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Citation for published version (APA):
Jensch, S. (2009). CT colonography as surveillance technique for patients at increased risk for colorectal cancer.

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CT Colonography with Limited Bowel Preparation: Prospective Assessment of Patient Experience and Preference in comparison to Optical Colonoscopy with Cathartic Bowel Preparation

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European Radiology 2009 Jul 23 [Epub ahead of print]
Abstract

**Purpose:** The purpose of this study was to prospectively compare participant experience and preference of limited preparation CTC with full-preparation colonoscopy in a consecutive series of patients at increased risk of colorectal cancer.

**Methods:** CTC preparation comprised 180ml diatrizoate meglumine, 80ml barium and 30mg bisacodyl. For the colonoscopy preparation four litres of polyethylene-glycol solution was used. Participants' experience (pain, embarrassment, discomfort) and preference were compared using Wilcoxon signed rank test and the Chi-squared test respectively. Associations between preference and experience parameters were determined by logistic regression.

**Results:** Data of 173 participants were included. Diarrhoea occurred in 94% of participants during CTC preparation. This side-effect was perceived as severely or extremely burdensome by 29%. Nonetheless, the total burden was significantly lower for the CTC preparation than for colonoscopy (9% rated the CTC preparation as severely or extremely burdensome compared with 59% for colonoscopy; p<0.001). Participants experienced significantly more pain, discomfort and total burden with the colonoscopy procedure than with CTC (p<0.001). After 5 weeks, 69% preferred CTC, 8% were indifferent and 23% preferred colonoscopy (p<0.001). A burdensome colonoscopy preparation and pain at colonoscopy were associated with CTC preference (p<0.04).

**Conclusion:** Participants’ experience and preference were rated in favour of CTC with a limited bowel preparation compared to full-preparation colonoscopy.
Introduction

Computed Tomography (CT) colonography is an established and widely used imaging technique in patients with symptoms of colorectal cancer. In addition, it has been identified as an effective instrument for screening average-risk individuals [1-4]. For CT colonography a cathartic bowel preparation is required. The cathartic bowel preparation is, however, burdensome and often considered the most unpleasant part of the examination [5, 6]. This is important for clinical examinations, but especially for screening where participation rates are important determinants of effective screening [7].

Several studies have reported promising results for CT colonography with a less extensive bowel preparation with regard to image quality and accuracy [8-12]. Data on acceptance of these limited bowel preparation schemes are however sparse. To our knowledge, three feasibility studies and one accuracy study have investigated patient acceptance of a limited preparation with favourable results [13-16]. To date, no comprehensive data on patient acceptance and preference in a larger cohort have been published.

Therefore, the purpose of our study was to assess intra-individual experience and preference for CT colonography with a limited preparation in comparison to optical colonoscopy with a cathartic preparation in a population at increased risk of colorectal cancer.

Materials and Methods

Study population

Patients with a personal or family history of colorectal polyps or cancer were invited to participate in our study [17]. All patients were scheduled for a routine optical colonoscopy at the endoscopy departments of the Academic Medical Center (AMC) or the Onze Lieve Vrouwe Gasthuis (OLVG). Exclusion criteria were: age under 18 years, previous reaction to iodine-containing contrast agent, inflammatory bowel disease, familial adenomatous polyposis or previous participation in a research project that involved ionising radiation within 12 months preceding the CT colonography examination. The institutional review board of both hospitals approved the study. All patients gave written informed consent.
Questionnaires

Participants filled out six questionnaires at different time points with regard to (appendix A):

1. Pre-test appraisal and post-test experience with the preparation for CT colonography and the preparation for optical colonoscopy.
2. Pre-test appraisal and post-test experience with the CT colonography and optical colonoscopy procedures.
3. Preference for their future examinations.

Participants’ pre-test appraisal was based on previous knowledge of the examinations and on information provided by us (in writing and by phone) and was filled out two weeks before CT colonography.

Participant’s experience with the preparation and the procedure was rated using a five-point scale (none, mild, moderate, severe, extreme) and filled out on the day of the examination. Furthermore, after completing both tests participants indicated which event was most burdensome to undergo (CT colonography preparation, the CT colonography procedure, optical colonoscopy preparation, or the optical colonoscopy procedure).

