Diseases of the Pancreas

1. Serum cholecystokinin levels increase during a meal and mediate pancreatic secretion.

Which of the following is true about this cholecystokinin effect in humans?

a) It is mediated by cholecystokinin receptors on the pancreatic acinar cell
b) It is mediated by enhancing pancreatic blood flow
c) It can be largely blocked by the muscarinic antagonist, atropine
d) It can be largely blocked by serotonin antagonists
e) It stimulates secretion of fluid and electrolytes more than protein

The recommended response is C.

There are two cholecystokinin (CCK) receptors, CCK\textsubscript{1} (previously CCK\textsubscript{A}) and CCK\textsubscript{2} (previously CCK\textsubscript{B}). The CCK\textsubscript{1} receptor has a much higher affinity for CCK than the CCK\textsubscript{2} receptor and mediates the secretory responses of the acinar cell to CCK. CCK antagonists have been shown to reduce the meal-stimulated pancreatic response, particularly that of proteins more than fluid and electrolytes. When atropine is given with the meal, pancreatic secretory responses are prominently diminished. Surprisingly, it was found that when the pancreas is stimulated by physiologic concentrations of CCK, atropine also inhibited most pancreatic secretion. Further, whether the CCK\textsubscript{1} is present on the human pancreatic acinar cell remains unclear. Thus, in humans it appears that CCK primarily stimulates the pancreas by acting on neural pathways and not directly on the pancreatic acinar cell.
2. Hereditary Pancreatitis is caused by mutations in:

a) The pancreatic secretory trypsin inhibitor
b) The Cystic Fibrosis Transmembrane Conductance Regulator (CFTR)
c) Chymotrypsinogen
d) Cationic trypsinogen
e) Procarboxypeptidase A1

The recommended response is D.

Hereditary pancreatitis is distinct clinical entity inherited as an autosomal dominant trait with incomplete penetrance and caused by mutations in cationic trypsinogen (PRSS1). While specific trypsinogen mutations cause disease, the disease mechanism remains unclear. Classic Cystic Fibrosis (CF) is associated with pancreatic insufficiency and chronic pancreatitis. Minor mutations in CFTR that do not cause classic CF can occasionally cause chronic pancreatitis. Mutations in the pancreatic trypsin inhibitor (SPINK1) may to increase the risk of chronic pancreatitis in susceptible individuals (e.g. those with minor CFTR mutations), but do not appear themselves to cause chronic pancreatitis.


3. How much of a healthy pancreas can be resected before an individual develops fat malabsorption due to exocrine insufficiency?

a) 25%
b) 50%
c) 75%
d) 90%
e) 99%

The recommended response is D.
The endocrine and exocrine pancreas has enormous functional reserve. Only 10% of a normal gland is required for normal fat digestion. Even less pancreatic reserve is required for normal protein or carbohydrate digestion.

4. A major stimulus for secretin release from duodenal S-cells and pancreatic bicarbonate secretion is
   
a) Duodenal pH <4.5
   b) Acidic amino-acids
   c) Short-chain fatty acids
   d) Duodenal pH <5.5
   e) Duodenal carbohydrate

The recommended response is A.

Secretin is secreted from neuroendocrine cells, S-cells, which can be found in the duodenal mucosa of the proximal small bowel. They release secretin with a duodenal pH below 4.5. Pancreatic bicarbonate secretion parallels secretin release. The amounts of secretin and bicarbonate secretion are directly related to the area of acidified duodenum. Long chain fatty acids, particularly oleate, can also cause secretin release.

_Chey WY, Konturek SJ._ Plasma secretion and pancreatic secretion in response to liver extract meal with varied pH and exogenous secretin in the dog. J Physiol. 1982 324:263-72
5. Which enzyme(s) are irreversibly inactivated when duodenal pH remains below 4.0?
   a) Lipase
   b) Chymotrypsinogen
   c) Colipase
   d) Lipase and colipase
   e) Trypsin

   The recommended response is A.

   In patients with chronic pancreatitis, decreased pancreatic bicarbonate secretion results in lowered duodenal pH. Among pancreatic digestive enzymes, lipase is the most pH sensitive; it requires a pH near neutrality for optimal activity. Its enzymatic activity decreases from a maximal value at about pH 7.5 to complete inhibition at pH 4.5. Below pH 4.0 lipase is irreversibly inactivated.

6. Which of the following diseases is often associated with decreased cholecystokinin release and exocrine pancreatic insufficiency, particularly in childhood?
   a) Chronic alcoholic pancreatitis
   b) Hereditary Pancreatitis
   c) Cystic Fibrosis
   d) Celiac Disease (Sprue)
   e) Crohn’s Disease
The recommended response is D.

