



Comparison of Patients' Compliances, Tolerances, and Experiences of Different Colonoscopic Bowel Preparation Agents: A Prospective Observational Study

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ABSTRACT

Aim: Patients' compliance and tolerance in terms of bowel cleansing agents and quality of bowel cleansing are important for a successful colonoscopy procedure.

Method: This is a prospective observational study that was conducted to compare the compliances, tolerances, and experiences of patients in whom polyethylene glycol (PEG), macrogol, and sennoside + enema agents were used for bowel cleansing before colonoscopy. The sample was composed of a total of 159 patients who received PEG (n=53), macrogol (n=53), and sennoside + enema (n=53) in the endoscopy unit in a university hospital in the province of Adana between March 1, 2020, and July 15, 2020. The "Descriptive Characteristics Form", which was developed by the researchers, and the "Colonoscopy Patient Assessment Form" and "Colonoscopy Procedure Assessment Form," which interrogated compliance, tolerance, and bowel cleansing quality and the patients' experiences, were used for data collection.

Results: In this study, compliance (p=0.115), bowel cleansing qualities (p=0.827), and experiences (p>0.05) were found to be similar in the patients in the three groups. However, it was found that the patients in the sennoside + enema group developed intolerance including nausea (p=0.039), vomiting (p=0.045), and malaise and fatigue (p=0.042) to a greater extent and needed more help (p<0.001) compared with the patients in the macrogol and PEG groups. Half of the patients (47.3%) described the bowel preparation for colonoscopy as tiring and wearing.

Conclusion: Sufficient bowel cleansing was provided with all three bowel cleansing agents used before colonoscopy in this study. The patients tolerated the PEG solution better than the sennoside + enema and macrogol agents. Comprehensive prospective randomized studies with large sample sizes are needed to better evaluate the effect of bowel cleansing agents and to help patients have a more comfortable colonoscopy procedure.

Keywords: Bowel preparation; colon cleansing, colonoscopy, comparative, agents

Introduction

Colonoscopy is an endoscopic procedure that is considered the gold standard and is currently used extensively in the screening of colorectal cancers or the diagnosis of colorectal diseases.^{1,2} Successful bowel cleansing and providing a tolerable bowel preparation are important to visualize and evaluate colonic mucosa at a good level during the procedure of colonoscopy.^{2,3} If a colonoscopy is performed with inadequate bowel preparation, the presence of a remnant of residual stool may lead to missing polyps, inability to

complete the procedure, negative impact on patients in the psychological, physiological, and economic aspects due to prolonged procedure, and even to the development of complications.^{4,5-7}

The ideal bowel preparation should be safe, efficient in terms of bowel cleansing, adequate, and tolerable.^{8,9} Polyethylene glycol (PEG) is a laxative that is not absorbed and not metabolized. It minimalizes fluid exchange in the colonic membrane due to its balanced electrolyte content and isoosmotic structure. Although the macrogol group



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has a similar content to PEG, the percentages of PEG and electrolytes are different. It has been reported that patients have difficulty in consuming the PEG and macrogol groups because of unfavorable taste and excess quantity and that this group caused dyspepsy.^{1,10,11} The senna group includes glycosidase and sennoside, and they perform bowel cleansing by being activated by colonic bacteria.^{1,12} However, controversial results indicate that sennoside is effective in bowel cleansing when used in combination with laxatives or when combined with the PEG solution.^{1,13} The literature involves studies comparing the efficiencies of the agents used in bowel preparation before colonoscopy.^{1,4,8,13-15} However, there is a limited number of studies in Turkey that compare the three different agents in terms of compliance and tolerance of patients, quality of bowel cleansing, and patients' experiences.^{7,9,12,16-18}

Based on this deficit, this study was planned and conducted to specify colonoscopy preparation agents appropriate for each patient, to help patients have a convenient and comfortable colonoscopy procedure by benefiting from bowel preparation experiences, and to provide optimal cleansing quality. In this study, answers to the following questions were sought: "Was there a difference between the patients who received three different agents of bowel cleansing before colonoscopy in terms of compliance, tolerance, and quality of bowel cleansing?" and "What were the experiences of the patients who received three different agents of bowel cleansing before colonoscopy?"

