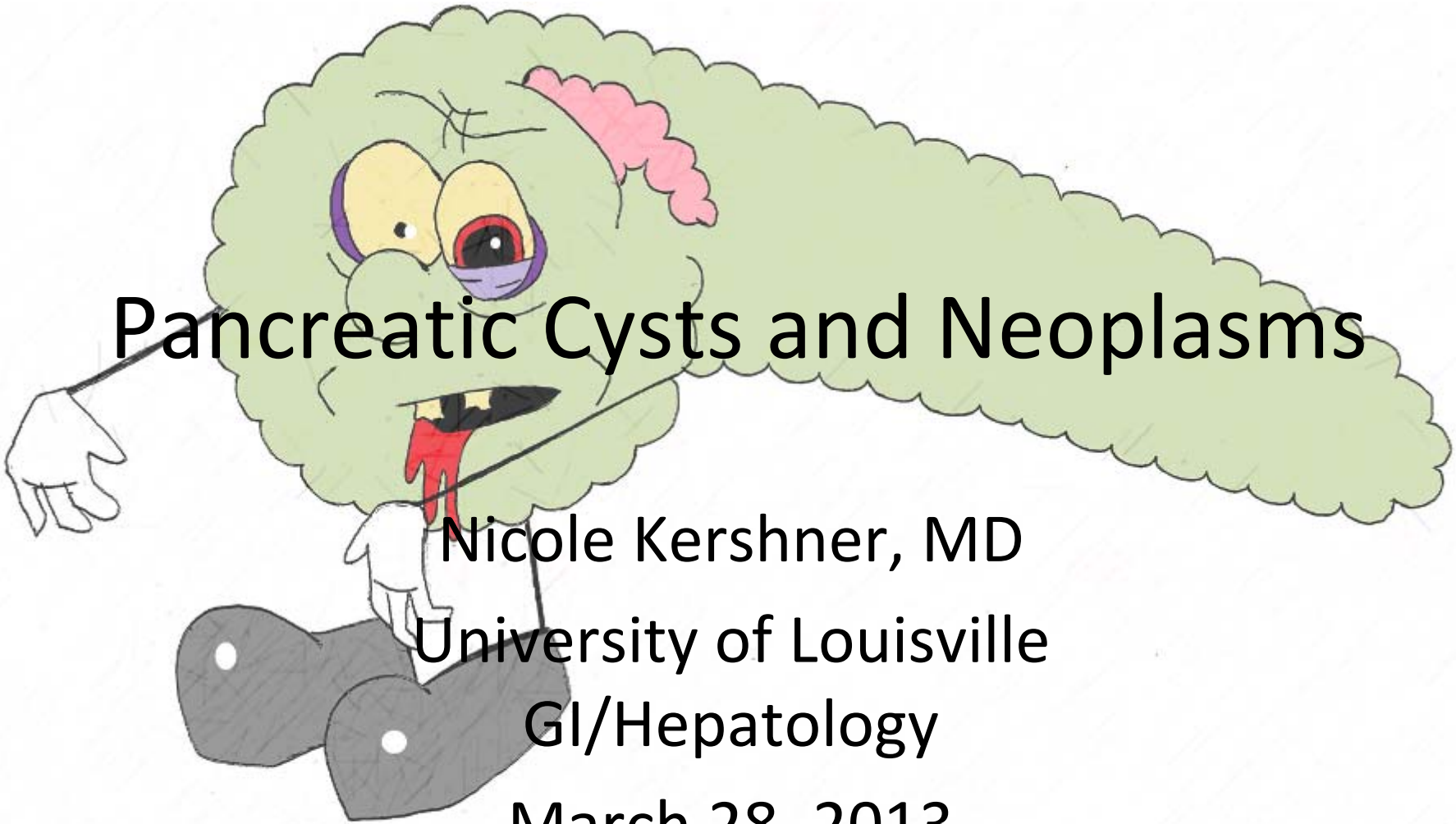

Pancreatic Cysts and Neoplasms

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GI/Hepatology

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Objectives

- Differential diagnosis of Pancreatic Cysts
- Discuss radiographic, endoscopic, and diagnostic imaging techniques
- Discuss key pathologic findings
- Review guidelines for management
- Discuss pancreatic adenocarcinoma and endocrine tumors

Differential Diagnosis of Pancreatic Cysts

- Pseudocysts
- Non-Neoplastic Pancreatic Cysts
  - true cysts, retention cysts, mucinous non-neoplastic cysts, and lymphoepithelial cysts
- Pancreatic Cystic Neoplasms
  - Serous Cystadenomas (SCAs), Mucinous Cystic Neoplasms (MCNs), Intraductal Papillary Mucinous Neoplasms (IPMNs), Solid Pseudopapillary Neoplasms (SPNs)
- Pancreatic Adenocarcinoma
- Pancreatic Endocrine Neoplasms

Diagnostic Imaging

- Helical CT with IV contrast
- PET/CT
- MRCP
- ERCP
- Pancreatoscopy
- EUS with fine needle aspiration

Goal of Evaluation

- Increasing frequency of diagnosis because of widespread use to imaging. Most cysts are detected incidentally.
- Critical decision is deciding which neoplasms need resection and which don’t

Quick Sonographic Terminology

- Echogenic or hyperechoic = BRIGHT
- Echopenic or hypoechoic = DARK
- Anechoic = BLACK
- Homogeneous = Uniform echoes
- Heterogeneous = Non-uniform echoes

Pancreatic Pseudocysts

- A collection of pancreatic juices extravasated from the ductal system due to pancreatic inflammation, obstruction, and necrosis
- 15-30% of pancreatic cysts overall
  - 50% of pancreatic cysts in patients with history of pancreatitis
- Characteristics:
  - Lined by fibrous tissue and granulation tissue instead of an epithelial lining…hence, the term “pseudo”

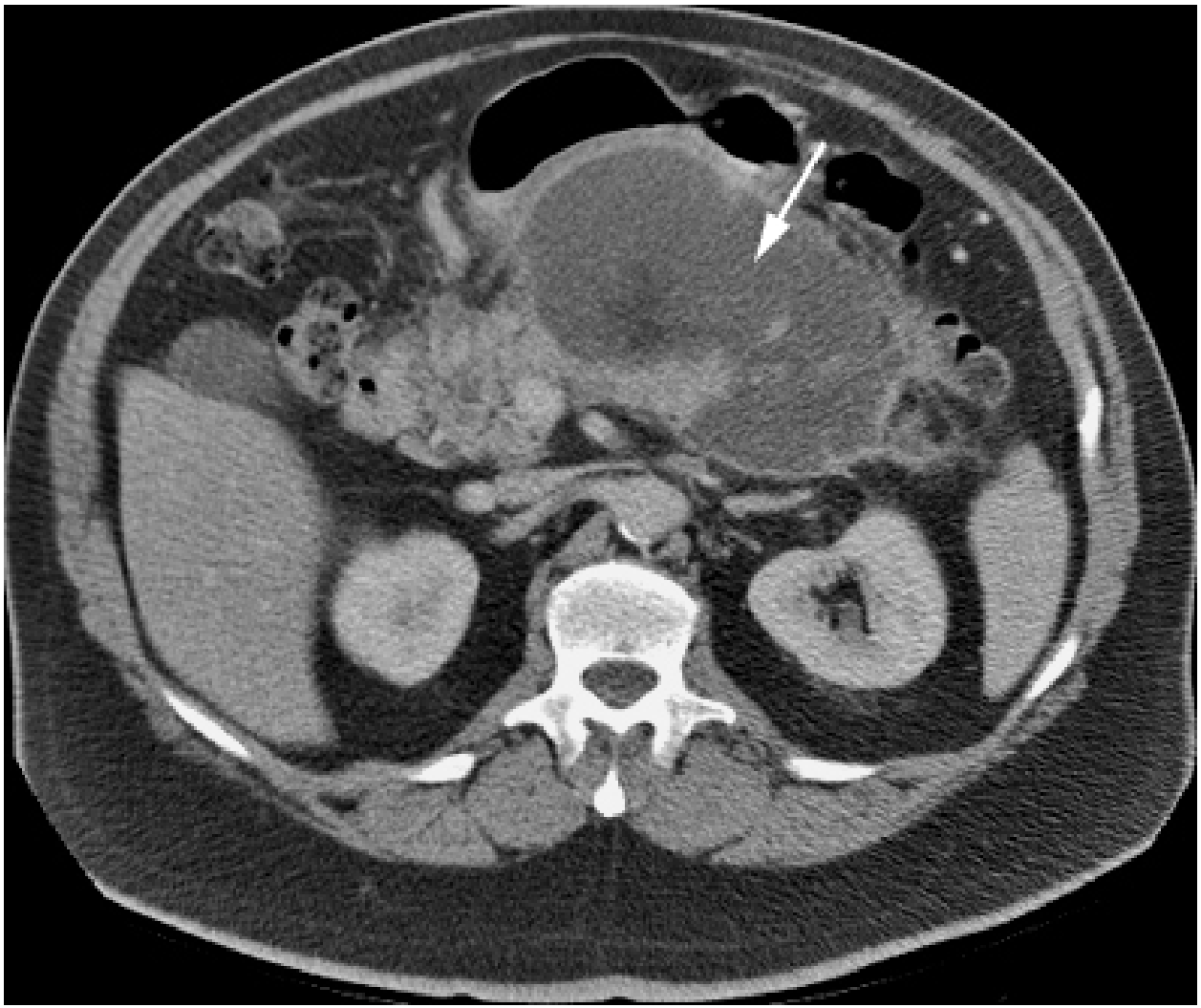
Imaging Characteristics

- May be single or multiple, small or large, within or outside the pancreas
- No septa, loculations, solid components, or wall calcifications
- Hypovascular
- Most communicate with the pancreatic ductal system and contain high concentrations of digestive enzymes
- EUS: Anechoic, thick wall (>3mm), parenchymal abnormalities suggestive of chronic pancreatitis

Management

- Most resolve spontaneously with supportive care (typically within 6 weeks)
- Larger cysts are more likely to be symptomatic or cause complications (infections, gastric outlet obstruction, bleeding)
- Drainage via:
  - Endoscopy (transmural or transpapillary drainage, transpapillary stenting)
  - Percutaneous catheter
  - Surgery

Pancreatic Pseudocyst in patient with history of recurrent pancreatitis



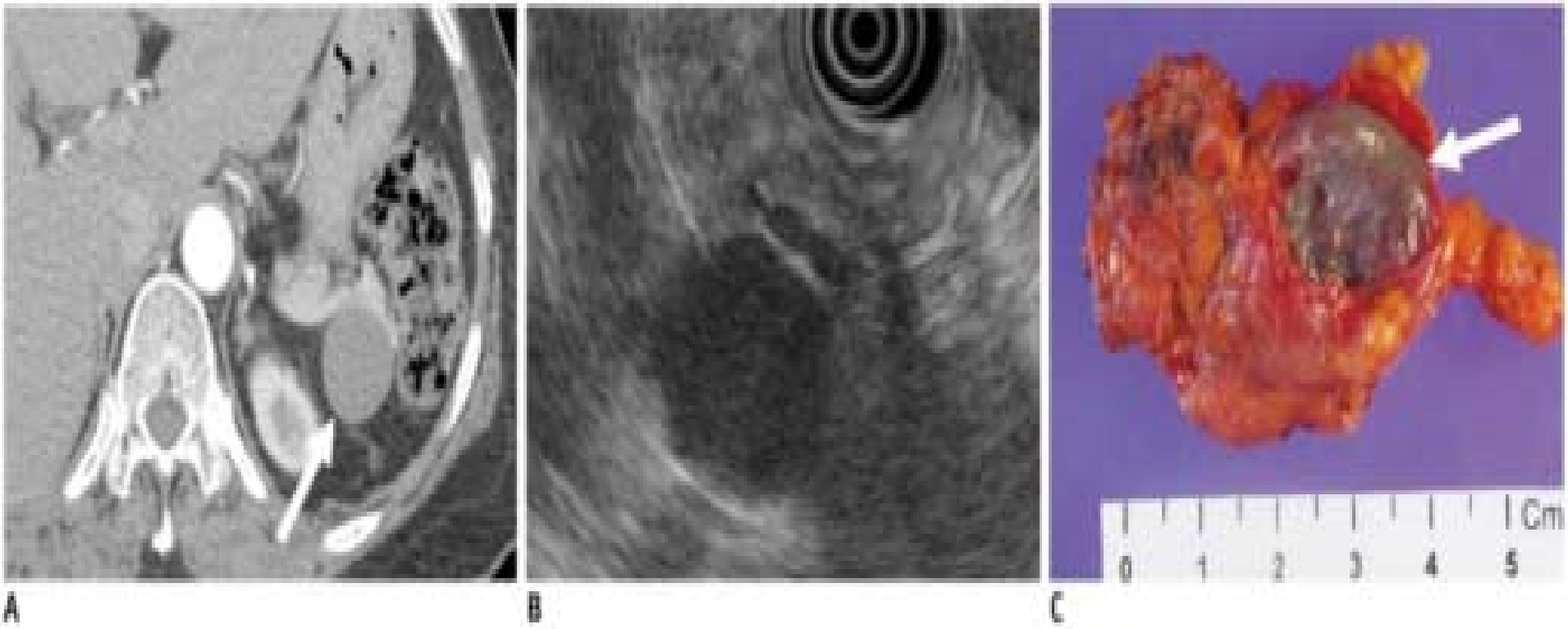
Non-Neoplastic Pancreatic Cysts

- True Cysts
  - Few cases of “benign epithelial cysts” of the pancreas
  - Have a cuboidal epithelial lining
  - Unclear natural history
- Retention Cysts:
  - Small dilated pancreatic duct side branches arising secondary to obstruction
- Mucinous non-neoplastic cysts:
  - Only recently described and difficult to differentiate from PCNs
  - Like PCNS, they are lined with mucinous lining, but lack neoplastic features or ductal communication

