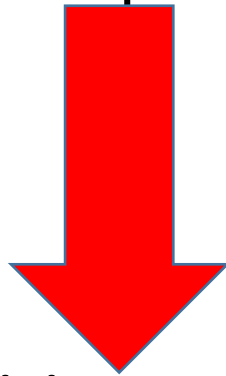


Acute and Chronic Pancreatitis

Acute pancreatitis

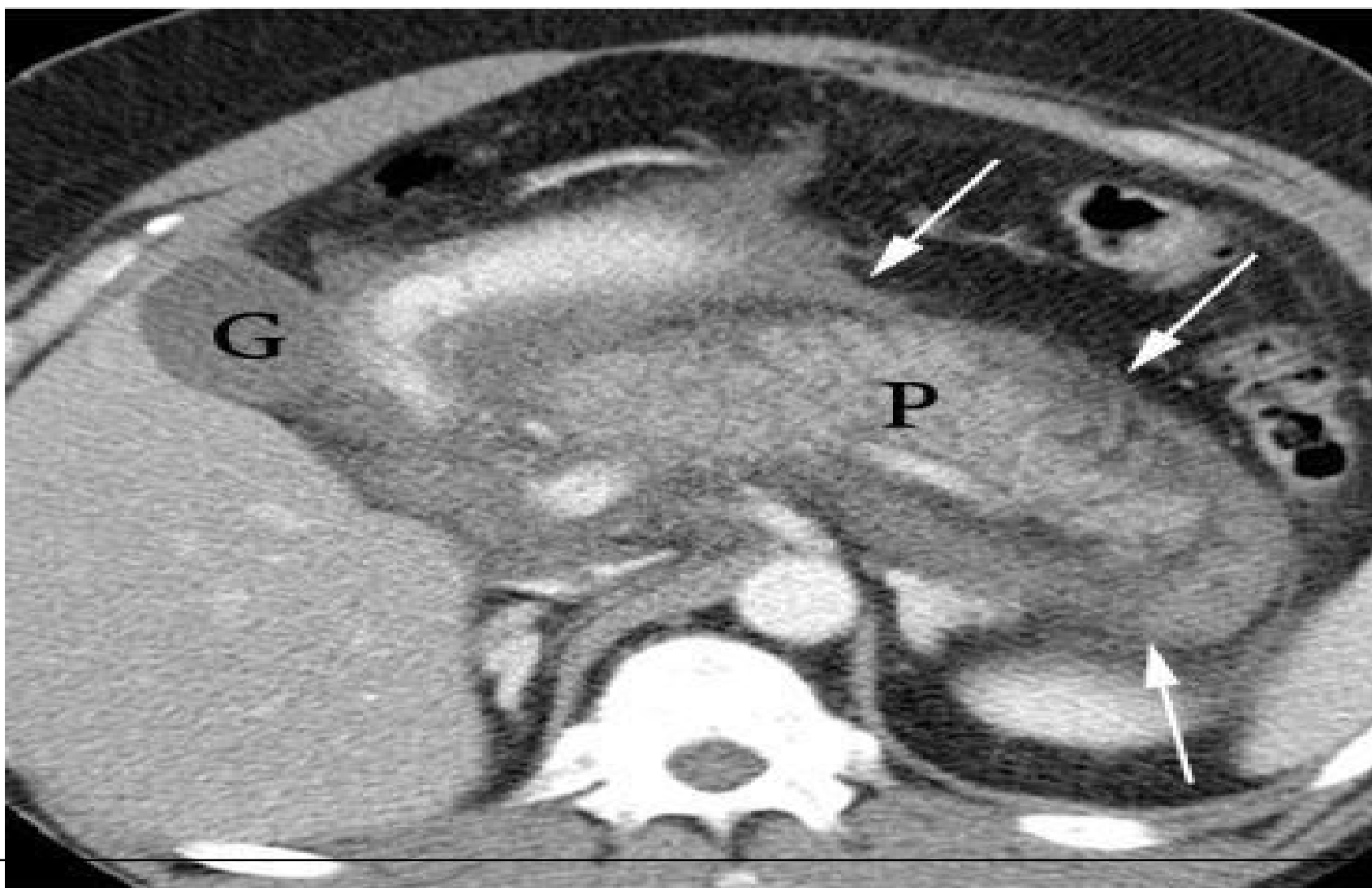
Acute pancreatitis

Interstitial pancreatitis

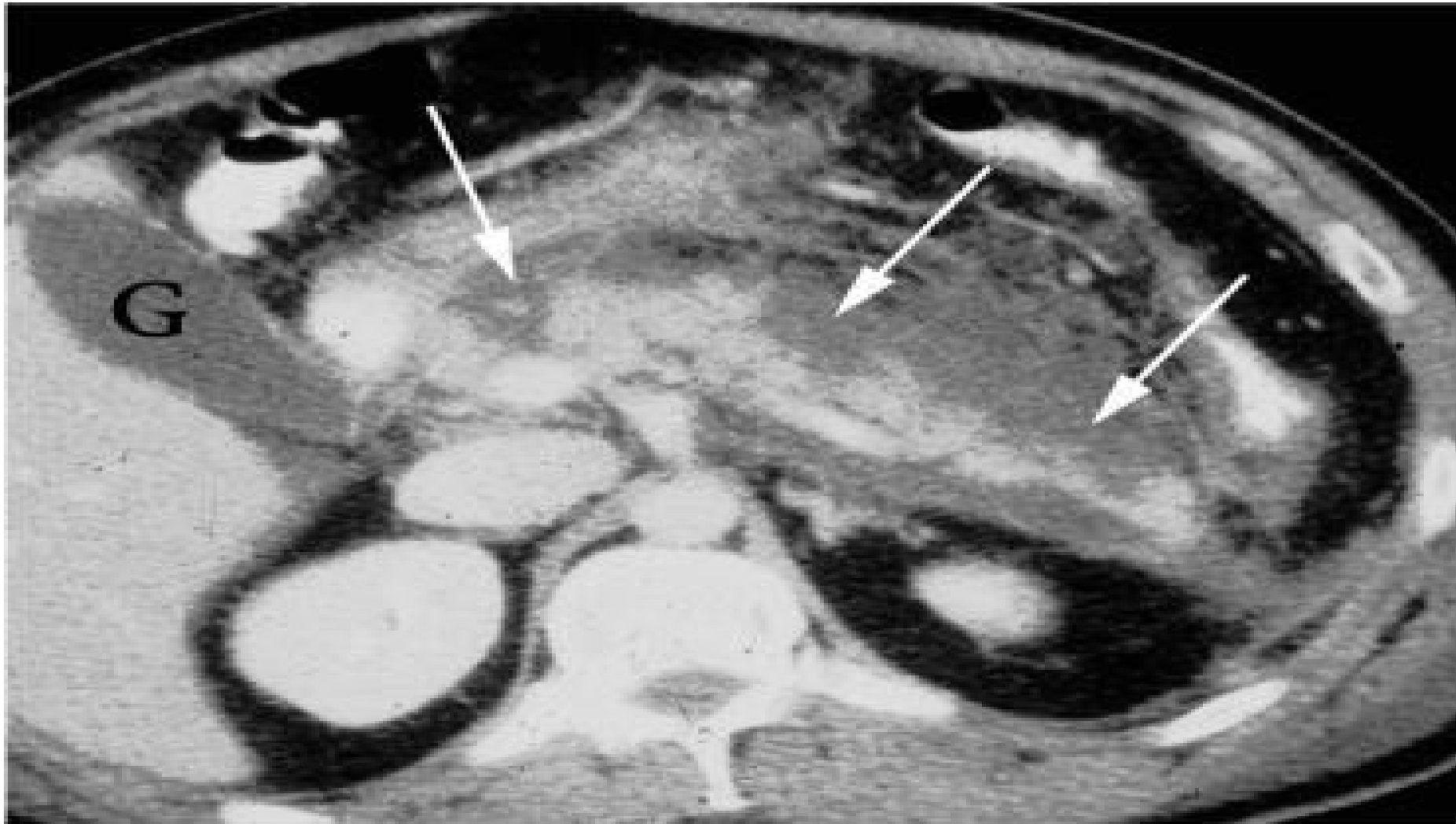


Necrotising pancreatitis

Interstitial pancreatitis



Necrotizing pancreatitis



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Etiology

Common Causes

- Gallstones
- Alcohol
- Hypertriglyceridemia
- ERCP
- Trauma
- Postoperative
- Drugs (azathioprine, 6-mercaptopurine, sulfonamides, estrogens, tetracycline, valproic acid, anti-HIV medications)
- Sphincter of Oddi dysfunction

