Radiological Analysis of Cystic lesions of the Pancreas

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Agenda

- Background
- Anatomy and histology
- Radiological workup of a cyst in the pancreas
- Patient presentations
- Summary
Background

- 2.2-2.4% of all cancers are pancreatic
- 4.7-5.5% deaths from pancreatic cancer
- 5-10% of all pancreatic neoplasms are of the cystic variety

The Pancreas: Anatomy

“Here lies the fickle romance of the abdomen; the pancreas lies with her head in the arms of the duodenum while her feet tickle the spleen.”

–NJ Mizeres
The Pancreas: Anatomy

- Retroperitoneal
- “Hidden”
- Virtually impossible to palpate
- Radiographic studies allow greater visualization and understanding of disease of the pancreas
The Pancreas: Ductal Anatomy

- Pancreatic ductal system forms from dorsal and ventral buds
- Wirsung and Santorini named after fusion
- Failure of fusion results in Pancreas divisum, which increases susceptibility to pancreatitis

Plate 279 Netter’s Atlas of Human Anatomy
The Pancreas: Ductal Anatomy

- 2.5-3L of alkaline fluid daily
- Ave 15 cm in length
- Apposed to duodenum, stomach, spleen, great vessels
The Pancreas: Histology

- Large reservoir of both endocrine and exocrine function.
- Disease becomes symptomatic only when severe impairment occurs.
- 85% exocrine

Gartner, LP, Hiat, JL, Color Atlas of Histology
Cystic lesions of the Pancreas

- Retention Cysts
- Pseudocysts
- Cystic Neoplasms
Cystic lesions of the Pancreas

- Retention Cysts: No clinical significance. Small, developmental, fluid filled, lined by normal duct or acinar cells.
- Pseudocysts
- Cystic Neoplasms
Cystic lesions of the Pancreas

This fifteen minute presentation focuses on cystic pancreatic neoplasms with a brief discussion of pancreatic pseudocysts. For further discussion of general cystic lesions and a more encompassing differential, please refer to the reference section.
Cystic lesions of the Pancreas: Pseudocyst

Pseudocysts

- secondary to inflammation and necrosis
- located within or outside the pancreas
- Lining contains fibrous and granulation tissue
- Lack of epithelial lining
- Present >6wks

from ACR teaching files
Cystic lesions of the Pancreas: Pseudocyst

Pseudocysts

- Pyloric Antrum
- Remarkably distended C-loop of duodenum
- Large Mass → CT for further evaluation

from ACR teaching files
Cystic lesions of the Pancreas: Pseudocyst

Pseudocysts

• Secondary to pancreatitis
• Variable size
• Located within or outside the pancreas
• Present >6 wks

John Kruskal, M.D, Ph.D, uptodate.com
Cystic Neoplasms of the Pancreas

- **Serous**: Microcystic
  - Cystadenoma/ cystadenocarcinoma

- **Mucinous**: Macrocystic
  - Cystadenoma/ cystadenocarcinoma
  - Intraductal papillary mucinous tumor (IPMT)

- **Zebras**
Survey of 9 Patients with Cystic Disease

- 7/9 cystic lesions were incidental findings
  - 4/9 MRI
  - 2/9 US
  - 1/9 CT
- 2/9 lesions in pancreas were suspected from patients’ history

Work-up of an incidental cyst

Cyst found incidentally

Focused Radiological Study

- CT
- US
- ERCP
- MRI
Work-up of an incidental cyst

Cyst found incidentally

- CT provides density of differentiation of intraductal and cystic spaces
- Septa may be appreciated with contrast enhancement
- Sensitive to Ca+ → can detect pathognomonic stellate calcific lesion of serous cystadenoma
- Allows for non-invasive CT follow-up
Work-up of an incidental cyst

Cyst found incidentally

Focused Radiological Study

Ultra Sound
- Non-invasive
- More sensitive for finding septa than CT
- Often used for follow up of pseudocyst
- US guided biopsy
- Fast, cheap
- Operator dependent
Work-up of an incidental cyst

Cyst found incidentally

ERCP
• clarifies non-specific findings
• Visualize filling defects
• Observe mucinous extrusions from ampulla of Vater in cases of IPMT
• Allows sampling of ductal lining cells
• Risk of pancreatitis

Focused Radiological Study
Work-up of an incidental cyst

Cyst found incidentally

Focused Radiological Study

- MRI
- Non-invasive
- Better display of subtle abnormalities- of complex cystic masses, cavities, septae, and nodules
- MRCP may be able to replace ERCP in the future
Work-up of an incidental cyst

- Cyst found incidentally
- Focused Radiological Study
  - Fluid Aspiration/Tissue Biopsy
    - Fluid thin and watery
    - Multiple small or microcysts
    - Enzyme rich
      - Hx-recent pancreatitis
    - Mucinous aspirate
    - One or macrocystic spaces
- DDX
Serous Cystadenoma/ Cystadenocarcinoma

- Second most common cystic tumor of the pancreas
- Middle aged women
- Equal distribution throughout the pancreas
- Mass may be quite large and produce symptoms from organ displacement.
- Microcystic: Many small cysts lined by glycogen-rich cells
- Lining is often denuded
- Low malignant potential
Patient KS

- 65 y/o female with epigastric pain, nausea, and vomiting.
Abdominal Plain Film
Patient KS

- Stellate calcification
- Possibly renal
- Possibly pancreatic
- CT for further eval.

