


Pancreatic Problems



Lecturer:
Dr. Abdualslam Alsharabi

Different from 436's lecture

 Team leaders: Alanoud Almansour, Ghaida Al Musma , Muath Alhamoud and Mohammed Alqwaifli

 Done by: Alanoud Bin Methem, Esraa Alnazzawi, Munira Alhadlag, Omar Alfawzan, and Tamim Alwahibi

 Revised by: Yazeed Al_Dossare

Color Index:

● Important

● Doctor's Notes

● Extra

● Davidson's

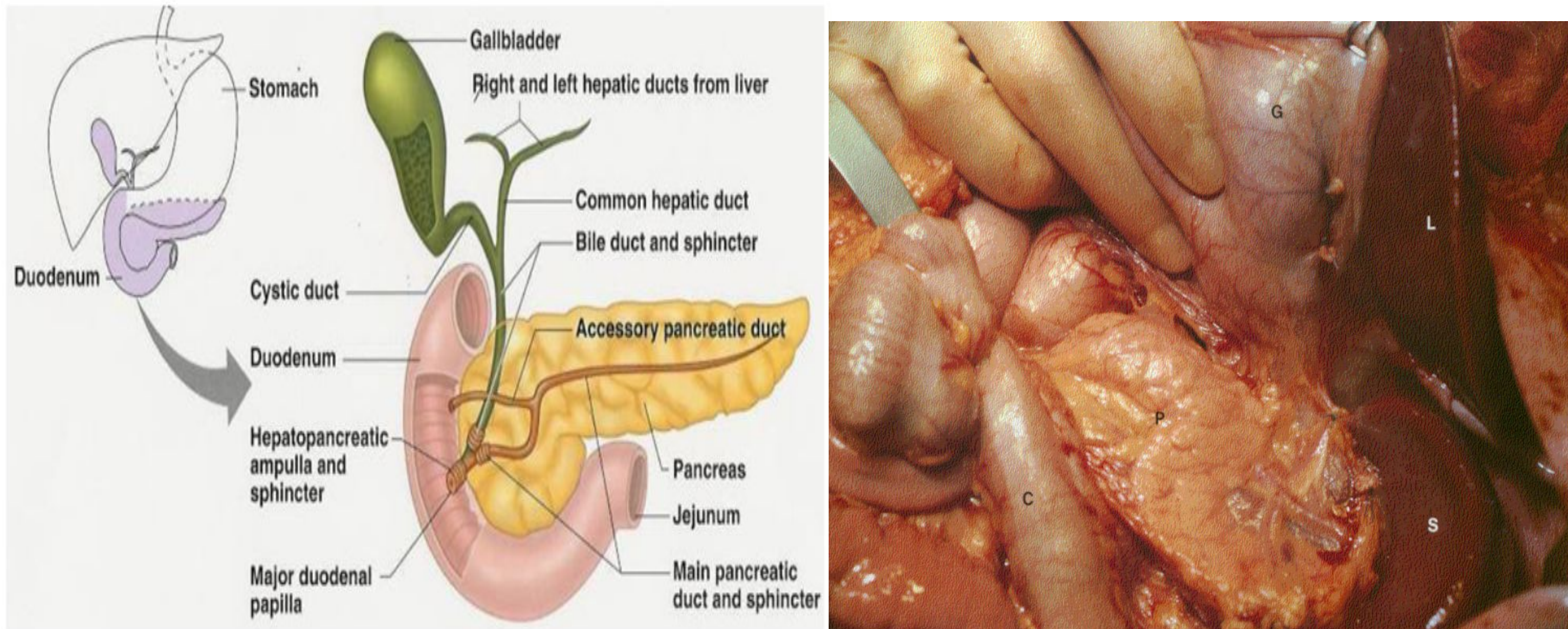
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Review of the Pancreas

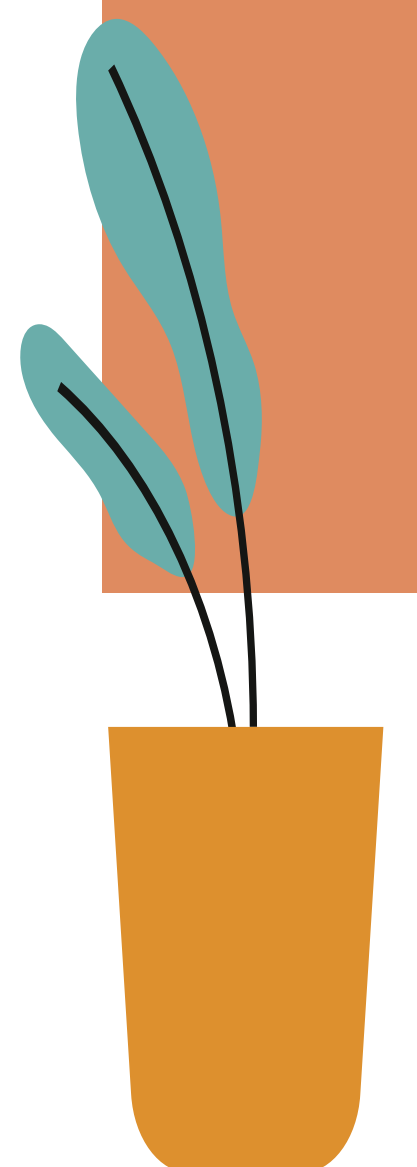
Anatomy of the Pancreas

- ★ The pancreas has an extensive arterial system arising from multiple sources
- ★ The venous drainage parallels arterial anatomy, and terminated in the portal vein
- ★ Multiple lymph nodes that drain the pancreas
- ★ Neural function is controlled by dual sympathetic and parasympathetic innervation
- ★ The Pancreas composed of: Head, Neck, body and tail and the landmark for the neck of the pancreas is superior mesenteric vein.



Histology of the Pancreas

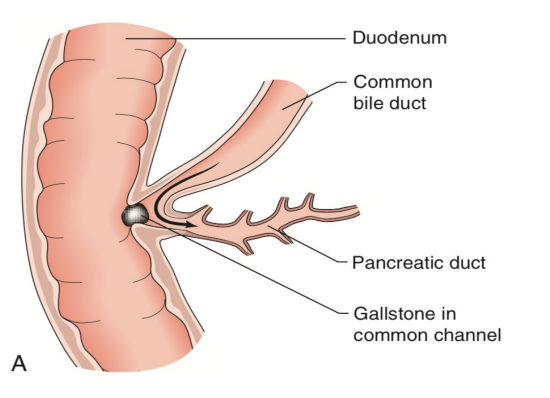
- ★ There are two distinct organ systems within the pancreas:
- ★ The **endocrine portion**: served by structures called the **islets of Langerhans**, which has several cell types:
 - Alpha cells (25% of total islet cells number): produce glucagon
 - Beta cells (the majority): produce insulin
 - Delta cells (the smallest): produce somatostatin
- ★ The **exocrine portion**: made up of **acini** (acinar cells contain zymogen) and **ductal systems**.
 - Essential for the digestion of fat, protein and carbohydrate.
 - The pancreas secretes 1-2 L of alkaline (pH7.5-8.8) enzyme-rich juice each day.
 - Trypsin is the key proteolytic enzyme, once trypsin has been activated, a cascade is established whereby the other proteolytic enzymes become activated in turn. Lipase and amylase are secreted as active enzymes.
 - Pancreatic secretion is stimulated by eating.
 - Hormonal and neural (vagal) mechanisms are involved.
 - Food entering the duodenum (notably fat and protein digestion products) releases CCK, which stimulates pancreatic enzyme secretion and contraction of the gallbladder, thereby increasing bile flow into the intestine.
 - Acid in the duodenum releases the hormone secretin, which stimulates the pancreas to secrete watery alkaline juice



