

COMPUTED TOMOGRAPHY IMAGING OF GASTRO INTESTINAL STROMAL TUMOUR: RETROSPECTIVE STUDY OF 40 CASES

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ABSTRACT: BACKGROUND: GIST is a visceral sarcoma that arises from the gastrointestinal tract. Computed tomography (CT) is an imaging modality of choice for diagnosing GIST. The clinical features and radiologic differential diagnosis of gastrointestinal stromal tumours are discussed by evaluating CT features of GIST in 40 cases. **METHODS & MATERIALS:** In this study, 40 biopsy proven cases of GIST attending our department from November 2010 to July 2012 are evaluated retrospectively. The CT scan was performed prior to the treatment in all these patients. CT imaging features that were taken into account include tumour location, size/diameter, degree & pattern of enhancement, intraluminal/exophytic, internal necrosis & haemorrhage, perilesional fat stranding, local spread, nodal & distant metastasis. **RESULTS:** In 26 out of 40 cases (65%), tumour was found in stomach, 8/40 (20%) in small bowel (jejunum & ileum), 4/40 (10%) in omentum and mesentery; and 2 (5%) tumour was found in transverse colon. 28/40 (70%) had exophytic tumour with communication to lumen of gastrointestinal tract or in omentum and mesentery; rest 12/40 (30%) had polypoidal mass. Size of tumour ranged from 4 to 15 cm, with mean of 7.9 cm. 30/40 (75%) cases showed heterogeneous enhancement with necrosis and/or calcification, rest 10/40 (25%) had homogenous enhancement. The CT HU ranged from 35 to 55, with mean of 40. 28/40 (75 %) cases had well defined margins of tumour, and rest 12 (30%) cases showed perilesional fat stranding and loss of fat plane with adjacent organ. 4/40 (10%) cases showed regional nodal involvement and 6/40 (15%) cases shows distant metastasis to liver & lungs. **CONCLUSIONS:** The stomach was the commonest site of GIST occurrence among our patients. The CT features of GIST were exophytic, ulcerated mass with well-defined tumour margins, and heterogeneous enhancement on post-contrast CT images.

KEYWORDS: Gastrointestinal stromal tumour; GIST; Computed tomography; sarcoma.

MESHTERMS: Digestive System Surgical Procedures; Gastrointestinal Stromal Tumors; Gastrointestinal Tract.

INTRODUCTION: GISTs are the most common mesenchymal tumour of the gastrointestinal tract; the neoplastic GIST cells appear to arise from a common precursor cell, which gives rise to the interstitial cells of cajal in the normal mesenteric plexus.¹ Gastrointestinal stromal tumours (GISTs) are rare, accounting for less than 3% of all gastrointestinal neoplasms and less than 6% of all sarcomas.²

GISTs are defined by their expression of c-kit (CD117), a tyrosine kinase growth factor receptor. Since most GISTs arise within the muscularis propria of the stomach or intestinal wall, they usually have an exophytic growth pattern and manifest as dominant masses outside the organ of origin.

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Radiologic features of GISTs vary depending on tumour size and organ of origin. Computed tomography (CT) is the imaging modality of choice in GIST.³ 70 % to 80% of GISTs are benign, and such tumours are often found incidentally at surgery and excised in the same session. Approximately 20% to 30% of GISTs are malignant.⁴ GISTs often metastasize to the liver and the peritoneum. However, pulmonary metastases are rarely seen.

This article summarizes our experience with 40 cases of GIST (26 gastric, 8 small intestinal, two colonic, four from the omentum and mesentery) from November 2010 to July 2012. The radiologic spectrum of GISTs throughout the gastrointestinal tract, omentum, and mesentery on CT scan is presented.

METHODS & MATERIALS: This retrospective study analyzed 40 cases of GIST attending our department from November 2010 to July 2012 are evaluated retrospectively. Only biopsy proven cases were included in this study, which underwent preoperative CT scan. In these 40 cases (24 males, 16 females, with ages ranging from 38 to 70 years, mean age: 55 years), detailed analysis of the CT images was performed.

