

# Radiology Team 429

## HEPATOBILIARY RADIOLOGY



# Radiology Team 429

**In this team we used the outlines from the:**

**Doctor's slides**

**Lecture notes**

**427 Radiology team**

**Diagnostic Imaging –PETER ARMSTRONG  
– 6<sup>Th</sup> Edition**

**Sorry we don't hold responsibility for any  
missing information or perhaps –  
perhaps -wrong material.**

**We tried our best to present this lecture in  
the best way, and we hope what we  
wrote is enough to cover the subjects.**

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Sarah Mahasin

**Team Members:**

Abdullah aleisa

**Best Wishes : )**

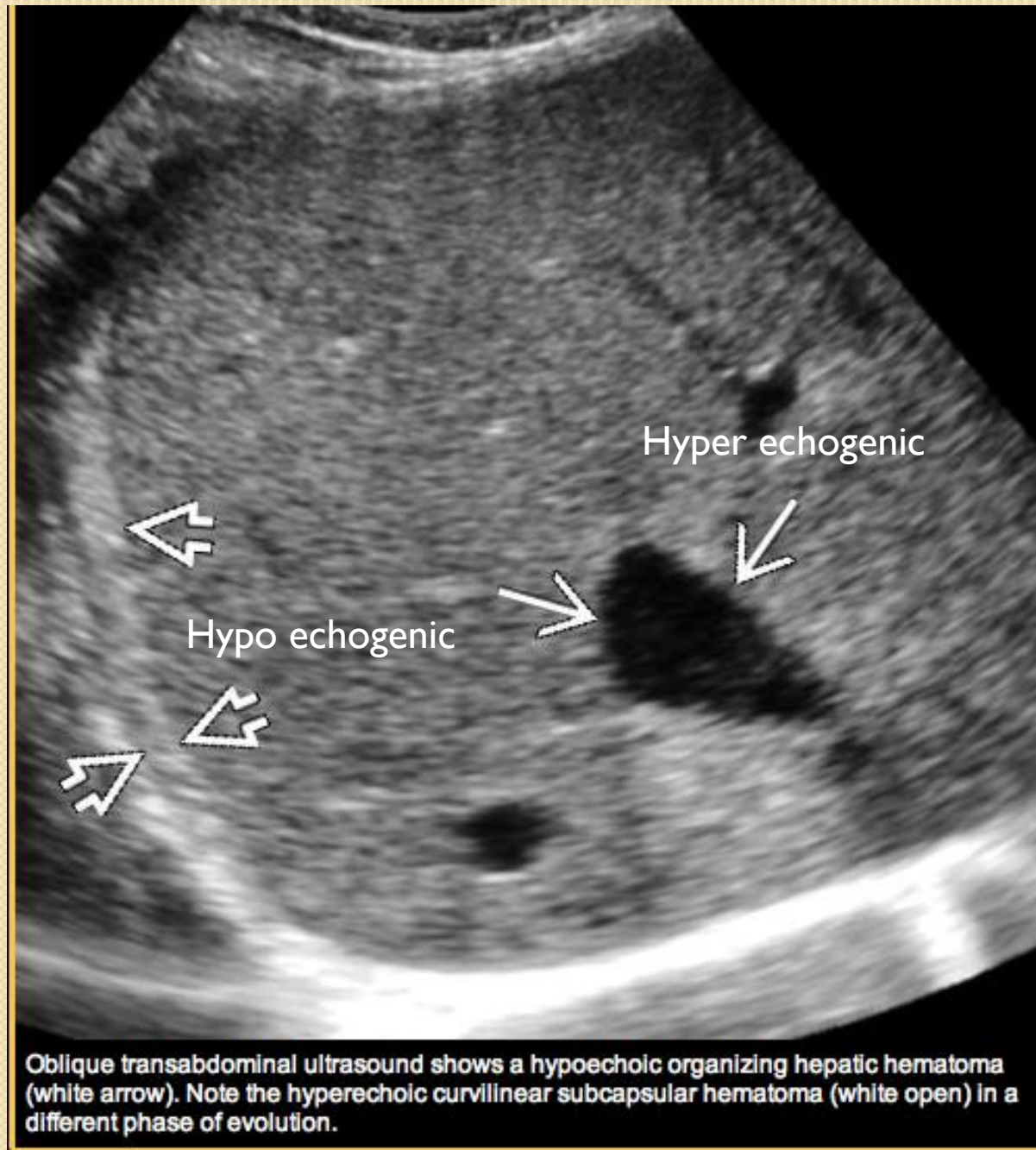
# IMP

- We add the notes we find it in the lecturer in the same slides
- The Imp notes you will find it in the next slide

# I. HEPATIC TRAUMA (US)

## Ultrasonographic Findings:

- Grayscale ultrasound lesions are common in segments 6, 7 and 8 which may be difficult to image in a trauma setting
- Helpful ancillary signs: Sub capsular hematoma, hemoperitoneum, right renal or splenic laceration/hematoma
- Subcapsular hematoma: Lentiform or curvilinear fluid collection
- Initially:
  - Injury Intraparenchymal hematoma Rounded echogenic or hypoechoic foci
  - Parenchymal laceration: Irregular shaped hematoma which may point towards capsular surface Parenchymal laceration may show direct extension to surface
  - Abnormal echotexture relative to normal liver due to hematoma which would evolve with time
- Hepatic fracture
  - Hepatic fracture is seen as laceration extending across two surfaces May result in infarction
  - Biloma
    - Rounded/ellipsoid, anechoic, loculated structures
    - Well-defined sharp margins, close to bile ducts



## ULTRASOUND

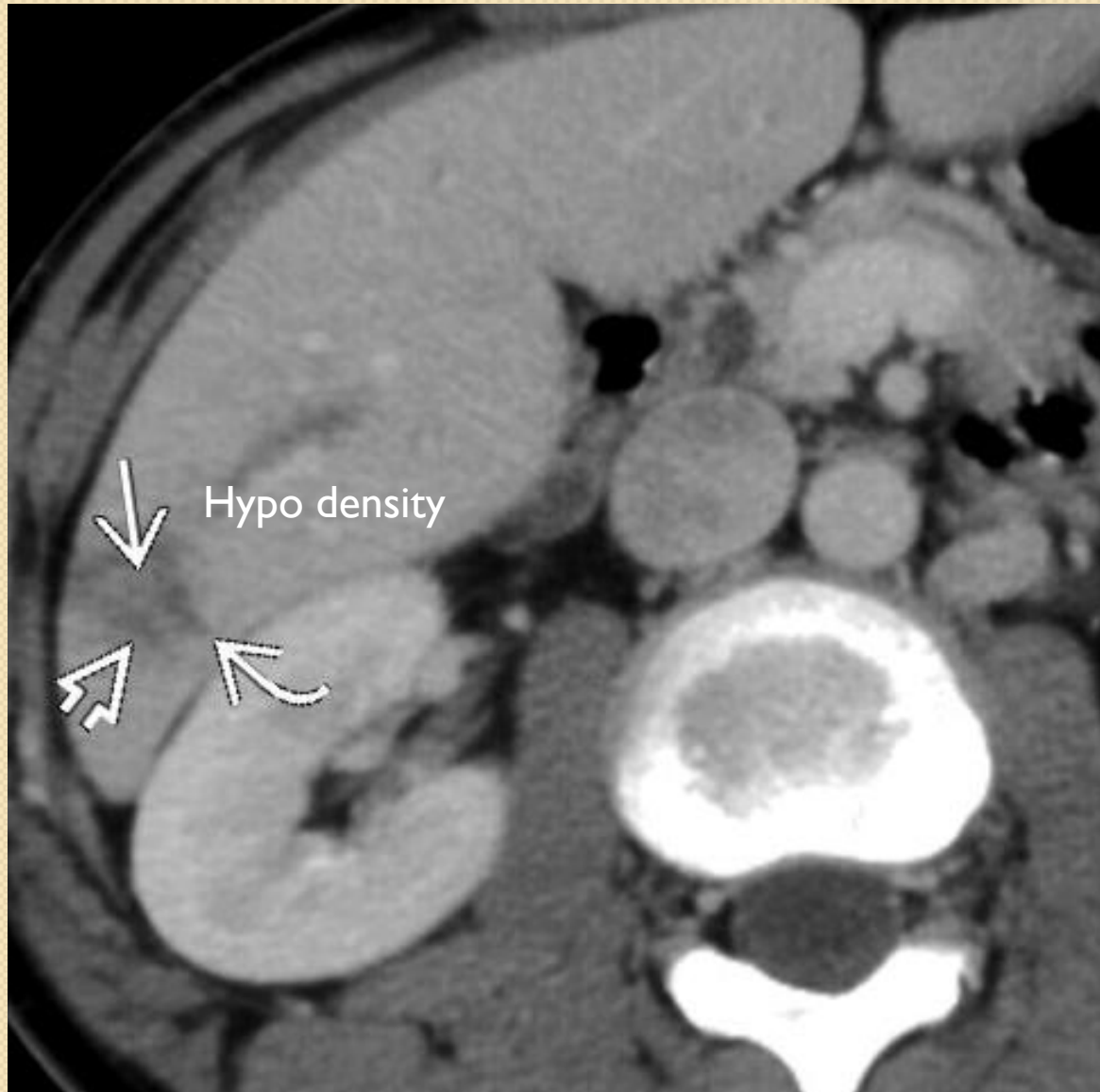
- Hyper echogenic → subcapsular hematoma
- Hypo echogenic → laceration of the liver



