# Acute Pancreatitis

## Definition
- A group of reversible lesions
- Characterized by inflammation of the pancreas
- Ranging in severity
  - Edema
  - Fat necrosis
  - Haemorrhage

## Aetiology
- **Metabolic**
  - Alcoholism – 65% of cases (Male)
  - Hyperlipoproteinaemia
  - Hypercalcaemia
  - Drugs – Thiazide
- **Genetic**
- **Mechanical**
  - Gallstone – 35% of cases (female)
  - Trauma
  - Iatrogenic injury
- **Vascular**
  - Shock
  - Embolism
  - Polyarthitis Nodosa
- **Infections**
  - Coxsackievirus
  - Mumps
  - Ascaris Lumbricoides
  - Mycoplasma pneumoniae

## Clinical Manifestations
- Sudden onset severe abdominal pain
  - Started at the Left Upper Quadrant of the abdomen
  - Radiates to the back
- Nausea and vomiting
- Fever
- Sweating
- Tachypnea
- Tachycardia
- Peripheral Vascular collapse
- Jaundice
- Hypoactive bowel sound
- Cullen sign
- Grey Turner sign

## Diagnostic Method
- **Microscopic Investigation**
- Neutrophilic infiltration
- **Laboratory Investigation**
  - **Blood test**
    - Serum Amylase
      - Sensitive markers for Acute Pancreatitis for the 1st 24 hours
      - Elevated for as high as 4 times the normal values
    - Serum Lipase
      - The onset of elevation is later compared to Amylase
      - The more specific for Pancreatic injury
    - Trypsin
      - The highest specificity and sensitivity for Pancreatic injury
      - Needs Radioimmunoassay which is expensive
    - Hypocalcaemia
      - Due to precipitation at the fat necrosis
      - If persistent, indicates poor prognosis
  - **Urine test**
    - Urinary Amylase
      - Has less sensitivity and specificity
      - Elevated after 2 days of incidence
      - Remain elevated for 7-10 days
  - **Radiology**
    - X-ray
      - To exclude perforation
    - CT scan
      - Demonstrates enlarged Pancreas
      - Ascites

## Complications
- Shock
  - Due to massive vasodilation of the systemic vasculatures
- Hypotensive shock can occur
- **DIVC**
  - Endothelial injury caused by released Pancreatic enzyme leads to activation of Platelets
  - Coagulation factor
- ARDS
  - Manifestation of shock
- Renal failure
  - Manifestation of shock
- **Pseudocyst formation**
  - Massive fatty necrosis lead to liquefactive necrosis
  - The necrosis debris may walled-off and leaving a fibrous cystic scar containing pancreatic enzymes
- Abscess formation
  - Secondary infection may superimposed the
- **Haemorrhagic Ascites**
- **Subcutaneous Fatty Necrosis**
  - Due to systemic release of Pancreatic Lipase
- **Chronic Pancreatitis**
  - Persistent inflammation may lead to chronicity

## Morphology
### Gross
- All cardinal signs of acute inflammation
  - Swollen
  - Redness
  - Tenderness

### Microscopic
- Microvascular leakage causing edema
- Fatty necrosis with Touton Giant cells
- Acute inflammatory reaction
- Proteolytic destruction of Pancreatic parenchyma
- Destruction f blood vessels causing haemorrhage
Duct Obstruction
- Gallstones
- Ampullary obstruction
  - Ascaris lumbricoides
  - Malignancy
- Chronic Alcoholism
- Ductal concretions

Acinar Cells Injury
- Alcoholism
- Drugs
  - Thiazide
- Trauma
- Ischemia
- Viruses
  - Coxsackievirus
  - Mumps

Defective Intracellular Injury
- Alcoholism
- Metabolic injury
- Genetic defects
- Duct obstruction

Interstitial Edema
Impaired Blood Flow
Ischemia

Release of intracellular Proenzymes and Lysosomal Hydrolases

Activation of enzymes

Delivery of Proenzymes to Lysosomal vesicles

Intracellular activation of enzymes

Acinar Cells Injury
Activated Enzymes

Interstitial edema and inflammation
Proteolysis (Proteases)
Fatty necrosis (Lipase, Phospholipase)
Haemorrhage (Elastase)

