Self-Pressurized Airway Device with Blocker versus Proseal at Different Head and Neck Positions

Reham Ali Abdelhaleem Abdelrahman[a*], Nesrine Abdelrahman El-Refai[a], Fatma Elsayed Aboharga[b], Shady Abo El ela[a] , Ahmed Kamal Mohamed Taha[b]

[a]Department of Anesthesia, Surgical ICU and Pain Management, Faculty of Medicine, Cairo University, Kasr Al-Ainy, 11562, Cairo, Egypt.

[a]Department of Anesthesia, Surgical ICU and Pain Management, Faculty of Medicine, Tanta University, Tanta, Egypt.

Abstract

Background: Supraglottic airway devices (SADs) are commonly employed in anesthetic practice due to their ease of placement and ability to secure the airway effectively.

Objectives: This study aimed to investigate the influence of various head and neck positions on ventilation parameters when using the Air-Q Self Pressurized Airway Device with Blocker (SP-Blocker) in comparison to the ProSeal Laryngeal Mask Airway (PLMA).

Patients and methods: A total of 140 adult female patients (ASA I&II) were included in the final analysis and divided equally permitting 70 patients in each group and scheduled for elective gynecologic laparotomy under general anesthesia. Measurements were initially taken in the neutral head position, followed by flexion, extension, and rotation in a randomized order. The parameters examined were oropharyngeal leak pressure (OLP), peak inspiratory pressure (PIP), expiratory tidal volume (ETV), fiber-optic view score, and ventilation score.

Results: In comparison with the neutral position, both devices showed increased OLP and PIP during flexion and reduced values during extension, with minimal differences observed in the rotated position. SP-Blocker demonstrated significantly higher OLP and PIP values than PLMA in both the neutral and flexed positions ($p < 0.0001$), but lower values in extension ($p = 0.0006$). ETV and ventilation scores remained stable for both devices during flexion, although PLMA was superior in extension ($p<0.0001$). The SP-Blocker provided better fiber-optic visualization of the glottis in all head and neck positions ($p < 0.0001$), except during flexion, where visualization was reduced for both devices, with the PLMA showing poorer performance ($p=0.0016$).

Conclusions: Both devices performed adequately during neck flexion; however, PLMA was more effective in maintaining ventilation during neck extension.

Keywords: Anesthesia; Supraglottic airway device; Head and neck position; Oropharyngeal leak pressure; Tidal volume; Glottis; Ventilation; Pneumoperitoneum.

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*Correspondence rehamali72@hotmail.com

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Introduction

Supraglottic airway devices (SADs) have emerged as practical alternatives to endotracheal intubation in planned surgical interventions under general anesthesia. Their widespread use stems from their straightforward application and reliable performance **(Cook and Cranshaw, 2005; Keller et al., 1999; Kim et al., 2007, 2017; Okuda et al., 2001).** However, their efficacy may be influenced by head and neck positioning **(Somri et al., 2016).** For example, neck flexion reduces the anteroposterior diameter of the pharynx by relaxing the muscles, while neck extension widens the airway by elevating the laryngeal inlet **(Park et al., 2009).**

Contemporary SADs such as the I-gel and Air-Q devices are designed without the need for manual cuff inflation **(Sanuki et al., 2011)**. In this study, two second-generation SADs are compared: the Air-Q Self Pressurized Airway Device with Blocker® (SP-Blocker) and the ProSeal Laryngeal Mask Airway™ (PLMA).

The PLMA is a reusable silicone device featuring dual lumens that allow for gastric tube insertion and reduce the risk of gastric insufflation. Device sizing is weight-based, and cuff inflation is monitored with a manometer to maintain a pressure of 60 cmH_2O **(Mishra et al., 2015).**

In contrast, the SP-Blocker is a single-use PVC device with a self-sealing, soft cuff. It has a wide orifice designed for automatic pressure regulation, reducing the risk of mucosal trauma. Its flexible guide channel accommodates suction and blocker tubes, facilitating pharyngeal suctioning and esophageal separation **(Galgon et al., 2012; Jagannathan et al., 2011).**

Because movements of the head and neck can alter both the shape and dimensions of the pharyngeal airway, thereby impacting oropharyngeal leak pressure (OLP) and ventilation efficiency. While the performance of PLMA in different head positions is well documented, limited evidence exists for the SP-Blocker.

Adequate positive pressure ventilation (PPV) requires an SAD to maintain a high OLP and low peak inspiratory pressure (PIP), with minimal leakage, thereby preserving consistent inspiratory and expiratory tidal volumes. Devices that Support this balance are particularly beneficial in patients with challenging airways.

The goal of this study was to evaluate how different head and neck positions as neutral, flexed, extended, and rotated positions impact OLP, PIP, inspiratory tidal volume (ITV), expiratory tidal volume (ETV), leak volume (LV), leak fraction (LF), and fiber-optic view, using the PLMA and SP-Blocker in adult female patients undergoing elective gynecologic laparotomy.

Patients and methods

This prospective, randomized, comparative clinical trial conducted in the Gynecology Department at Cairo University Hospitals on adult female patients classified as ASA (American Society of Anesthesiologists) physical status I or II, scheduled for elective gynecological laparotomy. The study involved the use of either the ProSeal Laryngeal Mask Airway (PLMA, **Fig.1A**) **(Mishra et al., 2015)** or the SP-Blocker device (**Fig.1B**) **(Galgon et al., 2012; Jagannathan et al., 2011)**.

