

Bowel preparation for the total colonoscopy by 2,000 ml of balanced lavage solution (Golytely) and sennoside

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Summary: One of disadvantages of the Golytely preparation is that examinees have to drink as much as 4,000 ml of Golytely. To overcome this disadvantage, we designed a modified preparation regimen in which examinees have to drink only 2,000 ml of Golytely by taking sennoside orally. Bowel preparation was carried out in 297 examinees by this modified method. Examinees ate their usual diet and took 36 mg of sennoside orally on the night before the examination. On the day of the examination, the examinees drank a total of 2,000 ml of Golytely. No severe complications were noted and 97% of the examinees were able to drink the dose of 2,000 ml. Subjects who had also experienced bowel preparation by the modified method of Brown were asked to compare the two regimens, and only 1% preferred Brown's method while 73% preferred bowel preparation by our Golytely method. The result of bowel preparation by this method was excellent or good in 90 to 97% of the subjects at all sites in the colon and rectum. We conclude that bowel preparation for total colonoscopy using 2,000 ml of Golytely and sennoside is superior because it is highly acceptable to the examinees and provides excellent gut irrigation. *Gastroenterol Jpn* 1992;27:728-733.

Key words: bowel preparation; Golytely; polyethylene glycol; sennoside; total colonoscopy.

Introduction

Recently, the incidence of colorectal cancer has increased in Japan. Preparation of the bowel for barium enema and total colonoscopy has generally been performed by the modified method of Brown so far. Examinees often complain that the examination itself is not so very painful but that the bowel preparation is very troublesome. Problems with the method of bowel preparation appear to be one factor which still limits the use of barium enemas and total colonoscopy.

Davis et al.¹ developed a new method for bowel preparation involving the use of a polyethylene glycol electrolyte lavage solution (Golytely) which is non-absorbable and non-secretory. Bowel preparation is possible on the day of the examination by this method. Many papers have reported that this

method has no side effects and that it achieves very good gut irrigation. However it has the major disadvantage that examinees must drink a large amount of the bowel preparation solution (@4,000 ml). Accordingly, beginning in September 1988 we modified the original method so that examinees drank only 2,000 ml of Golytely by taking sennoside orally.

Materials and Methods

Using our modified preparation regimen, 297 total colonoscopies (219 male, 78 female) were performed in our hospital. In this study, all bowel preparations were performed by our modified Golytely regimen instead of the conventional Brown's method. Their ages ranged from 15 to 85 years old, and the mean age was 57.

Table 1. Bowel preparation for total colonoscopy using Golytely

1. The day before the examination
1) Normal diet
2) A dose of 36 mg of sennoside is taken orally before retiring
2. The day of the examination
1) Fasting from the morning
2) Examinees drink Golytely in the morning
3) Examinees drink 200 to 250 ml of Golytely at intervals of 15 to 20 minutes
4) Examinees drink 2,000 ml of Golytely in total

The method of bowel preparation using Golytely is shown in **Table 1**.

The contents of Golytely are shown in **Table 2**. Examinees completed a questionnaire about the taste, the volume of Golytely, problems during drinking Golytely and a comparison with Brown's method. Five examiners participated in this study. Examiners completed a questionnaire concerning foam in the colorectum, peristalsis of the colorectum, the efficacy of gut irrigation, and the safety, and usefulness of Golytely.

Results

No severe side effects were noted in any subject. Of the 297 examinees, 177 (60%) filled out questionnaires. Examiners completed questionnaires in 159 out of 297 examinations (54%).

Only 1% of the examinees replied that the solution had a "bad taste" and 66% had no problem with the taste (**Figure 1**). Only 3% of the examinees could not drink the entire 2,000 ml of Golytely, which 61% had no problem drinking the required quantity (**Figure 1**). During the drinking of Golytely (**Figure 2**), 1% of the examinees complained of abdominal pain, 10% experienced chills or nausea, and 24% noted abdominal fullness. However 54% of the examinees had no complaints.

We asked 88 examinees who had previously experienced bowel preparation by the modified method of Brown to compare the two regimen (**Figure 2**). Only 1% preferred Brown's method and 73% preferred our Golytely regimen.