Participants’ preference for CT colonography or optical colonoscopy was rated using a seven-point scale (definitely, probably, possibly CT colonography; indifferent; possibly, probably, definitely optical colonoscopy) and based on the presumption that in 20% of CT colonography examinations a significant lesion would be found that would result in optical colonoscopy referral for polyp removal. Because adverse reactions to tests tend to temper in time and the attitude at that later time point will better reflect the attitude towards future screening, the preference was again assessed five weeks later at home. The questionnaires were designed by the Department of Social Medicine [6, 18]

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**Figure 1. Limited bowel preparation for CT colonography**

| Start low-fibre diet | 3 x 20 ml Barium | only liquids |
|----------------------|------------------|-------------|
| 1 x 20 ml Barium     | 3 x 20 ml diatrizoate meglumine | 2 x 60 ml diatrizoate meglumine |
|                      | 1 x 20 mg Bisacodyl | 1 x 10 mg Bisacodyl |

*no fibrous vegetables and fruit, no whole-wheat cereal products, no nuts.*
Limited bowel preparation for CT colonography

Participants were prepared with a low-fibre diet two days before CT colonography. A combination of 80 ml barium sulphate suspension (Tagitol V, E-Z-EM Inc., Westbury, USA) and 180 ml diatrizoate meglumine (200mg/ml hospital pharmacy) was prescribed for faecal tagging. Bisacodyl (hospital pharmacy AMC) was given the day before and on the day of the examination to reduce the amount of faeces in the colon (Fig. 1).

| Table 1. Participant characteristics |
|-------------------------------------|
| Gender                              |
| men                                 |
| women                               |
| Age                                 |
|                                      |
| Hospital Cultural background         |
| AMC/OLVG                            |
| western                             |
| non-western                         |
| not provided                        |
| Education                           |
| higher vocational / academic        |
| other                               |
| not provided                        |
| Income                              |
| above 27.000 €                      |
| below 27.000 €                      |
| not provided                        |
| Normal bowel habits                 |
| at least one defecation per day     |
| at least one defecation per 3 days  |
| less than one defecation per 3 days |
| not provided                        |
| Symptoms of CRC                     |
| abdominal pain                      |
| altered bowel habits                |
| hematochezia                        |
| Personal history of                 |
| colorectal polyps                   |
| colorectal cancer                   |
| colorectal polyps and cancer        |
| Prior optical colonoscopy           |
| yes                                 |
| no                                  |
| not provided                        |

CT colonography procedure

CT colonography was performed 1 to 4 weeks (mean 25 days) prior to optical colonoscopy. Participants were scanned in the Academic Medical Center by a dedicated CT colonography technician or research fellow [S.J.]. Through a thin flexible rectal tube the colon was distended with carbon dioxide (CO₂) by using an automatic insufflator (ProtocO₂l, E-Z-EM, Westbury-NY, USA). Butyl scopolamine
bromide (20 mg, Buscopan; Boehringer Ingelheim, Ingelheim, Germany) or, if contraindicated, Glucagon Hydrochloride (1 mg, Glucagon; Novo Nordisk A/S, Bagsvaerd, Denmark) was given intravenously immediately prior to the scan. Examinations were performed within a 22-seconds breath hold on a Philips Mx8000 CT scanner in supine and prone positions. The time that patients spent in the CT-room and the amount of insufflated CO₂ was recorded by a research nurse [A.H.].

Cathartic bowel preparation for optical colonoscopy
Bowel preparation for optical colonoscopy consisted of 4 litres poly-ethylene glycol electrolyte solution (Klean Prep, Helsinn Birex Pharmaceuticals, Dublin, Ireland) ingested the day before the examination or, if the examination was in the afternoon, 2 litres the day before and 2 litres on the day of the examination. After starting the catharsis participants were not allowed to eat.

