

ORIGINAL ARTICLE

Effect of General Anesthesia Induction with a Combination of Propofol and Etomidate Versus Propofol Alone on I-gel Laryngeal Mask Airway Insertion

Kanittha Nakkarin, Wichuda Panomai, Apisada Butpho

Department of Anesthesiology, Kumphawapi Hospital

KEYWORDS

propofol; etomidate; combination of propofol and etomidate; I-gel LMA insertion; LMA insertion conditions

CORRESPONDING AUTHOR

Kanittha Nakkarin

Department of Anesthesiology,
Kumphawapi Hospital
97 Village No.7, Jitprasong Road,
Kumphawapi Sub-district, Kumphawapi
District, Udon Thani 41110, Thailand
E-mail: mameawnoi17@gmail.com

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ABSTRACT

Propofol is one of the most commonly used anesthetic agents for laryngeal mask airway (LMA) insertion, but it is associated with unwanted complications such as hemodynamic instability and cardiovascular complications. Various intravenous anesthetic agents in combination with propofol have been studied in an attempt to minimize these complications. This prospective, randomized, double-blind, controlled study aimed to compare the effect of a combination of propofol and etomidate versus propofol alone on hemodynamics, LMA insertion conditions, and first-attempt success rate for I-gel LMA insertion. The participants comprised 62 adults aged 18–64 years of either sex with American Society of Anesthesiologists (ASA) physical status I-II who underwent elective surgery under general anesthesia at Kumphawapi Hospital, Udon Thani, Thailand, between May 2025 and August 2025. Patients were randomly allocated to the propofol (P) group (n=31), which received propofol 2 mg/kg, or the propofol + etomidate (PE) group, which received propofol 1 mg/kg plus etomidate 0.2 mg/kg for induction. Hemodynamic parameters were recorded before induction, 1 minute after induction, after successful LMA insertion, and 3, 5 and 10 minutes after LMA insertion. Jaw relaxation, LMA insertion conditions, and first-attempt success rate were also assessed and recorded. The results showed no significant differences in mean arterial pressure (MAP), systolic blood pressure (SBP), diastolic blood pressure (DBP), or heart rate (HR) at various time points following induction between the two groups ($p>0.050$). Good jaw relaxation was observed in 23/31 patients (74.19%) in group P versus 19/31 patients (61.29%) in group PE ($p=0.277$). Overall LMA insertion conditions were comparable between groups ($p=0.785$). The first-attempt success rate of I-gel LMA insertion was 83.37% in group P and 90.32% in group PE ($p=0.307$). In conclusion, there were no significant differences between the effects of propofol 1 mg/kg combined with etomidate 0.2 mg/kg and propofol 2 mg/kg on hemodynamic stability, jaw relaxation, LMA insertion conditions, or first-attempt success rate.

Introduction

The laryngeal mask airway (LMA) is supraglottic airway device that has been widely used for airway management during general anesthesia because it causes minimal disturbances in the cardiovascular and respiratory systems¹. Insertion of the LMA requires adequate anesthetic depth to suppress airway reflexes and provide jaw relaxation, preventing patient reactions to LMA insertion². Propofol is the most commonly used induction agent for general anesthesia during LMA insertion due to its ability to suppress upper airway reflexes, rapid onset, satisfactory recovery, short half-life, rapid elimination from blood circulation resulting in minimal sedative effects, and low postoperative nausea and vomiting rate^{3,4}. The dose of propofol for induction is 2–3 mg/kg, which provides sufficient suppression of upper airway reflexes, movement

and laryngospasm commonly result in hypotension and prolonged apnea⁵. Independent of cardiovascular disease, an induction dose of 2–2.5 mg/kg produces a 25%–40% reduction in systolic blood pressure⁶. Various intravenous anesthetic agents in combination with propofol have been studied in an attempt to decrease hemodynamic instability³.

Etomidate is an ultrashort-acting intravenous anesthetic agent that interacts with gamma-aminobutyric acid type A (GABA_A) receptors by binding directly to specific sites and increasing the affinity of the inhibitory neurotransmitter GABA in the central nervous system (CNS). A common induction dose of etomidate is 0.2–0.3 mg/kg. It has minimal effects on the cardiovascular system, causing only mild reduction in peripheral vascular resistance and is not associated with histamine release. Adverse effects of etomidate include transient adrenocortical suppression

lasting 6–12 hours, mostly resolving by 48 hours, and postoperative nausea and vomiting⁷. However, etomidate as a sole anesthetic agent does not provide adequate jaw relaxation or suppression of upper airway reflexes, even when used with a narcotic^{5,8}.