Lymphoepithelial Cysts

- Rare and benign
- Typically asymptomatic and found mostly in men
- Characteristics: Mature keratinizing squamous epithelium surrounded by a distinct layer of lymphoid tissue
- Imaging:
  - EUS – can be cystic, solid, or mixed appearing, hyperechoic areas within the cyst

- FNA - epithelial cells and small, mature lymphocytes in a background of keratinaceous debris, anucleate squamous cells, and multinucleated histiocytes
- Resect if symptomatic



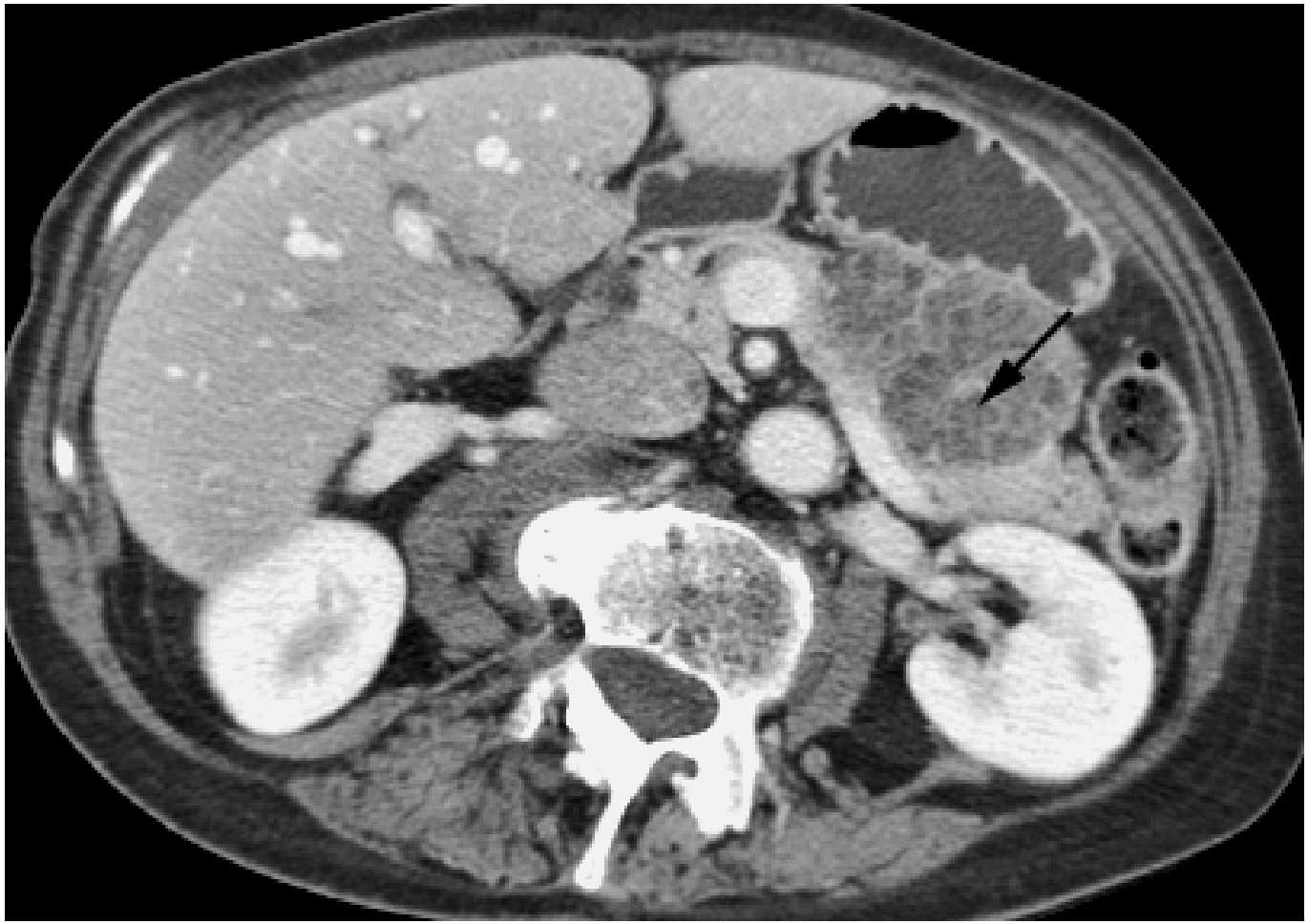
A. Transverse contrast enhanced CT image during arterial phase shows unilocular cystic lesion in tail of pancreas (white arrow). B. Endoscopic US image shows homogeneous echoic cystic lesion. C. Surgical specimen shows round tumor with surrounding fibrous capsule (white arrow).

Serous Cystadenomas

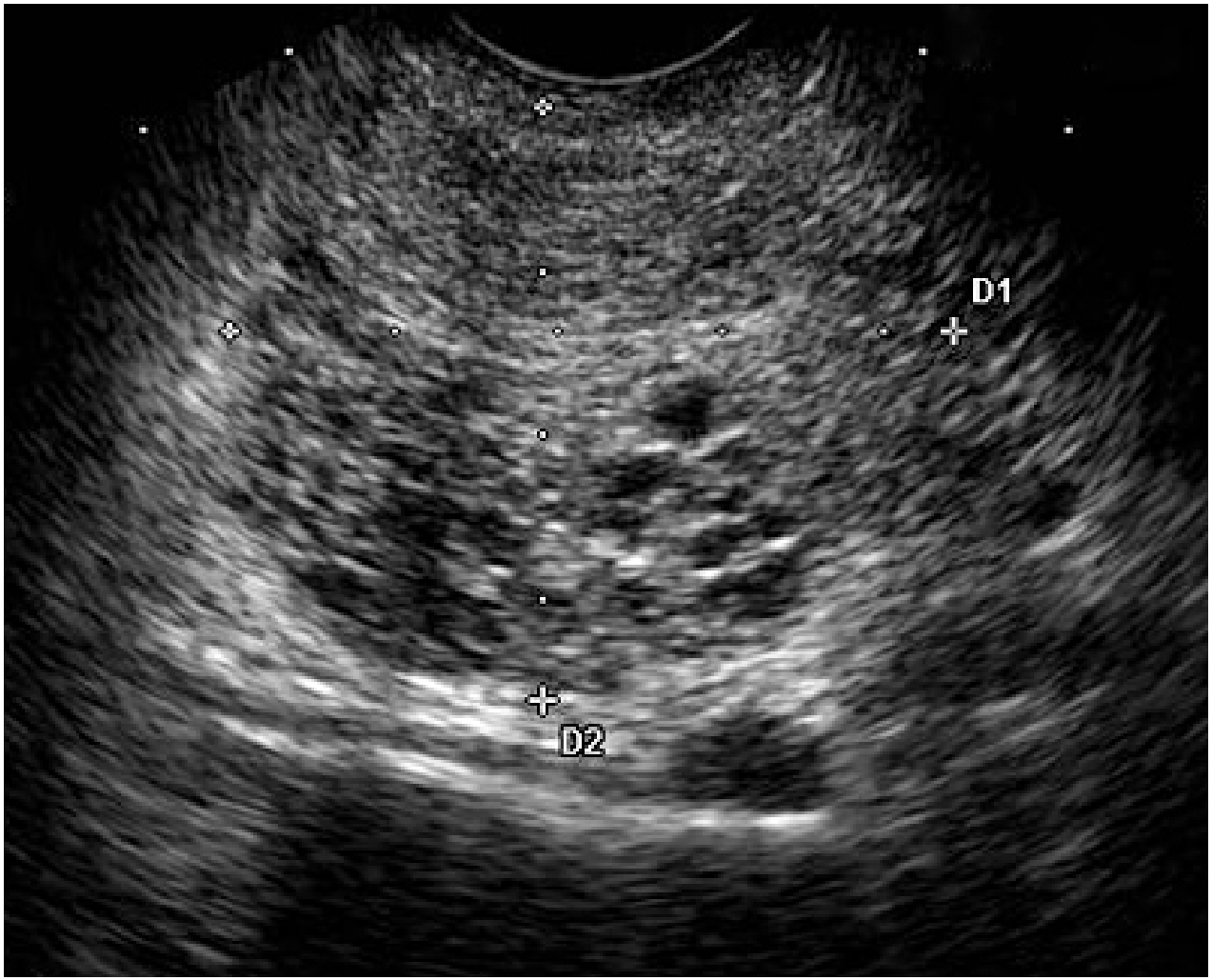
Demographic and Clinical Features

- Age of presentation: 5^{th}-7^{th} decade
- Gender distribution: Females > Males
- Typical Presentation: Incidental or abdominal pain or mass effect
- Typical Imaging Characteristics:
  - Microcystic, honeycomb appearance. Central "sunburst" calcification (10-20%)

