Diagnostic Accuracy of Multidetector Computed Tomography in Detecting Mesorectal Fascia Involvement in Colorectal Carcinoma

Makrukh Panezai, Javed Anwar, Abdul Latif Khattak*, Omar Amir, Ayesha Tareen, Humera Saleem*****

Combined Military Hospital Quetta/National University of Medical Sciences (NUMS) Pakistan, *Combined Military Hospital Lahore/National University of Medical Sciences (NUMS) Pakistan, **Combined Military Hospital Rawalakot/National University of Medical Sciences (NUMS) Pakistan, ***Combined Military Hospital Kharian/National University of Medical Sciences (NUMS) Pakistan

ABSTRACT

Objectives: To determine the diagnostic accuracy of multi detector computed tomography (MDCT) in detecting mesorectal fascia involvement in colorectal carcinoma, taking histopathology as a gold standard.

Study Design: Cross-sectional study.

Place and Duration of Study: Department of Radiology, Combined Military Hospital Quetta from Jun to Dec 2019.

Methodology: A total of 117 suspected patients of colorectal carcinoma, aged 40-80 years of either gender were included. All the patients underwent MDCT and then were looked for mesorectal fascia involvement. After surgical intervention, the his to pathological result of respected specimens was correlated with MDCT findings.

Results: MDCT showed mesorectal fascia involvement in 66 (56.41%) patients. Histopathology confirmed mesorectal fascia involvement in 62 (52.99%) cases, whereas 55 (47.01%) patients revealed no mesorectal fascia involvement. In MDCT positive patients, 56 patients were true positive, while ten patients were false positive. Among 51 MDCT negative patients, 6 were false-negative while 45 were true negative. Overall results of sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy of MDCT in detecting mesorectal fascia involvement, taking histopathology as the gold standard was, 90.32%, 81.82%, 84.85%, 88.24% and 86.32% respectively.

Conclusion: This study concluded that MDCT is a recommended modality due to its high sensitivity. It is an accurate modality for pre-operative detecting mesorectal fascia involvement in colorectal carcinoma patients.

Keywords: Computed tomography, Colorectal cancer, Histopathology, Mesorectal fascia.

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INTRODUCTION

Colorectal cancer widely is defined as cancerous growth in the parts of the large gut involving the colon or rectum, or in the appendix.[1] Certain risk factors predispose to colorectal cancer include older people, male gender, relatively increased dietary intake of fat, alcohol, red meat, increased body mass index, smoking and reduced physical activity.[2] Early diagnosis of Colorectal carcinoma is possible by screening 2-3 years before the onset of symptoms. The uncontrolled growth process is initiated in the mucosal lining of the bowel. If left undiagnosed or treatment is not initiated within the time, it can further grow into the muscular bowel layers of the bowel and then can penetrate the serosal layer.[3] Early diagnoses by screening are much more effective in decreasing the mortality from colorectal cancer. It is now recommended that screening should start at the age of 50 years, with surveillance continuing until a person is 75 years old.[4]

Colon carcinoma is the third most commonly diagnosed malignancy seen in developed countries. It is treated through surgical removal of the tumour with lymph nodes of affected bowels followed by adjuvant chemotherapy for stage II or III colorectal carcinoma. Prognostic factors in this regard include the stage of the tumour (T), extramural vascular invasion (EMVI) and lymphatic nodal involvement (N) and the total number of resected lymph nodes per operatively and lymph node ratio.[5,6] Once the rectal cancer diagnosis is finalized, a treatment line is initiated, which depends on accurate staging, which is done through various factors including depth of tumour invasion, mesorectal fat and fascial structure involvement, the status of surgical margins, invasion into surrounding structures, and peripheral metastasis.[7] These days, accurate pre-operative assessment is mandatory as treatment includes an aggressive multi-disciplinary approach that includes associated individual risk factors.[8]

Various imaging studies are currently being used for screening and staging colorectal cancer. Due to multiplaner reconstruction, cross-sectional studies such as CT scans, colonographic studies, magnetic resonance imaging & positron emission tomography

Correspondence: Dr Makrukh Panezai, Department of Radiology, Combined Military Hospital Quetta -Pakistan

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(PET) provide more accurate anatomic details about primary tumours and the extent of disease involvement.[9,10] Out of these imaging modalities, CT is a superior diagnostic tool with technological advancement in the documentation of local tumour growth, pre-operative assessment and prognostic values of colon cancers as maintained by the group of European Registration of Cancer Care (EURECCA). Extramural invasion (EMI) is another important factor of prognosis detectable by pre-operative CT with high sensitivity.