Mucosal damage in celiac disease follows a proximal to distal gradient of severity, being most damaging proximally. Patients with celiac disease, particularly children, have prominent pancreatic insufficiency. This has been attributed to a loss of the cells that release cholecystokinin (I cells) in the proximal duodenum. Patients often require exogenous pancreatic enzyme supplements until the pancreatic function recovers.


7. Which of the following suppresses stimulated pancreatic secretion?

   a) Lipid in the stomach

   b) Lipid in the duodenum

   c) Lipid in the ileum

   d) Lipid in the mouth

   e) peptides in the colon
The recommended response is C.

Free fatty acids and carbohydrates in the lumen of the distal ileal and proximal colon interact with mucosal endocrine cells to cause the release of peptide YY (PYY). Released into the circulation, PYY interacts with pathways that not only decrease pancreatic secretion, but also reduce gastric emptying and secretion and small bowel motility. Additional negative feedback pathways also mediate this response.


8) A 48 year old female is admitted with one day of severe epigastic abdominal pain, nausea and vomiting. On examination in the emergency room she is afebrile with a heart rate of 126 and BP of 86/45. mm Hg. Her abdominal examination reveals diffuse tenderness with rebound in the epigastrium and no bowel sounds. Her laboratory examination is notable for a white cell count of 15,000 with a left shift and a hematocrit of 47 with normal liver tests and amylase of 5200 (Nl=120) and Lipase of 2800 (Nl=80).

A diagnosis of acute pancreatitis is made. Which of the following is not helpful in predicting the severity of her acute pancreatitis.

a) Contrast enhanced CT scan of the abdomen

b) Interleukin 6 levels
c) Urinary TAP (Trypsinogen activated peptide) levels

d) APACHE-O

e) Marked elevation of amylase and lipase levels

The recommended response is E.

The ability to predict the course of acute pancreatitis may be useful for targeting therapy and monitoring” so that targeted therapy and monitoring can be offered to patients who will develop severe acute pancreatitis. While the clinical assessment for severe acute pancreatitis may be as accurate as some of the scoring systems, it only identifies about 40% of severe acute pancreatitis patients. Scoring systems such as Ranson’s and Glasgow take 48 hrs to complete. The APACHE-II scoring system appears to be as accurate at 24 hrs as other scoring systems at 48 hrs; addition of the body mass index – APACHE-O improved the performance of this scoring system. A number of serum markers with prognostic value have been described. The Interleukin-6 level and Urinary TAP have been compared favorably to other systems, but are not be readily available. Contrast enhanced CT scan of the abdomen is the most helpful means of assessing the degree of necrosis and pancreatic inflammation and thus severity of pancreatitis. CT scanning can also be used serially to correlate with clinical deterioration. The amylase and lipase levels are useful in making the diagnosis of acute pancreatitis but not in predicting severity of disease. CRP levels are also helpful although this level also needs to be checked after 48 hrs.
9) A 65 yr old male is admitted with severe abdominal pain, fever, nausea and vomiting. On examination he is febrile, with stable vital signs. Abdominal examination demonstrates diffuse upper abdominal tenderness, with rebound and absent bowel sounds. Left flank ecchymosis is present. Serum amylase and lipase are elevated. After aggressive fluid resuscitation a contrast CT scan demonstrates an edematous pancreas with non enhancement of about 30% of the gland and multiple peri-pancreatic fluid collection.

In terms of management of this patient which of the following statements about nutrition support is correct

a. Early parenteral nutrition results in better outcomes in patients with severe acute pancreatitis.
b. Total parenteral nutrition and enteral nutrition result in similar metabolic complications

c. Nutritional support is indicated in patients with mild to moderate pancreatitis to shorten recovery.

d. Total parenteral nutrition should be attempted before enteral feeding in the presence of an ileus.

e. Enteral nutrition is the preferred route for nutritional support in patients with necrotizing pancreatitis

The recommended response is E.

Patients with mild pancreatitis can be treated with hydration alone. Multiple studies have demonstrated that enteral feeding is safe and tolerated in acute pancreatitis. Additionally enteral feeding may preserve gut barrier function and prevent translocation of bacteria, which are implicated in pancreatic infections. Meta-analysis of the existing literature has demonstrated that outcome is improved with enteral feeding compared with parenteral feeding.

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10) A 45 yrs old male is seen 6 weeks following an episode of severe acute pancreatitis. The patient offers no complain and is able to tolerate a regular diet. Follow up CT scan demonstrates a 7 cm cystic structure in close proximity to the pancreatic head and antrum of the stomach.

Which of the follow are true about management of this patient.

a. The large size of this lesion is an indication for drainage
b. Percutaneous drainage is preferred in patients with pancreatic duct obstruction
c. Symptomatic pseudocysts within 10 mm of the gastric or duodenal wall may be drained by endoscopic cyst gastrostomy with acceptable complications rates.
d. Only cysts that “bulge” into the gastric or duodenal lumen should be drained endoscopically
e. Asymptomatic pseudocysts, are rare and most require drainage

The recommended response is C.

