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Original Research Article

Role of MDCT in Detection and Evaluation of Small Bowel Malignancies

Jayalatha Nethagani[1], Priyanka Govula[2], Kotha Swapna[3], Goura Praveena[4], Mounika[5]

[1]Director and Professor, Department of Radiodiagnosis, MNJ Institute of Oncology and Research Cancer Centre, Hyderabad, Telangana, India.
[2]Assistant Professor, Department of Radiodiagnosis, MNJ Institute of Oncology and Research Cancer Centre, Hyderabad, Telangana, India.
[3]Assistant Professor, Department of Radiodiagnosis, MNJ Institute of Oncology and Research Cancer Centre, Hyderabad, Telangana, India.
[4]Assistant Professor, Department of Radiodiagnosis, MNJ Institute of Oncology and Research Cancer Centre, Hyderabad, Telangana, India.
[5]Senior Resident, Department of Radiodiagnosis, MNJ Institute of Oncology and Research Cancer Centre, Hyderabad, Telangana, India.

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Corresponding author: Dr. Jayalatha Nethagani
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Abstract

Background: Small bowel primary malignant lesions are rare and they often present lately to the clinician resulting in poor prognosis. Early detection of small bowel malignancies is a challenge for radiologist. Previously, Double contrast barium studies were method of choice which are now replaced by CT and MRI. Cross sectional imaging is also superior to conventional endoscopy through which many small bowel neoplasms are inaccessible. In this study we evaluated small bowel malignancies using MDCT. It helps in detection of extramural extent, liver metastases and peritoneal seeding and aids in treatment planning.

Methods: This prospective study of role of MDCT in detection and evaluation of small bowel malignancies was conducted in Department of Radiodiagnosis at MNJ Institute of Oncology and Regional Cancer Centre, Hyderabad. A total of 24 patients of suspected small bowel lesions referred to department were included in study.

Results: Total of 24 patients were included. Most commonly affected group of patients were within age group of 50-60 years. Among them females were 37.5%% and males were 62.5%. Out of 24 patients, most common malignancy was adenocarcinoma (41%) and most common involved small bowel segment in adenocarcinoma was duodenum (60%).

Conclusion: MDCT provides high contrast resolution for small bowel malignancies. It provides added information about extramural extent, obstructive features and liver metastases and help in planning of treatment accordingly.

Keywords: Multidetector CT, Small Bowel Malignancy, Adenocarcinoma, Metastases.

Introduction

Small bowel malignancies are rare accounting for only 0.5% of all cancers and 3% of all gastrointestinal tumors. They are often presented late because of nonspecific clinical manifestations and low clinical suspicion index. Most of them are clinically silent and are often detected on imaging for other purposes. They are also missed due to misinterpretation of the findings. Average symptom to diagnosis interval for malignant lesion is 2 years. [1,2] Major risk factors are Crohn's disease and celiac disease due to chronic inflammation. Other risk factors include inherited syndromes such as HNPCC, FAP, Peutz-Jeghers syndrome and MEN 1 and dietary risk factors. Patients present with nonspecific complaints like nausea, vomiting, intermittent abdominal pain and weight loss and few present acutely with complications of obstruction and perforation. [3-5,6]. MDCT provides high contrast resolution for small bowel and offers clue for diagnosis with their nature such as irregular margins, heterogenous enhancement, invasion of adjacent structures and distant metastases. It gives good information about extramural extent which is not possible on double contrast barium studies and endoscopy. [4,7] MRI also provides excellent soft tissue resolution, but major disadvantages are motion artefacts and long scan time. Capsule endoscopy is recent

advancement which is also useful, but limited by large lesions which may preclude the passage of capsule. [2]

Material and Methods: The prospective study was conducted in Department of Radiodiagnosis at MNJ Institute of Oncology and Regional Cancer Centre, Hyderabad from December 2021 to August 2022. Patients were followed up to therapeutic/ biopsy diagnosis.

