

A COMPARATIVE STUDY BETWEEN CT COLONOGRAPHY AND CONVENTIONAL COLONOSCOPY IN DETECTING THE COLORECTAL LESIONS

Hariom Sharma¹, Kuldeep Mendiratta², Meenu Bagarhatta³, Poornima Sharma^{4*}

1. PG Resident, Department of Radio-diagnosis, 2. Senior Professor, Department of Radio-diagnosis, 3. Senior Professor and Head, Department of Radio-diagnosis, SMS Medical College, Jaipur, 4. Assistant Professor, Department of Community Medicine, PDU Medical College, Churu

*Corresponding author – Poornima Sharma

Email id – sharma.panna@gmail.com

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ABSTRACT

Background: Colorectal cancer is one of the most common cancers globally with a long interval of disease progression. Timely diagnosis and early interventions decrease the morbidity and mortality significantly. The current study was planned with an aim to compare CT colonography and conventional colonoscopy in detecting colorectal lesions. **Materials and methods:** A hospital-based comparative study was conducted on 90 patients in the department of radiodiagnosis, SMS medical college, Jaipur, Rajasthan in which CT colonography and conventional colonoscopy was performed on the same day. **Results:** A total of 72 lesions were detected in 63 patients. Entire colon was visible in 100% patients in CT colonography and 87.77% patients in conventional colonoscopy. Conventional colonoscopy detected lesions more in rectum, descending colon, transverse colon, and ascending colon while CT colonography detected lesions better in sigmoid colon and caecum. Conventional colonoscopy detected more lesions for size ≤ 5 mm while lesions 6-9 mm were better detected on CT colonoscopy. For lesions of ≥ 10 mm, lesion detection was same on both the modalities. **Conclusions:** Further prospective studies with a larger sample size and complete follow-up of the patients with the suggestive interventions are recommended for future references.

Keywords: Colorectal cancer, CT colonography, Conventional colonoscopy, colonic polyps

INTRODUCTION

Colorectal cancer is the third most common cancer in men and the second most common in women worldwide. However, in India, colon cancer ranks 9th and rectal cancer 10th among the most common cancers in men.(1)

Both the genetic and environmental factors play an important part in the etiology of colorectal cancer. However, a maximum of them are sporadic in incidence.(2) The progression of colorectal polyps to carcinoma takes place over a long period of time. Thus, the early diagnosis of premalignant lesions, such as polyps, is of great importance for patient survival.(3)

Polyps could be benign as well as malignant. Their further types are determined by histopathological examination.

Conventional colonoscopy is considered as the gold standard for colorectal lesions. However, on average, it is not possible to view the entire colon using colonoscopy in 5% of the patients.(4,5)

CT colonography has been proposed as an alternative procedure for the examination of colorectal cancer. However, it too has few contraindications like acute inflammatory conditions

such as acute diverticulitis, recent abdominal or pelvic surgery, colostomy, pregnancy, etc.(6)

With this background, the current study was planned with an aim to compare the results of 128-SLICE MDCT colonography with conventional colonoscopy in patients with colorectal lesions taking histopathology as gold standard and with an objective to compare the outcomes of MDCT colonography and conventional colonoscopy with the degree of significance.

METHODOLOGY

After receiving approval from the ethical committee, a hospital-based observational study was conducted on 90 patients in the department of Radio-diagnosis and the department of Gastroenterology, SMS Hospital, Jaipur, Rajasthan for a period of 1 year starting from June 2019. Having received the informed consent, all the patients were made to undergo CT colonography and conventional colonoscopy on the same day. The findings of CT colonography and conventional colonoscopy were blinded to prevent bias. The samples collected from colonoscopy were sent for the histopathological examination. Considering these findings as gold standard, CT colonography and conventional colonoscopic findings were correlated with them.

Preparation of the Patients

All patients were instructed to have liquid diet two days prior to the examination. Fecal tagging was performed with a 50 ml 40% w/v barium suspension. Patients were asked to ingest the barium in the first 15 min after their meal. A total of 137.5 gm PEGLEC powder dissolved in 2 lit of water was given to patients 12 hours prior to the CT colonography examination to facilitate bowel cleansing.

