ORIGINAL ARTICLE

Effect of routine preoperative fasting on residual gastric volume and acid in patients undergoing myomectomy

OV Ajuzieogu, AO Amucheazi, UI Nwagha[1], HA Ezike, SK Luka[2], DS Abam[3]

Departments of Anesthesia and [1]Obstetrics and Gynaecology, University of Nigeria Teaching Hospital, [2]Department Obstetrics and Gynaecology, University of Port Harcourt Teaching Hospital, Enugu, Enugu State, [3]Department of Anesthesia, Federal Medical Center, Keffi, Nassarawa, Nigeria

Abstract

Background: Preoperative fasting of patients aims to reduce the residual gastric volume (RGV). The magnitude of this reduction is yet to be ascertained in the Nigerian population.

Aim: To compare the RGV and pH of patients fasted for 6–12 h with those allowed oral intake of fluid up to 2 h preoperatively.

Subjects and Methods: This randomized study involved 90 American Society of Anesthesiologists physical status I–II patients booked for abdominal myomectomy under general anesthesia. The patients were randomized into three groups. Preoperative fasting from midnight (Group F, *n* = 30) was fasted from midnight to the operation time. Carbohydrate-rich drink group (Group C, *n* = 30) received 800 mL of oral carbohydrate solution in the evening before surgery (22:00 h). An additional 400 mL was given 2 h before anesthesia. Placebo drink group (Group P, *n* = 30) received water in the same protocol as Group C. The Student's *t*-test was used to analyze RGV and pH postoperative satisfaction and postoperative nausea and vomiting (PONV) were compared on a visual analog scale.

Results: The RGV and pH were similar for all groups ($P = 0.45$ and 0.90, respectively). Antiemetic consumption and PONV scores were lower in Group C compared with Groups F and P ($P = 0.01$). Patients' in Group C had higher satisfaction ($P < 0.001$).

Conclusion: Preoperative carbohydrate or water intake up to 2 h before surgery is safe with better satisfaction when compared to overnight fasting.

Key words: Fasting, myomectomy, pH, residual gastric volume

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Introduction

Current preoperative guidelines recommend oral intake of clear liquids with or without carbohydrates up to 2 h before

Address for correspondence:
Dr. OV Ajuzieogu,
Department of Anesthesia, University of Nigeria Teaching Hospital, Enugu, Enugu State, Nigeria.
E-mail: obinna.ajuzieogu@unn.edu.ng

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induction of general anesthesia to prevent complications of hunger and dehydration such as discomfort, dehydration, and stressful anesthesia induction to patients.[1-8] These guidelines are not being followed in our hospital because there are limited local evidence-based studies.[9-12]

We compared the preoperative residual gastric volume (RGV) and pH of patients fasted for 6–12 h with those allowed oral intake of water or carbohydrate-rich fluid up to 2 h before myomectomy to appraise the applicability of these current preoperative guidelines in our environment.

Subjects and Methods

The University of Nigeria Teaching Hospital, Enugu and Federal Medical Centre, Keffi Ethics Committees approved this prospective, double-blind randomized clinical study conducted between January 2014 and October 2014, (Reg no. NHREC/05/01/2013B-FWA0 0002458-1RB00002323). Ninety American Society of Anesthesiologists (ASA) physical status I and II patients aged 18–42 years scheduled for abdominal myomectomy were studied after obtaining a written informed consent from them. Patients with a history of any gastrointestinal disorder, receiving antacids, or H_2 receptor blockers, or those who refused general anesthesia were excluded. Other exclusion criteria were a history of diabetes mellitus, body mass index >30 kg/m^2 and pregnancy. The patients were randomly assigned, according to a computer-generated randomization list, into three preoperative treatment groups. Fasting from midnight (Group F, n = 30), preparation with carbohydrate-rich liquid drink (CRLD) (Group C, n = 30), and placebo drink group (Group P, n = 30). The fasting, F Group, were fasted from midnight to the surgery time. Patients in Group C received 800 mL of oral carbohydrate solution containing 12.5% glucose, 50 kcal/100 mL (Nutricia preop®; Nutricia, Zoetermeer, The Netherlands) the night before surgery and an additional 400 mL 2 h before induction of anesthesia. The placebo group received water in the same protocol as in Group C. The water was sweetened to taste like the CRLD but without calorie. A pharmacist who was not involved in the study packaged both drinks in coded containers, according to the computer randomization codes. The researchers were blinded to these codes. No pharmacologic premedication was administered to any patient.

The patients' preoperative anxiety states were graded using the State-Trait Anxiety Inventory (STAI) to grade their anxiety levels. Scores ranged from 20 to 80. A score above ≥45 denoted an anxious state [Annexure].[13]

A standard propofol-based general anesthesia was administered to all patients. After the induction of anesthesia, a multi-orifice 18-French gauge Argyle Salem Sump tube (Argyle Sherwood Services AG, Mexico) with anti-reflux valve was carefully passed through the patient's mouth into the stomach, approximately about 60 cm from the upper incisor. Accurate placement of the tube was confirmed by the aspiration of gastric contents. Failed or bloody aspirates were excluded from the study.