Inclusion Criteria

1. A total of 24 patients of suspected small bowel malignancies referred to department were included in this study.
2. Patients with incidentally detected small bowel lesions on imaging were included in this study.

Exclusion Criteria

1. Pregnant females and patients with deranged renal functional tests.
2. Benign small bowel lesions were excluded from this study.

Informed consent was taken from each patient prior to the scan. Subjects were scanned using SEIMENS 128 CT Scanner (SOMATOM DEFINITION) in supine position. First, 1500 ml of negative oral contrast was given to achieve adequate bowel distension and also to provide better contrast resolution between low density lumen and enhancing lesion and wall. Then, 120-140 ml of non-ionic contrast with concentration of 300mg/ml of iodine was injected at the rate of 4ml/sec and study was acquired in arterial and venous phase. Multiplanar reconstructed images were then interpreted.

Results

Total of 24 patients were included. Most commonly affected patients were within the age group of 50-60 years. Among them females were 37.5% and males were 62.5%. Out of 24 patients, most common malignancy was adenocarcinoma (41%) and second most common malignancies in our study were gastrointestinal stromal tumor (21%) and neuroendocrine tumor (21%). Most common involved small bowel segment in adenocarcinoma was duodenum (60%) and most common involved segment in gastrointestinal stromal tumor was ileum (50%). Most common local stage (TNM staging) of adenocarcinoma at the time of presentation in our study was T3 (60%).

Table 1: General characteristics

Sex	Frequency	Percentages
Male	15	62.5%
Female	09	37.5%

Table 2: Age Group

Age group	No. of cases	Percentages
40-50 years	04	16%
50-60 years	14	58%
60-70 years	06	25%

Table 3: Presenting complaints

Presenting complaints	Frequency	Percentages
Abdominal pain	14	58%
Vomiting	09	37.5%
Lower GI bleeding	08	33%
Weight loss	06	25%
Intestinal obstruction	02	8%

Table 4: Various types of lesions

Lesions	Frequency	Percentages
Adenocarcinoma	10	41%
Neuroendocrine tumors	05	21%
Gastrointestinal stromal tumor	05	21%
Lymphoma	02	8%
Metastases	02	8%

Table 5: Overall small bowel segments involved

Segments involved	Frequency	Percentages
Duodenum	12	50%
Ileum	08	33%
Jejunum	04	17%

Table 6: Small bowel segments involved in Adenocarcinoma

Segments involved	Frequency	Percentages
Duodenum	08	60%
Jejunum	01	25%
Ileum	01	12.5%

Table 7: Small bowel segments involved in GIST

Segments involved	Frequency	Percentages
Duodenum	01	8.3%
Jejunum	00	-
Ileum	04	50%

Representative cases:

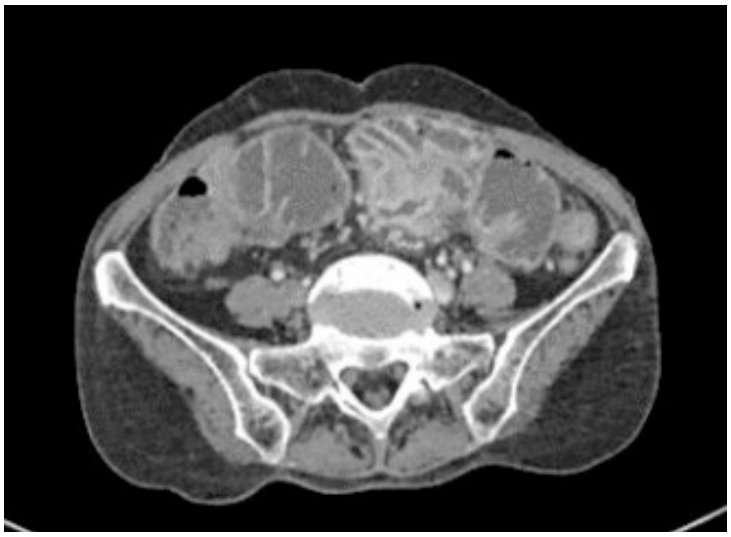


Figure 7: Axial section of CECT Abdomen shows focal enhancing mural thickening of ileal loop with mesenteric infiltration - Adenocarcinoma

