

COMPARISON OF LARYNGEAL MASK AIRWAY (LMA) I-GEL AND LMA CLASSIC IS REVIEWED FROM THE DOCTOR'S SATISFACTION ON BRONCHOSCOPY PROCEDURE IN DR WAHIDIN SUDIROHUSODO HOSPITAL MAKASSAR

Juliansyah ¹, Syafri Kamsul Arif ², Haizah Nurdin ^{3*}, Syamsul Hilal Salam ⁴, Ratnawati ⁵, Ari Santri Palinrunji ⁶ and Firdaus Hamid ⁷

^{1,2,3,4,5,6} Department of Anesthesia, Intensive Care and Pain Management, Faculty of Medicine, Hasanuddin University/RSUP Dr. Wahidin Sudirohusodo, Makassar, South Sulawesi, Indonesia.

⁷ Department of Clinical Microbiology, Faculty of Medicine, Hasanuddin University/RSUP Dr. Wahidin Sudirohusodo, Makassar, South Sulawesi, Indonesia.

*Corresponding Author Email: haizahnuridin@med.unhas.ac.id

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Abstract

Background: Bronchoscopy is a medical procedure that provides tracheobronchial visualization by placing optical instruments into the airway. The advantage of an LMA over an endotracheal tube is that it uses a larger diameter tube, allowing for better visibility and flexibility. **Objective:** This study aims to determine the comparison of satisfaction of pulmonologists and anesthesiologists with LMA i-gel and LMA classic in bronchoscopy procedures at RSUP Dr. Wahidin Sudirohusodo Makassar. **Method:** This research is an analytical research with an experimental design, using a double-blind randomized design with data collection techniques through questionnaires, which were carried out in the Bronchoscopy Treatment Room at Wahidin Sudirohusodo Hospital. **Results:** The sample characteristics of LMA i-gel and LMA classic were not statistically different. The results of this study were not influenced by age, anthropometric and gender variables. It was found that there were significant differences regarding the level of satisfaction with the use of i-gel LMA among pulmonologists based on the success of fiberoptic insertion, visualization, scope flexibility, fiberoptic size, and limitations of bronchoscopy procedures, as well as the success of insertion, incidence of dislocation, LMA features, hemodynamic effects during the procedure, and the incidence of side effects after the procedure compared to the use of classic LMA with a p value < 0.05. **Conclusion:** The use of i-gel LMA has success with one fiberoptic insertion, visualization, scope flexibility, fiberoptic size, unlimited bronchoscopy procedures, success with one LMA insertion, no dislocation and various LMA features which are higher than classic LMA. However, changes in hemodynamic effects and the incidence of post-operative side effects are also quite high when using LMA i-gel.

Keywords: Bronchoscopy, LMA i-gel, LMA Classic.

INTRODUCTION

Bronchoscopy is a medical procedure that provides tracheobronchial visualization by placing optical instruments into the airway. This action is carried out by a competent doctor by examining the bronchi or their branches for diagnostic or therapeutic purposes.¹ As lung disease cases become more complex and the need for minimally invasive procedures increases, the contribution of bronchoscopy becomes increasingly important. Doctors and medical personnel need to know the clinical application of bronchoscopy in diagnostic and therapeutic procedures for lung diseases.^{1,2} Use of LMA for airway management during *fiberoptic flexibel broncoscopy* (FFB) was first introduced in 1989 and has since been described as a safe and convenient tool for airway control during bronchoscopy in both adult and pediatric populations.³ LMA has been used successfully in certain procedures, such as balloon dilation, brachytherapy, bronchial stenting, and foreign body extraction.^{4,5}

