Protocol for the Examination of Specimens From Patients With Gastrointestinal Stromal Tumor (GIST)

Based on AJCC/UICC TNM, 7th edition
Protocol web posting date: December 2014

Procedures
• Biopsy
• Resection

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CAP GIST Protocol Revision History

Version Code
The definition of the version code can be found at www.cap.org/cancerprotocols.

Version: GIST 3.1.0.0

Summary of Changes
The following changes have been made since the October 2013 release.

Ancillary Studies
DOG1 (ANO1) has been added to the list of Immunohistochemical Studies.

The Molecular Genetic Studies section and explanatory note have been removed and relocated to the CAP GIST Biomarker Reporting Template.
Surgical Pathology Cancer Case Summary

Protocol web posting date: December 2014

GASTROINTESTINAL STROMAL TUMOR (GIST): Biopsy

Select a single response unless otherwise indicated.

Procedure
___ Core needle biopsy
___ Endoscopic biopsy
___ Other (specify): ________________________
___ Not specified

+ Specimen Size
  + Greatest dimension: ___ cm
  + Additional dimensions: ___ x ___ cm
  + ___ Cannot be determined (see “Comment”)

Tumor Site
Specify: ________________________ (Note A)
___ Not specified

+ Tumor Size
  + Greatest dimension: ___ cm
  + Additional dimensions: ___ x ___ cm
  + ___ Cannot be determined (see “Comment”)

GIST Subtype
___ Spindle cell
___ Epithelioid
___ Mixed
___ Other (specify): ________________________

Mitotic Rate
Specify: ___ /50 high-power fields (HPF)
___ Cannot be determined (explain): ________________________

Note: The required total count of mitoses is per 5 mm² on the glass slide section. With the use of older model microscopes, 50 HPF is equivalent to 5 mm². Most modern microscopes with wider 40X lenses/fields require only 20 HPF to embrace 5 mm². If necessary please measure field of view to accurately determine actual number of fields required to be counted on individual microscopes to count 5 mm².

+ Necrosis
  + ___ Not identified
  + ___ Present
    + Extent: ____%
  + ___ Cannot be determined

+ Data elements preceded by this symbol are not required. However, these elements may be clinically important but are not yet validated or regularly used in patient management.
Histologic Grade (Note B)
___ GX: Grade cannot be assessed
___ G1: Low grade; mitotic rate \leq 5/50 HPF
___ G2: High grade; mitotic rate >5/50 HPF

Risk Assessment (Note C)
___ None
___ Very low risk
___ Low risk
___ Intermediate risk
___ High risk
___ Overtly metastatic
___ Cannot be determined

Distant Metastasis (Note D)
___ Cannot be assessed
___ Distant metastasis
   Specify site(s), if known: ______________________________

+ Additional Pathologic Findings
+ Specify: ______________________________

Ancillary Studies (Note E)
Note: For molecular genetic and further immunohistochemical study reporting, the CAP GIST Biomarker Template should be used. Pending biomarker studies should be listed in the Comments section of this report.

Immunohistochemical Studies (select all that apply)
___ KIT (CD117)
   ___ Positive
   ___ Negative
___ DOG1 (ANO1)
   ___ Positive
   ___ Negative
___ Others (specify): ______________________________
___ Not performed

Prebiopsy Treatment (select all that apply)
___ No therapy
___ Systemic therapy performed
   Specify type: ______________________________
___ Therapy performed, type not specified
___ Unknown

+ Treatment Effect (Note F)
+ Specify percentage of viable tumor: ___%

+ Comment(s)

Data elements preceded by this symbol are not required. However, these elements may be clinically important but are not yet validated or regularly used in patient management.
CAP Approved  Gastrointestinal • GI Stromal Tumor
GIST 3.1.0.0

Surgical Pathology Cancer Case Summary

Protocol web posting date: December 2014

GASTROINTESTINAL STROMAL TUMOR (GIST): Resection

Select a single response unless otherwise indicated.