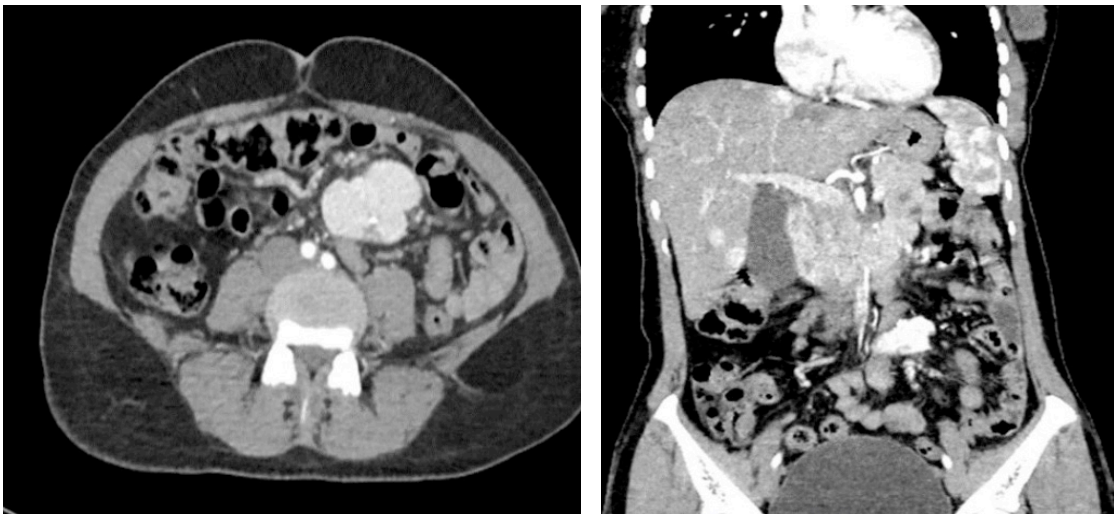


Figure 8: Axial and coronal sections of CECT abdomen shows focal, hyper enhancing, mural thickening of ileal loop and a hyper enhancing lesion in the small bowel mesentery and liver- Small bowel carcinoid with liver and mesenteric metastases

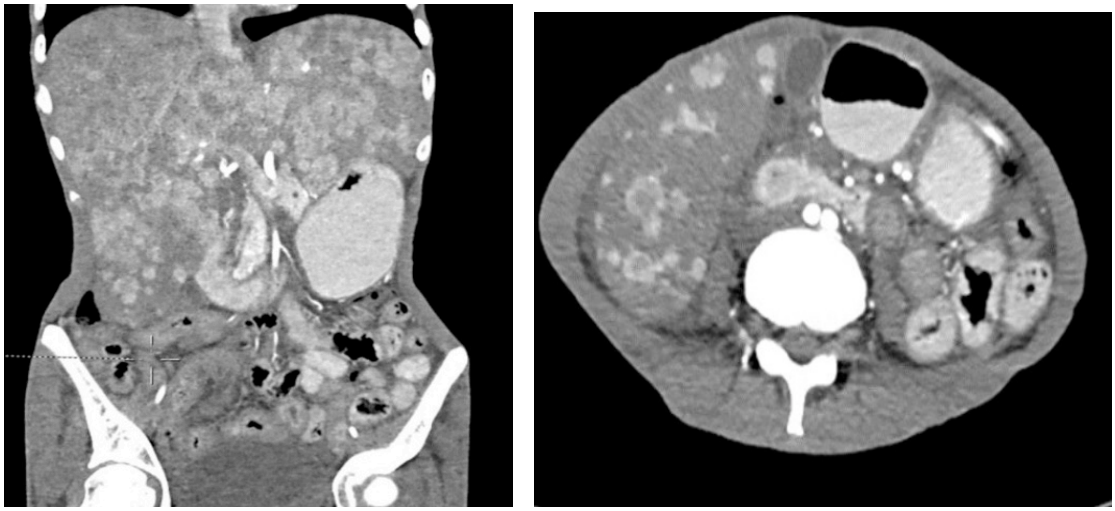


Figure 9: Coronal and axial sections of CECT abdomen shows hyper enhancing mural thickening of the second part of duodenum and multiple hyper enhancing lesions in the liver – Duodenal carcinoid with liver metastases

