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BRIEF REPORT

Post-operative colorectal cancer surveillance: preference for optical colonoscopy over computerized tomographic colonography

David S. Weinberg[1,2] · Jeremy Mitnick[1] · Eileen Keenan[1] · Tianyu Li[1] · Eric A. Ross[1]

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Abstract

Purpose Post-operative surveillance strategies for colorectal cancer (CRC) include periodic optical colonoscopy (OC) and abdominal-pelvic CT scan. Adherence with these recommendations is limited. For CRC screening, CT colonography (CTC) identifies larger adenomas and cancers nearly as well as OC. Most screening studies demonstrate that patients prefer CTC. However, CTC has never been compared to OC in the post-operative surveillance setting.

Methods We hypothesized that CTC might represent an attractive substitute for the standard OC/CT scan combination. Here, 223 patients underwent CTC followed by same day OC 1 year after curative CRC resection.

Results Of the 144/223 (64.6%) participants with a preference, 65.9% (95/144) preferred OC. This preference was more pronounced in women and in patients with polyps detected. No additional patient level factors significantly altered this primary result.

Conclusions In contrast to CRC screening, this first study in CRC post-operative surveillance patients demonstrates a preference for OC. Assuming patient preference is an important determinant, introduction of CTC as a method to increase patient adherence with CRC surveillance is unlikely to be effective.

Trial registration Clinical Trials.gov registration number: NCT02143115.

Keywords Colorectal cancer · Post-operative surveillance · CT colonography · Colonoscopy

Introduction

Longitudinal, post-operative surveillance is recommended for colorectal cancer (CRC) survivors who have undergone surgical resection with curative intent [1]. Several organizations have produced widely promulgated surveillance guidelines that incorporate endoscopic and radiologic imaging, laboratory testing and physical examination [1, 2]. However, adherence with this multi-component regimen is low, especially for the one year post-resection abdominal-pelvic CT scan and optical colonoscopy (OC) [3].

We recently completed a prospective trial comparing the clinical utility and cost effectiveness of the standard combination of CT scan and OC to an alternative, CT colonography (CTC) alone [4]. CTC has gained greatest attention as an option for routine CRC screening. In that setting, CTC identifies cancers and polyps, especially those ≥ 1 cm, nearly as well as OC. For screening or surveillance, CTC offers several potential advantages compared to OC. These include shorter procedure times, no sedation requirements or need for chaperone afterwards, and less risk of procedural complications. An additional advantage in post-operative surveillance is patient convenience as CTC allows for visualization of both intra- and extra-colorectal contents during the same examination.

For CRC screening, most studies have found that patients prefer CTC to OC [5]. No similar studies have been performed in the post-operative surveillance setting. Given the potential attributes of CTC, we hypothesized it might represent an attractive substitute to patients for independent CT and OC. Here, we report a comparison of patient preference of CTC v. OC in a cohort of patients 1 year after surgical resection.

✉ David S. Weinberg
david.weinberg@fccc.edu

[1] Fox Chase Cancer Center, Philadelphia, PA, USA

[2] Department of Medicine, Fox Chase Cancer Center, 333 Cottman Avenue, Philadelphia, PA 19111, USA

Methods

In addition to studying patient preference, other goals of this institutional review board approved, multi-center, prospective trial were to compare the clinical and cost effectiveness of CTC as a substitute for the standard CT and OC combination to identify colonic neoplasia at 1 year following CRC resection with curative intent [4]. In brief, eligible men and women ≥ 18 year with a history of stage 0-III CRC resected approximately 1 year earlier consented to a standard bowel preparation followed the next day by CTC with oral contrast tagging and then OC.

On arrival for study-related procedures, all participants received a brief written questionnaire meant to elicit perceptions and preferences regarding CTC versus OC and the EQ-5D to assess current health state quality of life [6]. Among other questions, participants were asked if they preferred CTC, OC or neither. In all cases, CTC followed by OC were performed on the same day. Participants were requested not to complete any questionnaires on the day of the procedures to allow for complete recovery from OC-related sedation. Participants were asked to return these materials within 7–10 days. Study members contacted participants to remind them if more than 10 days elapsed without receipt.

Per protocol, all participants completed the CTC first. Research coordinators collected CTC findings which were revealed to the colonoscopist during subsequent OC only after endoscopic examination of specific colon segments (e.g., cecum, ascending colon etc.) was complete. In the event, the CTC revealed a lesion that the OC did not, the endoscopist re-examined the colon segment in question. This second, "enhanced" view served as the gold standard for neoplasia identification.

