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Original Research Article

Evaluate the Effectiveness of I-Gel for Ventilation, Nasogastric Tube Placement, and Blind Tracheal Intubation

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Abstract

Background: A revolutionary supraglottic airway device with a soft, non-inflatable cuff is called the i-gel. Through the use of a standard polyvinyl chloride tracheal tube and stomach tube insertion, we sought to assess the effectiveness of the i-gel ventilatory device in our research.

Materials and Procedures: The research comprised 100 patients with American Society of Anesthesiologists (ASA) physical status I or II having elective surgery under general anaesthesia. I-gel was introduced when anaesthesia was induced, and the following measurements were made: The length of time needed for successful i-gel insertion, airway leak pressures, the simplicity of inserting a stomach tube, and a fiberscope image of the larynx. After that, an effort at blind tracheal intubation was made. Blind tracheal intubation and stomach tube insertion success rates on the first try and overall were assessed, and the length of the procedure was timed. Additionally, the existence of any adverse effects or complications after removal was noted.

Results: In 71 out of 100 patients, i-gel was successfully implanted on the first try, giving us a success rate of 100%. Additionally, we were able to install stomach tubes successfully in 78.33% of patients using blind endotracheal intubation and i-gel, and in 92.22% of cases overall. We also reached a leak pressure of 25.52 (2.33) cm of water in our testing.

Conclusion: I-gel may be used safely and with acceptable airway sealing pressures for ventilation, nasogastric tube placement, and as a route to blind endotracheal intubation.

Keywords: Tracheal Intubation, Nasogastric Tube, Seal Pressure, And I-Gel

Introduction

The "gold standard" in airway management is tracheal intubation with a Macintosh laryngoscope because it effectively prevents aspiration [1]. Laryngoscopy, however, need both neuromuscular paralysis and a significant pressor reaction [2]. Over the last two decades, a wide variety of supraglottic airway devices (SAD) have entered the anaesthetic field. These devices get around many of the issues that laryngoscopy and intubation bring up. SADs are simple to implant,

cause very minor hemodynamic changes, need no neuromuscular paralysis, and are well tolerated even during brief periods of mild anaesthesia [3]. Additionally, the prevalence of post-operative hoarseness and painful throat is decreased with supraglottic devices [4,5]. The hunt is on for a supraglottic airway device that combines the benefits of existing supraglottic airway devices with aspiration protection. A brand-new supraglottic airway device is called the i-gel (Intersurgical Ltd, Wokingham, UK) (SAD).

It is a single-use, latex-free supraglottic device with several design advances that might be superior to both the conventional (cLMA) and proseal LMA (PLMA). [6] I-gel successfully adheres to the perilaryngeal architecture and regularly achieves the right location for supraglottic ventilation, according to cadaver studies. Studies on manikins and human subjects revealed that inserting the i-gel was substantially simpler than inserting conventional SADs. Additionally, research suggests that i-gel is simpler to accurately implant than traditional SADs for non-anesthetists, making it a device that might be helpful in circumstances like resuscitation [7,8]. SADs are useful in emergency situations including life-threatening situations and restricted airways.

Following the creation of an airway, certain SADs, like as i-gel®, permit tracheal intubation utilising a blind or fiberoptic approach. Numerous examples of effective fiberoptic guided intubation with i-gel have been recorded [9-11]. Because it is not always feasible to use a fibreoptic endoscope for intubation owing to availability issues, we created this research to assess the success rate of i-gel in blind tracheal intubation.

Method and Materials

Following clearance from the institutional ethics committee, this research was carried out on 100 patients having elective surgery under general anaesthesia at the Tertiary Care Hospital and Medical College in Mumbai. From each patient, written informed consent was gained. Patients with ASA physical status I and II and ages 18 to 65 of either sex met the inclusion criteria. Exclusion criteria included patients with a history of head trauma, psychiatric disorder, respiratory tract (oropharynx, larynx) pathology, endocrine disorder, predicted difficult airway (such as mouth opening 2 cm, modified Mallampati class 3 and 4, BMI > 35 kg/m2), gastroesophageal reflux disease, hiatus hernia, esophageal varices, and pregnancy).

