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Comparison of Efficacy of Laryngeal Mask Versus I-Gel Airway Devices

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ABSTRACT

Background: Adequate ventilation is the primary goal of general anesthesia. A variety of supra-glottic airway devices were introduced to simplify airway management and minimize complications.

Objective: To compare the Laryngeal mask airway versus I-Gel in terms of insertion time, number of successful insertion attempts, and changes in hemodynamic parameters in patients getting general anesthesia.

Material and Methods: This comparative study was performed at the Anesthesia department, Pir Abdul Qadir Shah Institute of Medical Sciences, Gambat from 1st July 2020 to 31st December 2020. Patients achieving the inclusion criteria were divided into two groups. In Group-A, the I-Gel device was used for airway maintenance; while in Group-B, the Laryngeal Mask Airway(LMA) was used. The mean insertion time, insertion attempts, and hemodynamic parameters were recorded and compared in both groups.

Results: Total number of participants studied was 140; with 70 participants in each group. The mean age was 33.74±6.75 years in Group-A and 33.16±7.24 years in Group-B. Gender distribution showed 62.86 % (n=44) male in Group-A and 64.29% (n=45) in Group-B. A comparison of LMA versus I-Gel showed a mean insertion time of 22.81+3.09 seconds in Group-A and 31.53+2.46 seconds in Group-B ($p<0.0001$). The number of successful insertion attempts and the changes in the hemodynamic parameters was comparable in both groups ($p>0.05$).

Conclusion: This study concluded that the I-Gel device has a significantly low insertion time compared to LMA in elective settings. So, its use can be handy in emergency settings.

Keywords: I-Gel, LMA, General anesthesia, insertion time,

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INTRODUCTION

Adequate ventilation with minimal complications is the main objective of general anesthesia. The invention of the endotracheal tube can be linked to 1800 A.D.[1] Soon it became the gold standard device for maintaining ventilation.[1,2] Tracheal intubations can cause unpleasant changes in hemodynamic parameters which can lead to reflex cardiovascular responses, mainly in the form of hypertension, tachycardia, and dysrhythmias. These responses can cause myocardial ischemia and cerebral hemorrhage in rare cases.[2]

A variety of supra-glottic airway devices were introduced to simplify airway management and minimize complications. The laryngeal mask airway (LMA) is one of these and was introduced in 1982.[3] The laryngeal mask creates a moderate pharyngeal seal, which results in a leak during positive pressure ventilation which causes gastric insufflation. This predisposes the patients to gastric contents regurgitation and aspiration. It can also impede spontaneous ventilation secondary to diaphragmatic compression.[4-5]

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The I-Gel is another unique supraglottic airway device with a thermoplastic elastomer cuff that is not inflatable. Its unique design fits the device to the pharyngeal and peri-laryngeal structures, creating a good airway seal.[6] Compared to other supra-glottic airways, the I-Gel device does not need air inflation.[7] Keeping in view the above qualities the I-Gel might be a more suitable and safe airway device, especially in emergency settings.[6,7]

Various authors have made comparisons of different supraglottic airway devices but no definitive conclusion had been drawn on the efficacy of one device over the others. In 2016, a randomized study, compared mechanical ventilation in 100 patients either with I-Gel or LMA. They observed a shorter insertion time and less hemodynamic response with the use of the I-Gel device.[8] However, Radhika et al [9] did not note any significant difference between I-Gel and LMA devices.

Limited local data is available on the comparison of LMA and I-Gel use in terms of the changes in patients' hemodynamic parameters.[1,5] The current study aimed to compare I-Gel and LMA in terms of insertion time, the number of attempts, and changes in the hemodynamic parameters.

MATERIAL AND METHODS

This comparative study was performed at the Anesthesia department of Pir Abdul Qadir Shah

Jeelani Institute of Medical Sciences, Gambat, Pakistan, from 1st July 2020 to 31st December 2020. The total duration of the study was 6 months. Approval for the study was from the local hospital committee on 22nd June 2020 via diary number PAQSJIMS/IRB/11.