Acute Pancreatitis

Includes a broad spectrum of pancreatic diseases, that varies from mild parenchymal edema(80-90%) to severe hemorrhagic pancreatitis associated with gangrene and necrosis (very bad more complication here)

<p>Etiology</p>	<ul style="list-style-type: none"> ★ 90% of causes are caused by <ul style="list-style-type: none"> ○ Biliary tract disease (gallstones) 1st most common ○ Excessive alcohol intake <ul style="list-style-type: none"> ■ The exact mechanism of alcohol-related injury is unknown (mostly due to early activation of proteolytic enzymes) ★ Other frequent causes include: <ul style="list-style-type: none"> ○ Hyperlipidemia ○ Hypercalcemia (rare cause of pancreatitis and is usually secondary to hyperparathyroidism) ○ Trauma (blunt abdominal trauma) ○ Iatrogenic: ERCP (thats why its contraindicated to use it in pancreatitis) <ul style="list-style-type: none"> ■ Acute pancreatitis occurs in approximately 5% of patients undergoing ERCP ○ Ischemia ○ Viral infections are the most common cause of pancreatitis in children. ○ Some medications: Acetaminophen, NSAIDs, thiazides and sulfonamides
<p>Clinical Presentation</p>	<ul style="list-style-type: none"> ★ The clinical presentation also varies from mild abdominal discomfort to hypotension, metabolic derangements, sepsis, multi-organ failure and death. ★ The predominant clinical feature is abdominal pain <ul style="list-style-type: none"> ○ The pain normally begins in the mid epigastrium and may present in the right or left upper quadrants (nonlocalized abdominal pain may also occur) ○ Maximal pain occurs several hours into the illness ○ The pain has a penetrating quality that radiates to the back (Because pancreas is retroperitoneal structure) ○ In patients with alcohol associated pancreatitis, the pain often begins 12-48 hours after inebriation ○ Nausea and vomiting frequently occur with the pain
<p>Physical Examination</p>	<ul style="list-style-type: none"> - The typical findings are: <ul style="list-style-type: none"> ★ Fever ★ Tachycardia ★ Epigastric tenderness ★ Abdominal distention - Severe pancreatitis associated with hemorrhage into the retroperitoneum may produce two distinctive physical signs (indicate hemorrhagic pancreatitis): <ol style="list-style-type: none"> 1. Turner's sign 2. Cullen's sign - Jaundice is an uncommon finding at the initial presentation but may be seen with gallstone associated pancreatitis - With severe pancreatitis: major circulatory derangements such as hypotension, hypovolemia, hypoperfusion and obtundation may occur



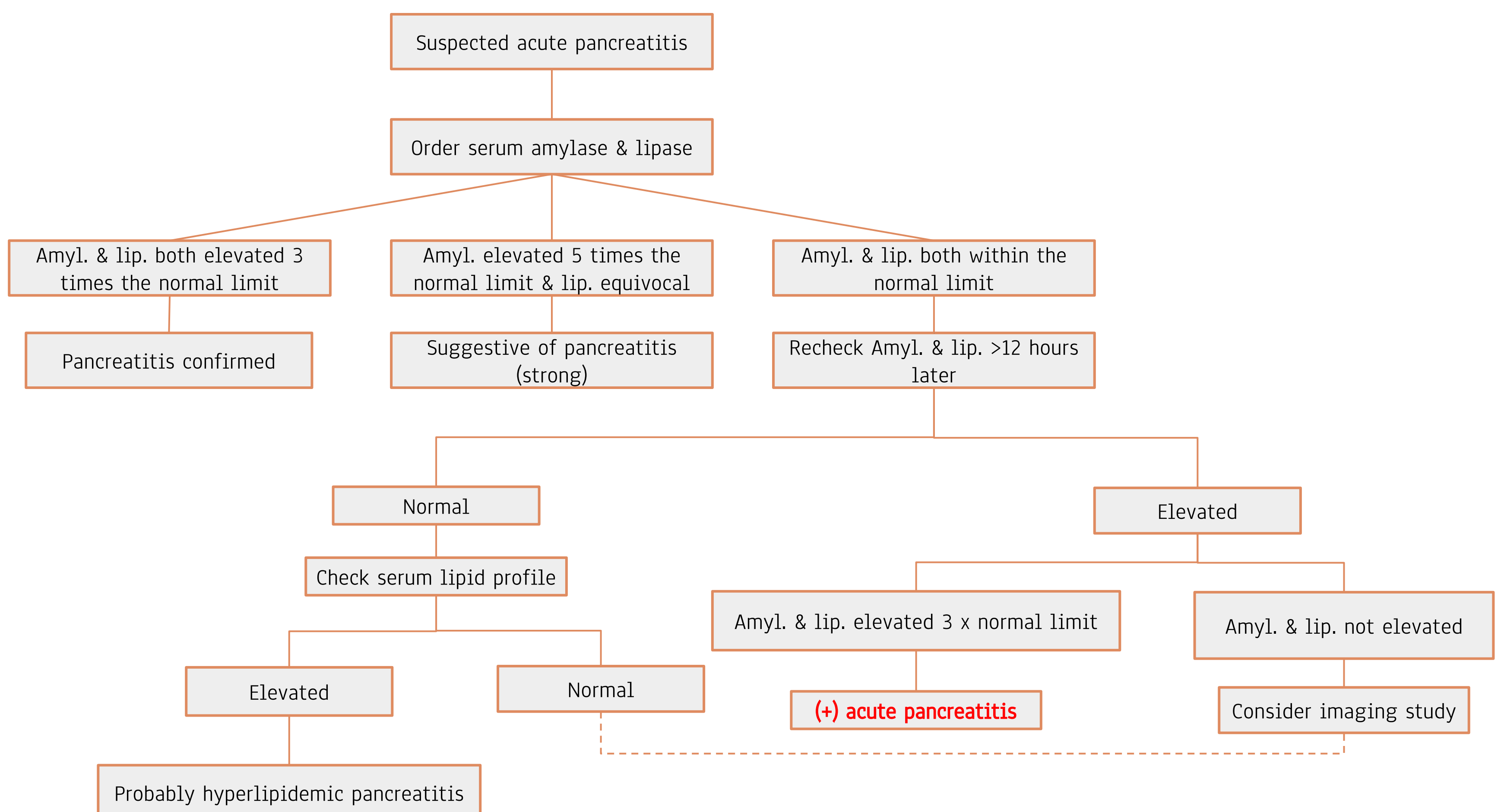
Turner's sign



Cullen's sign

Diagnosis of Acute Pancreatitis

Serum Amylase	<ul style="list-style-type: none"> - Elevated within 24 hours of onset of symptoms - The levels rapidly return to normal - Persistent hyperamylasemia indicates development of complications - The degree of elevation is not a reliable predictor of the severity - The magnitude is an independent predictor to differentiate gallstone associated pancreatitis from alcohol induced
Serum Lipase Level	<ul style="list-style-type: none"> - A more accurate indicator of acute pancreatitis (since it is solely of pancreatic origin) - Is not entirely specific for acute pancreatitis
Other lab test (not specific)	<ul style="list-style-type: none"> - Serum glucose levels: usually elevated - Abnormal liver function tests - Hypocalcemia (due to saponification effect produced by lipase which result in formation of fat necrosis).
Radiographic Evaluation	<ul style="list-style-type: none"> - Chest X-ray: <ul style="list-style-type: none"> - Left basal atelectasis - Elevation of the left hemidiaphragm - Left pleural effusion - Abdominal X-ray: <ul style="list-style-type: none"> - May reveal air in the duodenal loop - Gallstones in the gallbladder - Upper GI contrast studies: <ul style="list-style-type: none"> - Widening of the duodenal "C" loop - Anterior displacement of the stomach - Abdominal ultrasound (initial test then we do CT): <ul style="list-style-type: none"> - May be of limited value due to the presence of air and fluid within the bowel overlying the pancreas - May detect pancreatic edema - CT scan: Currently the most widely accepted & sensitive method used to confirm the diagnosis - MRI: <ul style="list-style-type: none"> - Holds great promise - Results are equal to that of CT scan



