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CT Evaluation of Gastrointestinal Stromal Tumors (GIST)

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Abstract: *Gastrointestinal stromal tumors (GIST) are currently the most common non-epithelial tumors ofthe gastrointestinal tract. The clinical symptoms are nonspecific, predominantly due to large tumor size and age of the patients. Aims and objectives: firstly, to assess the role of CT in tumor characteristic, tumor spread and enhancement patterns. Secondly, histopathological correlation, tumor complications, surgical outcome and follow up for recurrence. Finally, imaging surveillance to detect recurrence or progression. Materials & methods: A prospective study of 30 patients of bowel mass which were suspected of GIST referred from surgery and oncology units of SS hospital from July 2013 to June 2015. Computed tomography (CT) of abdomen was done using Toshiba Aquilion 16 CT Scanner. Results and observations: 25 GIST cases was confirmed on histology, gastric GIST was more common followed by small bowel GIST. Five cases were excluded due to adenocarcinoma and lymphoma. Conclusion: CT imaging of the bowel mass was helpful to speed up the management and decreased surgical morbidity. The importance of radiologist role in detecting the potent complications and provide a road map for the operating surgeon.*

Key words:*bleeding, computed tomography, gastrointestinal stromal tumors, recurrence*

I. Introduction

Gastrointestinal stromal tumors (GISTs) are currently the most common non-epithelial tumors ofthe gastrointestinal tractthat lack smooth muscle or Schwann cells (1). GIST was coined by Mazur and Clark (2) and arise from precursor of interstitial cells of Cajal which express a transmembrane receptor tyrosine kinase encoded by the KIT gene or CD 117 (3). GISTs express activating mutations in KIT that lead to ligand-dependent KIT tyrosine kinases activation and promote tumor survival and growth (4). The exact incidence in the Asian countries are unknown and many literature review are from the western. The clinical symptoms are nonspecific, predominantly due to large tumor size and age of the patients. Many of the cases presented with palpable abdominal mass and no obvious bowel obstruction. In our study, we highlight the incidence of GISTs and importance of CT in localizing, tumor spreadand enhancing pattern of bowel mass. Also to guide surgeon for better surgical outcome and to some extent to know the recurrence / relapse.

II. Aims And Objectives

- To assess the role of CT in localizing, characterizing, tumor spread and enhancement patterns
- Histopathological correlation
- Complications, surgical outcome and follow up for recurrence
- Imaging surveillance to detect recurrence or progression

III. Materials & Methods

A prospective study of 30 patients of bowel mass and clinically suspected of GIST referred from surgery and oncology units of SS hospital from July 2013 to June 2015. Computed tomography (CT) of abdomen was done usingToshibaAquilion 16 CT Scanner with 5 mm axial sections with thin reformatted images in multiple planes. A 4-6 hours of fasting for contrast study and prior written consent was taken. Appropriate statistical tool, charts and bar diagram was plotted in results. Cases are examined for histopathology using H & E in low and high power microscope. An 18 month surveillance was carried to study tumor recurrence or progress of the lesion.

Inclusion criteria: Palpable abdominal mass, clinically suspected GIST, histopathological proven cases
Exclusion criteria: 5 cases of other bowel tumors like adenocarcinoma and lymphoma

IV. Images, Bargraphs, Tables, Charts

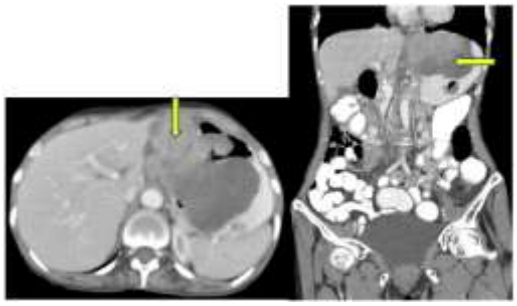

Figure 1: Stomach GIST in a 54 year old patient. Contrast CT abdomen demonstrates heterogenously enhancing large exophytic mass with necrosis at fundus of the stomach and abutting left lobe of the liver. No liver metastasis.

