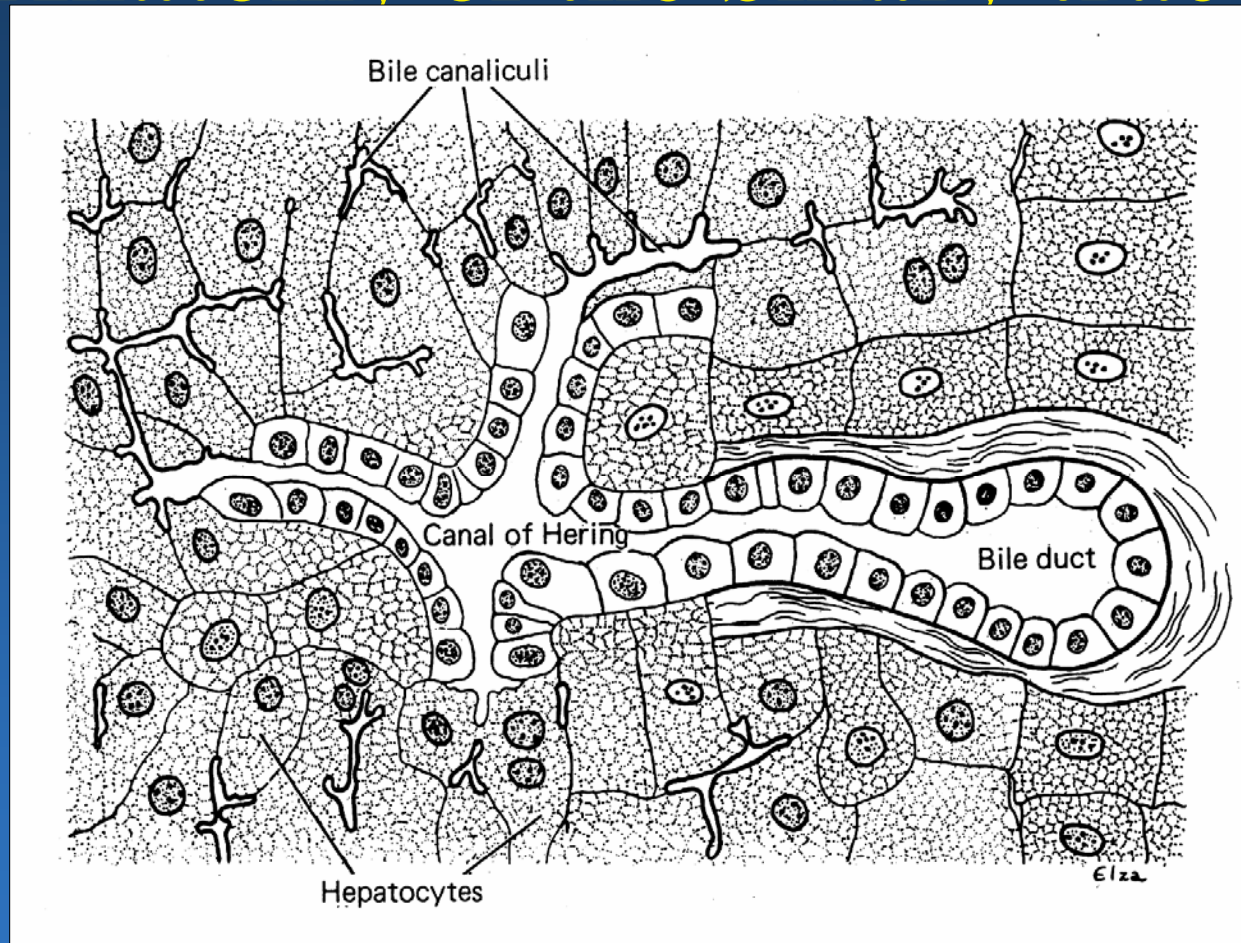


# Anatomy of the biliary tract



- Biliary secretions contribute up to 40% of bile volume
- Regulated by secretin

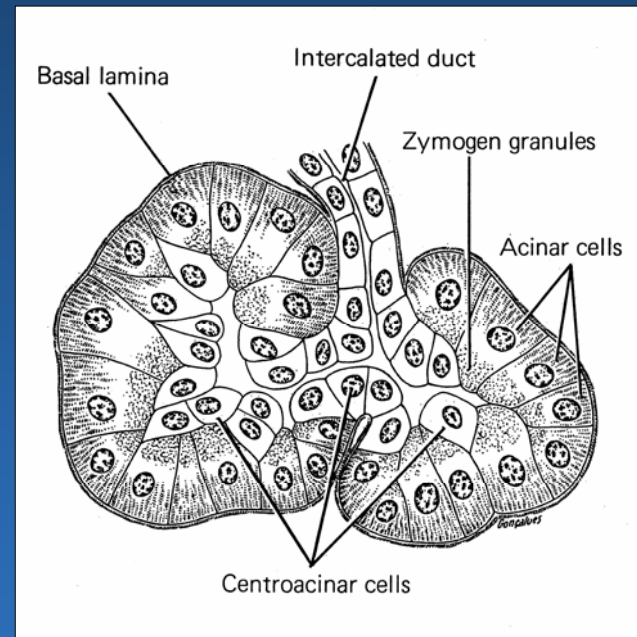
# Exocrine Pancreas- Anatomy

- **Acini**

- secretion of zymogens
- regulated by CCK

- **Ductal system**

- secretion of  $\text{HCO}_3^-$  rich fluid
- regulated by secretin



# Pathology of the exocrine pancreas

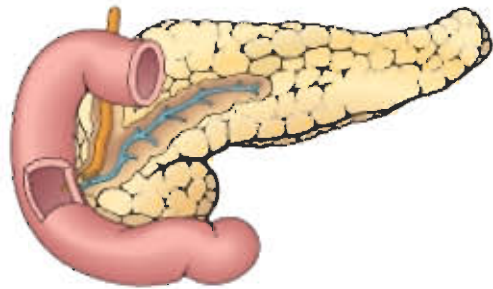
- Cystic fibrosis
- Acute pancreatitis
- Cysts and pseudocysts
- Neoplasms
  - Exocrine
  - Endocrine

# Acute pancreatitis

- Severe condition characterized by acute necrosis of pancreatic parenchyma
- Adults, M>F
- Etiology
  - alcohol
  - gallstones
  - trauma
  - ischemic damage
- Pathogenesis: autodigestion; ?mechanisms of activation

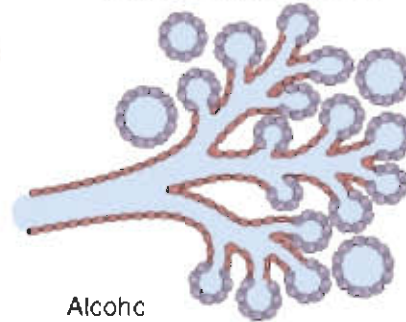
**CAUSES:**

**DUCT OBSTRUCTION**



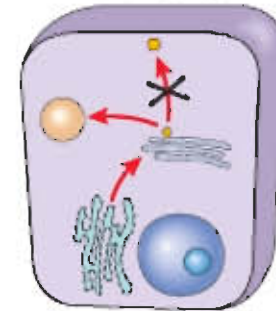
Cholelithiasis  
Ampullary obstruction  
Chronic alcoholism  
Ductal concretions

**ACINAR CELL INJURY**



Alcohol  
Drugs  
Trauma  
Ischemia  
Viruses

**DEFECTIVE INTRACELLULAR TRANSPORT**



Metabolic injury (experimental)  
Alcohol  
Duct obstruction

**MECHANISMS:**

Interstitial edema  
↓  
Impaired blood flow  
↓  
Ischemia

Release of intracellular proenzymes and lysosomal hydrolases  
↓  
Activation of enzymes (intra- or extracellular)

Delivery of proenzymes to lysosomal compartment  
↓  
Intracellular activation of enzymes

Acinar cell injury

**ACTIVATED ENZYMES**

**LESIONS:**

Interstitial inflammation and edema

+

Proteolysis (proteases)

+

Fat necrosis (lipase, phospholipase)

+

Hemorrhage (elastase)

**ACUTE PANCREATITIS**

# Acute pancreatitis- pathology

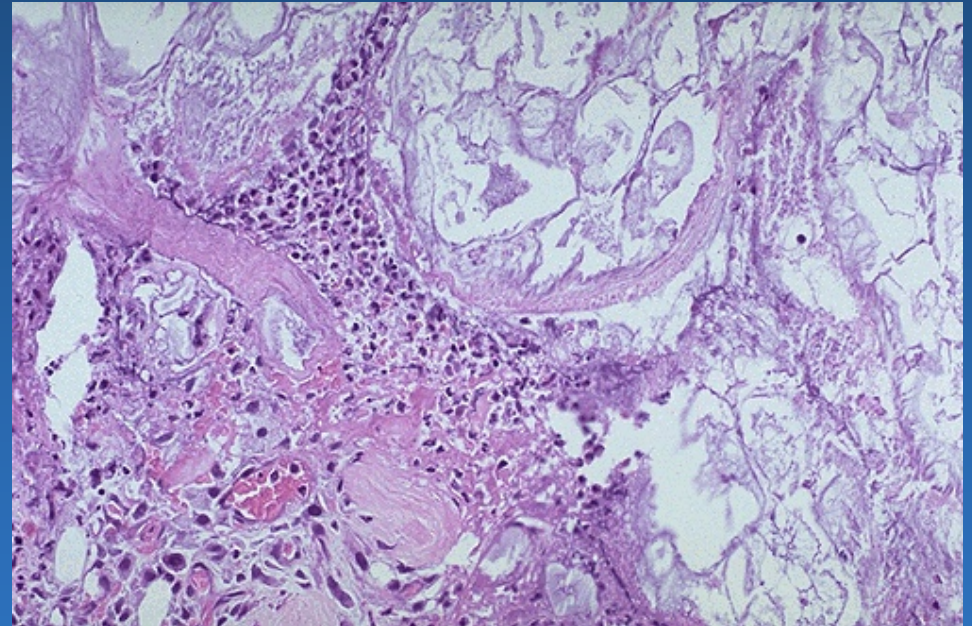
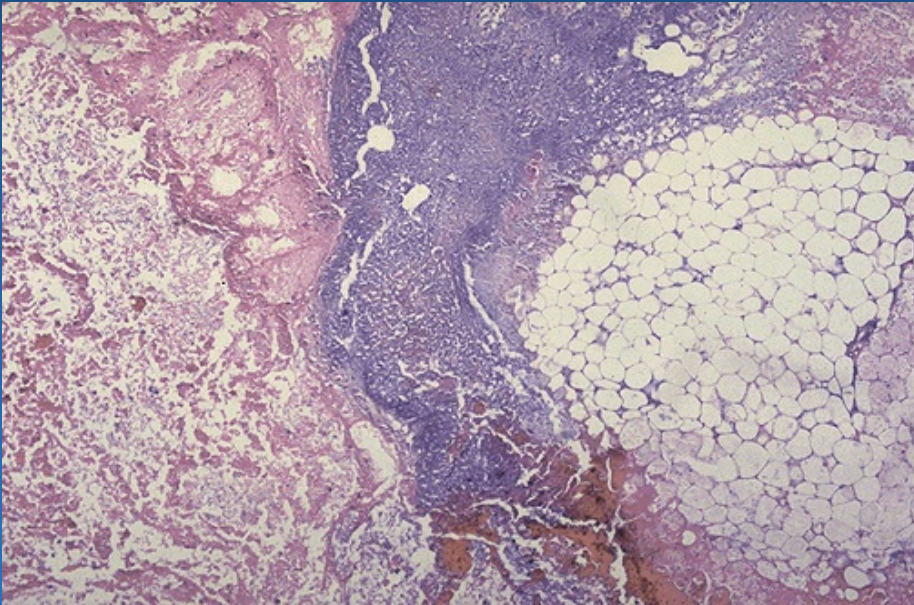
- **Early**
  - Congestion, edema
  - Vascular thrombi, parenchymal necrosis
  - Acute inflammation, fat necrosis
- **Late:** Scarring, chronic pancreatitis
- **Complications**
  - peritonitis
  - hypocalcemia
  - disseminated fat necrosis