Anesthesia method

Ringer lactate solution was begun in the operating room once an intravenous connection was established. Twenty minutes before to the onset of anaesthesia, all patients received intravenous doses of Glycopyrrolate 0.2 mg, metoclopramide 10 mg, tramadol 2 mg/kg, and midazolam 0.03 mg/kg. The usual monitors were connected. For three minutes, 100% oxygen was used to preoxygenate all of the patients. Propofol 2-2.5 mg/kg was used for induction, succinylcholine 1.5 mg/kg was used to help with muscular relaxation, and mask ventilation with a combination of oxygen, nitrous oxide, and halothane was sustained for 1 minute.

For blind tracheal intubation, a standard PVC (Polyvinylchloride) Endotracheal tube (Portex®) was utilised. Prior to usage, 2% lignocaine jelly (LOX 2% Neon) was applied to both the i-gel and the ETT. Those under 50 kg were fitted with an ETT size of 7.0 mm, whereas patients above 50 kg were fitted with a size 7.5 mm. I-gel was placed with the neck extended.

The time from when the i-gel was inserted between the dental arches until successful ventilation was confirmed by capnography, chest wall movement, auscultation of breath sounds, and the absence of an oropharyngeal leak with a peak airway pressure of less than 20 cm of H2O was referred to as the duration of successful

insertion. A stop watch was used to measure the passing of time. Acceptable movements were used in the event that effective ventilation could not be created, per the manufacturer's advice. It was noted how many tries were necessary for effective i-gel implantation. Removing the gadget from the mouth before reinsertion was deemed a failed effort. If the gadget couldn't be placed into the hole on the second try, i-gel failed.

After i-gel ventilation was effective, leak pressure was determined in a closed-loop system by shutting off the APL valve, maintaining a constant flow rate of 6 l/min, and letting the airway pressure to increase (maximum allowed 40 cm H2O). Leak pressure refers to the pressure at which a gas leak first appeared. The proximal end of the gastric channel, the stomach, and the mouth were all examined for signs of gas leakage (bubbling of lubricant placed on proximal end).

After that, a lubricated nasogastric tube was implanted, and its location was verified either by aspirating stomach contents or by placing a stethoscope over the epigastrium. The insertion of the nasogastric tube was limited to two tries. A fiberscope was used to view the device's location in respect to the larynx after the implantation.

The fiberscope was removed after the laryngeal grading, and the patient was then ventilated for another minute. After ventilation, tracheal intubation with i-gel was tried. When inserting, the following motions were attempted if resistance was felt: The tracheal tube was gently twisted to align the bevel and moved up and down inside the i-gel. Cricoid pressure was then administered.

After intubation with the i-gel, the endotracheal tube's proper placement was verified by capnography and chest wall auscultation for breath sounds. The time from inserting the ETT into the gel until effective ventilation was confirmed by chest rise, auscultation of breath sounds, and capnography was used to define the duration of successful blind tracheal intubation with i-gel. Then, an even smaller tracheal tube was used to extract the i-gel. If using the equipment to intubate the trachea proved futile, direct laryngoscopy was used instead. Oxygen, nitrous oxide, halothane, and vecuronium were used to maintain anaesthesia. For analgesia, paracetamol infusion (15 mg/kg) was administered over the course of 15 minutes, and injection diclofenac sodium aqueous was administered intravenously at a dosage of 1 mg/kg body weight. Neostigmine and glycopyrrolate were used to reverse neuromuscular blockade after surgery, and the patient's trachea was extubated after they had sufficiently recovered their neuromuscular function and could obey straightforward vocal directions.

Following the removal of the i-gel and ETT, we looked for any signs of lip or tooth injuries as well as mixed blood discharges. An investigator in the post-operative period who was blind to the research queried the patients about any symptoms of sore throat (throat pain, dysphonia), voice changes (hoarseness), and dysphagia after 2 hours, 8 hours, and after 24 hours.

Statistical analysis was performed on all data using IBM SPSS Statistics 20.0. Chi-square was utilised to compare the qualitative data, while descriptive statistics was used to compare the continuous variables.