Exclusion Criteria included body mass index ≥35 kg/m^2, an El-Ganzouri risk index ≥5, or who were currently pregnant were excluded from participation.

(A) (B)

Fig.1. (A) Proseal Laryngeal Mask Airway (PLMA), (B): Air Q Self-Pressurized Airway Device with Blocker(SP-Blocker)

Ethical approval was initially granted in 2017 (Reference No. N-95-2017) and subsequently renewed in 2024 (Reference No.N-188-2024) by the institutional Research Ethics Committee. The study was prospectively registered on ClinicalTrials.gov (Identifier: NCT04421261) on June 4, 2020, prior to recruitment commencement. All participants provided written informed consent before inclusion. The enrollment process followed the CONSORT flowchart as illustrated in (**Fig.2).**

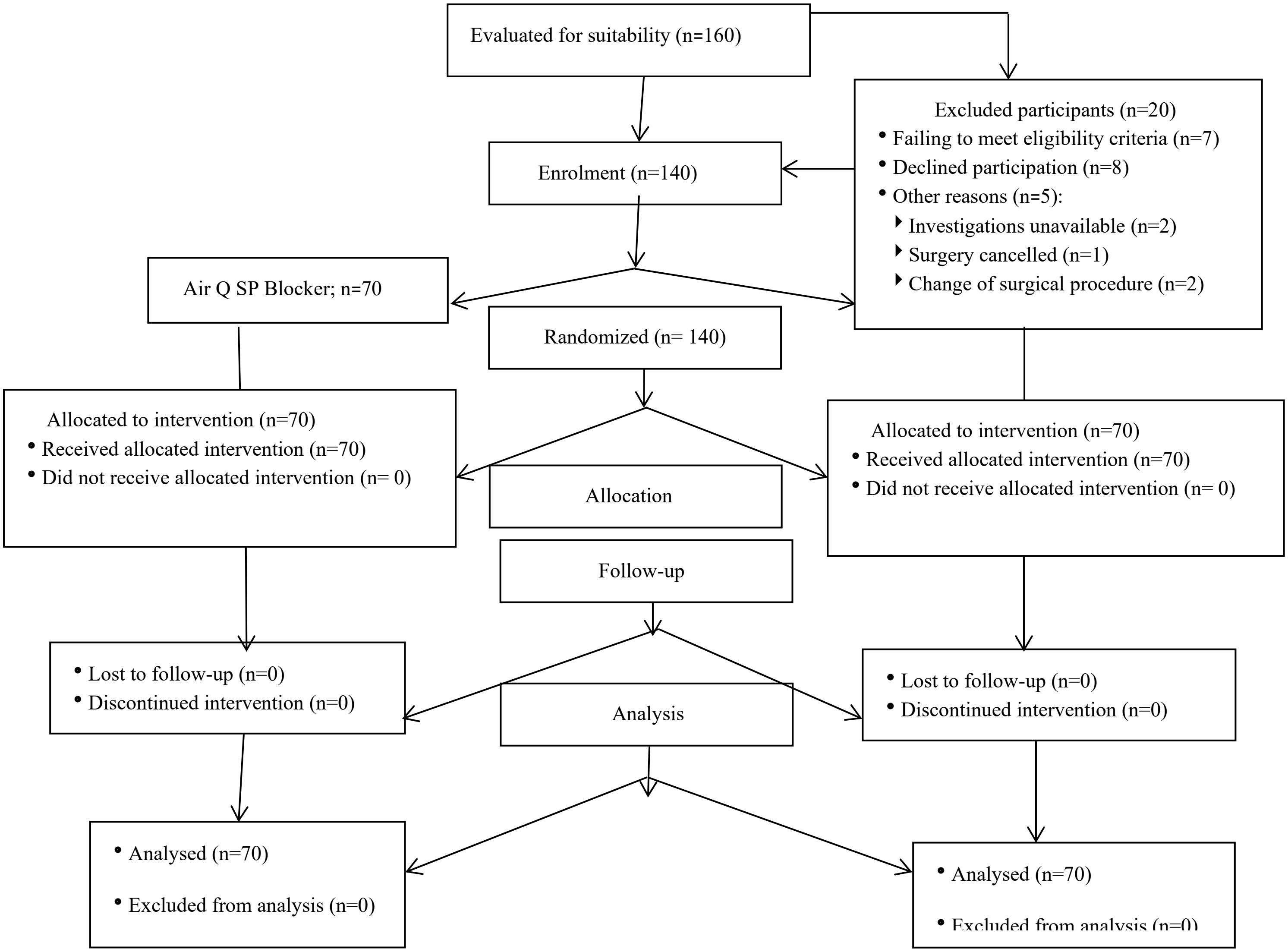

Fig.2. Consort Flow Chart Diagram

Randomization

Participants were sequentially enrolled and randomly allocated in a 1:1 ratio to either the PLMA or SP-Blocker group using an online tool (http://www.randomizer.org). Allocation concealment was ensured using sealed, opaque, and consecutively numbered envelopes and the patients were divided into two groups. The individual who handled the randomization data did not participate in clinical management or any procedural steps. Due to the nature of the intervention, full and complete blinding was not achievable, particularly for the different head and neck positions, which could not be obscured, even with physical shielding.