The evaluation of our Golytely method by the

Table 2. The composition of Golytely

Components	Weight
Polyethylene glycol 400	118 g
Na ₂ SO ₄	11.37 g
NaHCO ₃	3.37 g
NaCl	2.93 g
KCl	1.485 g
Distilled water*	

*Measured up to final volume of 2,000 ml.

examiners showed that with regard to foam in the colorectum, there was no problem in 85% of the examinations, and there was no problem in 92% with regard to peristalsis of the colorectum during the examination (**Figure 3**).

The effectiveness of gut irrigation in each part of the colorectum is shown in **Figure 4**. No examinees had poor bowel preparation when using our Golytely method and excellent or good irrigation was achieved in 90–97% of examinees at each location in the colorectum. There was a tendency for better irrigation to be achieved in the proximal colon compared with the distal colon.

The overall evaluation of our Golytely method is shown in **Figure 5**. Gut irrigation was excellent or good in 91% of the examinations and there were no problems regarding safety. The regimen was rated as very useful or useful in 92% of the examinations.

Discussion

Preparation for examination of the upper gastrointestinal tract is very easy. A normal diet can be taken until the day before the examination and patients only have to fast on the morning of the examination itself. Partly because of the simplicity of the method of preparation, in Japan examination of the upper gastrointestinal tract has become widespread and an increasing number of gastric and esophageal cancers have thus been detected at an early stage.

For examination of the colorectum, there are three main methods available, flexible sigmoidoscopy (FS), total colonoscopy and barium enema.

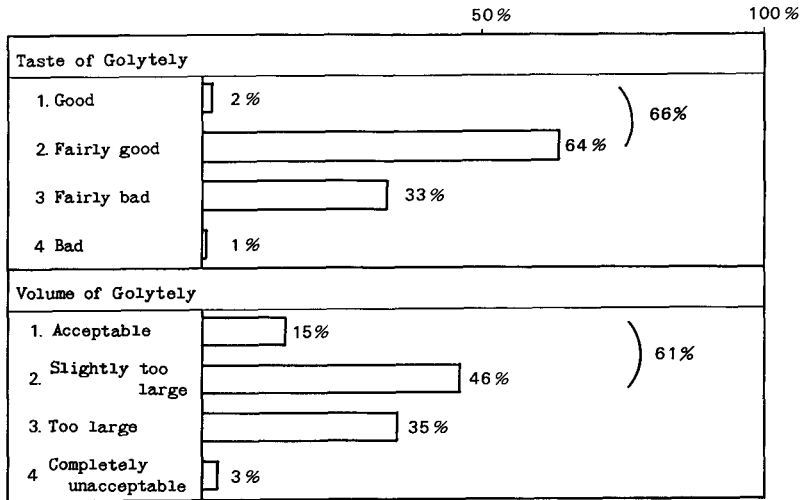


Figure 1. Evaluation by the examinees (1).

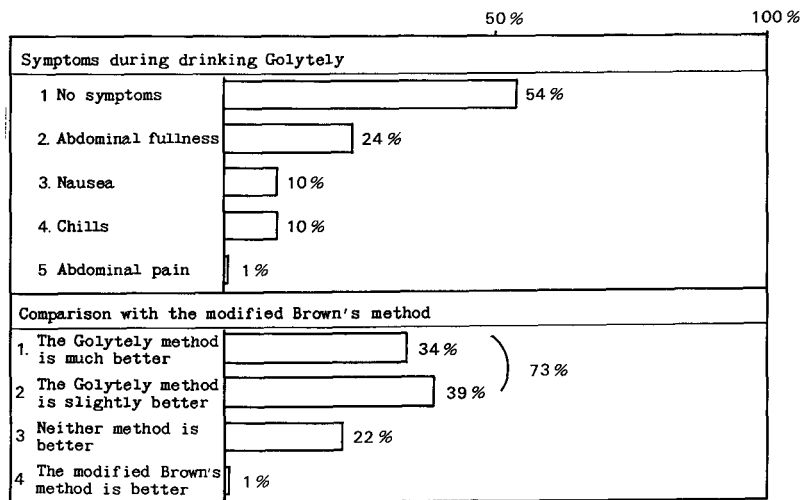


Figure 2. Evaluation by the examinees (2).

