DIAGNOSIS

Virtual colonoscopy detected colorectal polyps in asymptomatic patients with average risk for colorectal neoplasia

Pickhardt PJ, Choi JR, Hwang I, et al. **Computed tomographic virtual colonoscopy to screen for colorectal neoplasia in asymptomatic adults.** N Engl J Med. 2003;349:2191-200.

QUESTION

In asymptomatic patients with average risk for colorectal neoplasia, what is the accuracy of virtual colonoscopy for detecting colorectal polyps?

DESIGN

Blinded comparison of virtual colonoscopy (VC) with optical colonoscopy (OC).

SETTING

3 medical centers in the United States.

PATIENTS

1233 patients (mean age 58 y, 59% men) with average risk for colorectal cancer. Exclusion criteria included positive result on guaiac-based test of stool ≤ 6 months before referral; iron-deficiency anemia in the previous 6 months; rectal bleeding or hematochezia or unintentional weight loss > 4.5 kg in the previous 12 months; OC in the previous 10 years; barium enema in the previous 5 years; a history of adenomatous polyps, colorectal cancer, or inflammatory bowel disease; and pregnancy.

DESCRIPTION OF TEST AND DIAGNOSTIC STANDARD

VC was done before OC using a computed tomography (CT) protocol wherein pneumocolon was produced by insufflating room air through a rectal catheter immediately before scanning. A 4- or 8-channel CT scanner (GE LightSpeed or LightSpeed Ultra, General Electric Medical Systems) generated 2- and 3-dimensional (3-D) endoluminal displays of the colon and rectum while the patient held his or her breath in the supine and prone positions. The 3-D display was used for the initial detection of polyps. OC used a standard commercial video colonoscope inserted to the cecum. After each segment was inspected, results of VC for that segment were revealed. If a polyp ≥ 5 mm in diameter was seen on VC but not on OC, the endoscopist reexamined the segment to create the diagnostic standard (enhanced OC) and to capture false-negative results on OC that would otherwise be recorded as false-positive results on VC.

MAIN OUTCOME MEASURES

Sensitivity, specificity, and likelihood ratios.

MAIN RESULTS

554 adenomatous polyps were detected. The prevalence of polyps of diameters ≥ 6 mm, ≥ 8 mm, or ≥ 10 mm, was 13.6%, 6.7%, and 3.9%, respectively. The diagnostic performance of VC at increasing polyp sizes is shown in the Table. Sensitivity for initial OC was slightly less than that of VC at polyp sizes ≥ 8 mm. Of 55 polyps (≥5 mm in diameter) detected by VC but missed by initial OC, 21 (38%) were adenomatous and measured ≥ 6 mm in diameter. OC was not as sensitive as VC for detecting advanced neoplasms (measuring ≥ 10 mm) (sensitivity according to the polyp 88.1% vs 91.5%). Of the 2 adenocarcinomas identified, VC detected both and initial OC missed 1 (an 11-mm polyp).

CONCLUSION

In asymptomatic patients with average risk for colorectal neoplasia, virtual colonoscopy was sensitive and specific for detecting colorectal polyps.

Source of funding: Department of Defense.

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Test characteristics of virtual colonoscopy for detecting colorectal adenomas*

Polyp size	Sensitivity (95% CI)	Specificity (CI)	+LR	–LR
≥ 6 mm	89% (83 to 93)	80% (77 to 82)	4.35	0.14
≥ 8 mm	94% (86 to 98)	92% (91 to 94)	12.04	0.07
≥ 10 mm	94% (83 to 99)	96% (95 to 97)	23.45	0.06

*Diagnostic terms defined in Glossary; LRs calculated from data in article.

COMMENTARY

All currently accepted tests for colorectal cancer screening—fecal occult blood tests, sigmoidoscopy, double-contrast barium enema, and colonoscopy—are effective, but none is ideal. There is always room for another test with a different combination of such characteristics as accuracy, safety, convenience, comfort, cost, and availability. VC has been a promising option (1), but no rigorous evaluations of polyp detection have been done in persons at average risk for colorectal neoplasia.

Now there is good information on how well VC detects clinically important polyps in average-risk persons. 2 strong studies, published within 4 months of each other, come to different conclusions. The study by Pickhardt and colleagues says "CT virtual colonoscopy … is an accurate screening method … and compares favorably with optical colonoscopy…" The study by Cotton and colleagues says "computed tomographic colonoscopy … is not ready for widespread clinical application." I believe both are right. They ask different questions and get different answers.

Pickhardt and colleagues ask whether state-of-the-art VC under ideal circumstances can detect polyps in average-risk persons as well as conventional colonoscopy, the current gold standard. The test they studied had technologic features, such as "electronic cleansing" (computer-based removal of residual fluid), that are not generally available. Interpretation relied primarily on a 3-dimensional, rather than a 2-dimensional, approach to the detection of polyps, which is not generally used. Also, the 6 radiologists were specially trained, having done ≥ 25 (and in some cases > 100) such studies. Cotton and colleagues, on the other hand, studied the performance of VC under more ordinary circumstances, the kinds of settings where most patients would have the procedure.

