

Original Article

CT Evaluation of Rectal Carcinoma with Histopathological Correlation

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ABSTRACT

Colorectal cancer is a major cause of death from cancer in many countries. Computed tomographic (CT) scanning has been suggested as an aid to assess the extension of involvement, spread and staging of carcinoma rectum. A cross-sectional observational study was carried out to correlate the CT findings of rectal carcinoma with histopathological parameters. The study was conducted in collaboration with the Department of Radiology & Imaging and the Department of Colorectal Surgery, BSMMU, Dhaka. 50 patients were selected purposively among the admitted in the department of colorectal surgery having clinical diagnosis of rectal carcinoma during the period of July 2007 to April 2009. Verbal consent was taken from each patient. Multi slice CT of abdomen was performed after counseling the patients. Oral, per rectal and intravenous contrast was used for imaging. The postoperative resected tissue was sent for histopathological examination. Data were collected in a pre-designed and pre tested data collection sheet and analyzed using windows for SPSS. It was found that the CT findings were correlated well with the histopathological parameters. The present study showed, CT scan could detect rectal growth in 17 (34%) cases, rectosigmoid growth in 2 (4%) cases. It helped staging rectal cancer. T1M0N0 and T2M1N0 detected by CT scan were found in 3 (6%) cases in each group, T2M0N0 and T3M0N0 found in 23 (46%) cases and 2 (4%) cases respectively. Histopathological finding revealed all growth as cancer. It gave variations of differentiation. The sensitivity, accuracy, positive predictive value were 100%. Histopathological examination revealed adenocarcinoma in majority cases (86%). Anaplastic squamous cell carcinoma and poorly differentiated adenocarcinoma were found in 2 (4%) cases in each group. Metaplastic change and signet-ring type lesion were observed in 1(2%) of cases.

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INDRODUCTION

Colorectal cancer is third most common cancer throughout the world. More than one million new cases are diagnosed each year, and is the second leading cause of cancer death in United States. In the recent past, more than 145 000 people in USA were diagnosed colorectal cancer, more than 56 000 died of their disease (Heiken 2006)¹. Colorectal carcinoma has worldwide distribution with the highest death rates in United States, Australia, New Zealand, and Eastern European countries² (Clark 2008)

Another study stated an estimated 148,300 new cases per year and about 56,600 deaths, accounting nearly 10% of all cancer-related deaths in United States (Liu and Crawford 2004)³. Overall, colorectal cancer is the second most common malignancy in western countries, with approximately 18 000 deaths annually in the UK. The rectum is the most frequent site involved (Clark 2008)².

Colorectal carcinoma is common in Bangladeshi people, but exact prevalence or incidence records not available. Repeated attempts to find published work in various institutes of Bangladesh regarding colorectal carcinoma were futile as no report or statistics were available. However, 23 colorectal cancer cases were detected at the department of pathology BSMMU, in 2004. Of those, 17 were male and 6 were female. Two cases were of 20

years old and 17 were below fifty. National Institute of Cancer and Research, Mohakhali, Dhaka: 164 cases of colorectal carcinoma were reported among 541 cancer bearing patients in the year 2005. It was fifth most common malignancy by hospital record in that year. These represented onl the tip of an iceberg in Bangladeshi population.

An important aspect of the current strategy to reduce the colorectal cancer deaths involves prompt evaluation, colonic imaging of patients having symptoms or finding compatible with colorectal cancer. Such symptoms or findings include colonic bleeding (haematochezia, iron deficiency anemia, test positive for fecal occult blood), altered bowel habits, and abdominal pain or weight loss. (Rex, Marks, Clarke et al 1995)⁴.

Colorectal cancer remains a leading cancer killer worldwide. The disease is both curable and preventable, and yet the importance of widespread screening is only now starting to be appreciated. The critical role of the radiologist is elaborated to include accurate assessment of the tumor extent within the bowel wall and beyond and to detection of involved lymph node and distant metastases. Staging with CT imaging carries paramount importance along with other modalities in determining the most appropriate therapy and the risk of tumor recurrence and overall prognosis. (Gollub, Schwartz, Akhurst 2007)⁵.

Computed tomographic (CT) scanning has been suggested as an aid to assess local spread in patients having carcinoma of the rectum. Digital examination and proctoscopy are reasonably accurate guides when the assessment is made by an experienced clinician and when the tumor is low in the rectum. Clinical assessment is less reliable when the patient is obese, or the tumor is in the upper third of the rectum. Clinical detection of recurrent rectal carcinoma is difficult, especially in those patients who have had an abdominoperineal (AP) resection. Ultrasound scanning can be used to assess the site and extent of recurrent tumour. Theoretically the anatomical structure of the pelvis, fat surrounding the pelvic organs makes it ideal for the use of CT to detect recurrent tumor and to assess its extent. Various authors have reported on the value of CT in the detection of recurrent rectal carcinoma (Zheng, Johnson, Eddleston et al 1984)⁶.

