PANCREATIC CYSTS AND NEOPLASMS

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OBJECTIVES

- EPIDEMIOLOGY
- PRESENTATION AND DIAGNOSIS
- TREATMENT
- CYSTIC PANCREATIC TUMORS
- CASES
- EUS AND ITS ROLE
- REFERENCES

WHY DO WE CARE?

- PANCREATIC CA IS ALMOST UNIFORMLY FATAL AND HAS INCREASING INCIDENCE
- 5 YEAR SURVIVAL RATE IS <5% = LOWEST OF ANY CANCER
- USUALLY DIAGNOSED IN STAGE IV DISEASE WHICH IS UNRESECTABLE
- STAGE I AND STAGE II ARE RESECTABLE FOR CURE, HOWEVER ONLY 10-15% ARE CURRENTLY DIAGNOSED IN THIS STAGE

RISK FACTORS

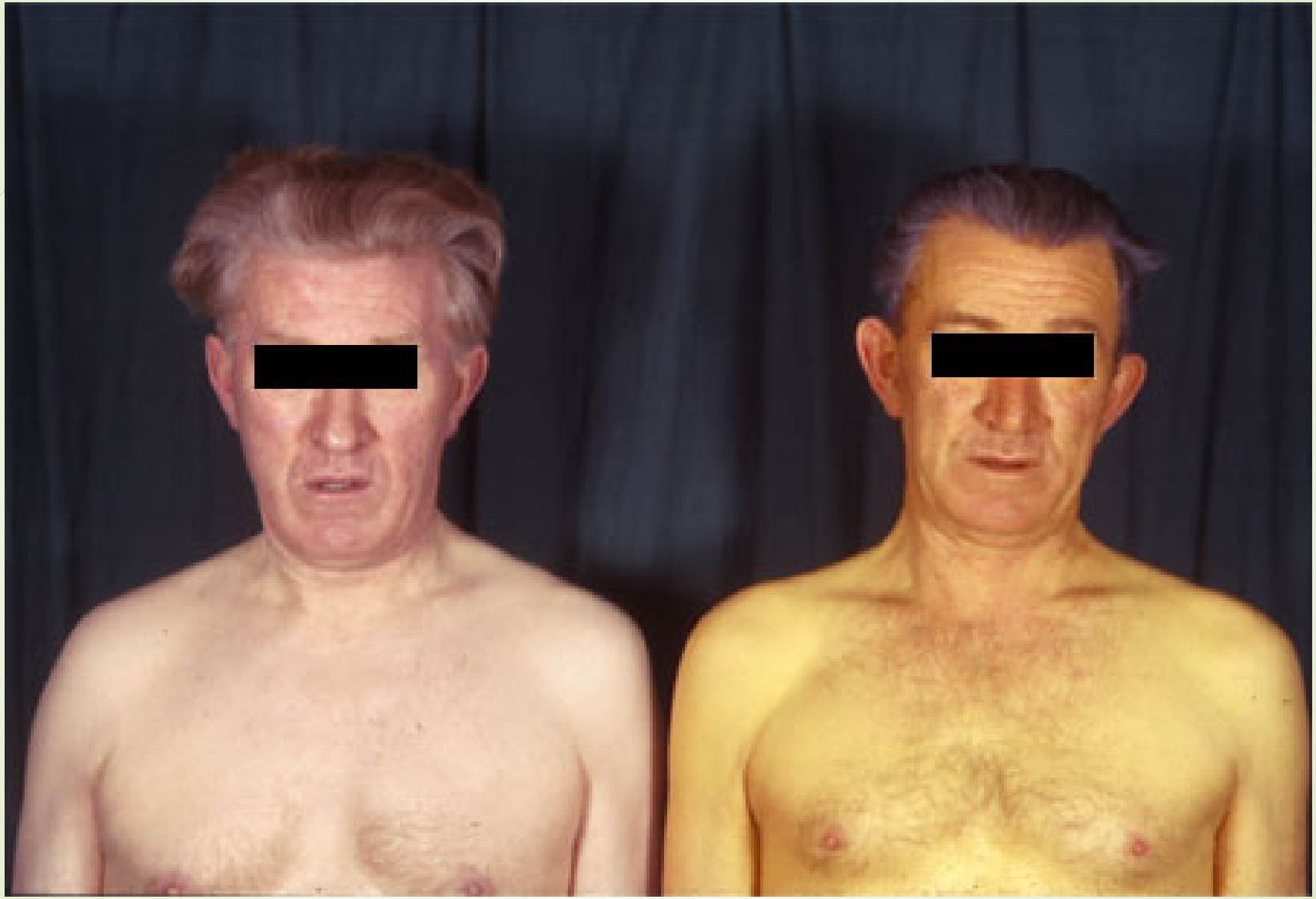
- SMOKING
- EXPOSURE TO AROMATIC AMINES (HAIRDRESSERS, CHEMICAL, PETROCHEMICAL, AND RUBBER INDUSTRIAL WORKERS)
- HEREDITARY PANC CA
  - (6-8% OF PTS WITH PANC CA HAVE A FAMILY HISTORY OF PANCRATIC CA)
  - IF 2 OR MORE 1ST DEGREE RELATIVES, THEN 18-57 FOLD INCREASED RISK OF PANC CA
- HEREDITARY CHRONIC PANCREATITIS
- IPMN
- PEUTZ-JEGHERS (STK11), HEREDITARY NONPOLYPOSIS COLORECTAL CA (MISMATCH REPAIR GENE MUTATIONS), FAMILIAL ATYPICAL MULTIPLE MOLE-MELANOMA SYNDROME (MUTATIONS AFFECTING p16)

HEREDITARY PANCREATITS

- MUTATIONS IN THE TRYPSINOGEN GENE
  - IT IS THE CHRONIC PANCREATITIS AND NOT THE GENE MUTATION ITSELF THAT INCREASES RISK OF PANCREATIC CA
- ESTIMATED RISK OF PANC CA AT AGE 70 IS 40% IN THIS POPULATION
- IN PATIENT WITH NON-HEREDITARY CHRONIC PANC (MUCH MORE COMMON), THE RISK IS ESTIMATED TO BE 2% PER DECADE OF HAVING THE DISEASE (SO MUCH LESS THAN IN HEREDITARY PANCREATITIS)

SCREENING GUIDELINES

- MANY PROPSED, BUT NO DATA TO SUPPORT
- K-RAS, CA 19-9, CROSS SECTIONAL IMAGING, AND EUS AT REGULAR INTERVALS HAVE BEEN TRIALED



PANCREATIC DUCTAL ADENOCARCINOMA

- 70% OCCUR IN THE HEAD OF THE PANCREAS
- HISTOLOGY MAY BE WELL-DIFFERENTIATED TUMORS WITH GLANDULAR STRUCTURES IN A DENSE STROMA VS POORLY DIFFERENTITATED WITH LITTLE OR NO GLANDULAR STRUCTURE OR STROMA
- METASTATIC DISEASE TO LIVER AND LUNG MOST COMMON BUT MAY ALSO AFFECT THE ADRENALS, KIDNEYS, BONE, BRAIN, OR SKIN

PRESENTATION AND DIAGNOSIS PAINLESS JAUNDICE?

- ABD PAIN IS ACTUALLY PRESENT IN 80% OF PRESENTING PATIENTS AND IS ASSOCIATED WITH ADVANCED DISEASE
- JAUNDICE IS A PRESENTING SYMPTOM IN 50% OF CASES
- PAINLESS JAUNDICE IS ACTUALLY DISCUSSED AS A SYMPTOM THAT IS MOST FREQUENTLY PREDICTIVE OF RESECTABILITY
- STEATORRHEA MAY BE PRESENT BUT IS FAR LESS COMMON (5%) BUT WHEN IS THE ONLY PRESENTING SYMPTOM IS PREDICTIVE OF LONGER SURVIVAL
- WEIGHT LOSS

DIAGNOSIS
TUMOR MARKERS

- CA 19-9 (SENSITIVITY 70% AND SPECIFICITY 87%) WHEN CUTOFF VALUE IS 70
- THIS TEST IS NOT USEFUL IF THE BILIARY TRACT IS OBSTRUCTED BECAUSE EVEN BENIGN BILIARY TRACT OBSTRUCTION CAN CAUSE A MARKED INCREASED IN CA 19-9 LEVELS
- OF NOTE THERE IS A SUBSET OF PATIENTS THAT DO NO EXPRESS LEWIS ANTIGENS (5-10% OF THE POPULATION), THEREFORE CA 19-9 WILL NOT BE DETECTABLE IN THIS GROUP
- OTHERS
- K-ras mutation(90%), p53 tumor cell suppressor gene (50-70%), DCC gene (50%)

IMAGING

- CT PANCREAS PROTOCOL
  - (PORTAL AND ARTERIAL VENOUS PHASE CONTRAST ENHANCEMENT)
  - THIS IS DIAGNOSTIC AND CAN BE USED FOR STAGING AS WELL
  - CONVENTIONAL CT 50-60% SENSITIVITY, BUT DUAL PHASE MULTI-DETECTOR HAS A 85% SENSITIVITY
  - HOWEVER, IF TUMOR <15 MM, OVERALL SENSITIVITY IS STILL < 80%
- EUS HAS A ROLE IF A SMALL CANCER IS NOT DETECTED BY MULTI-DETECTOR CT
  - 97% SENSITIVITY
  - FNA CAN BE PERFORMED OF THE TUMOR AS WELL AS REGIONAL LYMPH NODES

STAGING OF PANCREATIC ADENOCARCINOMA

- CT PANCREATIC PROTOCOL WITH MULTI-DETECTOR IS SUFFIECIENT FOR STAGING
- PANCREATIC MRI IS EQUIVALENT BUT LESS AVAILABLE
- EUS IS THE MOST ACCURATE, HOWEVER NOT NECESSARY IF THE ABOVE IMAGING HAS BEEN OBTAINED
- TYPICALLY APPEARS AS AN IRREGULAR HYPODENSE LESION
- SMALL LIVER OR PERITONEAL METASTASES USUALLY ARE NOT SEEN ON PREOPERATIVE IMAGING
- SOME HAVE SUGGESTED LAPAROSCOPIY FOR VIEWING OF THE LIVER AND PERITONEAL SURFACES PREOPERATIVELY
  - IF BODY/TAIL LESION WITH LOW CHANCE OF RESECTABILITY OR PTS WITH ASCITES
- 10-15% OF PATIENTS HAVE THESE SMALL METASTASES

Table 38.2. Stage Grouping for Pancreatic Ductal Adenocarcinoma[a]

Stage	*T*	*N*	*M*
0	Tis	N0	M0
I	T1	N0	M0
	T2	N0	M0
II	T3	N0	M0
III	T1	N1	M0
	T2	N1	M0
	T3	N1	M0
IVA	T4	Any N	M0
IVB	Any T	Any N	M1

[a] TNM staging system is defined in Table 38.1.

Table 38.1. Definition of TNM System for Staging of Pancreatic Ductal Adenocarcinoma[a]

Category	*Description*
	Primary Tumor (T)
TX	Primary tumor cannot be assessed
T0	No evidence of a primary tumor
Tis	In situ carcinoma
T1	Tumor limited to pancreas; ≤2 cm in greatest dimension
T2	Tumor limited to pancreas; >2 cm in greatest dimension
T3	Tumor extends directly into any of the following: duodenum, bile duct, peripancreatic tissues, portal or superior mesenteric vessels
T4	Tumor extends directly into any of the following: stomach, spleen, colon, adjacent large arterial vessels
	Regional Lymph Nodes (N)
NX	Regional lymph nodes cannot be assessed
N0	No regional lymph node metastasis
N1	Regional lymph node metastasis
	Distant Metastasis (M)
MX	Distant metastasis cannot be assessed
M0	No distant metastasis
M1	Distant metastasis

[a] Stages are defined in Table 38.2.

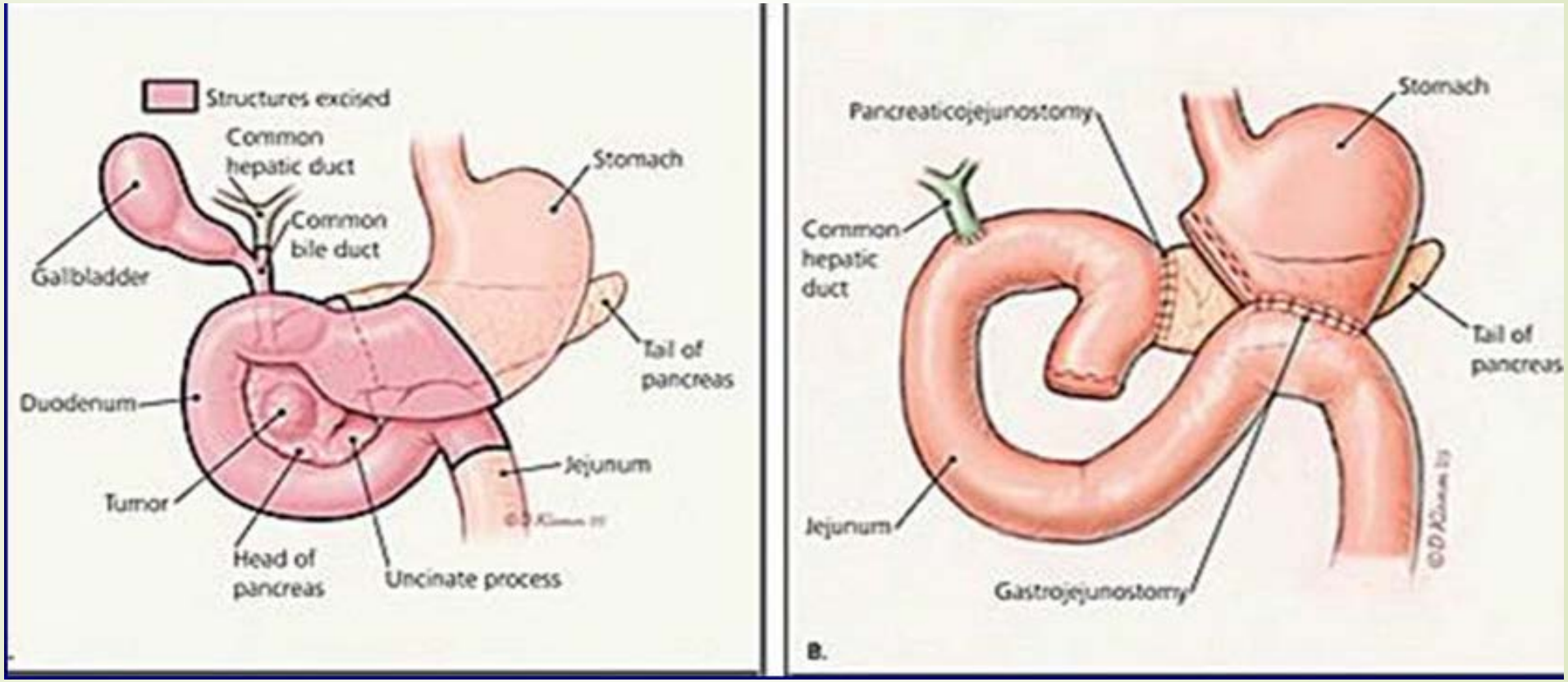
Treatment

- Surgery
- Chemotherapy
- Pancreatic Enzymes
- PALLIATIVE THERAPY

Surgical Treatment

- Stage I and Stage II = confined to pancreas without nodal or vascular involvement and in some cases may extend to local structures only
- Whipple Procedure = pancreaticoduodenectomy
- This involves performing a cholecystectomy, removal of a portion of the stomach (typically antrectomy), removal of distal bile duct, removal of the head of the pancreas duodenectomy, proximal jejunectomy, and regional lymph node dissection
- Reconstruction is by way of gastrojejunostomy, hepaticojejunostomy, and pancreaticojejunostomy.