CT Colonography Procedure

A small rubber catheter was inserted in left lateral position after lubricating with 2% lignocaine gel. The entire colon was inflated with room air via catheter using 50 ml syringe as per patient tolerance. MDCT colonography was performed using a 128 slice MDCT Philips Ingenuity scanner. MDCT examination was performed at 120 KVP, 0.75 second gantry rotation time, tube current auto mAs. Images were obtained at 64 x 0.625 collimation and 0.75 mm slice interval. A standard CT scout image was obtained to evaluate whether adequate bowel distention is available with the patient in supine position. When colonic distension was found to be inadequate, further air insufflations were given to

maximum patient tolerance. After adequate bowel distention, images of the entire colon and rectum was obtained with the patient in the supine and prone positions respectively in craniocaudal direction. Radiation dose reduction program was applied to reduce the radiation dose received by the patients.

Image Analysis

Data was then transferred to separate workstation and 2-D axial images were interpreted with a point-to-point comparison between supine and prone images. This was facilitated by scrolling of images through the entire colon. If an abnormality was detected, coronal and sagittal reformatted images were used to help determine whether the abnormality was a polyp, fold, or fecal matter. If an abnormality was seen during the supine review, prone images were compared to determine if the lesion was mobile as stool tended to move to the dependent surface of the colonic mucosa when a patient was turned from the supine to the prone position while the polyps maintained their position with respect to the bowel surface regardless of the patient's position. The presence, number, location, size and morphologic features of lesions were assessed by dividing the colon into six segments, viz., caecum, ascending colon, transverse colon, descending colon, sigmoid colon and rectum.

Statistical Analysis:

Data was entered systematically in MS excel ver 2007 spreadsheets and analysed using SPSS ver 16. Continuous data was expressed as mean values and SD. Discrete data was expressed in terms of percentage and proportion. Difference in proportion was analysed with Chi Square test and difference in mean was analysed with unpaired 'T' test. For all the practical purposes, P value less than 0.05 was considered statistically significant.

RESULTS

A total of 90 patients were included in the study, 60% were males and rest were females. The mean age of 90 patients was found to be 60.33 ± 9.67 years. The mean age of the males was 60.37 years whereas that of the females was 60.28 years. The difference in the mean age of the males and females was not statistically significant. (p-value >0.05). Maximum number of patients presented with the chief complaint of Altered Bowel habits (56.67%), followed by Bleeding Per Rectum (38.89%). The difference in the frequency of the various complaints of the patients was statistically significant (p value<0.05). (Table 1)

Table 1: Chief complaints with which the patients presented

Chief complaints	Number of Patients	Percentage	P-value
Altered Bowel habits	51	56.67%	0.000
BPR	35	38.89%	
Abdominal pain	34	37.78%	
Iron Deficiency Anemia	28	31.11%	
H/O Colonic Polyps	17	18.89%	

Diagnostic Evaluation of the Lesions

Out of 90 patients, 54 patients were diagnosed with one or more lesions at one or the other site of the colon. 6 patients were diagnosed with Ulcerative colitis and 3 patients with Tubercular colitis. Rest 27 patients did not have any findings on either conventional colonoscopy or MDCT colonography.

A total of 72 lesions were detected in these 63 patients. As 47 patients each were detected with single lesion at one or the other site, 5 patients were detected with 2 lesions at different sites and 2 patients were detected with 3 lesions at multiple sites. 6 patients of Ulcerative colitis and 3 patients of Tubercular colitis showed the mural thickness on MDCT colonography.

All these lesions were of various types and sizes confirmed by histopathology.

Visualisation of entire colon was 100% in CT colonography while it was only 87.77% in Conventional Colonoscopy. The difference between the two was statistically significant (p-value<0.05). (Table 2)

