Gastric residual volume after split-dose compared with evening-before polyethylene glycol bowel preparation

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Background and Aims: Split-dose bowel preparation for colonoscopy results in superior preparation quality. However, some endoscopy units remain hesitant to prescribe split-dose preparation given theoretical concerns about possible aspiration caused by gastric residual fluid when a second dose is given close to the time of endoscopy. Our aim was to compare gastric residual volume (GRV) in patients taking split-dose bowel preparation and those taking preparation the evening before colonoscopy.

Methods: We performed a prospective observational comparison of GRV among random inpatients undergoing same-day EGD and colonoscopy either after a split-dose bowel preparation or after a bowel preparation the prior evening.

Results: GRV was measured in 150 patients undergoing EGD and colonoscopy: 75 who completed a split-dose bowel preparation 2 to 3 hours before endoscopy and 75 who completed the bowel preparation regimen the prior evening. The mean GRV 2 to 3 hours after the last ingestion of bowel preparation among split-dose group patients was 21 ± 24 mL (± standard deviation; range, 0 to 125 mL), which was not different from the mean GRV of 24 ± 22 mL (range, 0 to 135 mL) in patients who ingested the preparation the prior evening ($P = .08$). GRV had no association with the presence of diabetes, gastroparesis, or opioid use.

Conclusions: GRV is the same after a split preparation and fasting for 2 to 3 hours or after preparation with overnight fasting. The data suggest that the risk of aspiration is identical after either preparation technique and thus that sedation for colonoscopy can be performed safely 2 hours after bowel preparation ingestion. (Gastrointest Endosc 2016;83:574-80.)

Split-dose bowel preparation, in which a portion of the bowel preparation is given the morning of the procedure, results in superior quality of bowel preparation and is better tolerated.[1-8] Despite evidence-based recommendations supporting the use of a split-dose bowel preparation, adoption of this practice has been limited because of practical difficulties.[9] For example, some physicians, including many anesthesiology providers, mandate waiting 6 to 8 hours after the last ingestion of a bowel preparation to decrease the risk of aspiration. This necessitates either asking patients to wake up at 2 to 3 AM or scheduling their procedure in the afternoon. Although some patients are willing to wake up in the middle of the night when told it helps clean the colon adequately and avoid repeating colonoscopy,[10] the question remains as to whether this is necessary. This idea remains unpopular because one-third of patients may be unwilling to wake up early to complete the split-dose preparation.[11]

The American Society of Anesthesiologists recommends a fasting period of 2 hours for clear liquids before administering sedation.[12] Bowel preparations by their nature are clear liquids, although the guidelines do not specifically address this point. However, many anesthesiologists remain concerned about aspiration risk. With an increasing number of colonoscopies being performed using propofol by anesthesiology providers, a waiting time of 6 to 8 hours has become a de facto standard in

Abbreviations: GRV, gastric residual volume; PEG, polyethylene glycol.

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many centers. To address this issue, we conducted a prospective study comparing gastric residual volume (GRV) among patients after split-dose bowel preparations and those who took bowel preparations the evening before colonoscopy.

METHODS

Study setting and population

Patients admitted to Parkland Memorial Hospital, the safety net health system of Dallas County, Texas, between March 2013 and June 2014 who required both upper endoscopy and colonoscopy on the same day were potentially eligible for the study. We excluded patients with active GI bleeding (ie, melena, hematemesis, or hematochezia) and those admitted to the intensive care unit. We intentionally did not exclude patients with medical conditions potentially associated with delayed gastric emptying such as diabetes, documented gastroparesis, and/or use of opioid medications.

Patients received bowel preparation as recommended by the gastroenterology consulting service and agreed on by the anesthesiology provider (if applicable). If both sets of providers agreed to a 2-hour time interval for sedation after last ingestion of bowel preparation, patients were prescribed a split-dose preparation. If the providers involved with the procedure preferred to wait longer than 2 hours, the patients received standard bowel preparation. The standard preparation included at least 4 L of polyethylene glycol (PEG) (GoLytley; Braintree Laboratories, Braintree, Mass) the evening before the procedure. The patients were then instructed to be "nil per os" (nothing by mouth) after midnight. The split-dose bowel preparation included 4 L of PEG the evening before the procedures and an additional 1 L of PEG administered between 5 and 6 AM the morning of the procedure.

The split-dose regimen used in this study is different from the split-dose regimen described in earlier studies, which is typically administered 2 L the evening before the procedure and 2 L administered the morning of the procedure. The modification was necessary because of logistical difficulties and practical limitations. First, for us to implement the 2 L + 2 L split dose would have necessitated changes in Epic (our electronic medical record) as well as re-education of the hospital nursing staff. Our leadership believed that this would be feasible only if this regimen could be adapted for all patients undergoing colonoscopy rather than only for patients undergoing colonoscopy with moderate sedation. We had already been using a 4 L + 1 L split-dose preparation for patients with a history of prior inadequate preparation, found that it worked very well, and thus used it for this study.

Upper endoscopy was performed between 8 and 9 AM (2 to 3 hours after last ingestion of bowel preparation). Patients in the split-dose group in whom EGD could not be performed within this time frame or those who did not finish a minimum 500 mL of the morning bowel preparation were excluded.

Data collection

The GRV was measured, immediately after sedation and insertion of endoscope into the stomach, by suctioning all fluid through the suction channel of the endoscope without the addition of any water (including water used to cleanse the endoscope lens or irrigation). The suctioned fluid was collected in a calibrated container attached to the suction port of the endoscope. The volume of fluid collected was measured and recorded by the endoscopy nurse.

Demographics, medical comorbidities and treatment, and indication for endoscopy were recorded for each patient from a review of the electronic medical record. Patient demographics of interest included age and gender. Medical comorbidity data included history of diabetes, gastroparesis, and use of metoclopramide, erythromycin, or opioid medications. Patients were considered to have diabetes if they were taking any medication for diabetes as an outpatient and considered to have gastroparesis if the diagnosis had been confirmed by a gastric emptying scan. Use of opioid medications was defined as patients administered scheduled opioid medications as inpatients.

Indications for upper endoscopy and colonoscopy for each patient were noted. Any sedation-related difficulties or adverse events were recorded, including witnessed aspiration or vomiting, use of reversal agent, prolonged recovery time, or transfer to higher level of care. This study was approved by the Institutional Review Board at UT Southwestern Medical Center, and all patients signed written informed consent.

Statistical analysis

Our primary outcome of interest was GRV. In a post-hoc power calculation we found 96 patients (48 in each group) would provide 90% power, with an alpha of .05, to demonstrate noninferiority, assuming a noninferiority margin of 15 mL. Including 150 patients (75 in each group) would provide 90% power to demonstrate noninferiority, assuming a margin of 12 mL.

We used the Fisher exact test and Wilcoxon rank-sum test for categorical and continuous variables, respectively, to identify covariates associated with GRV. Multivariate logistic regression was then performed using variables significant on univariate analysis as well as variables of a priori clinical importance. Statistical significance was defined as $P \leq .10$ for univariate and $P < .05$ for multivariate analyses. All data analyses were conducted using Stata 11.0 (College Station, Tex).