



Comparison of one and two-day bowel preparation with polyethylene glycol in pediatric colonoscopy

COLON

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ABSTRACT

Background/Aims: Proper colon preparation in children has been a challenge for many years. Different regimens have been used for this purpose, but the best regimen is not determined. The aim of this study was to evaluate successful colon preparation before colonoscopy in children who were treated with one- or two-day regimen with polyethylene glycol (PEG) plus bisacodyl and clear liquids.

Materials and Methods: In this randomized clinical trial, 100 children (2-14 years old) who were candidates for colonoscopy were enrolled and divided into two groups. The children in group one were started on 2 g/kg PEG powder (17 g in 240 mL water or another beverage) and 5 mg bisacodyl suppository (BD) the day before colonoscopy, whereas those in the other group were started on 1.5 g/kg PEG with fruit juices for two days and 5 mg bisacodyl suppository (BD) for two days before colonoscopy.

Results: Compliance rates, regimens, adverse effects, and complete colonoscopy were not significantly different between the two groups. The Boston score was excellent and good in 70% of group one and 72% of group two children, respectively. Compliance rate, adverse effects, and need for enema were similar in both groups. The rate of compliance and non-requirement of enema were significantly higher in children with satisfactory colon preparation.

Conclusion: The one-day PEG plus bisacodyl regimen for bowel preparation is as effective as the two-day regimen in children; furthermore, it is well tolerated and has low adverse effects.

Keywords: Colon, preparation, PEG, bisacodyl, children

INTRODUCTION

Colonoscopy is the customary process for visualizing the large bowel and terminal ileum for detecting pathologies in children and infants (1). The success rate of colonoscopy procedure varies from 51% to 96% (2-3). There are different factors that can improve the success rate of colonoscopy in children, such as good bowel preparation, adequate patient sedation, and experienced personnel (1). Good bowel preparation is a challenge when performing colonoscopy in children. Using oral sodium phosphate, magnesium citrate, or polyethylene glycol (PEG) with electrolytes is common for preparation for colonoscopy, but the best regimen is not determined.

Polyethylene glycol is an osmotic laxative agent that is widely applied for managing constipation and encopre-

sis in children (4-6). In previous studies, one- or two-day preparation with PEG has been used for colonoscopy, and both regimens are being considered to be safe, effective, and accepted methods for colon preparation (1,7).

We designed this study to evaluate colon preparation before colonoscopy in children who were treated with one- or two-day regimen of PEG plus bisacodyl and clear liquids.

MATERIALS AND METHODS

In this randomized clinical trial conducted in Children's Medical Center, affiliated to Tehran University of Medical Sciences, between September 2012 and September 2013, 110 children (2-14 years old) who were candidates for colonoscopy were enrolled. Exclusion criteria

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were allergy to PEG, emergency colonoscopy, and metabolic, cardiac or renal disease.

All parents were asked to fill informed consent forms before study. The study was approved by the ethics committee of Tehran University of Medical Sciences. The trial was registered in the Iranian Registry of Clinical Trials (IRCT number: IRCT2013121515802N1).

Ten children withdrew from the study before study entrance (as they did not follow the regimen), and 100 children were finally evaluated.

By means of computer generated random numbers, an expert technician randomly assigned the children to group 1 (one-day regimen) or group 2 (two-day regimen).

The children in group one were started on 2 g/kg PEG [17 g (one spoonful) PEG powder in 240 mL water or another beverage] in two or three divided doses and 5 mg suppository of bisacodyl (BD) the day before colonoscopy. The children were allowed to drink fruit juices of their choice. The children in the other group were started on 1.5 g/kg PEG with fruit juices for two days and 5 mg BD for two days prior to colonoscopy. If defecation was not adequate (loose stools passed three or four times), normal saline enemas were given before the colonoscopy on the day of colonoscopy.