Optical colonoscopy procedure
An experienced staff member (gastroenterologist or a gastro-intestinal surgeon with an average experience of 11 years, range 1-26 years) or a gastroenterology fellow under direct supervision of a experienced staff member performed the optical colonoscopy in the Academic Medical Center or the Onze Lieve Vrouwe Gasthuis. Participants received a standard dose of sedatives (5 mg of midazolam; Dormicum, Roche, Basel, Switzerland), or analgesics (0.05 mg Fentanyl-Janssen, Janssen Pharmaceuticals, Beerse, Belgium or 0.5 mg of Rapifen; hospital pharmacy) on request. The endoscopist increased the dose until sedation or pain control was sufficient. Butyl scopolamine bromide (20 mg, Buscopan; Boehringer Ingelheim, Ingelheim, Germany) was administered intravenously. During the examination a research nurse [A.H.] recorded whether participants received sedatives or analgesics.
The time to complete the optical colonoscopy (insertion and inspection) was captured with a stopwatch. After the examination participants were admitted to the recovery ward for two hours, upon which they could go home.

**Figure 2.** Flow-chart shows participation of the study population

![Flow-chart](chart.png)

**Statistical Analysis**

Data from participants who completed both examinations (CT colonography and optical colonoscopy) were included for analysis. Pre-test appraisal differences between CT colonography and optical colonoscopy and post-test experience differences between both examinations were tested for statistical significance using the Wilcoxon signed rank test. Differences in preference were tested for significance with Chi-square test after dichotomization (preference for CT colonography versus preference for optical colonoscopy); participants that were indifferent were not included in the analysis.
The Chi-square test was also used to test for significant differences in preference between the first and the second measurement (immediately post-test versus 5-weeks post-test). P <0.05 was considered to indicate a statistically significant difference.

Univariate logistic regression analysis was used to investigate associations between participants’ preferences for CT colonography or optical colonoscopy (for two time points: immediately post-test and 5-weeks post-test) and patient-related factors: age ≥ 65 years, sex, completion of academic or higher vocational education, income with respect to 27000 Euros (mean net Dutch annual income per household) or greater, recent symptoms of colorectal cancer, indication for surveillance (personal or familial history of colorectal carcinoma or polyps), difficult or painful defecation habits in daily life, use of sedatives or analgesics during optical colonoscopy, above average duration of the optical colonoscopy examination, presence of polyps at optical colonoscopy, above average duration of the CT colonography examination, above average amount of CO₂ used for colonic distension at CT colonography, and experience parameters on the day of the examination (burdensome bowel preparation for CT colonography or for optical colonoscopy; and pain, embarrassment or discomfort during CT colonography or optical colonoscopy [no, mild and moderate versus severe and extreme burden]). Subsequently, covariates with a P value of .10 or lower were included in the multivariate logistic regression model. A stepwise
backward selection strategy was used. Odds ratios are provided: an odds ratio less than 1 indicates a positive association with a preference for CT colonography; an odds ratio greater than 1 indicates a positive association with a preference for optical.

Results

Study population
Of 468 eligible individuals that were scheduled to undergo an optical colonoscopy during the inclusion period, 173 participants were included for analysis (Figure 2, Table 1) (17).

Bowel preparation, CT colonography and optical colonoscopy procedures
For CT colonography, all participants used the prescribed preparation. Participants rated the use of bisacodyl the most burdensome factor of the CT colonography preparation (Figure 3). Side-effects as abdominal pain, diarrhoea and flatulence were reported by respectively 46% (78/171), 94% (158/168) and 42% (72/170) of participants and were perceived as severely or extremely burdensome by respectively 23% (18/78), 29% (46/158) and 18% (13/72) (table 2). Diarrhoea was more burdensome compared to abdominal pain (p=0.015) and flatulence (p<0.001), while abdominal pain was more burdensome than flatulence (p=0.049).

The average time that participants spent in the CT examination room was 21 minutes (range 13-48). Buscopan was administered to 84% (143/170) of participants and glucagon to 13% (22/170) of participants. The average amount of insufflated CO₂ to distend the colon was 3.9 litres (range 2-8). The majority of participants (56%; 89/159) found CO₂ insufflation of the colon the most burdensome aspect of the CT colonography procedure, followed by the breath hold (25%; 39/159).