Respiratory tract assessment of the planned anesthetic technique for a bronchoscopic procedure requires a thorough examination of the upper airway to determine the patient's ability to maintain an adequate airway.⁶ Anesthesia options for bronchoscopy procedures can be done in various ways, such as Local Anesthetics and Airway Reflex Suppression^{7,8}, Nasal Anesthesia^{6,9}, Posterior Oropharyngeal and Upper Airway Anesthesia^{6,9}, Moderate Sedation¹⁰, General Anesthesia⁶ The advantage of an LMA over an endotracheal tube is that it uses a larger diameter tube, allowing for better visibility and flexibility.^{6, 11} There are several types of LMA, namely LMA *classic*, LMA *flexible*, LMA *proseal*, LMA *reinforce*, LMA *fastrach*, LMA i-gel, dan Modified Laryngeal Mask Airway (*Oro-Pharyngo-Laryngeal Airway Cap (OPLAC)*).¹² LMA *classic* and LMA i-gel is the type of LMA most often used at Dr. RSUP. Wahidin Sudirohusodo Makassar. This study aims to determine the comparison of satisfaction of pulmonologists and anesthesiologists with LMA i-gel and LMA *classic* in the bronchoscopy procedure at RSUP Dr. Wahidin Sudirohusodo Makassar.

RESEARCH METHODS

This research has received ethical approval from the Hasanuddin University Research Ethics Commission with No: 603/UN4.6.4.5.3L/ PP36/ 2023. This research is an analytical study with an experimental design, using a double-blind randomized design with data collection techniques through questionnaires, which was carried out in the Bronchoscopy Treatment Room at Wahidin Sudirohusodo Hospital in June 2023. The sample for this study was all patients who underwent bronchoscopy at Dr. Wahidin Sudirohusodo Makassar who met the inclusion criteria and agreed to take part in the research. This research was conducted on 72 patients who were divided into 2 groups, each group containing 36 samples. The samples were randomized, drawn by volunteers and then divided into 2 groups, namely group A which underwent the bronchoscopy procedure with i-gel LMA installation and group B which underwent the bronchoscopy procedure with LMA installation *classic*. Volunteers are also anesthesiologists who are tasked with carrying out i-gel and LMA LMA installation procedures *classic*. Questionnaires were given by volunteers after all bronchoscopy procedures were completed to pulmonologists and anesthesiologists (researchers).

The inclusion criteria for this study were patients who were planning a bronchoscopy, aged 18-65 years, and were conscious of *glasgow coma scale* 15, ASA physical status categories PS 2 and 3, and approval from his primary treating physician. The exclusion criteria in this study were patients with predicted difficulty in inserting the LMA due to limitations in opening the mouth, obstruction, airway obstruction/distortion, pulmonary fibrosis or stiff neck, and the patient/family refused to participate in the study. Criteria *drop out* in this study, the patient died less than 24 hours after surgery and was using a ventilator after the bronchoscopy procedure. The researchers asked for research approval from patients who had planned bronchoscopy procedures and recorded the patient's demographic data, then randomized the samples by volunteers (anesthesiologists on duty in the bronchoscopy room) and then divided them into 2 groups, namely Group A which underwent the bronchoscopy procedure with the installation of LMA i- gel. Group B underwent a bronchoscopy procedure with LMA installation *classic*. After the patient arrives at the bronchoscopy procedure room, the identity, diagnosis, action plan, and infusion access are checked again before the bronchoscopy procedure begins. Then they were taken to the bronchoscopy procedure room, then standard monitoring equipment was installed (blood pressure,

TAR, electrocardiogram (ECG), heart rate, oxygen saturation) and recorded by volunteers. During the procedure, hemodynamics were recorded every 5 minutes during the bronchoscopy procedure. The bronchoscopy procedure is completed then the anesthesia is stopped. It was recorded again when the patient was able to open his eyes with verbal stimulation, observation was carried out in the recovery room and side effects after anesthesia were observed in the form of nausea, vomiting, sore throat and coughing immediately after the LMA expulsion.

Questionnaires were given by volunteers to pulmonologists to assess satisfaction with the success of the insertion *fiberoptic* on 1 try, resulting visualization, flexibility *scope* used, size *fiberoptic* that can be used, as well as the limitations of bronchoscopy procedures, and anesthesiologists to assess satisfaction with the success of LMA insertion in 1 attempt, the incidence of LMA dislocation, LMA features, hemodynamic effects, and side effects after all bronchoscopy procedures are completed. Pulmonologists and anesthesiologists are doctors in charge of carrying out bronchoscopy procedures. A total of 8 pulmonologists who performed bronchoscopy procedures and 3 anesthesiologists who served as volunteers and carried out the LMA i-gel and LMA installation procedures *classic* during the research period. The researcher is an anesthesiologist who conducted a questionnaire assessment of the LMA i-gel and LMA classic installation procedures carried out by volunteers. After the questionnaire is filled out, it will be collected by volunteers and statistical analysis will be carried out using the IBM SPSS version 25 application by researchers.