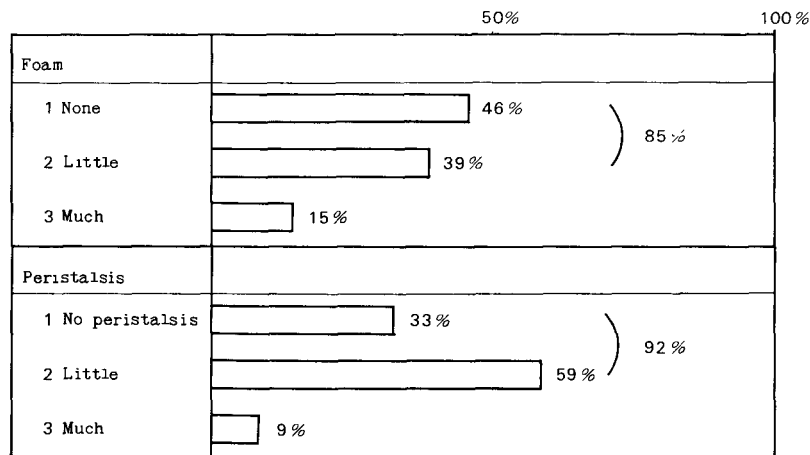


Figure 3. Evaluation by the examiners.

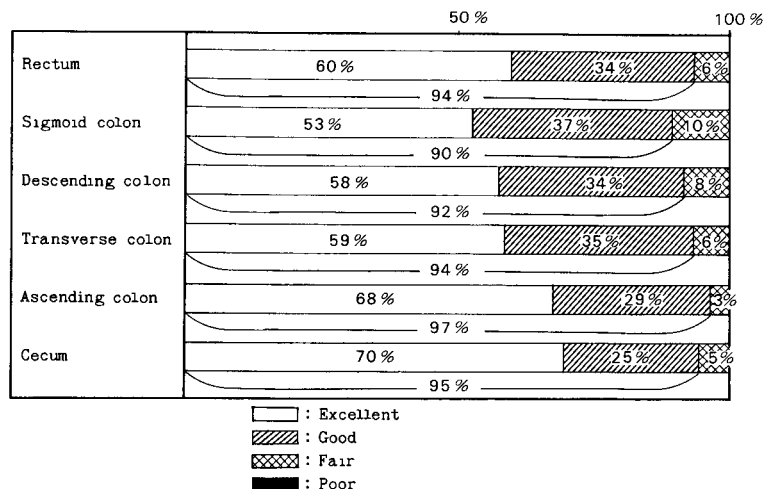


Figure 4. The effectiveness of gut irrigation in each part of the colorectum.

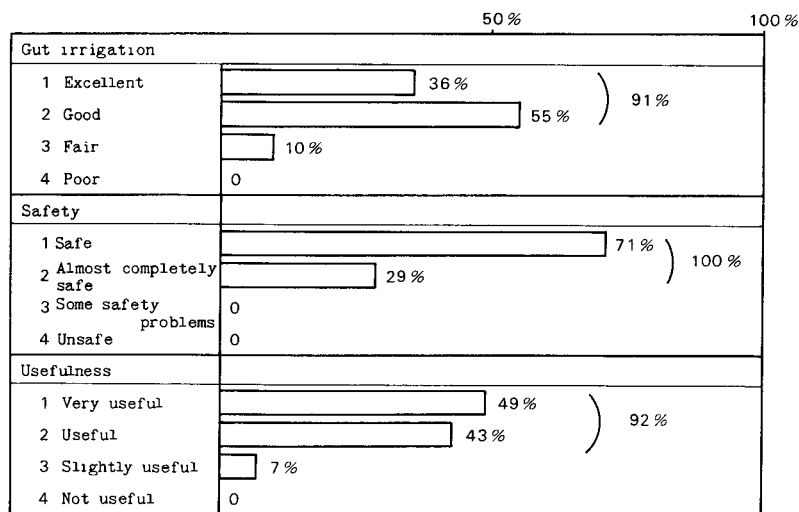


Figure 5. Overall evaluation of our Golytely bowel preparation method.

By FS, we can directly observe the mucosa of the distal colon and the rectum where colorectal carcinoma commonly occurs. The preparation of FS is very easy and the technique of FS is not difficult.

However we often have to examine the total colon and a tendency for the proximal migration of colorectal cancer has also been reported^{2,3}. The method of preparation for examination of the total colon by total colonoscopy or barium enema has generally been the modified method of Brown in Japan.

At the authors' institution the examinee takes a special low-residual diet from the morning of the

day before the examination and also takes laxatives (magnesium citrate and sodium picosulfate) on the night before the examination.