# HEPATIC TRAUMA (CT)

## CT Findings

- Lacerations
    - Simple or stellate (parallel to portal/hepatic vein branches)
    - Simple: Hypodense solitary linear laceration
    - Stellate: Hypodense branching linear lacerations
  - Parenchymal and subcapsular hematomas (lenticular configuration)
  - Unclothed blood (35-45 HU) soon after injury
- NECT: May be hyperdense relative to normal liver
- CECT: (contrast enhanced computed tomography) Hypodense compared to enhancing normal liver tissue
- Clotted blood (60-90 HU) More dense than unclothed blood & normal liver
- May be more dense than unenhanced liver
- Active hemorrhage or pseudoaneurysm



- Hypo density when contrast is giving → laceration of the liver
- MRI is not good for this case because it may take a long time ( 20 – 30 minutes )

# HEPATIC TRAUMA

CECT (contrast enhanced computed tomography): Active hemorrhage Isodense to enhanced vessels Seen as contrast extravasation (85-350HU)

Extravasated contrast material and surrounding decreased attenuation clot

Hemoperitoneum: Perihepatic and peritoneal recess collections of blood  
Periportaltracking: Linear, focal or diffuse periportal zones of decreased HU

Due to dissecting blood, bile or dilated periportal lymphatics

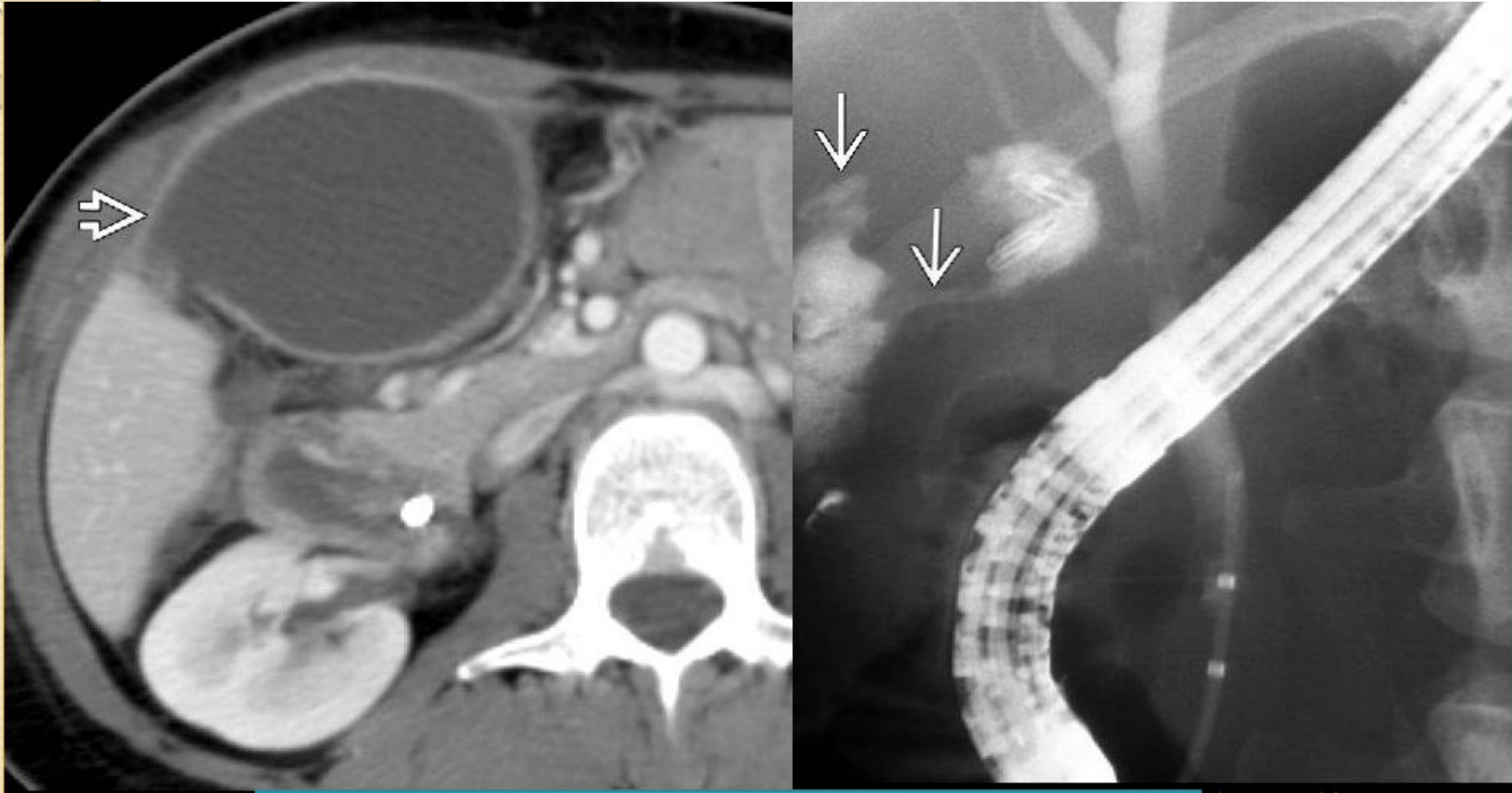
CT diagnosis of liver trauma

Accuracy: 96% Sensitivity: 100% Specificity: 94%





## 2. BILIARY TRAUMA



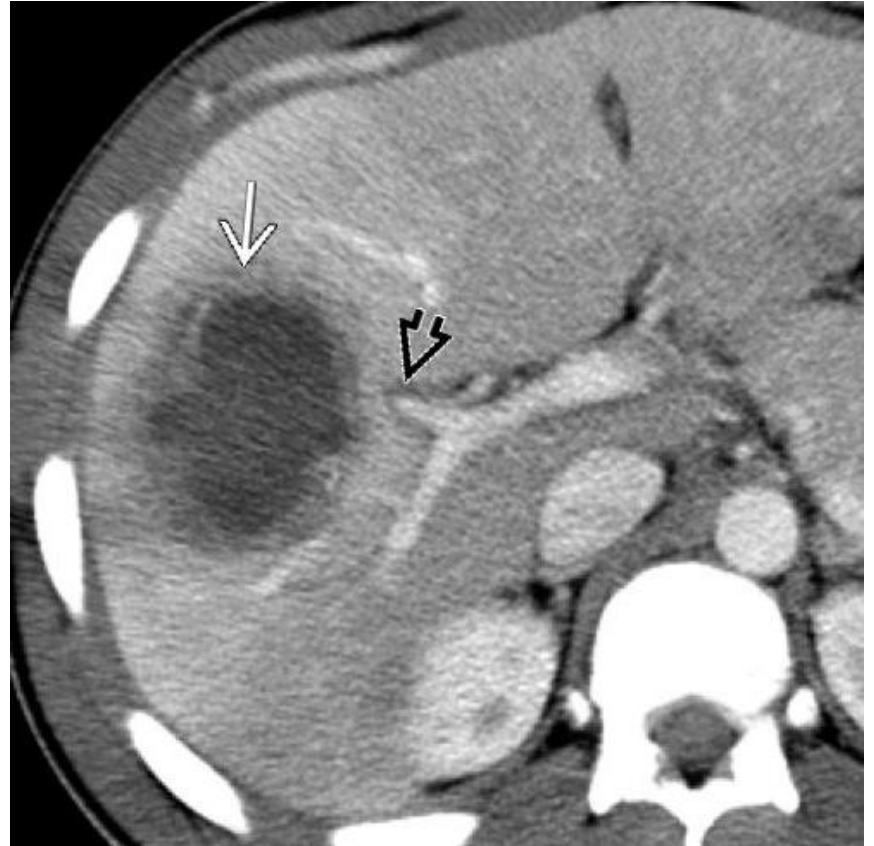
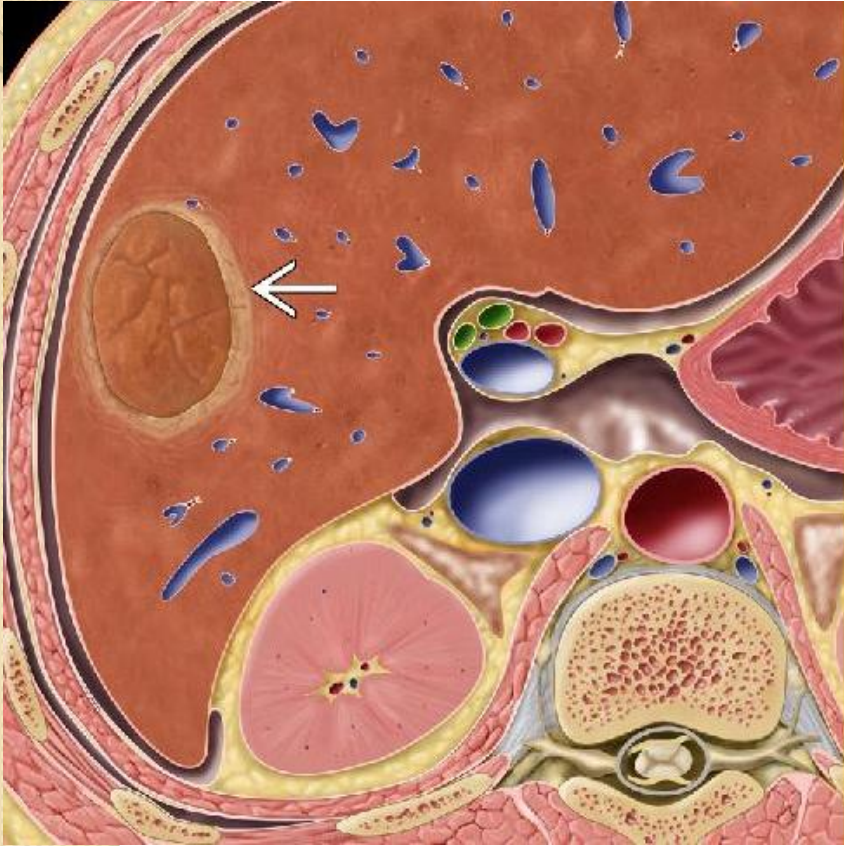
Bile leaks out of the gallbladder