Acute Pancreatitis
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</table>
| Chronic Pancreatitis | - Chronic alcoholism – middle age male  
- Long standing Pancreatic duct obstruction  
  - Pseudocysts  
  - Gallstones  
  - Neoplasms  
- Tropical Pancreatitis  
- Hereditary Pancreatitis  
  - Defects in PRSS1 gene  
  - SPINK1 gene  
- Chronic Pancreatitis associated with CFTR gene mutation | - Persistent upper abdominal pain  
  - Radiating to the back  
  - Often precipitated by  
    - Alcohol  
    - 30 minutes post-pancreatically  
- Jaundice  
- Malabsorption syndrome secondary to Pancreatic insufficiency  
  - Steatorrhea  
  - Vitamin deficiency  
- Diabetes mellitus | - Blood glucose level  
- CT scan  
- Abdominal ultrasound  
- X ray | - Diabetes mellitus  
- Pancreatic Carcinoma  
- Ascites  
- Fistulas  
- Gastroduodenal obstruction  
- Pancreatic  
  - Calcification  
  - Duct obstruction  
  - Pseudocysts |

### Pathogenesis

#### Ductal Obstructions by Concretions
- Many of the impending agents increase protein content in the Pancreatic juice  
- These proteins may produce ductal plugs

#### Toxic materials
- Direct toxic effects on the Acinar cells leading to  
  - Lipid accumulation  
  - Acinar cells loss  
  - Parenchymal fibrosis

#### Oxidative stress
- Alcohol may induce formation of oxidative stress  
- Subsequent chemokine that stimulates the Mononuclear Inflammatory cells  
- Oxidants also promotes fusion of lysosome and zymogen granules

#### Necrosis – Fibrosis
- Acute pancreatitis may cause local  
  - Perilobular necrosis  
  - Duct distortion  
  - Altered pancreatic secretion  
- Over time, this may lead to prominent fibrosis

### Morphology

#### Gross
- Hard  
- Extremely dilated duct  
- Visible calcified concretion

#### Microscopic
- Parenchymal fibrosis  
- Reduced in the number and size of acini  
- Dilation of Pancreatic duct  
- Relative sparing of islet of Langerhan  
- Ductal epithelium can be  
  - Atrophied  
  - Hyperplastic  
  - Squamous metaplasia  
  - Ductal concretions
Pancreatic Malignancy
Exocrine Part of the Pancreas

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<th>Morphology</th>
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<tr>
<td>Pancreatic Carcinoma/</td>
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<td>o Anorexia</td>
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<td>Thrombophlebitis</td>
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<td>Pancreatic cancer</td>
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<td>• Area of Metastasize</td>
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<td>o Distant organs</td>
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<td>• Sites of lesion</td>
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<td>o Head – 60% (early</td>
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<td>o Body – 15% (late</td>
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<td>o Tail – 5%</td>
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<td>o Entire gland – 20%</td>
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<td>invade the lobes of the liver</td>
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<td>• Large</td>
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<td>• Grey-white tumor mass</td>
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<td>• Hyperchromatism</td>
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<td>• Increase NC ratio</td>
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<td>• Cellular atypia</td>
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<td>• Pleomorphism</td>
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<td>• All are usually poorly</td>
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<td>• Desmoplastic</td>
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<td>changes are common</td>
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<td>Prognosis</td>
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<td>• Very poor prognosis</td>
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<td>• 5 years survival rate is less than 5%</td>
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</tbody>
</table>

Endocrine Part of the Pancreas

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<tbody>
<tr>
<td>Insulinomas</td>
<td>• Often benign in nature that produces Insulin</td>
<td>• Large mass</td>
<td>• Endocrine atypia</td>
<td>• Marked hypoglycaemia</td>
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<tr>
<td></td>
<td>• Arised from Beta cells of Islet of Langehans</td>
<td>• Typical red-brown tumor mass</td>
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<td></td>
<td>• Can be detected through Whipple triad</td>
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<td></td>
<td>• Symptoms and signs of hypoglycemia,</td>
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<td>• Concomitant plasma glucose level of 2.5 mmol/L or less, and</td>
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<td>• Reversibility of symptoms with administration of glucose.</td>
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<tr>
<td>Gastrinoma</td>
<td>• Malignant tumor that produces Gastrin</td>
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<td>• Cords and nest of uniform cells</td>
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<td></td>
<td>• Rounded nuclei</td>
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<td>• Moderate cytoplasm</td>
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<td>• Due to marked increase in Gastrin, gastric acid secretion is increased</td>
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<td>• Can lead to PUD</td>
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