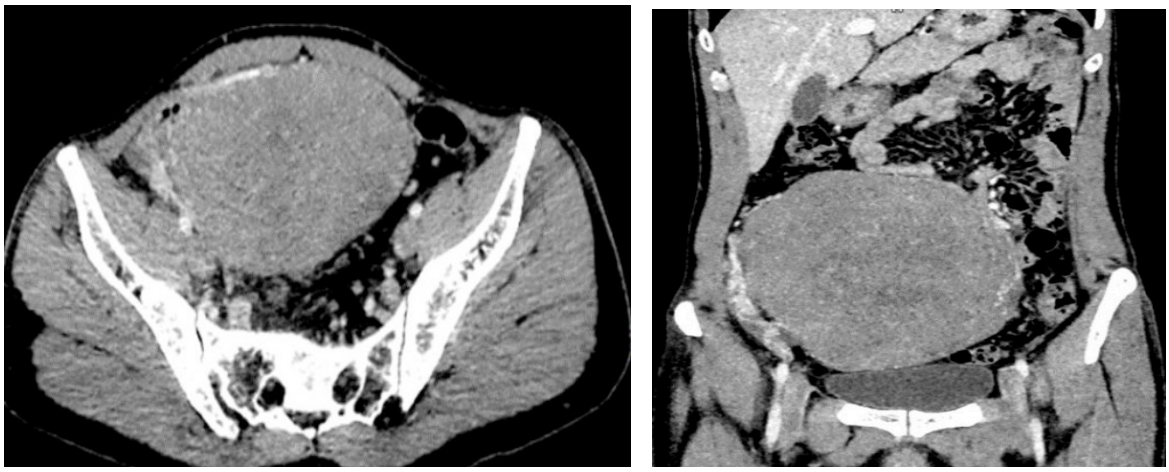


Figure 10: Axial and coronal sections of CECT abdomen shows large exophytic lesion showing mild enhancement with central non-enhancing areas within, arising from distal ileal loops – Gastrointestinal stromal tumor (GIST)

