

Efficacy of Split-Dosing versus Conventional Bowel Preparation in Colonoscopy: A Randomized Clinical Trial



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Abstract

Background: Colonoscopy is an indispensable investigative and therapeutic tool in colorectal conditions. The accuracy of colonoscopic diagnosis is dependent on the effectiveness of the bowel preparation and the visibility of the colonic mucosa. **Objective:** This study compares the efficacy of split-dosing bowel preparation compared to the conventional single-day timing of bowel preparation, by measuring the quality of colonoscopy performed using a validated bowel cleanliness score. **Methods:** An endoscopist-blinded clinical trial was conducted over a period of three months through convenient sampling at the Surgery Out-Patient Clinic at a secondary referral hospital in Malaysia. Data were recorded prospectively on the timing of bowel preparation, colonoscopic view of bowel cleanliness, age, and gender. **Results:** There was a total of 110 subjects for both conventional and test groups. Demographic studies showed 63 (57.3%) patients were under 60 years old, 61 (55.5%) were male, and 48 (44%) were Malays. For the patients undergoing colonoscopy, the majority of the 86 (78.2%) had good bowel preparation and 96 (87.3%) of them with high efficacy of bowel preparation. The timing of bowel preparation is significantly associated with the efficacy of the bowel preparation and the quality of the colonoscopy ($p < 0.05$). **Conclusion:** We conclude that split-dosing bowel preparation is significantly better than conventional timing bowel preparation in improving both the efficacy of bowel preparation as well as the quality of colonoscopy.

Keywords: Efficacy, Bowel Preparation, Split-Dosing

1. Introduction

Colonoscopy plays a vital role in facilitating the detection of many colorectal conditions. In addition, it has many therapeutic roles too, like polypectomies and clipping of bleeding vessels. Colorectal carcinoma, for example, in its early stage, is only detectable by colonoscopy. Patients whose colorectal cancers are detected and treated early are more likely to survive.^[1] Hence a good bowel preparation ensures a good quality colonoscopic study. The colon needs to be cleaned thoroughly, employing an appropriate pre-scope diet and mechanical bowel preparation, for a clear visualization to avoid missing any abnormal or suspicious-looking lesions.^[1] Poor or inadequate bowel preparation may lead to a repeated procedure or an inaccurate study.

The objective of this study is to compare the importance of the timing of bowel preparation and its efficacy on the quality of colonoscopy among patients who undergo the procedures for various reasons.

2. Methods

This study was a clinical trial conducted in Hospital Serdang, Selangor, Malaysia. The data collection period was for three months, from June to August 2013. Subjects comprised of patients

who were undergoing colonoscopy aged between eighteen and seventy years old. The inclusion criteria were patients who undergo colonoscopy for diagnostic, surveillance, and therapeutic reasons. Conversely, individuals who were contraindicated for bowel preparation, those who had electrolyte imbalance or contraindicated for sodium phosphate were excluded.

Convenient sampling method was employed, and the choice of mechanical preparation was sodium phosphate. Patients were then assigned to the conventional bowel preparation group and the test bowel preparation group. For the conventional bowel preparation group, sodium phosphate was given to patients at 2 pm and 8 pm on the day before the colonoscopy whereas in the test bowel preparation group, the regimen was given to patients at 6 pm on the day before the colonoscopy, and 6 am on the same day of the procedure. The data recorded prospectively in a standardized proforma. Dependent variables were the efficacy of bowel preparation and quality of colonoscopy whereas independent variables were timing for bowel preparation, age, and gender. The quality of the colonoscopy was assessed by the endoscopist and graded using the validated Aronchick scale.^[2] Data were analyzed using Predictive Analytic Software Version 21.0 (Social Package for Social Science Version 21.0). In order to determine the association between variables (where applicable), the Chi-Square test was used. A p-value of less to 0.05 was used for level of

significance. Institutional Ethical Committee approval was obtained.

3. Results

One hundred and ten patients (55 test and 55 conventional) were included in the study. Data was collected using a standardized proforma. Table 1 shows the distribution of patients that undergo colonoscopy by age group. Sixty-three patients (57.3%) who underwent colonoscopy were under the age of 60 years old compared to forty-seven patients (42.7%) who were above 61 years old. Based on the gender of patients, there were 61 (55.5%) male

patients who went for the colonoscopy compared to 49 (44.5%) female patients. As shown in Table 2, eighty-six (78.2%) patients who underwent colonoscopy had excellent or good bowel preparation, 10 (9.1%) of them had fair grading, and 14 (12.7%) of them had poor bowel preparation grading. Split-dosing bowel preparation was shown to be significantly more efficacious than the conventional bowel preparation ($p=0.004$) as stated in Table 3. Based on the results in Table 4, there were no significant differences in the age group of patients and efficacy of bowel preparation ($p=0.556$) and between the gender of patients and efficacy of bowel preparation ($p=0.892$).

