Current Indications and Applications of EUS

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ACG 10/2012

Case 1

82yo male with PMH HTN, DM, CAD on ASA with new onset dysphagia. For past few weeks, solid foods have been getting stuck intermittently in mid-chest region. He denies history of GERD.
EGD

- Pathology shows invasive adenocarcinoma
- New staging includes masses in 1st 5cm of stomach that extends into esophagus

Case 1

- PET-CT: uptake in distal esophagus only
- EUS: what T stage is this lesion?
Staging Esophageal Cancer

- **T**: extent of tumor
- **N**: extent of spread to regional lymph nodes
- **M**: presence of distant metastasis
- Lymph nodes decrease survival
- 29-56% change management based on EUS

**EUS: T Staging**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1m</td>
<td>Invades mucosa, deep mucosa</td>
</tr>
<tr>
<td>T1sm</td>
<td>Invades submucosa</td>
</tr>
<tr>
<td>T2</td>
<td>Invades muscularis propria</td>
</tr>
<tr>
<td>T3</td>
<td>Invades adventitia</td>
</tr>
<tr>
<td>T4a</td>
<td>Resectable tumor invading pleura, pericardium or diaphragm</td>
</tr>
<tr>
<td>T4b</td>
<td>Unresectable tumor invading other adjacent structures such as aorta, vertebral body, trachea, etc.</td>
</tr>
</tbody>
</table>
How Accurate Is EUS T Staging?

Depends

<table>
<thead>
<tr>
<th></th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT</td>
<td>50-90%</td>
</tr>
<tr>
<td>EUS</td>
<td>99%</td>
</tr>
<tr>
<td>T1</td>
<td>50%</td>
</tr>
<tr>
<td>T2</td>
<td>60%</td>
</tr>
<tr>
<td>T3</td>
<td>70%</td>
</tr>
<tr>
<td>T4</td>
<td>80-90%</td>
</tr>
<tr>
<td>T1-2 vs. T3-4</td>
<td>83-91%</td>
</tr>
</tbody>
</table>

Sensitivity | Specificity
---|---------|
T1 50-90% | 99%
T2 33-81% | 85-96%
T3 83-91% | 86-94%
T4 86%  | 97%

Shimpi et al. GIE 2007.

EUS: N Staging

- What EUS features are predictive of malignant LN?
  - >1cm
  - Round
  - Well-defined
  - Hypoechoic, homogeneous
- All 4 ⇒ 80-100% malignant
- Only 20-40% malignant lymph nodes with all 4
New Esophageal Cancer Staging

N extent of spread to regional lymph nodes
- Nx: Regional lymph nodes cannot be evaluated
- N0: No regional lymph nodes
- N1: Metastasis in 1-2 regional LN
- N2: Metastasis in 3-6 regional LN
- N3: Metastasis in ≥ 7 regional LN

- Regional LN includes LN in chest, around esophagus and celiac axis

Regional LN

- Does FNA increase accuracy of LN beyond EUS?

![Graph showing sensitivity and specificity for various imaging techniques](chart.png)

**YES**
**Which Scope?**

- High-frequency probe
  - Early stage, superficial tumors
  - Strictures

88% agreement T stage 3.3 vs. 2.3 LN (p=0.009)

**Esophageal Stricture: To dilate or not to dilate?**

- 30% with stricture requiring dilation
- 19% stage changed post-dilation
- Post-dilation, accuracy of T stage 61-86%

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Shimpi et al. GIE 2007.
Case 1

- EUS stage T3N1
- Patient underwent chemotherapy and radiation
- Oncologist refers back for EUS after treatment
- How accurate is EUS post-treatment?

EUS Post-Treatment

- Inaccurate, overstages
- EUS ~ CT post-chemo

Mesenas et al. Dis Esophagus 2008
EUS Post-Treatment

- ↓ cross-sectional area or thickness of tumor ≥ 50% correlates with treatment response, improved survival


Case 2

54yo male with GERD and new onset epigastric pain partially responsive to omeprazole. Referred for EGD.
Case 2

- Pathology shows Barrett’s esophagus with HGD and focal intramucosal carcinoma

Case 2

- What next?
  - Surgery
  - EUS
  - EMR
Case 2

- What next?

- Surgery
- EUS
- EMR

T1 Stage

Why is it important to differentiate T1m from T1sm?