For optical colonoscopy, an average of 4 litres polyethylene glycol electrolyte solution (PEG) was used (range 2.5-6). The average duration of the optical colonoscopy examination was 40 minutes (range 12-90). Sedation and/or analgesics were administered to 82% (139/169) of participants. In 73% (127/173) of participants a polyp was detected at optical colonoscopy (17). The movement of the scope was considered the most burdensome aspect of optical colonoscopy (50%; 81/162) followed by the CO₂ insufflation (30%; 48/162).
Experience of bowel preparation and procedure (CT colonography versus optical colonoscopy)

The total burden of the CT colonography preparation was significantly lower compared to the optical colonoscopy preparation (p<0.001); the CT colonography preparation was considered severe or extreme by 9% (15/171) of participants versus 59% (97/165) for optical colonoscopy (Figure 4a).

The total burden of the CT colonography procedure was also significantly lower in comparison to the optical colonoscopy procedure (p<0.001); 2% (4/173) rated CT colonography as severe (no participant considered CT colonography extremely burdensome) versus 23% (38/166) who rated optical colonoscopy severe or extreme burdensome (Figure 4b). Participants experienced significantly more pain (p<0.001) and discomfort (p<0.001) during the optical colonoscopy procedure than during the CT colonography procedure (Figure 5). Embarrassment was rated as none or mild by 97% (166/172) for CT-colonography and 93% (154/166) for optical colonoscopy; no statistical significant difference (p=0.19).

The total burden of the CT colonography procedure was also significantly lower in comparison to the optical colonoscopy procedure (p<0.001); 2% (4/173) rated CT colonography as severe (no participant considered CT colonography extremely burdensome) versus 23% (38/166) who rated optical colonoscopy severe or extreme burdensome (Figure 4b). Participants experienced significantly more pain (p<0.001) and discomfort (p<0.001) during the optical colonoscopy procedure than during the CT colonography procedure (Figure 5). Embarrassment was rated as none or mild by 97% (166/172) for CT-colonography and 93% (154/166) for optical colonoscopy; no statistical significant difference (p=0.19).

| Preference for CT colonography (n=115) | Preference for optical colonoscopy (n=37) |
|--------------------------------------|------------------------------------------|
| 4 litres PEG was burdensome          | OC is therapeutic                        |
| Complete CTC examination             | CTC preparation was burdensome           |
| (preparation and procedure) less     | In case of a positive CTC then follow-up with OC (2 examinations) |
| burdensome                           | 6 (16%)                                  |
| CTC preparation less burdensome      | 4 (11%)                                  |
| No sedation for CTC                  | OC is more accurate                      |
| No pain during CTC                   | Discomfort during CTC examination        |
| Less burden during CTC               | Sedatives at OC                          |
| Pain during OC                       | Ability to watch screen during OC         |
|                                       | No particular reason                     |
| If not necessary no (therapeutic) OC | 3 (3%)                                   |
| Simpler preparation for OC           | 1 (3%)                                   |
| Evaluation of extracolonic pathology | 1 (3%)                                   |
| No particular reason                 | 1 (3%)                                   |
|                                       | 2 (2%)                                   |
|                                       | 2 (2%)                                   |
| Participants wrote down on the questionnaire why they preferred CT colonography or optical colonoscopy as future examination. No list of possible reasons was provided.
Pre- and post-test appraisal of bowel preparation and procedure

In the pre- (2 weeks prior at home) and post-test (5 weeks after the examinations at home) appraisal; respectively 94% (152/162) and 87% (144/165) of participants indicated that the optical colonoscopy preparation would be or was more burdensome to undergo than the CT colonography preparation. With regard to the examination, respectively 94% (149/159) and 87% (142/164) of participants indicated pre- and post-test that optical colonoscopy was more burdensome than CT colonography. The small shift in the post-test appraisal in favour of optical colonoscopy preparation and procedure was significant (respectively p=0.003 and p=0.005). This is in line with the fact that 18% (30/165) of participants indicated that CT colonography was more burdensome than they had anticipated.