Early Prognostic Signs of Acute Pancreatitis (Ranson's Score)

We use it to determine if a patient with pancreatitis need to be admitted to the ICU or not + prognosis.

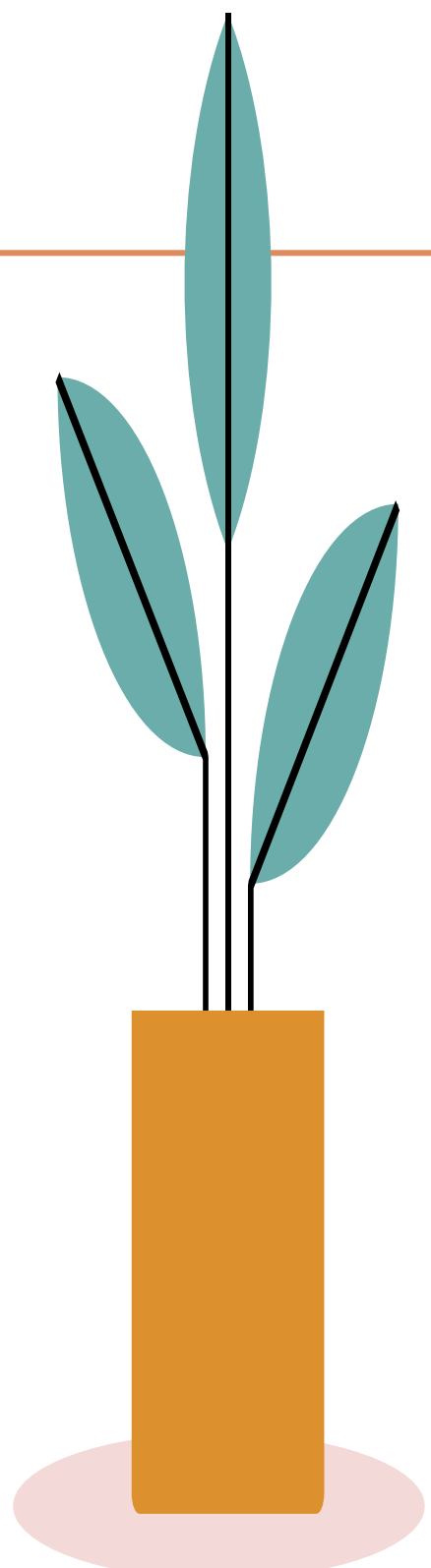
Criteria for pancreatitis not due to gallstones

At admission	During initial 48 hours
<ul style="list-style-type: none"> - Age >55 years old - WBC count > 16,000 - Blood glucose > 200 mg/dL - Serum lactate dehydrogenase (LDH) > 400 - Serum Aspartate Aminotransferase (AST) > 250 	<ul style="list-style-type: none"> - Hematocrit fall > 10% - BUN evaluation > 5 mg/dL - Serum calcium fall to < 8 mg/dL - Arterial O2 concentration < 60 mmHg <ul style="list-style-type: none"> - Base deficit > 4 mEq/L - Estimated fluid sequestration > 6 L

Criteria for gallstone pancreatitis

At admission	During initial 48 hours
<ul style="list-style-type: none"> - Age >70 years old - WBC count > 18,000 - Blood glucose > 220 mg/dL - Serum lactate dehydrogenase (LDH) > 400 - Serum Aspartate Aminotransferase (AST) > 250 	<ul style="list-style-type: none"> - Hematocrit fall > 10% - BUN evaluation > 2 mg/dL - Serum calcium fall to < 8 mg/dL <ul style="list-style-type: none"> - Base deficit > 5 mEq/L - Estimated fluid sequestration > 4 L

If the score ≥ 3 severe pancreatitis is likely



Acute Pancreatitis

It is possible to predict the severity of an attack using routinely available clinical and laboratory determinations. These tests are valuable in guiding the therapy of patients

Nonoperative Management

Standard therapy includes: **(Treatment of acute pancreatitis is mainly supportive)**

- ★ **IV fluids (2 liters)**
- ★ **Electrolyte replacement**
- ★ **Pain medication** (meperidine) (MSO₄ causes sphincter of Oddi spasm)
- ★ NG tube is reserved for patients with an ileus
- ★ Patients with severe pancreatitis often require nutritional support via parenteral alimentation (NPO)
- ★ **Antibiotic administration (in case of infective necrosis)** for prevention of septic complications

Operative Management

Is indicated in four specific circumstances:

1. Uncertainty of the diagnosis:

- No single test is 100% accurate in diagnosing acute pancreatitis
- Occasionally it may be difficult to exclude other diagnosis that mimics acute pancreatitis. In these situations, exploratory laparotomy may be indicated to exclude surgically correctable disease. If cholelithiasis is the cause, this can be surgically corrected

2. Treatment of secondary pancreatic infections

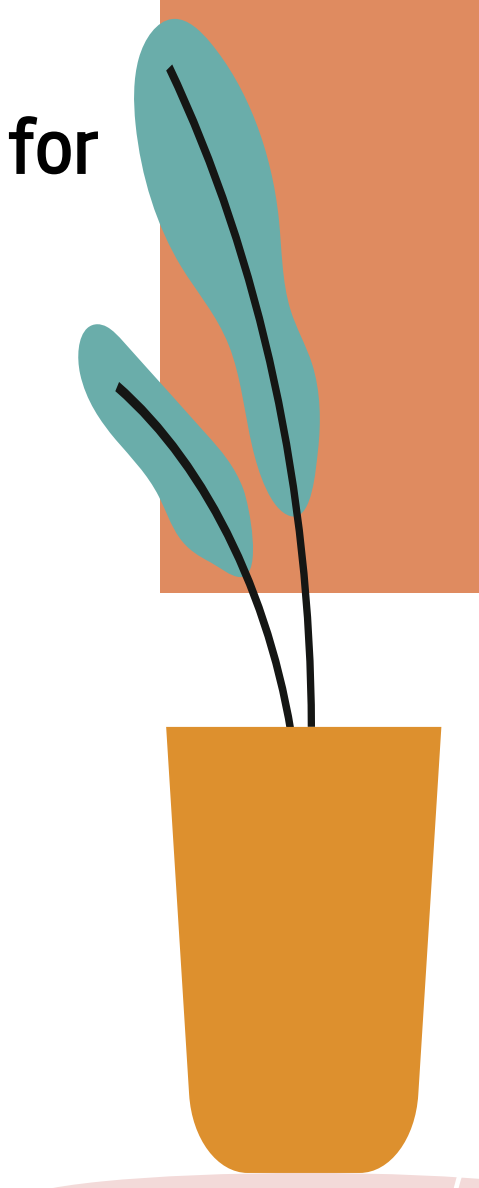
- **Pancreatic abscesses, infected pancreatic pseudocyst and pancreatic necrosis with infections (three serious and life-threatening complications)**
- Their frequency of occurrence is in direct proportion to the severity of pancreatitis
- In patients with six or more prognostic signs over half will develop a pancreatic septic complication
- The development of pancreatic septic complications should be suspected in patients in whom pancreatitis fails to resolve within the first week to 10 days

