Gastro-oesophageal reflux with the laryngeal mask during day-case gynaecological laparoscopy

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Summary
We have evaluated if breathing spontaneously via a laryngeal mask airway is associated with a higher risk of gastro-oesophageal reflux compared with positive pressure ventilation via a laryngeal mask airway in 40 patients undergoing day-case gynaecological laparoscopy. Patients were allocated randomly to receive either positive pressure ventilation or breathe spontaneously via a laryngeal mask airway. Using continuous oesophageal pH monitoring, three patients in the ventilated group and one in the spontaneous breathing group had gastro-oesophageal reflux (P=0.29). We found no evidence to suggest that breathing spontaneously via a laryngeal mask airway increased the risk of gastro-oesophageal reflux compared with positive pressure ventilation in this group of patients. (Br. J. Anaesth. 1998; 80: 675–676)

Keywords: equipment, masks anaesthesia; surgery, laparoscopy; gastrointestinal tract, reflux

Even though patients undergoing gynaecological laparoscopy are considered to be at a particular risk of gastric aspiration, the laryngeal mask airway (LMA) has been used successfully with a low incidence of regurgitation. However, Owens and colleagues have shown the use of the LMA to be associated with an incidence of gastro-oesophageal reflux (GOR) of 54% in spontaneously breathing patients. They suggested that a decrease in lower oesophageal sphincter barrier pressure by the LMA together with an increase in resistance to breathing with a greater negative intrathoracic pressure during inspiration, may promote GOR. Roberts and Goodman did not detect any episode of GOR in 63 patients who underwent gynaecological laparoscopy. All of their patients underwent ventilation via a tracheal tube. There is a paucity of data comparing the effect of spontaneous breathing with positive pressure ventilation (PPV) using the LMA in patients undergoing gynaecological laparoscopy. In this study, we have determined the incidence of GOR with the LMA in this “at risk” group of patients and investigated if breathing spontaneously was associated with a higher risk of GOR compared with PPV.

Methods and results
After obtaining approval from the hospital Ethics Committee and written informed consent, we studied 40 patients, ASA I or II, undergoing day-case gynaecological laparoscopy. Women with a history of reflux or hiatus hernia, those receiving medication that may affect gastric pH or motility, and those with a body mass index greater than 30 kg m⁻² were excluded.

After placement of routine monitoring devices, anaesthesia was induced with alfentanil 10 µg kg⁻¹, propofol 2–3 mg kg⁻¹ and glycopyrrolate 100 µg. While patients were apnoeic after induction, anaesthesia was maintained by gentle manual ventilation with 1–2% isoflurane and 66% nitrous oxide in oxygen. An oesophageal pH electrode was passed by the investigator before insertion of a size 3 LMA. Thereafter patients were allocated randomly to one of two groups to breathe spontaneously or receive PPV via the LMA. Patients in the PPV group received vecuronium 0.07 mg kg⁻¹ and underwent ventilation to normocapnia (Datex, Capnomac) with the Manley ventilator. Peak airway pressures were limited to 20 cm H₂O by adjusting tidal volume. Airway pressures were measured at the junction between the LMA and breathing system with a low pressure transducer and Datex monitor. Patients in the spontaneously breathing group were assisted manually until they resumed a regular breathing pattern. I.v. morphine, up to 0.15 mg kg⁻¹, and rectal diclofenac 100 mg were given to provide additional analgesia. No antiemetic was given until conclusion of the study.

Duration of anaesthesia, duration of pneumoperitoneum, peak intra-abdominal insufflation pressure and degree of head-down tilt were recorded. At the end of operation, neuromuscular block was antagonized in the PPV group with neostigmine 2.5 mg and glycopyrrolate 0.5 mg. The LMA, together with the pH electrode, were removed when patients were awake.

The monocrystalline antimony pH electrode (Synectics Medical Ltd) was calibrated before each set of measurements. The electrode was passed nasally and advanced under direct laryngoscopy until gastric pH was recorded, as described previously. It was then withdrawn to the gastro-oesophageal junction (as indicated by a sudden increase in pH) and secured another 4–5 cm above the gastro-oesophageal junction. Continuous oesophageal pH measurements were started when the electrode was positioned correctly.

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and recorded throughout operation. The anaesthetist was blinded to the pH measurements during operation. A reflux episode was defined as a decrease in pH to less than 4. The recordings were stored in the Digi-trapper MD monitoring device and analysed subsequently using Gastrosoft software (Synectics Medical Ltd).

The quoted incidence of reflux or regurgitation in gynaecological laparoscopy with PPV via a tracheal tube is less than 5%.\(^1\)\(^2\) Assuming an incidence of 10% with PPV via an LMA and given the reported incidence of GOR of more than 50% when breathing spontaneously via an LMA, power analyses suggested that 20 patients were required in each group to have more than 80% chance of showing a difference between the groups at \(\alpha < 0.05\). Patient data were compared using the unpaired \(t\) test. The incidence of reflux was analysed with Fisher’s exact test. \(P < 0.05\) was regarded as statistically significant.

There were no significant differences between the groups in patient characteristics, duration of anaesthesia, duration of pneumoperitoneum and degree of head-down tilt (table 1). Intra-abdominal insufflation pressure was higher in the group breathing spontaneously than in the group breathing by PPV,\(^\ast\) however, the difference was not statistically significant. Based on these results and the power of our study, we conclude that breathing spontaneously via an LMA did not increase the risk of GOR compared with PPV.

Comment

The LMA has been shown to decrease lower oesophageal sphincter barrier pressure.\(^3\)\(^4\) A combination of head-down and lithotomy position, and pneumoperitoneum used during gynaecological laparoscopy is thought to render these patients at a higher risk of regurgitation.\(^1\)

We found an incidence of GOR of 10% with the LMA in this patient population. This is much lower than the incidence of more than 50% reported by Owens and colleagues\(^5\) in patients undergoing a variety of minor surgical procedures, even when accounting for the reflux events that occurred in the recovery unit after the LMA had been removed in their patients. However, there is an adaptive increase in lower oesophageal sphincter pressure in response to increased intra-abdominal pressure during laparoscopic surgery\(^6\) which may have accounted for the relative low incidence of GOR in our study. We discontinued recordings at removal of the LMA as patients were thought to be able to protect their own airway at this point.

Righini and colleagues\(^7\) confirmed that the LMA significantly increased inspiratory airway resistance because of the configurational changes occurring when the LMA is \textit{in situ}. Greater negative intrathoracic pressures may be generated during the inspiratory phase of breathing via the LMA. This has been forwarded as a possible reason for the high incidence of GOR in spontaneously breathing patients.\(^3\)

However, we detected a lower incidence of GOR in the group breathing spontaneously (5%) compared with the PPV group (15%). The difference was not statistically significant. Based on these results and the power of our study, we conclude that breathing spontaneously via an LMA did not increase the risk of GOR compared with PPV.

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References

2. Verghese C, Brimacombe JR. Survey of laryngeal mask airway equipment. We also thank Dr K. Knowles for providing the computer software for data analysis.