# Acute pancreatitis



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# Acute pancreatitis



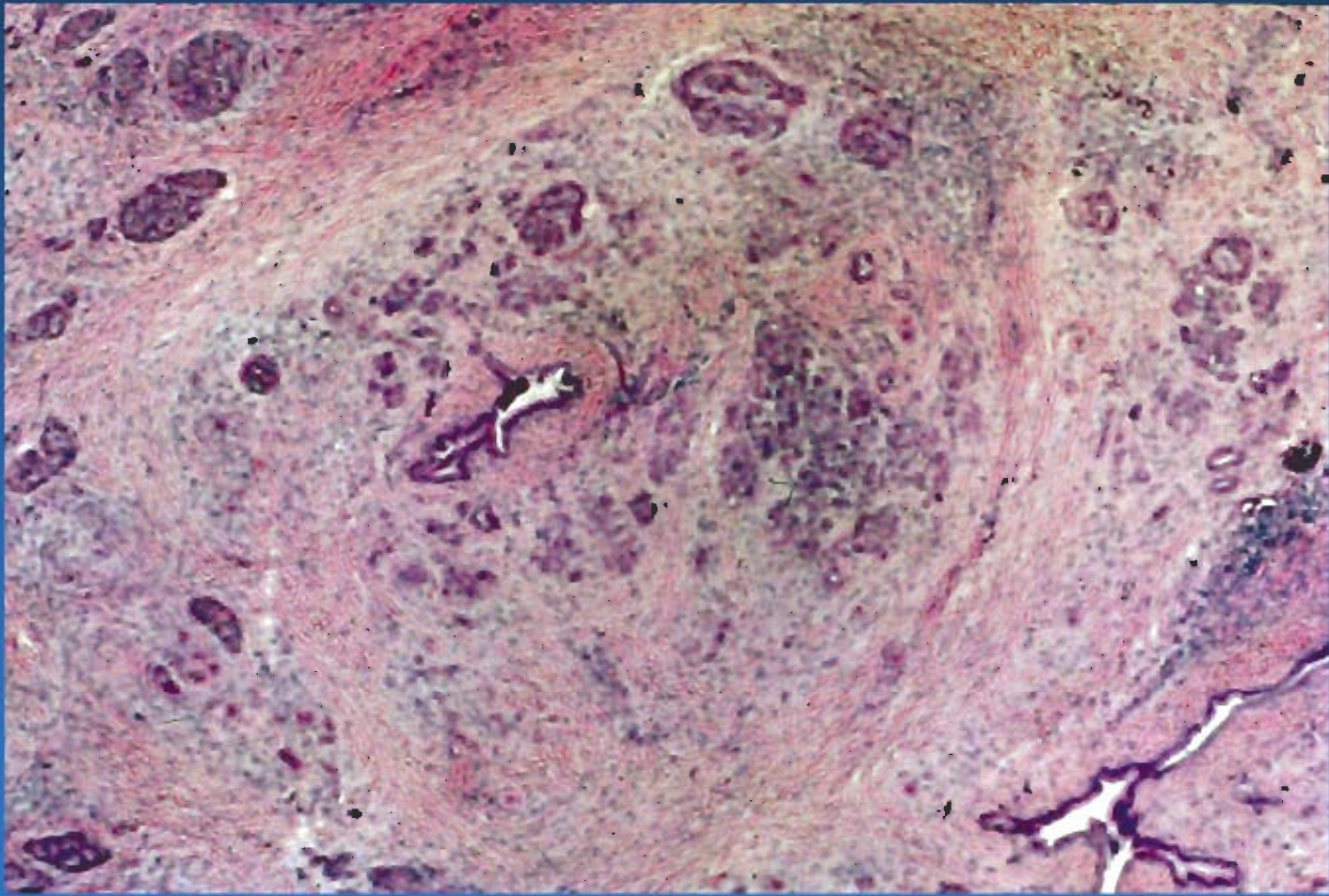


# Chronic pancreatitis

- Secondary to recurrent pancreatitis
- Pathogenesis
  - recurring acute pancreatitis (alcoholism, biliary tract disease, cystic fibrosis)
  - familial
  - autoimmune
- Complications
  - exocrine pancreatic insufficiency
  - diabetes mellitus

# Chronic pancreatitis- pathology

- **Pancreatic parenchymal atrophy, fibrosis**
- **Focal acute pancreatitis, fat necrosis**
- **Duct ectasia**
- **Calcifications**
- **Pseudocysts**



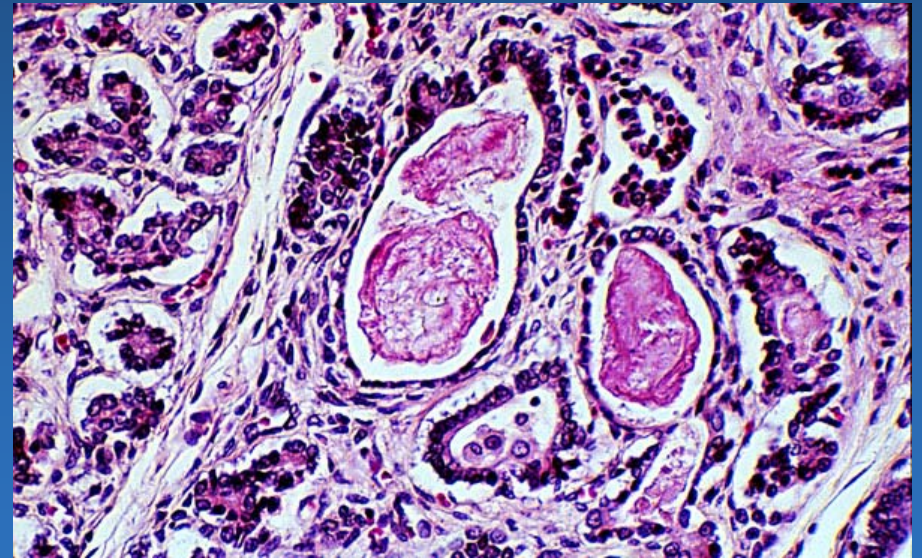
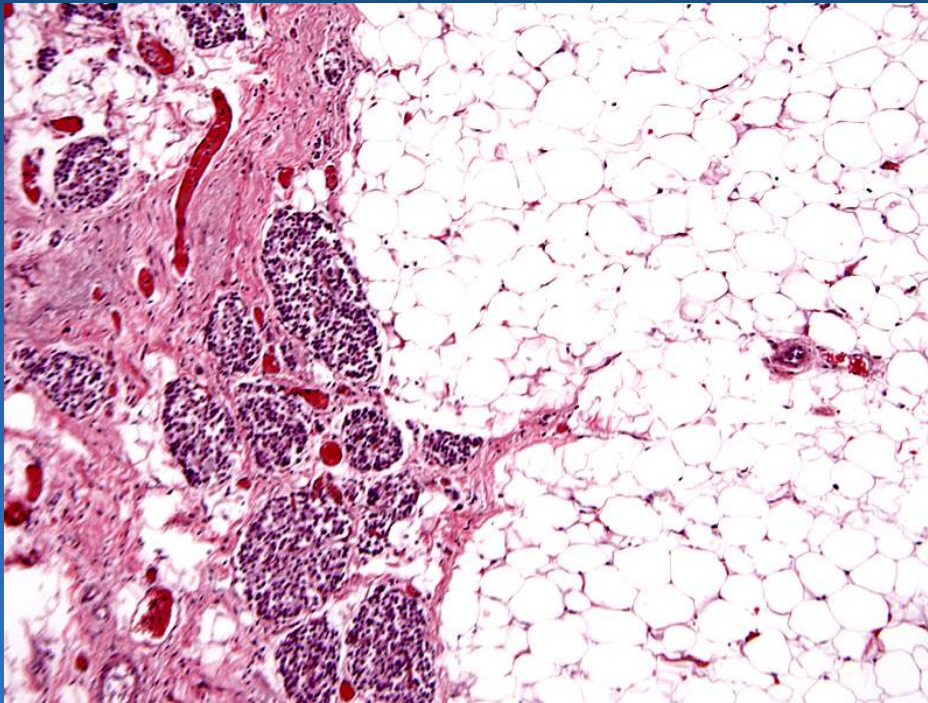
# Cystic fibrosis

- **CF: 1/3000 live births, Caucasians**
- **Gene defect: CFTR transmembrane cAMP-activated Cl<sup>-</sup> channel; common mutations results in impaired trafficking of protein and loss of surface expression**
- **Expressed in many epithelia (airway, pancreas, sweat glands)**
- **Results in inability to reabsorb Cl, and increase in viscosity of secretions**

# **Cystic fibrosis- pancreatic and GI pathology**

- **Dilated ducts filled with inspissated secretions**
- **Exocrine pancreatic atrophy with fibrosis (i.e chronic pancreatitis)**
- **Exocrine pancreatic insufficiency**
- **Diabetes relatively late**
- **GI tract: meconium ileus in infants**

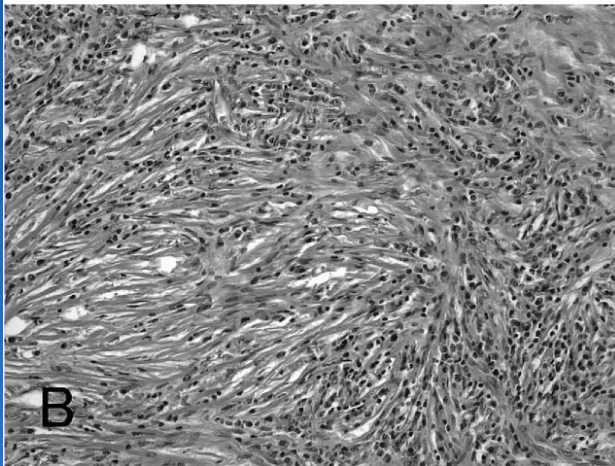
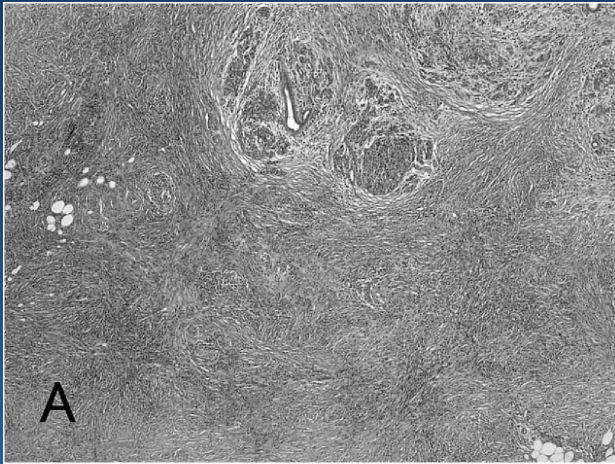
# Cystic fibrosis- pathology