Approximately 65% of patients with large pseudocysts will not have resolution of their cysts spontaneously. Enlarging or symptomatic pseudocysts should be evaluated for drainage. Endoscopic drainage of pseudocysts have a success rate of 65 to 89% with a complication rate of 5% including bleeding and infection. The complication and recurrence rate depends on amount of necrosis and complexity of the collection. Percutaneous drainage of pseudocysts in the setting of an obstructed pancreatic duct ay result in a precutaneous fistula formation.
11) A 55 yr old male is admitted with abdominal pain and hypotension. He denies hemaminesis or melena. The patient was recently hospitalized for an episode of severe acute pancreatitis complicated with pseudocyst development. Since discharge he has been tolerating a regular diet. A recent abdominal CT scan had demonstrated a minimal increase in the size of the pseudocyst, which is in close proximity to the mid body of the pancreas.

All of the following are true about management of this patient except?

a. Urgent upper endoscopy is indicated.
b. Surgery is usually not necessary.
c. Patient should undergo urgent contrast CT scan.
d. Most of these patients can be managed by angiography with embolization.
e. Patients can occasionally present with melena due to communication with the pancreatic duct.
The recommended response is A.

Rarely, erosion of a pseudocyst into an adjacent major vessel can cause a pseudoaneurysm. The may cause a sudden expansion of the pseudocyst with blood, rupture of the cyst or gastrointestinal bleeding when there is communication with the pancreatic duct (hemosuccus pancreaticus). CT scan with contrast can demonstrate the lesion and mesenteric angiography will confirm the diagnosis and embolization of the pseudoaneurysm can be accomplished during the procedure.

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12) A 40 yr old female patient is admitted with abdominal pain, radiating to the back for 2 days accompanied by nausea and vomiting. In the emergency room her temperature is 99 F, with heart rate of 90/bpm and blood pressure of 100/70 mm Hg. Her physical examination is noticeable for diffuse upper abdominal tenderness and guarding. The patient denies alcohol intake, but does give a history suggestive of biliary colic.

Laboratory examination demonstrates a WBC of 11,000, AST of 150 (NI<40) ALT 200 (NI<40) alkaline phosphatase of 150 and total bilirubin of 2. Amylase
and lipase are 1500 and 1000 respectively. The common bile duct measures 6 mm on abdominal ultrasound.

Following intravenous hydration and analgesics, the patient recovers. The liver tests normalize in 2 days.

All of the following are true about the management of the patient except:

- a. Early ERCP with biliary sphincterotomy is not indicated.
- b. Most patients with gallstone pancreatitis should receive an ERCP prior to cholecystectomy
- c. Cholecystectomy should be advised following an episode of gallstone pancreatitis
- d. Antibiotics are indicated in patients with suspected ascending cholangitis and acute pancreatitis.
- e. The possibility of a retained CBD stone in this patient is <8%

The recommended response is B.

Patients with acute biliary pancreatitis do not benefit from early ERCP in the absence of ascending cholangitis or evidence of biliary obstruction. If liver tests normalize the presence of CBD stones is less than 8% and these patients should undergo an intra-operative cholangiogram at time of cholecystectomy. If CBD stones are present this can be followed by ERCP and stone extraction. Cholecystectomy should be performed after recovery in all patients with acute biliary pancreatitis.
13) A 70 yr old non-alcoholic female is admitted with acute epigastric pain radiating to the back and accompanied nausea and vomiting. On examination she is afebrile, BP 110/70 mmHg and pulse of 100/min. She has epigastric tenderness with guarding but no rigidity; bowel sounds are reduced. Laboratory examination demonstrate: WBC of 20,000 cells/mm, AST of 120 U/L (Nl<40), ALT 200 U/L (Nl<40), Alkaline phosphatase of 245 U/L(Nl<120) and Total bilirubin of 2.5mg/dl (Nl<1.8). Amylase and lipase are elevated to 1200 U/L and 5000U/L, respectively.

Ultrasound examination demonstrates multiple gallstones in the gallbladder with a normal common bile duct. The pancreas is not visualized.

After initial resuscitation and analgesics, the patient is stable. After 24 hrs she complains of increasing pain. Her temperature is 101F, BP 90/70 mmHg and
pulse rate is 120/min. Abdominal examination is unchanged. Repeat laboratory tests demonstrate total bilirubin of 5.0 mg/dl, Alkaline phosphatase of 290 U/L.

The most appropriate next step in this patient's management would be

a) CT scan of abdomen to document pancreatic necrosis
b) Start oral enteral feeding to prevent complications
c) Emergent ERCP with biliary sphincterotomy
d) Emergency surgical consult for management of sterile necrosis
e) Repeat ultrasound of the gallbladder and biliary tree

The recommended response is C.

