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The efficacy of a through-the-scope sodium phosphate solution with completion colonoscopy on the same day as a salvage option for inadequate bowel cleansing

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Background/aim: The aim of this study was to investigate the efficacy of a through-the-scope sodium phosphate solution with completion colonoscopy on the same day as a salvage option for inadequate bowel preparation

Materials and methods: All participants were instructed to eat a low residual diet for 3 days before the scheduled colonoscopy and a clear liquid diet 18 h before the colonoscopy. The patients were asked to take split doses of an oral sennoside solution at 1800 and 2200 in the evening before the colonoscopy. In cases of inadequate bowel preparation detected during routine colonoscopy, a sodium phosphate solution was administered through the scope on the day of the colonoscopy procedure. The degree of bowel cleansing was assessed by the Boston Bowel Preparation Scale (BPS: 0–9).

Results: Almost excellent bowel cleansing was obtained with a statistically significant difference between the degree of bowel cleansing before and after the application of the sodium phosphate (Boston BPS: 5.48 ± 1.01 vs. 8.88 ± 0.33 respectively, $P < 0.001$).

Conclusion: Through-the-scope sodium phosphate with completion colonoscopy on the same day was shown to be an efficacious and acceptable method for inadequate bowel preparation.

Key words: Bowel preparation, colonoscopy, constipation, sodium phosphate

1. Introduction

Optimal bowel preparation is a key issue in colonoscopy, as it is closely related to the quality of the procedure. Optimal bowel cleansing decreases patient discomfort, costs of the procedure, risk of missed lesions, and unnecessary repetition of bowel preparation (1,2). Factors limiting the success of colonoscopy preparations are cleansing methods, patient compliance, and dietary modifications (3). For optimal bowel cleansing, the education of patients is considered *very important*. Many doctors and healthcare workers do not have enough time to explain the details of the bowel preparation process. Patients may also not pay sufficient attention to the preparation.

In general, bowel preparation consists of consuming a low-fibre diet for 1–4 days prior to the colonoscopy and a clear liquid diet for 1 day before the procedure (4). In cases of unsuccessful and failed preparations, the procedure must be repeated as early as possible (ideally, the day after the failed examination). Unfortunately, patients are usually hesitant about returning so soon for another colonoscopy, or they may simply refuse.

In failed examinations due to unsuccessful pre-procedural bowel preparations, the main reason for patients' hesitancy about undergoing a repeat procedure is the cumbersome cleansing methods. Moreover, among the patients with insufficient colonic cleansing during the first examination, 23% reported having experienced insufficient cleansing in the second colonoscopy as well (5). Other factors that affect a patient's decision are the cost of the procedure, length of hospital stay, and time off work (2). Furthermore, the assessment of the quality of bowel cleansing methods is another important topic. According to the American Society for Gastrointestinal Endoscopy and the American College of Gastroenterology, every colonoscopy report should include an evaluation of the quality of bowel cleansing (6). In this prospective study, we evaluated the efficacy of a through-the-scope enema as a bowel cleansing method at the time of a routine colonoscopy procedure in cases of unsuccessful bowel preparation.

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2. Materials and methods

Forty patients who underwent a routine colonoscopic examination in which the procedure was repeated due to insufficient bowel cleansing were recruited. All the study participants were instructed to eat a low-residual diet for 3 days before the scheduled colonoscopy and a clear liquid diet on the day before the routine colonoscopy procedure. The patients were asked to take a split dose of an oral sennoside solution (X-M Diet: 0.50 g/250 mL, Yenişehir Lab., Ankara, Turkey) at 1800 and 2200 in the evening before the colonoscopy.

Sennosides are the most commonly used agent for bowel cleansing in this country, because polyethylene glycol is not available at our pharmacies.