Materials and Methods

Design and Study Population

This was a prospective observational study. The study population consisted of 196 patients who met the inclusion criteria in the endoscopy unit of a university hospital in Adana between 2018-2019. In the calculation of the study sample, a two-sided hypothesis was established using the free-to-use G*Power software. It was found that a total of 159 patients, including 53 patients in each group (PEG, macrogol, and sennoside + enema), should be included in the study with 80% power, 0.05 type 1 error, and moderate effect size (0.25). The study was conducted between March 1, 2020, and July 15, 2020.

Inclusion and Exclusion Criteria

Patients aged 18-70 years who were willing to communicate and cooperate, wished to participate in the study, gave informed consent, were undergoing outpatient treatment, did not have any morbidity that could affect the ability to decide (dementia, psychological disorders, etc.), did not have visual, auditory or sensory losses, drank at least 75% of the solution and experienced urgent and active

lower intestinal tract bleeding, were included in the study. Patients who did not meet these criteria were excluded from the study.

Administration of Bowel Cleansing Agents

The agents specified by the American Gastrointestinal Endoscopy Association and preferred by physicians were used in the endoscopy unit for bowel preparation before colonoscopy. After written and verbal informed consent was obtained from eligible patients by the researchers, an appointment for colonoscopy was made by the medical secretary at different times (the first group: sennoside + enema; the second group: macrogol; the third group: PEG). The agent used for the PEG group (GoLyte[®] Braintree Laboratories, Inc, Braintree, MA) was a ready-to-use solution dissolved in 4 liters of water. Patients were informed that they should finish the whole solution between the hours of 18:00-22:00 in the evening before the procedure and encouraged to consume as much fluid as they could until 24:00.

For the agent used for the macrogol group (Endofalk[®] Dr. Falk Phar-ma Ltd., Freiburg, Germany), the patients were instructed to mix eight packets into 4 liters of water in the evening before the procedure, finish it between 18:00 and 22:00, and drink as much fluid as they could until 24:00.

For the agent used for the sennoside + enema group (X-M tablet[®], Yenişehir, Turkey), the patients were told to drink the first bottle and then 2 liters of water at 17:00 in the evening before the procedure and to drink the second bottle at 19:00 and then 2 liters of water. The patients were informed that they should administer the first enema at 24:00 (BT[®] enema 210 mlt contains 7.5 mg sennoside A+B Calcium) and the second enema one hour before the procedure.

Instruments

The "Descriptive Characteristics Form," "Colonoscopy Patient Evaluation Form," and "Colonoscopy Procedure Assessment Form" were used for data collection. These were created by the researchers by reviewing the literature and obtaining expert opinions.^{1,9,10,12,13} The standard Boston Bowel Preparation Scale (BBPS) was used to assess the quality of bowel cleansing in the "Colonoscopy Procedure Evaluation Form."

The Descriptive Characteristics Form: This form included nine questions related to age, sex, education status, body mass index (BMI), smoking status, mobility status, chronic disease status, drug use, and the reason for having a colonoscopy.

The Colonoscopy Patient Assessment Form: This form included ten questions related to the amount of preparation solution consumed, the amount of fluid consumed before

the procedure, status of compliance to diet, abdominal pain, nausea, vomiting, headache, status of intolerance to preparation solution, need for help for performing the bowel preparation, adequacy of the bowel preparation in terms of bowel cleansing, and experiences related to the colonoscopy procedure.

The Colonoscopy Procedure Assessment Form: This form included questions related to the duration of the procedure, BBPS, adequacy of bowel cleansing, and status of development of complications.