Anesthetic Management

Anesthesia was initiated intravenously with propofol (2 mg/kg), fentanyl (1 µg/kg), and rocuronium (0.3 mg/kg), followed by mask ventilation with 3–4% sevoflurane for three minutes. After achieving complete muscle paralysis (TOF = 0), the assigned supraglottic airway device (SAD) was inserted. A square-wave capnographic pattern, bilateral chest expansion, and the absence of audible air leakage during manual ventilation confirmed proper positioning. Each patient was allowed a maximum of two insertion attempts. If unsuccessful, tracheal intubation was performed and the patient was withdrawn from the study. Volume-controlled ventilation was used with a tidal volume of 10 mL/kg (based on actual body weight), a respiratory rate of12 breaths/min, and a fresh gas flow of 4 L/min to maintain $ETCO_2$ between 30–40 mmHg. Anesthesia was sustained using sevoflurane and intermittent IV boluses of rocuronium (0.1 mg/kg), titrated according to peripheral nerve stimulator monitoring. Pethidine (0.5 mg/kg IV) was administered for intraoperative analgesia. SADs were removed along with drain tubes following confirmation of adequate spontaneous breathing. Postoperative analgesia consisted of 1 g of IV paracetamol, repeated every 6 hours as needed.

The main outcome was OLP in various head and neck positions using PLMA and SP-Blocker. OLP was defined as the airway pressure at which a leak was audible at the mouth when the adjustable pressure-limiting (APL) valve was fully closed and a 3 L/min gas flow was applied while the patient was apneic. For safety, a ceiling value of 40 cmH_2O was set for OLP **(Kim et al., 2017; Ismail Youssef et al., 2024).**

Secondary outcomes: included peak inspiratory pressure (PIP), the maximum pressure observed at end-inspiration, which reflects airway resistance and pulmonary compliance; the OLP-PIP difference; expiratory tidal volume (ETV); ventilation scores; and fiber-optic glottic view scores. All these parameters were assessed in four distinct head and neck positions: neutral, flexed, extended, and rotated. Fiber-optic and ventilation scores were also recorded periodically in the neutral position until the procedure concluded.

Sample Size Calculation

Due to limited prior data on SP-Blocker, a preliminary pilot study was conducted. Nine patients using the SP-Blocker showed mean OLP values of 28.7±3.7 cmH_2O (neutral), 32.2±3.9 cmH_2O (flexion), 22.6±2.7 cmH_2O (extension), and 27.1±3.2 cmH_2O (rotation). Assuming a maximum inter-positional OLP difference of 5.1±3.6 cmH_2O for SP-Blocker and 4±4.11 cmH_2O for PLMA **(as per Mishra et al., 2015)**. Considering the difference of (6.1-4=1.1) cmH_2O to be the lowest clinically relevant variations in OLP between SP-Blocker and PLMA respectively, we measured a standardized difference (d) (target difference divided by SD) of 0.31 (1.1/3.6=0.31). n $(2/d^2)$ x $C_{p, power}$; variables in this equation were: n=number of individuals needed in each group, d=standardized difference, and $C_{p, power}$ =represents a constant determined by the specified values for the p-value and power. As $C_{p, power} = C_{0.05,90\%}$ =10.5, so 62 patients would be necessary for each research group; where: $n=2/(0.58)^2$ X 10.5= (2/0.34) X 10.5= 62. To compensate for potential dropouts, the sample size was increased by 10%, resulting in 70 participants per group. Therefore, the total required sample was 140 patients.

Statistical analysis

Statistical analysis was conducted using SPSS version 25 (IBM Corp., Chicago, IL, USA). Continuous data (expressed as mean ± standard deviation) were tested for normality using the Shapiro-Wilk test. Group comparisons were made using Student's t-test for means and the F-test for standard deviations. Categorical data were presented as frequencies and percentages and assessed using the Chi-squared test. Hemodynamic variables were analyzed via the Kruskal-Wallis one-way ANOVA with Dunn's post hoc test for multiple comparisons. A p-value <0.05 was considered statistically significant.

Results

Between July 2020 and December 2021, a total of 160 patients were randomized. After excluding 20 individuals, 140 participants remained eligible for final analysis, with equal allocation into two groups of 70 patients each, as outlined in Figure 2. All insertions of both the SP-Blocker and PLMA devices were successfully completed on the first attempt. Baseline demographic characteristics showed no statistically significant differences between the two groups **(Table.1).**

Table 1. Patients demographics

Parameter	PLMA (n=70)	Air-Q SP-Blocker (n=70)	p value
Age (years)	42.8±11.5	44.61±10.3	0.33
Weight (kg)	54.2±7.8	55.6±9.9	0.35
Height (cm)	168±4	167±5	0.19
BMI(kg/m^2)	20.2±2.4	20.63±2.58	0.31
ASA I&II: (№) (%)	67(95.7%) / 3(4.3%)	65(92.8%) / 5(7.2%)	0.46
El-Ganzouri multivariate risk index: (№) (%)			
0	25(35%)	27(36%)	
1	10(14%)	13(20%)	0.37
2	11(15%)	16(24%)	
3	19(28%)	10(15%)	
4	5(8%)	4(5%)	

Continuous normal variables are presented as mean ±SD (means compared by using Student's t-test, and SD compared by using F-test). Categorical data are presented as numbers and percentages using the Chi-squared test. (p>0.05): statistically not significant. (*): statistically significant (p<0.05). BMI: Body Mass Index