# Biliary Trauma

## Radiographic Findings

- Radiography: Biliary-enteric fistula: Pneumobilia
- ERCP To evaluate level, length, contour of strictures
- Post-traumatic strictures typically focal, smooth areas of narrowing with proximal dilation ERCP can facilitate definitive diagnosis and treatment of bile leaks and simple strictures
- Visualization and cannulation of fistula orifice; permits good-quality cholangiographic evaluation. May see active bleeding coming from major papilla
- Fluoroscopic Findings: Biliary-enteric fistula: Barium filling of biliary tree
- Nonionic or oil-based contrast material is indicated when biliary-bronchial fistula is suspected
- CT Findings Helical CT cholangiography or after IV administration of biliary contrast material to verify and localize bile duct leakage. May help avoid ERCP
- Biliary-enteric fistula: Oral contrast media visible in both bowel and biliary tree
- Can demonstrate extent and localization of parenchymal destruction in bilio-vascular fistula Presence of biliary dilatation, configuration of injured bile duct, and ancillary abdominal findings
- Hemobilia: Blood may appear as high-attenuation material ( $> 50$  HU) in ducts or gallbladder
- Liver laceration, hematoma, other potential sources of blood may also be detected CT-guided drainage; nonoperative management of parenchymal and perihepatic fluid collections

### 3. Amebic abscess



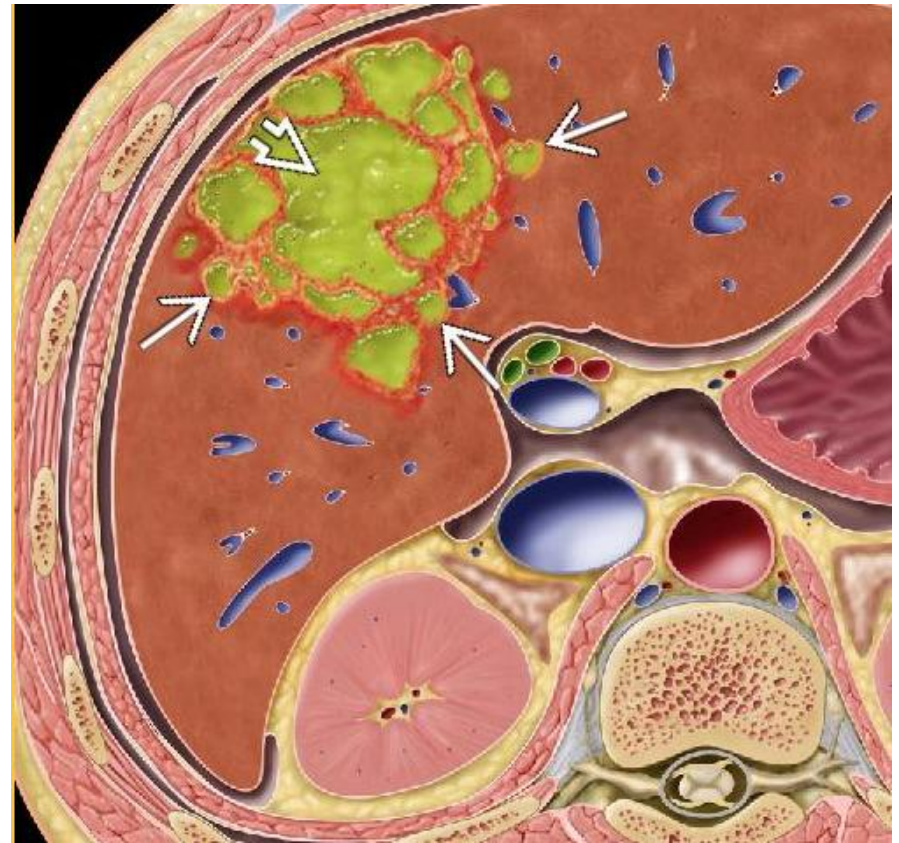
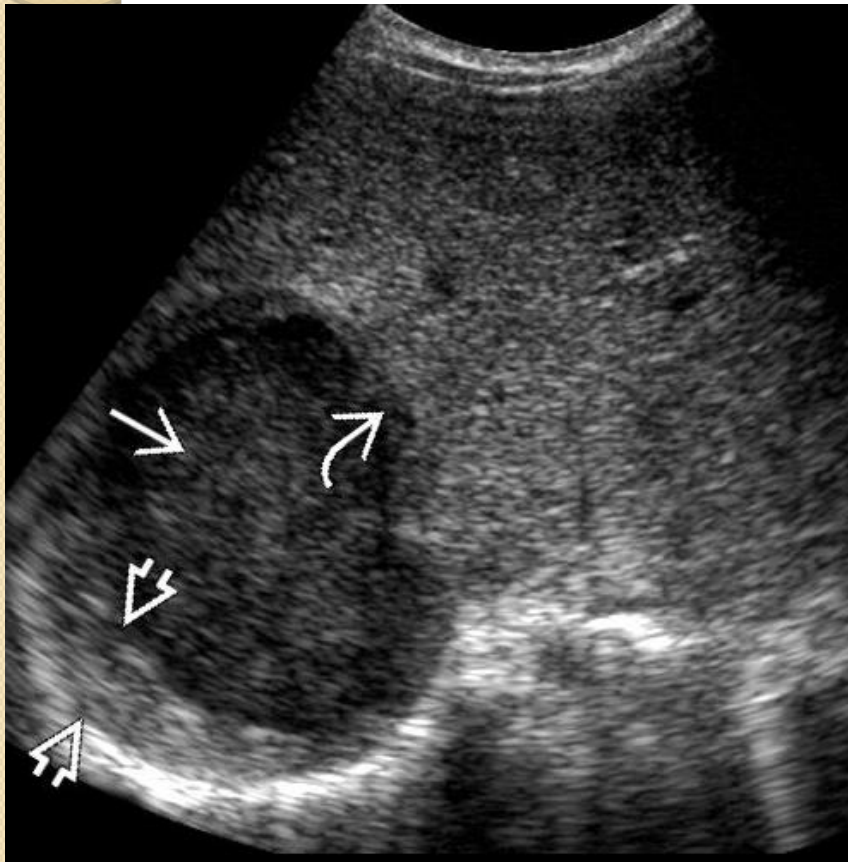
Amebic abscess has a ring surrounding the abscess unlike the pyogenic abscess