<table>
<thead>
<tr>
<th>T1 stage</th>
<th>% LN</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1a lamina propria</td>
<td>0%</td>
</tr>
<tr>
<td>T1b muscularis mucosae</td>
<td>7%</td>
</tr>
<tr>
<td>T1c-d submucosa</td>
<td>10-36%</td>
</tr>
</tbody>
</table>

- T1sm, Submucosal cancer-> surgery
- T1m, HGD/ intramucosal carcinoma-> endoscopy, surgery

Tian et al. GIE 2011
How Accurate Is EUS For T1 Staging?

- Conventional radial EUS scope: 49% accuracy
- Hi frequency ultrasound probe: 73-95% accuracy

Therefore, approach to early stage esophageal cancer:

- EUS: to exclude ≥T2 and LN
- If not T2 and no LN, EMR

Case 2

- EUS normal
- EMR performed
- Pathology: Barrett’s with multifocal HGD and focal intramucosal carcinoma with no submucosal invasion, margins negative.
- 4 years later no recurrent Barrett’s
### EUS in Gastric Cancer

Mocellin et al. GIE 2011.

- **T staging:** EUS~CT~MRI

### T and N Staging Gastric Cancer

<table>
<thead>
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<th>T staging</th>
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<td>Invades muscularis propria</td>
</tr>
<tr>
<td>T3</td>
<td>Invades subserosa connective tissue but not visceral peritoneum or adjacent structures</td>
</tr>
<tr>
<td>T4a</td>
<td>Invades serosa (visceral peritoneum)</td>
</tr>
<tr>
<td>T4b</td>
<td>Invades adjacent structures</td>
</tr>
</tbody>
</table>

### N extent of spread to regional lymph nodes

<table>
<thead>
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<th>Description</th>
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<tbody>
<tr>
<td>Nx</td>
<td>Regional lymph nodes cannot be evaluated</td>
</tr>
<tr>
<td>N0</td>
<td>No regional lymph nodes</td>
</tr>
<tr>
<td>N1</td>
<td>Metastasis in 1-2 regional LN</td>
</tr>
<tr>
<td>N2</td>
<td>Metastasis in 3-6 regional LN</td>
</tr>
<tr>
<td>N3</td>
<td>Metastasis in ≥7 regional LN</td>
</tr>
</tbody>
</table>
EUS in Rectal Cancer

- **N stage**
  - >5mm
  - Should FNA LN
  - M1: Extramesenteric (iliac) LN FNA upstage 7%

- **Operator experience**
  - Learning curve: T stage, 50 EUS; N stage 75 EUS

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<table>
<thead>
<tr>
<th>Recurrence</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT</td>
<td>82-85%</td>
<td>-</td>
</tr>
<tr>
<td>EUS</td>
<td>91-100%</td>
<td>57%</td>
</tr>
<tr>
<td>EUS-FNA</td>
<td>-</td>
<td>93%</td>
</tr>
</tbody>
</table>

Gleeson et al. GIE 2009.
Fernandez-Esparra et al. GIE 2011.

Fernandez-Esparra et al. GIE 2011.
Case 3

52yo male with new onset diabetes and on abdominal CT scan, 2 cm mass in head of pancreas.

Next step?

- EUS-FNA
- Surgery
- MRI
- Pancreatic protocol abdominal CT scan
Which Technique Most Accurate for Diagnosis of Pancreatic Cancer?

**EUS-FNA**

<table>
<thead>
<tr>
<th></th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT or US-guided FNA</td>
<td>62-81%</td>
<td>-</td>
</tr>
<tr>
<td>EUS-FNA</td>
<td>80-85%</td>
<td>98%</td>
</tr>
<tr>
<td>EUS-FNA in chronic pancreatitis</td>
<td>54-73%</td>
<td>-</td>
</tr>
</tbody>
</table>

Hewitt et al. GIE 2012.

Diagnosis Pancreatic Cancer: EUS

- Should there be a cytologist onsite during EUS-FNA?