Neutral and Rotated Head Positions

In both neutral and rotated positions, the SP-Blocker group demonstrated significantly higher OLP, lower peak inspiratory pressure (PIP), a greater OLP-PIP gradient, and superior fiber-optic glottic view scores compared to the PLMA group. However, no statistically significant differences were found in expiratory tidal volume (ETV) or ventilation scores between the groups. Within-group comparisons revealed no significant changes in any measured parameter (OLP, PIP, OLP-PIP, fiber-optic view score, ETV, or ventilation score) between neutral and rotated positions **(Table.2 ,3).**

Table (2): Device performance during different head and neck positions regarding OLP, PIP, (OLP-PIP), Expiratory Tidal Volume (ETV) and Ventilation Score

Parameters	PLMA (n=70)	Air-Q SP-Blocker (n=70)	p value
I. Oropharyngeal Leak Pressure (OLP) (cmH2O)			
Neutral	24±3.69	29±3.4	< 0.0001
Flexion	27±3.77*	35±3.8*	< 0.0001
Extension	21±3.21*	19±3.5*	0.0006
Lateral rotation	24±3.6	29±3.31	< 0.0001
II. Peak Inspiratory Pressure (PIP) (cmH$_2$O)			
Neutral	15±0.19	12.1±1.1	< 0.0001
Flexion	17±1.23*	15.5±2.38*	< 0.0001

Extension	13±1.06*	8±2.1*	< 0.0001
Lateral rotation	15±0.11	12.2±1.2	< 0.0001
III. (OLP-PIP)			
Neutral	10.5±3.59	17±2.3	< 0.0001
Flexion	12.5±2.39*	20±1.42*	< 0.0001
Extension	9.3±1.15*	6.5±1.4*	< 0.0001
Lateral rotation	10.3±3.51	17±2.1	< 0.0001
IV. Expiratory Tidal Volume (ETV) (ml/kg)			
Neutral	10.1±0.6	10±0.7	0.37
Flexion	10.1±0.6	10±0.7	0.37
Extension	10±0.4	8±1.53*	< 0.0001
Lateral rotation	10±0.7	10.1±0.68	0.39
V. Ventilation Score (3/2/1/0)			
Neutral	64/6/0/0	68/2/0/0	0.15
Flexion	64/6/0/0	68/2/0/0	0.15
Extension	64/6/0/0	7/63/0/0*	<0.0001
Lateral rotation	64/6/0/0	68/2/0/0	0.15

Continuous normal variables are presented as mean ±SD (means compared by using Student's t-test, and SD compared by using F-test). Categorical data are presented as numbers using the Chi-squared test. p>0.05: statistically not significant. p<0.05: statistically significant. Intra-group comparisons with referral to the neutral position are marked by (*) (which means statistically significant i.e., p<0.05).

Table 3. Fiber-optic glottis view score of both devices during different head and neck positions

Parameters	PLMA (n=70)	Air-Q SP-Blocker (n=70)	p value
Neutral	40/20/10/0/0	65/4/1/0/0	<0.00001
Flexion	30/18/22/0/0*	49/5/16/0/0*	0.0016
Extension	43/18/9/0/0	68/1/1/0/0	<0.00001
Lateral rotation	40/20/10/0/0	65/4/1/0/0	<0.00001

Fiber-optic glottis view score [Brimacombe score (№) (%)] (4/3/2/1/0):[4; only vocal cords visible/ 3; vocal cords plus posterior epiglottis visible/ 2; vocal cords plus anterior epiglottis visible/ 1; vocal cords not seen, but function adequate/ 0; vocal cords not seen and failure to function.]. Categorical data are presented as numbers and percentages and analyzed using the Chi-squared test. (p>0.05): statistically not significant. (*): statistically significant (p<0.05). Intra-group comparisons with referral to the neutral position are marked by (*) (which means statistically significant i.e., p<0.05).

Flexion and Extension Positions

Within-group analysis showed that, relative to the neutral position, both OLP and PIP increased significantly during neck flexion and decreased during extension. The OLP-PIP difference followed the same trend.

- **PLMA Group:** No significant changes in ETV or ventilation scores were observed during either flexion or extension. The fiber-optic glottic view score remained unchanged during extension but showed a marked decline during flexion.
- SP-Blocker Group: While ETV and ventilation scores were maintained during flexion, they significantly deteriorated during neck extension. The fiber-optic view score was unaffected during extension but declined during flexion relative to the neutral position.
- Between-groups comparison revealed that SP-Blocker provided significantly lower OLP, PIP, and OLP-PIP values

during extension and significantly higher values during flexion compared to the PLMA group (p < 0.0001). Ventilation and ETV scores did not differ significantly between devices during flexion, but during extension, these scores declined notably in the SP-Blocker group while remaining stable in the PLMA group (p<0.0001).

- As shown in (**Table.3),** the SP-Blocker consistently yielded better fiber-optic glottic views than PLMA across all positions (p<0.00001), except the flexed position. Even in flexion, where visualization was suboptimal for both devices, SP-Blocker still outperformed PLMA (p=0.0016), despite the epiglottis and vocal cords being only partially visible.

Time-Based Observations

At predefined intraoperative intervals, ventilation scores remained stable in both groups. However, the PLMA group exhibited a progressive decline in fiber-optic view scores throughout the surgery, while the SP-Blocker group maintained consistent visualization quality, as summarized in (**Table.4**).