Whipples Procedure



Alternative surgery

- Pylorus preserving Whipple which preserves the stomach
- improving outcomes such as the morbidity related to dumping syndrome and weight loss

CHEMOTHERAPY

- – Gemcitabine most widely used (better pain control, improved performance status, modest increase in survival compared to 5-FU)
- +/- RADIATION THERAPY

PANCREATIC ENZYMES

- INDICATED ONLY IF SYMPTOMS CONSISTENT WITH EXOCRINE INSUFFICIENCY SUCH AS STEATORRHEA

PALLIATIVE CARE

- PAIN MANAGEMENT
- MAY ALSO INCLUDE PANC ENZYMES HERE
- EXPANDABLE METAL BILIARY STENT FOR OBSTRUCTING DISEASE
- ENTERAL STENTING IF GOO ETC

PANC ADENOCARCINOMA

- POOR PROGNOSIS
- IF NOT A CANDIDATE FOR RESECTION, MEDIAN SURVIVAL IS STILL ~ 6 MONTHS
- 3-6 MONTHS IF DISTAL METS AT TIME OF DIAGNOSIS
- 5 YEAR SURVIVAL IS 5-15%
- OF THOSE THAT SURVIVE 5 YEARS, RECURRENCE IS HIGH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"You've got six months, but with aggressive treatment we can help make that seem much longer."

PANCREATIC CYSTIC LESIONS

- PSEUDOCYST = NOT ONE OF THE FOLLOWING: (ACUTE FLUID COLLECTION, PANCREATIC NECROSIS, WALLED OFF PANCREATIC FLUID COLLECTION)
- NON NEOPLASTIC
  - LYMPHOEPITHELIAL, RETENTION, MUCINOUS NON-NEOPLASTIC
- NEOPLASTIC
  - SEROUS CYSTADENOMAS, MUCINOUS CYSTIC NEOPLASMS, INTRADUCTAL PAPILLARY MUCINOUS NEOPLASMS, SOLID PSEUDOPAPPILARY NEOPLASMS
  - PANCREATIC ADENOCARCINOMA
  - PANCREATIC ENDOCRINE NEOPLASMS

PANCREATIC PSEUDOCYST

- A COLLECTION OF PANCREATIC JUICES EXTRAVASATED FROM THE DUCTAL SYSTEM DUE TO PANCREATIC INFLAMMATIN, OBSTRUCTION, AND NECROSIS
- 15-30% OF PANCREATIC CYSTS OVERALL
- 50% OF PANCRATIC CYSTS IN PATIENTS WITH HISTORY OF PANCREATITIS
- LINED BY FIBROUS TISSUE AND GRANULATION TISSUE INSTEAD OF AN EPITHELIAL LINING… HENCE THE TERM “PSEUDO”
- MAY BE SINGLE OR MULTIPLE, WITHIN OR OUTSIDE OF THE PANCREAS
- NO SEPTA, LOCULATIONS, SOLID COMPONENTS, OR WALL CALCIFICATIONS
- MOST COMMUNICATE WITH THE PANCREATIC DUCTAL SYSTEM
- ELEVATED AMYLASE/LIPASE
- EUS ANECHOIC, THICK WALL, + PARENCHYMAL CHANGES SUGGESTIVE OF CHR PANC

PSEUDOCYST MANAGEMENT

- MOST RESOLVE SPONTANEOUSLY WITH SUPPORTIVE CARE
- COMPLICATED BY GOO, INFECTION, OBSTRUCTION, OR BLEEDING REQUIRES TREATMENT
- IF LARGE AND THUS SYMPTOMATIC, MAY ALSO REQUIRE TREATMENT
- DRAINAGE VIA:
  - ENDOSCOPY (TRANSMURAL OR TRANSPAPILLARY) = AXIOS USUALLY TRANSGASTRIC VS PD DUCT STENTING VIA ERCP *** PREFERRED METHODS
  - PERCUTANEOUS
  - SURGICAL

NON NEOPLASTIC PANCREATIC CYSTS

- TRUE CYSTS – RARE, BENIGN CUBOIDAL EPITHELIAL LINING
- RETENTION CYST – SMALL DILATED PANCREATIC DUCT SIDE BRANCHES ARISING SECONDARY TO OBSTRUCTION
- MUCINOUS NON-NEOPLASTIC CYSTS – DIFFICULT TO DIFFERENTIATE FROM PANCREATIC CYSTIC NEOPLAMS
  - LACK NEOPLASTIC FEATURS OR DUCTAL COMMUNICATION, LINED WITH MUCINOUS LINING

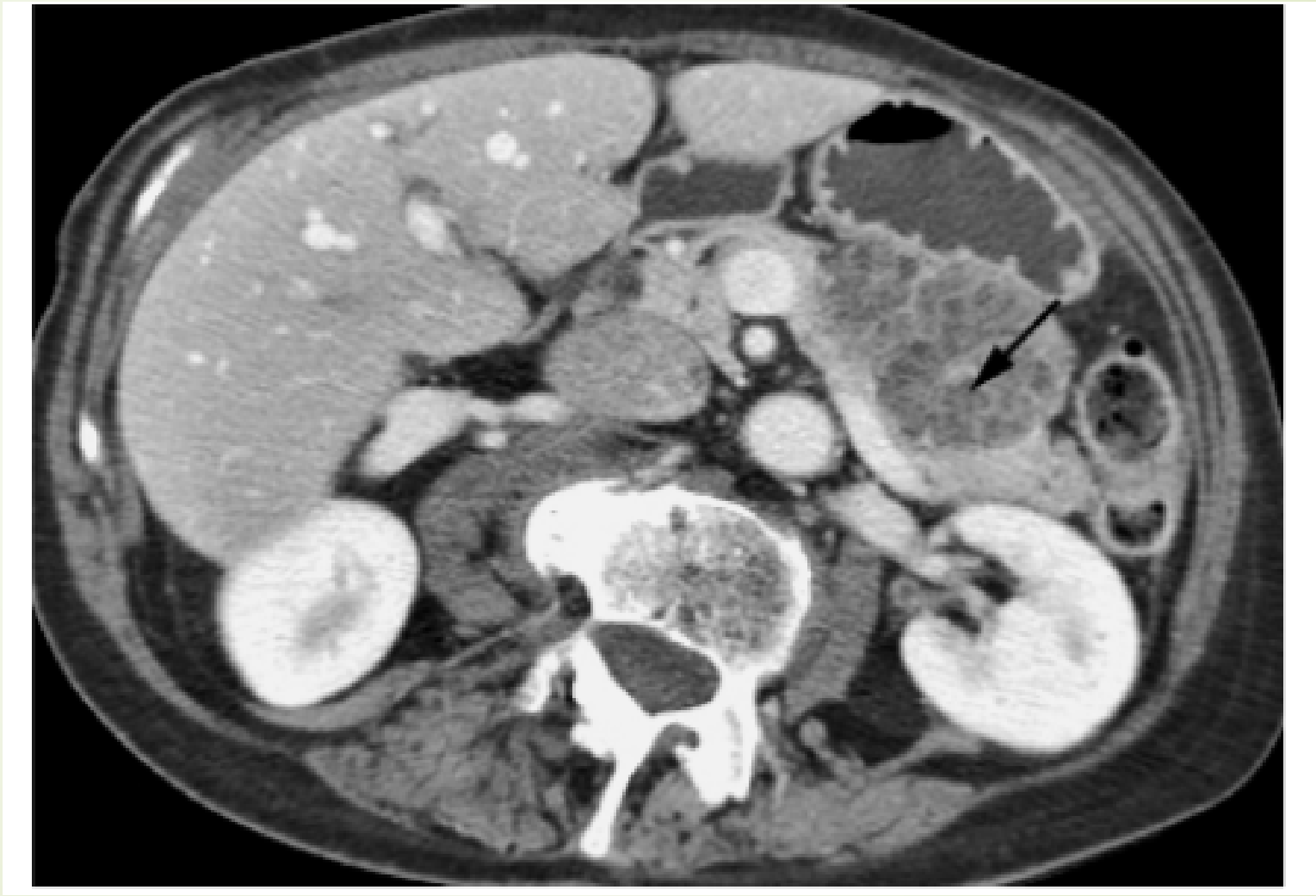
LYMPHOEPITHELIAL CYSTS

- RARE BUT BENIGN
- ASYMPTOMATIC AND FOUND MOSTLY IN MEN
- MATURE KERATINIZING SQUAMOUS EPITHELIUM SURROUNDED BY DISTINCT LAYER OF LYMPHOID TISSUE
- EUS APPEARANCE IS CYSTIC VS SOLID VS MIXED, TYPICALLY HAVING HYPERECHOIC AREAS WITHIN THE CYST
- SMALL EPITHELIAL CELLS, MATURE LYMPHOCYTES IN THE BACKGROUND OF KEKRATINACEOUS DEBRIS, ANUCLEATE SQUAMOUS CELLS, AND MULTINUCLEATED HISTIOCYTES
- IF SYMPTOMATIC, MAY REQUIRE RESECTION

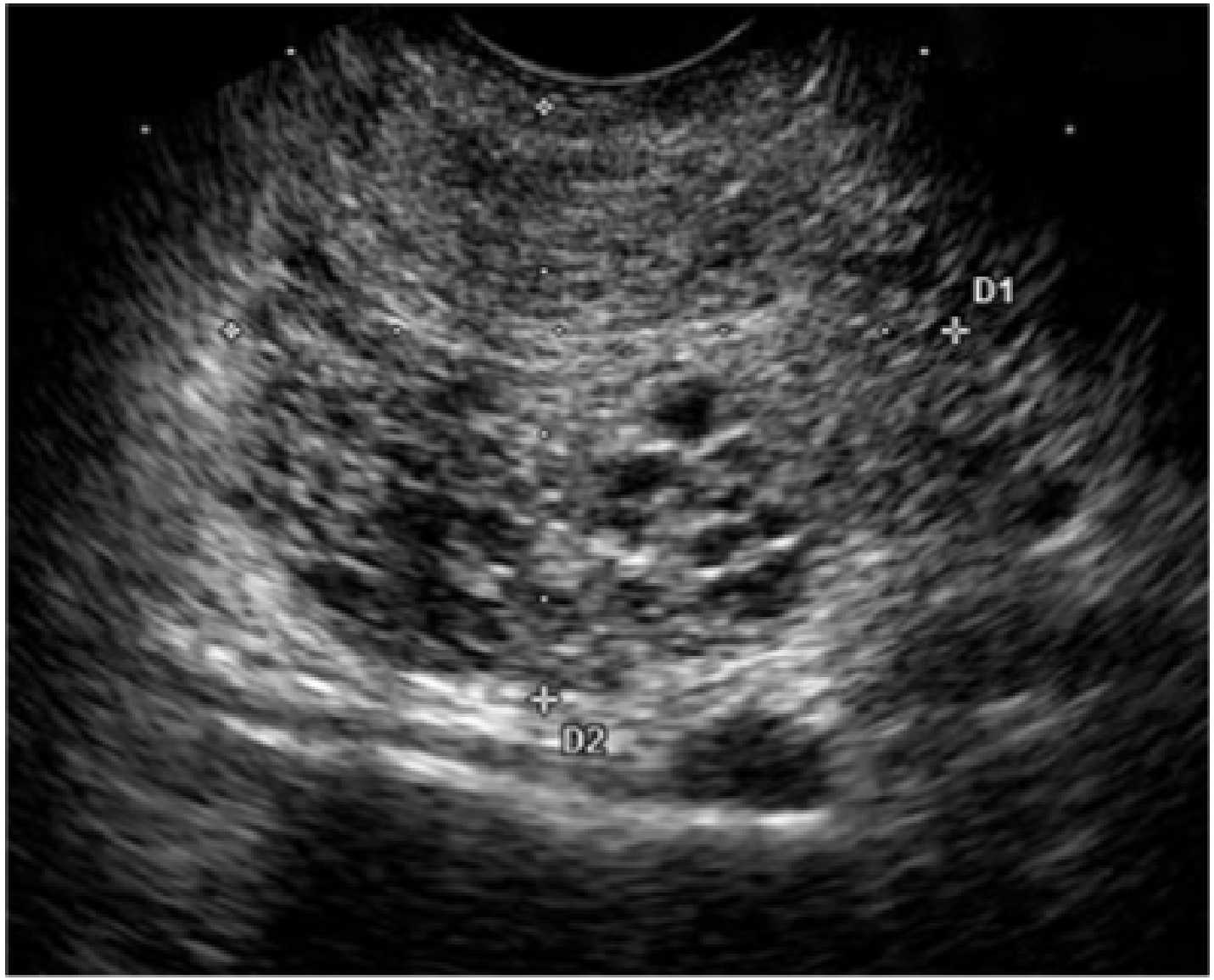
Serous Cystadenoma

- 5^{th} – 7^{th} decade
- F>M
- May be incidental finding vs abd pain or mass effect symptoms
- Microcystic, honeycomb appearance with central “sunburst” calcification in 10-20% of cases
- HISTOLOGY: CUBODIAL CELLS THAT STAIN + FOR GLYCOGEN
- CEA <5-20 TYPICALLY
- THESE ARE BENIGN LESIONS BUT SHOULD BE RESECTED IF SYMPTOMATIC
- (R/O IBS, BILIARY DISEASE, CHRONIC PANC, AND OTHER CAUSES OF ABD PAIN PRIOR TO SURGICAL TREATMENT

