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EVALUATION OF COLORECTAL WALL THICKENING WITH COMPUTED TOMOGRAPHY: A RETROSPECTIVE STUDY OF 20 PATIENTS

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ABSTRACT

OBJECTIVES: This study was conducted to study the Computed Tomography (CT) characteristics of wall thickening in case of benign and malignant lesions of the colon and rectum, to evaluate the effectiveness of CT in differentiating benign and malignant colorectal lesions and to evaluate the role of CT in pre-operative tumor staging of colorectal malignancies. SOURCE OF DATA : Data was collected from 20 patients with wall thickening involving the colorectal region on CT, referred to the department of Radio Diagnosis.

MATERIALS AND METHODS: A retrospective study was conducted over a period of 4 months from September 2013 to December 2013. In this study, 20 patients with wall thickening involving the colon and rectum on CT were included. CT findings were finally confirmed with histopathological diagnosis.

RESULTS: Out of the 20 patients, 12 patients were males and 8 were females. Most of the affected patients were in the age group of 50-70 yrs. All the 18 malignant lesions were correctly diagnosed on CT.1 of the 2 benign lesions was correctly diagnosed on CT. The other one was an inflammatory lesion of the colon which was diagnosed as malignancy on CT. The CT features of benign lesions were homogenous attenuation, mild symmetric wall thickening and diffuse involvement of the bowel. The CT features of malignant lesions were heterogeneous attenuation, marked asymmetric wall thickening and focal involvement of the bowel. In the CT staging o f malignant lesions, 3 of the 4 cases were correctly staged as T1/T2 lesions. 10 of the 12 cases were correctly staged as T3 lesions and all the 2 cases were correctly staged as T4 lesions.

CONCLUSIONS: CT proved to be an excellent modality in the diagnosis and differentiation of benign and malignant lesions of the colon and rectum. CT is also useful in the staging of malignant lesions which helps in proper planning of surgery and further management of the patient. Besides identifying the lesion, CT provides further information regarding pericolic abnormalities associated with the lesion, presence of lymph nodes, infiltration of adjacent viscera and the presence of distant metastases.

INTRODUCTION

Thickening of the bowel wall is the commonly identified abnormality on CT in cases of colorectal lesions.

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The differential diagnosis for bowel wall thickening is wide. The prognosis of patients with colorectal carcinoma is dependent on the stage of disease at the time of diagnosis. The depth of wall invasion, presence of lymph node and distant metastases are the major factors that influence prognosis. (Fernandes *et al.,* 2011) Accurate preoperative staging is essential for the planning of optimal therapy.

Colorectal cancer is a common tumor in the Western world. Rectal cancer is one of the most common malignant tumors of the gastrointestinal (GI) tract. The prevalence is higher in the West as compared to India and has been attributed to the differences in diet. The disease is more common after the age of 50 and shows a slight male predilection. (Paulsen *et al.,* 2006) Over the last decade, many improvements have been made in the management of colorectal cancer. With better radiological staging, curative surgical resection is becoming more popular. The initial diagnosis is usually made with colonoscopy or air-barium enema examination. However, with the increased use of CT as the initial imaging modality in patients with a variety of gastrointestinal symptoms, the radiologist may be the first to suggest the diagnosis of colon cancer on the basis of CT findings. (Balthazar,1991) CT is valuable in the management of colon cancer. Preoperative CT is useful for planning surgery or radiation therapy, particularly when local extension of tumor into adjacent organs or distant metastases are detected. (Brant *et al.,* 1999) In addition, preoperative CT provides baseline findings for comparison during the postoperative period and is the modality of choice for detection of local recurrence after surgical resection. Hence this study is an attempt to characterize wall thickening in patients with colorectal lesions as either benign or malignant based on the pattern of attenuation; degree of thickening; symmetric versus asymmetric thickening; focal, segmental, or diffuse involvement; and associated perienteric abnormalities. The study also aims at evaluating the role of CT in the tumor staging of malignant lesions. The CT findings finally correlated with histopathological findings.

MATERIALS AND METHODS

Source of Data: This is a retrospective study conducted in the Department of Radio Diagnosis. 20 patients with wall thickening involving the colon and the rectum on CT were included in the study.