Table 4. Device performance during the intraoperative period (Ventilation score and Fiber-optic glottis view score)

Parameters	PLMA (n=70)	Air-Q SP-Blocker (n=70)	p value
I. Ventilation score (3/2/1/0)			
Baseline	64/6/0/0	68/2/0/0	0.15
15 minutes after device insertion	64/6/0/0	68/2/0/0	0.15
30 minutes after device insertion	63/7/0/0	65/5/0/0	0.55
45 minutes after device insertion	61/9/0/0	65/5/0/0	0.79
At the end of surgery	57/13/0/0	64/6/0/0	0.49
II. Fiber-optic glottis view score [Brimacombe score (№) (%)] (4/3/2/1/0):			
Baseline	40/20/10/0/0	65/4/1/0/0	<0.00001
30 min. after device insertion	39/20/11/0/0	65/3/2/0/0	<0.00001
45 min. after device insertion	35/15/20/0/0	63/5/2/0/0	<0.00001
At end of surgery	30/4/36/0/0*	62/4/4/0/0	<0.00001

Categorical data are presented as numbers using the Chi-squared test. p>0.05: statistically not significant. p<0.05: statistically significant. Intra-group comparisons with referral to the neutral position are marked by (*) (which means statistically significant i.e., p<0.05).

Discussion

This study compared the clinical performance of SP Blocker versus PLMA and revealed that the SP Blocker group showed higher OLP, lower PIP and higher (OLP-PIP) than the PLMA group during different head and neck positions, except in extended positions, where the PLMA group showed higher parameters than the SP Blocker group. Moreover, both groups demonstrated adequate ventilation scores and ETV in various head and neck positions, except in extended positions, where the PLMA group showed better ventilation scores and ETV compared to the SP Blocker group. The investigators documented that SP Blocker was presented with a better fiber-optic glottis view score than PLMA throughout various positions. During the entire operative time, the SP-Blocker and

PLMA groups showed preserved ventilation scores, with a gradual intraoperative worsening of the fiber-optic glottis view score in the PLMA group, whereas it remained preserved in the SP-Blocker group.

SADs are safer than face masks through the provision of a glottis seal **(Moser et al., 2017).** Air-Q family included: standard Air-Q (Air-Q ILA), Air-Q Blocker and Air-Q SP**(Kim et al., 2017; Jagannathan et al., 2012; Galgon et al., 2011; Ismail Youssef et al., 2024; Bakker et al., 2010; Ahn et al., 2016; Darlong et al., 2014; Youssef et al., 2014; Hwang et al., 2019).** SP-Blocker is an enhanced disposable PVC-made version of standard Air-Q representing a revolution in SAD_s design **(Shehata et al., 2020).** Our discussion centered on SP-Blocker's functions, which are identical to those of standard Air-Q and Air-Q SP airways.

The results of our research align with earlier studies, which have shown a substantial decrease in OLP while utilizing classic LMA or flexible LMA in extended neck posture **(Keller and Brimacombe, 1999; Buckham et al., 1999)**, PLMA**(Park et al.,2009; Brimacombe and Keller, 2003),** I-gel **(Sanuki et al., 2011),** or Air-Q SP Airway **(Kim et al., 2017).** The decrease in OLP happened due to the enlargement of the anterior-posterior diameter of the pharyngeal space, which was caused by the upward movement of the laryngeal inlet and the hyoid when the neck was stretched. Consequently, the pharynx's pressure on the cuff of the LMA decreased **(Park et al., 2009; Brimacombe and Keller, 2003).** In this study, neck extension was found to reduce the occurrence of OLP. The mean OLP of the SP-Blocker was smaller than the indicated minimal airway sealing pressure of 20 cmH_2O, which is necessary for sufficient lung ventilation and to prevent gastric aspiration **(Brimacombe et al., 1999).** Additionally, the measured OLP of the SP-Blocker had been reduced compared to the reported OLP values of other LMA types, like the PLMA **(Park et al., 2009; Brimacombe and Keller, 2003)** or I-gel **(Sanuki et al., 2011).** Furthermore, our study found a significant reduction in ETV and ventilation score while utilizing the extended neck position with SP-Blocker, which is consistent with a previous study that used Air-Q SP airway **(Kim et al., 2017).** However, this is in contrast to showed adequate ventilation that was preserved while utilizing the PLMA **(Park et al., 2009)** or I-gel **(Sanuki et al., 2011)** in the extended neck positioning. This mismatch may have arisen due to the ability to inflate the massive ventral and dorsal cuffs of the PLMA with air, which allows them to fill the expanded pharynx resulting from neck elongation. Furthermore, the inflatable cuff of the I-gel has a substantial anterior-posterior width that adequately occupies the enlarged pharyngeal space caused by neck extension. Still, the adjustable cuff of the SP-Blocker appears to be unable to occupy the greater pharyngeal area. Consequently, when the neck was elongated using the SP-Blocker, a leakage developed around the cuff, resulting in an insufficient tidal volume. According to our findings, the SP-Blocker ought to be utilized with cautiousness in the extended neck position, and it must be determined whether the leak around the cuff is accompanied by sufficient or insufficient ventilation before beginning the operation, while PLMA may be more secure compared to SP-Blocker with extended neck positioning.

