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Research Article

# A comparative evaluation of different supraglottic ventilatory devices during general anesthesia with controlled ventilation: A pilot study

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**KEYWORDS**

SLIPA;
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**Abstract** *Introduction:* ProSeal Laryngeal mask airway (PLMA), I-gel air way and SLIPA (Streamlined Pharynx Airway liner) are ventilatory devices that are inserted easily and blindly as an alternative method to endotracheal intubations. They allowed safe ventilation with lesser pressor response.

*Aim of the study:* This study aimed to compare PLMA, I-gel air way and SLIPA during general anesthesia in insertion parameters, cardiovascular response, ventilation parameters and post-removal complications.

*Material and methods:* Sixty adult patients with mallampati score I and II scheduled for elective inguinal hernia repair under general anesthesia with controlled ventilation. Patients were randomly allocated to three equal groups in controlled pilot study, PLMA was used in the first, I-gel was used in the second and SLIPA was used in the third group. The three devices were compared as regards insertion parameters, cardiovascular responses, adequacy of ventilation (oxygen saturation, end tidal carbon dioxide, air leak), fibreoptic vision and postremoval complications.

*Results:* Manual manipulations were less in I-gel group (10%) in comparison with PLMA (20%) and SLIPA (30%) groups. However, air leak fraction was more evident in PLMA group. Postoperative sore throat occurred more frequently with SLIPA and PLMA and blood stained was significant in the SLIPA group.

*Conclusions:* We concluded that the I-gel, PLMA and SLIPA are effective ventilatory devices during controlled ventilation, without major complications. I-gel offers advantage over PLMA and SLIPA in being less manipulation needed during placement, less air leak, less postoperative sore throat and less in blood stained to the device after its removal in comparison with PLMA and SLIPA.



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## 1. Introduction

Endotracheal intubations have served a golden role in airway management. However, there are many adverse cardiovascular responses to Laryngoscopy and intubation [1], in addition to the problems during usage and postremoval complications as straining, coughing, breath-holding and laryngeal spasm [2].

Proseal Laryngeal mask airway (PLMA), I-gel and SLIPA are ventilatory devices which are inserted easily and blindly without the use of laryngoscope permitting smooth safe ventilation and saving airway crisis during difficult intubation [3].

PLMA provides safe, effective and hand free anesthesia with little risk factors for aspiration in addition to its important position in difficult intubation algorithm [4].

I-gel has a soft, gel-like, non-inflatable cuff, made of a gel-like thermoplastic elastomer, designed to provide an anatomical, impression fit over the laryngeal inlet [5].

SLIPA™ is a latex-free supraglottic airway that is indicated for the use during routine general anesthesia as an alternative to the face mask and laryngeal mask airway [6].

## 2. Aim of this study

The aim of this study was to compare the three different ventilatory devices with respect to ease of use, airway interventional requirements, insertion complications, fiberoptic view, cardiovascular response, ventilatory parameters and postoperative clinical problems during mechanical ventilation.

## 3. Material and methods

After approval from the Medical Ethical Committee this study was carried out on sixty patients of both sexes with age range 18–50 years, scheduled for elective hernia repair surgery in Menoufiya university hospital. Preoperative airway evaluation, and only patients with Mallampati score I and II, and those with thyromental distance ( patil's test) more than 6.5 cm were included in the study.

Exclusion criteria included known esophageal disease, pulmonary disease, cardiovascular disease (hypertensive, coronary insufficiency), neurological disorders (cerbro vascular accident) and patients with psychiatric disorders. Also patients at risk of regurgitation (obese, pregnant and obstructive hernia) and patients predicted to be difficult intubated as mentioned before, were excluded.

Patients were randomly allocated to three equal groups in a controlled pilot study. **PLMA** was used in **group I**, **I-gel** was used in **group II** and **SLIPA** was used in **group III**.

