

The outcome of a second preparation for colonoscopy after preparation failure in the first procedure

Shomron Ben-Horin, MD, Simon Bar-Meir, MD, Benjamin Avidan, MD

Tel-Hashomer, Israel

Background: There are scant data regarding the outcome of consecutive repeated procedures in patients who failed to adequately clean their colon for colonoscopy.

Objective: To investigate the outcome of a second colonoscopy after preparation-associated failure of the first colonoscopy.

Design and Setting: A retrospective study in a tertiary-referral center.

Patients: All patients with failure of colonoscopy because of poor preparation within a 1-year period.

Results: Of a total of 6990 colonoscopies performed during the study period, 307 procedures (4.4%) failed because of inadequate preparation. Data on subsequent repeated colonoscopies were available for 235 patients. The repeated procedure again failed because of unsatisfactory preparation in 54 of these patients (23%). The failure rate in subsequent third and fourth colonoscopies was also high (more than 25%). Of the various patient and procedure-related parameters examined, only the use of calcium channel blockers (CCB) was found to be predictive of a failed repeated preparation (odds ratio [OR] 3.2 [95% CI, 1.6-6.3], $P < .001$). In contrast, a next-day colonoscopy after failure of the index procedure was associated with a reduced risk of unsatisfactory second preparation (OR 0.31 [95% CI, 0.1-0.92], $P = .03$).

Limitations: Validated data on the specific bowel purgatives used were not available.

Conclusions: Almost a fourth of patients with an unacceptable colonic preparation will also fail the repeated colonoscopy, and patients who use CCB are at particular risk for failure. Strategies to manage this difficult-to-treat patient group should be investigated and may possibly include a preference for next-day colonoscopy. (Gastrointest Endosc 2009;69:626-30.)

Poor preparation adversely impacts the visualization of the bowel and the diagnostic quality of colonoscopy.^{1,2} Therefore, when colon cleanliness is inadequate, aborting the procedure and performing a repeated colonoscopy are advocated.³ In clinical practice, poor preparation that causes failure of colonoscopy was reported to occur in 0.3% to 6.5% of patients referred for colonoscopy,⁴⁻⁷ and predictive factors for preparation failure were also identified.^{8,9} However, to the best of our knowledge, there are no studies that specifically addressed the outcome of

Abbreviations: CCB, calcium channel blockers; OR, odds ratio.

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a second colonoscopy in patients who failed their index colonoscopy because of poor preparation. Moreover, as stated by the recent American Society for Gastrointestinal Endoscopy guidelines on bowel preparation, the best management approach for patients who failed their first colonoscopy is yet unknown.¹⁰ Therefore, the aim of the present study was to investigate the outcome of repeated colonoscopy after preparation-associated failure. A further aim was to identify predictive factors for a second preparation failure so to suggest future possible strategies to improve the outcome of this difficult-to-treat group of patients.

PATIENTS AND METHODS

Study population and data retrieval

This was a single-center retrospective study. All patients who underwent colonoscopy between July 1, 2006, and

July 1, 2007, were identified by a computerized search of the electronic database of the endoscopy unit at Sheba Medical Center, a tertiary-referral hospital in central Israel (with 16 practicing endoscopists). Patients whose procedure diagnosis was “failed colonoscopy” were further identified, and their colonoscopy report was retrieved and examined to determine the reason for procedure failure. Patients whose report indicated a failure of colonoscopy because of poor preparation comprised the study group, and the indicated clinical data were extracted from their charts. The study was approved by the Sheba institutional review board.

Statistical analysis

Continuous variables were analyzed by a 2-tailed Student *t* test or Mann-Whitney *U* test, as appropriate, and categorical variables were analyzed by the Fisher exact test. Multivariate analysis was performed on all variables found on univariate analysis to have an impact on the second colonoscopy outcome, with a significance level of $P < .1$. The outcome variable in the multivariate analysis was failure of the second colonoscopy (dichotomous variable), and dependent variables were entered into a backward logistic regression analysis model. The odds ratios (OR) and their 95% CIs were calculated to express the strength of the influence exerted by each individual parameter. All statistics were performed with MedCalc Software (Maria-kerke, Belgium); $P < .05$ was considered significant.

RESULTS

There were 6990 colonoscopies during the study period (4448 morning and 2542 afternoon procedures). A failed procedure was reported for 372 of these colonoscopies. Causes for failure included inadequate preparation in 307 patients (4.4% of the entire cohort), technical difficulty to advance the endoscope (35 procedures), and pain (19 procedures). Various miscellaneous causes were responsible for failure of an additional 11 aborted colonoscopies (eg, bradycardia, hypoxia, and vomiting).

Of the 307 patients whose colonoscopy failed because of inadequate preparation, data were available on 235 patients (77%) who underwent a second colonoscopy. These patients comprised the study population. The other 72 patients (23%) either had not undergone the recommended repeated colonoscopy or data were not available because the procedure was performed elsewhere.