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Virtual colonoscopy performed poorly in detecting colorectal neoplasia

Cotton PB, Durkalski VL, Pineau BC, et al. **Computed tomographic colonography (virtual colonoscopy): a multicenter comparison with standard colonoscopy for detection of colorectal neoplasia.** JAMA. 2004;291:1713-9.

QUESTION

In patients presenting for colonoscopy, what is the accuracy of computed tomographic (CT) colonoscopy (virtual colonoscopy [VC]) in detecting colororectal neoplasia?

DESIGN

Blinded, noninferiority comparison of VC with conventional colonoscopy.

SETTING

8 clinical centers in the United States and 1 center in England.

PATIENTS

615 patients (mean age 61 y, 55% women) presenting for colonoscopy because of overt and occult rectal bleeding, change in stool habit, abdominal pain, or surveillance after polypectomy. Patients who had had colonoscopy within the past 3 years were excluded.

DESCRIPTION OF TESTS

The colon was insufflated with room air or carbon dioxide. VC was done using 2- and 4-section CT scanners with nominal slice thicknesses of 2.5 or 5 mm and reconstruction increments of 1.5 or 1 mm, depending on equipment. Scans were read in 2-dimensional slices and 3-dimensional snapshot reconstructions when necessary. Radiologist interpretations were recorded in a sealed envelope for each colon segment. Conventional colonoscopy was done within 2 hours of VC. Endoscopists were blinded to VC results during insertion of the colonoscope. After each segment was examined and results recorded, the VC results for that segment were revealed, allowing the endoscopist to reexamine any discrepancy. The diagnostic standard comprised the initial VC results, additional findings on conventional colonoscopy after segmental unblinding to the VC results, and the results of additional diagnostic tests done later when clinically indicated.

OUTCOMES

Sensitivity and specificity of VC and conventional colonoscopy in detecting lesions ≥ 6 mm.

MAIN RESULTS

827 lesions were detected in 308 patients. The prevalence of lesions 1 to 5 mm, 6 to 9 mm, and ≥ 10 mm was 79%, 14%, and 6.5%, respectively. The sensitivity of VC for detecting lesions of any size was much less than that of conventional colonoscopy (Table).

CONCLUSION

In patients presenting for colonoscopy, virtual colonoscopy was inferior to conventional colonoscopy in detecting colorectal neoplasia.

Source of funding: Office of Naval Research, US Department of Defense.

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Test characteristics of virtual colonoscopy (VC) and conventional colonoscopy (CC) in detecting colorectal neoplasia*

Test	Lesion size	Sensitivity (95% CI)	Specificity (CI)	+LR	-LR
VC	1 to 5 mm	14% (10 to 18)	91% (87 to 94)	1.42	0.96
	≥ 6 mm	39% (30 to 48)	91% (88 to 93)	4.11	0.67
	6 to 9 mm	30% (20 to 40)	93% (91 to 95)	4.35	0.75
	≥ 10 mm	55% (40 to 70)	96% (94 to 98)	13.75	0.47
CC	1 to 5 mm	97% (95 to 99)	100%	∞	0.03
	≥ 6 mm	99% (97 to > 99.9)	100%	∞	0.01
	6 to 9 mm	99% (96 to > 99.9)	100%	∞	0.01
	≥ 10 mm	100%	100%	∞	0.0

*Diagnostic terms defined in Glossary; LRs calculated from data in article.

COMMENTARY *(continued from page 22)*

Is it time for VC to be included among the screening options? If I had had only the Pickhardt study to guide me, I might have been tempted. But the Cotton study reminds us that the test is not yet ready for general use. Sensitivity and specificity in ordinary circumstances are not high enough. Also, cost and the consequences to patients with abnormal results have not yet been vigorously examined. Abnormal VC results must be followed up with another procedure (conventional colonoscopy), with its own demanding preparation and costs. As for the strength of the evidence of effectiveness, there are no studies of whether screening VC prevents colorectal cancer deaths. However, the medical community seems willing to accept that polyp detection by any means, followed by removal, leads to fewer cases of colorectal cancer—by generalizing from studies in which both polyp or cancer detection rates and colorectal cancer deaths have been reported.

VC is already available in some centers and marketed to the general public. But it is not yet included in guidelines. As the technology continues to improve and if more studies of recent-generation technology are as persuasive as the Pickhardt study, it may be just a matter of time before VC is added to the list of accepted screening options. The Pickhardt study suggests that the time might not be far away, and the Cotton study reminds us that the time has not yet arrived.

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Reference

1. **Fenlon HM, Nunes DP, Schroy PC 3rd, et al.** A comparison of virtual and conventional colonoscopy for the detection of colorectal polyps. N Engl J Med. 1999;341:1496-503.