

# The challenging conundrum of cystic lesions in liver: to treat or to observe?

EE-121



[Binit Sureka](#)<sup>1</sup>, Neelmani Sharma<sup>1</sup>, Pushpinder S Khera<sup>1</sup>, Pawan Kumar Garg<sup>1</sup>, Taruna Yadav<sup>1</sup>, Vaibhav Varshney<sup>2</sup>, Poonam Elhence<sup>3</sup>

<sup>1</sup>Department of Diagnostic & Interventional Radiology, <sup>2</sup>Surgical Gastroenterology, <sup>3</sup>Pathology & Lab Medicine

All India Institute of Medical Sciences (AIIMS), Jodhpur

# Disclosure

- Nothing to disclose
- No conflicts of interest

# Learning Objectives

- ✓ List all the cystic lesions encountered in liver (non-neoplastic and neoplastic)
- ✓ Discuss the imaging findings of each type
- ✓ Differentiate complex cystic liver lesions from necrotic hepatic tumors
- ✓ Highlight the points to differentiate neoplastic vs neoplastic cystic liver lesions
- ✓ Briefly outline the approach and discuss the management of cystic lesions

# Diagnostic modalities

Diagnostic Modality	Sensitivity/ Specificity	Strengths	Limitations
US	90/90	<ul style="list-style-type: none"> <li>· Inexpensive</li> <li>· Widely available, No radiation</li> </ul>	<ul style="list-style-type: none"> <li>· Non-contrast</li> <li>· Limited evaluation</li> </ul>
CT	>90/>70	<ul style="list-style-type: none"> <li>· Widely available</li> <li>· Contrast - provide more information</li> </ul>	<ul style="list-style-type: none"> <li>· Radiation exposure</li> <li>· Complications</li> </ul>
MRI	90-100/95-100	<ul style="list-style-type: none"> <li>· No radiation exposure</li> <li>· Contrast -provide more Information</li> </ul>	<ul style="list-style-type: none"> <li>· Expensive, Availability</li> </ul>
CEUS	80-95/83-88	<ul style="list-style-type: none"> <li>· No radiation exposure</li> <li>· Real time imaging</li> <li>· Contrast - provide more information</li> </ul>	Limited availability Expertise
Pathology	-	<ul style="list-style-type: none"> <li>· Ability to accurately detect malignant cells</li> </ul>	<ul style="list-style-type: none"> <li>· Invasive</li> <li>· Sampling error</li> <li>· Interobserver variability</li> </ul>

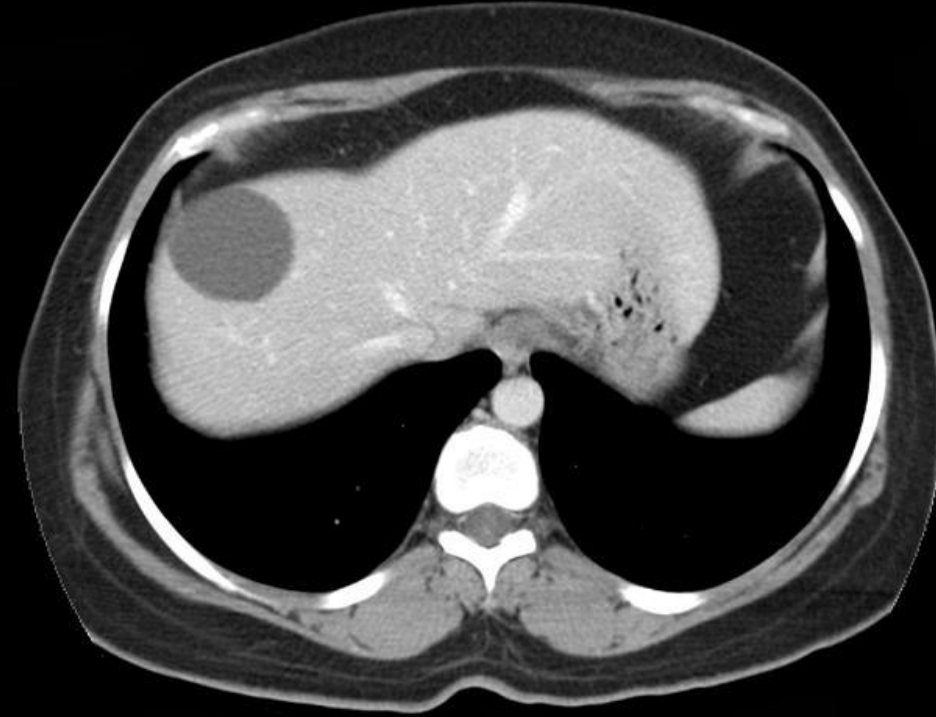
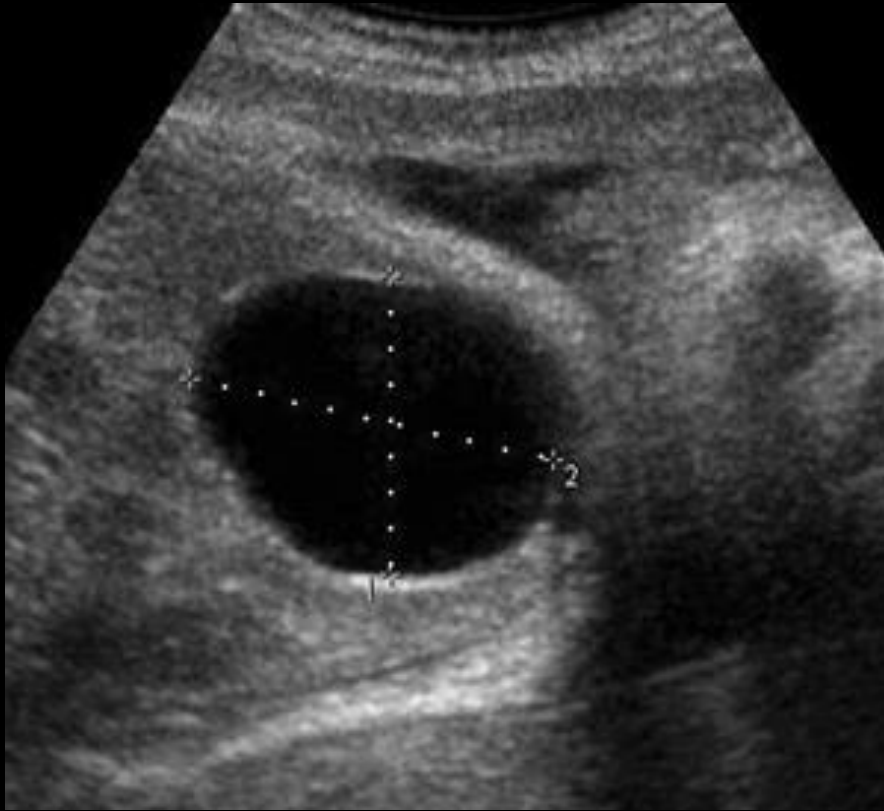
# Cystic hepatic lesions

