Original Research

COMPARATIVE STUDY OF I-GEL AND LARYNGEAL MASK AIRWAY FOR MINOR SURGICAL PROCEDURES UNDER TOTAL INTRAVENOUS ANAESTHESIA

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ABSTRACT

Background: Supraglottic airway devices are widely used during short elective procedures because they are easier to insert and less invasive than endotracheal tubes. Among them, the classic laryngeal mask airway (LMA) and the second-generation I-gel are both well-established devices. The present study compared their performance in adults undergoing minor surgical procedures under total intravenous anaesthesia (TIVA).

Methods: This hospital-based comparative study was conducted in the Department of Anaesthesiology, Gandhi Medical College and Hospital, Secunderabad, from June 2023 to November 2024. Ninety adult patients aged 18 to 60 years, belonging to ASA I or II, and scheduled for minor elective procedures under TIVA were enrolled and randomly allocated into two equal groups: I-gel (n=45) and LMA (n=45). Outcomes included insertion time, number of attempts, oxygen saturation, haemodynamic variables, airway manipulation, trauma, and postoperative sore throat. Continuous variables were compared using the independent t-test, while categorical variables were analysed using the chi-square test or Fisher's exact test where appropriate. A p value <0.05 was considered significant.

Results: Baseline characteristics were comparable between the two groups. Mean insertion time was significantly shorter with I-gel than with LMA (12.32 ± 2.05 s vs 16.01 ± 2.10 s; p<0.001). All patients in both groups had successful insertion on the first attempt. Mean oxygen saturation remained comparable in the I-gel and LMA groups (98.43 ± 1.01% vs 98.57 ± 0.78%; p=0.465). Heart rate and diastolic blood pressure were similar at all measured time points. Systolic blood pressure differed significantly only at 5 minutes, being higher in the I-gel group (122.67 ± 14.76 mmHg vs 116.09 ± 14.63 mmHg; p=0.037). Airway manipulation was required in 26.67% of cases in each group. Trauma was noted in 11.11% of the I-gel group and 4.44% of the LMA group (p=0.238), while postoperative sore throat occurred in 6.67% and 11.11% respectively (p=0.459).

Conclusion: Both I-gel and LMA were safe and effective for airway management during minor procedures under TIVA. I-gel offered a clear advantage in terms of faster insertion, while other perioperative outcomes were largely comparable. These findings support the use of I-gel as a practical alternative to LMA in suitable elective cases.

Keywords: I-Gel, Laryngeal Mask Airway, Supraglottic Airway Device, Total Intravenous Anaesthesia, Minor Surgery, Airway Management.

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INTRODUCTION

Airway management remains central to safe anaesthetic practice. For short elective procedures, supraglottic airway devices have become attractive alternatives to endotracheal intubation because they are less invasive, easier to place, and usually associated with fewer haemodynamic disturbances and less airway irritation [1, 2]. The laryngeal mask airway has been used extensively for this purpose and has established itself as a dependable device in

routine anaesthesia [1, 2]. However, the classic LMA has certain limitations, particularly cuff-related mucosal pressure and the absence of a gastric drainage channel. [3-5]

The I-gel is a second-generation supraglottic airway device designed to overcome some of these limitations. Its non-inflatable cuff, soft thermoplastic elastomer body, and integrated gastric channel allow it to sit anatomically over the laryngeal inlet without cuff inflation. This design may shorten insertion time, improve sealing, and reduce mucosal trauma and postoperative throat discomfort [5-8]. Previous comparative studies have reported favourable results with I-gel in terms of insertion characteristics and clinical performance, though outcomes have not been uniformly superior across all settings [9-13].

Minor surgical procedures performed under TIVA require an airway device that is reliable, quick to insert, and associated with minimal physiological disturbance. In such settings, both I-gel and LMA are practical options. The present study was undertaken to compare these two devices in adult patients undergoing minor elective surgical procedures under TIVA, with special emphasis on insertion time, number of attempts, oxygen saturation, haemodynamic responses, airway manipulation, and immediate postoperative complications.