# Amebic Abscess


- General Features
  - Best diagnostic clue: Peripherally located, sharply defined, round, hypodense mass with enhancing capsule
  - Location: Right lobe (72%) > left lobe (13%) Usually peripheral
  - Size: Few mm to several cm Other general features Most often solitary (85%)
- Radiographic Findings
  - Radiography Elevation of right hemidiaphragm, RLL atelectasis or infiltrate Right pleural effusion, Ruptured amebic abscess into chest, Lung abscess, cavity, hydropneumothorax, pericardial effusion
  - Fluoroscopic Findings Contrast enema often shows changes of amebic colitis
  - CT Findings NECT: Peripheral, round/oval, hypodense mass (10-20 HU) CECT Unilocular or multilocular lesions Low-attenuation enhancement of peripheral rim or capsule (edema) May demonstrate nodularity of margins Extrahepatic abnormalities RLL atelectasis, right pleural effusion, colonic changes Rarely gastric changes Pericardial fluid if left lobe abscess ruptures into pericardium



## 4. Pyogenic abscess

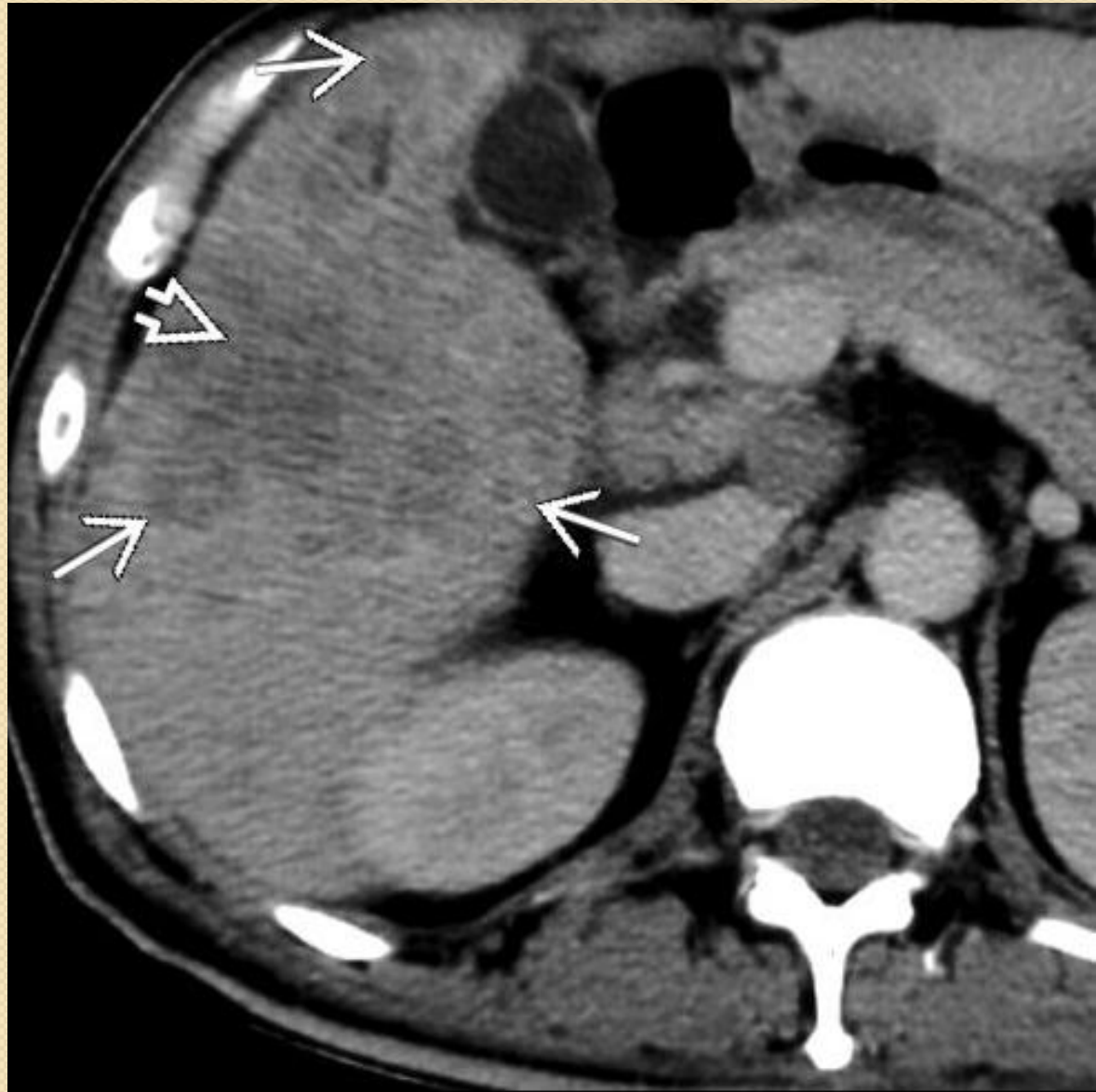




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- Pyogenic abscess: a Collection of small abscess together ( to deffrentiate between the pyogenic and amebic abscess ..The amebic abscess is surrounded by a hyper echogenic ring ).

# GENERAL FEATURES


- Best diagnostic clue: "Cluster" sign: Cluster of small pyogenic abscesses coalesce into a single large cavity
- Location: Varies based on origin
- Portal origin: Right lobe (65%); left lobe (12%); both lobes (23%) Biliary tract origin: 90% involve both lobes, close to biliary ducts
- If due to infection following an interventional procedure, the abscess is in the vicinity of the site of the procedure
- CT Findings
- NECT Simple abscess: Well-defined, round, hypodense mass (0-45 HU) "Cluster" sign
- Small abscesses aggregate to coalesce into a single big cavity, usually septated
- Complex pyogenic abscess: "Target" lesion
- Hypodense rim, isodense periphery
- Decreased HU in center
- Specific sign: Abscess with central gas
- Seen as air bubbles or an air-fluid level
- Present in less than 20% of cases
- Large air-fluid or fluid-debris level
- Often associated with bowel communication or necrotic tissue
- CECT: Sharply-defined, round, hypodense mass
- Rim- or capsule- and septal-enhancement
- Right lower lobe atelectasis & pleural effusion.
- Non-liquified infection may simulate hypervascular tumor



# 5.Fatty liver

- Terminology
- Steatosis metabolic complication of variety of toxic, ischemic, and infectious insults to liver
- Imaging Diffuse (more common) or focal fatty infiltration
- Decreased signal intensity of liver on T1 opposed-phase GRE images
- Often lobar, segmental, or wedge-shaped. More common along hepatic vessels, ligaments, and fissures
- Presence of normal vessels coursing through "lesion" (fatty infiltration)
- Imaging cannot determine etiology of steatosis
- NECT: Liver attenuation < spleen
- US: ↑ echogenicity, ↑ attenuation of sound beam
- Top Differential Diagnoses: Hepatitis, Diffuse lymphoma, or other tumor




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- Causes :
  - 1- high fat diet
  - 2- Alcoholism
  - 3- Chemotherapy