Table 2: Visualisation of entire colon

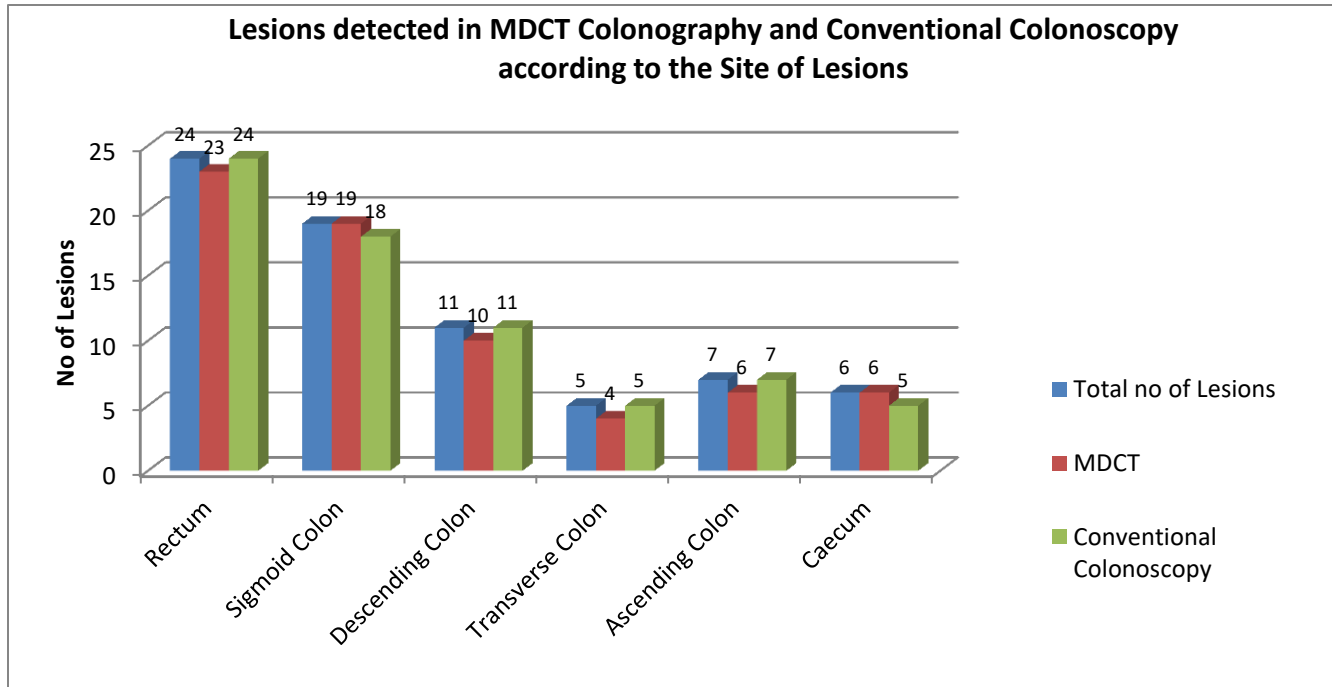
	MDCT Colonography		Conventional Colonoscopy		p value
	No of Patients	%	No of Patients	%	
Visualised	90	100%	79	87.77%	0.00
Not Visualised	0	0%	11	12.23%	

MDCT Colonography detected 68 out of total 72 lesions, i.e. 94.44%, whereas conventional colonoscopy detected almost 97.22% of lesions (70 out of 72 lesions). The difference between the two was not statistically significant (p value>0.05). Both the modalities correctly detected 66 lesions out of total 72 lesions diagnosed on histopathology. MDCT Colonography had detected 68 lesions but 2 of them were not visible on conventional colonoscopy. While MDCT Colonography missed 4 lesions which were later detected on conventional colonoscopy. Thus, conventional colonoscopy had detected a total of 70 lesions out of 72 lesions.

Table 3: Lesions detected in MDCT Colonography and Conventional Colonoscopy according to the Site of Lesions

Site of Lesion	Actual no of Lesions(72)	MDCT Colonography		Conventional Colonoscopy		p value
		No of lesions (68)	%	No of lesions (70)	%	
Rectum	24	23	95.83%	24	100%	0.312
Sigmoid Colon	19	19	100%	18	94.73%	0.311
Descending Colon	11	10	90.91%	11	100%	0.306
Transverse Colon	5	4	80%	5	100%	0.292
Ascending Colon	7	6	85.71%	7	100%	0.299
Caecum	6	6	100%	5	83.33%	0.296

Graph 1: Lesions detected in MDCT Colonography and Conventional Colonoscopy according to the Site of Lesions