MATERIALS AND METHODS

Study Design and Setting: This was a hospital-based comparative study carried out in the Department of Anaesthesiology, Gandhi Medical College and Hospital, Secunderabad, Telangana, over an 18-month period from June 2023 to November 2024.

Study Population: The study included adult patients admitted electively for minor surgical procedures under TIVA. Patients aged 18 to 60 years, weighing 40 to 90 kg, and belonging to ASA physical status I or II were considered eligible. Patients with a known or anticipated difficult airway, risk of aspiration, or pathology involving the neck, upper respiratory tract, or upper alimentary tract were excluded.

Sample Size and Allocation: A total of 90 patients were enrolled. They were allocated into two groups of equal size:

- **Group A:** I-gel (n=45)
- **Group B:** LMA (n=45)

Eligible patients were recruited through purposive sampling and then randomized using a computer-generated random number sequence. Allocation concealment was maintained with sealed opaque envelopes opened immediately before induction.

Procedure: After preoperative assessment and written informed consent, standard fasting guidelines and institutional premedication protocols were followed. In the operating room, standard monitoring included ECG, pulse oximetry, and non-invasive blood pressure. Anaesthesia was induced with intravenous agents according to standard TIVA protocol. The assigned supraglottic airway device was inserted by an anaesthesiologist experienced with both devices. The time from picking up the device to successful ventilation was recorded as insertion time. Number of attempts, need for airway manipulation, oxygen saturation, haemodynamic parameters, trauma, and postoperative sore throat were documented.

Data Collection and Outcomes: Demographic variables included age, sex, ASA grade, and body weight. Primary procedural outcomes were insertion time and number of attempts. Secondary outcomes included oxygen saturation, heart rate, systolic and diastolic blood pressure at predefined time points, airway manipulation, trauma, and postoperative sore throat. Data were collected by a dedicated observer blinded to device allocation and verified against anaesthesia records and operative notes.

Statistical Analysis: Data were entered into Microsoft Excel and analysed using standard statistical software. Continuous variables were expressed as mean ± standard deviation and compared using the independent t-test. Categorical variables were expressed as frequency and percentage and analysed using the chi-square test or Fisher's exact test where appropriate. A p value <0.05 was considered statistically significant.

RESULTS

Baseline Characteristics: The two groups were well matched with respect to age, sex, ASA grade, and body weight. The mean age was 38.29 ± 12.25 years in the I-gel group and 36.69 ± 11.87 years in the LMA group (p=0.531). Mean body weight was 63.71 ± 14.89 kg and 65.04 ± 14.12 kg respectively (p=0.664). Male patients constituted 64.44% in the I-gel group and 51.11% in the LMA group (p=0.200). ASA grade distribution was also similar, with no significant difference between groups (p=0.833) (Table 1).

Table 1: Baseline Characteristics of the Study Groups

Variable	I-gel (n=45)	LMA (n=45)	p value
Age, years (mean ± SD)	38.29 ± 12.25	36.69 ± 11.87	0.531
Weight, kg (mean ± SD)	63.71 ± 14.89	65.04 ± 14.12	0.664

Male, n (%)	29 (64.44)	23 (51.11)	0.200
Female, n (%)	16 (35.56)	22 (48.89)	
ASA I, n (%)	23 (51.11)	22 (48.89)	0.833
ASA II, n (%)	22 (48.89)	23 (51.11)	

Insertion Characteristics: Insertion was successful on the first attempt in all patients in both groups. Consequently, no statistical comparison was applicable for number of attempts. Insertion time, however, differed markedly between devices. The mean insertion time was significantly lower in the I-gel group than in the LMA group (12.32 ± 2.05 s vs 16.01 ± 2.10 s; t=-8.42; p<0.001). This was the most prominent difference observed in the study and suggests that I-gel allows faster establishment of the airway under TIVA (Table 2; Figure 1).