Figure 4a-b. Total burden of the bowel preparation and procedure

Figure 4a shows that the bowel preparation for optical colonoscopy was considered more burdensome compared to the bowel preparation for CT colonography (p< 0.001). Figure 5b demonstrates that the optical colonoscopy procedure was more burdensome to undergo than the CTC procedure (p< 0.001).

Figure 5. Pain and discomfort associated with the examination

Participants experienced more pain and discomfort during the optical colonoscopy examination compared to the CT colonography examination (p-values <0.001).
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Pre-test, 57% (90/159) of participants was most reluctant to undergo the optical colonoscopy procedure compared to the preparation for optical colonoscopy; post-test, 67% (111/165) actually considered the optical colonoscopy preparation more burdensome than optical colonoscopy itself (p<0.001). The bowel preparation for optical colonoscopy was considered the most burdensome event, as indicated immediately post-test and 5-weeks later at home (Figure 6).

Participants’ preference and determinants of preference

In the recovery room after optical colonoscopy as well as 5 weeks later at home most participants indicated a preference for CT colonography as their next examination (p-values <0.001); respectively 76% (124/164) and 69% (115/166) of participants preferred CT colonography versus 16% (27/164) and 22% (37/166) of participants who preferred optical colonoscopy (Figure 7). The small shift after 5 weeks towards optical colonoscopy was significant (p=0.03). Table 3 displays the different reasons of participants for their choice of preference.

With regard to associations between preference and patient-related factors, recent symptoms of colorectal cancer was a positive determinant of a preference for optical colonoscopy directly after optical colonoscopy (odds ratio 1.70; p=0.03) but 5 weeks later at home this association was no longer present (Appendix B1). With regard to participants’ experience parameters, a burdensome bowel preparation for CT colonography (odds ratio 6.06; p=0.01) and a painful CT colonography procedure (odds ratio 6.34; p=0.03) were independent determinants for optical colonoscopy preference. Likewise, a burdensome optical colonoscopy preparation (odds ratio 0.40; p=0.05) and pain at optical colonoscopy (odds ratio 0.10; p=0.01) were
associated with a preference for CT colonography. After 5 weeks, the same determinants of experience were still associated (all p-values ≤ 0.04) with the same preference outcome (appendix B2).

**Discussion**

In our 5-weeks follow-up study, the majority of participants (69%; 115/166) indicated a preference for CT colonography as their next examination. This preference was apparent despite the fact that participants were informed that in 20% of CT colonography examinations a referral for optical colonoscopy would still be required for removal of polyps. The cathartic bowel preparation and pain and discomfort experienced during optical colonoscopy were such that optical colonoscopy was considered a more burdensome test than limited prepared CT colonography.

In accordance with previous studies, we found a better patient tolerance for the limited preparation versus the cathartic preparation (13-16). However in our study, almost all participants (158/168) experienced diarrhoea during the CT colonography preparation and this side-effect was considered very burdensome. Although Taylor et al. indicated an increased defecation frequency in their study (15), the occurrence of diarrhoea was not reported or remarkably only a few patients experienced diarrhoea in these earlier studies (13, 14, 16). For example, Iannaccone et al reported that diarrhoea occurred in just 6% (13/203) of participants (16). This is worth mentioning, because the use of iodinated contrast agents and/or added laxatives is generally associated with diarrhoea (19). In that study a higher dose of diatrizoate meglumine (200 mL with a concentration of 370 mg/mL) was used than in our study.

**Figure 7. Participant preference directly post-test and 5-weeks post-test**

|                      | directly post-test | 5-weeks post-test |
|----------------------|-------------------|-------------------|
| definitely CTC       | 56                | 52                |
| probably CTC         | 14                | 12                |
| possible CTC         | 6                 | 5                 |
| indifferent          | 8                 | 8                 |
| possible OC          | 2                 | 1                 |
| probably OC          | 7                 | 11                |
| definitely OC        | 8                 | 11                |

Participants preferred CT colonography above optical colonoscopy as their next examination of choice; as indicated by participants directly after optical colonoscopy (76%) and 5 weeks later at home (69%) (p-value <0.001). Values represent percentages.
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(180 mL with a concentration of 200 mg/mL) but no bisacodyl was added (16). At present, we do not add any laxatives anymore to the preparation and we have reduced the dose of iodinated contrast. Patients still experience diarrhoea with this new protocol but the burden of diarrhoea is significantly improved and image quality has not been impaired (20). Despite the occurrence of side-effects in our study, the preparation for CT colonography was well tolerated by participants and considered significantly less burdensome than the preparation for optical colonoscopy (9% of participants rated the CT colonography preparation as severely or extremely burdensome compared to 59% for optical colonoscopy; P<0.001).

