CYSTIC PANCREATIC NEOPLASMS- NEW INSIGHTS

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CYSTIC PANCREATIC TUMORS

CLASSIFICATION

- Pseudocyst
- Serous tumor
- Mucinous tumor
- IPMN
- SPEN
- Simple epithelial cyst
- Cystic islet cell tumors
- Adenocarcinoma with cystic degeneration
- Lymphangioma

90%
SEROUS CYSTADENOMAS

- More common in women
- Older age group > 60 yr.
- Preference for location in head of the pancreas
- Most often incidental - can be symptomatic
- Several types: typical (sponge-pattern and honeycomb) and atypical (unilocular, solid)
SEROUS CYSTADENOMAS

**Common type:**
- Multilocular
- Most often located in head of pancreas
- Lobulated external contour
- Cystic mass with small lacunes or cysts (<2 cm) separated by septae
- May have central scar with ca++ (uncommon)
- Resembles “honey-comb”
- Rarely be hypervascular
MUCINOUS CYSTIC TUMORS

- Arise usually from body/ tail of pancreas - approx. 80%
- Seen in middle aged women
- Large cysts (usually > 2 cm)
- Can be thick walled
- Uni or multilocular
- + or - mural nodules
- Mucosa- intestinal epithelium
MUCINOUS CYSTIC TUMORS
PREDICTORS OF MALIGNANCY
CYSTADENOMA vs. CYSTADENOCARCINOMA

- Wall thickness, septations and calcifications in wall or septa - most useful predictors
- Risk of malignancy with all 3 findings - 0.95
- Thin walled lesions with no calcifications low risk of malignancy 0.13 - can be observed - ? follow-up imaging

*Procacci C et al., Eur Radiol 2001
MUCINOUS CYSTIC TUMORS
UNILOCULAR MUCINOUS TUMOR

IMAGING FINDINGS

• Unilobar mucinous tumor can mimic “pseudocyst”
• Seen as thin walled lesion-no mural nodules or tumor excrescences
• Most often - history of prior or ongoing pancreatitis or imaging findings (duct diln., Ca++ etc.)
• In some cases when no prior history of pancreatitis is obtd. differentiation from ‘pseudocyst” not possible
CYSTIC PANCREATIC LESIONS
CYSTIC NEOPLASMS VS. PSEUDOCYSTS
MR IMAGING FINDINGS

• Evaluate sensitivity and specificity of several morphologic features in cystic pancreatic lesions
• 22 cystic neoplasms and 20 pseudocysts compared
• External morphology, presence of septa, and debris evaluated
• Concordant findings in 95% of cases
  * Macari M et al Radiology 2009
13 of 14 lesions with debris were pseudocysts
1/22 neoplasms also had debris
Microlobulated morphology and septae were more likely to be seen in neoplasms, but these signs did not reach statistical significance
Presence of debris appears to be highly specific MR finding for diagnosis of pseudocysts

* Macari M et al Radiology 2009
INTRADUCTAL PAPILLARY MUCIN-PRODUCING TUMORS [IPMT]

- Separate entity from mucinous cystic tumors
- Seen more commonly in middle aged men (60-70 yrs)
- Symptoms and imaging appearance can mimic pancreatitis
- Diagnosis at times made late
INTRADUCTAL PAPILLARY MUCinous PRODUCING TUMORS [IPMT]

- Tumor can involve:
  - main pancreatic duct - main duct type
  - side branches - side branch or branch duct type
  - or both - combined type
IPMT-Main Duct Type

IPMT-Side Branch Type

Procacci C Radiographics 1999

IPMT-Combined Type
INTRADUCTAL PAPILLARY MUCIN PRODUCING TUMORS

MAIN DUCT TYPE

CT/ MR

- Pancreatic atrophy
- Dilated MPD - massive dilatation can be seen
- Intraductal filling defects due to mucin or tumor
- May be associated with side branch involvement
- Aggressive frank carcinomas seen more often than in side branch variety
INTRADUCTAL PAPILLARY MUCINOUS PRODUCING TUMORS
MAIN DUCT TYPE
ERCP

