

Whole gut irrigation and Prepacol® laxative preparation for colonoscopy: a comparison

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Two techniques for preparation of the colon for colonoscopy were compared in a controlled trial. Fifty patients given a low residue diet and the laxative Prepacol® were compared with 50 patients given whole gut irrigation. Significantly more patients suffered from vomiting ($P=0.0005$), shivering ($P=0.0062$) and nausea ($P=0.031$) following irrigation; in two cases the procedure had to be abandoned because of profuse vomiting. Irrigation was less well tolerated by the patients ($P=0.00002$) than preparation with Prepacol®. On the other hand, the quality of bowel preparation was found to be better ($P=0.0005$) after irrigation. On two occasions colonoscopy was not possible following Prepacol® preparation because of faecal residue. Patients with a previous colorectal resection showed a similar quality of cleansing to those patients prepared with irrigation. We conclude that Prepacol® is as efficient as irrigation for patients who have had a previous colorectal resection because the quality of bowel preparation is as good and the associated patient discomfort is small.

Keywords: Whole gut irrigation, Hewitt's solution, Prepacol®, colonoscopy

Adequate colon preparation before diagnostic and therapeutic procedures is important because safety and diagnostic accuracy depend on adequate visualization¹. Cleansing can be achieved with laxatives, enemas^{2,3}, whole gut lavage with Hewitt's⁴ or Golytely® solution^{5,6}, and dietary measures⁷ used either alone or in combination.

Standard techniques such as laxatives, dietary measures and cleansing enemas are time consuming, uncomfortable for the patient and frequently unsatisfactory⁸. As an alternative, rapid enteral administration of saline or balanced salt solutions have been recommended to improve efficiency and patient acceptance for colon preparation before colonoscopy^{5,9,10}.

We have conducted a randomized trial comparing whole gut irrigation using Hewitt's solution with a technique using the laxative Prepacol® (Nicholas GmbH, Sulzback, FRG), a combination of sodium hydrogen phosphate and bisacodyl.

Patients and methods

The study included 100 consecutive patients undergoing elective colonoscopy over a 5-month period. Criteria for exclusion included heart or kidney insufficiency, pregnancy, partial colonic obstruction and emergency colonoscopy. After patients had provided informed consent, a careful history was documented and a physical examination was performed.

A computer-generated randomization was used to assign patients to either group A (irrigation with Hewitt's solution) or group B (preparation with Prepacol®).

Group A

These patients were not subjected to any dietary restrictions until the day of preparation, which was the day of colonoscopy. Baseline body-weight, heart rate and blood pressure values were measured. Sodium, potassium, leucocyte count, haemoglobin and haematocrit were measured in the peripheral venous blood. An arterial blood gas analysis was performed. These measurements were repeated 1 h after irrigation (Figure 1).

A nasogastric tube (16 Charrière) was then inserted and prewarmed Hewitt's solution was infused at a rate of 2-3 l/h until stool outflow was clear or a total of 10 litres had been given.

Group B

Three days before colonoscopy the above clinical and blood parameters were measured. Colon preparation was started on the following day. Dietary restriction forbade bread, vegetables, fruit juice, carbonated water and milk. A minimum of 2 litres fluid per day was required. On the day before colonoscopy a solution of 30 ml sodium monohydrogen phosphate and sodium dihydrogen phosphate, and 2 h later 20 mg bisacodyl, were taken (Figure 1).

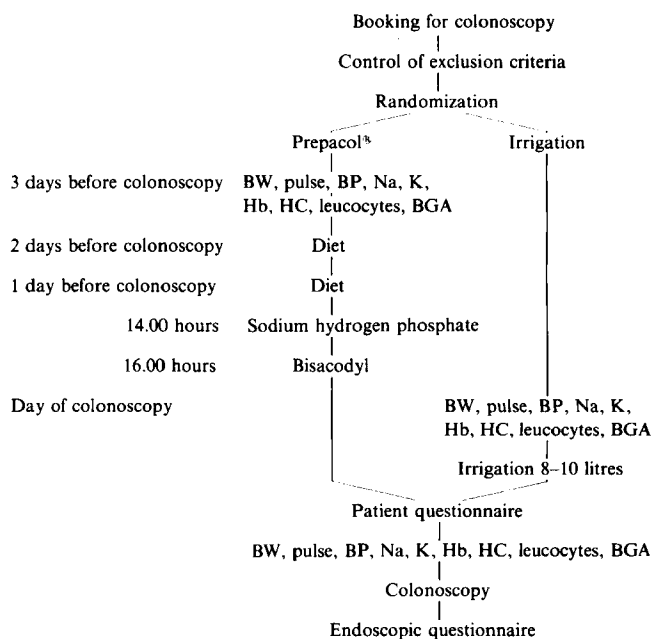


Figure 1 Study design. BW, body-weight; BP, blood pressure; Na, sodium; K, potassium; Hb, haemoglobin; HC, haematocrit; BGA, blood gas analysis

