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Prolonged cecal insertion time is associated with decreased adenoma detection

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Background and Aims: The adenoma detection rate (ADR) is an important colonoscopy quality parameter. A longer withdrawal time is associated with increased adenoma detection; however, the effect of cecal insertion time on adenoma detection is unclear. The aim of this study was to evaluate if cecal insertion time is associated with adenoma detection.

Methods: The study included 50- to 89-year-old subjects undergoing an elective outpatient colonoscopy as part of a randomized trial on cap-assisted colonoscopy. The primary outcome was the adjusted mean number of adenomas per patient across quartiles of lengthening patient insertion times. Secondary outcomes included the mean number of advanced adenomas, ADR, and advanced ADR. Adjusted regression analysis was applied to assess for a possible trend.

Results: Among 1043 included study subjects, the median cecal insertion time was 5.3 minutes (interquartile range [IQR], 3.5-8.1) and the median withdrawal time was 8.6 minutes (IQR, 7.1-10.7). Cecal insertion time was not associated with withdrawal time ($P = .950$). The mean number of adenomas per patient decreased across increasing insertion time quartiles from 1.1 to .7, corresponding to a 11% decline per quartile ($P = .031$). Similarly, the number of advanced adenomas decreased from .15 to .06, corresponding to a 7% decline per quartile ($P = .013$). The observed decrease in adenoma detection was similar for proximal and distal adenomas. Endoscopists' individual insertion times were not associated with adenoma detection.

Conclusions: A longer cecal insertion time was associated with a decreased detection of adenomas and advanced adenomas. A long insertion time may be a marker for a more difficult examination that requires a longer withdrawal time to assure adequate examination and adenoma detection. (Clinical trial registration number: NCT01935180.) (Gastrointest Endosc 2017;85:574-80.)

The adenoma detection rate (ADR) is considered an important quality metric for screening colonoscopy.¹ A low ADR is inversely associated with a higher risk for the patient to develop postcolonoscopy colorectal cancer.² Although many studies have examined procedure characteristics and interventions to improve adenoma detection, few factors have been found to be

effective.³ A withdrawal time of at least 6 minutes is associated with a higher ADR compared with a shorter withdrawal time.⁴ However, lengthening withdrawal time alone does not ensure optimal polyp detection,⁵ and a study suggests that technical ability and diligence of the examiner are similarly important.⁶

Abbreviations: ADR, adenoma detection rate; IQR, interquartile range.

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There is reason to believe that insertion time may also be associated with adenoma detection. At the patient level, cecal insertion time is influenced by patient and procedural factors, including bowel cleansing, age, history of constipation, prior abdominal surgical, sex, and body mass index.⁷⁻⁸ A longer insertion time may reflect a more difficult examination, which may hinder adenoma detection during withdrawal. At the endoscopist level, technical skill is required for advancing the endoscope to the cecum. Cecal intubation times and cecal intubation rates > 90% have been identified as competency metrics.⁷ A short insertion time may indicate technical skill, which may also promote a meticulous examination with increased adenoma detection during withdrawal. Further, after a prolonged insertion time, the endoscopist may feel fatigued or under time pressure and accelerate endoscope withdrawal with the potential to miss polyps.

The primary aim of this study was to assess whether cecal insertion time is associated with adenoma detection. We were further interested in understanding whether a possible association is related to patient or endoscopist factors.

METHODS

Study population and procedures

The study included subjects who were 50 to 89 years of age undergoing an elective outpatient colonoscopy at the Dartmouth-Hitchcock Medical Center, Lebanon, New Hampshire, or the VA Medical Center, White River Junction, Vermont. All participants were part of a randomized trial on cap-assisted colonoscopy ([clintrials.gov](https://clinicaltrials.gov/ct2/show/study/NCT01935180) NCT01935180).⁹ The cap used was a 4-mm transparent distal attachment cap (Disposable Distal Attachment, Models D-201-15004, D-201-12704; Olympus America Inc Center Valley, PA, USA). Patients with known inflammatory bowel disease, active colitis, coagulopathy, polyposis syndrome, or poor general health as defined by American Society of Anesthesiologists class greater than 3 and those undergoing an emergency colonoscopy were excluded from the study. For the current analysis, we additionally excluded patients with prior colon resection, incomplete colonoscopy, poor bowel preparation, and incomplete documentation of insertion or withdrawal times.

All study subjects underwent a standard bowel cleansing preparation, typically a 4-L polyethylene glycol solution the day before the colonoscopy. Each study patient underwent only 1 study colonoscopy. Study procedures were performed by 10 experienced board-certified gastroenterologists using standard endoscopes (H-CF/H-PCF 180; Olympus). All study participants provided informed written consent for the initial trial and use of the data for additional analysis. The study was approved by the local institutional review board.

Outcome measures

The primary outcome was the mean number of adenomas per patient, which was chosen because it is a more valid representation of adenoma detection as opposed to the ADR.¹⁰ Secondary outcomes included the mean number of advanced adenomas, ADR, and advanced ADR. The ADR represents the proportion of patients with at least 1 adenoma. Advanced adenomas were defined as adenomas ≥ 10 mm in size or containing villous features, high-grade dysplasia, or cancer. The advanced ADR included all patients with at least 1 advanced adenoma.

Procedure characteristics were assessed as part of the initial trial. Cecal insertion time was defined as the time elapsed from introducing the colonoscope into the rectum until intubation of the cecum. Withdrawal time was defined as the time to withdraw the endoscope from the cecum to the rectum among all patients without a polypectomy. Procedure data were recorded during the colonoscopy by trained personnel (sedation nurse or research assistant).

Statistical analysis

To examine a possible association between cecal insertion time and adenoma detection, we performed patient- and endoscopist-level analyses. For the patient-level analysis, we categorized insertion times of all patients into quartiles of insertion time. We then assessed the measures of adenoma detection and withdrawal time across lengthening quartiles of insertion times. In addition, we assessed the effect of insertion time on proximal (proximal to, and not including, the splenic flexure) and distal adenoma detection. For the endoscopist-level analysis, we assessed adenoma detection and withdrawal times by individual endoscopist's median insertion times.

Proportions are presented as percentages. Continuous variables are expressed as means with standard deviations if normally distributed and as medians with interquartile ranges (IQR) if not normally distributed.

Poisson regression analysis was applied to examine an association between insertion time and number of detected adenomas or advanced adenomas. Unit changes across quartiles of insertion times are presented as relative change expressed as percentage with 95% confidence interval. To examine an association between insertion time and ADR and advanced ADR, we used adjusted logistic regression analysis expressed as odds ratio with 95% confidence interval across quartiles of insertion time and to calculate a test of trend. To examine the effect of endoscopists on associations between insertion time adenoma detection, we applied the factor endoscopist as a fixed effect. We calculated test of trend using Poisson regression (withdrawal time, mean number of adenomas, and advanced adenomas) and logistic regression (ADR and advanced ADR). All regression models considered possible confounders, including age, sex, quality of colon

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