The gastric aspirate was obtained by the application of gentle negative pressure to the tube using a 50 mL syringe. The patients were slightly tilted to both sides to maximize the emptying of the stomach. The volume was measured using the graduated markings on the syringe. The pH was measured using a calibrated B Braun pH meter (B-Braun Scientific and Instrument Company, England). The gastric pH and volumes were recorded for each patient, and the patients' demographic data (name, Age, ASA physical grade status, weight, height, and vital signs) were collected for analysis. Postoperative nausea and vomiting (PONV) scores were recorded at admission (1), 10, 15, and 30 min in the recovery room and 6 hourly in the ward for 24 h. PONV were graded using a visual analog scale (VAS) score of 1–10.[14] An anesthesiologist who was blinded to the groups made the assessment. Patients who scored 4 or more were treated with metoclopamide intravenous, 10 mg. Patient's satisfaction was assessed on a numeric rating scale 24 h after surgery.

Based on a previous study,[15] a sample size of 30 in each group was deemed adequate to produce a 95% confidence interval with a power of 0.8. The data were analyzed with Statistical Package for Social Sciences 17.0 (SPSS, Inc., Chicago, IL, USA). One-way analysis of variance (ANOVA) was used for comparison of mean pH and RGV values in the three groups after assessing normality with Levene's test for homogeneity of variances. Analyses of PONV was performed and presented on the basis of intention to treat. Height, weight, age, and ASA status were compared using the ANOVA test while STAI scores among the three groups were compared with Kruskal–Wallis test. $P < 0.05$ was considered statistically significant. Multiple regression analysis was carried out to analyze the relationship between demographic factors with RGV and pH.

Results

A total of 88 patients completed the study with two dropping out due to faulty aspiration technique. There was a 100% response rate to the STAI inventory questionnaire. The study groups were demographically similar in age, gender, weight, height, and ASA status [Table 1].

The median Stat-Trait anxiety score of Groups F, C, and P were 50 (46–55), 48 (40–50) and 27 (25–34), respectively (P = 0.03) (Kruskal–Wallis kw [df = 1] =5.24, P = 0.03). There were no statistically significant differences

Table 1: Demographic data

	Group F	Group C	Group P	*P*
Age (years)	26.00±3.70	27.00±3.00	26.50±4.35	0.45
Height	151.55±5	155.20±3.50	155.30±3.55	0.40
Weight	64.50±3.90	64.00±4.00	62.10±3.30	0.70
ASA I/II	25/5	25/3	27/3	
STAI median (range)	50 (46-55)	48 (40-50)	27 (25-34)	0.03

ASA=American Society of Anesthesiologists; STAI=State-Trait AnxietyInventory

Table 2: Comparison of residual gastric volume and pH among the groups *n* (range)

	Group F	Group C	Group P	*P*
RGV (*n*)	26 (4-105)	24 (6-90)	27 (5-100)	0.45
pH	1.77±0.30	1.75±0.28	1.80±0.30	0.90

RGV=Residual gastric volume

Table 3: Postoperative nausea and vomiting, visual analogue scale, metoclopramide consumption and patient satisfaction

	Group F	Group C	Group P	*P*
VAS recovery room	7.0±1.00	7.5±0.75	8.0±0.50	0.60
VAS 24 h	6.0±1.25	4.0±1.0	7.0±0.50	0.05
Metoclopramiderecovery (mg) room (mg)	15	15	20	0.20
Metoclopramide 24 h (mg)	15	10	30	0.01
Patient satisfaction	6±0.5	8±0.75	4±0.15	0.03

VAS=Visual analogue scale

among group means of RGV and pH as determined by one-way ANOVA [Table 2].

($F(2,45) = 1.397$, $P = 0.45$, $F(2,43) = 1.50$, $P = 0.90$)

Multiple regression analysis performed between age, height, and weight versus RGV and pH demonstrated no association.

The mean PONV scores from VAS and metoclopramide consumption are shown in Table 3.

The VAS scores and metoclopramide consumption were not statistically different between groups in the recovery room. The 24-h values were statistically significantly lower in Group C compared to F and P. The patient satisfaction on a numeric rating scale was higher in Group C.

Discussion

The findings of this randomized trial showed that drinking of carbohydrate-rich fluid 2 h before elective abdominal myomectomy was not associated with complications during surgery and anesthesia.[12,16-18] The RGV in the patients who had such drinks was not statistically different from those who starved for 6–10 h preoperatively. Various randomized controlled studies and a meta-analyze have consistently documented that oral intake of water and other clear fluids up to 2 h before induction of anesthesia does not increase gastric volume or acidity.[7,19] We also demonstrated that allowing oral intake of the carbohydrate-rich fluid had some protective influence on PONV as well as ensuring better patient satisfaction. These findings are encouraging in preoperative patient care.