The conventional colonoscopy detected all the lesions in rectum while MDCT Colonography missed one lesion which was <5mm in size, i.e., 95.83% could be detected correctly. In sigmoid colon, 100% of the lesions were detected correctly on MDCT colonography while one lesion which was synchronous to the other lesion in rectum was missed by conventional colonoscopy. Thus 94.73% were detected correctly by conventional colonoscopy. The conventional colonoscopy detected all the lesions in descending, transverse and ascending colon (100%) while MDCT Colonography missed one lesion each which were <5mm in size all in descending, transverse and ascending colon, i.e., 90.91%, 80% and 85.71% respectively were detected correctly by MDCT Colonography. In caecum, the MDCT Colonography detected all the lesions correctly while conventional colonoscopy missed one lesion because of the stricture in ascending colon beyond which the colonoscope could not

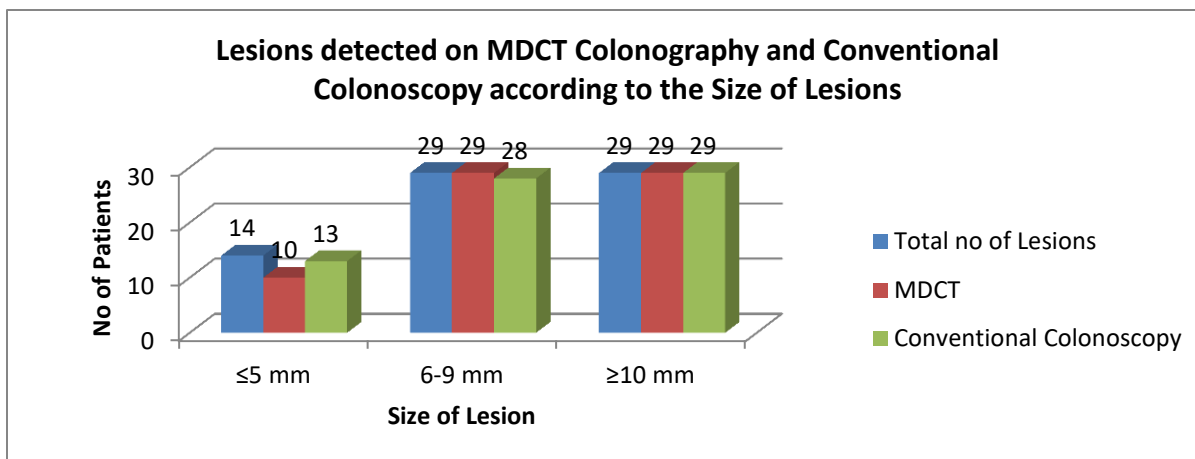
proceed, hence detected 83.33% lesions correctly. However, the differences in the diagnostic accuracy of the lesions between the two modalities at each site was not statistically significant (p-value>0.05). (Table 3 and graph 1)

The MDCT Colonography missed 4 lesions of size <5 mm while colonoscopy missed only 1 lesion of this size. Hence, MDCT Colonography correctly diagnosed 71.41% lesions of size <5mm while conventional colonoscopy detected 92.85% lesions of the same size. In the lesions of 6-9 mm size, MDCT Colonography detected all of them correctly while conventional colonoscopy missed one lesion in this range of size. Thus, 96.55% were detected correctly. Both the modalities accurately detected all the lesions of size >10mm. However, the difference in the diagnostic accuracy of the two modalities at different sizes was not statistically significant (p value>0.05). (Table 5 and graph 2)

Table 5: Lesions detected on MDCT Colonography and Conventional Colonoscopy according to the Size of Lesions

Size of Lesion	Actual no of Lesions (72)	MDCT Colonography (68)		Conventional Colonoscopy (70)		p value
		No of lesions	%	No of lesions	%	
≤5 mm	14	10	71.41%	13	92.85%	0.139
6-9 mm	29	29	100%	28	96.55%	0.313
≥10 mm	29	29	100%	29	100%	1.000

Graph 2: Lesions detected on MDCT Colonography and Conventional Colonoscopy according to the Size of Lesions



DISCUSSION

Colorectal cancer is a potential health problem resulting in significant morbidity and mortality. Colonic carcinogenesis is a multistep process which involves a number of morphologic, molecular and genetic changes, widely known as Adenoma-to-Carcinoma sequence. It almost takes a decade for a normal colon to convert into an invasive cancer. This makes it a potentially preventable disease, provided a timely detection, diagnosis and treatment is given to the patient. The two major types of polyps in colon are hyperplastic and adenomatous polyps.

