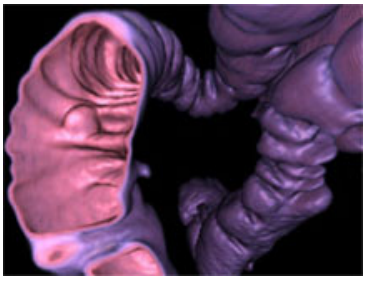
COMPUTED TOMOGRAPHIC COLONOGRAPHY
"VIRTUAL COLONOSCOPY"



Colorectal Cancer

- Second most frequent cause of death from malignancy in industrialized countries
- Lifetime risk is 6%; over 90% of cases occur after age 50
- Most lesions arise in adenomatous polyps
- Early detection of CRC and polypectomy reduces morbidity and mortality
- Current screening recommendations beginning at age 50: FOBT, flexible sigmoidoscopy, double contrast barium enema, colonoscopy

Screening Modalities

- Conventional colonoscopy
  - Most effective method of detecting colorectal tumors
  - Disadvantages – Need for sedation, discomfort, expense, bleeding (<1%), risk of perforation (1/2000)
- CT colonography ("Virtual Colonoscopy")
  - Helical computed tomographic scanning of the colon after cathartic preparation and colonic distention
  - Clear liquid diet for 24 hours, bowel prep night before and day of exam
  - Complete scan of the colon in prone and supine positions
  - 2.5- to 5-mm thick slices; reconstruction with 3-D "fly-throughs"

Computed Tomographic Colonography (Virtual Colonoscopy): A Multicenter Comparison With Standard Colonoscopy For Detection Of Colorectal Neoplasia.
Cotton Pb et al. *JAMA*. 2004;291(14):1713-9

- Non-randomized, multicenter, evaluator blinded study
- 600 participants (mean age 61 yrs) underwent CTC followed by conventional colonoscopy with segmental unblinding of CTC results
- Primary outcome – Sensitivity and specificity of CTC and conventional colonoscopy in identifying participants with and without lesions sized ≥ 6 mm
  - CTC: 39.0%, 90.5%
  - Colonoscopy: 99.0%, 100%
- 827 lesions detected in 308 participants; 104 participants has lesions ≥ 6 mm
- Participant preference – CTC 46%, colonoscopy 41%, no preference 13%
- No progressive improvement in accuracy as the number of cases increased
- Approximately 20% chance that colonoscopy needed for treatment after lesion identified on CTC

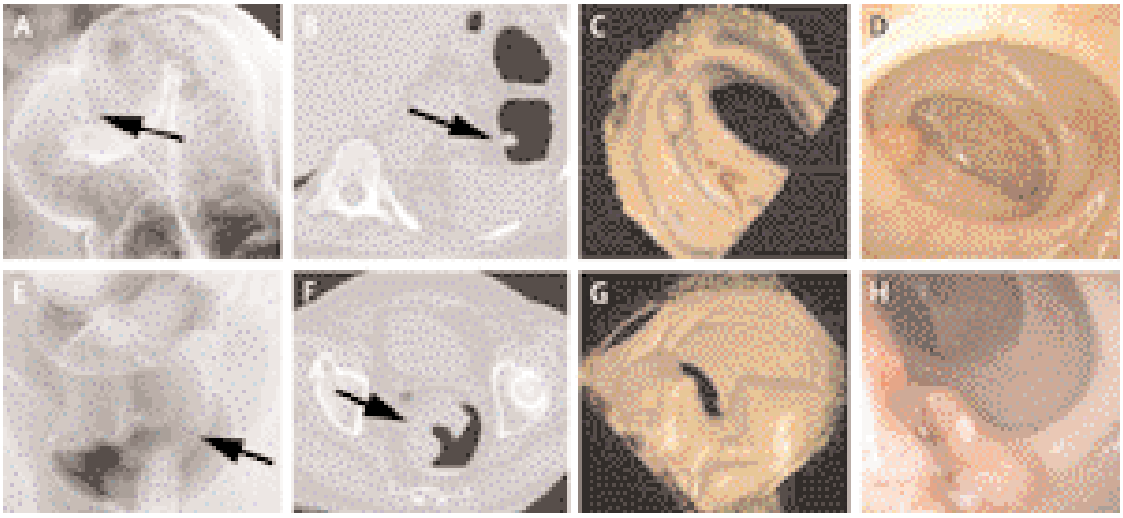
Table 1. Detection of Participants With and Without Lesions*

True Lesion Size, mm	Total No. of Participants With Lesions	Initial Conventional Colonoscopy		Computed Tomographic Colonography	
		No. of Participants With Detected Lesions	Sensitivity, % (95% CI)	No. of Participants With Detected Lesions	Sensitivity, % (95% CI)
≥6†	104	103	99.0 (97.1->99.9)	41	39.0 (29.6-48.4)
≥10	42	42	100	23	55.0 (39.9-70.0)
6-9	76	75	98.6 (95.9->99.9)	23	30.0 (19.7-40.3)
1-5	274	265	96.7 (94.6-98.8)	37	13.5 (9.5-17.5)