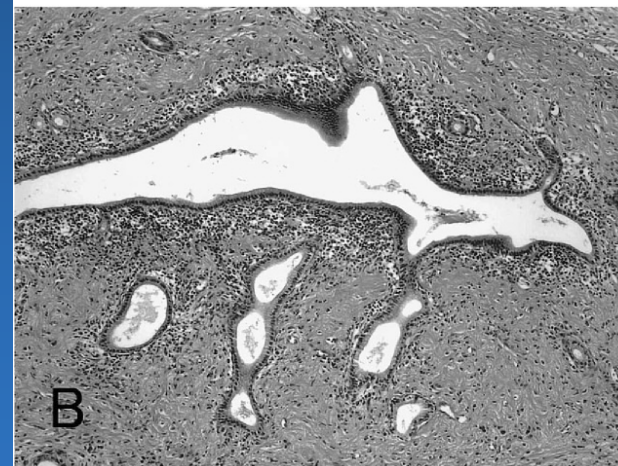
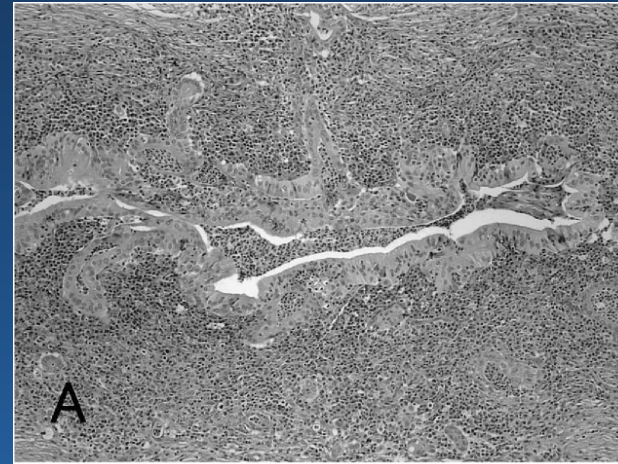
# Cystic fibrosis pancreas- gross



# Idiopathic (autoimmune) pancreatitis

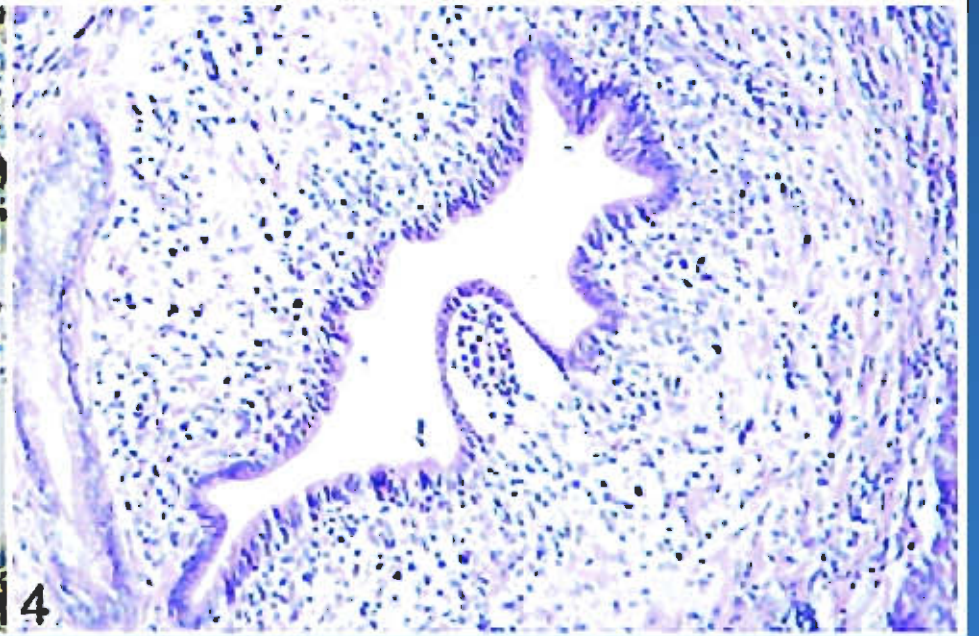
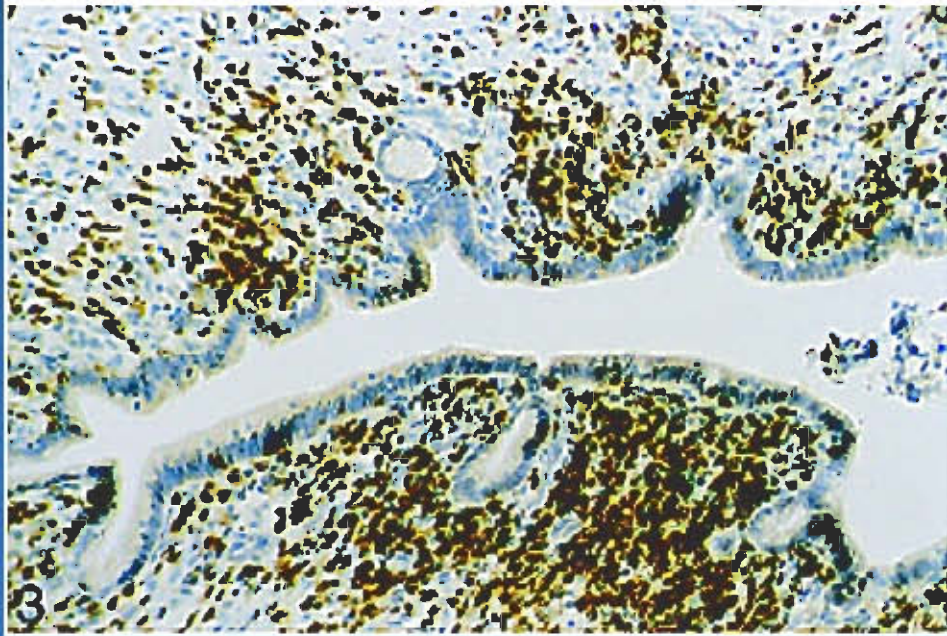
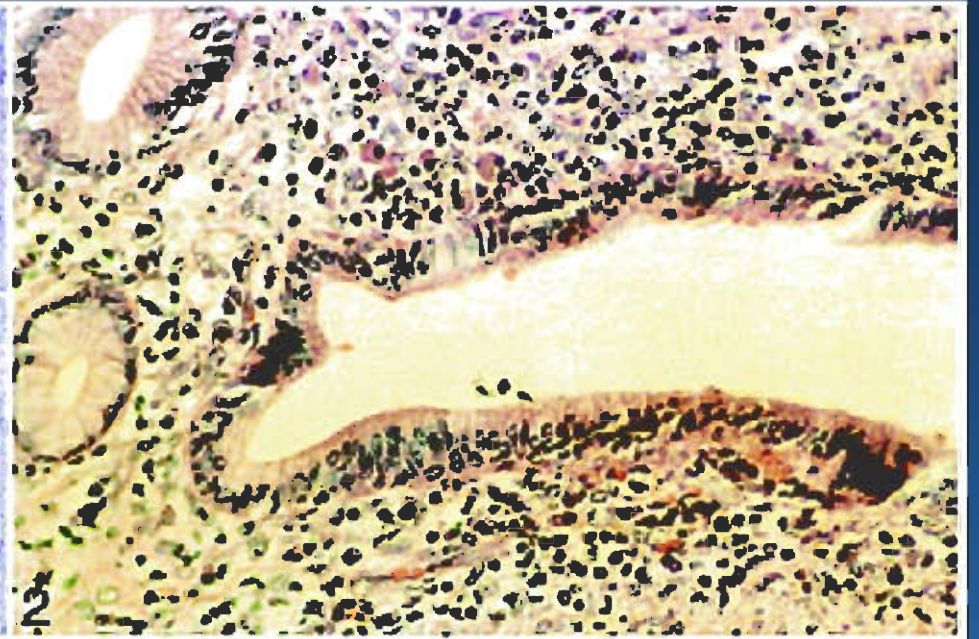
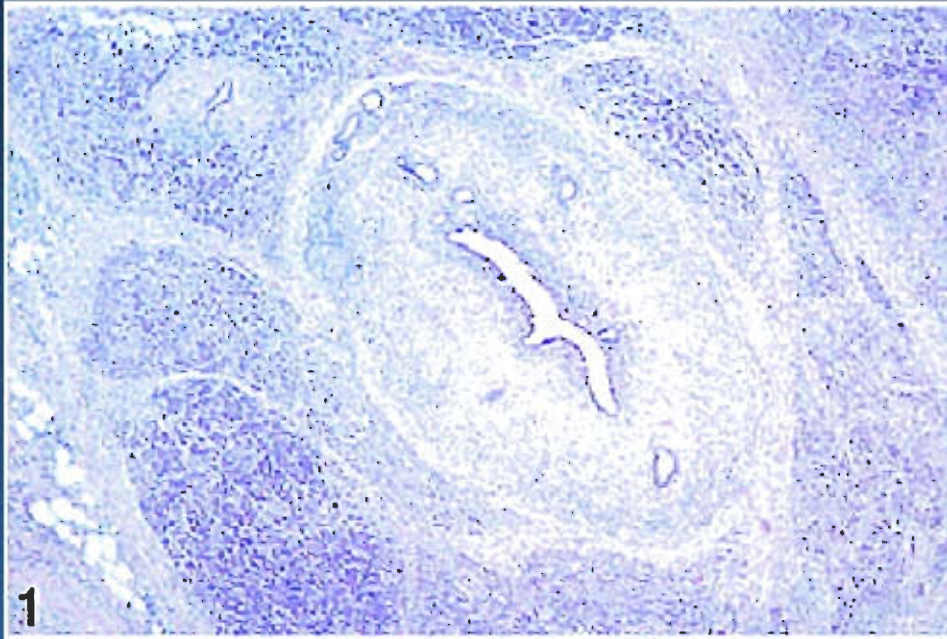


Parenchymal atrophy



Periductal inflammation

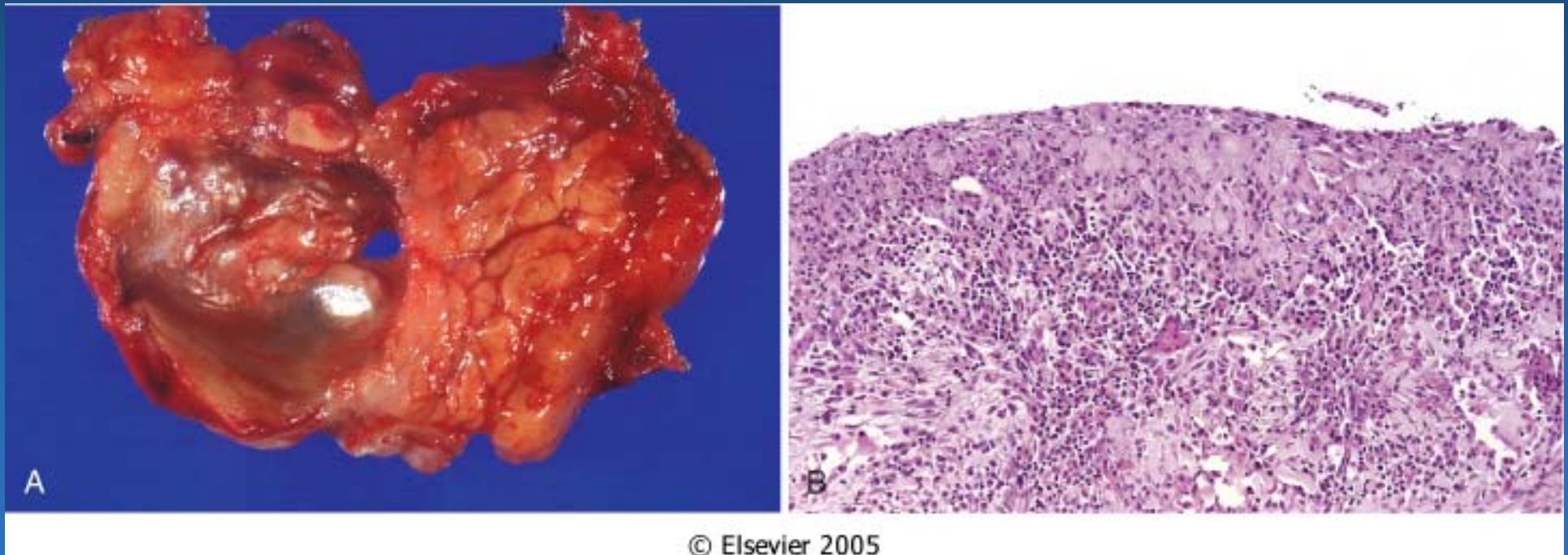




# Pancreatic cysts and pseudocysts

- **Most cystic lesions are pseudocysts associated with acute or chronic pancreatitis**
- **Congenital (associated with polycystic kidney disease, von Hippel Lindau syndrome)**
- **Neoplastic**
  - **cysts lined by serous (pancreatic duct-like) or mucinous epithelium**
  - **benign or malignant**