The abdomen & pelvic CT scans were performed on Siemens Somatom emotion 6slice scanner. Patients were scanned typically after proper bowel preparation, oral administration of 1000 mL 10 % mannitol, per rectal gastrograffin and intravenous administration of 80 mL (350 mg/mL) iohexol, with a section thickness of 5 mm. The CT imaging features included tumour diameter, number and location, tumour margin (well defined, irregular or clearly invasive), location of metastasis, effect of contrast and pattern of enhancement. Details of CT scan were evaluated in MPR (sagittal and coronal) reconstruction. In addition, we also recorded the surgical findings, including complications, size and location of the tumor.

RESULTS: The CT imaging findings showed that in 26/40 (65 %) cases tumour was found in stomach, 8/40 (20%) in small bowel (jejunum & ileum), 4/40 (10%) in omentum and mesentery; and two (5%) tumours were found in transverse colon. 28/40 (70%) had exophytic tumour with communicating to lumen of gastrointestinal tract or in omentum and mesentery; rest 12/40 (30%) had polypoidal mass. The size of tumour ranged from 4 to 15 cm with mean of 7.9 cm. 30/40 (75%) cases showed heterogeneous enhancement with necrosis [Figure 1 & 2] and/or calcification, rest 10/40 (25%) had homogenous enhancement.

CT Hounsfield Units (HU) ranged from 35 to 55, with mean of 40. 28/40 (75 %) cases had well defined margins of tumour, and rest 12 (30 %) cases showed perilesional fat stranding and loss of fat plane with adjacent organ. 4/40 (10%) cases showed regional nodal involvement and 6/40 (15%) cases showed distant metastasis to liver & lungs [Figure 3].

Operative findings showed that the smallest GIST was 4 cm×3.8 cm×3.4 cm and the largest was 15 cm×13 cm×10.2 cm in size. The commonest complications among our patients were diarrhoea and wound infection. In all the patients, lymphadenectomy was performed; metastasis to the lymph nodes was found in 4/40 (10%) cases.

DISCUSSION: GISTs are the most common mesenchymal tumours of the gastrointestinal tract. They arise from interstitial cells of Cajal and almost always express a specific tyrosine kinase growth factor receptor known as c-KIT (CD117), which helps to differentiate them from true leiomyomas.⁵

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The older medical literature refers these tumours as leiomyomas, leiomyoblastomas, leiomyosarcomas or schwannomas. However, in 1983, electron microscopy and immunohistochemistry studies revealed that these lesions contain no smooth muscle or Schwann cells, and so the nomenclature was changed to GIST.⁶

Most patients are older than 50 years at the time of diagnosis; the median age at presentation ranges from 50-60 years.⁷ In our study, the age of study population ranged from 38 – 70 yrs. with mean age of 55 yrs. GISTs show no predilection for one sex, although a slight male predominance has been reported.⁸ GISTs are uncommon in young adults and children, and when they occur in these age groups, they are sometimes associated with a syndrome such as neurofibromatosis type 1, familial GIST, or the Carney triad (gastric GIST, extra-adrenal paraganglioma, and pulmonary chondroma).⁵

GISTs can occur anywhere along the GI tract but are most common in the stomach (50%) and small bowel (25%). Colon (10%), omentum/mesentery (7%), and esophagus (5%) are less common primary sites. A few GISTs occur within the abdomen and retroperitoneum but show no clear anatomic association with the GI tract.⁹ This data correlate well with our study in which stomach was the most common site of tumour (65%).

Exophytic tumours showed a propensity for ulceration and communication with lumen of stomach and small bowel.¹⁰ The size of the tumour ranged from 0.5 to 21 cm, with a mean of 6.8 cm. Imaging and operative incidental findings are common. The most common presentation in symptomatic GISTs is gastrointestinal bleeding caused by ulceration of the overlying mucosa of the tumour.³

The classical CT of MR imaging features of GIST are described as large exophytic tumour with heterogeneous contrast enhancement, arising from the stomach or small bowel.²

In our study, the tumour size ranged from 4–15 cm. with mean size remain 7.9 cm. 70% cases were exophytic and most of them showed ulceration & communication with gastrointestinal lumen. 75% cases showed heterogeneous enhancement with tumour size >7 cm. We found that large tumour sizes appeared to be related to heterogeneous enhancement.