Prolonged fasting may lead to several adverse effects including an increase in catabolic pathways, metabolic derangement and may aggravate insulin resistance.[16-19] Insulin resistance ordinarily exerts a positive protection in surgery.[20] However, this resistance can have negative consequences for patient health beyond a critical value.[21] One of the mechanisms to attenuate insulin resistance is the preoperative administration of CRLDs.[22] Bopp *et al*. showed that there was better comfort and satisfaction with anesthetic care when 200 mL of a standard carbohydrate drink was allowed preoperatively.[23] In a study by Faria *et al*., adult women scheduled to undergo elective laparoscopic cholecystectomy, were randomized to either routine preoperative fasting for 8 h or take 200 mL of a carbohydrate drink 2 h before the operation. They concluded that the reduction of the period of preoperative fasting limited insulin resistance and the organic response to trauma.[24]

Hausel *et al*.[25] in their randomized clinical trial, studied 252 elective surgery patients after an overnight fasting, carbohydrate drink, and placebo. They found the lowest incidence of hunger, thirst, and anxiety in the carbohydrate group, which also had the lowest anxiety state. Our finding of low STAI score and better patient satisfaction agrees with these results.

Current preoperative fasting guidelines permit intake of clear liquids for 2 or more hours before anesthesia.[10-12] The carbohydrate-rich drink used in this study is a clear fluid. Carbohydrate drinks are known to increase gastric emptying because their osmolarity is low (<295 mOsm/kg).[26] One interesting finding from our study was the lower RGV of the carbohydrate-rich fluid group. These were also the findings in two previous studies.[27,28]

Majority of patients from the three groups had RGV greater than the traditionally quoted level of 25 mL. Sutherland[29] showed that 30–50% patients undergoing elective surgery after a fasting period of more than 8 h have a gastric volume >25 mL and 64–82% have gastric pH <2.5. Maltby *et al*.[7] noted that on average, about 25 mL of acidic gastric juice remained in the stomach after an overnight fast with a possibility of reaching 200 mL because the stomach continuously secretes up to 50 mL/h of acidic fluid even in fasting patients.

The accuracy of blind aspiration of gastric contents used in this study has been questioned.[30,31] Taylor *et al*.[32] reported

that blind gastric aspiration significantly underestimated true gastric volume but that it can be used to obtain a fair estimate of gastric volume. If this is so, the large gastric volumes we obtained will suggest that overnight fasting does not significantly reduce the gastric volume at the time of induction. Aspiration using a visually-guided gastroscope should probably be reserved as the method of choice when precise measurement of gastric volume is needed.

We studied the relationship between PONV, fasting, placebo, and carbohydrate-rich drink in the recovery room and 24 h after. We found no difference in these parameters in the recovery room. The 24-h record revealed lower scores for PONV in Group C, which also had less metoclopramide consumption. In a randomized study by Hausel *et al*. on 172 patients undergoing elective laparoscopic cholecystectomy, they found the incidence of PONV and VAS to be lower in the CRLD than in the fasted group in the 24 h postoperative period.[33]

In our study, patients who drank the carbohydrate-rich fluid had less preoperative anxiety and better satisfaction than the fasting group. The anxiety states of the three groups were analyzed before induction. The median STAI anxiety score of patients fasting 6 h or longer was statistically significantly higher.[34] A study by Neslihan *et al*.[12] randomized forty ASA I–II patients who underwent elective laparoscopic cholecystectomy into two groups of preoperative carbohydrate drink group (Group C, $n = 20$) and preoperative fasting group (Group F, $n = 20$). Group C was given a 400 mL carbohydrate drink 2 h before surgery. The patients of Group F were fasted 8 h before the surgery. They found that preoperative carbohydrate drink may be used safely and also improves patient's satisfaction and comfort in patients' undergoing laparoscopic cholecystectomy.

Conclusion

Use of 800 mL of oral carbohydrate-containing solution and 400 mL of water for the night before surgery and before 2 h of surgery respectively reduces preoperative anxiety, RGV, intraoperative metabolic derangement, PONV, and gives better patient satisfaction. While the practice is yet to be fully adopted by anesthetists in Nigeria, further studies with larger sample sizes are encouraged to explore this potentially beneficial practice.

Limitations of the study

High-risk patients, obese patients, and patients with ASA physical status III or higher were excluded from the study since the risk of preoperative oral intake in these patients is widely debatable.

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Conflicts of interest

There are no conflicts of interest.

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Annexure

The State-Trait Anxiety Inventory (STAI) is a validated 20-item self-report assessment device, which includes separate measurement of state and trait anxiety. Various reliability and validity tests have been conducted on the STAI and have provided sufficient evidence that the STAI is an appropriate and adequate measure for studying anxiety in research and clinical settings (Sesti, A [2000]. STAI in medication clinical traits. Quality of life Newsletter, 25, 15e16).