

Comparison of ProSeal Laryngeal Mask Airway and i-gel for Ease of Insertion and Hemodynamic Stability in Patients Undergoing General Anaesthesia

Dr. Raksha Vyas^{1*}, Dr. Chandra Kant Sharma¹, Dr. Manish Singh Chauhan¹

¹*Department of Anaesthesiology, Shri Bangar Hospital, Government Medical College, Pali, NH-62 (formerly NH-14), Sumerpur Road, Pali - 306401, Rajasthan, India

¹Assistant Professor (Dr. Raksha Vyas) | Senior Resident (Dr. Chandra Kant Sharma) | Associate Professor (Dr. Manish Singh Chauhan)

*Corresponding Author: Dr. Raksha Vyas, Assistant Professor, Department of Anaesthesiology, Shri Bangar Hospital, Government Medical College, Pali, NH-62 (formerly NH-14), Sumerpur Road, Pali - 306401, Rajasthan, India

Abstract

Background: Supraglottic airway devices (SADs) have become an important alternative to endotracheal intubation because they provide effective airway management with fewer airway-related complications and less hemodynamic disturbance. Among second-generation SADs, the ProSeal laryngeal mask airway (PLMA) and i-gel are widely used owing to their improved airway sealing and provision for gastric drainage. However, differences remain regarding ease of insertion, hemodynamic response, and postoperative airway-related complications.

Objective: To compare the ProSeal laryngeal mask airway and i-gel with respect to ease of insertion, hemodynamic stability, oxygen saturation, postoperative recovery, and airway-related complications in patients undergoing elective surgery under general anaesthesia.

Methods: This prospective comparative observational study included 102 adult patients (ASA physical status I–II) undergoing elective surgical procedures under general anaesthesia. Patients were equally allocated to receive either i-gel (Group A, n=51) or PLMA (Group B, n=51). Ease of insertion was evaluated by the number of insertion attempts and insertion time. Hemodynamic parameters, oxygen saturation, Aldrete recovery score, and perioperative complications were compared between the two groups.

Results: First-attempt insertion success was comparable between the groups (92.2% vs. 90.2%). The mean insertion time was significantly shorter with i-gel (8.92 ± 0.89 s) than with PLMA (12.31 ± 1.86 s; $p < 0.01$). Pulse rate and oxygen saturation remained comparable throughout the perioperative period. Mean arterial pressure was significantly lower in the i-gel group during later intraoperative and postoperative measurements. Recovery scores were similar in both groups. Airway-related complications were infrequent in both groups but occurred more frequently with PLMA.

Conclusion: Both devices provided effective airway management and satisfactory oxygenation. However, i-gel demonstrated easier and faster insertion with superior hemodynamic stability and a lower incidence of airway-related complications, making it a suitable alternative to ProSeal LMA for elective surgical procedures.

Keywords: i-gel; ProSeal laryngeal mask airway; supraglottic airway device; hemodynamic stability; general anaesthesia; airway management

How to cite this article: Vyas R, Sharma CK, Chauhan MS. Comparison of ProSeal Laryngeal Mask Airway and i-gel for Ease of Insertion and Hemodynamic Stability in Patients Undergoing General Anaesthesia. *Int J Drug Deliv Technol.* 2026;16(71s): 501-506. DOI: 10.25258/ijddt.16.71s.61

INTRODUCTION

Airway management remains one of the most critical responsibilities of the anaesthesiologist during general anaesthesia. Although endotracheal intubation continues to be regarded as the gold standard for securing the airway, it is associated with several disadvantages, including sympathetic stimulation, hemodynamic fluctuations, postoperative sore throat, cough, dysphonia, and trauma to the upper airway. These adverse effects have encouraged the development of supraglottic airway devices (SADs), which provide an effective alternative for airway management while reducing airway-related morbidity and minimizing

cardiovascular stress responses during insertion and removal (1,2).