- Nondiagnostic cytology lower with rinsing entire sample into Cytolyt without smears

- If no cytologist, FNA 5-7 times

EUS-FNA Pancreas Mass Technique

- **Which needle?**
  - 22 or 25 gauge
  - 25 gauge uncinate
  - ?19 gauge if no cytologist

- **# passes?**
  - 5-7 passes if no cytologist

- **Technique of pass?**
  - Through entire mass
  - Elevator to change trajectory
  - Avoid necrotic areas

- **Suction?**
  - No difference in diagnostic yield
  - 10cc suction
  - If bloody, no suction
  - If nondiagnostic, suction

- **Stylet?**
  - No difference in diagnostic yield

Staging Pancreatic Cancer

**Accuracy locoregional staging**

- CT
- MRI
- EUS

**Accuracy resectability**

- CT
- MRI
- EUS
- CT+EUS

Staging Pancreatic Cancer

- **Resectable**: no metastases, no LN, no tumor contact with vessels
- **Unresectable**: distant metastases, LN outside surgical field, or encasement SMA, celiac trunk, origin common hepatic artery
- **Borderline resectable**: no distant metastases, at most short segment occlusion of veins, abutment SMA or celiac trunk, at most short segment encasement CHA with sparing of origin from celiac

-Tamm et al. Rad Cl N Am 2012-

Staging Pancreatic Cancer

- **T**:
  - T1: tumor only in pancreas, ≤2cm
  - T2: tumor only in pancreas, >2cm
  - T3: tumor beyond pancreas, no involvement of celiac axis, SMA, or portal vein
  - T4: tumor involves celiac axis or SMA

- **N**:
  - N0: no regional LN
  - N1: regional LN
Staging Pancreatic Cancer

- Compared to CT, EUS is:
  - Superior for detection small masses
  - Superior for portal vein invasion
  - Inferior for SMA and SMV involvement

- Compared to CT, MRI is:
  - Probably similar in detecting and staging
Case 4

- 35yo female with GERD not responsive to PPI and underwent EGD.

Case 4

- EUS

- What is differential diagnosis for the lesion?
EUS Differential Diagnosis
Subepithelial Lesions

<table>
<thead>
<tr>
<th>Submucosal lesion</th>
<th>EUS characteristic</th>
</tr>
</thead>
<tbody>
<tr>
<td>GIST</td>
<td>Hypoechoic, 2nd/4th layer</td>
</tr>
<tr>
<td>Lipoma</td>
<td>Hyperechoic, 3rd layer</td>
</tr>
<tr>
<td>Carcinoid</td>
<td>Mildly hypoechoic, 1st, 2nd, 3rd layer</td>
</tr>
<tr>
<td>Cyst</td>
<td>Anechoic, 2nd or 3rd layer</td>
</tr>
<tr>
<td>Pancreatic rest</td>
<td>Hypoechoic or heterogeneous, 2nd, 3rd, 4th layer</td>
</tr>
<tr>
<td>Granular cell tumor</td>
<td>Heterogeneous, 3rd layer</td>
</tr>
</tbody>
</table>

EUS in Subepithelial Lesions

- Distinguish from extrinsic compression 94%
- Diagnose lesion
  - Radial echoendoscope
  - Hi-frequency ultrasound probe for small lesions
- Diagnose malignancy
  - 2 of 3 present: 64% sensitivity, 80% specificity
    - Lesions >3 cm
    - Irregular border
    - LN> 1cm
  - 50% >3cm malignant
Tissue Diagnosis of Subepithelial Lesions

- EUS-FNA
  - Needle: 22 or 25 gauge
  - 19 gauge?
  - # pass: ~5 passes
  - Onsite cytologist
  - Larger (≥2cm) gastric lesions higher diagnostic yield

- Jumbo forcep bite-on-bite: 36% significant bleeding

- EMR

Thickened gastric fold

- Diagnosis difficult

- EUS predictors of malignancy
  - Thickened submucosa, muscularis propria, serosa
  - Ascites, lymph nodes
Case 5

- 45yo female with diabetes admitted with severe RUQ pain.
- Abdominal US: gallstones, thickened gallbladder wall with pericholecystic fluid. CBD is 6mm.
- HIDA: no filling of the gallbladder but excretion into duodenum.
- ALT 100, AST 89, T bili 2, Alk phos 69.

Should pt undergo ERCP?

Risk of CBD Stone

- Low: No risk factors
  - 0-10%
  - Conservative

- Intermediate: Abnormal LFT, Age >55 year, Clinical gallstone pancreatitis
  - 10-50%
  - ?

