Cystic Lesions of the Pancreas

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ROSE
Rapid Onsite Evaluation

- ROSE has been shown to be effective in optimizing the yield and efficiency of EUS-FNA
- Only solid tumors should be asked for ROSE
- Like frozen and intra-operative consultation, definitive diagnosis should NOT be demanded on ROSE
- Staffing, time, and cost constraints limit availability

Pancreatic Cyst Terminology

- Unsatisfactory (Reason)
- Negative (Consider descriptive)
  - Cystic contents: Mucinous epithelium is not identified
  - Negative for high grade dysplasia or malignancy, no cyst contents
  - Necrotic/edematous cells present without mucinous epithelium c/w pseudocyst
- Atypical
  - Mucinous epithelium present, no evidence of high grade dysplasia
    - of uncertain origin
    - c/w mucinous neoplasm (most likely IPMN)
  - C/W acinar cystadenoma
- Suspicious for malignancy
  - Mucinous epithelium present with at least high grade dysplasia/CIS
  - Abnormal epithelium suspicious for invasive adenocarcinoma
- Positive for malignancy
  - Adenocarcinoma
Pancreatic Lesions
- Solid
  - Chronic pancreatitis
  - Ductal adenocarcinoma
  - Acinar cell carcinoma
  - Pancreatic endocrine neoplasm (PEN)
  - Solid pseudo-papillary tumor (SSPT)
  - Pancreatoblastoma
  - Metastasis
- Cystic
  - Pseudocyst
  - Serous cyst
  - Mucinous cyst (MCN and IPMN)
  - Cystic degeneration of typically solid tumors
    - PEN
    - SSPT
    - other
  - Other more rare cysts
    - Simple cysts
    - Lymphoepithelial cyst
    - Peripancreatic cysts

EUS-Fine Needle Aspiration
- Transgastric: body and tail
- Transduodenal: head

Cysts of the pancreas
- Non-neoplastic
  - Pseudocyst
  - Retention cyst
  - Congenital cyst
  - Foregut cyst
  - Endometriotic cyst
- Cystic nonepithelial neoplasms
  - Lymphangiomata
  - Hemangioma
- Secondarily cystic solid neoplasms
  - Ductal adenocarcinoma
  - Endocrine neoplasms
  - Acinar cell neoplasms
  - Solid pseudo-papillary neoplasm
Cysts of the pancreas

- Primarily cystic epithelial neoplasms
  - Serous cystadenoma
  - Mucinous cystic
    - w/ low grade dysplasia
    - w/ high grade dysplasia
    - w/ invasive carcinoma
  - Intraductal papillary mucinous neoplasm (IPMN)
    - w/ low grade dysplasia
    - w/ high grade dysplasia
    - w/ invasive carcinoma

- Secondarily cystic solid neoplasms
  - Ductal adenocarcinoma
  - Endocrine
  - Acinar cell
  - Solid pseudo papillary

EUS: Normal Stomach

- Thick mucus
- Small clusters
- Apical mucin
- Cell types
  - Mucinous, parietal, chief cells

Duodenum

- Thin mucus
- Large tissue fragments
- Goblet cells
- Terminal bars
Pancreas

- Ductal cells
- Acinar cells
- Islet cells

International Guidelines for Pancreatic Cysts
2012 Version

Pancreatic pseudocyst

- Clinical
  - Age: All ages (pancreatitis – older)
  - Males>Females
  - Tail more common
  - 2-30 cm
- Gross: fibrous, necrotic wall
- Chemistry: high amylase and lipase, low CEA

Adsay NV. ModPathol (2007): 20:S71-S93
Pancreatic pseudocyst

- Hypocellular and lack epithelial cells
- Nonspecific cyst
- Necrosis, protein debris, inflammation, cholesterol crystals, and etc.