Gallstone pancreatitis requires specific therapeutic considerations. Early biliary sphincterotomy is beneficial in patients with severe acute biliary pancreatitis by preventing biliary sepsis and reducing hospital mortality. This benefit is seen in patients with elevated bilirubin levels or other signs of biliary obstruction. Early ERCP is no beneficial in patients with mild biliary pancreatitis and in the absence of biliary obstruction. Patients with presumed biliary pancreatitis and rising bilirubin in the setting of clinical deterioration, suggestive of ascending cholangitis should undergo urgent ERCP.


14) A 42 year old woman is being evaluated for chronic relapsing upper abdominal pain radiating to her back. The pain is worse following meals. She has a history of modest alcohol use. Her CBC, amylase and liver chemistries are all normal. Upper endoscopic examination revealed a small Hiatal hernia but was otherwise unremarkable. Abdominal ultrasonography as well as abdominal CT scanning is normal. The pain has not improved with proton pump inhibitors.

ERCP revealed a normal main pancreatic duct and minor irregularity of the side-branches consistent with mild chronic pancreatitis. Sphincter of Oddi manometry revealed normal biliary and pancreatic basal pressures. EUS revealed parenchymal changes consistent with chronic pancreatitis.

Which of the following is the most appropriate initial therapy:

A. ERCP with pancreatic duct sphincterotomy and stenting
B. Celiac plexus neurolysis with alcohol
C. Laparoscopic Cholecystectomy
D. Pancreatic enzymes therapy using non-enteric coated enzymes
E. Octreotide
The recommended response is D.

In the setting of a minimally abnormal ERCP and normal sphincter of Oddi basal pressures few patients respond to endoscopic sphincterotomy. Celiac plexus blocks are an effective method of palliating pain in pancreatic carcinoma but have been disappointing in chronic pancreatitis. Laparoscopic cholecystectomy is not indicated. The use of pancreatic enzymes supplements for pain relief by enhancing feedback inhibition of pancreatic secretion appears to be most beneficial in patients without steatorrhea and with “small duct disease”. This patients have relatively normal pancreatograms and tend to be young and middle-aged females without a history of alcohol abuse. Non-enteric coated pancreatic enzymes preparations are useful for the treatment of pain whereas enteric-coated enzyme preparations are useful for steatorrhea. Gastric acid can degrade non enteric coated enzymes and therefore acid suppressive therapy should be prescribed in conjunction. The effectiveness of Octreotide in treating pain from chronic pancreatitis has not been definitively demonstrated.


15) A 56 year old male with a 30 year history of alcohol abuse has a 1 year long history of intermittent epigastric pain. Multiple calcifications and a dilated pancreatic duct were found on CT scanning and the patient was started on a coated pancreatic enzyme substitute for oily stools. He continues to be disabled because of abdominal pain and is dependant on narcotic analgesics.

ERCP revealed a dilated irregular main pancreatic duct of 15 mm containing multiple stones. There were multiple strictures in the main duct producing a “chain of lakes” appearance.

Which of the following treatment is likely to be most beneficial.

A. Substitute the enteric coated for a non-enteric coated pancreatic enzyme substitute.

B. Total pancreatectomy

C. ERCP with extracorporeal shock wave lithotripsy, pancreatic stenting and stone removal

D. Lateral pancreaticojejunostomy (Modified Puestow procedure)

E. Celiac plexus neurolysis

The recommended response is D.

Non enteric coated pancreatic enzyme substitutes such as Viokase appear more effective in decreasing pain in chronic pancreatitis. They are believed to work by enhancing feedback inhibition of pancreatic secretion. Most feedback inhibition takes place in the
proximal duodenum and non-enteric coated supplements release more of there proteases in the proximal duodenum. In this patient with advanced disease and severe symptoms enzyme substitutes alone are unlikely to prove effective in controlling pain. Total pancreatectomy would be a last resort given the extent of the operation and the often brittle diabetes that results. ERCP with extracorporeal fragmentation of pancreatic duct stones, stenting, dilation and endotherapy is an option but in a patient with multiple strictures and stones is likely to require Herculean efforts including multiple procedures (both ERCP and ESWL). In this otherwise healthy man operative decompression and drainage of the pancreatic duct is a more attractive option and would be likely to result in an immediate improvement in his pain and narcotic requirement.


16) A 44 year old man with a history of chronic pancreatitis and isolated splenomegaly presents with hematemesis and hypotension. Upper endoscopy is attempted but the patient is uncooperative and pulls the endoscope out. The esophagus was examined and no varices seen.

The diagnosis can be confirmed by the following test:
The recommended response is E.

The splenic vein meanders along the posterior surface of the pancreas where it can be affected by inflammation which may lead to thrombosis. Chronic pancreatitis is an important cause of noncirrhotic portal hypertension. Gastric varices in the absence of esophageal varices occur as a result of associated portal hypertension. The diagnosis of splenic vein thrombosis can be made by contrast enhanced abdominal CT scanning or Doppler ultrasonography (this has an appreciable false negative rate due to collatorals – would advocate contrast CT, MR or angio if strongly suspected). Splenectomy is usually curative.


