Imaging of Gastrointestinal Stromal Tumors (GIST)

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Learning objectives

- Describe the typical imaging findings of GIST at initial presentation.

- Imaging findings following treatment.

- Surveillance of treatment by imaging.

- Adverse effects of treatment.
**Introduction**

- GISTs are the most frequent mesenchymal tumors of the GI tract. However they represent less than 1% of GI tract tumors.

- They originate from interstitial cells of Cajal (intestinal pacemaker tissue) at the muscularis propria around the myenteric plexus.

- Almost 95% of GISTs express a transmembrane tyrosine kinase growth factor receptor (KIT protein-CD117) encoded by KIT oncogene, which distinguish GIST from other mesenchymal tumors.
GIST Sites of Occurrence

- Stomach (60%)
- Small bowel (30%)
- Colon and rectum (5%)
- Esophagus (< 5%)

Occasionally it may primarily affect the omentus, mesentery and retroperitoneum.

Introduction

Imaging findings of GIST

- **Solitary tumor.**

- **Growth pattern:**
  - Exophytic (30-40%)
  - Intramural (29-44%)
  - Endoluminal (18-22%)
  - Mixed (16-20%)

- **Size:**
  - Variable, from millimeters to large mass.
Imaging findings of GIST (Small tumors < 3 cm)

- Less aggressive behavior
  - Homogeneous
  - Well-defined
  - Soft tissue attenuation
  - Variable degree of contrast enhancement

Imaging findings of GIST
(Small tumors < 3 cm)
Imaging findings of GIST
(Small tumors < 3 cm)
More aggressive behavior

Heterogeneous
Irregular or lobulated contour
Intense contrast enhancement mostly peripherally
Mucosal ulceration in mucosal surface
May invade adjacent structures
Central cavitation, necrosis, hemorrhage, cystic degeneration
Calcification is uncommon (3%)
Imaging findings of GIST
(Large tumors)

Imaging findings of GIST
(Large tumors)

Imaging findings of GIST
(Large tumors)
Imaging findings in **Malignant** GIST

- Small intestinal GIST may have a more aggressive course in comparison with gastric GIST at the same size.
- Size > 5 cm
- Invasion to adjacent organs
- Indistinct contour
- Satellite nodules
- Irregular surface
Imaging findings in **Malignant** GIST

Imaging findings in **Malignant** GIST

Imaging findings in Malignant GIST

- Metastatic GIST mostly involves liver and peritoneum.

- Lymph node involvement is unusual. Lymph node metastasis is more common in epithelioid secondary to histological similarity with epithelial neoplasm.

- Primary treatment for metastatic GIST is tyrosine kinase inhibitor such as imatinib mesylate (Gleevec).
Imaging findings in **Metastatic** GIST
Imaging findings in **Metastatic** GIST

Response to treatment in GIST

- Heterogeneously hyperdense $\rightarrow$ Homogeneously hypodense

- Resolution of the enhancing tumor nodules

- Decrease in tumor vessels

Response to treatment in GIST

Response to treatment in GIST

Response to treatment in GIST

- Development of myxoid degeneration and, occasionally, hemorrhage or necrosis.
- The term cyst or cystic change should be avoided for treated tumors at imaging.
- Decrease in the tumor attenuation is seen within 1 month (as early as 5 days).
Response to treatment in GIST

- Paradoxically, tumors **may enlarge** during treatment.

- Enlargement of the tumor, if associated with an overall decrease in tumor enhancement, does not indicate progression.
When the findings at CT are inconclusive or inconsistent with the clinical presentation, FDG PET should be performed.

Short-term follow-up CT, perhaps within 1 month, can be a good alternative when FDG PET is not available.
Surveillance after treatment of GIST

- Recurrence occurs in most patients, even after a complete resection with a tumor-free margin.

- The median time to recurrence after surgical resection is approximately 2 years.

- Recurrences typically occur first in the liver or peritoneum.

- Traditional criteria for progression:
  1- Tumor size increase
  2- Development of new lesions at the site of the previous disease
  3- Development of metastasis
Surveillance after treatment of GIST

✓ The development of enhancing tumor nodules within the treated hypo attenuating tumor, regardless of changes in tumor size, is consistent with GIST recurrence.

Adverse effects of treatment with imatinib

- **Fluid retention (most common),** diarrhea, nausea, fatigue, muscle cramps, abdominal pain, and rash.

- Fluid overload may manifest as ascites, a pleural effusion, a pericardial effusion, or extensive subcutaneous edema.

Intratumoral hemorrhage can occur in approximately 5% of patients with bulky tumors and may require surgical intervention.

Careful observation is needed to detect possible decreases in hemoglobin levels during the first 4–8 weeks of imatinib treatment.

CT is the imaging modality of choice for diagnosis and staging of GISTs at initial presentation and for monitoring during and after treatment.

CT may help us to differentiate probably benign from probably malignant GISTs.

Contrast-enhanced CT is as reliable as PET in the evaluation of treatment responses.

A short-term follow-up CT study can be a good alternative when PET is not available.
Thank you for your kind attention