

Effect of physician-provided education on the quality of bowel preparation

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Abstract

Background and study aims: Inadequate bowel preparation in patients scheduled for colonoscopy is an important problem. In our study, we aimed to investigate the effect of physician-provided bowel preparation education on the quality of bowel preparation and process.

Patients and methods: A total of 150 outpatients who were referred to Kocaeli University Medical Faculty Hospital Gastroenterology Unit for colonoscopy between May 2019 and October 2019 were enrolled in our prospective, endoscopist-blinded study. Patients were divided into two groups. Group 1 (education group) included 73 patients who received 10 minutes of verbal information from a physician in addition to a written information form. Group 2 (control group) included 75 patients who received information from a medical secretary in addition to a written information form. During colonoscopy, the quality of bowel preparation was assessed using the Boston bowel preparation scale (BBPS). A BBPS score ≥ 5 was considered adequate bowel preparation. The mean BBPS score, polyp detection rate, cecal intubation rate and time, and procedure time were also evaluated.

Results: The rate of adequate bowel preparation (BBPS score ≥ 5) was 90.4% and 74.7% in groups 1 and 2, respectively ($p = 0.021$). The odds ratio for having a BBPS score ≥ 5 in the education group was 3.199 compared with the control group (95% confidence interval = 1.254-8.164; $p = 0.015$). The cecal intubation rates were 91.8% and 88% in groups 1 and 2, respectively ($p > 0.05$). The cecal intubation time, procedure time, and adenoma detection rates were similar between the groups. The relationships of age, education level, sex, diabetes mellitus, medicine use, procedure time, and intraabdominal surgery with inadequate bowel preparation were analysed using a logistic regression model. Univariate and multivariate analyses revealed no significant factors associated with inadequate bowel preparation.

Conclusions: Patient education on the bowel preparation process via a physician improved the quality of bowel preparation. (Acta gastroenterol. belg., 2021, 84, 407-410).

Key words: Bowel preparation, colonoscopy, patient education.

Introduction

Colonoscopy is the most efficient method for colorectal cancer screening in moderate-risk patients over age 50 years and in high-risk young patients (1). To visualize mucosal lesions during the colonoscopy procedure, adequate bowel preparation is essential. Inadequate bowel preparation has been reported in up to 30% of patients (2). The diagnostic accuracy and therapeutic safety of colonoscopy depend on bowel cleanliness and the nature of bowel preparation (3). It is important that patients are educated and involved in the process of preparing for colonoscopy. Effective education significantly improves the quality of bowel preparation (4,5). Recent international guidelines suggest the importance of providing both verbal and written instructions for all parts of the colonoscopy preparation process (6,7). Inadequate

bowel preparation for colonoscopy can lead to missed lesions, cancelled procedures, prolonged processing time, increased costs, and potential increases in adverse event rates (8,9).

Our aim was to determine the frequency of inadequate bowel preparation in our clinic and to analyse the effect of physician-provided personalized education on colonoscopy preparation on the quality of bowel cleansing in patients scheduled for outpatient colonoscopy. The results obtained in this study will aid in achieving optimal bowel preparation, reducing the number of unnecessary procedures, increasing the success of the colonoscopy, and consequently achieving benefits in terms of patient and procedure costs.

Materials and methods

Patients and Methods

In this study, 150 outpatients who were referred to Kocaeli University Medical Faculty Hospital Gastroenterology Unit between May 2019 and October 2019 for colonoscopy procedures for any reason were enrolled. The study was approved by the local ethical committee (Approval number: 03.04.2019/KOU GOKAEK 2019/06.07/2019/88).

Polyethylene glycol (PEG) electrolyte lavage solution was the recommended bowel cleansing method. Demographic information and histories of systemic disease, surgery, and drug use in all patients were examined.