17) A 62 year old male with a 30 year history of alcohol abuse presents with jaundice and pruritus. His bilirubin is elevated to 6 mg/dl and transaminases are 2.5 times the upper
limit of normal. Abdominal CT scanning revealed calcification in the head of the pancreas but no mass. ERCP revealed multiple strictures in the main pancreatic duct and a moderately high grade 2 cm stricture in the intrapancreatic portion of the common bile duct. No malignancy was detected on brushings and biopsies of the stricture as well as by EUS guided FNA. The CEA and CA 19-9 levels were normal. The patient has no constitutional signs of malignancy.

Which of the following is the most effective way of managing the common bile duct stricture.

A. ERCP with balloon dilation and placement of several plastic stents across the stricture.
B. Roux-en-Y Choledochojunostomy
C. Whipple procedure
D. Pancreatic enzyme supplementation and Octreotide
E. ERCP with metal stent placement

The recommended response is B.

ERCP with serial dilations and stenting is an effective therapy for benign bile duct strictures not related to chronic pancreatitis. In chronic pancreatitis only 25-50% respond. This poor response is presumably because of the differing pathogenesis between biliary strictures associated with chronic pancreatitis and post-operative strictures. In chronic pancreatitis, fibrotic tissue and calcification in the pancreatic head surrounds the bile
duct; in the latter, only the duct wall is fibrotic. ERCP with metal stenting has been attempted; however, universal stent occlusion due to epithelial hyperplasia limits this approach. A Whipple procedure for this situation would be unreasonable. Pancreatic enzyme supplementation and Octreotide would be unlikely to confer significant benefit. A biliary enteric bypass is the appropriate management in this patient


18) Which of the following is true with regards to malabsorption in chronic pancreatitis:

A. A minimum of 30,000 units of lipase during each meal is typically required to substantially reduce steatorrhea and allow stabilization of body weight, cramps and bloating.

B. Acid suppressive therapy such as PPI’s are necessary for effectiveness of both enteric-coated and uncoated preparations

C. Medium-chain triglycerides, which do not require intraluminal lipolytic activity for absorption, should be added to the diet of most patients with chronic pancreatitis

D. Jejunal tube feeding is indicated

E. Azotorrhea (protein malabsorption) typically develops earlier than steatorrhea in patients with chronic pancreatitis
The recommended response is A.

Patients with steatorrhea should receive pancreatic enzyme supplements with meals and snacks. A total of at least 30,000 units of lipase taken before and during each meal is necessary to significantly ameliorate steatorrhea and reduce diarrhea and bloating. The effectiveness of enzyme supplementation can be enhanced by acid suppressive therapy, but this is only needed for non-enteric coated preparations that are susceptible to degradation by gastric acid. Medium-chain triglycerides, which do not require intraluminal lipolytic activity for absorption, are only needed in the rare patient who cannot maintain an adequate fat intake. A positive qualitative stool fat determination indicates a fecal fat excretion of 12-15 grams of fat or more. Protease secretion tends to be preserved longer than lipase secretion so steatorrhea occurs before azotorrhea.


19) A 35 year old female with a history of two episodes of mild acute pancreatitis is found to have a 3 cm cyst in the body of the pancreas on CT. The thin-walled
cystic lesion was present on abdominal US performed during her first hospitalization for acute pancreatitis and no prior imaging was available.

What would be the next best step in further evaluating the cause of pancreatitis and the cystic lesion?

A) Repeat CT scan in 6 months
B) EUS with FNA
C) Follow clinical course
D) ERCP
E) Abdominal Ultrasound

The recommended response is B.

Mucinous cystic lesions are often mistaken for pseudocysts. Indicators of a possible mucinous cystic neoplasm, such as a side-branch intraductal papillary mucinous neoplasm (IPMN), rather than a pseudocyst, include the absence of a prior history of the pancreatitis or the presence of the lesion on imaging prior to or at the initial presentation of acute pancreatitis. IPMN may cause acute pancreatitis due to mucin obstructing the pancreatic duct. EUS with FNA and analysis of the cyst fluid for amylase, CEA and cytology can usually distinguish between a cystic neoplasm and a pseudocyst. If a cystic neoplasm is identified, surgical resection would be indicated.
20) A previously healthy, 63 year old male with a history of tobacco use presents with painless jaundice. A contrast CT of the abdomen identifies a 3 cm mass in the head of the pancreas obstructing the bile duct. Distant metastases are not seen on CT of the abdomen and chest. The lesion appears to be separate from surrounding vessels and surgical consultation identifies the patient to be an appropriate candidate for a Whipple procedure.

What would be the next best step in management.