- High: US: CBD stone OR Bilirubin >4 mg/dL OR US: Dilated CBD AND Bilirubin 1.8-4 mg/dL
  - >50%
  - ERCP

Maple et al. GIE 2010.
Approach to Intermediate Risk

**EUS**
- EUS safer than ERCP
- EUS similar to ERCP for CBD stones ~95%
- 46-60% more invasive tests avoided with EUS
- Limitations MRCP:
  - Lower sensitivity for small stones <6mm
  - 15-20% intrasphincteric CBD not seen on MRCP
- 1yr follow-up negative EUS:
  - 14/238 (5.9%) CBD stone; all presented w/in 1 month
  
  Karakan et al. GIE 2009.

Cost-Effective Approach to CBD Stone?
- **Depends** on risk of CBD stone
  - MRCP always more expensive than EUS

  ![Risk of CBD stone](image.png)

  Buscarini et al. GIE 2003.
CBD Stone

<table>
<thead>
<tr>
<th></th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>20-55%</td>
<td>83%</td>
<td>56%</td>
</tr>
<tr>
<td>Helical CT</td>
<td>40-85%</td>
<td>88-92%</td>
<td>78%</td>
</tr>
<tr>
<td>MRCP</td>
<td>85-91%</td>
<td>93%</td>
<td>92%</td>
</tr>
<tr>
<td>EUS</td>
<td>93%</td>
<td>96%</td>
<td>96%</td>
</tr>
<tr>
<td>ERCP</td>
<td>90-98%</td>
<td>92-98%</td>
<td>-</td>
</tr>
</tbody>
</table>

Case 5

- 45yo female with acute cholecystitis and dilated CBD with minimally elevated LFTs.
- Intermediate risk for CBD stone
- Best next step: EUS
Case 6

- 36yo female with menorrhagia.
- MRI pelvis: fibroid uterus and lobulated pancreatic cystic mass

Case 6

- MRI pancreas with MRCP
Case 6

- Differential diagnosis?
  - Benign
    - Serous cystadenoma
    - Pseudocyst
    - Lymphoepithelial cyst
    - Lymphangioma
  - Premalignant/malignant
    - Mucinous cystic neoplasm
    - IPMN
    - Solid pseudopapillary tumor (SPEN)
    - Neuroendocrine tumor
    - Acinar cell carcinoma
    - Metastases to pancreas (ovarian cystadenocarcinoma)

Serous Cystadenoma

- GRANDMOTHER
  - Multicystic, lobular
  - Rarely unilocular or few septa
  - Occasionally solid-appearing
  - 30% pathognomonic central scar
  - PAS + glycogen-staining cuboidal epithelial cells
Mucinous Cystic Neoplasm

MOTHER

- Ovarian-like stroma
- >95% body-tail
- Smooth, well-defined, unilocular or few septae
- Malignancy:
  - Thick cyst wall
  - Thick septae
  - Mural nodules
  - Calcifications, usually peripheral
  - Size >6cm

IPMN

FATHER

- Ductal mucin-producing cells in papillary patterns

Classifications:

<table>
<thead>
<tr>
<th>Radiology</th>
<th>Histology</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Branched</td>
<td>1. Gastric type</td>
</tr>
<tr>
<td>2. Main duct</td>
<td>2. Intestinal type</td>
</tr>
<tr>
<td>3. Combined type</td>
<td>3. Pancreatobiliary type</td>
</tr>
</tbody>
</table>

Misclassification:
- 20% branch duct actually mixed type
IPMN on Radiology

Segmental or diffuse main PD dilation > 5mm

13% 35% 30-50%

How Accurate Is Morphology?

Not Very

<table>
<thead>
<tr>
<th>Morphology</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDCT and MRI correct diagnosis</td>
<td>40-67%</td>
</tr>
<tr>
<td>MDCT and MRI mucinous vs. nonmucinous</td>
<td>71-84%</td>
</tr>
<tr>
<td>EUS mucinous vs. nonmucinous</td>
<td>51%</td>
</tr>
</tbody>
</table>

- EUS experts: Only fair interobserver agreement (k=0.24) neoplastic vs. nonneoplastic cysts

Morphology: Mural Nodules

- How good are we at detecting mural nodules?
  - Not good: detect 40-60%
  - EUS sensitivity 75%, specificity 83%

Zhong et al. CGH 2011.