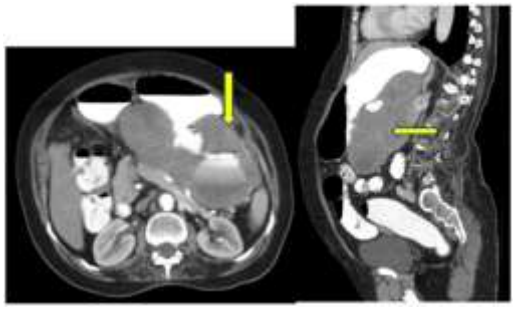

Figure 2: Stomach GIST in 60 year old patient. Contrast CT abdomen demonstrates large exophytic heterogeneously enhancing lobulated mass lesion with necrosis arising from greater curvature of stomach. Mucosal ulceration, fistulation and extension of oral contrast into the tumor mass (arrow) are seen.

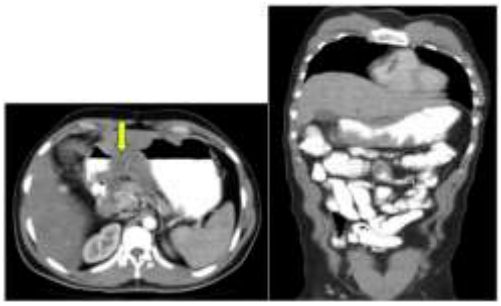

Figure 3: Stomach GIST. Contrast CT abdomen demonstrates diffuse circumferential nodular wall thickening involving lesser and greater curvatures of the stomach extending upto D1 segment of the duodenum. No perigastric fat stranding. Multiple small volume perigastric and peripancreatic nodes.

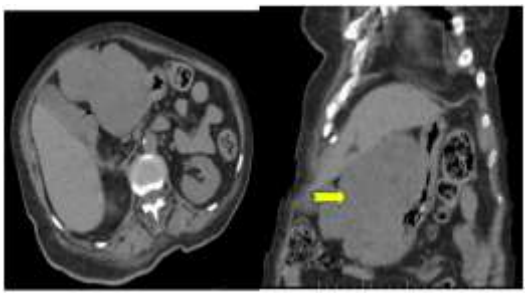

Figure 4: Duodenal GIST. CT abdomen demonstrate large exophytic mass in relation to duodenum (D2)

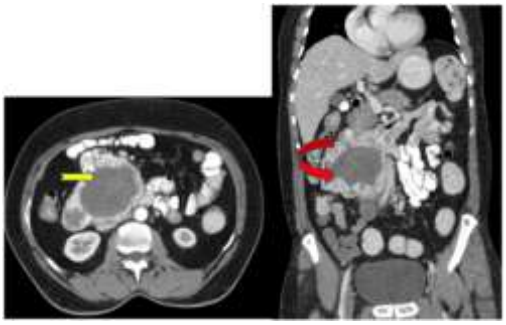

Figure 5: Duodenal GIST. CT abdomen demonstrate large exophytic mass in relation to duodenum (D3) with necrosis. No ascites / liver metastasis.

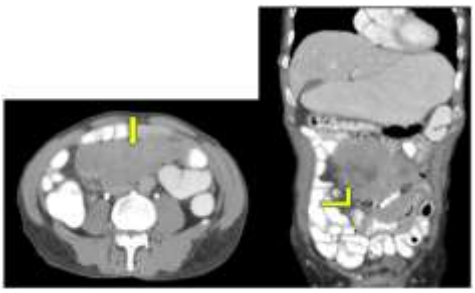

Figure 6: Jejunal GIST. Contrast CT abdomen demonstrates large exophytic soft tissue mass (15 x 11 x 6 cms) with necrosis from jejunal loop anterior to the abdominal aorta seen encasing superior mesenteric artery without infiltration. No evidence of calcification/ hemorrhage.

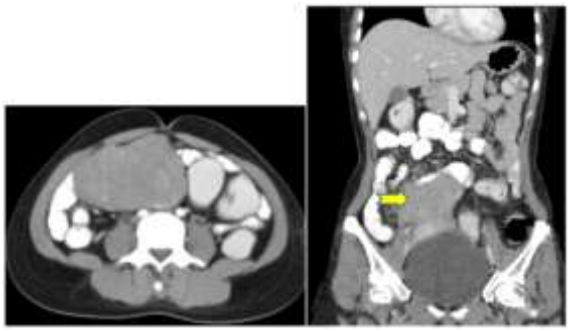

Figure 7: Ileal GIST. Contrast CT abdomen demonstrate large heterogeneously enhancing exophytic mass lesion with specks of calcification arising from proximal ileal loops. No proximal small bowel obstruction. No liver metastasis/ ascites /nodal spread.