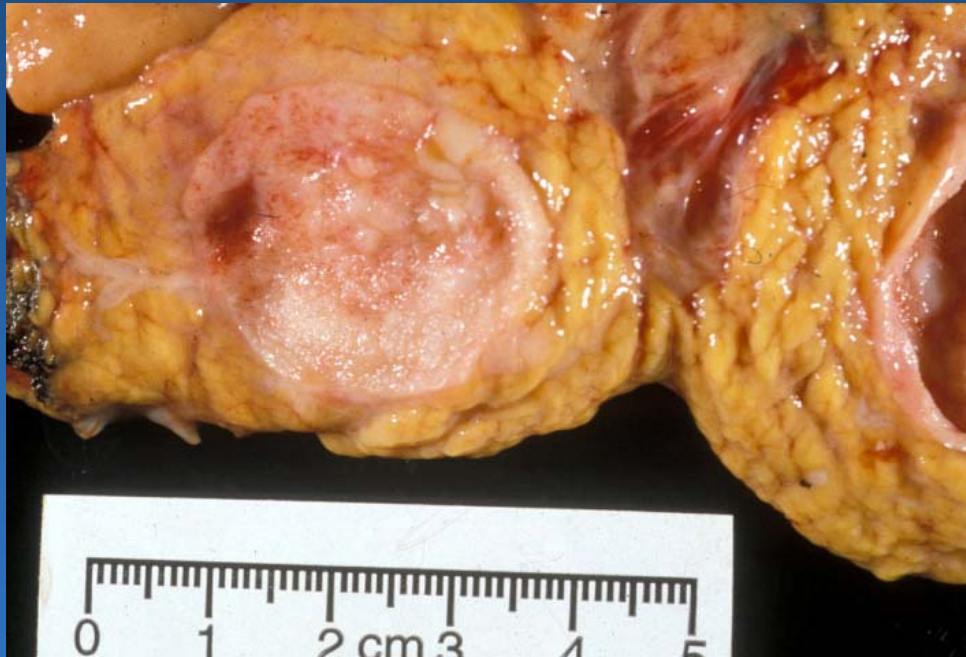
# Pancreatic pseudocyst



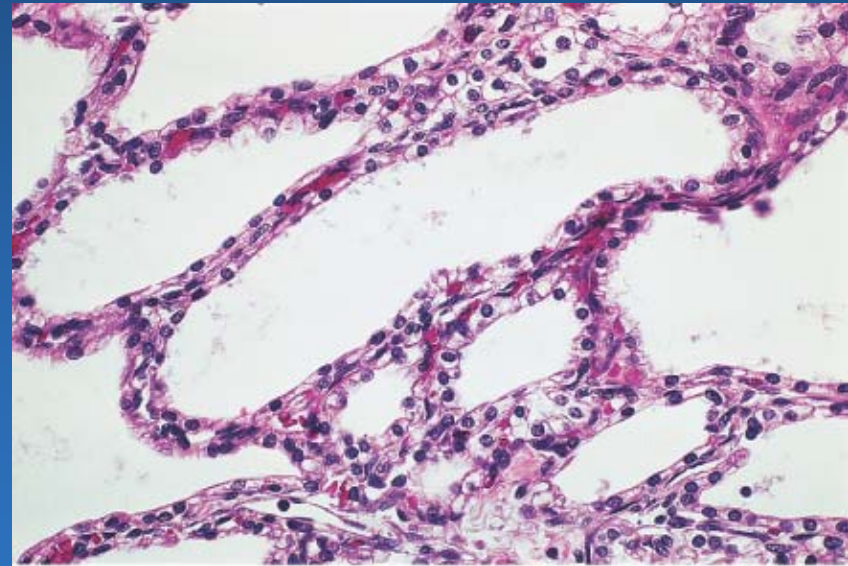
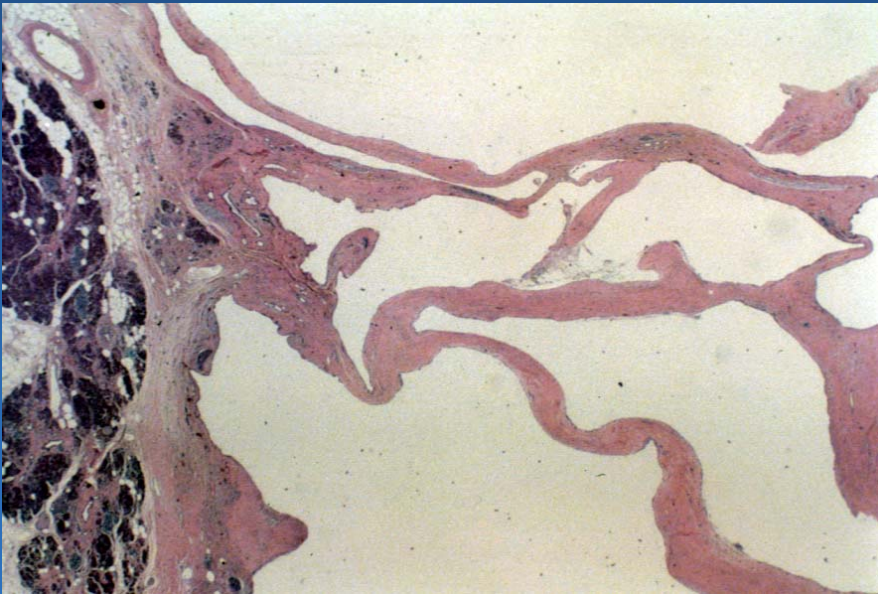
# Pancreatic neoplasms

- **Vast majority are epithelial in origin**
- **Exocrine**
  - **ductal-type adenocarcinoma**
  - **acinar cell carcinoma (unusual)**
  - **Serous cystic tumors**
  - **mucinous neoplasms (unusual)**
- **Endocrine**
  - **functional**
  - **non-functional**

# Serous cystic tumor- gross

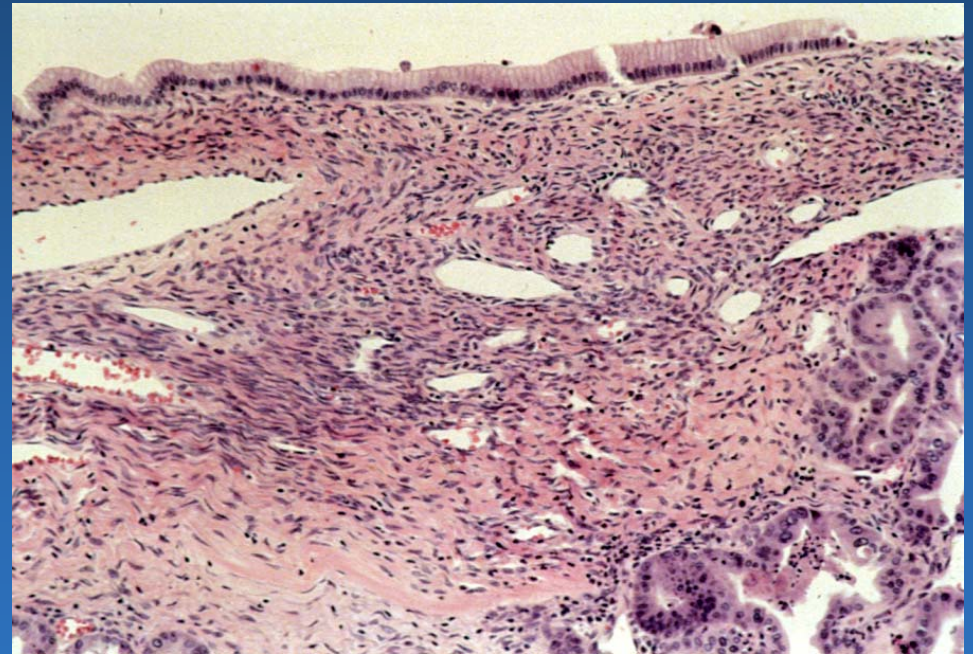


# Serous cystadenoma

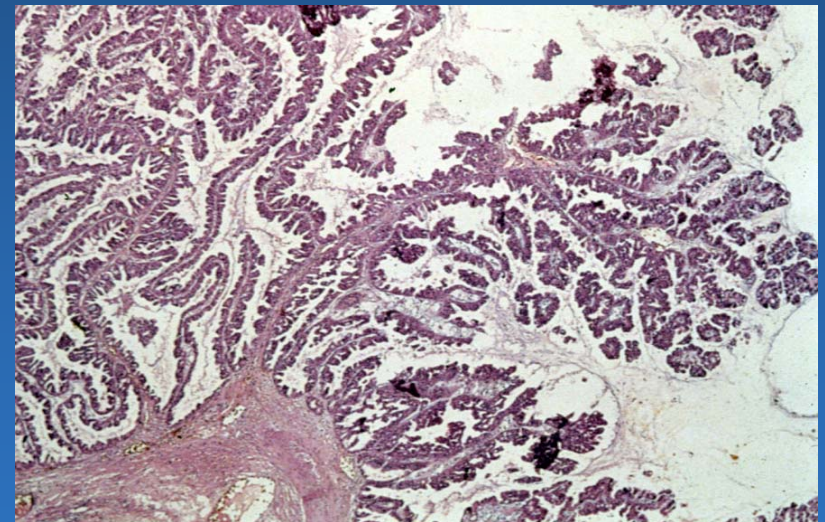
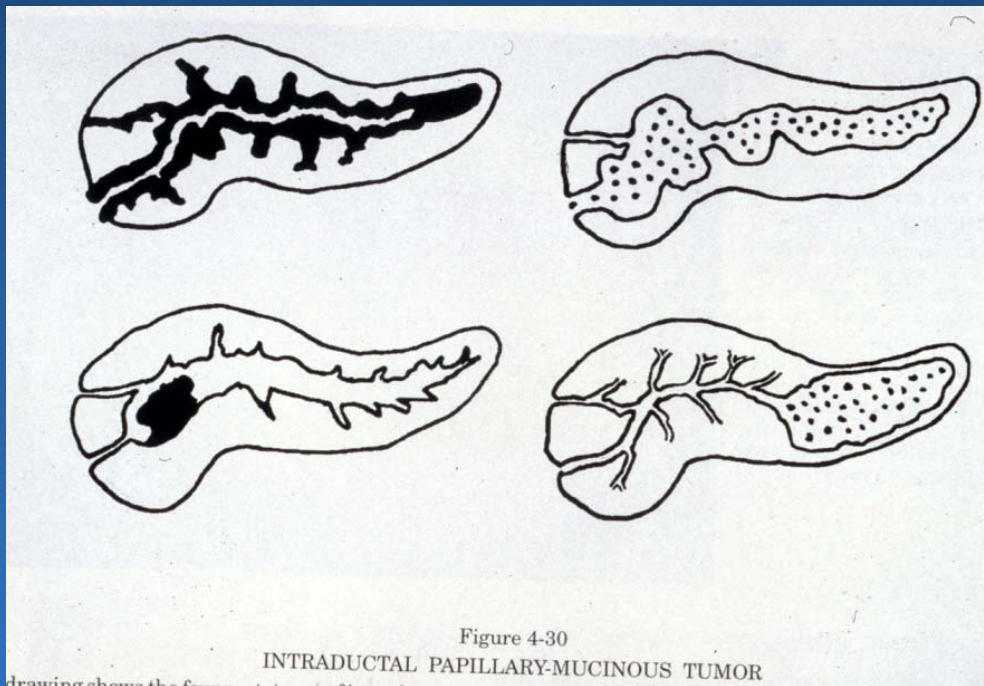