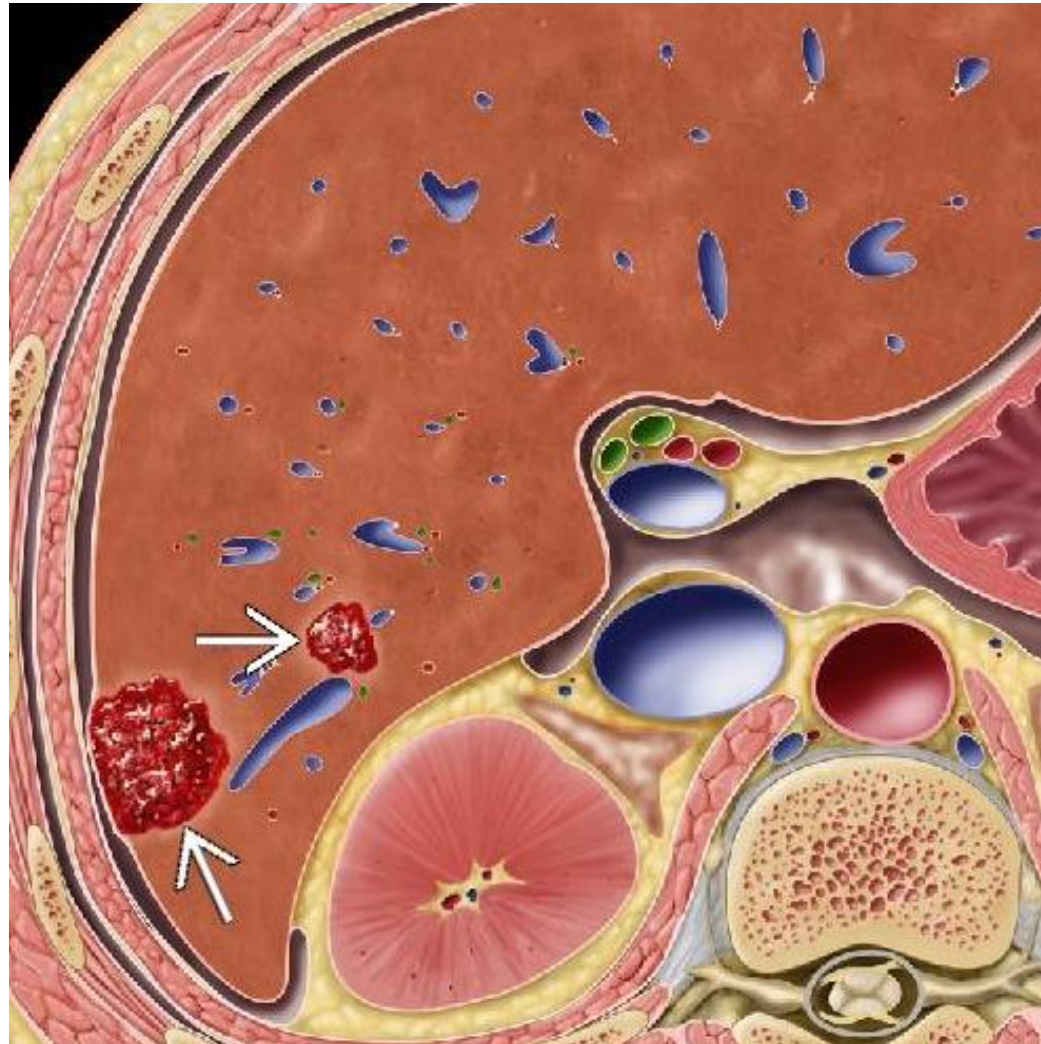
Right ultrasound: hyperechoic  
Left CT: hypodense



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- Fatty liver either **focal** or **diffused**
  - on the slide is focal fatty liver .. the fatty liver differ from the mass that the mass push the surrounding structures away.

# 6. HEPATIC CAVERNOUS HEMANGIOMA

- Terminology: Benign tumor composed of multiple vascular channels lined by a single layer of endothelial cells supported by thin fibrous stroma
- Imaging Findings
  - Best diagnostic clue: Well-defined, uniformly hyperechoic mass
  - Echogenicity depends on plane of scanning, direction & angle of insonation
  - Always found next to a vessel which it displaces but does not infiltrate
  - Hyperechoic mass (in over two-thirds of patients)
  - May appear hypoechoic in a fatty liver
  - Homogeneous echotexture: More likely heterogeneous in large lesions
  - Smooth borders: May be lobulated in large lesions
  - Occasionally see posterior acoustic enhancement
  - May show vessels in periphery of tumor
  - No visible color Doppler flow in center of lesion (flow too slow to be detected) Flow pattern is nonspecific
  - Contrast-enhanced Doppler US demonstrates the same filling-in phenomenon as seen on CECT
- Top Differential Diagnoses: Hepatocellular Carcinoma (HCC), Metastases Steatosis
- Diagnostic Checklist: Hemangioma may look different at different times of scanning due to the rate of blood flow within the lesion



**Bloody sacs  
collect  
together to  
form a  
mass and it  
pushes the  
vessels.**



In Ultra sound  
Hyper  
echogenic  
mass



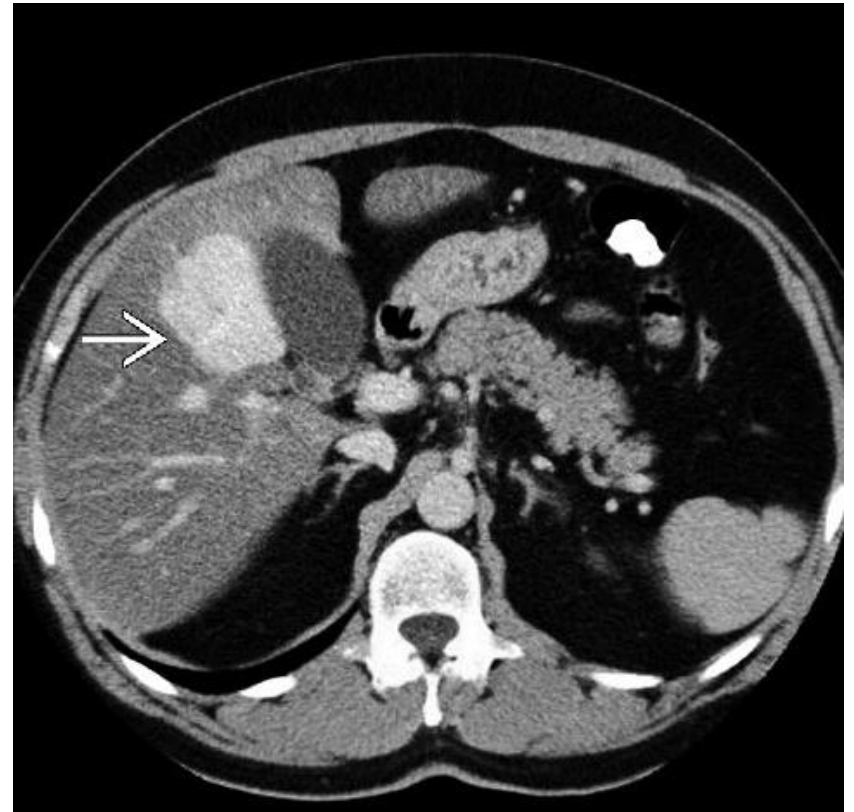
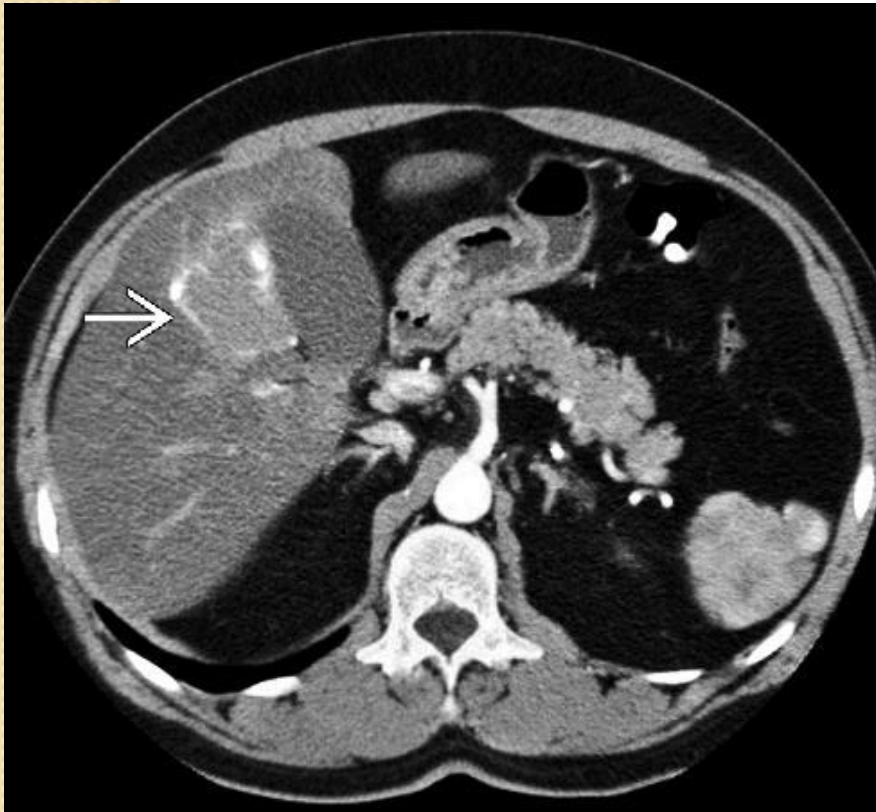
# Hemangioma






