

# The Importance of CT Pneumocolon in Detecting Colonic Lesions

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## Abstract

**Background:** Colonic masses are clinically important because some of them are malignant and others have a tendency to become malignant such as polyps. CT pneumocolon may have a role in the evaluation and diagnosis of these masses.

**Objective:** To determine the accuracy of computed tomography (CT) pneumocolon in the detection of colonic masses compared with colonoscopy.

**Patients and Methods:** A total of 60 patients with colorectal symptoms underwent evaluation for the presence of colorectal neoplasms by using both colonoscopy and CT pneumocolon and a comparison was made between them.

**Results:** On colonoscopy, 10 out of 60 patients were having a negative colonoscopy. The results of colonoscopy of the other 50 patients were as follow; three out of fifty colonoscopies revealed invasive colorectal carcinomas in these patients. The remaining 47 colonoscopies for 47 patients revealed benign polyps. The sizes of these polyps were as follows; (6 polyps were >1 cm in diameter), (17 polyps were 6-9 mm), and (24 polyps were ≤5 mm). CT pneumocolon detected all 3 malignant masses seen and biopsied by colonoscopy, but only (28 single polyps) which according to their size (4 polyps were ≥ 1cm), (11 polyps were 6-9 mm) and (13 polyps ≤5 mm), this gives CT pneumocolon a sensitivity of (63%), specificity of (70%) and accuracy (63%).

**Conclusion:** CT pneumocolon has high sensitivity and specificity for a detection of large-sized masses, but not for small ones. CT pneumocolon may be suitable for investigating patients with symptomatic colorectal masses noninvasively.

**Keywords:** Pneumocolon, colonoscopy, polyp, colonic carcinoma

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## Introduction

Colonic masses can be benign or malignant. These masses either originate in the colon or metastatic from other organs to the colon [1]. Many colonic malignant tumors are treatable if the diagnosis is done early. Carcinoma of the colon usually begins in the mucosal layer, then grows and invades deeper through the colonic wall. Cancer cells can spread through the blood and lymphatic vessels once the disease reaches the submucosa [1]. Deeper invasion can even perforate the colonic serosal layer resulting in fecal peritonitis at which time diagnosis will be delayed [2].

CT pneumocolon is an alternative less invasive method to colonoscopy using CT scan images to visualize the colon for any polyps or masses in symptomatic patients. CT pneumocolon have a good advantage when compared with colonoscopy in the detection of colonic masses because it is less invasive. It is also associated with fewer complications and can give good information that supports the findings of colonoscopy [4]. CT pneumocolon through using the x-ray and computer can provide two and three dimensions section of the colon [4]. Examination starts from the distal part of the rectum to the lower end of a small bowel, displaying the images on a screen [4]. Furthermore, CT pneumocolon can show masses without the need for camera insertion into the colon. Colonic lesions that can be visualized by CT pneumocolon include large

tumors some large polyps, and diverticular [4].

CT images were obtained in the prone and supine positions during prolonged breath-holding. Then these images are reconstructed in axial, sagittal and coronal planes [5]. CT pneumocolon as colonoscopy also needs colonic preparation with oral laxative, but without sedation or analgesia (unlike colonoscopy). CT pneumocolon is so safe and rarely has a significant complication [6]. Unlike colonoscopy, CT pneumocolon can see extra-colonic intra-abdominal organs, giving good information about extra-colon deposit [6]. The current study aimed to evaluate the importance and the accuracy of computed tomography (CT) pneumocolon in detecting colonic masses examined with the usual colonoscopy.

