The water exchange method and difficult colonoscopy

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Abbreviations: BMI, body mass index; RCT, randomized controlled trial

Commentary

In a recent invitation to author a book chapter I was asked to respond to the following question “I had a difficult colonoscopy and no matter what I tried, I just could not reach the cecum. I max out on IV sedations and have no anesthesiology support. Can you help me?” Most colonoscopists agree this is a difficult colonoscopy. By “no matter what I tried” the questioner should have implemented minimal air insufflation, loop reduction, abdominal compression and changing patient position. These are indispensable maneuvers for increasing the success of cecal intubation with any insertion method.

The mechanism of difficult colonoscopy is not fully known. Associated factors pertaining to patient, past history and current colonoscopy characteristics have been summarized in a recent hypothesis-generating review.¹ Patient characteristics include female gender with low BMI, or after hysterectomy; low body mass index (BMI) (≤ 25) in general; younger age (≤ 40 or ≤ 20 yrs), advanced age (> 50 yrs), and older age (> 80 yrs); and anxiety and anticipation of discomfort. Past history characteristics include abdominal and/or pelvic surgery, diagnosed left-sided diverticulosis, incomplete colonoscopy (redundant colon, difficult sigmoid, difficult to sedate), previous poor bowel preparation, history of irritable bowel syndrome and end stage renal disease on hemodialysis. Current colonoscopy characteristics include difficult anatomy, technically difficult insertion, patient pain or discomfort, prolonged insertion time; inflammatory bowel disease symptoms, severe colonic inflammation, active lower gastrointestinal bleeding, obstructing malignancy; poor bowel preparation, afternoon colonoscopy, colonoscopy following gastroscopy and unsedated colonoscopy.

Expert colonoscopists have reported a variety of techniques for use in difficult cases primarily aimed at reducing discomfort during colonoscopy.² Recent additions include the use of single³ and double-balloon endoscopes;⁴ external straightener, upper endoscope, pediatric colonoscope, enteroscope; guide wire

exchange;⁵ propofol sedation,⁶ transparent hood (cap) attached to the tip of the endoscope;⁷ changing methods to deal with poor preparation;⁸ and use of CO₂ instead of air insufflation.⁹

In this presentation, I shall discuss the application of the water exchange method¹⁰⁻¹⁶ in difficult colonoscopy patients. I shall include two types of data. Data set 1 pertains to the application of the water exchange method in a small number of patients referred for prior incomplete colonoscopy. Data set 2 pertains to the post hoc analysis of two RCT in which patients with a history of abdominal surgery were examined.

In data set 1 anecdotal experience at two sites is described. At one US site (FWL) the reasons for prior failed colonoscopy included: poor bowel preparation after several attempts (n=2), redundant colon (n=2) [unpublished data] and paradoxical agitation due to history of usage of narcotic medications (n=1).¹¹ All were successfully examined to the cecum with the water exchange method. At one site in China (YLP), 10 patients with prior failed colonoscopy were examined. The reasons for failure in these 10 unsedated patients were: redundant colon (n=8); bowel adhesion (n=1); and unknown cause (n=1). There were 5 men and 5 women. The mean BMI was 21.9. The mean age was 50.8 years. The mean pain score during colonoscopy was 3.9 (0=none, 10=maximum). The mean distension score after colonoscopy was 1 (0=none, 10=maximum). The proportion achieving cecal intubation within 30 min was 60%. Eight were successful examined to the cecum using water exchange. The patient with bowel adhesion remained a failure of cecal intubation. The endoscope could not be advanced beyond the transverse colon and the color of the mucosa turned pale when insertion pressure on the colonoscope shaft was increased. This patient had incomplete bowel obstruction and subsequently required surgical operation for correction. In the second cecal intubation failure using the water exchange method the colonoscope could not be passed beyond the transverse colon due to difficulty in visualizing the lumen. After distension of the lumen with air, cecal intubation was achieved.

In data set 2 post hoc analysis of two RCT at two VA facilities was performed.^{12,13} The hypothesis that in patients with a history of abdominal surgery the water exchange method would enhance successful cecal intubation was tested. The primary outcome of the analysis was the proportion of patients achieving cecal intubation without medications. The options for colonoscopy

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Table 1. Demographic variables and procedure-related outcomes

Method	Air (n=22)		Water Exchange (n=22)	
Completed unsedated	Yes	No	Yes	No
Age (yrs)	64.5 (8.9)	58.0 (9.0)	63.0 (9.1)	57.0 (4.6)
BMI	35.4 (8.9)	30.1 (6.8)	30.1 (5.3)	27 (6.6)
Time to cecum or end of insertion attempt (min)	23±16	18±15	21±12	11±3
Volume of water (ml)	127±163	13±29	1424±719 ^{c,d}	1067±551 ^{c,d}
Maximum discomfort ^b (0=none, 10=most severe)	3.7±2.1	5.5±1.8 ^c	2.5±2.0 ^d	4.0±1.0
Abdominal surgery				
Appendectomy	2	4	8	2
Cholecystectomy	4	2		
Abdominal hernia	5	1	4	
Inguinal hernia		2	4	
Bladder resection		1		
Bladder suspension			1	
Caesarean-section				1
Splenectomy			1	
Vagotomy		1		
Abdominal aneurysm			1	
Total	11 (50%)	11 (50%)	19 (86%) ^a	3 (14%)

Data are means±SD. BMI, body mass index; Maximum discomfort (0=none, 10=most severe). Data are frequency (%). ^ap=0.022, vs Air, Fisher's exact test.

^bp=0.003, ANOVA with contrasts. ^cvs air & yes, ^dvs air & no.

included scheduled, unsedated (N=82, Sepulveda) and on demand sedation (N=100, Sacramento). Patients' history of abdominal surgery and maximum discomfort (0=none, 10=most severe) during colonoscopy were tabulated. Both studies employed the comparison of water exchange method versus air insufflation.

Demographic and procedure-related variables and the type of abdominal surgery and the number of patients completing unsedated colonoscopy in each category are shown in **table 1**. The proportion of patients completing unsedated colonoscopy in the water exchange group (19 of 22) was significantly higher than that (11 of 22) in the air group (p=0.022, Fisher's exact test). Patients who completed unsedated colonoscopy using the water exchange method had lower maximum pain scores during colonoscopy. The limitation of the analysis is the inclusion of only an elderly veteran population. Water exchange significantly increased the proportion of patients who could complete unsedated exam in the "difficult colonoscopy" cohort with a history of abdominal surgery and decreased the maximum discomfort during colonoscopy in these patients.

These data sets suggest the provocative hypothesis that the water exchange method may enhance cecal intubation in patients with factors associated with difficult colonoscopy. Application of the water exchange method does not preclude the completion of colonoscopy even in prior cecal intubation failure. Future RCT of air insufflation versus water exchange colonoscopy in patients with other factors associated with difficult colonoscopy and in non veteran settings deserve to be considered and supported.

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