Previous research on the PLMA, flexible LMA, classic LMA, and Air Q SP Airway has shown that the flexed position leads to a higher OLP compared to the neutral position. This conclusion aligns with our study **(Kim et al., 2017; Okuda et al., 2001; Park et al., 2009; Keller and**

Brimacombe, 1999; Buckham et al., 1999; Brimacombe and Keller, 2003; Xue et al., 2008). The SP-Blocker is designed to fit the back of the pharynx, ensuring that its airway opening is aligned with the inlet to the larynx. This leads to a notable rise in OLP throughout the procedure, surpassing the performance of the PLMA. This might explain why the SP-Blocker provides more OLP than the PLMA while the neck is flexed. Furthermore, several studies on PLMA have demonstrated that head flexion improves the quality of breathing **(Park et al., 2009; Xue et al., 2008).**The researchers regarded the rise in OLP caused by neck flexion as advantageous since it enhanced the seal between the cuff and the pharynx without negatively impacting breathing. Nevertheless, prior research on the I-gel has shown insufficient airflow when the neck is flexed, as evidenced by a significant reduction in the ventilation score **(Jain et al., 2015; Mishra et al., 2015).** However, in the current investigation, the ventilation score and ETV were preserved when the neck was flexed using PLMA and SP-Blocker, despite an elevation in OLP. Furthermore, the difference in our findings regarding insufficient ventilation with the I-gel may be due to the non-inflatable cuff of the I-gel, the limited space for air passage, and the straighter form of the airway tube compared to the SP-Blocker and PLMA.

Our findings indicate that an increased PIP is necessary when the neck is flexed to achieve the same TV as in the neutral position. This phenomenon may have arisen due to the reduction in the anterior-posterior diameter of the pharynx caused by neck flexing. Additionally, the cuff of the SP-Blocker had been completely compressed and readily flattened by the adjacent tissues, resulting in partial occlusion of the airway. Nevertheless, the heightened obstruction of the airway during head flexion didn't appear to be essential, as sufficient airflow was sustained at comparable levels to those seen in neutral positioning.

The fiber-optic observations in our investigation were consistent with previous outcomes regarding the classic LMA. It was observed that neck flexion resulted in the narrowing of the pharynx and the posterior deflection of the epiglottis, leading to a greater obstruction of the fiber-optic view **(Kim et al., 2017; Okuda et al., 2001).** However, it should be noted that the fiber-optic view does not always correspond with the effectiveness of ventilation using the LMA **(Brimacombe and Keller, 2003; Xue et al., 2008)**. Despite considerable alteration in fiber-optic vision caused by flexed neck positions, breathing was sufficient in the majority of participants in our research.

Prior research on the PLMA, Air-Q SP airway, and I-gel studies have shown that rotated neck positioning has no impact on OLP or breathing when compared to the neutral position. These findings align with the findings of our study **(Park et al., 2009; Sanuki et al., 2011).**

Prior investigations on the flexible LMA have shown that the OLP in the rotating position was either similar to or lower than that of the neutral position. This pressure drop may be attributed to the absence of transmitted force throughout the airway tube **(Kim et al., 2017; Buckham et al., 1999; Keller and Brimacombe, 1999).** Conversely, in prior investigations of the traditional LMA, the OLP exhibited an increase when the position was rotated **(Buckham et al., 1999; Brimacombe and Keller, 2003).** Based on our results, we found that adequate ventilation could be achieved in the rotated neck position by using either SP-Blocker or PLMA.

Prior research on PLMA has shown a more substantial decrease in OLP when using the device in the extended neck posture. This contrast has shown a more significant reduction in OLP when using the device in the extended neck posture compared to other devices. The PLMA has a lower anterior-posterior diameter and a cuff design that differs from the laryngeal tube suction and corbra peri-laryngeal airway **(Park et al., 2009).**This means that the size and/or form of the PLMA may be linked to its decreased ability to create a tight seal when the neck is extended. Nevertheless, Park and colleagues documented that the PLMA yielded a satisfactory average OLP value of [18.5(5.4) cmH_2O] when the neck was extended. Furthermore, it didn't cause any difficulties in breathing, despite a significant decrease in OLP of (mean variation −8.00 cmH_2O) **(Park et al., 2009).** Furthermore, the PLMA was shown to have no negative impact on the ventilation score or fiber-optic vision when the head and neck positions were altered, as indicated by studies **(Mann et al., 2012; Park et al., 2009; Mishra et al., 2015).**

The OLP is crucial for safeguarding the larynx and providing sufficient ventilation since it serves as the sealing mechanism of SADs **(Kim et al., 2015).**Brimacombe and colleagues proposed that the OLP ought to exceed 10 cmH_2O since this is the estimated fluid pressure in the posterior pharyngeal cavity **(Brimacombe et al., 1996).** The findings regarding SP-Blocker were in line with the original data presented by Kim et al., which showed that 39% of instances using the air-Q self-pressurizing airway in the extended neck positions experienced an OLP of fewer than 10 cmH_2O. Furthermore, apart from inadequate airway safety, the air-Q self-pressurizing airway didn't adequately support ventilation in the extended neck positions, as indicated by a reduction in ETV and ventilation score **(Kim et al., 2017).**