## Patients and Methods

This is a cross-sectional study of sixty patients who underwent CT pneumocolon then colonoscopy to assess the accuracy and sensitivity of the former in detecting colonic lesions. The study was achieved at the department of radiology in Al- Imamein Al-Kademein hospital during the period September 2014 - September 2015. A total of sixty symptomatic patients were enrolled in the study. The average age of the patients is 61.5 years. Thirty-three (55%) were males and twenty-seven (45%) were females. All of the sixty patients were having symptoms suggesting colonic disease. Those patients were referred from gastrointestinal tract

(GIT) unit for assessing the colon for any lesions by performing CT pneumocolon and colonoscopy. Excluding criteria include patients who have a history of inflammatory bowel disease, pregnant females, patients who have no satisfactory examination. The data collected included, patient's name, age, sex, case history, surgical history and date of examination. All patients had their bowel adequately prepared before the examination. CT pneumocolon examination was achieved by placing the patient in the left lateral position and a rectal tube inserted. Intravenous hyoscine N-butyl-bromide (20 mg) was administered. Subsequently, the colon is gently insufflated with air till the patient feels mild abdominal discomfort. Also, colonic distension was assessed. Scanning was started sixty seconds later, passing caudocranially from symphysis pubis bone to the diaphragm. The procedure didn't require sedation. The CT pneumocolon was performed during breath-hold once the scan level passed higher than the true pelvis. Supine and prone pelvis views were obtained in the majority of patients. Interpretation of the scan pictures was performed using an extended digital computer (CT somatom definition AS forty-six slice Siemens medical system Germany). In addition, the images were viewed by a pair of independent radiologists to minimize inter-observer errors. After a minimum of one hour following completion of the CT scan, a colonoscopy was performed, Patients were sedated with intravenous pethidine. Colonoscopies were performed using the customary video colonoscopy. The endoscopist was unaware of the CT

pneumocolon results. The examination level of the colon was at a maximum at 170 cm from the anal verge. Flexible sigmoidoscopy was used, and abnormalities were recorded where ever seen. Polyp size was estimated directly when retrieved using biopsy forceps. The colon was divided into four segments: right, transverse, left, and rectosigmoid and the polyps found were recorded to be found in which part of the colon. An agreement was evaluated between the two techniques depending on the size and site of the mass.

### Statistical analysis

The data analyzed using frequencies and percentages only.

### Results

Sixty patients were included in the current study. Ten patients were having a negative colonoscopy (no colonic lesions). Fifty lesions were revealed by colonoscopy and underwent histopathological examination. Forty-seven out of fifty patients (94%) had benign pathology in the form of a single polyp and only 3 patients (6%) had malignancy lesions. The distribution of lesions was as following: 24 polyps (48%) were < 5 mm, 17 (34%) polyps were between 6- 9 mm, 6 polyps (12 %) > 10 mm, and three (6%) invasive carcinoma Table (1). When comparing colonoscopy with CT pneumocolon for sixty patients, it had been seen that fifty patients were having positive findings on colonoscopy, seven patients were truly negative (normal) in both colonoscopy and pneumocolon and three patients were having false positive findings on CT pneumocolon.

**Table (1):** Distribution of lesions depending on real finding on colonoscopy

Finding	Colonoscopy
	(n.%)
Polyp $\leq$ 5 mm	24 (48%)
Polyp 6-9 mm	17 (34%)
Polyp $\geq$ 10 mm	6 (12%)
Carcinoma	3 (6%)
Total	50

CT pneumocolon sensitivity was only 62% as it detected only 31 out of the 50 lesions seen by colonoscopy. These thirty-one lesions were distributed as follow; three lesions (6%) which were proved malignant on colonoscopy and 28 (56%) polypus lesions. Out of the 28 polypus lesions; 13 polyps (46%) sized  $\leq$  5 mm, 11 polyps (39%) sized 6-9 mm, and 4 polyps (14%) sized >

10 mm. CT pneumocolon also recorded false negative results and as follow: 11 patients (22%) sized  $\leq$ 5mm, 6 patients (12%) sized 6-9mm and 2 patients (4%) sized 10mm or more. Furthermore, CT pneumocolon recorded 7/50 patients as having true negative results and 4/50 patients as having false positive lesions Table(2).