Procedure
___ Excisional biopsy
___ Resection
   Specify type (eg, partial gastrectomy): ________________________________
___ Metastasectomy
___ Other (specify): ________________________________
___ Not specified

Tumor Site
Specify (if known): ________________________________
___ Not specified

Tumor Size
Greatest dimension: ___ cm
+ Additional dimensions: ___ x ___ cm
___ Cannot be determined (see “Comment”)

Tumor Focality
___ Unifocal
___ Multifocal
   Specify number of tumors: ____
   Specify size of tumors: _______________________

GIST Subtype
___ Spindle cell
___ Epithelioid
___ Mixed
___ Other (specify): _______________________

Mitotic Rate
Specify: ___ /50 HPF
___ Cannot be determined (explain): ________________________________

Note: The required total count of mitoses is per 5 mm² on the glass slide section. With the use of older model microscopes, 50 HPF is equivalent to 5 mm². Most modern microscopes with wider 40X lenses/fields require only 20 HPF to embrace 5 mm². If necessary please measure field of view to accurately determine actual number of fields required to be counted on individual microscopes to count 5 mm².

Necrosis
+ ___ Not identified
+ ___ Present
   + Extent: ___%
+ ___ Cannot be determined

+ Data elements preceded by this symbol are not required. However, these elements may be clinically important but are not yet validated or regularly used in patient management.
Histologic Grade (Note B)

__ GX: Grade cannot be assessed
__ G1: Low grade; mitotic rate ≤5/50 HPF
__ G2: High grade; mitotic rate >5/50 HPF

Risk Assessment (Note C)

__ None
__ Very low risk
__ Low risk
__ Intermediate risk
__ High risk
__ Overtly malignant/metastatic
__ Cannot be determined

Margins

__ Cannot be assessed
__ Negative for GIST
  Distance of tumor from closest margin: ___ mm or ___ cm
__ Margin(s) positive for GIST
  Specify margin(s): ____________________

Pathologic Staging (pTNM) (Note G)

TNM Descriptors (required only if applicable) (select all that apply)

__ m (multiple)
__ r (recurrent)
__ y (posttreatment)

Primary Tumor (pT)

__ pTX: Primary tumor cannot be assessed
__ pT0: No evidence for primary tumor
__ pT1: Tumor 2 cm or less
__ pT2: Tumor more than 2 cm but not more than 5 cm
__ pT3: Tumor more than 5 cm but not more than 10 cm
__ pT4: Tumor more than 10 cm in greatest dimension

Regional Lymph Nodes (pN) (Note D)

__ Not applicable
__ pN0: No regional lymph node metastasis
__ pN1: Regional lymph node metastasis

Distant Metastasis (pM) (Note D)

__ Not applicable
__ pM1: Distant metastasis
  + Specify site(s), if known: ____________________

+ Additional Pathologic Findings
+ Specify: ____________________

+ Data elements preceded by this symbol are not required. However, these elements may be clinically important but are not yet validated or regularly used in patient management.
Ancillary Studies (Note E)

Note: For molecular genetic and further immunohistochemical study reporting, the CAP GIST Biomarker Template should be used. Pending biomarker studies should be listed in the Comments section of this report.

Immunohistochemical Studies (select all that apply)
___ KIT (CD117)
    ___ Positive
    ___ Negative
___ DOG1 (ANO1)
    ___ Positive
    ___ Negative
___ Others (specify): ________________________________
___ Not performed

Preresection Treatment (select all that apply)
___ No therapy
___ Previous biopsy or surgery
    Specify: ________________________________
___ Systemic therapy performed
    Specify type: ________________________________
___ Therapy performed, type not specified
___ Unknown

+ Treatment Effect (Note F)
+ Specify percentage of viable tumor: ___%

+ Comment(s)
Explanatory Notes

A. Location
Gastrointestinal stromal tumors may occur anywhere along the entire length of the tubal gut, as well as in extravisceral locations, which include the omentum, mesentery, pelvis, and retroperitoneum.\textsuperscript{1-3} Typically, they arise from the wall of the gut and extend inward toward the mucosa, outward toward the serosa, or in both directions. Lesions that involve the wall of the gastrointestinal (GI) tract frequently cause ulceration of the overlying mucosa. Infrequently, lesions invade through the muscularis mucosae to involve the mucosa. Mucosal invasion is an adverse prognostic factor in numerous studies. Because the anatomic location along the GI tract affects prognosis, with location in the stomach having a more favorable prognosis, it is very important to specify anatomic location as precisely as possible.\textsuperscript{4}

B. Histologic Grade
Histologic grading, an important component of soft tissue sarcoma staging, is not well suited to GISTs, because most of these tumors have low or relatively low mitotic rates below the thresholds used for grading of soft tissue tumors, and because GISTs often manifest aggressive features with mitotic rates below the thresholds used for soft tissue tumor grading (the lowest tier of mitotic rates for soft tissue sarcomas being 10 mitoses per 10 HPF). In GIST staging, the grade is determined entirely by mitotic activity.