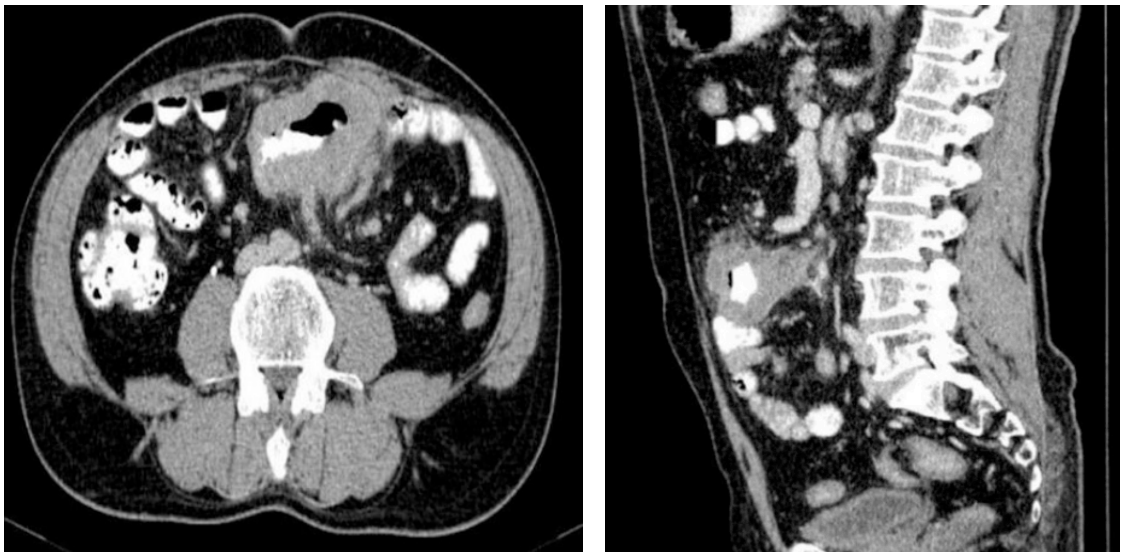


Figure 11: Axial and sagittal sections of CECT abdomen shows circumferential, enhancing thickening of ileal loop causing dilatation of the lumen, without any obstruction- Lymphoma

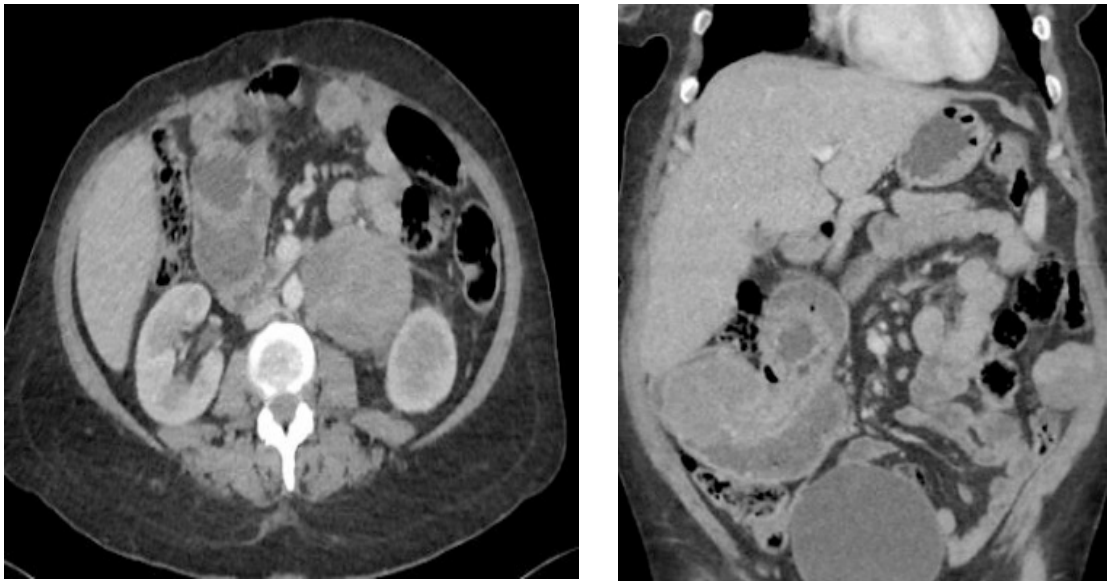


Figure 12: Axial section of CECT abdomen at renal level show heterogeneously enhancing lesion in left retroperitoneum. Coronal section of CECT abdomen shows focal, heterogeneously enhancing intramural/submucosal lesion noted involving the small bowel loops causing intussusception- Retroperitoneal sarcoma with metastasis in small bowel

