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ORIGINAL ARTICLE

Application of the LMA-Supreme™ and i-gel™ laryngeal masks during pelvic operations in adults

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Summary *Objective:* The aim of this study was to evaluate the practical application and safety of the i-gel and LMA-Supreme laryngeal masks for airway management during pelvic operations in adults.
Methods: Ninety patients undergoing general anesthesia for elective pelvic operations (ASA Grades I-II) were randomly divided into two groups, the i-gel group and the Supreme group. The laryngeal mask was inserted after induction, and the relevant examination grading indexes were recorded.
Results: The Supreme group required less time for laryngeal mask insertion and gastric tube indwelling time. Gastric tube indwelling was easier, compared with those in the i-gel group ($p = 0.03$), but the i-gel group had fewer complications ($p = 0.03$). There were no significant differences in the degree of difficulty in insertion, airway sealing pressure, $PETCO_2$, Ppeak, and laryngeal mask alignment accuracy between the two groups ($p > 0.05$). There was no statistically significant difference in fibrobronchoscopy grading between the two groups ($p > 0.05$).
Conclusion: The i-gel and LMA-Supreme laryngeal masks are safe and effective for airway management in patients during pelvic operations.

1. Introduction

Because of stimulation induced by the insertion of the laryngoscope and catheter, traditional endotracheal intubation often causes increased heart rate, arrhythmia, and other cardiovascular system adverse reactions in patients.[1] In

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recent years, with the progress of technology, the laryngeal mask as a ventilation device has been recognized by clinicians and has gradually become widely used for its simple operation and good ventilation effect.[2] At present, the most commonly used laryngeal masks in clinical practice include the i-gel, the laryngeal mask supreme (LMA-Supreme), and other types of laryngeal masks. The i-gel laryngeal mask is a noninflatable, disposable laryngeal mask remodeled in accordance with human oropharyngeal anatomy,[3] and studies have shown that it can be used for anesthesia airway management during various operations.[4] Compared with the i-gel laryngeal mask, the LMA-Supreme is designed with an aerated cuff.[5] At present, research has shown that these two kinds of laryngeal masks have been used in emergency airway ventilation,[6,7] endoscopic operation,[8–10] and in pediatric surgery,[11–13] and have achieved similar effects, especially with regard to advantages in short operation.

Pelvic operations are short operations, but there has been no research on the application of these two kinds of laryngeal masks for general anesthesia during pelvic operations. Therefore, whether the airway sealing of these two types of laryngeal masks can be safely applied for positive pressure airway ventilation management during pelvic operations remains to be clarified. Here, we describe the first comparison of the application of the i-gel and LMA-Supreme laryngeal masks. The aim of this study was to determine the practical application and safety of the i-gel and LMA-Supreme laryngeal masks for airway management during pelvic operations in adults.

2. Materials and methods

2.1. Patients

From May 1st to December 31st 2013, 90 patients in our hospital undergoing elective laparotomy for pelvic surgery by the open method were enrolled in our study. Patients in our study had ASA Grades I–II and were aged 18–55 years with body weight 50–85 kg and body mass index (BMI)30 kg/m^2. There were no sex-related limitations, and patients were enrolled if they had no heart, lung, liver, and/or kidney function abnormalities; no history of neurological or psychiatric disease; no history of excessive gastric acid secretion; and were required to have an empty stomach for surgery.

The patients were randomly divided into two groups using random digits based on the type of laryngeal mask used. There were 45 cases in each group – the LMA-Supreme (Supreme) group and the i-gel group. This study was conducted in accordance with the declaration of Helsinki and was conducted with approval from the Ethics Committee of Liaoning Cancer Hospital. Written informed consent was obtained from all participants.

Upon entering the operation room, the upper limb venous access for each patient was secured, and the blood pressure, electrocardiogram (ECG), blood oxygen saturation (SpO_2), and bispectral index (BIS) values were monitored. After facemask oxygen aspiration for 10 minutes, fentanyl (0.003 mg/kg), etomidate (0.3 mg/kg), and atracurium (0.5 mg/kg) were infused intravenously for induction. Upon relaxation of the temporomandibular joint, the laryngeal mask model was selected according to the patient's body weight.

Patients in the i-gel group were fitted with an i-gel laryngeal mask (Intersurgical Ltd., Berkshire, UK), with size selection dependent on the patient's weight (30–60 kg, i-gel size 3; 61–90 kg, size 4). Without the mask cuff, the i-gel group did not require inflation. Patients in the Supreme group were fitted with the supreme laryngeal mask (LMA, Singapore): 30–50 kg, size 3; 51–70 kg, size 4; and >70 kg, size 5. The mask was applied by the manual method, and the LMA was inserted along the velopharyngeal curve. After insertion, patients in the Supreme group received gas to maintain intracuff pressure at 60 cmH_2O (1 cmH_2O = 0.098 kPa).

Ventilation was controlled to ensure good bilateral chest movement, and the laryngeal mask was checked to ensure no leakage. A gastric tube was inserted through a drainage tube to drain gastric contents. During the operation, propofol, fentanyl, and atracurium were used intraoperatively to maintain anesthesia, and were adjusted as needed based on monitoring of vital signs. After the patients recovered spontaneous breathing and showed $SpO_2 \geq 95\%$, tidal volume (VT) about 6 mL/kg, and reflection to calling, the laryngeal mask was removed to end the anesthesia. All 90 patients were treated by the same two trained anesthesiologists.

The following measurements were recorded – the duration of laryngeal mask insertion (from the initiation to successful insertion), the laryngeal mask insertion times, the degree of difficulty of laryngeal mask insertion (based on the anesthesiologist's judgment), the degree of difficulty of gastric tube insertion (based on the anesthesiologist's judgment), the airway sealing pressure (defined as the highest gas pressure recorded after closing the outgassing cutting of the ventilation loop anesthetic and adjusting the gas flow to 3 L/min), pressure of end–tidal carbon dioxide tension ($PETCO_2$), position on airway pressure (Ppeak), laryngeal insertion complications, laryngeal mask alignment accuracy (related to throat exposure), the fiber bronchoscope examination grading (the fiber-optic bronchoscope [Karl Storz GmbH Endoskope; Tuttlingen, Germany] was inserted at the joint of the airway tube and the cuff body to observe the glottal exposure: only the glottis visible, 4 points; the glottis and epiglottis lateral surface visible, 3 points; the glottis and epiglottis inferior surface visible, 2 points; glottis not visible, 1 point), and other indexes.

2.2. Statistical analysis

All data were recorded into Epidate software, using SPSS v. 17.0 (SPSS Inc., Chicago, IL, USA) statistical software for analysis. Measurement data were presented as the mean ± standard deviation ($\bar{x} \pm SD$) and compared using the Student t test. Count data were compared with the χ^2 test and the ranked data were compared with the rank sum test. A significance level of $p < 0.05$ was used.

3. Results

3.1. General data

There were no significant differences in age, height, weight, ASA grading, other general indexes, anesthesia