At regular fixed time points intraoperatively, the investigators recorded that the ventilation score was maintained in both groups compared to the baseline value. However, the fiber-optic grading deteriorated more in the PLMA group compared to the SP Blocker group, which showed no changes in fiber-optic score compared to the baseline score. This could be due to the improved design of SP-Blocker, including a keyhole-shaped ventilating orifice for resting epiglottis and raised heel of mask cuff, which can elevate epiglottis and center larynx maximizing space for fiber-optic bronchoscope resulting in better view of the laryngeal inlet with SP-Blocker than PLMA offering a better chance to position endotracheal tube if needed at correct tracheal depth **(Schebesta et al., 2014).** This finding became in agreement with studies examining the standard Air-Q which reported a better fiber-optic view when Air-Q is compared with first-generation SAD_s **(Ha et al., 2018)** and second generation SADs **(Aly and Ghanem, 2017; Moorthy et al., 2019),** but at odds with studies showing no difference in fiber-optic glottis view between Air-Q Blocker and PLMA **(Youssef et al., 2014)** and Air-Q ILA and PLMA **(Galgon et al., 2011).**
Several limitations should be acknowledged. First, it was not possible to eliminate instrument selection bias, as the anesthesiologist could identify the device based on its distinct external appearance. Second, all airway insertions were conducted by a senior anesthesiologist, which may restrict the applicability of the findings to less experienced practitioners. Blinding concerning head and neck positioning was also not feasible due to the visible nature of posture changes. Lastly, the relatively small sample size, limited to female patients with normal airway anatomy, may limit the generalizability of the results to cases involving difficult airways or broader populations.

Conclusion

Both the PLMA and SP-Blocker proved effective and safe for use during neck flexion. However, the PLMA demonstrated superior performance compared to the SP-Blocker when the neck was placed in an extended position.

References

- **Ahn EJ, Choi GJ, Kang H, Baek CW, Jung YH, Woo YC. (2016).** Comparative efficacy of the Air-Q intubating laryngeal airway during general anesthesia in pediatric patients: A Systematic Review and Meta-Analysis. Biomed Research International, 11pages. Article ID 6406391
- **Aly AA, Ghanem MT. (2017).** Comparison of the performance of the Self-Pressurized Air-Q Intubating Laryngeal Airway with LMA-Proseal in pediatric patients under general anesthesia: a randomized controlled trial. Ain Shams Journal of Anesthesiology, 10 (1):149-155.
- **Bakker EJ, Valkenburg M, Galvin EM. (2010).** Pilot Study of the Air-Q Intubating Laryngeal Airway in clinical use. Anaesth Intensive Care, 38(2):346-48.
- **Brimacombe J, Berry A, Brain AI. (1996).** Optimal intra-cuff pressures with the laryngeal mask. Br J Anaesth, 77(2): 295–296.
- **Brimacombe J, Keller C. (2003).**Stability of the LMA-ProSeal and standard laryngeal mask airway in different head and neck positions: a randomized crossover study. Eur J Anaesthesiol, 20 (1); 65-69.
- **Brimacombe JR, Keller C, Gunkel AR, Pühringer F. (1999).** The influence of the tonsillar gag on efficacy of seal, anatomic position, airway patency, and airway protection with the flexible laryngeal mask airway: a randomized, cross-over study of fresh adult cadavers. Anesth Analg, 89(1):181-186.
- **Buckham M, Brooker M, Brimacombe J, Keller C. (1999).** A comparison of the reinforced and standard laryngeal mask airway: ease of insertion and the influence of head and neck position on oropharyngeal leak pressure and intracuff pressure. Anaesth Intensive Care, 27(6): 628–631.
- **Cook TM, Cranshaw J. (2005).** Randomized crossover comparison of ProSeal Laryngeal Mask Airway with Laryngeal Tube Sonda during anaesthesia with controlled ventilation. Br J Anaesth, 95(2): 261–266.
- **Darlong V, Biyani G, Baidya DK, Pandey R, Punj J. (2014).** Air-Q blocker: A novel supraglottic airway device for patients with difficult airway and risk of aspiration. J Anaesthesiol Clin Pharmacol, 30(4):589-590.
- **Galgon RE, Schroeder KM, Joffe AM, Han S, Andrei A. (2011).** The air-Q ®intubating laryngeal airway vs. the LMA-Proseal TM: a prospective, randomized trial of airway seal pressure. Anaesthesia, 66(12): 1093-1100.
- **Galgon RE, Schroeder K, Joffe AM. (2012).** The self-pressurising air-Q® Intubating Laryngeal Airway for airway maintenance during anaesthesia in adults: a report of the first 100 uses. Anaesth Intensive Care, 40 (6):1023-1027.
- **Ha SH, Kim MS, Suh J, Lee JS. (2018).** Self-pressurized air-Q® intubating laryngeal airway versus the LMA® Classic TM: a randomized clinical trial. Canadian Journal of Anesthesia, 65(5): 543-550.
- **Hwang J, Hong B, Kim YH, Lee WH, Jo Y, Youn S, et al. (2019).** Comparison of laryngeal mask airway supreme TM as non-inflatable cuff device and self-pressurized air-Q TM in children:

