

In split-dose prepared patients, water exchange could significantly improve overall and segmental bowel preparation scores and increase adenoma detection rate

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The association between colonoscopists with a low adenoma detection rate (ADR) and interval cancers led to research into different approaches to improve the quality of colonoscopy. High quality cleansing promoted the detection of neoplastic lesions, particularly the flat ones (e.g., sessile serrated polyps) with increased malignant potential, and inadequate bowel preparation increased the risk of missed adenomas. If the inadequate bowel preparation rate is >13%, screening colonoscopy is not cost-effective compared with a fecal immunochemical test [1]. For improving bowel cleansing, split-dose bowel preparation has received much attention [2].

In this issue of the *Annals of Gastroenterology*, Adike *et al* [3] describe an analysis of segmental Boston Bowel Preparation Scale (BBPS) score and ADR. The authors raised the question of whether a higher level of cleanliness was associated with a higher ADR. They used the BBPS to assess the quality of bowel preparation. Their primary goal was to determine the association of segmental and overall ADR and serrated polyp detection rate (SDR) with segmental and total BBPS scores. All outpatient screening colonoscopies with documented BBPS scores were retrospectively reviewed at their tertiary institution from January to December 2013. Chi-square tests and logistic regression were used to analyze the detection rates of adenomas and serrated polyps in relation to bowel preparation scores. Odds ratios (ORs) were calculated using logistic regression that controlled for withdrawal time, age, body mass index, diabetes status, and sex. The results included 1991 colonoscopies. The overall ADR was 37.5% (95% confidence interval 35.3-39.6). There was a significant difference in the overall ADR and SDR across all bowel category groups, with total BBPS scores of 8 and 9 being associated with lower detection rates than scores of 5, 6, and 7. As the

quality of bowel preparation improved, there was a statistically significant decrease in the ADR ($P=0.04$, OR 0.79) of the right colon, while in the left colon there was a statistical decrease in the SDR ($P=0.019$, OR 0.78). The authors concluded that segmental ADR and SDR both decreased as bowel preparation scores increased, decreasing particularly in patients with excellent preparation scores of 8 and 9. They suggested that a possible explanation for this unexpected discrepancy may be the longer and better visualization of the mucosa when cleansing and suctioning is necessary.

The manuscript addresses the important question of whether overall and segmental cleanliness scores might be related to the detection rate of various lesions. This report, however, is limited by its retrospective nature, as randomized controlled trials (RCTs) are needed to adequately address the question of degree of bowel cleanliness and ADR.

The BBPS score was developed with air insufflation (AI) during the insertion and withdrawal phases. The segmental cleanliness scores are assigned after the colonic lumen has undergone intra-procedural cleaning [4]. Traditionally, with AI, endoscopists aim to achieve cecal intubation as quickly as possible, without taking time to wash and clean the colon lumen during insertion. During withdrawal, inspection, cleaning and washing of the mucosal surface laden with residual feces is a natural and integral part of the withdrawal procedure [5]. The BBPS score does not distinguish between the colon segment that is already clean to start with and the segment the colonoscopist must expend effort on cleaning to achieve an excellent score. The latter will undoubtedly require time for water infusion and suction during the withdrawal phase. One group of expert colonoscopists reported that up to 19% of the withdrawal time could easily be devoted to such cleaning [6]. Subtracting the time needed for biopsy and polypectomy, the remainder is inspection time. Thus, with traditional AI colonoscopy the inspection time is inversely related to the time taken to clean the colon lumen to achieve good or excellent cleanliness. On the other hand, if the colonoscopists choose not to go all out to improve the cleanliness to excellent, there will be more time for inspection. The result of the current study could reflect the artificial distinction of good and excellent bowel preparation in the BBPS, and the cleaning effort needed to get from good to excellent. The authors arbitrarily combined those with poor and fair BBPS scores (up to 4) as an inadequate group, scores of 5-7 as good, and scores of 8 and 9 as excellent. If the authors used the conventional definition, <6 as inadequate and ≥ 6 as adequate, the analysis might show that those with adequate scores have a higher ADR than those with inadequate scores.

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Table 1 Comparison of water exchange (WE) and air insufflation (AI) in a randomized controlled trial [10]

Characteristic	WE	AI	P
Number of subjects	408	408	
Overall BBPS score*	9.0 (7.0-9.0)	8.0 (6.0-9.0)	<0.001
Overall ADR	49.3%	40.4%	0.03
Right colon BBPS score*	3.0 (2.0-3.0)	2.0 (2.0-3.0)	<0.001
Right colon ADR, n (%) [95% confidence interval]	98 (24.0) [20.0–28.5]	69 (16.9) [13.4–20.9]	0.036

*Median (IQR)

P-values are based on analyses using relative risk or χ^2

BBPS, Boston Bowel Preparation Scale; ADR, adenoma detection rate; AI, air insufflation; WE, water exchange

A recent RCT showed that improved bowel cleanliness associated with the use of split-dose preparation led to a significant improvement in ADR [7]. A plausible explanation is that, when the colon is adequately cleaned by the split-dose preparation prior to colonoscopy so that minimal effort needs to be devoted to cleaning during withdrawal, the entire duration of the withdrawal phase can be devoted to inspection for polyps.

The authors of the current report indicated that no data were collected on techniques such as water infusion or image enhancement techniques used by endoscopist to improve adenoma detection. In a series of RCTs [8-10], several studies employed insertion cleaning of the colon lumen to improve cleanliness above and beyond what was already achieved with split-dose preparation, so that during withdrawal minimal effort was needed to clean, with a resultant significant increase in ADR. In one particular RCT (Table 1) [10], median overall BBPS scores were 8 and 9 ($P<0.001$) and overall ADRs were 40.4% and 49.3% ($P=0.03$) in the AI and water exchange (WE) group, respectively. Median right colon BBPS scores were 2 and 3 ($P<0.001$) and right colon ADRs were 16.9% and 24.0% ($P=0.036$), respectively. This is in contrast to the lower ADR in the excellent compared with good bowel preparation reported in the current retrospective study. When a median overall BBPS score of 8 was achieved by traditional withdrawal cleaning in the AI group, the associated distraction from inspection might conceivably have produced the lower ADR. On the other hand, when a median overall BBPS score of 9 was achieved by insertion cleaning, there was less distraction from inspection in the WE group, possibly accounting for a significantly higher overall ADR.

Insertion cleaning with WE reproducibly increased ADR. Prevention of interval cancers by insertion cleaning with WE remains to be demonstrated. A future study in split-dose-prepared patients, focusing on the impact of WE insertion cleansing compared with traditional AI withdrawal cleaning on the occurrence of interval cancers, deserves to be considered.

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