ORIGINAL RESEARCH ARTICLE

CT Role in Differentiation of Mucinous and non-Mucinous Carcinomas of Rectum

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A B S T R A C T

Introduction: Colorectal carcinomas can broadly be classified as either non-mucinous or mucinous. Usually, mucinous adenocarcinomas present at a more advanced stage, have more aggressive local spread and have an increased incidence of lymph node involvement. Screening Computed Tomography (CT) is widely used for the initial evaluation of these tumours. Study objective was to retrospectively analyse the CT images of rectal carcinomas and suggest parameters to aid differentiation of mucinous and non-mucinous tumours.

Materials and methods: The CT images of 25 cases of mucinous and 27 cases of non-mucinous adenocarcinoma were retrospectively studied and evaluated for parameters like morphology, wall thickness, size, pattern and degree of enhancement. Also, evaluated was involvement of adjacent structures, lymph nodes and distant metastases. SPSS Version 22.0 was used for analysis. All the parameters were analysed for significance using the chi-square test.

Results: Mucinous adenocarcinomas of the rectum showed a greater propensity for eccentric bowel thickening, heterogenous enhancement and calcification with a p value <0.05.Heterogenous enhancement showed the greatest sensitivity (74%) and calcification the greatest specificity (83%). The other parameters did not show any difference between the two groups.

Conclusion: CT features most likely to suggest rectal mucinous carcinoma are heterogenous contrast enhancement, eccentric wall thickening and intratumoral calcification. As mucinous carcinomas follow an aggressive course, if a diagnosis of mucinous carcinoma of the rectum can be suggested on the staging CT, it may influence patient management.

Keywords: CT, Carcinoma, Mucinous, Non-Mucinous, Adenocarcinoma,Rectum.

INTRODUCTION

Colorectal carcinoma has been classified into various histological subtypes by the World Health Organization, but broadly they can be classified as either non-mucinous or mucinous. Mucinous adenocarcinomas are considered more aggressive and have a poorer prognosis.[1,2] Furthermore, those mucinous adenocarcinomas occurring in the rectum are especially unsafe owing to proximity to important structures like the anal sphincter.[3] Differentiation between mucinous and non-mucinous adenocarcinomas has a great impact on further management. Attempts have been made to differentiate between these two broad subtypes based on the initial imaging. Since there lacunae in literature this study was planned to retrospectively analyse the CT images of rectal carcinomas and suggest parameters to aid differentiation of mucinous and non-mucinous tumours.

MATERIAL AND METHODS

Twenty-five patients of biopsy proven mucinous carcinoma of the rectum studied retrospectively which are archieved between October 2018 to September 2019 were selected for this retrospective study. As a control group, 27 patients of biopsy proven non-mucinous adenocarcinoma of the rectum were selected from the same period using simple random sampling. Thus, all patients had positive preoperative CT scans and pathologically proven disease. The pathological basis of the diagnosis of mucinous carcinoma was that at least 50% of the tumour should be composed of extracellular mucin.The study population (n=55) consisted of 31 males and 24 females with an age range of 23 to 67 years and a mean ageof 46.4 years. CT examination had been performed using a Somatom Emotion 16 scanner (Siemens Medical Solutions). Patient had been administered 1000 mL oral contrast. In addition,150 mL contrast had also been administered per rectum. Images were obtained with helical acquisition from the top of the diaphragm to the anal verge using exposure factors of 120/165/0.5 (kV/mAs/rotation time) and a slice collimation of 2 mm and reconstruction intervals of 5 mm and 2 mm. IV contrast enhancement was performed with100 mL of non-ionic contrast material (iopromide 300) (Ultravist - Schering) through the antecubital vein at a rate

of 3 mL/sec and a delay time of 50 secs. Both enhanced and unenhanced scans were routinely performed. The CT images of these patients were retrospectively reviewed and evaluated for morphology (annular wall thickening or mass lesion), wall thickness, size of mass lesion(volume), pattern of enhancement (homogenous or heterogenous), degree of enhancement (mild, moderate or intense) and the presence or absence of calcification. The degree of enhancement was graded as mild if less than that of uninvolved bowel, moderate if equal to uninvolved bowel and intense if greater than uninvolved bowel. Other parameters evaluated were adjacent fat infiltration more than 1 cm, lymph node involvement, involvement of adjacent structures and distant metastases. These parameters were corroborated with the histopathology.