A) ERCP with brushing and stenting of the bile duct
B) EUS with FNA of the pancreas mass
C) Surgical resection
D) Obtain serum CA19-9
E) MRI scan

The recommended response is C.

Drainage of the bile duct is not required prior to surgical resection of a pancreas head mass and has been shown to be detrimental in some studies due to the risk of
cholangitis following instrumentation of the bile duct. Indications for biliary stenting include a delay in the performance of surgery or the development of cholangitis.

EUS is a useful tool to provide staging information complementary to that of a helical contrast CT scan in assessing for local and regional lymphadenopathy and the relationship of the mass to surrounding vessels. A tissue diagnosis is not required prior to surgical resection, and a negative FNA would likely not alter the plan for surgical resection. The utilization of EUS/FNA can be individualized based on the surgical outlook, the quality of CT imaging and the need for a tissue diagnosis prior to initiating chemotherapy.

References:


21) A 51-year-old female presents with mild abdominal pain and a cholestatic pattern of liver function test elevation. CT of the abdomen revealed mild intra and
extrahepatic biliary dilation along with diffuse prominence of the pancreas with mass-like areas in the head and body. ERCP revealed several areas of stricturing of the pancreas duct and a smooth intrapancreatic biliary stricture. Cytologic brushing of the bile duct was normal. EUS guided FNA of the pancreas head and body was negative for malignancy and revealed chronic inflammation.

What would be the next best step in management?

A) Pancreatectomy.
B) Check serum antinuclear antibodies
C) Initiate a trial of prednisone
D) MRI scan with MRCP
E) Abdominal US

The recommended response is C.

While an underlying malignancy can not be entirely excluded, the overall picture is suggestive of autoimmune pancreatitis given the appearance of the pancreas on CT, the multiple areas of stricturing of the pancreatic duct and failure to identify malignancy with brushing and FNA. Autoimmune pancreatitis has been associated with elevations of serum IgG4. Therapy with prednisone (and possibly ursodeoxycholic acid when both pancreatic and biliary involvement is present) will provide clinical and radiographic
improvement in a majority of patients. Follow-up imaging is important to assess the
response to therapy.

Hirano, K, Shiratori, Y, Komatsu, Y, et al. Involvement of the biliary system in


22) A 47 year old female presents with recurrent episodes of symptomatic
hypoglycemia. Fasting insulin levels are found to be elevated and a pancreatic
neuroendocrine tumor is suspected. Imaging with contrast CT and MRI are normal.

Which test would be most helpful in localizing this lesion?

A) Abdominal US
B) Somatostatin-receptor scintigraphy
C) ERCP
D) Endoscopic Ultrasound
E) Positron emission tomography (PET)

The recommended response is D.

Accurate preoperative localization of insulinomas is desirable. When imaging with CT
or MRI with contrast fail to identify a tumor, EUS is usually regarded as the next test of
choice, with a sensitivity of up to 85%. While pentetreotide scintigraphy is a very useful
test for other islet-cell tumors it will miss up to 40 percent of insulinomas due to a low
expression of subtype 2 somatostatin receptors. PET may detect the presence of a
neuroendocrine tumor, however, has a limited role.

Anderson, MA, Carpenter, S, Thompson, NW, et al. Endoscopic ultrasound is highly
accurate and directs management in patients with neuroendocrine tumors of the pancreas.
Am J Gastroenterol 2000; 95:2271.

Jensen RT. Carcinoid and pancreatic endocrine tumors: recent advances in molecular
23) Which of the following tests would be least useful as part of the initial screening for multiple endocrine neoplasia type-1 (MEN1)?

A) serum calcium
B) serum gastrin
C) fasting serum glucose
D) CA125
E) visual acuity

The recommended response is D.

MEN-1 is an autosomal dominant predisposition to the development of tumors of the parathyroid gland, anterior pituitary and pancreatic islet cells (most commonly insulinoma) along with gastrointestinal adenomas (Zollinger-Ellison syndrome). MEN1 is defined as the presence of two of the three main tumor types. MEN1 is present in 20-60% of patients with Zollinger-Ellison syndrome.

References-
24) Which of the following features most definitively identifies an unresectable pancreatic adenocarcinoma?

- a. tumor size greater than 4 cm
- b. presence of peritumoral nodes
- c. encasement of the superior mesenteric artery
- d. encasement of the portal vein
- E) tumor location in the pancreas tail

The recommended response is C.

Involvement of the superior mesenteric artery is a broadly accepted defining feature of an unresectable pancreas tumor. Venous resection and grafting is performed in some centers. Tumors located in the body and tail are more likely to present at an advanced stage, however may be resected with a distal pancreatectomy. There is a lower 5 year survival with local nodal involvement, however, this does not preclude resection.


