



MDCT APPROACH TO DIAGNOSIS OF BOWEL PATHOLOGIES BASED ON WALL THICKENING

Radiodiagnosis

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ABSTRACT

A prospective study was conducted over a period of one year, from January 2016 to January 2017, on 115 patients who were referred to the department of Radio Diagnosis for contrast enhanced MDCT imaging with clinical suspicion and/or in those diagnosed to have bowel wall thickening on ultrasound. The study results were correlated with histopathology wherever available, follow up scans and clinical response to treatment in cases with infective and inflammatory pathology. Our study concluded that the pattern of bowel wall thickening and perienteric changes has significant role in narrowing the differential diagnosis with good CT sensitivity and specificity in diagnosing neoplastic bowel thickening.

KEYWORDS

Multidetector computed tomography, bowel wall thickening, histopathology.

Introduction:

As multidetector computed tomography allows multiplanar reconstruction and acquires high resolution images, it can be considered as an important imaging modality for the detection and characterisation of bowel wall thickening. It also allows the visualization of perienteric changes which further play a role in the diagnosis of bowel pathologies. Adequate luminal distension is required for assessing the wall thickness, which was achieved by administering negative contrast medium and adequate bowel preparation. However bowel preparation may not be possible in acute settings.

Bowel wall thickness is measured with adequate luminal distension. According to previous studies small bowel wall usually measures less than 3 mm when collapsed and 1-2 mm when distended. The large bowel measures less than 5 mm when collapsed and less than 3 mm when distended.^{1,2,3}

The various causes of bowel wall thickening are infection, inflammation, neoplasm, ischemia and radiation induced.

The parameters to be considered for MDCT evaluation of bowel wall thickening are: length of involvement, degree of thickening, pattern of involvement, pattern of attenuation and perienteric changes like adjacent mesenteric fat stranding, enlarged and/or necrotic lymph nodes, increased mesenteric vascularity and presence of distant metastases.

The bowel wall thickening is further classified according to length of involvement as focal (< 5cm), segmental (6-40 cm) and diffuse (>40 cm), based on degree of thickening as mild, moderate and marked, based on the pattern of involvement as either symmetric/Asymmetric. The various patterns of attenuation are white attenuation, gray attenuation, fat halo, water halo and black attenuation.^{1,2,3}

AIM: To identify the etiology of bowel wall thickening based on patterns of involvement and attenuation on contrast enhanced MDCT imaging.

MATERIALS AND METHODS:

From January 2016 to January 2017, over a period of one year, the study was performed in 115 patients who were referred to the department of Radiodiagnosis, K S Hegde medical academy, Mangalore for multidetector computed tomography with clinical suspicion of bowel pathology and sonographically detected bowel wall thickening after obtaining institutional ethical committee clearance. The patients were referred from the departments of general surgery, general medicine and gastroenterology. They were subjected

to multidetector computed tomography using general electric (GE) 16 slice CT. Adequate bowel preparation was performed in the patients except in those where it was not indicated. Negative oral and rectal contrast medium was administered in patients wherever possible. Intravenous contrast medium was administered in all the patients. The axial and thin section multiplanar reformatted images of non-contrast and contrast enhanced images [CECT] were obtained. The findings were compared with histopathology wherever available and clinical response to treatment was noted in patients where histopathology was not available and follow up was advised. The studies were analysed and reported by a single experienced radiologist. The sensitivity, specificity, positive and negative predictive values were calculated for CT in diagnosing neoplasms.

RESULTS:

The age of the patients included in the study ranges from 10-90 years with more patients in the age group of 60-70 years (23.47%) and few in the age groups of 10-20 (3.47%) and 80-90 years (1.73%). More number of patients were females.

The five patterns of enhancement were observed. Out of the 115 patients, 39 (33.9%) were diagnosed to have neoplastic pathology, 34(29.5%) were identified to have infective pathology, 25(21.7%) were found to have inflammatory pathology. 5(4.3%) were found to have ischemic pathology and 5(4.3%) were found to have radiation induced bowel wall thickening. There were 4 patients in whom it was difficult to characterize between inflammatory and infective etiology because of similarity in attenuation, where clinical details helped to arrive at a diagnosis. 3(2.5%) cardiac patients who were on anticoagulant therapy had bowel wall thickening because of intramural hematoma. All the cases of neoplasm showed gray attenuation.