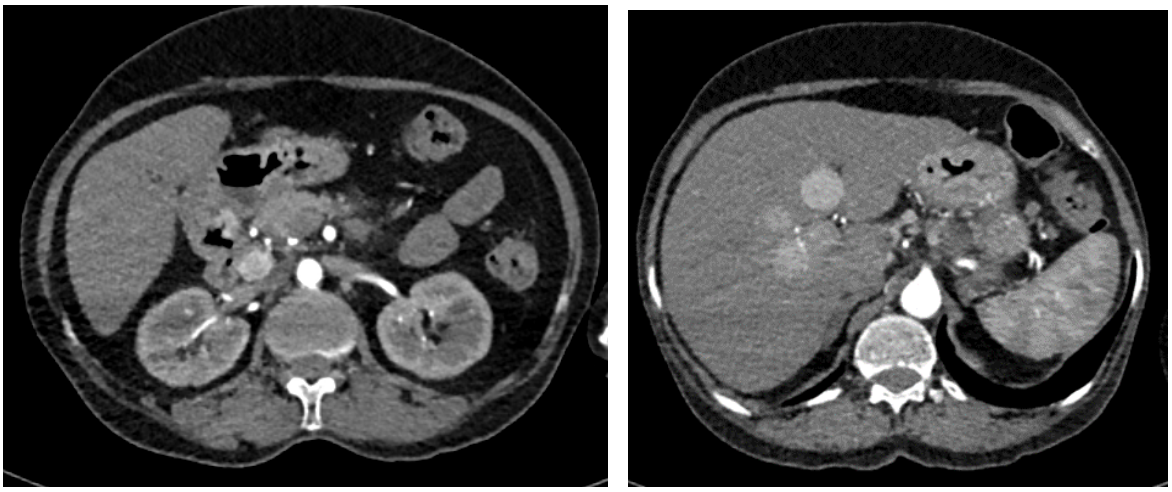
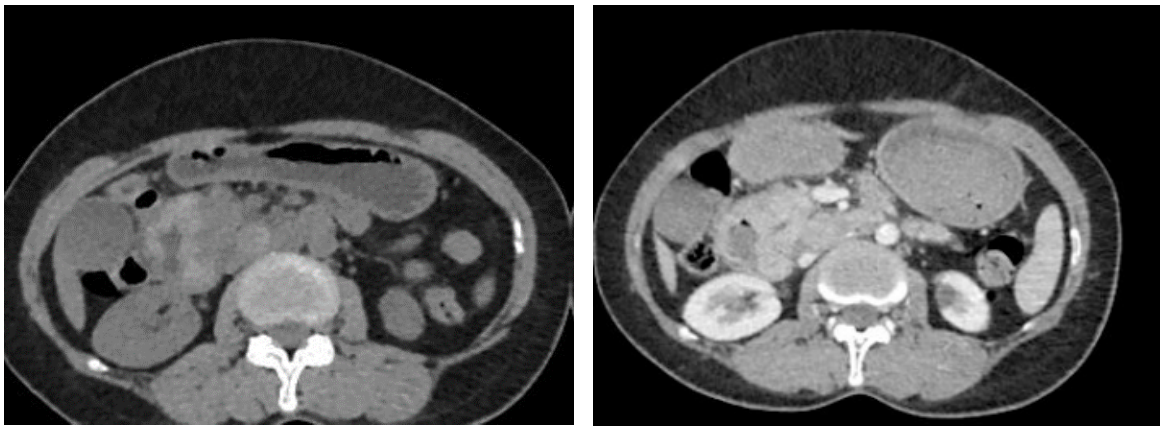


Figure 13: Axial sections of CECT abdomen shows focal hyper enhancing lesion in duodenal wall with hyper enhancing liver lesions- Duodenal carcinoid with liver metastases



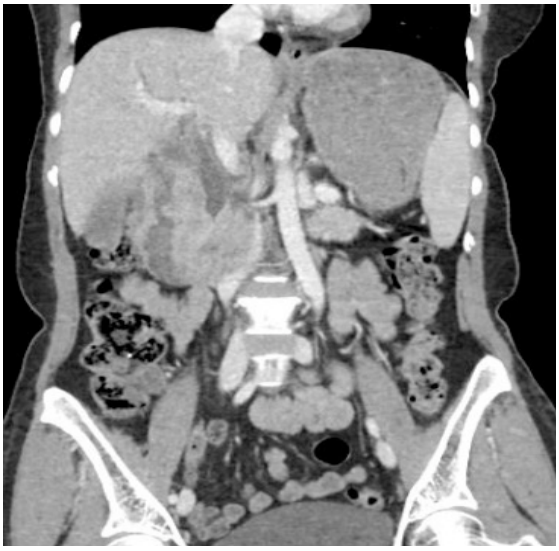


Figure 14: Known case of malignant melanoma showing focal hyperdense thickening of the second part of duodenum on plain images which is showing homogenous enhancement on post contrast images- Secondary duodenal melanoma