Method of Collection of Data: In this study, patients with wall thickening involving the colon and rectum on CT were included. CT was performed using a 16 slice CT scanner. All patients were placed in the supine position on the CT table, and a rectal tube was inserted. 10% iodinated contrast was gently infused into the Rectum & colon to get adequate colonic distension. CT acquisitions were performed in the arterial phase (start delay of 25 -35 seconds) and in the portal venous phase (start delay of 50- 70 seconds) with a section width of 5 mm.

RESULTS

This was a hospital based correlative study to describe the role of MDCT in the evaluation of colorectal lesions. In this study, 20 patients with bowel wall thickening involving the colon and rectum on CT were observed. Of these 12 (60%) were males while 8 (40%) were females. The age group commonly affected were those in the age group of 50-70 yrs. Of the 20 patients with colorectal lesions on CT 18 lesions (90%) were diagnosed as malignant and 2 lesions (10%) were diagnosed as benign on histopathology. The rectum was the commonest site of malignant lesions (50%).

Attenuation of Bowel Wall: Among the 2 benign cases, 1 case (50%) had homogenous attenuation and 1 case (50%) had heterogeneous stratified attenuation. Of the 18 malignant cases, 17 cases (94.44%) had heterogeneous mixed attenuation and 1 case (5.5%) had homogenous us attenuation on CT. DEGREE OF BOWEL WALL THICKENING: Among the 2 benign cases, 1 case (50%) had Mild wall thickening and 1 case (50%) had Marked wall thickening. Of the 18 malignant cases, 16 cases (94.44%) had Marked wall thickening and 1 case (5.5%) had Mild wall thickening on CT.

Symmetric Versus Asymmetric Wall Thickening: Among the 2 benign cases, 1 case (50%) had symmetric wall thickening and 1 case (50%) had asymmetric wall thickening. Of the 18 malignant cases 15 cases (94.44%) had asymmetric wall thickening and 3 case (5.5%) had symmetric wall thickening on CT.

Length of Involvement of Bowel Wall Thickening: Among the 18 malignant cases, 16 cases (88.88%) had focal involvement of the bowel and 2 cases (11.11%) had segmental involvement of the bowel. Of the 2 benign cases 1 case (50%) had focal involvement of the bowel, and 1 case (50%) had diffuse involvement of the bowel.

Lymph Nodes: Both benign and malignant lesions had multiple enlarged lymph nodes in approximately 75% of the cases. Hence, according to our study presence of enlarged lymph nodes in patients with colonic wall thickening has no role in differentiating benign and malignant lesions of the colon.

Fat Stranding: All the benign lesions had evidence of pericolic fat stranding. Pericolic fat stranding was present in 10 cases (55.55%) of malignancy. Pericolic fat stranding was absent in 8 cases (44.44%) of malignancy.

Infiltration of Adjacent Viscera: Infiltration of the adjacent structures was seen in 2 cases (11%) of malignancy. Infiltration of the bladder was seen in 1case (50%). Infiltration of the cervix and puborectalis muscle is seen in 1 case. Infiltration of adjacent structures is highly suggestive of malignancy.

Distant Metastases: Distant metastasis was seen in 5 cases (27%) of malignancy. Liver metastases was seen in 3cases (60%), lung metastases was seen in 1 case (20%), adrenal & bone metastases in 0 case (0%) and omental deposits in 1case (20%).

Role of ct in Differentiating Benign and Malignant Lesions: Among the 19 lesions identified as malignancy on CT, histopathology confirmed malignancy in 18 cases. 1 case diagnosed as malignancy on CT was confirmed as inflammatory on histopathology. Hence in our study CT had a sensitivity of 100%, specificity of 50 %. The case diagnosed as benign on CT was confirmed as benign on histopathology. 1 case diagnosed as malignant on CT was confirmed as inflammatory o n histopathology. Hence in our study CT had a specificity of 100% in the diagnosis of benign lesions.

