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Original Research Article

Comparison between Three Insertion Techniques for Supraglottic Airway Device I-Gel Placement: Standard, Rotation and Reverse in Terms of Insertion Characteristics & Success Rate

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Abstract

Aims & Objectives: To compare the three techniques of I-Gel placement (standard, rotation and reverse) in terms of insertion characteristics and success rate. To assess & compare mean time of insertion, ease of insertion, first attempt and overall success rate, Oro-pharyngeal Leak Pressure, Manoeuvres required and Ease of placement of Nasogastric Tube among the three groups.

To compare and assess complications such as sore throat and blood staining.

Methods: After approval of the Institutional Ethics Committee, 102 patients of ASA Grade I & II, aged 18-65 years who were undergoing elective surgery under general anaesthesia were included. After induction of anaesthesia, i-gel was inserted by using the standard, rotation and reverse techniques in Groups I, II, and III, respectively. The primary objective was to determine mean time of insertion. Secondary variables included ease of insertion, first attempt success rate, oropharyngeal leak pressure, manoeuvres required, ease of placement of nasogastric tube, and complications if any.

Results: Time taken for insertion was shortest and significantly lower ($P < 0.05$) for group III in comparison with the other two groups. There were no significant differences in overall success rate, first attempt success rate, manoeuvres required and incidence of complications among the three groups ($P > 0.05$). Baseline haemodynamic parameters were comparable in all three groups at base line, 1, 3, and 5 min after i-gel insertion.

Conclusion: Although the time of insertion is shortest when i-gel is inserted using the reverse technique, all techniques are comparable and choice of technique depends upon the comfort and experience of the investigator.

Keywards: Manoeuvres, nasogastric tube, Oro-pharyngeal Leak Pressure.

Introduction

I-gel, a second-generation supraglottic airway device (Intersurgical, Wokingham, UK), uses a thermoplastic elastomer soft gel-like cuff that does not require intra-cuff pressure adjustment or cuff inflation. These days, this equipment is widely used in resuscitation, pre-hospital emergency airway care, and conventional elective anaesthesia. In terms of ease of insertion, I-gel has been reported to perform better than other SADs [1]. It can also be used as a conduit for fiberoptic intubation on patients with restricted airways. [2,3] I-gel insertion success rates when employing standard technique vary from 78 to 93% on the first try, but they rise to a relatively high level of 84-100% after two tries. [4] Because of this technique's thick and semi-rigid cuff, which forces the tongue to fold, placement can occasionally be challenging. Multiple attempts can lengthen the time it takes for securing the airway in the operation theatre or in an emergency situation, as well as cause trauma to the supraglottic structures and oral cavity. Tongue folding, a major obstacle to the proper application of I-gel, can be prevented with the aid of a manual tongue stabilization technique. [5] Other insertion methods, such as rotation or reverse, can also be employed to regulate the insertion of supraglottic airway devices. There aren't many studies that demonstrate how using rotation or reverse techniques can improve the success of I-gel placement. [6,7] However, a randomized controlled trial comparing all three methods has not been attempted yet. The three I-gel placement techniques were evaluated in this study for their insertion features, first-attempt and total success rates, and incidence of complications, if any.

Material and Methods

At Sri Aurobindo Medical College & PG Institute, Indore (M.P.), the anesthesiology department carried out an analytical cross-sectional study. The study sought to examine the standard, rotation, and reverse approaches of I-Gel placement in terms of the insertion features and success rate after receiving approval from the institutional ethics committee. The trial involved 102 patients over the course of 18 months, with 34 in each group, from 1 April 2021 to 30 September 2022. All ASA grade I and II patients who were scheduled for elective surgery under general anaesthesia and who were between the ages of 18 and 65 were included in the study. Patients coming in for emergency surgery, those with a known problematic airway, those with a BMI >35 kg/m2, and acute sore throats were excluded.

1. I-gel was introduced using usual procedure in **Group I** patients undergoing elective surgery under general anaesthesia.
2. Patients in **Group II** underwent elective surgery while under general anaesthesia, and I-gel was introduced using rotation technique
3. Patients in **Group III** underwent elective surgery while under general anaesthesia, and I-gel was inserted using reverse technique.

Before the induction of anaesthesia, the patient was pre-medicated with IV Glycopyrrolate 0.01 mg/kg and IV Midazolam 0.05 mg/kg. The normal anaesthetic monitoring devices were put in place when the patient entered the operating room. After pre-oxygenation, the patient was given an IV induction dose of 2 mg/kg of propofol, 1 mg/kg of fentanyl, and 0.5 mg/kg of atracurium. When the patient became apneic and reached a sufficient level of anaesthesia, the I-gel Insertion was carried out. One of the study's insertion strategies was used to introduce the I-gel. Weight was used to standardise I-gel size

(I-gel size 3 for 30-60 kg and size 4 for 50 to 90 kg and size 5 for more than 90kg).

