Original Research Article

A Clinical Study to Evaluate Role of CT in Colorectal Malignancies

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Abstract: Carcinoma of the colon and rectum is one of the most prevalent malignancies worldwide. Prognosis of patients with colorectal carcinoma is dependent on the stage of disease at the time of diagnosis. The depth of wall invasion and the presence of lymph node and distant metastases are the major factors that influence prognosis. Accurate preoperative staging is essential for the planning of optimal therapy. Computed tomography (CT) is a recognized method for pre- and postoperative staging of rectal carcinoma. Preoperative CT is useful for planning surgery or radiation therapy, particularly when local extension of tumor into adjacent organs or distant metastases are detected. In addition, preoperative CT pro vides baseline findings for comparison during the postoperative period and is the modality of choice for detection of local recurrence after surgical resection.
Keywords: Colorectal cancer, Computed tomography, adenocarcinoma, Prognosis

INTRODUCTION

Carcinoma of the colon and rectum is one of the most prevalent malignancies worldwide. Medical literature abounds with evidence that early detection and aggressive management of these lesions can significantly improve patient survival[1,2].

Colorectal cancer is usually diagnosed by barium studies and colonoscopy followed by biopsy. Although these techniques provide superb visualization of the mucosa, they cannot determine the depth of mural invasion by the tumor or the extent of metastatic disease. In patients with colorectal cancer, accurate assessment of tumour extent within and beyond the bowel wall, the presence or absence of lymphadenopathy and distant metastases is significantly important [2].

Prognosis of patients with colorectal carcinoma is dependent on the stage of disease at the time of diagnosis. The depth of wall invasion and the presence of lymph node and distant metastases are the major factors that influence prognosis[3]. Detection of colorectal carcinoma before the malignancy has invaded into or extended through the muscularispropria and before lymph node metastases have occurred offers the best prognosis for the patient and the option of more limited surgery. Accurate preoperative staging is essential for the planning of optimal therapy.

Computed tomography (CT) is a recognized method for pre- and postoperative staging of rectal carcinoma[4-6]. Initially CT was reported to be accurate in staging patients with primary rectal or rectosigmoid carcinoma. Computed tomography (CT) is almost universally accepted as the primary screening modality for the evaluation of patients suspected of having colonic disease. CT has the advantages of wide availability and ease of performance. Key benefits of CT over alternative modalities are that it no t only accurately demonstrates the bowel wall but also outlines the peri-colonic soft tissues and adjacent structures. CT cannot demonstrate subtle superficial mucosal changes revealed on barium studies, but it is a highly sensitive method for the detection of intramural disease and extraluminal extension of colonic disease. CT can help assess inflammatory conditions, as well as facilitate comprehensive diagnosis and staging of abdominal neoplasms. In patients with symptoms of intestinal disease, CT can be used to help both diagnose other gastrointestinal disorders and differentiate them from abdominal diseases not involving the gastrointestinal system.

The hallmark of a malignant lesion on CT is eccentric or asymmetric thickening of the bowel wall, the irregular and Iobulated inner and outer contour, and/or the focal soft-tissue mass usually exceeding 2 cm from the luminal to serosal surface. The area of involvement varies in size. There is abrupt transition, luminal narrowing, and sometimes a spiculated outer

contour. Regional adenopathy and distal mesenteric, retroperitoneal, and liver metastases, when present, confirm the neoplastic nature of the primary lesion.

Thickening of the bowel wall is the commonly identified abnormality on CT in case of colorectal lesions[7]. The differential diagnosis for bowel wall thickening is wide. Once a bowel wall thickening detected, is 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 intestinal segment. CT features include degree of thickening of 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[7].

Hence CT is considered more accurate for evaluating the intramural and extra intestinal components, including involvement of the mesentery, peritoneal cavity, retroperitoneum and solid organs. Preoperative CT is useful for planning surgery or radiation therapy, particularly when local extension of tumor into adjacent organs or distant metastases are detected. In addition, preoperative CT pro vides baseline findings for comparison during the postoperative period and is the modality of choice for detection of local recurrence after surgical resection[5].

AIMS AND OBJECIES
1. To study CT characteristics of wall of thickening in case of benign and malignant lesion of colon and rectum.
2. To evaluate effectiveness of CT in differentiate benign and malignant colorectal lesion
3. To evaluate role of CT in preoperative staging of tumor of colorectal malignancies.
4. To evaluate role of CT in treatment plan of tumor of colorectal malignancies.