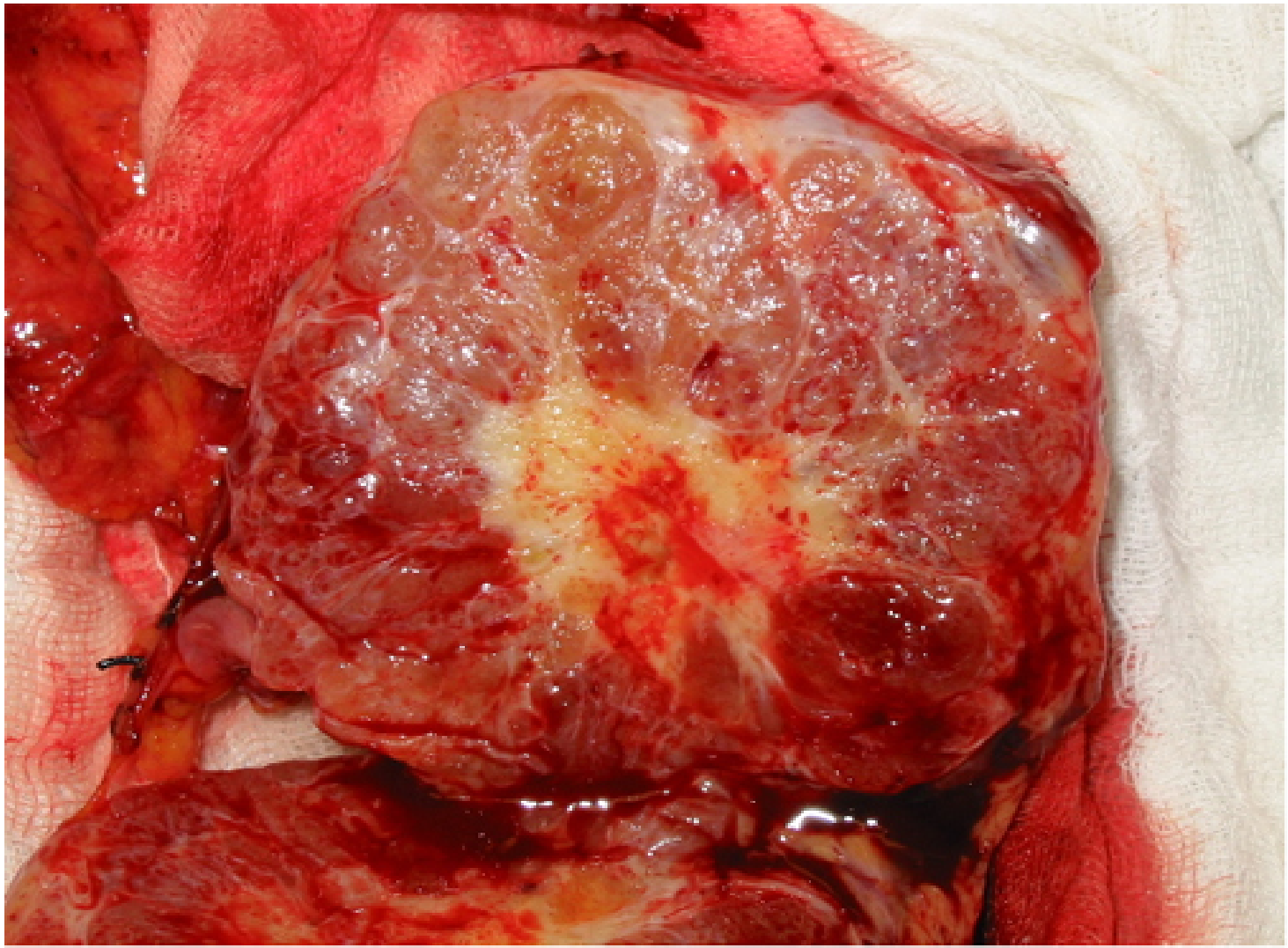
Serous Cystadenoma



Serous Cystadenoma

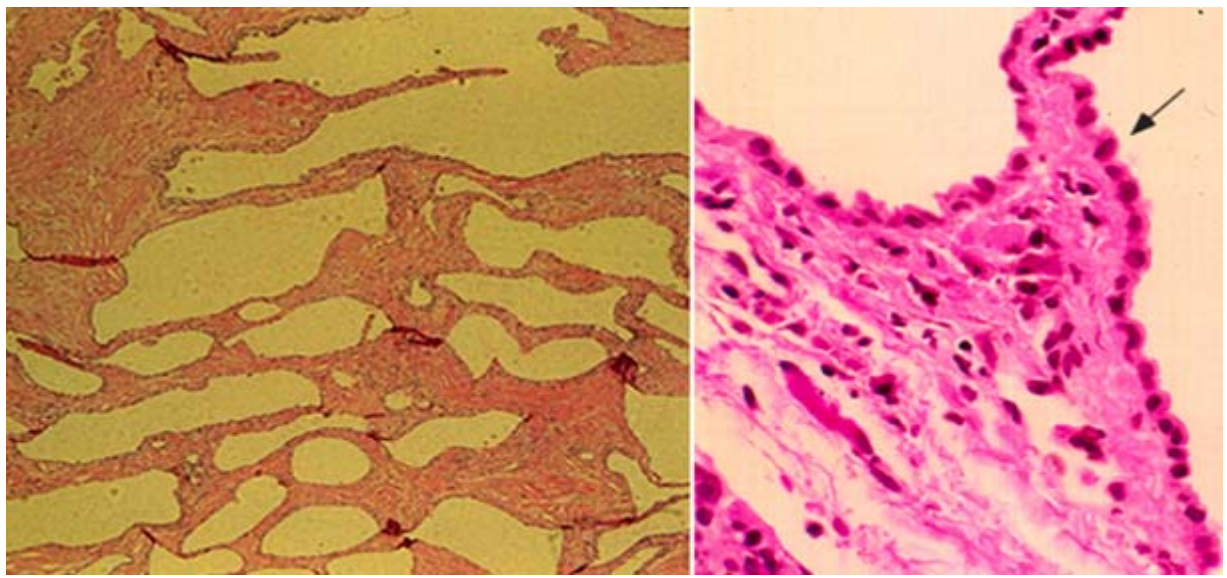


Serous Cystadenoma



Diagnostic Features

- Typical Cytology: Cuboidal cells that stain positive for glycogen
  - Typical CEA level: <5-20ng/mL



Prognosis and Management

- Considered benign
- Treatment: Resect if symptomatic

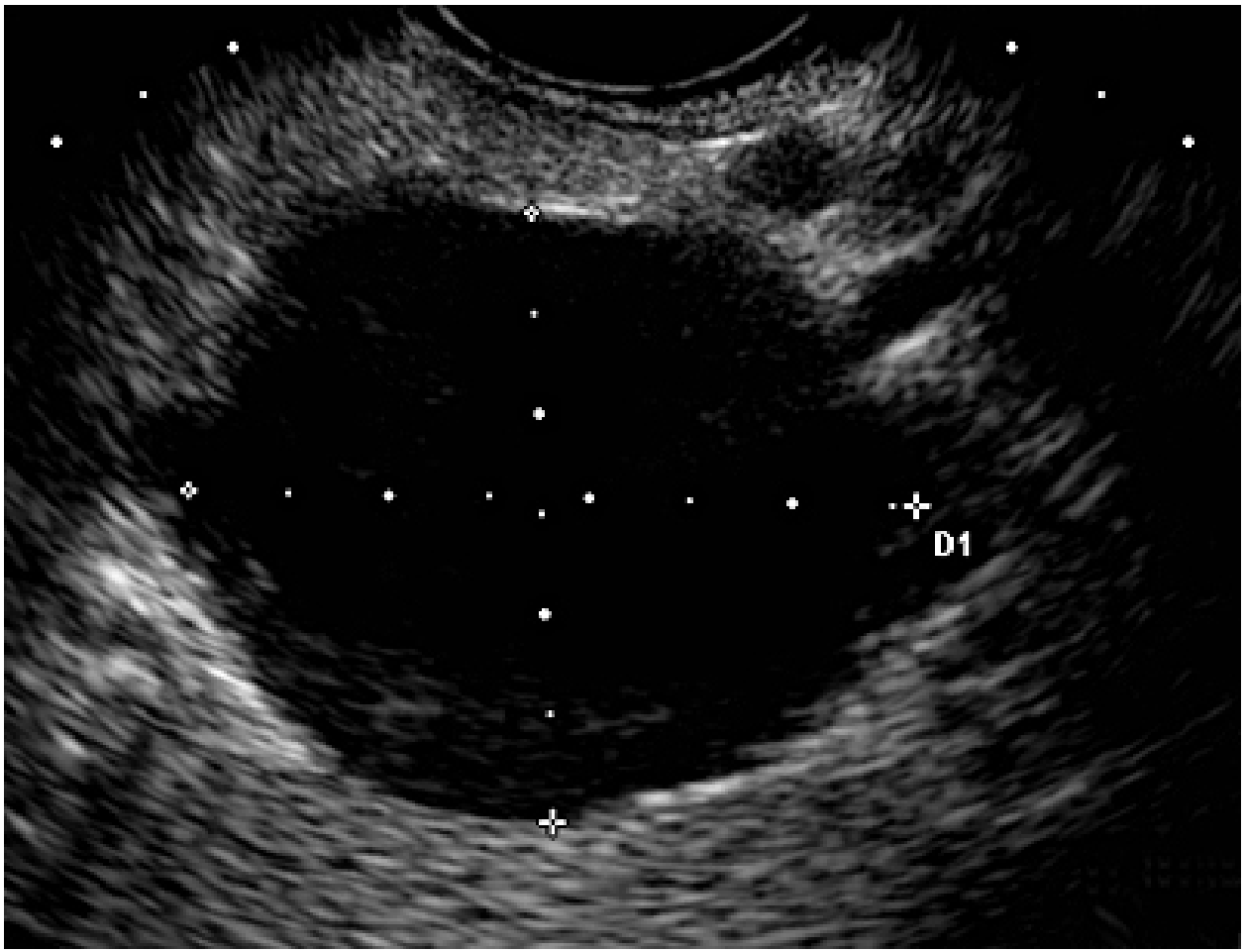
Mucinous Cystic Neoplasm

Demographic and Clinical Features

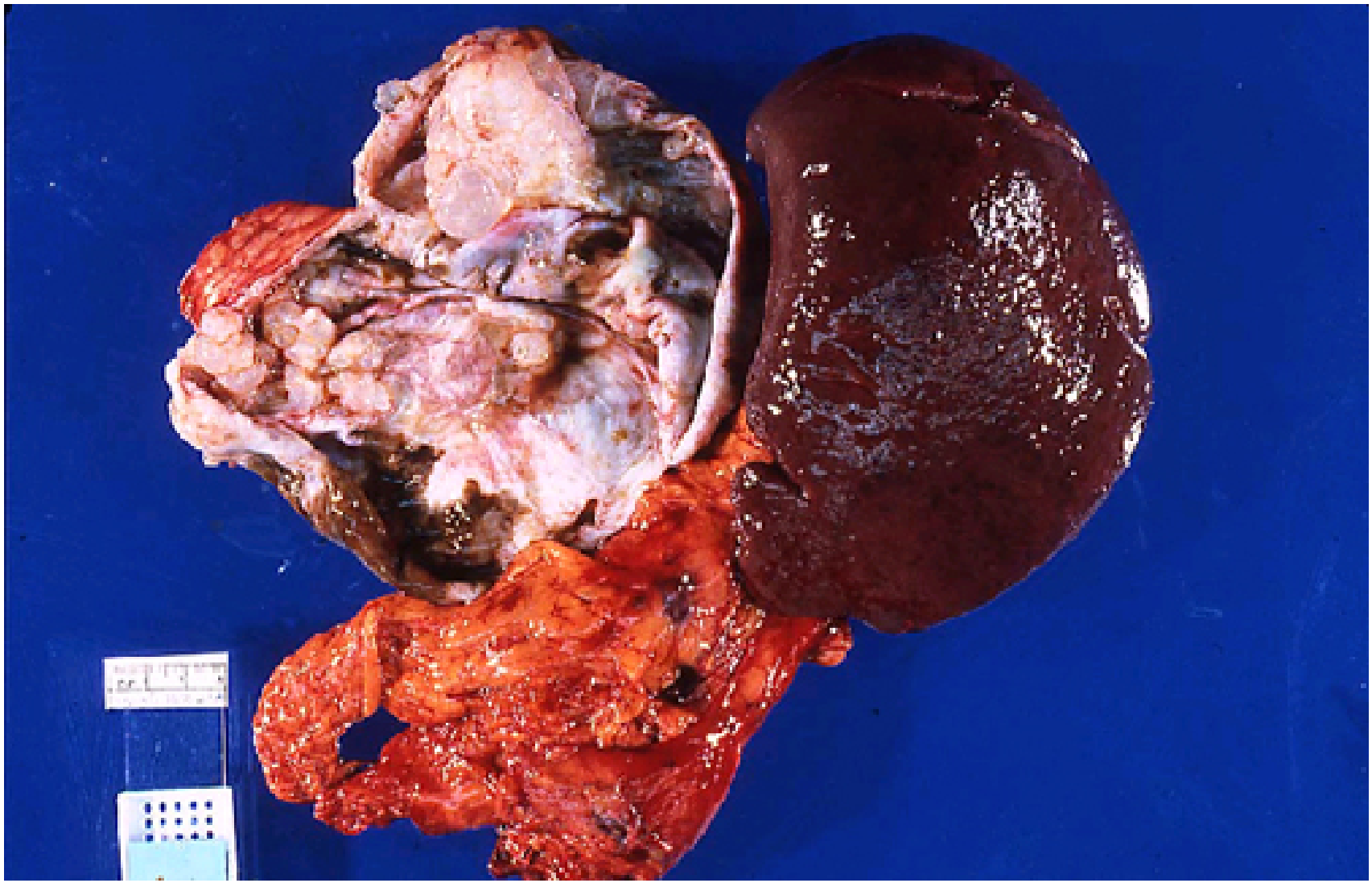
- Age of presentation: 5^{th}-7^{th} decade
- Gender distribution: >80% females
- Typical Presentation: Incidental or abdominal pain
- Typical Imaging Characteristics:
  - Unilocular or septated cyst +/- wall calcifications. Solid component may suggest malignancy. Usually in the tail of the pancreas

Mucinous Cystic Neoplasm

Mucinous Cystic Neoplasm

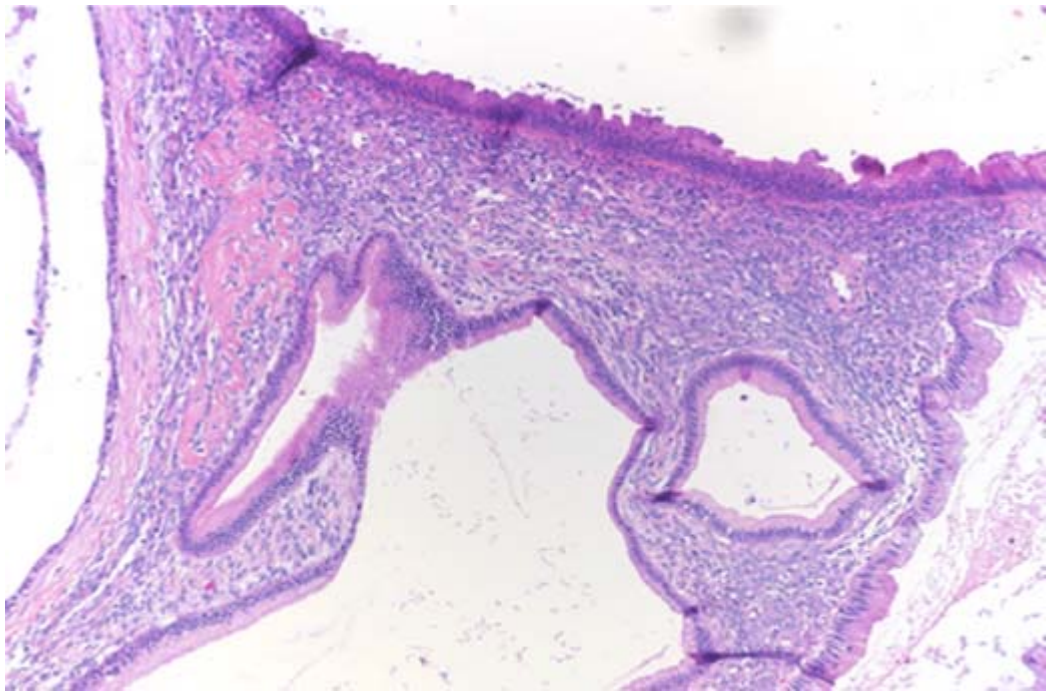


Mucinous Cystic Neoplasm



Diagnostic Features

- Typical Cytology: Columnar cells with variable atypia. Stains positive for mucin
  - Typical CEA level: >200ng/mL