25) A 50-year-old man with history of recurrent acute pancreatitis undergoes an evaluation for mild anemia and positive stool occult blood test. The endoscopic views of distal esophagus and gastric fundus are shown in Figures 45A and 45B. Which of the following is the most appropriate next step in management?
A. Biopsy of the lesion
B. Liver biopsy
C. Abdominal ultrasonography with Doppler study
D. Administration of oral non-selective beta-blockers
E. Administration of oral proton pump inhibitors

The recommended response is C.

The endoscopic views show isolated gastric fundal varices without esophageal varices. Gastric fundal varices can be seen in patients with liver cirrhosis and/or portal hypertension. However, splenic vein thrombosis must be considered in the absence of signs of chronic liver diseases and esophageal varices. In addition, pancreatitis can also induce the formation of splenic vein thrombosis. Abdominal ultrasonography with Doppler study is the most appropriate next step in management to assess the portal and splenic venous system. In addition, pancreas, liver, and spleen can be evaluated simultaneously. In case of gastric variceal bleeding from splenic vein thrombosis, splenectomy is recommended treatment. Alternatively, arterial embolization of the splenic artery can be performed, especially in patients with multiple co-morbid illnesses with high surgical risks.

Biopsy of the lesion is contraindicated because it could result in severe gastrointestinal bleeding. Liver biopsy is not indicated in this patient unless signs of chronic liver diseases and/or portal hypertension are present. Non-selective beta-blockers are
recommended to prevent gastrointestinal bleeding from esophageal or gastric varices due to portal hypertension, but they do not reduce the incidence of bleeding from splenic vein thrombosis. Proton pump inhibitors are not proven to prevent gastric variceal bleeding.


26) A 54-year-old woman is evaluated for chronic persistent epigastric pain radiating to the back and diarrhea for the past 5 months. She has lost approximately 20 lbs. CT scan of the abdomen shows a mildly enlarged pancreatic head with a dilated and tortuous main pancreatic duct in the head and neck of the pancreas. Endoscopic, ERCP and EUS findings are shown in Figures 46A-46D. Which of the following is the most appropriate management?

A. Oral administration of pancreatic enzyme supplements
B. Celiac plexus neurolysis
C. Celiac plexus block
D. Pancreatoduodenectomy or subtotal pancreatectomy
E. Endoscopic placement of pancreatic duct endoprosthesis

The recommended response is D.
The radiographic figure from ERCP shows a massively dilated and tortuous main pancreatic duct with a filling defect. The endoscopic view of papilla shows a massively dilated pancreatic duct orifice with a gelatinous mucus, which is the same material producing the filling defect in the main pancreatic duct in ERCP. In addition, the endosonographic examination reveals a mural nodule adjacent to the main pancreatic duct. These findings are consistent with intraductal papillary mucinous neoplasm (IPMN). This condition is a spectrum of mucin-secreting adenomatous neoplasm of the pancreatic duct epithelium. IPMN is characterized by cystic dilation of pancreatic duct. According to the site of involvement, IPMN can be classified into 3 categories: main duct type, side-branch duct type, and combined type. Most branch duct type is benign, whereas the other two types are often malignant. A large size of side-branch duct and marked dilation of the main pancreatic duct indicate the presence of adenoma at least. The additional findings of mural nodule or mass increase the possibility of malignant transformation and surgical treatment should be recommended. The type of surgery depends on the location of involvement. IPMN are more frequently located in the head of the pancreas and therefore require a pancretoduodenectomy. Because IPMN tends to grow longitudinally along ducts, rather than radially into the parenchyma, the resection margins must be examined intraoperatively with a frozen section to confirm clearance of the tumor. In one study, 19% of patients with IPMN require a total pancreatectomy because of the extensive involvement of pancreatic ductal system. The prognosis is favorable after complete resection of benign and noninvasive malignant IPMN. Adequate lymph node dissection is necessary for malignant IPMN with aggressive parenchymal invasion. On the other hand, asymptomatic branch type IPMN without mural nodule or
mass can be followed conservatively, and EUS and/or cross-sectional imaging should be recommended every 6-12 months.

Oral administration of pancreatic enzyme supplements is the treatment of choice for patients with chronic pancreatitis with exocrine insufficiency. Although it may alleviate abdominal pain and diarrhea, it does not address the issue of potential malignancy. Celiac plexus block is recommended for patient with refractory abdominal pain from chronic pancreatitis, whereas celiac plexus neurolysis is recommended for unresectable pancreatic malignancy. Both procedures are not indicated in this patient. The placement of pancreatic duct endoprosthesis is not indicated for this premalignant (or malignant) condition.

A 40-year-old woman presents with a 3-cm cystic lesion in the tail of the pancreas, which was identified incidentally from CT scan of the abdomen as shown in Figure 47A. She denied abdominal pain and has never had pancreatitis. EUS imaging is shown in Figure 47B. EUS-FNA of the cystic fluid demonstrates low amylase, low carcinoembryonic antigen (CEA), and no mucinous epithelium. Which of the following is the most likely diagnosis?