Several studies have demonstrated that etomidate and etomidate–propofol admixture provide better hemodynamic stability than propofol induction. Most of these studies used propofol 2.5 mg/kg and did not compare LMA insertion conditions^{3–5,8}.

The primary objective of this study was to evaluate hemodynamic stability following induction with propofol 2 mg/kg or a combination of propofol 1 mg/kg and etomidate 0.2 mg/kg for I-gel LMA insertion. The secondary objectives were to assess the effects on LMA insertion conditions and first-attempt success rate.

Materials and Methods

This prospective, randomized, double-blind, controlled study was conducted in accordance with the Declaration of Helsinki and the International Council for Harmonisation – Good Clinical Practice (ICH-GCP) at Kumphawapi Hospital, Udon Thani, Thailand, from May 2025 to August 2025, and retrospectively registered to the Thai Clinical Trials Registry (TCTR 20260114010). All patients were informed about the study and provided written consent to participate. Sixty-two patients with American Society of Anesthesiologists (ASA) physical status I–II, aged 18–64 years and of either sex, who underwent elective surgery under general anesthesia with LMA, were enrolled into the study. Exclusion criteria were patients who refused to participate or could not communicate with the researcher; contraindication to any study drugs; pregnancy or lactation; cardiovascular disease such as ischemic heart disease, hypertension, or arrhythmia; existing pathology in the pharynx or larynx; limited mouth opening (< 2.5 cm); Mallampati score ≥ 3 ; difficult airway; body mass index (BMI) > 30 kg/m²; full stomach; reactive airway disease; known primary or secondary adrenal insufficiency; use of steroid medication by any route; sepsis; history of epilepsy or seizure disorder; glomerular filtration rate (GFR) < 30 ml/min/1.73 m²; and cirrhosis Child-Pugh B–C.

The sample size was calculated based on a previous study³, where the mean arterial pressure (MAP) after induction was 77.4 ± 12.3 mmHg in the propofol group and 86.5 ± 12 mmHg in the propofol + etomidate group. Type I error (α) was set at 0.05 and type II error (β) at 0.2 (80% power). This resulted in a sample size of 28 patients per group. To account for potential attrition, 10% was added to each group, resulting in a final sample size of 31 patients per group.

The 62 patients who met the inclusion and exclusion criteria were randomly allocated into two equal groups using block randomization generated by computer (<https://www.sealedenvelope.com/simple-randomiser/v1/lists>). The propofol group (P) received propofol 2 mg/kg (Propofol-[®]Lipuro 1%, B.Braun, Melsungen, Germany), and the propofol + etomidate group (PE) received propofol 1 mg/kg combined with etomidate 0.2 mg/kg (Etomidate-[®]Lipuro, B.Braun, Melsungen, Germany). The drugs were prepared in 20-ml syringes and diluted to 20 ml by a research assistant who was not involved in patient care. In the operating

room, the patients, anesthesiologist, and nurse anesthetist in charge of the case were unaware of group allocation and drug preparation. All patients were pre-oxygenated with 100% oxygen via face mask at flow rate of 6 L/min for 5 minutes. Standard monitoring, including electrocardiogram (EKG), non-invasive blood pressure (NIBP), and peripheral oxygen saturation (SpO₂) were applied. Vital signs were recorded every 5 minutes using a calibrated automated non-invasive blood pressure monitor. Patients were premedicated with intravenous fentanyl 1 μ g/kg, 3 minutes prior to induction with propofol or propofol + etomidate admixture, administered over 20 sec according to randomization, until loss of consciousness, which was confirmed by inability to respond to verbal commands and loss of eyelash reflex. One minute after completion of study drug injection, the LMA was inserted in the sniffing position by an anesthetist nurse with experience in at least 50 I-gel LMA insertions. The I-gel LMA was chosen according to the manufacturer's recommendations⁹. Successful LMA insertion was defined as proper placement of the device, confirmed by adequate bilateral chest expansion and capnography³. Following successful LMA insertion, anesthesia was maintained with 2% sevoflurane and an equal mixture of O₂–N₂O (2 L/min). Mean arterial pressure (MAP), systolic blood pressure (SBP), diastolic blood pressure (DBP), and heart rate (HR) were recorded before induction (Tb), 1 minute after induction (T0), after successful LMA insertion (T1), and 3 (T2), 5 (T3), and 10 (T4) minutes after successful LMA insertion. I-gel LMA insertion conditions were evaluated by the degree of jaw relaxation using Young's Criteria¹⁰, while the overall insertion conditions were assessed using the Modified Scheme of Lund and Stovener¹⁰. The number of attempts, apneic time (time between the last spontaneous breath after induction and the resumption of spontaneous breathing), induction time (time from the start of induction to loss of consciousness), and the number of patients who received an additional bolus of propofol were recorded. If any of the reactions listed below occurred during the first attempt at I-gel insertion, a further bolus of 0.5 mg/kg of propofol was administered.