Table 2: Comparison of Insertion Characteristics

Variable	I-Gel (N=45)	LMA (N=45)	Test Statistic	P Value
Insertion time, sec (mean ± SD)	12.32 ± 2.05	16.01 ± 2.10	t = -8.42	<0.001
Number of attempts (mean ± SD)	1.00 ± 0.00	1.00 ± 0.00	NA	NA

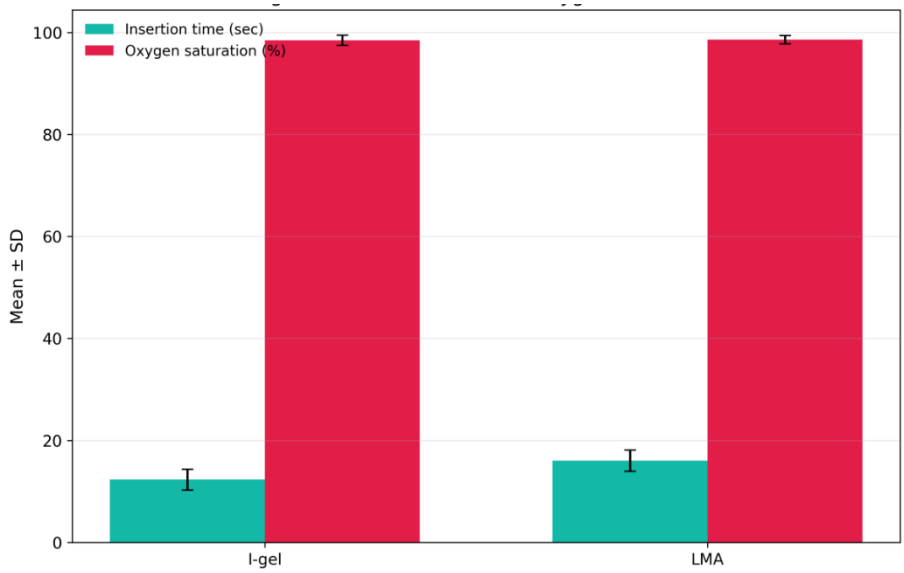

Figure 1: I-Gel Showed a Clearly Shorter Mean Insertion Time than LMA, while both Devices Achieved Universal First-Attempt Placement

Oxygenation and Haemodynamic Profile: Mean oxygen saturation was maintained at high levels in both groups and did not differ significantly (98.43 ± 1.01% in the I-gel group vs 98.57 ± 0.78% in the LMA group; p=0.465). This indicates that both devices were equally effective in maintaining oxygenation during the procedure.

Heart rate values remained comparable at all measured time points. At baseline, the mean heart rate was 74.84 ± 9.54 beats/min in the I-gel group and 75.82 ± 10.22 beats/min in the LMA group (p=0.640). No significant intergroup difference was observed during airway instrumentation or at 1, 3, and 5 minutes.

Systolic blood pressure was also broadly similar between groups except at 5 minutes, when the I-gel group showed a higher mean value than the LMA group (122.67 ± 14.76 mmHg vs 116.09 ± 14.63 mmHg; p=0.037). No significant difference was seen at baseline, during airway instrumentation, or at 1 and 3 minutes. Diastolic blood pressure did not differ significantly at any recorded time point (Table 3; Figure 2-4).

Table 3: Oxygen Saturation and Haemodynamic Parameters

Variable	I-Gel	LMA	P Value
Oxygen saturation, % (mean ± SD)	98.43 ± 1.01	98.57 ± 0.78	0.465
Heart rate baseline, beats/min	74.84 ± 9.54	75.82 ± 10.22	0.640
Heart rate during instrumentation, beats/min	75.78 ± 9.32	78.51 ± 9.24	0.166
Heart rate at 1 min	76.91 ± 9.97	76.09 ± 11.70	0.721
Heart rate at 3 min	75.00 ± 9.99	77.11 ± 9.35	0.304