TNM STAGING OF COLORECTAL MALIGNANCIES
> **TX** = primary tumor cannot be assessed
> **T0** = no evidence of primary tumor
> **Tis** = carcinoma in situ
> **T1** : Tumor invades submucosa.
> **T2** : Tumor invades muscular is propria.
> **T3** : Tumor invades through the muscular is propria into the subserosa, or into the pericolic or perirectal tissues.
> **T4** : Tumor directly invades other organs or structures, and/or perforates =T2, T3, or T4), are considered instead In CT image analysis, o only three T stages (ofthe normal four T stages as reported in the TNM system. T1 and T2 tumors were combined to represent one T stage, =T2. This classification is used to

address known limitations of CTin distinguishing T1 and T2 lesions

MODIFIED CT TUMOUR STAGING
> $\leq$T2 = smooth outer border of thickened colorectal wall with a clear surrounding fat plane
> T3 = tumor with rounded or nodular advancing margin
> T4 = obliteration of fat planes between colorectal tumor and adjacent organ

MATERIAL AND METHODS
This was a prospective study conducted in the Department of General Surgery, S.P. Medical College and P.B.M. Associated Group of Hospitals, Bikaner. Forty Six patients with wall thickening involving the colon and the rectum on CT were included in the study.

STUDY PERIOD
Six Months from May 2014 to October 2014.

INCLUSION CRITERIA
- All age groups and both sexes
- Patients with wall thickening involving the colon and rectum
- Patients in whom histopathological findings will be available for correlation

EXCLUSION CRITERIA
- Patients with lesions involving the anal canal.
- Patients in whom histopathological findings are not available for correlation

METHOD
For CT scan, we were prepared the patient nil by mouth 8 hours before CT performed and then CT was started IV and oral contrast.

In oral contrast, 50ml non ioniciohexol diluted in 4 litre water and was given to patient 1 liter/hour and CT film was taken after 4 hours. After confirming the contrast reach in colon by plain CT, CECT slice was taken.

Iohexol dye was injected intravenous 1ml/kg body weight and CT film was taken in arterial phase, portal venous phase and post delayed phase and with a section width of 5mm was taken. It will be characterized using the following criteria.
- Location
- Attenuation
  - Homogenous
  - Heterogenous stratified
  - Heterogenous mixed
- Degree of wall thickening
  - Mild (<2cms)
  - Marked (>2cms)
- Symmetric versus asymmetric wall thickening
- Focal, segmental or diffuse wall thickening
- Presence of lymph nodes

- Presence of peri-colonic fat stranding
- Infiltration of adjacent viscera
- Presence of metastasis
- Staging in cases of suspected malignancy

DATA ANALYSIS

Collected data were analyzed by sensitivity, specificity, positive predictive value, chi square test.

OBSERVATIONS

In present study, out of total 46 patients, 25 were heterogenous mixed and 21 were heterogenous stratified. Out of total 25 heterogenous mixed patients, most common age group was 41-50 years (40%) while in heterogenous stratified group most common age group ≤ 40 years (28.1%). Overall most common age group was 41-50 years where total 16(34.8%) patients were found.

Mean age in heterogenous mixed patients was 50.80±13.07 years while mean age in heterogenous stratified cases was 47.76±15.37 years and the difference was found statistically insignificant (p>0.05).

Table 1: Distribution of Cases according to location in relation to Attenuation

Location	Attenuation				Total	
	Heterogenous Mixed		Heterogenous Stratified			
	No.	%	No.	%	No.	%
Ano Rectum	10	40.0	0	-	10	21.7
Caecum	4	16.0	5	23.8	9	19.6
Caecum, As Colon	0	-	5	23.8	5	10.9
Discending Colon	1	4.0	0	-	1	2.2
Rectosigmoid	3	12.0	4	19.0	7	15.2
Rectum	0	-	4	19.0	4	8.7
Sigmoid	0	-	3	14.3	3	6.5
Tr Colon	4	16.0	0	-	4	8.7
Tr, Rectosigmoid	3	12.0	0	-	3	6.5
Total	25	100	21	100	46	100
χ^2	30.134					
P	<0.001					

According to table-1, most common location was ano rectum where total 10 patients were found and they all belonged to heterogenous mixed group followed by caecum (n=9), rectosigmoid (n=7), caecum, As colon (n=5), rectum and Tr Colon (n=4 each), sigmoid and Trrectosigmoid (n=3 each) and discending colon (n=1).

