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Comparison of I-Gel and Auragain in Airway Management

Havayolu Yönetiminde I-Gel ile Auragain Kullanımının Karşılaştırılması

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ABSTRACT

Objective: We aimed to compare the superiority of I-Gel and Auragain, the second-generation supraglottic airway devices (SGAD) with different cuff structures, in terms of speed and ease of placement, oropharyngeal leak pressure (OLP), resistance of gastric contents, and post-operative oropharyngeal pain.

Materials and Methods: A total of 70 patients aged 18-65 years, with ASA scores I-II, who used I-Gel or Auragain to provide airways under general anesthesia were included in the study. Patients were divided into two groups as I-Gel and Auragain according to the type of SGAD used.

Results: OLP, placement duration and Visual Analogue Score (VAS) were found to be statistically significantly higher in the Auragain group ($p<0.05$). In addition, a moderate positive correlation was found between VAS score and placement duration and number of attempts ($p<0.05$). Gastric decompression success was similar in both groups ($p>0.05$).

Conclusion: The use of I-Gel provides faster airway and less postoperative throat ache. The use of Auragain provides more efficient ventilation and higher OLP values. In addition, throat ache increases with the number of attempts and the duration of placement in both groups.

Keywords: Airway management, Auragain, I-Gel, oropharyngeal leak pressure

ÖZ

Amaç: Kaf yapıları birbirinden farklı olan ikinci nesil supraglottik havayolu araçları (SGAD)' ndan I-Gel ve Auragain'in yerleştirme hızı ve kolaylığı, oluşturdukları orofaringeal kaçak basıncı (OKB), mide içeriğinin direnajı, post-operatif orofarinkste neden oldukları ağrı bakımından birbirlerine olan üstünlüklerini karşılaştırılmayı amaçladık.

Materyal ve Metot: Çalışmaya 18-65 yaş arası, ASA skoru I-II olan, genel anestezi altında havayolu sağlanması için I-Gel veya Auragain kullanılan toplam 75 hasta dahil edildi. Hastalar kullanılan SGAD türüne göre I-Gel ve Auragain olarak iki gruba ayrıldı.

Bulgular: OKB, yerleştirme süresi ve Vizüel Analog Skala (VAS) skorlarının Auragain grubunda istatistiksel olarak anlamlı düzeyde yüksek olduğu bulundu ($p<0.05$). Ayrıca VAS skoru ile yerleştirme süresi ve deneme sayısı arasında pozitif yönde orta düzey korelasyon saptandı ($p<0.05$). Her iki grubun mide dekompresyonu başarısı ise benzer bulundu ($p>0.05$).

Sonuç: I-Gel kullanımı ile daha hızlı havayolu sağlanmakta ve daha az postoperatif boğaz ağrısı oluşmaktadır. Auragain kullanımı ise daha etkin ventilasyon ve daha yüksek OKB değeri sağlamaktadır. Ayrıca her iki grupta da deneme sayısı ve yerleştirme süresinin fazla olması ile boğaz ağrısı artmaktadır.

Anahtar Kelimeler: Auragain, havayolu yönetimi, I-Gel, orofaringeal kaçak basıncı

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INTRODUCTION

Difficulty in airway management is a major cause of morbidity and mortality in anesthesia practice. Every anesthesiologist aims to start anesthesia with confidence.[1] The introduction of the Laryngeal Mask Airway (LMA) has eased the approach to airway management. There have also been changes in airway management application algorithms. New supraglottic airway devices (SGAD) have been a powerful alternative to tracheal intubation.[2] Despite these advantages SGAD also have disadvantages such as difficulty in placement, inability to provide effective ventilation and risk of aspiration of gastric contents. The second-generation SGAD are superior to the previous generation with easier placement, more effective ventilation and lower aspiration risk with their structures suitable for airway anatomy and the gastric canal they contain.[3] I-Gel and Auragain are second generation SGAD that provide perilaryngeal closure with these properties.[4]

I-Gel is an innovative supraglottic airway device with a soft, gel-like, and transparent structure made of thermoplastic elastomer suitable for medical use. Its non-inflated cuff structure separates the pharyngeal, laryngeal and perilaryngeal structures and, unlike inflatable cuffs, prevents trauma due to compression.[4] Ambu Auragain is an airway device used as an alternative to a face mask to establish and maintain the airway in emergency and routine anesthesia applications. It allows gastric access and intubation.[4]

In this study, we aimed to compare the superiority of I-Gel and Auragain, the second-generation SGAD with different cuff structures, in terms of speed and ease of placement, oropharyngeal leak pressure (OLP), resistance of gastric contents, and postoperative oropharyngeal pain.