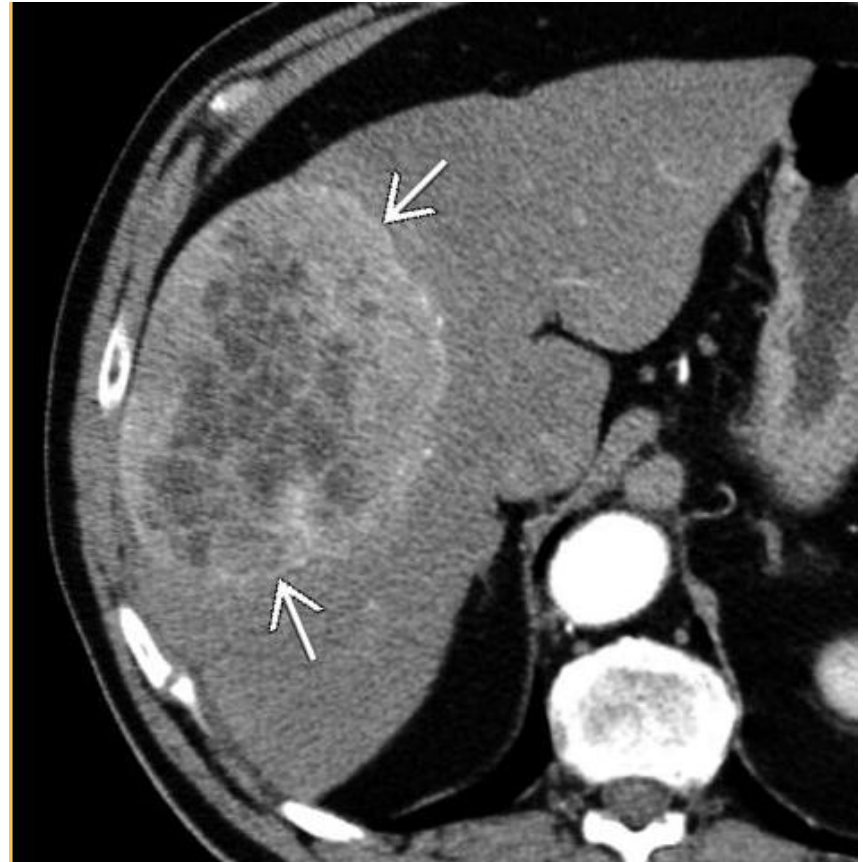
- On CT ..
- When patient is giving a contrast and scanned after 20 sec. the contrast will be in the arteries ( arterial “early” phase ) → Rt. Picture ( hyper dense dots)
- And after some time the contrast will reach the veins ( venous “delayed” phase ) → the lesion is diffused

# Hemangioma CT



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- left picture → Arterial phase “early”
  - Right picture → venous phase “delayed”
  - Diagnostic feature for hemangioma

## 7. Hepatoma “HCC”



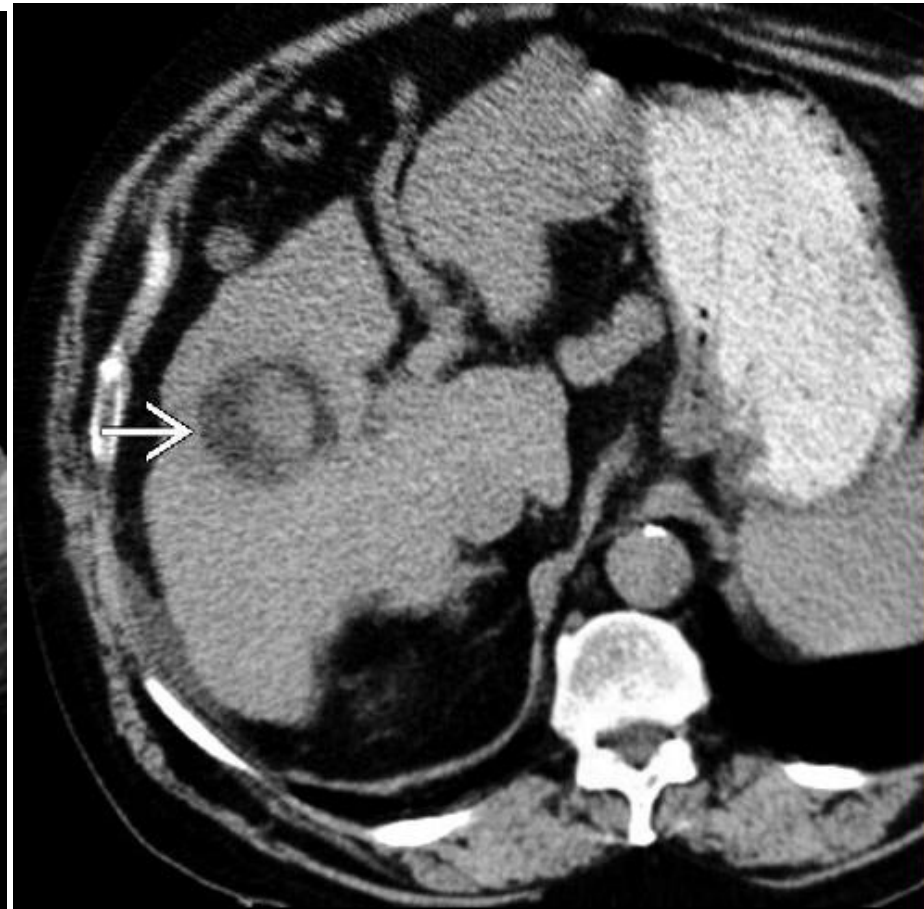
- Hepatoma don't happen in normal liver
- Happens only in abnormal liver ( cirrhosis “most common” , hepatitis ) , and have a necrosis centrally
- In the arterial “early” phase → enhancement is high
- In the venous “delayed” phase → enhancement is low ( the opposite of hemangioma )



