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THE EFFECT OF CLEAR LIQUID AMOUNT WHICH CONSUMED BEFORE COLONOSCOPY ON COLON CLEANSING

KOLONOSKOPİ ÖNCESİ TÜKETİLEN BERRAK SIVI MİKTARININ KOLON TEMİZLİĞİNE ETKİSİ

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SUMMARY

Introduction: *Colonoscopy, which is used in the diagnosis and treatment of colonic diseases, requires adequate bowel preparation before the procedure. In this study, we aimed to guide patient education before colonoscopy by determining the factors affecting insufficient colon cleansing and especially the effect of the amount of fluid consumed on the last day.*

Materials and Methods: *Two hundred patients between the ages of 18-75, who agreed to participate in the study at the SBU Izmir Bozyaka Training and Research Hospital, were evaluated prospectively, and beforethe colonoscopic examination, sennoside-based oral laxative and phosphate-based enema were applied. The demographic characteristics of the patients were recorded. A questionnaire including the diet and the amount of fluid they received the last day during the preparation of the colon was applied. The adequacy of bowel preparation was measured by the Ottawa scale. All data were analyzed by the SPSS program.*

Results: *A total of 200 patients were included in the study between March 2017 and April 2019. 13 patients were excluded because the cecum could not be reached due to technical reasons, stool pollution, or mass. The mean age of the patients was 52.1 ± 12.9 and 45.5% of the patients were male. In accordance with the 3-day preparation protocol of our unit, 78% of the patients followed the first two days of the diet, 75% did not consume solid food on the last day and 78% consumed more than 7 glasses of clear liquid. The number of patients with adequate colonoscopic preparation (Ottawa score ≤7) was 150 (80.2%). There was a statistically significant decrease in the Ottawa scale as the amount of liquid drunk increased (p = 0.026). Factors such as gender, age, marital status, literacy, satisfaction with life, income level, to be inpatient or outpatient, and comorbidities were statistically insignificant in relation to inadequate bowel preparation (Ottawa ≥8). It was determined that nonadherence with diet increased the risk of inadequate colon preparation 2.465 times (p = 0.038) and the consumption of clear liquid less than 7 glasses increased the risk of inadequate colon preparation by 3.194 times (p = 0.005).*

Conclusion: The low amount of clear fluid taken the day before colonoscopy and nonadherence to the diet are the most important factors affecting insufficient colon cleansing. Endoscopists and endoscopy nurses should emphasize the importance of diet and adequate clear fluids to patients in pre-colonoscopy education.

ÖZ

Giriş: *Kolon hastalıklarının tanı ve tedavisinde önemli yer tutan kolonoskopi işleminin başarısı için işlem öncesi bağırsak hazırlığının yeterli olması gereklidir. Bu çalışmada yetersiz kolon temizliğini etkileyen faktörleri ve özellikle son gün tüketilen berrak sıvı miktarının etkisini incelemek ve kolonoskopi öncesi hasta eğitimlerine yön vermek amaçlanmıştır.*

Gereç ve Yöntem: *SBU İzmir Bozyaka Eğitim ve Araştırma Hastanesi'nde çalışmaya katılmayı kabul eden 18-75 yaş arası 200 hasta prospektif olarak değerlendirildi ve kolonoskopik muayeneden önce kolon hazırlığı için sennosid bazlı oral müshil ve fosfat bazlı lavman uygulandı.Hastaların demografik özellikleri kaydedildi. Kolon hazırlığı aşamasında uyguladıkları diyet ve son gün aldıkları sıvı miktarı sorularını içeren anket uygulandı. Kolon hazırlığının yeterliliği ve kolonoskopik temizlik derecesi Ottawa skalası ile ölçüldü. Tüm veriler SPSS programında analiz edildi.*