GX: Grade cannot be assessed
G1: Low grade; mitotic rate $<5/50$ HPF
G2: High grade; mitotic rate $>5/50$ HPF

Note: The required total count of mitoses is per 5 mm$^2$ on the glass slide section. With the use of older model microscopes, 50 HPF is equivalent to 5 mm$^2$. Most modern microscopes with wider 40X lenses/fields require only 20 HPF to embrace 5 mm$^2$. If necessary please measure field of view to accurately determine actual number of fields required to be counted on individual microscopes to count 5 mm$^2$.

C. Risk Assessment
Because GISTs can recur many years after initial excision, we now regard most GISTs as having at least some potential for distant metastasis. This concept was originally the result of a National Cancer Institute-sponsored consensus conference that was held in 2002.\textsuperscript{1} More specific data generated by large follow-up studies refined the biologic potential assessment.\textsuperscript{4-8} Criteria obtained from those data were adopted in a National Cancer Care Network (NCCN) Task Force report on GIST.\textsuperscript{9} We have adopted the criteria for risk stratification, as indicated in the Table.\textsuperscript{4-8} The scheme includes anatomic site as a factor, because small bowel GISTs carry a higher risk of progression than gastric GISTs of similar size and mitotic activity. For anatomic sites not listed in this table, such as esophagus, mesentery, and peritoneum, or in the case of “insufficient data,” it is best to use risk criteria for jejunum/ileum.
### Table 1. Guidelines for Risk Assessment of Primary Gastrointestinal Stromal Tumor (GIST)

<table>
<thead>
<tr>
<th>Tumor Parameters</th>
<th>Risk of Progressive Disease (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mitotic Rate</td>
<td>Gastric</td>
</tr>
<tr>
<td>≤5 per 50 HPF</td>
<td>≤2 cm</td>
</tr>
<tr>
<td></td>
<td>&gt;2 - ≤5 cm</td>
</tr>
<tr>
<td></td>
<td>&gt;5 - ≤10 cm</td>
</tr>
<tr>
<td></td>
<td>&gt;10 cm</td>
</tr>
<tr>
<td>&gt;5 per 50 HPF</td>
<td>≤2 cm</td>
</tr>
<tr>
<td></td>
<td>&gt;2 - ≤5 cm</td>
</tr>
<tr>
<td></td>
<td>&gt;5 - ≤10 cm</td>
</tr>
<tr>
<td></td>
<td>&gt;10 cm</td>
</tr>
</tbody>
</table>

## D. Metastasis

Gastrointestinal stromal tumors generally metastasize to a very limited subset of anatomic sites. They rarely metastasize to lymph nodes, which is important to note because lymphadenectomy is unnecessary except in rare circumstances when an enlarged or otherwise suspicious lymph node is encountered. Gastrointestinal stromal tumors metastasize predominantly to the liver or to the peritoneal surfaces, where there can be disseminated intra-abdominal disease presenting as innumerable metastatic nodules. Very rarely, GISTs metastasize to the lungs. This situation is associated with rectal location or very advanced disease. Metastasis to bone has also been documented, but it is very rare.

## E. Ancillary Studies

### Immunohistochemistry

Because of the advent of small-molecule kinase inhibitor therapy in the treatment of GIST [see the following], it has become imperative to distinguish GIST from its histologic mimics, mainly leiomyoma, leiomyosarcoma, schwannoma, and desmoid fibromatosis. Immunohistochemistry is instrumental in the workup of GIST. Approximately 95% of GISTs are immunoreactive for KIT (CD117). Most KIT-negative GISTs are gastric or extravesical GISTs that are positive for the platelet-derived growth factor receptor A (PDGFRα) mutation. KIT immunoreactivity is usually strong and diffuse but can be more focal in unusual cases. It is not unusual for GISTs to exhibit dot-like perinuclear staining, while less commonly, some cases exhibit membranous staining. These patterns do not clearly correlate with mutation type or response to therapy. Approximately 70% of GISTs are positive for CD34, 30% to 40% are positive for smooth muscle actin, 5% are positive for S100 (usually focal), 5% are positive for desmin (usually focal), and 1% to 2% are positive for keratin (weak/focal).
Figure 1. Patterns of KIT staining in gastrointestinal stromal tumor (GIST). A, Diffuse and strong immunoreactivity in a typical GIST. B, Focal and weak pattern in an epithelioid gastric GIST with a PDGFRA mutation. C, Dot-like perinuclear staining. D, Membranous pattern. (Original magnification X400.)