3. Correction of associated biliary tract disease:

- Cholecystectomy (early) reduces overall length of stay and **eliminated the need for a second hospitalization**

4. Progressive clinical deterioration despite optimal supportive care

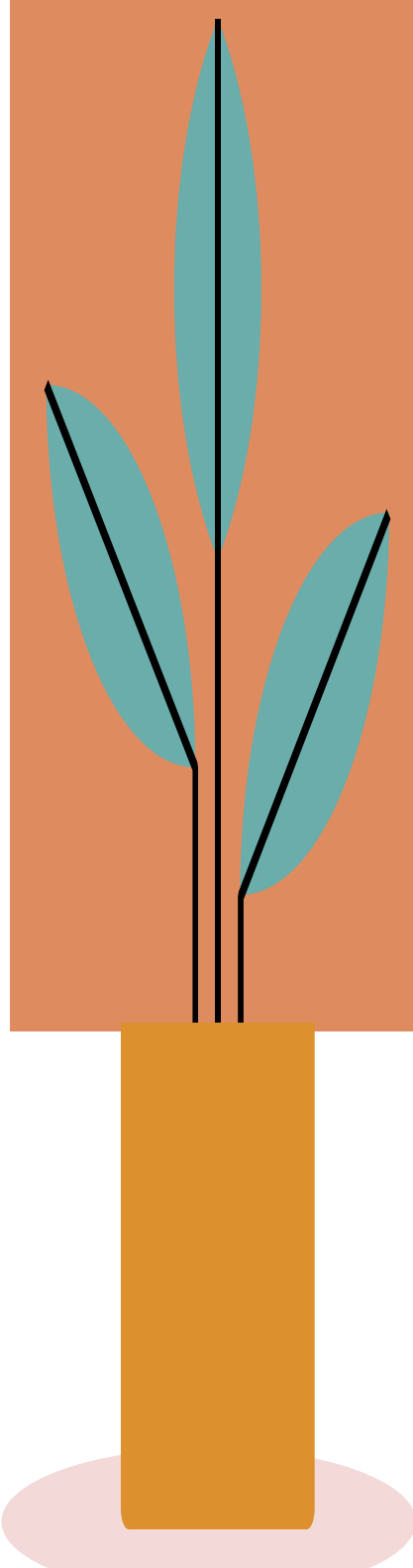
- In patients who **fail** to respond to nonoperative supportive care, operative intervention has been advocated. This is the most controversial indication for surgical therapy. Some physicians recommend removing necrotic tissue, while others recommend total pancreatectomy



Chronic Pancreatitis

Etiology	<ul style="list-style-type: none"> - Is associated with Chronic alcohol abuse (most common), cystic fibrosis, congenital anomalies of the pancreatic duct and trauma to the pancreas. - The exact mechanism of alcohol induced disease is unknown.
Clinical Presentation	<ul style="list-style-type: none"> ★ Incidence is approximately 4 per 100,000. ★ The typical patient presents with a history of alcohol abuse in the fourth or fifth decade of life. ★ Abdominal pain is the feature that prompts consultation. ★ The pain is commonly epigastric in location but may be localized to the right or left of midline. ★ Radiation to the back is common. ★ Anorexia and weight loss may be present. ★ Insulin-dependent diabetes occurs in up to one-third of these patients. ★ Up to 25% have steatorrhea as result of Malabsorption (implies reduced pancreatic exocrine function). ★ In chronic pancreatitis there will be chronic inflammation (Recurrent Inflammation followed by healing by fibrosis) as result of this fibrosis the pancreas will lose its function including the exocrine part (No secretion of enzymes and digestion of fat) + endocrine part. ★ Complication: Pancreatic carcinoma
Diagnosis	<ul style="list-style-type: none"> ★ Is usually suspected on clinical findings. ★ Routine laboratory tests are rarely helpful. ★ Radiographic evaluation may reveal pancreatic calcifications on plain films. ★ CT scan is useful in evaluating the size and texture of the pancreas. ★ Endoscopic retrograde pancreatography. ★ Pancreatic endocrine function.

Nonoperative Management	Operative Management
<ul style="list-style-type: none"> - Control of abdominal pain: <ul style="list-style-type: none"> ★ Can be a problem (drug dependency). ★ In some patients total abstinence from alcohol relieves the pain. ★ Dietary changes are also recommended. - Treatment of endocrine insufficiency. - Treatment of exocrine insufficiency. <p>Treatment of Malabsorption (Give pancreatic enzymes)</p>	<ol style="list-style-type: none"> Ampullary procedures: <ol style="list-style-type: none"> Designed to eliminate pancreatitis by preventing bile reflux into the pancreatic duct (results have not been favorable). Ductal drainage procedures: <ol style="list-style-type: none"> Designed to decompress the pancreatic duct in a retrograde manner Pancreaticojejunostomy (success rates 60-90%) Ablative procedure (last step) <ol style="list-style-type: none"> Pancreatectomy (total or subtotal). Most obtain adequate pain relief however these procedures can cause IDDM.



Disruptions of the Pancreatic Duct (Dr did not focus on it)

- ★ In adults, the most common cause is **alcoholic pancreatitis**.
- ★ In children the most common cause is **neoplasms**.
- ★ Disruptions of the main pancreatic duct cause external or internal pancreatic fistulas.

External Pancreatic Fistula	Internal Pancreatic Fistula (pancreatic pseudocyst)
<ul style="list-style-type: none"> - May occur as a result of pancreatic operations (25% of cases). - Fistulas that drain < 200 ml per day are classified as low output fistulas. - Complications include sepsis, fluid and electrolyte abnormalities and excoriation. - Parenteral nutrition is utilized to avoid pancreatic stimulation by oral intake. - Most pancreatic fistulas close with nonoperative management. 	<ul style="list-style-type: none"> - Represents 75% of cystic lesions of the pancreas. - It may results in infection or bleeding <ul style="list-style-type: none"> - Electrolyte concentrations in the pseudocyst fluid are equivalent to those in plasma. - Patients present most often with upper abdominal pain, early satiety, nausea and vomiting. - An abdominal mass is present in less than half. - Laboratory findings are nonspecific. - CT scan of the abdomen is the favored study and initial assessment. <p>Treatment: Observe for 6-12 weeks (resolve spontaneously) After 12 weeks the chance the pseudocyst to go away is small and chance of complication is high so after 3 months we do CT and if it's more than 5 cm you have to treat it.</p> <ul style="list-style-type: none"> ● Drainage indicated if: <ul style="list-style-type: none"> ○ External drainage(through the skin: in case of Infection. ○ internal (Endoscopic) drainage: <ul style="list-style-type: none"> ■ Symptomatic (related to size). ■ > 5 cm (internal drainage).