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# Mucinous cystic neoplasm



# Intraductal papillary mucinous tumor

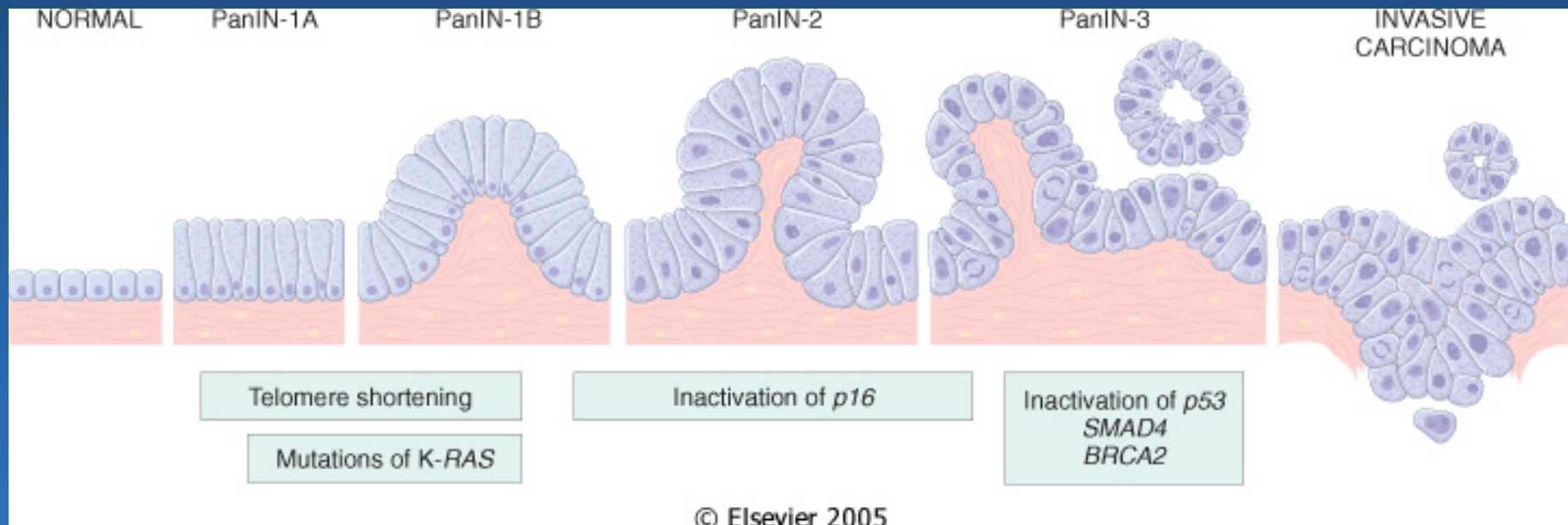




# Pancreatic carcinoma

- Majority arise from ductal epithelium
- Peak age >50 years, slight M>F
- Symptoms: weight loss, painless jaundice; may be asymptomatic until relatively advanced
- Pathology: tubular adenocarcinoma showing a range of differentiation
- Aggressive neoplasm with poor prognosis

# Pancreatic intraepithelial neoplasia



# Pancreatic carcinoma gross

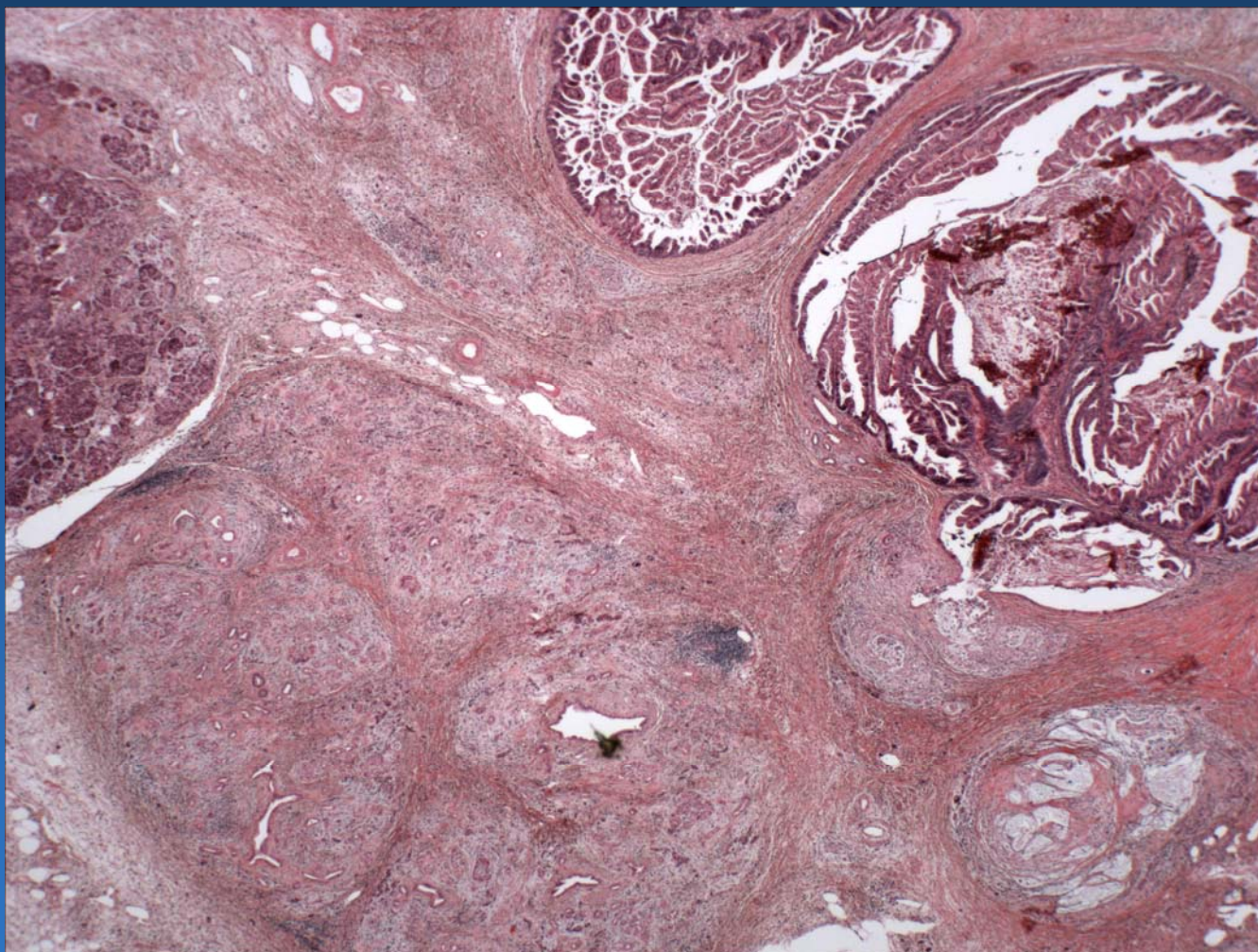


Pancreatic carcinoma

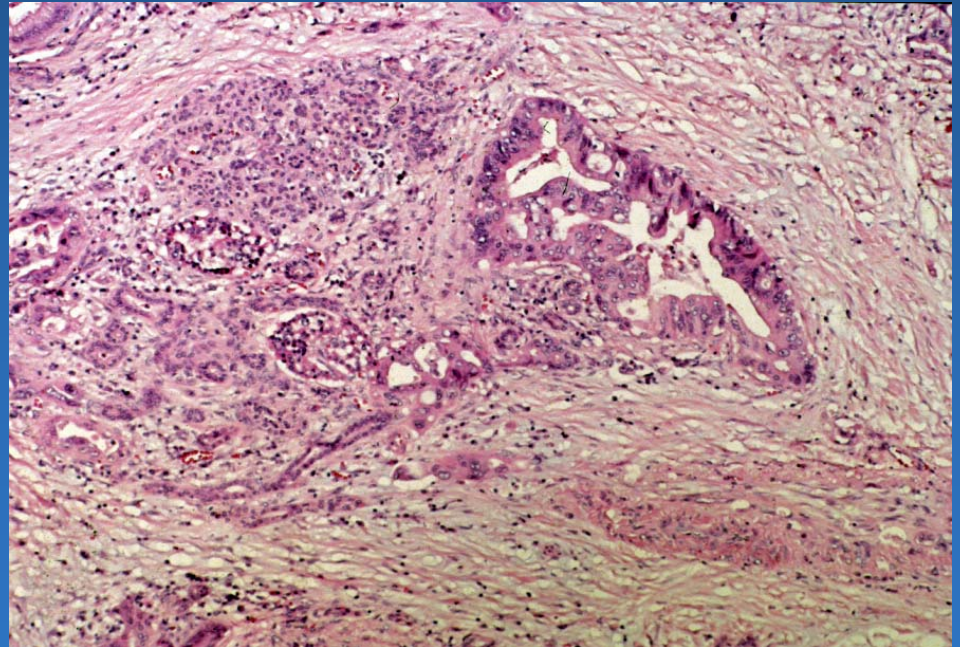
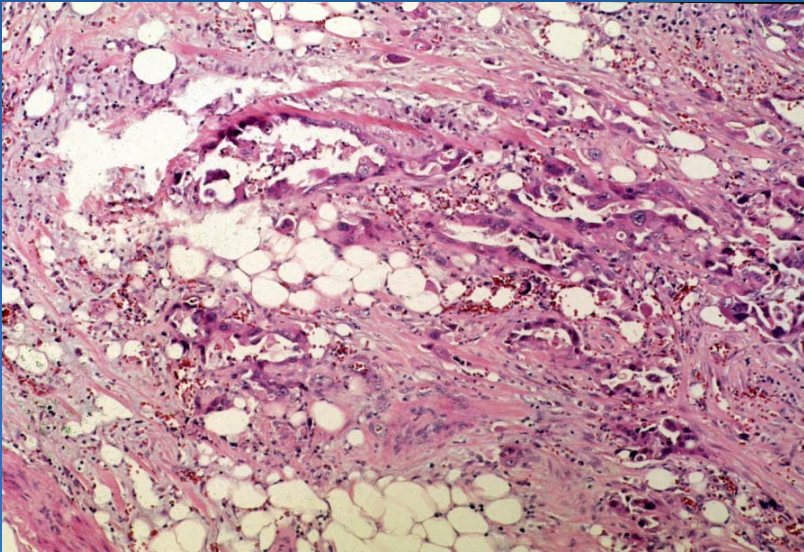