DISCUSSION

With the development of multidetector computed tomography scanners (MDCT), computed tomography became an important tool in the detection and characterisation of bowel abnormalities. This technology makes possible the acquisition of isotropic data and affords the capability of performing high-resolution multiplanar reconstruction. (Fernandes et al., 2011) In particular, CT enterography acquired after luminal distention through the administration of high volumes of neutral contrast material (1500-2000 ml of water, water-methylcellulose solution, polyethylene glycol electrolyte solution or low-concentration barium) is helpful in displaying the thickness and mural enhancement of the small bowel wall. (Paulsen *et al*.,2006) If luminal distention is inadequate, one of several ancillary maneuvers should be attempted: 1) delayed imaging to permit passage of enteric contrast into the region of interest; 2) administration of additional oral contrast and/or effervescent material to distend the proximal GI tract; 3) rectal administration of gas or enteric contrast material to distend the colorectum; and 4) patient repositioning to shift intraluminal material. In general, mild bowel-wall thickening (<1 cm) suggests benign pathology, (Balthazar, 1991 and Brant, 1999) although early malignancies may have a similar appearance. Marked bowel-wall thickening (>2 cm) suggests malignancy, (Brant, 1999 and Macari M, Balthazar, 2001) although certain benign conditions (especially mycobacterial infection, cytomegalic virus infection, Crohn disease, and severe ischemic colitis) may also cause marked wall thickening. Wall thickening between 1 and 2 cm is abnormal, but not specific for benignity or malignancy. (Levy *et al*., 2003) Metastases to the bowel may occur via hematogenous dissemination (melanoma, lung, breast, and Kaposi sarcoma), peritoneal seeding (ovary, GI primaries), or direct invasion (pancreatic and GI primaries). Hematogenous metastases typically arise along the antimesenteric border. (Brant, 1999 and Thompson,2003) Bowel metastases from peritoneal seeding form along the mesenteric border. (Maglinte *et al* ., 2000) CT findings include rounded bowel-wall masses with luminal protrusion (Filippon, 2004) Metastases (especially breast metastases to the stomach) may cause diffuse submucosal infiltration, circumferential bowel-wall thickening, and poor distensibility, indistinguishable from primary adenocarcinoma. (Hodgman *et al*.,1986 and Frager *et al*., 1983) An unusual but important variant is a cavitating metastasis.

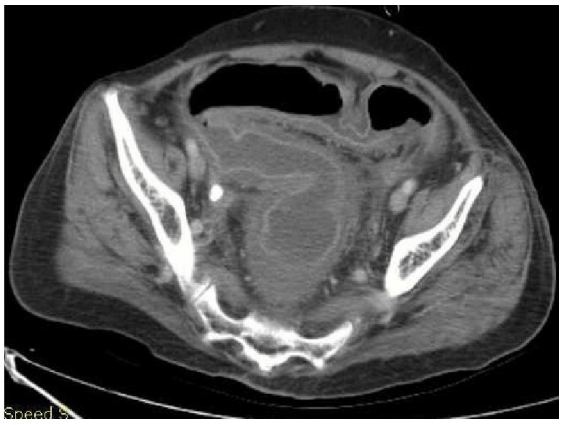

Figure. 1 (a) CT- Inflammatory disease involving the entire colon

Figure.1 (b) CT- Inflammatory disease involving the entire colon

Axial CECT sections showing diffuse symmetric wall thickening involving the caecum, ascending co lo n, transverse colon, descending colon and the rectum. Heterogenous stratified enhancement (Target sign) seen.

Figure .2 (a) CT- Carcinoma Ascending colon (T4)

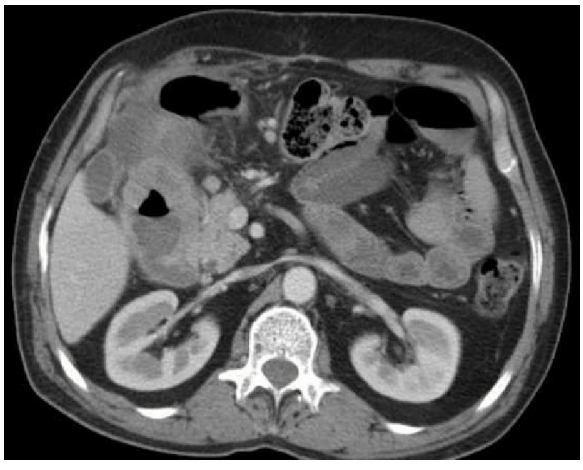

Figure. 2 (b) CT- Carcinoma Ascending colon (T4).

Axial CECT sections of abdomen showing heterogeneously enhancing asymmetric wall thickening involving the ascending colon infiltrating the duodenum suggestive of T4 lesion.