SEROUS CYSTADENOMA

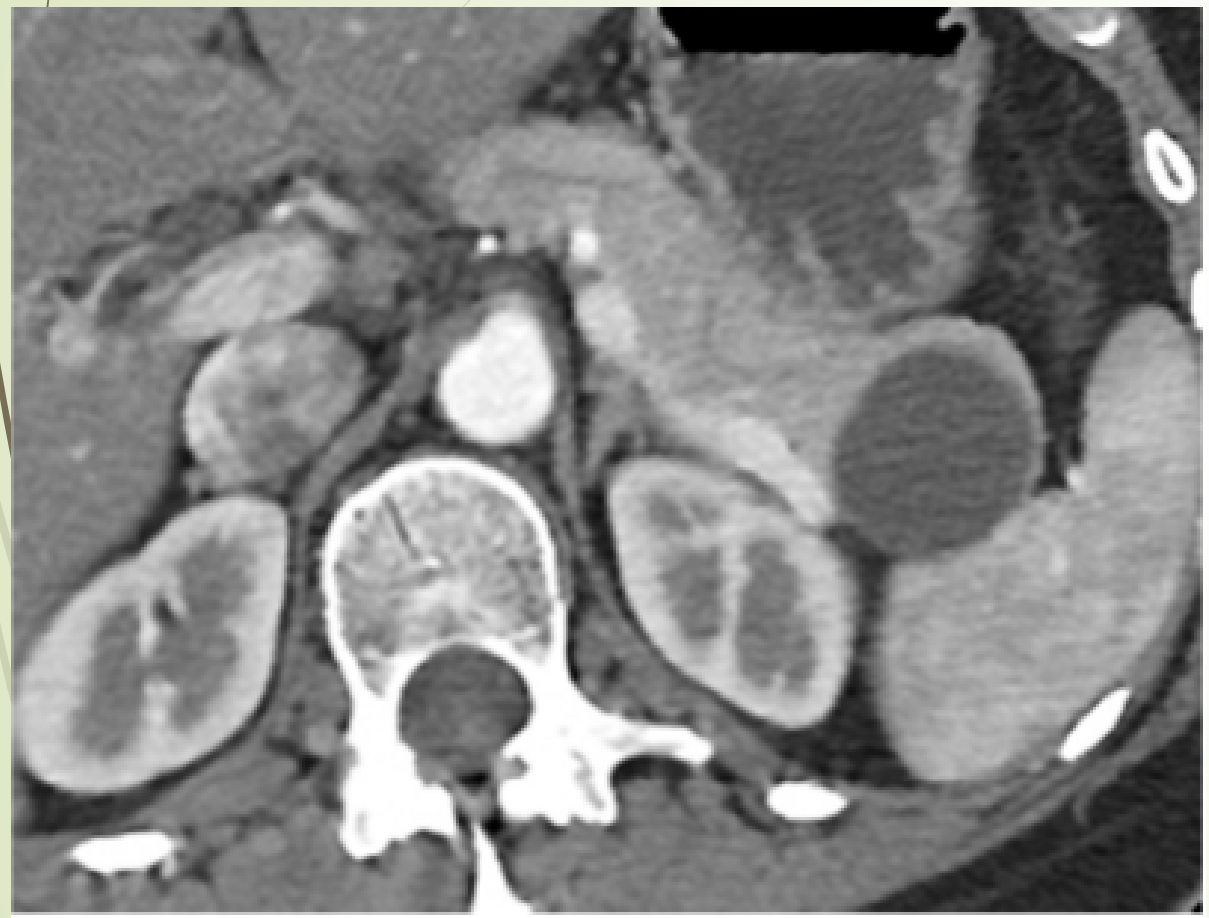


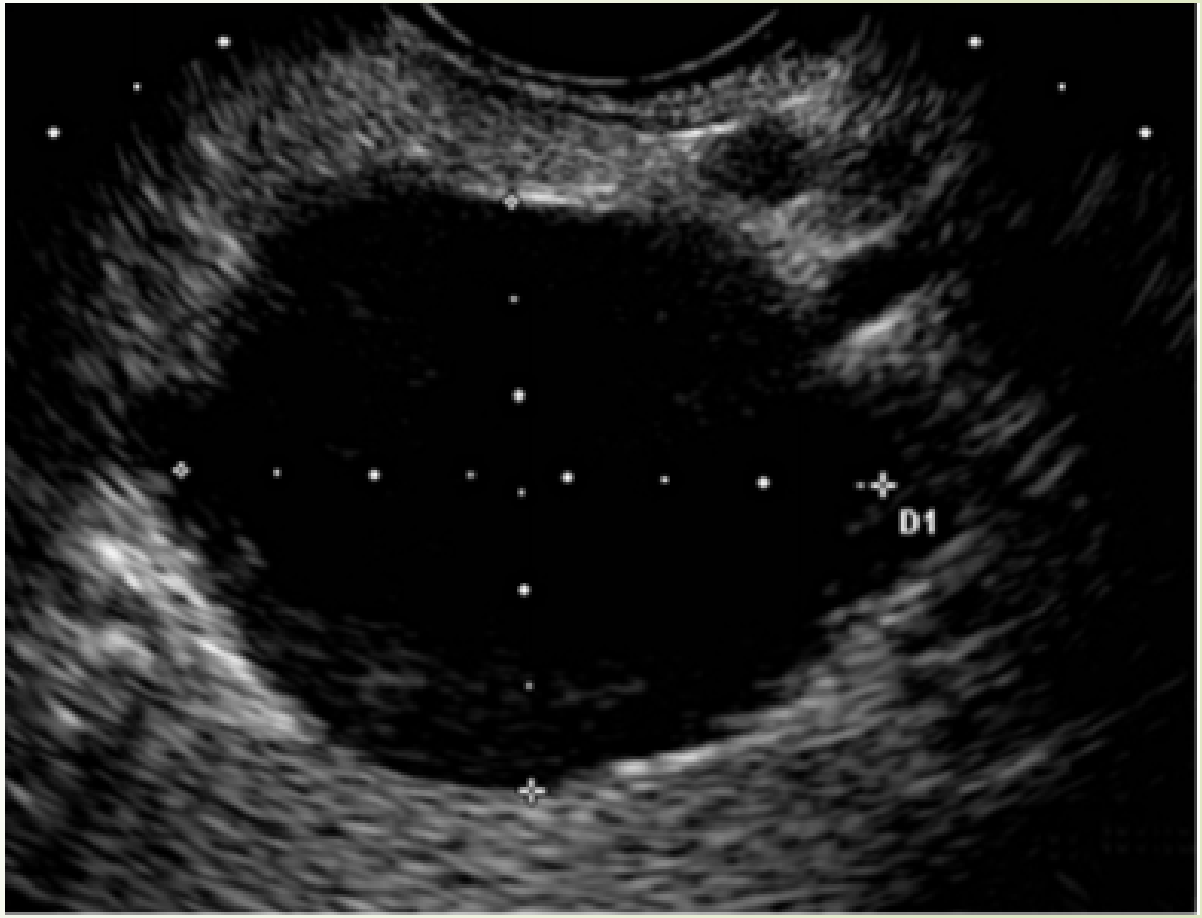
SEROUS CYSTADENOMA



MUCINOUS CYSTIC NEOPLASM

- 5^{TH} – 7^{TH} DECADE
- 80% F >M
- PRESENTS AS INCIDENTAL FINDING BUT CAN CAUSE ABD PAIN
- UNILOCULAR, MAY HAVE SEPTATIONS +/- WALL CALCIFICATIONS
- SOLID COMPONENT MAY SUGGEST MALIGNANT TRANSFORMATION
- USUALLY IN THE TAIL OF THE PANCREAS
- HISTOLOGY SHOWS COLUMNAR CELLS WITH VARIABLE ATYPIA THAT STAIN POSITIVE FOR MUCIN
- CEA >200 TYPICALLY
- MODERATE MALIGNANT POTENTIAL

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MANAGEMENT

- BECAUSE OF SIGNIFICANT MALIGNANT POTENTIAL…
- >5 CM, THICKENED/CALCIFIED/IRREGULAR CYST WALL, INTERNAL SOLID COMPONENT (MURAL BODIES) = INCREASED RISK FOR MALIGNANCY
- TREATMENT = RESECTION
  - HEAD LESION: PANCREATICODUODENECTOMY/ WHIPPLE PROCEDURE
  - BODY/TAIL LESION; DISTAL PANCREATECTOMY WITH SPLENECTOMY

INTRADUCTAL PAPILLARY MUCINOUS NEOPLASM

- 5^{TH} – 7^{TH} DECADE
- F>M
- MAY PRESENT AS PANCREATITIS OR EXOCRINE INSUFFICIENCY
- MAIN DUCT VS BRANCH DUCT VS MIXED
- SAME IMAGING PRINCIPLES – MRCP AND CT GREAT FOR LARGE LESIONS, EUS FOR SMALL LESIONS, MRCP SLIGHTLY BETTER THAN CT IN RETROSPECTIVE STUDIES
- ERCP ALSO DIAGNOSTIC (NOT RECOMMENDED) BUT MUCUS MAY BE SEEN AT AMPULLA
- COLUMNAR CELLS +FOR MUCIN, CEA >200

IPMN'S

- HIGH MALIGNANT POTENTIAL IF MAIN DUCT
- LOW TO MODERATE MALIGNANT POTENTIAL IF BRANCH DUCT
- TREATMENT
  - RECENT INTERNATIONAL GUIDELINES HAVE CHANGED IN 2017 FROM PRIOR 2012 REVIEW

WORRISOME FEATURES

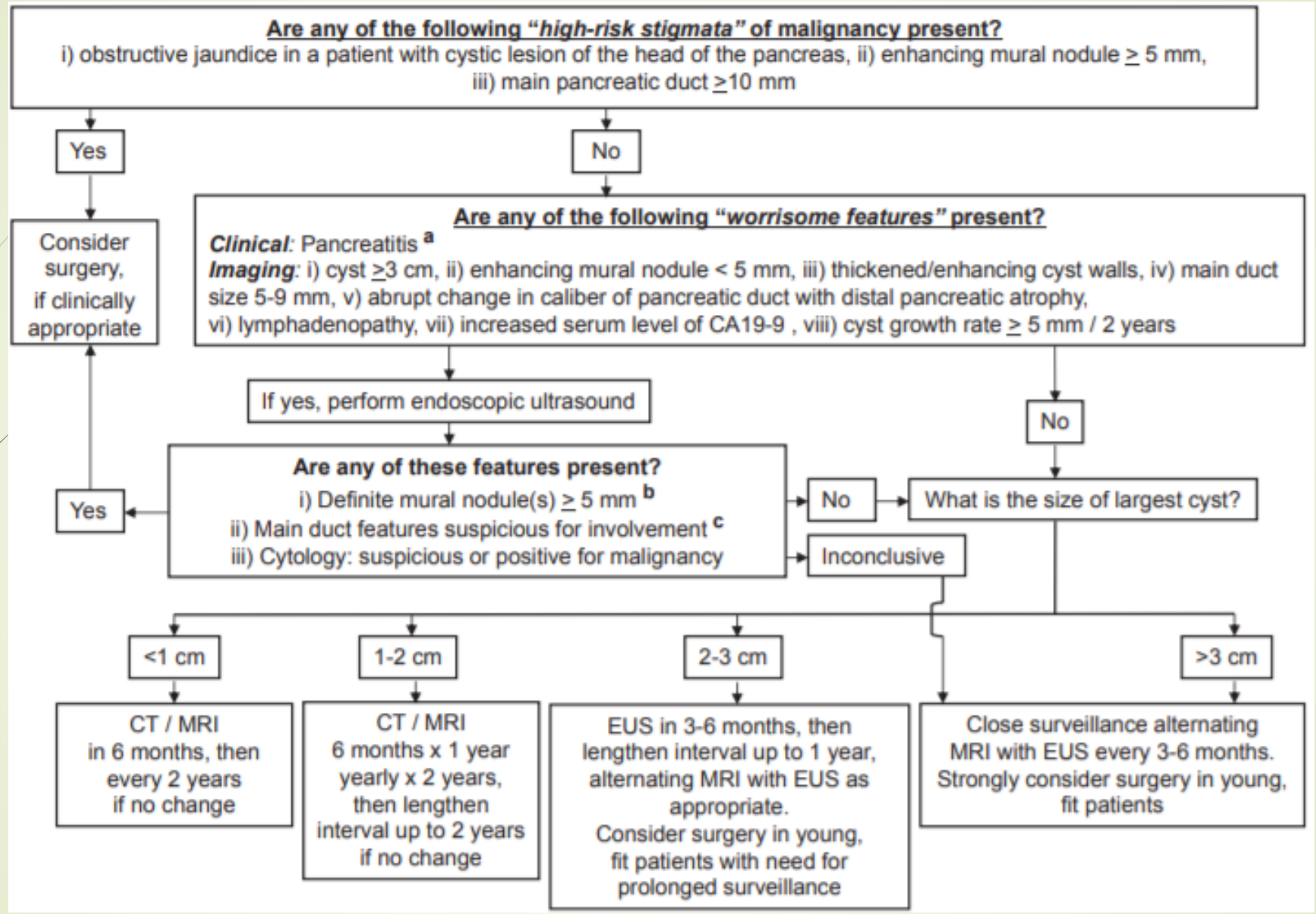
- SIZE >3 CM
- MURAL NODULES OR SOLID COMPONENT
- MAIN PD 5-9 MM
- CHANGE IN CALIBER OF MAIN PD WITH DISTAL PANCREAS ATROPHY
- LYMPHADENOPATHY
- RAPID GROWTH > 5 MM IN 2 YEARS
- ELEVATED CA 19-9

IPMN'S

The management of intraductal papillary mucinous neoplasm (IPMN) continues to evolve. In particular, the indications for resection of branch duct IPMN have changed from early resection to more deliberate observation as proposed by the international consensus guidelines of 2006 and 2012.

Another guideline proposed by the American Gastroenterological Association in 2015 restricted indications for surgery more stringently and recommended physicians to stop surveillance if no significant change had occurred in a pancreatic cyst after five years of surveillance, or if a patient underwent resection and a non-malignant IPMN was found.

