Acute Pancreatitis: New Concepts
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Objectives
• differentiate between categories of acute pancreatitis
• list the most common etiologic factors for acute pancreatitis
• differentiate between new and old management concepts of acute pancreatitis.

Acute Pancreatitis
Acute Inflammation of the Pancreas

Types
• Mild (previously referred to as interstitial pancreatitis)
  • Edema with little or no necrosis damage
  • Hypovolemia as a result of fluid leak into peritoneal cavity
  • Usually resolves within ~7 days

• Severe (previously referred to as necrotizing pancreatitis)
  • Extensive necrosis of pancreas and peripancreatic fat
  • Erosion into blood vessels with hemorrhage
  • SIRS frequently occurs
  • High complication rate and mortality

Etiology
• Obstruction of common bile duct: second most common cause
  • Cholelithiasis
  • Post-endoscopic retrograde cholangiopancreatography (ERCP)
• Alcoholism: most common cause
  • Chronic alcohol intake leads to secretory and structural changes in the pancreas contributing to duct obstruction
  • Alcohol increases the amount of trypsinogen
• Hypertriglyceridemia

Drugs
• Thiazide diuretics
• Furosemide
• Estrogen
• Procainamide
• Tetracycline
• Sulfonamides
• Corticosteroids
• Azathioprine (Imuran)
• Opiates
• Propofol
Etiology

- Peptic ulcer with perforation
- Cancer especially tumors of pancreas or lung
- Injury to pancreas
  - Trauma
  - Surgical
  - Biliary
  - Duodenal
  - Iatrogenic
  - Radiation injury

- Pregnancy: third trimester; ectopic pregnancy
- Ovarian cyst
- Hypercalcemia
- Lupus erythematosus
- Infections
  - Mumps
  - Coxsackievirus B
  - Mycoplasma
  - Infectious mononucleosis
  - Viral hepatitis

- Ischemia (e.g., shock and multiple organ dysfunction syndrome)
- Post-cardiopulmonary bypass
- Infection, sepsis
- Hereditary factors
- Idiopathic (20% of cases)

Clinical presentation: Subjective

- May have history of precipitating event
- Abdominal pain
  - Precipitating: may occur after a heavy meal, especially if fatty, or a drinking bing
  - Palliation: may be eased by leaning forward or fetal position
  - Quality: "boring"
  - Region: diffuse in epigastrum but may be in left upper quadrant
  - Radiation: to back or flanks
  - Severity: moderate to very severe
  - Timing: sudden onset; constant

- Associated symptoms
  - Abdominal tenderness, guarding
  - Nausea, vomiting, retching
  - Dyspepsia
  - Flatulence, diarrhea
  - Weight loss
  - Weakness
Clinical presentation: Objective

- Tachycardia
- Hypotension may be seen due to decreased circulating volume due to effusion or hemorrhagic; may be decreased due to SIRS and/or sepsis
- Fever: usually low-grade (e.g., 37.8-39°C)
- Jaundice possible if biliary obstruction
- Vomiting
- Hematemesis

Clinical presentation: Objective

- Grey Turner’s signs or Cullen’s sign may be seen in with hemorrhage
- Abdominal distention
- Decreased bowel sounds
- Indications of peritoneal irritation: involuntary guarding during palpation of the abdomen
- Epigastric mass may be palpable especially if pseudocyst
- Ascites may be present
- Steatorrhea (i.e., bulky, pale, foul-smelling, floating)

Clinical presentation: Objective

- Breath sounds changes: may be diminished due to atelectasis, pleural effusion, or ARDS; crackles may also be heard
- Chvostek’s or Trousseau’s signs may be positive in hypocalcemia

SIRS: 30% of patients with acute pancreatitis have SIRS within 48 hours after admission

- 2 or more of the following
  - Tachycardia (more than 90 beats/min)
  - Hyperpnea (respiratory rate > 20 breaths/min or Paco₂ < 32 mm Hg)
  - Hyperthermia (temperature > 38°C) or hypothermia (temperature < 36°C)
  - Leukocytosis (WBC count > 12,000 cells/mm³) or leukopenia (WBC count < 4000 cells/mm³ or > 10% bands)

Clinical presentation: Diagnostic

- Chemistries
  - Potassium: may be decreased especially if vomiting
  - Calcium: decreased
  - Magnesium: decreased
  - Glucose: elevated if endocrine function of the pancreas is compromised
  - Triglycerides: may be elevated
  - Amylase: usually elevated to greater than 3x normal
    - Peaks at 4-24 hours after onset of symptoms; usually returns to normal within 4 days
    - May not be elevated if pancreatitis is due to hypertryiglyceremia

Clinical presentation: Diagnostic

- Lipase: elevated
  - Stays elevated longer than amylase
  - More specific than amylase
- Albumin: decreased
- BUN: may be elevated due to hypovolemia
- AST, ALT, LDH, alkaline phosphatase, bilirubin: elevated in liver or biliary disease
Clinical presentation: Diagnostic

- Hematology
  - Hct: Decreased with hemorrhage, elevated with hemoconcentration due to third spacing
  - WBC: usually elevated with left shift