In cases of unsuccessful bowel preparation detected during a routine colonoscopy, a sodium phosphate solution (B.T. enema 135 mL: 19 g of sodium dihydrogen phosphate and 7 g of disodium hydrogen phosphate; Yenişehir Lab., Ankara, Turkey) was administered through the scope on the day of the colonoscopy procedure.

The exclusion criteria were as follows: intolerance or an allergy to one of the solutions applied, a history of malignancy, gastrointestinal bleeding, an inflammatory bowel disease, electrolyte imbalance, colonic obstruction, colorectal surgery, an acute or chronic renal disease, diabetes mellitus, thyroid abnormality, a neurological or psychological disease, a chronic cardiopulmonary disease, use of medications that affect bowel motility, and insufficient cooperation by the patient.

There are a number of existing bowel preparation scales (BPSs) available to assess the quality of colonic cleansing (4). The most useful ones are the Aronchick BPS (7), Ottawa BPS (8), and Boston BPS (9). Among these scales, the Boston BPS seems to be more favourable as it includes a rating for each colonic segment.

The Boston BPS was developed to limit interobserver variability in the rating of bowel preparation quality. Subjective terms such as “excellent,” “good,” “fair,” “poor,” and “unsatisfactory” are replaced by a four-point scoring system. This scoring system is applied to each of the three segments of the colon: the right colon (cecum and ascending colon), the transverse colon (hepatic and splenic flexures), and the left colon (descending colon, sigmoid colon, and rectum). For these reasons, we chose the Boston BPS. The scoring system is as follows:

0 (point): unprepared colon segment with a stool that could not be cleared

1 (point): portion of mucosa visible in a segment after cleansing and other areas not visible because of retained material

2 (points): minor residual material after cleansing but the mucosa of the segment generally clearly visible

3 (points): entire mucosa of a segment clearly visible after cleansing

The total score ranges from 0 (unsatisfactory) to 9 (excellent). Before the application of the sodium phosphate solution, the efficiency of the bowel preparation was determined according to the Boston BPS scoring system.

Our clinic, a tertiary centre, has expert endoscopists and its yearly volume of colonoscopy procedures is almost 3000 cases.

All colonoscopy procedures were performed by three expert endoscopists. They were experienced in the evaluation of the bowel cleansing scoring system according to the Boston BPS. Every procedure was performed unsedated. The sodium phosphate solution was applied to the proximal part of the unsuccessfully cleansed colon segment. If the colonoscope was not able to be advanced, the solution was applied to the furthest reachable point, without any risky manoeuvre. The maximum dose of sodium phosphate solution applied in every patient was 135 mL. In cases of unsuccessful cleansing in more than one segment, half of the solution was applied to the proximal part of the unclean segment, and the remainder was applied to the distal parts of the unclean segment. In addition, 100–150 mL of water was applied immediately to each unclean colonic segment after the application of the sodium phosphate solution in every patient. The patients underwent a second colonoscopy after the exit of clear rectal effluents into a toilet was confirmed. During the second colonoscopy, the Boston BPS score was recalculated. Intravenous 0.9% sodium chloride infusion was performed for all participants during the colonoscopy.

2.1. Ethics

The study was approved by the local ethical committee and complied with the requirements of the Helsinki Declaration. Written informed consent was obtained from all the subjects before the procedure and additional verbal information was provided during the procedure.

2.2. Statistical analysis

The Statistical Package for the Social Sciences (SPSS) 16.0 for Windows was used to analyse the data. All the data were expressed as mean \pm standard deviation (SD). An unpaired t test was used to compare continuous variables. A paired t test was used for the comparison of the Boston BPS scores before and after the administration of the through-the-scope enema. A value of $P < 0.05$ was considered statistically significant.

3. Results

The characteristics of the patients are shown in Table 1. Constipation was the most frequent indication for a colonoscopy. The baseline bowel preparation quality of the study participants is shown in Table 2. Almost excellent bowel cleansing was obtained following the through-the-

Table 1. Demographics and characteristics of study participants.