Etiology	Lesion
<b>Non neoplastic (Developmental, Inflammatory, Trauma)</b>	<p><b>Developmental:</b> Simple cyst, Biliary hamartoma, Caroli disease, Polycystic liver disease, Ciliated foregut duplication cyst</p> <p><b>Inflammatory:</b> Pyogenic abscess, amebic abscess, Hydatid cyst, Fungal microabscesses, Intrahepatic pseudocyst</p> <p><b>Trauma related:</b> Biloma, seroma, hematoma</p>
<b>Neoplastic</b>	<p>Biliary cystadenoma and cystadenocarcinoma</p> <p>Cystic HCC</p> <p>Cystic metastases</p> <p>Undifferentiated embryonal sarcoma</p>

# Simple Hepatic Cysts

- Congenital; form from biliary ducts that do not connect to the biliary system
- Thin, smooth walls, cuboidal-epithelium, secrete bile-like fluid
- Size: < 1cm up to 30 cm
- May contain up to 2 septa
- No communication with the biliary tree
- Do not show enhancement
- Complex – hemorrhage, superinfection
- Includes congenital cyst, biliary hamartomas, Caroli disease and PCLD

# Simple Hepatic Cysts



Ultrasound image showing anechoic cystic lesion with posterior acoustic enhancement. No septations seen  
CT image showing water-attenuation simple cyst in segment VIII of liver with imperceptible walls



