Disclosures

No relevant disclosures

Material and Support From:
Guerbet LLC
Boston Scientific
Phillips
“Decisions about diagnostic management and resectability should involve multidisciplinary consultation at a high-volume center with use of appropriate imaging studies.” NCCN Guidelines

1. Diagnostic Management
   - Imaging reporting
2. Image staging and Resectability
3. Multidisciplinary consultation (Cases)
4. Beyond
Diagnostic Management

• Patients found to have a Mass on routine CT MUST be considered for repeat imaging with Pancreatic Protocol to Properly stage.
  – May change the Tumor Stage in up to 50% of patients

• Pancreatic Protocol: CT or MRI
  – Late Arterial (Pancreatic phase) : 35-50 sec
  – Portal venous phase : 60-90 sec
 Diagnostic Management : Pancreatic Protocol: CT

Late Arterial (Pancreatic phase)

- Normal Pancreatic Paranchyma
- Hepatic Artery
- Kidney Cortex, Bowel

Portal venous phase

- Portal Venous anatomy
- Mets to Liver
Diagnostic Management: MDCT versus MRI

- MDCT (Multi-Detector CT) better spatial resolution
  - Clarity
  - Less optimal at detecting liver mets (80%)

- MRI has better contrast resolution (Intensity)
  - Conspicuity
    - Small, iso- or slightly hypo- attenuating pancreatic lesions are seen
    - Tumor vessel interface
  - Much better detection of hepatic metastatic disease (nearly 100%)

  - MRI is currently reserved for problem solving but may help resolve Hazy tumor vessel interface a known weakness of CT.
Diagnostic Management: Computed Tomography

- Panc Protocol CT is 80% for predicting resectability
  - Most of the 20% (misses) are related to:
    - Small liver metastases
    - Vascular encasement
    - Peritoneal metastases
    - Pancreatic tail lesions

- Above 90% for predicting Unresectability
In January of 2014
- The Society of Abdominal Radiology and Pancreatic Association
- Published a Pancreatic Ductal Adenocarcinoma Reporting Template in the Journal of Radiology.

The template is a Literature and High-volume institution supported check-list that programmatical Stages and Anatomically evaluates patients with PADC.

Evaluation of this template showed:
- Structured reporting in pancreatic cancer provides superior evaluation and confidence in the referring physicians.
Diagnostic Management: Reporting Template

Example:

<table>
<thead>
<tr>
<th>Category and Parameters</th>
<th>Finding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morphologic evaluation</td>
<td></td>
</tr>
<tr>
<td>Appearance in the pancreatic parenchymal phase</td>
<td>Hypo-, iso-, or hyperattenuating</td>
</tr>
<tr>
<td>Size (axial dimension) (cm)</td>
<td>Measurable or nonmeasurable</td>
</tr>
<tr>
<td>Location</td>
<td>Head, uncinate process, body, or tail</td>
</tr>
<tr>
<td>Pancreatic duct abrupt narrowing and upstream dilatation</td>
<td>Yes or no</td>
</tr>
<tr>
<td>Biliary tree abrupt narrowing and upstream dilatation</td>
<td>Yes or no</td>
</tr>
<tr>
<td>Arterial disease (SMA, celiac axis, or common hepatic artery)</td>
<td></td>
</tr>
<tr>
<td>Soft-tissue contact</td>
<td>( \leq 180^\circ ) or ( &gt;180^\circ )</td>
</tr>
<tr>
<td>Hazy stranding contact</td>
<td>( \leq 180^\circ ) or ( &gt;180^\circ )</td>
</tr>
<tr>
<td>Vascular contour irregularity</td>
<td>Yes or no</td>
</tr>
<tr>
<td>Extension to first SMA branch, hepatic artery bifurcation</td>
<td>Yes or no</td>
</tr>
<tr>
<td>Anatomic variants</td>
<td>Yes or no; describe</td>
</tr>
<tr>
<td>Venous disease (portal vein and/or SMV)</td>
<td></td>
</tr>
<tr>
<td>Soft-tissue contact</td>
<td>( \leq 180^\circ ) or ( &gt;180^\circ )</td>
</tr>
<tr>
<td>Hazy stranding contact</td>
<td>( \leq 180^\circ ) or ( &gt;180^\circ )</td>
</tr>
<tr>
<td>Vascular contour irregularity (tethering or teardrop)</td>
<td>Yes or no</td>
</tr>
<tr>
<td>Extension to first draining vein</td>
<td>Yes or no</td>
</tr>
<tr>
<td>Venous thrombosis</td>
<td>Yes or no; bland or tumor thrombus</td>
</tr>
<tr>
<td>Venous collateral vessels</td>
<td>Yes or no</td>
</tr>
<tr>
<td>Extrapancreatic disease</td>
<td></td>
</tr>
<tr>
<td>Liver lesions</td>
<td>Yes or no; suspicious, indeterminate, or benign</td>
</tr>
<tr>
<td>Peritoneal or omental disease</td>
<td>Yes or no</td>
</tr>
<tr>
<td>Ascites</td>
<td>Yes or no</td>
</tr>
<tr>
<td>Suspicious lymph nodes</td>
<td>Yes or no</td>
</tr>
<tr>
<td>Other disease</td>
<td>Yes or no; describe</td>
</tr>
</tbody>
</table>