The subsequent second colonoscopy failed again because of inadequate preparation in 54 of 235 patients (23%), designated as the “second failure group.” An additional 8 patients had the repeated procedure fail because of other causes (difficult intubation in 4 patients, redundancy in 1, obstructing tumor in 2, and severe colitis in 1 patient). The characteristics of the 54 patients in the second failure group were compared with the patients whose

Capsule Summary

What is already known on this topic

- When colon preparation is inadequate, the colonoscopic examination should be suspended in favor of repeated colonoscopy at another time.

What this study adds to our knowledge

- Retrospective data revealed that 54 of 235 patients with inadequate colon preparation also failed repeated colonoscopy.
- The use of calcium channel blockers was found to be predictive of a failed repeated bowel preparation.

preparation in the second colonoscopy was acceptable (Table 1). We also compared the 2 groups for several procedure-related parameters that may have influenced the outcome of the second colonoscopy (Table 2). These analyses revealed that next-day colonoscopy; younger age; and a recommendation for a preparation regimen that combined polyethylene glycol, enemas, and low-residue diet for 5 days were all associated with a higher likelihood of acceptable preparation in the repeated procedure. In contrast, being hospitalized, a concomitant diagnosis of a neurologic disorder, a procedure indication for polyp follow-up, a lack of any specific recommendation for repeated preparation, and the use of calcium-channel blockers (CCB) were all associated with a second failure of preparation. However, on multivariate analysis, only the use of CCB remained as a significant predictor of a second preparation failure (OR 3.2 [95% CI, 1.6-6.3], $P < .001$), and only a next-day colonoscopy was found to be associated with a reduced rate of second preparation failure (OR 0.31 [95% CI, 0.1-0.92], $P = .03$).

The subsequent course of patients who failed even their second colonoscopy was also investigated. A third colonoscopy was performed in 38 of these 54 patients (70%) who failed their second preparation. Ten of 38 procedures (26%) failed again because of poor preparation quality, 2 because of obstructing tumor, and 1 because of pain. Nine of 10 patients had a fourth colonoscopy, and, in 3 of them (33%), even the fourth colonoscopy failed because of the low quality of preparation. The outcome of consecutive colonoscopies in the study cohort is depicted in Figure 1. Although too small a group for any meaningful statistical analysis, 2 of these 3 patients underwent a fifth colonoscopy, which was considered acceptable, despite intermediate-quality preparation in both.

DISCUSSION

The present study investigated the failure rate among patients referred for a repeated colonoscopy after failure

TABLE 1. Comparison of demographic and patient clinical characteristics between the group with acceptable second preparation for colonoscopy and the group with second failed preparation ("second failure colonoscopy")

	Second failure colonoscopy	Acceptable second colonoscopy preparation	P value
Mean (SD) age (y)	64.4 ± 15	60.4 ± 17	.09
M/F	36/18	113/68	.68
Hospitalized (no. [%])	14 (26)	28 (15)	.10
Indications (no. [%])			
Constipation	2 (4)	15 (8)	.37
Anemia	12 (22)	23 (13)	.13
Rectal bleeding	6 (11)	30 (17)	.39
Changed bowel habits	1 (2)	14 (7)	.20
Polyp follow-up	10 (18)	17 (9)	.09
Screening	1 (2)	16 (9)	.13
Abdominal pain	5 (9)	17 (9)	>.99
Cancer follow-up	1 (2)	10 (6)	.46
Family history of colorectal carcinoma	3 (5)	8 (4)	.72
Diarrhea	4 (7)	9 (5)	.50
Miscellaneous	9 (16)	22 (12)	.37
Comorbidities/drugs (no. [%])			
Chronic heart failure	11 (20)	21 (12)	.11
Chronic renal failure	13 (24)	29 (16)	.22
Diabetes	22 (41)	52 (29)	.13
Neurologic disorders	4 (7)	4 (2)	.08
Dementia	8 (15)	14 (8)	.18
Diverticulosis	6 (11)	32 (18)	.30
Cirrhosis	1 (2)	1 (0.5)	.41
Use of CCB	26 (48)	34 (19)	<.001
Tricyclic antidepressants	2 (4)	2 (1)	.23

TABLE 2. Comparison of procedure-related characteristics between the group with acceptable second preparation for colonoscopy and the group with a second failed preparation ("second failure colonoscopy")

	Second failure colonoscopy	Acceptable second colonoscopy preparation	P value
Interval to second colonoscopy			
Median (SD) days	16.5 ± 51	12 ± 57	.64
Within 7 days (no. [%])	16 (29)	65 (36)	.42
Within 3 days (no. [%])	8 (15)	44 (24)	.19
Next-day colonoscopy (no. [%])	5 (9)	37 (20)	.06
Time of day of second colonoscopy (no. [%])			
After 11:00 (of 51 patients)	33 (65)	97 (59)	.35
After 12:00	23 (45)	62 (38)	.26
After 13:00	12 (23)	29 (18)	.31
Afternoon examination	3 (6)	18 (10)	.42
Preparation recommended (no. [%])			
None noted	34 (63)	79 (44)	.01
PEG	5 (9)	10 (6)	.35
PEG + enema	10 (18)	43 (24)	.46
PEG + enema + extended diet	2 (4)	28 (15)	.02
Peg + extended diet	1 (2)	8 (4)	.69
Phosphosoda (with or without enema)	1 (2)	5 (3)	>.99
Other	1 (2)	8 (4)	.69

PEG, Polyethylene glycol.

of the first preparation and characterized its correlates. The results show that this selected group of patients had an extraordinarily high rate of poor-preparation-associated failure in their repeated procedure (23%) and in subsequent procedures (>25% failure rate) (Fig. 1).