Courtesy: Dr. H. Gramm
Computational Tomography (CT) of the Abdomen
Patient KS

- Stellate calcification in pancreas
- Tiny cysts in a large multilobulated mass lesion
- Some cysts are confluent

Courtesy: Dr. H. Gramm
Reconstruction CT of the Abdomen
Patient KS

- Symptoms from mass effect → impingement on stomach and duodenum
Correlation of KUB to CT Patient KS

Serous Cystadenoma Microcystic

Courtesy: Dr. H. Gramm
Radiological Parameters of Serous Cystadenoma

At least 4-6 cm

If multiloculated contains no more than 6 loculations each less than 2cm

Highly vascular on angio

Lined with evenly spaced, flat, cuboidal to polygonal cells

Cyst contains abundant glycogen

Serous Cystadenoma Microcystic

Courtesy: Dr. H. Gramm
Correlation of KUB to CT
Patient KS

Serous Cystadenoma
Microcystic

Courtesy: Dr. H. Gramm
Mucinous Cystadenoma/Cystadenocarcinoma

• Most common cystic neoplasm of the pancreas
• Typically affects middle aged women
• Occurs in body or tail of pancreas
• Presents with a mass lesion composed of one or more macrocytic spaces
• Lined by mucous secreting cells
• Lining is often denuded (hence difficult to make diagnosis even with pathology)
• High malignant potential
• Most are malignant at time of diagnosis
Patient MG

- 45 y/o woman with abdominal pain
Single Contrast Barium Study
Patient MG

- Impressive displacement of Small Bowel to RLQ

CT for follow up Eval.

* Body of Stomach
* Antrum of stomach

{Image of radiograph with annotations}

Courtesy: Dr. H. Gramm
Abdominal CT
Patient MG

* unilocular cyst
No septa!

• Thin rim

• No fat stranding in surroundings

Courtesy: Dr. H. Gramm
Correlation of Single-contrast Ba and CT

Patient MG

Mucinous cystadenoma
Macrocystic

Courtesy: Dr. H. Gramm
Gross Pathology
Patient MG

From: www.uptodate.com

Mucinous cystadenoma
Macrocystic

Courtesy: Dr. H. Gramm
Intraductal Papillary Mucinous Tumor (IPMT)

- “mucinous duct ectasia”
- Dilated ductal segments usually within the head of the pancreas
- Hyperplasia and dysplasia of mucin producing columnar epithelium.
- Formation of papillary projections may either protrude into pancreatic duct or remain in branch ducts
- Duct obstruction from mucin plug or compression from cystic mass
- High malignant potential
- More common in elderly men
- Can have thick mucous extruding from ampulla of Vater
- Patients can present with repeat episodes of pancreatitis
Patient JT

- 45 y/o male with abdominal pain
Computational Tomography (CT) of the Abdomen

Patient JT

Pancreas
Cyst
Dilated duct of Wirsung communicates with cyst
Lumen of duodenum

Courtesy: Dr. H. Gramm
Endoscopic Retrograde Cholangiopancreatography
Patient JT

Reveals Cyst
Filling defects
Typically can obs. Mucin extruding from Papilla of Vater

Courtesy: Dr. H. Gramm
Correlation of (ERCP) with CT
Patient JT

IPMT-Main Type

Courtesy: Dr. H. Gramm
Radiological Parameters for IPMT

IPMT-Main Type

Malignancy Highly Suspected:
Filling defects Diffuse main duct dil > 15mm
Side branch > 3 cm

Courtesy: Dr. H. Gramm
IPMT Variants

Main Type

- Main pancreatic duct +/- side branch involvement → consider resection

Side Branch Type

- Side branch involvement only → if lesion is less than 2.5 cm → follow up with MRI
T1 W MRI
Side Branch Variant

Courtesy: Dr. M. Morrin
T1 W MRI
Side Branch Variant

* Liver
* IVC
* Aorta
* SMA

Pancreas

(fat bright; fluid dark)

Courtesy: Dr. M. Morrin
Ultrasound Side Branch Variant

- Cysts on side branches
- Not communicating with main pancreatic duct

Courtesy: Dr. M. Morrin
Mucin Producing Zebras of the Pancreas

Rare cystic neoplasms also included in differential:
• Papillary Cystic Tumor of the pancreas
• Cystic Islet Cell tumor
• Pancreatic Sarcoma
• Pancreatic Cysts associated with
  • Von Hippel-Lindau

Very Rare
• Cystic teratoma (very rare)
• Enteric cyst of the pancreas (very rare)
• Lymphoepithelial cysts
• Cystic lymphangioma
Cystic lesions of the Pancreas: Summary

Pseudocysts

Cystic Neoplasms:
- Serous cystadenoma
- Mucinous Cystadenoma/cystadenocarcinoma
- Intraductal papillary mucinous tumor

Imaging Modalities
References

• Steer, MJ. Cystic Lesions of the Pancreas, June 11, 2002 (last updated)
• www.uptodate.com
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