The BBPS was prepared by Lai et al.¹⁹ to evaluate bowel cleansing and its reliability and validity were proven. It includes a scoring system ranging between 0-3 for each of three parts of the colon (right colon: cecum and ascending colon; transverse colon: hepatic and splenic flexure; left colon: descending colon, sigmoid colon, and rectum). The scores are as follows: excellent-adequate image, little amount of clear fluid, minimal aspiration, no need for washing (3); good-adequate image, excess amount of clear fluid, frequent aspiration (2); moderate-adequate image, mixture of liquid and semi-solid stool, can be aspirated or eliminated by washing (1); inadequate preparation-inadequate image, mixture of semi-solid and solid stool, cannot be eliminated by aspiration or washing "0". According to the BBPS, a score of 0 indicates inadequate cleanliness, and a score of 9 indicates perfect cleanliness. As the cleanliness score progresses from 0 to 9, it indicates that bowel cleanliness is approaching perfection.

Data Collection

A random list was created by the medical secretary, who assigned the patients into three groups in a 1:1:1 ratio using a computer-assisted simple random sampling method. The assignment of 53 patients from each group was made using the lottery method, and colonoscopy procedures were performed at different times (the first group: sennoside + enema; the second group: macrogol; the third group: PEG). The researchers provided standardized dietary education to the patients who wanted to participate in the study (they were informed that stewed fruit juice, vermicelli soup with small particles, and soup prepared with meat could be consumed 2 days before the procedure). It was stated that patients should not drink peach juice or apricot juice, they could consume pulpless apple and cherry juice, and they should not drink lentil soup. The education took place in the nurse's room in the endoscopy unit and lasted 10-15 minutes. At the end of the training, patients were given a standard education brochure prepared by the endoscopy unit.

On the day of the colonoscopy, the researchers filled in the "Descriptive Characteristics Form" and the

"Colonoscopy Patient Assessment Form" to evaluate the states of compliance and tolerance. The BBPS scale in the "Colonoscopy Procedure Assessment Form" was completed by the researchers by questioning the physician who performed the colonoscopy procedure immediately after the procedure, and the development of complications was recorded. The patients were interviewed again 15-30 minutes after the procedure was completed for descriptions related to bowel cleansing. It took 30-40 minutes to fill out these forms, and no negative feedback was received from patients or physicians.

Ethical considerations

After approval was obtained from the Çukurova University Faculty of Medicine Clinical Research Ethics Committee (approval number: 64, date: 14.02.2020) and Academic Committee (25.02.2020), the study was conducted in accordance with the principles of the Declaration of Helsinki. Patients were informed by the researcher using a voluntary information form, and those who agreed to participate in the study gave written and verbal consent.

Statistical Analysis

In the assessment of the data, the categorical data were expressed as numbers and percentages, and the continuous data were expressed as mean, standard deviation, and minimum-maximum values. Compatibility of the variables with the normal distribution was examined using visual (histogram and probability graphs) and analytic methods (Kolmogorov-Smirnov/Shapiro-Wilk tests). In the comparison of the categorical variables, the chi-squared test was used. The Kruskal-Wallis test was used for more than two variables for the groups that were not compatible with the normal distribution. Fisher's exact test was used when the observed values were <5. In all tests, a p-value <0.05 was considered statistically significant.

Results

The descriptive characteristics of the patients included in the study are presented in Table 1. It was found that 54.7% of the patients (n=87) were female, 38.7% (n=67) were primary school graduates, 30.0% (n=48) were smokers, 43.3% (n=65) had comorbidities, 54% (n=81) used medications continuously, 71.0% (n=113) had a colonoscopy because of constipation, diarrhea, distension, or abdominal pain. The mean age was 50.08±12.4 years, and the mean BMI was 27.17±4.9.

