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Test-positive rate at CT colonography is increased by rectal bleeding and/or unexplained weight loss, unlike other common gastrointestinal symptoms

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Abstract

Purpose: We evaluated the rate of significant colonic and extra-colonic abnormalities at computed tomography colonography (CTC), according to symptoms and age.
Materials and methods: We retrospectively evaluated 7361 consecutive average-risk subjects (3073 males, average age: 60.3 ± 13.9; range 18–96 years) for colorectal cancer (CRC) who underwent CTC. They were divided into three groups according to clinical symptoms: 1343 asymptomatic individuals (group A), 899 patients with at least one "alarm" symptom for CRC, including rectal bleeding and unexplained weight loss (group C), and 5119 subjects with other gastrointestinal symptoms (group B). Diagnostic and test-positive rates of CTC were established using optical colonoscopy (OC) and/or surgery as reference standard. In addition, clinically significant extra-colonic findings were noted.
Results: 903 out of 7361 (12%, 95% confidence interval (CI) 0.11–0.13) subjects had at least one clinically significant colonic finding at CTC. CTC true positive fraction and false positive fraction were respectively 637/642 (99.2%, 95%CI 0.98–0.99) and 55/692 (7.95%, 95%CI 0.05–0.09). The pooled test-positive rate in group C (138/689, 20.0%, 95%CI 0.17–0.23) was significantly higher than in both groups A (79/1343, 5.9%, 95%CI 0.04–0.07) and B (420/5329, 7.5%, 95%CI 0.07–0.08) ($p < 0.001$). Aging and male gender were associated to a higher test positive rate. The rate of clinically significant extra-colonic findings was significantly higher in group C (44/689, 6.4%, 95%CI 0.04–0.08) versus groups A (26/1343, 1.9%, 95%CI 0.01–0.02) and B (64/5329, 1.2%, 95%CI 0.01–0.02) ($p < 0.001$).
Conclusion: Both test-positive and significant extra-colonic finding rates at CTC are significantly increased in the presence of "alarm" gastrointestinal symptoms especially in older patients.

Keywords: Colorectal cancer; CT colonography; Gastrointestinal symptoms

1. Introduction

Colorectal cancer (CRC) is the second cause of cancer-related death [1] and generally results from the transformation of clinically silent adenomas [2] that are sought by screening tests [3]. Persistence or sudden occurrence of various abdominal symptoms is often considered an indication to search or rule out colonic abnormalities, including CRC or precancerous polyps [4]. Literature suggests that the use of optical colonoscopy (OC) is warranted only for subjects with rectal bleeding and unexplained weight loss [5], whereas the other symptoms' specificity remain questionable [6–8]. Meanwhile, the current diagnosis guidelines for individuals with average-risk for CRC only apply if there is no gastrointestinal symptom or complain [2], raising potentially important concerns. Indeed, as long as all symptoms are considered equivalent in terms of diagnostic yield, individuals with nonspecific gastrointestinal symptoms are evaluated, when needed, by OC, causing potential congestion of the facilities by low resection-rate procedures [9–11]. Second, patient compliance to current CRC screening guidelines is low. Almost 50% of asymptomatic subjects 50 years of age and older escape screening programs over a period of 10 years [12], while subjects with nonspecific gastrointestinal symptoms agree to undergo colonic explorations, for reassurance in a greater percentage [7].

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Computed tomography (CT) colonography (CTC) has emerged over the past decade as an accurate and less invasive alternative to OC in series of symptomatic patients [13,14]. Similarly good results were obtained in series of asymptomatic subjects [15]. To our knowledge, there are little data evaluating the test-positive rate according to gastrointestinal symptoms at CTC in the literature. This has implications for risk-stratification and potentially impacts CRC screening recommendation. We therefore evaluate in this study, the distribution of clinically significant colonic findings and extra-colonic at CTC, according to symptoms and age through a review of a 7-year experience in a single non-academic center.

2. Materials and methods

2.1. Patients

Our institutional review board approved the study and authorized this retrospective patient data analysis without further consent. We searched our hospital records for all subjects who completed a CTC procedure between June 2003 and August 2010. This search yielded 9122 subjects (3822 males, 5300 females, average age: 60.11 ± 13.75 years, range: 18–96 years). Indications for CTC included screening and direct referral ($n = 8573$), secondary referral after incomplete OC ($n = 285$), and Double Contrast Barium Enema (DCBE) referral change ($n = 264$). This referral change was justified by the non-superiority of DCBE over CTC for colonic lesions in several studies [16,17].