Chronic pancreatitis

# Pancreatic ductal adenocarcinoma



# Pancreatic carcinoma

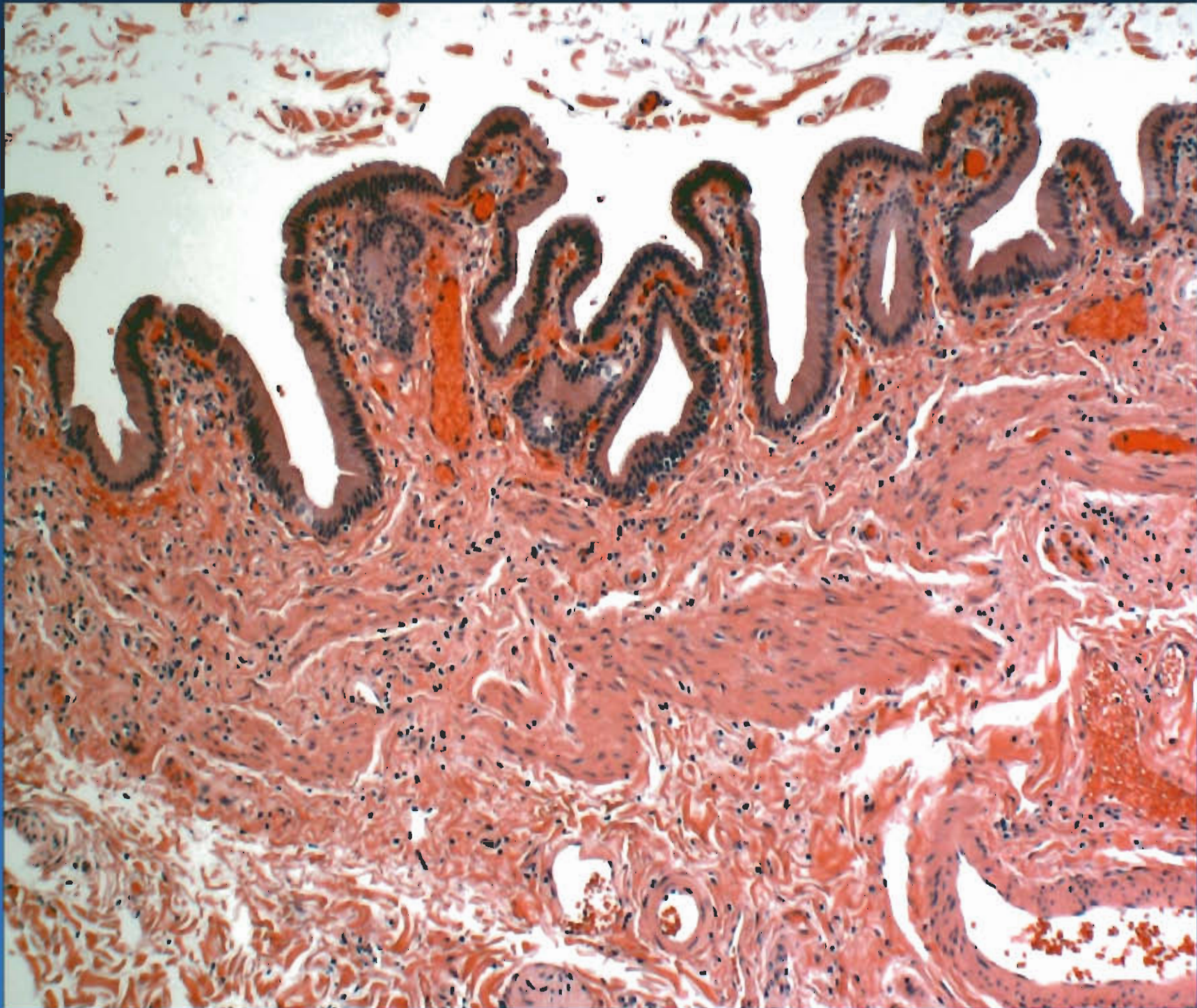


# Pancreatic endocrine tumors

- Arise from islet cells
- May be functional or non-functional
- Gastrinomas (from delta cells) associated with Zollinger-Ellison syndrome
- Insulinomas: associated with hypoglycemia
- Pathology similar to GI carcinoids
- Liver metastasis common

# Gallbladder

- **Anatomy**
  - Mucosa
  - Submucosa
  - Muscularis
  - Serosa
- **Functions**
  - Storage and concentration of bile
  - Regulated by CCK, secretin





# Gallstones

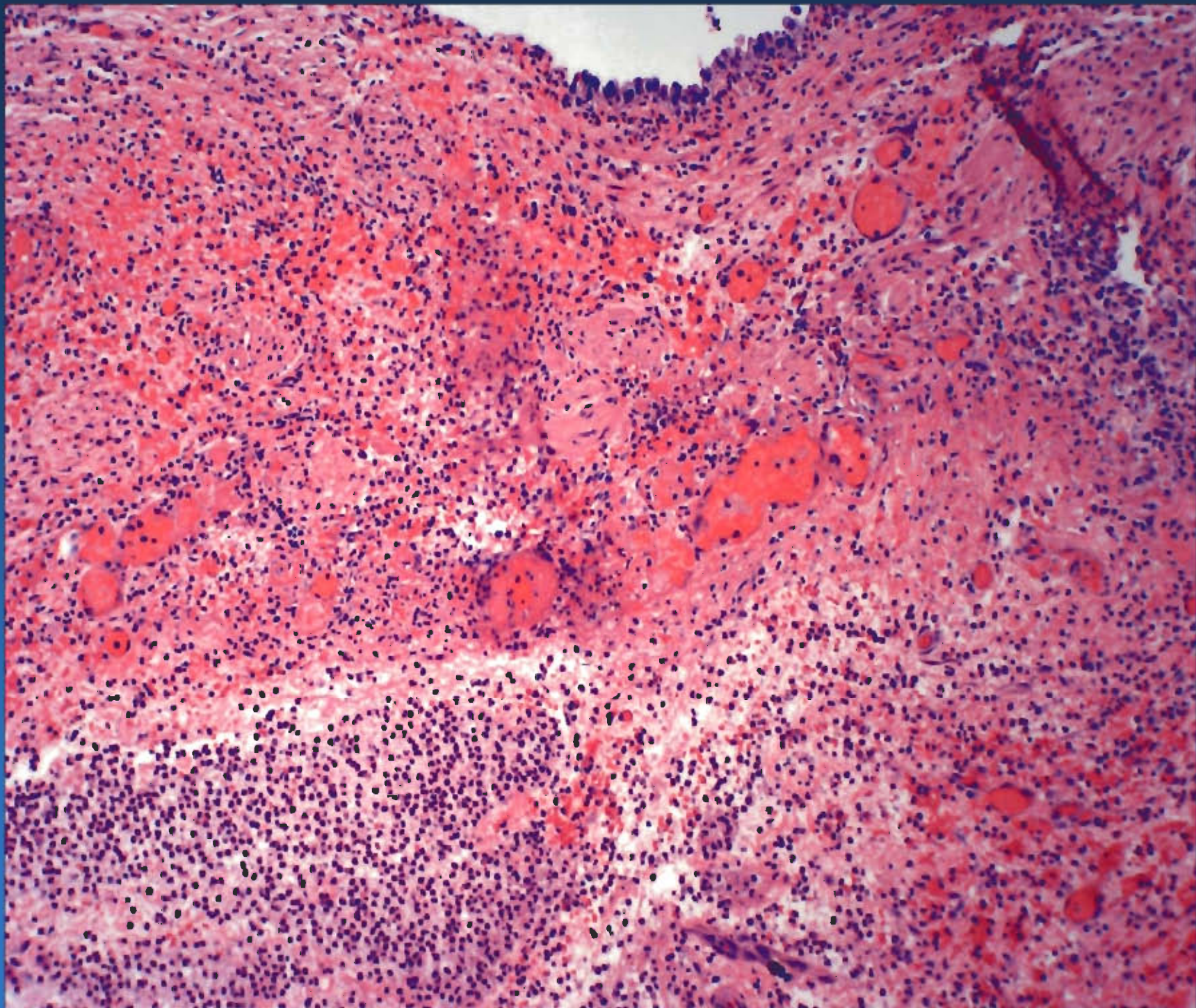
- **Extremely common in U.S.**
- **Risk factors: female gender, obesity, parity**
- **Etiology likely multifactorial**
- **Classification**
  - **Cholesterol**
  - **Bilirubinate**
  - **Mixed**
- **Effects: 80% asymptomatic; acute cholecystitis, gallstone ileus, ?gallbladder CA**