The incidence of the development of colorectal carcinoma in a particular region depends mainly on dietary intake, lifestyle and hereditary factors.[9] This study will help determine the diagnostic accuracy of multidetector computed tomography (MDCT) in the local population with statistics, as there is an inconsistency found in various studies on the values of sensitivity and specificity through MDCT for detection of the magnitude of involvement of mesorectal fascia. In case diagnostic accuracy is found high, then patients can be provided with a non-operative imaging test for the early detection of the extent of colorectal carcinoma and the selection of proper treatment pre-operatively, helping reduce the mortality of these patients.

METHODOLOGY

This cross-sectional study was conducted at the Diagnostic radiology department Combined Military Hospital Quetta from June to December 2019. The sample size was calculated to be 117 cases with 95% confidence level, 12% desired precision and taking the prevalence of mesorectal fascia involvement as 56.04% with a sensitivity of 80.40% and specificity of 75.0% MDCT in diagnosing mesorectal fascia involvement.[11]

The sampling technique was non-probability, consecutive sampling. The study subject was considered as a colorectal carcinoma patient if the patient was losing weight more than 10 kg in six months coupled with the loss of appetite, worsening constipation, having increased body temperature of more than 99o F, presence of attenuating, hypoattenuating or hyperattenuating mass in the rectum on MDCT and extension of <1mm of mesorectal fascia on histopathology.

Inclusion Criteria: All the suspected patients of colorectal carcinoma of either gender and age group 40-80 years, were included in the study.

Exclusion Criteria: The study did not include all those patients with neoadjuvant chemotherapy, allergy to contrast, chronic liver disease, chronic liver failure, and pregnancy.

The study was conducted after approval of the Ethical Review Committee Board (Certificate no. 005). We enrolled 117 admitted patients in other departments of Combined Military Hospital, Quetta and were referred by the clinician to the Diagnostic Radiology Centre, who fulfilled the inclusion criteria.

While ensuring privacy and confidentiality, consent was sought from patients for plain and contrast-enhanced CT scans. Each Computed Tomography scan findings were interpreted by one consultant radiologist and looked for the involvement of mesorectal fascia (present/absent). All patients have undergone an operation, and the specimen was sent for histopathology. MDCT findings were compared with histopathology report.

Statistical Package for Social Sciences (SPSS) version 23.0 was used for the data analysis. Patient age and duration of disease were presented as mean and standard deviation. Gender and mesorectal fascia involvement on MDCT and histopathology were presented as frequency and percentages. Further analysis with a 2×2 contingency table was used to calculate sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of MDCT in detecting mesorectal fascia involvement, taking histopathology as a gold standard.

RESULTS

In our present study age range was from 40-80 years, with a mean age of 57.29 ± 9.50 years. Seventy-nine patients (65.52%) were between 40-60 years of age group. Among 117 patients, 67 (57.26%) were males, and 50 (42.74%) were females. The ratio of males to females was 3:1.

Table-I: Two by two contingency table of multidetector comp-uted tomography (MDCT) in detecting involvement mesorectal fascia in colorectal carcinoma patients, taking histopathological outcome as gold standard.

	Positive on Histopathology	Negative on Histopathology
Positive on Multidetector Computed Tomography (MDCT)	56 True Positive (TP)	10 False Positive (FP)
Negative on Multidetector Computed Tomography (MDCT)	06 False Negative (FN)	45 True Negative (TN)

The average span of cancer was 11.69 ± 2.67 months. All the patients were subjected to MDCT. MDCT showed mesorectal fascia involvement in 66

(56.41%) patients. Histopathology confirmed mesorectal fascia involvement in 62 (52.99%) cases, whereas 55 (47.01%) patients revealed no mesorectal fascia involvement, as shown in Table-I. Of MDCT positive patients, 56 of these were true-positive, while ten patients were false-positive. Of 51 MDCT negative patients, 6 patients were false-negative while 45 were true-negative.

