Video capsule endoscopy: is bowel preparation necessary?

Carmine Catalano,[1] Rafael Antonio Ching Companioni,[2] Pouya Khankhanian,[3,4] Neil Vyas,[1] Ishan Patel,[1] Raghav Bansal,[2] Aaron Walfish[2]

[1]Department of Internal Medicine, Icahn School of Medicine at Mount Sinai (Elmhurst Program), Elmhurst Hospital Center, Elmhurst, New York, USA
[2]Department of Gastroenterology, Icahn School of Medicine at Mount Sinai (Elmhurst Program), Elmhurst Hospital Center, Elmhurst, New York, USA
[3]Center for Neuroengineering and Therapeutics, University of Pennsylvania, Pennsylvania, USA
[4]Department of Neurology, University of Pennsylvania, Pennsylvania, USA

Correspondence to
Dr Carmine Catalano, Department of Internal Medicine, Icahn School of Medicine at Mount Sinai (Elmhurst Program), Elmhurst Hospital Center, 79-01 Broadway, Elmhurst, New York, NY 11373, USA; Carmine.Catalano13@gmail.com

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ABSTRACT

There is no standardized protocol for bowel preparation prior to video capsule endoscopy, although one is strongly recommended. The purpose of our study was to see if there was a statistical significance between small bowel mucosal visualization rates for those who received bowel preparation and those who did not. We retrospectively analyzed all patients who had a video capsule endoscopy from August 2014 to January 2016 at a tertiary care center. All patients fasted prior to the procedure. Bowel preparation when used consisted of polyethylene glycol. A long fast consisted of 12 or more hours. The grading system used to assess the small bowel was adapted from a previously validated system from Esaki *et al*. Statistical analyses were performed using Fisher's exact test or Welch's 2-sample t-test and statistical significance was present if the p value was ≤0.05. 76 patients were carried forward for analysis. Small bowel mucosal visualization rates were similar between those who received bowel preparation and those who did not (92.5% vs 88.9%, p=0.44). Small bowel mucosal visualization rates were significantly better in those patients who had a long fast compared with those who had a short fast (97.7% vs 81.3%, p=0.019). Our study demonstrates that the addition of bowel preparation prior to video capsule endoscopy does not significantly improve small bowel mucosal visualization rates and, in addition, there is a statistically significant relationship between increased fasting time and improved small bowel mucosal visualization. A prolonged fast without bowel preparation might be satisfactory for an adequate small bowel visualization but further randomized, prospective studies are necessary to confirm these findings.

Significance of this study

What is already known about this subject?
- Fasting is necessary prior to video capsule endoscopy.
- Ideal fasting time is controversial.
- Experts recommend bowel preparation prior to video capsule endoscopy, but there is no standard guideline.

What are the new findings?
- Increased small bowel visualization rates with increased fasting time (12 hours or greater).
- No significant difference in small bowel visualization rates among patients who received bowel preparation and those who did not.
- Bowel preparation may not be necessary.

How might these results change the focus of research or clinical practice?
- A prolonged fast without bowel preparation might be satisfactory for an adequate small bowel visualization but larger, randomized, prospective studies are necessary to confirm these findings.

INTRODUCTION

Developed in 2001, video capsule endoscopy (VCE) is another tool that gastroenterologists can include in their armamentarium to evaluate the small bowel in a non-invasive way. VCE has many indications but it is most commonly used for evaluation of occult gastrointestinal bleeding after an unrevealing upper endoscopy and colonoscopy. Other indications include the diagnosis and evaluation of inflammatory bowel disease, malabsorption syndromes such as celiac disease, or suspicion of small bowel malignancy.[1–3] In order to improve small bowel mucosal visualization rates, patients are asked to fast prior to the procedure and a bowel preparation (BP) may be prescribed as well. The most commonly prescribed BP and the one that appears to offer the most improvement in small bowel mucosal visualization rates is polyethylene glycol (PEG). When PEG-based regimens are used, the use of 2 L of PEG versus 4 L has not been shown to be inferior. It is also common for gastroenterologists to administer antifoaming agents such as simethicone prior to the procedure, as this has also been shown to improve visualization rates.[4 5] Ideal fasting time as well as the need for BP is controversial and based on expert opinion rather than standard guidelines. The primary goal of our study is to prove our hypothesis that small BP significantly improves small bowel mucosal visualization rates prior to VCE (table 1).

