


Effects on BBPS score with bowel preparation time and dosage

Wei Lu, MD^a, Kena Zhou, MD^a , Congbo Cai, MD^b, Yi He, MD^a, Honggang Jiang, MD^a, Xinke Li, MD^{c,*} 

Abstract

Background: To evaluate the effects on the Boston Bowel Preparation Scale (BBPS) score with different bowel preparation times and dosages.

Methods: Six hundred patients who underwent colonoscopy in the Endoscopy Center of Ningbo No.9 Hospital in 2021 were recruited and randomly assigned to 3 groups: Group A: “4-hour 1+2L” bowel preparation regimen; Group B: “6-hour 1+2L” bowel preparation regimen; and Group C: “4-hour 0+2L” bowel preparation regimen. BBPS score among these groups is compared and analyzed in the Statistical Product and Service Solutions software.

Results: There was no difference in baseline characteristics among the three groups of patients ($P > .05$). There was no significant difference in the BBPS score between Group B and Group C, whereas the BBPS score in Group A was significantly higher than that in Groups B and C ($P < .05$).

Conclusion: The “4-hour 1+2L” bowel preparation regimen can obtain higher BBPS score for colonoscopy, which is suggested to be the optimal plan for colonoscopy patients of the time and dosage. Definitely, higher BBPS score can improve the quality of colonoscopy diagnosis and treatment consequence.

Abbreviations: BBPS = Boston Bowel Preparation Scale, PEG = polyethylene glycol.

Keywords: bowel preparation, colonoscopy, dosage, time

1. Introduction

Colonoscopy is a standard procedure for colorectal cancer screening, and adequate bowel preparation is of great significance for an effective colonoscopy.^[1] The rate of polyps detection could be 37.1% with a well-prepared bowel condition, whereas 26.4% in bad-prepared situation.^[2] Polyethylene glycol (PEG) is known to be an effective drug for bowel preparation.^[3] The Boston Bowel Preparation Scale (BBPS) is a widely accepted tool to measure the quality of bowel preparation, with scores ranging from 0 to 9. Score 0 indicates very unsatisfactory bowel preparation, and score 9 suggests completely fine bowel preparation.^[4]

There is currently no consensus on the optimal timing and dosage recommendations for bowel preparation medicine. Studies have shown that compared with low-dose PEG, high-dose PEG has a higher success rate of bowel preparation and better bowel preparation conditions.^[5] Investigators have also found that bowel preparation with 1L PEG is effective in patients with inflammatory bowel disease.^[6] There are other reports suggesting that lower volumes of 1-L PEG might be associated with higher levels of bowel cleansing and higher BBPS scores in each segment compared with 2-L PEG.^[3]

A survey in the United Kingdom suggests that no instructions are currently provided to optimize bowel preparation time before colonoscopy.^[2] Separate and single-dose PEG solutions for colonoscopy bowel preparation had similar efficacy in bowel preparation quality. However, separate regimen appears to be superior to single regimen in terms of patient compliance and side effects.^[7] Separate-time bowel preparation quality was better than one-time bowel preparation, with an overall BBPS score of 7.25 ± 1.53 vs 6.71 ± 1.65 ($P = .005$).^[8] Separate 2+2L bowel preparation was superior to one-time 4L (89.2% vs 62.5%; $P < .001$).^[8]

2. Materials and Methods

2.1. Clinical characteristics

This retrospective study recruited physical examination patients who underwent colonoscopy at the Endoscopy Center of Ningbo Ninth Hospital from January 1, 2021, to October 31, 2021. Included criteria are as follows: the age range is from 40 to 66 years old, there is no history of abdominal surgery, and the past history is healthy and has no other chronic diseases. According to the patients' 3 different bowel preparation

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The datasets generated and analyzed during the current study are available from the first author on reasonable request.

The study was performed in accordance with the guidelines of the Declaration of Helsinki. The study protocol and the form of consent were approved by the Ethics Committee of the Institutional Review Board of Ningbo No.9 Hospital. Written informed consent was obtained from all participants before our gathering of data and the study.

^a Endoscopy Center, Ningbo No.9 Hospital, Ningbo, China, ^b Emergency Department of Ningbo Yinzhou No.2 Hospital, Ningbo, China, ^c Intensive Care Unit, Ningbo No.9 Hospital, Ningbo, China.