The Overall documented MDCT sensitivity was 90.32%, specificity 81.82%, positive predictive value 84.85%, negative predictive value 88.24% and diagnostic accuracy 86.32% in detecting mesorectal fascia involvement taking histopathology as the gold standard shown in Table-II.

Table-II: Diagnostic parameters of multidetector computed tomography (MDCT) in detecting involvement mesorectal fascia in colorectal carcinoma patients.

Diagnostic Parameters	Equations	Results
Sensitivity	TP/(TP+FN)	90.32%
Specificity	TN/(TN+FP)	81.82%
Positive Predictive Value	TP/(TP+FP)	84.85%
Negative Predictive Value	TN/(TN+FN)	88.24%
Diagnostic Accuracy	(TP+TN)/All Patients	86.32%

DISCUSSION

This study showed that multi detector computed tomography (MDCT) is a highly sensitive and accurate modality in detecting mesorectal fascia involvement in colorectal carcinoma and has not only dramatically improved our ability to detect mesorectal fascia involvement in colorectal carcinoma patients but also improves patient care both by timely and proper surgical treatment, which consequently reduces complications.

Cancer involving the colon and rectum is becoming more common and represents the fourth leading cause of cancer-related deaths. It is now the 2nd most common malignancy globally and represents approximately one million newly diagnosed colorectal cancers per year. The most commonly diagnosed colorectal cancers involve the rectum in 1/3 of cases, commonly involved sites seen in 40% of cases within 6 cm of the anal opening. As colonoscopy and biopsy remain the gold standard for definitive diagnosis, the role of traditional radiologic imaging is of utmost importance concerning the local staging of patients with a known diagnosis. It helps in local and distant stages of the disease. The role of radiological imaging inaccurate local and distant staging is well documented, with multidetector computed tomography (MDCT), magnetic resonance imaging (MRI), and positron emission tomography (PET) offering valuable tools in the identification of tumours spread to the lungs, liver and distant nodal involvement. These are the three most common sites of distant metastatic colorectal cancers.[12]

In our study, MDCT positive patients, 56 patients were true-positive, while 10 patients were falsepositive. In 51 MDCT negative patients, six were false-negative while 45 were true-negative. The Overall documented MDCT sensitivity was 90.32%, specificity 81.82%, positive predictive value 84.85%, negative predictive value 88.24% and diagnostic accuracy 86.32% in detecting mesorectal fascia involvement, taking histopathology as the gold standard. Two studies, however, carried out found diagnostic accuracy in detecting mesorectal fascia involvement in 56.04 % patients of with colorectal carcinoma showed different sensitivities of 80.40% versus 33.0 % and specificities of 75.0% versus 81.0 %respectively.[11,12]

Multiple studies have been conducted over the last 15 years on the role of MDCT as a diagnostic tool for the local and distant staging of the tumour. However, the results have been mixed.[13,14] CT is now being used as the initial imaging modality for rectal cancer staging because of its wide availability and relatively quick scanning times. Because of this, MDCT can scan the entire abdomen, pelvis and chest for local staging and distant metastases side by side.[15] However, the role of MDCT is of limited value for early-stage i-e T1 and T2 tumours. For evaluation of these lesions, EUS is much more effective. CT scan has led to over-staging these early-stage cancers (T1 or T2) as T3 tumours for these limitations.

Recently, few reports have shown that computed tomography (CT) staging in rectal cancer is quite accurate in estimating the extent of the disease and helpful in planning the treatment of rectal cancer.[16,17] CT is used to stage rectal.

Carcinomas before initiation of treatment, staging of recurrent disease, and detection of distant metastases after surgical intervention. These days, as a part of pre-surgical.

Planning, CT is being used for pre-operative assessment of the growth and involvement of adjacent structures, including the fat and pelvis muscles.[16-18] In a study, the percentage of carcinoma of the colon was 60%. The accuracy of detection of CRC in poorly prepared bowel on CT is documented to have an accuracy

of approx. 80% with sensitivities of 75-100% and specificities of 86-96%.[19]

CONCLUSION

This study concluded that MDCT is a recommended modality due to its high sensitivity. It is an accurate modality for pre-operative detecting mesorectal fascia involvement in colorectal carcinoma patients.

Conflict of Interest: None.

