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ORIGINAL ARTICLE

TITLE : EFFECTIVENESS OF MULTIDETECTOR COMPUTED TOMOGRAPHY IN DIFFERENTIATING MALIGNANT FROM BENIGN LESIONS IN THE COLON

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Abstract:

Introduction: Colorectal cancer is the second most common cause of cancer death in developed countries

Aim : Effectiveness of MDCT in differentiating malignant from benign lesions in the colon.

Materials and Methods: The study was done for a period of 2 years from Oct 2014 to Aug 2016 in the department of Radio-diagnosis in teaching hospitals attached to Bapuji, Chigateri General Hospital, Davangere, Karnataka. Referred patients with clinically suspecting large bowel pathology CT was carried out using TOSHIBA ACTIVION 16 SLICE MDCT scanner. The imaging technique will be plain CT followed by oral (positive), rectal, and IV contrast. **Results**: Of the 40 patients, 24 patients were males and 16 were females. Most of the affected patients were in the age group of 61-70 yrs. All the 26 malignant lesions were correctly diagnosed on CT. 13 of the 14 benign lesions were correctly diagnosed on CT, except one case with an inflammatory lesion of the colon which was diagnosed as a malignancy on CT. The CT features of benign lesions were homogenous attenuation, mild symmetric wall thickening, and diffuse involvement of the bowel. The CT

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features of malignant lesions were heterogeneous attenuation, marked asymmetric wall thickening, and focal involvement of the bowel. **Conclusion** : MDCT proved to be an excellent modality in the diagnosis and differentiation of benign and malignant lesions of the colon and rectum. Besides identifying the lesion MDCT provides further information regarding pericolic abnormalities associated with the lesion, presence of lymph nodes, infiltration of adjacent viscera, and the presence of distant metastases.

KEYWORDS: MDCT, Wall thickening, Pericolic fat stranding

INTRODUCTION

Colorectal cancer is the second most common cause of cancer death in developed countries. In 1998, there were 131,000 new cases of colorectal cancer and 56,000 deaths in the United States.[1] The initial diagnosis is usually made with colonoscopy or air-barium enema examination; however, with the increased use of computed tomography (CT) as the initial imaging modality in patients with a varietyof gastrointestinal symptoms, the radiologist may be the first to suggest the diagnosis of colon cancer based on CT findings.

Colorectal cancer is the third most common cancer in men and the second in women worldwide. The age-adjusted incidence rates of colorectal cancer in all the Indian cancer registries are very close to the lowest rates in the world. However population-based on time-trend studies show a rising trend in the incidence of colorectal carcinoma in India.[2]

CT is an increasingly useful technique in the evaluation of intestinal disease, allowing the evaluation of bowel disease as well as extra-intestinal disease. CT also provides an excellent assessment of the peri-enteric abnormalities that frequently accompany bowel disease (adenopathy, ascites, fat stranding, presence of abscesses, and fistulas) and improves specificity in diagnosis.[3]

Conventional barium examinations remain superior to CT for evaluating intra- luminal and mucosal disease, but CT is far more accurate for evaluating the intramural and extra-intestinal components, including involvement of the mesentery, peritoneal cavity, retroperitoneum, and solid organs.

Thickening of the bowel wall is the commonly identified abnormality on CT in case of colorectal lesions.[4] The differential diagnosis for bowel wall thickening is wide. Once a bowel wall thickening is detected, its radiologic features are analyzed by using criteria specific to CT imaging. It is important to define the wall thickening as focal, segmental, or diffusely affecting an entire

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intestinal segment. CT features include the degree of thickening of the intestinal wall, symmetry of involvement, smooth versus irregular or lobulated inner or outer contour, and pattern of enhancement.

Associated findings such as exophytic component, lymphadenopathy, distal metastases, adjacent mesenteric inflammatory response, phlegmon, or abscess are additional important features that are helpful in the differential diagnosis.

Michael et al[5] studied the CT characteristics of bowel wall thickening basedon the pattern of attenuation and enhancement; degree, symmetry, the extent of thickening; and associated abnormalities. They concluded that the association ofseveral abnormal parameters will lead to a correct diagnosis or will narrow the differential diagnosis in most cases. When confusing or overlapping CT parameters are encountered or uncertainties persist, barium examinations should be liberally used as complementary diagnostic studies.

Hence this study is an attempt to characterize wall thickening in patients with colorectal lesions as either benign or malignant based on the pattern of attenuation; degree of thickening; symmetric versus asymmetric thickening; focal, segmental, or diffuse involvement; and associated peri-enteric abnormalities. The CT findings are finally correlated with histopathological findings

METHODOLOGY

Source of Data:

The main source of data for the study are patients who come to the following teaching hospitals attached to Bapuji educational association, JJM medical college, Davangere

1 Bapuji hospital

2 Chigateri general hospital

Methods :

This is a correlative type of study. Data will be collected from a minimum of 30 cases of suspected large bowel lesions referred for CT of the abdomen.