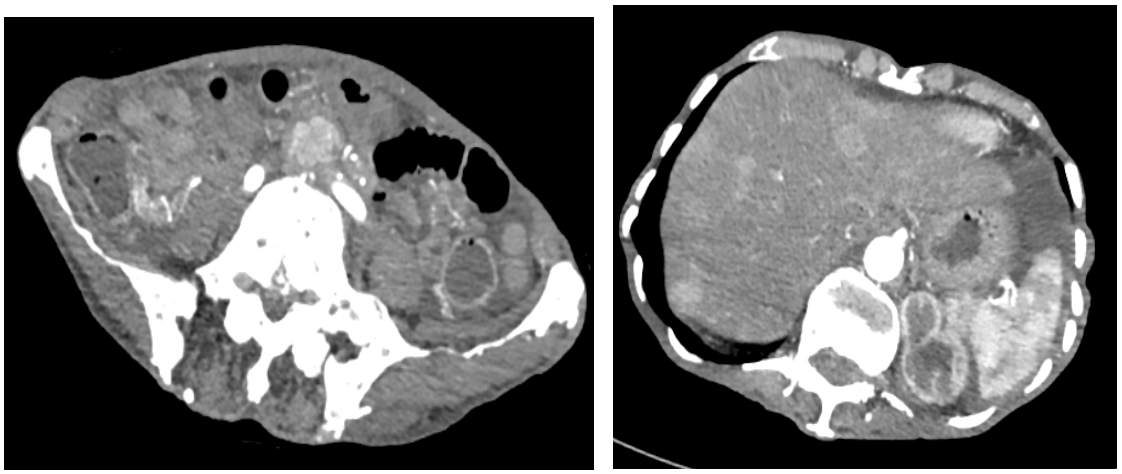


Figure 15: Axial sections of CECT abdomen at ileal and liver level shows hyper enhancing focal mural thickening of ileal loop with hyper enhancing lesions in liver- Ileal carcinoid with Liver metastases

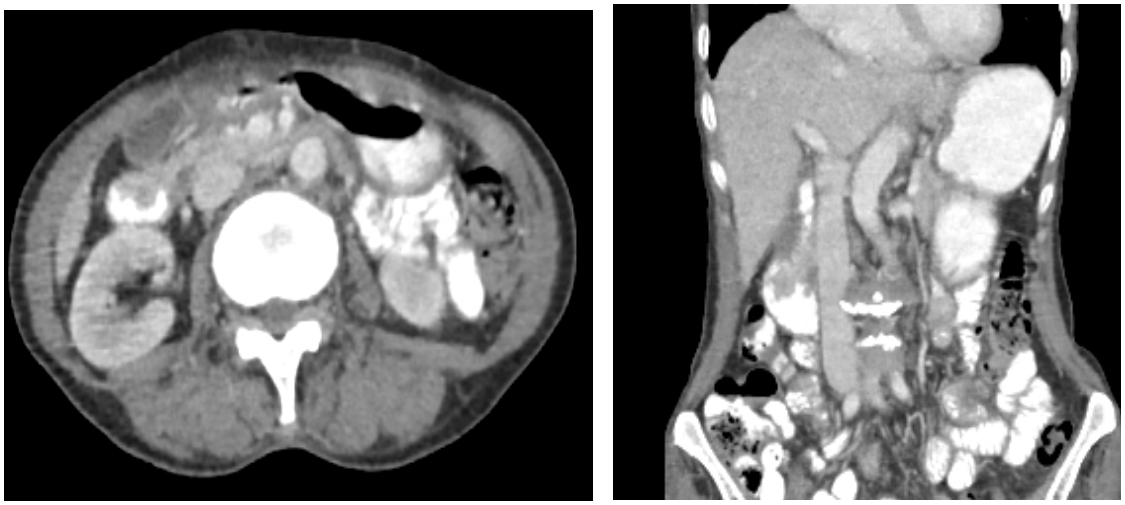


Figure 16: Axial and coronal sections of CECT abdomen shows heterogeneously enhancing focal mural thickening in duodenum- Adenocarcinoma

