Evaluation of I-Gel™ versus Classic LMA™ for Airway Management by Paramedics and Medical Students: A Manikin Study

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Abstract

Background and Aim: Airway management is a lifesaving skill which all health-care workers should possess. Currently, most of the resuscitation councils recommend supraglottic airway devices as the technique of choice for airway management during cardiopulmonary resuscitation by health-care providers without expertise in tracheal intubation. This is because of its high first-pass success rate and easy to acquire and retain skill even by novices. Materials and Methods: The present study was planned to compare the efficacy of two commonly available supraglottic airway devices, classic LMA (cLMA) and I-gel in securing airway in adult manikin by inexperienced persons (58 paramedics and 46 medical students), after a brief training. Our primary aim was to determine the first attempt success rate, and other parameters studied were the time and ease of insertion, overall success rate, and preference for device. Results: The first-attempt success rate of I-gel was higher in both groups of participants (74% in students and 69% in paramedics) compared to that of cLMA (70% in students and 53% in paramedics) although the overall success was the same. Majority of participants could secure airway quickly and easily by I-gel than by cLMA. More than 90% of participants preferred I-gel over cLMA. Conclusion: This study shows that inexperienced persons could learn to place the I-Gel and cLMA successfully in the manikin after a brief training in manikin. The first-attempt success rate and insertion of I-gel was easier and faster than that of cLMA by both groups of participants and most participants preferred I-gel due to ease of handling.

Keywords: Airway management, laryngeal mask airway, I-gel, manikin, paramedics, medical students

Introduction

Maintenance of airway patency and ensuring ventilation is of critical importance during medical emergencies such as sudden cardiac or respiratory arrest. Endotracheal intubation (ETI) is the gold standard for maintenance of a patent airway. ETI is a specialized skill, which requires training and practice to acquire and retain and might not be possessed by all medical professionals. Endotracheal tubes have a high chance of misplacement (25%) when intubation is attempted outside the operation room settings.[¹] Various resuscitation guidelines have increasingly emphasized the need to minimize interruption of compressions when establishing a clear airway during cardiopulmonary resuscitation (CPR). The longer duration of interruption needed during ETI when performing CPR can adversely affect cerebral and cardiac perfusion. Due to these reasons, currently, supraglottic airway devices (SADs) have been incorporated by most of the resuscitation councils for airway management during CPR as the preferred technique by health-care providers without expertise in ETI.[²,³] SADs acting as a bridge between face mask ventilation and ETI overcome many of these limitations and have the added advantage of a shorter learning curve of fast and correct placement even by novices. Thus, SADs are invaluable and preferred devices for quick and confirmed airway patency, especially when used by novices in airway management during emergency situations.

Initial few studies tentatively proposed use of I-gel for securing airway during cardiopulmonary arrest.[⁴,⁵] Later, several

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simulation and clinical studies related to airway management were done to find out the optimal SAD for different groups of health-care workers during emergency situation\(^{[5-9]}\) but with variable results.

The present study planned to compare the efficacy of two commonly available SADs, cLMA and I-gel, in securing airway by inexperienced persons (paramedics and medical students) in emergency situations as a part of prehospital management. We conducted the study in adult manikin where each participant attempted insertion of cLMA and I-gel after a brief training. Our primary objective was to determine the first-attempt success rate. In addition, we also determined the overall success rate, time taken for insertion, manipulations required for insertion, and the individual preference of a particular device.