Results

The statistical analysis included all 100 of the study's participants. Other than the fact that 55% of the patients participating in the research were females, there were no notable findings in the demographic data of the patients [Table 1]. In terms of ASA physical status I and II, the study sample was equally distributed [Table 1]. I-gel insertion had a 100 percent success rate, and in 95% of patients , it was successful on the first try [Table 2]. The installation of the nasogastric tube was effective

92.22% of the time (Table 2). The mean ease of insertion score was 1.044 (0.206), and the mean i-gel insertion time was 20.91 (2.23) seconds on average [Table 2]. The overall success rate for intubating patients with the i-gel was 78.33% , with a first try success rate of 65.55% [Table 2]. I-gel effectively intubated a patient's trachea in a mean time of 21.20 (4.39) seconds [Table 2]. Airway seal pressure was 25.52 (2.33) on average. Dysphonia, vocal changes, lip or dental injuries, or the presence of blood-tinged secretions were not seen.

Table 1: Demographic characteristics of the patients

Gender M:F	**45: 55**
Age. (years) mean IUD	34.56
Weight (Kg) mean±SD	52.23 ± 3.4
Height (cm) nnean±SD	145.56 ± 4.56
B.M.I (Kg/m2) meen±SD	20.23 ± 1.75
Mouth opening (cm) mean±SD	3.68± 0.13
Neck circt.mference (cm) mean±SD	33.21 ±1.34

Table 2: Various parameters of i-gel insertion

I gel insertion	**Total *n*= 100**
First attempt success rate %	95
Overall success rate %	100
Insertion time when first attempt successful (seconds)	21.22
Overall insertion time (seconds)	20.91
Time required in removal of i-gel	5.45
Ease of insertion score of i-gel	score %
Firs attempt success rate %	65.1 %
Overall success rate %	78.2 %
Intubation time when first attempt successful(seconds)	19.45
Overall intubation time (seconds)	21.18

Discussion

I-gel is a single-use supraglottic airway device without latex that has a number of design advancements. It is constructed of soft, gel-like medical-grade thermoplastic elastomer that is anatomically shaped to suit the perilaryngeal structures without the need of an inflating cuff [6].

A stiff and flattened stem to facilitate insertion and enhance stability is another design innovation. Additionally, it has a stomach channel that enables the insertion of a nasogastric tube, thereby lowering the likelihood of aspiration. It is a very adaptable device that has been utilised as an endotracheal intubation conduit, a rescue ventilation device, and a main ventilation device [9-12]. Gatward *et al*. characterised insertion of i-gel as simple in the great majority of instances with an 86% first-time success rate in a trial they did on 100 non-paralyzed patients [13].

In our trial, we had a first-time placement success rate of 95% and an overall placement success rate of 100% for i-gel. The success rate for i-gel insertion on the first try was 84% in the study by Halwagi *et al*., while the total success rate was 96% [14]. The first try i-gel insertion success percentage in M. Kleine Brueggeney *et al.,* trial's was 93.7%, while the total success rate was 98.7% [15]. Similar to the outcomes of the trials carried out by Halwagi *et al*., the successful i-gel insertion time from insertion till

confirmation of effective ventilation was similarly quite brief [14].

According to Halwagi *et al*., the successful insertion of an i-gel took 26 (24) seconds overall and 19 (8) seconds on the first try. Successful i-gel injection took, according to M. Kleine Bruggeney *et al*., 23 (15) seconds. In our investigation, the first successful i-gel insertion took 20.52 (1.44) seconds, and the total number of successful i-gel insertions took 20.91 (2.23) seconds. I-gel insertion time in the research by Keijzer *et al*. was as quick as 8.5 (6.3) seconds [16].

These findings support the idea that i-gel is simple to inject and outperforms both its cLMA and PLMA rivals [17,18]. In actuality, PLMA's success percentage on the first try is higher. Additionally, Wharton *et al*. found that novices with little to no previous anaesthetic expertise could accurately and readily apply i-gel to patients and manikins in their trial [19]. Because it is flexible, soft, non-metallic, and more anatomically curved, it may be easier to implant.