Written informed consent was given by all subjects prior to procedures. 1761 subjects with a familial or personal history of polyps or colorectal cancer, genetic conditions, inflammatory bowel disease, who were at increased- or high-risk for colorectal cancer [2] were excluded. The remaining 7361 subjects, with average-risk [18] for CRC (general population) (3073 males, 4288 females, average age: 60.3 ± 13.9 years, range 18–96 years) were evaluated. Their clinical status with regard to the presence of the following gastrointestinal symptoms, prior to CTC was retrieved from the referral forms and/or gathered by patient's anamnesis and all other available patient data, including: (i) abdominal pain, (ii) constipation, (iii) diarrhea, (iv) irregular bowel movement, (v) bloating, (vi) melena, (vii) rectal bleeding, and (viii) unexplained weight loss. We retrospectively assigned the subjects to three main groups, according to the purported clinical importance of these symptoms regarding the level of specificity for CRC [5]: group A included the asymptomatic subjects; group B, the patients with one or more nonspecific symptom(s) (i–vii) in the absence of an established "alarm" symptom (vii and viii), who were assigned to group C.

2.2. CTC technique

All patients underwent the same standardized procedure that consisted into three steps including patient preparation, scanning and data interpretation. The preparation involved two steps including cathartic colonic cleansing and residual fluid tagging. For patients in good general condition, colonic cleansing was achieved by a one-day clear liquid diet, one bottle of sodium phosphate preparation (Fleet-Phospho-soda®, Wolfs, Zwijndrecht, Belgium) and 4 tablets of bisacodyl (Dulcolax®, Boehringer Ingelheim, Ingelheim, Germany). For frail patients, cleansing consisted into 2 days of low-residue diet combined to 8 g of magnesium–sulphate on the examination day's morning, in addition to 2 tablets of bisacodyl and 100 ml of contrast agent (Gastrografin®, Schering AG, Berlin, Germany) twice a day. In patients with renal insufficiency, cardiac failure or severe hypertension, preparation consisted in 3 days of low-residue diet with 2l of Moviprep® (Norgine, Heverlee, Belgium) (propyleneglycol + ascorbic acid) and 4 tablets of bisacodyl the day before the study. Residual fluid tagging was obtained by ingestion of 100 ml Gastrografin® the evening before the procedure and total colonic residual fluid volume was reduced by using a suppository of bisacodyl approximately 2 h before examination, except for patients who underwent CTC after incomplete OC. These patients drank 100 ml of Gastrografin and inserted a suppository of bisacodyl 1 h before the procedure. Before data acquisition, an iv injection of 20 mg/1 ml of Buscopan® (butylhyoscinbromid – Boehringer Ingelheim, Bruxelles, Belgium) was performed and a rectal cannula was inserted for colonic distension with an automatic carbon dioxide insufflator VMX-1010A (Vimap technologies™, Girona, Spain).

A 32-row (GE Lightspeed VCT™, GE Healthcare, Milwaukee, WI) until 09/2010, then a 64-row (GE Discovery CT750 HD™, GE Healthcare, Milwaukee, WI) multislice scanners were used for image acquisitions. Parameters consisted into 1.2 mm-thick slices with a 0.625 mm reconstruction interval, using a 50 mA s low-dose protocols with variable kV, adjusted to body-density for dose reduction, supplemented since 2010 by an adaptive statistical iterative reconstruction algorithm (ASIR) (GE Healthcare, Milwaukee, WI). Two acquisitions were performed: the first in supine position and the second, either in prone position, or right decubitus for unfit and obese patients. Immediate review of the images was performed by a radiologist in all cases. In 897 patients (10%), a third acquisition was ordered because of a segmental collapse preventing confident analysis.

Reading was performed offline on a workstation (Advantage Windows, GE Healthcare, Milwaukee, WI) with a software (Colon VCAR) allowing filet-view, supplemented by "computer aided diagnosis" (CAD) assistance from January 2009, and electronic cleansing from June 2010. Reconstruction algorithms, image display preferences and reading principles used for interpretation are described elsewhere [19]. We used C-RAD reporting classification for all findings [20]. Each finding was assigned to both a colonic segment and a distance to the anal margin.

2.3. Data analysis

Clinically significant colonic findings were defined as either $\geq$6 mm polyps, masses or others requiring work-up or treatment [20]. Clinical files, and reports were searched for repeat CTC, OC and surgical procedures after the initial CTC, when applicable. A reviewer was requested to match CTC and the reference