Prognosis and Management

- Moderate malignant potential
  - Findings associated with malignant transformation: large size (>5cm), thickened/calcified/irregular cyst wall, internal solid component
- Treatment: Resection
  - Head lesion: Pancreaticoduodenectomy
  - Body/Tail lesion: Distal pancreatectomy with splenectomy

Intraductal Papillary Mucinous Neoplasms

Demographic and Clinical Features

- Age of presentation: 5^{th}-7^{th} decade
- Gender distribution: Females = Males
- Typical Presentation: Incidental or pancreatitis
  - Main duct IPMNs may present with pancreatic insufficiency
- Typical Imaging Characteristics:
  - Main Duct IPMN: Dilated main pancreatic duct +/- parenchymal atrophy
  - Branch Duct IPMN: Dilated pancreatic duct branches

Morphologic Classification of IPMNs

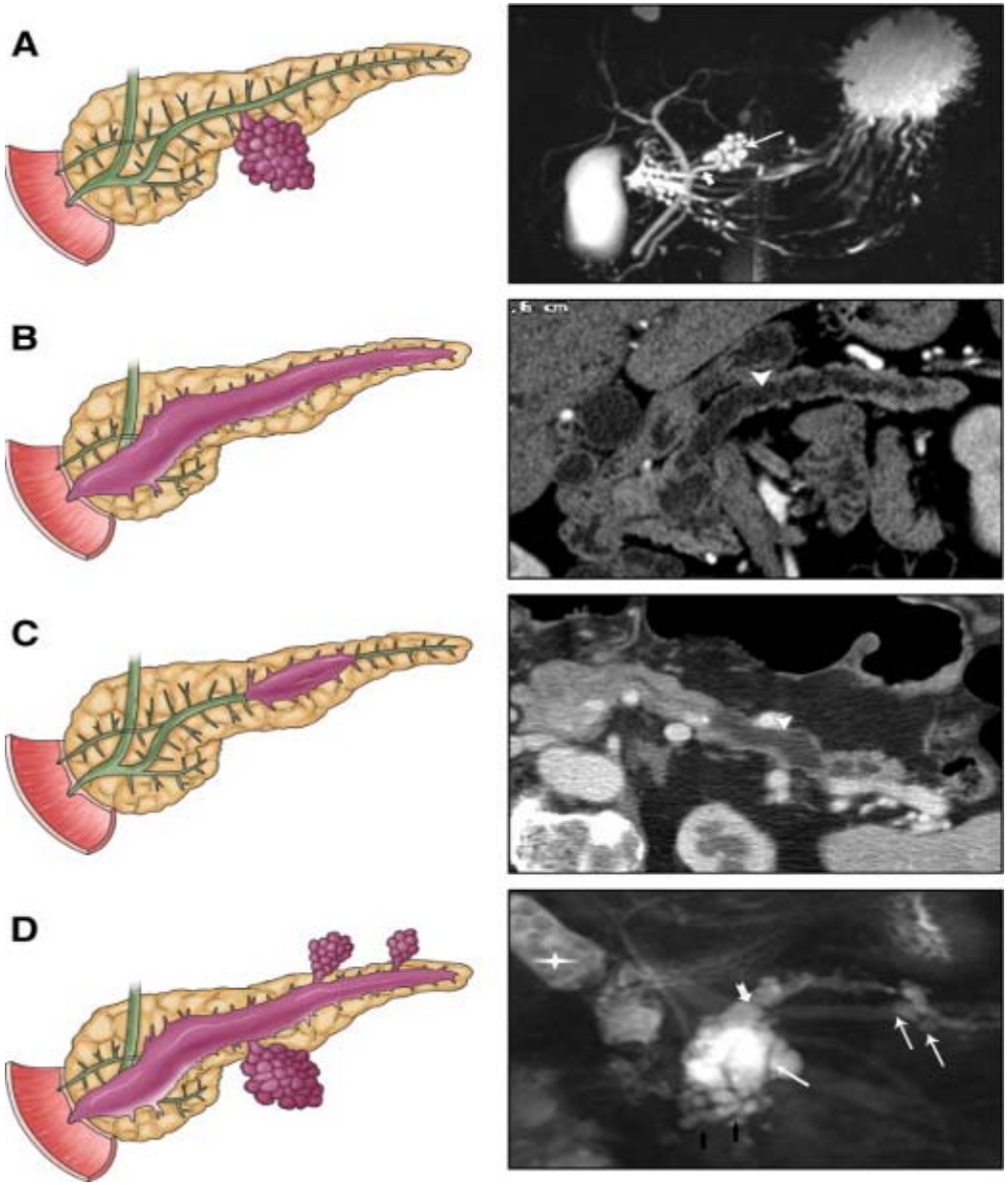
A and D) MRCP and (B and C) CT.

(A)Branch duct IPMN is characterized by cystic dilatation of the side branches (arrow) with grape-like clusters of cysts communicating (thick arrow) through a narrow channel with the pancreatic duct that shows little to no dilation.

(B)Diffuse main duct IPMNs shows a more or less uniform dilatation throughout the extent of the main pancreatic duct (arrowhead) and also may show a patulous ampulla of Vater.

(C)Segmental main duct IPMN shows a localized dilatation (arrowhead) of the duct.

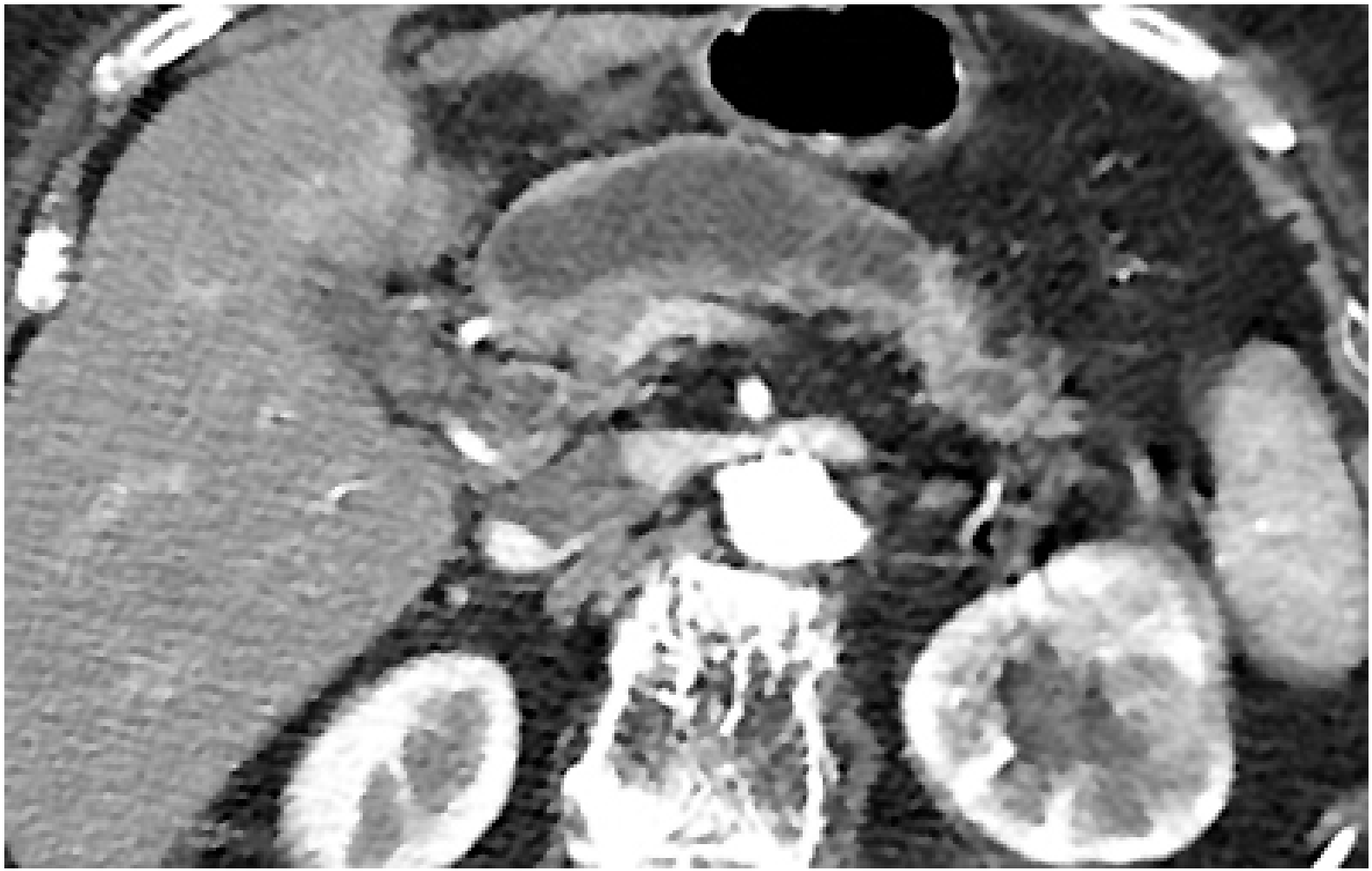
(D)Mixed IPMN possesses both main pancreatic duct (thick arrow) and cystic branch duct dilatation (black and white arrows). Gallbladder filled with gallstones is also seen (asterisk).



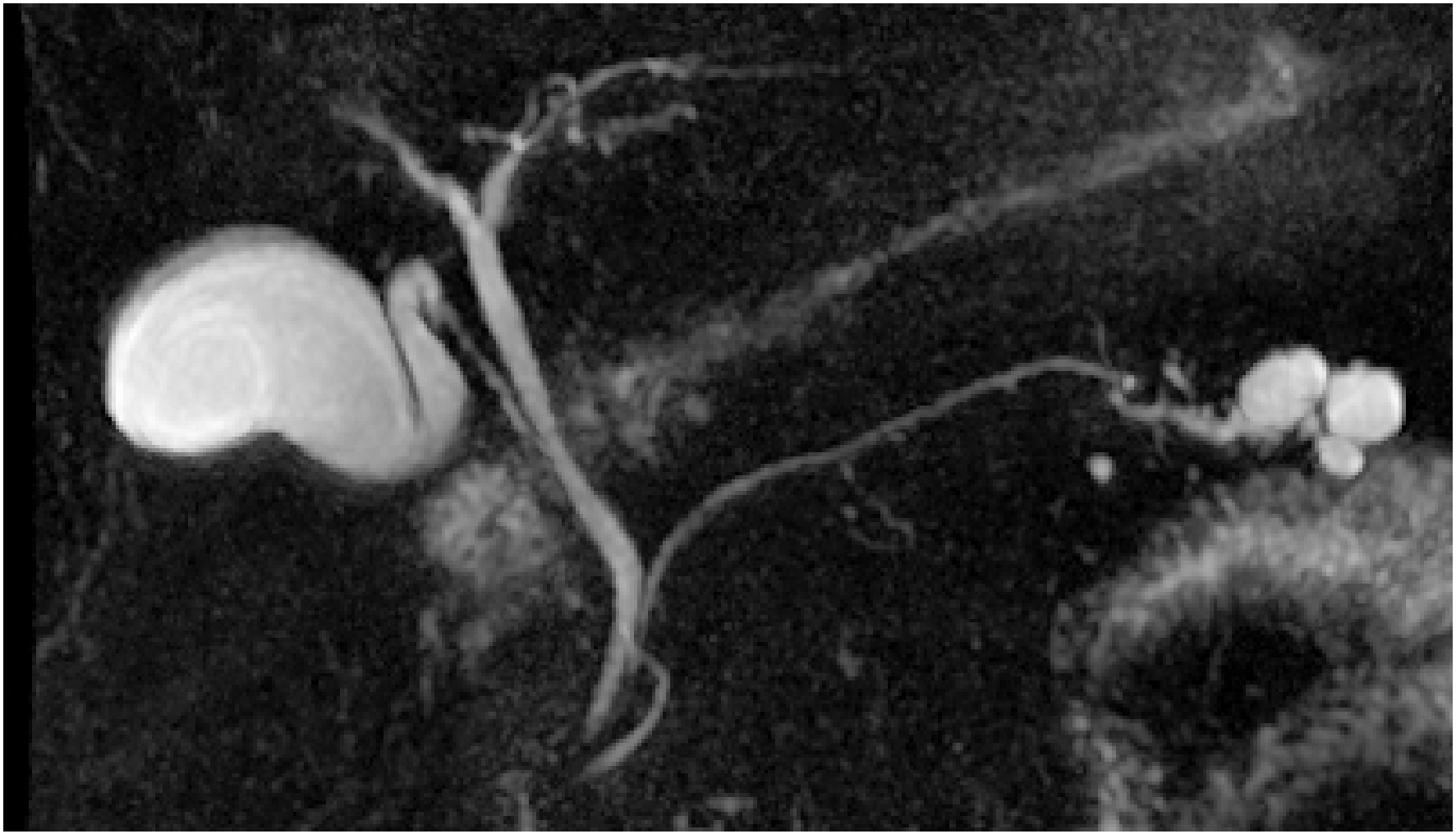
Imaging Modalities

- CT and MRCP
  - Requires dedicated pancreatic protocol technique
  - May see communication between branch duct lesions and main PD, but lack of communication does not rule out IPMN
  - Involvement of the main pancreatic duct typically shows dilation of the duct and atrophy in the body/tail
  - MRCP is better for small lesions (<3cm) in showing ductal communications. Also better to identify small mural nodules