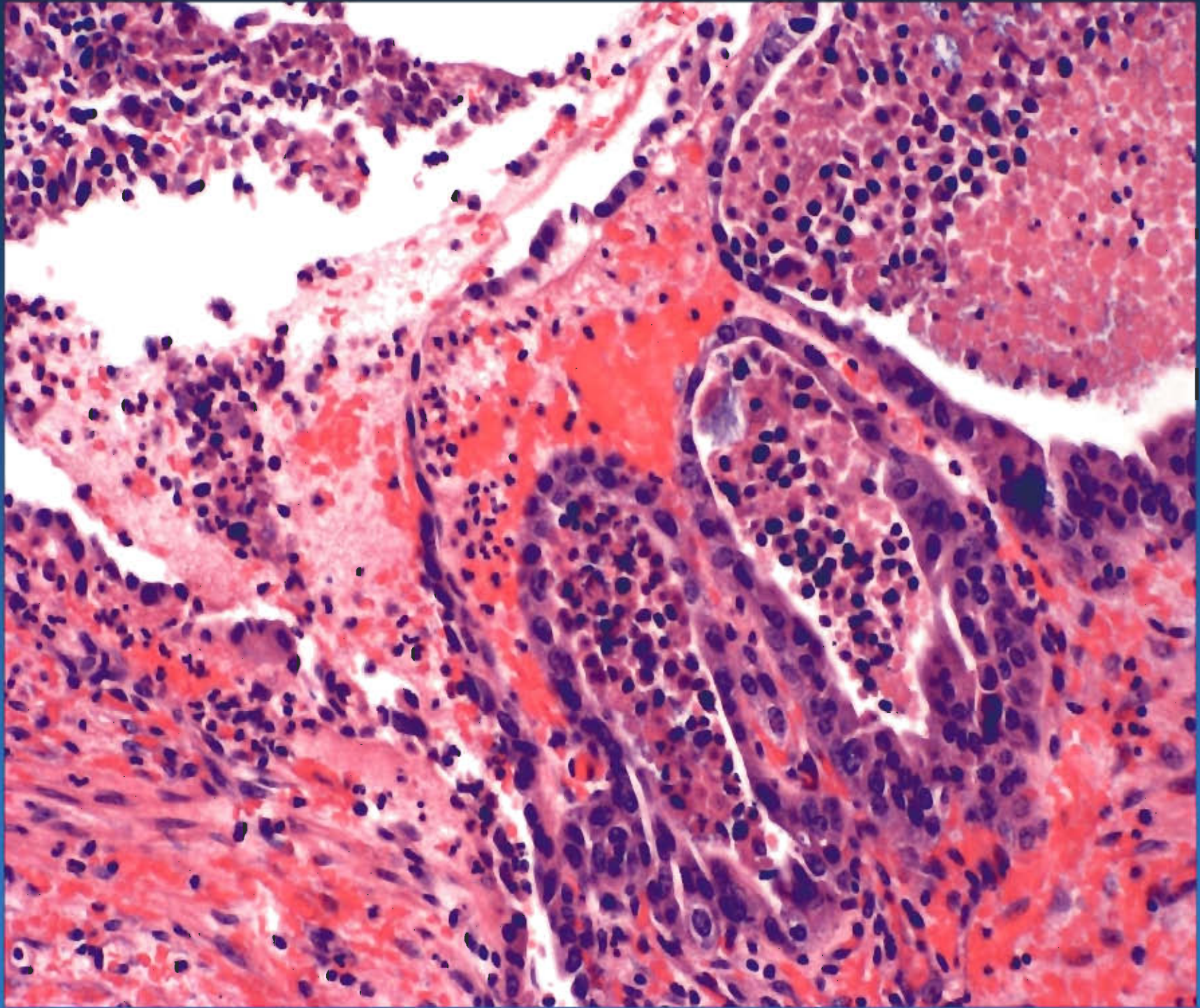
# Cholelithiasis



# Acute Cholecystitis

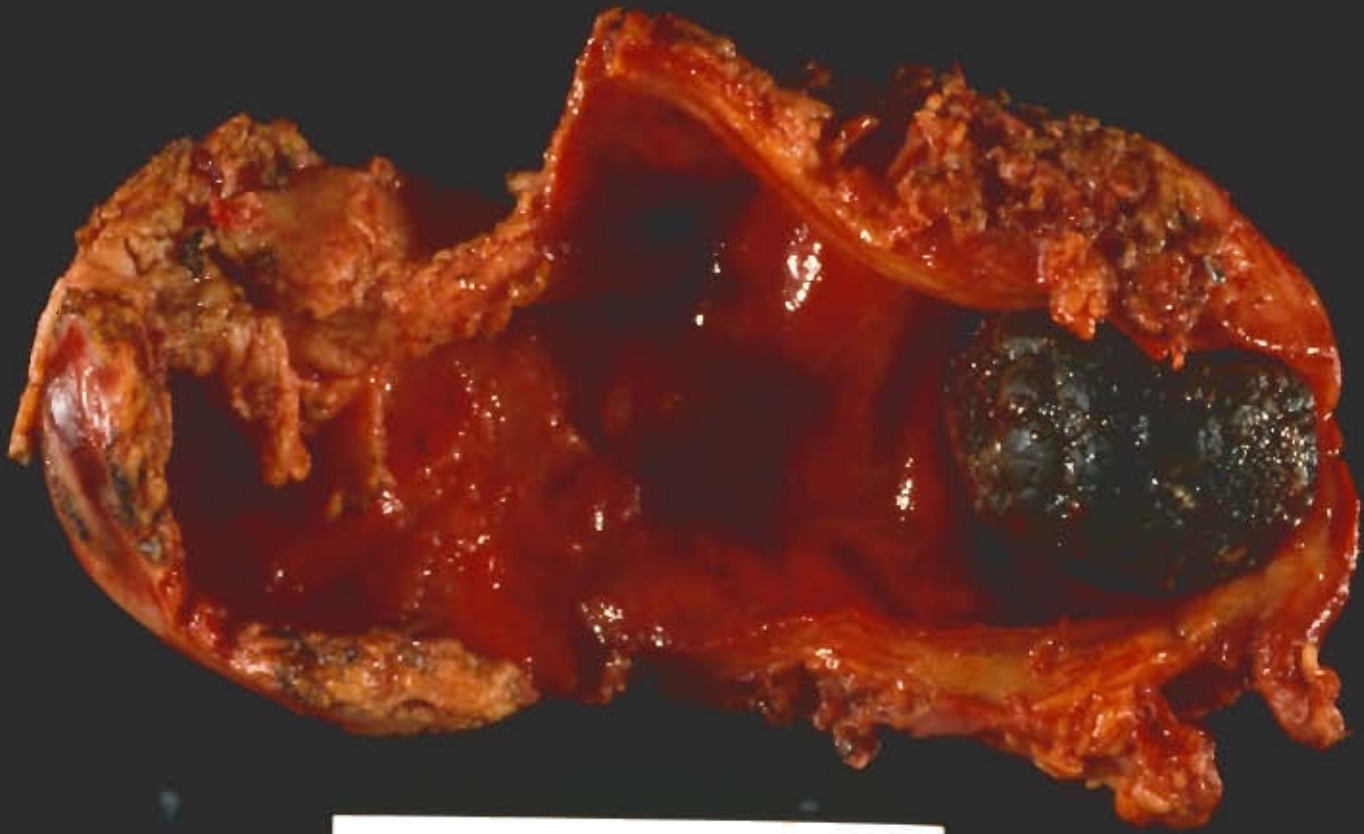
- **Clinical**: 90% a/w gallstones
  - acalculous
  - HIV-associated
- **Gross**: distended, hemorrhagic, exudate
- **Microscopic**: AI, necrosis
- **Variants**:
  - vasculitis
  - emphysematous
  - gangrenous



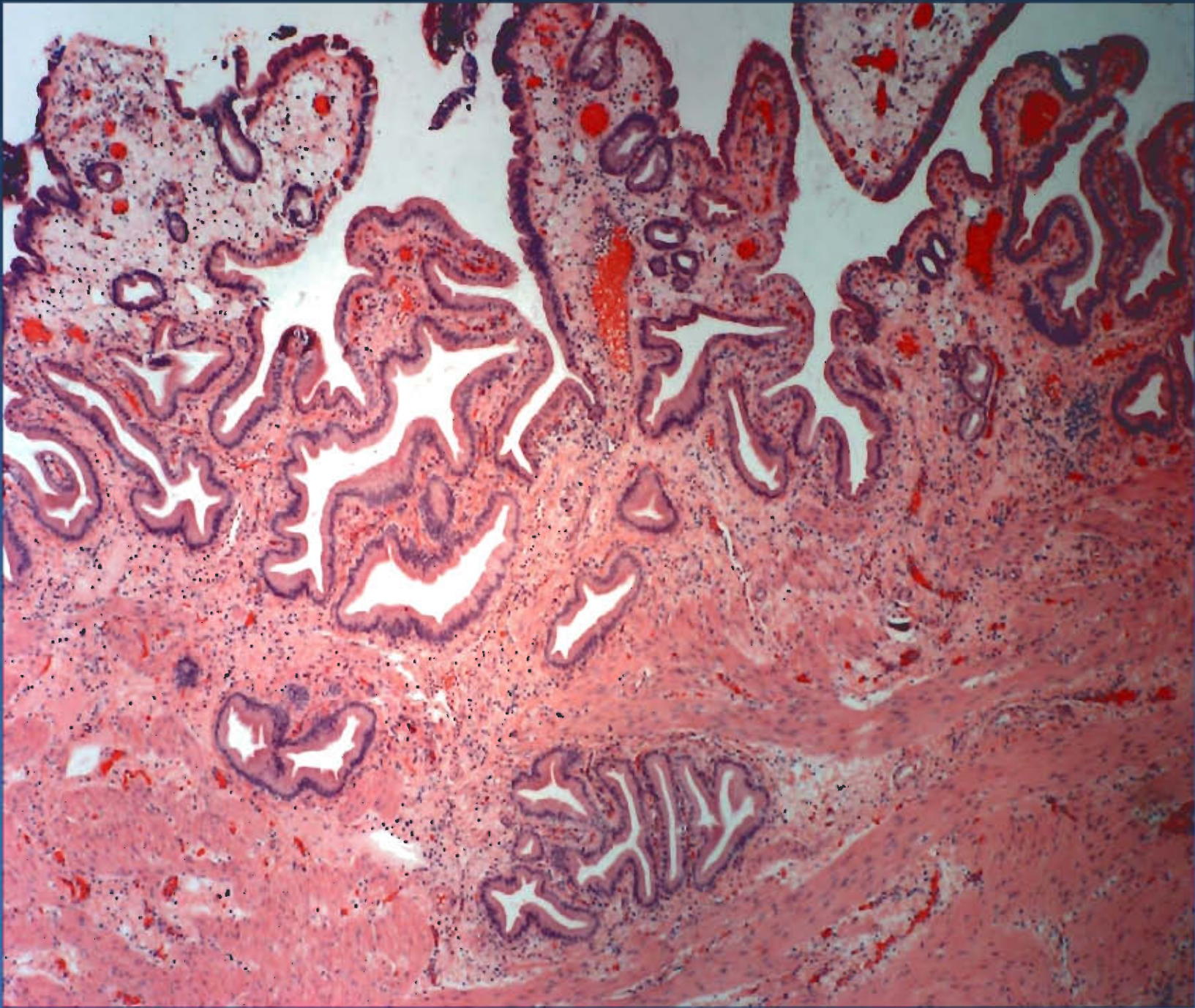


# Chronic cholecystitis

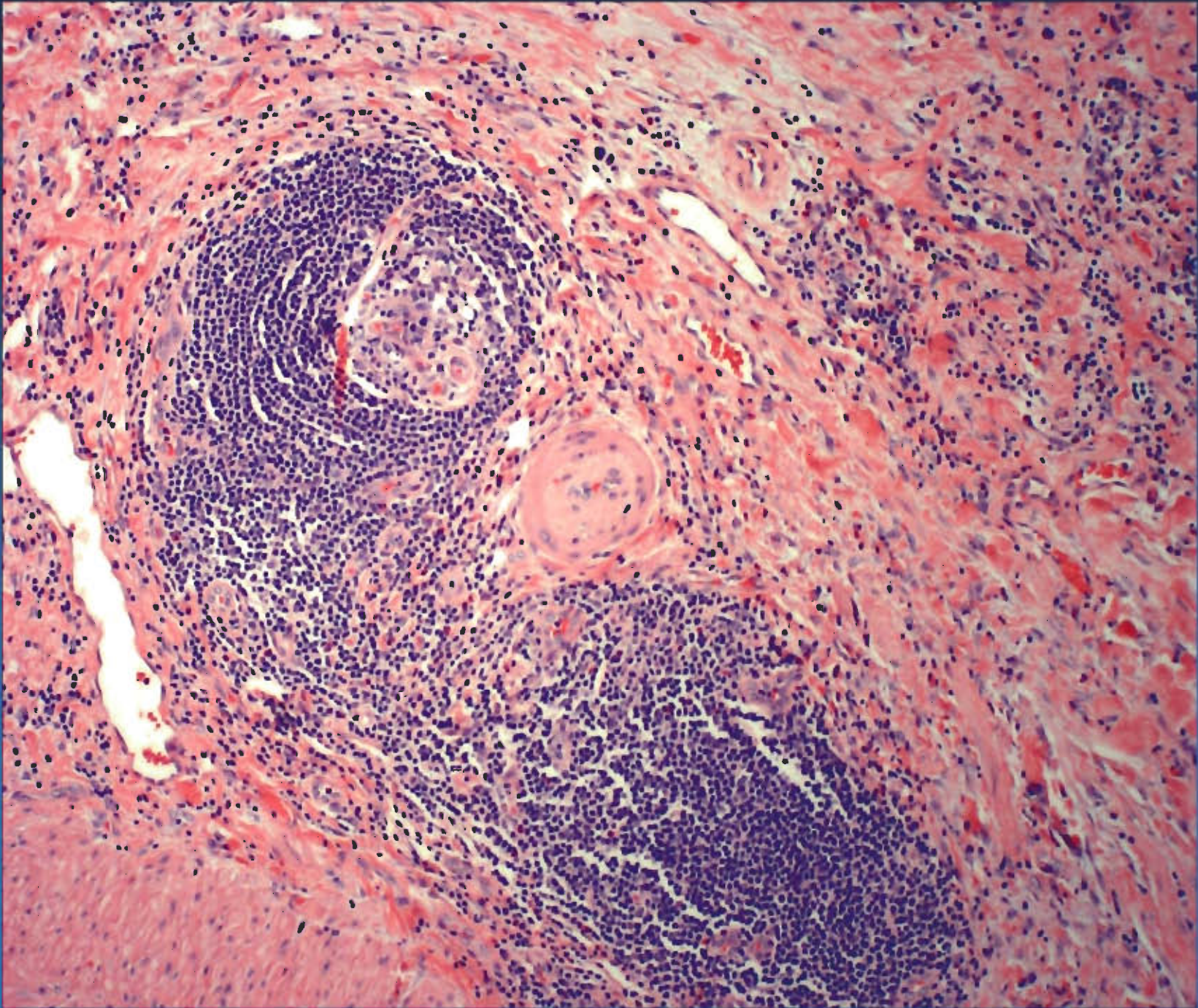
- Usually due to repetitive acute cholecystitis
- Most associated with gallstones, may also be associated with bacterial infection in biliary tract
- Gross appearance: Fibrotic gallbladder with wall thickening contraction
- Microscopic: Fibrosis, chronic inflammation, mucosal hyperplasia with Rokitansky-Aschoff sinuses