Table 2: Distribution of Cases according to Degree of Wall Thickening in relation to Attenuation

Degree of Wall Thickening	Attenuation				Total	
	Heterogenous Mixed		Heterogenous Stratified			
	No.	%	No.	%	No.	%
Marked	16	64.0	14	66.7	30	65.2
Mild	9	36.0	7	33.3	16	34.8
Total	25	100	21	100	46	100
χ^2	0.036					
P	0.850					

According to Table-2 wall thickening, 30 patients had marked degree of wall thickening and out of them 16 and 14 were from heterogenous mixed and heterogenous stratified group respectively while mild degree of wall thickening was present in 16 patients and out of them 9 and 7 were from heterogenous mixed and heterogenous stratified group respectively.

On applying chi square test, the difference was found statistically insignificant (p>0.05).

Table 3: Distribution of Cases according to Pattern of Wall Thickening in relation to Attenuation

Pattern of Wall Thickening	Attenuation				Total	
	Heterogenous Mixed		Heterogenous Stratified			
	No.	%	No.	%	No.	%
Asymmetric	21	84.0	18	85.7	39	84.8
Symmetric	4	16.0	3	14.3	7	15.2
Total	25	100	21	100	46	100
χ^2	0.026					
P	0.872					

According to table-3, pattern of wall thickening was asymmetric in 39 patients and out of them 21 were from heterogenous mixed group and 18 were from heterogenous stratified group. symmetric pattern of wall thickening was present in only 7 patients and out of them 4 and 3 were from heterogenous mixed and heterogenous stratified group respectively.

On applying chi square test, the difference was found statistically insignificant (p>0.05).

Mean CT Stating in heterogenous mixed was 2.92±0.86 while in heterogenous stratified group it was 3.33±0.58 and the difference was found statistically insignificant (p>0.05).

Most common histopathological diagnosis was moderate differentiated adenocarcinoma where total 19(41.3%) of patients were found followed by adenocarcinoma, adenocarcinoma rectosegmois (6 patients each), adenocarcinoma segmococcus (4 patients), caecal adenocarcinoma, mucinous adenocarcinoma, squamous cell carcinoma, signet ring cell adenocarcinoma (2 patients each) and Mild Differentiated adenocarcinoma, rectum adenocarcinoma (1 patient each) while 1 patients had no findings.

Histopathological stating in relation to attenuation. Only 9 patient had their histopathological stage 2 and they belonged to heterogenous mixed group while 15 patients had their histopathological stating 3 and out of them 3 belonged to heterogenous mixed group and 21 patients had their histopathological stating 4 and out of them 13 patients belonged to heterogenous mixed group.

Mean histopathological stating in heterogenous mixed group was 3.16±0.94 and in heterogenous stratified group it was 3.40±0.50 and the difference was found statistically insignificant (p>0.05).

In surgical intervention, APR colostomy was present in total 16 patients and out of them 13 patients belonged to heterogenous mixed group, Right hemicolectomy was present in 14 patients and out of them 4 belonged to heterogenous mixed group, 11 patients had LAR and out of them 4 belonged to heterogenous mixed group while Colo-Colon anastomosis was present in 4 patients and they all belonged to heterogenous mixed group.

On applying chi square, the difference was found statistically highly significant.

Table 4: Distribution of Cases according to CT Staging in Relation to Histopathological Staging

CT Stating	Histopathological Staging						Total	
	II		III		IV			
	No.	%	No.	%	No.	%	No.	%
II	10	100.0	1	6.7	0	-	11	23.9
III	0	-	14	93.3	5	23.8	19	41.3
IV	0	-	0	-	16	76.2	16	34.8
Total	10	100	24	100	21	100	46	100
χ^2	33.308							
P	<0.001							

Table 4 shows distribution of cases according to CT staging in relation to histopathological staging. In CT stage 2, 11 patients was found and only 1 patient had histopathological stage 3 and 10 patients had histopathological stating 2, In CT staging III, total 19 patients were found and out of them 14 and 5 had histopathological staging III and IV respectively while 16 patients had their CT staging IV and they all had

histopathological stage 4. This difference was found statistically highly significant (p>0.001).

