

Effects of Metoclopramide and Ranitidine on Preoperative Gastric Contents in Day-Case Surgery

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This prospective, randomized, double-blinded study was performed to evaluate the effects of intravenous metoclopramide and ranitidine on preoperative gastric contents in outpatients receiving intravenous anesthesia for laparoscopic gynecologic surgery. Fifteen minutes before the induction of anesthesia, the Z-M group (n = 20) received 50 mg ranitidine and 10 mg metoclopramide intravenously and the control group (n = 20) received the same volume of normal saline. Before the surgery, a 14-F multiorifice nasogastric tube was inserted to aspirate the gastric contents of patients under sedation with propofol and midazolam. The mean pH values of the gastric fluid were 2.7 ± 2.0 (SD) [median 1.6 (range: 1.2-7.2)] in the control group, and 6.1 ± 1.9 [median 6.8 (range 1.4-7.8)] in the Z-M group. The mean aspirated volumes (mL) were 15.3 ± 10.4 (SD) [median 11.0 (range: 5.0-44.0)] in the control group, and 6.9 ± 10.0 (SD) [median 4.5 (range: 0-38.0)] in the Z-M group. There were significantly more high-risk (gastric fluid volumes > 25 mL and pH < 2.5) patients in the control group (4/20, 20%) than in the Z-M group (1/20, 5%). In conclusion, intravenous prophylactic ranitidine and metoclopramide may be an easy and useful method to decrease the volume while increasing the pH of gastric contents, and therefore may reduce the number of patients at risk for aspiration pneumonia in ambulatory laparoscopic procedures who receive an anesthesia.

Key Words: Day-case surgery, laparoscopy, metoclopramide, preoperative gastric content, ranitidine

INTRODUCTION

Early studies suggest that outpatients may have an increased risk of aspiration if the volume of

their gastric contents is greater than 25 mL and the pH is less than 2.5.¹ However, Olsson et al. found that there was no increased risk of aspiration in 'fasted' outpatients compared to inpatients undergoing elective surgery.² Therefore, routine prophylaxis for aspiration is no longer recommended.³

Many outpatients receive anesthesia for surgery by face mask or by various degrees of sedation using intravenous anesthetics. A reduced level of consciousness interferes with the protective upper airway reflexes and is also associated with impaired function of the lower esophageal sphincter.^{4,5} Pulmonary aspiration is commonly observed in patients with impaired consciousness who were operated on in the supine position.⁶ Therefore, outpatients undergoing laparoscopic surgery using abdominal gas insufflations may be at risk for acid aspiration syndrome. No reports about the effect of intravenous pharmacotherapy on preoperative gastric contents in these patients have been published.

The use of metoclopramide, a dopamine antagonist, in combination with an H₂ receptor blocker has been advocated to decrease postoperative emesis and to reduce the risk of aspiration pneumonia.⁷ However, the time available for preparation of these patients may be too short for oral premedication to be effective because healthy patients undergoing elective surgery may not be seen by an anesthesiologist until the day of surgery. Therefore, we have undertaken this prospective, randomized, double-blinded investigation to evaluate the effects of prophylactic intravenous metoclopramide and ranitidine on preoperative gastric contents in outpatients receiving

Received August 31, 2005
Accepted November 16, 2005

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intravenous anesthesia for gynecologic laparoscopic surgery.

MATERIALS AND METHODS

The study was approved by the hospital Ethics Committee. Written informed consent was obtained from each patient. Forty women (American Society of Anesthesiologists physical status I) undergoing diagnostic laparoscopy in the infertility clinic were enrolled. Patients with a history of any gastrointestinal disorder or who were receiving any medication which would interfere with gastrointestinal function were excluded from the study. The study design was randomized and double-blinded with patients allocated according to a computer-generated randomization method. Fifteen minutes before the induction of anesthesia, 50 mg ranitidine (Zantac[®]; GlaxoSmithKline, Pennsylvania, USA) and 10 mg metoclopramide (Mexolon[®]; DongWha, Anyang, Korea) were given intravenously to the Z-M group (n = 20) and the same volume of normal saline to the control group (n = 20).

All patients fasted after midnight, and no other premedication was given. After preoxygenation with 100% oxygen via face mask for 5 minutes, intravenous sedation was induced and maintained using 0.5 mg/kg midazolam and 4 µg/mL of target concentration of propofol without tracheal intubation. Before the start of surgery, a 14-F multiorifice nasogastric tube (Levin tube, Yushin Medical, Shiheung, Korea) was inserted by an anesthesiologist. Placement of the nasogastric tube was verified by auscultation over the epigastrium while injecting air and then aspirating gastric contents. Attempts to maximize gastric fluid aspirate volume were made by continuing aspiration intermittently as the tube was slowly withdrawn with a rotating motion. This maneuver was repeated in both slightly side tilting positions and in the Trendelenburg and reverse Trendelenburg position to ensure maximum emptying of the stomach. The gastric aspirate was collected in an in-line collection container, and measured later using a graduated cylinder. All aspirations were uneventful, and no patients experienced coughing, laryngospasm, or vomiting during the procedure.

During the aspiration, 100% oxygen was administered intermittently with positive pressure, when necessary. After the aspiration of gastric contents, the nasogastric tube was removed. Anesthesia was maintained using increasing target concentrations of propofol and adding incremental doses of alfentanil to enhance sedation.