RESEARCH RESULT

Research on 72 patients undergoing bronchoscopy under general anesthesia using LMA i-gel and LMA *classic* at Dr. RSUP. Wahidin Sudirohusodo Makassar and obtained satisfaction ratings from Pulmonologists and Anesthesiologists.

Table 1: Characteristics of the Research Sample

	LMA i-gel	LMA <i>classic</i>	Mark <i>p</i>
Age (years)	48,94 ± 11,822	49.72 ± 11,795	0.781
IMT* (kg/m²)	23.033 ± 3,473	22.389 ± 3,784	0.454
Body Weight (kg)	57,69 ± 9,942	58,89 ± 10,237	0.935
Height (cm)	159,81 ± 6,515	160,53 ± 5,887	0.623
Gender			
Man	23	24	0,804
Woman	13	12	
ASA physical status**			
2	13	6	0,063
3	23	30	

IMT*: Body mass index, ASA**: *American Society of Anesthesiologists*

The sample characteristics of LMA i-gel and LMA *classic* were not statistically different ($p > 0.05$). Thus, the two research sample groups are homogeneous. It can be assumed that the results of this study are not influenced by age, anthropometric and gender variables. Comparison of age, weight, height, BMI, ASA physical status between the two groups was tested using the Independent T-Test and gender was tested using the Chi-square *Test*.

Table 2: Level of satisfaction with the use of LMA among pulmonologists

Variable	LMA i-gel N=36		LMA classic N=36		Mark <i>p</i>
	N	%	N	%	
Insertion success <i>fiberoptic</i>					0.016
Insertion <i>fiberoptic</i> succeeded on the first try	33	91.7	11	30.6	
Insertion <i>fiberoptic</i> successful on the 2nd try or more	3	8.3	25	69.4	
Visualization					0.014
Good visualization	31	86.1	7	19.4	
Limited Visualization	5	13.9	29	80.6	
Flexibility scope					0.042
Flexible	33	91.7	6	16.7	
Not Flexible	3	8.3	30	83.3	
Size <i>fiberoptic</i>					0.018
Limited size	3	8.3	30	83.3	
Unlimited size	33	91.7	6	16.7	
Action Limitations					0.039
Limited	4	11.1	5	13.9	
Unlimited	32	88.9	31	86.1	

N: frequency, %: percentage, Statistical analysis: *Chi-Square Test*

Based on an analysis of the level of satisfaction with the use of LMA during bronchoscopy procedures, pulmonologists found the frequency of successful insertion of *fiberoptic* in the bronchoscopy procedure using LMA i-gel, 33 samples (91.7%) were successfully inserted in one attempt compared to LMA classic, flexibility scope The bronchoscopy used was felt to be better when using LMA i-gel, namely 33 samples (91.7%), using variations in size *fiberoptic* during bronchoscopy procedures more can be used on LMA i-gel as many as 33 samples (91.7%) can use several size variations *fiberoptic*, limitations of bronchoscopy when using LMA i-gel only 4 samples said it was limited in action. It was found that there was a significant difference regarding the level of satisfaction with the use of LMA i-gel among pulmonologists based on the success of insertion *fiberoptic*, visualization, flexibility scope, size *fiberoptic*, and the limitations of bronchoscopy compared to the use of LMA classic with a p-value <0.05.

Table 3: Level of satisfaction with the use of LMA among anesthesiologists

Variable	LMA i-gel N=36		LMA classic N=36		Mark <i>p</i>
	N	%	N	%	
Insertion Success					0.035
1 insertion	34	94.4	19	52.8	
> 1 insertion	2	5.6	17	47.2	
Dislocation event					0.027
Easy to dislocate	5	13.9	19	52.8	
Not easy to dislocate	31	86.1	17	47.2	
Feature					0.009
Diverse features	36	100	7	19.4	
Limited features	0	0	29	80.6	
Hemodynamic effects					0.001
There's been a change	17	47.2	6	16.7	
No change occurred	19	52.8	30	83.3	
Post-Action Side Effects					0.009
There is	23	63.9	6	16.7	
There isn't any	13	36.1	30	83.3	

N: frequency, %: percentage, Statistical analysis: *Chi-Square Test*

Based on an analysis of the level of satisfaction with the use of LMA during bronchoscopy procedures, anesthesiologists found that the success rate of LMA insertion in 1 trial was higher when using LMA i-gel, namely 34 samples (94.4%), the incidence of dislocation when using LMA during bronchoscopy procedures was higher.