IPMN - CT

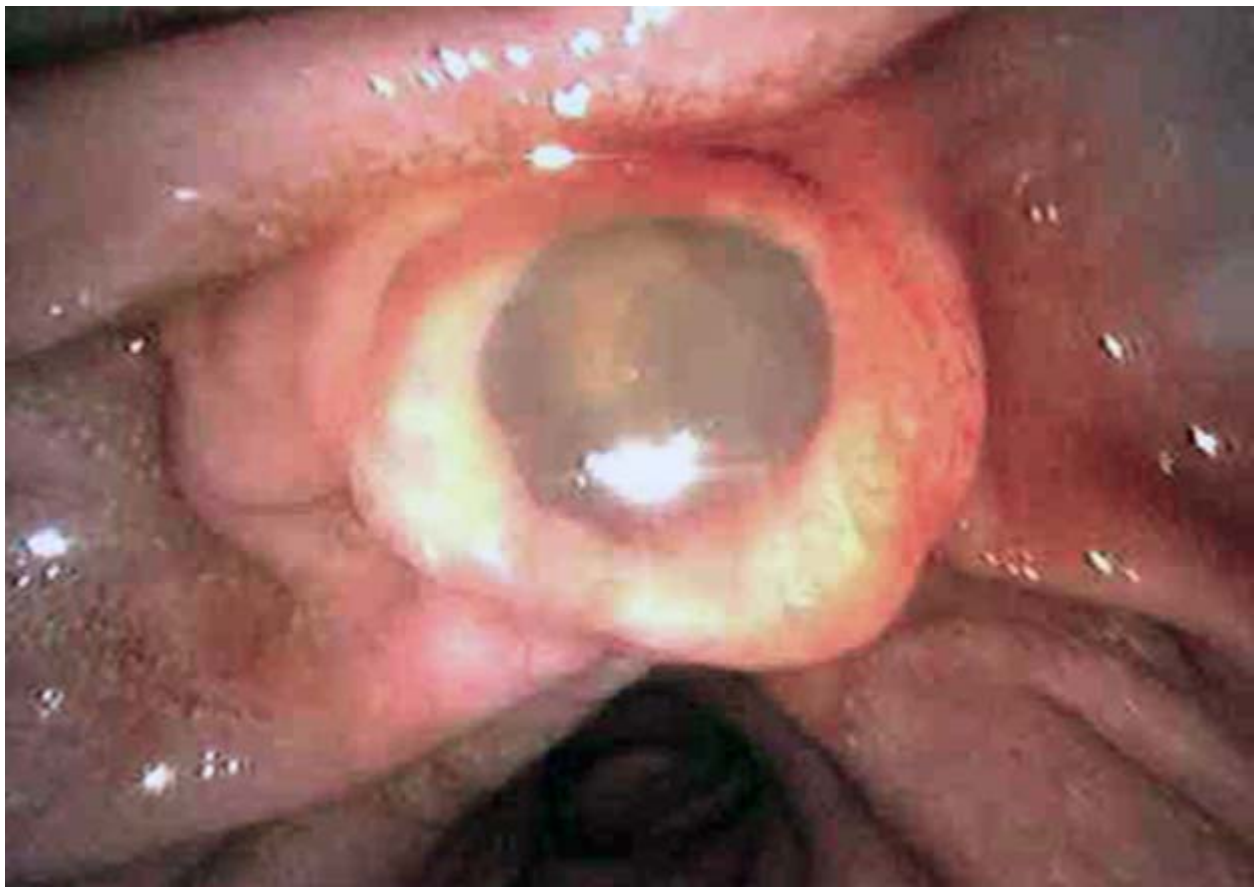


IPMN - MRCP



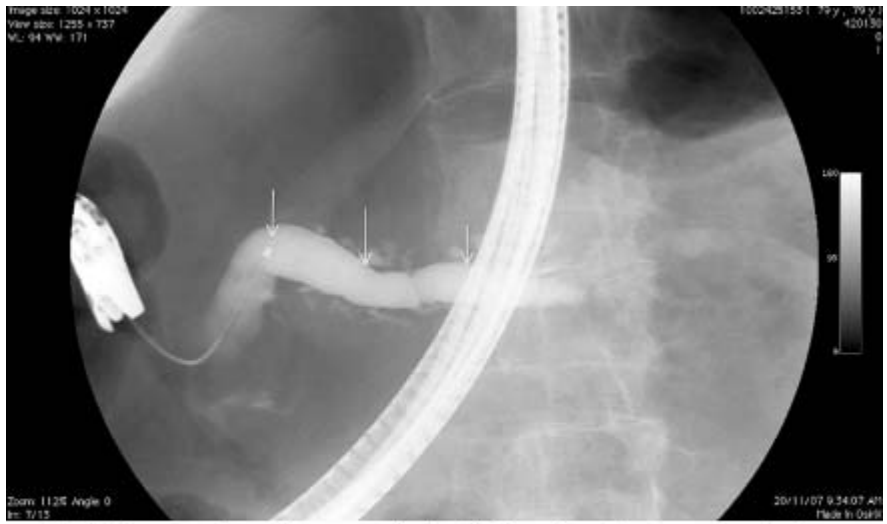
Imaging Modalities

- ERCP
  - Ampulla of Vater extruding mucus



Imaging Modalities

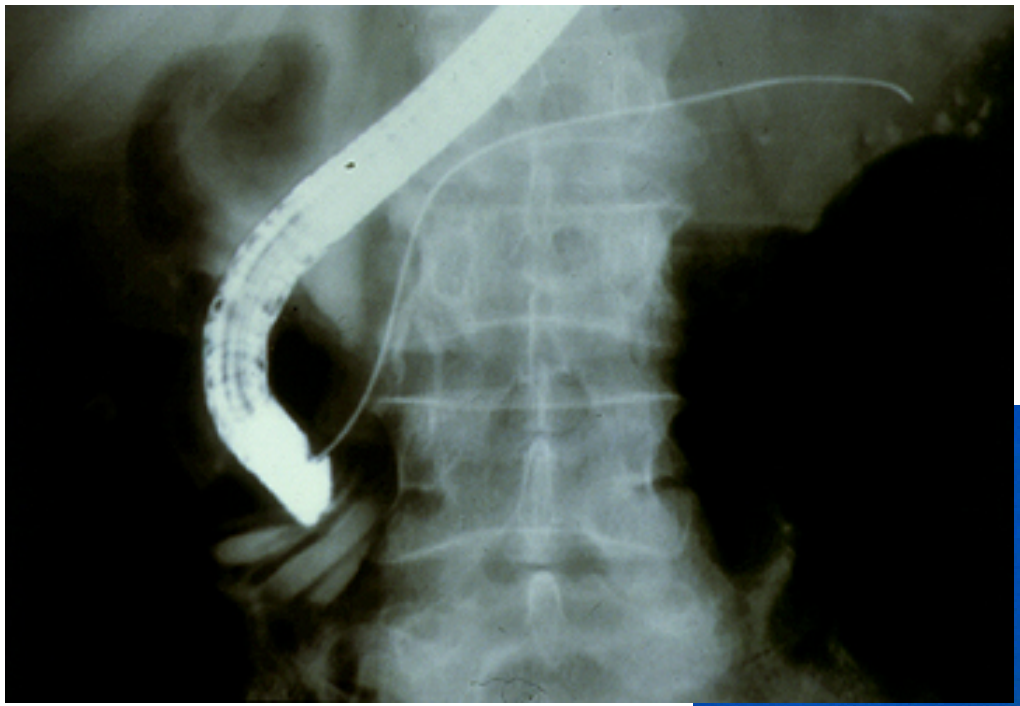
- ERCP
  - Main duct IPMN may show diffuse ductal dilation, mucinous filling defects.

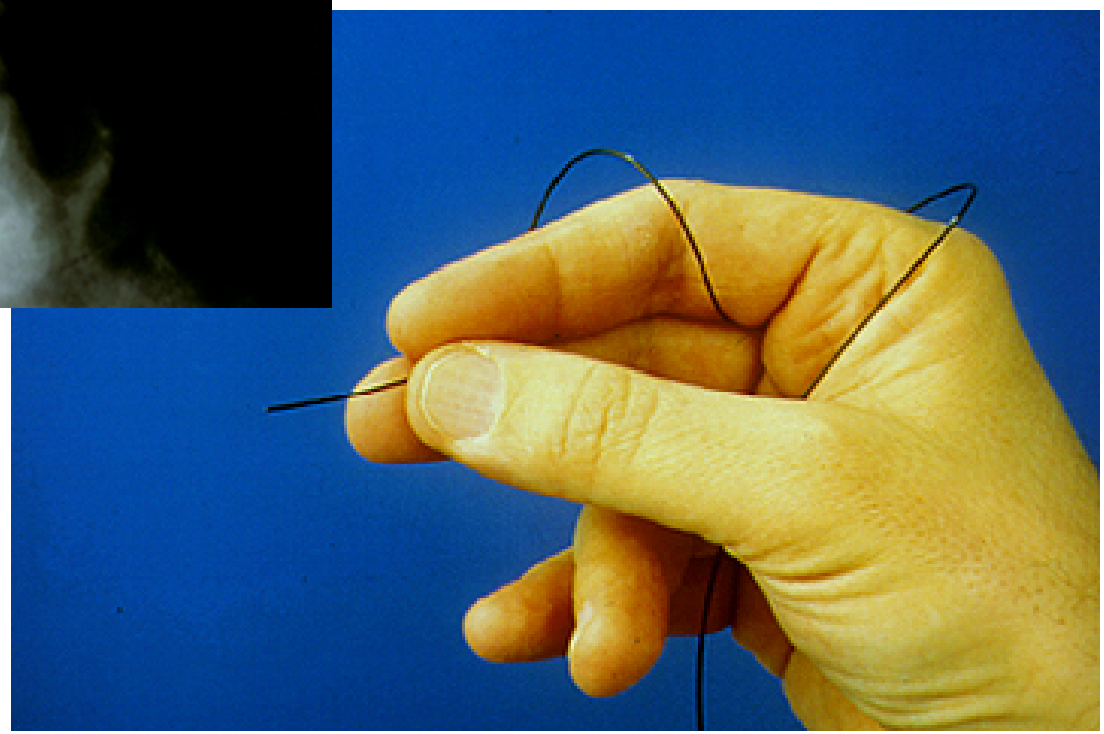


ERCP image showing massively dialated main pancreatic duct.

