Imaging Pancreatic Cancer
Focus on Intraductal Papillary Mucinous Tumor

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Mr. P’s presentation

Mr. P is a 65 year-old gentleman with a 10 year history of chronic pancreatitis and a more recent diagnosis of diabetes mellitus who presented with left-sided flank pain that radiated to the lower abdomen. He complained of several days of nausea and vomiting.
Presentation continued

Mr. P’s symptoms were thought to be due to a renal or ureteral calculus and he received a CT scan for further work-up. His initial studies were done at an outside hospital and were unavailable. His scan may have looked similar to the following.
CT scan with contrast

Mass in pancreatic head
Causing a dilated pancreatic duct

Stomach w/ oral contrast
Anatomy, Antatomie, Anatomia

Anatomy

www.yahooligans.com/reference/gray/fig/1098.html

Uncinate Process (behind sma and smv)
Uncinate process

The uncinate is that part of the head that wraps behind the SMA and SMV. 

Vasculature

Aorta

Celiac Trunk

Splenic Artery

Portal vein

Splenic vein

Inferior mesenteric vein

mywebpages.comcast.net/wnor/pancreas.htm
Splenic Vein

Portal vein

Splenic vein

Pancreas body
Pancreatic Ducts

- Major pancreatic duct
- Accessory duct
- Common bile duct
- Minor papilla
- Major papilla
- Duodenum

mywebpages.comcast.net/wnor/pancreas.htm
Cross-sectional anatomy at T12

Cross sectional anatomy at T12

Cross sectional anatomy at T12-L1

Cross sectional anatomy L1-L2

Cross sectional anatomy at L2

ERCP – diagnostic procedure (biopsy obtained)

MRCP showing dilated and irregular distal pancreatic duct (Patent common bile duct)
Histology of ERCP biopsy specimen
Intraductal papillary mucinous tumor

Feldman: Sleisenger & Fordtran's Gastrointestinal and Liver Disease, 7th ed


Papillary villous projections extending into the lumen of a pancreatic duct
Note the motion artifact

Dilated main duct and multiple small cystic structures in head of pancreas

T₁ weighted image with fat suppression
MRCP with hyperintense pancreatobiliary system
Large mass in head of pancreas
MRCP coronal section

Pancreatic duct and cysts

Duodenum

BIDMC PACS
Uncinate
Differential Diagnosis
(Cystic lesions of the pancreas)

• Pseudocysts
  – 10% incidence with acute pancreatitis
  – Chronic pancreatitis
    • Acute exacerbation
    • Progressive obstruction due to stricture and/or protein plugging
  – Trauma

• Retention cysts

• Neoplasms
  – Serous cystadenoma
  – Mucinous cystadenocarcinoma
  – Ductal adenocarcinoma
  – Papillary cystic tumors
  – Rare entities – sarcoma, teratoma, cystic islet cell tumor, lymphangioma
Intraductal papillary mucinous tumor of the pancreas

- **IPMT** – first described by Ohhashi in 1982 who made a distinction between this tumor and the more common mucinous cystic neoplasm
- World Health Organization classification in 1996
- Cystic neoplasms of the pancreas are not common
  - 10% of pancreatic cysts
  - 5% of pancreatic neoplasms
- Slow growing tumor of head and uncinate process of pancreas
  - Prognosis better due to location and growth rate

IPMT features

• Where? Head and uncinate process of pancreas
• Who? Older men (60-70)
  – Mucinous cystadenocarcinoma more common in young women
• How? Obstructive pancreatitis, pancreatic insufficiency, pain and weight loss (biliary obstruction less common)
  – Recurrent pancreatitis 25% (patients lack EtOH history)
• Associations - Diabetes mellitus in 50-75 % pts.
• Prognosis – 3 year survival 55-76% if malignancy present

Imaging the Pancreas

– Plain Film
– Computed Tomography
– Magnetic Resonance Imaging
– Magnetic Resonance Cholangiopancreatography
– Endoscopic Retrograde Cholangiopancreatography
– Ultrasound
  • Endoscopic
  • Intraductal (experimental)
– Positron Emission Tomography (experimental)
CT +/- contrast

• Standard abdominal CT vs. pancreas protocol scan
• Multiple phase study necessary
  – Arterial, venous and parenchymal phases
  – Multirow detector scanner have highest sensitivity
• Tumors enhance less than normal parenchyma
• Role of 3-dimensional reconstruction
  – Visualization of ducts
  – Vasculature
• Weaknesses
  – Micrometastatic spread to liver
  – Lymph node involvement

Encasement of celiac trunk

Vascular involvement is almost an absolute contraindication to resection
MRI

- Pre-operative staging performed with MRI or CT scanning
- $T_1$ weighted images with fat suppression ideal for pancreatic parenchyma
- MRCP obtained at the same time
MRCP

- MRCP – demonstrate the cystic lesions of IPMT
  - Not uncomfortable for the patients
  - Preoperative staging and postoperative follow-up
  - Findings in malignancy
    - Main Duct Tumor – dilation of Main Duct > 15 mm suggests malignancy
    - Branch Duct Tumor – Cystic dilation >30 mm suggests malignancy, multiple small cystic lesions (“cluster of grapes”)
  - Mural nodules vs. mucin globs

ERCP

- ERCP findings
  - Invasive vs. noninvasive lesions
  - Branch and main duct tumors
  - Mucinous secretion through Ampulla of Vater
  - Biopsy
  - Therapeutic procedures (protein plug removal)
  - Disadvantages compared to MRCP
    - Safety
    - Operator dependency
    - Inferior sensitivity and specificity?
Endoscopic ultrasound

- EUS findings in IPMT
  - Main and branch duct tumor findings
  - Staging
- Invasive vs. noninvasive disease
- IPMT vs. chronic pancreatitis

Conclusion

• Role of imaging in pancreatic cancer
  – Determine which pts. are not eligible for surgical intervention. Surgeries are wrought with morbidity and mortality and deciding when to pursue palliative care is crucial.
    • Vascular involvement
    • Metastatic disease to liver and other adjacent organs

• IPMT
  – Main duct vs. Branch Duct
  – Good prognosis

• Differences among imaging modalities
  – Institution and surgeon dependent
  – Given seriousness of surgical resection a combination of studies is not unreasonable
References

References cont.


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