MATERIALS AND METHODS

Ethics Committee Approval: Our study was approved by the University of Health Sciences, Haydarpaşa Numune Training and Research Hospital, Ethics Committee (Date: 18.04.2022, decision no: 79). The study was carried out in accordance with international guidelines. Written informed consent was obtained from all patients before the procedure.

Research Design: Between 04.05.2022 and 14.07.2022, 75 patients aged 18-65 years, with American Society of Anesthesiologists (ASA) score I-II, who used I-Gel or Auragain to provide airway under general anesthesia were included in the study. Patients younger than 18 years and older than 65 years, ASA score 3 or more, obese (BMI >35), with predicted general anesthesia duration of 3 hours or longer, with risk of difficult airway (mallampathy 3-4) or history of difficult intubation, with oral and pharyngeal pathology, having nausea-vomiting and with aspiration risk were excluded. Patients were divided into two groups as I gel (Group I) or Auragain (Group II) according to the supraglottic airway device used.

Data Collection: All patients were premedicated with midazolam 0.05 mg/kg/iv 30 min before elective surgery. Patients brought to the operating room were monitored with DII-lead electrocardiography, blood pressure (non-invasive), peripheral oxygen saturation (SpO_2).

All patients underwent induction of general anesthesia with 1-2 mcg/kg fentanyl, 2 mg/kg propofol and 0.6-1.2 mg/kg rocuronium bromide protocol, which is the standard protocol in our hospital. The patient was ventilated with 100% FiO_2 on manual/bag ventilation with a face mask. After loss of eyelash reflex, airway was established using either I-Gel or Auragain airway instruments and the patient was connected to the anesthesia device. The study included anesthesiology and reanimation clinic physicians with at least 4 years of experience. The type and size of SGAD used by the anesthesia team for the patient were recorded. Duration of successful placement, number of attempts, and transition to tracheal intubation in case of unsuccessful placement were recorded. Successful placement duration was measured as the time between the end of bag-valve ventilation and the connection of the placed SGAD to the breathing circuit and the appearance of square waves on the capnograph.

After the cuff was inflated, the cuff pressure was measured with a cuff manometer and lowered so that it did not rise above 40 cmH_2O. In both groups, the measurement of OLP after SGAD placement was determined and recorded using manometer stability test. During the manometer stability test, the Adjustable Pressure-Limiting valve was closed to 40 cmH_2O to prevent barotrauma and if no leakage sound was still heard, this value was recorded in the case report form.

After successful placement, the largest lumen aspiration catheter that could pass through the gastric canal of the two SGAD was advanced. The epigastric region was auscultated while 20 ml of air was sent into the stomach with an aspiration probe using a syringe to avoid gastric regurgitation. The probe that reached the stomach was aspirated with a syringe and successful cases were recorded.

After the surgical procedure was completed, intravenous and inhaled anesthetic agents used for maintenance of anesthesia were discontinued and the patient was awaited to wake up. After the patient's airway protective reflexes returned and the patient was able to respond to verbal commands, the SGAD was removed. The duration of SGAD use (from ini-

tial placement to removal) was recorded as the duration of the operation.

After awakening from general anesthesia, patients were taken to the recovery room for complete recovery and observation. The patients were monitored by two nurses on duty until transferred to ward. At 60 minutes in the postoperative recovery room, the responsible researcher asked the patient to evaluate the presence or absence of sore throat according to the Visual Analog Scale (VAS) score (0= no pain, 10= intolerable pain) and the score declared by the patient was recorded on the case report form.[5]

Power Analysis: The minimum number of patients to be included in the study was found to be 50 in the sample size analysis calculated by taking type 1 error 0.05, type 2 error 0.05, effect size 0.94 (reference values group 1=20.83±2.90 (n=30) group 2=20.93±3.11 (n=30).[6] Considering the possible losses, 70 patients were included in the study to increase the statistical power.