Second-generation supraglottic airway devices have substantially improved the safety profile of airway management by incorporating gastric drainage channels that reduce the risk of gastric insufflation and pulmonary aspiration. These devices also provide improved airway sealing, allowing effective positive pressure ventilation during elective surgical procedures. Consequently, they are increasingly preferred in routine anaesthetic practice, particularly for short-duration procedures and ambulatory surgery requiring rapid postoperative recovery (3,4). The ProSeal laryngeal mask airway (PLMA), introduced by Brain and colleagues, is a reusable

Comparison of ProSeal Laryngeal Mask Airway and i-gel for Ease of Insertion and Hemodynamic Stability in Patients Undergoing General Anaesthesia

second-generation supraglottic airway device equipped with a drain tube and inflatable cuff that provides a higher oropharyngeal sealing pressure than the classic laryngeal mask airway. Although PLMA has demonstrated excellent ventilatory performance, cuff inflation, relatively complex insertion techniques, and a steeper learning curve may prolong insertion time and increase airway manipulation (5,6).

The i-gel is a newer, cuffless, single-use supraglottic airway device manufactured from a soft thermoplastic elastomer designed to conform anatomically to the perilaryngeal structures. Because it does not require cuff inflation, the i-gel allows rapid placement, minimizes tissue compression, and potentially reduces airway trauma. Its integrated gastric drainage channel further enhances patient safety by decreasing the risk of aspiration while maintaining effective ventilation (7,8).

With the growing popularity of minimally invasive and day-care surgical procedures, there is an increasing need for airway devices that can be inserted quickly, provide adequate ventilation, maintain cardiovascular stability, and minimize postoperative airway complications. Several investigators have compared PLMA and i-gel regarding insertion characteristics, sealing pressure, respiratory mechanics, and postoperative outcomes. While both devices provide satisfactory ventilation, published evidence suggests that the i-gel may offer advantages in terms of ease of insertion and reduced hemodynamic response, whereas PLMA may provide slightly higher airway sealing pressures under certain clinical conditions (9).

Despite these observations, variability among published studies and differences in patient populations warrant further evaluation of these devices. Therefore, the present study was undertaken to compare the ProSeal laryngeal mask airway and i-gel in adult patients undergoing elective surgery under general anaesthesia. The primary objective was to evaluate ease of insertion and hemodynamic stability, while secondary outcomes included oxygen saturation, postoperative recovery assessed by the Aldrete score, and airway-related complications.

Materials and Methods

Study Design and Setting

This prospective comparative observational study was conducted in the Department of Anaesthesiology after obtaining approval from the Institutional Ethics Committee. Written informed consent was obtained from all participants before enrolment. The study included adult patients undergoing elective surgical procedures under general anaesthesia.

Study Population

A total of 102 patients aged 18–55 years with American Society of Anesthesiologists (ASA) physical status I or II and body weight between 40 and 75 kg were enrolled. Patients were equally allocated into two groups (n = 51 each):

- Group A: Airway secured using the i-gel.
- Group B: Airway secured using the ProSeal laryngeal mask airway (PLMA).

Inclusion Criteria

- Age 18–55 years.
- ASA physical status I or II.
- Body weight 40–75 kg.
- Patients undergoing elective surgery under general anaesthesia.
- Provision of written informed consent.

Exclusion Criteria

Patients with any of the following were excluded:

- Anticipated difficult airway.
- Mouth opening <2.5 finger breadths.
- Obesity.
- Cervical spine disease.
- Gastroesophageal reflux disease or hiatus hernia.
- Increased risk of aspiration.
- Significant systemic illnesses including hypertension and ischemic heart disease.
- Refusal to participate in the study.

Anaesthetic Technique

After establishing intravenous access with an 18G or 20G cannula, all patients received Ringer's lactate infusion. Standard monitoring, including electrocardiography, non-invasive blood pressure, pulse oximetry, and capnography, was instituted before induction.