**Materials and Methods**

The study was conducted in a medical college having undergraduate and postgraduate courses. Total 104 inexperienced participants, including paramedics (Group P, \(n = 58\)) and medical students (Group M, \(n = 46\)), consented to be part of this study. Written and informed consent was obtained from each of them. No participant had received training in airway and had no experience in using SAD. Protocol was presented to the institutional research committee for ethical clearance and it was approved. Before practical demonstration, all the participants had a 30-min PowerPoint presentation including lecture and video clips where they were familiarized with the SAD devices and their usage, role of inexperienced persons in prehospital CPR, and the need of the study. Following this theory class, every participant was demonstrated the correct technique of insertion of both the devices: CLMA (Laryngeal Mask Airway Co., Ltd., Jersey, U.K.) and I-gel\(^{TM}\) (Intersurgical, Wokingham, UK) in the manikin (Laerdal Resusci Anne Airway Trainer\(^{TM}\), Laerdel, Stavanger, Norway). Insertion was demonstrated step by step with proper verbal instructions in a group of eight candidates per batch, so that each candidate could watch the steps properly. To aid in insertion of device, they were also told to use one or more maneuvers if needed (changing the depth of insertion of SADs, extension or flexion of neck, and chin lift). They were also instructed how to inflate the cuff of cLMA with 30 ml of air after insertion and ventilate the lungs of manikin with self-inflating resuscitation bag. Prior to each attempt, oral cavity of manikin and devices were lubricated as per the manufacturer’s instruction. After completion of the demonstration, the candidates were called for practical hands on training where only the performing candidate was allowed in the room, so that none of the participants could watch the performing participant and induce the element of learning bias. Each participant was instructed to insert both devices one by one. The order in which devices were to be used was decided by chit in a box method to eliminate any bias. We selected size 4 of both cLMA and I-gel (best fit for the manikin).

Each participant was allowed only three attempts of insertion for each device. If he/she was unable to insert and ventilate it successfully, it was labeled as failure. Overall success rate was calculated based on the cumulative success rate after three attempts or less. Time for insertion (calculated from holding the device in hand before insertion till the visible chest rise of lungs was observed following ventilation with resuscitation bag), subjective ease of insertion (easy, difficult, and very difficult), and number and types of manipulations needed for insertion were also noted by an anesthesiologist other than instructor. At the end of the individual performance, the participants were asked regarding which device they will prefer to use.

**Statistical analysis**

Descriptive statistics of the continuous variables were presented as mean ± standard deviation/median (interquartile range) and compared by Kruskal–Wallis H test. Categorical data in frequency (%) and compared by Chisquare test. \(P < 0.05\) was considered statistically significant. Statistical Package for the Social Sciences, version-23 (SPSS-23, IBM, Chicago, IL, USA) was used for data analysis.

**Results**

The findings of the study are summarized in Table 1. The first-attempt success rate of I-gel was higher than that of cLMA in both groups although slightly higher in students than in paramedics for both I-gel (74% vs. 69%) and cLMA (70% vs. 53%) in Groups P and M, respectively. 22% and 24% of paramedics and students, respectively, required 2\(^{nd}\) attempt to insert I-gel successfully. The overall success rate for I-gel insertion was 100% in both groups of participants, whereas for cLMA, it was 91% and 98% in paramedics and medical students, respectively (\(P = 0.99\)). None of the participants failed in inserting I-gel, whereas 8/58 of paramedics and 1/46 of students failed to insert the cLMA.

Time required for successful insertion of I-gel was significantly shorter than that required for cLMA in both groups of participants: 16.79 ± 9.12 s (median, 15 s and interquartile range [IQR], 10–18) for paramedics and 13.13 ± 6.82 s (median, 10 s and IQR, 9–19) for students. Whereas, insertion time for cLMA was 25.53 ± 19.44 s (median, 15 s and IQR, 15–26) for paramedics and 19.15 ± 10.08 s (median, 15 s and IQR, 14–20 s) for students (\(P < 0.001\)).

Most participants in both groups felt that insertion of I-gel was easier than that of cLMA. 96% of students and 90% of paramedics rated insertion of I-gel easy compared to 85% of students and 66% of paramedics, who rated insertion of cLMA easy. 35% and 15% of paramedics and students, respectively, rated insertion of cLMA difficult (\(P < 0.001\)). For successful insertion of devices, airway manipulation (extension of neck or chin lift) was not frequently required by most participants for both I-gel and cLMA. Regarding preference of device if needed to use, majority of the participants opted for I-gel over cLMA.