CT has been accepted by all the medical specialties as an important diagnostic tool, most of all for surgeons, neurologists and oncologists as it can be and has been applied to all parts of body (Kreel 1991)⁷.

CT has been used in the detection and demonstration of bowel pathology and is likely to replace the traditional imaging techniques, further in the future. The introduction of CT in the 1970s heralded a new era in radiology, initially with applications to the head and later to the chest and abdomen. Abdominal studies were originally confined to the solid organs and the retro-peritoneum, extending eventually

into the peritoneal cavity (Freeman 2001)⁸.

Zheng, Johnson, Eddleston et al. (1984)⁶ carried out a prospective study to evaluate the value of CT scanning in patients with rectal carcinoma (Zheng, Johnson, Eddleston et al 1984)⁶. This study was designed to assess the efficacy of CT for evaluation of rectal carcinoma and correlation with histopathological findings.

MATERIALS AND METHODS

This cross sectional study was conducted among 50 admitted patients clinically having rectal carcinoma at Bangabondhu Sheikh Mujib Medical University (BSMMU) in collaboration of the Department of Radiology & imaging and the Colorectal Surgery during the period of July 2007 to April 2009. Each of these 50 patients underwent CT of abdomen with oral, per rectal and intravenous contrast administration. After surgery, histopathological examination of resected tissue was done. The whole diagnostic procedure was accomplished with other investigations. Histopathological reports were then compared with that of CT to evaluate the usefulness of CT in evaluating rectal carcinoma. Data were collected using a structured data collection sheet. Written consent from the patients was taken at first counseling about the objectives of history taking, examination and investigations. A checklist was used take down informations.

RESULTS

The cross sectional study was done on 50 randomly selected patients of any age. All these 50 patients were truly diagnosed as rectal carcinoma both by CT and on histopathology. Out of these 50 patients 3 patients had hepatic metastasis which was revealed by ultrasonography examination.

Table-1: Age distribution in patient of rectal carcinoma (n=50)

Age group (Years)	Frequency	(%)
30-39	21	42
40-49	22	44
50 and above	07	14
Mean age(\pm SD)= 41.28(\pm 6.52), Minimum age= 30 years old & maximum age = 55 years old.		

Among selected 50 cases the average respondents were- 41.28 years old. The minimum age of the patient was 30 and maximum age was 55.

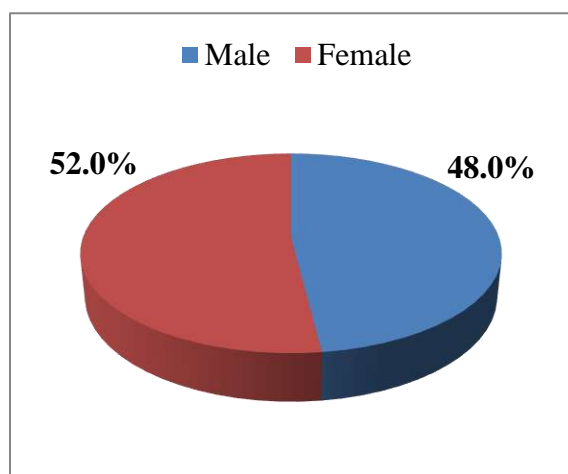


Figure-1: Pie chart showing sex distribution of patients having rectal carcinoma. It reveals female predominance of incidence. Fifty two percent of cases were female.

Table-2: Distribution of the patients by findings of general examination (n=50)

Symptoms	Present f(%)	Absent f(%)
Anaemia	24(48.0)	26(52.0)
Jaundice	2(4.0)	48 (96.0)
Hepatomegaly	3(6.0)	47(94.0)
Cough	1(2.0)	49(98.0)

Table-3: Distribution of the patients by clinical diagnosis (n=50)

Clinical Diagnosis	Frequency	Percentage
Anorectal carcinoma	1	2.0
Ca- Rectum	48	96.0
Recto-sigmoid growth	1	2.0
Total	50	100.0

Table-4: Distribution of the patients by CT scan finding (n=50)*

Attribute	Frequency	Percentage
Rectal wall thickness increase	50	100.0
Narrowing of the lumen	42	84.0
Fat plane	12	24.0

distortion		
Adjacent tissue invasion	2	4.0
Distance metastasis	6	12.0
Contrast enhancement	48	96.0

* Multiple response

Rectal wall thickening with contrast enhancement of lesion and narrowing of rectal lumen were signified