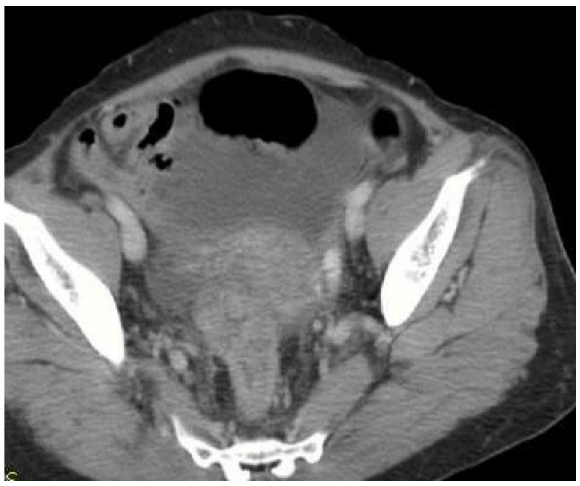

Figure. 3 CT Carcinoma Rectum (T2).

Axial CECT sho wing mild wall thickening involving the rectum with smooth outer margin. This was proved to be a case of adenocarcinoma, stage T2.

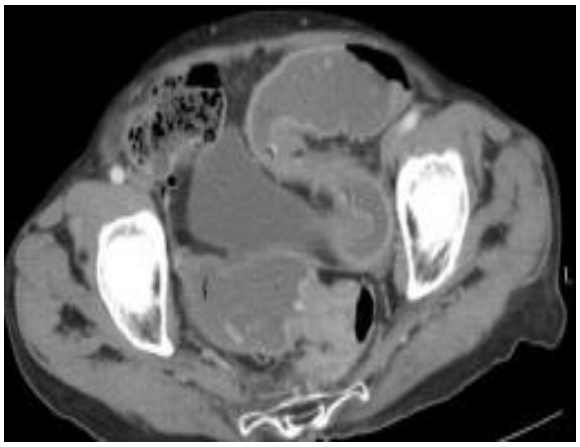

Figure. 4 (a) CT- Carcinoma Recto-sigmoid causing intestinal obstruction

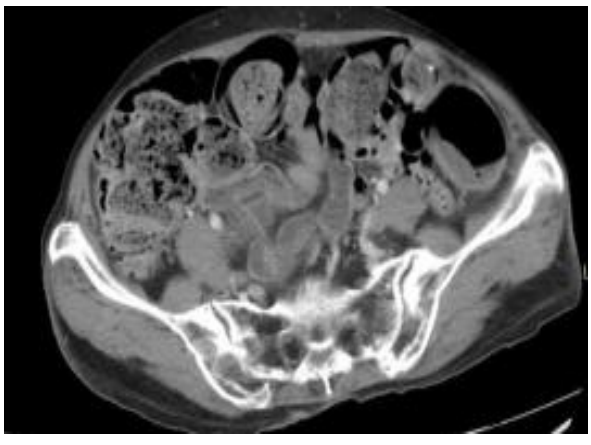

Figure. 4 (b) CT- Carcinoma Recto- sigmoid causing intestinal obstruction.

Axial CECT sho wing wall thickening involving the recto-sigmo id. The wall thickening is causing intestinal o bstr uctio n with dilatation the proximal large bowel loops.

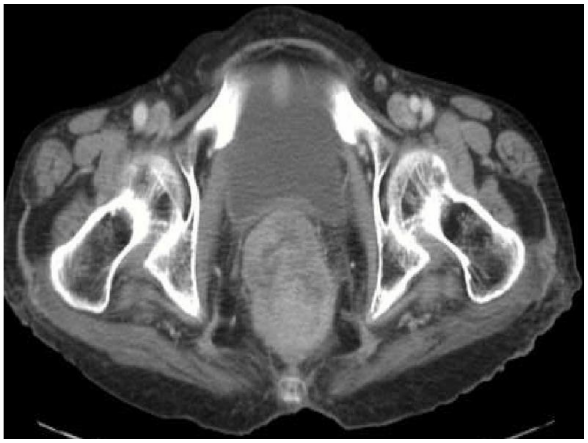

Figure. 5 (a) CT- Carcinoma Rectum infiltrating cervix

Figure. 5 (b) CT- Carcinoma Rectum infiltrating cervix

Axial CECT showing heterogeneously enhancing asymmetric wall thickening involving the rectum which is seen infiltrating the cervix causing pyometra. This is a T4 lesion.