Criteria for assessment of laryngeal mask airway insertion conditions¹⁰

1. Jaw relaxation
 - Good: relaxed with no muscle tone
 - Incomplete: moderately relaxed with some muscle tone
 - Poor: poorly relaxed with full muscle tone
2. Patient response
 - 2.1 Coughing and gagging
 - None
 - Mild: one or two coughs
 - Moderate: three or more coughs
 - Severe: bucking
 - 2.2 Patient movement
 - None
 - Mild: transient or minimal
 - Moderate: lasted more than a few seconds but resolved within 20 seconds
 - Severe: sustained or needed propofol to allow LMA insertion

2.3 Laryngospasm

- None
- Partial: stridor present, use of accessory muscles of respiration
- Complete: paradoxical chest and abdominal movements, ventilation not possible

Overall insertion conditions

- Excellent: no gagging, coughing, movement, or laryngospasm
- Good: insertion resulting in mild to moderate coughing, gagging, or movement, with no laryngospasm
- Poor: insertion possible but resulting in moderate to severe coughing, gagging, or patient movement, with no laryngospasm
- Unacceptable: severe coughing, severe movement or laryngospasm

If hypotension occurred (defined as decrease in MAP of more than 20% from baseline), 6 mg of ephedrine (if HR < 60 bpm) or 4 µg of norepinephrine (if HR > 60 bpm) was administered. For patients with isolated bradycardia (HR < 50 bpm), 0.6 mg of atropine was given. In the event of laryngospasm, propofol 0.25–0.5 mg/kg¹¹ was administered;

if not relieved, 0.1–0.2 mg/kg of succinylcholine was subsequently given¹². Patients were excluded from the study if general anesthesia was maintained with an endotracheal tube, life threatening complications occurred, or an additional bolus of propofol was required more than once.

Data analysis was performed using Stata version 13 software (StataCorp, College Station, TX, USA). Descriptive statistics, including frequency and percentage, were used for categorical variables. Data distribution of continuous variables was examined using the Shapiro-Wilk test. The mean and standard deviation (SD) or the median (interquartile range [IQR]) was used for continuous variables. To compare proportions, the Chi-square test and Fisher's exact test were applied. The independent t-test and the Mann-Whitney U test were used to compare continuous variables between two groups as appropriate. Intergroup comparison of hemodynamic parameters at various time points were analyzed using linear mixed model, while intragroup comparison using linear mixed model followed by post hoc pairwise comparison with Bonferroni correction. Results were reported as beta coefficient (b) with 95% confidence intervals (95% CIs). A *p*-value < 0.05 was considered statistically significant.