DISCUSSION

This is a hospital based correlative study to describe the role of CT scan in evaluation of colorectal lesion and further management and treatment plan of colorectal malignancies.

In our study 46 patients included with wall thickening and attenuation of lesion (homogenous or heterogenous) involving the region of colon and rectum were studied.

Out of 46 patients, 34 were males and 12 were females. Out of 34 males 16 patients belong to heterogenous mixed and remaining 18 belongs to stratified group. Out of 12 females, 9 belonged to heterogenous mixed and 3 belonged to stratified group. In our study male are more affected (73.9% than female (26.1%).

In present study out of total 46 patients, 25 were heterogenous mixed and 21 were heterogenous stratified. The most common age group was 41-50 years where total 16(35%) patients were found. Mean age in heterogenous mixed patients was 50.8±13.4 year while mean age in heterogenous stratified patients was 47.7±15 years.

In present study 34 patients (74%) belonged to rural area and 12 patients belonged to urban area. In rural area (26%) out of 34 patients 20 and 14 were heterogenous mixed and heterogenous stratified.

This study showed that colorectal lesions are more commonly affecting the rural population than urban. This study show that unawareness of rural population about there health, low socioeconomic status, having smoking, diet that leads to more population lead to colorectal lesion. As this study is done at government hospital setup where lower socioeconomic status, low nutritional status and poor farmers are more come to OPD then high class society.

In present study most common occupation patients that affected colorectal lesion was farmer out of 46 cases 28 cases (60%) were farmer. In 28 cases out of them 14 each from heterogenous mixed and heterogenous stratified group. Next common group was occupation than housewives (12 patients; 20%). Out of them 9 and 3 were heterogenous mixed and heterogenous stratified group.

This study shows farmer and housewives are more commonly affected or proved case as they are not aware about the health care of them self and heavy smoking habit of farmer, insecticide, pesticide use.

In present study the most common complaint from that patient comes in clinic was rectal bleeding (37%) in 17 cases out of 46 cases followed by altered bowel habit (20%). Pain abdomen+ loose stool, pain abdomen+ weight loss (8%), anorexia and weight loss, pain abdomen, constipation, bleeding PIR and weakness +weight loss, altered bowel habit+ weight loss 4%. This study show rectal bleeding followed by altered bowel habit is chief complaint in colorectal lesion.

In present study the overall most common site for malignancy in colorectal region was from on rectum (24 cases out of 46 cases) in 50% cases that is followed by sigmoid colon. This shows the rectosigmoid part is most common involving in malignancy, next most common part involving was caecum.

In our study according to wall thickening, 30 patients (65%) had marked thickening and out of them 16 and 14 were heterogenous mixed and heterogenous stratified while mild degree of wall thickening was present in 16 patients and out of them 9 and 7 were heterogenous mixed and heterogenous stratified respectively.

In our study out of 46 cases having heterogenous attenuation in which 25 cases were heterogenous mixed and 21 cases were heterogenous stratified.

Out of 46, 45 cases having malignancy except one case that had heterogenous attenuation but histopathologically benign. This study show heterogenous attenuation is feature of malignant lesion while homogenous attenuation feature of benign lesion.

In our study out of 46 patients, 38 patients (82%) were found focal involvement of bowel loop and out of them 23 and 15 were heterogenous mixed and heterogenous stratified group.

Segmental type of involvement was found in only 8 patients (18%) and out of them 2 and 6 were found heterogenous mixed and stratified group. So this study show focal involvement of bowel loop is significant feature of malignant lesion that on segmental involvement may be seen in initial stage of malignant lesion.

In our study adjacent visceral invasion was present in 15(32%) patients out of 46 and out of them 6 was heterogenous mixed and 9 were heterogenous stratified and remaining 31 patients adjacent visceral involvement absent.

Here the visceral involve show that advance stage of disease. Infiltration to adjacent stratified or bladder, cervix muscle were found infiltration on adjacent stratified in high suggestive of malignancy. If there is adjacent visceral invasion that significantly altered the management and treatment plan of malignant lesion.