Etiology

Uncommon Causes

- Vascular causes and vasculitis (ischemic-hypoperfusion states after cardiac surgery)
- Connective tissue disorders
- TTP
- Cancer of the pancreas
- Hypercalcemia
- Periapillary diverticulum
- Pancreas divisum
- Hereditary pancreatitis
- Cystic fibrosis
- Renal failure

Etiology

- **Rare Causes**
 - Infections (mumps, coxsackievirus, cytomegalovirus, echovirus, parasites)
 - Autoimmune (e.g., Sjögren's syndrome)
- **Causes to Consider in Patients with Recurrent Bouts of Acute Pancreatitis without an Obvious Etiology**
 - Occult disease of the biliary tree or pancreatic ducts, especially microlithiasis, sludge
 - Drugs
 - Hypertriglyceridemia
 - Pancreas divisum
 - Pancreatic cancer
 - Sphincter of Oddi dysfunction
 - Cystic fibrosis
 - Idiopathic

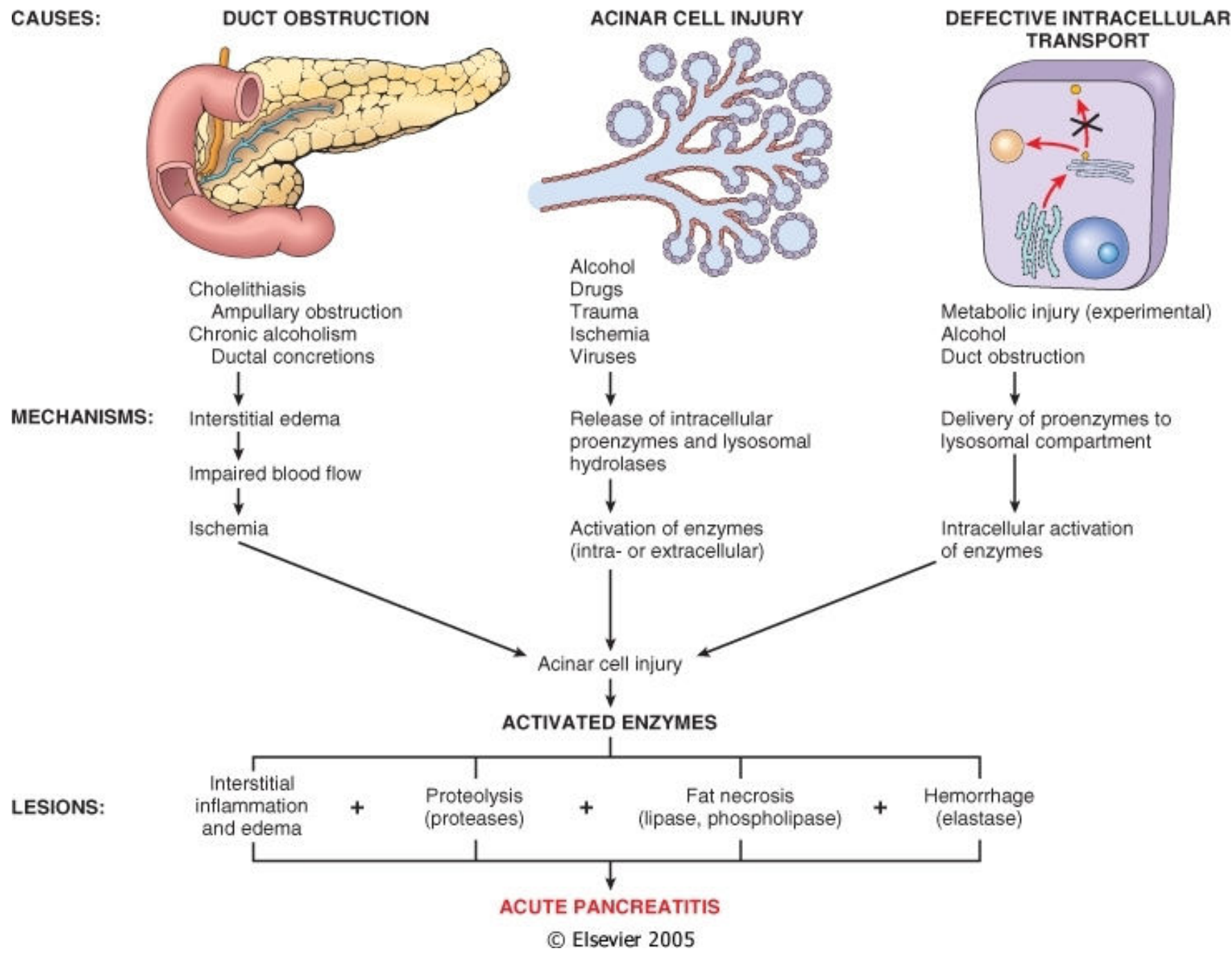
Pathophysiology

Proteolytic
enzymes
activated

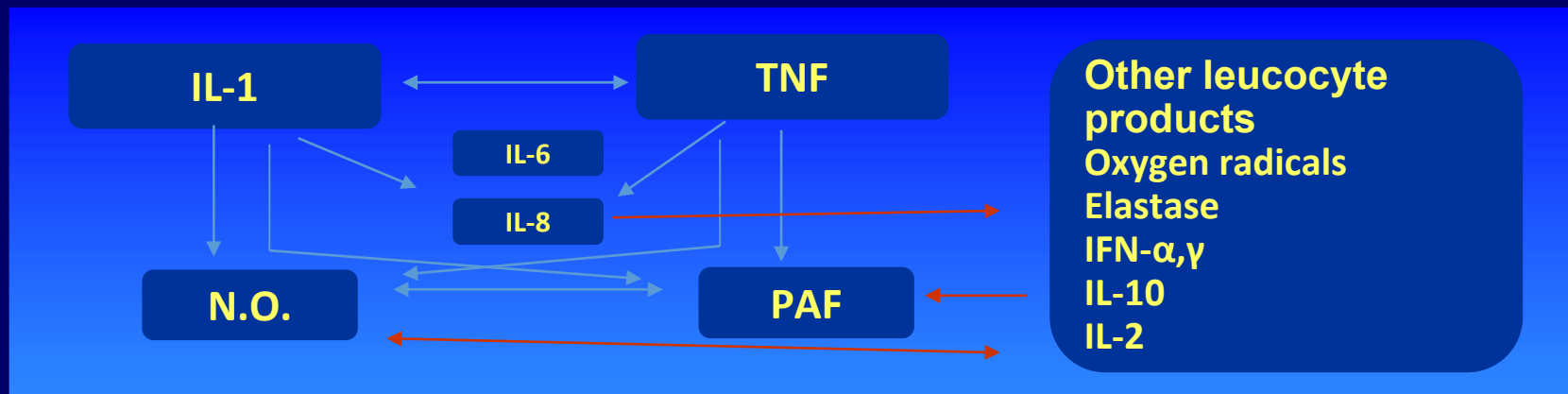
- In pancreatic parenchyma
- endotoxins, exotoxins, viral infections, ischemia, anoxia, lysosomal calcium, and direct trauma