After informed consent, the patient will be given oral contrast (1.5L water+20mlof sodium diatrizoate) and make his supine position on the CT table and rectal tube will be inserted and rectal contrast (500ml water+10ml of sodium

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diatrizoate) is given. IV injection of 80 ml of non-ionic contrast (iopromide 300) will be administered at 3ml/sec. CT acquisition will be performed in the arterial phase and in the portal venous phase at a rotation speed of 0.8 see*

The lesion will be characterized based on the thickening of the bowel wall, depth of involvement of lesion, and pericolic spread. The results obtained from the CT scan studies will be correlated with the surgical and histopathological findings.

Inclusion Criteria:

- Patients with suspected large bowel lesions.
- Patients in whom histopathological findings are available for correlation.

Exclusion criteria:

- Patients in whom correlation with histopathology is not available.

The study requires an MDCT scan of patients with colorectal lesions followed by confirmation with histopathological examination.

Statistical Analysis:

Collected data will be analyzed by sensitivity, specificity, positive predictivevalue, negative predictive value, and kappa statistics.

RESULTS

In this study, 40 patients with bowel wall thickening involving the colon and rectum on CT were observed. Of these 24(60%) were males while 16(40%) were females.

Most of the patients with colorectal lesions in our study were in the age group of 61-70 yrs(22.2%) followed by those above 70 yrs and those in the age group of 41- 50 yrs(20%). Patients below 30 yrs were the least affected.

Of the 40 patients with colorectal lesions on CT 26 lesions (65%) were diagnosed as malignant and 14 lesions (35%) were diagnosed as benign on histopathology.

Table 1: Sites of distribution in benign lesions

Site	Frequency	Percent
Caecum+Ascending Colon	3	21.4%

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Caecum+Ascending Colon+Transverse Colon	2	14.2%
Caecum+Ascending Colon+Transverse Colon+Descending Colon+Sigmoid Colon	3	21.4%
Ascending Colon+Transverse Colon	2	14.2%
Transverse Colon+Descending Colon	2	14.2%
Rectum	2	14.2%
Total	**14**	**100**

There was the involvement of the entire length of the caecum, ascending colon, transverse colon, descending colon, and sigmoid colon in 21.4% of the cases and involvement of caecum and ascending colon in 21.4% of the cases.

Table 2: Sites of distribution in malignant lesions

Site	Frequency	Percent
Caecum + Ascending Colon	1	3.8%
Ascending Colon	3	11.5%
Transverse Colon	1	3.84%
Descending Colon	2	7.6%
Descending Colon + Rectum	6	23.07%
Rectum	13	5.0%
Total	**26**	**100**

Rectum was the most common region to be involved (50%) followed by the DC+rectum (23.07). Three lesions involved AC and 2 lesions involved DC and one lesion in TC

Table 3: Pattern of attenuation of lesion

Attenuation of the bowel wall	**Histopathology**		**Total**
	Adenocarcinoma	**Inflammatory/ infective**	

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Homogenous attenuation	Count	1	13	14
		7.1%	92.9%	100%
		3.8%	92.9%	35%
Heterogenous stratified attenuation	Count	0	1	1
		0	100%	100%
		0	7.1%	2.5%
Heterogenous mixed attenuation	Count	25	0	25
		100%	0	100%
		96.2%	0	62.5%
Total	Count	26	14	40
		65%	35%	100%
		100%	100%	100%

$X^2 = 35.92$, p= 0.000

Of the 14 benign cases, 13 cases (92.8%) had homogenous attenuation and 1 case (7.2%) had heterogeneous stratified attenuation. Of the 26 malignant cases, 25 cases (96.1%) had heterogeneous mixed attenuation and 1 case (3.9%) had homogenous attenuation on CT.

Table 4: CT in diagnosing benign and malignant lesions

CT Impression		**Histopathology**		**Total**
		Adenocarcinoma	**Inflammatory/ infective**	
Malignancy	Count	26	1	27
		96.3%	3.7%	100%
		100%	7.1%	67.5%
Benign (Inflammatory/	Count	0	13	13
		0	100%	100%

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Infective)		0	92.9%	32.5%
Total	Count	26	14	40

*X^2= 35.78, P= 0.000 HS, Kappa = 0.94, very good agreement.