  - Branch duct IPMN appear as a cluster of grapes that communicate with the main duct

Ultrathin Pancreatoscope

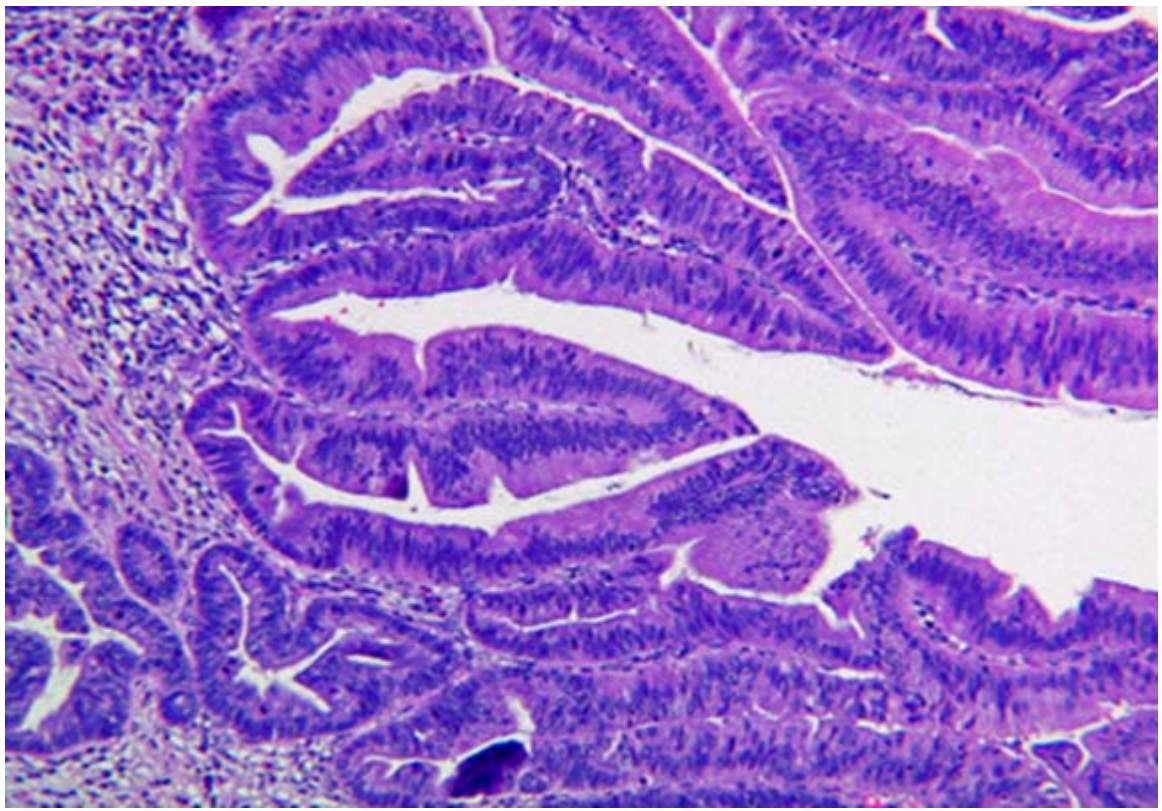




Pancreatoscopy of IPMN

Diagnostic Features

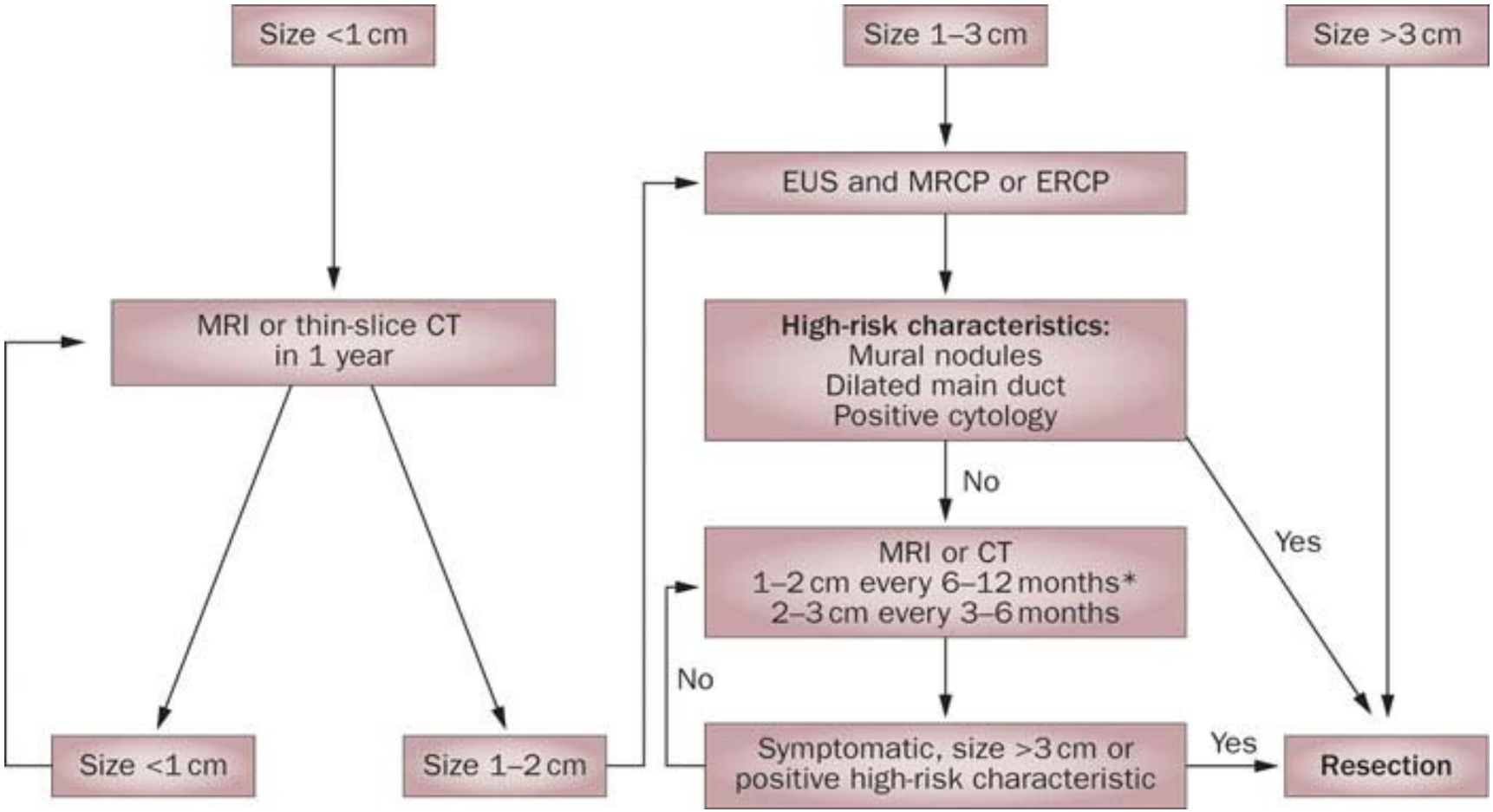
- Typical Cytology: Columnar cells with variable atypia. Stains positive for mucin.
  - Typical CEA level: >200ng/mL



Prognosis and Management

- Malignant Potential:
  - Main duct IPMNs = High
  - Branch duct IPMNs = Low to moderate
- Treatment:
  - Main duct IPMNs = Resection with post resection surveillance
  - Branch duct IPMNs = Closely monitor or resection with post resection surveillance
  - Controversy over adjuvant therapy

Algorithm for management of Branch Duct IPMNs

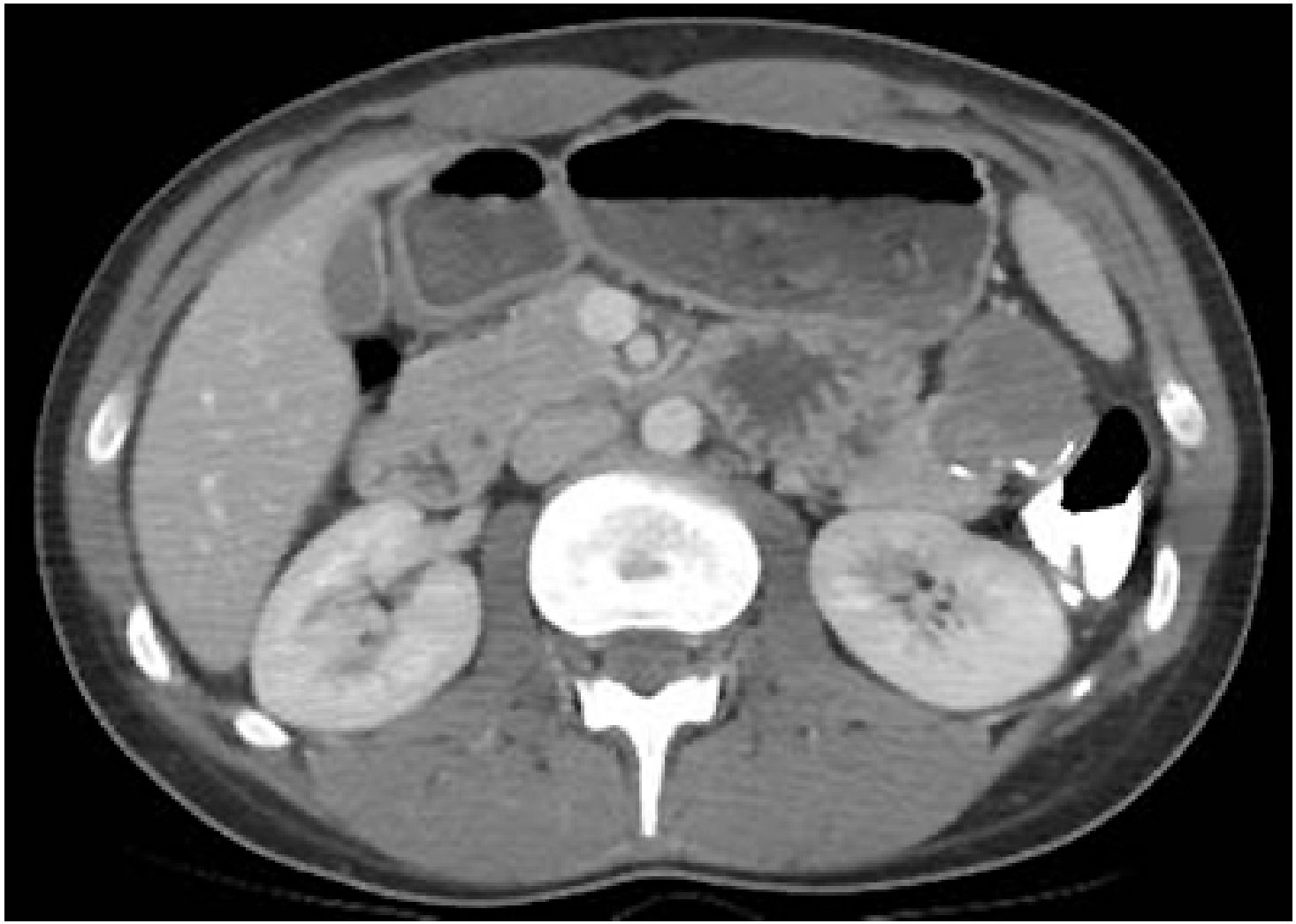


Solid Pseudopapillary Neoplasms

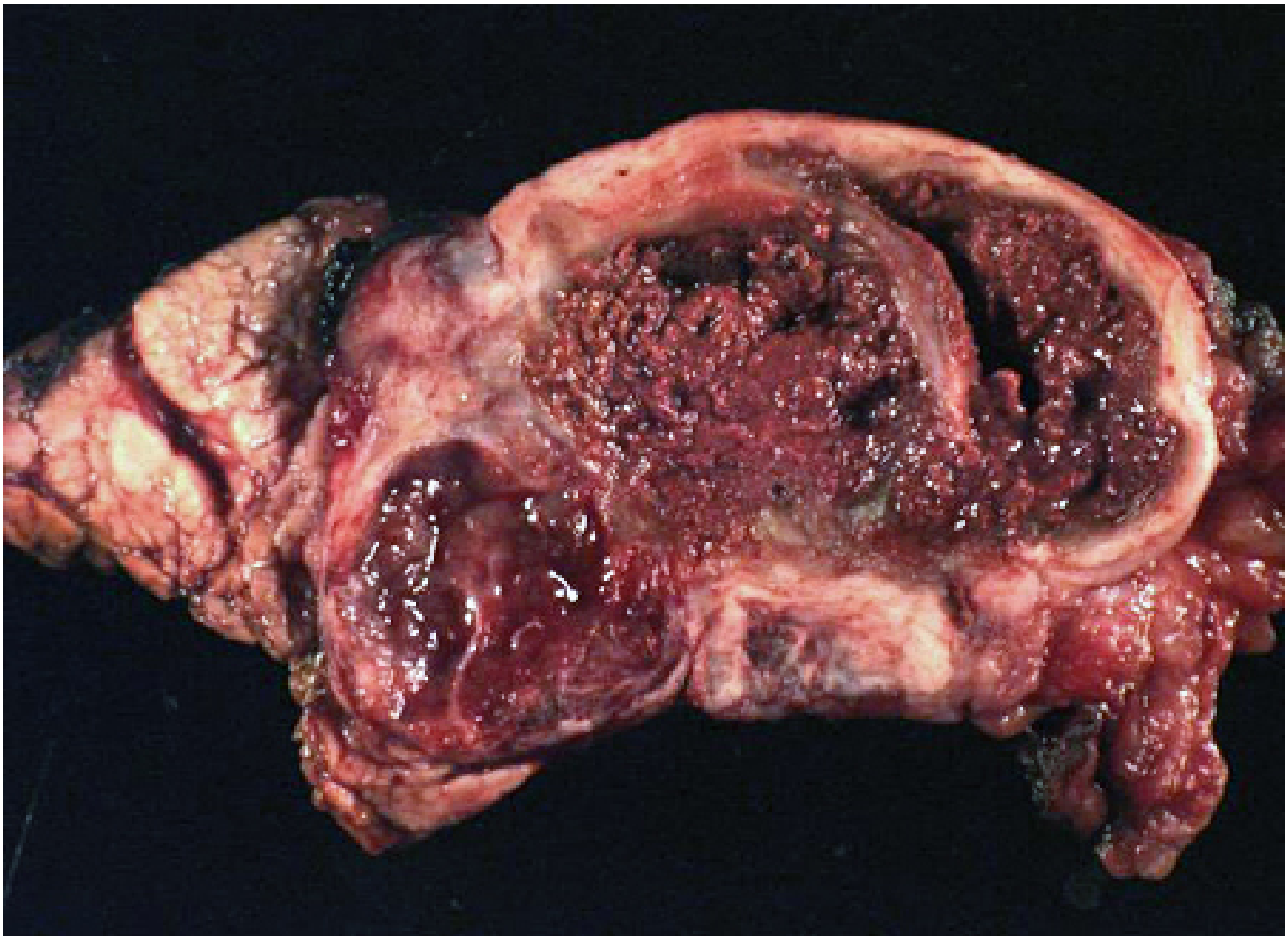
Demographic and Clinical Features

- Age of presentation: 2nd-3rd decade
- Gender distribution: Typically young women
- Typical Presentation: Incidental or abdominal pain or mass effect
- Typical Imaging Characteristics: Solid and cystic mass +/- calcifications. Often in body or tail of pancreas