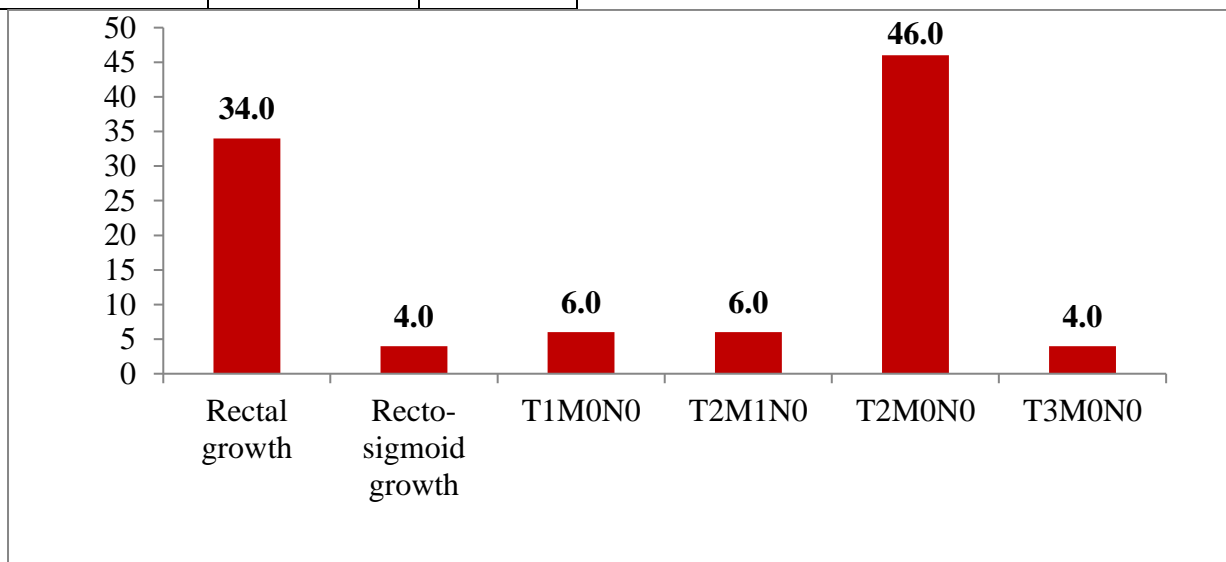


Figure-2: Distribution of the patients by diagnosis made by CT scan findings.

Table-5: Distribution of the patients by diagnosis made by Histopathological findings.

Histopathological findings	Frequency	Percentage
Anaplastic squamous cell carcinoma	2	4.0
Metaplastic change	1	2.0
Poorly differentiated adenocarcinoma	2	4.0
Rectal adenocarcinoma	43	86.0
Signet ring type	1	2.0
Undifferentiated rectal carcinoma	1	2.0
Total	50	100.

		0
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Adeno carcinoma was prevalent on differentiation

Table-6: Correlation between diagnosis of rectal carcinoma by CT scan and Histopathological findings.

CT diagnosis	Histopathological diagnosis		Total
	+ve for rectal carcinoma	-ve for rectal carcinoma	
+ve for rectal carcinoma	50 (True positive)	0 (False positive)	50

-ve for rectal carcinom a	0 (False negative)	0 (True negative)	0
Total	50	0	50

Table-7: Validity tests for CT scan

Validity test	Percentage
Sensitivity	100
Specificity	0
Accuracy	100
Positive predictive value	100
Negative predictive value	0

DISCUSSION

CT has revolutionized the cross sectional imaging. It provides detail anatomical outline without interference by adjacent structures in visualizing each other. It is the primary imaging modality evaluating abdominal organs.

CT scan time has been reduced to sub second for each slice. Soft tissue structure is readily discernible with the addition of contrast agent. Vascular structure can be further defined and the relative vascularity of structure other than vessels can be determined.

The present study was conducted aiming establishing the usefulness of CT to evaluate rectal carcinoma and their correlation with histopathology. The validity of the test was expressed by calculating sensitivity, specificity, accuracy, positive predictive value and negative predictive value.

This study included 50 purposively selected patients of suspected rectal carcinoma. CT scans of abdomen and histopathology of resected tissue were done for every patient. The findings were discussed and compared with previously published relevant studies.

The mean (\pm SD) age of the patients was 41(\pm 6.5) years with a minimum of 30 and maximum of 55 years. The highest incidence (44%) was in age group 40-49 years. Our observation is not consistent with that of Clark (2008)². He stated the peak incidence for colorectal carcinoma is between ages 60 and 79. Fewer than 20% of cases occur before age 50 (Clark 2008). The difference of the observation may be due to the fact that the people of our series may not be highly conscious about the dietary habit and risk factors of rectal carcinoma. So they have been affected earlier.