With regard to the CT colonography examination, 56% (89/159) of participants indicated that the insufflation of the colon with CO₂ was the most burdensome part. This is in line with a previous study that showed that insufflation of air and the insertion of the inflexible rectal tube were considered the most burdensome aspects (13). Insertion of a rectal tube was in our study not considered burdensome because we used a thin flexible catheter. Although in our study several aspects of the CTC examination were rated severely or extremely burdensome by some participants, the complete procedure was considered severely burdensome by only 2% (4/173) and no participant considered the examination extremely burdensome. In comparison, significantly more participants; 23% (38/166) perceived the optical colonoscopy examination as severe or extreme burdensome (p<0.001).

Five weeks after completing both tests, 69% of participants preferred CT colonography and 22% preferred optical colonoscopy. In an earlier acceptance study comparing cathartic CT colonography to optical colonoscopy, 61% of participants preferred CT colonography (6). It is reasonable to assume that the present 8% increase in CT colonography preference can be attributed to the limited preparation as other factors were the same (except for the use of a flexible catheter). The observed increase was not as large as we anticipated probably because most participants had diarrhoea as side-effect. This is underlined by the fact that a burdensome CT colonography preparation was associated with an optical colonoscopy preference (p=0.01). However, the decisive factor for most participants to prefer optical colonoscopy was the therapeutic aspect. As this is an important benefit of optical colonoscopy, it is a detriment of limited CT colonography (in comparison to cathartic CT colonography) because same day referral for therapeutic optical colonoscopy is not possible.

Some limitations of our study should be discussed. First, the bowel preparation for optical colonoscopy comprised standard 4 litres of polyethylene-glycol solution (PEG)
Patient acceptance of limited prepped CT colonography

(KleanPrep; Norgine Ltd; Harfield, UK) [21, 22]. However, 2 litres of PEG (Moviprep; Norgine Ltd; Harfield, UK) or sodium phosphate can prepare the colon as effectively [23, 24, 25], although the latter cannot be used in patients with heart and kidney failure [26, 27]. Preference outcome might have shifted towards optical colonoscopy if a milder preparation had been used for optical colonoscopy. A second potential limitation is that participants were told that the accuracy of CT colonography and optical colonoscopy with limited preparation were comparable [16]. It is likely that better accuracy for optical colonoscopy might move the preference pattern towards optical colonoscopy [28]. Third, the fact that only participants were included who were willing to undergo CT colonography in addition to their scheduled optical colonoscopy might have influenced our results in favour of CT colonography. Fourth, a surveillance population of individuals at increased risk was investigated and therefore we cannot be certain if our data are applicable to a screening population at average risk. However, as the referral rate for optical colonoscopy in a screening setting would probably be lower than the indicated 20% in our study, we believe that the reported preference for CT colonography could be an underestimation. Finally, no randomised comparison was made between non-cathartic and cathartic CT colonography. However, as the PEG preparation for optical colonoscopy is also widely used for cathartic CT colonography, we believe that a limited preparation will be preferred above a PEG preparation for CT colonography.

In conclusion, this prospective study investigated individual experience and preference of CT colonography with a limited preparation more stringent than prior studies. Our results demonstrated that the occurrence of diarrhoea was frequent and considered a burdensome side-effect of the CT colonography preparation. To optimize patient acceptance, further efforts should be made to reduce this side-effect. CT colonography however was better tolerated by participants than optical colonoscopy with regard to both preparation and procedure. As such, an apparent preference for CT colonography was observed in this population at increased-risk for colorectal cancer. Therefore, we believe that CT colonography with a limited bowel preparation can be of value to increase participation rates in screening programs for colorectal cancer.