Solid Pseudopapillary Neoplasm

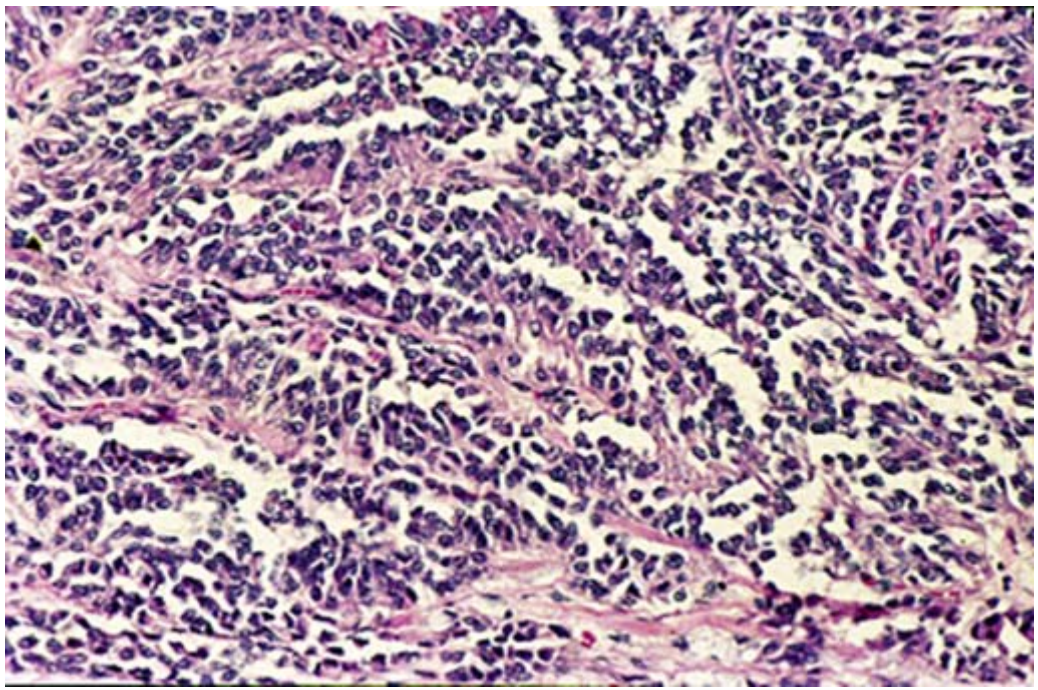


Solid Pseudopapillary Neoplasm



Diagnostic Features

- Typical Cytology: Characteristic branching papillae with myxoid stroma. Stains positive for vimentin and α1- antitrypsin
  - Typical CEA level: Insufficient Data



Prognosis and Management

- Moderate to High Malignant Potential
- Treatment: Resection

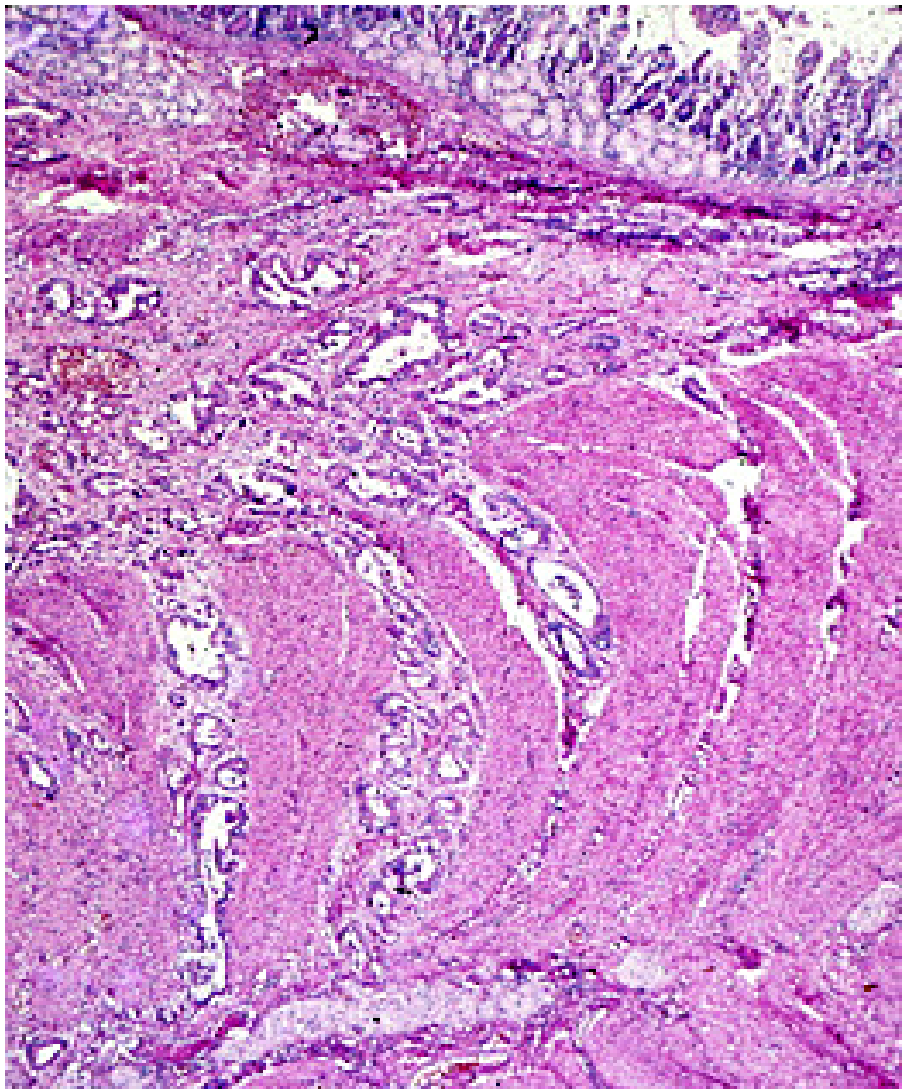
Pancreatic Adenocarcinoma

- Fourth leading cause of adult cancer deaths
  Age of presentation: risk increases after age 50 with peak between 65 and 80
- Risk factors: Cigarette smoking, chronic pancreatitis, diets high in fat and meat, DM2, chemical exposure (benzidine and β-naphthylamine), hereditary pancreatitis, family history of pancreatic cancer, cancer syndromes
- 90% are ductal adenocarcinomas

Demographic, Clinical, and Histological Features

- 60-75% occur in the head of the pancreas
- Clinical presentation: Jaundice, weight loss, anorexia, fatigue, depression, back pain, thromboembolic phenomena, glucose intolerance ~ 2yrs prior to diagnosis, Courvoisier's sign
- Histology: adenocarcinoma is well differentiated, consisting of duct-like structures lined by cuboidal or columnar cells embedded in extensive fibrous stroma
- CA 19-9

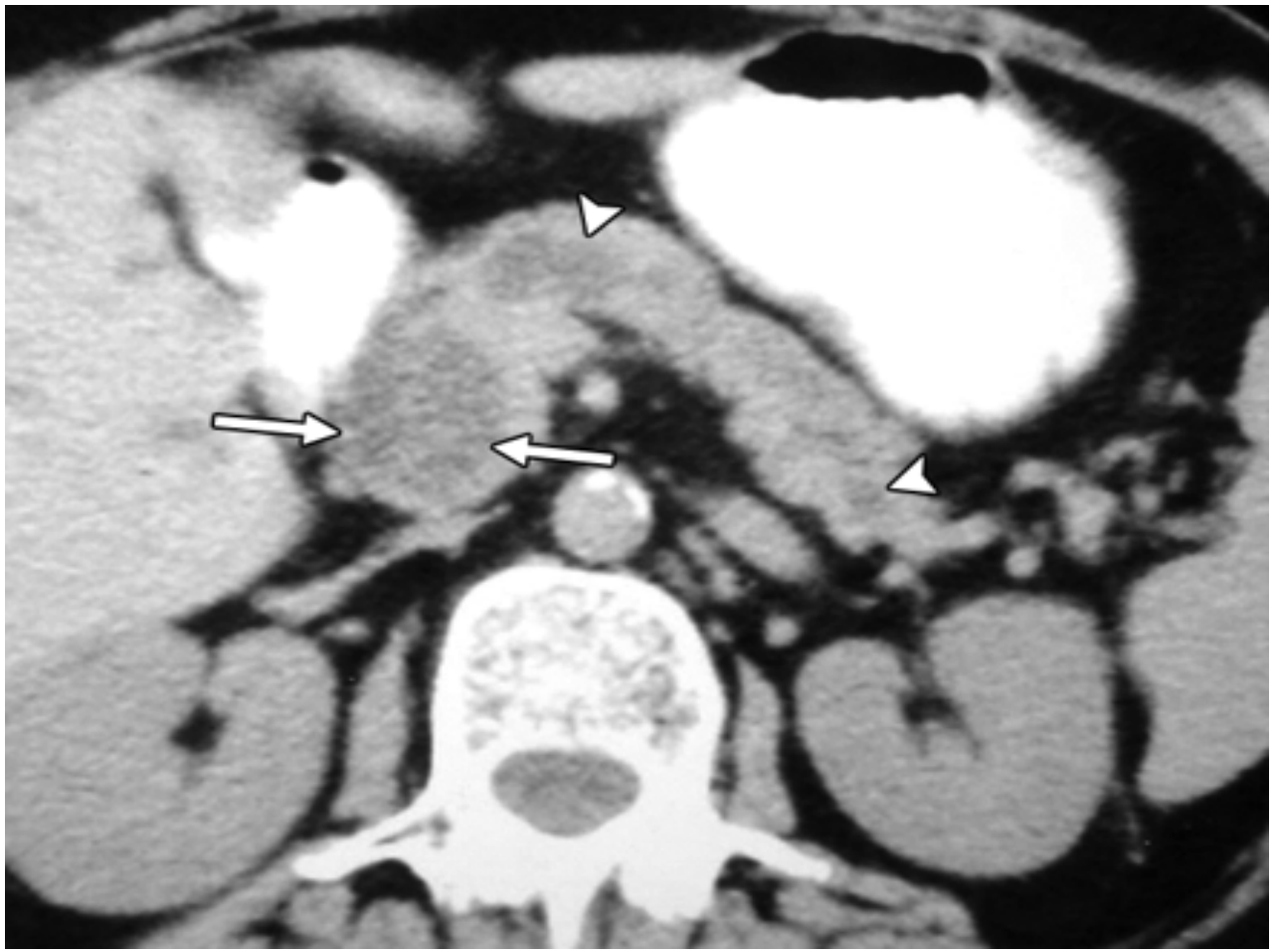
Pancreatic Ductal Adenocarcinoma



Imaging

- Abdominal ultrasound
- Spiral CT Abdomen/Pelvis
  - Greater sensitivity
  - Provides staging information concerning potential resectability: distant metastases and local vascular involvement
- EUS/ERCP can be done if cancer is suspected but not seen on ultrasound or CT
  - Increased sensitivity with combination of brushings and intraductal biopsy

“Double Duct Sign”