Premedication consisted of intramuscular glycopyrrolate (0.2 mg) and pentazocine (30 mg). Following adequate preoxygenation with 100% oxygen, anaesthesia was induced using intravenous propofol (2–2.5 mg/kg), lignocaine (1.5 mg/kg), and succinylcholine (1.5–2 mg/kg). According to group allocation, an appropriately sized i-gel or PLMA was inserted by an experienced anaesthesiologist using the standard insertion technique.

Correct placement of the airway device was confirmed by bilateral equal chest expansion, bilateral air entry on auscultation, a square-wave capnography tracing, and effective positive-pressure ventilation. More than two insertion attempts were considered unsuccessful, and the airway was subsequently secured by conventional endotracheal intubation. After successful placement, a nasogastric tube was introduced through the gastric drainage channel whenever appropriate.

Anaesthesia was maintained using oxygen, nitrous oxide, isoflurane, and intermittent positive-pressure ventilation with vecuronium bromide for neuromuscular blockade. At the conclusion of surgery, residual neuromuscular blockade was reversed using neostigmine (0.05 mg/kg) and

Comparison of ProSeal Laryngeal Mask Airway and i-gel for Ease of Insertion and Hemodynamic Stability in Patients Undergoing General Anaesthesia

glycopyrrolate (0.008 mg/kg). The airway device was removed after patients regained adequate spontaneous ventilation and responded appropriately to verbal commands.

Outcome Measures

Primary Outcomes

The primary endpoints were:

- Number of insertion attempts.
- Time required for successful airway insertion (seconds).
- Hemodynamic stability assessed by pulse rate and mean arterial pressure (MAP).

Secondary Outcomes

Secondary outcome measures included:

- Peripheral oxygen saturation (SpO₂).
- Postoperative recovery assessed using the Modified Aldrete Recovery Score.
- Immediate airway-related complications, including blood staining of the device, cough, nausea, laryngospasm, and lip or dental trauma.
- Delayed complications assessed 12 hours postoperatively, including sore throat, dysphagia, dysphonia, and tongue numbness.

Hemodynamic Assessment

Pulse rate, mean arterial pressure, and oxygen saturation were recorded at baseline, immediately after airway insertion, and at 5, 10, 15, and 30 minutes intraoperatively. Postoperative recordings were obtained immediately after device removal and subsequently at 5, 10, 15, 30, and 60 minutes.

Recovery Assessment

Postoperative recovery was evaluated using the Modified Aldrete Recovery Score at 0, 5, 10, 15, and 30 minutes following removal of the airway device. Patients achieving satisfactory recovery scores were transferred to the postoperative ward according to institutional protocol.

Statistical Analysis

Data were entered into Microsoft Excel and analysed using SPSS version 23.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean $\pm$ standard deviation (SD), whereas categorical variables were presented as frequencies and percentages. Intergroup comparisons of continuous variables were performed using the independent Student's *t*-test, while categorical variables were analysed using the Chi-square test. A two-tailed *p*-value <0.05 was considered statistically significant.

Results

A total of 102 patients undergoing elective surgical procedures under general anaesthesia were included in the study. Patients were equally allocated into two groups: Group A (i-gel, *n* = 51) and Group B (ProSeal laryngeal mask airway [PLMA], *n* = 51). Baseline demographic characteristics were comparable between the two groups. The primary

outcomes evaluated were ease of insertion and hemodynamic stability, whereas oxygen saturation, postoperative recovery, and airway-related complications were assessed as secondary outcomes.

Table 1. Baseline demographic characteristics of the study population

Variable	i-gel (n=51)	PLMA (n=51)	P value
Age (years)	38.16 $\pm$ 10.81	40.12 $\pm$ 9.55	0.334
Weight (kg)	50.73 $\pm$ 4.94	52.96 $\pm$ 5.67	0.624
Male	44 : 7	19 : 32	—
Female			

The two study groups were comparable with respect to demographic characteristics. The mean age was 38.16 $\pm$ 10.81 years in the i-gel group and 40.12 $\pm$ 9.55 years in the PLMA group (*p*=0.334). Similarly, mean body weight did not differ significantly between the groups (*p*=0.624). Although the sex distribution varied, both groups were otherwise clinically comparable before intervention.