Supine with their heads in the sniffing posture, the patients were positioned. I-gel™ was introduced to group I with its concavity facing the mandible in the mouth. It was then advanced down the hard palate, soft palate and posterior pharynx before being pushed posteriorly into its final position. In group II, the entire I-gel™ cuff was inserted into the patient's mouth in a midline approach without inserting a finger. It was then rotated 90 degrees anticlockwise around the patient's tongue, advanced until resistance was felt at the hypopharynx, and then it was re-rotated clockwise to the standard orientation, returning to the midline.

I-gel™ was injected in group III with its concavity pointing in the direction of the hard palate. The device was turned 180 degrees once it reached the pharynx to put it in its final position for positive pressure ventilation. By observing a square wave capnograph, auscultation, movement of the chest wall, and the absence of an audible leak with peak airway pressure (PAP) 20 cm H2O during manual ventilation, the appropriate placement of I-gel™ was confirmed.

A range of manoeuvres, including chin lift, jaw thrust, head extension, neck flexion, gentle advancement, or retraction of device, were used to improve the ventilation if the leak occurred at a pressure of less than 20 cmH2O. The I-gel™ was reinserted using the same method if the air leak remained in spite of the manipulations, marking the attempt a failure.

An assistant employed a gentle jaw thrust on the second attempt; if the issue was still present, I-gel™ in a lesser or larger size was used. For the same technique, a maximum of three attempts were permitted. After three unsuccessful tries, it was considered a failure, and an alternative device was used to regulate the airway. The number of insertion attempts were recorded.

Result

A total of 102 patients were enrolled with 34 patients in each group. According to Table 1, all three groups' demographic traits were comparable.

Table 1: Demographic characteristics among different groups. Values are mean±SD

Parameter	Group I (*n*=34) Standard	Group II (*n*=34) Rotation	Group III (*n*=34) Reverse	*P*
Age (years)	42.32 ± 12.92	40.64 ± 13.35	40.17 ± 12.25	0.074
Male/Female	7/27	8/26	8/26	0.238
BMI (kgm-2)	23.14±3.07	23.65±3.08	23.81±2.74	0.527
ASA grade I/II	31/3	30/4	31/3	0.856
MPG grade I/II/III	7/23/4	7/24/3	5/25/4	0.731
Size of i-gel™ (3/4/5)	22/11/2	21/10/3	19/12/3	0.269
Duration of surgery (min)	68.56±24.69	72.49±23.24	67.84±20.27	0.665

Tables 2 and 3 display the study's insertion characteristic data. For groups I, II, and III, respectively, the mean time of insertion was 17.94 ± 4.39 s, 16.41 ± 3.56 s, and 15.14 ± 2.89 seconds. Time taken for insertion was shortest and significantly lower for group III compared to the other two groups (P = 0.042). The rest of the groups' insertion times were comparable (Table 2). In groups I, II, and III, the first attempt success rates were 82.36%, 85.3%, and 88.24%, respectively. I-gel insertion had the highest overall success rate and first-time success rate in group III, followed by groups II and I, but the difference was not statistically significant (P = 1.969, 0.315).

Table 2: Mean insertion time and success rate for i-gel placement among different groups. Values are number (proportion) or mean±SD

Parameter	**Group I (*n*=34) Standard**	**Group II (*n*=34) Rotation**	**Group III (*n*=34) Reverse**	***P****
Mean time of insertion (sec)	17.94±4.39	16.41±5.36	15.14±2.89	0.042*
Success rate:				
First attempt	28 (82.36%)	29 (85.3%)	30 (88.24%)	1.969
Second attempt	1 (2.94%)	2 (5.88%)	1 (2.94%)	
Third attempt	2 (5.88%)	1 (2.94%)	2 (5.88%)	
Failure	3 (8.82%)	2 (5.88%)	1 (2.94%)	
Overall success rate	31 (91.12%)	32 (94.12%)	33 (97.05%)	0.315

*$P<0.05$ is significant.

The groups were comparable in terms of ease of insertion. (P = 0.760) Two (5.9%) patients in group III, three (8.8%) patients in group II, and three (8.8%) patients in group I all required maneuvers (P = 0.712; Table 3). The groups had similar means for OLP, PAP, and nasogastric tube placement. At baseline and 1, 3, and 5 min after I-gel insertion, Heart Rate and Mean Arterial Pressure were comparable in all three groups.