In our study we found that metastasis was absent in 33 patients (71%) overall metastasis was found in 13 cases out of 46 in which liver metastasis in 7 cases (15%) and lung metastasis in 6 cases (13%). This show liver is more commonly involvement in distant metastasis of colorectal malignancy followed by

lung. This is agreement with study done by Horton et al[47] in their study have described that liver is predominant organ to be involved with metastasis for colorectal cancer.

In present study overall most common type of histopathology were found adenocarcinoma. 43 cases out of 46 (93%) cases and remaining 2 cases found squamous cell carcinoma and one case is found as benign that was heterogenous stratified type. In adenocarcinoma most common was moderate different adenocarcinoma where total 19 patients (41%) were found.

In our study 11 patients out of 46 (24%) had their CT staging 2 and out of them 10 belong to heterogenous mixed and 19 patients had their CT staging 3 and out of them 7 belong to heterogenous mixed group and 16 patients had their CT staging 4(34%). This showing that as stage increases probably diagnosing by CT seen in increase a CT scan correctly diagnosis III and IV stage.

Among 46 cases identified malignant on CT histopathologically confirmation malignancy in 45 cases, 1 case as benign on histology.

All cases diagnosed on benign on CT were confirm as benign on histology that show CT is an excellent modality in differentiating benign and malignant lesion of colon and rectum.

In present study according to CT staging in relation to histopathological staging. In CT stage 2, 11 patients were found and 10 patients had histologically stage 2 and 1 patient had histopathological staging 3, so here 1 cases underestimate by CT.

In CT staging 3 total 19 cases were found and out of them 14 cases had histological staging 3 (74%) and remaining 5 cases diagnosed at stage 4 histopathologically were 5 cases were under staging in CT staging.

In CT stage 4 all 16 cases of 46(35%) were diagnosed as stage 4 also in histopatholoigcally.

SUMMARY AND CONCLUSION
SUMMARY
This is a hospital based correlative study to describe the role of CT scan in evaluation of colorectal lesion and further management and treatment plan of colorectal malignancies.
The following points were drawn
- Male were affected commonly as compared to female.
- Most of affected patients were in the age group 41-50 years.
- There were 45 cases of malignant and one case with benign inflammatory lesion.

- Rural population were more affected than urban.
- By occupation, farmer and house wives are more affected person than business persons.
- Rectal bleeding followed by altered bowel habit is most commonly symptom in malignant disease.
- Most of person having Hb$\geq$ 7.
- Rectosigmoid part is most common site of malignant lesion followed by caecum.
- Heterogenous mixed attenuation was seen in 25 of 46 and heterogenous stratified in 20 out of 46 that is malignant lesion.
- Mild thickening feature of benign lesion but may be present in initial stage of malignant lesion.
- Marked wall thickening was present in 65% of cases.
- Asymmetrical wall thickening was present in 85% of cases i.e. classical feature of malignancy.
- Focal involvement of bowel was seen in 36 of 56 in malignancy with 8 cases of 46 having segmental involvement in malignant cases.
- Malignant lesion had presence of enlarged lymph node in 84% of cases.
- In malignant lesion bowel length involvement <5 cms were in 45% of cases.
- Fat stranding was seen in 90% of cases of malignant lesion.
- Infiltration of adjacent visceral invasion found in 15 malignant lesion.
- Distant metastasis was seen in 13 cases of malignancy.
- 43 out of 46 malignant lesion were found adenocarcinoma in histopathological diagnosis.
- Right side malignancy right hemicolectomy was done and left sided APR with colostomy or LAR was done.
- 10 out of 11 cases were correctly staged at T2 lesion, 14 out of 19 cases were correlated staged T3 and all T4 cases were correlate stage on T4 lesion.

CONCLUSION
- CT is an excellent modality in diagnosis and differentiation of benign and malignant lesion of colon and rectum since it has advantage of providing thinner section, faster acquisition and multiplanner images with contrast enhanced images.
- CT is also useful in preoperative evaluation and staging of colorectum malignant lesions which helps in proper planning or surgery and further management of patients.
- CT with its axial and reformatted imaging is useful tool to differentiate early colorectal and

advance cancer and an in recurrences of disease.

- Besides identifying the lesion CT provide further information regarding pericolic abnormalities associated with lesion as extent of disease, lymph nodes status, infiltration of adjacent visceral and presence of distant metastasis.
- CT also provide information about surgical planning of cancer as its resectibility is present or not and further management of cancer as surgical or chemotherapy or radiotherapy.

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