Table 2. Ease of insertion of airway devices

Variable	i-gel (n=51)	PLMA (n=51)	P value
First-attempt success	47 (92.2%)	46 (90.2%)	0.727
Second-attempt success	4 (7.8%)	5 (9.8%)	
Mean insertion time (seconds)	8.92 $\pm$ 0.89	12.31 $\pm$ 1.86	0.002

Successful placement on the first attempt was achieved in 92.2% of patients receiving the i-gel and 90.2% receiving PLMA, with no statistically significant difference between the groups (*p*=0.727). However, the mean insertion time was significantly shorter with the i-gel (8.92 $\pm$ 0.89 seconds) than with PLMA (12.31 $\pm$ 1.86 seconds), indicating easier and faster placement of the i-gel (*p*=0.002).

Table 3. Comparison of intraoperative and postoperative hemodynamic parameters

Parameter	Findings
Pulse rate	Comparable throughout the study (all <i>p</i> >0.05)
Mean arterial pressure	Comparable initially; significantly lower in i-gel group from 10 minutes after insertion until 60 minutes postoperatively (<i>p</i> <0.05)

Comparison of ProSeal Laryngeal Mask Airway and i-gel for Ease of Insertion and Hemodynamic Stability in Patients Undergoing General Anaesthesia

Pulse rate remained stable in both groups throughout the intraoperative and postoperative periods, with no statistically significant intergroup differences at any measured time point. In contrast, mean arterial pressure showed significant differences after the initial five minutes. Patients managed with the i-gel demonstrated significantly lower mean arterial pressure from 10 minutes after insertion through the postoperative observation period, suggesting superior hemodynamic stability compared with PLMA.

Table 4. Oxygen saturation and postoperative recovery

Variable	i-gel	PLMA	P value
Oxygen saturation (SpO ₂)	Maintained at 99–100%	Maintained at 99–100%	>0.05
Modified Aldrete Recovery Score	Comparable	Comparable	>0.05

Peripheral oxygen saturation remained consistently between 99% and 100% in both groups throughout the perioperative period, with no statistically significant differences observed. Similarly, postoperative recovery assessed using the Modified Aldrete Recovery Score was comparable between the two groups at all recorded intervals, indicating similar recovery profiles following removal of the airway devices.

Table 5. Airway-related complications

Complication	i-gel (n=51)	PLMA (n=51)
Blood on airway device	2	6
Nausea	1	0
Cough	0	1
Dysphonia	1	0
Sore throat	0	0
Dysphagia	0	0
Tongue numbness	0	0

No major intraoperative airway complications such as aspiration, regurgitation, bronchospasm, or laryngospasm were observed in either group. Blood staining of the airway device occurred more frequently in the PLMA group (6 cases) than in the i-gel group (2 cases), although this difference was not statistically significant. One patient in the i-gel group experienced postoperative nausea, while one patient in the PLMA group developed postoperative cough. During the 12-hour follow-up period, dysphonia was reported in one patient in the i-gel group, whereas no cases of sore throat, dysphagia, or tongue numbness were observed in either group.

Overall, airway-related complications were infrequent and comparable between the two devices.

Discussion

The present study compared two widely used second-generation supraglottic airway devices, the i-gel and the ProSeal laryngeal mask airway (PLMA), with respect to ease of insertion, hemodynamic stability, oxygenation, postoperative recovery, and airway-related complications in patients undergoing elective surgery under general anaesthesia. Both devices provided effective airway management and adequate ventilation; however, the i-gel demonstrated significant advantages in terms of faster insertion and superior hemodynamic stability, while postoperative recovery and complication rates were comparable between the two groups.