Patients were divided into two groups. Group 1 (education group) included 75 patients who received 10 minutes of verbal information from a physician in addition to a written information form. Group 2 (control group) included 75 patients who received information from a medical secretary in addition to a written information form. The importance of bowel preparation and how to perform bowel preparation were explained to the patients. During the education, the pre-colonoscopy diet, importance of sufficient hydration, and correct

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Submission date : 27/09/2020

Acceptance date : 16/02/2021

timing of taking PEG were explained. The importance of bowel preparation was emphasized; inadequate bowel preparation can result in missed lesions and the need for a repeat colonoscopy. Patients with a known history of colorectal cancer, under 18 years of age, with mental retardation, with ulcerative colitis or Crohn's disease, or with a history of major abdominal surgery and inpatients were excluded from the study. Patients capable of using PEG electrolyte lavage solution completely were included in the study.

As routine preparation, all patients scheduled for colonoscopy were asked to avoid fibrous foods 3 days before the procedure, and a diet of clear liquids was planned for the last day. The PEG solution was diluted with 4 l water; the first half was taken at 18:00 the day before the procedure, with 240 ml (one cup) taken every 10 minutes, and the second half was taken at 22:00. Clear fluid intake was stopped during the last 2 hours before the procedure.

All colonoscopies were performed using a Fujinon brand colonoscope by a senior experienced endoscopist who was blinded to the groups. During the colonoscopy procedure, the physician evaluated the bowel cleansing according to the BBPS scale. The physician assigned a score of 0-3 separately for the three segments of the bowel, giving a total score of 0-9. The scoring system was as follows: 0 (inadequate): unprepared colonic segment in which the mucosa cannot be assessed due to the presence of stools ; 1 (poor): visibility of some of the mucosa in the colonic segment but poor visibility of other areas due to staining, residual stool, and/or opaque fluid ; 2 (good): visible colonic mucosa but minor residue, minor stool, and/or opaque liquid particles present ; 3 (excellent): a good view of the entire colonic mucosa, with no residue, minor stool, or opaque liquid fragments. Previous validation studies have shown that a BBPS score ≥ 5 is associated with a higher polyp detection rate and is considered adequate bowel preparation (10). Intravenous midazolam was used for sedation.

The reason for the colonoscopy procedure, drugs used, start time of the colonoscopy, time to reach the cecum, duration of the procedure, removal of any polyps, complications, and the bowel cleansing BBPS score were recorded.

Statistical analysis

Statistical evaluation was performed using IBM SPSS 20.0 (IBM Corp., Armonk, NY, USA). The distribution of the data was evaluated using the Kolmogorov-Smirnov test. Numerical variables are expressed as means \pm standard deviation and categorical variables as frequencies (percentage). Comparisons between groups were performed using Student's t test when the distribution was normal and the Mann-Whitney U test otherwise. Differences between categorical variables were evaluated by the chi-square test. Logistic regression analysis was used to determine the relationships of

Table 1.— Sociodemographic characteristics of the patients

	Education group	Control group	p value
Age (mean \pm SD)	51.78 \pm 15.07	53.59 \pm 14.04	0.452
Sex (%)			0.413
Female	35 (47.9%)	41 (54.7%)	
Male	38 (52.1%)	34 (45.3%)	
BMI (mean \pm SD)	28.02 \pm 4.95	27.16 \pm 5.11	0.30
Education level (%)			0.161
Illiterate	4 (5.5%)	4 (5.3%)	
Literate	1 (1.4%)	4 (5.3%)	
Primary school graduate	38 (52.1%)	38 (50.7%)	
High school graduate	9 (12.3%)	16 (21.3%)	
Graduated from university	21 (28.8%)	13 (17.3%)	
Medical disease (%)	50 (68.5%)	52 (69.3%)	1.000
Diabetes mellitus (%)	16 (21.9%)	12 (16%)	0.478
Constipation (%)	16 (21.9%)	25 (33.3%)	0.171
Prior abdominal surgery (%)	28 (38.4%)	39 (52%)	0.095

various factors with the variable of interest. In tests of bidirectional hypotheses, $p < 0.05$ was considered sufficient for statistical significance.

Results

In our study, 75 outpatients were in the education group and 75 outpatients in the control group. Two of 75 patients in the education group were excluded from the study because of procedure-related intolerance. The general characteristics of the patients included in the study are shown in Table 1. Of the 73 patients in the education group informed by the physician, 38 were male (52.1%) and 35 female (47.9%). Of the 75 patients in the control group, 34 were male (45.3%) and 41 female (54.7%). The mean age was 51.78 \pm 15.07 years in the education group and 53.59 \pm 14.04 years in the control group.