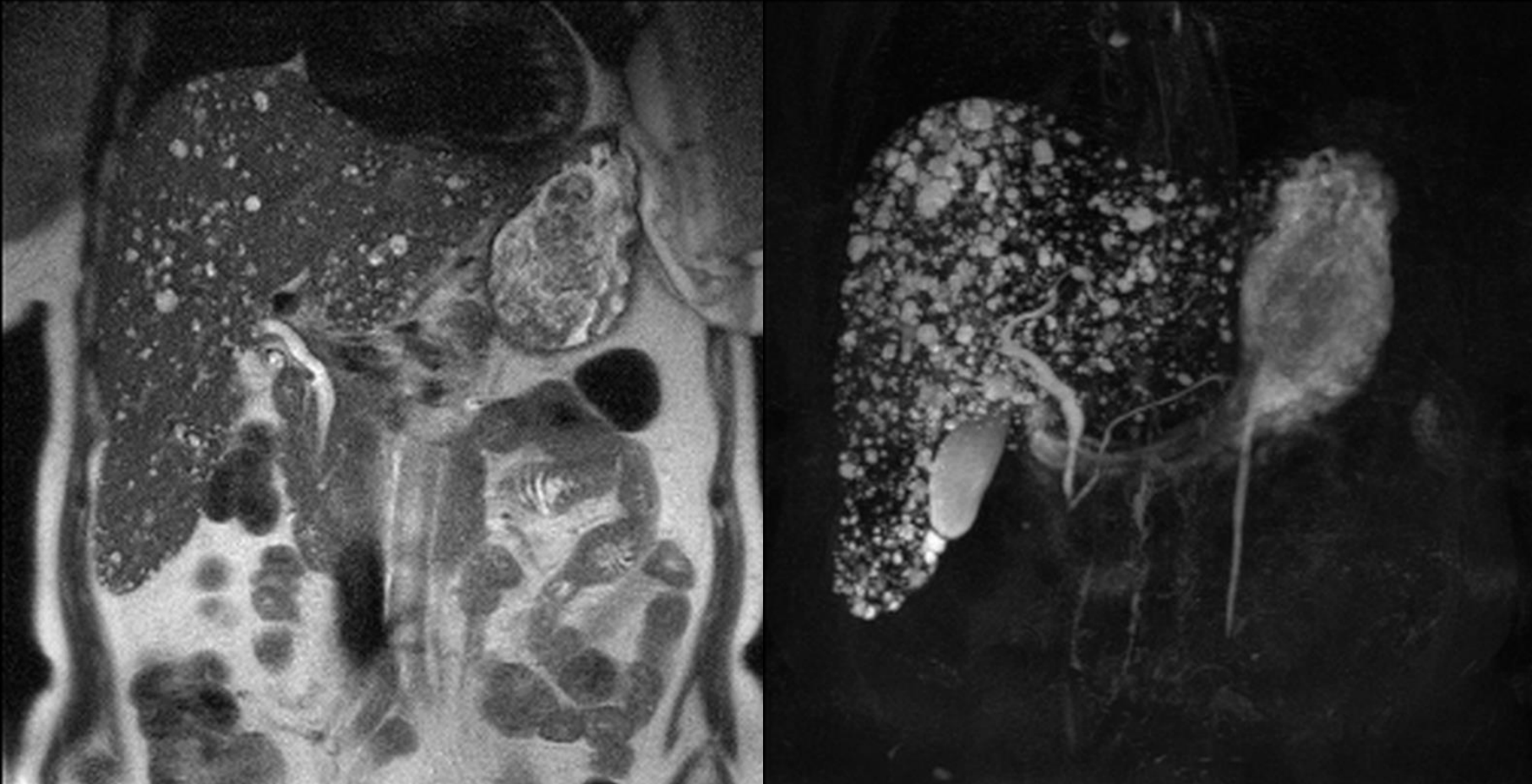
# Biliary Hamartoma

## (von Meyenburg Complex)

- Caused by ductal plate malformation
- Small round/irregular lesions with predilection for subcapsular region
- Imaging: simple cystic appearance, < 15mm, no communication with biliary system, no diffusion restriction on DWI sequences
- Atypical imaging: hypo/hyperechoic, peripheral enhancement, eccentric nodular enhancement
- **DD: metastases, microabscesses, Caroli disease, multiple simple cysts**



# Biliary Hamartoma (von Meyenburg Complex)



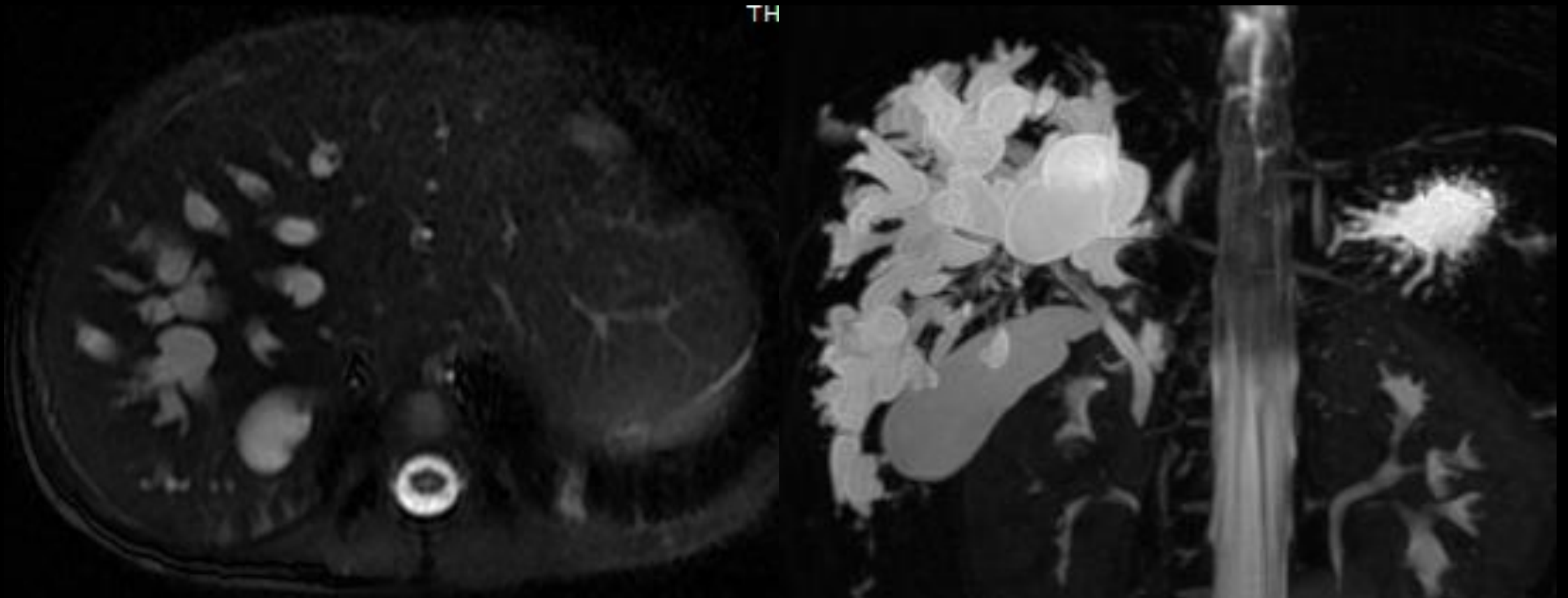
Coronal T2-weighted MR image and 2D-MRCP image showing multiple tiny T2-hyperintense cystic lesions studded in liver parenchyma which do not communicate with the biliary tree