Ease of insertion is an important determinant of successful airway management, particularly in elective surgical procedures where rapid establishment of a secure airway is desirable. In the present study, first-attempt insertion success was comparable between the two devices (92.2% for i-gel versus 90.2% for PLMA), indicating that both devices can be inserted reliably by experienced anaesthesiologists. However, the mean insertion time was significantly shorter with the i-gel than with the PLMA. The absence of an inflatable cuff in the i-gel probably contributed to quicker placement by eliminating the additional steps required for cuff inflation and positioning. Similar findings have been reported by Chauhan et al., Das et al., and Jadhav et al., who demonstrated that the i-gel requires less insertion time and fewer manipulations than the PLMA while maintaining a comparable success rate. These observations suggest that the anatomical design and cuffless structure of the i-gel simplify insertion without compromising airway security (10–12).

Hemodynamic stability is particularly important during airway manipulation because sympathetic stimulation may produce undesirable cardiovascular responses, especially in patients with limited cardiopulmonary reserve. In the present study, pulse rate remained comparable between the two groups throughout the perioperative period, whereas mean arterial pressure was significantly lower in the i-gel group from 10 minutes after insertion until the postoperative observation period. The greater hemodynamic response associated with PLMA may be explained by increased airway manipulation and cuff inflation during placement. Maharjan et al. similarly reported that i-gel produced the least cardiovascular stimulation when compared with other airway devices, while Das et al. also demonstrated significantly smaller changes in heart rate and blood pressure following i-gel insertion. These findings support the conclusion that the i-gel provides superior cardiovascular stability during

Comparison of ProSeal Laryngeal Mask Airway and i-gel for Ease of Insertion and Hemodynamic Stability in Patients Undergoing General Anaesthesia

airway management under general anaesthesia (11,13).

Effective oxygenation is essential regardless of the airway device used. In the present study, oxygen saturation remained between 99% and 100% in both groups throughout the intraoperative and postoperative periods, with no statistically significant differences. Both airway devices therefore maintained adequate ventilation and oxygenation during controlled ventilation. Similar observations have been reported in previous comparative studies, where both i-gel and PLMA provided satisfactory oxygenation without clinically significant desaturation. These findings indicate that both second-generation supraglottic airway devices are equally effective in maintaining oxygenation during elective surgical procedures (14).

Postoperative recovery, assessed using the Modified Aldrete Recovery Score, was comparable in both groups, with most patients achieving complete recovery within the early postoperative period. This suggests that the choice of airway device had little influence on immediate postoperative recovery following standardized anaesthetic management. Comparable recovery scores have also been described by Trivedi and Patil, who found no significant difference in postoperative recovery between patients managed with the i-gel and those receiving the PLMA (14).

Airway-related complications were infrequent in both groups. Blood staining of the airway device was observed more frequently in the PLMA group, while isolated cases of nausea, cough, and dysphonia occurred without statistical significance. No patient developed aspiration, regurgitation, bronchospasm, laryngospasm, sore throat, dysphagia, or tongue numbness during follow-up. Previous investigators have similarly reported a greater incidence of minor airway trauma and pharyngolaryngeal morbidity with PLMA, probably because of its inflatable cuff and relatively more difficult insertion. Although the overall complication rates remained low in both groups, the i-gel demonstrated a trend toward less airway trauma, supporting its atraumatic design and ease of placement (10,12,15).

Conclusion

Both the i-gel and ProSeal laryngeal mask airway (PLMA) were effective supraglottic airway devices for maintaining the airway during elective surgical procedures performed under general anaesthesia. Both devices provided a high first-attempt insertion success rate, adequate oxygenation, satisfactory postoperative recovery, and a low incidence of perioperative complications.

However, the i-gel demonstrated several clinically important advantages over the PLMA. It required significantly less time for insertion and was associated with superior hemodynamic stability, particularly with respect to mean arterial pressure

during the intraoperative and postoperative periods. Although airway-related complications were infrequent with both devices, minor complications such as blood staining of the device occurred more frequently with the PLMA.