Morphology:
Size, enhancement, Duct

Artery: SMA, CA, CHA
Vein: PV, SMV

Contact \( \neq 180 \), Hazy
Contour irregularly
Thrombosis
Varients

Mets:
Liver, Peritoneal, LN
Image Grading and Staging

- **Stage I & II (T1-T3)**
  - Resectable

- **Stage III** (T4, Any N, Mo {M1 can be a non-regional LN})
  - Borderline resectable
  - Locally Advanced
    - Increased extent of vascular involvement
    - Not amenable to resection

- **Stage IV**
  - Metastatic disease
    - Including Lymph Nodes out side of standard surgical fields.
Image Staging: Tumor Grading

- **T1**: <2 cm
- **T2**: >2 cm
- **T3**: Extending beyond Pancreas
- **T4**: Involving SMV or SMA
Image Staging: Stage I

- Stage I
- T1: <2cm or T2: >2cm
- No Nodes
- No Vessels
- No Extention
Image Staging: Stage IIA & IIB

Stage IIA ✔

No Nodes
No Vessels

Extending beyond Pancreas

Stage IIB ✔

T1
or
T2
or
T3

<2cm

Yes Lymphadenopathy
No Vessel

Extension Outside

>2cm
Image Staging: Stage IIB – Standard LN Resections

- Stage IIB
- T1 or T2 or T3
- Yes Lymphadenopathy
- No Vessel
- Extension Outside

- Whipple
- Left Pancreatectomy
Image Staging: Stage I, IIA & IIB

Stage I

T1 or T2

<2cm or >2cm

No Nodes
No Vessels
No Extension

Stage IIB

T1 or T2 or T3

<2cm

Yes Lymphadenopathy
No Vessel

Extension Outside

Stage IIA

Extending beyond Pancreas

T3

No Nodes
No Vessels

Distinction from Stage III: No Vessel Involvement
Image Staging: Stage III – Vessel Involvement

Distinction from Stage I&II:
Yes to Vessel Major Vessel Involvement

Yes Vessel
“Any” Lymphadenopathy (Not M nodes)
Image Staging: Stage III – Vessel Involvement

Stage III – two categories

Borderline resectable
- Abutting Artery: CA, CHA, SMA
- Any resectable or reconstructable vein

Locally Advanced LAPC (increased extent of vascular involvement)
- Encased artery
- Unreconstructable vein
Stage III Classification: The Resection borderlands

- Distinction between the two Stage III categories (*Borderline resectable* and *Locally advanced*)
  - Not precisely defined across institutions
  - May be defined by Imaging and/or Clinical criteria
  - May be defined operationally during a MDC