**Acknowledgments**

We would like to thank Marjolein Liedenbaum and Christina Lavini for their critical review of this manuscript.
### Chapter 4

## Appendices

### Appendix A. Content of Questionnaires and Number of Responses per Question

| Questionnaire | Q 1 | Q 2 | Q 3 | Q 4 | Q 5 | Q 6 |
|---------------|-----|-----|-----|-----|-----|-----|
| **Where and when completed?** | By mail 2 weeks before CTC | In waiting room before CTC | In waiting room after CTC | In waiting room before OC | In recovery room after OC | At home by mail 5 weeks after OC |
| Number of returned questionnaires | 173/173 (100) | 173/173 (100) | 173/173 (100) | 169/173 (98) | 167/173 (97) | 166/173 (96) |
| Baseline characteristics | + | + | - | - | - | - |
| Most reluctant factor of the examination | 173/173 (100) | - | - | - | - | - |
| How burdensome was low-fibre diet | 173/173 (100) | - | - | - | - | - |
| How burdensome was Bisacodyl | 169/173 (98) | - | - | - | - | - |
| How burdensome were contrast agents | 173/173 (100) | - | - | - | - | - |
| Side-effects of the CTC bowel preparation | - | 168/173 (97) | - | - | - | - |
| Total burden of entire bowel preparation | - | 171/173 (99) | - | 165/171 (95) | - | - |
| How painful was procedure | - | - | 171/173 (99) | - | 167/173 (97) | - |
| How embarrassing was procedure | - | - | 172/173 (99) | - | 166/173 (96) | - |
| How much discomfort was procedure | - | - | 173/173 (100) | - | 164/173 (95) | - |
| Total burden of entire procedure | - | - | 173/173 (100) | - | 167/173 (97) | - |
| Most burdensome aspect of procedure | - | - | 159/173 (92) | - | 162/173 (94) | - |
| Most burdensome preparation; CTC or OC | 162/173 (94) § | - | - | - | 160/173 (92) | 165/173 (95) |
| Most burdensome procedure; CTC or OC | 159/173 (92) § | - | - | - | 159/173 (92) | 164/173 (95) |
| Preference for examination; CTC or OC | - | - | - | - | 164/173 (95) | 166/173 (96) |

*With burdensome is meant the extent of burden (e.g. the degree of unpleasantness) that was associated with a particular aspect and rated on a five-point scale; 1. not burdensome, 2. mildly burdensome, 3. moderately burdensome, 4. severely burdensome or 5. extremely burdensome. Participants were asked to rate both the individual aspects of the preparation and procedure as well as the entire preparation and procedure as a whole (i.e. = total burden).*
### Appendix B1. Patient-related Determinants of Participants’ Preference for CT Colonography or Optical Colonoscopy