A total of 140 patients participated in this study. The Sample size was calculated by using the WHO sample size calculator taking the Level of signifier = 5%, Power of the test = 80%. Sampling was done through the non-probability consecutive sampling technique. Patients were divided equally into two groups, Group-A and Group-B. Seventy patients were in each group. Patients were randomly allotted into two groups each based on the computer-generated codes (Random Allocation Software, ver. 1.0; Isfahan University of Medical Sciences, Isfahan, Iran).

The Inclusion criteria included American Society of Anesthesiologists (ASA) I and II, with Mallampati Grades I and II admitted in our hospital undergoing elective surgery under general anesthesia in supine or lithotomy positions with an age range between 18-60 years of either gender. Patients with a history of gastroesophageal reflux, upper respiratory tract infection, BM1> 35 Kg/m^2, patients with limited neck extension, hypertension, pregnancy, and history of any cardiovascular and renal disease were excluded from participating.

Patients fulfilling the inclusion criteria were planned for airway maintenance either with I-Gel or LMA. Patients were kept nil per oral for at least six hours before the procedure. Written informed consent was taken before the procedure. In Group-A patients I-Gel while in Group-B patients, LMA was inserted for airway maintenance.

Patients were pre-oxygenated with 100% oxygen for 3 minutes and sevoflurane was administered with a face mask using a circle system. All patients were induced then with Propofol (dose of 2-2.5 mg/kg) intravenous slowly followed by insertion of an airway device. Proper insertion of LMA/I-Gel was confirmed by normal capnography trace on the monitor. After insertion, the device was fixed by tapping the chin. When ventilation was found to be inadequate manipulation was done till successful insertion was achieved. The procedure was done by a consultant Anesthesiologist.

Out of 165 patients, 140 were included while 25 did not fulfill the selection criteria (figure 1). Patient demographics i.e., age, Body mass index(BMI), gender, type of airway used, insertion time, number of insertion attempts, and the changes in hemodynamic parameters were noted on a predesigned proforma. The insertion time was defined, as the time taken in seconds from holding the device to the connection of the device to the airway circuit (after its insertion), and the attainment of a normal square wave capnogram reading. The number of attempts was defined as the attempts taken for successful insertion of the airway while changes in the hemodynamic parameters were defined as the difference between the baseline and hemodynamic parameters after device insertion.

The data was entered in SPSS version 22. Means ± standard deviation were calculated for quantitative variables i.e., insertion time, age, and body mass index. An Independent T-Test was applied for comparing the quantitative variables. Frequencies with percentages were calculated for qualitative variables i.e., gender, age group, the number of insertion attempts, and ASA group. Qualitative variables were compared through a chi-square test. P-value $\leq$ 0.05 was considered significant.

RESULTS

The total number of Participants in each group was 70. The mean age was 33.74$\pm$6.75 years in Group-A and 33.16$\pm$7.24 years in Group B. Age-wise distribution is shown in Table 1. Gender-wise distribution showed62.86 %(n=44) males in Group-A and 64.29% (n=45) in Group-B while 37.14 %(n=26) females in Group-A and 35.71 %(n=25) in Group-B (Table No.1). The mean BMI of the patients was calculated as 28.64$\pm$2.74 in Group-A and 29.16$\pm$2.66 kg/m^2 in Group B. Comparison of LMA versus I-Gel showed a mean insertion time of 22.81+3.09 seconds in Group-A and 31.53+2.46 seconds in Group-B with a significant-value was 0.0001. ASA grading, number of insertion attempts, and changes in hemodynamic parameters are given in Table No. 02