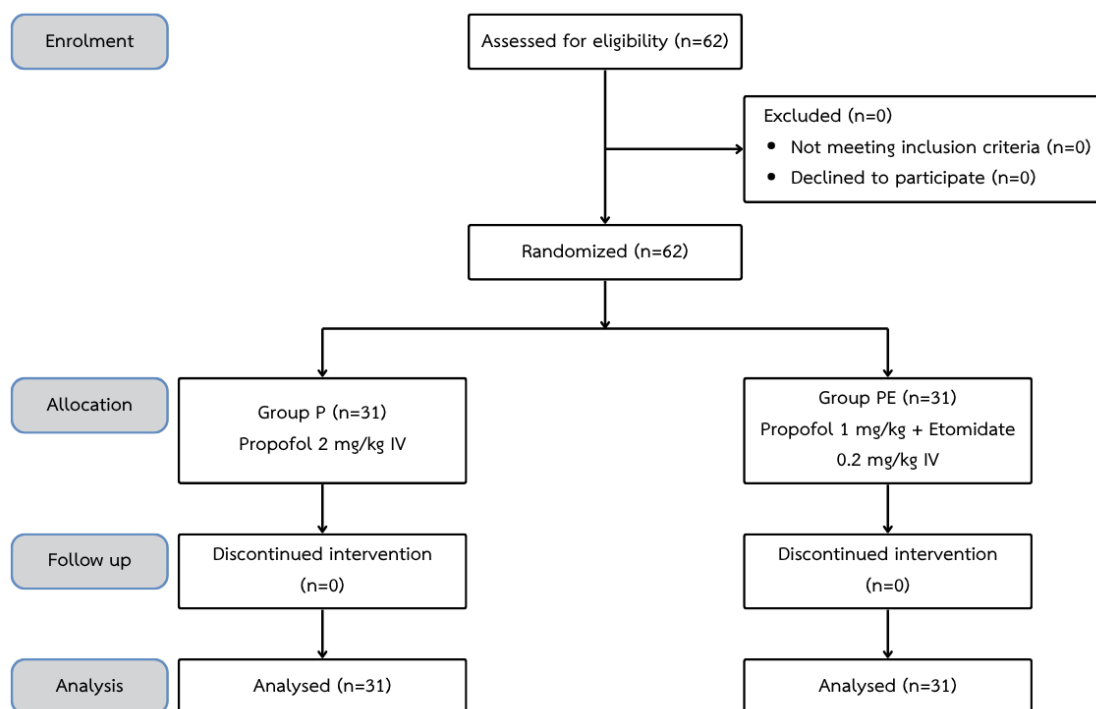


Figure 1 CONSORT flow diagram of this study

Results

In this study, 62 patients from the General Surgery, Gynecology and Orthopedic departments were enrolled. There were no significant differences in demographic data and mean MAP, SBP, DBP, and HR before induction between the two groups (Table 1).

Mean MAP, SBP, and DBP decreased significantly from baseline at different time points in both groups, but there

were no significant differences between the two groups. HR at different time points decreased significantly from baseline at 10 minutes in group P, whereas there was a significant difference from baseline at 3, 5 and 10 minutes after LMA insertion in group PE. However, there were no significant differences between the two groups (Table 2).

Table 1 Baseline demographic and hemodynamic parameters

Parameter	Group P (n = 31)	Group PE (n = 31)	p-value
Age (yr), median (IQR)	46 (37-55)	46 (37-55)	0.994
Gender, n (%)			0.799
Male	17 (54.84%)	16 (51.61%)	
Female	14 (45.16%)	15 (48.39%)	
Weight (kg), mean $\pm$ SD	59.71 $\pm$ 10.74	59.74 $\pm$ 9.14	0.999
Height (cm), mean $\pm$ SD	164.32 $\pm$ 10.30	161.68 $\pm$ 8.81	0.282
BMI (kg/m ²), median (IQR)	21.40 (19.98-24.71)	23.82 (20.5-24.67)	0.324
ASA physical status, n (%)			0.442
I	16 (51.61%)	19 (61.29%)	
II	15 (48.39%)	12 (38.71%)	
Mallampati score, n (%)			0.799
I	15 (48.39%)	16 (51.61%)	
II	16 (51.61%)	15 (48.39%)	
Department, n (%)			0.960
General surgery	14 (45.16%)	15 (48.39%)	
Gynecology	6 (19.35%)	6 (19.35%)	
Orthopedic	11 (35.48%)	10 (30.26%)	
MAP before induction (mmHg), mean $\pm$ SD	100.90 $\pm$ 9.13	98.32 $\pm$ 10.65	0.301
SBP before induction (mmHg), mean $\pm$ SD	137.03 $\pm$ 11.6	133.35 $\pm$ 13.90	0.255
DBP before induction (mmHg), mean $\pm$ SD	82.48 $\pm$ 9.07	80.61 $\pm$ 10.57	0.458
HR before induction (bpm), mean $\pm$ SD	72.48 $\pm$ 13.54	74.52 $\pm$ 13.72	0.559

Table 2 Comparison of hemodynamic changes from baseline during I-gel insertion between two groups