Table 1: Distribution of patients that undergo colonoscopy according to age group

Demographic characteristic	Number of patient(s)	Percentage (%)
Age group:		
<60	63	57.3
>60	47	42.7
Total	110	100.0

Table 2: Distribution of bowel preparation grading among patients that undergo colonoscopy

Bowel preparation grading	Number of patient(s)	Percentage (%)
1) Excellent/Good	86	78.2
2) Fair	10	9.1
3) Poor	14	12.7
Total	110	100.0

Table 3: Association between timing of the bowel preparation and quality of colonoscopy

Timing of bowel preparation	Quality of colonoscopy				Total	Chi – Square Test Value	
	Clear Visualization	%	Poor Visualization	%		χ^2	<i>p</i> –value
Group							
Test	53	96.4	2	3.6	55	8.185	0.004*
Conventional	43	78.2	12	21.8	55		
Total	96		14		110		

Table 4: Association between timing of the bowel preparation, age group and gender with the efficacy of bowel preparation

Timing of bowel preparation	Efficacy of bowel preparation				Chi – Square Test Value	
	High	%	Low	%	χ^2	<i>p</i> –value
Group						
Test	53	96.4%	2	3.6%	8.185	0.004*
Conventional	43	78.2%	12	21.8%		
Total	96		14			
Age group						
<60	56	88.9%	7	11.1%	0.347	0.556
>60	40	85.1%	7	14.9%		
Total	96		14			
Gender						
Male	53	86.9%	8	13.1%	0.109	0.892
Female	43	87.8%	6	12.2%		
Total	96		14			

4. Discussion

Our findings show that there are no significant differences in the efficacy of bowel preparation and the quality of colonoscopy between the age and gender among patients. However, there is a

significant association between the timing of bowel preparation and the quality of colonoscopy ($p=0.004$). The test group (split-dosing bowel preparation) had shown a better quality of colonoscopy than the conventional group (same day bowel preparation). Based on our findings, 53 out of 55 (96.4%) patients

from proposed group had a clear visualization of the colon compared to the conventional group where only 43 out of 55 patients (78.2%) had a clear visualization of the colon.

Frommer et al demonstrated that split dosing of sodium phosphate solution resulted in a significantly less fecal material in the right colon compared with sodium phosphate solution administered on the day before the procedure.^[3] In another study evaluating an evening-morning split-dosing bowel preparation, dosing the morning of the procedure (AM dosing), and dosing the day before the procedure (PM dosing), both PM/AM and AM dosing showed superior colon cleansing compared with PM dosing.^[4] Moreover, the detection of flat lesions was significantly greater in the PM/AM and AM dosing groups than in the PM dosing groups. These results provided further evidence that improvement in the quality of bowel preparation associated with PM/AM split dosing was associated mainly with the second purgative dose (AM dose) administered the same day as the colonoscopy.^[4]

In another study, Church et al demonstrated that a 'same-day' administration resulted in a significantly better quality of bowel preparation compared to a 'one day before' timing, using the same quantity of polyethylene glycol-electrolyte (PEG) solution.^[5] Patients who were administered purgatives on 6 pm on the day before colonoscopy and 6 am on the same day of colonoscopy had a greater proportion of excellent or good grading of bowel cleanliness and a lower proportion of fair grading of bowel cleanliness compared to patients who were administered purgatives the day before.^[5] Likewise, Gupta et al demonstrated that 'day before' versus 'same day' bowel preparations had superior efficacy over 'same day' preparations.^[6] Parra-Blanco et al found that the 'same day' preparation improved the detection rates of colonic adenomas.^[4] Hyung et al also found that inadequate bowel preparation increases the chances of missed polyps.^[7]

Regarding the age group and efficacy of bowel preparation, Ness et al found that the age of patients did not appear to have an impact on the quality of bowel preparation in patients undergoing colonoscopy.^[8] On the other hand, Nguyen et al demonstrated that mean age of ≥ 66 years was predictive of poor colonoscopy preparation.^[9] In two other Asian studies, age ≥ 60 years were similarly associated with poor bowel preparation.^{[10], [11]} Increased age was known to be associated with a reduced colonic transit, greater co-morbidity, and polypharmacy, which will, in turn, affect colonic cleansing.^[12]

In a study of 649 American patients, of whom 21.7% had poor bowel preparation, the male gender was an independent predictor of poor bowel preparation.^[8] Leibold et al further reported that male patients had a 1.4 times risk of poor bowel preparation compared to female patients in another American study of 10 921 subjects undergoing colonoscopy.^{[13], [14]} In general, men are less health conscious and were less likely to seek medical help.^[15] Women are more likely to seek medical attention early in the prevention of illnesses.^[16] This fact may attribute to more diseases among men or at least result in late presentations of diseases among males. It is also possible to deduce that men were less compliant with their pre-scope diet preparation and mechanical bowel preparation leading to a poorer quality of the colonoscopic study. Our research shows that there were more male subjects (55.5%) who underwent colonoscopy, compared to female patients

(44.5%) and there were no gender differences seen in bowel preparation.

In conclusion, our study shows that there is a significant association between timing of bowel preparation and the quality of colonoscopy. However, there was no association between age group, gender, and efficacy of bowel preparation.

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6. Declarations

6.1 Conflict of Interest

There is no personal or financial conflict of interest.

6.2 Financial support

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