Prior to discharge from the endoscopy site participants were informed of their OC results. Study protocol did not require separate discussion of CTC and OC findings. While CTC result disclosure was not precluded, individual findings or a comparison of CTC and OC findings were rarely requested.

Statistical methods

Chi-square or Fisher's exact tests and Kruskal–Wallis tests were used to evaluate relationships between preference (CTC, OC, no preference) and categorical or continuous variables, respectively. The significance of second-order interactions among covariates on patient preference were assessed using multinomial logistic regressions. All tests were two-sided with a 5% type I error. Analyses were conducted using SAS v9.4.

Results

For this clinical trial, 231 patients underwent CTC and OC. Of these, 223 (96.5%) submitted all preference questionnaires. Of participants who completed surveys the majority were Caucasian (88.3%) and male (60.5%) with stage II or III disease (79.8%). Most subjects were treatment naïve before CRC surgery; however, 45 patients (20.2%) received neo-adjuvant chemoradiation. Overall, 51.6% of participants had at least one colorectal polyp detected by conventional or enhanced OC.

For the primary question of diagnostic test preference, 95 participants (42.6%) preferred OC, 49 (22.0%) preferred CTC, and 79 (35.4%) had no preference.

A statistically significant relationship between gender and preference was observed ($p = 0.048$, Table 1), with 51.1% of females preferring OC, while 41.5% of males expressed no preference. Further, subjects with one or more polyps detected by enhanced colonoscopy had statistically significant differences in preference as compared to those without polyps ($p = 0.007$, Table 1). CTC was preferred by 13.9% with polyps and 30.6% of patients without polyps. In contrast, 49.6% of the patients with polyps preferred OC. There were no statistically significant associations between preference and other variables including race, ethnicity, site of primary tumor, stage, pre-surgery treatment type, post-surgery treatment type, presence of ostomy, or level of discomfort reported during CTC or OC.

While total EQ-5D scores were significantly different across preference groups ($p = 0.049$, Table 1), there were no significant associations identified between preference and any of the EQ-5D sub-domains (i.e., mobility, self-care, usual activities, pain/discomfort, anxiety/depression).

Exploratory analyses identified a significant interaction between gender and presence or absence of anxiety or depression on patient preference ($p = 0.032$). Interestingly, anxious or depressed males were approximately twice as likely to prefer OC as males who were not (65% vs. 32%). In contrast, the preference profile for women was largely unaffected by level of anxiety or depression. Finally, the association between preference and presence or absence of polyps was not significantly different for men and women (test of interaction p value = 0.638).

Discussion

In the United States, about 100,000 patients annually undergo Colorectal Cancer (CRC) resection with curative intent [7]. These patients join the roughly 1,000,000 CRC survivors eligible for participation in post-resection surveillance [8]. Surveillance in CRC patients is pursued

Table 1 CTC v. OC preferences by gender, presence of absence of polyps, and EQ5D results

	CT colography	Optical colonoscopy	No preference	*p* value
Gender				0.048[b]
Female[a]	20 (22.7%)	45 (51.1%)	23 (26.1%)	
Male[a]	29 (21.5%)	50 (37.0%)	56 (41.5%)	
Polyp detected by optical colonoscopy				0.007[b]
No[a]	33 (30.6)	38 (35.2)	37 (34.3)	
Yes[a]	16 (13.9)	57 (49.6)	42 (36.5)	
Stage				0.536[b]
I	7 (15.6)	19 (42.2)	19 (42.2)	
II	18 (25.7)	32 (45.7)	20 (28.6)	
III	24 (22.2)	44 (40.7)	40 (37.0)	
EQ5D—mobility				0.303[b]
No problems[a]	44 (23.7)	77 (41.4)	65 (35.0)	
Some problems[a]	4 (11.8)	16 (47.1)	14 (41.2)	
EQ5D—self-care				0.434[c]
No problems[a]	48 (22.4)	89 (41.6)	77(36.0)	
Some problems[a]	0 (0.0)	4 (66.7)	2(33.3)	
EQ5D—usual activities				0.288[b]
No problems[a]	43 (23.9)	74 (41.1)	63(35.0)	
Some problems[a]	5 (12.5)	19 (47.5)	16 (40.0)	
EQ5D—pain/discomfort				0.404[b]
No problems[a]	37 (23.1)	64 (40.0)	59 (36.9)	
Some problems[a]	11 (18.3)	30 (50.0)	19 (31.7)	
EQ5D—anxiety/depression				0.244[b]
No problems[a]	39 (22.5)	69 (40.0)	65 (37.6)	
Some problems[a]	9 (20.0)	24 (53.3)	12 (26.7)	
EQ5D[d]	0.94 (0.10)	0.89 (0.13)	0.93 (0.11)	0.049[e]
Age[d]	57.47 (15.01)	58.38 (13.48)	59.33 (11.74)	0.673[e]