Parameter	Time vs Tb	Group P (n = 31) β (95% CI)	p -value ¹	Group PE (n = 31) β (95% CI)	p -value ¹	p -value ²
MAP (mmHg)	T0	-19.387 (-24.396, -14.379)	<0.001	-18.548 (-23.557, -13.540)	<0.001	0.816
	T1	-13.322 (-18.331, -8.314)	<0.001	-14.806 (-19.815, -9.798)	<0.001	0.681
	T2	-17.322 (-22.331, -12.314)	<0.001	-14.000 (-19.009, -8.992)	<0.001	0.358
	T3	-16.549 (-21.557, -11.540)	<0.001	-14.548 (-19.557, -9.540)	<0.001	0.580
	T4	-18.903 (-23.911, -13.895)	<0.001	-13.226 (-18.234, -8.217)	<0.001	0.116
SBP (mmHg)	T0	-25.742 (-32.126, -19.358)	<0.001	-25.065 (-31.448, -18.681)	<0.001	0.883
	T1	-18.968 (-25.351, -12.583)	<0.001	-21.161 (-27.545, -14.777)	<0.001	0.634
	T2	-23.613 (-29.997, -17.229)	<0.001	-19.194 (-25.577, -12.810)	<0.001	0.337
	T3	-23.065 (-29.449, -16.681)	<0.001	-19.258 (-25.642, -12.874)	<0.001	0.409
	T4	-25.129 (-31.513, -18.745)	<0.001	-18.742 (-25.126, -12.358)	<0.001	0.166
DBP (mmHg)	T0	-15.484 (-20.130, -10.838)	<0.001	-15.645 (-20.291, -10.999)	<0.001	0.962
	T1	-9.419 (-14.065, -4.774)	<0.001	-13.581 (-18.226, -8.935)	<0.001	0.214
	T2	-13.774 (-18.420, -9.128)	<0.001	-11.290 (-15.936, -6.645)	<0.001	0.459
	T3	-13.710 (-18.355, -9.064)	<0.001	-12.903 (-17.549, -8.258)	<0.001	0.810
	T4	-12.935 (-17.581, -8.290)	<0.001	-10.290 (-14.936, -5.645)	<0.001	0.430
HR (bpm)	T0	-0.968 (-4.949, 3.014)	0.634	-3.419 (-7.401, 0.562)	0.092	0.393
	T1	-0.258 (-4.240, 3.723)	0.899	-3.258 (-7.240, 0.724)	0.109	0.296
	T2	-0.516 (-4.498, 3.466)	0.799	-5.000 (-8.982, -1.018)	0.014	0.119
	T3	-3.710 (-7.691, 0.272)	0.068	-5.645 (-9.627, -1.663)	0.005	0.501
	T4	-4.226 (-8.208, -0.244)	0.038	-8.032 (-12.014, -4.051)	<0.001	0.185

p -value¹ = comparison within each group versus baseline (Tb)

p -value² = comparison between group P and Group PE

β = beta coefficient

Tb = before induction (baseline)

