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## Oral Sulfate Solution is as Effective as 2 L Polyethylene Glycol Plus Ascorbic Acid

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See “Comparison of Oral Sulfate Solution and Polyethylene Glycol Plus Ascorbic Acid on the Efficacy of Bowel Preparation” by Ji Hyung Nam, Seok Bo Hong, Yun Jeong Lim, et al., on page 568-574.

Bowel preparation is a key component in colonoscopy and is closely related to its quality. Adequate bowel preparation is required for safe and reliable colonoscopy. The adherence of patients to the method of ingestion of a bowel preparation solution is a major factor that increases bowel cleanliness. However, a large volume of the preparation solution has to be ingested, and it has unpleasant taste and side effects. Some patients report that the most unpleasant part of a colonoscopy is ingesting the preparation solution, and there is no clear agreement regarding the best colonic cleansing regimen.

Polyethylene glycol (PEG) electrolyte solution was introduced in 1980 by Davis et al.<sup>1</sup> It is an oral isotonic solution that is neither digested nor absorbed by the intestine. However, a large volume (4 L) of PEG electrolyte solution, that usually carries an unpleasant taste, needs to be ingested. To reduce the intake volume, various solutions with additives have been studied. A formulation of 2 L PEG plus ascorbic acid (PEG-AA) has been popularly used for bowel preparation as its bowel cleansing effect is comparable to that of 4 L PEG. Furthermore, compared to 4 L PEG, it has lesser side effects, such

as vomiting and nausea, and has higher tolerability. It can also increase the willingness of patients to undergo repeat bowel preparation. Similar to 2 L PEG-AA, oral sulfate solution (OSS) is a low-volume preparation that has recently been developed. In a typical case, OSS is supplied in an aqueous liquid form in a 177 mL bottle. The water is filled up to the 473 mL mark on the bottle. The patients are instructed to take a reduced volume (946 mL) of the preparation solution and 1,892 mL of water, with additional fluid consumption permissible during the preparatory phase.<sup>2</sup> Previous studies comparing OSS with 2 L PEG-AA, showed similar results of high efficacy when both regimens were used in split- or same-day regimens.<sup>2-5</sup>

Although both regimens have a good effect on bowel cleansing, they have side effects. Ascorbic acid, as an adjunctive to PEG, can cause hemolysis when administered to patients with glucose-6-phosphate deficiency. Furthermore, 2 L PEG-AA is not recommended in patients with severe renal insufficiency (creatinine clearance <30 mL/min), congestive heart failure (New York Heart Association III or IV), phenylketonuria, or glucose-6-phosphate dehydrogenase deficiency.<sup>3</sup> The osmotic power of sulfate can induce renal failure or hyperuricemia. OSS is contraindicated in patients with congestive heart disease, ascites, and severe renal insufficiency (glomerular filtration rate <30 mL/min).<sup>3</sup> Therefore, care should be taken when administering PEG-AA or OSS to these patients.

The quality of bowel preparation may be influenced by many factors such as diet, patient education, adjunctive drugs, bowel preparation regimen, colonoscopy start time, dosing method (split dose or single dose), and hospitalization status.

Elderly, male, obese, and diabetic patients; inpatients; pa-

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tients taking >8 drugs; those consuming antidepressants or narcotic analgesics; those with severe constipation; and those with neurological disorders (stroke, spinal cord injury, or Parkinson's disease), or those with a history of gastrointestinal surgery are likely to have an inadequate bowel preparation. Therefore, special attention should be paid to their bowel preparation for colonoscopy. The European Society of Gastrointestinal Endoscopy has recommended a minimum standard of  $\geq 90\%$  for the rate of adequate bowel preparation.<sup>6</sup> However, it has been reported that the rate of inadequate bowel preparation in the patients undergoing colonoscopy in real-life clinical practice is 25%–30%.<sup>7,8</sup>

