

Split Versus Non-Split Morning Dosing Regimen for Assessment of Quality of Bowel Preparation for Colonoscopy

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ABSTRACT

Background: Different bowel preparation regimens are available. Currently we are giving the entire preparation on the day of colonoscopy. Multiple studies have shown splitting the regimen might improve the quality of bowel preparation with lesser side effects and better compliance. The study was done to compare the efficacy and tolerability of split bowel preparation regimen with non-split dosing regimen.

Methods: Single centered observational comparative study was done in a tertiary care hospital. One hundred ninety eight patients requiring elective colonoscopy were assigned to receive one of the two preparations (split versus morning) prior to colonoscopy. Main outcomes were bowel preparation quality and patient compliance and tolerability.

Results: There was no significant difference between the two regimen for the mean total Boston Bowel Preparation Scale (6.79VS 6.74,P value -0.777).Patient compliance was better for split dosing compared to single dosing (99 vs 5 p value-<0.001).There were more side effects in the single dosage compared to split dosing except for sleep disturbance which was more in split dosing.

Conclusions: The study found that split-dose and single dose polyethylene glycol solution for bowel preparation before colonoscopy had similar efficacy in the quality of bowel preparation. Split-dose polyethylene glycol appears to be superior to single-dose PEG for patient compliance and side effects.

Keywords: Boston bowel preparation scale; bowel preparation; colonoscopy; split dosage preparation

INTRODUCTION

Colonoscopy is used to diagnose and treat a variety of colorectal diseases.¹⁻³ Colonoscopy for screening have been shown to reduce colorectal cancer incidence and mortality.^{4,5} The success of a colonoscopy is determined by the quality of bowel preparation.⁶⁻¹⁰ A good colonoscopy ensures that mass lesions other than small polyps (less than 5 mm) are not overlooked by the preparation.¹¹

For bowel preparation before colonoscopy, polyethylene glycol (PEG) solution has been commonly used in regular 4-L split-dose or same-day regimens.¹²⁻¹³ The use of a split dosing regimen has shown to improve patient adherence and tolerance to bowel preparations.¹⁴⁻¹⁵

The primary aim of this study was to evaluate the efficacy of colon cleansing in patients undergoing colonoscopy, comparing the mode of administration, i.e., split versus

morning- only dose, using the Boston Bowel Preparation Scale. Patients' compliance and tolerance were assessed as secondary end points.

METHODS

Present study was observational comparative study. The study was approved by the institutional review board of National Academy of Medical Science, Bir Hospital Kathmandu

Between January 2020 and February2021,all patient above 18 years age planned for elective colonoscopy were included in the study. Exclusion criteria included- Patients with intense coronary disorder, congestive cardiovascular failure, significant angina, known or suspected renal impairment, known or suspected intestinal obstruction, or other comorbidities that may forestall colonoscopy.

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Patients found in the outpatient facility of our specialty as well as hospitalized patients who required elective colonoscopy were evaluated for enrolment in the study. 198 eligible patients were equally divided into two groups by an investigator who was not involved in colonoscopy. Patients were provided written instructions in a sealed envelope, for either regimen, by their gastroenterologists who was unknown to the bowel preparation regimen. Patients were advised on bowel preparation regimen along with dietary restrictions. The patients were advised not to eat indigestible food such as fruits, vegetables, or cereals for 3 days prior to colonoscopy. Patients were advised to take an early light dinner the day before the procedure. They were also advised to take a liquid diet the day before their colonoscopy, and only clear liquids orally after midnight until the procedure time. The morning preparation group were advised to consume one packet of PEG dissolved in 2 L of water on the morning of the colonoscopy (between 6 am and 7 am). The split-dose group were advised to dissolve one packet of PEG in 2 L of water and consume one-half of this, the evening before the day of the colonoscopy (between 6 pm and 7pm) and the other half on the morning of the procedure (4-6 hours before the procedure). Patients were advised not to discuss their bowel preparation with their endoscopist but to contact the receiving nurse if questions arises.. Drinking at least 75% of the preparation volume was regarded as proper amount of PEG taken for bowel preparation. Colonoscopies were performed between 8 am and 5 pm. Bowel preparation was scored by the same endoscopist performing the colonoscopy.