Autodigestion

- Activated proteolytic enzymes digest pancreatic and peri pancreatic tissues
- also activate elastase and phospholipase A₂



Acute Pancreatitis



Complications:

- Vascular leakage
- Hypovolemia
- Shock
- ARDS
- Acute renal tubular necrosis

Clinical features

- Abdominal pain
- Nausea, vomiting, and abdominal distention
- Low-grade fever
- Tachycardia
- Hypotension
- Jaundice
- Erythematous skin nodules
- Atelectasis, pleural effusion

- Abdominal tenderness and muscle rigidity
- Diminished bowel sounds
- A faint blue discoloration around the umbilicus (Cullen's sign) may occur as the result of hemoperitoneum
- Blue-red-purple or green-brown discoloration of the flanks (Turner's sign) reflects tissue catabolism of hemoglobin

- Grey Turner sign



Source: Lichtman MA, Shafer MS, Felgar RE, Wang N:
Lichtman's Atlas of Hematology: <http://www.accessmedicine.com>
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- Cullen's sign



Source: Lichtman MA, Shafer MS, Felgar RE, Wang N:
Lichtman's Atlas of Hematology: <http://www.accessmedicine.com>
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Workup

Laboratory Data

- ↑ serum amylase and lipase
- >threefold ↑ clinch the diagnosis
- No correlation between the severity and the degree of elevation
- After three to seven days, values tend to return toward normal
- Pancreatic isoamylase and lipase levels may remain elevated for 7 to 14 days

Markers of Severity within 24 Hours

- **SIRS** [temperature $>38^{\circ}$ or $< 36^{\circ}\text{C}$, Pulse > 90 , Tachypnea > 24 , WBC $> 12,000$]
- **Hemoconcentration** (Hct $>44\%$)
- **BISAP** (bedside index of severity in acute pancreatitis)
 - (B) Blood urea nitrogen (BUN) >22 mg%
 - (I) Impaired mental status
 - (S) SIRS: 2/4 present
 - (A) Age >60 years
 - (P) Pleural effusion
- **Organ Failure**
 - Cardiovascular: systolic BP <90 mmHg, heartrate >130
 - Pulmonary: Pao_2 <60 mmHg
 - Renal: serum creatinine >2.0 mg%
 - Gastrointestinal: bleeding >500 mL/24 hours

Severity

- **Risk Factors**
 - Age > 60 years
 - Obesity, BMI > 30
 - Comorbid disease
- **Markers during Hospitalization**
 - Persistent organ failure
 - Pancreatic necrosis
 - Hospital-acquired infection

Laboratory Data

- ***Leukocytosis*** (15,000–20,000 leukocytes per L)
- **Hemoconcentration**
 - with hematocrit values >44%
 - and/or blood urea nitrogen (BUN) level >22 mg/Dl
- ***Hyperglycemia***
 - decreased insulin release,
 - increased glucagon release,
 - increased output of adrenal glucocorticoids and catecholamines.
- ***Hypocalcemia***

Laboratory Data

- ***Hyperbilirubinemia*** (>4.0 mg/dL) in 10%
 - is transient
 - return to normal in four to seven days
- Serum **alkaline phosphatase** and **aspartate aminotransferase** levels are also transiently elevated
- Elevated serum **lactic dehydrogenase** levels (>500 U/dL)
- ***Hypertriglyceridemia*** occurs in 5–10%

- **Hypoxemia** (arterial Po_2 60 mmHg), which may herald the onset of ARDS
- **Electrocardiogram** ST-segment and T-wave abnormalities simulating myocardial ischemia.

RADIOLOGY

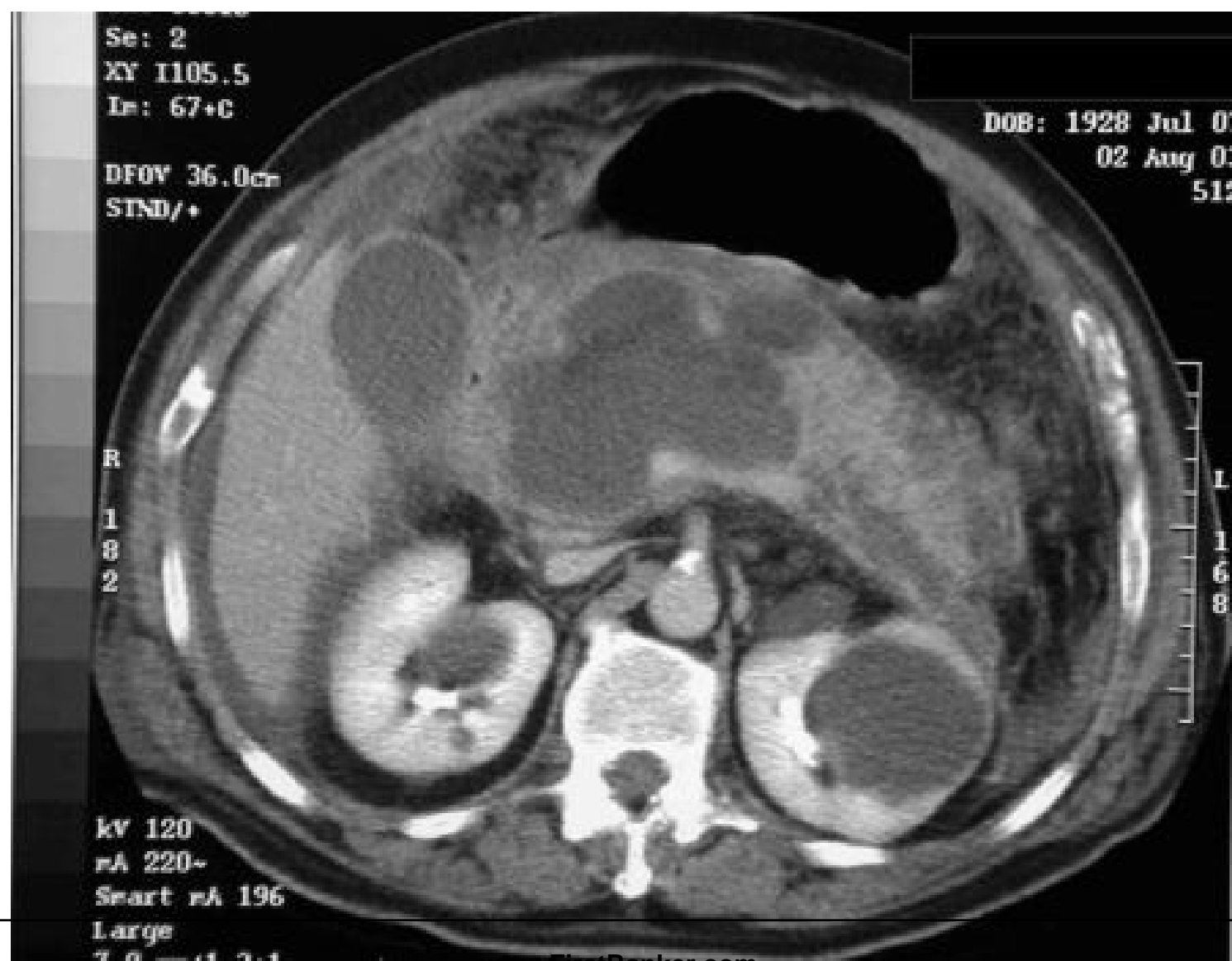
- CXR
 - Symphatic pleural effusion
 - Atelectasis
 - A.R.D.S.
- AXR
 - Sentinel loop
 - Colon cutoff sign
 - Duodenal ileus
 - Calcifications
 - Obscured psoas lines
- 79% will have radiological signs !!!