Statistical Analysis: IBM SPSS Statistics 22 (IBM SPSS Turkiye) program was used for data analysis. While evaluating the study data, conformity of the parameters to normal distribution was evaluated using the Shapiro Wilks test. While evaluating the study data, in the context of comparing descriptive statistical methods (Mean, Standard deviation, frequency) and comparing quantitative data, Student t test was used for comparison of normally distributed parameters between two groups and Mann Whitney U test was used for comparison of non-normally distributed parameters between two groups. Chi-Square test was used to compare qualitative data. Significance was evaluated at $p<0.05$.

RESULTS

The mean age of the 70 patients included in our study was 45.61±12.59 years (min=18, max=65). Demographic characteristics, ASA and Mallampati Scores of the patients according to the groups are presented in Table 1.

The success of gastric decompression according to the type of SGAD was similar in both groups (Table 2).

According to the type of SGAD, OLP, placement duration and VAS scores were found to be statistically significantly higher in the Auragain group (Table 3).

Table 1. Sociodemographic characteristics and ASA and Mallampati Scores by groups.

		SGAD Type n (%) or 'Mean±SD'		p
		I-Gel (n:35)	AG (n:35)	
Gender	Female	18(56.3)	14(43.8)	0.472
	Male	17(44.7)	21(55.3)	
ASA	1	5(62.5)	3(37.5)	0.710
	2	30(48.4)	32(51.6)	
Age		45.49±12.07	45.74±13.26	0.874
BMI		26.25±3.71	24.88±3.32	0.055
Mallampati I/II		15/20	15/20	1

SGAD: Supraglottic Airway Devices; **SD:** Standard deviation **AG:** Auragain; **ASA:** American Society of Anesthesiologists; **BMI:** Body Mass Index.

Table 2. Comparison of gastric decompression by type of SGAD.

			SGAD Type		p
			I-GEL	AG	
Gastric Decompression	Yes	n	21	24	0.618
		%	46.7	53.3	
	No	n	14	11	
		%	56.0	44.0	

SGAD: Supraglottic Airway Devices; **AG:** Auragain**; SD:** Standard deviation.

Table 3. Comparison of duration and pressures by SGAD type.

	SGAD						
	I-GEL			AG			
	Mean	SD	Median	Mean	SD	Median	p
OLP (cmH_2O)	22.45	10.87	20.0	33.71	8.68	40.0	**0.001**
Placement Duration (seconds)	26.25	14.58	22.0	29.34	7.82	28.0	**0.001**
SGAD Size	4.37	.64	4.0	4.45	0.70	5.0	0.461
Number of Attempts	1.40	.91	1.0	1.25	0.56	1.0	0.866
Operation Duration (minutes)	69.42	28.27	60.0	61.14	20.79	60.0	0.375
VAS Score	2.14	1.11	2.0	2.77	1.08	2.0	**0.011**

SGAD: Supraglottic Airway Devices; **AG:** Auragain, **SD:** Standard deviation; **OLP:** Oropharyngeal Leak Pressure; **VAS:** Visual Analogue Score.

There was no significant difference in the distribution of the number of I-Gel and Auragain attempts (Table 4).

There was a moderate positive correlation between VAS score and placement duration and number of attempts (Table 5).

Table 4. Distribution of the number of attempts by SGAD type.

			SGAD		
			I-GEL	AG	
Number of Attempts	1.0	n	28	28	0.347
		%	80.0	80.0	
	2.0	n	3	5	
		%	8.6	14.3	
	3.0	n	1	2	
		%	2.9	5.7	
	Tracheal	n	3	0	
		%	8.6	0.0	

SGAD: Supraglottic Airway Devices; AG: Auragain.

Table 5. Correlation between VAS score and measurements.

		VAS score
Operation duration	r	0.092
	p	0.450
SGAD Body	r	0.023
	p	0.850
Placement Duration	r	0.405
	p	**0.001**
Oropharyngeal Leak Pressure	r	0.183
	p	0.130
Number of Attempts	r	0.419
	p	**0.001**

VAS: Visual Analogue Score; **SGAD:** Supraglottic Airway Devices.

DISCUSSION AND CONCLUSION

The most characteristic feature of the second generation SGAD is that they allow easier placement of gastric resistance tubes. They also reduce the risk of aspiration by closing the esophagus and increasing pharyngolaryngeal separation. This improves ventilation quality and safety.[7] There are studies measuring the amount of aspiration of gastric contents.[8,9] In these studies, the content aspirated from the stomach was expressed as the mean volume between the groups and successful gastric aspiration was not evaluated for each patient. In our study, gastric access of the aspiration catheter was confirmed by epigastric auscultation in all patients. In patients whose gastric contents could be aspirated, there was no statistically significant difference between the two groups.