Individuals who have undergone total colonoscopy or barium enema after bowel preparation by Brown's method often state that the examination itself was not very painful but that preparation was very troublesome. We consider that this is an important factor preventing barium enema and total colonoscopy from being performed more readily.

In 1980, Davis et al.¹ designed an electrolyte solution (Golytely) with sodium sulfate as the predominant salt and polyethylene glycol as an

additional osmotic agent. With Golytely, it is possible for bowel preparation to commence on the day of the examination yet still achieve good gut irrigation. Since it is both non-absorbable and non-secretory, there is little change in body fluids and Golytely is safe for patients with cardiac or renal disease.

A major disadvantage of the original preparation regimen using Golytely was that examinees had to drink as much as 4,000 ml of the solution. At first, the authors tried to use 4,000 ml of Golytely but none of the examinees could drink such a large volume of Golytely. Accordingly, we reduced the volume of solution needed by combining Golytely with a mild laxative (sennoside).

Regarding the taste of Golytely, 66% of the examinees had no problem but 1% could not drink it at all because of their dislike of the taste and 33% drank it only with difficulty. We thus think that there is room for improvement of the taste of Golytely.

Regarding the 2,000 ml volume of Golytely, 3% of the examinees could not consume such a quantity and 35% drank it only with difficulty. It would thus seem to be desirable to use a smaller volume of Golytely, if possible. Sumioka et al.⁴ reported that bowel preparation was possible using only 1,000 ml of Golytely, but our experience suggest that 1,000 ml is insufficient to achieve good bowel preparation in all cases. Nagatani et al.⁵ reported that gut irrigation was poor with 1,000 ml of Golytely and that it was good with 2,000 or 3,000 ml.

Ueno et al.⁶ reported a problem with foam in the colon and rectum after preparation by Golytely, but we found little or no foam in 85% of the examinations. The reason for this difference could be the reduced volume of solution used in our study.

It was thought that peristalsis might be a problem because the examinees drank a large volume of the bowel preparation solution. However, no problems were noted in 92% of the examinations (Figure 3). This may also be related to the lesser amount of Golytely used.

Concerning gut irrigation the result for each part of the colorectum were excellent or good in 90–97% of the examinations and was never poor.

The effect was particularly good in the cecum and the ascending colon, where black liquid stool sometimes remains after preparation by the modified Brown's method. It is assumed that the proximal colon was cleaner because Golytely was taken orally.

Observation was often disturbed slightly, due to a considerable amount of the solution remaining in the distal colon and rectum. However, it was possible to observe the colorectum by aspirating the solution or by changing the position of the examinee. We usually use a splinting device when performing total colonoscopy, and after insertion of the splinting device most of the residual solution flows out spontaneously. Thus when the colonoscope is retracted after reaching the cecum, little solution remains in the distal colon and the rectum.

Five examinees forgot to take the sennoside and were excluded from the present study. Gut irrigation was poor or fair in three of them (60%), suggesting that sennoside is useful in bowel preparation. In 1989, Okawa et al.⁷ reported that 20 patients prepared using 2,000 ml of Golytely, sennoside, and metoclopramide achieved good gut irrigation. They used metoclopramide for the purpose of the strengthening gastric peristalsis, but although we only used sennoside, we found that the bowel preparation was still excellent. Accordingly we consider that there is no need to use metoclopramide. In our series of 297 cases, good gut irrigation was achieved in 91% of the examinations by using sennoside only. Sennoside probably removes most of the stool before the examinees start to drink Golytely and the remaining stool become soft and easier to excrete after drinking Golytely.

One of the disadvantages of bowel preparation by the modified Brown's method is the foul odor of the stool that examiners note during colonoscopy. Our examiners did not detect such a smell with Golytely. Also, 73% of the examinees who had also experienced the modified Brown's method preferred the bowel preparation by our Golytely method. Thus bowel preparation by our Golytely method was more acceptable than the modified Brown's method for both examinees and examiners. Bowel preparation by our Golytely

method should replace the modified Brown's method for total colonoscopy.

If the bowel preparation for the barium enema becomes simpler and easier for the examinees by the Golytely method, barium enema will be performed more frequently and more colorectal carcinomas will hopefully be detected at an earlier stage. Bowel preparation using a relatively small volume of Golytely (2,000 ml) and sennoside was excellent. We consider that this method increases patient acceptance and should become the preferred method of bowel preparation for total colonoscopy.

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