To assess the cleansing quality of the bowel preparations, the Boston Bowel Preparation Scale (BBPS) was used. The Boston Bowel Preparation Scale is classified as follows.¹⁰

- 0 Unprepared colon segment with mucosa not seen due to solid stool that cannot be cleared
- 1 Portion of mucosa of the colon segment seen, but other areas of the colon segment not well seen due to staining, residual stool and/or opaque liquid.
- 2 Minor amount of residual staining, small fragments of stool and/or opaque liquid, but mucosa of colon segment seen well
- 3 Entire mucosa of colon segment seen well with no residual staining, small fragments of stool or opaque liquid. The wording of the scale was finalized after incorporating feedback from three colleagues experienced in colonoscopy.

Each segment of the colon received a segmental score from 0 to 3, and these segment scores were summed for a total BBPS ranging from 0 to 9. Adequate bowel

preparation was defined as score of ≥ 2 for each location. The cleansing of the bowel preparation was compared using the mean score from both groups. .

Before the colonoscopy, a blinded investigator provided a questionnaire to the patients to assess compliance and tolerance for the procedure. The questionnaire contained following variables a) sleep disturbance-yes/no b) vomiting-yes/no c) abdominal pain-yes/no d) Bloating-yes/no e) ease of ingestion-yes/no f) willingness to repeat preparation-yes/no .This investigator was not involved in the colonoscopy or dividing the bowel preparation regimen

The information was obtained by interview method as per the proforma. The demographic profile of the patients like age, sex, indications of colonoscopy, tolerability and adverse events were recorded. The BBPS and colonoscopic findings were obtained from the colonoscopy reports of the patients and were recorded in the proforma.

Sample size was calculated with 95% confidence interval and 80% power of the test with the margin of error 10% and the prevalence rate of 50% as unbiased estimator) using the following formulae

Mean and standard deviation were calculated for numeric data. Frequency and percentage were calculated for categorical data. To compare, independent t-Test was used for numerical data. Chi square and fisher's exact test were used for categorical data as appropriate. The level of significance of test was set at 5%

RESULTS

This comparative observational study conducted between January 2020 to February 2021, included 198 patients planned for colonoscopy. Patients were divided equally into split and non split groups. The mean age of patients was 49 and 56% were male. The indications for colonoscopy were similar between two groups as shown in table 1.

Table 1. Primary indications of Colonoscopy.

| Indications | Non Split Dosage | Split Dosage | X ² Value | p value |
|-----------------------|------------------|--------------|----------------------|---------|
| Blood in stool | 30(30.3) | 31(31.30) | 0.024 | 0.878 |
| Pain abdomen | 36(36.4) | 25(25.5) | 2.714 | 0.990 |
| Change in bowel habit | 31 (31.3) | 28 (28.3) | 0.217 | 0.641 |
| Abnormal imaging | 15(15.2) | 29(29.3) | 5.727 | 0.017 |

| | | | | |
|--------|----------|----------|-------|-------|
| Others | 21(21.2) | 32(32.3) | 3.118 | 0.077 |
|--------|----------|----------|-------|-------|

The most common indication for colonoscopy was blood in stool (30%) and pain abdomen (30%). The most common colonoscopic finding was cecal polyp (17%) followed by colonic ulcer (15%). Colonoscopic findings were significantly higher in split regimen group as shown in table 2. Total procedural time was significantly shorter in split regimen group (33.12 vs 27.12, p < 0.001) as shown in table 3.