The cecum could be intubated in 67 (91.8%) of the 73 patients in the education group and 66 (88%) of the 75 patients in the control group, with no statistically significant difference between the two groups ($p > 0.05$). The cecal intubation time was similar between the two groups: 7.4473 \pm 3.55 minutes in the education group and 8.1975 \pm 4.55 minutes in the control group ($p > 0.05$).

The proportion of patients with a BBPS score ≥ 5 was 90.4% in the education group and 74.7% in the control group, with a significant difference between the groups ($p = 0.021$). There was also a significant difference in the mean BBPS score between the groups: 6.51 \pm 2.17 in the education group and 5.41 \pm 2.63 in the control group ($p = 0.004$).

The right colon BBPS score was 1.92 \pm 0.829 in the education group and 1.57 \pm 0.91 ($p = 0.013$) in the control group; the left colon BBPS score was 2.33 \pm 0.728 in the education group and 1.84 \pm 0.959 in the control group ($p = 0.001$). There was no significant difference in the transverse colon BBPS scores between the groups ($p > 0.05$). The adenoma detection rate was 23.3% in the education group and 25.3% in the control group, with no significant difference ($p > 0.05$).

Table 2. — The effect of physician provided patient education on bowel preparation and colonoscopy

	Education group	Control group	p value
Cecal intubation (%)	67 (91.8%)	66 (88%)	0.624
Intubation time (minutes)	7.44 ± 3.55	8.19 ± 4.55	0.478
Procedure time (minutes)	17.75 ± 8.56	20.25 ± 11.38	0.245
BBPS ≥ 5 (%)	66 (90.4%)	56 (74.7%)	0.021
Total BBPS score	6.51 ± 2.17	5.41 ± 2.63	0.004
Right colon score	1.92 ± 0.829	1.57 ± 0.91	0.013
Transverse colon score	2.29 ± 0.79	2 ± 0.97	0.075
Left colon score	2.33 ± 0.728	1.84 ± 0.959	0.001
Adenoma detection rate (%)	17 (23.3%)	19 (25.3%)	0.922

In univariate analyses using a logistic regression model, the odds ratio for having a BBPS score ≥ 5 in the education group was 3.199 compared with the control group (95% confidence interval = 1.254-8.164; $p = 0.015$).

The relationships of factors such as age, education level, sex, presence of diabetes mellitus, drug use, time of colonoscopy, and intraabdominal surgery history with inadequate bowel preparation were analysed (Table 3). No significant relationships were detected in the univariate or multivariate analyses.

Discussion

In our study, we observed significantly higher quality of bowel preparation in outpatients who received education by a physician pre-colonoscopy. In a previous study, the reason for suboptimal bowel preparation was due the patient's lack of understanding of its importance, lack of confidence in the ability to follow the instructions, and confusion about the diet before colonoscopy (11).

Previous evaluations of interventions to increase the effectiveness of colonoscopy preparation quality include the studies by Rosenfeld et al. (12) on written

instruction in addition to verbal instruction, Liu et al. (5) on telephone re-education regarding the details of bowel preparation on the day before colonoscopy, and Griffin et al. (13) on interactive voice-response systems to ensure that patients attend appointments. The interventions used in these studies improved bowel preparation quality. The European Society of Gastrointestinal Endoscopy (ESGE) recommends that written and verbal information about bowel preparation be delivered together by healthcare professionals (6).

In our study, we evaluated the quality of bowel preparation using the BBPS score. We considered BBPS ≥ 5 as adequate bowel preparation. The proportion of bowel preparations with a BBPS score ≥ 5 differed significantly between the two groups: 90.4% in the education group versus 74.7% in the control group. In a similar study by Shieh et al. (14), the rates were 97.4% (39 patients) in the education group and 80% (60 patients) in the control group. The small number of samples in this study and the lack of randomization may have affected the results. In previous studies, inadequate bowel preparation was found in 21.7% and 30% of patients, while the inadequate bowel preparation rate in our control group was 25.3%.

In our study, the control and education groups were homogeneous, and there were no statistically significant differences between the two groups in terms of age, sex, BMI, chronic disease, chronic constipation, diabetes mellitus, or intra-abdominal surgery history.

