

Utility of Simethicone as a Terminal Adjunct to Standard Bowel Preparation for Colonoscopies - A Retrospective Cohort Study

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Abstract

Peutz-Jeghers syndrome is an autosomal dominant hamartomatous polyposis involving gastrointestinal tract associated with mucocutaneous hyperpigmentation involving lips, buccal mucosa, hand and feet and predisposing the patient to various extraintestinal and intestinal cancers. This article includes case report of a 12 year female diagnosed with intussusception due to Peutz-Jeghers Syndrome. This patient underwent emergency exploratory laparotomy followed by resection of about 30 cm necrosed, gangrenous ileum about 50cm proximal to ileocecal junction and then ileoileal anastomosis performed. This patient had pigmented hypermelanotic macules over lower lip, buccal mucosa and face. This case was thoroughly examined and found to be a rare case of intestinal obstruction in paediatric patients.

Key words: Peutz-Jeghers-syndrome; intussusception; hamartomatous polyposis.

Introduction

Colorectal cancer is amongst the top cancers prevalent in an age-standardized population. This has allowed colonoscopies to become widely available for use for both screening and diagnostics in the general population. The cornerstone of a good

colonoscopy and avoidance of missed lesions such as small polyps that of good bowel preparation which enhances visibility. While credited with being the gold standard for colonic evaluation with a high degree of sensitivity and specificity, it can only be utilized as such if there is adequate colonic visibility.² Yet, 20-25% of colonoscopies have been reported to have poor bowel preparation.³⁻⁶

Older age, male sex and the presence of underlying diseases can prevent compliance to the bowel preparation that has been prescribed, increasing the chances of encountering a poorly prepared bowel intra-procedurally.⁶ Advanced age is associated with more co-morbidity, along with which is polypharmacy that may contribute to constipation and increased colonic transit time. Patients with cardiac or renal conditions may be on fluid restriction protocols, and frequent toileting when the bowel preparation is commenced may lead to pre-mature abandonment of any preparatory regime prescribed. The issues faced by elderly with regard to compliance and even complications related to bowel preparation highlights them as a niche population who require special care⁷, although most institutions adopt a standard preparatory regime. Significantly, this is a population where appropriate and adequate screening would positively correlate with detection and treatment outcomes.

Endoscopists have different solutions, volumes and combinations of bowel preparation that are offered to patients pre-procedure. This is often

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determined by the institution's protocol and availability of the cleansing agent for prescription. In the 2019 updated guideline on bowel preparation for colonoscopy by the European Society of Gastrointestinal Endoscopy (ESGE), the addition of oral simethicone to bowel preparation was recommended, albeit a weak recommendation with moderate quality evidence¹. However, there has been no consensus regarding the optimal timing for the addition of oral simethicone to the bowel preparatory regime. Our retrospective study aimed to determine if adding simethicone as an adjunct in the final stages of bowel preparation resulted in better colonic evaluation.

Methodology

A retrospective data analysis of 278 patients from 1st October 2019 to 29th February 2020 was collected and analyzed as part of a department audit by the Department of General Surgery in Changi General Hospital Singapore, and approved by a local Institutional Review Board.

The inclusion criterion for the study was any patient above the age of 18 who had consented for colonoscopy, regardless of indication. 16 patients were excluded on grounds of having a history of a colectomy, suboptimal documentation invalidating data use, variant bowel preparatory regime, newly diagnosed tumors (requiring biopsy, tattoo, evaluation), and rubber band ligation of piles (See Figure 1).

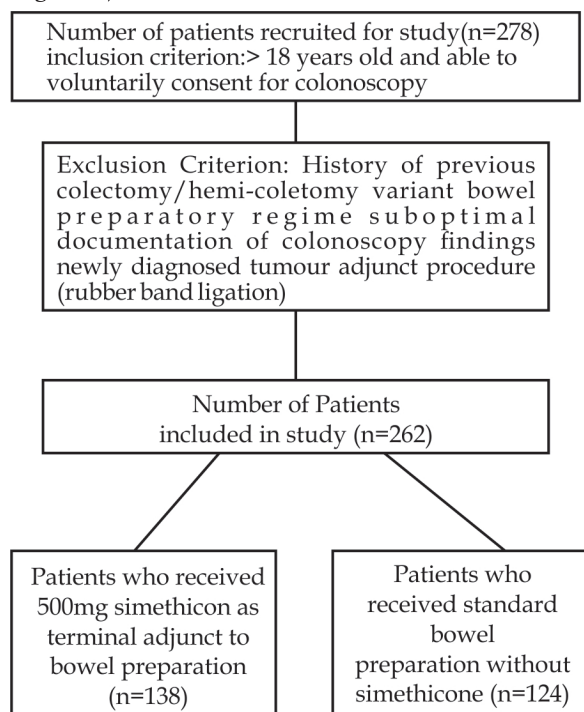


Fig. 1: Inclusion and Exclusion Criterion for study.