- Arterial blood gases
  - Metabolic acidosis
  - Respiratory complications may cause respiratory acidosis and hypoxemia

- Urine
  - Amylase: usually elevated

Clinical presentation: Diagnostic

- Stool: increase in fecal fat
- ECG: may suggest MI (e.g., ST-T wave elevations)
- Chest X-ray
  - May show left pleural effusion, elevated left hemidiaphragm, left atelectasis
  - May show pulmonary complications of pancreatitis (e.g., atelectasis, pneumonia, ARDS, pleural effusion)
- Flat plate of abdomen
  - May show cause (e.g., cholelithiasis)
  - May show ileus and bowel dilation
  - May show calcified pancreatic stones

Clinical presentation: Diagnostic

- Upper GI
  - May show delayed gastric emptying
  - May show enlargement of duodenum
  - May show presence of dilated loop of smooth bowel adjacent to the pancreas
- Abdominal ultrasound: may show pancreatic swelling, edema, gallstone, pseudocyst, or peripancreatic fluid collections
- CT scan
  - May show enlargement, edema, or necrosis of the pancreas
  - May show complications of pancreatitis (e.g., pancreatic pseudocyst or abscess)

Balthazar and Ranson’s system for grading pancreatitis by CT findings

- Grade A: Normal pancreas
- Grade B: Focal or diffuse enlargement of pancreas
- Grade C: Mild peripancreatic inflammatory changes
- Grade D: Fluid collection in a single location
- Grade E: Multiple fluid collections or gas within the pancreas or peripancreatic inflammation

Clinical presentation: Diagnostic

- MRI: shows inflammatory changes within the pancreas
- Endoscopic retrograde cholecystopancreatography (ERCP)
  - Contraindicated in acute pancreatitis
  - Remember that pancreatitis is a complication of this study
  - Used more often in chronic pancreatitis; identifies ductal changes or calculi
- HIDA scan: may identify hepatocellular disease from biliary obstruction as cause of pancreatitis
- Peritoneal lavage: positive for blood if hemorrhage

Clinical presentation: Diagnostic

- MRCP: shows inflammatory changes within the pancreas
- MRI: may show delayed gastric emptying
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Ranson’s Prognostic Criteria

- Mild or Severe
  - Mild: scores only 1-2
  - Severe: scores more than 6 criteria
- Mortality:
  - 0 to 2: 2% mortality
  - 3 to 4: 15% mortality
  - 5 to 6: 40% mortality
  - 7 to 8: 100% mortality

- At the time of admission or diagnosis
  - Age over 55 years
  - WBC over 16,000/mm³
  - Serum glucose greater than 200 mg/dL
  - Serum lactate dehydrogenase (LDH) greater than 350 units/L
  - Serum aspartate aminotransferase (AST) greater than 250 units/L
  - Hct drop greater than 10%
  - Increase in BUN greater than 5 mg/dL
  - Calcium less than 8 mg/dL
  - Base deficit greater than 4 mEq/L
  - Estimated fluid sequestration greater than 6 L
  - PaO₂ less than 60 mm Hg
Collaborative management

Maintain airway, oxygenation, ventilation
- Elevate head of bed 30-45° especially if ascites restricts diaphragmatic excursion
- Administer oxygen as necessary to maintain SaO₂ 94% unless contraindicated
  - In patients with COPD, administer oxygen to achieve a SaO₂ of 90% by pulse oximetry
- Monitor SaO₂ closely and evaluate work of breathing in detection of development of atelectasis and/or ARDS

Maintain adequate circulating volume and fluid and electrolyte balance
- Administer crystalloids and colloids as required to restore circulating blood volume: 5-10 ml/kg/hr
- Hemodynamic monitoring may be necessary
  - Concerns
    - Fluid sequestration: abdominal hypertension, abdominal compartment syndrome
    - ARDS
- Monitor sodium, calcium, potassium, magnesium, and phosphate
  - Administer calcium replacement orally or intravenous as prescribed
  - Administer potassium replacement as prescribed
  - Restrict sodium to 500 mg/daily for patients with ascites
- Measure abdominal girth daily for patients with ascites
- Weigh daily at the same time on the same scale

Decrease release of and destruction by pancreatic enzymes
- Assist with treatment of cause
  - Alcohol cessation if alcohol related
  - Cholecystectomy after resolution of pancreatitis if caused by cholelithiasis
  - Discontinuance of offending drug if drug induced
  - Statins, niacin, fibrates, and/or omega-3 fatty acids if related to hypertriglyceridemia

Decrease release of and destruction by pancreatic enzymes
- Maintain NPO status during acute phase and with any recurrence of pain
- Insert nasogastric tube and maintain suction to keep stomach decompressed and inhibit secretion of pancreatic juices
- Administer drugs to decrease pancreatic enzymes
  - Octreotide acetate (Sandostatin) 50 mcg/hr IV for 72 hours in the early stage of AP could prevent the development of SAP
  - H₂ receptor antagonists IV: no longer recommended

Decrease release of and destruction by pancreatic enzymes
- Keep environment free of food odors
- Perform mouth care with water or normal saline only; do not use alcohol-containing or flavored mouthwash or toothpaste
**Decrease release of and destruction by pancreatic enzymes**

- Perform peritoneal lavage: may be used for severe pancreatitis
  - Performed percutaneously or via laparotomy
  - Intraperitoneal space is rinsed with lavage fluid to remove toxic substances released from the pancreas
  - May be done for 2-3 days
  - Technique is the same as for peritoneal dialysis for renal failure

**HOWEVER:** the lavage of the peritoneal cavity in patients with severe acute pancreatitis does not appear to confer a clinical benefit.