**Associations: ADPKD, Polycystic liver disease**

# Caroli disease

- Ductal plate malformation – large ducts (AR inheritance)
- Todani classification – type V
- Saccular dilatation of large intrahepatic ducts
- Associations - biliary hamartomas, polycystic liver disease, hepatic fibrosis (Caroli syndrome), polycystic kidney disease, renal tubular ectasia, ARPKD
- Complications – recurrent cholangitis and abscess, stone formation, cholangiocarcinoma (7%), secondary biliary cirrhosis, portal hypertension
- Imaging – communication with the biliary tree, *central dot sign*
- DD – PCLD, biliary hamartomas, PSC, RPC, distal obstruction

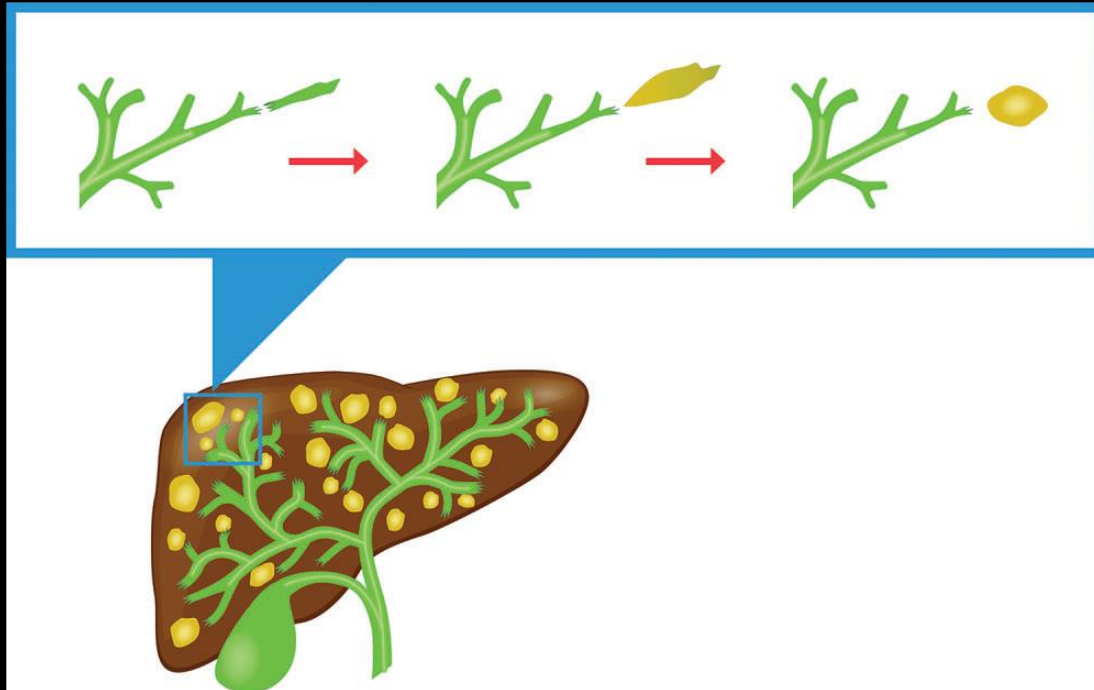
# Caroli disease



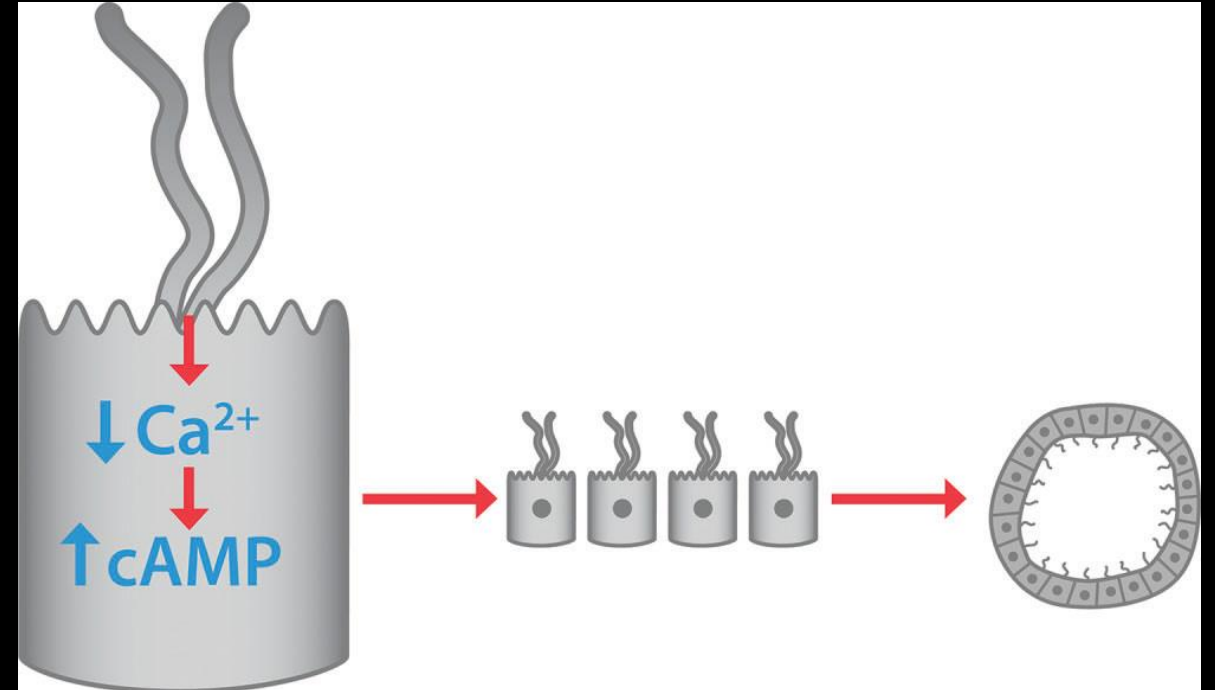
Axial T2-weighted MR image and 3D- MRCP image showing saccular dilation of intrahepatic bile ducts communicating with the biliary tree

# Polycystic Liver Disease

Isolated PCLD (AD) and associated with ADPKD (PCLKD)



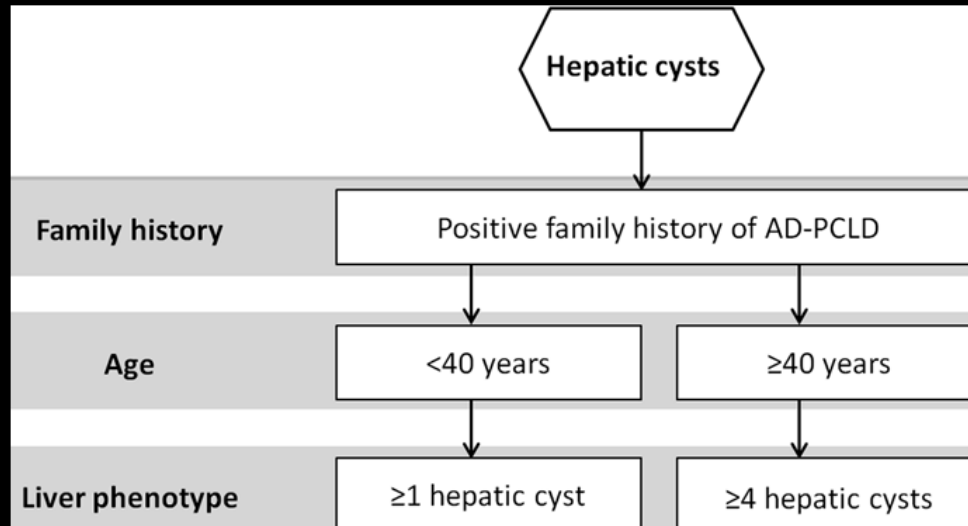
Detachment of retained abnormal bile ducts  
which dilate to form cysts