Monitoring was applied before induction and included an electrocardiogram, pulse oximetry, capnograph and noninvasive blood pressure monitor using Oscar II Datex monitor (Datex, Helsinki, Finland) and tidal volume using the inline spirometer of anesthesia machine.

All patients received premedications with 2 mg midazolam and atropine 0.01 mg/kg given intravenously just before transport to the operating room. After 3 min of preoxygenation, anesthesia was induced with 2 μg/kg of fentanyl and 2.5 mg/kg of propofol slow I.V after loss of eyelash reflex and onset of apnea, insertion of the ventilatory device was done. Insertion of the ventilatory device, in group I, PLMA was inserted by index finger insertion technique and according to Brain's instruction in group II, I-gel was inserted according to the manufacturer's recommendations [7]. In group I and group II a size 4 of each device was used in all patients. In group III we used the size according to the recommendation of the manufacturer, which involved gender and height and inserted according to the manufacturer's recommendations [8].

Effective ventilation was defined as proper chest expansion, a square wave capnograph trace, absence of audible leak, and lack of gastric insufflations.

Anesthesia was maintained using inhalation of 1.2% isoflurane. Neuromuscular blockade was obtained with cisatracurium 0.15 mg/kg and maintained throughout the surgery to train of four count of 1/4, as assessed by peripheral nerve stimulator.

Controlled ventilation using tidal volume (vt) of 8 ml/kg, respiratory rate (RR) 12 cycles/min and I/E ratio of 1:2. VT, RR, and I/E ratio were manipulated so as to optimize Paw not more than 20 cm $H_2O$.

At the end of operation anesthetic agents were switched off. Reversal of neuromuscular blocking agents using neostigmine and atropine, gentle oral suction was performed and when swallowing recurred deflation of cuff in group PLMA was done. The device was removed after full recovery of muscle relaxant using train of four then effective breathing was assured.

The following parameters were assessed: *Insertion parameters:* first time placement rate and insertion time (from the removal of face mask to attachment of breathing circuit), number of intubation attempts, manipulator after insertion to assure patent airway (chin lift, jaw thrust and head tilt) and complications during insertion (cough, breath holding, biting, laryngeal spasm and lip or teeth injury).

*Fiberoptic bronchoscopic view* was recorded through the suction opening in the L shape connection between the tube and the Bain circuit, a 2-mm fiberoptic bronchoscope was inserted for evaluating glottic view. The best views from the tip of the orifice of I-gel, PLMA and SLIPA were graded from 1 to 4 follows: 1 (only vocal cords seen), 2 (partial visibility cords and/or arytenoids seen), 3 (only epiglottis seen), 4 (no vocal cords, arytenoids nor epiglottis visible). In addition, epiglottic down-folding was also noted [9]. The good view takes score 1 or 2.

*Hemodynamic parameter* heart rate, mean arterial blood pressure were measured before induction, after induction and after device insertion.

*Ventilation parameters* (incidence of oxygen desaturation ($S_P0_2 < 90\%$), hypercarbia ($P_ECO_2 > 45$ mmHg), reliability of air tight seal of the supraglottic airway, auscultation of air leak at antero-lateral neck (oropharyngeal leak) and epigastrium (gastric leak) at peak airway pressure (Paw = 20 cm $H_2O$), fraction of leak = Exp • $V_T$ (by ventilator spirometry)/ Inspiratory $V_T$ (by ventilator presetting) × 100 and maximum airway sealing pressure were measured by closing the expiratory valve of the breathing circuit and noting the pressure at which a leak developed with fixed fresh gas flow of 3 L/m.

*Postremoval complications:* (cough, regurgitation, breath holding, laryngeal spasm, oropharyngeal injuries and detection of blood traces on the airway just after the removal of the device and sore throat 6 h after this removal).

Statistical analysis of data was carried out as for all comparisons. $P < 0.05$ was considered significant. The values obtained were expressed as mean ± SD for numerical data.