In our study, in MDCT Colonography, the entire colon could be visualised in 100% of the patients whereas in Conventional Colonoscopy, the entire colon could be visualised in only 87.77% of the patients. Out of the 11 patients which colonoscopy missed, the colonoscope could not traverse past the lesion in 6 patients as the size of the lesion was big enough to not allow the colonoscope to cross them. Amongst these 6 patients, 5 patients had single large occlusive lesion while 1 patient had 2 synchronous lesions where the first lesion was occlusive and the second one could only be diagnosed via MDCT colonography and not conventional colonoscopy as colonoscope could not pass the first lesion. In 4 out of 11 patients, the colonoscopy could not be performed because of the severe discomfort and patient incooperation whereas in 1 patient, the colonoscope could not reach beyond the ascending colon due the strictures in the colon. In the same patient, the mural thickness in caecum was appreciated via MDCT colonography which the colonoscope missed. Our results were supported with that of study by Singh K et al(4) where the

visualization of the entire colon was possible in all the patients with CT colonography and only in 31 patients (62%) with entire colon visualization with conventional colonoscopy.

In our study, both the modalities correctly detected 66 lesions out of total 72 lesions diagnosed on histopathology. MDCT Colonography had detected 68 lesions and conventional colonoscopy had detected a total of 70 lesions out of 72 lesions. In the similar study by Singh K et al(4), Conventional colonoscopy detected 38 lesions out of 41 lesions; two proximal synchronous lesions were missed because colonoscope could not be passed beyond distal occlusive mass one lesion proximal to the anastomotic site was also missed, as colonoscope could not reach up to the lesion due to tortuous and abnormal anatomy of the colon. On the contrary, all these lesions were detected with CT colonography. Another study by Devir et al(3), four polyps were detected using conventional colonoscopy but could not be determined at MDCT colonography. However, one polyp detected using MDCT colonography was not detected with conventional colonoscopy.

The conventional colonoscopy detected all the lesions in rectum while MDCT colonography missed one lesion which was <5mm in size. In sigmoid colon, 100% of the lesions were detected correctly on MDCT colonography while one lesion which was synchronous to the other lesion in rectum was missed by colonoscopy. The conventional colonoscopy detected all the lesions in descending, transverse and ascending colon (100%) while MDCT colonography missed one lesion each which were <5mm in size all in descending, transverse and

ascending colon. In caecum, the MDCT colonography detected all the lesions correctly while colonoscopy missed one lesion because of the stricture in ascending colon beyond which the colonoscope could not proceed.

Similarly, in the study by Devir et al(3), one polyp over 10 mm and 2 polyps between 6 mm and 9 mm were missed due to failure in distinguishing them from the mucosal folds and one polyp below 5 mm was not detected because of inadequate colon cleansing during MDCT colonography. Similarly, one flat lesion in rectum was missed on CT colonography in Singh K et al(4) in a patient who presented with bleeding per rectum as the residual fluid in rectum masked it. In a meta-analysis by Pickhardt et al(7), most cancers missed at CT colonography were located in the rectosigmoid colon. The MDCT missed 4 lesions of size <5 mm in the current study while colonoscopy missed only 1 lesion of this size. In the lesions of 6-9 mm size, MDCT detected all of them correctly while colonoscopy missed one lesion in this range of size. Both the modalities accurately detected all the lesion of size >10mm. In a recent study by Sali L et al(8), it was concluded that CT colonography is a reliable technique to delineate the precise segmental location of colorectal carcinoma, to establish the presence of synchronous cancers and polyps greater than 10 mm. Similarly, Nagata K et al(9) suggested that in colonoscopy, the presence of nine lesions ≥ 10 mm that were detected by CTC. J Wessling et al(10) reported that the colonography identified the carcinoma and 23 polyps (77 %). 3 of 3 polyps were 10 mm or more (100 %), 6 of 7 were 5.1 to 9.9 mm (86 %) and 14 of 20 were 5 mm or smaller (70 %). Further prospective studies with larger sample size, with the inclusion of 3-D endoluminal data acquisition and complete follow up of the patients with the suggestive interventions are recommended for future references.

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