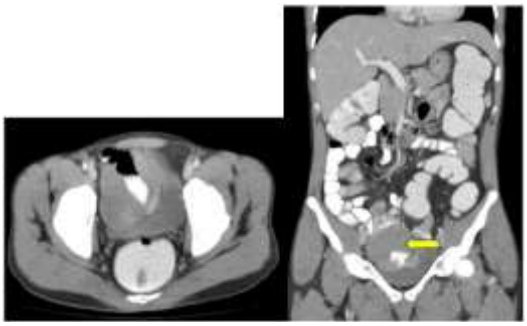

Figure 8: Ileal GIST. Contrast CT abdomen demonstrate heterogeneously enhancing exophytic mass lesion with necrosis arising from distal ileal loops. No proximal small bowel obstruction. No liver metastasis/ ascites /nodal spread.

V. Observation And Results

Figure 9: Pie chart demonstrates gender wise distribution, male (60 %) and female (40 %).

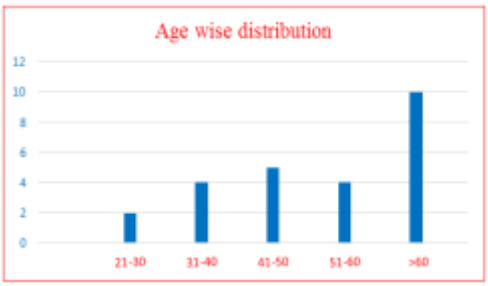

Figure 10. Bar graph illustrate age wise distribution. Highest incidence in >60 year age group.

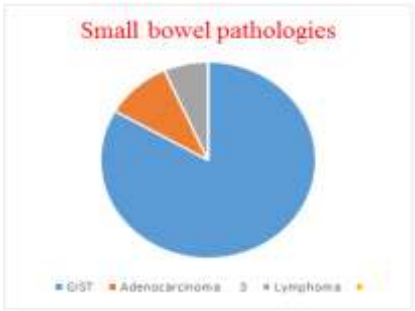

Figure 10: Pie chart illustrates Small bowel pathologies.

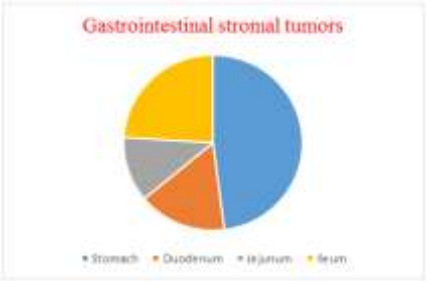

Figure 11: Pie chart illustrates organ wise distribution of gastrointestinal stromal tumor (GIST)

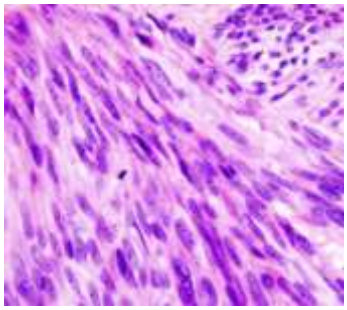

Figure 10.Histopathological examination (x 200 H & E). Majority of spindle shaped cells and few epithelioid cells. Immunohistochemical show positive KIT protein and CD 34 expression.

VI. Discussion

GISTs are thought to arise from the interstitial cells of Cajal with 95% staining positive for CD117 (c-KIT) and 70% for CD34 and associated with carney triad and neurofibromatosis type I (7). They usually present above 40 years and peak at 60 years old. Male to female incidence is equal in most of the literature review. Our study showed slight increase in male and twice more common in male than female population. They may arise from any region of gastrointestinal tract from oesophagus to rectum but common in gastric (60-70 %), small bowel (30 %) and less frequent in colon and rectum (5 %), oesophagus (<2%) and rare in appendix (5, 6). Some primary GISTs primarily arising from omentum, mesentery, or retroperitoneum are rare. Our study was primary focused on bowel mass which was primarily suspected of GIST in the abdomen. The incidence of GISTs were gastric 48 %, duodenum 16 %, jejunal 12 %, ileal 24 %. There were no cases of GISTfrom the large bowel. Five cases were not included in the study group because few cases are diagnosed as adenocarcinoma and lymphoma on histopathology. Though few cases are sometime difficult to diagnosis on imaging due to large size, necrosis and cystic degeneration in the bowel mass. Most of the GISTs are nonspecific with vague clinical symptoms, large tumors show abdominal distension, pain abdomen while anemia and bleeding may be seen in few cases. On histology, one of three patterns were observed, predominantly spindle, predominantly epithelioid cells or mixture of spindle and epithelioid cells. Our study showed, predominant spindle cells variety in 75 % cases and mixed pattern in 20 % and 4-5 % of predominantly epithelioid cells. On immunohistochemistry, identifying KIT (CD117), a tyrosine kinase receptor in the interstitial cells of Cajal is key factor in diagnosis of GIST in 95% of patients (8). Various mesenchymal tumors are considered in the differential diagnosis includes leiomyomas, leiomyosarcomas, schwannoma, fibromatosis, inflammatory myofibroblastic tumor, inflammatory fibroid polyp and melanoma. The prognosis of the GIST depends on two histopathological parameters, namely tumor size and mitotic index (5, 6).Computed tomographyis the better imaging modality in detecting tumor size, tumor spread, contrast enhancement and any active bleeding. The sensitivity and specifity in tumor detection and staging are relatively high on CT and far comparable to MRI.