Authors' Contribution

MP:, JA: Direct, concept, design, data collection and analysis, ALK:, OA: Concept and design, AT: Concept, data analysis, HS: Concept and design.

REFERENCES

1. He J, E fron JE. Screening for colorectal cancer. Adv Surg 2011; 45(1): 31–44.
2. Watson AJ, Collins PD. Colon cancer: a civilization disorder. Digestive Dis 2011; 29(2): 222–228.
3. Morikawa T, Kuchiba A, Lochhead P. Prospective Analysis of Body Mass Index, Physical Activity, and Colorectal Cancer Risk Associated with ß-Catenin (CTNNB1) Status. Cancer Res 2013; 73(5): 1600-1610.
4. Kekelidze M, D'Errico L, Pansini M, Tyndall A, Hohmann J. Colorectal cancer: Current imaging methods and future perspectives for the diagnosis, staging and therapeutic response evaluation. World J Gastroenterol 2013; 19(46): 8502-8514.
5. Rollvén E, Abraham-Nordling M. Assess-ment and diagnostic accuracy of lymph node status to predict stage III colon cancer using computed tomography. Cancer Imag 2017; 17(1): 3.
6. Chang YJ, Chang YJ, Chen LJ. Evaluation of lymph nodes in patients with colon cancer undergoing colon resection: a population-based study. World J Surg 2012; 36(08): 1906–1914.
7. Halappa VG, Villalobos CPC, Bonekamp S, Gearhart SL, Efron J, Herman J, et al. Rectal Imaging: Part I, High-Resolution MRI of carcinoma of the rectum at 3 T. Am J Roentgenol 2012; 199(1): W35–W42.
8. Ghieda U, Hassanen O, Eltomey MA. MRI of rectal carcinoma: Preoperative staging and planning of sphincter-sparing surgery. Egyptian J Radiol Nuclear Med 2014; 45(1): 1–5.
9. Nerad E, Lahaye MJ, Maas M, Nelemans P. Diagnostic accuracy of CT for local staging of colon cancer: a systematic review and meta-analysis. Am J Roentgenol 2016; 207(5): 984-995.
10. Hassan U, Khan R, Mehmood MT. Comparing histophathological and magnetic resonance imaging based mesorectal facia status in patients with rectal carcinoma. J Coll Physicians Surg Pak 2014; 24(4): 236-240.
11. Samee A, Selvasekar CR. Current trends in staging rectal cancer. World J Gastroenterol 2011; 17(07): 828-834.
12. Dewhurst C, Rosen MP, Michael A Blake MA. ACR Appropriateness Criteria pretreatment staging of colorectal cancer. J Am Coll Radiol 2012; 9(11): 775-871.
13. Saklani AP, Bae SU, Clayton A, Kim NK. Magnetic resonance imaging in rectal cancer: a surgeon's perspective. World J Gastroenterol 2014; 20(8): 2030-2041.
14. Dayde D, Tanaka I, Jain R, Tai MC, Taguchi A. Predictive and prognostic molecular biomarkers for response to neo-adjuvant chemoradiation in rectal cancer. Int J Mol Sci 2017; 18(3): 573.
15. Churink NW, Lambregts DMJ, Beets-Tan RGH. Diffusion-weighted imaging in rectal cancer: current applications and future perspectives. Br J Radiol 2019; 92(1096): 20180655.
16. Singla SC, Kaushal D, Sagoo HS, Calton N. Comparative analysis of colorectal carcinoma staging using operative, histopathology and computed tomography findings. Int J App Basic Med Res 2017; 7(1): 10-14.
17. Pyenson B, Pickhardt PJ, Sawhney TG, Berrios M. Medicare cost of colorectal cancer screening: CT colonography vs. optical colonoscopy. Abdom Imag 2015; 40(8): 2966–7296.
18. Myo K, Manda V, Qi LJ, Rawlings D, Leung E. Sensitivity of routine CT abdomen and pelvis for detecting colorectal cancer. Int J Surg 2016; 36(1): S60.
19. Mangat S, Kozoriz MG, Bicknell S, Spielmann A. The accuracy of colorectal cancer detection by computed tomography in the unprepared large bowel in a community-based hospital. Canadian Assoc Radiol J 2018; 69(1): 92-96.