A blind physician collected data regarding demographic characteristics, indication of colonoscopy, adverse effects (abdominal pain, nausea, vomiting, and headache), frequency of defecation before and after preparation, compliance of children for the regimen, need for saline enema, and Boston score ("excellent," "good," "fair," "poor").

Poor=unable to see mucosa according to solid stool as the result of unprepared colon.

*Fair=portion of mucosa of the colon segment seen but other areas of the colon segment not well seen because of staining, residual stools, and/or opaque liquid.

*Good=minor amount of residual staining, small fragments of stools, and/or opaque liquid but mucosa of colon segment seen well.

*Excellent=seeing the entire mucosa of the colon (8) and success of colonoscopy. Colonoscopy success was considered if the procedure was completely performed and the colon was well visualized up to the ileum terminal.

Data were analyzed by SPSS version 18 (SPSS Inc., Chicago, IL, USA). The data were shown as mean \pm SD. Independent sample t-test was applied for continuous variables, and Pearson χ^2 test with Fisher's exact test was used for the assessment of

Table 1. Demographic characteristics, indication for colonoscopy, and defecation frequency before and after the regimens

	Group 1	Group 2	p value
Age (years)	6.9 \pm 3.1	8 \pm 3	0.07
Sex			
Male	29	34	0.3
Female	21	16	
Pre-regimen defecation frequency			
2–3 times per week	15	27	0.003
1 time per day	26	17	
2 times per day	7	0	
More than 2 times per day	2	6	
Indication for colonoscopy			
Bloody stools	49	47	0.3
Abdominal pain	1	3	
Post-regimen defecation frequency			
1 time per day	1	2	0.004
2 times per day	7	24	
3 times per day	21	12	
4 times per day	15	7	
More than 4 times per day	6	5	

categorical variables. $p < 0.05$ was considered to be statistically significant.

RESULT

One hundred children enrolled in this study. Sixty three were male and 37 were female. The most common indication for colonoscopy was bloody stools in both groups. Pre- and post-regimen defecation frequencies were significantly different between the two groups (Table 1).

Compliance of regimen, adverse effects, and complete colonoscopy were not significantly different between the two groups (Table 2). The Boston score was excellent and good in 70% of group one and 72% of group two children, respectively.

The rate of compliance and non-requirement of enema were significantly higher in the children with satisfactory colon preparation. Demographic characteristics (age and sex), indication for colonoscopy, and type of regimen were not significantly different between the children with and without satisfactory colon preparations (Table 3).

DISCUSSION

The standard procedure for visualizing the large bowel and terminal ileum for detecting pathologies in children and infants is colonoscopy (1). One of the challenging issues in performing colonoscopy is bowel preparation, and different regimens such as one-, two-, or four-day PEG regimens are used for this purpose.

Table 2. Factors regarding the use of regimens in both groups

	Group 1	Group 2	p value
Regimen comfortableness			
Fully easy and tasty	20	28	0.3
Easy and tasty	26	20	
Some tasteless and hard	3	2	
Tasteless and hard	1	0	
Compliance of regimen			
Yes	46	47	0.6
No	4	3	
Adverse effects			
Nausea	1	3	0.6
Bloating	1	1	
Abdominal pain	2	4	
Headache	1	2	
Need for enema			
Yes	6	9	0.4
No	44	41	
Complete colonoscopy			
Yes	35	36	0.8
No	15	14	
Boston score			
Poor	4	3	0.9
Fair	11	11	
Good	28	29	
Excellent	7	7	

The results of the current study showed that one- and two-day bowel preparation with PEG plus bisacodyl were well-accepted regimens with low side-effects for colon preparation in children. In both groups, in approximately 70% of the children, the physician reached the terminal ileum or the cecum, which was lower than the rate in previous studies. Phatak et al. (7) used 2 g/kg of PEG and a 5 mg tablet of bisacodyl daily for 2 days before colonoscopy and found that the preparation was excellent in 92% of the children with a compliance rate of 95%. This difference could be because of a higher prevalence of constipation before preparation in the children in our study compared with that of the children in their study. In the study by Phatak et al. (7), the mean frequency of stool frequency was 2 before preparation and increased to 4 and 6.5 one and two days after regimen initiation, respectively.