The practice of adding simethicone as an adjunct to the bowel preparation was only initiated in a phased manner from October 2019. There were also a number of patients who had been electively listed for colonoscopy prior to initiation of the study. As such, there was a composite of patients who underwent colonoscopy during the data accrual period belonging to either the simethicone (n=138) or standard bowel preparatory wing (n=124) and comparison of outcome measures was performed on these two groups.

All patients received a staged bowel preparation regime of 2 litres PEG solution commencing the evening prior to the colonoscopy followed by 1 litre of PEG solution at 6a.m. on the morning of the procedure. For patients in the simethicone arm, 5mls (500mg) of simethicone was to be added and consumed with the last cup of PEG on the morning of the procedure. The endoscopist was not informed if the patient had taken simethicone at any point pre, intra- or post-procedurally to avoid biased reporting. 23 scopes were performed by junior residents, 44 by senior residents and 195 by senior endoscopists (2 consultants, 2 senior consultants). Endoscopy sessions ran throughout the day and the patients may have been in the a.m. or p.m. session. Withdrawal time was counted as the time taken from the visualization of the appendiceal lumen until the end of the procedure. Colonic flushing was routinely performed with water. In the event of significant bubbles encountered, colonic flushing was occasionally supplemented with a simethicone dilution at the endoscopist's discretion. All polyps encountered were photographed using normal white light endoscopy and narrow band imaging (NBI). Polypectomy was performed via snare polypectomy or biopsy forceps as per the endoscopist preference.

7 performing doctors were involved in performing the colonoscopies, ranging from junior residents to senior endoscopists. All senior endoscopists were accredited, and a senior endoscopist supervised all residents. Documentation incorporated the adequacy of bowel preparation (good, fair, poor, very poor, suboptimal), Boston Bowel Preparation Scale (BBPS) scoring, bubbles encountered (significant, moderate, minimal), polyps / lesions and any diagnostic or therapeutic procedure performed (e.g. polypectomy, biopsy). This report was then retrospectively reviewed with regard to the primary outcome measure of polyp detection rate, and secondary measures of withdrawal time and bubbles encountered to evaluate the effectiveness of adding simethicone as a terminal adjunct to bowel preparation. Only polyps identified in the

right colon (caecum and ascending colon) were taken into account for the analysis for polyp detection rate. 5ml (500mg) of simethicone was used as an easily administrable volume to enhance patient compliance. In addition, MF Madhoun et al demonstrated in a recent meta-analysis that the results were superior in higher doses of simethicone (>478mg).⁸ All patients underwent pre-procedure counselling by a nurse with regard to how to take their bowel preparation and a clinic hotline was available for further clarification. No patient in this study was pre-operatively stratified to belong to a high scope risk category by cardiology, none had heart failure or end stage renal disease.

Results

A total of 278 patients underwent colonoscopies during the study period. 16 patients were excluded for various reasons such as a history of right hemicolectomy, suboptimal documentation or received a different bowel preparation regime. The final analysis included 262 patients with 124 patients in the non-simethicone arm and 138 in the simethicone arm. The median age of patients in the non-simethicone arm was 60, and 61 in the simethicone arm.

260 patients were screened for right sided polyps for the primary outcome measure of polyp detection. 123 of these patients belonged to the non-simethicone arm, while 137 belonged to the simethicone arm. In the non-simethicone arm 18 patients had polyps detected (14.6%), while in the simethicone arm, 37 patients had polyps detected (27.0%). Patients receiving simethicone were more likely to have polyps identified in the right colon OR 2.16 (95% CI 1.15 - 4.04, $p < 0.05$). Patients who received simethicone were also more likely to have a higher number of polyps identified. The average number of right-sided polyps identified in the non-simethicone arm was 0.17 ± 0.08 , while this was 0.33 ± 0.10 in the simethicone group ($p = 0.01$). The study population was also evaluated for the correlation between simethicone and the severity of bubbles encountered in the right colon. Patients in the simethicone arm (69.0%) were more likely to have no bubbles compared to those in the no simethicone arm (12.1%). Conversely, the proportion of the sample population found with significant amount of bubbles were 1.4% versus 33.3% respectively when comparing the simethicone versus no simethicone arms. The addition of simethicone was found to have a significant correlation when comparing the severity of bubbles (none, mild, moderate, significant) across both arms ($p < 0.01$). Furthermore, statistical analysis showed the

simethicone arm was drastically more likely to have none or minimal bubbles (OR 15.84 CI 5.07 - 49.45, $p < 0.01$), (Figure 2).

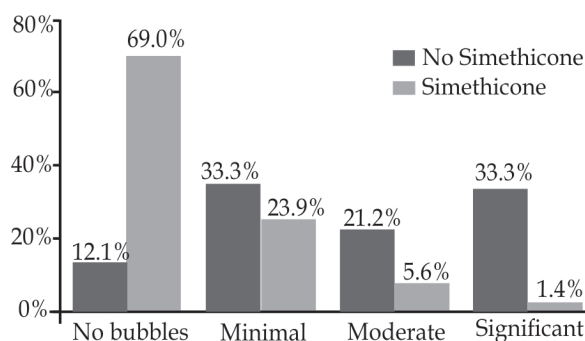


Fig. 2: Comparison of extent of bubbles encountered with simethicone versus non-simethicone based bowel preparatory regimes.