CT in the diagnosis of benign lesions

Sensitivity - 92.9%

Specificity - 100%

Positive predictive value - 100%

Negative predictive value - 96.3%

CT in the diagnosis of malignant lesions

Sensitivity -100%

Specificity - 92.9%

Positive predictive value - 96.3%

Negative predictive value - 100%

Figure 1 . Axial CECT image showing peritoneal metastasis secondary to rectal adenocarcinoma

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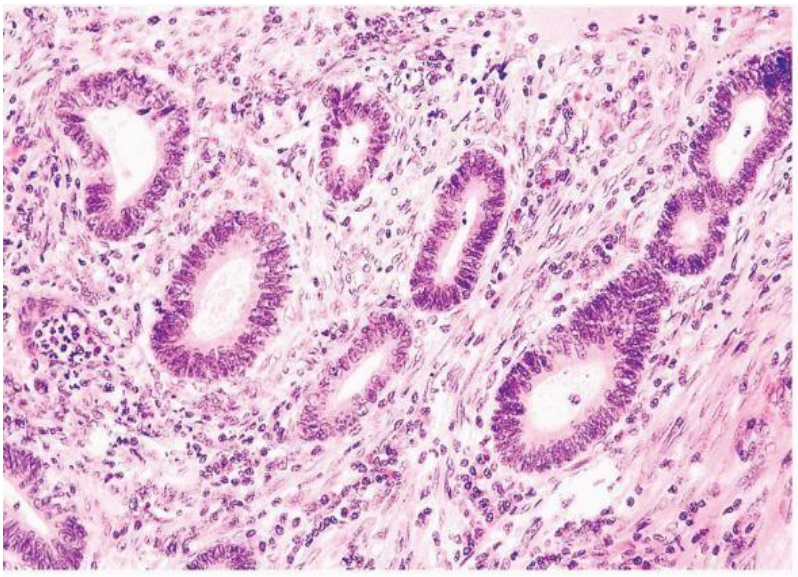

Figure 1A . Rectal adenocarcinoma microscopic picture

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Figure 2. Coronal reformatted CECT image showing diffuse wall thickening involving caecum and ascending colonup to hepatic flexure which was proved later to be lymphoma histopathologically

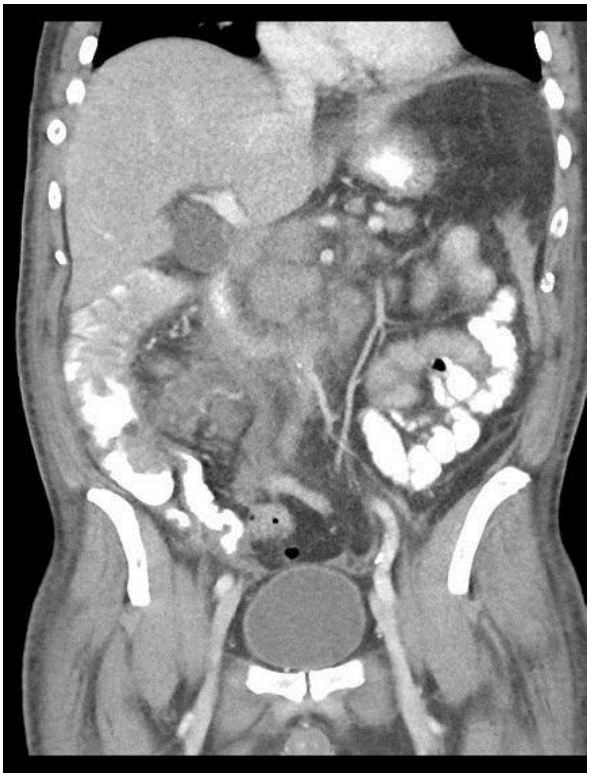

Fig 2A. Mantle cell lymphoma showing nuclear atypia

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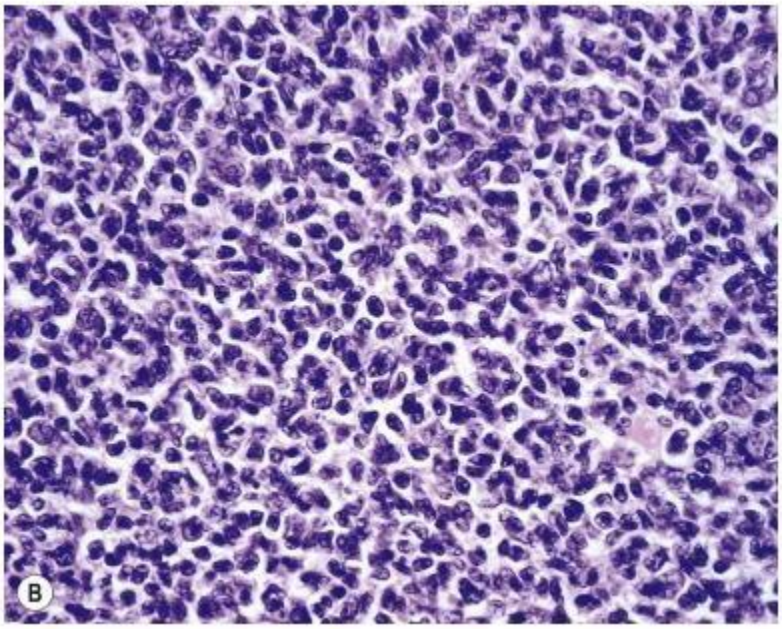