Table 3: Comparison of Insertion characteristics among different groups

Parameter		Group I (*n*=34) Standard	Group II (*n*=34) Rotation	Group III (*n*=34) Reverse	*P**
Ease of insertion	Easy	30 (88.3%)	30 (88.3%)	31 (91.2%)	0.760
	Difficult	4 (11.7%)	4 (11.7%)	3 (8.8%)	
Maneuvers required		3 (8.8%)	3 (8.8%)	2 (5.9%)	0.712
Oropharyngeal leak pressure (cm H_2O)		25.14±3.77	26.39±4.19	27.31±4.09	0.124
Peak airway pressure (cm H_2O)		14.08±2.42	14.35±2.58	14.29±2.73	0.448
Ease of NG tube placement Easy/ difficult/ failure		30/3/1	31/3/0	33/1/0	0.657

Discussion

Using the i-gel instead of tracheal intubation is beneficial for patients having elective surgery. For proper ventilation and oxygenation to occur, the device must be positioned correctly. When implanted following the accepted approach, all supraglottic airways, including i-gel, advance over the tongue in a midline orientation. The non-inflatable cuff on the i-gel is unusual and is a little stiffer and bulkier before cuff inflation than those on other devices. These could be the main reasons for tongue folding or posterior displacement at the back of the mouth, which has an inconsistent success rate and leads to placement failure. [5,10,11] The results of using the rotation and reversal procedures to boost supraglottic airway insertion success rates have been conflicting. Thus, this study was carried out to assess the three i-gel insertion methods (standard, rotation, and reverse). The main objective of our investigation was mean insertion time. When compared to standard technique, it was found to be statistically lower in reverse technique (P= 0.042).

Furthermore, the reverse approach showed a statistically insignificantly greater overall and first-time success rate than the normal and rotation techniques, making it simpler in terms of placements and less likely to result in side effects including sore throats and blood staining. Because the i-gel can pass through the pharyngeal wall without encountering any resistance, there might be fewer complications in groups II and III.

Park *et al*. performed a meta-analysis to compare the standard and rotation approaches for inserting supraglottic airway devices such as the LMA Classic, LMA Proseal, SoftSeal, and i-gel. The seven experiments on adult patients used rotation angles of 90° and 180° (rotation and reverse technique in the present study). In the subgroup analysis, the three studies that used 90° rotation on adult patients showed better results with no heterogeneity. Nevertheless, a subgroup analysis of the three studies using the 180° rotation approach in adult patients failed to demonstrate an improvement in success rates.

The rotation technique improved first-attempt and overall success rates, was quicker to insert, needed fewer attempts, and caused fewer instances of blood on the removed device, which suggested less mucosal trauma, according to the meta-analysis. Superior results for postoperative sore throat, fiberoptic view, or OLP, however, could not be confirmed. [12] Our findings are in agreement with this meta-analysis when it comes to the reverse technique (180° rotation). This analysis and the current study are not comparable because we looked at 90° and 180° rotation as different rotation approaches.

Four different types of supraglottic airways were examined in the studies that made up this meta-analysis, and the disparate results may have been caused by the various device characteristics. Our findings are consistent with the ones from the Sharda *et al*. study. They compared regular and reverse i-gel insertion in 100 individuals. They noticed a shorter mean insertion time in the reverse group, and the difference was statistically significant (P = 0.012). The first attempt success rates were 86% and 96%, respectively, in the conventional and reverse groups (P = 0.08).

Compared to patients in the reverse technique group, patients in the standard technique group experienced more sore throats and device stains from blood. [7] The utilization of the conventional and rotational i-gel insertion techniques was compared by Kim *et al*. [6] and Muneer *et al*. [13] in their studies.

They claimed that the rotation technique led to a higher first attempt success rate, a quicker insertion time, a higher airway seal pressure, and less blood staining of the device in contrast to the current study. Kim *et al*. found that the rotation technique resulted in fewer patients needing manipulations (29% vs. 39%) and more straightforward insertions (86% vs. 97%). The rotation group's standard score was, however, lower than Brimacombe's. (P = 0.001)

This can be attributed to the difference in experience between the study population and the investigator (>300 i-gel insertions using standard technique). Nasogastric tube placement was similar across all three groups. In 94% of patients utilizing the rotation technique, Liew *et al*. [14] reported easy nasogastric tube placement, while in 100% of patients using the conventional i-gel insertion technique, Singh *et al*. [15] reported easy nasogastric tube placement. Baseline HR and MAP were similar across all groups. They were comparable between the groups at 1, 3, and 5 minutes following the insertion of the i-gel (P > 0.05). Our results are in agreement with those from studies by Sharda *et al*. and Kim *et al*. [6,7]. They discovered no difference in the groups' HR and MAP after inserting the i-gel. The success rates in the two groups were comparable, despite the fact that the reverse technique in the current study had a significantly lower mean insertion time than the standard technique. As a result, inserting the device more quickly by a few

seconds might not have a clinically significant effect.

