Original Article

Comparison of multidetector computed tomographic colonography and conventional colonoscopy for detection of colorectal polyps and cancer

Naveen Kalra, Sudha Suri, Deepak K Bhasin,* Saroj Kant Sinha,* N Saravanan, Taswinder Kour, Kim Vaiphei,** J D Wig*#

Departments of Radiodiagnosis, *Gastroenterology, **Histopathology and #General Surgery, Postgraduate Institute of Medical Education and Research, Chandigarh 160 012

Background: Computed tomographic colonography (CTC) is a new technique for detecting colonic neoplasms. Data on the utility of this method in the Indian population are limited. Methods: Forty-two patients with symptoms of colonic disease underwent CTC and conventional colonoscopy (CC) within one week of each other, and the findings at these two investigations were compared. Results: The entire colon could be evaluated in 38 patients on CTC and in 23 patients on CC. Of the 19 patients who had incomplete CC, 14 had occlusive colonic lesions. Of the 86 lesions detected on CC, 76 (88.4%) were correctly identified on CTC with regard to location and size. CTC was false negative for 10 lesions and false positive for 5 lesions in 3 patients. The sensitivity and specificity of CTC were 65% and 77%, respectively, for lesions 1-5 mm; 97% and 83% for 6-9 mm-sized lesions; and 100% and 100% for lesions 10 mm or larger. Extracolonic findings were seen in 24 of 42 patients (57%). Conclusions: CTC is reliable for detecting lesions 6 mm or larger in size. It permits evaluation of the region proximal to an occlusive growth, which is often not possible with CC.

Methods

Between January 2002 and August 2005, 42 patients (median age 50 years [range 10-84]; 24 men) with symptoms of colonic disease (lower abdominal pain, weight loss, altered bowel habits, diarrhea or rectal bleeding) or with past history of surgery for colonic carcinoma were enrolled. In them, CTC and CC were performed within one week of each other. All patients gave informed consent, and the study was approved by the institutional Ethics Committee.

Computed tomographic colonography

Each patient received bowel preparation with 2 liters of polyethylene glycol electrolyte solution (Peglec; Tablets [India] Limited) six hours prior to CTC. CTC was performed using a multidetector computed tomography scanner (Light Speed; GE Medical Systems, Milwaukee, USA), with 5 mm collimation, 2.5 mm interslice interval, 0.6 s rotation time and 15 mm table feed per rotation at 120 KV. The tube current was 70 mAmp in prone position and 250 mAmp in supine position.

The colon was gently insufflated through a rectal tube with 40 puffs (approximately 50 mL/puff) of room air or up to the level of patient tolerance; insufflation was begun with the patient in the left lateral position and ended with the patient in the prone position. Adequacy of colon distension was checked on a digital scout film. Unenhanced scans were obtained in the prone position followed by contrast-enhanced scans in the supine position. After ensuring adequacy of colon distension by a repeat scout film and additional air insufflation if required, an iodinated non-ionic contrast (100 mL) was injected intravenously at 2.5 mL/s using a pressure injector, and images were acquired in the portal venous phase. All scans were obtained in cranio-caudal direction with suspended respiration.

Data were processed using a Solaris 3D Work-
station (Sun Microsystems) and GE Advantage Navigator software (GE Medical Systems, Milwaukee, USA), and axial 2D CT images and endoluminal 3D reconstructions were obtained. Two radiologists (NK, SS) with at least 8 years’ experience in gastrointestinal radiology, who were unaware of clinical data, findings at CC and those of any previous imaging, first scrolled through the axial image sets (prone followed by supine) and then navigated through the virtual images in forward and reverse directions. Image interpretation was done by both the radiologists independently and then differences, if any, were resolved by consensus. All lesions were recorded and their sizes measured.

Conventional colonoscopy
It was done by a gastroenterologist (DKB or SKS) with at least 8 years’ experience in colonoscopy, who was unaware of the results of CTC, using a video endoscope (CF-Q160; Olympus, Tokyo, Japan). Number, size and location of lesions were recorded, and biopsy of lesions or polypectomy was done as deemed necessary. For measurement of lesion size, the tip of the colonoscope was withdrawn 3 to 4 cm from the lesion and its largest diameter was visually estimated. In case of incomplete examination, the endoscopist recorded the estimated extent of examination.

Sensitivity and specificity of CTC were calculated using CC as the gold standard.

Results
Of the 42 patients, 23 had complete CC. The reasons for incomplete examination included occlusive colonic growth (14 patients), and redundant and tortuous colon (5). There were no complications during CC. Thirteen patients had no polyp or mass lesion at CC. In the remaining 29 patients, 86 lesions were detected; of these, 26 (30%) were 1-5 mm in size, and 30 (35%) each were 6-9 mm and ≥10 mm in size. Thirty-eight lesions were subjected to biopsy or polypectomy; at histology, 18 were adenocarcinoma, 15 were hyperplastic polyps, 2 each revealed adenomatous polyps and dysplasia, and 1 was leiomyoma. The malignant lesions were located in the rectosigmoid region (10), sigmoid colon (2), splenic flexure (2), transverse colon (1) and ascending colon (3).