0 1 2 cm 3 4 5  
BWH Pathology  
**S95- 17297**







# Gallbladder carcinoma

## Clinical

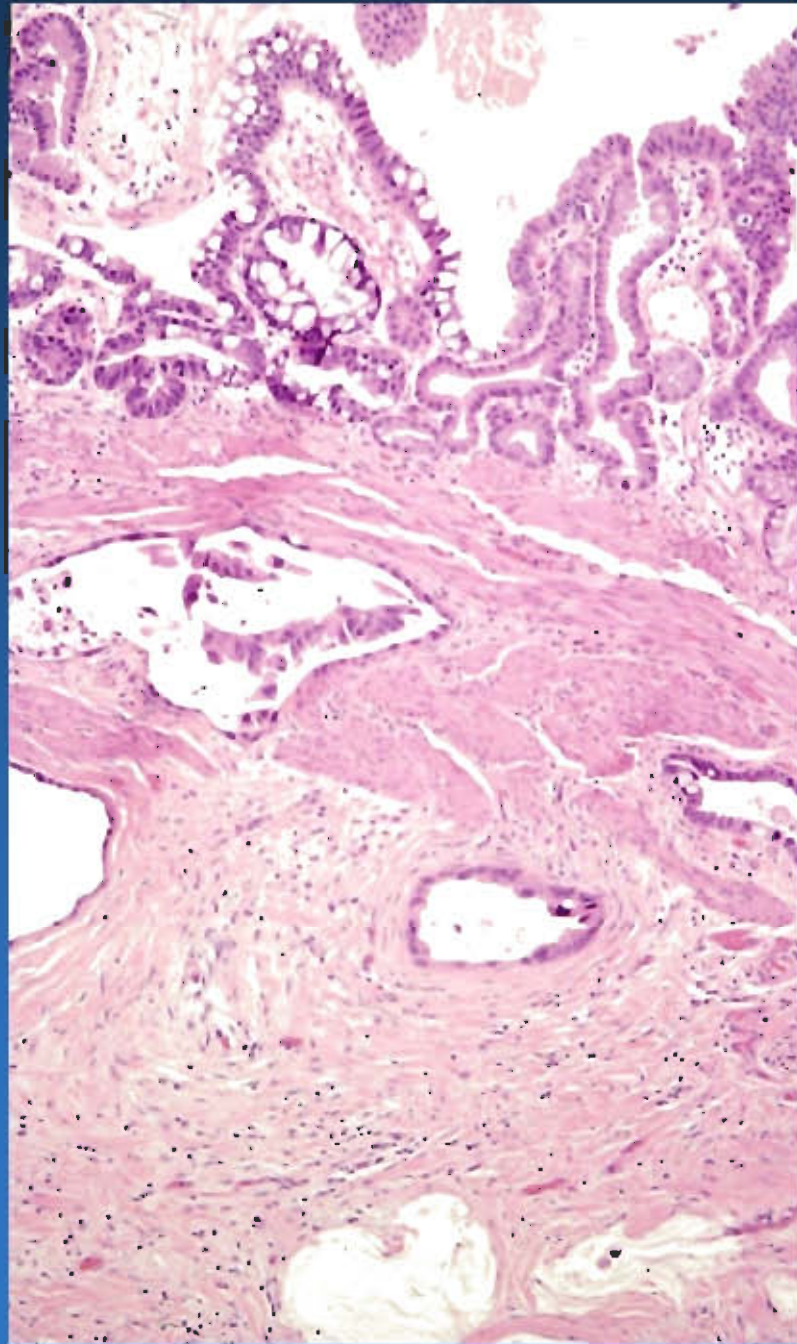
- **Most common GB malignancy, incidence 1/100K**
- **F:M 2:1, peak in 8th decade**
- **Risk factors: ethnicity, gallstones, abnormal CDP junction, UC, porcelain GB, chemicals**
- **Symptoms: pain, jaundice, weight loss**

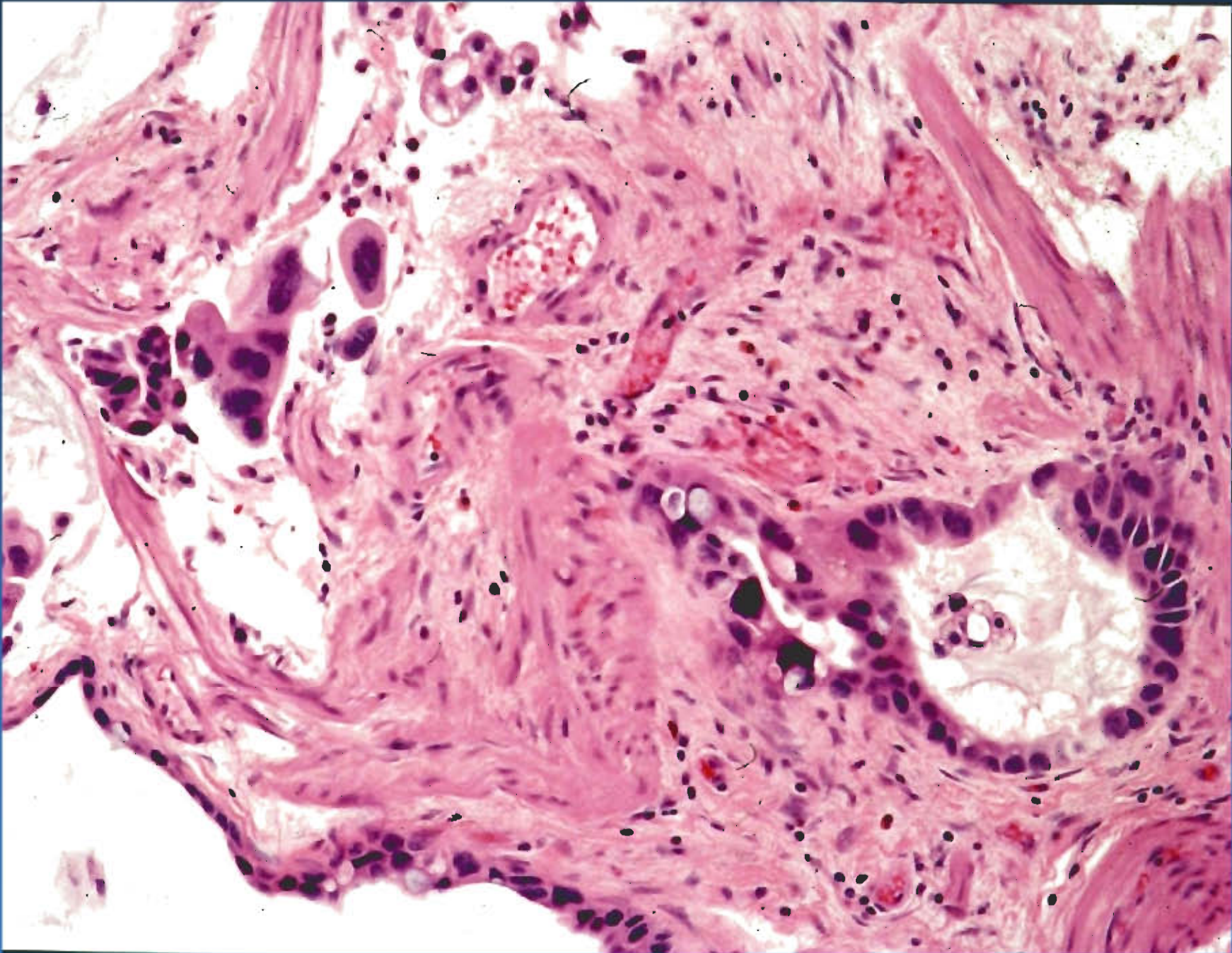
## Gross

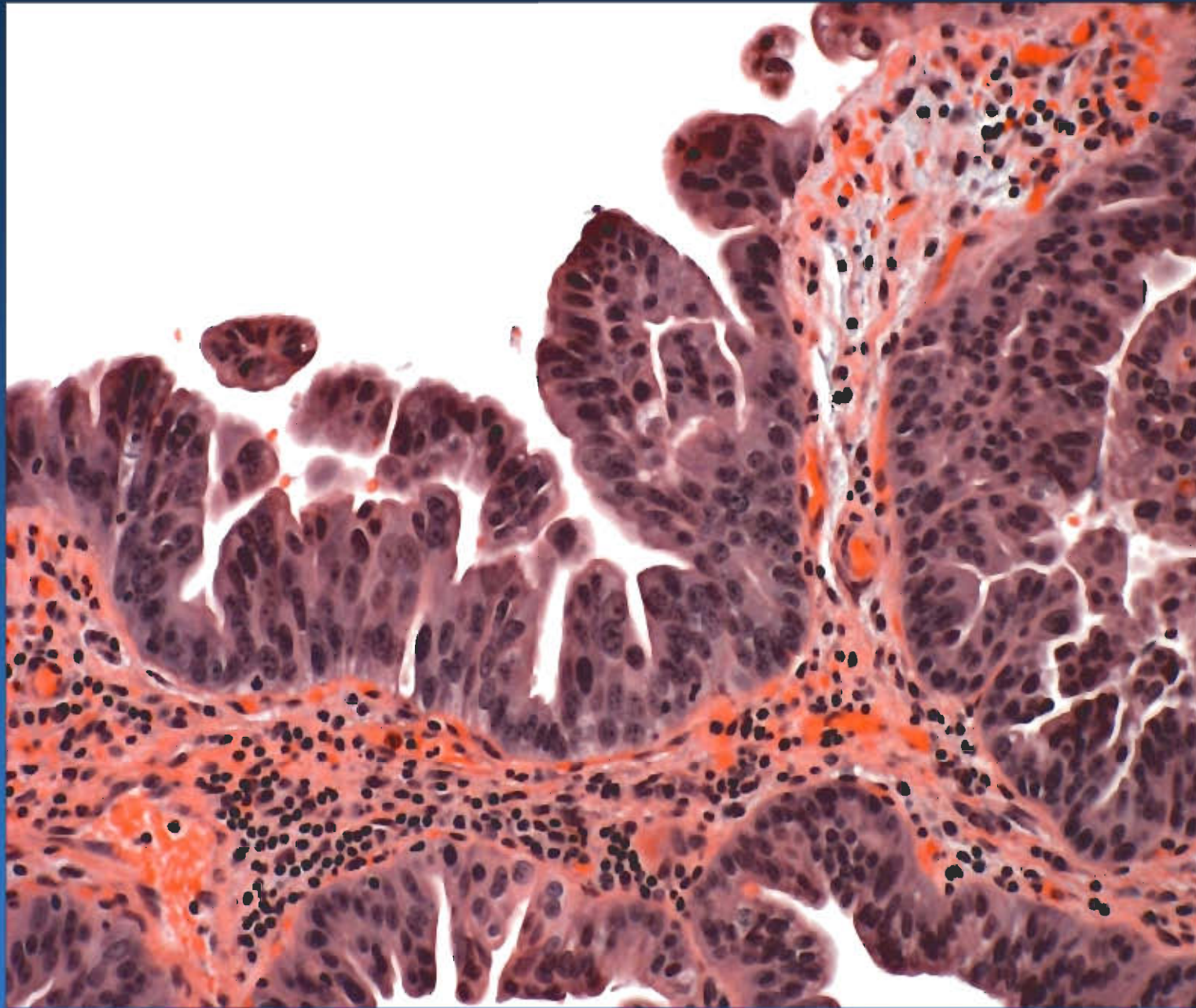
- **Mostly fundus; nodular, polypoid or infiltrative**

# Gallbladder carcinoma- pathology

- **75-90% adenocarcinoma NOS**
  - **Well differentiated (50%)** **>95% glands**
  - **Moderately differentiated glands** **50-94%**
  - **Poorly differentiated** **5-49% glands**
  - **Undifferentiated** **<5% glands**
- **Adenocarcinoma variants-** papillary, mucinous, adenosquamous, signet ring cell
- **Other:** pleomorphic/giant cell, small cell, squamous cell
- **Special studies:** mucin+;CK7+CK20+/-; CEA+
  - **30-40% focally positive for NE markers**







# Cholangitis

- **Primary sclerosing cholangitis**
- **Secondary cholangitis (more common)**
  - **choledocholithiasis**
  - **prior procedure, surgery**
  - **infection**
  - **pancreatitis**
  - **toxic injury**
- **Two types usually difficult to distinguish histologically**

# Primary Sclerosing Cholangitis

- Clinical: middle aged adults, M>F
  - **70-90% of pts have IBD (usually UC)**
  - **other associated conditions**
- Radiology: Stricture (“beading”) of BDs
- Indications for biopsy:
  - **BD biopsy: exclude malignancy**
  - **liver biopsy: confirm diagnosis or r/o others; evaluate progression of liver disease**



# Primary Sclerosing Cholangitis- Pathology

- Periductal and periglandular lymphocytic inflammation
- Mild ductular distortion, concentric fibrosis
- Progression: obliteration of lumen
- Ddx:
  - invasive carcinoma
  - secondary cholangitis