*Correspondence: Xinke Li, Intensive Care Unit, Ningbo No.9 Hospital, No. 68 Xiangbei Road, Jiangbei District, Ningbo, China (e-mail: bxk1668@163.com).

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regimens, altogether 600 patients were randomly screened out and divided into 3 groups: Group A+B+C.

2.2. Methods

2.2.1. Bowel preparation drugs

The bowel preparation bag used in our study is compound PEG electrolyte powder (manufacturer: Shenzhen Wanhe Pharmaceutical Co., Ltd., China). The ingredients of each bag are PEG 4000, anhydrous sodium sulfate, sodium chloride, potassium chloride, and sodium bicarbonate. Preparation process: dissolve 1 bag in water and stir evenly to make a 1-L solution.

2.2.2. Bowel preparation regimens

Group A: Oral 1-L Compound PEG Electrolyte Powder the night before examination and 2L taken 4 hours before examination on the same day. Group B: Oral 1-L Compound PEG Electrolyte Powder the night before examination solution and 2L taken 6 hours before the examination on the same day. Group C: 2-L compound PEG electrolyte powder solution was orally administered 4 hours before the examination on the same day.

2.2.3. Qualifications of colonoscopists and score standard

All the colonoscopists in the endoscopy center are trained by systematic theory combined with real practice. The main contents include the operation requirements of colonoscopy, standardization of writing, and BBPS score assessment.

2.2.4. Requirements for colonoscopy

The terminal point of each colonoscopy test is reaching the ileocecal, and the withdrawal time should be more than 6 minutes. Every segment of the large intestinal mucosa was carefully observed, and the BBPS score was assessed in 3 colon segments.

2.2.5. Observation index

The BBPS Score is a primary scoring criterion for bowel preparation during colonoscopy. The specific scoring standards according to the scale are as follows: using a 4-point for 3 segments of the colon, right segment (cecum to ascending colon), transverse segment (liver zone to splenic flexure), and left segment (descending colon, sigmoid colon and rectum). Score 0: the bowel is completely unprepared. Score 1: massive fecal mass and opaque intestinal fluid. Score 2: a small amount of fecal fluid and intestinal fluid. Score 3: a small amount of transparent liquid remains. The BBPS score of each colonoscopy patient was initially evaluated by a standard-trained digestive endoscopy doctor, and then supervised and verified by a specialist nurse in the endoscopy center.

2.3. Statistical methods

SPSS 13.0 software (California, USA) was used to analyze and process the data of the research subjects. The chi-square test was used

to compare the comparability of the data between these 3 groups, and $P > .05$ indicated that there was no difference in the data composition between the groups. Measurement data are expressed as mean \pm standard deviation. Because the measurement data did not conform to the normal distribution, the nonparametric rank-sum test was used, and $P < .05$ was regarded as statistically significant.

3. Results

3.1. Comparison of clinical baseline information of patients in these 3 groups

The 600 colonoscopy patients included in this study were divided into 3 groups: A, B, and C, with 200 patients in each group. Group A had 116 cases aged 40–55 years and 84 cases aged 56–66 years; 83 males and 117 females. Group B had 118 patients aged 40–55 years, 82 patients aged 56–66 years; 105 males and 95 females. Group C included 120 patients aged 40–55 years and 80 patients aged 56–66 years; 96 males and 104 females. The results of chi-square analysis by the SPSS software showed that there was no significant difference in the age and gender factor among these samples ($P > .05$), indicating the comparability of these data for further study (see Table 1 for details).

3.2. Status of BBPS score among the three groups

The actually lowest score of BBPS in the 3 groups was 3 points, whereas the highest was 9. Moreover, the average BBPS of Group A was 7.815 ± 1.0518 , the average BBPS of Group B was 7.295 ± 1.2022 , and the average BBPS of Group C was 7.47 ± 0.8442 . Generally speaking, the average BBPS score of bowel preparation in Group A was higher than that in Groups B and C. The results of nonparametric rank-sum test analysis showed that the BBPS score in Group A was significantly higher than those in Groups B and C ($P < .005$). For further study, we compared the BBPS score between two groups separately. It is illustrated that the BBPS score of Group A was significantly higher than that of Group B ($P = 7.1 \times 10^{-5}$), as well as the same significance with Group C ($P = 4.1 \times 10^{-6}$). In addition, there is no significant difference of BBPS score between Groups B and C ($P=0.13$) (Fig. 1).