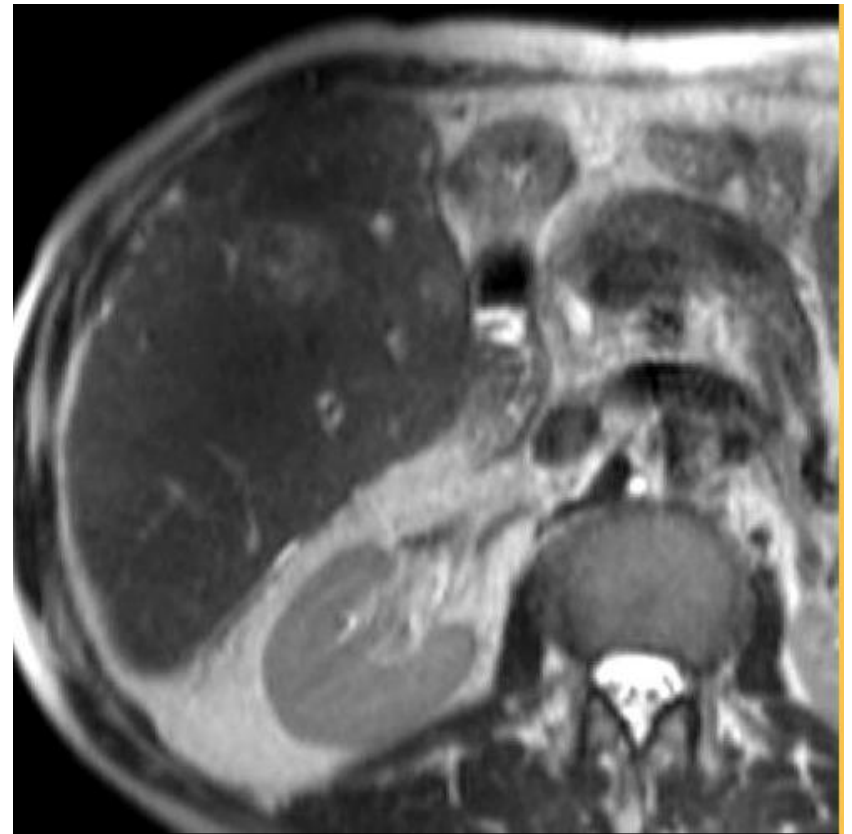
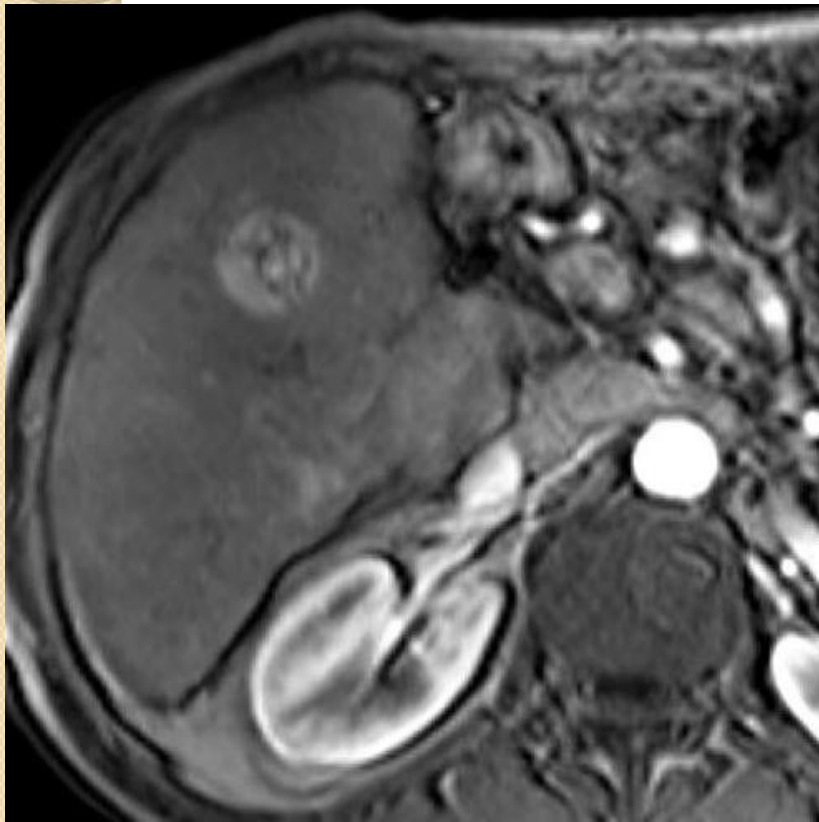
# HCC

- Imaging Findings
  - Best diagnostic clue: Large heterogeneous mass with vascular invasion (portal or hepatic vein)
  - More commonly right lobe of liver (solitary)
  - Hypoechoic: Most common appearance, especially for small HCC Indicates a solid tumor
  - Hyperechoic: Sometimes in small HCC Indicates fatty metamorphosis/hypervascularity
  - Mixed echogenicity: More common in larger HCC Indicates tumor necrosis/fibrosis Invasion of portal vein & less commonly hepatic vein may occur
- Top Differential Diagnoses: Focal Nodular Hyperplasia (FNH), Metastases Hepatic Hemangioma, Cholangiocarcinoma
- Pathology Cirrhosis (60-90%): Due to chronic viral hepatitis (HBV, HCV) or alcoholism High incidence: Africa & Asia; low in Western hemisphere
- Clinical Issues Clinical Profile: Elderly patient with history of cirrhosis, ascites, weight loss, right upper quadrant pain & ↑ alpha-fetoprotein (AFP)
- Diagnostic Checklist Any mass detected in a cirrhotic liver is regarded as HCC until proven otherwise HCC: Hypervascular mass invading portal vein

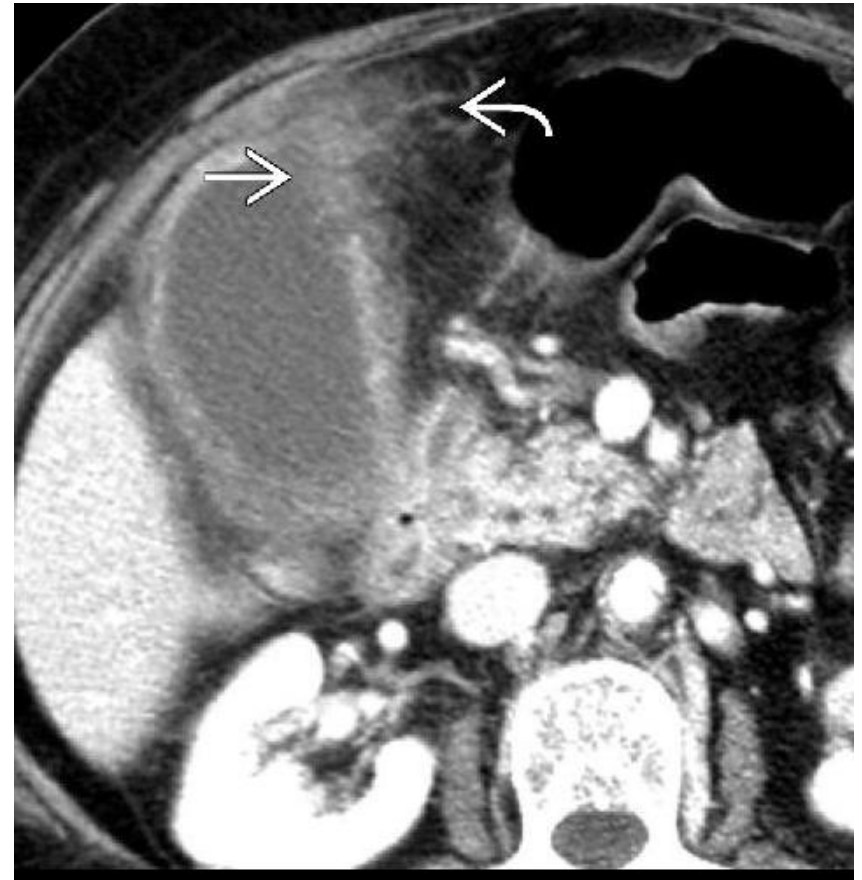
# HCC




# HCC



## 8. CHOLECYSTITIS



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- **Old females usually have cholecystitis**
  - **- Gallbladder wall is thickened ( normally 1-2mm)**
  - **- Stone seen in the ultrasound ( hyper-echoic & the acoustic shadow is there )**
  - **CT is not good in detecting gallbladder stones.**