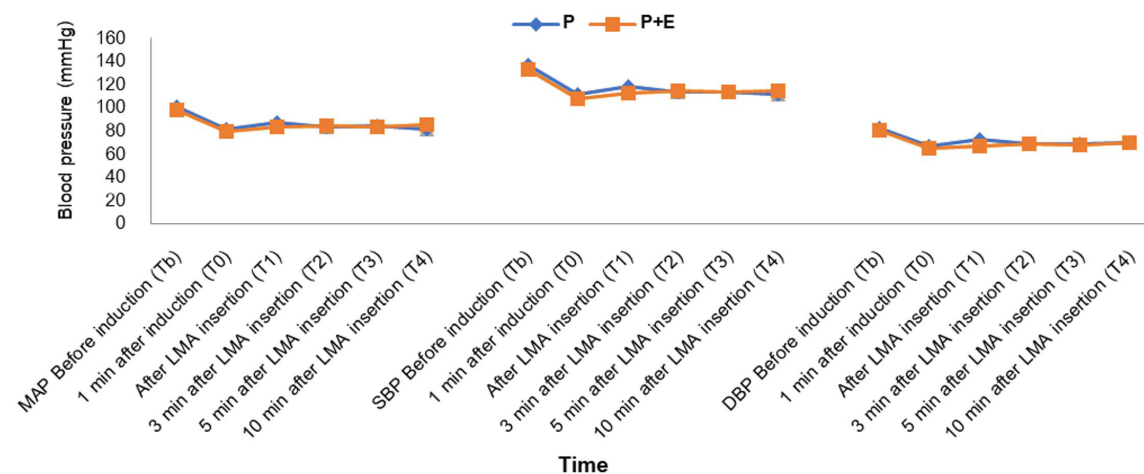
T0 = 1 minute after induction

T1 = after successful LMA insertion

T2 = 3 min after LMA insertion

T3 = 5 min after LMA insertion

T4 = 10 min after LMA insertion

**Figure 2** Comparison of MAP, SBP, and DBP at various time points between the two groups

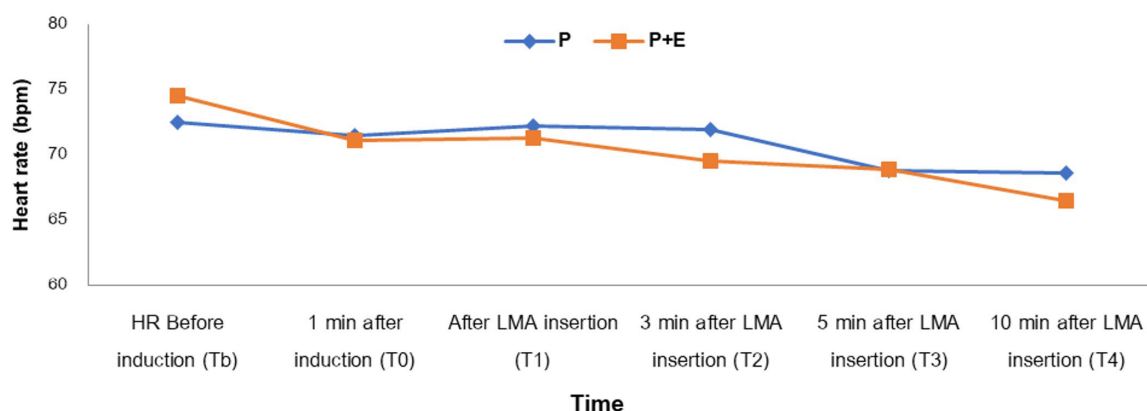


Figure 3 Comparison of HR at various time points between the two groups

For I-gel LMA insertion conditions, jaw relaxation was good in 74.19% of patients in group P and 61.29% in group PE; however, this difference was not statistically significant ($p=0.277$). Regarding patient response during LMA insertion, there were no statistically significant differences between the two groups for coughing and gagging or patient movement, although clinically, the incidence of no coughing was higher in group P. No laryngospasm was observed in either group. Overall LMA insertion conditions were rated as excellent in 80.65% of patients in group P and 74.19% in group PE

($p=0.785$). First-attempt success rates were 83.87% and 90.32% in groups P and PE, respectively ($p=0.307$) (Table 3). The number of patients who experienced hypotension (MAP dropped more than 20% from baseline) was 80.65% in group P and 67.74% in group PE ($p=0.246$). The total amounts of vasopressor and atropine administered were not significantly different between groups. The incidence of nausea and vomiting was approximately the same between groups (Table 4). None of patients experienced postoperative complications within 24 hours.

Table 3 LMA insertion conditions and number of insertion attempts

Parameter	Group P (n = 31)	Group PE (n = 31)	p-value
Jaw relaxation, n (%)			0.277
Good	23 (74.19%)	19 (61.29%)	
Incomplete	8 (25.81%)	12 (38.71%)	
Poor	0 (0.00%)	0 (0.00%)	
Gagging / coughing, n (%)			0.315
None	28 (90.32%)	24 (77.42%)	
Mild	2 (6.45%)	6 (19.35%)	
Moderate	1 (3.23%)	1 (3.23%)	
Severe	0 (0.00%)	0 (0.00%)	
Patient movement, n (%)			0.788
None	26 (83.87%)	26 (83.87%)	
Mild	4 (12.90%)	3 (9.68%)	
Moderate	1 (3.23%)	2 (6.45%)	
Severe	0 (0.00%)	0 (0.00%)	
Laryngospasm, n (%)			1.000
None	31 (100%)	31 (100%)	
Partial	0 (0.00%)	0 (0.00%)	
Complete	0 (0.00%)	0 (0.00%)	

Table 3 Continued

Parameter	Group P (n = 31)	Group PE (n = 31)	p-value
Overall insertion conditions, n (%)			0.785
Excellent	25 (80.65%)	23 (74.20%)	
Good	4 (12.90%)	6 (19.35%)	
Poor	2 (6.45%)	2 (6.45%)	
Unacceptable	0 (0.00%)	0 (0.00%)	
Number of attempts, n (%)			0.307
1	26 (83.87%)	28 (90.32%)	
2	5 (16.13%)	2 (6.45%)	
3	0 (0.00%)	1 (3.23%)	

Table 4 Incidence of hypotension, nausea and vomiting, vasopressor and atropine consumption