Morphology: Mural Nodules

- Mucus
  - Hypoechoic compared to adjacent soft tissue
  - Smooth edged
  - Hyperechoic rim

- Nodule
  - Iso/hyperechoic compared to adjacent soft tissue
  - Irregular border

- Diagnostic accuracy improved 57% to 79% after teaching 3 factors

Zhong et al. CGH 2011.
Case 6

- Patient underwent EUS-FNA
- Cytology nondiagnostic
- CEA <0.2 ng/mL
- Amylase 46.4 U/L
- No k-ras or LOH mutations

Cytology

<table>
<thead>
<tr>
<th>Cytology</th>
<th>Sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mucinous vs. non-mucinous</td>
<td>&lt;50%</td>
</tr>
<tr>
<td>BWH (29) mucinous/malignant vs. benign</td>
<td>28%</td>
</tr>
</tbody>
</table>

- Diagnostic yield appears higher for cystic neuroendocrine and solid pseudopapillary neoplasm (75% accuracy)
- Safe: ~2.2% complication of 603 pts, no surgery
- ASGE recommends prophylactic antibiotics

Maker et al. ASO 2008.
Lee et al. CGH 2005.
Cyst Fluid Analysis

<table>
<thead>
<tr>
<th>Test</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mucinous cyst CEA&gt;192 ng/mL</td>
<td>75%</td>
<td>84%</td>
</tr>
<tr>
<td>Serous or pseudocyst CEA&lt;5 ng/mL</td>
<td>54%</td>
<td>94%</td>
</tr>
<tr>
<td>Excludes pseudocyst Amylase &lt;250 U/L</td>
<td>44%</td>
<td>98%</td>
</tr>
<tr>
<td>Mucinous cyst k-ras mutation</td>
<td>45%</td>
<td>96%</td>
</tr>
<tr>
<td>Malignancy k-ras followed by allelic loss</td>
<td>37%</td>
<td>96%</td>
</tr>
</tbody>
</table>

- High CEA does not distinguish between benign and malignant
- Different measurements of CEA
- Amylase usually lower in MCN than IPMN

Van der Waaij et al. GI& 2005.
Case 6

- Patient underwent EUS-FNA
- Cytology nondiagnostic
- CEA <0.2 ng/mL
- Amylase 46.4 U/L
- No k-ras or LOH mutations
- Most likely serous cystadenoma

Case 6

- Patient underwent distal pancreatectomy
- Pathology: serous cystadenoma
EUS Criteria for CP

- Parenchymal findings
  - Body and/or tail
  - Hyperechoic foci: ≥3, ≥3mm length and width
  - Hyperechoic strands: ≥3, ≥3mm, ≥2 different directions
  - Lobularity: ≥3, ≥5mm structure with hyperechoic rim

Catalano et al. GIE 2009.

- Parenchymal findings
  - Anywhere in pancreas
  - Cysts: ≥2mm
  - Stones >2mm length and width with shadow, at least 3
EUS criteria for CP

- **Ductal findings**
  - Anywhere in PD: Calcification
  - Body and/or tail
  - Dilated main PD: ≥ 3.5mm body, >1.5mm tail
  - Hyperechoic PD walls >50% main PD
  - Irregular main PD margin: uneven and ectatic
  - Dilated side branch: ≥ 3 tubular anechoic structures >1mm width communicating with main PD

Rosemont EUS CP Criteria

**Parenchymal**

- **Major A**
  - Hyperechoic foci with shadowing
- **Major B**
  - Lobularity
    - A. With honeycombing, Contiguous ≥ 3 lobules
    - B. Without honeycombing, Noncontiguous lobules
- **Minor:**
  - Hyperchoic foci without shadowing
  - Cysts
  - Stranding

**Ductal**

- **Major A:**
  - MPD calculi
- **Minor:**
  - Irregular MPD contour
  - Dilated side branches
  - MPD dilation
  - Hyperechoic MPD margin
Rosemont EUS CP Criteria

- **Consistent with CP**
  - 1 major A + ≥ 3 minor features
  - 1 major A + major B feature
  - 2 major A features

- **Suggestive of CP**
  - 1 major A + <3 minor
  - 1 major B + ≥ 3 minor features
  - ≥5 minor features

- **Indeterminate for CP**
  - 3-4 minor features, no major
  - major B alone or with <3 minor

- **Normal**
  - ≤2 minor, no major features

---

Case 7

- 66yo male with newly diagnosed pancreatic cancer undergoing chemotherapy. Ongoing epigastric and back pain despite oxycontin BID with oxycodone q4h for breakthrough pain.

