

Adopting the Water Method: Lessons, Tips, and Pitfalls Learned

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Abstract

After studying the literature, an experienced traditional colonoscopist achieved proficiency using the water method and documented his progress with two groups: the first 20 patients and a subsequent group of the next 25 patients. Cecal intubation rates and procedure-related outcomes were compared with a retrospective, control group consisting of 100 consecutive patients who had undergone traditional colonoscopy. Cecal intubation for the first 20 patients averaged almost 10 minutes. The average time for the next 25 patients was 7.8 minutes. The air insufflation group required an average of 5.8 minutes for cecal intubation. In the second, fewer patients required change in their position (8% vs. 30%) and external pressure (12% vs. 30%) as an aid to insertion. In sedated patients examined by an experienced traditional colonoscopist, the water method can be learned quickly.

Introduction

Water-related colonoscopy techniques have been described¹⁻¹⁰ and reviewed.² Water infusion causes local distension and facilitates passage through segments with significant diverticulosis.⁵ With the patient in the left lateral position, the water infused into the sigmoid colon opens a passage⁶ and the water weighs down the left colon straightening the sigmoid segment.^{6,7,9} The use of warm water minimizes spasm.⁸ Suction of residual air in the colonic lumen minimizes angulations at the flexures, which facilitates advancement.^{3,9} The absence of air insufflation avoids colon elongation, which increases difficulty in reaching the cecum. The water method has been found to allow 52% of patients who were willing to start the colonoscopy

without pre-medications to complete the exam without any sedation.¹ In addition, this method increases adenoma detection rate (ADR). Since the learning curve for competency for water infusion is not described, we relay our experience with the water method using cecal intubation rates as a surrogate for successful colonoscopy.

Methods

In June of 2009, an experienced endoscopist at a VA Medical Center in Phoenix performed consecutive water infusion colonoscopies procedures using only the published literature as training.⁷⁻⁹ Data recorded included: patient demographics, procedure indication, cecal intubation, and total procedure time. Drug usage, dosage, as well as body position change and external pressure to facilitate visualization of the cecum were also recorded. Patients were placed in the left lateral decubitus position with the air feature on the light generator turned off immediately after inserting the scope into the rectum. Water at room temperature was infused through the colonoscope using a pedal pump to distend and find the lumen. Contaminated water was also exchanged for clean water to facilitate scope advancement and visualization.^{3,4} When the presumed cecum was reached, the air feature was used to confirm the location. If the cecum had not been reached, colonoscopy was deemed unsuccessful and was continued aiming to reach the cecum. Cecal intubation was confirmed upon identifying the appendix opening and ileocecal valve. Air was used for the withdrawal portion in all patients. All colonoscopies were performed using video-colonoscopes (160/180 series, Olympus Corporation). The measured outcomes were cecal intubation rates, cecal intubation and withdrawal time, and the need for external pressure

Table 1: The learning curve of the water method in screening colonoscopy patients

	Air (Retrospective)	Water (Prospective)	
	100 Reference Cases	Case 1-20	Case 21-45
Age (years)	61.3±0.9	60.5±1.0	59.3±1.0
Cecal intubation rate (ITT)*	98%	70%	92%
Final cecal intubation rate	98%	100%	100%
Cecal intubation time	5.8±0.4	9.7±1.2a	7.8±0.6a
Total time	18.9±0.7	21.8±1.2	20.4±1.4
Fentanyl dose (µg)	76.5±2.8	77.6±3.3	76.0±3.2
Midazolam dose (mg)	3.1±0.1	3.1±0.1	3.0±0.1
Abdominal compression	Not recorded	6 (30%)	3 (12%)
Position change	25/97 (25.8%)	6 (30%)	2 (8%)

*ITT: intent-to-treat; Data are mean SEM; a versus air; $p < 0.05$ (t-test).

and patient position change. Patient tolerance was defined as excellent, good, fair, fair adequate, fair compromised, and poor, based on the endoscopist's judgment and drove the decision to give additional sedation (fentanyl and/or midazolam). All detected polyps were removed and sent for histopathologic examination. Adenoma detection rate (ADR) was defined as the percent of patients with at least one adenoma on histology. A historical cohort of 100 consecutive, traditional colonoscopies using the same equipment and immediately prior to the adoption of the water method was used for comparison purposes. With the traditional method, air was used during scope insertion and water at room temperature used via a pedal pump for washing purposes only.

Results

This report is based on the analysis of 45 patients who were presented at the ACG Meeting in October 2009. The mean age of this group was 59 years; their indications included screening in 29 patients (64%), surveillance in 10 (22%), four (9%) with occult/overt bleeding, and two (4%) patients with symptoms. The traditional group of 100 had a mean age of 61 years with indications as follows: screening in 51%, surveillance in 27%, and presumed occult bleeding in 22% of patients.

We arbitrarily divided the 45 study patients into the "first" 20 and "second" 25 cases for comparison. The ultimate cecal in-

Table 2: Adenoma detection rates

	Air (Retrospective)	Water (Prospective)	
	100 Reference Cases	Case 1-20	Case 21-45
Patients with Adenomas	46 (46%)	9 (45%)	9 (36%)
Total # Adenomas	90	17	15
# Adenomas per patient	0.90	0.85	0.6

Data are frequency (% total).

tubation rate was 100%. The cecal intubation rate increased from 70% (14/20) to 92% (23/25) for the first 20 and second 25 cases, respectively. For the first 20 cases, average cecal intubation time was roughly eight minutes and the second group had an average cecal intubation time of eight minutes. The withdrawal times were similar. The total study group patients had an average cecal intubation time of roughly eight minutes thirty seconds, while the historic group had an average cecal intubation time of roughly six minutes. Eight percent of patients in the second group required position changes compared to 30% in the first group. Moreover, 12% of patients in the second group required external pressure compared to 30% in the first group. Of the total group 17.8% required position change versus 25.8% of the traditional group.