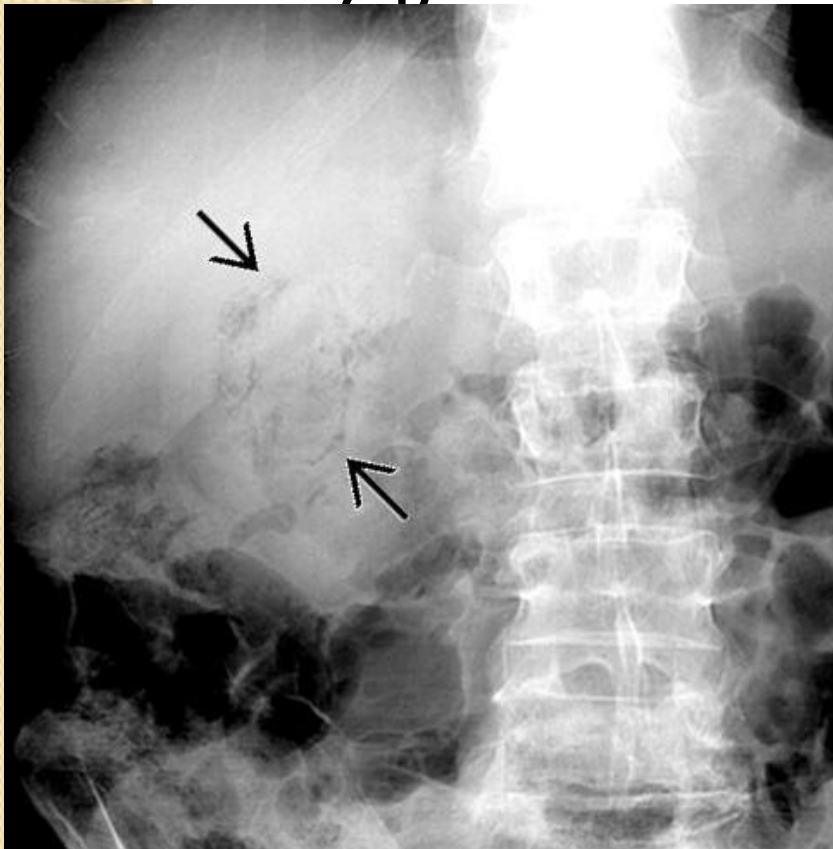


# Cholecystitis

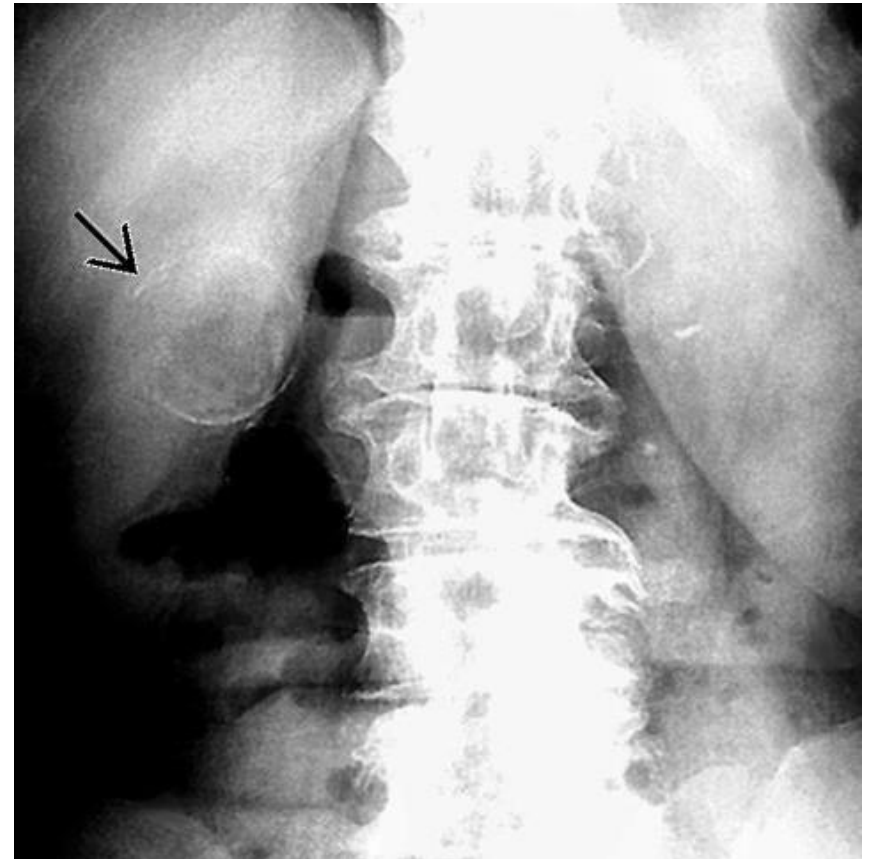
- Terminology Acute inflammation of gallbladder (GB)
- Imaging
  - US Uncomplicated: Positive sonographic "Murphy" sign; gallstone impacted in neck of GB or cystic duct; thickened GB wall ( $> 4$  mm)
  - Complicated: Gallstones; pericholecystic fluid/abscess; intraluminal membranes; gas in GB wall/lumen; sonographic
  - Murphy sign absent in 1/3 of patients; asymmetric wall thickening
  - Biliary scintigraphy Nonvisualization of GB at 4 hours has 99% specificity
  - Best imaging tool: US or biliaryscintigraphy
- Protocol advice: Longitudinal and transverse images of GB, parasagittal images of GB neck region & cystic duct in LPO position to detect impacted gallstones (i.e., immobile)
- Clinical Issues Acute RUQ pain, fever. May progress to gangrenous cholecystitis and perforation if untreated. Excellent prognosis in uncomplicated cases or with prompt surgery. Calcified stones in only 15-20% of patients with cholecystitis
- Diagnostic Checklist: Consider perforated ulcer or pancreatitis with secondary GB wall thickening, Sonographic Murphy sign must be unequivocal to be considered positive


# Cholecystitis

- EMPHYSEMATOUS GB



- PORCELAIN GB



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- Emphysematous Gallbladder → air in the gallbladder “ due to infection especially in diabetic patients “
  - Porcelain gallbladder → calcification in the gallbladder “ calcium “

## EMPHYSEMATOUS

- Form of acute cholecystitis caused by gas-forming infection in gallbladder lumen, wall, or both
- Imaging: Ranges from several bubbles to extensive intramural or intraluminal collection within GB
- Best imaging tool: CT  $\pm$  contrast
- Top Differential Diagnoses: Gangrenous cholecystitis, Gas-forming hepatic abscess, Gas in biliary tree from biliary-enteric anastomosis or sphincterotomy, Retroperitoneal gas,
- Pathology: Gas-forming gallbladder infection
- Clinical Issues: Most common signs/symptoms Fever, RUQ pain, sepsis. Other signs/symptoms: Gram-negative septic shock and peritonitis if perforation
- Diagnostic Checklist: Consider Gas-forming hepatic abscess, Retroperitoneal air Image interpretation pearls, Curvilinear gas in gallbladder wall on CT "Champagne" sign of effervescent gas bubbles on ultrasound

## PORCELAIN GB

- Curvilinear or granular calcification in gallbladder (GB) wall
- May involve entire wall or just a segment
- Echogenic curvilinear structure in GB fossa with acoustic shadowing, Coarse foci of calcification in GB wall with acoustic shadowing
- Top Differential Diagnoses: Large gallstone, Mimics porcelain GB on all modalities. Wall-echo-shadow complex = large gallstone. Cholecystitis emphysematous Echogenic crescent in gallbladder with acoustic shadowing on ultrasound mimics GB wall calcification
- CT can best distinguish gas from calcium/iodinated oil in GB wall following hepatic chemoembolization
- Pathology: Whether porcelain GB is a risk factor for gallbladder carcinoma is controversial. Uniform, thin calcification of wall without soft tissue mass, probably not significant risk
- Clinical Issues: Prophylactic cholecystectomy is recommended
- Diagnostic Checklist: Look for gallbladder mass on CT if porcelain GB identified Wall-echo-shadow sign on ultrasound can differentiate

# 9.ACUTE PANCREATITIS



CT is diagnostic with high amylase markedly inflamed hypodense pancreas

Pancreas is edematous and enlarged



# ACUTE PANCREATITIS

Terminology: Acute inflammatory process of pancreas with variable involvement of other regional tissues or remote organ systems

- Imaging: Enlarged pancreas, fluid collections, and obliteration of fat planes
- ERCP: Communication of pseudocyst with main pancreatic duct (acutely)
- CT: Focal or diffuse pancreatic enlargement Heterogeneous enhancement, nonenhancing necrotic areas
- Pathology/Etiology: Alcohol, gallstones, metabolic, infection, trauma, drugs
- Pathogenesis: Reflux of pancreatic enzymes, bile, duodenal contents, and increased ductal pressure
- Most important criterion: Presence and extent of necrotizing pancreatitis (nonenhancing parenchyma)
- Clinical Issues Patient with history of alcoholism, fever, and severe mid-epigastric pain radiating to back Increased serum amylase and lipase leukocytosis, hypocalcemia (poor prognostic sign)
- Diagnostic Checklist: Bulky, irregularly enlarged pancreas with obliteration of peripancreatic fat planes, fluid collections, pseudocyst, or abscess formation
- Rule out other pathologies, which can cause "peripancreatic infiltration"