- Options?
Case 7

- Percutaneous celiac plexus neurolysis (CPN)
- Surgical CPN
- EUS-CPN

Celiac Plexus Neurolysis

- Celiac plexus:
  - Pain from pancreas and all abdominal organs except left colon, rectum, pelvic organs
EUS-CPN

- Which needle?  
  No data
  22 gauge

- Where inject?  
  celiac ganglia

- Uni or bilateral?  
  Unilateral ~ bilateral

Levy et al. GIE CI N Am 2012.  
EUS-CPN

- **What inject?**
  1. 10-20cc 0.25% bupivacaine or 10cc 1% lidocaine
  2. 10-20cc 98% alcohol

- **Prophylaxis?**
  1. 500-1000cc NS pre
  2. Monitor 2 hrs post
  3. Cipro x3days (operator dependent)

Ley et al. GIE Cl N Am 2012.

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EUS-CPN

- **How effective?**
  - 58% pain response, recent RCT ~74%
  - 22% complete pain response
  - Nearly all pts on same or higher dose narcotic, recent RCT ~33% decrease pain meds

- **When perform?**
  - Perhaps early

Ley et al. GIE Cl N Am 2012.
Leblanc et al. GIE 2012.
Complications EUS-CPN

- Worse pain up to 48h 9%
- Diarrhea up to few d 4-15%
- Orthostasis 1%
- Bleeding
- Retroperitoneal abscess
- Perforation 0.03-0.07%
- Gastroparesis
- 1 paralysis: unilateral cancer alcohol, ganglia
- (1 death: bilateral CP alcohol)

Fuji et al. Endo 2012.

Case 8

54yo male necrotizing gallstone pancreatitis 5 weeks ago, transiently intubated now on floor with abdominal pain and unable to eat.
Case 8

- What are the management options?
  - Surgical necrosectomy
  - Radiologic percutaneous drain
  - Endoscopic necrosectomy

EUS in Pseudocyst Drainage and Necrosectomy

- Detect blood vessel
- Confirm distance between gastric wall and cyst wall <1cm
- Confirm contents
- EUS changed mgt in 18-37.5%

- RCT EUS vs. non-EUS guided drainage

Antillon et al. GIE 2006.
Varadarajulu et al. GIE 2008.
Endoscopic Necrosectomy

Courtesy Dr. Christopher Thompson, Director Therapeutic Endoscopy at BWH
Endoscopic vs. Surgical Necrosectomy

Serum IL-6 after Necrosectomy

- *p<0.05

Bakker et al. JAMA 2012

Endoscopic vs. Surgical Necrosectomy

- *p<0.05

Bakker et al. JAMA 2012
Potpurri of Interventional EUS

- EUS-guided Etoh pancreas cyst lavage:
  - 33% cyst resolved on f/u CT

- Spot tattoo pancreatic neuroendocrine

EUS-guided Access to Biliary and Pancreatic ducts

- EUS can provide access to biliary and pancreatic ducts when ERCP fails
- Multiple points of access

Dewitt et al. GIE 2009.
Lennon et al. GIE 2010.

EUS-guided Access to Biliary and Pancreatic ducts

Success

- Rendez vous ERCP
- Antegrade
- Crossover

Shah et al. GIE 2011.

EUS-guided Access to Biliary and Pancreatic ducts

- Complication 10.5%
- Major complication 20%
- 8.6% biliary, 16% pancreatic
  - 1 hepatic subcapsular hematoma
  - 1 bile leak
  - 1 infection
  - 1 pneumoperitoneum
  - 4 mild pancreatitis
  - 1 severe pancreatitis - surgery
  - 1 perforation - surgery

Shah et al. GIE 2011.
PANK (Pancreatic Antegrade Needle Knife) Procedure

Conclusions

- EUS/ EUS-FNA key for:
  - Staging luminal cancers and pancreatic cancer
  - Diagnosis of pancreatic cancer, intermediate probability CBD stones

- EUS helpful for subepithelial lesions, thickened gastric wall, chronic pancreatitis, pancreatic cysts

- Therapeutic indications evolving including EUS-guided CPN/CPB, necrosectomy, biliary and pancreatic access