Discussion

MDCT has evolved as the primary modality for evaluation of small bowel malignancies. The most common age group affected in our study was above 50 years. It is in concordance with study by James H. North et al. In this study maximum affected were males 62.5% and females were 37.5%, this is in concordance with study also done by James H. North et al., where 64% of males were affected and 38% of females were affected. In this study adenocarcinoma was most common small bowel malignancy which represents 41%. This is in discordance with study done by Masselli. G et al., in which lymphoma was most common small bowel malignancy represented 39.4% and adenocarcinoma for 15%. This discordance may be due to large sample size and regional differences in the distribution of disease. But it is in concordance with study done by Johannes et.al., in which adenocarcinoma was most common malignancy representing 43% and also concordant with study by James H. North et al., where 47% were affected with adenocarcinoma. Most commonly involved segment is duodenum in our study. This is in concordance with study done by Pushan kumar sharma et.al and Devidas B Dahiphale et.al.

Adenocarcinoma represents 25-40% of primary malignant small bowel lesions. Mean age of occurrence is 50-75 years. At CT, it appears as circumferential or eccentric enhancing thickening with irregular luminal narrowing. Advanced lesions show adjacent mesenteric fat infiltration and regional adenopathy. [1,3, 8]

Carcinoid tumors represents 25% of primary tumours of the small bowel and 90% of small bowel carcinoid tumors arise in the distal ileum. Primary carcinoid tumour can be difficult to detect at CT and more often, a spiculated mesenteric mass is found at CT or MRI and represents mesenteric metastatic disease. The mesenteric mass often appears desmoplastic and can cause fibrotic reaction in surrounding tissues leading to bowel obstruction. The likelihood of metastases correlates to primary tumour size. Lesions smaller than 1 cm have nodal and liver metastases in fewer than 30% of patients. For tumours of 1-2 cm in size, this increases to 60%-80% for nodal metastases and 10% for liver metastases. Tumours larger than 2 cm have nodal metastases in 80% and liver metastases in 40%-50%. [9,10]

Malignant GIST appears as a large, bulky, predominantly exophytic mass. At CT, it appears as heterogeneous, enhancing, lobulated mass with areas of hypo- or hyper enhancement, necrosis, ulceration, cavitation, or haemorrhage. Metastases to the liver, omentum, or peritoneum can occur. Lymphadenopathy is uncommon and would favour other neoplasms. [11, 12]

Lymphomas make up about 20 % of all small bowel tumours. The most common site is distal ileum due to the presence of abundant lymphoid tissue. It usually presents as a thick-walled infiltrating mass with aneurysmal dilatation without obstruction. Rarely, it presents as an intraluminal polypoid mass or a large eccentric mass with extension into the surrounding soft tissues with possible ulceration and formation of fistulas. [13, 14]

Metastasis may reach the small bowel by the hematogenous route or by direct invasion or contiguous spread. Haematogenous metastasis usually occurs from lung cancer, breast cancer, and melanoma. In our study two cases of metastases from melanoma. The most common tumours to directly invade the small bowel include ovarian cancer and colon cancer.

Limitation

Hospital based and observational study design, small sample size especially, very few cases with malignant lesions, among the study group were the limitations of our study.

Conclusion

Malignancies of the small bowel are rare and are often is covered late in their clinical course. MDCT has recently become a powerful tool in the diagnosis of these lesions, which allows for diagnostic characterization of the lesion, prediction of histology, staging of regional and distant spread, and follow-up after treatment. A precise diagnosis can often be suggested from imaging alone as cross-sectional features correlate well with a histologic subtype. Because early diagnosis often provides the best hope for cure, when faced with unexplained GI tract blood loss, bowel obstruction, pain, weight loss, or other abdominal complaints for which a cause cannot be found, small bowel malignancies should be considered and investigated with MDCT. This will facilitate timely and effective management.

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