• Dilated MPD
• Intraductal filling defects due to - mucin or tumor
• Bulging patulous papilla
• Outpouring of mucin
INTRADUCTAL PAPILLARY MUCIN-PRODUCING TUMORS
SIDE BRANCH TYPE - CT/ MR

- Cystic lobulated mass
- May have septae
- Can be located anywhere
- Can overlap appearance of serous tumor
- Communication with PD established with ERCP/ MRCP/ CPR - MDCT can be diagnostic
- ERCP: “cluster-of grapes” appearance
INTRADUCTAL PAPILLARY MUCIN-PRODUCING TUMORS
SIDE BRANCH VS. MAIN DUCT TUMORS

• 145 IPMN’s resected and analyzed
• Branch duct tumors less aggressive than main duct tumors
• Findings associated with malignancy were: thick walled cysts, presence of nodules and cyst size larger than 3 cm, presence of symptoms
• 5 year-disease specific survival for noninvasive IPMN was 100% vs. 63% for those with invasive cancer

* Rodriguez JR Gastroenterology 2007
INTRADUCTAL PAPILLARY MUCIN-PRODUCING TUMORS
SURGICAL MANAGEMENT

• 208 pts 168 partial and 40 total pancreatectomy
• 88 adenoma with borderline malignancy, 19 in-situ carcinoma, and 63 invasive carcinoma
• Incidence of carcinoma 64% in main duct tumors and <20% in side branch tumors
• 5 yr. survival with non-invasive IPMN was 94% as compared to 31% in invasive carcinoma

* Schnelldorfer T Arch Surg 2008
INTRADUCTAL PAPILLARY MUCIN-PRODUCING TUMORS
DIFFERENTIATION FROM OTHER TUMORS

- 53 pts. with path proven cystic pancreatic lesions and had CT and MRI reviewed by 2 readers
- Morphology analyzed and assigned confidence levels for differentiating IPMN’s from other lesions
- Confidence levels compared using ROC analysis

* Song SJ JMRI 2007
For predicting ductal communication it was 0.95 and 0.91 for readers I and II for MRI as compared to 0.79 and 0.77 for CT

For predicting differentiating from other cystic lesions, it was 0.99 and 0.93 for readers I and II for MRI as compared to 0.88 and 0.85 for CT

MRI superior to CT in differentiating IPMN’s from other pancreatic cystic lesions

* Song SJ JMRI 2007
Symptomatic patients with pancreatic cystic lesions need to be explored surgically.

All main duct and combined type IPMN’s are to be resected.

Side branch IPMN’s > 3 cms in size or with cysts features such as mural nodules and or wall thickening should undergo resection.

All mucinous cystic neoplasms should be resected.

Follow up for unresected side branch IPMN’s:
- < 10 mm - annual
- 10-20 mm - 6-12 months
- > 20 mm - 3-6 months

* Tanaka M Pancreatology 2006
International Consensus Guidelines for The Management of IPMN’s and Mucinous Cystic Pancreatic Tumors

• Mucinous tumors must have “ovarian-type” epithelium- distinguishes them from IPMN
• All mucinous tumors must be resected
• All main duct and mixed type tumors should be resected in good surgical candidates
• Symptomatic side branch tumors and those > 3cms, and with mural nodules and main duct dilatation [> 6mm] should be resected- higher likelihood of malignancy

* Tanaka M Pancreatology 2006
Asymptomatic side branch tumors, <3 cms in size, with no mural nodules or main duct dilatation can be observed.

- If lesion < 1 cms, yearly f/u
- If lesion is between 1 and 2 cms, 6-12 month f/u and for lesions > 2 cms, 3-6 month f/u
- Interval of follow-up can be lengthened after 2 years of stability

* Tanaka M et al Pancreatolog 2006
SOLID PSEUDOPAPILLARY EPITHELIAL NEOPLASMS

- Usually affects young women (mean age 25-30 yr.)
- Also been referred to as “solid and cystic epithelial” neoplasms
- Tumors are considered a low-grade malignancy
- Can involve any portion of the pancreas
- Can be predominantly cystic or solid or may have a mixture of components
- Hemorrhage and fluid-fluid levels common
CHARACTERIZATION OF CYSTIC NEOPLASMS - MUCINOUS vs. SEROUS

- Accurate characterization possible in only 60% of neoplasms
- Serous tumors more often accurately characterized than mucinous tumors
- Tumors misdiagnosed due to overlapping appearance

* C Procacci et al. J Comput Asst Tomog 1999
* Horton KA et al. AJR 2000
CYSTIC PANCREATIC LESIONS
IS CT AN ACCURATE PREDICTOR OF MALIG NANT POTENTIAL?

