



Original contribution

Gastric regurgitation in patients undergoing gynecological laparoscopy with a laryngeal mask airway: a prospective observational study[☆]



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Abstract

Objective: The use of pneumoperitonium and the placement of patients in Trendelenburg position are commonly cited reasons for the potential development of intraoperative regurgitation of gastric contents and the need for an endotracheal tube in laparoscopic surgery. The main objective of the current investigation was to evaluate the presence of regurgitation of gastric contents in the oropharynx of patients having laparoscopic gynecological surgery with a laryngeal mask airway (LMA).

Design: Prospective, observational clinical investigation.

Interventions: Not applicable.

Measurements: Healthy subjects having a laparoscopic gynecological surgery under general anesthesia with a ProSeal LMA were included in the study. An insufflation pressure of 15 mm Hg was established as the maximum intra-abdominal pressure for the pneumoperitonium, and patients were placed in Trendelenburg position at a 15° angle. The pH of secretions extracted from subjects' hypopharynx was measured at multiple time points during the surgical procedure. A pH of oropharynx secretions ≤ 4.1 indicated the regurgitation of gastric contents.

Main results: Eighty subjects were recruited and completed the study. The median (range) of pH measurements at any time (T3-T9) was 6.5 (5.5-7.0). The median (range) for the lowest pH for each subject was 6.0

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(5.5-7.0). The lowest detected pH in the hypopharynx was not correlated (Spearman ρ) with total surgical time ($P = .9$), total pneumoperitonium time ($P = .17$), or total Trendelenburg position time ($P = .47$).

Conclusions: Our current results suggest that the use of an LMA in healthy patients undergoing laparoscopic gynecological surgery may be safe. Future studies to confirm or refute our findings are warranted.

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1. Introduction

Patients having surgery under general anesthesia have better postsurgical recovery when a laryngeal mask airway (LMA) is used compared with an endotracheal tube [1]. Nonetheless, the risk of aspiration pneumonitis frequently leads clinical practitioners to choose an endotracheal tube instead of an LMA for patients undergoing laparoscopic procedures [2-4]. The use of pneumoperitonium and the placement of patients in Trendelenburg position in laparoscopic surgery are commonly cited reasons for the potential development of intraoperative regurgitation of gastric contents and the need for an endotracheal tube [5].

Several studies have evaluated the use of LMA for laparoscopic surgery. Nevertheless, prior studies have focused on the examination of the adequacy of ventilation using the LMA rather than safety aspects related to aspiration of gastric contents. Safety analyses have been limited to report the absence of clinical aspiration and very few studies have systematically evaluated the presence of gastric regurgitation. The need for more studies evaluating the presence of gastric regurgitation in patients undergoing laparoscopic procedures with an LMA has also been suggested by a systematic review of the literature [6].

The main objective of the current investigation was to evaluate the presence of regurgitation of gastric contents in the oropharynx of patients having laparoscopic gynecological surgery with an LMA. We specifically sought to determine the pH of oropharynx secretions at multiple times during the surgical procedure.

2. Methods

This study was a prospective, observational clinical investigation. Study approval was obtained from the Royal Spanish Charitable Society/Hospital (Real Sociedade Espanhola de Beneficência/Hospital), and written informed consent was obtained from all the study participants. The study is reported following the STROBE guidelines [7]. The study was performed between August 2012 and October 2013. Eligible subjects were consecutive healthy women undergoing gynecological laparoscopy. Patients with a history of full stomach, gastroesophageal reflux disease, hiatal hernia, body mass index $> 30 \text{ kg/m}^2$, diabetes mellitus, or any other conditions that might delay the passing of the gastric contents were excluded.

Reasons to drop out after inclusion in the study were the need to use an endotracheal tube or conversion to an open incision.

After fasting for at least 6 hours, subjects were taken to the operating room and standard American Society of Anesthesiologists monitors were applied. Subjects did not receive any premedication. Anesthesia was induced with fentanyl ($2-4 \mu\text{g kg}^{-1}$), propofol ($1.5-2.5 \text{ mg kg}^{-1}$), and rocuronium (0.6 mg/kg). An LMA (ProSeal; Teleflex, San Diego, CA) size 3 or 4 following the manufacturer's recommendation according to subjects' weight was inserted by an experienced anesthesiologist, and the cuff inflation pressure was kept $\leq 60 \text{ cm H}_2\text{O}$. A maximum total of 3 attempts were made to place the device, and in the case of failure, orotracheal intubation was used. Anesthesia maintenance was achieved using propofol ($4-12 \text{ mg kg}^{-1} \text{ h}^{-1}$), remifentanyl ($0.1-2.0 \mu\text{g kg}^{-1} \text{ min}^{-1}$), and rocuronium (0.15 mg kg^{-1}). Patients were ventilated with intermittent positive pressure ventilation with a tidal volume of 8 mL kg^{-1} and 10-12 breaths per minute were used for this study. An insufflation pressure of 15 mm Hg was established as the maximum intra-abdominal pressure for the pneumoperitonium and patients were placed in Trendelenburg position at a 15° angle.

Secretions in the hypopharynx were collected via a suction probe (one for each aspirate) inserted into the esophageal drainage tube of the LMA-ProSeal at 1 cm from its distal end at various defined times, as follows: T1 (baseline), after the placement of the LMA; T2, after insufflation of the abdominal cavity (pneumoperitoneum); T3, before the head-down positioning; T4, after the head-down positioning; T5, after the end of insufflation; T6, after returning to a horizontal position; T7, at the end of surgery; and T8, after removing the LMA (measured on the outside of the LMA shell near the end of the drainage tube on both sides).

To measure the pH of the secretions in the hypopharynx, we used pH test strips, pH 0-9 (Merck, Darmstadt, Germany), due to their reliability, high accuracy, and for already having been validated in other studies [8-10]. If the secretions were pigmented, such as in the presence of blood, which would make the pH test strip measurements less reliable, the collected material was measured using a bench top pH meter in the central laboratory for a more reliable measurement. Based on prior studies, a pH of ≤ 4.1 was considered to indicate the regurgitation of gastric contents into the secretions in the hypopharynx [11].

A sample of 80 patients evaluated at 7 points of the surgical procedure (T2 through T8) would generate 560 data points. This would allow us to establish a maximum incidence of

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