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Diagnostic accuracy of contrast enhanced computed tomography in detection of colorectal cancer in clinically suspected patients

Abid Ali Sahito[1], Rukhsana Parveen Samo[2], Vicky Kumar[3], Aijaz Bhurgari[4], Kailash Hotchandani[5], Aiman Ashraf [6]

[1,4]Assistant Professor, Radiology Department Bilawal Medical College LUMHS Jamshoro
[2]Senior lecturer, Department of pathology LUMHS
[3,5]Medcial Officer, Radiology Department of Shaheed Mohtarma Benazir Bhutto Trauma Centre Karachi
[6]Woman Medical Officer, Health department Govt. of Sindh

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Address of Correspondent
Dr. Abid Ali Sahito
Assistant professor
Radiology Department Bilawal Medical College LUMHS Jamshoro
Email: aabid_sahito@hotmail.com

ABSTRACT

Objective: To determine the diagnostic accuracy of contrast enhanced computed tomography (CECT) abdomen to detect the colorectal cancer in clinically suspected patients by taking histopathology as gold standard.

Methodology: This was a descriptive Cross sectional study, which was carried out at radiology department of Civil Hospital, Karachi, from January 2015 to November 2015 and comprised patients referred for CECT of abdomen with clinical suspicious of colorectal carcinoma. The diagnosis of the colorectal cancer was made on the basis of radiological appearance on CT and then compared with histopathological findings. The primary performance of CECT abdomen in terms of sensitivity and specificity in the diagnosis of colorectal carcinoma was calculated.

Results: Out of the 244 subjects, 154 (63.1%) were males and 90 (36.9%) were females. Mean age of the patients was 46.84±10.88 years. Colorectal carcinoma was labeled in 224 patients on CECT abdomen, out of these among 206 patients; carcinoma was proven on histological findings. Contrasted enhanced computed tomography showed diagnostic accuracy of 89.8% followed by sensitivity 92.0% and specificity 65.0%.

Conclusion: Contrast enhanced CT is a non-invasive imaging technique in the diagnosis of colorectal cancer with sensitivity 92.0% and specificity 65.0%.

Keywords: Colorectal Cancer, Diagnostic Accuracy, CECT.

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Introduction

Gastrointestinal cancers are showing worldwide rise in incidence.[1] Among these colorectal carcinoma is the commonest malignancy, its prevalence is higher throughout the world; about 25.4% in males and 20.1% in females of gastrointestinal malignancies.[2] Lail RA showed that colorectal cancer is the commonest gastrointestinal tumor and the 2nd commonest cause of mortality in the Pakistan.[1] Early diagnosis and prompt management can improve the patients' outcome.

There is wide variation in radiological appearance of bowel wall involvement in colorectal carcinoma; commonly presented as asymmetric wall thickening and heterogeneous post contrast enhancement.[3] Other disorders like inflammatory, infectious or ischemic pathology can also cause bowel wall thickening,[4] which is generally symmetric and showing homogenous enhancement.[5] Normally thickness of bowel wall

depending upon the degree of distension, measuring up to 3mm, which is composed of four layers including mucosa, submucosa, muscular layer and serosa.[6,7] Generally it measures less than 1cm in benign diseases and more than 2cm in malignant diseases, however there is variable thickness and pattern of bowel wall involvement, especially in colorectal carcinoma.[6] Imaging particularly CT is the important diagnostic technique for evaluation of abdomen and pelvis, especially in assessing and characterization of gastrointestinal disorders.[5,7] It not only allows the evaluation of bowel disease but also provides an excellent assessment of extra intestinal abnormalities, resulting in improved specificity in diagnosis of the lesions.[5] CT plays a vital role in the evaluation and management of colorectal carcinoma for measuring the local extent, regional lymph nodes detection and the distant metastasis.[8]

Previous studies showed variable positive predictive values, specificity and sensitivity of the CT in the diagnosis of colorectal carcinoma.[2,5,9,10] But, there is a paucity of local data regarding the use of contrast enhanced CT abdomen for differentiating colorectal lesions so current study has been conducted to assess the diagnostic accuracy of CECT in patients with clinically suspected colorectal cancers, taking histopathology as gold standard.

Methodology

This was a descriptive cross-sectional study, which was done at radiology Department of civil Hospital, Karachi from 3rd January 2015 to 2nd November 2015, after taking informed consent from participants and ethical approval from ethical review committee**.** Patients with age of 25 to 60 years referred for CECT of abdomen due to clinical suspicion of colorectal carcinoma, having bleeding per rectum, altered bowel habit, anemia with hemoglobin <10gm/dl or positive fecal occult test either of the gender were included. Patients already diagnosed with colorectal carcinoma, ischemic/infective/inflammatory bowel diseases or residual colorectal carcinoma after surgery and patients on chemotherapy or radiotherapy were excluded. Cases with renal impairment and allergic to urograffin were also excluded. Study sample size was calculated by taking prevalence of colorectal cancer in men, worldwide, 12.7%;[11] sensitivity of contrast enhanced CT for colorectal carcinoma 92%,[2] specificity of contrast enhanced CT for colorectal carcinoma 79.2%,[9] Confidence level 95%, desired precision 8% for sensitivity and 9% for specificity, the study sample size stands to be 244.

