Dig Dis Sci (2017) 62:289–291
DOI 10.1007/s10620-016-4385-x

EDITORIAL

Predicting Suboptimal Bowel Preparation: Taking It Up a PEG

Shaheel M. Sahebally[1]

Received: 9 November 2016 / Accepted: 15 November 2016 / Published online: 23 November 2016
© Springer Science+Business Media New York 2016

The increased incidence of colorectal cancer (CRC) over the last decades has driven the widespread launch of population-based screening programs worldwide, for which colonoscopy has become the primary diagnostic tool. Optimal bowel preparation is a pre-requisite for accurate and safe colonoscopy, as it enables adequate mucosal visualization, increasing the diagnostic yield for colonic lesions, supported by the observation that polyp and adenoma detection rates are directly proportional to the quality of bowel preparation. Improved colonic cleansing is associated with a fivefold increase in cecal intubation rates as well as a twofold increase in adenoma detection [1].

With the advent of several cleansing agents, e.g., sodium picosulfate (SPS), sodium phosphate (NaP), and polyethylene glycol (PEG) harboring enhanced palatability as well as smaller formulation volumes (2L vs. 3L vs. 4L PEG solutions), significant improvements in colonic cleansing have been observed. Yet, suboptimal bowel preparation remains as the nemesis of the endoscopist, with rates of 20–25% typically reported [2, 3]. Inadequate colonic lavage not only prolongs procedure time and increases patient discomfort, but also increases the number of unpopular repeat examinations and increases the risk of peri-procedural complications. Current guidelines from the US Multi-Society Task Force on CRC stipulate that an adequate bowel preparation is one that enables visualization of polyps >5 mm [4].

While there have been numerous investigational head-to-head comparisons of different preparation agents with respect to efficacy of colonic lavage and patient tolerability [5, 6], few have evaluated the factors associated with an inadequate colonic cleansing. Prediction of suboptimal preparation is of paramount importance as it may enable clinicians to accurately identify patients who may require further bowel cleansing with additional methods or regimens before they receive intravenous sedation and begin the examination. Because colonoscopy is costly and time consuming, these patients may be better served by having their procedure rescheduled after additional or alternative cleaning measures are put in place, helping maximize the use of endoscopy resources. In this month's issue of *Digestive Diseases and Sciences*, Cheng et al. [7] report on their single-center, prospective study evaluating predictive factors associated with suboptimal bowel preparation using an intermediate (3L)-volume PEG solution. They studied >1400 patients with a mean age of 52.5 ± 11.1 years undergoing outpatient colonoscopic examinations mostly indicated for CRC screening or polyp surveillance in Taiwan. A majority of the subjects (77.6%) received split-dose preparations (i.e., 2L of PEG the evening before colonoscopy and 1L the next morning) as they were scheduled for morning colonoscopy. The rate of suboptimal bowel preparation, defined as a Boston Bowel Preparation Scale (BBPS) score ≤6, was 17.2%. The authors reported that male gender, constipation, obesity (body mass index ≥27 kg/m^2), and inadequate (<80%) oral PEG intake were independent predictors of suboptimal preparation.

The cited study, the first to report predictive factors contributing to inadequate preparation associated with an intermediate (3L)-volume PEG solution, adds to the literature regarding this topic. The European Society of Gastrointestinal Endoscopy (ESGE) guidelines [8] recommend a split-dose regimen of a 4L PEG solution (or a same-day regimen for afternoon colonoscopy) as first-line for routine

✉ Shaheel M. Sahebally
sahebalm@tcd.ie

[1] Department of Colorectal Surgery, University Hospital Galway, Newcastle Road, Galway, Ireland