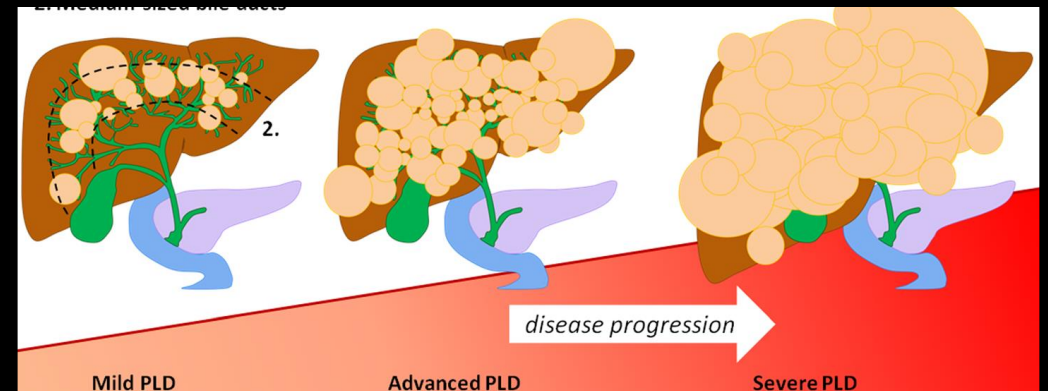
Defect in biliary cilia, leading to hyperproliferation  
of cholangiocytes and generation of cysts

# Polycystic Liver Disease

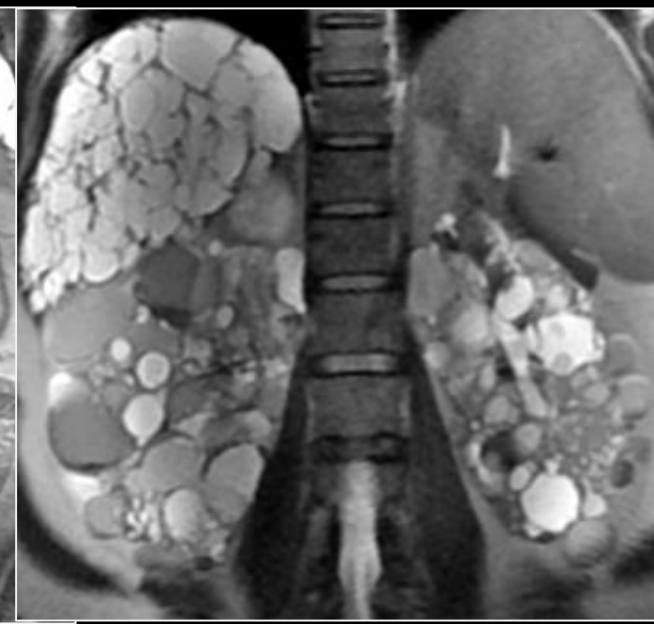
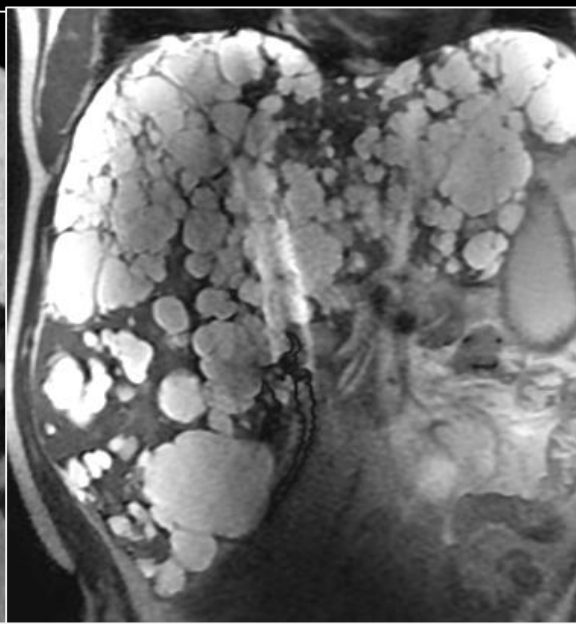
## Reynolds criteria for PCLD



- Two types: intrahepatic, peribiliary
- Typically > 20 cysts
- Complications – hemorrhage, rupture, infection, PHTN, mass effect