Bulgular: *Çalışmaya Mart 2017 ve Nisan 2019 tarihleri arasında toplamda 200 hasta dahil edildi. 13 hasta teknik nedenler, gaita kirliliği ya da kitle nedeni ile çekuma ulaşılamadığından dışlandı. Hastaların yaş ortalaması 52.1±12.9 ve %45,5'i erkek idi. Ünitemizin 3 günlük hazırlık protokolüne uyumlu olarak, hastaların %78'i ilk iki günkü diyete uymuş, %75'i son gün katı gıda tüketmemiş ve %78'i 7 bardaktan fazla berrak sıvı tüketmiş idi. Kolonoskopik hazırlığı yeterli olan (Ottawa skor ≤7) hasta sayısı 150 (%80,2) idi. İçilen berrak sıvı miktarı arttıkça Ottawa skorunda istatistiksel anlamlı azalma saptanmıştır (p=0.026). Yetersiz barsak temizliği (Ottawa ≥8) riskiyle ilişkili olarak cinsiyet, yaş, medeni durum, okur yazarlık, hayattan genel memnuniyet, gelir düzeyi, yatan hasta olma ve ek hastalıklarının bulunması gibi faktörler istatistiksel olarak anlamsız idi. İlk 2 günlük diyete uyumsuzluğun kolon kirliliği riskini 2.465 kat arttırdığı (p=0,038) ve 7 bardaktan az berrak sıvı tüketiminin ise kolon kirliliği riskini 3.194 kat arttırdığı saptandı (p=0,005).*

Tartışma: *Kolonoskopi işleminden bir gün önce alınan berrak sıvı miktarının az olması ve diyete uyumsuzluk, yetersiz kolon temizliğini etkileyen en önemli faktörler olarak öne çıkmaktadır. Endoskopistler ve endoskopi hemşireleri kolonoskopi öncesi eğitimde, hastalara diyetin ve yeterli berrak sıvı tüketmelerinin önemini özellikle vurgulamalıdırlar.*

INTRODUCTION

Currently, colonoscopy is accepted as the gold standard method for imaging the entire colon mucosa. The incomplete colonoscopic examination is defined as a failure in cecal intubation or effective mucosal imaging, and its proportion from large-scale studies appears to be between 10-20% (1,2,3). Diagnostic accuracy and therapeutic safety depend in part on the quality of colon preparation. Insufficient cleaning causes lesions to be overlooked, process repetition, loss of time and labor, increased cost, and reduced patient satisfaction (4,5). Numerous studies have been done to identify the causes of inadequate bowel preparation. Among the causes of inadequate bowel preparation areprevious inadequate preparation history, hospitalized patient, advanced age, male gender, and presence of concomitant diseases such as dementia, diabetes mellitus(5,6).Understanding the factors that can be corrected for the patient and the health institution can reduce the number of incomplete colonoscopic examinations.

Bowel preparation regimens generally include a diet with laxatives. A clear liquid diet is often recommended the day before the colonoscopy (7). There are also studies on a low-residual diet that started a few days before the procedure, excluding foods that have indigestible content, and that can be as effective as a clear liquid diet (7,8). In summary, the effect of the amount of clear liquid on the quality of colon preparation is not clearly defined. This study aims to determine the factors affecting colon cleansing and to evaluate the effect of the amount of clear liquid consumed on the last day on colon cleansing quality.

MATERIALS AND METHODS

In the SBU İzmir Bozyaka SUAM endoscopy unit, a cross-sectional study was planned, consisting of patients whose colonoscopy was planned according to the clinical indication. 200 patients aged 18-75 were included in the study. Patients with emergency colonoscopy indication and pregnant patients were not included in the study. The patients included in the study were informed within the scope of the study and their consent was obtained for this. Also, local ethics committee approval was obtained to conduct the study(06.09.2016/4).