Heart rate at 5 min	76.47 ± 9.30	75.96 ± 8.94	0.791
SBP baseline, mmHg	118.33 ± 17.20	118.07 ± 13.64	0.935
SBP during instrumentation, mmHg	119.76 ± 14.93	118.80 ± 14.81	0.761
SBP at 1 min, mmHg	117.22 ± 14.19	120.40 ± 15.40	0.312
SBP at 3 min, mmHg	121.18 ± 14.85	123.24 ± 16.50	0.534
SBP at 5 min, mmHg	122.67 ± 14.76	116.09 ± 14.63	0.037
DBP baseline, mmHg	79.93 ± 10.76	79.76 ± 7.87	0.929
DBP during instrumentation, mmHg	82.93 ± 9.42	79.76 ± 9.92	0.123
DBP at 1 min, mmHg	80.40 ± 9.37	77.82 ± 10.16	0.214
DBP at 3 min, mmHg	77.93 ± 10.08	79.64 ± 11.36	0.452
DBP at 5 min, mmHg	78.49 ± 8.23	79.89 ± 9.33	0.452

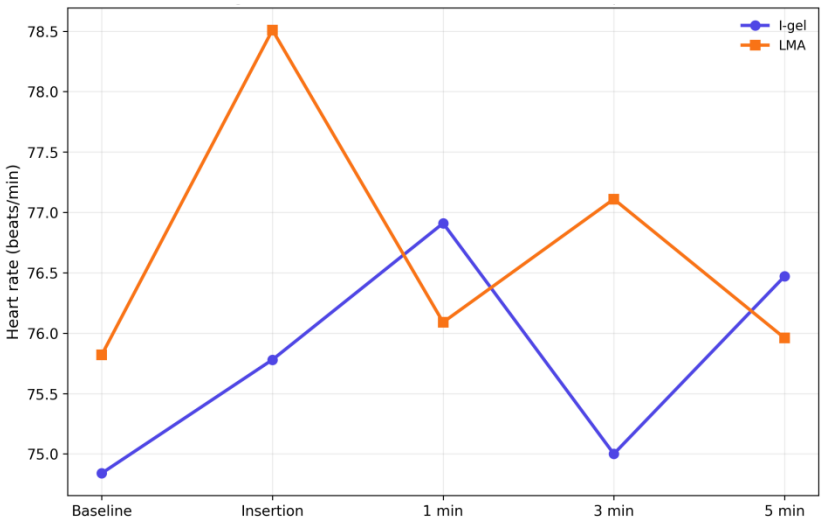

Figure 2: Heart Rate at Different Time Points

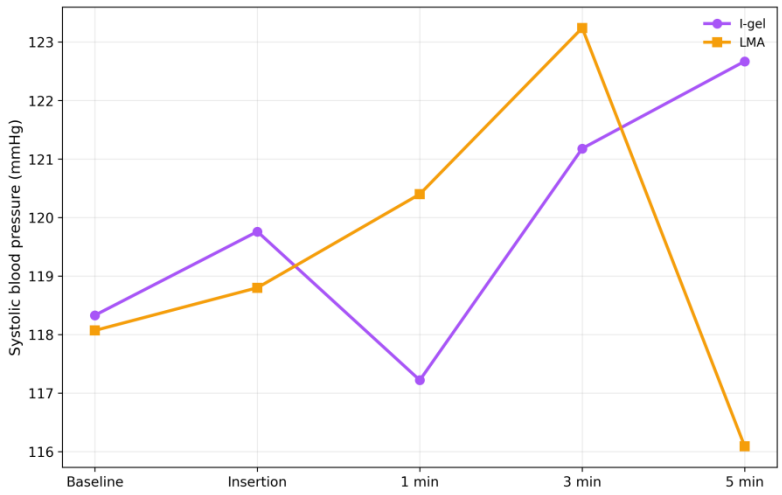

Figure 3: SBP at Different Time Points

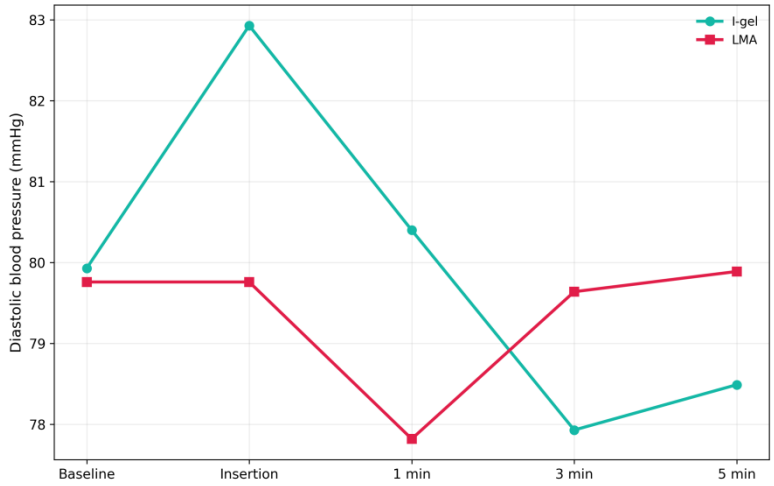

Figure 4: DBP at Different Time Points

Airway Manipulation and Postoperative Complications: Airway manipulation was required in 12 patients (26.67%) in each group, while 33 patients (73.33%) in each group required no manipulation. The rates were identical (p=1.000), suggesting that maintenance of airway position after placement was similar with both devices.