A. Mucinous cystic neoplasm  
B. Serous cystadenoma  
C. Intraductal papillary mucinous neoplasm  
D. Pancreatic adenocarcinoma with central cystic degeneration  
E. Neuroendocrine tumor of the pancreas

The recommended response is B.

The CT scan and EUS imaging show a mixed macro-microcystic lesion with central scarring in the tail of the pancreas, consistent with serous cystadenoma (SCA). Cystic lesions of the pancreas are increasingly discovered through the routine use of cross-sectional imaging tests. Although, these lesions may cause recurrent pancreatitis, abdominal pain, and pancreatic-biliary obstruction, most patients are asymptomatic. Since some of these lesions may harbor occult malignancy or develop into malignancy, differentiation between benign, malignant/pre-malignant, and inflammatory lesions is important. SCAs are benign cystic lesions of the pancreas that rarely cause symptoms.
Malignancy is exceptionally rare. Cross-sectional imaging (CT scan or MRI) and EUS evaluation of SCA demonstrates a number of characteristic features. The classic findings include microcystic morphology, a central area of fibrosis or calcification, and a highly vascular stroma. However, 25% of SCA can present as macrocystic morphology. The fluid aspirated usually is non-viscous, acellular, and contains no mucin. In addition, the CEA level of the fluid is low or absent.


28) A 50-year-old man with chronic alcoholism presents for an evaluation of chronic epigastric pain and diarrhea. EUS and ERCP are performed and findings are shown in Figures 48A-C. Which of the following test results is most likely to be abnormal?

A. Serum CA 19-9
B. Serum immunoglobulin G subclass 4
C. Cytology from EUS-guided fine needle aspiration
D. Quantitative fecal fat
E. Serum amylase and lipase
The recommended response is D.

The endosonographic examination shows hyperechogenic foci and hyperechogenic strands (Figure 48A), as well as lobularity of pancreatic parenchyma (Figure 48B). The pancreatogram from ERCP shows a massively dilated and irregular main pancreatic duct and dilation (clubbing) of multiple side-branch ducts. These findings are consistent with severe chronic pancreatitis.

The diagnosis of chronic pancreatitis remains clinical challenging. Though there is no ideal gold standard beside histology, several modalities have been used to establish the diagnosis. ERCP remains the major method for detection of morphological changes. However, increasing evidence suggests that ERCP may not be sensitive enough especially in patients with early or mild chronic pancreatitis. The Cambridge classification, developed by a panel of experts, is generally used for grading of severity based on morphology of main pancreatic duct and side-branch ducts. In the past decade, EUS and MRCP have been increasingly used in clinical practice because they are relatively less invasive compared to ERCP. Nine standard EUS criteria have been described and categorized into 2 groups: parenchymal and ductal criteria. Parenchymal criteria include hyperechogenic foci, hyperechogenic strands, lobularity of contour of gland, and cysts. Ductal criteria include main pancreatic duct dilation, duct irregularity, hyperechogenic ductal margins, dilated side-branch ducts, and stones. The diagnosis of chronic pancreatitis is usually suspected when 3-5 or more criteria present. In contrast to EUS, there are no standard criteria described for MRCP. In addition, the imaging
techniques are also different among individual institution. Despite several reports supporting the high accuracy of EUS and MRCP for the diagnosis of chronic pancreatitis, the clinical value remains controversial. The overriding concern appears to be that these tests may overdiagnose chronic pancreatitis and the degree of interobserver agreement remains poor. Nevertheless, all of these modalities appear to be highly accurate for patients with severe chronic pancreatitis because of obvious morphological changes of the pancreas, which can be detected by any modalities.

In this patient with severe chronic pancreatitis, quantitative fecal fat is likely to be abnormal because of pancreatic exocrine insufficiency. Serum CA 19-9 is a tumor marker for pancreatic adenocarcinoma. An elevated level of serum CA 19-9 can be detected in 50-75% of individuals with pancreatic adenocarcinoma, compared to only 10-20% of individuals with chronic pancreatitis. An increased level of serum immunoglobulin G, especially subclass 4, is one of the characteristics and criteria widely used for the diagnosis of autoimmune pancreatitis. The typical findings of autoimmune pancreatitis are diffusely irregular narrowing of the main pancreatic duct by ERCP and diffuse enlargement of the pancreas by EUS or cross-sectional imaging, which are not detected in this patient. Fine needle aspiration is not recommended as a routine diagnostic extension of EUS to diagnose chronic pancreatitis because of poor sensitivity and specificity. Cytology from fine needle aspiration of chronic pancreatitis often shows normal findings. Serum pancreatic enzymes of patients with chronic pancreatitis are usually normal, except in patients who developed superimposed acute pancreatitis.


Figures

Figure 45A
Figure 46B
Figure 46C
Figure 48A
Figure 48C