- 48 lesions analyzed by 2 readers
- Accuracy based on CT findings alone (benign or malignant) was 61%
- When combined with clinical and imaging data accuracy improved to 90%
- Malignancy prediction with CT features alone is inaccurate

* Fisher WE et al. HPB 2008
# Tumor Markers in Cyst Fluid in the Differential Diagnosis of Cystic Lesions of the Pancreas

<table>
<thead>
<tr>
<th>Biomarker</th>
<th>Serous Cystadenoma</th>
<th>Mucinous Cystic Neoplasm</th>
<th>Intraductal Papillary Mucinous Neoplasms</th>
<th>Pseudocyst</th>
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<tbody>
<tr>
<td>CEA</td>
<td>Low</td>
<td>High</td>
<td>High</td>
<td>Low but variable</td>
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<tr>
<td>CA 19-9</td>
<td>Variable</td>
<td>Variable</td>
<td>Variable</td>
<td>Variable</td>
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<tr>
<td>Amylase</td>
<td>Low</td>
<td>Low</td>
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DIAGNOSIS OF CYSTIC PANCREATIC NEOPLASMS: REPORT OF THE COOPERATIVE PANCREATIC CYST STUDY

- 341 patients - EUS, FNA/ fluid analysis
- 112 had surgical proof
- 68 mucinous (52 mucinous, 16 IPMN’s), 7 serous, 27 inflammatory, 5 endocrine, 5 other
- ROC analysis of various tumor markers (CEA, CA19-9, CA125, CA72-4, CA15-3)
- CEA -> 192 ng/mL best predictor for mucinous tumors
- Area under curve 0.79 for separating mucinous from nonmucinous cystic lesions

* Brugge WR et al Gastroenterology 2004
CYSTIC PANCREATIC LESIONS
Incidental lesion = or < 3 cms

• How is it Managed?
• What is the role of additional imaging?
• What should be done? - Follow up or surgery?
CYSTIC PANCREATIC LESIONS

Risk of malignancy in lesions < 3 cm: Is it safe to observe asymptomatic patients?

- Multi-institutional study of 166 cases evaluated between 1998-2006
- 135 benign: 31 malignant
- 93.4% of these were benign lesions
- Incidence of malignancy in small < 3 cms benign appearing lesions was 3.3%
- Male pts., older pts and symptomatic patients were more likely to have malignant tumors
- Imaging features favoring malignancy were: solid component, bile duct and pancreatic duct dilation and enlarged lymph nodes
- Patients with small cystic lesions (< 3 cms), who have low risk of malignancy can be observed and resection undertaken in select group of these patients

* Lee CJ J Gastrointest Surg 2008*
CYSTIC PANCREATIC LESIONS
< 3 cm cysts: How aggressive should management be?

• 86 pts studied
• Surgery or EUS guided cyst fluid analysis, cytology and follow up imaging
• 75/86 lesions were benign
• 36 cysts were unilocular- 35 benign
• Presence of septa associated with borderline or in situ malignancy in 20%
• 13% of small cysts were of aggressive histology

* Sahani DV et al Radiology 2006
CYSTIC PANCREATIC LESIONS
MANAGEMENT

- If patient is symptomatic- surgical resection (irrespective of tumor morphology)
- Young patient- indeterminate lesion- surgery
- Other indications for surgical resection:
  - Diagnostic uncertainty-> 3 cms, nodules, wall thickening or septae
  - Pt. fear of malignant degeneration
- Elderly patient with comorbidities - high risk patient- if possible conservative management
- Weigh the risk of surgery vs. risk of malignancy
- Observe < 3 cms asymptomatic cysts with no features of overt malignancy