METHODS

Local Institutional Review Board (IRB) approval, including a waiver of the requirement

Table 1 Descriptive data for patients who underwent VCE

Number of Patients	76
Males	32 (42%)
Females	44 (58%)
Average age	58.7
Race	
White	4 (5%)
African-American	9 (12%)
Hispanic	44 (55%)
Asian	21 (28%)
BMI	
<18.5	2 (3%)
18.5 to 29.9	51 (67%)
>30	23 (30%)
Diabetes	25 (33%)
Neurological disease	2 (3%)
Anticholinergic medications	4 (5%)
Prior GI surgery	13 (17%)
Bowel preparation	
PEG	40 (53%)
No PEG	36 (47%)
Fasting time	
12 hours or >mean	44 (58%) 12.6 hours
<12 hours	32 (42%)
Mean	10.9 hours

BMI, body mass index; GI, gastrointestinal; PEG, polyethylene glycol; VCE, video capsule endoscopy.

to obtain informed consent, was procured prior to the start of the study. Using our electronic medical records, we retrospectively analyzed all patients who had a VCE from August 2014 to January 2016 at a tertiary care center. All patients fasted prior to the procedure and were placed on a clear liquid diet prior to fasting. They received simethicone prior to the procedure. They were prescribed PEG for BP and asked to fast for 12 hours prior to the procedure. On the day of the procedure, patients were asked if they underwent the prescribed BP and for how long they fasted. This information was entered into our electronic medical records. The same attending from our gastroenterology department personally reviewed all images from the VCEs. The reviewer was blinded to the patient's clinical data including fasting time and the use of BP. The grading system for this study was derived from a previously validated system from Esaki *et al*.[6] The fluid transparency and mucosal invisibility of the entire small bowel was inspected, assessed, and graded by reviewing the images at low speed (4 frames/s). If the predominant grade of fluid transparency and mucosal invisibility was either grade 1 or 2, the small bowel mucosal visualization was considered adequate. If the predominant grade was either grade 3 or 4, it was considered inadequate. The grading system is outlined in table 2. Small bowel mucosal visualization rates were compared between patients with regard to BP, fasting time, obesity, diabetes, prior gastrointestinal surgery, neurological disease as well as the use of anticholinergic medications. We also calculated gastric transit time (GTT), small bowel transit time (SBTT), and cecal visualization (CV). Statistical analyses were performed using Fisher's exact test for all comparisons except for transit times where Welch's two-sample t-test was used. Results were considered statistically significant if the p value was ≤0.05.

Table 2 Grading system for the assessment of visual quality

Fluid transparency	
Grade 1	Clear fluid without obscuring vision
Grade 2	Slightly dark fluid minimally obscuring vision
Grade 3	Opaque fluid partially obscuring vision
Grade 4	Turbid fluid severely obscuring vision
Mucosal invisibility (%)*	
Grade 1	<5
Grade 2	5 to 15
Grade 3	15 to 25
Grade 4	>25

*The percentage indicates the proportion of length of time of video image in which more than 50% of visualization and interpretation was disturbed.

RESULTS

A total of 80 patients had VCE during the 18-month study period. Three patients were excluded due to a history of gastroparesis and one patient was excluded for capsule interference from a pacemaker. A total of 76 patients were carried forward for analysis. The mean age was 58.7 years. There were 32 male patients (42.1%) and 44 female patients (57.9%). There were 25 patients with diabetes (32.9%). There were 23 patients with obesity (30.3%). Despite all patients being prescribed and advised to undergo BP, not all complied. Forty patients chose to undergo BP with PEG (52.6%) and 36 patients declined BP (47.4%). Despite all patients being advised to fast for 12 hours prior to the procedure, not all patients complied. There were 44 patients who fasted for 12 hours or more (57.9%) and 32 patients who fasted for <12 hours (42.1%). The 12-hour fasting time was a recommendation from the manufacturer of the video capsule, but as long as the patient fasted for a minimum of 8 hours they were allowed to undergo VCE and included in this study. Small bowel mucosal visualization rates were similar between those who received BP and those who did not (92.5% vs 88.9%, p=0.44). In the subgroup of patients with obesity, small bowel mucosal visualization rates were generally lower, but were similar between those who received BP and those who did not (52.6% vs 47.4%, p=0.50). Subgroup analyses in patients with diabetes, patients with prior gastrointestinal surgery, patients with neurological disease, and patients taking anticholinergic medications revealed no significant differences in small bowel mucosal visualization rates between those who received BP and those who did not. GTT, SBTT, and CV were not statistically different between those who received BP and those who did not. Small bowel mucosal visualization rates were significantly higher in those patients who had a long fast compared with those who had a short fast (97.7% vs 81.3%, p=0.019, see table 3). In the subgroup of patients with obesity, small bowel mucosal visualization rates were again higher in those patients who had a long fast compared with those who had a short fast (68.4% vs 31.6%, p=0.025, see table 3). Subgroup analyses in patients with diabetes, prior gastrointestinal surgery, neurological disease,

Table 3 Adequate bowel visualization based on parameter for those with and without bowel preparation prior to VCE