The adenoma detection rate in the first 20 cases (45%) was similar to the second 25 cases (36%), and as a group the ADR was also similar (40%) to the historic control (46%).

Failure to reach the cecum using the water method occurred in eight cases and was attributed to misidentification (four cases), prolonged procedure time secondary to technical difficulty (three cases lasting more than 12 minutes), and inadequate bowel preparation.

Discussion

In the hands of an experienced colonoscopist, the water infusion method can be rapidly incorporated and learned. Cecal intubation time is expected to be longer than the endoscopist's average for conventional colonoscopy but improves over time. Whether or not the cecal intubation time ultimately approaches the time seen during conventional colonoscopy needs to be tested with a larger sample size. Furthermore, assistant involvement may be obviated since fewer patients required position changes and external pressure. The polyp detection rates were similar throughout the study and were similar to historical controls.

Misidentification of the cecum was common at the beginning of the study. Suctioning the suspected cecal wall often left a

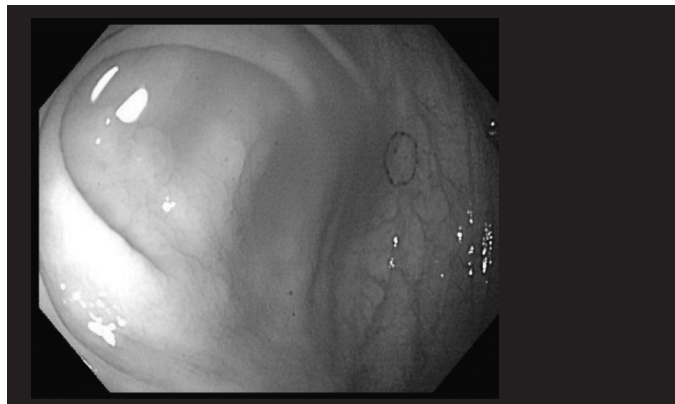
Table 3: Reasons for “failed” ITT cecal intubation during the water method

CASE	REASON FOR “FAILURE”	LOCATION WHERE AIR SWITCHED ON	TIME AT WHICH AIR SWITCHED ON
# 6	Prep	Recto-sigmoid	Not recorded
# 7	Prolonged/tortuosity	Not recorded	10 min
# 11	Misidentification cecum	Hepatic flexure	12 min
# 15	Prolonged	Hepatic flexure	12 min
# 19	Misidentification cecum	Hepatic flexure	8 min
# 20	Misidentification cecum	Transverse colon	11 min
# 38	Misidentification cecum	Hepatic flexure	6 min
# 44	Unable to get into ascending colon	Hepatic flexure	18 min

ITT: intent-to-treat

“suction mark” (Figure 1), which in turn could be used as a landmark. The time spent to reach the cecum as well as the distance traveled was a reliable indicator of arrival at the cecum. For example, if an expected cecal time had elapsed, especially at a distance of about 60 cm or less, it was unlikely the cecum had been reached. Initially, an estimated additional two minutes will be required for cecal intubation when compared to traditional colonoscopy.

Figure 1: Endoscopic picture depicting a characteristic suction mark next to appendix opening (crescent-shaped structure in the left side) for aiding to identify the cecum



In conclusion, in sedated patients examined by an experienced colonoscopist, the water method has a learning curve that may be easily achievable, has lower rates of changes in patient’s position, and has similar polyp detection rates when compared to historical controls.

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References

1. Leung JW, Mann S, Leung FW. Option for screening colonoscopy without sedation – a pilot study in United States veterans. *Aliment Pharmacol Ther.* 2007;26(4):627-631.
2. Leung FW. Water-related method for performance of colonoscopy. *Dig Dis Sci.* 2008;53(11):2847-2850.
3. Leung FW, Aharonian HS, Leung JW, et al. Impact of a novel water method on scheduled unsedated colonoscopy in U.S. veterans. *Gastrointest Endosc.* 2009;69:546-550.
4. Leung JW, Mann SK, Siao-Salera R, et al. A randomized, controlled comparison of warm water infusion in lieu of air insufflation versus air insufflation for aiding colonoscopy insertion in sedated patients undergoing colorectal cancer screening and surveillance. *Gastrointest Endosc.* 2009;70(3):505-10.
5. Falchuk ZM, Griffin PH. A technique to facilitate colonoscopy in areas of severe diverticular disease (letter). *NEJM.* 1984;310:598.
6. Baumann UA. Water intubation of the sigmoid colon: water instillation speeds up left-sided colonoscopy. *Endoscopy.* 1999;31:314-7.
7. Hamamoto N, Nakanishi Y, Morimoto N, et al. A new water instillation method for colonoscopy without sedation as performed by endoscopists-in-training. *Gastrointest Endosc.* 2002;56:825-8.
8. Church JM. Warm water irrigation for dealing with spasm during colonoscopy: simple, inexpensive, and effective. *Gastrointest Endosc.* 2002;56:672-4.
9. Mizukami T, Yokoyama A, Imaeda H, et al. Collapse-submergence method: simple colonoscopic technique combining water infusion with complete air removal from the rectosigmoid colon. *Digestive Endoscopy.* 2007;19:43-47.
10. Brocchi E, Pezzilli R, Tomassetti P, et al. Warm water or oil colonoscopy: towards simpler examinations? *Am J Gastroenterol.* 2008;102:1-7.