Neoplasms of the Pancreas (*Exocrine*)

- ★ The **fifth** most common cause of cancer death.
- ★ **90%** of patients die within the first year after diagnosis.
- ★ The five-year survival rate is **1%**.
- ★ More common in black people, **smokers** and in males.
- ★ Could be linked to the presence of DM & possibly past history of chronic pancreatitis & long-term high-fat diets.
- ★ Over **90%** of malignant pancreatic **exocrine** tumors are duct cell **adenocarcinomas**.
- ★ **The most common site of origin is in the head of the pancreas.**

1. Periampullary Adenocarcinoma

Difficult to differentiate from 3 other malignant periampullary neoplasms: **ampullary carcinoma**(In the head of the pancreas), duodenal carcinoma & carcinoma of the distal common bile duct.

Clinical Presentation	<ul style="list-style-type: none"> ★ Jaundice & weight loss ★ Abdominal pain
Laboratory	★ Elevated serum bilirubin (obstructive jaundice), alkaline phosphatase, CEA and CA 19-9
Radiography	<ul style="list-style-type: none"> ★ Upper barium series may be positive with large tumors ★ Ultrasound may be of benefit ★ CT scan provides better accuracy of diagnosis.
Management	<ol style="list-style-type: none"> 1. <u>Nonoperative</u>: <ol style="list-style-type: none"> a. Is recommended in patients with documented distant metastases. b. Unresectable local disease. c. Chronic debilitating illnesses 2. <u>Operative</u>: <ol style="list-style-type: none"> d. The Whipple procedure: <ol style="list-style-type: none"> i. The gallbladder, common bile duct, entire duodenum, head of the pancreas, pylorus & distal stomach are removed (five-year survival rate approximates 15-25%). ii. Care is taken to assess distant intra-abdominal metastasis including lymph nodes. e. Palliative surgery: <ol style="list-style-type: none"> i. Designed for patients with unresectable disease to alleviate obstruction and tumor associated pain. ii. Biliary-enteric bypass. f. Adjuvant therapy: <ol style="list-style-type: none"> i. The data indicates that chemotherapy alone has no role in periampullary carcinoma. ii. Combination therapy has slightly better results (20 months)

2. Adenocarcinoma of the Body and Tail of the Pancreas

- Represents up to 30% of all cases of pancreatic carcinoma.
- The tumors in this location usually grow quite large prior to becoming symptomatic.
- These tumors do not cause early obstructive jaundice or GI obstructive symptoms.
- **Clinical presentation is usually weight loss and pain (90% of patients).**
- Physical exam findings are often nonspecific.
- CT scan is the best study for detection of primary and metastatic disease.

Other Pancreatic Tumors

- ★ Cystadenocarcinoma of the pancreas (Not commonly seen)
 - Generally seen in females between the ages of 40-60
- ★ Acinar-cell carcinoma: A rare malignancy with no sexual predominance
- ★ Benign neoplasms of the exocrine pancreas
 - Cystadenoma
 - Solid and papillary neoplasms of the pancreas

Neoplasms of the Pancreas (*Endocrine*)

- ★ Rare with an incidence of five per one million.
- ★ Endocrine tumors are named according to the major hormone produced by the tumor.
- ★ Malignancy is determined by the presence of local invasion, spread to regional lymph nodes or hepatic/distant metastasis.
- ★ Tumor localization is best identified using CT scan or MRI

Insulinoma

- ★ The **most common endocrine** tumor of the pancreas.
- ★ **Symptoms:**
 - Hypoglycemia at fasting, documentation of blood glucose levels of <50 and relief of symptoms following administration of glucose.
- ★ **Detection methods:**
 - Blood glucose and insulin levels are sampled every 4-6 hours after a 72 hour fast.
- ★ **Management:**
 - Surgery (most are benign)
 - Pharmacologic therapy may be useful in patients with residual tumor following resection (Diazoxide)

Gastrinoma (Zollinger-Ellison Syndrome)

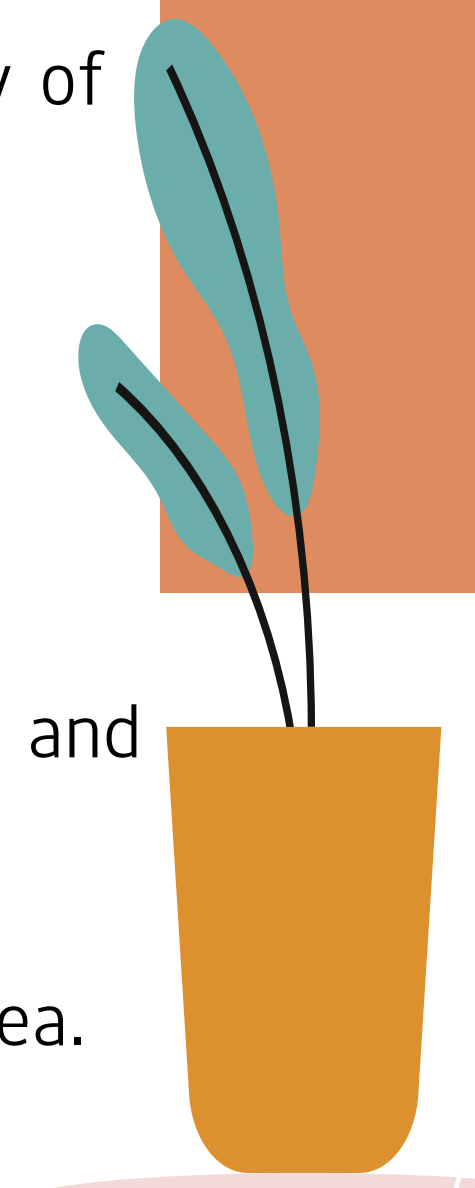
- ★ **Symptoms:**
 - Primary peptic ulceration in unusual locations.
 - Gastric acid hypersecretion despite adequate therapy.
 - Identification of an islet cell tumor of the pancreas.
- ★ **Detection methods:**
 - When a gastrinoma is suspected, fasting serum gastrin levels should be obtained
- ★ **Management:**
 - Control of gastric acid hypersecretion.
 - Alteration of the natural history of the gastrinoma (tumor localization, assessment of metastatic disease and tumor resection).

Pancreatic Lymphoma

- ★ Involvement of the pancreas with non-Hodgkin's lymphoma is an unusual neoplasm.
- ★ **Symptoms:**
 - Weight loss abdominal pain, may include jaundiced & symptoms of gastric outlet obstruction.
- ★ **Physical Finding:** Palpable abdominal mass.
- ★ Abdominal CT scan may suggest the diagnosis (large soft tissue mass in the vicinity of the pancreas).
- ★ Diagnosis is confirmed by needle biopsy

Other Endocrine Tumors

- ★ Verner-Morrison syndrome (VIPoma) :
 - A pancreatic islet cell tumor associated with severe watery diarrhea, hypokalemia and either achlorhydria or hypochlorhydria.
- ★ Glucagonoma: Hallmarks are mild diabetes and severe dermatitis.
- ★ Somatostatinoma (rare endocrine tumor): Presents as gallstones, diabetes & steatorrhea.
- ★ Nonfunctional islet cell tumors.