**Prevent and treat pain and discomfort**

- Consider neurolytic block of celiac plexus for severe persistent pain
- Utilize nonpharmacologic pain relief methods (e.g., imagery, distraction)
- Treat nausea with prescribed antiemetics; perform mouth care after emesis should it occur
- Ensure adequate sleep and rest
- Consider increase in pain as ominous: may indicate pancreatic necrosis, abscess formation, or hemorrhage

- Note: though meperidine (Demerol) for years has been considered the analgesic of choice in acute pancreatitis, recent studies show no significant difference between morphine and meperidine in the degree of spasm of the sphincter of Oddi

**Administer appropriate nutritional support considering restrictions**

- Administer nutritional support parenterally during acute phase of illness
- Administer enteral nutrition below the duodenum after ileus is resolved
  - Elemental (e.g., Vivonex)
  - Below the ligament of Treitz (e.g., jejunostomy tube)
- Clear liquids or elemental diet such as Vivonex after inflammation subsides (pain subsides, serum amylase normal) → low fat, full liquids → eventually regular diet
- Avoid alcohol and food high in fat
- Administer fat-soluble vitamins, thiamine, folic acid
- Monitor serum glucose levels closely and administer glucose or insulin as indicated

**Prevent and monitor for infection**

- Antibiotics that effectively penetrate the pancreatic tissue and provide good coverage against gram-negative enteric and anaerobic organisms (e.g., imipenem/cilastatin [Primaxin], ofloxacin [Floxin], metronidazole [Flagyl]) may be prescribed.
- If there is no improvement after 1 week, a CT-guided aspiration may be performed. Bacteria found present in the aspirate suggests pancreatic necrosis with infection and indicates the need for surgery.
- Monitor for clinical indications of abscess formation
  - Increase in abdominal pain
  - Vomiting
  - Fever
  - Leukocytosis

**Administer peritoneal lavage:** may be used for severe pancreatitis

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Prepare patient for surgical measures for relief of pancreatitis if necessary
• During acute phase, surgery is performed only if absolutely necessary
• Cholecystectomy if bile reflux is the cause of pancreatitis
• Drainage and removal of abscess or pseudocysts
  • Pancreatic pseudocysts occur when digestive juices break through the normal ducts of the pancreas and collect in spaces lined by fibroblasts and surfaces of adjacent organs.
  • Pancreatic resection/total pancreatectomy
    • Used if pancreas and/or other organs are necrotic
    • Total pancreatectomy
    • Results in diabetes and other metabolic difficulties
      • Islet cell autotransplantation is sometimes performed
      • Segmental pancreatic autotransplantation is sometimes performed: part of viable pancreatic tissue reimplanted following total pancreatectomy

Maintain normal serum glucose levels
• Monitor serum glucose levels closely
• Administer insulin as indicated and prescribed
• Maintain constant infusion rate of TPN or enteral feedings

Assess for alcohol withdrawal syndrome
• If present, administer sedatives (e.g. chlordiazepoxide [Librium]) as prescribed
  • Most drugs used for this purpose including chlordiazepoxide (Librium) have potential for liver toxicity; dosage is adjusted and liver function studies are monitored
  • Avoid alcohol-containing mouthwash or medications

Monitor for complications
• Hypoglycemia or hyperglycemia
• Hypocalcemia
• Hemorrhage
• Shock
• Sepsis
  • Disseminated intravascular coagulation (DIC)
  • DVT, PE: SCD
  • Acute renal failure
  • Abscess
  • Perforation

Monitor for complications
• Pseudocysts: collection of inflammatory debris, pancreatic secretions, and necrotic tissue; may cause compression of portal vein and bile duct or rupture and peritonitis and sepsis
  • Causes pain or ache in abdomen, feeling of bloating, or poor digestion
  • Treatment: nothing for small cysts or drainage by surgical, endoscopic, or percutaneous approach for larger cysts
  • Pancreatic fistula: communication between the pancreas and the skin; pancreatic secretions drain onto the skin
    • Treatment: replacement of fluids and electrolytes; octreotide
1. Which of the following would be appropriate for pain management of a patient with acute pancreatitis? (more than one may be correct)
   a. meperidine
   b. morphine
   c. fentanyl
   d. hydromorphone

2. Which of the following would be a serious complication of overhydration of a patient with acute pancreatitis? (more than one may be correct)
   a. pancreatic necrosis
   b. intraabdominal hypertension
   c. acute renal failure
   d. pulmonary edema

References