These figures underscore the uniqueness of this group compared with the general population undergoing colonoscopy. Moreover, the exceedingly high rate of preparation failure in the repeated colonoscopy and the significant resources used by this group of patients make a strong incentive for the need to study and tailor specific preparation policies for these individuals.

As a first step toward this aim, several procedure-related parameters were examined in an effort to identify factors

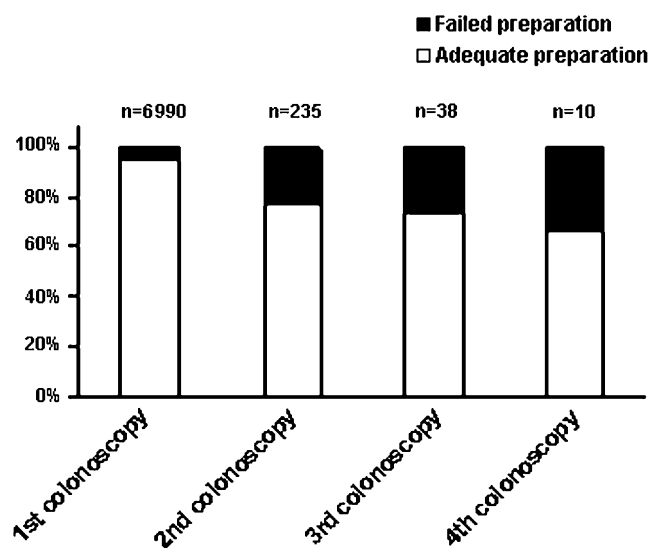


Figure 1. Percentage of patients with adequate and inadequate colon preparation in each of the consecutive colonoscopies.

that may be manipulated to improve the efficacy of preparation for repeated colonoscopy. A first pertinent finding was a higher rate of acceptable preparation at the second colonoscopy with a next-day examination (Table 2). The benefit was small, yet, given the implications for endoscopy practices, next-day repeated colonoscopy probably merits further investigation by a prospective controlled study to ascertain if this approach can be endorsed for all patients with poor-preparation-associated failure.

Unexpectedly, the use of CCB was found to be strongly associated with an inadequate second preparation for colonoscopy. Although CCBs are often implicated as a cause of drug-induced constipation, constipation as the procedure indication was not found to be independently predictive of preparation failure in our study. This fact, and the multivariate analysis used, both argue against any confounding effect underlying the impact of CCB on colon cleanliness. Indeed, it can be postulated that, even in the lack of overt constipation, CCB may slow colonic transit and result in a higher rate of preparation failure. Notwithstanding, additional studies are pertinent to corroborate this intriguing finding.

Interestingly, our findings did not reproduce the results of a prior study that identified constipation, in-patient status, and neurologic diseases as predictive factors for poor preparation that caused failure of a first colonoscopy.⁸ These discrepancies may stem from the different cohort studied (ie, all patients referred to colonoscopy vs those who already failed 1 colonoscopy) but may also relate to population size. Compliance with instructions and the use of phosphosoda were associated with an adequate preparation for a first colonoscopy in another study,⁹ but assessment of these parameters was precluded by our study design.

Several limitations of our study should be acknowledged. Interpretation of the failure variable is limited by

the fact that no standard evaluation of preparation quality could be implemented in this retrospective study. Arguably, then, the high rates of second preparation failure may stem from overzealous “disqualifying” endoscopists. However, this limitation is not unique to our study, because, in the lack of widely accepted criteria, even experienced endoscopists often disagree on what constitutes a disqualifying preparation.¹¹ Moreover, our finding of a 4.4% failure rate in the first colonoscopy is comparable with failure rates reported by other studies in clinical settings and in clinical trials of purgatives,^{4,5,12-15} thereby lending support to the judgment of cleanliness used by our endoscopists as reflecting a standard of care in clinical practice. Another limitation of our study is that the specific purgatives actually ingested by the patients could not be validated in this retrospective study. Thus, whether any preparation regimen is superior in patients who failed their first colonoscopy cannot be deduced from the results of the present work, but we recently launched a prospective controlled study that specifically addresses this question.

In conclusion, patients who failed their first preparation have a significant risk (approximately 25%) of failing their subsequent procedures. This risk is associated with the use of CCB and may possibly be reduced by scheduling a next-day repeated procedure. Additional studies are required to clarify the optimal management of this difficult-to-treat group of patients.

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Current affiliations: Department of Gastroenterology, Sheba Medical Center and Sackler School of Medicine, Tel-Aviv University, Tel-Hashomer, Israel.

Reprint requests: Shomron Ben-Horin, MD, Gastroenterology Department, Sheba Medical Center, Tel Hashomer 52621, Israel.

If you want to chat with an author of this article, you may contact him at sben-horin@013.net.il.

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