ORIGINAL ARTICLE

Impact of 2 generational improvements in colonoscopes on adenoma miss rates: results of a prospective randomized multicenter tandem study

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Background and Aims: Numerous randomized studies have shown that changing certain features of colonoscopes, usually incorporated when switching from one endoscope generation to the next, mostly do not increase adenoma yield. There is, however, indirect evidence that it may be necessary to skip one instrument generation (ie, changing from one generation to the next but one) to achieve this effect.

Methods: We compared the latest-generation colonoscopes from one company (Olympus Exera III, 190-C) with the next to last one (Olympus 160/5-C) in a prospective multicenter study randomized for the order of colonoscopes in a tandem fashion, involving 2 different examiners. Patients with increased risk for colorectal neoplasia undergoing colonoscopy (positive fecal occult blood test, personal/familial history of colorectal cancer/adenoma, rectal bleeding, recent change in bowel movements) were included. The primary outcome was the adenoma miss rate with the 190 (190-C) colonoscope in comparison with the 160/5 colonoscope (160/5-C).

Results: A total of 856 patients (48.8% male; mean age, 58.3 years) with a personal (41%) or family (38%) history of colorectal neoplasia, rectal bleeding (19%), and other indications were included. Of the 429 patients in the 190-C first group, 16.6% (95% confidence interval [CI], 13.0%-20.1%) had at least one adenoma missed during the first procedure, compared with 30.2% (95% CI, 25.9%-34.6%) in the group with 160/5-C first ($P < .001$). Similarly, the adenoma detection rate during the first colonoscopy was 43.8% versus 36.5% ($P = .030$) for 190-C versus 160/5-C, respectively.

Conclusions: This randomized tandem trial showed lower adenoma miss rates and higher adenoma detection rates for the newer 190 colonoscopes compared with the 160/5 series. These results suggest that it takes multiple improvements, such as those implemented over 2 instrument generations, before an effect on adenoma (miss) rate can be observed. (Study registration number: ISRCTN 2010-A01256-33.) (Gastrointest Endosc 2018;■:1-10.)

(footnotes appear on last page of article)

INTRODUCTION

Colonoscopy has been shown to reduce colorectal cancer incidence and mortality by finding early-stage cancers and detecting and removing adenomas as precursor lesions.[1-3] The outcome of colonoscopy crucially depends on the quality of the procedure. To define (screening) colonoscopy outcome quality, the adenoma detection rate (ADR) has been agreed on as the main surrogate parameter[4-6] based on studies that have shown a good correlation between ADR and interval cancer rate.[7,8]

For a number of years, several new imaging technologies for colonoscopies have been tested with regard to ADR improvement. Such improvements are usually incorporated with a generation change of instruments and include widening of the angle of view, high-definition imaging (HDI), or enhanced imaging methods such as narrow-band imaging, Fujinon intelligent chromoendoscopy, blue-light imaging, or I-Scan. However, despite some encouraging reports, especially initially in the assessment,[9,10] none of those features have been consistently shown to improve ADR when finally tested in randomized studies, as summarized in meta-analyses on HDI[11] or image enhancement techniques.[12-17]

Therefore, it might take several combined changes in endoscope technology before an increase in ADR can be

measured. Quite a few features with regard to imaging quality are usually changed or improved when skipping one colonoscope generation, as suggested by recent larger retrospective analyses of screening colonoscopies.[18,19] We tested this hypothesis in this randomized tandem study, which compared the most recent colonoscope generation from one company with the next but last one. For the reasons mentioned above, we considered it unlikely that incorporating a third group with the intermediate endoscope generation would reveal additional significant differences. The main outcome parameter in this study was adenoma miss rate (AMR) during tandem colonoscopy, which is another way of looking at adenoma detection by elucidating miss rates of the first examination that then become evident at the second colonoscopy.[20]

PATIENTS AND METHODS

Study design

The study was a prospective multicenter randomized cross-over study involving 6 expert centers with multiple experienced examiners, performed between July 2012 (with different starting points of centers) and April 2014 (common endpoint). The study was approved by the French Ethical committee CPP (comité de protection des personnes) Sud Est III under the number 2011-012B. The study is registered in the European clinical trial register (EUDRACT) under the reference 2010-A01256-33. All authors had access to the study data and reviewed and approved the final manuscript.

Study population

Patients were selected from scheduled colonoscopies to represent a higher-than-average risk group.

Inclusion criteria were the following:

- Age ≥18 years.
- Higher than average risk for colorectal cancer: positive fecal occult blood test, personal or familial (first-degree relatives) history of colorectal cancer or colorectal adenoma, patients with symptoms suggestive of colorectal neoplasm (rectal bleeding, recent change in frequency and consistency of stools).
- Status 1 and 2 of the American Society of Anesthesiology (ASA) classification.
- Signed informed consent.

Exclusion criteria were the following:

- Mental or physical condition that can adversely affect the preparation or conduct of the examination or that precludes compliance with the study and/or device instructions.
- Inability to undergo bowel cleansing for colonoscopy.
- Previous abdominal surgery of the GI tract (other than uncomplicated appendectomy or cholecystectomy).
- Known or suspicion of inflammatory bowel disease.
- Complicated diverticular disease within 3 months before inclusion.
- Very high risk for colorectal cancer, history of extensive polyposis, patients with known genetic disease (familial adenomatous polyposis, hereditary non-polyposis colorectal cancer)/Lynch syndrome.
- Coagulation abnormalities or taking drugs affecting coagulation precluding biopsy or polypectomy.
- Life-threatening conditions, status >2 of the ASA classification.
- Renal insufficiency or any contraindication or medication contraindicating the administration of bowel cleansing.
- Female patients who are pregnant or nursing, or of childbearing potential and are not using adequate contraception.
- Participation in another clinical trial within 30 days before or during this study.

Study procedure

Randomization and study groups. After informed consent, patients were randomly assigned to 1 of 2 study groups, receiving either 190-C first or 160/5-C first. Permuted block randomization with block size of 4 was generated with stratification on the centers in opaque concealed envelopes, and sealed envelopes with consecutive inclusion numbers were used to determine the group allocation of each patient and the order of the 2 examiners. The sequence was generated by the Pôle Information médicale Evaluation Recherche in Lyon (France).

Patients were assigned after randomization to 1 of the 2 groups:

(1) 190-C first: first examination with the latest-generation colonoscope (190 series CF or PCF colonoscopies, Olympus Corp, Hamburg, Germany), followed by a second back-to-back colonoscopy performed with a colonoscope from the 160/5 series (CF or PCF colonoscopies, Olympus Corp, Hamburg, Germany), ie, the next but last generation, skipping the 180 generation endoscopes.

(2) 160/5-C first: first examination with the 160/5 generation colonoscope, followed by a second colonoscopy performed with a 190 colonoscope.

The 2 examinations in each patient were performed back to back by 2 different endoscopists, again in random order. Instrument specifications are shown in detail in Table 1. Narrow-band imaging was used at the discretion of the endoscopist.

A second colonoscopy was not performed in case of any of the following circumstances evident at the first colonoscopy:

- Insufficient colonic preparation
- Colonic lumen obstruction diagnosed
- Extensive polyposis (>10 adenomas)
- Abnormal colonic wall, eg, severe diverticulitis
- Adverse events
- Excessive sedation/anesthesia, time, or deterioration of vital signs