The fiberoptic view grading for the rotation group was noticeably superior to the norm. Due to the fact that the OLP was consistent across all groups, this will also have little impact. The three i-gel placement strategies are therefore identical clinically. Our research had few restrictions. Blinding was not feasible for the insertion technique and recording insertion time. Moreover, results might not be applicable to anesthesiologists skilled in rotation and reversal techniques since i-gel was only inserted by researchers with training in standard technique. The study's conclusions might not apply to some segments of the population, such children and the elderly.

Conclusion

According to our findings, all I-gel insertion strategies are equivalent clinically, and the choice of approach depends on the investigator's comfort level and knowledge with the particular technique. We further contend that due to higher first attempt and overall success rates, fewer attempts for successful insertion, and less blood stains and sore throat, the reverse technique may be more effective when device insertion is unsuccessful on the first try.

References

1. Duckett J, Fell P, Han K, Kimber C, Taylor C. Introduction of the i-gel supraglottic airway device for prehospital airway management in a UK ambulance service. Emerg Med J. 2014;31:505-7.
2. Emmerich M, Tiesmeier J. The I-gel supraglottic airway: A useful tool in case of difficult fiberoptic intubation. Minerva Anestesiologica. 2012; 78: 1169-70.
3. Rustagi PS, Nellore SS, Kudalkar AG, Sawant R. Comparative evaluation of i-gel® insertion conditions using dexmedetomidine-propofol versus fentanyl-propofol A randomised double-blind study. Indian J Anaesth. 2019;63:900-7.
4. Theiler L, Gutzmann M, Kleine-Brueggeney M, Urwyler N, Kaempfen B, Greif R. I-gel supraglottic airway in clinical practice: A prospective observational multicentre study. Br J Anaesth. 2012;109:990-5.
5. Taxak S, Gopinath A. Insertion of the i-gel™ airway obstructed by the tongue. Anesthesiology. 2010; 112: 500-1.
6. Kim HC, Yoo DH, Kim HJ, Jeon YT, Hwang JW, Park HP. A prospective randomised comparison of two insertion methods for i-gel™ placement in anaesthetised paralysed patients: Standard vs rotational technique. Anaesthesia. 2014;69:729-34.
7. Sharda M, Kapoor MC, Atray R, Garg S. Insertion of i-gel™ by the reversed technique improves the success rate and reduces the time taken for its placement: A prospective, randomized, controlled, interventional trial. J Anaesthesiol Clin Pharmacol. 2017; 33:226-30.
8. Singh J, Yadav MK, Marahatta SB, Shrestha BL. Randomised crossover comparison of the laryngeal mask airway classic with i-gel laryngeal mask airway in the management of difficult airway in post burn neck contracture patients. Indian J Anaesth. 2012;56:348-52.
9. Verghese C, Berlet J, Kapila A, Pollard R. Clinical assessment of the single use laryngeal mask airway – The LMA-Unique. Br J Anaesth. 1998; 80:677-9.
10. Hwang JW, Park HP, Lim YJ, Do SH, Lee SC, Jeon YT. Comparison of two insertion techniques of ProSeal laryngeal mask airway: Standard versus 90-degree rotation. Anesthesiology. 2009;110:905-7.
11. Sen I, Bhardwaj N, Latha YS. Reverse technique for i-gel supraglottic airway insertion. J Anaesthesiol Clin Pharmacol.

2013;29:128-9.
12. Park JH, Lee JS, Nam SB, Ju JW, Kim MS. Standard versus rotation technique for insertion of supraglottic airway devices: Systematic review and meta-analysis. Yonsei Med J. 2016; 57:987-97.
13. Muneer MN, Malik S, Kumar N. Comparison of ease of i-gel™ insertion with standard and rotational techniques in adults. J Surg Pakistan. 2016;21:122-5.
14. Liew GH, Yu ED, Shah SS, Koyhandan H. Comparision of the clinical performance of i-gel™, LMA Supreme and LMA ProSeal in elective surgery. Singapore Med J. 2016;57:432-7.
15. Singh A, Bhalotra AR, Anand R. A comparative evaluation of ProSeal laryngeal mask airway, I-gel and Supreme laryngeal mask airway in adult patients undergoing elective surgery: A randomised trial. Indian J Anaesth. 2018;62:858-64.