bowel cleansing before colonoscopy with PEG as the only recommended agent in patients with renal failure. Nevertheless, data from a previous meta-analysis show that patients have more difficulty completing PEG-based regimens than SPS- or NaP-based regimens. Furthermore, PEG-based regimens are associated with a significantly greater number of adverse events, likely due to the inherently larger volume and salty taste of the mixture [9], of particular significance in an Asian population, due to a smaller body size compared to a Caucasian population. In this regard, the same authors in a different publication prospectively compared a 2L PEG versus a 3L PEG solution in a Taiwanese cohort, demonstrating that the 3L regimen was associated with significantly superior cleansing as well as a higher adenoma detection rate (ADR) [10]; hence, the intermediate-volume PEG was evaluated in the current study. While the observed findings have implications for clinical practice, especially for an Asian cohort, there are a few salient points worth mentioning. The exceptionally high (59%) ADR observed was attributed by the authors to their policy of polypectomy during colonoscopy insertion, rather than during withdrawal. Though no evidence in the literature suggest that Taiwanese patients have a higher incidence of adenomas, the observed findings certainly beg the question. Alternatively, this high ADR may reflect the correspondingly high rate of successful bowel cleansing. Secondly, although only 3.4% of patients failed to consume >80% of the 3L volume of PEG, these data were self-reported and thus likely to be over-estimated. Furthermore, since vomiting following ingestion of PEG is common and since no data were provided regarding same, these results have to be interpreted with caution. Thirdly, although prior gastrointestinal surgery has been consistently associated with a suboptimal preparation in previous studies, this was not the case in the cited study notwithstanding that 31% of patients had undergone prior gastrointestinal surgery. Knowledge of the specific type of surgery these patients underwent would be helpful since prior colonic resection was an exclusion criterion as per the authors. Though the World Health Organization defines obesity as a BMI $\geq$ 30 kg/m^2, the threshold used in the cited study was lower ($\geq$27 kg/m^2), impeding broad generalization of the findings. Nearly 25% of the studied cohort suffered from constipation, but no information was available as to their medication history, specifically whether they were taking promotility medications, which could have affected the BBPS scores. Nonetheless, the findings of the cited study are noteworthy and demonstrate that a 3L PEG solution is a viable alternative to the recommended 4L preparation in an Asian population.

It would be interesting to see whether the same results could be replicated in a Caucasian population and determine predictive factors of inadequate colonic preparation in this setting. An ever-aging population poses increasing demands for screening colonoscopy. The ability to accurately predict occurrences of suboptimal colonoscopic preparation in certain patient cohorts together with measures to counteract these will undoubtedly improve resource utilization and alleviate part of the burden of healthcare systems that are already under tremendous financial and time constraints.

Key Concepts

- Identification of patients prior to performing sedated colonoscopy at risk for suboptimal bowel preparation would optimize endoscopic resources.
- While a 3L PEG regimen is both effective and tolerable in a Taiwanese population, further research is needed to determine whether the predictive factors observed in the current study can be extrapolated to a Caucasian population.

Compliance with ethical standards

Conflict of interest None.

References

1. Marmo R, Rotondano G, Riccio G, et al. Effective bowel cleansing before colonoscopy: a randomized study of split-dosage versus non-split dosage regimens of high-volume versus low-volume polyethylene glycol solutions. *Gastrointest Endosc*. 2010;72:313–320.
2. Mahadev S, Green PH, Lebwohl B. Rates of suboptimal preparation for colonoscopy differ markedly between providers: impact on adenoma detection rates. *J Clin Gastroenterol*. 2015;49:746–750.
3. Lebwohl B, Kastrinos F, Glick M, Rosenbaum AJ, Wang T, Neugut AI. The impact of suboptimal bowel preparation on adenoma miss rates and the factors associated with early repeat colonoscopy. *Gastrointest Endosc*. 2011;73:1207–1214.
4. Johnson DA, Barkun AN, Cohen LB, et al. Optimizing adequacy of bowel cleansing for colonoscopy: recommendations from the US multi-society task force on colorectal cancer. *Gastroenterology*. 2014;147:903–924.
5. Yang HJ, Park SK, Yeom DH, et al. Randomized trial comparing oral sulfate solution with 4-L polyethylene glycol administered in a split-dose as preparation for colonoscopy. *J Gastroenterol Hepatol*. 2016. doi:10.1111/jgh.13477.
6. Choi HS, Chung JW, Lee JW, et al. Polyethylene glycol plus ascorbic acid is as effective as sodium picosulfate with magnesium citrate for bowel preparation: a randomized trial. *J Dig Dis*. 2016;17:268–273.
7. Cheng CL, Liu NJ, Tang JH, et al. Predictors of suboptimal bowel preparation using 3-litres of polyethylene glycol for an outpatient colonoscopy: a prospective observational study. *Dig Dis Sci*. (Epub ahead of print). doi:10.1007/s10620-016-4343-7.

8. Hassan C, Bretthauer M, Kaminski MF, et al. Bowel preparation for colonoscopy: European Society of Gastrointestinal Endoscopy (ESGE) guideline. *Endoscopy*. 2013;45:142–150.
9. Tan JJ, Tjandra JJ. Which is the optimal bowel preparation for colonoscopy—a meta-analysis. *Colorectal Dis*. 2006;8:247–258.
10. Cheng CL, Kuo YL, Liu NJ, et al. Impact of bowel preparation with low-volume (2-liter) and intermediate-volume (3-liter) polyethylene glycol on colonoscopy quality: a prospective observational study. *Digestion*. 2015;92:156–164.