STATISTICAL ANALYSIS

Recorded observations were filled in SPSS Version 22.0 which was used for analysis. All the parameters were analysed for significance using the chi-square test

RESULT

As per table 1 all parameters were assessed using the chi-square test. Both types could present either as annular wall thickening or as mass lesions with the former being more common. There was no significant difference in the size of the mass lesions between mucinous carcinoma and non-mucinous adenocarcinoma. In the annular wall thickening type, the mean wall thickness was not significantly different between mucinous carcinoma and non-mucinous adenocarcinoma. However, mucinous carcinomas were significantly more likely to show eccentric wall thickening than non-mucinous adenocarcinomas. Another typical feature was heterogenous contrast enhancement, which was much more common in mucinous carcinomas as compared to non-mucinous adenocarcinomas. Calcification was seen in this study largely in the mucinous variety though it was associated with only a small percentage.

Parameter	Mucinous (N=25)	Non-Mucinous (N=27)	p value
Morphology			0.11
Annular wall thickening	18	22	
Mass lesion	8	6	
Mean wall thickening	2.6	2.2	0.20
Size of mass lesion	14.6	15.2	0.14
Pattern of wall thickening			0.04*
Concentric	12	20	
Eccentric	16	10	
Enhancement pattern			0.01*
Homogenous	7	20	
Heterogenous	20	6	
Degree of enhancement			0.24
Mild	10	9	
Moderate	11	15	
Intense	3	2	
Calcification	6	2	0.01*

*p<0.05 is statistically significant

Table-1: Mucinous and non- mucinous carcinomas comparison of the characteristics as per CT

Parameter	Sensitivity (%)	Specificity (%)
Eccentric wall thickening	42	66.8
Heterogenous enhancement	76.4	82.8
Calcification	21.2	82.4

Table-2: Sensitivity and Specificity of parameters suggestive of Mucinous carcinoma of rectum

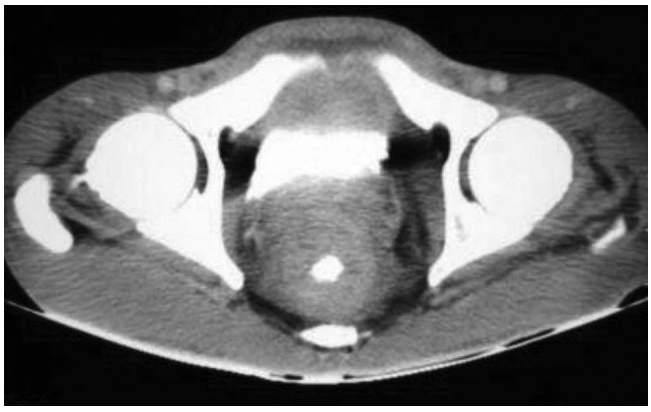

Figure-1: Contrast-Enhanced CT Pelvis Showing Concentric Thickening of Rectum with Homogenous Enhancement- Non-Mucinous Carcinoma

Figure-2: Contrast-Enhanced CT Pelvis Showing Eccentric Thickening of Rectum with Heterogenous Enhancement and Multiple Calcific Foci- Mucinous Carcinoma

As per table 2 the sensitivity and specificity of the various CT parameters that showed a statistically significant difference between mucinous carcinoma and non-mucinous adenocarcinoma. Heterogenous contrast enhancement showed the highest sensitivity (76%) with a specificity of 82.8%. Intratumoural calcification showed the highest specificity (82.4%) with a sensitivity of 20.8%.