Table 2. Colonoscopy Findings of the participants.

| Colonoscopy Findings | Non Split Dosage | Split Dosage | χ ² Value | p value |
|----------------------|------------------|--------------|----------------------|---------|
| Ulcer | 10(10.1) | 20(20.2) | 3.929 | 0.047 |
| Polyp | 9(9.1) | 25(25.3) | 9.09 | <0.001 |
| Normal | 32(32.3) | 16(16.2) | 7.04 | 0.008 |
| Other Findings | 51(51.50) | 69(69.7) | 6.85 | <0.001 |

Table 3. Procedure time of the participants.

| | | X̄±SD | t value | P value |
|-----------------|-----------|------------|---------|---------|
| Insertion time | Non Split | 27.19±8.75 | 5.30 | <0.001 |
| | Split | 21.29±6.44 | | |
| Withdrawal time | Non Split | 6.28±0.75 | 0.97 | 0.332 |
| | Split | 6.18±0.70 | | |
| Total time | Non Split | 33.12±8.96 | 5.04 | <0.001 |
| | Split | 27.47±6.60 | | |

The two study groups did not show significant difference between the two regimen for the mean total BBPS (6.79 vs 6.74, P value -0.777). Between the two group there were no significant difference in BBPS for any segment left colon (2.32 vs 2.31, p value-0.896) transverse colon (2.20 vs 2.21, p value-0.9) right colon (2.28 vs 2.18, p-value -0.181) as shown in table 4.

Table 4. Quality of Bowel Preparation Using BBPS.

| | | X̄±SD | t-value | P-value |
|------------------|-----------|-----------|---------|---------|
| Left side colon | Non split | 2.30±0.57 | 0.13 | 0.896 |
| | Split | 2.31±0.50 | | |
| Transverse colon | Non split | 2.20±0.58 | 0.12 | 0.9 |
| | Split | 2.21±0.54 | | |
| Right colon | Non split | 2.28±0.59 | 1.34 | 0.181 |
| | Split | 2.18±0.46 | | |
| Total score | Non split | 6.79±1.40 | 0.28 | 0.777 |
| | Split | 6.74±1.07 | | |

Most patients found it easier to take the split dosage preparation as compared to the single dosage regimen (99 vs 5, p value < 0.001) and the difference was significant. Adverse events like abdominal pain, vomiting, bloating were significantly higher in the single dosage group while sleep disturbance was significantly higher in split dosage group (p value < 0.001) as shown in table 5.

Table 5. Patient compliance and Tolerance.

| Side Effects | Non split N(%) | Split N(%) | p-value |
|-----------------------------------|----------------|------------|---------|
| Abdominal pain | 9 (9.1) | 0 | 0.003* |
| vomiting | 5 (5.1) | 0 | 0.059* |
| Bloating | 17 (17.2) | 0 | <0.001* |
| Sleep disturbance | 0 | 28 (28.3) | <0.001* |
| Compliance | | | |
| Ease of ingestion | 5 (5.1) | 99 (100) | <0.001* |
| willingness to repeat preparation | 16 (16.2) | 95 (96) | <0.001* |

*Fischer exact test

DISCUSSION

Colonoscopy is useful procedure for treatment and diagnosis of colonic and terminal ileal disease. Colon preparations mostly due to their large volumes have been restricted by their tolerability. According to some studies as many as 38% of patients do not complete the preparation because of poor palatability and/or intolerance of such a large volume of solution to consume.¹⁶⁻¹⁷ Split preparation has been shown to be better than the conventional previous-evening preparation in terms of quality of bowel preparation and patient compliance.¹⁸⁻²² The split-dose regimen is also approved by the American College of Gastroenterology and is considered an optimal choice for colonoscopy.²³

In this study we found that the bowel preparation quality was similar between split and nonsplit regimen of PEG as assessed by the BBPS. The study showed that the side effect were more in the single dosing. Compliance and tolerance was better in the split dosing group

Based on our results, split-dose PEG offers major benefits in clinical practice because it relates to better patient compliance (which potentially could improve bowel preparation quality) lesser side effects. Patients receiving the split-dose PEG bowel preparation also had an increased willingness to repeat the same preparation (which may improve follow-up colonoscopy compliance)

There are several limitations of this study. The number

of patient was small and it included homogenous population. This study was carried out in a single hospital, the results may not be generalizable to all patients undergoing colonoscopy

CONCLUSIONS

Our study did not find the difference in the quality of bowel preparation between the split dosing and non-split (morning) dosing regimen. However we have found that the split dosing had lesser side effect, better compliance and willingness to repeat the procedure

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Competing interests: None declared

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