CT Findings and Grading of Acute Pancreatitis [CT Severity Index (Ctsi)]		
Grade	Findings	Score
A	Normal pancreas: normal size, sharply defined, smooth contour, homogeneous enhancement, retroperitoneal peripancreatic fat without enhancement	0
B	Focal or diffuse enlargement of the pancreas, contour may show irregularity, enhancement may be inhomogeneous but there is no peripancreatic inflammation	1
C	Peripancreatic inflammation with intrinsic pancreatic abnormalities	2
D	Intrapancreatic or extrapancreatic fluid collections	3
E	Two or more large collections or gas in the pancreas or retroperitoneum	4

Necrosis score based on contrast-enhanced CT	
Necrosis (%)	Score
0	0
<33%	2
33-50%	4
>50%	6
CT severity index equals unenhanced CT score plus necrosis score; 6 = severe disease.	

CT Scan of acute pancreatitis

- CT shows significant swelling and inflammation of the pancreas



Diagnosis

- Requires two of the following:
 - typical abdominal pain,
 - threefold or greater elevation in serum amylase and/or lipase level,
 - and/or confirmatory findings on cross-sectional abdominal imaging.

Differential diagnosis

- (1) perforated viscus, especially peptic ulcer
- (2) acute cholecystitis and biliary colic
- (3) acute intestinal obstruction
- (4) mesenteric vascular occlusion
- (5) renal colic
- (6) myocardial infarction
- (7) dissecting aortic aneurysm
- (8) connective tissue disorders with vasculitis
- (9) pneumonia
- (10) diabetic ketoacidosis

Complications

Local complications

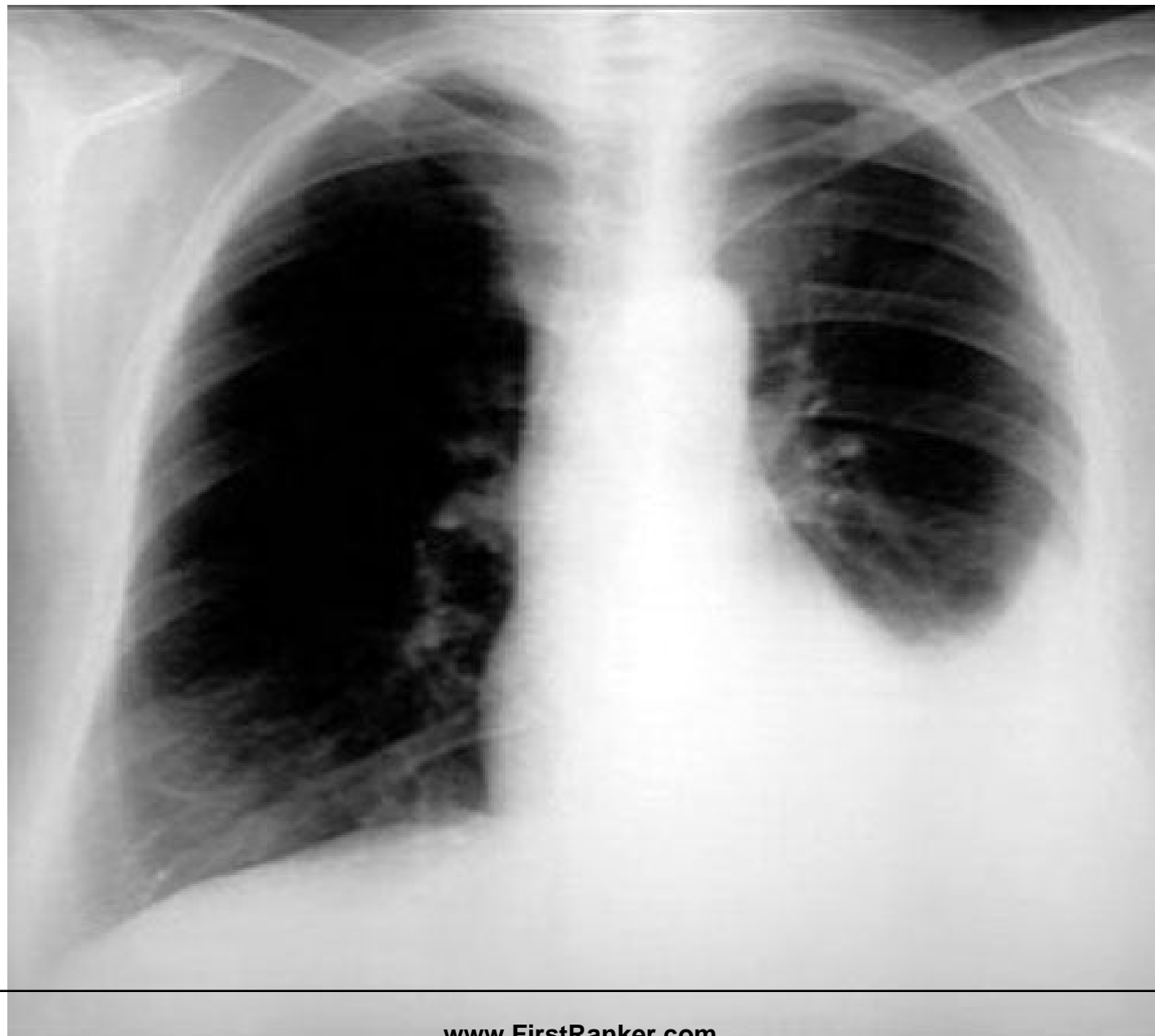
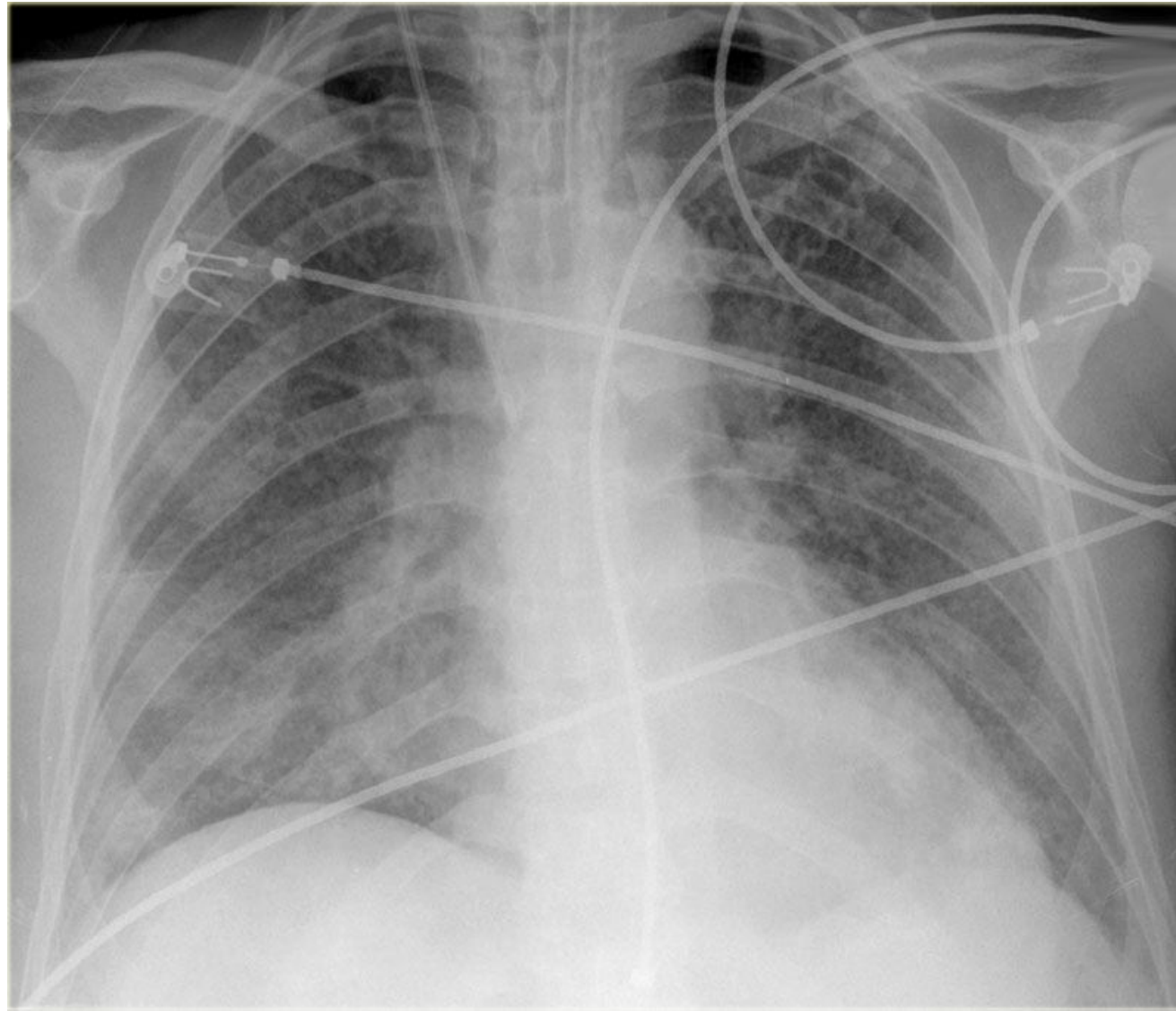
- Necrosis
 - Sterile
 - Infected
 - Walled-off necrosis
- Pancreatic fluid collections
 - Pancreatic abscess
 - Pancreatic pseudocyst
 - Pain
 - Rupture
 - Hemorrhage
 - Infection