Often found in the use of LMA *classic* namely 19 samples (52.8%), LMA features when using LMA i-gel during bronchoscopy procedures are more diverse (100%) such as shape, lumen size, and ease of fixation, hemodynamic changes are more often found during bronchoscopy procedures when using LMA i-gel, namely 17 samples (47.2%), incident side effects after the bronchoscopy procedure (nausea, vomiting, sore throat, coughing immediately after the procedure) were more often found when using LMA i-gel, namely 23 samples (63.9%).

It was found that there was a significant difference regarding the level of satisfaction with the use of i-gel LMA among anesthesiologists based on the success of insertion, incidence of dislocation, LMA features, hemodynamic effects during the procedure, and the incidence of side effects after the procedure compared to the use of LMA *classic* with a p -value < 0.05 .

DISCUSSION

We have controlled the characteristics of age, body mass index and ASA physical status from the start in the inclusion criteria so as not to influence the research results. Where the age of the research sample is limited to 18-65 years old, and ASA physical status class 2 and 3.

This aims to avoid data inhomogeneity in the research sample which could influence the results of the research. In this study, the use of i-gel LMA obtained good visualization when the bronchoscopy procedure began to be carried out in the form of a display vocal *fold* down to the bronchial tree, which is in line with research by Alex Moore et al get the level glottic visualization was better in the i-gel LMA group compared to LMA *Fastrach* with a significantly higher percentage of class 1 visualizations (63.3% vs 3.3%; $p < 0,0001$).¹³

The success rate for LMA insertion on the first attempt was higher in the LMA i-gel group, in line with previous research conducted by Ramachandran et al. The success rate for the first insertion was 85-96% in the LMA i-gel group and 77.1-100% in the LMA group *classic*.¹⁴ In another study by Hashemian et al, the average number of i-gel and LMA LMA insertion attempts classic are 1.6 ± 1.3 and 1.3 ± 0.6 ($p = 0.265$).¹⁵

The incidence of dislocation when using LMA during bronchoscopy is more common when using LMA *classic* namely 19 samples (52.8%). When using LMA i-gel, it was found that 5 samples (13.9%) had dislocations with a value $p = 0.027$. Different results obtained in research Ramachandran, et al.

Placement failure at the time of insertion was 0.40–0.52% in the LMA group *classic* while 0–3.86% in the LMA i-gel group, this was not significant.¹⁴ In Hashemian et al.'s study, there was also an insignificant difference in the incidence of dislocation during the LMA insertion procedure *classic* and i-gel (1.4 ± 1.1 vs 1.2 ± 1.4 ; $p = 0.270$).¹⁵

The LMA features of the i-gel LMA are more diverse when used for bronchoscopy procedures, such as shape, lumen size, and ease of fixation when compared to the features of the LMA *classic*.

Ramchandran et al explained that i-gel LMAs have a special design at the tip that results in lower esophageal seal pressure, but this has not been shown to increase the risk of aspiration, possibly related to the presence of a drain tube feature. Despite these safety features, peak airway pressure may have a very important role in preventing esophageal insufflation of air and the potential increased risk of pulmonary aspiration.¹⁴

In this study, significant results were found during the bronchoscopy procedure performed. Hemodynamic changes are more frequent when using LMA i-gel. In contrast to other studies, including those conducted by Bhola P and Pratheeba et al., hemodynamic changes were found in both groups but there were no significant differences in the clinical hemodynamic changes that occurred in both the LMA group *classic* or LMA i-gel.^{16,17}