A comparison of patients' compliance and tolerance between groups is presented in Table 2. In this study, a statistically significant difference was not found between the groups in terms of rates of complete consumption of the solution (p=0.397) and difficulty in complying with the

bowel preparation agent ($p=0.115$). However, the rates of complete consumption of the solution ($n=46$; 86%) were found to be higher, and rates of difficulty in complying with the bowel preparation agent ($n=4$; 8%) were found to be lower in the sennoside + enema group compared with the PEG and macrogol groups. When the patients' states of tolerance were compared in the study, the rates of vomiting (sennoside + enema group: 38; macrogol group: 26; PEG group: 16; $p=0.045$), nausea (sennoside + enema group: 74; macrogol group: 58; PEG group: 40; $p=0.039$), malaise and fatigue (sennoside + enema group: 64; macrogol group: 44; PEG group: 42; $p=0.042$) were found to be statistically significantly higher in the patients in the sennoside + enema group compared with the patients in the macrogol and PEG groups. In the patients in the sennoside + enema group, the rates of abdominal pain and distension ($p=0.092$), thirst, malaise and fatigue, and bleeding and irritation around the anus were found to be high, though the differences were not statistically significant ($p>0.05$).

A comparison of the efficacy of the three cleansing agents used for bowel preparation before colonoscopy is shown in Table 3. In the sennoside + enema, macrogol, and PEG

groups, a statistically significant difference was not found in terms of favorable bowel cleansing quality (sennoside + enema group: 56; macrogol group: 50; PEG group: 48; $p=0.827$) and reaching the cecum and intubation of the terminal ileum (macrogol group: 94.0; sennoside + enema group: 88; PEG group: 90; $p=0.576$). In this study, the rate of patients in the sennoside + enema group who could not complete the colonoscopy procedure due to inadequate bowel preparation was lower than the patients in the PEG and macrogol groups but not significantly (sennoside + enema group: 18; macrogol group: 32; PEG group: 28; $p=0.210$).

Table 4 shows a comparison of patients' experience with three different cleansing agents used for bowel preparation before colonoscopy. There was no statistically significant difference among the patients in the sennoside + enema, macrogol, and PEG groups in terms of the agents being drinkable based on taste ($p=0.458$), thinking that they cleaned their bowels adequately ($p=0.192$), not being able to sleep due to frequent toilet visits ($p=0.356$), or their opinions about the colonoscopy procedure ($p=0.090$). The counts of need for help were found to be higher in the patients in

Table 1. Descriptive characteristics of the patients included in the study ($n=159$)

Descriptive characteristics		Groups				P
		Sennoside + enema, (n=53)	Macrogol, (n=53)	PEG, (n=53)	Total, (n=159)	
Gender, n (%)	Female	23 (44.0)	32 (60.0)	32 (60.0)	87 (54.7)	0.179
	Male	30 (56.0)	21 (40.0)	21 (40.0)	72 (45.3)	
Year (mean \pm SD)		46.6 \pm 12.8	51.3 \pm 13.0	52.3 \pm 10.8	50.0 \pm 12.4	0.051
BMI (kg/m ²), mean \pm SD		25.6 \pm 4.9	27.7 \pm 4.7	28.1 \pm 4.9	27.1 \pm 4.9	0.026
Education status, n (%)	Illiterate	5 (10.0)	3 (6.0)	3 (6.0)	11 (7.3)	0.927
	Primary school	23 (40.0)	23 (40.0)	21 (36.0)	67 (38.7)	
	Secondary school	4 (8.0)	4 (8.0)	3 (6.0)	11 (7.3)	
	High-school	12 (24.0)	9 (18.0)	11 (22.0)	32 (21.3)	
	University and above	9 (18.0)	14 (28.0)	15 (30.0)	38 (25.3)	
Status of smoking, n (%)		18 (34.0)	13 (24.0)	17 (32.0)	48 (30.0)	0.513
Mobility, n (%)	Mobile	48 (90.0)	53 (100.0)	48 (90.0)	149 (93.3)	0.069
	Limited movement	5 (10.0)	0 (0.0)	5 (10.0)	10 (6.7)	
Comorbidities, n (%), (cardiac disease, diabetes, hypertension, COPD ^{**})		16 (16.0)	25 (50.0)	24 (48.0)	65 (43.3)	0.138
Current medication, n (%), (anti-diabetic, anti-hypertensive, anti-coagulant)		24 (48.0)	28(56.0)	29 (58.0)	81 (54.0)	0.569
Indication for colonoscopy, n (%)						
Constipation, diarrhea, distention, abdominal pain		36 (68.0)	35 (66.0)	42 (79.2)	113 (71.0)	0.576
Polyp, bleeding, malignancy screening		17 (32.0)	18 (34.0)	11 (20.8)	46 (29.0)	