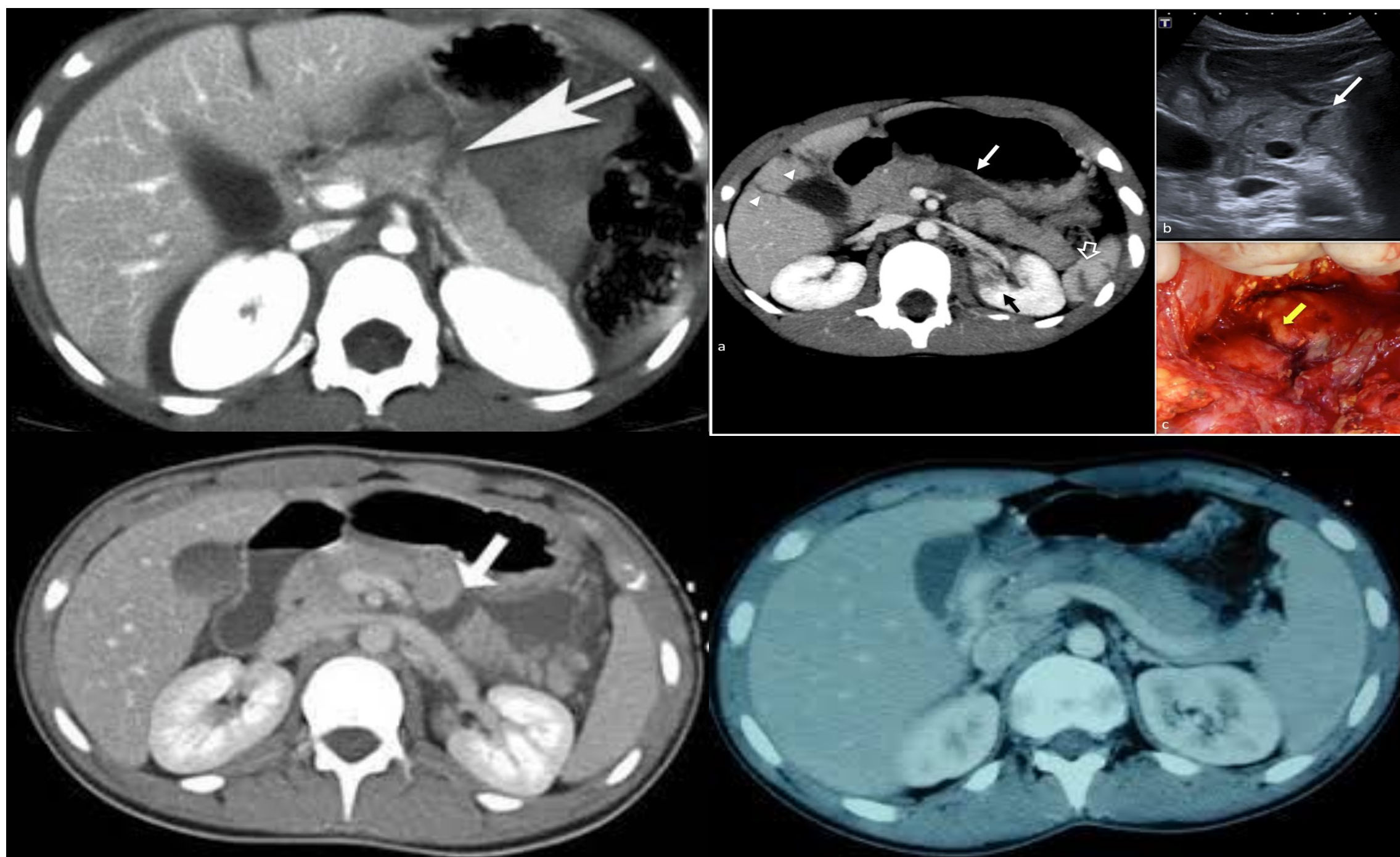


Pancreatic Trauma

- The pancreas is injured in less than 2% of patients with abdominal trauma.
 - ◆ Two-thirds are associated with penetrating abdominal trauma.
 - ◆ If the pancreas is injured usually adjacent organs and major vascular structures are also injured.
 - ◆ The majority of fatal cases is due to damage from nearby vascular structures.
 - ◆ The second most common cause of death involves intra-abdominal sepsis.
 - ◆ In blunt abdominal trauma, the extent and location of pancreatic injury is determined by the mechanism of injury and location of impact.

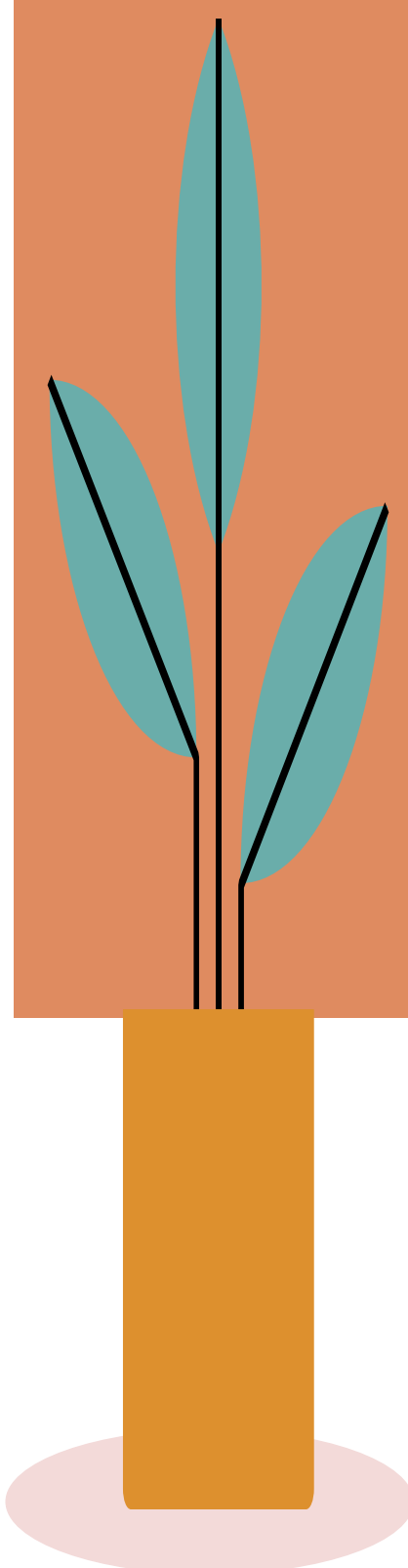
Diagnosis

- ★ No laboratory test is sufficiently accurate for the specific diagnosis of pancreatic injury.
- ★ Amylase is elevated in most patients with blunt trauma and only slightly elevated with penetrating injury.
- ★ Peritoneal lavage is inaccurate because the pancreas is retroperitoneal.
- ★ Chest and abdominal films are often not helpful .
- ★ **CT scan of the abdomen is gaining acceptance in evaluating pancreatic injury.**



Management

- ★ If the patients have stable vital signs and lack a specific indication for exploration they are treated with observation and followed for complications such as abscess, pseudocyst or phlegmon.
- ★ If the patients undergo laparotomy for other reasons the pancreas must be assessed utilizing a Kocher's maneuver.
- ★ The goal of operative therapy should include control of hemorrhage, debridement of nonviable tissue and adequate drainage of exocrine secretions.