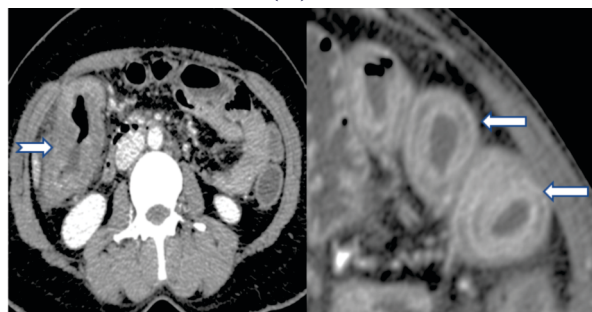
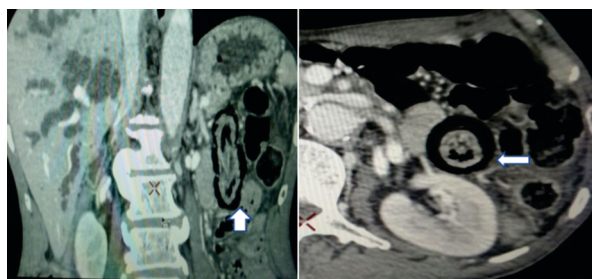
Out of 115 patients histopathology reports were available for 93 which includes all the neoplasms. The sensitivity of MDCT for diagnosing neoplasm based on pattern of bowel wall thickening and attenuation was 97.36%, specificity was 96.36%, positive predictive value was 94.87% and negative predictive value was 98.14%.

Table 1: Distribution of CT patterns of attenuation in study population (n=115)

PATTERNS OF ATTENUATION	NO. OF PATIENTS (n=115)	PERCENTAGE
WHITE ATTENUATION	6	5.21%
GRAY ATTENUATION	39	33.91%
WATER HALO	57	49.56%
FAT HALO	8	6.95%
BLACK ATTENUATION	5	4.34%

Table 2: Distribution of radiological diagnosis among study population (N=115)

RADIOLOGICAL DIAGNOSIS	NO. OF PATIENTS (n=115)	PERCENTAGE
INFECTIVE	34	29.56%
INFLAMMATORY	25	21.73%
NEOPLASTIC	39	33.04%
RADIATION INDUCED	5	4.34%
ISCHEMIC	5	4.34%
INTRAMURAL HEMATOMA	3	2.60%
OVERLAP	4	3.47%

Figure 1: Axial CECT images demonstrating gray attenuation type of bowel wall thickening (1a) in a case of colon malignancy and water halo attenuation in (1b)**Fig.1a****Fig.1b****Figure 2: Coronal (2a) and axial (2b) CT images demonstrating black attenuation in a case of bowel ischemia****Fig.2a****Fig.2b****Discussion:**

It was proved that computed tomography is an ideal imaging modality to differentiate benign and malignant etiology of bowel wall thickening with a high sensitivity and specificity.⁴ In our study, out of 39 patients with radiological diagnosis of neoplasm, 37 correlated with histopathology and in 2 patients it turned out to be tuberculous etiology. In one patient it turned out to be neoplasm which was reported as infective. It was observed that there was some overlap in these two conditions as gray attenuation is seen in both the conditions.

Our study shows that characteristic enhancement pattern of bowel wall thickening is helpful in diagnosing the various bowel pathologies. MDCT has good sensitivity and specificity in diagnosing neoplastic bowel wall thickening. The gray attenuation pattern, focal and asymmetric thickening was helpful in diagnosing neoplastic conditions. Black attenuation was typical enhancement pattern in ischemic bowel disease with intramural air. Water halo and fat halo patterns of attenuation were seen in both infective and inflammatory conditions where we required additional information like perienteric changes and clinical history for diagnosis. Fat halo was also seen in radiation enteritis where history of radiation exposure and other features like adhesions and dilated loops helped in diagnosis. Water halo shows edematous changes in the submucosal layer and fat halo shows fat infiltration. White attenuation was seen in cases of intramural hematoma and shock bowel.

CONCLUSION:

Characteristic attenuation pattern of bowel wall thickening is not only helpful in differentiating neoplastic and non neoplastic bowel

thickening, but also to narrow the differential diagnosis in other pathologies as well. Overlap in the diagnosis can be overcome by considering perienteric factors and clinical details which play a crucial role in better diagnosis. Due to the high sensitivity and specificity MDCT may be considered as a reliable method of investigation for patients with bowel wall thickening, especially of neoplastic etiology.

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