In a study conducted by Adamiak et al. (1), the medical records of 272 children who underwent colonoscopy and who were treated with a one-day PEG bowel preparation regimen were evaluated. In their study, the regimen was effective in 93% of

Table 3. Comparison of different factors in all enrolled children with and without colonoscopy completion

	Satisfactory colon preparations	Unsatisfactory colon preparations	p value
Age (years)	7.6±3.1	7.2±3.2	0.5
Sex			
Female	28	20	0.4
Male	43	9	
Indication for colonoscopy			
Abdominal pain	3	1	0.8
Bloody stools	68	28	
Compliance			
Yes	71	22	<0.001
No	0	7	
Need for enema			
Yes	0	15	<0.001
No	71	14	
Type of regimen			
One day	35	15	0.8
Two days	36	14	

the children, which is higher than our success rate. In both studies, the main indication for colonoscopy was abdominal pain followed by bloody stools. In this study, the main reason for colonoscopy was bloody stools followed by abdominal pain.

In our study, the most common adverse effects were abdominal pain followed by nausea. The compliance with both regimens was 92%.

The safety of the PEG regimen in children has been acknowledged in previous studies, and drug-related adverse effects such as nausea, vomiting, or abdominal cramping are not disabling and could be tolerated by children before preparation (1).

Our results showed a high compliance rate, no statistically significant difference between adverse effects, and the same success rate in the two groups, which indicate that the one-day regimen was as effective as the two-day regimen.

The high compliance rate of the children in this study could be because of different factors. First, PEG is a tasteless powder, so it could become pleasant by mixing in a beverage. The children were allowed to mix the powder with a beverage of their choice. Second, it is easy to take bisacodyl. Third, the duration of the regimen was short. Finally, the children were allowed to drink the prescribed regimen in divided doses with no time restriction.

When we compared the satisfactory and unsatisfactory colonoscopy findings, we found that there were no significant differences regarding age, sex, indication for colonoscopy, and regimen type. However, the need for enema was significantly higher in the unsatisfactory group, whereas the compliance rate was significantly higher in the satisfactory group. These findings are compatible with the findings of Phatak et al. (7).

In recent years, PEG has been used for bowel preparation in children and adults. As it has no electrolytes, it could be well tolerated by children. In comparison with PEG-ELS, which contains PEG 3350 and electrolytes, patients could drink a less volume of PEG 3350 in a short time, and as it is tasteless, it is better tolerated (9-10). On the other hand, adverse effects such as nausea, vomiting, and need for nasogastric tube insertion are more with the use of PEG-ELS than with the use of PEG 3350.

Other options for bowel preparation in children include prolonged clear liquid diet and use of laxatives. Because of the long duration of these regimens (2 or 3 days) and the unpleasant taste of most laxatives, it is difficult for children to tolerate these regimens (10).

Smaller volume and excellent colon cleansing are the advantages of sodium phosphate, but unpleasant taste and higher risk of hyperphosphatemia and hypocalcemia development are its disadvantages (6,11-13).

The bowel preparation in our study was approximately 70% in each group. The shorter duration of the regimens and possibility to consume PEG with beverages are advantages of both our regimens, especially the one-day regimen.

This study had some limitations. As it was conducted in a tertiary hospital, the number of children in each group was limited. Multi-center studies with larger sample sizes are recommended.

One-day PEG plus bisacodyl regimen for bowel preparation is as effective as the two-day regimen in children; in addition, it is well tolerated and has low adverse effects.

Ethics Committee Approval: Ethics committee approval was received for this.

Informed Consent: Written informed consent was obtained from patients' parents who participated in this study.

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