Randomized controlled non-inferiority study. Medicine (Baltimore), 98(10): e 14746.
- **Ismail Youssef MM, Dobal NM, Hammad YM, El-Refai NAR, Abdelrahman RAA. (2024).** Comparison between Air-Q Self Pressurized Airway Device with Blocker and Proseal Laryngeal Mask Airway in anesthetized paralyzed adult female patients undergoing elective gynecological operations. Anaesthesiol Intensive Ther., 56 (2):108-120.
- **Jagannathan N, Sohan LE, Sawardekar A, Shah R, Ryan R, Jagannathan R, et al. (2012).** A randomized comparison of Self-Pressurized Air-Q™ Intubating Laryngeal Airway with the LMA-Unique™ in children. Anaesthesia, 67(9): 973-979.
- **Jagannathan N, Sohn LE, Mankoo R, Langen KE, Roth AG, Hall SC. (2011).**Prospective evaluation of the self-pressurized air-Q intubating laryngeal airway in children. Paediatr Anaesth, 21(6):673-680.
- **Jain D, Ghai B, Bala I, Gandhi K, Banerjee G. (2015).** Evaluation of I-gel airway in different head and neck positions in anesthetized paralyzed children. Paediatr Anaesth, 25 (12): 1248–1253.
- **Keller C, Brimacombe J. (1999).** The influence of head and neck position on oropharyngeal leak pressure and cuff position with the flexible and the standard laryngeal mask airway. Anesth Analg, 88(4): 913–916.
- **Keller C, Brimacombe JR, Keller K, Morris R. (1999).** Comparison of four methods for assessing airway sealing pressure with the laryngeal mask airway in adult patients. Br J Anaesth, 82(2): 286–287.
- **Kim HJ, Lee K, Bai S, Kim MH, Oh E, Yoo YC. (2017).** Influence of head and neck position on ventilation using the air-Q® SP airway in anaesthetized paralyzed patients: a prospective randomized crossover study. Br J Anaesth, 118(3): 452–457.
- **Kim JT, Jeon SY, Kim CS, Kim SD, Kim HS. (2007).** Alternative method for predicting optimal insertion depth of the laryngeal tube in children. Br J Anaesth, 99(5): 704–707.
- **Kim MS, Lee JH, Han SW, Im YJ, Kang HJ, Lee JR. (2015).** A randomized comparison of the i-gel with the self-pressurized air-Q intubating laryngeal airway in children. Paediatr Anaesth, 25(4): 405–412.
- **Mann V, Mann S, Rupp D, Rohrig R, Weigand M, Muller M. (2012).** Influence of head position and neuromuscular block on the clinical efficacy of supraglottic airway devices. A prospective randomized study to compare the laryngeal tube suction (LTS) with the proseal laryngeal mask. [German]. Notfall Rettungsmed, 15 (2):136–141.
- **Mishra SK, Nawaz M, Satyapraksh MVS, Parida S, Bidkar PU, Hemavathy B, et al. (2015).** Influence of Head and Neck Position on Oropharyngeal Leak Pressure and Cuff Position with the ProSeal Laryngeal Mask Airway and the I-Gel: A Randomized Clinical Trial. Anesthesiol Res Pract, 2015 (Article ID 705869): 7 pages.
- **Moorthy PVC, Desai D, Upadhyay MR. (2019).** Comparison of the Air-Q intubating laryngeal airway with the Proseal laryngeal mask airway in elective surgeries: A randomized controlled study. Indian J Clin Anaesth, 6(3):349-354.

- **Moser B, Audige L, Keller C, Brimacombe J, Gasteiger L, Bruppacher HR. (2017).** Flexible bronchoscopic intubation through the AuraGain TM laryngeal mask versus a slit Guedel tube: a non-inferiority randomized-controlled trial. Can J Anesth, 64 (11): 1119-28.
- **Okuda K, Inagawa G, Miwa T, Hiroki K. (2001).** Influence of head and neck position on cuff position and oropharyngeal sealing pressure with the laryngeal mask airway in children. Br J Anaesth, 86(1): 122–124.
- **Park SH, Han SH, Do SH, Kim JW, Kim JH. (2009).** The influence of head and neck position on the oropharyngeal leak pressure and cuff position of three supraglottic airway devices. Anesth Analg, 108 (1): 112–117.
- **Sanuki T, Uda R, Sugioka S, Daigo E, Son H, Akatsuka M, et al. (2011).** The influence of head and neck position on ventilation with the i-gel airway in paralysed, anaesthetised patients. Eur J Anaesthesiol, 28(8): 597–599
- **Schebesta K, Karanovic G, Krafft P, Rossler B, Kimberger O. (2014).** Distance from the glottis to the grille: the LMA Unique, Air-Q and Cobra PLA as intubation conduits: a randomized trial. Eur J Anaesthesiol, 31(3):159-165.
- **Shehata JI, El-Refai NA, Yousef MI, Dobal NA, Mohamed AA, Abo El Ella KM, et al. (2020).** A Prospective Randomized Comparative Study Between The Self-Pressurized Air-Q With Blocker And Air-Q Blocker In Female Patients Undergoing Minor Gynecological Procedures. J Anesthesia and Clinical Care, 7(1): 100047.
- **Somri M, Vaida S, Fornari GG, Mendoza GR, Charco-Mora P, Hawash N etal., (2016).** A randomized prospective controlled trial comparing the laryngeal tube suction disposable and the supreme laryngeal mask airway: the influence of head and neck position on oropharyngeal seal pressure. BMC Anesthesiol,16 (87): 123.
- **Xue FS, Mao P, Liu HP, Yang QY, Li CW, He N, et al. (2008).** The effects of head flexion on airway seal, quality of ventilation and orogastric tube placement using the ProSeal (TM) laryngeal mask airway. Anaesthesia, 63(9): 979–985.
- **Youssef MMI, Lotfy M, Hammad Y, Elmenshawy E. (2014).** Comparative study between LMA-Proseal TM and Air-Q® Blocker for ventilation in adult eye trauma patients. Egyptian Journal of Anaesthesia, 30(3):227-233.