Local complications

- **Obstruction of gastrointestinal tract** (stomach, duodenum, colon)
- **Pancreatic ascites**
 - Disruption of main pancreatic duct
 - Leaking pseudocyst
- **Involvement of contiguous organs** by necrotizing pancreatitis
 - Massive intraperitoneal hemorrhage
 - Thrombosis of blood vessels (splenic vein, portal vein)
 - Bowel infarction
- **Obstructive jaundice**

Systemic complications

- **Pulmonary**
 - Pleural effusion
 - Atelectasis
 - Mediastinal abscess
 - Pneumonitis
 - Acute respiratory distress syndrome
- **Cardiovascular**
 - Hypotension
 - Hypovolemia
 - Sudden death
 - Nonspecific ST-T changes in electrocardiogram simulating myocardial infarction



Systemic complications

- **Hematologic**

- Disseminated intravascular coagulation

- **Gastrointestinal hemorrhage**

- Peptic ulcer disease
- Erosive gastritis
- Hemorrhagic pancreatic necrosis with erosion into major blood vessels
- Portal vein thrombosis, variceal hemorrhage

- **Renal**

- Oliguria
- Azotemia
- Renal artery and/or renal vein thrombosis
- Acute tubular necrosis

Systemic complications

- **Metabolic**

- Hyperglycemia
- Hypertriglyceridemia
- Hypocalcemia

- **Encephalopathy**

- Sudden blindness (Purtscher's retinopathy)
- Central nervous system
- Psychosis

- **Fat emboli**

- Fat necrosis
- Subcutaneous tissues (erythematous nodules)
- Bone
- Miscellaneous (mediastinum, pleura, nervous system)

HOW DO WE DETERMINE PROGNOSIS?

- 80% Will recover without any complications
- 20% Will develop severe cardio-pulmonary complications or septic complications
- Prognostic assessment :
 - Ranson
 - Imrie
 - APACHE 2
 - CRP
- Classify into mild or severe acute pancreatitis (Atlanta classification 1992)

Treatment

- To limit severity of pancreatic inflammation
- To interrupt the pathogenesis of complications
- To support the patient and treat complications

TREATMENT

- **NON-OPERATIVE**
- **To limit severity of pancreatic inflammation**
 - Inhibition of pancreatic secretion
 - Nasogastric suction
 - Pharmacologic
 - Hypothermia
 - Pancreatic irradiation
 - Inhibition of pancreatic enzymes
 - Corticosteroids
 - Prostaglandins

TREATMENT

- **To interrupt the pathogenesis of complications**
 - Antibiotics
 - Antacids
 - Heparin
 - Low molecular weight dextran
 - Vasopressin
 - Peritoneal lavage

TREATMENT

- **To support the patient and treat complications**
 - Restoration and maintenance of intravascular volume
 - Electrolyte replacement
 - Respiratory support
 - Nutritional support
 - Analgesia
 - Heparin

When to operate?

- Diagnostic laparotomy
- To limit the severity of the pancreatic inflammation
 - Biliary procedures
- To interrupt the pathogenesis of complications
 - Pancreatic drainage
 - Pancreatic resection
 - Pancreatic debridement
 - Peritoneal lavage
- To support the patient and treat complications
 - Drainage of pancreatic infection
 - Feeding jejunostomy
- To prevent recurrent pancreatitis

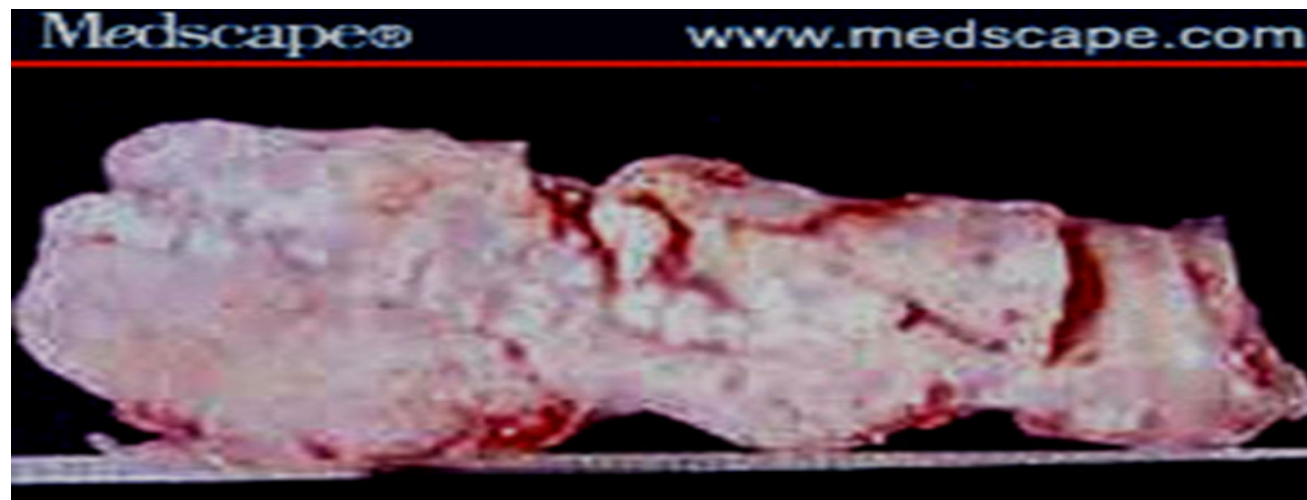
Summary of treatment

- All patients
 - Nasogastric suction
 - NPO
 - Monitor and maintenance of intravascular volume
 - Respiratory monitoring and support
 - Antibiotics(selective)
 - Early laparotomy only for diagnosis
 - Estimate prognosis by early signs
- Patients with severe pancreatitis
 - Peritoneal lavage
 - Nutritional support
 - Suspect and treat pancreatic sepsis
 - Heparin if hypercoagulable

Chronic Pancreatitis

Definition and Prevalence

- Defined as chronic inflammatory condition that causes irreversible damage to pancreatic structure and function.
- Incurable
- 5 To 27 Persons Per 100,000