In this issue of *Clinical Endoscopy*, Nam et al.<sup>9</sup> compared the efficacy of OSS and PEG-AA and identified the patient characteristics that were favorable in certain formulations. Overall, 106 (63.5%) patients received OSS and 61 (36.5%) patients received PEG-AA. The rate of inadequate bowel preparation was 12.3% in patients receiving OSS and 32.8% in patients receiving PEG-AA ( $p=0.001$ ). OSS (odds ratio [OR]=0.26;  $p=0.003$ ) and morning examination (OR=0.11;  $p=0.038$ ) were found to be significantly associated with efficient bowel preparation. Compared with PEG-AA, the efficacy of OSS was only significant in patients aged  $\geq 50$  years versus that in those aged <50 years (OR=0.13;  $p=0.001$  vs. OR=0.96;  $p=0.959$ ). A similar finding among female versus male patients (OR=0.06;  $p=0.002$  vs. OR=0.58;  $p=0.339$ ) was observed. Thus, they concluded that OSS was significantly more efficient for bowel preparation than PEG-AA, especially in patients aged  $\geq 50$  years and female patients. Further, morning examination led to good-quality bowel preparation, irrespective of the preparation regimen used.

This study has several limitations. First, it was a single-center, retrospective study. Hence, there may be a selection bias among the patients. Second, the rate of inadequate bowel preparation was 32.8%, which was higher than the usual rate in patients receiving PEG-AA. Moreover, patients receiving PEG-AA were more likely inpatients and were administered fewer split doses; these would have affected their results. Third, the authors did not analyze the safety issues.

Nevertheless, the authors attempted to analyze the causes of inadequate bowel preparation in real-life clinical practice and

found that OSS was more efficient than PEG-AA in female patients and patients aged  $\geq 50$  years. These findings provide evidence that certain bowel preparation formulas may be more effective in a specific group of patients and that patient characteristics should be considered when prescribing a preparation regimen.

#### Conflicts of Interest

The authors have no financial conflicts of interest.

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## REFERENCES

1. Davis GR, Santa Ana CA, Morawski SG, Fordtran JS. Development of a lavage solution associated with minimal water and electrolyte absorption or secretion. *Gastroenterology* 1980;78:991-995.
2. Di Palma JA, Rodriguez R, McGowan J, Cleveland M. A randomized clinical study evaluating the safety and efficacy of a new, reduced-volume, oral sulfate colon-cleansing preparation for colonoscopy. *Am J Gastroenterol* 2009;104:2275-2284.
3. Hassan C, East J, Radaelli F, et al. Bowel preparation for colonoscopy: European Society of Gastrointestinal Endoscopy (ESGE) guideline - update 2019. *Endoscopy* 2019;51:775-794.
4. Lee HH, Lim CH, Kim JS, et al. Comparison between an oral sulfate solution and a 2 L of polyethylene glycol/ascorbic acid as a split dose bowel preparation for colonoscopy. *J Clin Gastroenterol* 2019;53:e431-e437.
5. Kim B, Lee SD, Han KS, et al. Comparative evaluation of the efficacy of polyethylene glycol with ascorbic acid and an oral sulfate solution in a split method for bowel preparation: a randomized, multicenter phase III clinical trial. *Dis Colon Rectum* 2017;60:426-432.
6. Kaminski MF, Thomas-Gibson S, Bugajski M, et al. Performance measures for lower gastrointestinal endoscopy: a European Society of Gastrointestinal Endoscopy (ESGE) quality improvement initiative. *Endoscopy* 2017;49:378-397.
7. Froehlich F, Wietlisbach V, Gonvers JJ, Burnand B, Vader JP. Impact of colonic cleansing on quality and diagnostic yield of colonoscopy: the European panel of appropriateness of gastrointestinal endoscopy European multicenter study. *Gastrointest Endosc* 2005;61:378-384.
8. Harewood GC, Sharma VK, de Garmo P. Impact of colonoscopy preparation quality on detection of suspected colonic neoplasia. *Gastrointest Endosc* 2003;58:76-79.
9. Nam JH, Hong SB, Lim YJ, et al. Comparison of oral sulfate solution and polyethylene glycol plus ascorbic acid on the efficacy of bowel preparation. *Clin Endosc* 2020;53:568-574.