HOWEVER AS DISCUSSED DURING OUR MOST RECENT JOURNAL CLUB, A LONG TERM STUDY SUGGESTED HIGH RISK OF MALIGNANT TRANSFORMATION IN PTS FOLLOWED >10 YEARS

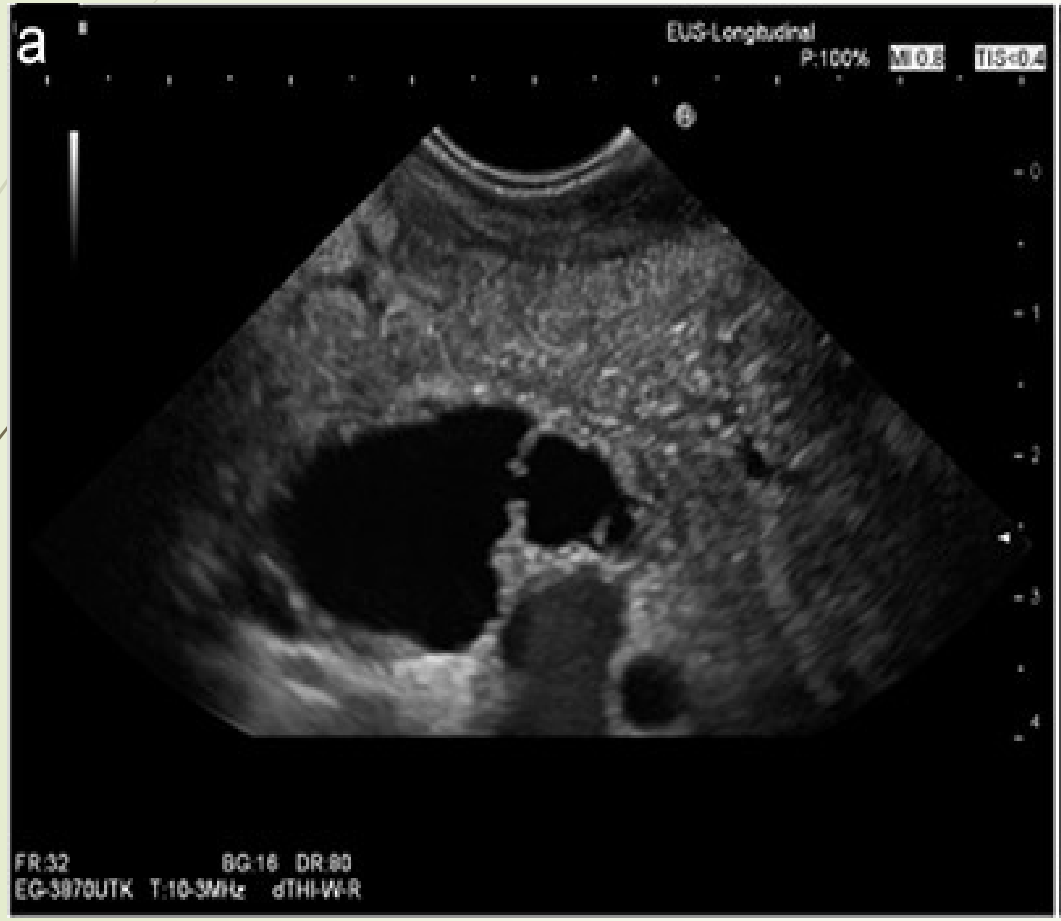

Are any of the following "high-risk stigmata" of malignancy present?
i) obstructive jaundice in a patient with cystic lesion of the head of the pancreas, ii) enhancing mural nodule ≥ 5 mm,
iii) main pancreatic duct ≥10 mm
Yes
No
Consider surgery, if clinically appropriate
Are any of the following "worrisome features" present?
Clinical: Pancreatitis [a]
Imaging: i) cyst ≥3 cm, ii) enhancing mural nodule < 5 mm, iii) thickened/enhancing cyst walls, iv) main duct size 5-9 mm, v) abrupt change in caliber of pancreatic duct with distal pancreatic atrophy,
vi) lymphadenopathy, vii) increased serum level of CA19-9 , viii) cyst growth rate ≥ 5 mm / 2 years
If yes, perform endoscopic ultrasound
No
Are any of these features present?
i) Definite mural nodule(s) ≥ 5 mm [b]
ii) Main duct features suspicious for involvement [c]
iii) Cytology: suspicious or positive for malignancy
Yes
No
What is the size of largest cyst?
Inconclusive
<1 cm
1-2 cm
2-3 cm
>3 cm
CT / MRI in 6 months, then every 2 years if no change
CT / MRI 6 months x 1 year yearly x 2 years, then lengthen interval up to 2 years if no change
EUS in 3-6 months, then lengthen interval up to 1 year, alternating MRI with EUS as appropriate. Consider surgery in young, fit patients with need for prolonged surveillance
Close surveillance alternating MRI with EUS every 3-6 months. Strongly consider surgery in young, fit patients

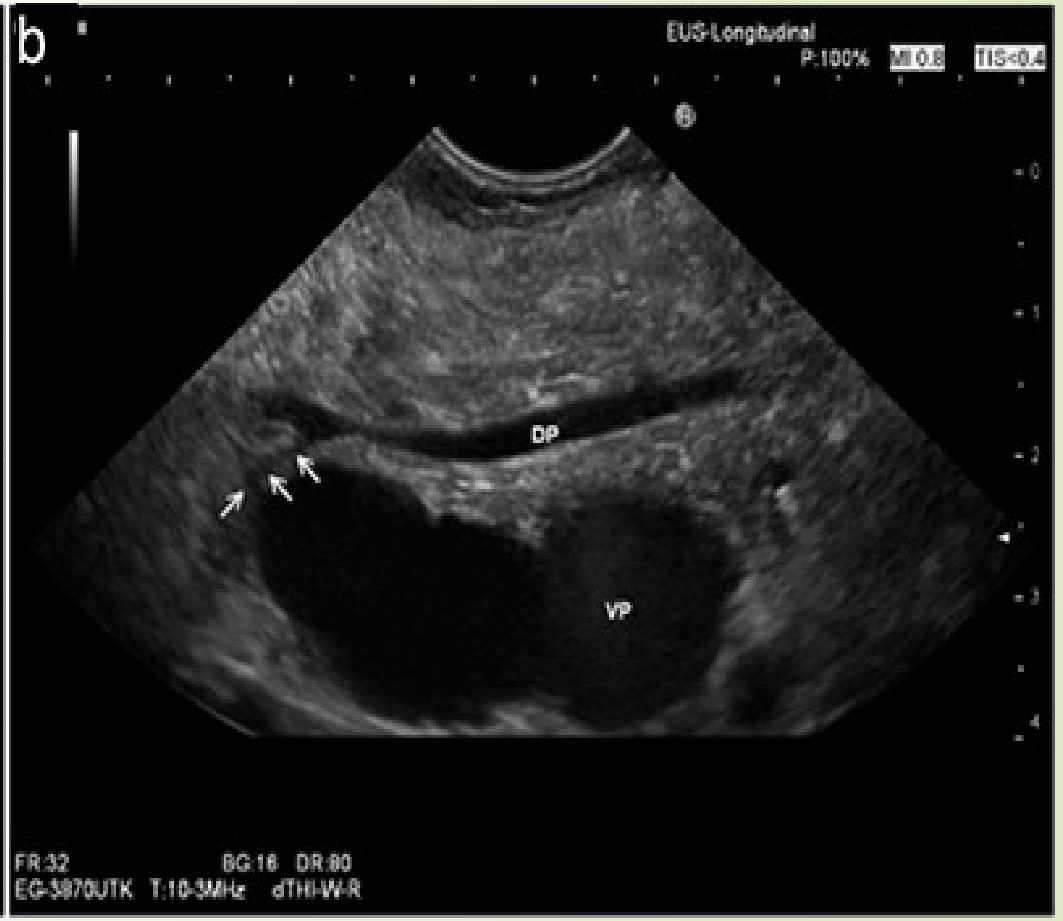
SOLID PSEUDOPAPILLARY NEOPLASM

- USUALLY YOUNG WOMEN IN 2ND OR 3RD DECADE
- SOLID AND CYSTIC MASS +/- CALCIFICATIONS
- OFTEN IN BODY OR TAIL
- CAN BE LARGE WITH MASS EFFECT
- BRANCHING PAPILLAE WITH MYXOID STROMA
- STAINS POSITIVE FOR VIMENTIN AND ALPHA1-ANTITRYPSIN
- CEA LEVELS HAVE A WIDE RANGE
- LOW MALIGNANT POTENTIAL
- HOWEVER, TREATMENT IS SURGICAL RESECTION

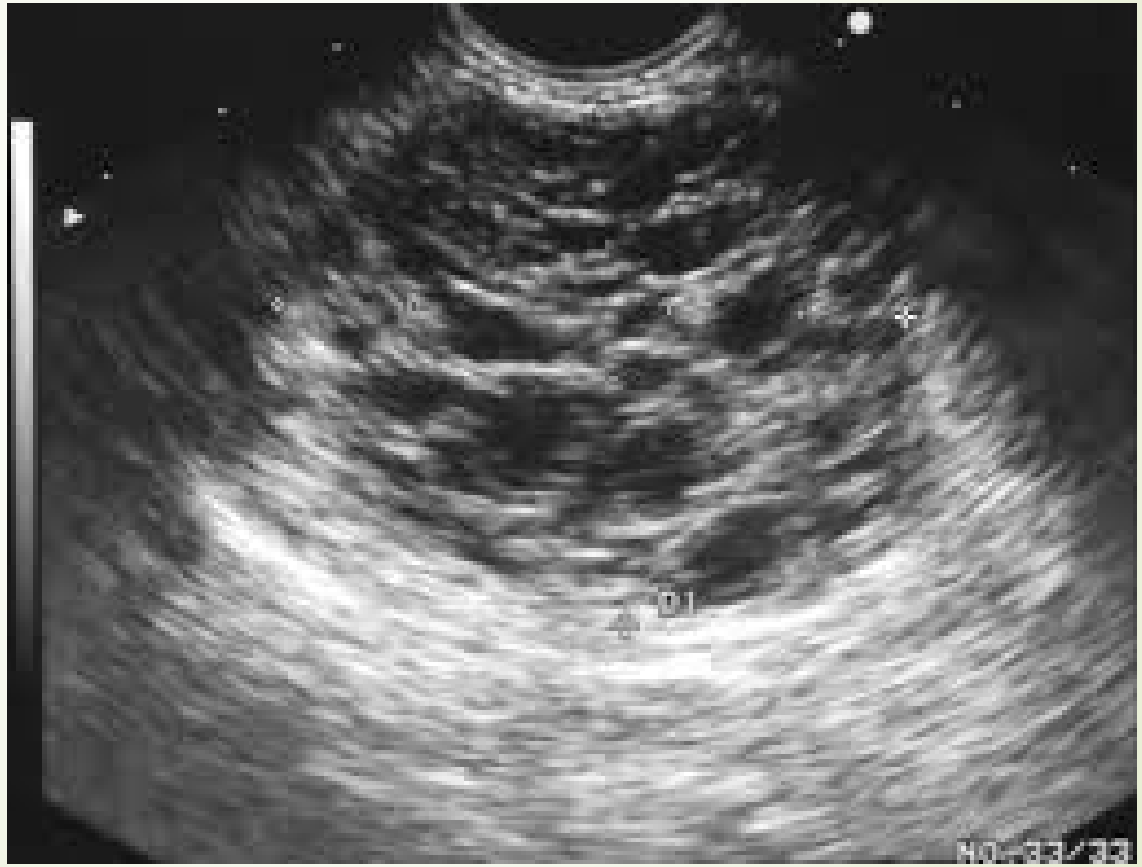
Name that cyst !!!

BD - IPMN

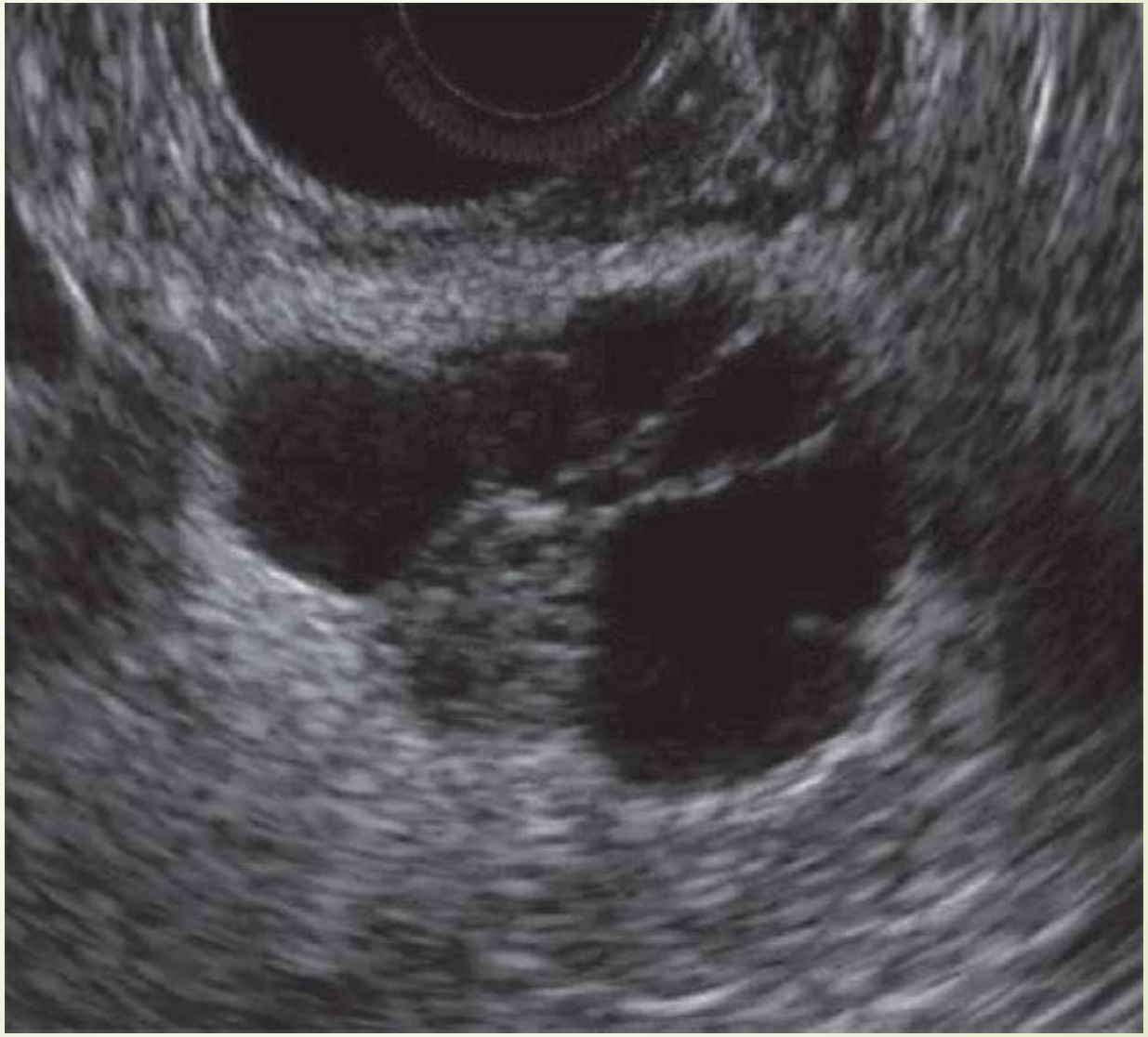

a
EUS-Longbudinal
P:100%
MI 0.8
TIS<0.4
FR:32
BG:16 DR:80
EG-3870UTK T:10-5MHz dTHI-W-R


b
EUS-Longbudinal
P:100%
MI 0.8
TIS<0.4
DP
VP
FR:32
BG:16 DR:80
EG-3870UTK T:10-5MHz dTHI-W-R