Our study's mean airway seal pressure of 25.52 (2.33) cm of water is comparable to that of Keijzer *et al*., who found that the leak pressure in the i-gel group was 26.8 (9.5) cm of water [16]. Uppal *et al*. measured a median airway seal pressure of 28 cm of water in their investigation [20]. These tests show that the i-gel LMA's airway seal is superior to the cLMA's (16–20 cm of H2O), but it falls just short of the PLMA's airway seal (30 cm of H2O) [21]. These experiments also demonstrate that, despite i-lower gel's airway seal pressure, it still offers sufficient sealing pressures in the majority of clinically relevant situations.

The i-gel has an internal opening for gastric drainage that may be used to implant a nasogastric tube as additional protection against aspiration. The success rate of nasogastric tube insertion in our research was 92.66%, which is similar to other SADs that permit gastric tube insertion. However, the size of gastric tube that can be placed via the i-gel is smaller than the PLMA.

Following i-gel implantation, anatomic placement compares well to other supraglottic devices. In accordance with Michalek P *et al* research's which found laryngeal view grade I (percentage of glottic opening 75-100%) in 70.22% instances, we noticed that the laryngeal view was grade 1 in 78.33% of cases (141 patients) and grade 2 in 21.66% of cases (39 patients) when graded by fiberscope [22]. According to Sastre *et al*., laryngeal view (Brimacombe scale) was grade 1 in 77.78% of instances in the i-gel group compared to intubating laryngeal mask airways. [23] M. Kleine Brueggeney *et al*. showed that grade 1 glottic view occurred in 68.35% of instances [15]. The epiglottis blocker for the i-gel is located on the outside of the bowl, and the larynx can typically be seen clearly and unhindered via the fiberoptic vision. Additionally, it lacks an epiglottic aperture bar, which lessens obstructions to the glottic vision.

Over time, the intubating laryngeal mask airway (ILMA) has risen to the top of the list of supraglottic airway instruments used for endotracheal intubation. Studies have shown that both blind intubation and fibre optic guidance have good success rates [24-26]. In a research by Michalek *et al*., they discovered that ILMA and i-gel are both very successful methods for endotracheal intubation [22]. However, blind intubation with i-gel did not have the same result. With i-gel, the authors were able to achieve a success rate of 51% as opposed to 88% with ILMA. In the research by Halwagi *et al*., the success rate for tracheal intubation on the first try was 69%, and the success rate for tracheal intubation overall was 73% [14]. In the research by Bruggeney *et al*., 96% of initial attempts at tracheal intubation were successful [15]. According to Sastre *et al*., 40% of blind tracheal intubations were

successful overall. [23] With a first try success rate of 58.33% (106 patients) and an overall success rate of 78.33%, we attained comparable findings in our research. However, both our study and earlier studies assert that it is effectively possible to intubate a large subset of the population using i-gel, particularly if fibre optic guidance is used, despite the fact that the results of previous studies do not support the superiority of i-gel over ILMA as a conduit for endotracheal intubation.

Tracheal intubation took 19.70 (3.44) seconds on the first try and 21.20 (4.39) seconds overall with a success rate of 80%. Other research has produced similar findings. [14] The frequency of postoperative problems was minimal and mostly limited to dysphagia and sore throats. These issues were minor and self-limiting. The prevalence of sore throats was comparable to the cLMA, where it has been estimated to range from 12 to 28% [27,28].

The findings of the trial by Keijzer *et al*. were comparable in that i-gel had a decreased incidence of sore throats[16]. No patient displayed dysphonia or a change in voice. In any instance, there was no evidence of tooth or lip injuries, or of blood-tinged secretions covering the i-gel or endotracheal tube. There are various things restricting our investigation. First of all, the participants in our research are low risk individuals with healthy airways and no aspiration or regurgitation risk. Patients who had trouble breathing were not included in the trial. In addition, no comparisons were conducted between i-gel and its most probable rivals, ILMA and PLMA. Additionally, our research may have been biassed due to a lack of blinding. Since just one anesthesiologist in our setting is utilising i-gel, the findings cannot be generalised to the total anesthesiologist community.

Conclusion

We draw the conclusion from our research that i-gel may be used safely for ventilation, the insertion of nasogastric tubes, and as a route to blind endotracheal intubation with low risk of complications and adequate airway sealing pressures.

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