True Lesion Size, mm	Total No. of Participants Without Lesions	Initial Conventional Colonoscopy		Computed Tomographic Colonography	
		No. of Participants Without Detected Lesions	Specificity, % (95% CI)	No. of Participants Without Detected Lesions	Specificity, % (95% CI)
≥6†	496	496	100	449	90.5 (87.9-93.1)
≥10	558	558	100	535	96.0 (94.3-97.6)
6-9	524	524	100	488	93.1 (90.9-95.2)
1-5	326	326	100	295	90.5 (87.3-93.7)

Analysis Of Contrast Barium Enema, Computed Tomographic Colonography, And Colonoscopy: Prospective Comparison. Rockey Dc et al. *Lancet*. 2005;365:305-11

- Prospective cohort study
- 614 patients completed ACBE then CTC and colonoscopy 1-2 weeks later
- Sensitivity and specificity for lesions ≥ 6 mm in size
    - ACBE: 41%, 82%
    - CTC: 55%, 89%
    - Colonoscopy: 98.7%, 99.6%



Missed Lesions And False-Positive Findings On Computed Tomographic Colonography: A Controlled Prospective Analysis
Arnesen RB et al. *Endoscopy*. 2005;37(10):937-44

- 100 CTCs before colonoscopies on the same day, radiologists and endoscopists were blinded to each other
- Unblinded analysis comparing CTC with video recordings of colonoscopies to determine reasons for tumors being missed or false-positive diagnoses on CTC
- 90 polyps detected in 41 patients

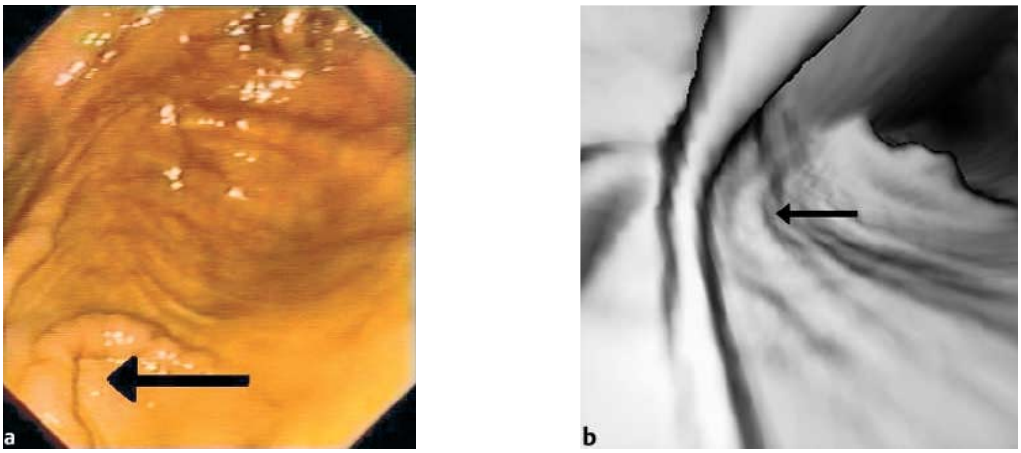
- CTC sensitivity and specificity
  - ≥ 5 mm tumors: 67%, 84%
  - ≥ 10 mm tumors: 75%, 95%
- Most important reasons for the false findings of tumors ≥ 5 mm were perception errors and misinterpretation of flat lesions
- Residual stool was frequently the reason for misinterpreting lesions ≥ 10 mm

Table 3 Reasons for false-negative findings. The figures in parentheses are percentages of the total number of false-negative findings

Tumor size (mm)	*Perceptual error*	*Collapsed colonic segment*	*Stool or fluid*	*Inadequate technology*	Total
< 5	16 (29 %)	3 (6 %)	2 (4 %)	14 (26 %)	35 (65 %)
5.0 – 9.9	8 (15 %)	4 (7 %)	1 (2 %)	–	13 (24 %)
≥ 10	2 (4 %)	1 (2 %)	2 (4 %)	1 (2 %)	6 (11 %)
Total	26 (48 %)	8 (15 %)	5 (9 %)	15 (28 %)	54 (100 %)

Table 4 Reasons for false-positive findings. The figures in parentheses are percentages of the total number of false-positive findings

Tumor size (mm)	*Perceptual error*	*Stool*	Total
< 5	27 (55 %)	3 (6 %)	30 (61 %)
5.0–9.9	9 (18 %)	6 (12 %)	15 (31 %)
≥ 10	2 (4 %)	2 (4 %)	4 (8 %)
Total	38 (78 %)	11 (22 %)	49 (100 %)



a. Video colonoscopic image of a flat elevated tubulovillous adenoma (arrow) in the cecum, which was misinterpreted as a mucosal fold on CTC. b. 3D reformatted CTC image of the lesion (arrow).

Advantages Of Virtual Colonoscopy

- CTC may have application in patients with obstructing tumors and in patients where colonoscopy is incomplete for other reasons.
- The fact that the technique may detect extracolonic lesions can be observed as an advantage or a disadvantage.

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