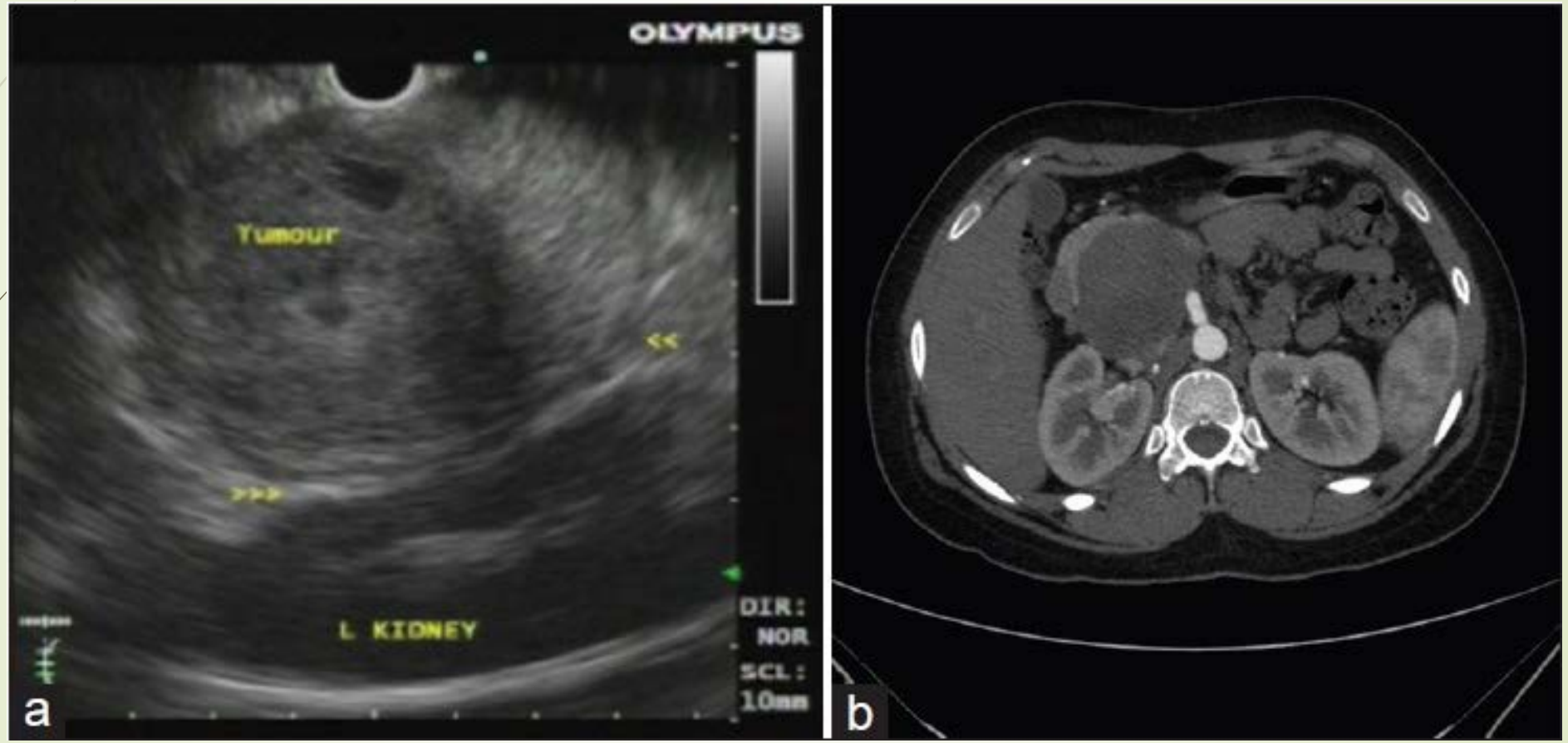
SEROUS CYSTADENOMA



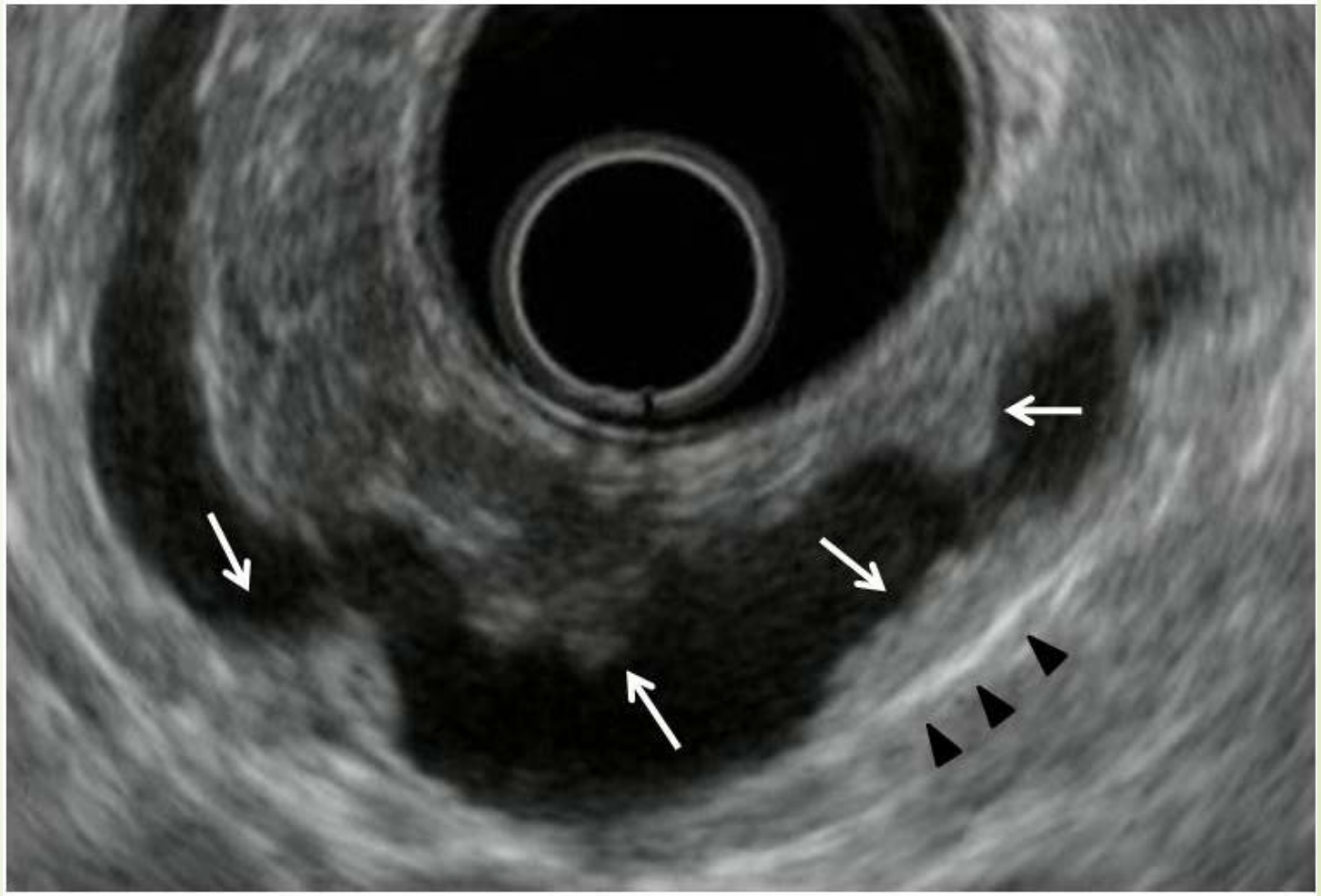
MCN



Solid Pseudopapillary Cystadenoma



Main Duct IPMN



Main Duct IPMN

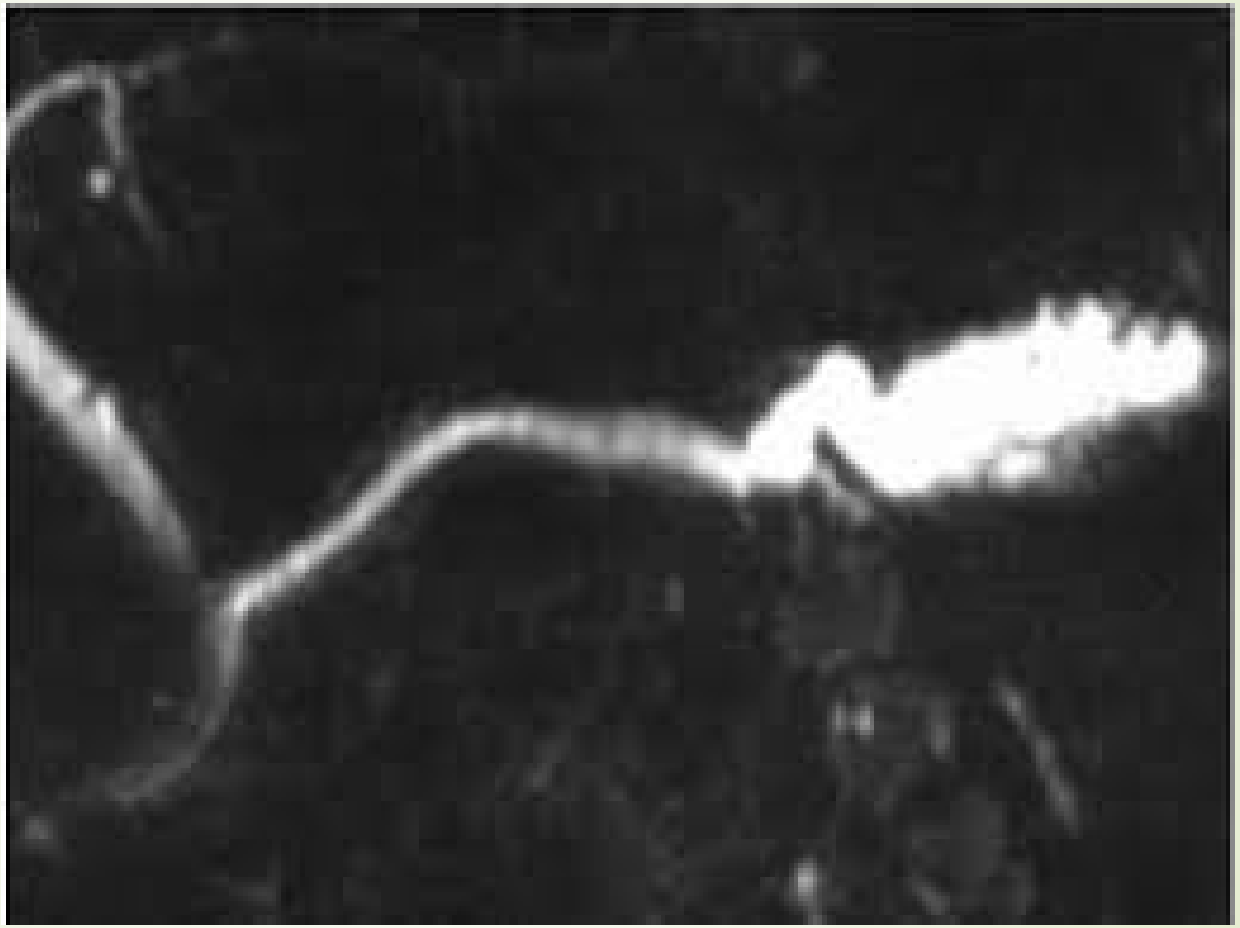
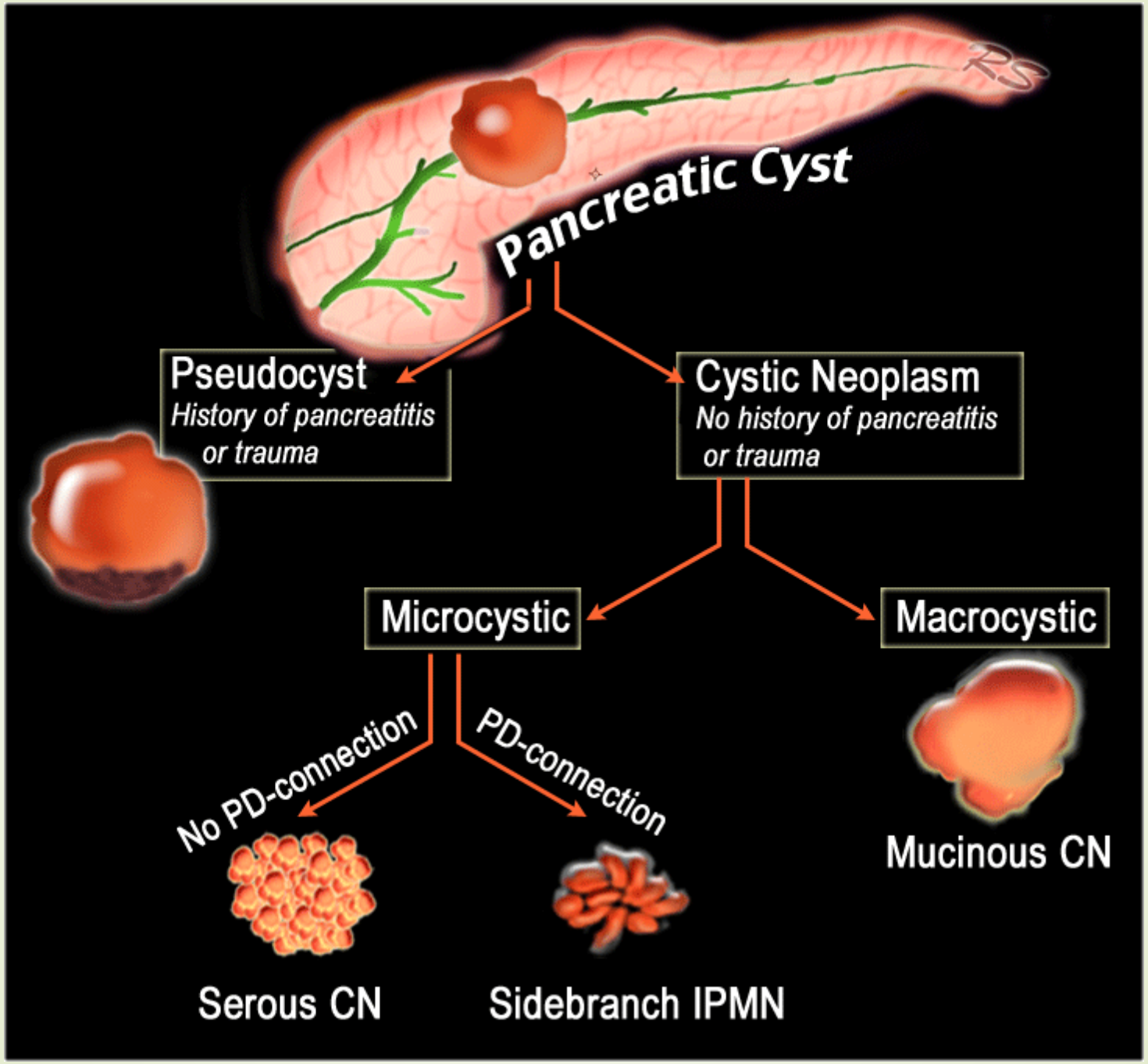