During the pre-colonoscopy preparation in the endoscopy unit, two X-M® diet 250 ml (with sennoside content) solutions and BT® 210 ml (with sodium phosphate) enema are used 1 day before the procedure. The information and consent form, which includes the details of the diet that recommends a low-residual diet on the third and second days before the procedure and at least 15 glasses of clear liquid consumption on the last day, is distributed to patients during the appointment. In this form, all foods and beverages to be eaten and not to be eaten, and the usage times and times of laxatives are specified, detailed information will be explained before and after the procedure and complications are explained.

Immediately before the colonoscopy procedure, a questionnaire form containing demographic features such as age, gender, marital status, educational status, income level, additional diseases, and the diet they applied during the clinical and colon preparation phase, which could affect the quality of the preparation, was filled in. The amount of fluid consumed on the day before the procedure was recorded with the size of the water glass(a glass of water approximately 200 ml).

In our study, during the colonoscopy procedure performed by our specialists, the Ottawa bowel preparation scale, which rates residual and fecal debris, was used to document the quality of the preparation. The Ottawa bowel preparation scale is a validated scoring system, and its cleaning efficiency is graded in three colonic segments (cecum-ascending colon / transverse colon / right colon) and total colon (9). The total Ottawa bowel preparation scale score ranges from 14 (extremely poor cleaning) to 0 (excellent cleaning) as found in Table 1. As defined in the Ottawa score, satisfactory cleansing and inadequate bowel cleansing total scores are ≤7 and ≥8 in accordance.

All the data were processed by Statistical Package for the Social Sciences (SPSS, Chicago, IL, USA) 24.0 program for Windows. Statistical analysis shows departures from normality according to Shapiro-Wilk's test and presented as a median and interquartile range. Non-parametric Mann−Whitney U and Kruskal–Wallis test was used for comparing the data and $p<0.05$ value was regarded as statistical significance. Univariate and multivariate analyses were made to determining factors associated with insufficient bowel cleansing (Ottawa ≥8) risk.

RESULTS

A total of 200 patients who applied to our endoscopy unit with colonoscopy indication between March 2017 and April 2019 were included in our study. During the colonoscopy procedure, 13 patients were excluded from the study because the cecum could not be reached due to technical reasons, stool pollution, or mass. The mean age of the patients was 52.1 ± 12.9, 54.5% of the patients were female and 55.5% were male. The demographic characteristics of the patients included in the study are summarized in Table 2.

Following the 3-day preparation protocol of our unit, 78% of the patients complied with the first 2-day diet. On the last day, the number of patients without solid food consumption was 141 (75%). During the colon preparation process, it was determined that 78% of the patients consumed more than 7 glasses of clear liquid per day.

The number of patients with sufficient colon preparation (Ottawa score ≤7) was 150 (80.2%). As the amount of clear liquid selected in our analysis increases, a statistically significant decrease is observed in the Ottawa score (p = 0.026) (Fig. 1). Factors associated with inadequate bowel cleansing (Ottawa ≥8) risk were analyzed by univariate and multivariate analyzes. As a result of the examination, literacy (*p* = 1.000), general satisfaction from life (*p* = 0.321), gender (*p* = 0.503), marital status (p = 0.35), inpatient (*p* = 0.487), income level and additional diseases were found to be statistically insignificant in terms of bowel cleansing. Dietary incompliance and low consumption of clear fluid were observed as factors associated with the risk of inadequate bowel cleansing (Ottawa ≥8). It was found that non-compliance with the first 2-day diet increased the risk of colon contamination by 2.465 times (*p* = 0.038). Also, it was found that consumption of clear liquid less than 7 glasses increased the risk of colon contamination by 3.194 times (*p* = 0.005) (Tab. 3).