**Table (2):** Distribution of the lesions after performing CT pneumocolon in comparison with the real findings detected by colonoscopy

Finding	Colonoscopy	CT				Percentage
	No.	True positive	False negative	True negative	False positive	
Polyp $\leq$ 5 mm	24	13	11	0	2	Accuracy 63 % Sensitivity 62 % Specificity 70 %
Polyp 6-9 mm	17	11	6	0	1	
Polyp $\geq$ 10mm	6	4	2	0	0	
Carcinoma	3	3	0	0	0	
<b>Total</b>	<b>50</b>	<b>31</b>	<b>19</b>	<b>7</b>	<b>3</b>	<b>60</b>

The thirty-one lesions detected by 31 CT pneumocolon were distributed as follow; 3 polyps (10%) in the ascending colon, 6 polyps (19%) in the transverse colon, 9 polyps (29%) in the

descending colon and 10 polyps (32.3%) in the rectosigmoid. The three malignant lesions (9.7%) were sited at the rectosigmoid CA Table (3)

**Table (3):** Distribution of the lesions detected by CT pneumocolon in the colon in comparison with their real sites detected by colonoscopy

	Colonoscopy	CT
	No.	True Positive
Ascending colon (polyp)	8	3 (10%)
Transverse colon (polyp)	12	6 (19%)
Descending colon (polyp)	14	9 (29%)
Recto-sigmoid(polyp)	13	10 (32.3%)
Recto-sigmoid (CA)	3	3 (9.7%)



**Figure (1):** Female patient, 52 years old, presented with abdominal pain and rectal bleeding, CT pneumocolon showed a colonic mass (adenocarcinoma)



**Figure (2):** Male patient, 51 years, presented with abdominal pain and change in bowel habits, CT pneumocolon showed a sigmoid polyp

## Discussion

A colorectal polyp may also be described as a mucosal elevation which is crucial due to

the fact of their malignant potential, which depends upon the histology. There are multiple different types of polyps according

to their histology (adenomatous, hyperplastic, inflammatory polyps). They occur sporadically or as a part of a polyposis syndrome. Most colorectal cancers are believed to originate from preexisting adenomatous polyps and the risk a malignancy is strongly related to the polyp's size. Colorectal polyps of >1 cm diameter are clinically more important than smaller ones. An interval period of 10 -15 years is required for the polyps to evolve to invasive malignancy. This reflects the very slow-growing.

The current study results revealed that CT pneumocolon had a poor overall sensitivity for diagnosing colonic polyps especially small polyps sizing less than 1 cm, but CT pneumocolon had greater sensitivity and specificity for diagnosis larger polyps (over one cm) [8]. Three invasive large intestine cancers which are detected, their size ranged between 3 cm and seven cm, and 31 polyps for variable sizes). The results for all masses detected in the study are as follow: sensitivity is (62 %), specificity is 70% and also accuracy is 63 % [8].

Furthermore, we found that mass detection by CT pneumocolon increased with increasing masses diameter. We have a tendency to hypothesize that the diagnosis of polyps would be possible with collimation of 8 mm, also pitch of 1.5, and reconstruction interval of 4 mm. At the time of the study, the colon should be adequately cleaned and distended with air insufflation. These parameters allow supine scanning to be done during a single breath withhold in most all patients, with a radiation dose that it is the same as that of conventional barium enema (5–7mSv) [9]. In the present study, the

sensitivity (62%) was near to other reported sensitivity 60% - 80% in some studies, that using thinner collimation, reconstruction interval and three dimensional reconstruction with specialized laptop computer software [10-12].

We also found that the site is an important factor for the detection of colon tumors, which is against previous studies which revealed that the site is of no value in detecting tumors [13]. In our study, CT pneumocolon detected 3 polyps in the ascending colon and 6 polyps in the rectum and sigmoid colon. On the other hand, a large number of masses were found on the left side of the colon, mainly in the recto- sigmoid part. This is a common feature that corresponds to the distribution of pathological masses along with the four parts of the colon [14].

Finally, however not for small size bellow one cm. In addition, CT pneumocolon provided clinically relevant information on cancer staging and extra-colonic abnormalities that weren't obtainable from endoscopy [15].

## Conclusions

CT pneumocolon has high sensitivity and specificity for the detection of large-sized masses, but not for small ones.

## Recommendations

CT pneumocolon may be suitable for investigating patients with symptomatic colorectal masses noninvasively.

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**Ethical clearance:** This study was approved by medical ethics committee of college of medicine ,university of Diyala.

**Conflict of interest:** Nil

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