Pancreatic Trauma

Categorization of Pancreatic Injury

- ★ Pancreatic contusion without capsular rupture.
- ★ Pancreatic capsular and parenchymal rupture without injury to the main pancreatic duct.
- ★ Severe pancreatic parenchymal injury with rupture of the main pancreatic duct.
- ★ Combined severe pancreatic and duodenal injuries.

Class I injury	Class II injury	Class III injury	Class IV injury
<ul style="list-style-type: none"> - Is treated by external drainage alone. - This prevents occult capsular disruptions that could potentially cause accumulation of pancreatic secretions that will eventually cause a pseudocyst or abscess. - Drains are usually left in place until oral intake is reestablished. 	<ul style="list-style-type: none"> - Are treated by cautious debridement of devitalized tissue, adequate hemostasis and closure of major capsular disruptions. - External drainage is also recommended. 	<ul style="list-style-type: none"> - These injuries require individualized treatment based on their location and injuries to adjacent structures. - Injuries to the body and tail are best treated by distal pancreatectomy. - Drains are also placed 	<ul style="list-style-type: none"> - Mortality approaches 45% due to frequently associated adjacent visceral or vascular injuries. - Treatment is individualized based on the extent of damage.

Surgical Recall:

What maneuver is used to mobilize the duodenum and pancreas and evaluate the entire pancreas?

- Kocher maneuver: Incise the lateral attachments of the duodenum then lift the pancreas to examine the posterior surface

What is the acronym to remember all causes of pancreatitis? (I GET SMASHED)

- Idiopathic, Gallstones, Ethanol, Trauma, Scorpion bite, Mumps (viruses), Autoimmune, Steroids
- Hyperlipidemia/Hypercalcemia, ERCP & Drugs

What is the etiology of hypocalcemia with pancreatitis? Fat saponification: fat necrosis binds to calcium

What are the signs of pancreatic exocrine insufficiency?

- Steatorrhea (fat malabsorption from lipase insufficiency stools float in water) & malnutrition

What are the signs of pancreatic endocrine Insufficiency? Diabetes (glucose intolerance)

Why may amylase/lipase be normal in a patient with chronic pancreatitis?

- Because of extensive pancreatic tissue loss (burned-out pancreas)

Why are most pancreatic cancers in the tail non-resectable?

- These tumors grow without symptoms until it is too late and they have already spread
- Head of the pancreas tumors draw attention earlier because of biliary obstruction

What is the classic presentation of pancreatic cancer in the head of the pancreas? Painless jaundice

Why must the duodenum be removed if the head of the pancreas is removed?

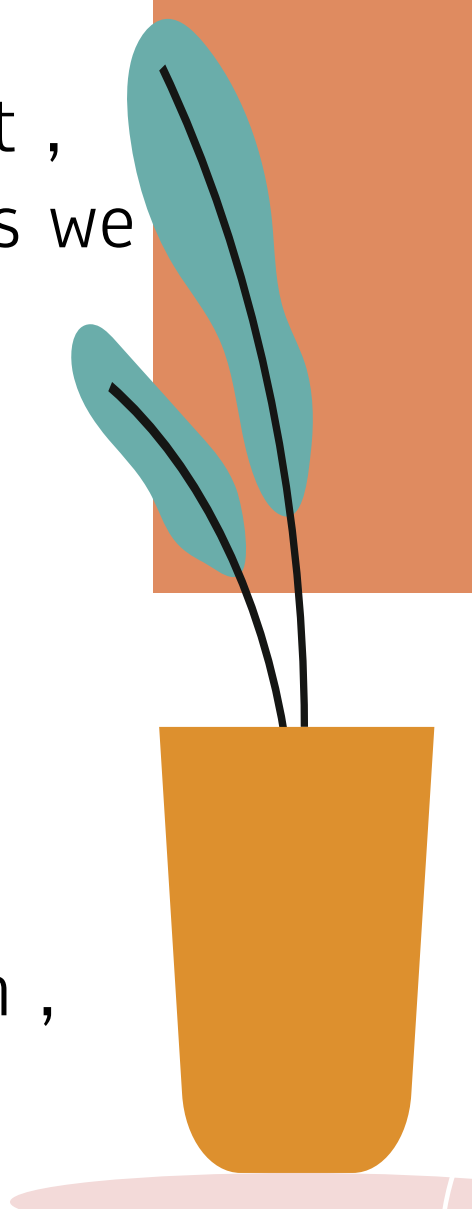
- They share the same blood supply (gastroduodenal artery)

Doctor's Notes

- **IMPORTANT:** If two people have obstructive jaundice, how can I know if it's due to cancer or gallstones?

Head of pancreas cancer	Gallstones
Mostly Elderly	Mostly Young
Significant weight loss	No significant weight loss
Constitutional symptoms (fever, weight loss , night sweats, loss of appetite, fatigue)	No constitutional symptoms
Longer and progressive course (development of jaundice is gradual)	Shorter and acute course (Jaundice develops quickly)
Painless	Painful

- ★ I want you to remember that 90% of pancreatic masses occur in the head, and from the exocrine portion of the pancreas (Adenocarcinomas).
- ★ 90% of acute pancreatitis cases in the KSA is due to biliary pancreatitis (small stones in the ampulla of Vater leading to activation of pancreatic enzymes), in other countries it may be alcohol. Why small stones? Because big stones cannot make it all the way to the ampulla of Vater, they will be dislodged higher leading to only obstructive jaundice.
- ★ 80% of acute pancreatitis will end up as edematous type pancreatitis (simply edema and will need I.V fluids for management only) .
- ★ Serum amylase rises first in acute pancreatitis but has a short half life. Whereas Lipase rises later but lasts longer.
- ★ Urine amylase and lipase can help you differentiate which phase the patient is in.
 - If the patient is in the RESOLVING phase amylase in the urine will be higher than in the serum.
- ★ The most important investigation: CT with IV CONTRAST.
- ★ The most important thing in the management of acute pancreatitis: **aggressive IV fluids.**
- ★ Infected necrotizing pancreatitis = antibiotics and surgery.
- ★ To differentiate between acute and chronic pancreatitis we don't depend on the lab test , instead we depend on the radiological investigation (in the case of chronic pancreatitis we will see calcifications)
- ★ **A resectable (non metastatic) tumor in the tail of the tumor -> treatment is distal pancreatectomy (we remove the tail of the pancreas plus the splenic artery and vein)**
- ★ **Neck or body -> subtotal pancreatectomy**
- ★ In non resectable pancreatic tumors most of them they will present late with back pain , we do a celiac plexus nerve block to relieve the severe back pain that accompanies the tumor.



Summary

- The pancreas has an extensive arterial system arising from multiple sources
- The venous drainage parallels arterial anatomy, and terminated in the portal vein
- Has two distinct organ systems within the pancreas:
 - ◆ Endocrine portion: islets of Langerhans
 - ◆ Exocrine portion: acini and ductal systems.