Abdomen CT scan was done with IV contrast by using 16 "Slice Toshiba Activion Scanner in the portal venous phase (at 70sec)". Images were obtained in contagious axial sections from xiphisternum to pubic symphysis and reformatted in sagittal and coronal planes for the analysis. Images were analyzed and labeled positive for colorectal carcinoma when showing focal asymmetric bowel wall thickening (>3mm) associated with one or more CT findings like heterogenous enhancement, perilesional fat stranding, local visceral invasion, regional lymphadenopathy and hepatic metastasis. All the data was recorded in the self-made profoma. Data was analyzed by using SPSS version 22. Frequency and percentage were calculated for categorical variables. Mean and standard deviation were calculated for numerical variables. 2X2 table was used to calculate the Sensitivity, specificity, PPV, NPV and accuracy of "CECT" by taking histopathological findings as gold standard.

Results

Frequency distribution of patients according to gender and age is shown in Table 1.

Out of 244 patients, 224 patients (91.8%) showed colorectal carcinoma while 20 patients (8.2%) showed benign colorectal lesion on contrast enhanced CT (CECT) abdomen and 206 patients (84.4%) were conformed on histopathology as malignant cases.(Table II)

Diagnosed accuracy of CECT abdomen was 89.8% followed by sensitivity 92.0%, specificity 65.0%, PPV 96.7% and NPV 41.9% by taking gold standard histopathology (Table II).

Table 1: Frequency distribution of patients according to gender and age (n=244)

	Frequency	Percentage
Gender		
Male	154	63.1%
Female	90	36.9%
Total	244	100.0%
Age		
Mean ±SD	46.84±10.88 years	
Minimum	18 years	
Maximum	60 years	

Table 2: Diagnostic accuracy of CECT abdomen (n=244)

CT Scan Findings	Histopathology Findings		
	Yes (n=213)	**No** (n=31)	**Total**
Yes	206	18	224
No	7	13	20
Total	213	31	244

Discussion

Colorectal carcinoma is the major cause of morbidity and mortality worldwide. In Pakistan it is the most common gastrointestinal cancer constituting 25.4% among males and 20.1% in females, which was similar to our study as males were higher in contrast to females.[2] CECT is a non-invasive vital imaging technique for the diagnosis of intestinal disease, so far more accurate in evaluation of intramural and extraintestinal disease.[5]

In our study, males were 63.1% and females were 35.9%, this is in concordance with the studies done by Shaikh *et al.*[12] and Yeli *et al.*[13] Lail et al[1] also found that 60.3% patients with colorectal carcinoma were male. In our study, the mean age was 46.84±10.88 years which was similar to the findings of Lail *et al.*[1] and Zalit *et al.*[14] But this is in contrast with developed countries where colorectal carcinoma is unusual in young adults with peak incidence seen at 65years.[1,14] Patel KK et al[15] also found mean age of 50 years. Richie *et al.*[5] observed that heterogeneous attenuation is the malignant feature and homogeneous attenuation is the benign feature. Lymph nodes enlargement was seen in most of the cases. So the enlarged lymph nodes didn't help in differentiating the benign and malignant lesions in our study. This is in agreement with studies done by Richie *et al.*[5] and Yeli *et al.*[13] We determined 89.8% diagnostic accuracy to correctly diagnose the malignant colorectal lesion. Which was similar to the study of Singla SC et al.[8]

This study showed the sensitivity 92.0% of CECT abdomen, which was similar to the findings of Ashraf *et al.*[2] (92%) but is higher than Bai et al.[10] (84.4%) and less than Richie *et al.*[5] (100%) as well as Yeli *et al.*[13] (96.29%). Our study demonstrated comparable positive predictive value (96.7%) to a study by Richie *et al.*[5] (97.30%) but high value than Bai *et al.*[10] and Yeli et al.[13] The overall low specificity of 65.0% in our study means over-staging occurred might be due to the risk of under-staging of malignant lesion and/or misinterpretation of benign desmoplastic reaction by minimal pericolonic stranding as tumor invasion. Lao *et al*[9] determined the sensitivity of 70.2%; specificity of 79.2%; PPV of 85.7% and NPV of 60.0%. Nørgaard *et al*[16] also found accuracy of 73%, sensitivity of 70%; specificity of 78%; the PPV of 81% and NPV of 66% for extramural tumor invasion on staging CT in his study done on 74 patients. Sultana N et al[17] also found comparable findings for diagnostic accuracy of CECT in the diagnosis of colorectal carcinoma. Yu Q et al[18] also observed that CECT is the effective and feasible imaging technique to detect the colorectal cancer. Milsom JW et al[19] also found similar findings.

Most previous studies showed variable results but had high negative predictive value to distinguish colorectal lesions by CECT abdomen.[5,10,13] Though in the present study NPV was 41.9%, which may be either due to the difference in study sample size, age, gender and geographical variations. Another reason may include that tuberculosis is endemic in our population and is a common confounder for colorectal lesion. So, despite good accuracy, sensitivity and positive predictive value, CECT abdomen negative for malignancy still needs to be confirmed by taking histopathology.

There were few limitations in our study such as the small sample size and confined to single Centre. Other limitations were the low specificity and negative predictive value (NPV) in this study either due to different demographics and regional or environmental influence or tumor morphology, which warrants further research on larger population.

Conclusion

CECT is a non-invasive imaging modality that plays an important role in the diagnosis and differentiation of colorectal lesions by careful analysis of characteristics of lesion with better diagnostic accuracy. Accuracy of CECT abdomen is quite satisfactory in our setup especially for detecting the colorectal carcinoma in clinically suspected patients taking histopathology as gold standard.

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