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Etiology

- **Alcohol, 70%**
- **Idiopathic (including tropical), 20%**
- **Other, 10%**
 - Hereditary
 - Hyperparathyroidism
 - Hypertriglyceridemia
 - Autoimmune pancreatitis
 - Obstruction
 - Trauma
 - Pancreas divisum

Classification:

1. Calcific pancreatitis
2. Obstruction pancreatitis
3. Inflammatory pancreatitis
4. Auto immune pancreatitis
5. Asymptomatic fibrosis
6. Tropical pancreatitis
7. Hereditary pancreatitis
8. Idiopathic pancreatitis

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Signs and Symptoms

- Steady and Boring Pain
- Not Colicky
- Nausea /Vomiting
- Anorexia- Most Common
- Malabsorption And Weight Loss
- Diabetes Mellitus

- Classic triad “ pancreatic calcification , steatorrhea , and diabetes mellitus”
- Found in <1/3
- **secretin stimulation test** (abnormal when 60% or more of pancreatic exocrine function has been lost)
- decreased serum trypsinogen (<20ng/ml) or a fecal elastase level of <100ug/mg of stool strongly suggests severe pancreatic insufficiency

Laboratory Studies

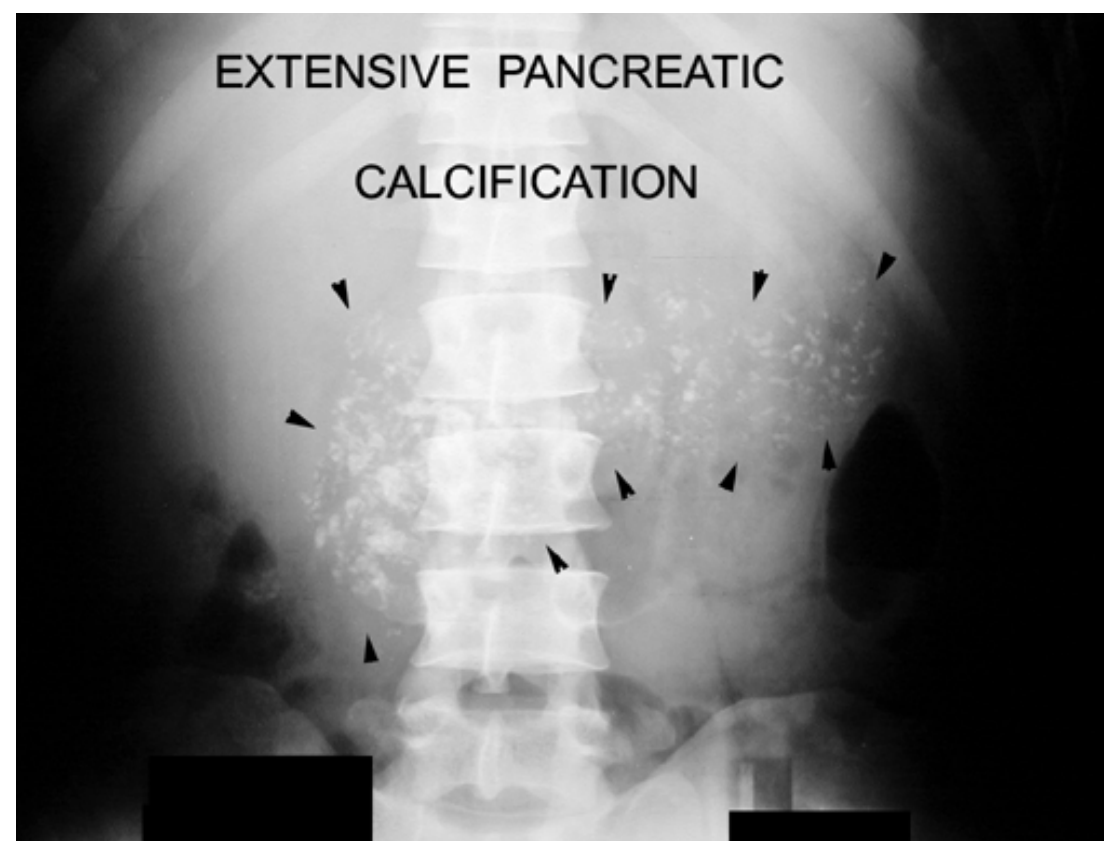
Tests for Chronic Pancreatitis	
I. Measurement of pancreatic products in blood	
A. Enzymes	
B. Pancreatic polypeptide	
II. Measurement of pancreatic exocrine secretion	
A. Direct measurements	
1. Enzymes	
2. Bicarbonate	
B. Indirect measurement	
1. Bentiromide test	
2. Schilling test	
3. Fecal fat, chymotrypsin, or elastase concentration	
4. [¹⁴ C]-olein absorption	

Imaging techniques

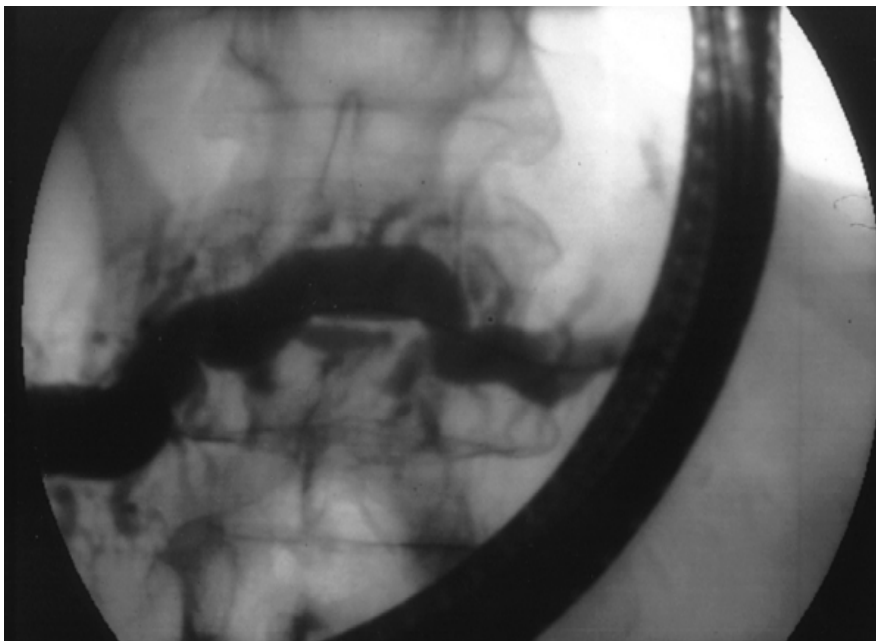
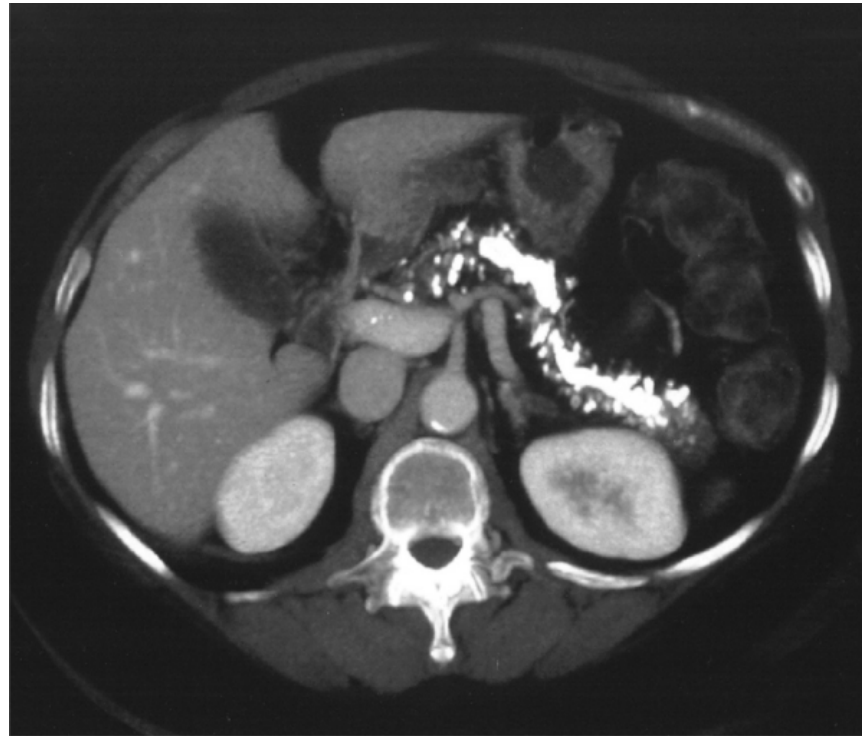
- A. Plain film radiography of abdomen
- B. Ultrasonography
- C. Computed tomography
- D. ERCP
- E. MRCP
- F. EUS