Parameter	Group P (n = 31)	Group PE (n = 31)	p-value
Hypotension, n (%)	25 (80.65)	21 (67.74)	0.246
Ephedrine (mg), median (IQR)	12 (6-18)	12 (9-18)	0.553
Norepinephrine (ug), mean $\pm$ SD	9.78 $\pm$ 3.53	10.80 $\pm$ 6.27	0.672
Atropine, n (%)	4 (12.90%)	2 (6.45%)	0.390
Nausea and vomiting, n (%)	0 (0.00%)	1 (3.23%)	0.313

Additionally, there were no significant differences in induction time (time from the start of induction until loss of consciousness), LMA insertion time (time from mouth opening until successful LMA insertion), apneic time (time

between the last spontaneous breath after induction and the resumption of spontaneous breathing) and additional propofol requirement (Table 5).

Table 5 Induction time, insertion time, apneic time and additional propofol requirement

Parameter	Group P (n = 31)	Group PE (n = 31)	p-value
Induction time (sec), median (IQR)	40 (35-46)	38 (35-43)	0.709
Insertion time (sec), median (IQR)	16 (12-20)	14 (12-22)	0.882
Apneic time (min), median (IQR)	2.43 (1.19-6.01)	1.79 (0.71-4.73)	0.132
Additional propofol requirement, n (%)	5 (16.13%)	6 (19.35%)	0.740

Discussion

LMA insertion requires adequate jaw relaxation and prevention of patient reactions to LMA insertion, such as movement and laryngospasm¹. Propofol is the most popular agent for LMA insertion due to its ability to obtund upper airway reflexes, but a dose of 2–3 mg/kg commonly results in hypotension and prolonged apnea⁵. Kanazawa et al.¹³ observed no significant differences among three propofol dosages (2, 2.5, and 3 mg/kg) in responses to LMA insertion. Previous studies demonstrated that fentanyl 1 μ g/kg pretreatment significantly reduced propofol requirements for LMA insertion¹⁴, caused less hypotension and bradycardia, and resulted in shorter apneic time than fentanyl 2 μ g/kg, while mouth opening and LMA insertion conditions were not different^{15,16}. Etomidate is an intravenous agent that is

suitable for patients with cardiovascular disease⁷. It can be used in combination with propofol for induction^{3,4,17-19}. Gade and Reddy¹⁷ evaluated hemodynamic changes after LMA insertion using the same etomidate dose with different doses of propofol. They found that etomidate 0.2 mg/kg combined with propofol 0.5 or 1 mg/kg resulted in better hemodynamic stability after LMA insertion than propofol 1.5 mg/kg alone, without a significant difference in insertion time. Accordingly, propofol 2 mg/kg and etomidate 0.2 mg/kg combined with propofol 1 mg/kg were selected for this study.

The results of this study showed no significant difference in hemodynamic stability between the combination of propofol 1 mg/kg and etomidate 0.2 mg/kg and propofol 2 mg/kg after induction for I-gel LMA insertion. Mean

MAP, SBP, and DBP decreased significantly from baseline at all time points; however, no significant differences were observed between groups P and PE. Similarly, Liu et al.¹⁸ studied the efficacy and safety of ciprofol, propofol, a propofol-etomidate mixture, or a ciprofol-etomidate mixture in patients undergoing painless gastroscopy. In their study, group P received 200 mg of propofol, while group PE received a 1:1 mixture of propofol (100 mg in 10 mL) and etomidate (20 mg in 10 mL). They found no statistically significant differences in SBP, DBP, or HR at time points T0 (before induction), T1 (first minute after induction), and T2 (end of the examination) among the four groups. SBP and DBP in all four groups were significantly decreased at T1 and T2 compared with T0. This finding is likely attributed to reduced vascular tone and peripheral vasodilation following drug administration, leading to a decline in blood pressure. In our study, heart rate in group P decreased significantly compared with baseline at time point T4. In group PE, there were significant decreases from baseline at time points T2, T3, and T4; however, no significant differences were observed between the two groups. This may be related to the administration of an additional bolus of propofol or norepinephrine for the treatment of hypotension. Nevertheless, the heart rate changes observed were not clinically harmful.