The volume of gastric fluid and pH were measured using a metered cylinder and a double-checked pH meter (model-920A, Orion Research, Inc., Beverly, Massachusetts, USA), respectively. The blood concentration of glucose was measured at the same time using a blood glucose meter (SureStep, Lifescan inc. Milpitas, California, USA).

Results are given as mean ± standard deviation (SD) or in ranges where appropriate. Statistical analysis was performed using Mann-Whitney rank sum test and t-test for parametric values, and Chi-square analysis to compare the proportions of patients in the two groups. A $p < 0.05$ was accepted as statistically significant. A power analysis was performed to determine sufficient sample sizes required for establishing significant differences in the gastric variables and in the percentage of patients at risk for aspiration pneumonia based on the results of the preliminary study using an α value of 0.05 and power of 0.9.

RESULTS

The patients' data, preoperative diagnosis, and procedure are presented in Table 1. There were no statistical differences in the patients' demographics, oral fasting time, and blood glucose concentration between the two groups.

The mean pH values of gastric fluid were 2.7 ± 2.0 (SD) [median 1.6 (range: 1.2-7.2)] in the control group and 6.1 ± 1.9 [median 6.8 (range 1.4-7.8)] in the Z-M group. The mean volumes aspirated (mL) were 15.3 ± 10.4 (SD) [median 11.0 (range: 5.0-44.0)] in the control group and 6.9 ± 10.0 (SD) [median 4.5 (range: 0-38.0)] in the Z-M group. The number of patients with a gastric pH below 2.5 were 13 (65%) in the control group, and 1 (5%) in the Z-M group ($p < 0.05$). The number of patients who had gastric contents greater than 25 mL were 4 (20%) in the control group, and 1 (5%) in the Z-M group ($p < 0.05$). There were significantly more

Table 1. Patients Data

	Control group (n = 20)	Z-M group (n = 20)
Age (yr)	34.1 ± 4.5	34.0 ± 4.8
Weight (kg)	55.4 ± 6.1	56.7 ± 8.2
Height (cm)	159.6 ± 4.8	162.3 ± 6.4
Fasting time (h)	13.7 ± 1.4	13.7 ± 2.0
Glucose (mg/dL)	104.7 ± 6.5	99.3 ± 5.7

Data are mean ± SD.

Z-M group: Patients received 50 mg ranitidine and 10 mg metoclopramide intravenously fifteen minutes before the induction of anesthesia.

There are no statistically significant differences between the two groups.

patients considered high-risk for aspiration (gastric fluid volumes > 25 mL and pH < 2.5) in the control group (4/20, 20%) than in the Z-M group (1/20, 5%).

The time taken for gastric aspiration in each patient did not exceed 10 minutes. During the insertion of the nasogastric tube, there was no epistaxis, vomiting, oxygen desaturation as measured by pulse oxymeter, or any other serious complications.

DISCUSSION

Early reports investigating the potential risk of acid aspiration pneumonitis in adult outpatients demonstrated the presence of a gastric pH below 2.5 in 76-85% of patients, while volumes of gastric contents greater than 25 mL were seen in 52-85% of patients.^{1,8,9} Similar to previous reports, our data demonstrate the existence of potential risks of acid aspiration in untreated outpatients undergoing elective surgery. 65% of our patients had a gastric pH < 2.5 and 20% had a combination of gastric pH < 2.5 and gastric contents volume > 25 mL. Intravenous ranitidine in combination with metoclopramide 15 minutes before surgery significantly reduced these risk factors. Thus, the advantages and safety of intravenous ranitidine and metoclopramide have encouraged us to use these drugs before this type of surgery in the outpatient anesthetic unit.

H₂-receptor antagonists bind competitively to

receptors on the basal parietal cell membrane. Metoclopramide, the most common prokinetic drug, stimulates esophageal, gastric, and small bowel activities. Other studies have failed to demonstrate a significant advantage of this drug combination over an H₂ receptor antagonist alone. However, metoclopramide may offer an additional protective effect as a result of its ability to increase lower esophageal sphincter tone.¹⁰

With compromised protective airway reflexes, passive regurgitation in patients with impaired level of consciousness may result in pulmonary aspiration. There were 7% claims for aspiration during regional anesthesia or sedation in the ASA Closed Claims Project Database.¹¹ Therefore, patients undergoing a laparoscopic procedure using abdominal gas insufflation without intubation must be considered to be at risk for acid aspiration. These patients typically receive pharmacotherapy in our hospital, although routine administration of these drugs has not been recommended by the ASA.¹² Recent guidelines by the ASA do not recommend routine preoperative use of gastric acid secretion blockers for patients who have no apparent increased risk of aspiration. There is no sufficient evidence published to evaluate whether reduced gastric acid secretion is associated with decreased morbidity and mortality. Additional trials are needed to prove their efficacy in decreasing the frequency of pulmonary aspiration.

An important criticism may be directed toward the fact that the gastric volumes in this study are

not representative of the total volume of gastric contents, because emptying the stomach with an nasogastric tube has not been shown to ensure complete emptying of gastric contents.¹ Hence, it is possible that gastric volumes might have been underestimated. Dye absorption technique and fiberoptic gastroscopy are more reliable than blind aspiration, but they are more complicated, time consuming, and clinically limiting.

In conclusion, intravenous prophylactic ranitidine and metoclopramide is an easy and useful method to decrease the volume and increase the pH of gastric contents. Therefore, this procedure can reduce the proportion of patients at risk of aspiration pneumonitis who undergo laparoscopic procedures while receiving intravenous sedation.

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