PEG: Polyethylene glycol, SD: Standart deviation, *BMI: Body mass index, **COPD: Chronic obstructive pulmonary disease

Table 2. Comparison of the efficacy of three different cleansing agents used for bowel preparation before colonoscopy

States of compliance and tolerance	Groups				P (post-hoc)
	Sennoside + enema ^a , (n=53)	Macrogol ^b , (n=53)	PEG ^c , (n=53)	Total, (n=159)	
	n (%)	n (%)	n (%)	n (%)	
Compliances					
Drinking the solution					
Three-quarters of the solution	7 (14.0)	14 (26.4)	17 (32.2)	38 (23.9)	0.397
Complete solution	46 (86.0)	39 (73.6)	36 (67.9)	121 (76.1)	
Difficulty in complying with the preparation agents	4 (8.0)	12 (22.0)	6 (12.0)	22 (14.0)	0.115
Tolerance states					
Presence of vomiting	19 (38.0)	13 (26.0)	8 (16.0)	40 (26.7)	0.045^{a,b} ; 0.034
Presence of headache	17 (34.0)	22 (42.0)	18 (36.0)	56 (37.3)	0.682
Presence of nausea	39 (74.0)	31 (58.0)	21 (40.0)	90 (57.3)	0.041^{a,c} ; 0.040
Presence of abdominal pain	34 (68.0)	22 (44.0)	25 (50.0)	81 (54.0)	0.092
Presence of abdominal flatulence	28 (52.0)	26 (50.0)	16 (30.0)	70 (44.1)	0.231
Presence of thirst	20 (40.0)	11(22.0)	18 (40.0)	49 (32.6)	0.268
Malaise and fatigue	34 (64.0)	23 (44.0)	22 (42.0)	79 (50.0)	0.042^{a,c} ; 0.039
Bleeding and irritation around the anus	23 (44.0)	13 (24.0)	14 (26.0)	50 (31.4)	0.098

^{a-c}: Bonferroni test was used in post-hoc analysis, PEG: Polyethylene glycol

Table 3. Comparison of the efficacy of three different cleansing agents used for bowel preparation before colonoscopy (n=159)

	Groups				p
	Sennoside + enema, (n= 53)	Macrogol, (n=53)	PEG, (n=53)	Total, (n=159)	
	n (%)	n (%)	n (%)	n (%)	
Bowel cleansing quality level according to BBPS					
Excellent	2 (4.0)	1 (2.0)	2 (4.0)	5 (3.3)	0.827
Good	31 (58.0)	27 (50.0)	26 (48.0)	84 (52.0)	
Moderate	18 (34.0)	24 (46.0)	22 (42.0)	64 (40.7)	
Inadequate	2 (4.0)	1 (2.0)	3 (6.0)	6 (4.0)	
Reaching the cecum region	47 (88.0)	50 (94.0)	48 (90.0)	145 (90.7)	0.576
Reaching the terminal region	44 (82.0)	47 (88.0)	45 (84.0)	136 (84.7)	0.698
Failure to complete the procedure					
Inadequate bowel preparation	9 (18.0)	17 (32.0)	15 (28.0)	41 (26.0)	0.210
Pain in the patient	40 (74.0)	34 (64.0)	38 (72.0)	112 (70.0)	
Excessive loops (fold)	2 (4.0)	-	-	2 (1.3)	
Obstructive lesion	2 (4.0)	2 (4.0)	-	4 (2.7)	