TABLE 2. Characteristics of pancreatic cystic lesions

	Pseudocyst	IPMN	Mucinous cystic neoplasm
Clinical features	History of moderate to severe pancreatitis	History of pancreatitis, abdominal pain, or found incidentally	Usually found incidentally but can cause abdominal pain and a palpable mass if large
Morphology/ EUS findings	Anechoic, thick-walled, rare septations, regional inflammatory nodes may be seen	Dilated main pancreatic duct or side branches; may appear as a septated cyst; may have a solid component	Macrocystic, occasionally septated; peripheral calcifications, solid components and regional adenopathy when malignant
Fluid characteristics	Thin, muddy-brown	Viscous or stringy, clear	Viscous or stringy, clear
Fluid chemistries	Elevated amylase, low CEA	Elevated amylase and CEA	Elevated CEA, low amylase
Cytology	Neutrophils, macrophages, histiocytes; negative staining for mucin	Mucinous columnar cells with variable atypia; fluid stains positive for mucin	Mucinous columnar cells with variable atypia; fluid stains positive for mucin
Malignant potential	None	Yes	Yes

TABLE 2. Continued

Serous cystic neoplasm	Cystic endocrine neoplasm	Solid pseudopapillary neoplasm	Ductal adenocarcinoma with cystic degeneration
Usually found incidentally but can cause abdominal pain and a palpable mass if large	May have clinical features of solid pancreatic endocrine neoplasm	Usually found incidentally; rarely causes abdominal discomfort	Presents with painless jaundice, abdominal/back pain or rarely pancreatitis
Microcystic with a "honeycomb" appearance; rarely has a macrocystic component; central calcification	Unilocular cyst occupies most of neoplasm	Solid and cystic components	Primarily solid mass with cystic spaces
Thin, clear to serosanguineous	Thin, clear	Bloody + necrotic debris	Bloody ± debris
Low CEA and amylase	Variable	Variable	Variable
Cuboidal epithelium that stains positive for glycogen	Monomorphic endocrine tumor cells; stains positive for chromagranin and synaptophysin	Monomorphic cells with round nuclei and eosinophilic or foamy cytoplasm; stains positive for vimentin and a-1-antitrypsin	Malignant adenocarcinoma may be seen, but varying degrees of atypia may be present in the specimen
Almost none (rare reports)	Yes	Yes	Already present


Pancreatic Cyst
Pseudocyst
History of pancreatitis or trauma
Cystic Neoplasm
No history of pancreatitis or trauma
Microcystic
Macrocystic
No PD-connection
PD-connection
Mucinous CN
Serous CN
Sidebranch IPMN

Endoscopic treatment of cystic lesions

Recently, endoscopic cyst ablation with ethanol alone or in combination with paclitaxel for suspected pancreatic cystic neoplasms has been proposed as an alternative to surgery.[92-95] Cysts selected for ablation have typically been less than 3 to 4 cm in size, unilocular or oligolocular (<3-6 locules), and without evidence of communication with the MPD. A randomized trial showed that ethanol is superior to saline solution for pancreatic cyst ablation.[92,96] The chemotherapeutic agent paclitaxel has been added in more recent studies to standard ethanol lavage to potentially improve response rates. The hydrophobic nature of paclitaxel is believed to foster its retention in the cyst and minimize peri-cystic leakage. Overall reported rates of cyst resolution range from 33% to 79%, with increased efficacy observed with smaller initial cyst volumes, multiple ethanol ablations, or ethanol and/or paclitaxel combination

therapy.[95-97] Adverse events have been reported in approximately 12% of cases and include abdominal pain, focal peritonitis, pancreatitis, fever, pericystic spillage, splenic vein obliteration, and portal venous thrombosis.[96,98] Uncertainties remain regarding the durability of the technique,[99] whether complete epithelial ablation has been achieved in radiographically resolved cysts and the impact on the malignant potential of these cysts.[100] A recent study demonstrated that EUS-guided cyst ablation may eliminate mutant DNA in neoplastic pancreatic cysts.[101] However, patients achieving cyst ablation are thought to be at continued risk of developing ductal adenocarcinoma and should undergo continued surveillance imaging.[102] Given these limitations, EUS-guided cyst ablation is performed only at select centers and might be considered for patients who refuse or are not candidates for surgery.

Recommendations

1. We recommend EUS-FNA of any pancreatic cystic lesion over 3 cm in diameter or when cross-sectional or EUS imaging confirms an epithelial nodule, dilated main pancreatic duct, or suspicious mass lesion. ⊕⊕⊕◯
2. We suggest that EUS-FNA is optional in asymptomatic patients in whom cross-sectional imaging demonstrates a cyst <3 cm and without either a mass and/or epithelial nodule or associated dilated main pancreatic duct. ⊕⊕◯◯
3. We recommend initial testing of aspirated pancreatic cyst fluid for CEA, amylase, and cytology. ⊕⊕⊕◯
4. We suggest that molecular testing of the cyst be considered when initial ancillary testing of cytology and CEA is inconclusive and when test results may alter management. ⊕⊕◯◯

5. We suggest administration of prophylactic antibiotics for patients undergoing EUS-FNA for the evaluation of cystic pancreatic neoplasms. ⊕⊕◯◯
6. We suggest that ERCP, pancreatoscopy, and intraductal US may be helpful in the diagnosis and characterization of suspected main duct IPMNs. ⊕⊕◯◯

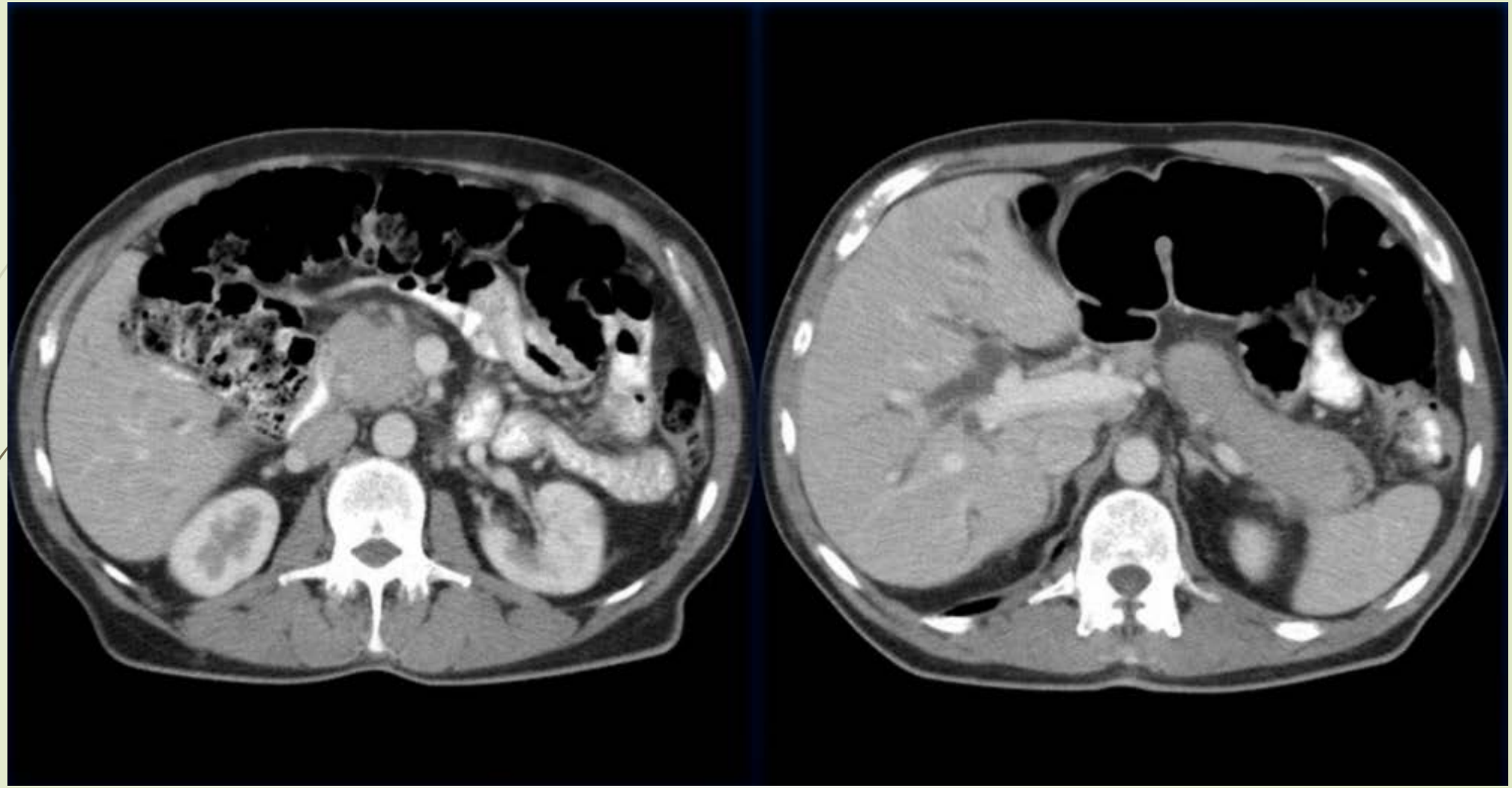
Case 1

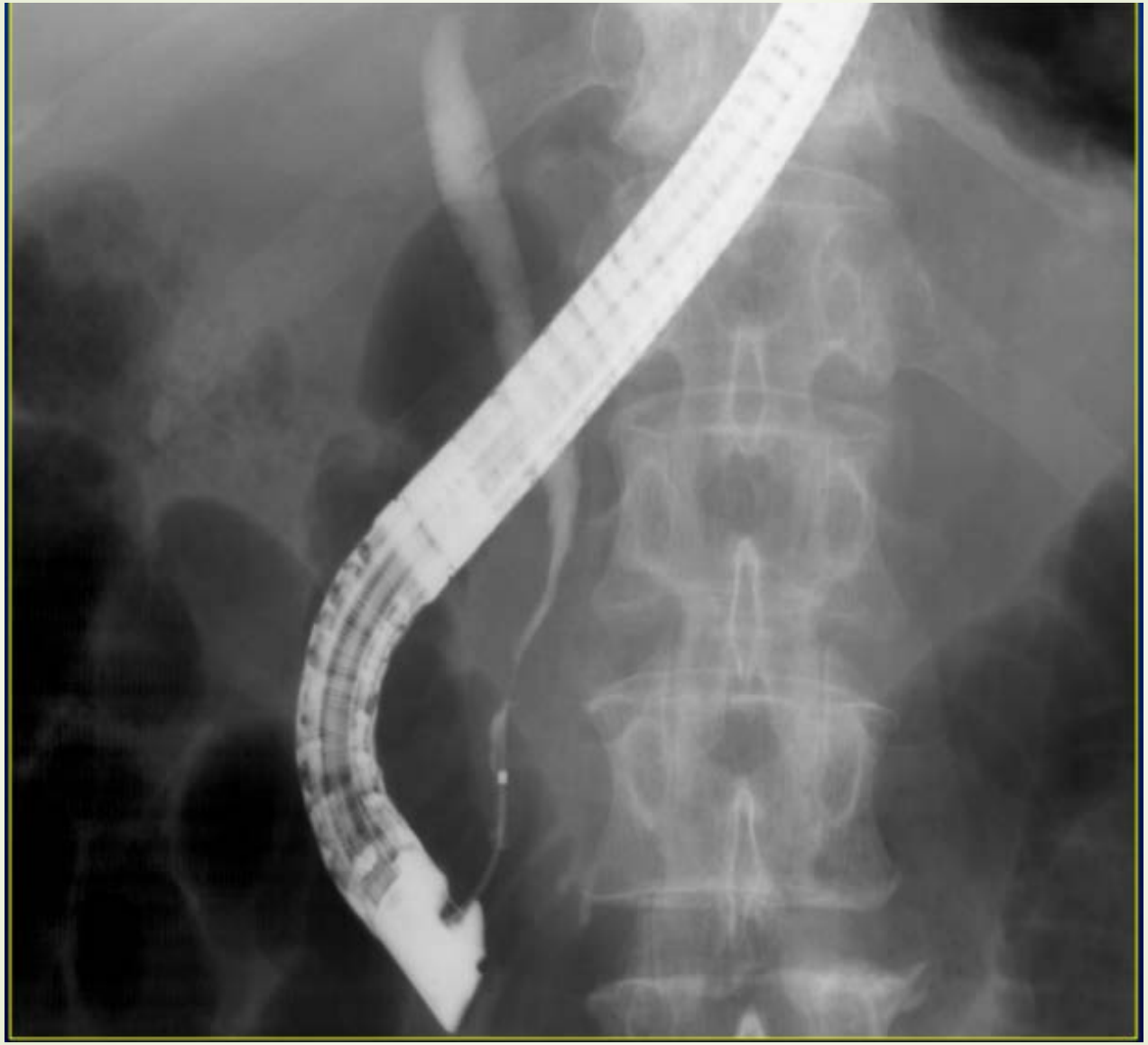
A 64 yo male naturopathic physician with a past history of hypertension and hyperlipidemia is seen in the emergency department with a 6-week history of epigastric discomfort. He also complains of anorexia, early satiety, and a 30 lb weight loss over the past 2-3 months. At his most recent physical examination, he was newly diagnosed with type 2 diabetes.

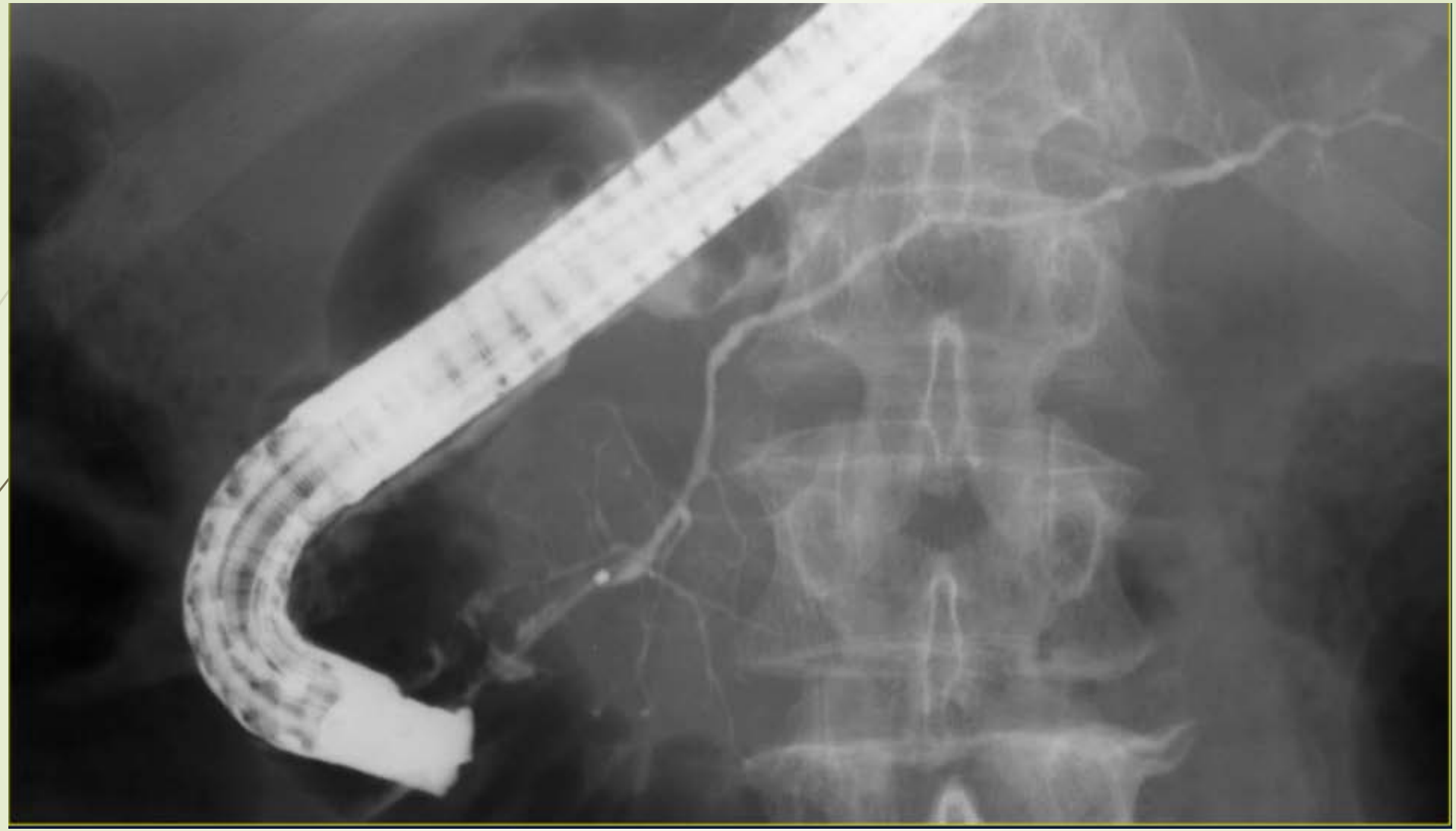
Exam: ill-appearing male, generalized icterus, abdominal exam negative

Labs:

- WBC 9,000, Hb 11.4g/dl,
- Bilirubin 8 mg/dl, direct 6.9mg/dl, AST 280, ALT 312, ALKP 640, CA 19-9: 390 U/ml







Which of the following statements is correct about this patient's most likely diagnosis and management?