- **Plain films :**

- Pancreatic calcifications : 30%
- most common with alcoholic pancreatitis



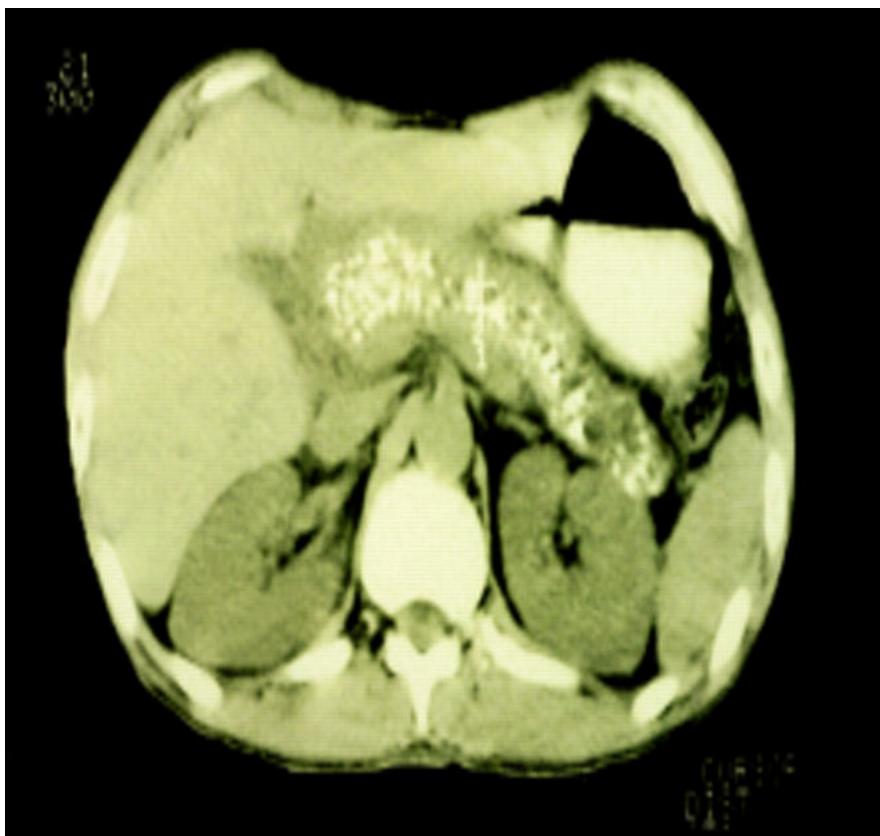
Pancreatic calcifications. CT scan showing multiple, calcified, intraductal stones in a patient with hereditary chronic pancreatitis



Endoscopic retrograde cholangiopancreatography in chronic pancreatitis. The pancreatic duct and its side branches are irregularly dilated

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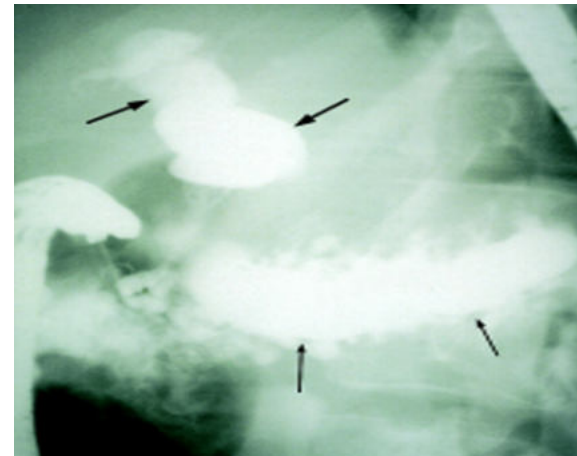
CT features



- Pancreatic atrophy, calcifications, and main pancreatic duct dilation

ERCP

- ERCP is a highly sensitive radiographic test for CP



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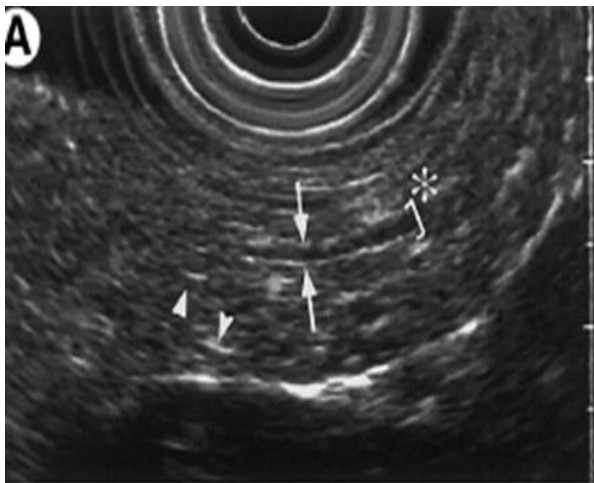
MRCP

- MRCP allows a noninvasive alternative to ERCP for imaging the pancreatic duct.



EUS

EUS is a minimally invasive test that allows simultaneous assessment of ductal and parenchymal structure