**Discussion**

This manikin study shows that the paramedics and medical students were able to place the I-gel and cLMA successfully...
in a manikin after a brief training session. The first-attempt success rate was higher for I-gel in both the groups (74% in medical students and 69% in paramedics) compared to cLMA (70% and 53% for medical students and paramedics, respectively). Overall high success rate for I-Gel has been reported by previous studies[6-9, 16-18] however, the results of the first-attempt success rates have been variable (54%–96.9%) in different studies.[8-16] The reasons for this disparity can be due to use of these devices by different groups of peoples ranging from novices to anesthesiologist and also use in different manikins and clinical scenarios. 

Time taken for successful insertion was also shorter and lesser maneuvers were employed during I-gel insertion by both the groups of participants compared to cLMA, a finding consistent with other reports.[6, 16-18] Wharton et al.[6] had further confirmed that I-gel can be placed quickly both in manikin (median insertion time 14 s) and patients (17.5 s).

In emergency situations like cardiac arrest, along with cardiac compression, securing airway patency is of utmost importance, but it should be done with minimum interruption of cardiac compressions.[19, 20] For achieving this, SADs are superior devices and are potentially advantageous compared to ETI, especially when resuscitation is being attempted by persons who are not adept in airway management.

There is substantial evidence that SADs reportedly require less technical skills and are suited for use by novice and occasional operators.[21, 22] Without adequate training and experience, complications with ETI are high. The incidence of failure, unrecognized esophageal intubation, and dislodgement of endotracheal tube are also high.[1, 22] A number of studies have been conducted in manikin[24-26] as well as in patients[6, 7, 27] using various available SADs. Most authors reported better results with I-gel than with other SADs[6-8, 24, 27] except LMA supreme. Further, in a manikin study, it was demonstrated that the I-gel can decrease the time taken to establish an airway during CPR by up to 50% compared with the LMA-classic, PLMA, or tracheal tube.[17] Nakstad and Sandberg[28] in their study showed that even in simulated restricted access to the area, 80% of physicians were able to secure airway with a mean time of 12.3 s ± 3.6 with Igel. as compared to 65% success rate and mean time 28 s ± 13 with ETI. The reasons for better success rate when using an I-gel could be attributed to its intuitive, cuff less design, with widened, flattened, semi-rigid stem, and bite block for easier insertion.[10] Most participants were of the opinion that I-gel was superior in terms ease of handling and required less time for insertion and they would prefer it over cLMA if required to use for securing airway patency during emergency conditions.

There is clear evidence from literature that quick insertion[24, 27] with higher success rate by inexperienced persons represents a definite advantage of I-gel over cLMA as a tool for prehospital airway management.[24, 27] The additional advantage of I-gel over cLMA is its drain tube that allows access to gastrointestinal tract, so reducing chances of aspiration. I-gel has also shown to do better than other SADs for blind intubation.[29]

Based on this manikin study, we can conclude that I-gel can be quickly and easily inserted with high first-attempt success rate by novices. By extrapolating these findings, we can accept I-gel as a reasonable choice of SADs in securing airway in emergency conditions by health-care professional who are
inexperienced in airway management. Ease of handling and minimum maneuvers for insertion are additional advantages.

The study has its fair share of limitations. The biggest limitation of the study was the moderate sample size in this study with all the participants who were all medical professionals. Hence, our results may not be extrapolated to general population. Second, we did not study adequacy of seal, cuff leak pressures, leak fraction, etc., Third, being a manikin study, certain things could not be mimicked such as secretions, blood, and vomitus which may be encountered in real-life emergency situations, which complicates the process of SAD placement. Finally, postprocedural complications such as intraoral injuries and sore throat could not be recorded since it was a manikin-based investigation.

**Conclusion**

This study emphasizes that when personnel inexperienced with airway management are provided manikin-based training for airway management with Igel, it may be of enormous benefit in emergency situations such as cardiopulmonary arrest. Inherent limitations of simulation setting indicate that additional evidence is necessary to confirm the advantages of Igel.[27] Basic life support training is becoming widespread for all cadres of healthcare workers and general population and frequent training is mandated as occasional performers may falter in face of a real situation. On a similar note, we also suggest placement of SADs training be made an essential part of resuscitation training and regular drills be conducted among persons who have restricted airway management skills, so that they can place it efficiently and correctly during crisis situations.

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**Conflicts of interest**

There are no conflicts of interest.

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