Age (years)	46.95 ± 13.59
Sex (female/male)	28 (70%)/12 (30%)
Indications for colonoscopy n (%)	
Screening	4 (10%)
Constipation	12 (30%)
History of polyps	8 (20%)
Colonic wall thickening	1 (2.5%)
Weight loss	1 (2.5%)
Abdominal pain	2 (5%)
Diarrhoea	2 (15%)
Irritable bowel syndrome	1 (2.5%)
Change in bowel habits	4 (10%)
Anaemia	5 (12.5%)

Table 2. Bowel preparation quality of the study participants.

Inadequately cleansed bowel segments n (%)	
Left colon	34 (85%)
Transverse colon	33 (82.5%)
Right colon	9 (22.5%)
Number of inadequately cleansed bowel segments n (%)	
Only one segment	8 (20%)
Two segments	28 (70%)
Three segments	4 (10%)

scope administration of the sodium phosphate solution. There was a statistically significant difference between the degree of bowel segment cleansing before and after the application of the sodium phosphate solution (Boston BPS score 5.48 ± 1.01 vs. 8.88 ± 0.33 respectively, $P < 0.001$, Figure). No complication was observed secondary to the sodium phosphate solution application.

Eleven of the 12 patients (91.7%) undergoing a colonoscopy with the indication of constipation had two or more dirty segments compared to 21 of the 28 patients (75.0%) with other indications. However, there was no statistically significant difference ($P > 0.05$) between these two groups. Moreover, the time interval between the administration of the sodium phosphate solution and the

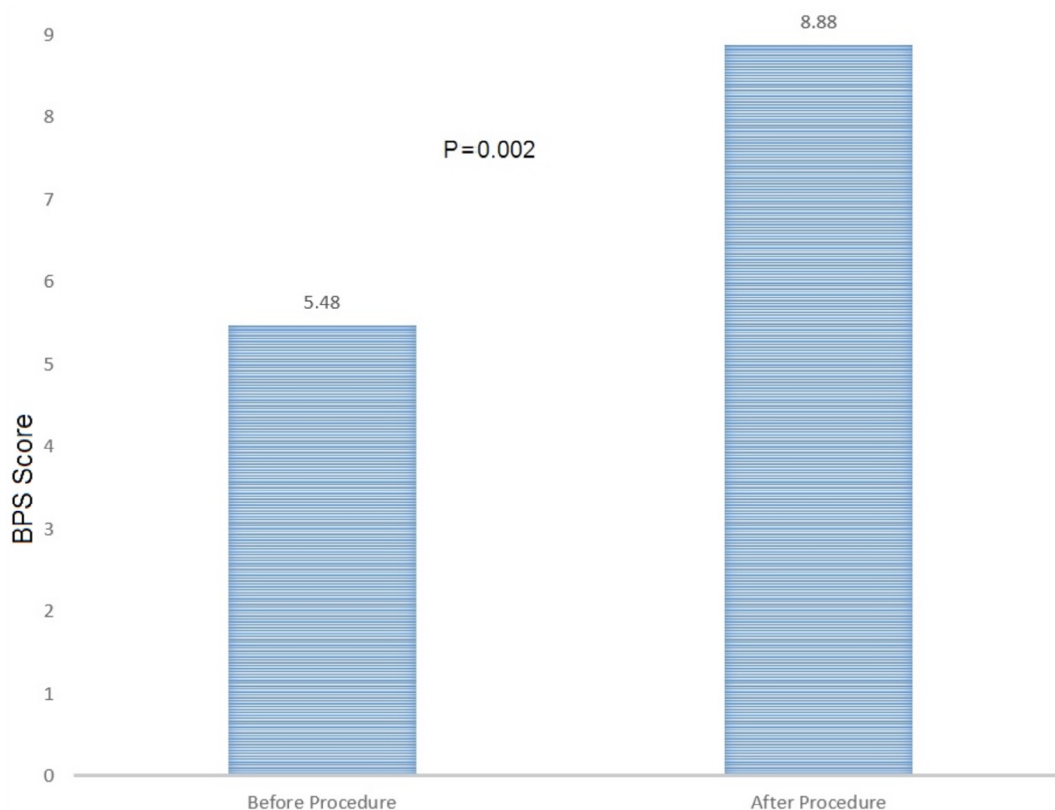


Figure. Comparison of bowel cleansing according to the Boston Preparation Scale (BPS) before and after the administration of the through-the-scope sodium phosphate solution.