In Pratheeba et al.'s study, the mean values of initial heart rate and blood pressure were comparable and not clinically significant. However, it was found that the increase in pulse rate was higher and longer when LMA was installed *classic* remained elevated from baseline when compared with i-gel and was clinically significant $p = 0,0001$.¹⁷ Radhika et al, attributed the hemodynamic improvement to the minimal sympathetic response caused by cuff inflation in the LMA group *classic*.¹⁸

The difference in results in this study could occur because the shape of the i-gel LMA is more rigid than the LMA *classic* resulting in increased hemodynamics during i-gel LMA insertion, the possibility of inadequate anesthesia depth due to not using an anesthetic depth measuring device (Bispectral Index (BIS) monitor), and the anesthesiologist's lack of experience in using i-gel LMA anesthesia. More side effects occurred after the procedure with LMA i-gel compared to LMA *classic*.

These results are different from several other studies that have been conducted. Complications observed include nausea, vomiting, sore throat, and coughing. Helmy et al in their research found that the incidence of nausea or vomiting after the procedure was higher in the LMA group *classic* compared to i-gel (20% vs 5%, $p = 0.032$).¹⁹

In Ramachandran et al.'s study, there were averages of 1.0–40.0% and 1.22–20.1% in the LMA group *classic* and i-gel that has wounds on the airways.¹⁴ Helmy et al in their research found that LMA i-gel (40%) had a higher rate of causing mild-moderate throat pain after the procedure compared to LMA *classic* (37.5%) ($p = 0.34$). However, this is not clinically significant.¹⁹

Then in Hashemian et al's research, it was found in the LMA group *classic* (15.6%) and i-gel (12.5%) ($p > 0.999$) who experienced cough after surgery.¹⁵ In this study, there were more post-treatment side effects, namely nausea, vomiting, sore throat and coughing immediately after the procedure occurred in the LMA i-gel group.

This is possible because the i-gel LMA shape is stiffer and presses the airway mucosal structure at the insertion site.

Table 4: Pulmonologist and anesthesiologist satisfaction questionnaire regarding the use of LMA i-gel and LMA classic in bronchoscopy procedures at Wahidin Sudirohusodo General Hospital.

Lungs

Questionnaire	LMA i-gel	LMA classic
Insertion success rate <i>fiberoptic</i> on 1 action attempt		
Resulting visualization		
Flexibility <i>scope</i> bronchoscopy used during bronchoscopy procedures		
Size <i>fiberoptic</i> that can be used		
Limitations of bronchoscopy procedures that can be performed		

Anesthesiologist

Questionnaire	LMA i-gel	LMA classic
Success rate of LMA insertion in 1 attempt		
The incidence of LMA dislocation during bronchoscopy procedures		
Fitur LMA		
Intraoperative hemodynamic effects:		
- Hypotension		
- Tachycardia		
- Desaturation		
Side effects that occur after bronchoscopy:		
- Occurrence of nausea and vomiting		
- Sore throat		
- Coughing occurs immediately after the procedure		

The table above is a questionnaire given to pulmonologists and anesthesiologists who perform bronchoscopy procedures with the installation of LMA i-gel or LMA classic after the bronchoscopy procedure is completed. In this study, it was said that they were satisfied if the pulmonologist and anesthesiologist assessed ≥ 3 of the total number of questions in the questionnaire regarding LMA i-gel and LMA classic.

This research can be a reference for assessing the satisfaction of pulmonologists and anesthesiologists with LMA i-gel and LMA classic in patients who will undergo a bronchoscopy procedure in DR. Sudirohusodo Makassar.

There are no limitations to this study Specific criteria such as the minimum number and experience of bronchoscopy procedures performed by a pulmonologist and the number of anesthesia procedures performed using LMA i-gel or LMA classic to the anesthesiologist during the bronchoscopy procedure.

CONCLUSION

Based on the satisfaction of pulmonologists with the use of LMA i-gel, the success of one insertion is higher *fiber optic*, visualization, flexibility *scope*, size *fiberoptic*, and the limitations of bronchoscopy compared to LMA classic. Likewise, based on the Anesthetist's satisfaction with the use of LMA-igel, it has a single insertion success, minimal dislocations and various features which are higher than classic LMA. However, changes in hemodynamic effects and the incidence of postoperative side effects are also quite high when using LMA i-gel.

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