|                                | Direct post-test | 5-weeks post-test |
|--------------------------------|------------------|-------------------|
|                                | Univariate       | Multivariate      | Univariate       | Multivariate      |
|                                | analysis         | analysis          | analysis         | analysis          |
| Age ≥ 65                       | 0.13 (0.02-0.97) | 0.14 (0.02-1.18) | 1.10 (0.45-2.73) | NA                |
|                                | p=0.05           | p=0.07            | p=0.83           | NA                |
|                                | (0.39-2.20)      |                   | (0.60-2.71)      | NA                |
| Female                         | 2.34 (1.00-5.49) | 1.92 (0.75-4.90)  | 1.48 (0.69-3.16) | NA                |
|                                | p=0.05           | p=0.17            | p=0.53           | NA                |
| High level of education        | 1.02 (0.37-2.80) | NA                | 0.93 (0.40-2.18) | NA                |
|                                | p=0.97           |                   | p=0.87           | NA                |
| Income ≥ 27000 euro            | 1.70 (0.70-4.10) | 1.02 (1.00-1.04)  | 1.02 (1.00-1.04) | NA                |
|                                | p=0.03           | p=0.03            | p=0.08           | NA                |
| Symptoms of colorectal cancer  | 0.51 (0.22-1.21) | NA                | 0.67 (0.31-1.43) | NA                |
| at present                     | p=0.13           |                   | p=0.30           | NA                |
| Personal history of colorectal | 0.89 (0.30-2.59) | NA                | 0.89 (0.34-2.28) | NA                |
| polyps                         | p=0.82           |                   | p=0.80           | NA                |
| Personal history of colorectal | 2.52 (0.80-7.92) | NA                | 0.91 (0.40-2.06) | NA                |
| cancer                         | p=0.11           |                   | p=0.82           | NA                |
| Family history of colorectal   | 0.27 (0.61-1.23) | 0.30 (0.07-1.41)  | 0.42 (0.13-1.29) | NA                |
| polyps or cancer               | p=0.09           | p=0.13            | p=0.13           | NA                |
| Difficult or painful defecation | 1.20 (0.37-3.82) | NA                | 2.83 (0.67-8.52) | NA                |
| in daily life                  | p=0.76           |                   | p=0.18           | NA                |
| Use of sedatives or analgesics | 1.02 (0.99-1.05) | NA                | 2.42 (1.12-5.25) | NA                |
| at optical colonoscopy         | p=0.26           |                   | p=0.03           | NA                |
| Duration optical colonoscopy   | 1.27 (0.47-3.42) | NA                | 0.91 (0.40-2.06)| NA                |
| > 40 min                       | p=0.64           |                   | p=0.82           | NA                |
| Depiction of polyps at optical | 1.56 (0.66-3.66) | NA                | 1.58 (0.74-3.35) | NA                |
| colonoscopy                    | p=0.31           |                   | p=0.24           | NA                |
| Duration CT colonography > 20 | 1.08 (0.46-2.57) | NA                | 0.63 (0.28-1.42) | NA                |
| min                             | p=0.86           |                   | p=0.26           | NA                |
| Insufflation of CO₂ at CT       |                 |                   |                  |                  |
| colonography (> 4 litres)       |                 |                   |                  |                  |
### Appendix B2. Experience determinants of participants’ preference for CTC or OC

| Experience                        | Direct post-test | 5-weeks post-test |
|-----------------------------------|------------------|-------------------|
|                                   | Univariate       | Multivariate      | Univariate       | Multivariate      |
| Burdensome bowel preparation for CT colonography | 3.59 (1.16-11.14) p=0.03 | 6.06 (1.61-22.87) p=0.01 | 3.533 (1.15-10.87) p=0.03 | 5.69 (1.51-21.51) p=0.01 |
| Painful CT colonography examination | 5.13 (1.20-22.01) p=0.03 | 6.34 (1.23-32.60) p=0.03 | 12.95 (2.56-65.60) p=0.01 | 9.80 (1.74-55.08) p=0.01 |
| Embarrassment experienced during CT colonography | 0.00 (0.00-) p=1.00 | NA | 0.00 (0.00-) p=1.00 | NA |
| Discomfort experienced during CT colonography | 0.94 (0.92-8.17) p=0.94 | NA | 3.29 (0.64-17.08) p=0.01 | NA |
| Burdensome bowel preparation for optical colonoscopy | 0.42 (0.18-0.98) p=0.05 | 0.40 (0.16-1.02) p=0.05 | 0.32 (0.15-0.71) p=0.01 | 0.31 (0.13-0.77) p=0.01 |
| Painful optical colonoscopy examination | 0.17 (0.04-0.74) p=0.02 | 0.10 (0.02-0.58) p=0.01 | 0.32 (0.12-0.89) p=0.03 | 0.28 (0.08-0.94) p=0.04 |
| Embarrassment experienced during optical colonoscopy | 0.00 (0.00-) p=1.00 | NA | 0.00 (0.00-) p=0.99 | NA |
| Discomfort experienced during CT optical colonoscopy | 0.18 (0.24-1.43) p=0.11 | NA | 0.15 (0.02-1.52) p=0.07 | 0.32 (0.03-3.06) p=0.32 |

- An odds ratio less than one indicates a positive association with a preference for CT colonography.
- An odds ratio greater than one indicates a positive association with a preference for optical colonoscopy.
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