- Because the terminology making up the definition is open to interpretation
  - Multiple interpretations exist

- This is the gray zone of resection
Stage III: Vascular terminology - Artery

- **Abutment**: Less than or equal to 180° tumor contact without deformity
- **Encasement**: More than 180° tumor contact without deformity
- **Deformity**: Tumor contact with deformity or thrombus - Carries a risk of vascular invasion
Stage III: Vascular terminology - Vein

Abutment
Less reliable; perhaps 40% vascular invasion

Encasement
More reliable; perhaps 80% vascular invasion
Complete encircling = Tumor adherence

Deformity
Tear Drop – Highly associated with vascular invasion
### Stage III Classification: The Resection borderlands

<table>
<thead>
<tr>
<th></th>
<th>NCCN</th>
<th>MD-Anderson</th>
<th>AHPHA/SSO/SSAT</th>
<th>Alliance Intergroup</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA</td>
<td>Head: No Abutment</td>
<td>Abutment</td>
<td>No Abutment No Encasement</td>
<td>Abutment</td>
</tr>
<tr>
<td></td>
<td>Tail: Abutment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHA</td>
<td>Abutment or Short-segment encasement allowing reconstruction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SMA</td>
<td>Abutment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SMV/PV</td>
<td>Encasement and/or reconstructible occlusion</td>
<td>Occlusion</td>
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Stage III Classification:
Criteria for Arterial Resectability

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**Abutment** on the artery is not considered as sensitive a sign of Vessel invasion.

**Encasement** and Arterial **Irregularity** are considered sensitive signs of Vessel Invasion.

SMA/Lymphatic anatomic relationship combined with Major morbidity and mortality associated with SMA injury propels consensus on abutment.
## Stage III Classification: Criteria for Venous Resectability

<table>
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<tr>
<th>SMV/PV</th>
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<th>Alliance Intergroup</th>
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<tr>
<td></td>
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</tr>
</tbody>
</table>
Stage III Classification: Risk for Venous Invasion

Vascular invasion:
- Unilateral (51%)
- Bilateral (74%)
- Occlusion (92%)

Tear Drop – Highly associated with vascular invasion
Case 1 Stage III: Locally Advanced Encased Right Hepatic artery off SMA
Case 1 Stage III: Locally Advanced Encased Right Hepatic artery off SMA
Case 1 Stage III: Locally Advanced
Encased Right Hepatic artery off SMA
Case 1 Stage III: Locally Advanced Encased Right Hepatic artery off SMA
Case 1 Stage III: Locally Advanced
Encased Right Hepatic artery off SMA
Case 1 Stage III: Locally Advanced
Encased Right Hepatic artery off SMA
Case 1 Stage III: Locally Advanced Encased Right Hepatic artery off SMA
Case 1 Stage III: Locally Advanced Encased Right Hepatic artery off SMA
Case 1 Stage III: Locally Advanced Encased Right Hepatic artery off SMA
Case 1 Stage III: Locally Advanced
Encased Right Hepatic artery off SMA
Case 2 Stage III: Borderline Resectable – Tear Drop
Case 2 Stage III: Borderline Resectable – Tear Drop
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Case 2 Stage III: Borderline Resectable – Tear Drop
Case 2 Stage III: Borderline Resectable – Tear Drop
Beyond!

**Diagnostic:**
Non-Invasive detection of Macro & Microscopic tumor extent

**Therapeutic:**
Utilize protocols and technology To increase the absolute number or R0 resections or equivalent
Beyond the Borderlands: IRreversible Electroporation (IRE)

- A focal ablation therapy that uses high voltage low energy DC electrical pulses to permanently open pores in the cell membranes of soft tissue, which causes cells to die.
Beyond the Borderlands: IRreversible Electroporation (IRE)

Locally advanced PAC encasing the CA & CHA

Pre

Probes

Immediately Post