The average withdrawal time was also found to be significantly shorter in the simethicone arm versus those who did not receive simethicone. The average time for the simethicone arm and the non-simethicone arm was 14 (5 - 49) minutes and 16.4 (6 - 53) minutes respectively ($p < 0.05$), (Figure 3).

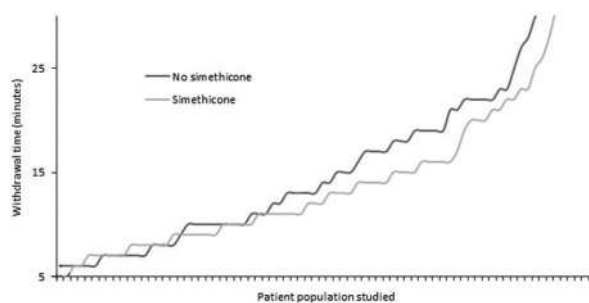


Fig. 3: Comparison of withdrawal times in the simethicone versus non-simethicone arms.

Discussion

This retrospective cohort study strongly suggests that adding simethicone to the bowel preparation protocol on the morning of the procedure, taken with the last cup of PEG, is beneficial in enhancing colonic visualization. Patients who received simethicone are statistically more likely to have more polyps identified; fewer bubbles encountered and reduced withdrawal time.

A poorly prepared colon will compromise visibility, resulting in endoscopists having to spend more time trying to irrigate the colon intra-procedurally for adequate visualization. This is time-consuming, adds to procedural related fatigue for the endoscopist, lengthens procedure time and time under sedation for patients. It also increases patient discomfort and does not guarantee success, with missed lesions becoming an inevitable

possibility of a poorly prepped study. Guidelines suggest three intrinsic properties of good bowel preparation that it should be safe, palatable and efficacious.⁹⁻¹¹ The addition of simethicone to staged bowel preparation with PEG is a simple and effective measure in helping to enhance colonic visibility in the above manner, contributing to a better outcome. Most colonic polyps encountered are also sub-centimeter and these may be camouflaged in a poorly prepped colon or one clouded with significant bubbles, and simethicone with bowel preparation has shown itself to be an easy adjunct to counteract this.

Simethicone itself is a mixture of polymethyl siloxanes and hydrated silica gel. It is an anti-foaming-agent that works on the premise of reducing the surface tension of air bubbles postulated to form from the detergent activity of bile salts¹², allowing them to coalesce into larger ones that may be passed out more easily by flatulence.¹³ It is not systemically absorbed and hence has a good safety profile¹⁴, does not significantly increase the volume of solution that the patient has to drink, is easy to administer, cheap, and easily available. Possible side effects of use reported include that of nausea, vomiting and mild diarrhoea¹⁴ although in our clinical experience these were not encountered.

Furthermore, loose watery stool in the context of bowel preparation was to be expected. While simethicone also may be used as part of an endoscopic flushing intra-procedurally, this may lengthen the time of the procedure¹³ and is not routinely performed in our centre anymore due to crystallization within the channel and channel occlusion encountered with some patients. There has also been association with endoscopy-related infections.¹⁵ This makes per oral simethicone a good adjunct to bowel preparation.

While our results are of statistical significance, limitations of our study being formulated from a retrospective database analysis in a single center and relatively small patient population must be acknowledged. The colonoscopy reports in the authors' center are documented by an assistant (junior doctor) as the findings are verbalized by the endoscopists. The reports are then vetted by the endoscopists after the procedure.

However, inadvertent errors in the transcription process are an inherent limitation with this method.² patients were discounted from the simethicone arm due to unrealistic withdrawal times that were attributed to a scribing error.

Only 152 of the 262 patients included had data

captured on the extent of bubbles encountered intra-procedurally. Furthermore, it was not possible to collect objective data on the severity of the bubbles due to a lack of an accredited or standardized grading scale. This was a subjective assessment according to each individual endoscopist's discretion on bubbles encountered.

Finally, there has been much reporting on simethicone in existing studies as a useful adjunct though optimal dosing and timing remains debated. Our study aimed to evaluate the efficacy of it as a terminal adjunct. As such, there can be potential room for further study comparing simethicone added at the start versus the end of the bowel preparatory regime as a prospective study to further clarify this utility.

Conclusion

We conclude that the addition of 500mg of simethicone to the last cup of PEG in a staged bowel preparatory procedure pre-colonoscopy is a safe and efficacious means of improving colonoscopy outcomes. The addition of simethicone has proven to reduce the severity of bubbles encountered and shorten the withdrawal time of the procedure. Further prospective randomized control studies comparing the timing for the addition of simethicone may enhance the significance of the data gathered in this study.

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