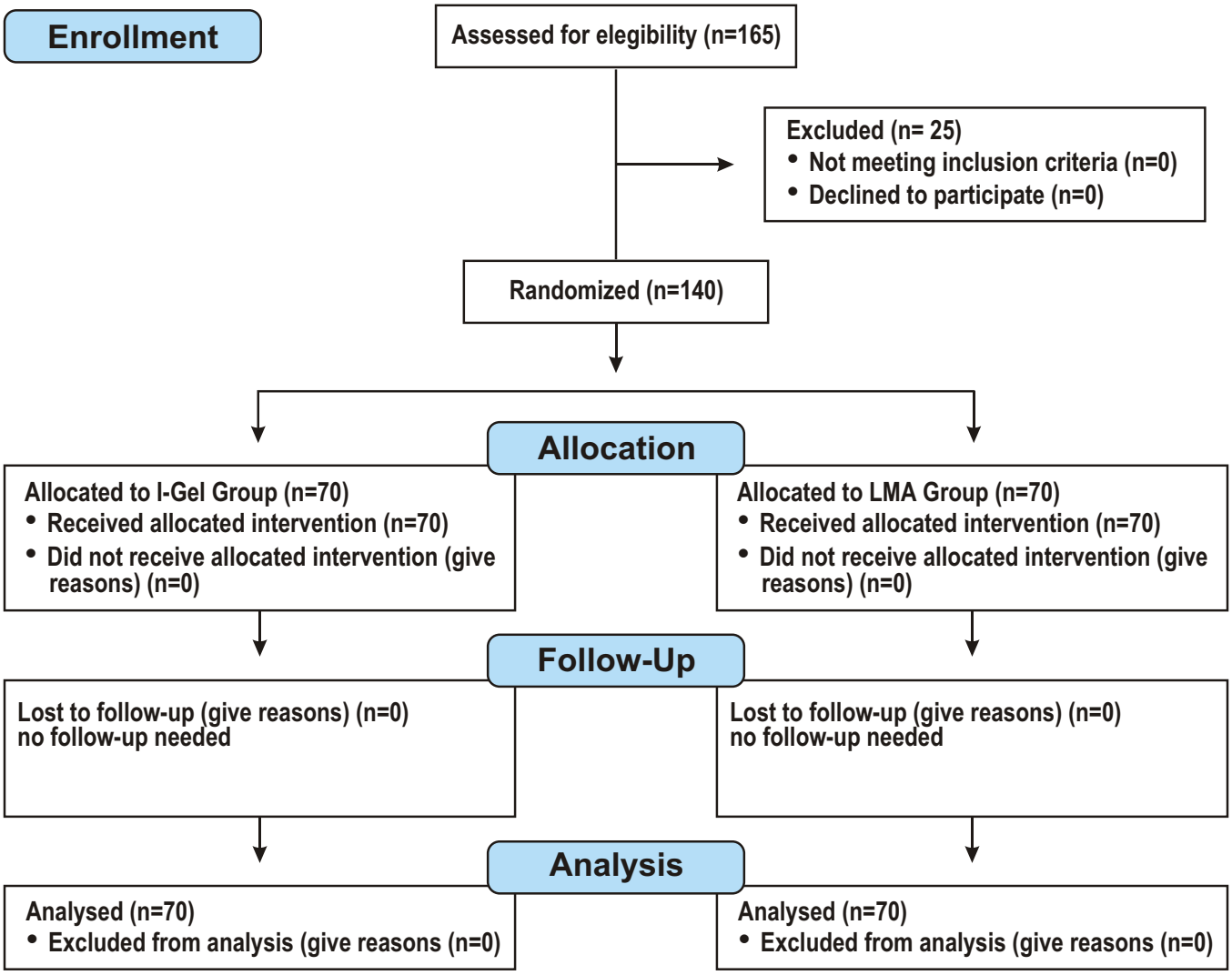


Figure 01. Consort Flow Chart

Table 01: Age and Gender Distribution (n=140)

	Group-A (n=70)		Group-B (n=70)		
Parameters	**Number of Patients**	**Percentages**	**Number of Patients**	**Percentages**	**P-value**
Age (Years)					0.498
18-40	34	48.57%	38	54.28%	
41-60	36	51.43%	32	45.72%	
Gender					0.860
Male	44	62.86%	45	64.29%	
Female	26	37.14%	25	35.71%	

