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Original article

Sleeve gastrectomy surgery: When 2 alcoholic drinks are converted to 4

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Abstract

Background: While it is well established that Roux-en-Y gastric bypass (RYGB) causes a rapid and heightened peak blood alcohol concentration (BAC), results from previous studies on the effects of sleeve gastrectomy (SG) on alcohol pharmacokinetics are conflicting. Data from 2 studies found SG did not affect BAC, whereas another study found SG caused a heightened peak BAC after alcohol ingestion. Moreover, these 3 studies estimated BAC from breathalyzers, which might not reliably estimate peak BAC.

Objectives: The aims of this study were evaluate (1) the effect of SG, relative to RYGB and a presurgery group, on alcohol pharmacokinetics and subjective effects, and (2) whether breathalyzers are reliable in this population.

Setting: Single-center prospective nonrandomized trial.

Methods: We performed alcohol challenge tests in 11 women who had SG surgery 1.9 ± .1 years ago (body mass index = 35.1 ± 6.6 kg/m^2), 8 women who had RYGB surgery 2.2 ± .4 years ago (body mass index = 30.0 ± 5.2 kg/m^2), and 9 women who were scheduled for bariatric surgery (body mass index = 44.1 ± 4.0 kg/m^2). BAC were estimated from breath samples and measured by gas chromatography at various times after consuming approximately 2 standard drinks.

Results: BAC increased faster, peak BAC was approximately 2-fold higher, and feelings of drunkenness were heightened in both SG and RYGB groups relative to the presurgery group (P values < .001). BAC estimated from breath samples underestimated BAC by 27% (standard deviation = 13%) and missed peak BACs postsurgery.

Conclusions: SG, similar to RYGB, causes marked alterations in the response to alcohol ingestion manifested by a faster and higher peak BAC. The breathalyzer is invalid to assess effects of gastric surgeries on pharmacokinetics of ingested alcohol. (Surg Obes Relat Dis 2017;▮:00–00.) © 2017 American Society for Metabolic and Bariatric Surgery. All rights reserved.

Keywords: Sleeve gastrectomy; Bariatric surgery; Metabolic surgery; Pharmacokinetics; Ethanol; Alcohol; Breathalyzer

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Sleeve gastrectomy (SG) is the most frequent bariatric surgical procedure performed in the United States. Yet, data on its intermediate and long-term effects remain limited. For example, it is unknown whether SG is associated with increased likelihood of developing an alcohol use disorder. However, the increased risk of developing an alcohol use disorder after Roux-en-Y gastric bypass surgery (RYGB) [1–4] and gastrectomy surgery for ulcer disease and gastric cancer [5–7], suggests that attention to this potential serious side effect of SG is critical.

The increase in alcohol use disorder after RYGB and gastrectomy is likely caused, in part, by surgery-related changes in gastric anatomy that alter the pharmacokinetics and subjective effects of ingested alcohol. While it is well established that RYGB [8–11] and gastrectomy [12] accelerate alcohol absorption and cause a rapid, large increase in peak blood alcohol concentration (BAC), results from previous studies on the effects of SG on alcohol pharmacokinetics are conflicting. We are aware of 3 studies that evaluated the effect of SG on BAC achieved after drinking. Of studies, 2 found SG did not affect BAC [13,14], whereas another study found SG caused a marked increase in peak BAC after alcohol ingestion [15]. However, all 3 studies used breath analysis techniques to estimate BAC.

The use of the breath analysis techniques to estimate BAC in the bariatric population has limitations. First, to ensure that there is no residual mouth alcohol, which could dramatically affect the estimation of BAC, the protocol for breath analysis techniques requires waiting at least 15 minutes after patients finish their drink to take a breath sample. Such a time lag restriction could result in entirely missing peak BAC in conditions when alcohol absorption is significantly faster, such as after RYGB, and gastrectomy. Second, we are not aware of any published study that evaluated whether breath-sampling techniques provide a valid assessment of BAC in patients with severe obesity or gastric bypass patients. Notably, BAC estimated from alcohol breath techniques depends on several factors, including lung volume, hematocrit, and body size, and the algorithm currently used to derive BAC estimations is based on data from healthy lean men [16].

The primary goals of the present study were to evaluate the effect of SG, relative to RYGB and a presurgery group, (1) on alcohol pharmacokinetics, by measuring BAC with gas chromatography, the gold standard technique, as well as by breath analysis; and (2) on alcohol subjective effects, by using the drunkenness scale of the Addiction Research Center Inventory, a validated questionnaire. A secondary aim of this study was to determine whether breath analysis, which is normally used to estimate BAC, is a reliable technique to study the effects of RYGB or SG on alcohol pharmacokinetics.

Methods

Patients

There were 11 women who had SG (SG group) and 8 women who had RYGB (RYGB group) within the last 1 to 5 years, and 9 women who were scheduled to have RYGB at Barnes-Jewish Hospital in St. Louis, MO (presurgery group) who participated in this study (Table 1), which was approved by the Washington University institutional review board. All patients provided written informed consent.

Patients were recruited by reviewing their medical record to determine initial eligibility followed by a personal interview conducted at the Bariatric Surgery Clinic. We only studied women because most patients who have bariatric surgery are women [17] and sex can affect alcohol pharmacokinetics [18]. All patients completed a comprehensive medical evaluation, including history, physical examination, blood tests, and urine pregnancy test. Subject's alcohol use patterns were assessed with the Alcohol Module of the Semi-Structured Assessment for the Genetics of Alcoholism [19]. To be eligible for the study, patients had to be regular, light drinkers and not have evidence of risky drinking, according to the National Institute of Alcohol Abuse and Alcoholism guidelines 1 month before enrolling in the study. Patients with lifetime alcohol dependence, current regular use of drugs other than alcohol, or current use of medications that can affect alcohol pharmacokinetics were excluded. In addition, patients who smoked cigarettes in the last 6 months, were pregnant, breastfeeding, or not using an effective birth control method, anemic, or had liver disease were excluded. Data from a subsample of these patients have been reported previously [9]. The study is registered with the Clinical Trials.gov identifier: NCT01843257.

Study design and experimental procedures

The study was conducted in the Clinical Research Unit at Washington University School of Medicine. Using a randomized crossover design, all patients were evaluated in 2 sessions, approximately 1-week apart. Body fat-free mass (FFM) was assessed in the Clinical Research Unit by using dual-energy x-ray absorptiometry. Patients consumed either .5 g of alcohol per kg of FFM (equivalent to ~2 standard alcoholic beverages: alcohol condition) or a non-alcoholic placebo beverage (control condition) at each visit. The dose of alcohol consumed was based on each subject's total FFM, because FFM, not weight, correlates closely with alcohol volume of distribution [20].

Alcohol and placebo challenge tests

For each session, patients were admitted to the Clinical Research Unit after an overnight fast and remained fasted