second colonoscopy procedure was significantly longer in patients with constipation than in the other patients (27.66 ± 4.75 vs. 21.60 ± 5.20 min, $P = 0.001$). Apart from the prolonged time interval between the administration of the sodium phosphate and the second colonoscopy in the constipated patients, the Boston BPS score was similarly improved following the administration of the through-the-scope sodium phosphate solution (5.08 ± 0.90 vs. 8.92 ± 0.29 , $P = 0.002$).

4. Discussion

In the present study, we successfully demonstrated the effectiveness of the through-the-scope sodium phosphate solution administration in patients with initially inadequate bowel preparation. Moreover, we showed that this method was safe, easily applicable, and cost effective.

In routine daily practice, patients who present for a colonoscopy after failing to complete the required bowel preparation regimen are best managed by rescheduling the procedure for another day. The patients are required to undergo a repeat colonoscopy soon after the first failed procedure, increasing the costs of delivering colonoscopy.

The most important factors affecting colonic cleansing are constipation, the intolerance of laxatives, and insufficient bowel cleansing preparation (10). Additional factors include male sex, obesity, diabetes mellitus, cirrhosis, Parkinson disease, difficulty in taking drugs used for colonic cleansing and/or drinking large amounts of water, and noncompliance with the diet (11–14). Some patients refuse to undergo a repeat colonoscopy due to these difficulties. Ben-Horin et al. reported that 23% of patients who required a second colonoscopy because of a failed first examination caused by inadequate bowel preparation were lost to follow-up. They reported that a subsequent second colonoscopy failed in about 23% of patients because of inadequate bowel preparation (5). These data emphasise the importance of new strategies to overcome the problems in achieving adequate bowel cleansing for a colonoscopy. In such failed cases, the European Society of

Gastrointestinal Endoscopy suggests cleansing of the colon in the same session using irrigation pumps or repeating the procedure on the following day after additional bowel preparation (15). In a previous paper, Eliakim et al. (16) compared the performance of a novel endoscopic device with that of standard cleansing. They demonstrated that their novel disposable catheter was safe and efficient in intraprocedural cleansing of a suboptimally prepared colon and that it enabled a higher quality colonoscopy. Although their study was promising, the requirement for a sophisticated device for bowel cleansing at the time of the procedure is a concern. In this context, the application of the through-the-scope sodium phosphate solution may be a promising alternative method. Based on our results, the quality of bowel cleansing was significantly improved with this method, and an adequate colonoscopic examination was able to be completed on the same day. In addition, our method requires no additional personnel or equipment, and the cost is negligible.

Some issues may arise related to the design of this study. Sodium phosphate solutions have several side effects, including hypophosphataemia and hypernatraemia (17). In this study, we did not observe any side effects related to sodium phosphate. The absence of side effects was likely due to the relatively short exposure time to this compound and the strict patient selection criteria. Additionally, the introduction of the sodium phosphate solution to proximal colonic segments, which have less vascularity than the rectum does, and the dilution of the enema by the immediate administration of water may have resulted in minimal absorption of the sodium and phosphate reduced the likelihood of side effects.

In the present study, the through-the-scope sodium phosphate solution with completion colonoscopy on the same day was shown to be an efficacious and safe salvage option for inadequate bowel preparation, with high patient acceptability. Further randomised controlled trials are required to confirm our data.

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