Split-dose sodium picosulfate–magnesium citrate colonoscopy preparation achieves lower residual gastric volume with higher cleansing effectiveness than a previous-day regimen

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Background and Aims: It is known that sodium picosulfate–magnesium citrate (SPMC) bowel preparations are effective, well tolerated and safe, and that split-dosing is more effective for colon cleansing than previous-day regimens. Anesthetic guidelines consider that residual gastric fluid is independent of clear liquid fasting times. However, reluctance to use split-dosing persists. This may be due to limited data on residual gastric fluid volumes (RGFVs) and split-dosing bowel preparations, and that these may not be perceived as standard clear liquids. Furthermore, no studies are available on RGFV/residual gastric fluid pH (RGFpH) and SPMC. We aimed to evaluate the cleansing effectiveness and the RGFV/RGFpH achieved after an SPMC split-dosing regimen compared with a SPMC previous-day regimen.

Methods: This was a single-center observational study. A total of 328 outpatients scheduled for simultaneous EGD and colonoscopy and following a split-dosing or previous-day regimen of SPMC were included. We prospectively measured colon cleanliness by using the Ottawa Bowel Preparation Scale, RGFV, and RGFpH.

Results: Ottawa Bowel Preparation Scale scores for overall, right, mid-colon, and colon fluid were significantly better in the split-dosing group. In the split-dosing group, the 3- to 4-hour fasting time consistently achieved the best cleansing quality. RGFV was significantly lower in the split-dosing group (11.09 vs 18.62, $P < .001$). No significant differences in RGFpH were detected.

Conclusions: Split-dosing SPMC provides higher colon cleansing quality with lower RGFVs than previous-day SPMC regimens. SPMC in split-dosing acts exactly as a standard clear liquid acts, and thus anesthetic guidelines on this issue may be applied with no concerns. (Gastrointest Endosc 2016;83:566-73.)

Colonoscopy is currently the criterion standard test for both colorectal cancer screening and investigation of both colon and terminal ileum diseases.[1-3] To achieve a successful examination of the entire colon mucosa, the effectiveness and tolerability of bowel preparations are essential.[4,5] Inadequate colon preparation results in longer procedures[6]; decreased cecal intubation rate[6]; decreased detection of small, large, and flat polyps[6-8]; and increased patient discomfort and costs,[4,9] whereas large-volume or unpalatable agents are poorly tolerated and decrease patient adherence to recommendations (and therefore efficacy) and willingness to repeat the procedure.[4,5,10,11]

To increase efficacy and compliance, new laxative agents and different doses and regimens are being developed and compared. Citrafleet (Laboratorios Casen Recordati SLU, Utebo-Zaragoza, Spain) is a small-volume preparation based on oral sodium picosulfate and magnesium citrate (SPMC) with a combined osmotic and

Abbreviations: FT, fasting time; NaP, sodium phosphate; OBPS, Ottawa Bowel Preparation Scale; PEG, polyethylene glycol; PPI, proton pump inhibitor; RGFpH, residual gastric fluid pH; RGFV, residual gastric fluid volume; SPMC, sodium picosulfate–magnesium citrate.

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stimulant effect. SPMC has been widely used in Europe for many years and is considered an effective, well-tolerated, and safe bowel preparation for colonoscopy.[11-15] On the other hand, there is extensive evidence that split-dosing regimens, which consist of the administration of at least 1 portion of the preparation on the evening before the procedure and the rest on the morning of the examination, are more effective for colon cleansing[2,16-18] and adenoma detection[19] than previous-day regimens, when either polyethylene glycol (PEG) or sodium phosphate (NaP) are prescribed. Recent studies have also demonstrated that split-dosing is more effective than previous-day preparations when SPMC is used.[20,21] Based on this evidence, split-dosing is recommended as the standard preparation by the American College of Gastroenterology[1] and different guidelines.[5,22] Specifically, a SPMC split regimen is recommended by the European Society of Gastroenterology as a valid alternative to a standard 4-L PEG split regimen.[23]