Table 02. Comparison of Both Groups in Terms of Clinical and Technical Parameters

Parameters	Group (A) n=70	Group (B) n=70	P-value
ASA grading			0.389
ASA grade I	26(37.14%%)	31(44.28%)	
ASA grade II	44(62.85%%)	39(55.71%)	
Insertion attempt			0.558
1st attempt	54(77.14%)	51(72.86%)	
2nd attempt	16(22.86%)	19(27.14%)	
Insertion time; (seconds	22.81+3.09	31.53+4.46	0.0001
Changes in Hemodynamic Response			
Heart rate(/min)	5.9±3.9	6.17±3.2	0.655
Systolic Pressure(mmHg)	7.4±4.49	8.6±5.4	0.155
Diastolic pressure(mmHg)	3.5±1.9	4.1±2.3	0.094
MAP(mmHg)	2.1±1.7	2.5±1.9	0.191
MAP, mean arterial pressure;			

DISCUSSION

The maintenance of the airway with adequate ventilation is fundamental to general anesthesia. The changes in hemodynamic parameters associated with endotracheal intubation can be avoided with various supraglotticdevices.[10]

This study was performed to determine the efficacy of two different supraglottic airway devices i.e., LMA and I-Gel, in terms of duration of insertion, the number of attempts, and changes in hemodynamic parameters. The changes in hemodynamic parameters were comparable between both these devices. Also, the rate of successful insertion in both groups was comparable, proving the less-invasive nature and insertion ease of both these devices. However, the insertion time for maintaining an effective airway was found significantly shorter in the I-Gel group (22.81+3.09 seconds) compared to the LMA group (31.53+4.46 seconds). As the I-Gel device does not need insufflation and can be put into position without the use of an introducer.

The findings of this study were comparable with another comparative study, performed on 100 patients, who underwent airway maintenance for routine elective surgical procedures either with I-gel or LMA. They also noted a shorter insertion time with I-Gel. [8]

Another randomized study also compared the ease of insertion and changes in hemodynamic responses among patients in whom these two devices were used. They also noted a shorter duration with I-Gel insertion and also observed a less hemodynamic response with I-Gel insertion. They concluded that I-Gel is a better alternative to LMA.[10] Helmy et al.,[11] and Chauhan et al.[12] also reported a significantly lower I-Gel insertion time compared to other supraglottic airway devices.

However, Durrani et al.,[5] found that the mean insertion time between I-Gel and LMA devices was not statistically significant. Also, Theiler et al.,[13] noted a longer insertion time with I-Gel. They attributed the longer insertion time to the bulky device design of the I-Gel. The findings of these two studies were inconsistent with this study.

Another study also tested the hypothesis that I-Gel, ProSeal, and Supreme devices do have the same efficacy during maintenance ventilation. They also concluded that in terms of ease of insertion, all these devices were equivalent. However, they found I-Gel to have greater initial oropharyngeal leak pressure in comparison with the ProSeal and Supreme.[14]

CONCLUSION

This study concluded that I-Gel has a significantly lower insertion time compared to LMA. So, it is more appropriate to use I-Gel for airway maintenance, especially in emergency settings.

Study Limitations:

This study was based on a single-center experience with a relatively small sample size. Further, local studies with a multicenter approach with a larger sample size are needed to validate this study's results. The second limitation of this study was that the oropharyngeal leak pressure comparison between both these devices was missing so this comparison should be kept in mind in future studies.

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DATA SHARING STATEMENT: The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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AUTHOR'S CONTRIBUTION

The following authors full fill authorship criteria as per ICMJE guidelines;

Zaman A, Hamza A:	Idea conception, data acquisition, final approval, agreed to be accountable for all the work.
Ullah K, Dogar AW:	Design of the work, drafting the work, critical rivision, final approval, agreed to be accountable for all the work.
Ahmad Z:	Data analysis, drafting of the work, final approval, agreed to be accountable for all the work.
Hussain A:	Data interpretation, critical revision, final approval, agreed to be accountable for all the work.