**Adult Polycystic Liver Kidney Disease  
(APLKD)**

**Polycystic Liver Disease (PLD) with  
normal kidneys**



# Simple Vs Complex cysts

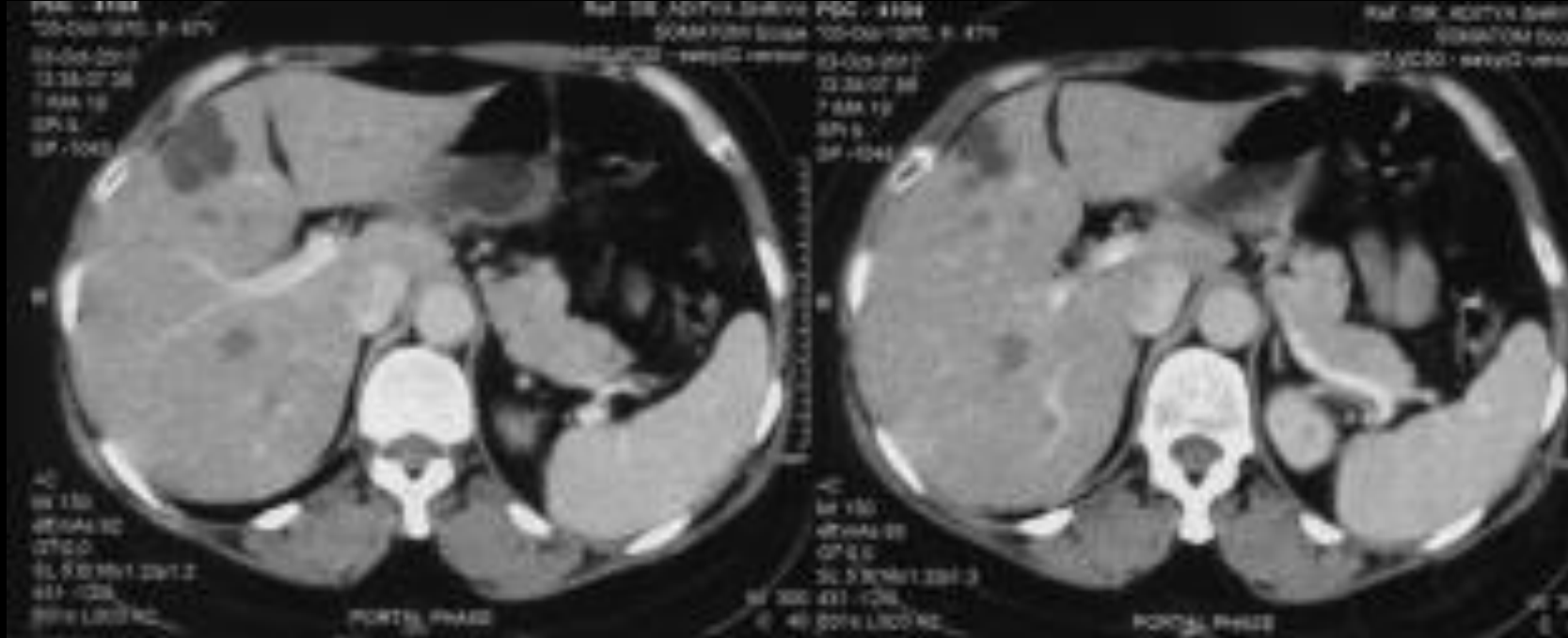
Simple	Complex
<ul style="list-style-type: none"><li>✓ Thin, smooth walls</li><li>✓ May contain up to two septae</li></ul>	<ul style="list-style-type: none"><li>✓ Septated (&gt; 3 septae)</li><li>✓ Septal enhancement</li><li>✓ Mural irregularity or nodularity</li><li>✓ Debris</li><li>✓ Calcification</li><li>✓ Fluid levels</li></ul>



# Ciliated hepatic foregut duplication cyst

- Arise from the embryonic foregut
- Lined by ciliated pseudostratified columnar epithelium
- Discovered incidentally
- **Imaging: solitary nonenhancing, < 3cm, subcapsular, segment IV, V, VIII**
- Rarely malignant transformation to squamous cell carcinoma
- Worrisome – symptomatic, > 4cm, solid component, septations
- DD – simple hepatic cyst, hydatid cyst

# Ciliated hepatic foregut duplication cyst



Contrast-enhanced CT image showing lobulated cystic lesion in Segment IV of liver which is subcapsular in location

# Pyogenic Liver Abscess

- Typical presentation – fever and RUQ pain (*Klebsiella pneumonia*, *Escherichia coli*, and *Staphylococcus*)
- Imaging: well-defined, low-attenuation round lesion with enhancing peripheral rim
- Single nonloculated fluid collection, single multiloculated cystic mass, solid (phlegmonous), multifocal lesions
- Double target sign – inner and outer layer
- Cluster sign with THAD
- Turquoise sign – thin arborizing internal septae
- DD – Hepatic tumor, absorbable hemostatic material

# Pyogenic Liver Abscess

Liver Abscess	Necrotic Hepatic Tumor
<ul style="list-style-type: none"><li>• Layered wall enhancement</li><li>• Early inner rim enhancement that persists in delayed phases and progressive delayed enhancement of the outer layer</li><li>• THAD</li><li>• Perilesional edema</li><li>• MR – Diffusion restriction (central in small and peripheral/mixed in large)</li><li>• Short interval follow-up after course of antibiotics in doubtful cases</li></ul>	<ul style="list-style-type: none"><li>• Wall nodular</li><li>• No perilesional edema</li><li>• Central progressive enhancement and simultaneous capsular washout</li><li>• Ancillary features - capsular retraction, biliary duct dilatation, lobar or segmental atrophy</li><li>• MR – DR (peripheral and within internal septations)</li></ul>