Table 1. Ottawa bowel preparation scale

(A) For each colon segment (Cecum-ascending colon, transverse colon, left colon)	
Excellent (Mucosal detail is visible)	0
Good (Minimal turbid liquid)	1
Moderate (Fluid aspiration is essential to provide the image)	2
Weak (Washing and aspiration is necessary for a logical image)	3
Inadequate: Solid stool obscuring mucosal detail and not cleared with washing and suctioning	4
(B) Total colon fluid score range	
A small amount of fluid	0
A moderate amount of fluid	1
A large amount of fluid	2
TOTAL OTTAWA COLON PREPARATION SCORE = A+B	

Table 2. Demographic characteristics and preparation of patients during colonoscopy

Age, mean ± SD**	52.1±12.9 (19-74)
Number of female patients (%)	102 (%54,5)
Number of patients ≥60 years old (%)	62 (%33,2)
Number of outpatients (%)	184 (%98,3)
Appointment time to colonoscopy [Median, IQR*]	1 month [1 (0.03-6 month)]
Number of patients without solid food consumption on the last day	141 (%75)
Number of patients compatible with the strict diet for the first 2 days	145 (%78)
Number of patients with ≥7 cups of liquid consumption on the last day (%)	145 (%78)
The number of patients with sufficient preparation according to Ottawa scoring (score ≤7 points)	150 (%80,2)
Number of literate patients	176 (%94,1)
Ottawa total score (out of 14), [median, IQR]	4 [5 (0-13)]
Number of patients with sufficient colon preparation (Ottawa score ≤7) (%)	150 (%80,2)

*IQR: Interquartile range; **SD: Standard deviation

Table 3. Univariate and multivariate analysis results of the determining factors associated with insufficient bowel cleansing (Ottawa ≥8) risk

		Univariate analysis			Multivariate analysis		
		Adequate colon preparation (Ottawa ≤7)	Inadequate colon preparation (Ottawa ≥8)	*p*	OR	%95 CI	*p*
Demographics							
Age	≥ 60	50 (%80,6)	12 (%19,4)	0.917			
	<60	100 (%80)	25 (%20)				
Gender	Male	70 (%82,4)	15 (%17,6)	0.503			
	Female	80 (%78,4)	22 (%21,6)				
Dietary factors before colonoscopy							
Diet compliance for the first 2 days	No	28 (%66,7)	14 (%33,3)	0.012	*2.465*	*1.050-5.787*	*0.038*
	Yes	122 (%84,1)	23 (%15,9)				
The amount of fluid consumed on the last day	≥7 glasses	123 (%84,8%)	22 (%15,2)	0.003	*3.191*	*1.425-7.147*	*0.005*
	< 6 glasses	27 (%64,3%)	15 (%35,7)				
Solid food consumption on the last day	Not consumed	118 (%83,7)	23 (%16,3)	0.054	1.628	0.700-3.785	0.257
	Consumed	32 (%69,6)	14 (%30,4)				
Marital status							
	Single	30 (%75)	10 (%25)	0.351			
	Married	120 (%81,6)	27 (%18,4)				
Education status							
literacy status	Illiterate	9 (%81,8)	2 (%18,2)	1.000			
	Literate	141 (%80,1)	35 (%19,9)				
Satisfaction status with life							
Satisfied	No	11 (%68,8)	5 (%31,3)	0.321			
	Yes	138 (%81,2)	32 (%18,8)				

CI, confidence interval; OR *odds* ratio

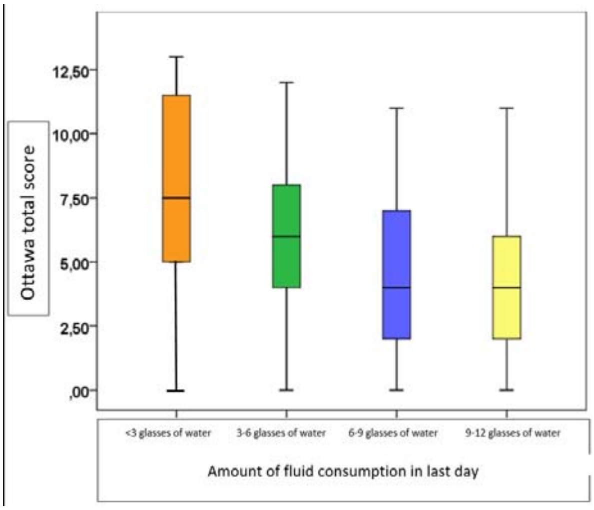

Figure 1. The significant relationship between the amount of clear fluid consumed the day before the colonoscopy procedure and the Ottawa score (p = 0.026)