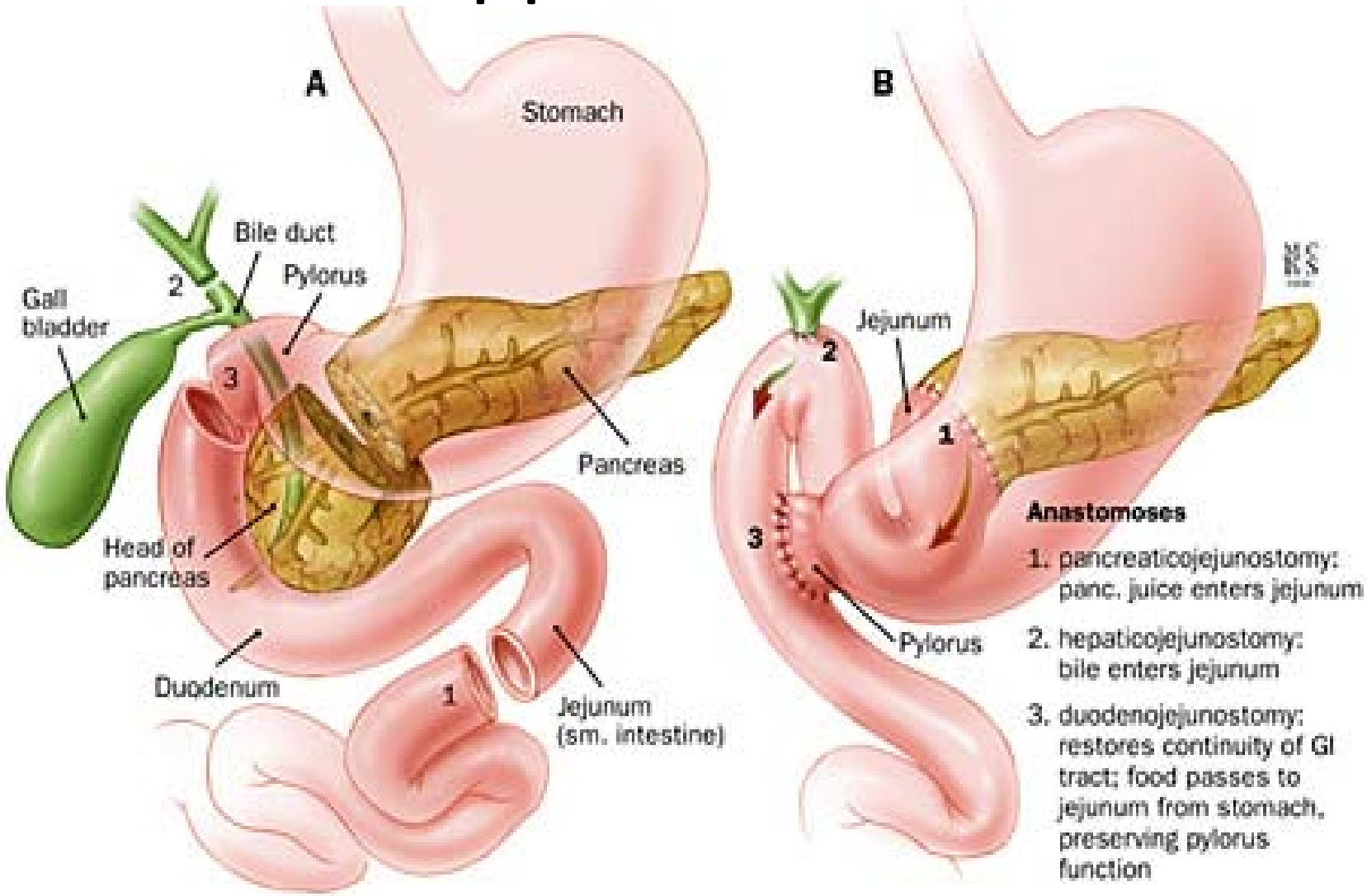
Arrows point to common bile duct

Arrowheads point to pancreatic duct

Treatment

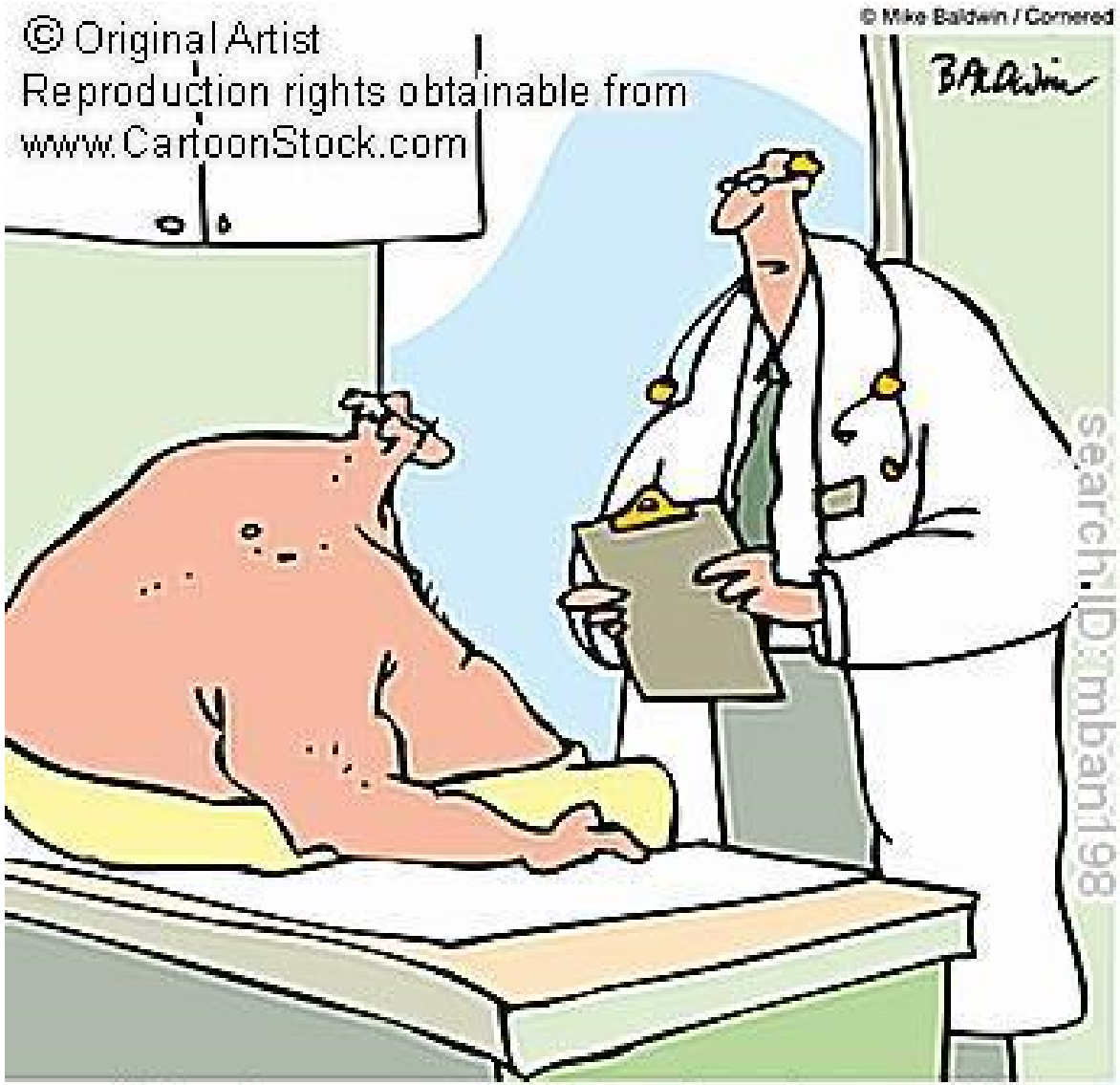
- 85% of patients are unresectable at time of diagnosis
  - Distant metastases
  - Invasion or encasement of the celiac or superior mesenteric arteries or confluence of the superior mesenteric and portal veins
- Chemotherapy +/- radiation
  - Gemcitabine most widely used (better pain control, improved performance status, modest increase in survival compared to 5-FU)
- Surgery
  - Whipple procedure
  - Tumors in the body/tail can undergo distal pancreatectomy and splenectomy
  - Post-operative adjuvant chemotherapy +/- radiation

Whipple Procedure



Prognosis

- Poor
- Patients that aren't candidates for resection have a median survival of 6-10 months (locally advanced disease) and 3-6 months (distant metastases)
- Patients that undergo resection have a median survival of 15-17 months and a 5-year survival of 5-20%
  - Large number of 5-year survivors succumb to recurrence
- Palliative management
  - Pain management, supplementing pancreatic enzymes, expandable metal biliary stent, enteral stent



"You've got six months, but with aggressive treatment we can help make that seem much longer."

Pancreatic Endocrine Tumors

- Arise from islet cells
- Rare
- Can occasionally appear cystic
- Functional tumors are diagnosed based on hormonal manifestations and by measurement of hormone levels in the blood
- Localization of tumors by abdominal CT, somatostatin receptor scintigraphy, and EUS
- Best treated by surgical resection, if possible
- If surgery is not possible, symptoms of hormone overproduction can sometimes be mitigated by surgical tumor debulking, pharmacologic reduction in hormone secretion by octreotide, or in the case of gastrinoma – PPIs

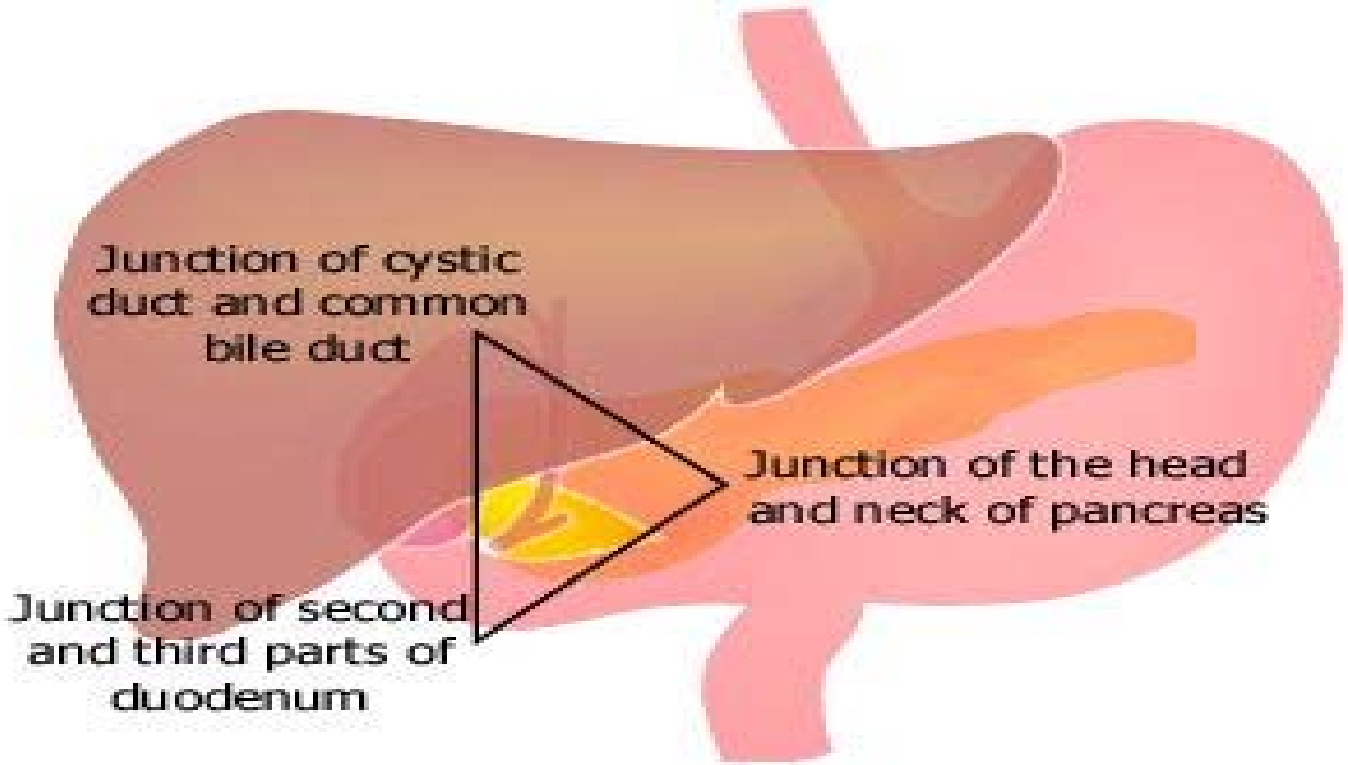
Insulinoma

- Most common (1-2 million people/year)
- Symptoms: Resulting from blood glucose <50 mg/dL, which are relieved with glucose administration
- 90% are benign and >70% are solitary
- EUS is helpful in localizing insulinomas that are too small to be seen on CT
- Tx: If possible, surgical resection. If not possible, diazoxide or octreotide

Gastrinoma (Zollinger-Ellison Syndrome)

- Massive hypersecretion of gastric acid resulting in severe peptic ulcer disease and sometimes chronic diarrhea
- 40-75% of these tumors are seen in the duodenum
- Majority are malignant and multiple lesions are common
- Elevated gastrin levels
- Borderline elevated gastrin levels? Secretin stimulation test causes rapid rise in serum gastrin levels

Gastrinoma Triangle



Glucagonoma

- Rare tumor
- Symptoms: Glucose intolerance, weight loss, anemia, necrolytic migratory erythema
- Glucagon levels >1000 pg/mL
- Typically, they are large, solitary
- Cure with surgical resection

Necrolytic Migratory Erythema

VIPoma

- Extremely rare (1:10,000,000 people/year)
- Symptoms: Secretory Diarrhea (>750-1000gm/day), dehydration, achlorydia, and hypokalemia
- Typically, they are large, solitary tumors
- >50% are malignant
- Treatment:
  - Possibly cure with surgery
  - Octreotide

Summary

- The pancreas is a jerk
- Recognition of pancreatic neoplasms is on the rise
- Diagnostic evaluation focuses on the malignant potential of pancreatic cysts
- Management is driven by symptoms and the certainty of the diagnosis