

## Water exchange enhanced cecal intubation in potentially difficult colonoscopy. Unsedated patients with prior abdominal or pelvic surgery: a prospective, randomized, controlled trial CME

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**Background:** Colonoscopy is widely used for management of colorectal diseases. A history of abdominal or pelvic surgery is a well-recognized factor associated with difficult colonoscopy. Although water exchange colonoscopy (WEC) was effective in small groups of male U.S. veterans with such a history, its application in other cultural settings is uncertain.

**Objective:** To investigate the application of WEC in such patients.

**Design:** Prospective, randomized, controlled, patient-blinded study.

**Setting:** Tertiary-care referral center in China.

**Patients:** Outpatients with prior abdominal or pelvic surgery undergoing unsedated diagnostic, screening, or surveillance colonoscopy.

**Intervention:** Patients were randomized to examination by either WEC or conventional air colonoscopy (AC).

**Main Outcome Measurements:** Cecal intubation rate.

**Results:** A total of 110 patients were randomized to the WEC (n = 55) or AC (n = 55) group. WEC significantly increased the cecal intubation rate (92.7% vs 76.4%;  $P = .033$ ). The maximum pain scores ( $\pm$  standard deviation) were  $2.1 \pm 1.8$  (WEC) and  $4.6 \pm 1.7$  (AC), respectively ( $P < .001$ ). Multivariate analysis showed that the colonoscopy method was the only independent predictor of failed colonoscopy (odds ratio 11.44, 95% confidence interval, 1.35-97.09). A higher proportion of patients examined by WEC would be willing to have a repeat unsedated colonoscopy (90.9% vs 72.7%,  $P = .013$ ).

**Limitations:** Single center; unblinded but experienced endoscopists.

**Conclusion:** This randomized, controlled trial confirms that the water exchange method significantly enhanced cecal intubation in potentially difficult colonoscopy in unsedated patients with prior abdominal or pelvic surgery. The lower pain scores and higher proportion accepting repeat of the unsedated option suggest that WEC is promising. It may enhance compliance with colonoscopy in specific populations. (Clinical trial registration number: NCT01485133.) (Gastrointest Endosc 2013;77:767-73.)

*Abbreviations:* AC, air colonoscopy; BBPS, Boston Bowel Preparation Scale; BMI, body mass index; RCT, randomized, controlled trial; WEC, water exchange colonoscopy.

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Colonoscopy is widely used for management of colorectal diseases. Screening colonoscopy decreases the incidence and mortality of colorectal cancer by detection and treatment of precancerous lesions and early cancer.<sup>1-3</sup> In patients with a history of abdominal or pelvic surgery, a failure rate of 14.2%<sup>4</sup> has been reported, even with sedation. Postoperative adhesions may have changed the anatomy of the colon, contributing to the difficulty. Insufflated air may distend, lengthen, and angulate the colon, leading to increased discomfort in all, especially the unsedated patient, and greater difficulty of cecal intubation for the endoscopists.

The use of water infusion in lieu of air insufflation obviates excessive lengthening of the colon and facilitates completion of colonoscopy, even in unsedated patients. Several studies revealed that the water exchange method can significantly reduce the pain score and enhance the success of cecal intubation in unsedated or minimally sedated patients.<sup>5-7</sup>

The water exchange method had been shown to increase the proportion of patients able to complete unsedated colonoscopy in small groups of male U.S. veterans with previous abdominal surgery. Veterans may represent a special population with better toleration of the discomfort of unsedated colonoscopy.<sup>8</sup> It is not known whether in another cultural setting patients with a history of abdominal or pelvic surgery will benefit from water exchange colonoscopy (WEC). In addition, colonoscopies are technically more difficult to perform in women who have undergone gynecologic (pelvic) surgeries. Both previous gynecologic surgery and previous hysterectomy are independent predictors of difficulty of intubation in unsedated female patients.<sup>9</sup> It is not known whether WEC would facilitate the performance of colonoscopy in unsedated female patients with a history of pelvic surgery.

We report a prospective, randomized, controlled trial (RCT) that was designed to investigate whether, compared with conventional air colonoscopy (AC), WEC could increase cecal intubation rates in Asian (Chinese) patients with prior abdominal or pelvic surgery.

## METHODS

This prospective, patient-blinded RCT, approved by the local institutional review board (ClinicalTrials.gov NCT01485133) was conducted at the Endoscopic Center of Xijing Hospital, China. Written informed consent was obtained from all the patients.

### Patients

The ratio of unsedated to sedated colonoscopy is about 3:1, and both sedated and unsedated colonoscopy are routine at our center. From November 2011 to July 2012, outpatients who underwent unsedated colonoscopy were invited to participate. Patients with a history of abdominal or pelvic surgery were enrolled. Exclusion criteria in-

### Take-home Message

- Water exchange colonoscopy can significantly reduce the pain score and increase cecal intubation rates in unsedated patients with prior abdominal or pelvic surgery. This method also was associated with a higher proportion of patients who reported willingness to repeat unsedated colonoscopy.
- The lower pain scores and higher proportion of patients accepting a repeat of the unsedated option suggest that water exchange colonoscopy is a promising addition to colorectal cancer prevention.

cluded any of the following: aged <18 years or >80 years; current pregnancy; history of colon resection; severe colon stricture or obstructing tumor; hemodynamic instability; and inability to provide informed consent. Patients who met the inclusion criteria were randomly assigned to the WEC or AC group by using computer-generated random numbers immediately before the examination. The randomization list was not accessible to the endoscopists or assistants.

The preparation method was reported with an acceptable cleansing rate and tolerance.<sup>10</sup> All patients consumed a regular meal for lunch and clear liquids for dinner the day before the colonoscopy. They drank two sachets of polyethylene glycol 4000 electrolytes powder (WanHe Pharmaceutical Co, Shenzhen, China) dissolved in 2 L of water between 4:00 AM and 5:00 AM within 2 hours of the colonoscopy on the same day of colonoscopy. Patients were encouraged to drink more clear liquids after purgatives for adequate hydration before colonoscopy.

Patient blinding involved colonoscopists not informing the patients of the methods, the set-up (colonoscope, water pump, and other equipment) was the same for both WEC and AC, and the display screen was placed over the head of the patients so they could not see the endoscopic images.

### Endoscopic procedure

All colonoscopies were performed from 9:00 AM to 1:00 PM by two experienced colonoscopists (Y.L.P. or L.H.Z.). Before the start of the study, both had performed >2000 ACs and 50 WECs (with 100% cecal intubation rate in the last 30). The variable-stiffness colonoscope (CF-Q260; Olympus, Beijing) was used.

An assistant explained to the patients the pain scores (degree of abdominal pain) to be used. At regular intervals during the insertion phase, patients were asked by an unblinded assistant to report the pain score by using an 11-point visual analog scale (0 = no pain and 10 = most severe pain imaginable).<sup>11,12</sup>

Colonoscopy began with the patient in the left lateral position. For WEC,<sup>13</sup> the air pump was turned off before colonoscopy. During insertion, residual air in the lumen

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