Parameter	Bowel preparation N (%)	No bowel preparation N (%)	Difference (p value)
Bowel preparation alone	37 (92.5)	32 (88.9)	0.440
Obese	10 (52.6)	9 (47.4)	0.499
Diabetes	14 (93.3)	9 (90.0)	0.649
Prior GI surgery	9 (100)	2 (50.0)	0.077
Neurological disease	1 (100)	1 (100)	1
Anticholinergic medication	1 (100)	3 (100)	1
Cecal visualization	34 (85.0)	32 (88.9)	0.368
GTT	32.14 min	29.64 min	0.693
SBTT	251.22 min	261.88 min	0.588

GI, gastrointestinal; GTT, gastric transit time; N, number of patients; SBTT, small bowel transit time; VCE, video capsule endoscopy.

or those taking anticholinergic medications revealed no significant association between small bowel mucosal visualization rates and fasting time. GTT was significantly shorter in patients who had a long fast compared with those who had a short fast (22.37 vs 43.09 min, p=0.004). There was no significant difference in SBTT or CV between patients with a long fast compared with those without (table 4).

DISCUSSION

Prior to VCE, small bowel evaluation was extremely difficult due to its shear length and tortuosity. VCE by some is still considered a 'new' technology; however, it has been around for nearly 15 years and guidelines regarding small BP prior to the procedure are still lacking. The manufacturer only recommends a 24-hour intake of clear liquids followed by a 24 fast prior to the procedure.[7] The addition of small bowel cleansing agents is left to the discretion of the individual endoscopist and based on their prior experiences as well as expert opinion. There are numerous studies and meta-analyses advocating for the use of bowel cleansing agents. In addition to a clear liquid diet and fasting, the use of PEG over other cathartics seems to be the agent of choice. The use of 2 L of PEG appears not to be inferior to the use of 4 L. Unlike prokinetic agents, antifoaming agents have also been shown to increase small bowel mucosal visualization rates.[8 9] Our study compares fasting alone to the current 'standard' of BP (2 or 4 L of PEG plus simethicone) and has found no statistically significant difference in small bowel mucosal visualization rates among the two. There was a statistically significant increase in small bowel mucosal visualization rates for those patients who underwent a fasting time of at least 12 hours when compared with those patients who fasted for <12 hours, regardless of BP, and this was also demonstrated in our obese population. Small BP is not entirely benign. Common side effects include nausea, vomiting, and abdominal discomfort. These burdens may come without adding any increased benefit for the endoscopist or the patient. Since a small BP may not definitely improve direct mucosal visibility, further thought should be given before prescribing this to all patients. Several limitations were present in this study. Owing to a small sample size and lack of power, there may have been a statistically significant difference in small bowel mucosal visualization rates and BP that was not seen. Recall bias must also be taken into account as patients were asked if they underwent BP and for how long they fasted. The patient will likely be able to recall if they underwent BP but may not be as accurate regarding the duration of their fast. Another limitation present with this study as well as prior studies is that there is no uniform grading system to assess the quality of bowl preparation prior to VCE. It will be difficult to determine the need for small BP until a universally accepted and properly validated grading system becomes available.[10]

Table 4 Adequate bowel visualization based on parameter for those with a long fast versus a short fast prior to VCE

Parameter	Long fast (12 hours or more) N (%)	Short fast (<12 hours) N (%)	Difference (p value)
Fasting time alone	43 (97.7)	26 (81.3)	0.019
Bowel preparation			
PEG	27 (96.4)	10 (83.3)	0.209
None	16 (100)	16 (80)	0.082
Obesity	13 (68.4)	6 (31.6)	0.025
Diabetes	14 (100)	8 (72.7)	0.111
Prior GI surgery	6 (100)	5 (71.4)	0.269
Neurological disease	1 (100)	1 (100)	1
Anticholinergic medication	3 (100)	1 (100)	1
Cecal visualization	37 (84.1)	28 (87.5)	0.388
GTT	22.37 min	43.09 min	0.004
SBTT	257.25 min	255.27 min	0.918

GI, gastrointestinal; GTT, gastric transit time; N, number of patients; PEG, polyethylene glycol; SBTT, small bowel transit time; VCE, video capsule endoscopy.

CONCLUSION

The addition of BP prior to VCE is controversial in whether it significantly improves small bowel mucosal visualization rates, and our study refutes any additional benefit. Our study does show a statistical significance between increased fasting time and improved small bowel mucosal visualization rates. A prolonged fast without BP might be satisfactory for an adequate small bowel visualization but larger randomized, prospective studies are necessary to confirm these findings.

Competing interests None declared.

Ethics approval Mount Sinai.

Provenance and peer review Not commissioned; externally peer reviewed.

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