Trauma was noted in 5 patients (11.11%) in the I-gel group and 2 patients (4.44%) in the LMA group, but this difference was not statistically significant (p=0.238). Postoperative sore throat was seen in 3 patients (6.67%) using I-gel and 5 patients (11.11%) using LMA, again without a statistically significant difference (p=0.459) (Table 4; Figure 5). Overall, both devices were associated with low and acceptable complication rates.

Table 4: Airway Manipulation and Complications

Outcome	I-Gel (N=45)	LMA (N=45)	P Value
Airway manipulation required, n (%)	12 (26.67)	12 (26.67)	1.000
Trauma, n (%)	5 (11.11)	2 (4.44)	0.238
Postoperative sore throat, n (%)	3 (6.67)	5 (11.11)	0.459

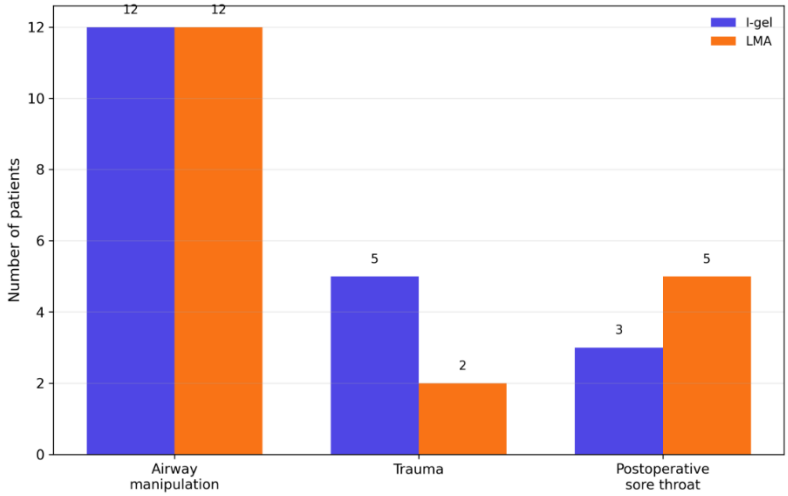

Figure 5: Airway Manipulation and Complications

Figure 6 shows that the two study groups were almost identical with respect to ASA grade distribution. In the I-gel group, 23 patients belonged to ASA I and 22 to ASA II, while in the LMA group, 22 patients were ASA I and 23 were ASA II. This near-equal distribution indicates that both groups were well matched at baseline in terms of preoperative physical status, which strengthens the fairness of comparison between the two airway devices.