DISCUSSION

Pre-procedure bowel preparation should be enough for the success of the colonoscopy procedure, which plays an important role in the diagnosis and treatment of colon diseases. The effectiveness of colonoscopy in detecting precancerous polyps passes through a good examination of the colonic mucosa, which will undoubtedly be affected by the degree of the cleansing of the bowel. It is obvious that colonoscopy repetition that will be performed after inadequate preparation or uncompleted colonoscopies, will show consequences in terms of labor loss, patient difficulty, and cost. Besides, there are uncertainties about the management of patients who have completed a total colonoscopy under moderate bowel preparation.

An optimal colon preparation is vital for the thorough examination of the mucosa, and the degree of bowel cleansing is considered one of the quality markers of the colonoscopy procedure (7). However, it is not uncommon to encounter suboptimal bowel preparation in daily colonoscopy practice. Up to 25% of suboptimal preparation is reported in colonoscopies, and colonoscopy repeats may be associated with the increased medical cost and unexpected complications (8). An extremely poor colon preparation can significantly limit imaging, causing adenoma and risk lesions to be missed, and a condition associated with interval colorectal carcinoma may occur (9).

In this study, it was planned to examine the factors affecting inadequate colon cleansing and the effect of diet, especially the amount of clear liquid consumed on the last day, and to direct patient education before colonoscopy. For this purpose, in our study, the determining factors affecting inadequate colon cleansing, which is a common situation in daily endoscopy practice, were examined in detail, and especially the effect of the amount of clear liquid consumed on the last day was emphasized.

Studies showing that bowel preparation is better in outpatient colonoscopy than inpatients have been published (10). In the study published by Hendry et al in March 2007 and on 1516 inpatients and 9055 outpatients, it is seen that bowel preparation in outpatients is more satisfactory than inpatients (11). In our study, it was found that the status of being an outpatient or inpatient with other demographic features was statistically insignificant in terms of insufficient colon cleansing. New studies can be done on this subject by increasing the number of patients.

The diets and drugs recommended before colonoscopy differs in many endoscopy centers. In accordance with the preparation protocol of our unit, the differences in dietary compliance observed among patients who applied Sennoside-based oral laxative and Phosphate-based enemas affected the bowel cleansing quality. Compliance with the first 2 days of the 3-day diet protocol before the procedure appears to be effective in colon cleansing (OO: 2.465, 95% GA: 1.050-5.787, $p = 0.038$). In this diet, besides plenty of liquid food, digestible non-pulp foods such as rice, pasta, mashed potatoes can be continued. Apart from these, pulp and shelled foods with indigestible parts in the intestine should be removed from the diet. Reilly and Walker have shown that the only dietary supplement to standard practice is the clear liquid diet in improving bowel preparation quality (12). In our study, clear glasses of 7 glasses and more, which are drunk the day before the procedure, stand out as the most important factor affecting bowel cleansing (OO: 3.191, 95% GA: 1.425-7.147, $p = 0.005$). Also, abundant fluid consumption will reduce cramp and similar ailments caused by the preparation of medicine and will maintain the fluid and electrolyte balance (13).

CONCLUSION

Given the potential risk and cost of colonoscopy repeat, the importance of developing preparatory strategies to improve colon cleansing quality in daily practice is obvious. A simple method that can enable endoscopists and endoscopy nurses to use a common language for bowel preparation should go into routine practice. In our study, it is revealed that endoscopists and endoscopy nurses should emphasize the importance of consuming clear fluid and adhering to diet in patient education before the procedure.

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