Conduct of the study

Before entering the endoscopy room, patients were asked to assess the comfort/discomfort of the colon preparation according to a questionnaire. Flatulence, abdominal and anal pain, nausea, vomiting, headache, vertigo, shivering and tiredness were documented and the severity was assessed as either considerable, moderate or absent. Patients were also asked whether the preparation was very bothersome, onerous, slightly onerous or not onerous at all, and whether they would agree to undergo this preparative procedure again.

Two experienced colonoscopists, blinded as to the type of preparation used, scored the quality of preparation according to the following grading system;

- (a) *Excellent*: no faecal residue present;
- (b) *Good*: minimal faecal material, not interfering with interpretation of the colonoscopy;
- (c) *Fair*: moderate faecal debris, small polyps up to 5 mm could not be excluded;
- (d) *Poor*: marked faecal residue, inability to interpret the colonoscopic results.

The quality of preparation for each colonic segment examined (caecum and ascending, transverse, descending and rectosigmoid colon) was documented.

Statistics

Paired data were analysed using Fisher's exact test, unpaired data using Student's *t* test ($P \leq 0.05$ was considered to be significant). Correlations between metric and non-metric data were assessed by using the Spearman correlation coefficient (significant for $|t| > 2$).

Results

Characteristics of the study population

Group A and B patients were similar in age, sex, status (ambulatory or hospitalized colonoscopy), indication for colonoscopy and previous gastrointestinal operations (Table 1).

The irrigation had to be stopped in two group A patients because of profuse vomiting. Thus, only 48 group A patients were actually colonoscoped.

Forty-eight patients in group B followed their diet accurately and all 50 patients completed the preparation. One patient took the laxative 1 day too early and colonoscopy had to be interrupted due to the presence of too much faecal residue.

Endoscopic findings and quality of preparation

The endoscopic findings and interventions performed are listed in Table 2. The time that elapsed before reaching the ileum was

Table 1 Patient characteristics

	Group A: irrigation	Group B: Prepacol®
<i>n</i>	50	50
Age (years)	60.3 (13.9; 17-85)	55.3 (17.6; 22-80)
Sex (male:female)	17:13	21:29
Interruption of preparation	2	-
Ambulatory:hospitalized	10:40	14:36
Indication for colonoscopy		
Tumour search	23	29
Abdominal pain	16	12
Colon follow-up	11	9
Previous gastrointestinal operations		
Right hemicolectomy	3	2
Left hemicolectomy	2	1
Sigmoid resection	-	2
Low anterior resection	1	6
Abdominoperineal resection	2	-
Colon segment resection	-	2
Appendectomy	12	8
Other (stomach, small bowel)	7	5

Values in parentheses are s.d. and range

Table 2 Endoscopic findings, reasons for interruption of colonoscopy, endoscopic interventions and time elapsed in reaching the ileum

	Group A: irrigation (n=48)	Group B: Prepacol® (n=50)
Time to ileum (min)	16.2 (9.5; 5-40)	14.3 (7.8; 4-40)
Duration of colonoscopy (min)	24.4 (14.3; 7-60)	20.4 (10.4; 5-45)
Interruption of colonoscopy		
None	42	43
Obstructing tumour	4	2
Poor preparation	-	2
Pain	2	3
Endoscopic findings		
Normal	17	22
Diverticulosis	11	10
Diverticulitis	2	-
Adenoma	1	3
Carcinoma	4	5
Polyps	15	9
Other	3	3
Endoscopic intervention		
None	32	38
Biopsy	5	7
Polypectomy	11	6

Values in parentheses are s.d. and range

Table 3 Quality of preparation

	Group A: irrigation (n=48)	Group B: Prepacol® (n=50)	<i>P</i>
Excellent	29	8	37
Good	18	29	
Fair	1	11	13
Poor	-	2	

P = 0.0005

similar, although two patients prepared with Prepacol® had so much stool in the colon that colonoscopy was not possible.

There were no differences in the distribution of endoscopic findings between the two groups. In the Prepacol® group, fewer polyps were visualized, but this difference was not significant ($P = 0.098$). The analysis of colon cleansing score showed a significantly better preparation following whole gut irrigation ($P = 0.0005$) (Table 3). The localization of residual faeces after preparation showed that Prepacol® does not clean the caecum and ascending colon as efficiently as irrigation, while cleansing of the transverse, descending and rectosigmoid colon was nearly equal in both groups. The quality of preparation after Prepacol® was equal to that of irrigation in patients with a previous colorectal resection.