A. The patient should be referred for Whipple resection

B. EUS would likely show a discrete hypoechoic mass in the head of pancreas

C. Long-term treatment with pancreatic enzyme replacement and alcohol abstinence is indicated

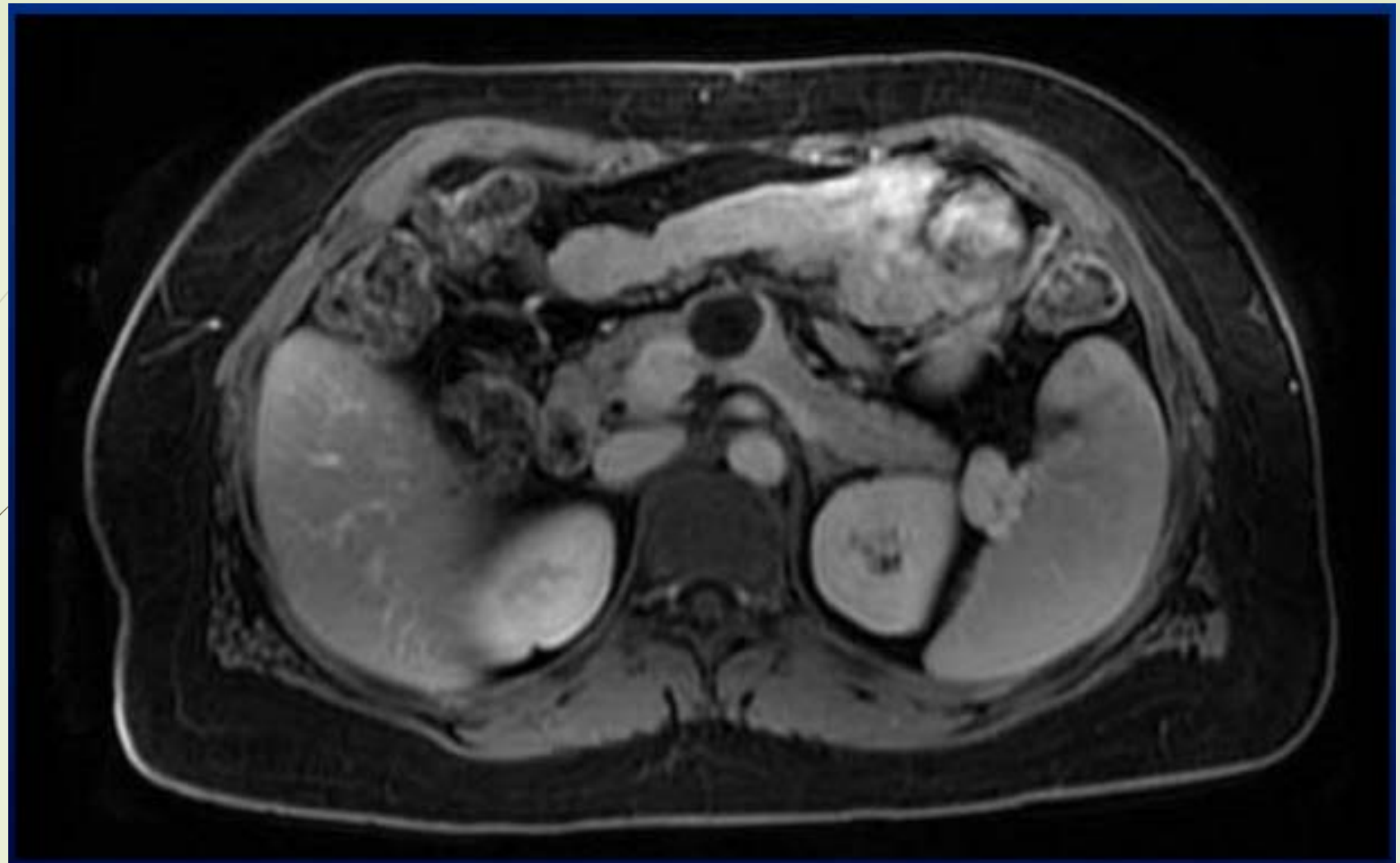
D. Elevated serum IgG4 & response to corticosteroids is likely

E. ERCP & PD sphincterotomy will improve pain

Case 2

- A 50 year old woman is referred to you for further evaluation of an incidentally detected pancreatic cyst. She had a CT scan of the abdomen performed for evaluation of renal calculi. An MRI of the abdomen was suggested, which she had performed through her primary care doctor. She is asymptomatic.

She has hypertension, which is well controlled, and had a hysterectomy in the past for uterine fibroids. Her mother died from pancreatic cancer at age 70. She is very anxious about this cyst, and wonders if she has developed pancreatic cancer.



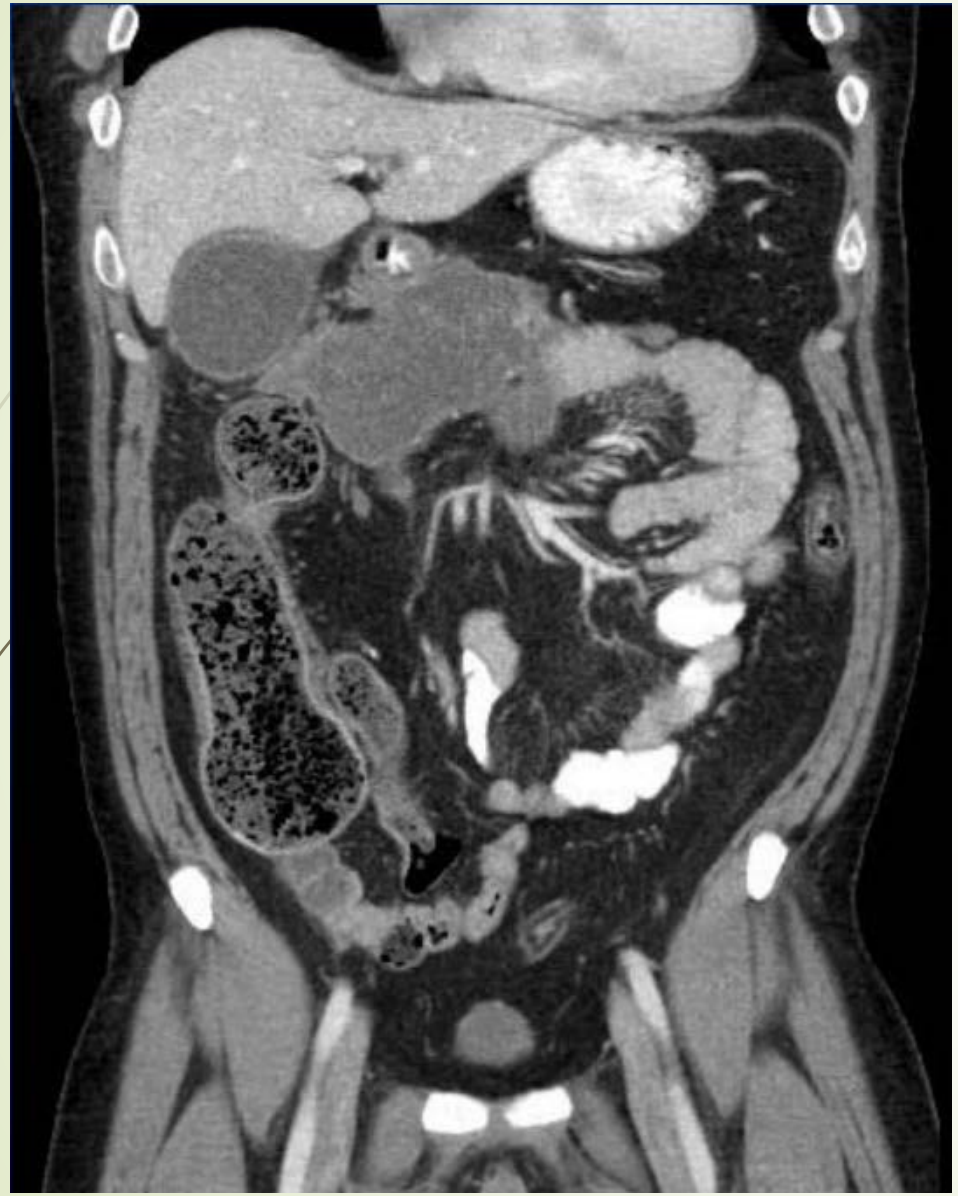
MRI- Unilocular, 2.0 cm cyst with thin wall, no septations; normal pancreatic duct and no visible communication of the cyst to the pancreatic duct

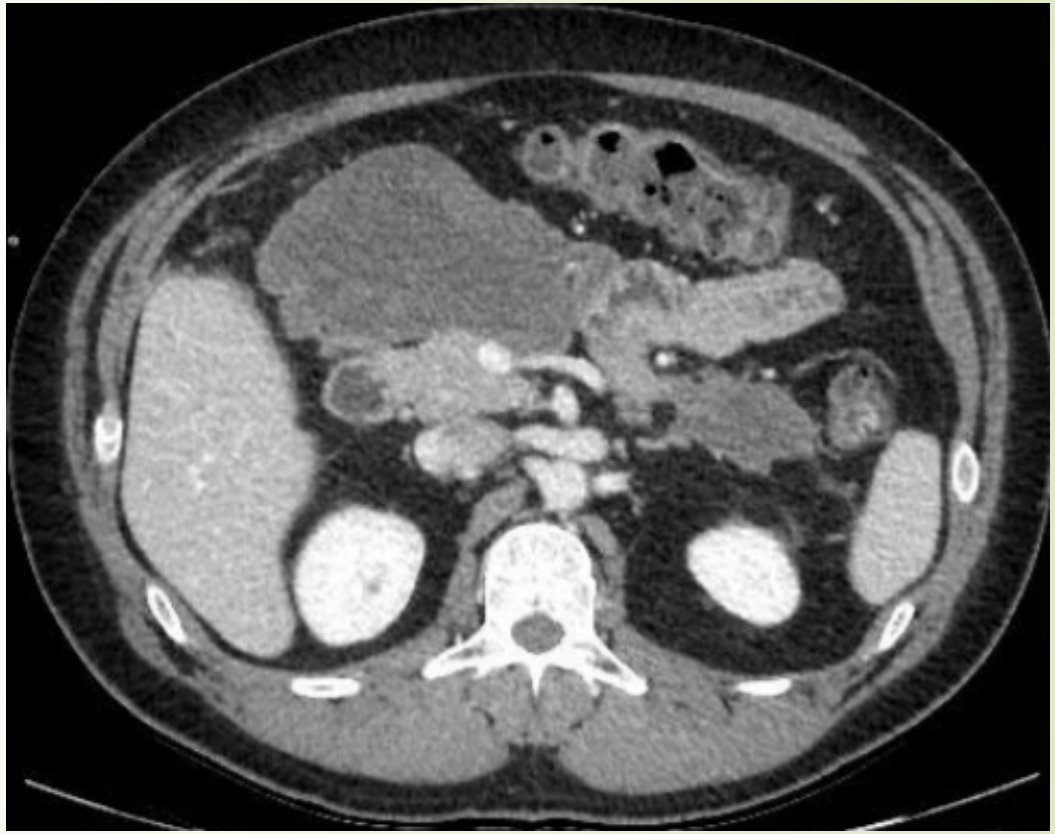
- Which of the following is the most likely diagnosis?

A. Branch duct intraductal papillary mucinous neoplasm (BD-IPMN)
B. Main duct IPMN
C. Mucinous cystic neoplasm
D. Serous cystadenoma
E. Cystic neuroendocrine tumor

CASE 3

- 32 year-old male with ulcerative colitis and primary sclerosing cholangitis is transferred to your hospital for further evaluation of abdominal pain. He had post-ERCP pancreatitis 4 months ago for evaluation of a dominant stricture and required a 15-day hospitalization. He denies fever or chills but has early satiety and postprandial abdominal pain that has led to a 10 lb weight loss. He is on Adalimumab for UC.
- Labs: WBC 9,800, Bili 1.4, AST 110, ALT 145, ALKP 220.
- Imaging…





How would you best classify this collection?

A. Acute peripancreatic fluid collection

B. Walled-off necrosis

C. Acute necrotic collection

D. Pancreatic pseudocyst

E. Mucinous pancreatic cyst

- What is the next best step in the management of this patient?