OLP is the most important marker of placement success and effective ventilation in SGAD use.[10] In many studies conducted with SGAD and monitoring OLP, average OLP values in the range of 22-34 cmH_2O for I-Gel and 18.6-32.8 cmH_2O for Auragain were given.[8,11-13] Pradeep et al.[14] also found a significantly ($p<0.0001$) higher mean OLP value in the Auragain group. Based on these results, it can be concluded that the inflatable cuff structure in the Auragain structure provides better perilaryngeal localization compared to I-Gel.[10]

In the literature, there are also studies with I-Gel and Auragain in which no significant difference was observed between OLP values.[8,11-13] Kim et al.[15] found that the mean OLP value in I-Gel (23.3cm H_2O) was significantly ($p<0.001$) higher than Auragain (18.6 cm H_2O) in a study conducted in pediatric patients without the use of neuromuscular blockers.

Looking at the placement durations in studies comparing I-Gel and Auragain, there are results where I-Gel placement duration is shorter, as in our study.[13,14,16] The most important factor for the shorter I-Gel placement duration is the lack of an inflatable cuff structure.[16]

In different studies, placement durations were reported in the range of 8-50.53 seconds for I-Gel and 13-72.03 seconds for Auragain.[8,11,14,15] Among the reasons for these significant differences between placement durations are the difference in the interval chosen for the placement time, practitioner experience and the number of attempts.

Some studies did not find significant results between I-Gel and Auragain placement durations.[8,11,15] Sarma et al.[17] found the mean placement duration of I-Gel

(28.73 sec) longer than Auragain (25.07 sec) in their study.

In our study, first-attempt placement, and overall placement success for I-Gel and Auragain were similar. In studies, the first placement success rate for I-Gel was 66.7-100% and 60-100% for Auragain.[8,11,14,15] Some studies reported success for I-Gel and Auragain at first attempt in all patients.[8,11,15] These differences in the success rate may be attributed to the use of muscle relaxant agents during induction of anesthesia and the experience of the practitioner. Kriege et al.[18] reported 75% initial placement success with experienced practitioners and 68% with inexperienced practitioners. The study emphasized that practitioner experience is an important determinant of the success of SGAD deployment.

SGAD's cuff structure, which contributes to the perilaryngeal seal, presses against the surrounding tissue to provide a seal for ventilation. However, excessive and prolonged pressure transmitted by the cuff to the pharyngeal mucosa may exceed the mucosal capillary perfusion pressure and cause complications.[19] One of the most common complications in this situation is postoperative throat ache. In our study, VAS score was verbally inquired with the patients in the recovery room at the 1st hour postoperatively. Studies reported that throat ache was more common in the Auragain group, although not statistically significant.[12,17] Deepak et al.[12] found that mean OLP values were very similar between Auragain and I-Gel groups at different cuff pressures, and postoperative throat ache was higher in Auragain groups compared to I-Gel, although not significantly. Lakshmi et al.[16] found more postoperative throat ache in the I-Gel (13%) group than in the Auragain (10%) group, although not statistically significant.

In our study, a moderate positive correlation was observed between the number of multiple placements attempts and the duration of attempts, and VAS score in both groups. Taniguchi et al.[20] also found that the length of operation duration (p=0.026) and the length of placement duration (p=0.018) were significant in the occurrence of post-op throat ache after I-Gel use in 426 patients. In addition, although it was not statistically significant in the I-Gel group (p=0.658), throat ache was more common in those with a higher number of attempts.

The limitations of our study are that hemodynamic parameters of the patients were not recorded; perioperative analgesic agents could not be standardized, and postoperative throat ache was inquired only in the operating room follow-up and not during the ward follow-up. According to the results of our study, the use of I-Gel, a supraglottic airway device, provides faster airway and less postoperative throat ache. The use of Auragain provides more efficient ventilation and higher OLP values. In addition, throat ache increased with the number of attempts and the duration of placement in both groups. We believe that further studies are needed to support these findings.

Ethics Committee Approval: Our study was approved by the University of Health Sciences, Haydarpaşa Numune Training and Research Hospital, Ethics Committee (Date: 18.04.2022, decision no: 79).

Conflict of Interest: No conflict of interest was declared by the authors.

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