However, there is still some reluctance to use split-dosing regimens in daily clinical practice. The main reason seems to be the speculation that a shortened fasting period before colonoscopy sedation would imply higher amounts of residual gastric liquid and consequently a higher risk of pulmonary aspiration. To date, we have no evidence of increased risk of pulmonary aspiration when a split-dosing regimen is prescribed; however, data are scarce and studies rely on surrogate indicators of aspiration risk, such as gastric volume and pH. These studies have demonstrated that residual gastric fluid and pH are independent of the clear liquids fasting period,[24-27] and thus, most anesthetic guidelines support a clear liquids fasting period of 2 to 3 hours before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia.[28,29] If some resistance to using split-dosing regimens still persists, this may be because clinicians do not perceive colon preparations as a standard clear liquid. In fact, the previously mentioned studies explicitly refer to limited volumes of water, coffee, tea, isotonic, or carbohydrate drinks and clear juices.[26] However, none specifically mention bowel preparations. Furthermore, conflicting results exist on whether the high volume and particular osmotic characteristics of these preparations may alter gastric emptying.[30,31]

The only previous published study addressing this issue demonstrated that residual gastric volume of patients prepared with split-dosing regimens of PEG or NaP was similar to those prepared with previous-day regimens by using the same agents.[32] However, no similar studies have been carried out with other common agents such as SPMC, and we do not know how the split-dosing regimen of a bowel preparation could modify residual gastric fluid pH.

The aim of the study is to assess the effectiveness and safety profile of a split-dosing regimen with SPMC, comparing colon-cleansing efficacy, residual gastric fluid volume (RGFV), and residual gastric fluid pH (RGFpH) between an SPMC split-dosing regimen and an SPMC previous-day bowel preparation.

METHODS

Between October 2012 and May 2014, we prospectively recruited consecutive patients 18 to 80 years of age scheduled for an elective outpatient EGD and colonoscopy on the same day at our hospital (Clínica Universidad de Navarra, Pamplona, Spain). Exclusion criteria included suspected or known acute colon disease, ileus, bowel obstruction or pseudo-obstruction, known gastroparesis, gastric outlet obstruction, or known hiatal hernia larger than 4 cm. Patients with a history of upper GI surgery that could interfere with gastric emptying or bowel motility (such as an intestinal bypass or a gastric or bowel resection) or any colorectal surgery (excluding appendectomy or hemorrhoid surgery) were excluded. Patients with renal insufficiency (defined as a creatinine level higher than normal range for age and sex), congestive heart failure, uncontrolled hypertension, American Society of Anesthesiologists class IV, pregnant or lactating women, or those patients unable to comprehend the nature of the study or give their consent were also excluded. The study was approved by the local and regional ethics committee (EO 10/2012) and by the institutional review board on April 2012 (ICT-PIC-2012-01). Written informed consent was obtained from all participants.

At the time of acceptance into the study, patients were interviewed by a dedicated nurse who collected their demographic data and baseline characteristics and assigned patients to a previous-day bowel preparation group or the split-dosing group based on the hour of the first medical visit appointment. Patients who visited from 9:00 AM to 12:00 PM were assigned to the split-dosing group, whereas those who visited from 12:00 PM to 3:00 PM received instructions for a previous-day schedule. Opioids and oral iron were discontinued if possible at the time of the medical visit or at least 48 hours before the procedure, as is usually done in our daily medical practice. Benzodiazepines, tricyclic antidepressants, prokinetics, and proton pump inhibitors (PPIs) were maintained as prescribed until the initiation of the preparation. The nurse carefully explained the instructions, indicating the need to observe a low-fiber diet 2 days before the procedures and giving oral and written information about the forbidden foods and the importance of adequate colon cleansing for the purpose of the procedure, as is usually done in our daily clinical practice. All patients were instructed to have a light low-fiber breakfast and lunch the day before the procedure. Citrafleet consists of 2 sachets, each containing 10 mg of sodium picosulfate, 3.5 g of light magnesium oxide, and 10.97 g of anhydrous citric acid. Patients in each group were instructed to follow the directions shown in Table 1. Patients in the previous-day regimen group were allowed to ingest clear liquids until 11:30 PM of the day before the procedure, whereas patients in the split-dosing group were allowed to ingest clear liquids until 7:30 AM of the same day of the procedure. Procedures could take place from 9:30 AM to 3:00 PM. The minimum fasting time was set at 2 hours. Just before