While there was a significant difference in the right and left colon BBPS scores between the groups, there was no significant difference in the transverse colon BBPS score. Shieh et al. (14) detected significant differences between the left colon and transverse colon.

Successful cecal intubation rate is the most important indicator of colonoscopy quality (15). According to the

Table 3. — Risk factors associated with poor bowel preparation according to univariate and multivariate analyses

Patient factors	Quality of bowel preparation, n(%)		Unadjusted OR	95% CI	p value	Adjusted OR	95% CI	p. value
	Inadequate n = 26	Adequate n = 122						
Age								
< 65 years	18 (15.5%)	98 (84.5%)	1.00					
≥ 65 years	8 (25%)	24 (75%)	1.815	0.705-4.669	0.216	1.131	0.340-3.759	0.841
Sex								
Female	11 (14.5%)	65 (85.5%)	1.00					
Male	15 (20.8%)	57 (79.2%)	1.555	0.661-3.658	0.312	1.869	0.688-5.073	0.220
Education level								
≥ High school	9 (15.3%)	50 (84.7%)	1.00					
< High school	17 (19.1%)	72 (80.9%)	1.312	0.541-3.178	0.548	1.423	0.498-4.067	0.510
Diabetes mellitus								
No	20 (16.7%)	100 (83.3%)	1.00					
Yes	6 (21.4%)	22 (78.6%)	1.364	0.491-3.791	0.522	1.833	0.569-5.908	0.310
Drug use								
No	8 (17.8%)	37 (82.2%)	1.00					
Yes	18 (17.5%)	85 (82.5%)	0.979	0.391-2.453	0.965	0.829	0.265-2.594	0.748
Timing of colonoscopy								
Morning	10 (17.2%)	48 (82.8%)	1.00					
Evening	16 (17.8%)	74 (82.2%)	1.038	0.435-2.476	0.933	1.383	0.535-3.577	0.503
Previous abdominal surgery								
No	11 (13.6%)	70 (86.4%)	1.00					
Yes	15 (22.4%)	52 (77.6%)	1.836	0.779-4.324	0.165	1.720	0.653-4.532	0.273

latest guidelines of the American Society for Gastrointestinal Endoscopy and American College of Gastroenterology, updated in 2015, colonoscopists should be able to perform cecal intubation in over 90% of all colonoscopies and over 95% of colonoscopies performed for screening in healthy adults (16). In our study, the cecal intubation rates were 88% in the control group and 91.8% in the education group. The reason for the low cecal intubation rates may be due to the inadequate bowel cleansing in some patients.

In the study performed by Shieh et al. (14), the cecal intubation time was 8.7 minutes in the education group and 9.2 minutes in the control group, compared with 7.44 and 8.19 minutes in the education and control groups, respectively, in our study.

Another indicator of colonoscopy quality is the adenoma detection rate. According to the latest guidelines of the American Society for Gastrointestinal Endoscopy and American College of Gastroenterology, the adenoma detection rate should be at least 25% in patients over 50 years undergoing screening colonoscopy (16). In our study, the rates were 25.3% in the control group and 23.3% in the education group.

Inadequate preparation for colonoscopy can lead to prolonged procedure times and failure to detect pathologies (17). Unsuccessful procedures should be re-evaluated by computed tomographic colonography or colonoscopy. This situation is with markedly increased costs and some risks to the patient (18, 19).

In a review by Kurlander et al. (20), the cost effectiveness of education provided by a physician was estimated to be lower than that of education provided by medical assistant staff, videos, or brochures. Information should be accessible across a full range of ages and socioeconomic statuses, and interventions that can be performed while a patient is present in the clinic may be more reliable than additional interventions given later, depending on the patient.

Our study has some limitations. The number of patients was relatively low, complete randomization was not performed (quasi-experimental method), and a split-dose regimen was not used for bowel cleansing.

Our results indicate that information on the bowel preparation process delivered to the patient by the physician increases the bowel preparation quality. Accordingly, it reduces the procedure time and the risk of procedure delays. The education and written instructions regarding bowel preparation are simple, feasible, safe, and inexpensive.

Conflict of interests

None declared.

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