Based on these findings, the i-gel may be considered a preferable second-generation supraglottic airway device for routine elective surgical procedures because of its ease of insertion, faster airway establishment, favorable hemodynamic profile, and comparable safety and efficacy.

References

1. Das A, Majumdar S, Mukherjee A, Mitra T, Kundu R, Hajra BK, et al. I-gel in ambulatory surgery: A comparison with LMA-ProSeal in paralyzed anaesthetized patients. *J Clin Diagn Res.* 2014;8(3):80-84.
2. Brain AJJ, Verghese C, Strube PJ. The LMA ProSeal: A laryngeal mask with an oesophageal vent. *Br J Anaesth.* 2000;84:650-654.
3. Bamgbade OA, Macnab WR, Khalaf WM. Evaluation of the I-gel airway in 300 patients. *Eur J Anaesthesiol.* 2008;25:865-866.
4. Gabbott DA, Beringer R. The I-gel supraglottic airway: A potential role for resuscitation? *Resuscitation.* 2007;73:161-162.
5. Lu PP, Brimacombe J, Yang C, Shyr M. ProSeal versus the classic laryngeal mask airway for positive pressure ventilation during laparoscopic cholecystectomy. *Br J Anaesth.* 2002;88(6):824-827.
6. Sharma B, Sehgal R, Sahai C, Sood J. ProSeal laryngeal mask airway versus I-gel: A comparative evaluation of respiratory mechanics in laparoscopic cholecystectomy. *J Anaesthesiol Clin Pharmacol.* 2010;26(4):451-457.
7. Kannaujia A, Srivastava U, Saraswat N, et al. A preliminary study of I-gel: A new supraglottic airway device. *Indian J Anaesth.* 2009;53(1):52-56.
8. Kim YH. Pulmonary aspiration associated with supraglottic airways: ProSeal laryngeal mask airway and I-gel. *Korean J Anesthesiol.* 2012;63(6):489-490.
9. Singh I, Gupta M, Tandon M. Comparison of clinical performance of I-gel with LMA-ProSeal in elective surgeries. *Indian J Anaesth.* 2009;53(3):302-305.
10. Chauhan G, Nayar P, Seth A, Gupta K, Panwar M, Agrawal N. Comparison of clinical performance of the I-gel with LMA ProSeal. *J Anaesthesiol Clin Pharmacol.* 2013;29(1):57-60.

Comparison of ProSeal Laryngeal Mask Airway and i-gel for Ease of Insertion and Hemodynamic Stability in Patients Undergoing General Anaesthesia

11. Das A, Majumdar S, Mukherjee A, Mitra T, Kundu R, Hajra BK, et al. I-gel in ambulatory surgery: A comparison with LMA-ProSeal in paralyzed anaesthetized patients. *J Clin Diagn Res.* 2014;8(3):80-84.
12. Jadhav PA, Dalvi NP, Tendolkar BA. I-gel versus laryngeal mask airway-ProSeal: Comparison of two supraglottic airway devices in short surgical procedures. *J Anaesthesiol Clin Pharmacol.* 2015;31:221-225.
13. Maharjan SK. The haemodynamic and ventilatory responses with I-gel, laryngeal mask airway and tracheal intubation during laparoscopic cholecystectomy. *J Kathmandu Med Coll.* 2012;1(2).
14. Trivedi V, Patil B. A clinical comparative study of evaluation of ProSeal LMA versus I-gel for ease of insertion and hemodynamic stability. *Internet J Anaesthesiol.* 2009;27(2).
15. Sharma B, Sood J, Sahai C, Ved PK. Efficacy and safety performance of ProSeal laryngeal mask airway in laparoscopic surgery: Experience of 1000 cases. *Indian J Anaesth.* 2008;52(3):288-296.