Acute Pancreatitis

Etiology:

- 90% of causes are caused by biliary tract disease (gallstones) or excessive alcohol intake
- Hyperlipidemia, Hypercalcemia, Trauma, Ischemia, medications

Signs:

- Fever
- Tachycardia
- Epigastric tenderness
- Abdominal distention
- Severe pancreatitis physical signs:
 - Turner's sign
 - Cullen's sign
- Hypovolemia, Hypotension, hypoperfusion

Symptoms: Abdominal pain (most common)

- Begins in the mid epigastrium and may present in the right or left upper quadrants, may radiates to the back

Ranson's Criteria:

1. Not due to gallstones
 - a. At admission:
 - i. Age >55
 - ii. WBC > 16,000
 - iii. glucose > 200 mg
 - iv. LDH > 400
 - v. AST > 250
 - b. During Initial 48 hours:
 - i. Hematocrit fall > 10%
 - ii. BUN > 5
 - iii. calcium < 8
 - iv. Arterial O₂ < 60
 - v. Base deficit > 4
 - vi. Estimated fluid sequestration > 6L
2. Due to gallstones:
 - a. At admission:
 - i. Age > 70
 - ii. WBC > 18,000
 - iii. glucose > 220 mg
 - iv. LDH > 400
 - v. AST > 250
 - b. During Initial 48 hours:
 - i. Hematocrit fall > 10%
 - ii. BUN > 2
 - iii. calcium < 8
 - iv. Base deficit > 5
 - v. Estimated fluid sequestration > 4L

Diagnosis:

- Labs: serum amylase, lipase & glucose
- Radiographic

Management:

1. Nonoperative: IV fluids, electrolyte replacement, pain medication (meperidine) & antibiotic
2. Operative:
 - a. Uncertainty of the diagnosis: (exploratory laparotomy)
 - b. Treatment of secondary pancreatic infections
 - c. Correction of associated biliary tract disease: Cholecystectomy
 - d. Progressive clinical deterioration despite optimal supportive care

Chronic Pancreatitis

Etiology:

- Is associated with alcohol abuse (most common), cystic fibrosis, congenital anomalies of the pancreatic duct and trauma to the pancreas.

Symptoms: Abdominal pain is the feature that prompts consultation.

- Epigastric in location but may be localized to the right or left of midline & radiation to the back is common.
- Anorexia and weight loss may be present & Insulin-dependent diabetes occurs in up to one-third of these patients.
- Up to 25% have steatorrhea (implies reduced pancreatic exocrine function).

Diagnosis:

- CT scan is useful in evaluating the size and texture of the pancreas.

Management:

1. Nonoperative: Control of abdominal pain, treatment of endocrine & exocrine insufficiency
2. Operative: Ampullary procedures, Ductal drainage procedures and Ablative procedure

Summary

Exocrine Pancreatic Tumors

- Neoplasms of the pancreas are mostly located in the head of the pancreas
- **Cigarette smoking** is one of the important risk factors

★ Periampullary Adenocarcinoma

Symptoms: **Jaundice**, weight loss & abdominal pain

Laboratory: Elevated serum bilirubin (**obstructive jaundice**), alkaline phosphatase, CEA and CA 19-9

Radiography: CT scan provides better accuracy of diagnosis.

Management:

1. **Nonoperative:** In patients with documented distant metastases, unresectable local disease or chronic debilitating illnesses
2. **Operative:**
 - a. The Whipple procedure
 - b. Palliative surgery
 - c. Adjuvant therapy

★ Adenocarcinoma of Body & Tail

Symptoms:

- The tumors in this location usually grow quite large prior to becoming symptomatic.
- These tumors do not cause early obstructive jaundice or GI obstructive symptoms.
- Clinical presentation is usually weight loss and pain (90% of patients).

Radiography: CT scan is the best study for detection of primary and metastatic disease.

Endocrine Pancreatic Tumors

★ Insulinoma (most common)

Symptoms: Hypoglycemia at fasting, documentation of blood glucose levels of <50 and relief of symptoms following administration of glucose.

Diagnosis: Blood glucose and insulin levels are sampled every 4-6 hours after a 72 hour fast.

Management:

- Surgery (most are benign)
- Pharmacologic therapy may be useful in patients with residual tumor following resection (Diazoxide)

★ Gastrinoma (Zollinger-Ellison Syndrome)

Symptoms:

- Primary peptic ulceration in unusual locations.
- Gastric acid hypersecretion despite adequate therapy.

Diagnosis: When a gastrinoma is suspected, fasting serum gastrin levels should be obtained

Management:

- Control of gastric acid hypersecretion.
- Alteration of the natural history of the gastrinoma (tumor localization, assessment of metastatic disease and tumor resection).

★ Pancreatic Lymphoma

Symptoms:

- Weight loss abdominal pain, may include jaundiced & symptoms of gastric outlet obstruction.

Physical Findings: Palpable abdominal mass.

Diagnosis:

- Abdominal CT scan may suggest the diagnosis (large soft tissue mass in the vicinity of the pancreas).
- Diagnosis is confirmed by needle biopsy

Pancreatic Trauma

- The pancreas is injured in less than 2% of patients with abdominal trauma.
- **CT scan of the abdomen is gaining acceptance in evaluating pancreatic injury.**
- Amylase is elevated in most patients with blunt trauma and only slightly elevated with penetrating injury.

Categories

- Class I: Is treated by external drainage alone
- Class II: Treated by cautious debridement of devitalized tissue, adequate hemostasis and closure of major capsular disruptions & external drainage is also recommended
- Class III: Individual treatment based on the location; body & tail are treated by distal pancreatectomy
- Class IV: Mortality approaches 45% treatment is individualized based on the extent of damage

Quiz

1. A 60-year-old Hispanic woman presents to the hospital with the sudden onset of severe abdominal pain which radiates through to her back. There is some relief from sitting up and leaning forward and the pain is worse when lying on her back. She denies alcohol use and does not smoke. She has hypertension that has not been well controlled. She has diabetes, Type 2, that was recently diagnosed and is controlled with metformin. On examination her BMI is 31; BP is 100/60, her pulse is 110/ minute, respirations are 20/ min; her temperature is 38.5° C. There is no apparent jaundice or conjunctival pallor. Her breath sounds are normal; heart exam shows a tachycardia without murmurs, rubs, or gallops; there is guarding and diffuse tenderness throughout the abdomen on abdominal exam and the bowel sounds are absent. **What is your most likely diagnosis?**
 - a. Chronic pancreatitis
 - b. Acute pancreatitis
 - c. Insulinoma
 - d. None of the above
2. What is the most likely etiology regarding the case from question 1?
 - a. Metformin
 - b. Alcohol intake
 - c. Hypercalcemia
 - d. Gallstones
3. Acute pancreatitis is often associated with hypovolemia. What fluid resuscitation is suggested?
 - a. 250-500 mL per hour Ringer's lactate
 - b. 250-500 mL per hour D5W
 - c. 250-500 mL per hour D5 1/2N saline
 - d. 250-500 mL per hour D5 NS
4. An operation in which the surgeon removes the "head" of the pancreas, the duodenum, the gallbladder, and the bile duct is known as a pancreaticoduodenectomy. It is also frequently referred to as the:
 - a. Sugarbaker procedure
 - b. Ablative procedure
 - c. Whipple procedure
 - d. Ampullary
5. A 42-year-old woman was admitted with lightheadedness, chills and shakiness. The onset of the symptoms was from 1 year ago. This symptom improved after eating of candy or fruit juice. Initial laboratory testing revealed blood glucose level in 30-40 mg/dl. The patient was admitted for management for hypoglycemia. Blood tests evidenced high insulin and c-peptide levels despite low plasma glucose level. Endoscopic ultrasonography (EUS) revealed pancreatic mass. **What's your most likely diagnosis?**
 - a. Pancreatic lymphoma
 - b. Periampullary Adenocarcinoma
 - c. Adenocarcinoma of tail of the pancreas
 - d. Insulinoma