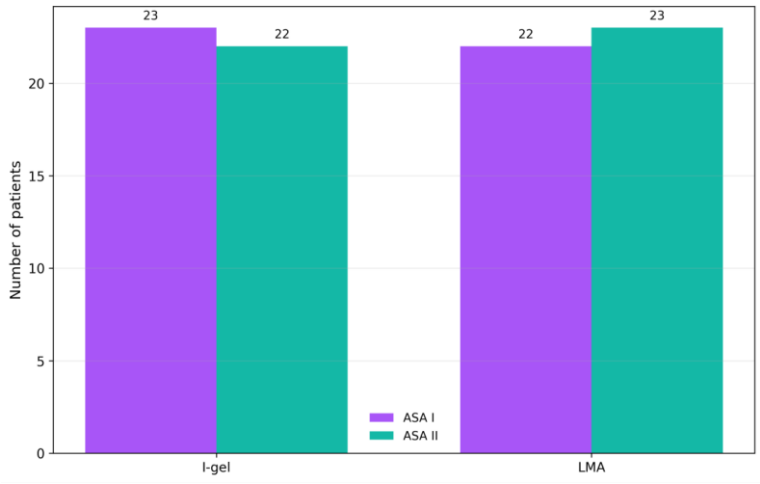

Figure 6: ASA Grade I & II Distribution between the Groups

DISCUSSION

This study compared I-gel and LMA in adult patients undergoing minor elective procedures under TIVA and found that both devices performed well in routine clinical use. The most important finding was the significantly shorter insertion time with I-gel. This result is clinically relevant because a shorter insertion interval can simplify airway establishment and reduce interruptions during induction, especially in short procedures and busy operation theatres. Similar observations have been reported in previous comparative studies where I-gel showed faster placement than various LMA models [9-13].

All patients in both groups had successful first-attempt insertion. This reflects the operator's familiarity with both devices and suggests that each is dependable in experienced hands. While some studies have reported higher first-pass success with I-gel, particularly among less experienced users, the present data show that both devices can perform equally well when handled by trained anaesthesiologists [6,7,11].

Oxygen saturation remained stable and comparable between groups, confirming that both devices provided effective ventilation during the study procedures. Heart rate and diastolic blood pressure showed no significant intergroup difference at any measured time point. This suggests that both supraglottic devices are haemodynamically well tolerated under TIVA. The isolated difference in systolic blood pressure at 5 minutes, although statistically significant, was not accompanied by a consistent pattern across other time points. It is therefore more appropriate to interpret it as a limited observation rather than proof of a sustained haemodynamic advantage for one device over the other.

The rates of airway manipulation were identical in the two groups, which indicates that once positioned, both devices maintained their clinical utility similarly in this patient population. Trauma was numerically more frequent with I-gel, whereas postoperative sore throat was numerically more frequent with LMA, but neither difference reached statistical significance. This pattern is plausible. The firmer contour of I-gel may occasionally contribute to minor mucosal contact during insertion, while the inflatable cuff of LMA may be associated with more postoperative throat irritation. Still, the low event rates in both groups suggest that either device is acceptable in terms of short-term tolerability.

Taken together, the present results support the view that I-gel and LMA are both suitable for minor procedures under TIVA, but I-gel offers a practical advantage in terms of speed of insertion. For departments seeking a device that is simple, rapid, and effective for short elective surgery, I-gel appears to be an attractive option. At the same time, the comparable oxygenation, stable haemodynamic profile, and low complication rates seen with LMA confirm that it remains a dependable airway device in this setting.

Limitations: This study was conducted in a single centre, which may limit wider generalisability. The sample size, though adequate for the primary comparison, was relatively modest for detecting small differences in less common complications. Only immediate perioperative and early postoperative outcomes were assessed, so longer follow-up data are not available. In addition, fibreoptic confirmation of device position and airway leak pressure measurements were not included. These factors should be considered when interpreting the findings.

CONCLUSION

Both I-gel and LMA were safe and effective supraglottic airway devices for minor surgical procedures under TIVA. The major difference between the two was insertion time, which was significantly shorter with I-gel. All other key perioperative outcomes, including success of placement, oxygenation, haemodynamic variables, need for airway manipulation, trauma, and

postoperative sore throat, were broadly comparable. In routine adult elective practice, I-gel may therefore be preferred when quicker airway establishment is desired, while LMA remains a reliable alternative.

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