	0.000	0.000	0.000
45 min after insertion	7/16/10/9/14*	36/15/2/4/1*	2/10/6/19/17*	0.000	0.000	0.061
At end of surgery	5/12/12/9/18*	29/20/1/5/3*	1/6/4/17/26*	0.000	0.000	0.014

Data presented as absolute frequency.
*Intra-group significance compared to baseline value (P<0.05).
P value[1]: significance between LMA classic group and I-gel group; P value[2]: significance between LMA classic group and Air-Q group; P value[3]: significance between I-gel group and Air-Q group (P<0.05).

patients, P<0.002) and cough (9 *vs*. 0 and 11 patients, P<0.002) in the LMA classic, I-gel and AIR-Q groups, respectively (Table II).

Discussion

The results of this study showed that maximum neck flexion increased the OLP and compromised the ventilation in spontaneously breathing children leading to increased PIP, decreased exhaled tidal volumes, worsening of the ventilation score and the fiberoptic glottis view grade in the three devices investigated. The OLP mildly decreased with extension and left lateral rotation with mild effect on ventilation parameters. Monitoring device performance throughout the intraoperative period showed gradual increase in the PIP and gradual worsening of the ventilation score and fiberoptic glottis view score in the three devices investigated. The I-gel LMA exhibited the best ventilation parameters and fiberoptic view grade at different head and neck positions tested and throughout the intraoperative period.

Our results are similar to those of previous studies that showed a significant increase in the OLP in the maximally flexed neck position in anesthetized paralyzed children while using the classic LMA,[15] Proseal LMA[16] or I-gel.[14] In contrast, our patients were spontaneously breathing throughout the procedure, as this is the popular protocol for day-case surgery.

The higher OLP recorded during neck flexion improves the airway seal with less liability of gastric insufflation during ventilation.[17] However, the effect of increased OLP on the quality of ventilation is debatable. While maximum flexion maintains ventilation quality in anesthetized paralyzed adults using Proseal LMA[18] and air-Q® SP,[8] it seriously worsens ventilation in many pediatric studies.[14-16] Jaine *et al.* concluded that in extreme head and neck flexion caution must be warranted when using I-gel in anesthetized paralyzed children owing to deterioration of ventilation. Despite the high OLP they recorded during flexion, the airway pressure increased, exhaled tidal volume reduced with poor fiberoptic view grading. Moreover, one of their patients showed obstruction during maximum neck flexion that relieved when resumed to the neutral position.[14] Lee *et al*. concluded that the flexed head and neck positions negatively affected ventilation due to obstruction of the airway while using AuraGain LMA in anesthetized paralyzed children.[10] Gupta et al demonstrated the same findings using I-gel and Laryngeal Mask Airway Supreme in anesthetized spontaneously breathing children.[19] Pediatric airway peculiar anatomy namely, the large occiput, cephalic larynx and the large folded epiglottis explains these findings.[11]

The three devices investigated in this study showed the same changes during neck flexion. However, the I-gel had the least deterioration compared with the LMA classic and AIR- Q.

Despite being significant, mild effect on the

quality of ventilation was recorded during extension and left lateral rotation in this study. Our findings are in agreement with many adult and pediatric studies that reported mild decrease in the OLP with mild or no effect on the exhaled tidal volumes and PIP, compared to the neutral position.[14-18]

The fiberoptic findings we recorded in this study are in agreement with previous results for the classic LMA, I-gel and Air-Q in which neck flexion narrowed the pharynx and deteriorated the glottis view.[14-18, 20] However, in this study, the least deterioration in fiberoptic view grading was recorded in patients anesthetized with I-gel compared with the classic LMA and Air-Q.

Maintaining efficient ventilation with the SAD throughout the operative procedure is not guaranteed. In this study, we recorded progressive decrease in ventilation score and deterioration in fiberoptic view grading throughout the operative procedure. Most of studies on SAD, compared different types of SAD in terms of ease of insertion, insertion time, sealing performance and airway morbidity.[21] However, positional stability of the SAD and the quality of ventilation it produces throughout the operation is an area of research that is not clarified.

In terms of hypo-pharyngeal airway morbidity and adverse effects, we recorded decreased incidence of perioperative complications with the I-gel LMA compared with the classic LMA and Air-Q. These results are in accordance with previous studies that compared the I-gel with different types of LMAs.[7, 14, 16, 19, 22]

Limitations of the study

A limitation to this study was that the investigators that performed the assessments were not blind to the head and neck positions and SAD investigated. Blinding the patients' head and neck was not feasible. In addition, most studies in such topic were performed in an un-blinded approach.[8, 14, 16]

Conclusions

In conclusion, the I-gel was easier to insert than the LMA classic and AIR-Q in anesthetized spontaneously breathing children. The I-gel LMA exhibited the best ventilation parameters and fiberoptic view grade at different head and neck positions tested and throughout the intraoperative period. It may be the supraglottic airway device of choice for those patients.

What is known

• The use of laryngeal mask airway (LMA) in pediatric day-case surgery is dramatically increasing. Unlike the endotracheal intubation, positional stability of the LMA and the quality of ventilation it produces are questionable.

• We investigated the clinical performance of single use LMA classic, AIR-Q and I-gel at different head and neck positions and during the operative procedure in pediatric elective day-case surgery.

What is new

• Neck flexion increased OLP and compromised the ventilation leading to increased PIP, decreased TV, worsening of ventilation score and fiberoptic glottis view. The I-gel LMA exhibits the best ventilation parameters and fiberoptic view grade at different head and neck positions and throughout the intraoperative period in anesthetized, spontaneously breathing children.

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