Serous cystadenoma

- Clinical
  - Gender: more common in women than men (7:3)
  - Older (average 61-68)
  - Location: anywhere
  - Symptoms: abdominal pain and weight loss
  - Site predilection: None, maybe head
  - Prognosis: vast majority benign
  - Gross: Numerous tightly packed small cyst and stellate scar; sponge-like
  - Chemistry: low amylase and CEA

Serous Cystadenoma: Cytology

- Scant cellularity
- Histiocytes and histiocytes with hemosiderin common
- Flat sheet of cuboidal, bland, serous-type epithelium
  - are not often present
- Lining cells with bland, centrally located nuclei, and may have nuclear grooves
  - mimic benign mesothelial cells
### Cytology – Low diagnostic accuracy

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<tr>
<th>Parameter</th>
<th>Value</th>
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<tbody>
<tr>
<td>CT confirmed</td>
<td>3/12 (25%)</td>
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<tr>
<td>Histiocytes present</td>
<td>1/21 (7%)</td>
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<tr>
<td>Histiocytes with hemosiderin</td>
<td>11/21 (52%)</td>
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<tr>
<td>GI contamination</td>
<td>1/75 (1%)</td>
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<tr>
<td>SCA cells</td>
<td>1/21 (5%)</td>
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<tr>
<td>Prospectively Dx</td>
<td>1/21 (5%)</td>
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</table>


### Mucinous Cystic Neoplasm

- **Gender:** much more common in women than men
- **Age:** mean age at diagnosis – 50
- **Location:** Tail > head
- **Gross:** Thick fibrous wall, multicystic; usually larger than 2cm
- **Lined by ovarian stroma, septa may CA++
- **Chemistry:** low amylase, high CEA

Adsay NV. ModPathol (2007): 20:S71-S93

### Mucinous cystic neoplasm: cytology

- **Thick mucous, if present, extremely helpful**
- **Low cellularity**
- **Flat sheet or single mucous cells**
- **Ovarian type stroma often absent**
- **Cytologic atypia depend on differentiation**
- **Cytology often underestimate the final histologic grade**

Is this a mucinous cyst?

Neoplastic mucin or GI mucin?

If there are abundant “gut” epithelium, be careful!
Intraductal Papillary Mucinous Neoplasm (IPMN)

- Male >> Female
- Mean age 68
- Location: Head (89%)
- Gross: Localized, multicentric, imp. to document of pancreatic ductal system
- Cystically dilated ducts containing mucin with various degrees of atypia
- Chemistry: High amylase, high CEA
- Imaging: Communicate with pancreatic duct system – mucin oozing from the ampulla of Vater

Intraductal Papillary Mucinous Neoplasm: Cytology

- Thick mucus
- Papillary groups
- Low vs high cellularity
- Goblet cells
- Atypia

**IPMN - Cytology**

<table>
<thead>
<tr>
<th></th>
<th>Stelow</th>
<th>Michaels</th>
<th>Layfield</th>
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<tbody>
<tr>
<td>Thick mucus</td>
<td>18/18</td>
<td>10/11</td>
<td>10/13</td>
</tr>
<tr>
<td>Papillary</td>
<td>3/18</td>
<td>5/11</td>
<td>8/13</td>
</tr>
<tr>
<td>Low cellularity</td>
<td>9/18</td>
<td>4/11</td>
<td>5/13</td>
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<tr>
<td>High cellularity</td>
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<td>7/11</td>
<td>6/13</td>
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<tr>
<td>Goblet cells</td>
<td>6/18</td>
<td>N/A</td>
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<tr>
<td>Atypia</td>
<td>3/18</td>
<td>7/11</td>
<td>6/13</td>
</tr>
</tbody>
</table>
**IPMN – Triple Test**

- Clinical-EUS: Thick mucin and cystic dilated duct system
- Radiographic: Cyst communicate with pancreatic duct
- Cytology: Mucinous neoplasm

**Adenocarcinoma**

- Major criteria
  - Nuclear overlap and crowding
  - Nuclear contour irregularity
  - Chromatin clearing or clumping
- Minor criteria
  - Single epithelial cells
  - Necrosis, mitosis
  - Nuclear enlargement

Adc Cytol. 1995; 39:1-10

**Cystic Neuroendocrine Neoplasms**

- Rare; 5-10% of pancreatic neoplasms
- Cyst formation not due to necrosis in contrast to cystic adenocarcinoma
- Usually unilocular; up to 25 cm
Cystic Neuroendocrine Neoplasms: Cytology

- Cellularity: varies
- Loose aggregate and single cell pattern
- Monomorphic appearance; some cells out of proportion to others
- Plasmacytoid, bi-nucleate
- Salt and pepper chromatin
- Pink granules of air dry
- Synaptophysin +

Ki-67 Matters

Ki-67 < 2%

Ki-67 ~30% (Neuroendocrine CA)