4. Discussion

Colonoscopy is the gold standard for the diagnosis of colorectal disease.^[9] Adequate bowel preparation prior to colonoscopy is essential for visualization of the colonic mucosa.^[10] The higher the cleanliness of the bowel preparation, the clearer the lesions will be displayed under the colonoscopy. Therefore, optimization of bowel preparation can improve the quality of colonoscopy. The BBPS score is a well-known and important parameter for assessing intestinal cleanliness.^[11]

PEG electrolyte solution is an isotonic laxative and a common oral lavage for bowel preparation before colonoscopy.^[12] As a general medicine for bowel preparation, PEG has a favorable safety profile and efficacy.^[13] This type of colon cleanser relies on the osmotic activity of PEG to retain water in the intestinal lumen without being absorbed, resulting in massive diarrhea,

Table 1

General information of patients in three groups.

Group		A	B	C	χ^2	P
Age	≤ 55 y	116	118	120	0.165	.921
	> 55 y	84	82	80		
Gender	Male	83	105	96	4.907	.086
	Female	117	95	104		

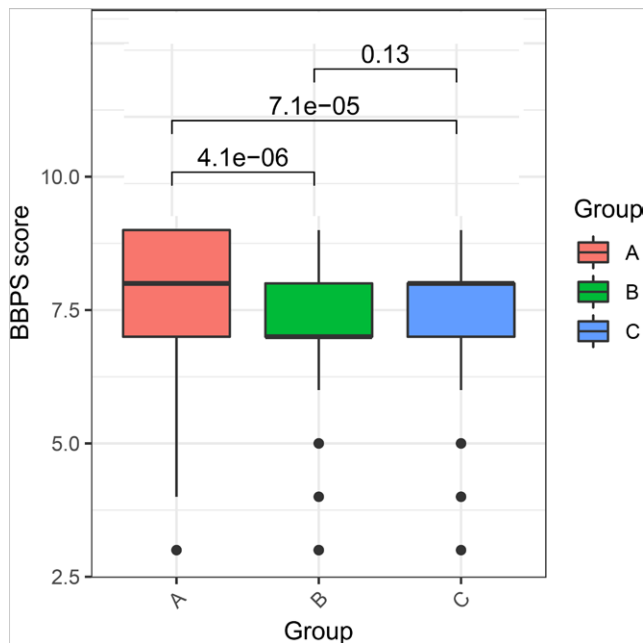


Figure 1. BBPS score illustration among three groups.

and the addition of electrolytes can prevent the disturbance of the internal environment during the diarrhea process.^[14]

At present, there is no consensus on the optimal time and the dosage of bowel preparation before colonoscopy. There are studies and clinical trials worldwide exploring the best options for bowel preparation.^[2,7] Our study found that taking 1+2L of compound PEG electrolyte powder solution 4 hours before colonoscopy could obtain a higher large intestinal BBPS score and improve the quality of colonoscopy. This is consistent with the findings of Siddiqui et al.^[15] They are in favor that the quality of bowel preparation is inversely proportional to the interval between the last dose of bowel preparation and the start of colonoscopy.

After the analysis of included colonoscopy patients in the Endoscopy Center of our hospital, the conclusions are as follows: First, bowel preparation cleanliness of 3-L Compound PEG was better than that of 2L. Second, with 3-L PEG solution, 4 hours before colonoscopy examination is optimal than that before 6 hours. Of course, this study is based on data from a single center with a small sample, and multiple centers and larger samples are required for further confirmation.

5. Conclusion

We strongly recommend that taking 1-L PEG the day before colonoscopy and 2-L PEG 4 hours before colonoscopy examination is the optimal regimen for colon preparation. That is to say, “4-hour 1+2L” is the preferred recommendation for colonoscopy, which can significantly improve intestinal cleanliness and discover large intestinal lesions more clearly.

Author contribution

Conceptualization, software, and writing-original draft: Wei Lu, Kena Zhou. Data curation: Yi He and Honggang Jiang. Formal analysis: Congbo Cai. Methodology: Kena Zhou and Congbo Cai. Supervision, validation, and writing-review and editing: Xinke Li.

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