[a]Frequency (%)

[b]χ^2 test

[c]Fisher's exact test

[d]Mean (Standard Deviation)

[e]Kruskal–Wallis Test

to facilitate the early detection of recurrence, and to prevent new cancer development through adenomatous polyp detection. Procedures that result in the earlier detection of recurrent disease amenable to intervention are intuitively attractive. However, the utility of post-operative surveillance for CRC patients is uncertain. A recent Cochrane Collaboration meta-analysis supported the benefit of multi-component surveillance including periodic CT scan and colonoscopy [9], but several larger, more recent studies have not [10, 11].

The potential benefits of surveillance are reduced by limited patient adherence. Adherence by CRC survivors with all components of post-resection surveillance is less than 50% [3]. Adherence with individual surveillance components, for example CT or 1 year colonoscopy, is equally poor. Reducing the financial and psychological burden on patients is one potential mechanism to improve adherence [12, 13]. We hypothesized that CTC, a single non-invasive test that requires no sedation and can provide the same clinical information as the combination of CT and OC might provide an attractive, convenient surveillance alternative. CTC is most studied as a method of CRC screening. In that setting, CTC is generally preferred over OC. Factors associated with this preference include less pain, discomfort and embarrassment. Perceived inconvenience is also less [5].

The present study looks for the first time at the role of CTC as a component of CRC surveillance. In contrast to screening, we found an overall preference for OC over CTC, especially for women and for those participants with polyps detected by OC. No additional factors examined, for example patient demographics or primary tumor characteristics, significantly modified this primary result. Higher levels of anxiety were self-reported by men who preferred OC, but no similar relationship was seen for women.

Why surveillance patients express a greater preference for OC is uncertain. It is reasonable to speculate that patients with a personal history of CRC might harbor greater pre-test concerns regarding neoplasia than screening patients [5]. Interventions with diagnostic and therapeutic capacity might be more attractive than tests with diagnostic capacity alone. Our finding that polyp identification (and removal through polypectomy) was associated with OC preference supports this concept. Interestingly, the preference for CTC over OC as a method of CRC screening is typically reduced or erased in hypothetical scenarios where participants were asked to anticipate a greater chance that polyps or cancers will be missed [14]. Other possible explanations include that patients are sedated for OC but not CTC. It is conceivable colonic resection, and in some cases pelvic irradiation, makes subsequent CTC more uncomfortable due to more difficult insufflation or reduced bowel compliance, although in this study the amount of discomfort reported during OC had no impact on preference. Finally, unlike the screening setting, the majority of CRC survivors have experience with both OC and CT scanning. This familiarity may contribute to improved perception about the relative attractiveness of OC.

This first report has limitations. Roughly, 50% of eligible patients approached declined to participate in this clinical trial. The majority of refusers cited scheduling challenges or no interest in clinical trials as the basis for non-participation. Less than 10% (22/231) specifically cited reluctance to undergo CTC as the cause of non-participation. Although the demographics of participants and non-participants were identical, there may be baseline differences we did not capture. We made no specific effort to standardize the preparation for, or execution of CTC or OC across study sites. All enrollment sites had previously demonstrated, substantial experience in the performance of CTC and OC. Variation in test performance may have affected our results, however, the heterogeneity of enrollment sites and the performance frequency of these common procedures argues in favor of the generalizability of results. Other factors, for example clinical effectiveness and cost effectiveness may affect how attractive different surveillance strategies appear. Although study participants were not aware during the study, our group has recently demonstrated that CTC appears less clinically effective [4], but more cost-effective than OC to detect advanced neoplasia [15]. This information may influence decision-making by patients or policy-makers going forward.

In summary, unlike the CRC screening setting, patients with a history of resected CRC preferred OC to CTC for colonic visualization. When combined with recent evidence suggesting that OC is also more clinically effective to detect colonic neoplasia, it is unlikely that patients or providers would opt for CTC even if it is modestly more cost-effective. While broadly advocated, adherence with CRC surveillance recommendations is low. The current study does not support the use of CTC as a substitute for the OC as a component of post-operative surveillance. Other, better methods to enhance surveillance adherence remain to be identified.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflicts of interest.

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