In contrast to our study, Hosseinzadeh et al.³ studied hemodynamic changes following anesthesia induction and LMA insertion using propofol 2.5 mg/kg IV, etomidate 0.3 mg/kg IV, and a combination of propofol 1 mg/kg plus etomidate 0.2 mg/kg IV. They reported a significantly greater decrease in MAP, SBP, DBP, and HR at all stages of anesthesia after induction in the propofol group compared with the propofol + etomidate group. This finding is in accordance with the results of Jamwal et al.⁴ who evaluated hemodynamic changes during ProSeal LMA insertion using propofol, etomidate, and a propofol + etomidate admixture in patients undergoing laparoscopic cholecystectomy. SBP, DBP and MAP were reported to be lower in the propofol group but more stable in other two groups. A brief episode of increased blood pressure occurred after LMA insertion in the etomidate group, suggesting that the combination of etomidate and propofol provided greater hemodynamics stability compared with etomidate or propofol used alone. The difference between these studies and ours could be attributed to the higher dose of propofol (2.5 mg/kg) used in their study. Additionally, Viburajah and Selvaraj¹⁹ evaluated the effects of propofol, etomidate, and a combination of propofol and etomidate on the hemodynamic response to induction and endotracheal intubation and reported that a combination of propofol 1 mg/kg and etomidate 0.2 mg/kg was associated with greater hemodynamic stability compared with propofol 2 mg/kg, which differed from our findings. This difference may be related to the lower mean age of participants in their study compared with ours. Age differences may affect propofol requirements²⁰.

In our study, propofol provided slightly better jaw relaxation than the combination of propofol and etomidate. More patients in group PE exhibited gagging and coughing responses to LMA insertion than those in group P. This could account for the reduced propofol dose and less airway suppression by etomidate in group PE. However, these differences were not statistically significant. Head or limb movement was similar between two groups. Overall LMA insertion conditions and first-attempt success rates

were comparable between the two groups. However, there is a lack of previous studies comparing LMA insertion conditions between propofol alone and propofol combined with etomidate, as most prior studies mainly focused on hemodynamic stability and did not comprehensively evaluate LMA insertion conditions as performed in the present study. Dutt et al.¹⁵ compared insertion conditions for the classic LMA using propofol at a dose of 2.5 mg/kg, with fentanyl 1 (F₁) and 2 µg/kg (F₂) administered 3 minutes prior to LMA insertion. They found no statistically significant difference in insertion conditions between the two groups. The incidence of full mouth opening and gagging/coughing in the F1 and F2 groups from their study was comparable to that of good jaw relaxation and gagging/coughing observed in group P in our study, which was better than group PE, although the difference was not significant. First-attempt success rate and head/limb movement in their F1 and F2 groups were nearly the same as those in our P and PE groups. These indicated comparable efficacy of propofol 2 mg/kg with fentanyl 1 µg/kg versus propofol 2.5 mg/kg with fentanyl 1-2 µg/kg for LMA insertion conditions.

A shorter apneic time was observed in group PE compared with group P; however, the difference was not significant and may be associated with the reduced dose of propofol and minimal ventilatory effect of etomidate⁷.

The incidence of postoperative nausea and vomiting in both groups was approximately the same, which may be due to the antiemetic effect of propofol³.

The strengths of our study include its randomized, double-blind, controlled design, which was intended to minimize selection bias and ensure that the baseline characteristics of both groups were comparable. We also had clear objectives and well-defined assessment tools. The results have implications for clinical anesthesia practice. However, this study had some limitations. First, we did not use bispectral index monitoring (BIS) to evaluate the depth of anesthesia and guide the appropriate dosage of anesthetic drugs, which might have affected hemodynamic parameters. Second, additional boluses of propofol administered in response to patient reactions during LMA insertion might have affected blood pressure, although the number of patients requiring additional propofol was nearly the same in the two groups. Third, this study was conducted in healthy adult patients; therefore, outcomes in patients with cardiovascular disease or in elderly patients may differ. Finally, this study used I-gel LMA, other LMA type might yield different results.

Conclusions

A combination of propofol 1 mg/kg and etomidate 0.2 mg/kg was not superior to propofol 2 mg/kg for induction in terms of hemodynamic stability. Both regimens resulted in significant decreases in MAP, SBP, and DBP from baseline. Propofol provided slightly better jaw relaxation and fewer patient responses to I-gel LMA insertion than the combination of propofol and etomidate; however, these differences were not statistically significant. Overall insertion conditions and first-attempt success rates were not significantly different between the two groups.

Ethical statement

This study was conducted in accordance with the Declaration of Helsinki and was approved by the Institutional Human Research Ethics Committee of

Kumphawapi Hospital (protocol code KPEC 23/2568; approval date: 2 May 2025). Informed consent was obtained from all participants or their legal representatives.

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