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Treatment

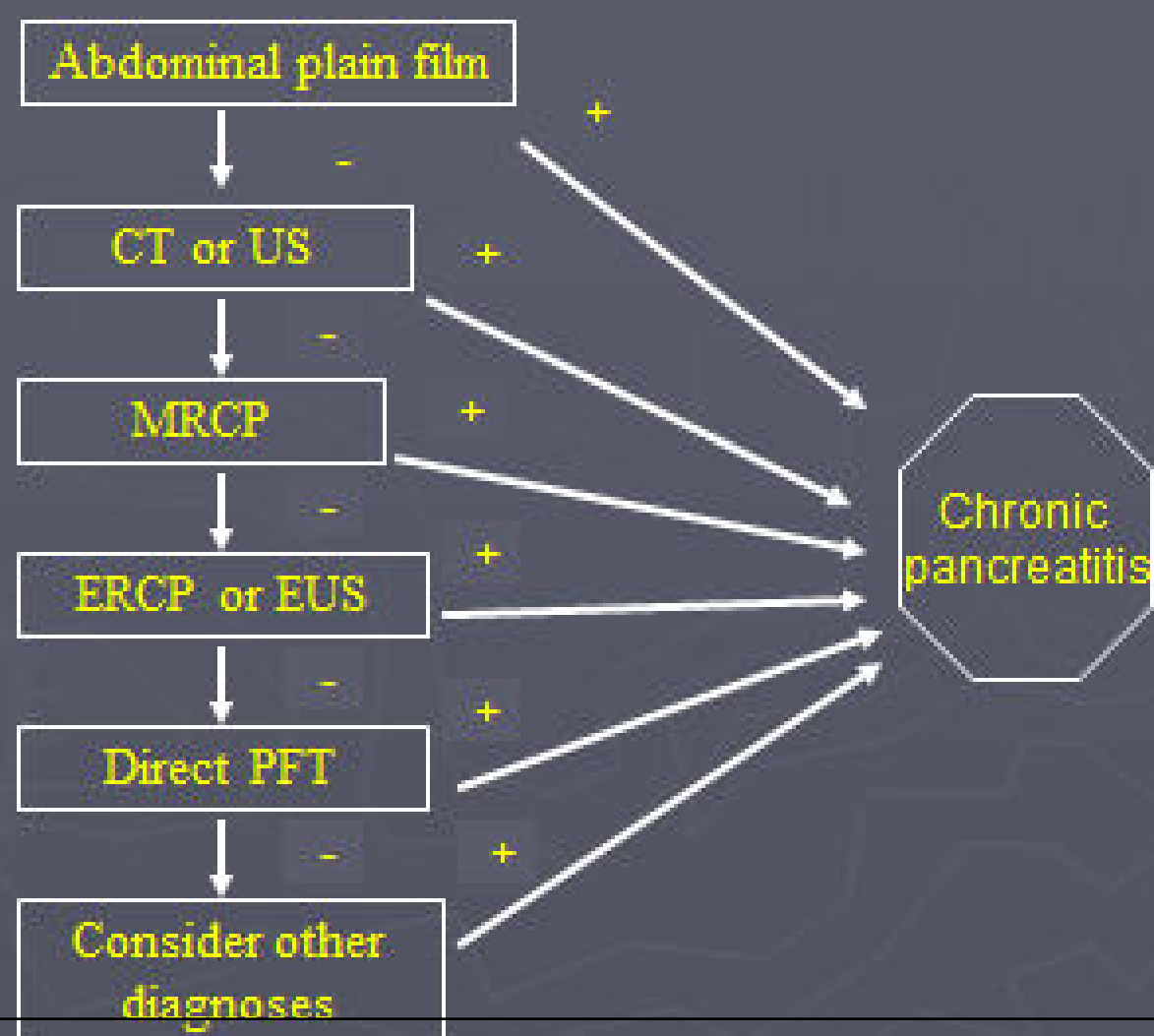
- Analgesia
- Enzyme Therapy
- Antisecretory Therapy
- Neurolytic Therapy
- Endoscopic Management
- Surgical Therapy

Complications

- Pseudocyst
- Pancreatic Ascites
- Pancreatic-Enteric Fistula
- Head-of-Pancreas Mass
- Splenic and Portal Vein Thrombosis

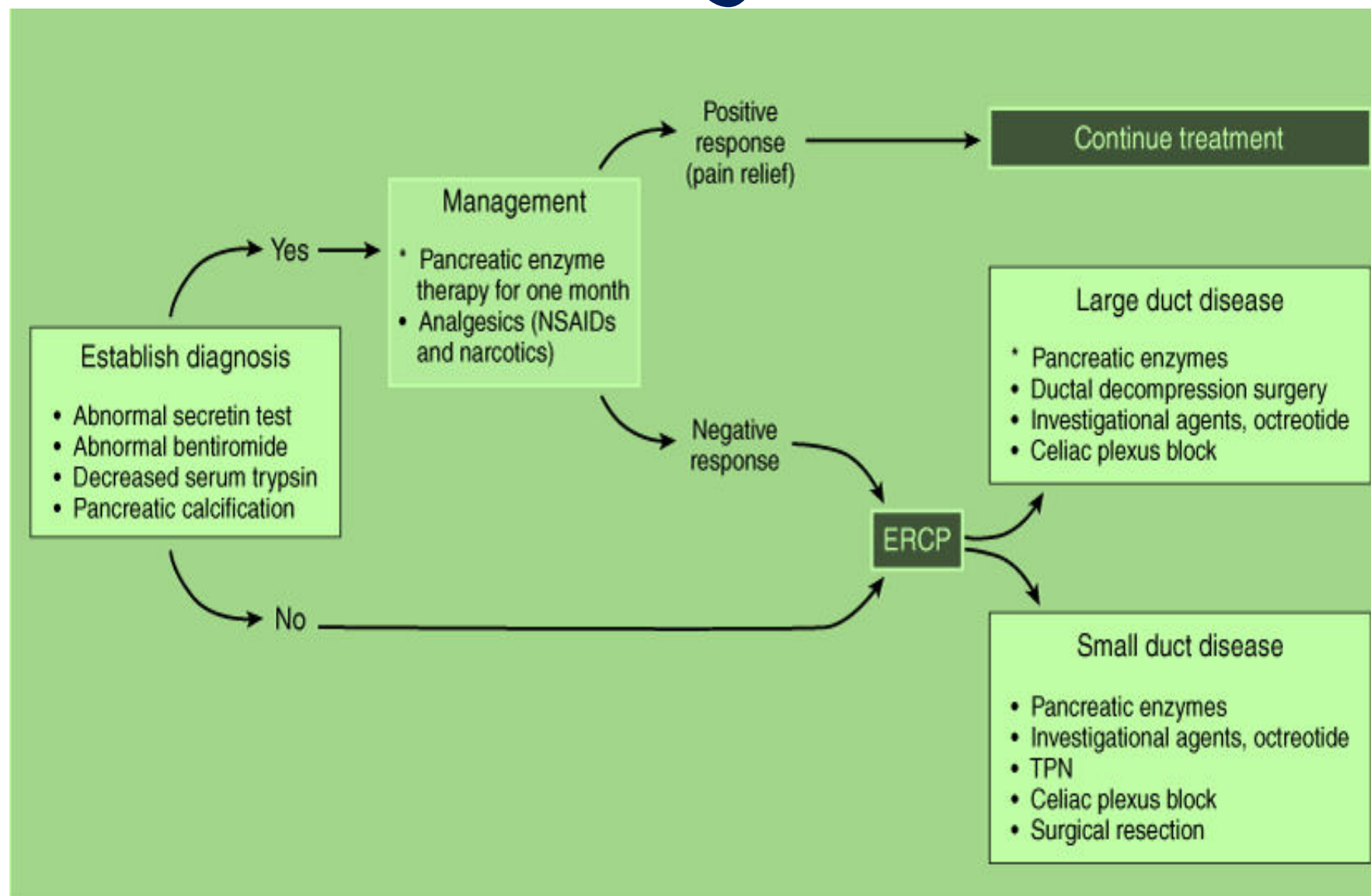
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The Cleveland Clinic Foundation Approach to Diagnosis of Chronic Pancreatitis



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Management



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A 45-year-old man presents to the emergency room complaining of severe epigastric pain that radiates to his back and left scapula. He has had severe nausea and vomiting associated with the pain for 3 days. Nothing seems to relieve his pain. He drinks about a fifth of bourbon a day. He has not had a bowel movement in several days. He also complains of a very dry mouth. He is afebrile and normotensive with a heart rate of 110 beats/min. He is mildly tender on abdominal examination. His serum amylase level is 650 IU/L. Which of the following is the most appropriate initial step in the management of this patient?

- (A) Exploratory laparotomy and pancreatic débridement
- (B) Discharge and close follow up as outpatient
- (C) Obtain an abdominopelvic computed tomography (CT) scan
- (D) Perform esophagogastroduodenoscopy (EGD)
- (E) Admit for intravenous (IV) hydration and withhold oral feeding

A 48-year-old, alcoholic male has been hospitalized over the last 20 years more than 30 times for episodes of acute pancreatitis. He now presents to the emergency department complaining of mid-back pain and horribly malodorous and frequent soft stools. He describes that the stools float in the toilet. He also explains that he has lost 30 lb over the last 6 months. Which of the following therapeutic measures is the best option to improve this patient's health maintenance?

- (A) Total pancreatectomy
- (B) Oral pancreatic enzyme replacement
- (C) Total parenteral nutrition
- (D) Octreotide therapy
- (E) High-fat diet