In addition, we found tumours in 28 (70%) of our patients were well-defined, and in study of Lee et al,¹⁰ more than two-thirds of patients also had well-defined GISTs. Thus, well-defined tumours appear to be a feature of GISTs on CT imaging.

All GISTs should be considered as malignant because of their propensity for recurrence. Approximately 20% to 30% of GISTs are truly malignant, and these neoplasms are identified based on their mitotic index, tumour necrosis index, and Ki-67 index (which reflects expression of the 395 kDa nuclear antigen MIB-1). According to recent pathological studies, high values for these parameters are the most important prognostic factors for metastasis and mortality in this patient population.^{11, 12}

Liver metastases and/or dissemination within the abdominal cavity are the usual clinical manifestations of malignancy.⁴ Lymph node metastases are extremely uncommon; its spread to the lungs or other extra-abdominal locations is also extremely rare.¹³ In our study, 15 % cases showed distant metastasis: 4 in liver and 2 in lungs. Nodal metastasis was also found in 10% cases.

Gastric adenocarcinoma and lymphoma should be considered in the differential diagnosis of gastric GISTs although gastric they commonly have associated regional lymphadenopathy. Although anorectal and colonic GISTs are rare, the differential diagnoses of these tumours are similar to those

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of gastric and small bowel GISTs. The most important complications of GIST are haemorrhage and spontaneous rupture into the peritoneal or endoluminal cavities caused by emergent laparotomies.⁴

It is now well known that imatinib, a new molecularly targeted tyrosine kinase receptor blocker, results in a dramatic response and markedly improved long-term survival in patients with GISTs after adequate surgery. The increasing recognition of GISTs and their prolonged survival have made imaging increasingly important not only for diagnosis but also for monitoring the effects of treatment and detecting tumour progression.

CONCLUSIONS: In conclusion, the stomach was the commonest site of GIST tumour location among our patients, with a mean tumour diameter of 7.9 cm. The CT features of GISTs included well defined tumour margins and predominantly heterogeneous contrast enhancement, with internal necrosis and CT Hounsfield units of 35 to 55.

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Sl. No.	Features	Details
1.	Location	Stomach - 26/40 (65%) Small Bowel - 8/40 (20%) Omentum & mesentery - 4/40 (10%) Large bowel - 2/40 (5%)
2.	Size	4 to 15 Cms. Mean - 7.9 Cms
3.	Exophytic/ Extraluminal	28/40 (70%)
4.	Intraluminal/ Polypoidal	12/40 (30%)
5.	Necrosis	20/40 (50%)
6.	Calcification	4/40 (10%)
7.	Margins	Well defined - 28/40 (70%) Ill defined - 12/40 (30%)
8.	CT HU	30 to 55 Mean - 38.1
9.	CT Density	Heterogeneous - 30/40 (75%) Homogenous - 10/40 (25%)
10.	Nodes	4/40 (10%)
11.	Metastasis	6/40 (15%)

Table 1: Table showing results of analysis of CT imaging of 40 GIST patients



Fig 1: CECT showing well defined heterogeneously enhancing soft tissue density lesion arising from transverse colon.

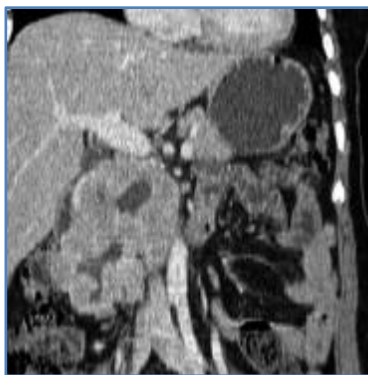


Fig. 2: CECT coronal section showing exophytic lobulated lesion with central necrosis.



Fig. 3: CECT axial section showing well defined hypodense metastatic lesions in liver.

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