A. Hold Adalimumab and repeat imaging in 4 weeks

B. Continue Adalimumab, institute antibiotics, and repeat imaging in 4-6 weeks

C. Perform CT-guided fine needle aspiration

D. Refer to surgery for open necrosectomy

E. Endoscopic drainage and debridement

REFERENCES

- Mayo Clinic Gastroenterology and Hepatology Board Review. Mayo Clinic Scientific Press. 2015
- GIE
- ASGE
- AGA
- WJOG
- U OF L GI DEPARTMENT WEBSITE ☺

What we did not talk about... but will

- EUS, INDICATIONS, DIAGNOSIS VS THERAPIES
- MRCP REVIEW
- PANCREATIC ENDOCRINE TUMORS (INSULINOMAS, VIPOMAS, ETC)
- ERCP INDICATIONS, DIAGNOSTIC VS THERAPEUTIC
- OTHER BILIARY DISEASES (CHOLEDOCHAL CYSTS, GENETIC SYNDROMES, ETC)

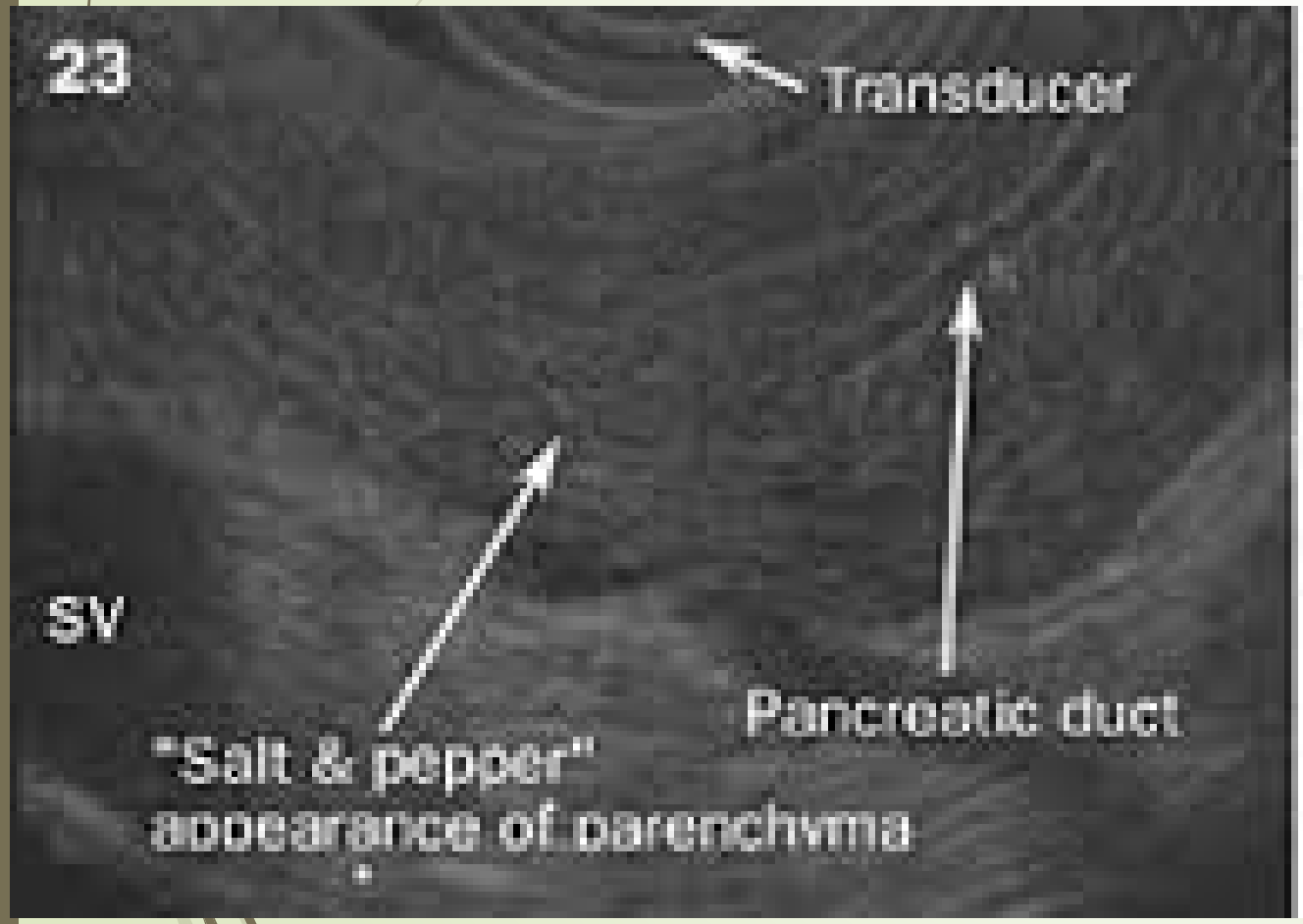
INDICATIONS FOR EUS

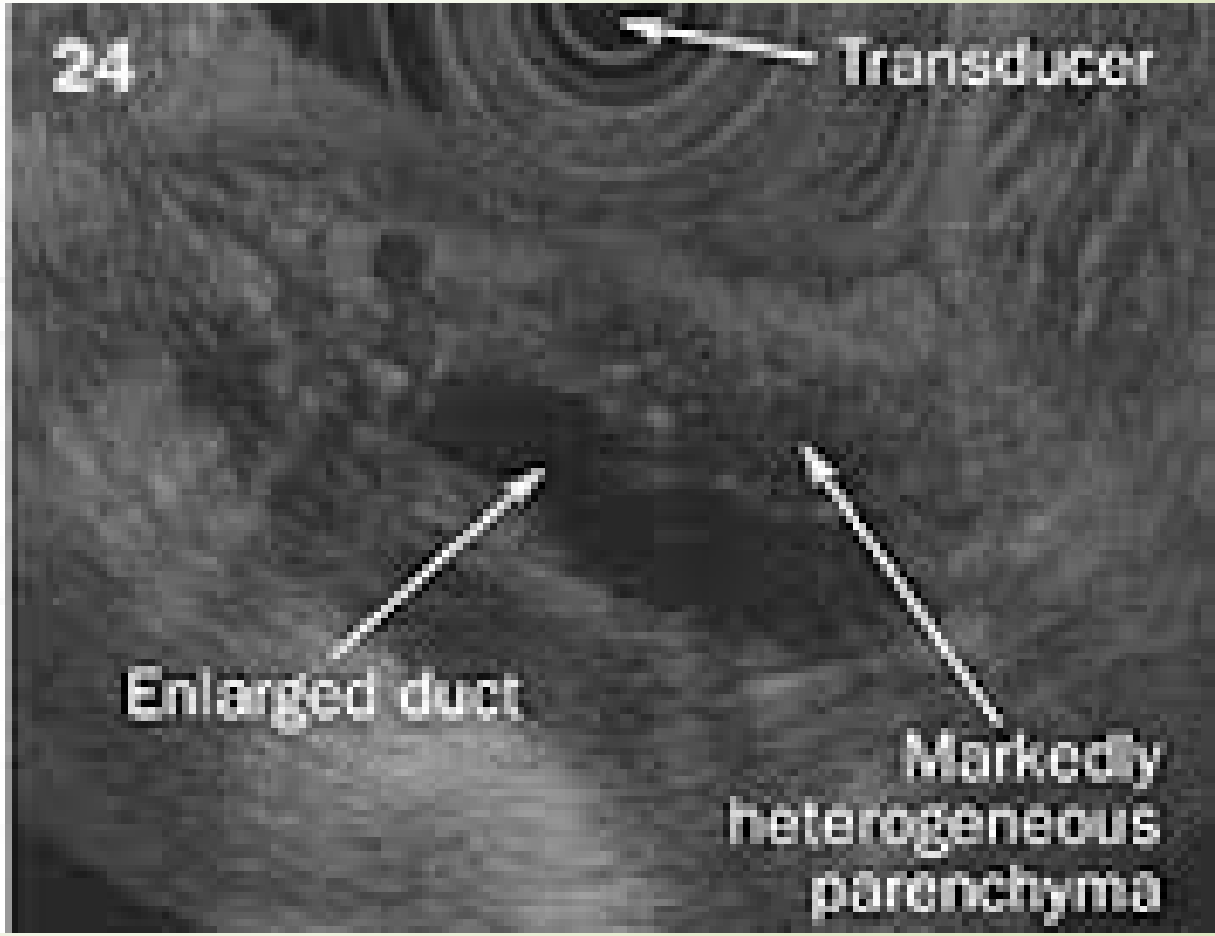
- DIAGNOSTIC PURPOSES
  - SUSPICION OF CHRONIC PANCREATITIS WITHOUT OTHER DEFINITIVE EVIDENCE (CHRONIC ABD PAIN OF UNKNOWN ETIOLOGY)
  - PANCREATIC CYSTIC LESION EVALUATION
  - PANCREATIC CA
  - MEDIASTINAL LAD OR NON-SMALL CELL LUNG CA
  - SUSPECTED CHOLEDOCHOLITHIASIS
- THERAPEUTIC
  - PANCREATIC FLUID COLLECTION DRAINAGE
  - CELIAC PLEXUS NEUROLYSIS

EUS EVALUATION OF THE PANCREAS

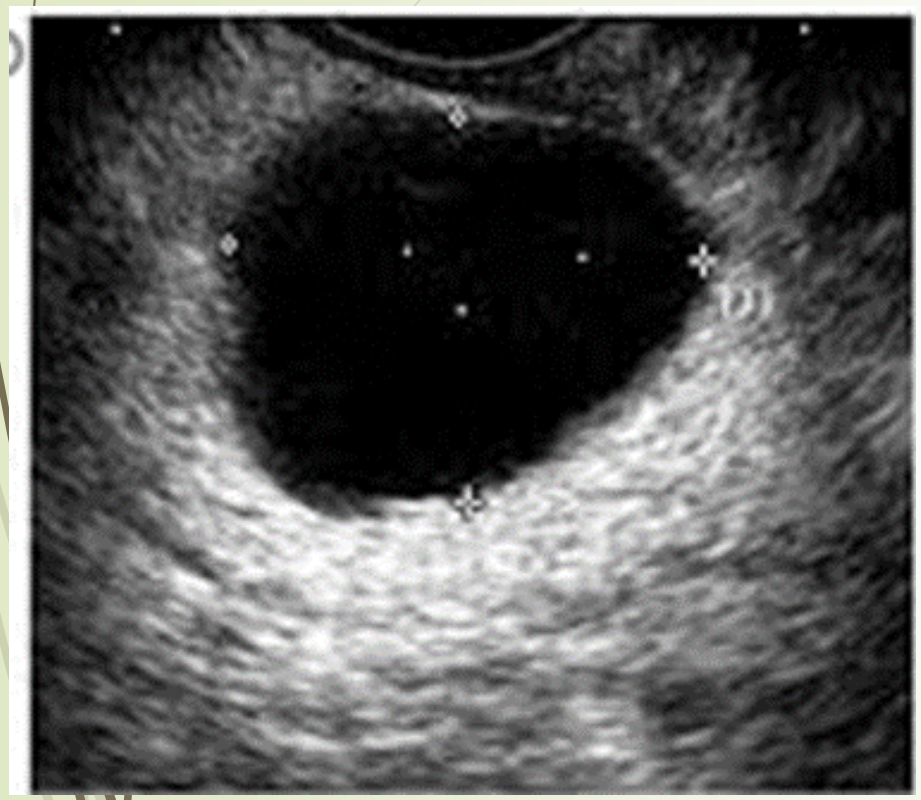
- SALT AND PEPPER LOOK
- CYSTS CAN APPEAR BRIGHT, DARK, OR BLACK
- BRIGHT = HYPERECHOIC
- DARK = HYPOECHOIC
- BLACK = ANECHOIC
- HOMOGENOUS VS HETEROGENOUS

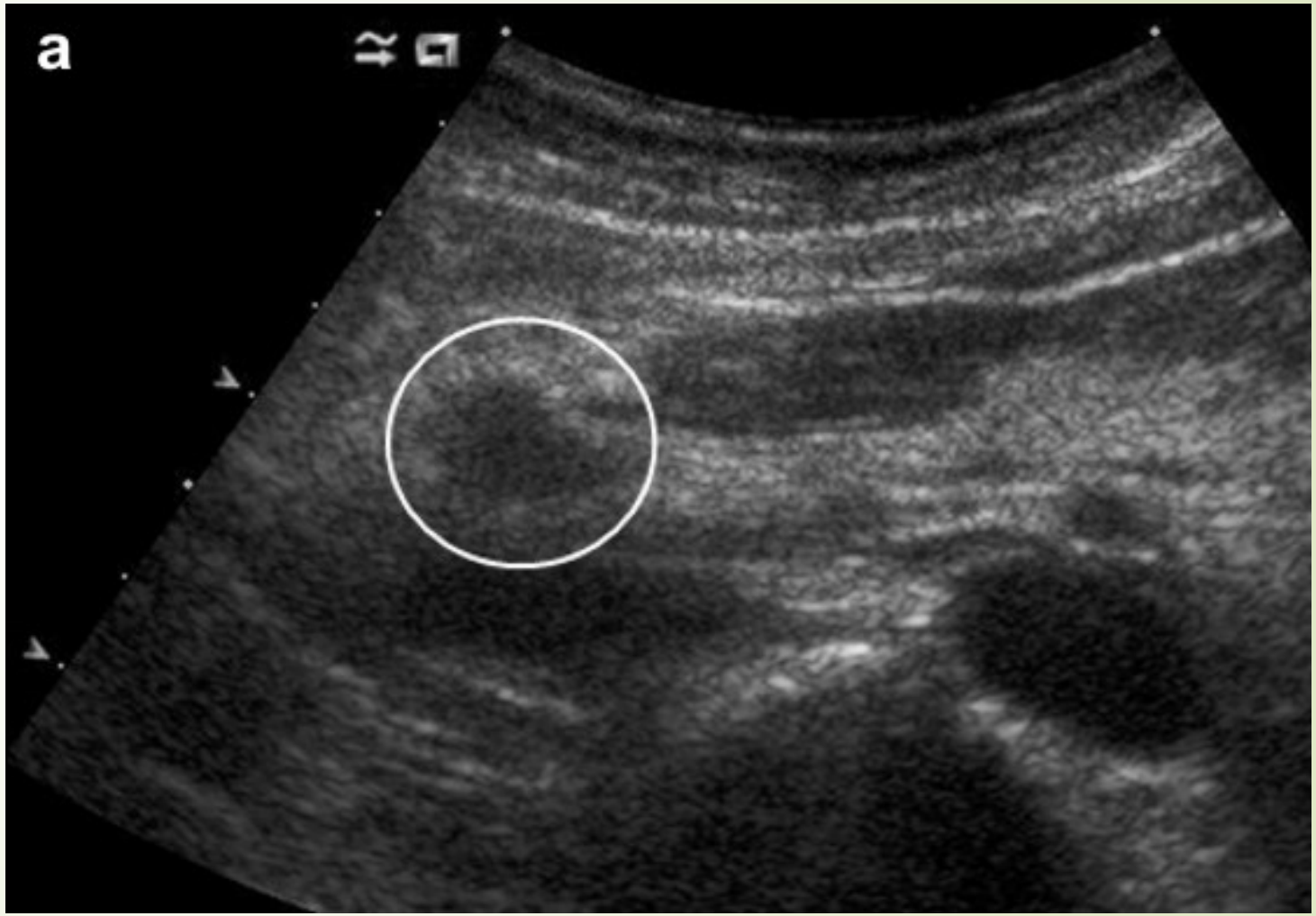
Pancreatic EUS





Anechoic vs hypoechoic (MC)





PANCREATIC PSEUDOCYST DRAINAGE VIA HOT AXIOS

- https://www.youtube.com/watch?v=YwcJHDdhg2Q