DISCUSSION

Of the various histological types of colorectal carcinoma-adenocarcinoma, mucinous adenocarcinoma, signet ring carcinoma, adenosquamous carcinoma and undifferentiated carcinoma (medullary), adenocarcinoma accounts for the vast majority. This is followed by mucinous adenocarcinoma. Usually, mucinous adenocarcinomas present at a more advanced stage, have a greater propensity for extensive

pararectal spread, an increased incidence of lymph node involvement leading to a poorer prognosis.[1,2] Along with signet ring adenocarcinomas, mucinous adenocarcinomas show an increased tendency to metastasise.[3] In addition, the site of colorectal mucinous adenocarcinoma also influences the prognosis. Those cancers occurring in the rectum are more aggressive than other adenocarcinomas of the same site.[4]The accepted definition of mucinous carcinoma is that atleast 50% of the lesion must be mucinous on histopathological examination, although some authorities have suggested that a mucin content more than 10% maybe enough to label a carcinoma as mucinous. A biopsy is then taken from the lesion, which is evaluated by histopathology, which confirms malignancy and determines whether it is mucinous or non-mucinous. However, biopsy at this stage may not conclusively demonstrate the lesion to be mucinous, eventhough a subsequent biopsy may show a mucinous tumour.[5] Mucinous tumours have a higher signal on T2 weighted images. These high signals are thought to be due to pools of extracellular mucin and have been shown to have higher tumour to muscle, tumour to fat and tumourto urine signal intensity ratios on fast spin echo T2 weighted images (fig-1,2). Therefore, these appearances are like necrosis or fluid collections. Consequently, MRI allows diagnosis of mucinous tumours on MRI with high degree of accuracy.[6,7,8] However, Computed Tomography (CT) is more widely used for the initial evaluation and staging of colorectal carcinoma. There have been attempts by various workers to differentiate between the mucinous and non-mucinous varieties of gastric and colorectal tumours using CT.[5,9] Colorectal neoplasms are especially common in the rectum. Nearly, 40% of colorectal carcinomas occur in this location. Additionally, due to the peculiar anatomical location along with proximity to various structures like the levator ani sling and anal sphincters, rectal carcinomas require painstaking planning with a tailored approach for each patient. Nowadays, increasing number of patients are being offered sphincter preservation in addition to curative resection.[10] Currently, CT of abdomen has the best spatial resolution of any modality, although with the disadvantage of low soft tissue contrast. On routine CT, the primary lesion (polypoid or annular) can be detected and characterised along with associated findings like lymphadenopathy, peritoneal implants and spread of tumour through the bowel wall. It is also used to detect metastases to the liver and other sites. Due to this, CT is widely used for preoperative assessment of colorectal carcinoma.[11] Mucinous carcinomas of the colorectal region have been attributed the following differentiating features on CT as compared to non-mucinous carcinomas- greater wall thickening and tumour size, eccentric wall thickening, heterogenous enhancement with decreased enhancement of solid component, large hypoattenuating area andcalcification.[5,11] According to our results both mucinous adenocarcinoma and non-mucinous adenocarcinoma of the rectum can present as either annular wall thickening lesions or mass lesions with the former being more common, there was no statistically significant difference between the mean wall thickness of mucinous and non-mucinous tumours. Also,rectal tumours presenting as mass lesions did not show a statistically significant difference between the size of the lesion in the mucinous and non-mucinous varieties. Though the reasons for this are not clear, it is possible that due to the proximity of the rectum to critical structures like the levator ani, rectal tumours present at an earlier stage. It is also possible that due to the smaller lumen of the rectum,mass lesions, especially those which have a predominantly intraluminal polypoid component cause symptoms earlier in the natural course of the disease. These findings appear to be at variance with the findings of previous workers who found mucinous tumours to have a greater mean wall thickness. They also noted a larger size in case of mass lesions, though this was not considered statistically significant.[5] Furthermore, our results showed that mucinous carcinomas showed a greater propensity for eccentric bowel wall thickening. This finding is consistent with previousreports.[5] Extracellular mucin could dissect preferentially in a particular part of the tumour. This is more likely to happen in a tumour of histologically higher grade where the cells are less tightly packed.Heterogenous contrast enhancement was more commonly seen in mucinous carcinomas. This is likely to be due to the hypoattenuating pools of extracellular mucin,which have been reported by various workers in mucinous tumours of different sites.[5,6,7]

CONCLUSION

CT features most likely to advise rectal mucinous carcinoma are heterogenous contrast enhancement, eccentric wall thickening and intratumoural calcification. Thus, it may be possible to differentiate between mucinous and non-mucinous carcinomas of the rectum using CT. But further studies are required to assess whether the mucinous character of adenocarcinoma of the rectum can be considered an independent prognostic factor in diagnosis of mucinous carcinoma of the rectum.

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