PEG: Polyethylene glycol, BBPS: Boston Bowel Preparation Scale

Table 4. Comparison of patients' experiences with three different cleansing agents used for bowel preparation before in colonoscopy preparation (n=159)

Experience	Groups				p	
	Sennoside + enema, (n=53)	Macrogol, (n=53)	PEG, (n=53)	Total, (n=159)		
	n (%)	n (%)	n (%)	n (%)		
Drinkable taste of the solution	31 (58.0)	36 (68.0)	42 (80.0)	109 (68.6)	0.458	
Thinking that adequate bowel cleansing is achieved	51 (96.0)	52 (98.0)	53 (100.0)	155 (98.0)	0.192	
Need for help (family member, friend)	30 (56.0)	7 (14.0)	8 (16.0)	43 (28.7)	<0.001	
Not being able to sleep due to frequent toilet visits	21 (40.0)	17 (32.0)	24 (46.0)	62 (39.3)	0.356	
Opinions about the colonoscopy procedure	Difficult procedure	5 (10.0)	1 (2.0)	3 (6.0)	9 (6.0)	0.090
	Tiring and wearing process	25 (46.0)	26 (50.0)	26 (46.0)	71 (47.3)	
	Process that causes feeling of shame	7 (14.0)	3 (6.0)	12 (24.0)	22 (14.7)	
	Easy procedure	16 (30.0)	23 (42.0)	12 (24.0)	48 (32.0)	

PEG: Polyethylene glycol, BBPS: Boston Bowel Preparation Scale

the sennoside + enema group (sennoside + enema group: 56; macrogol group: 14; PEG group: 28.7; $p < 0.001$) and the difference was statistically significant at a high level. It was found that 47.3% of all patients in this study described bowel cleansing for colonoscopy as tiring and wearing.

Discussion

In a successful colonoscopy procedure, compliance and tolerance of patients in terms of the agents used in bowel preparation are important.^{8,20} In this study, a perspective is provided on the safety and efficacy of bowel cleansing agents used in colonoscopy preparation by assessing patients' compliance, tolerance, and experience.

It has been stated that 10-20% of the patients who have applied PEG, macrogol, sodium phosphate, and sennoside + enema agent for bowel cleansing have difficulty in complying with the diet and drinking the solution.^{7,9,21-23} It has been reported that adequate bowel cleansing cannot be performed in at least 5-15% of the patients because of difficulty in drinking the preparation solution, which is 3-4 liters, or because of unfavorable taste.^{1,24,25} In this study, it was found that 14% of all patients had difficulty in complying with bowel preparations, and the patients in three different groups were similar in terms of drinking the solution completely. In the sennoside + enema group, the rates of difficulty in complying with bowel preparation processes were found to be lower compared with the PEG and macrogol group, though the difference was not statistically significant. The patients' compliance with bowel cleansing was similar to the literature.^{1,9,10,12,13} In this study, the social support levels of the patients and their previous knowledge and experience

about colonoscopy procedures were not investigated. The fact that the patients in the sennoside + enema group had less difficulty compared with the other groups, although not significantly, may be explained by the fact that their knowledge and experience of colonoscopy procedures or social support levels may be slightly better.

Bowel cleansing can lead to disturbances such as flatulence, nausea, vomiting, pain, and diaper rash in the anal region due to frequent defecation and insomnia.^{1,6,7,10} Some studies have reported that prolonged abdominal distension and the development of paralytic ileus affected the recovery process negatively.^{5,27} In this study, the rates of vomiting, nausea, malaise, and fatigue were found to be higher in the patients in the sennoside + enema group compared with the macrogol and PEG groups. Studies in the literature have reported that nausea, vomiting, and abdominal pain develop at a higher rate in patients in whom the sennoside bowel cleansing agent is applied, in line with this study.^{14,27} In contrast to this study, other studies reported that there was no difference between patients' compliance and tolerances.^{12,28} Further randomized controlled studies with larger sample sizes are needed to evaluate patients' tolerance states.