Weight, vital signs and biochemical measurements

Comparison of all measurements showed no difference between the two groups before preparation. After irrigation, potassium, haemoglobin and haematocrit decreased significantly; sodium, sodium bicarbonate, pH, base excess, systolic blood pressure and body-weight increased significantly. Preparation with Prepacol® led to a significant decrease in potassium, haematocrit, P_{O_2} and body-weight.

These changes in biochemical and clinical measurements did not require any therapeutic intervention.

Patient comfort

During irrigation, vomiting ($P = 0.0005$), shivering ($P = 0.0062$) and nausea ($P = 0.031$) were significantly more common than

Table 4 Patient reaction to the preparation for colonoscopy

	Group A: irrigation (n=50)	Group B: Prepacol® (n=50)	P
Very bothersome	13	2	0.00002
Onerous	14	5	
Slightly onerous	15	16	
Not a problem	8	27	

during preparation with Prepacol®. Of the 50 patients in group B, 49 stated they would agree to use this form of preparation again, while 20 of the 50 patients in group A stated they would refuse irrigation again. Twenty patients in the Prepacol® group have previously been prepared by irrigation, and 19 of these stated that they would prefer to take Prepacol®.

The comfort/discomfort score showed that whole gut irrigation is significantly less well tolerated than the use of Prepacol® ($P=0.00002$) (Table 4).

Discussion

Adequate colon cleansing for diagnostic and therapeutic procedures is extremely important. Furthermore, follow-up after operation or endoscopic polypectomy is acceptable to the patient only if the preparation and the colonoscopy are not too painful or bothersome. End-points of a trial studying colon cleansing techniques must include the adequacy of colonic visualization, side-effects related to the method, and patient comfort.

Conventional colon cleansing methods (1–3 days of clear liquids, laxatives and enemas) provide a relatively faeces-free colon but are time consuming, inconvenient and uncomfortable for the patient³. In order to improve preparation, whole gut lavage solutions were developed. In this study irrigation was found to be significantly better than Prepacol® when the quality of cleansing was considered. Other randomized trials comparing conventional 2 or 3-day bowel preparation with whole gut lavage have shown that the quality of cleansing after irrigation is superior^{3,11,12}. On the other hand, our study has shown that the quality of cleansing with Prepacol® was similar to irrigation when patients had had a previous colorectal resection.

Another important aspect of colonic preparation for colonoscopy is the associated metabolic changes^{5,13,14}. We found significant changes in metabolic factors after both whole gut irrigation with Hewitt's solution and Prepacol®. In healthy patients these changes are negligible; however, they may be of importance in patients with heart or kidney disease.

Patient acceptance of follow-up after colorectal operation or endoscopic polypectomy depends in part on the amount of discomfort associated with the endoscopic procedures and bowel preparation. Some authors have stated that conventional colon cleansing methods are uncomfortable for the patient while whole gut irrigation may be more comfortable³. However, in a survey carried out by Downing *et al.*¹⁵ 17 per cent of patients developed abdominal pain and 30 per cent experienced nausea and vomiting during irrigation. We were able to confirm these findings: 10 per cent of our patients experienced abdominal pain, 10 per cent had anal pain, 26 per cent had vomiting, and 14 per cent had shivering during irrigation. In contrast, patients prepared with Prepacol® reported a significantly lower rate of nausea, vomiting and shivering. Furthermore, patients

prepared with irrigation stated significantly more often that the preparation was either very bothersome or onerous. Forty per cent of patients did not want to undergo a repeat preparation with irrigation. These results are similar to those of Downing *et al.*¹⁵: 29 per cent of patients stated they would refuse irrigation for a subsequent preparation.

In the UK, Picolax® (Nordic Pharmaceuticals Ltd., Feltham, UK), which like Prepacol® is an osmotic cathartic agent, is widely used. De Lacey *et al.*¹⁶ showed that the colon was as well prepared by Picolax® without washout as it was by colonic lavage. Roe *et al.*¹⁷ showed that Picolax® produced a cleaner bowel than that achieved by enema and washout preparation. Unfortunately there are no randomized trials comparing Prepacol® and Picolax®.

In summary, Prepacol® is recommended for patients who have had a colorectal resection because patient comfort is better and the quality of cleansing is as good as with irrigation. Prepacol® also provides satisfactory preparation in patients who have not had previous colorectal operations.

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