Figure. 6 CT- Carcinoma Rectum with liver metastasis.

Axial CECT showing peripherally enhancing hypodense lesion in the liver suggestive of metastasis in this patient with adenocarcinoma of the rectum.

Table. 1 CT features on the evaluation of bowel wall thickening

CT features		Malignant	Benign
Attenuation of bowel wall	Homogenous	1	1
	Heterogenous	17	1
Degree of bowel wall thickening	Mild < 2cm	2	1
	Marked >2 cm	16	1
Symmetric versus asymmetric wall thickening	Symmetric	3	1
	Asymmetric	15	1
Length of involvement of bowel wall thickening	Focal	16	1
	Segmental	2	-
	Diffuse	-	1
Fat stranding	Present	10	2
	Absent	8	-

This morphology is most common with metastatic melanoma (Jones *et al*., 1986 and Hodgman *et al*.,1986 and may mimic NHL, adenocarcinoma, GIST, or diverticular abscess. Complications of bowel metastases include intussusception, obstruction, and perforation. (Shank *et al* .,1990 and Butch *et al*., 1986) CTC potentially represents a comprehensive examination for CRC staging, as it allows for the evaluation of the inner and outer colonic wall (T stage), pericolonic lymph nodes (N) and distant metastases (M) (Figure 2). Several studies evaluated accuracy of CTC for T and N staging of CRC. (Hodgman *et al*., 1986 and Adams *et al.,*1999) Because CT cannot discriminate the different bowel wall layers, a simplified T staging system has been proposed for CTC reports with a grouped T1/T2 category for lesions confined to the bowel wall, T3 category for lesions invading subserosal fat and T4 category for cancer invading adjacent organs. (Hodgman *et al*.,1986) Homogenous attenuation after intravenous contrast is seen in inflammatory diseases, sub mucosal hemorrhage or hematoma. In case of infarction, the wall is circumferentially thickened and may show a target or halo sign. (Balthazar *et al*., 1987) Inflammatory lesions may show target or double halo sign and stratified enhancement pattern and is a sign of non malignant disease. (Macari M, Balthazar, 2001 and Levy *et al*., 2003) CT is unable to differentiate the different layers of the rectal wall and has lower overall predictive accuracy than EUS and MRI. Initial data showed CT T-staging accuracy of 79% to 94% in patients with primarily advanced T-stage disease, (Ahualli J, 2005 and Hodgman *et al*.,1986) while its accuracy fell to a range of 52-74% when a broader spectrum of tumor sizes were analyzed. (Shank *et al*.,1990 and Cova *et al*., 1994) While nodal staging accuracy has ranged from 54% to 70%. (Butch RJ *et al*.,1986 and Adams *et al.,*1999) The decrease in accuracy may have been due in part to the lack of detailed spatial and contrast resolution offered by standard CT imaging techniques, leading to diminished accuracy for early-stage lesions confined to the rectal wall. Although improvement in CT imaging (e.g., MDCT) has occurred, however, data are limited on whether such advances will result in improved locoregional staging accuracy. (Adams *et al.,* 1999 and Matsuoka *et al*., 2003) In a study of 21 patients comparing MDCT with MRI, an agreement of 95% was found between MDCT and histology, (Matsuoka *et al*., 2003) while (Kulinna *et al*., 2004) reported an accuracy of 86% in a 92 patient study. A study by (Taylor *et al*., 2007) addressed the clinical important prediction of the tumor relationship to the MRI and reported a poor agreement between MDCT, MRI and histology (kappa 0.06-0.15) in 42 patients treated with a short course of radiotherapy (5 Gy × 5 Gy) or surgery only.(Taylor *et al*., 2007) No study up till date has compared the degree of agreement of MDCT and EUS in pre-operative staging of rectal cancer.

Conclusion: MDCT is an excellent modality in the diagnosis and differentiation of benign and malignant lesions of the colon and rectum, since it has the advantage of providing thinner sections, faster acquisition and multi planar reformatted images. MDCT is also useful in the staging of malignant lesions which helps in proper planning of surgery and further management of the patient. MDCT with its axial and reformatted images is an useful tool to differentiate early colorectal carcinoma and advanced cancer. Besides identifying the lesion MDCT provides further information regarding pericolic abnormalities associated with the lesion, presence of lymph nodes, infiltration of adjacent viscera and the presence of distant metastases.

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