F. Treatment Effect
Gastrointestinal stromal tumors respond well to the newer targeted systemic therapies, imatinib mesylate and sunitib malate. The types of treatment effects that have been seen are hypocellularity, myxoid stroma, fibrosis, and necrosis. Nests of viable tumor cells are virtually always seen. Because all of these histologic features can be seen in untreated GISTs, it is not possible to know whether they are due to treatment or not. As a practical compromise, we think it is best to report the percentage of viable tumor after treatment.

G. TNM and Stage Groupings
The American Joint Committee on Cancer (AJCC) and International Union Against Cancer (UICC) GIST staging system is recommended.14

TNM Descriptors
For identification of special cases of TNM or pTNM classifications, the “m” suffix and “y” and “r” prefixes are used. Although they do not affect the stage grouping, they indicate cases needing separate analysis.

The “m” suffix indicates the presence of multiple primary tumors in a single site and is recorded in parentheses: pT(m)NM.

The “y” prefix indicates those cases in which classification is performed during or after initial multimodality therapy (ie, neoadjuvant chemotherapy, radiation therapy, or both chemotherapy and radiation therapy). The cTNM or pTNM category is identified by a “y” prefix. The ycTNM or ypTNM categorizes the extent of tumor actually present at the time of that examination. The “y” categorization is not an estimate of tumor before multimodality therapy (ie, before initiation of neoadjuvant therapy).
The "r" prefix indicates a recurrent tumor when staged after a documented disease-free interval and is identified by the "r" prefix: rTNM.

**T Category Considerations**
In the case of ruptured tumors, estimates of tumor size can be obtained from radiologic data, if available.

**N Category Considerations**
Nodal metastasis is extremely rare in GIST, and there is no routine indication for lymph node biopsy or lymph node dissection. In the absence of information on regional lymph node status, N0/pN0 is appropriate; NX should not be used.

**M Category Considerations**
Most GISTs metastasize to intra-abdominal soft tissues, liver, or both. Intra-abdominal metastasis refers to tumor involvement in the abdominal cavity away from the primary mass. Such metastasis is usually to the serosal surfaces of the abdomen, pelvis, and retroperitoneum. Multiple primary tumors can be seen in the setting of neurofibromatosis type 1 or familial GIST syndrome and should not be considered intra-abdominal metastasis. Rare cases of multiple independent GISTs at different GI locations have been reported. In the absence of a primary gastrointestinal GIST, solitary omental, mesenteric, pelvic, or retroperitoneal GISTs should be considered primary tumors because extra-gastrointestinal GISTs have been described. Liver metastasis implies the presence of metastatic tumor inside the liver parenchyma as 1 or more nodules. Adherence to liver capsule, even if extensive, as sometimes seen in gastric GISTs, should not be considered liver metastasis.

### Staging Grouping: Gastric GISTs

<table>
<thead>
<tr>
<th>Stage</th>
<th>T1 or T2</th>
<th>N0</th>
<th>M0#</th>
<th>Mitotic Rate</th>
</tr>
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<tbody>
<tr>
<td>IA</td>
<td>T1 or T2</td>
<td>N0</td>
<td>M0#</td>
<td>Low</td>
</tr>
<tr>
<td>IB</td>
<td>T3</td>
<td>N0</td>
<td>M0</td>
<td>Low</td>
</tr>
<tr>
<td>II</td>
<td>T1</td>
<td>N0</td>
<td>M0</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>T2</td>
<td>N0</td>
<td>M0</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>T4</td>
<td>N0</td>
<td>M0</td>
<td>Low</td>
</tr>
<tr>
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<td>T3</td>
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<td>M0</td>
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</tr>
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<td>N0</td>
<td>M0</td>
<td>High</td>
</tr>
<tr>
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<td>Any T</td>
<td>N1</td>
<td>M0</td>
<td>Any rate</td>
</tr>
<tr>
<td></td>
<td>Any T</td>
<td>Any N</td>
<td>M1</td>
<td>Any rate</td>
</tr>
</tbody>
</table>

# M0 denotes no distant metastasis.

### Stage Grouping: Small Intestinal GISTs

<table>
<thead>
<tr>
<th>Stage</th>
<th>T1 or T2</th>
<th>N0</th>
<th>M0</th>
<th>Mitotic Rate</th>
</tr>
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<tr>
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References