Our study revealed, most of the patients had only primary education indicating they may not have adequate knowledge about the healthy balance diets preventing rectal carcinoma.

The male female ratio in present study is 1:1.1 which is almost similar to observation of Clark (2008) that described the male-to-female ratio as 1.2:1; for rectal carcinoma. For more proximal tumors there is no gender difference (Clark 2008)

The present study showed, most of the patients residing in rural areas (82%), others were residing in urban areas (18%). This finding corresponds with the fact that 80% of the population live in rural area.

The present study found anemia was in 24 (48%) patients. Jaundice, hepatomegaly, and cough in 2 (4%), 3 (6%) and 1(2%) patient respectively. Clark (2008) described that the clinical manifestation of rectal carcinoma are bleeding per rectum, tenesmus, and early morning diarrhea. Prolong bleeding per rectum may cause anemia. Hepatic metastasis causes hepatomegaly and jaundice (Clark 2008).

All the patients (100%) had normal chest radiograph indicating no metastasis in the lungs. Though Clark (2008) stated the principal sites for blood-borne metastases are liver (34%), lungs (22%) and adrenals (11%). The remaining 33% are divided among the many other locations where secondary carcinomatous deposits tend to lodge, including the brain. (Clark 2008) A CT often shows whether the cancer has spread to the liver, lungs, or other organs (American cancer society).

Both ultrasonography and barium enema detected rectal mass in 9 (18%) cases, mass in sigmoid colon in 1 (2%) case. Moreover, ultrasonography could detect hepatic metastasis in 3 cases. Sigmoidoscopy was done in only 6 cases and could detect rectal cancer in all 6 (100%) cases.

The present study showed that CT scan could detect rectal growth in 17 (34%) cases, rectosigmoid growth in 2 (4%) cases. It also helped staging of the rectal cancer. It detected T1MONO and T2M1NO were found in 3 (6%) cases in each group, T2MON0 and T3MONO were found in 23 (46%) cases and 2

(4%) cases respectively. Theses observation is supported by American cancer society and Clark (2008)

In a report of American Cancer Society it was stated that computed tomography (CT or CAT) scan may be done for a number of reasons, such as to help find out whether a suspicious area is cancer, to learn how far cancer have spread, and to help learn if treatment is working (American cancer society).

There are three areas, however, where the use of CT scanning may help in the optimal management of individual patients: initial staging, radiotherapy planning, and in early diagnosis of recurrent disease (William and Husband 1987). Histopathological finding revealed all the growth as cancer, it also gave the different variation of differentiation. Histopathology found that rectal adenocarcinoma was present in majority of the cases (86%). Anaplastic squamous cell carcinoma and poorly differentiated adenocarcinoma were found in 2 (4%) cases in each group. Metaplastic change and signet-ring type lesion were observed in 1(2%) of cases in each type.

The clinical features of the present series were per rectal bleeding and sense of incomplete bowel evacuation in 43 (86%) and 44 (88%) cases respectively. Abdominal mass and abdominal pain were present in -11 (22%) and 25(50%) cases. 36(72%) patients had weight loss. This finding is consistent with the findings Clark (2008). He described that bleeding is the earliest and most common symptom. Sense of incomplete

defecation, alteration of bowel habit and pain are other important clinical features. He also mentioned weight loss as a feature in case of hepatic metastasis.

CT scan meticulously detected rectal wall thickness, narrowing of the lumen, distortion of the fat plane. It also detected adjacent tissue invasion, extension of the tumor, and distance metastasis which was not possible for other modalities of investigation.

The sensitivity, accuracy, and positive predictive value of the test were 100%. In the present study the CT scan finally detected rectal carcinoma in all 50 (100%) patients. 40 (80%) cases were simply diagnosed as rectal carcinoma. 1 (2%) case was diagnosed as anorectal growth, 1 as rectal anaplastic squamous cell carcinoma and another as rectal growth with local invasion. 3(6%) rectal carcinoma were detected with metastasis in the liver. Another 4(8%) had the growth in rectosigmoid area.

Conclusion

As the CT findings of the present study correlated well with the histopathological findings and the validity tests values were almost identical or even higher than observed by others, it can be concluded that CT is accurate and sensitive modality in the evaluation of rectal carcinoma.

CT thus be regarded as one of the most accurate and sensitive modality in the diagnosis of rectal carcinoma and can be chosen as a primary diagnostic imaging modality in patients suspected of having rectal growth. Moreover CT scan can

meticulously detect rectal wall thickness, narrowing of the lumen, distortion of the fat plane. It also detects adjacent tissue invasion, extension of the tumor, and distance metastasis which are not possible by other modalities of investigation. However, a comparative study of MRI and CT can be recommended to find out the relative usefulness of these modalities in the evaluation of rectal carcinoma.

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