Most of the GIST are large during presentation and usually between 3 and 10 cm. The tumors are less than 2 cm are usually benign, whereas those over 5 cm are usually malignant (9).Gastric GISTs in the greater curvature have a low malignant potential despite reaching a large size [10] and 20–30% of GISTs are malignant at presentation (11). Primary GISTs are typically large, hypervascular, enhancing masses on contrast- enhanced CT scan and are often heterogeneous because of necrosis, hemorrhage, or cystic degeneration at the time of presentation. Approximate 50 % of GIST show mucosal ulceration and fistulization to the gastrointestinal lumen(1, 3) and demonstrated by presence of air or oral contrast material on CT within the mass.Bowel obstruction is rare due to exophyticcomponent.Epithelial tumor presents with bowel obstruction, ascites and lymph node spread. Tumor calcification is rare and accounts for less than 3 % (13). Most metastases of GISTs involve the liver and peritoneum by hematogenous spread and peritoneal seeding, respectively. Less commonly, metastases are found in the soft tissue, lungs, and pleura. GISTs metastasizing to the lymph nodes are extremely rare. Our study illustrates, most of the tumor ranging from 5- 10 cm, necrosis was common in large tumor of >7 cm. Mucosal ulceration and fistulation was common in gastric GISTs with extension of oral contrast within tumor mass in 50 % cases. Small bowel GIST were diagnosed due to their large size and palpable mass. Two of the cases show small volume mesenteric nodes, possibly reactive / nonspecific.

Management of the GIST depends on histopathology and tumor staging. Use of preoperative biopsy of suspected GISTs has been controversial because of the potential risks of hemorrhage and tumor seeding into the peritoneal cavity. However no accurate date was available in regards to post biopsy hemorrhage or tumor seeding. There is some limitation in fine needle aspiration cytology due to inadequate sampling and proper cell type on histology. In some institution, core biopsy is usually preferred with careful sampling by using large bore needle. We used the Bard biopsy gun for our histology sampling. Complete surgical resection was the main stay for localized primary GISTs. Our 60 % of GIST tumor was surgically treated and unresected tumor are started with chemotherapy. We had an 18 month follow up of surgically resected cases and one case was detected to be tumor recurrence. In our institution, we recommended to follow up every year upto 5 years. Despite apparently complete resection with clear margins, the recurrence rate are high; hepatic or mesenteric recurrence occurs in 40– 90% of patients undergoing apparently curative surgery (12). This may be partly due to tumor rupture leading to mesenteric implants. For advance GISTs, Imatinib- a selective adenosine triphosphate (ATP) competitive inhibitor of KIT, BCR-ABL, PDGFR-alpha and beta is popularly used. The main goal of imaging surveillance is to detect recurrence or progression as early as possible.Single follow-up CT scan would be appropriate for completely resected low risk tumours, whilst those with medium and high risk disease might usefully have a CT scan at 6 months followed by annually thereafter for 5 years.PET-CT and CT provides a more accurate assessment and prediction of the quality of response.

VII. Conclusion

The role of CT in localizing, characterizing, tumor spread and enhancement pattern in the bowel mass was helpful to speed up the management and decreased surgical morbidity. Sometime due to extensive necrosis, mucosal ulceration, there was a high chance of bleeding. The importance of radiologist is to detect these potent complications and provide a road map for the operating surgeon.

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