It was found that the bowel cleansing quality and the rates of detecting polyps and reaching the cecum were similar in patients who were administered PEG, sennoside, macrogol, picoprep (sodium picosulfate/magnesium citrate combination), and sodium phosphate agents.^{12,15,21,27,29} In the study conducted by Kaplan,¹¹ however, it was reported that bowel cleansing quality and patients' tolerances were better in the PEG solution compared with the sennoside without enema agent. In this study, the good level bowel cleansing rates in the sennoside + enema group were found

to be higher than in the PEG and macrogol groups, though the difference was not significant. The percentage of patients whose colonoscopy procedures could not be completed due to inadequate bowel cleansing was found to be low. It is thought that the three agents met the ideal criterion for qualified colonoscopy assessment in bowel cleansing; none of them was superior to the other, and all yielded results that were compatible with the literature.

Studies have reported that endoscopic interventions mostly caused anxiety and concern in patients (discomfort, pain, or feeling embarrassed in the pre-procedural preparation period or during the procedure), but patients were very satisfied with the healthcare team's professional behavior and pleasant attitude.³⁰⁻³² Çakır et al.⁹ and Yakut et al.³² reported that almost half of the patients using the sennoside + enema agent for bowel preparation before a colonoscopy described the procedure as tiring and reported that they would not repeat it if the procedure failed. In this study, the patients in the sennoside + enema group might have needed more help because it was difficult for them to perform the enemas themselves while experiencing nausea, vomiting, malaise, and fatigue. Although Çakır et al.⁹ and Yakut et al.³² did not investigate the need for assistance in patients who used sennoside + enema for bowel preparation before a colonoscopy in their study, their description of bowel preparation as a tiring experience supports the authors' findings. In this study, almost half of the patients in the three groups described the procedure as troublesome and wearing, and they were unable to sleep due to going to the toilet frequently. In accordance with the literature, this result shows that although the bowel cleansing quality of the agents used in bowel preparation before a colonoscopy is adequate, patients get tired, they need help, and tolerance, compliance, and comfort level are still important issues. In this context, the bowel preparation process for colonoscopy and the agents that are used should be studied further to increase tolerance, compliance, and comfort in patients.

Study Limitations

The results cannot be generalized because the limitations of this study were that it was single-center, the sample was small, and it was not a randomized controlled study.

Conclusion

In this study, compliance with bowel preparation, bowel cleansing qualities, and experiences with bowel preparation were found to be similar in the patients who were administered sennoside + enema, macrogol, and PEG solutions. However, it was found that the patients in the sennoside + enema group developed intolerance involving

nausea, vomiting, malaise, and fatigue with a higher frequency, and they needed help in applying the cleansing agent to a greater extent compared with the patients in the macrogol and PEG groups. It was found that almost half of the patients in the three groups described the colonoscopy procedure as tiring and wearing. In conclusion, this study demonstrated that adequate bowel cleansing for colonoscopy could be achieved in three different groups using different bowel cleansing agents. The PEG solution was tolerated better by patients compared with the sennoside + enema and macrogol solutions. Further prospective randomized studies with large sample sizes are needed to better evaluate bowel cleansing agents and to help patients have a more comfortable experience in bowel cleansing.

Ethics

Ethics Committee Approval: After approval was obtained from the Çukurova University Faculty of Medicine Clinical Research Ethics Committee (approval number: 64, date: 14.02.2020) and Academic Committee (25.02.2020), the study was conducted in accordance with the principles of the Declaration of Helsinki.

Informed Consent: Patients were informed by the researcher using a voluntary information form, and those who agreed to participate in the study gave written and verbal consent.

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Authorship Contributions

Surgical and Medical Practices: Ş.A., S.K.Ş., Concept: Ş.A., S.K.Ş., Design: Ş.A., S.K.Ş., Data Collection or Processing: Ş.A., S.K.Ş., Analysis or Interpretation: Ş.A., S.K.Ş., Literature Search: Ş.A., S.K.Ş., Writing: Ş.A., S.K.Ş.

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