DISCUSSION

This was a hospital-based correlative study to describe the role of MDCT inthe evaluation of colorectal lesions.

In our study, 40 patients with wall thickening involving the region of the colon and rectum were studied.

Out of these 40 patients, 24 were males and 16 were females. The age group commonly affected were those in the age group of >50 years (30%). These are in concordance with the study done by RajeshRSet al [6]. They studied the pattern of colorectal lesions in 54 patients and found that males were more commonly affected (53.71%) and most of the patients were in the age group of 61-70 years (24.07%).

Among the 40 cases, 26 cases were histopathologically proved to be malignantand 14 cases were proved to be benign.

Most of the patients with benign lesions of the colon had contiguous involvement of the caecum, ascending colon, transverse colon, descending colon, and rectum. Rectum was the commonest site for malignant lesions (50%). This is in agreement with the study done by Rajesh et al.[6] In their study there was the involvementof the rectum in 53.71% of the cases.

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ATTENUATION OF BOWEL WALL:

Among the 14 benign cases, 13 cases (92.8%) had homogenous attenuation and 1 case (7.2%) had heterogeneous stratified attenuation. Of the 26 malignant cases , 25 cases (96.1%) had heterogeneous mixed attenuation and 1 case (3.9%) had homogenous attenuation on CT. This is in agreement with studies done by Balthazar EJ et al[7] and Michael et al[5] who have told that homogenous attenuation is a feature of the benign disease (inflammatory/infective) and heterogeneous attenuation is a feature of malignancy (adenocarcinoma). 1 case with inflammatory disease of the colon had heterogeneous stratified attenuation (target appearance). This was in agreement with the study done by Jorge Ahuhalli[8] who described that the target sign is a feature of benign disease seen in cases of ischemic colitis, inflammatory colitis, and infectious colitis.

FAT STRANDING:

All the benign lesions had evidence of pericolic fat stranding. Pericolic fat stranding was present in 18 cases (69.2%) of malignancy. Pericolic fat stranding was absent in 8 cases (30.8%) of malignancy. Filippone et al[9] in their study have found that pericolic fat stranding adjacent to a malignant lesion is a feature of invasion of pericolic fat and hence is a feature of T3 lesions. However, it is not a reliable criterion and may result in over staging of lesions as T3. Pereira et al[10] have described that pericolic fat stranding is a common finding seen in inflammatory conditions of the colon.

ROLE OF CT IN DIFFERENTIATING BENIGN AND MALIGNANTLESIONS:

Among the 27 lesions identified as a malignancy on CT, histopathology confirmed malignancy in 26 cases. 1 case diagnosed as a malignancy on CT was confirmed as inflammatory on histopathology. Hence in our study, CT had a sensitivity of 100%, specificity of 92.90%, a positive predictive value of 96.30%, and a negative predictive value of 100% in the diagnosis of malignant lesions.

All the cases diagnosed as benign on CT were confirmed as benign on histopathology. 1 case diagnosed as malignant on CT was confirmed as inflammatory on histopathology. Hence in our study, CT had a sensitivity of 92.90%, specificity of 100%, a positive predictive value of 100%, and a negative predictive value of 96.30% inthe diagnosis of benign lesions.

K= 0.92 (Excellent agreement). Hence CT is an excellent modality in differentiating benign and malignant lesions of the colon and rectum.

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CONCLUSION

MDCT is an excellent modality in the diagnosis and differentiation of benign and malignant lesions of the colon and rectum since it has the advantage of providingthinner sections, faster acquisition, and multiplanar reformatted images.

MDCT with its axial and reformatted images is a useful tool to differentiate early colorectal carcinoma and advanced cancer.

Besides identifying the lesion MDCT provides further information regarding pericolic abnormalities associated with the lesion, presence of lymph nodes, infiltration of adjacent viscera, and the presence of distant metastases.

CONFLICT OF INTEREST : NIL

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