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Research Article

I-gel vs cuffed tracheal tube during volume controlled ventilation in elective laparoscopic cholecystectomy

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KEYWORDS

I-gel;
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Abstract *Background:* In this study we tested the new, single-use supraglottic airway device; i-gel with a n\on-inflatable cuff as an effective airway as conventional endotracheal tube. Gas leak was measured and compared with that of cuffed tracheal tube during volume controlled ventilation in elective laparoscopic cholecystectomy.

Methods: Sixty patients, ASA I–II, were randomly selected to the study. Standard anaesthetic technique was used for all patients. The i-gel was then inserted. The lungs were ventilated at three different tidal volumes (6, 8 and 10 ml kg^{-1}) using volume controlled ventilation (VCV). The leak volume was calculated as the difference between the inspired and expired tidal volumes. The leak fraction was also calculated as the leak volume divided by the inspired tidal volume. These observations were recorded with every tidal volume before and after pneumoperitoneum with the i-gel and the conventional tracheal tube.

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Results: Before pneumoperitoneum there was no significant difference in leak fraction between i-gel and tracheal tube at 6 and 8 ml kg^{-1} tidal volume. Significant differences were found after pneumoperitoneum at 8 and at 10 ml kg^{-1} before and after pneumoperitoneum.
Conclusion: We suggest that i-gel can be used as an alternative device to endotracheal tube during VCV for laparoscopic cholecystectomy provided that peak pressure does not exceed leak pressure.

1. Introduction

Supraglottic airway devices are used now for airway control during spontaneous and controlled ventilation under general anesthesia. The i-gel (Intersurgical Ltd., Wokingham, UK) is a new supraglottic airway device (SAD) made of thermoplastic elastomer which is soft, gel-like and transparent [1]. The i-gel™ is an anatomical device achieving a mirrored impression of those structures without causing multidirectional forces of compression or displacement trauma to the tissues and structures in the vicinity. A drain tube is placed laterally to the airway tube that allows the insertion of a gastric tube (maximum 14 F gauges). Studies on Cadaver showed that i-gels effectively conformed to the perilaryngeal anatomy and consistently achieved proper positioning for supraglottic ventilation [2]. Manikins studies and patients have shown that the insertion of the i-gel was significantly easier when compared with insertion of other SADs [3,4]. Few studies had been done to evaluate the use of i-gel during controlled ventilation but they did not evaluate its use during procedures with airway pressure more than 25 cm H_2O [5]. Our study was designed to evaluate the i-gel sealing pressure and as effective airway as cuffed tracheal tube during volume controlled ventilation in laparoscopic cholecystectomy.

2. Method

After ethics committee of New Jeddah Clinic Hospital (Jeddah, Saudi Arabia) approval and written informed consent 60 patients, 18–60 years old, ASA I–II, Mallampati class I or II, male and female were selected for elective laparoscopic cholecystectomy. Patients were randomly selected for airway management by either i-gel (I-group) or cuffed endotracheal tube (T-group) and data reading done before (B) and after (A) pneumoperitoneum to 14 mmHg in supine position. Patients with body mass index >35 kg m^{-2}, difficult airway possibility, cervical spine problems, mouth opening <2.5 cm, full stomach and gastroesophageal reflux disease, were excluded. All patients received premedication midazolam 1 mg, ranitidine 50 mg and dansetron 4 mg intravenously, 45 min before surgery. We used Datex-Ohmeda; *Aisys* (GE healthcare) with standard monitor. Anesthesia protocol was made the same for all patients. Preoxygenation then induction of anesthesia was done by propofol 2–2.5 mg kg^{-1}, fentanyl 1–1.5 μg kg^{-1} and neuromuscular relaxation achieved by rocuronium 0.8 mg kg^{-1} with increments of 0.15 mg kg^{-1} boluses to maintain TOF >1. Ventilation by face mask was done till adequate depth of anesthesia and relaxation. Anesthesia was maintained by oxygen/nitrous oxide, sevoflurane mixture.

I-gel device (Fig. 1) was carefully selected according to manufacturer recommendations. Patient weighing 50–90 kg, size 4 was used and patients weighing above 90 kg, size 5 was appropriate for them. Proper preparation, lubrication with water soluble lubricant was done. Senior anesthetist inserted the i-gel by continuous introduction into the mouth against hard palate till resistance felt as recommended by the manufacturer. Correct placement of the device was confirmed by observation of proper chest expansion, square shape of end tidal CO_2 waveform and absence of audible leak sounds. In case the airway and ventilation were not established properly; gentle pushing, pulling, head extension, jaw thrust, or neck flexion manipulations were tried before considering failed attempt. Failed attempt was recorded when the device removed from the mouth. Three attempts were allowed before considering failed attempt. Device was then tapped over the chin and connected to anesthesia machine. Gastric tube is lubricated and inserted down the gastric drainage port.

In T-group the trachea of the participant was intubated with an appropriate size tracheal tube: size 8.5 was used for the male participants and size 7.5 was used for the female participants.

Fresh gas flow was adjusted at 3 l min^{-1}. Leak pressure then measured by closing the expiratory valve and recording airway pressure (not allowed to be more than 40 cm H_2O) at which equilibrium was achieved. Equilibrium point was identified by either: (1) plateau on pressure–time curve or digitally displayed pressure gauge. (2) Pressure at which audible gas was heard by auscultation of lateral aspect of thyroid cartilage. The patient was then ventilated by volume controlled ventilation with three tidal volumes (6, 8 and 10 ml kg^{-1}), inspiratory to expiratory ratio 1:2 without positive end expiratory pressure. Respiratory rate was adjusted to maintain 35–45 mmHg

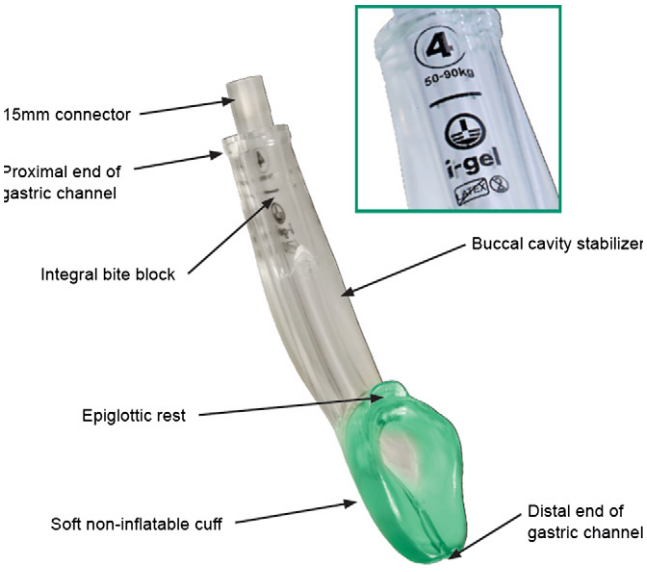

Figure 1 Components of the i-gel (adopted from i-gel user guide, Intersurgical Co.).