At CTC, examination of the complete colon was possible in 38 patients; it was incomplete in the remaining 4 patients because of retained intraluminal fluid or feces (3), or inadequate colonic distension (1). The average time spent in the CT suite for per rectal air insufflation and image acquisition was 20 minutes, and that for image processing and interpretation was 30 minutes.

CTC detected 76 (88%) of the 86 lesions detected on CC with regard to location and size. There were 5 false-positive lesions on CTC in 3 patients. The overall performance of CC and CTC was comparable (McNemar test; p=0.197). The sensitivity of CTC was significantly higher for lesions 6 mm or larger in size than for those smaller than this size (p<0.001, chi-squared test) (Table).

CTC identified all the 18 malignant lesions. Of these, 14 lesions were obstructive, precluding the examination of the proximal colon at CC. Nine of these patients had synchronous polyps, of which two were larger than 10 mm; both these were malignant on surgical biopsy. In 4 of these 9 patients, the synchronous lesions were proximal to the occlusive growth in the colon and were not accessible at CC. In one patient, multiple synchronous lesions were seen at CTC both proximal and distal to the occlusive growth in the splenic flexure; of these, only one lesion in the rectum could be seen at CC but not the 5 lesions located in the ascending colon and transverse colon (Fig).

CTC detected only 6 of the 15 hyperplastic polyps, but all the adenomatous polyps, dysplastic polyps and leiomyoma.

CTC revealed extracolonic findings in 24 patients (57%), including renal cysts (8 patients) and aortic atherosclerosis (7 patients). Fourteen patients with malignant lesions had extracolonic findings, including peri-lesional lymph nodes (6), soft-tissue stranding (6), extraluminal extension of the colonic lesion (3), adjacent organ infiltration (4) and hepatic cysts (4).

Discussion
CC is used as the reference standard in studies on

<table>
<thead>
<tr>
<th>Size of lesion (mm)</th>
<th>No. of lesions detected by both CC and CTC (n=76)</th>
<th>No. of lesions detected only at CC (n=10)</th>
<th>No. of lesions detected only at CTC (n=5)</th>
<th>Sensitivity (%)</th>
<th>Specificity (%)</th>
</tr>
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<tbody>
<tr>
<td>&lt; 5</td>
<td>17</td>
<td>9</td>
<td>3</td>
<td>65</td>
<td>77</td>
</tr>
<tr>
<td>6-9</td>
<td>29</td>
<td>1</td>
<td>2</td>
<td>97</td>
<td>83</td>
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<tr>
<td>≥10</td>
<td>30</td>
<td>0</td>
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these lesions are adenomatous on histology, with fewer than 1% being histologically advanced, and virtually none being malignant. If we take this perspective into consideration, the present study has revealed CTC to be a reliable investigation for the detection of precursors of colorectal cancer. One area of concern, however, is small flat adenomas that may exhibit a more aggressive biological behavior. These however are uncommon and may be missed on CC also.

There were 5 false-positive lesions on CTC. These occurred in segments of colon having poor distension or where thickened and complex folds were misinterpreted as polyps. Other causes of false-positive lesions at CTC are undissolved ingested tablets and retained stool. Also, small colonic lesions may be obscured by non-distension of the colon or by retained fluid in the large gut.

Extracolonic findings were common and were seen in 57% of our patients. Previous studies have reported extracolonic findings in 15%-85% of patients. Fourteen of our 18 patients with malignant colonic growth showed extracolonic findings at CTC, helping in determination of the extent of these lesions. However, we did not correlate these CTC findings with surgical findings. Four patients had liver lesions, which could be characterized as cysts on the contrast-enhanced films. Synchronous lesions were seen in 9 of 18 (50%) patients with colorectal cancer on CTC; though only two of these were larger than 10 mm, both had synchronous malignancy at histology.

A limitation of the present study is the small sample size. Hence, our results need to be verified in a larger prospective study.

In conclusion, multidetector CT colonography is a reliable tool for detecting colonic mass lesions larger than 5 mm. CTC is of value in evaluating the colonic segment lying proximal to the main lesions, such as colonic cancers including those with occlusive growths. Contrast-enhanced CTC is also useful in identifying extracolonic findings.

References
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Correspondence to: Dr. Kalra, Assistant Professor. Fax: (172) 274 5768. E-mail: navkal2004@yahoo.com

Acknowledgements: The authors thank their institution for partial funding for this study. We thank Mr P.C. Pant and Ms Poonam Sharma for providing technical support for drafting this manuscript, and Mr. Vineet Charles and other nursing staff for help in preparing patients for CT colonography.

Received December 19, 2005. Received in final revised form July 15, 2006. Accepted July 22, 2006