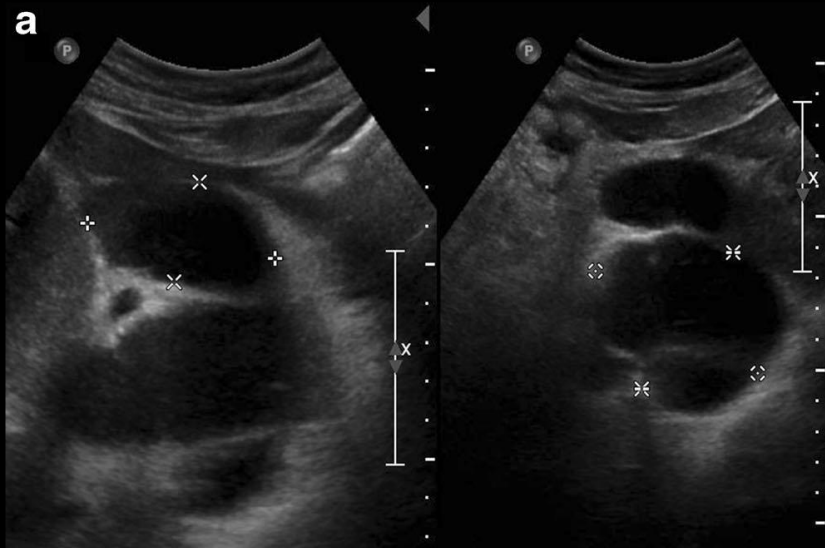
# Pyogenic Liver Abscess



Contrast-enhanced CT images showing hypoattenuating cystic lesion with thick-irregular walls and internal septations with perilesional edema suggestive of liver abscess

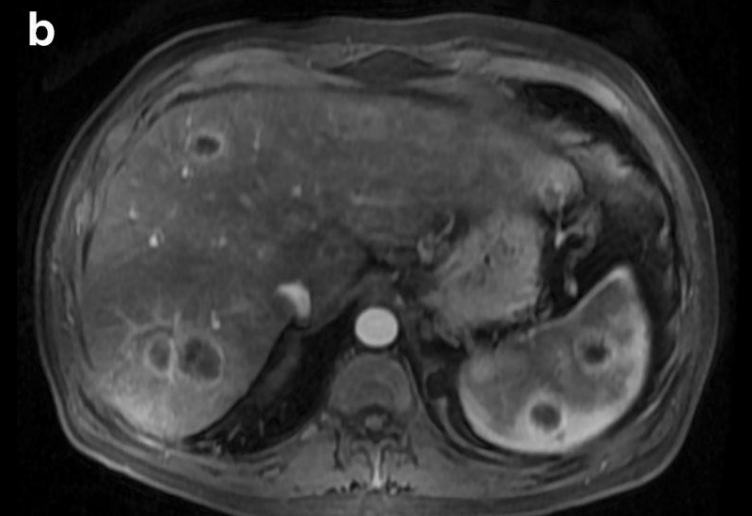
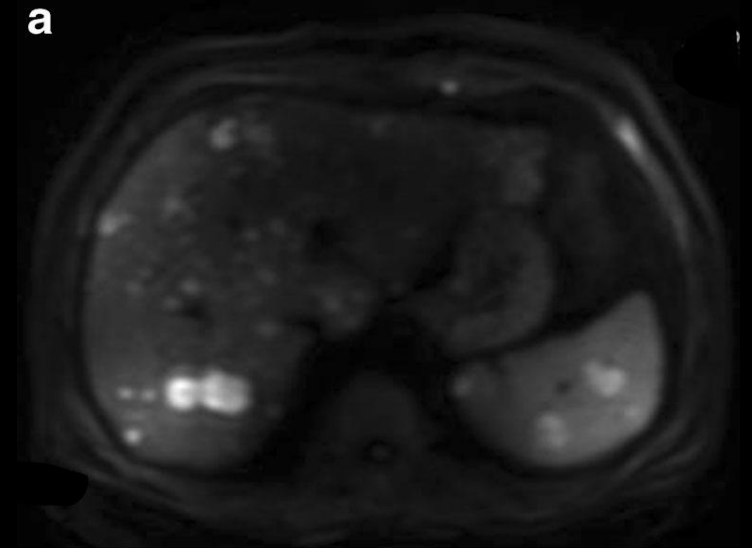
## The imaging conundrum of hepatic lymphoma revisited

S. Rajesh<sup>1</sup> · Kalpana Bansal<sup>1</sup> · Binit Sureka<sup>1</sup> · Yashwant Patidar<sup>1</sup> · Chhagan Bihari<sup>2</sup> · Ankur Arora<sup>1</sup>



Case 1

Mimickers of abscess  
2 different Cases of  
lymphoma



Case 2

# Amebic Liver Abscess

- *Entamoeba histolytica*
- Mortality – 30% if untreated
- Imaging differentiation from pyogenic abscess is difficult
- Imaging – solitary, unilocular, right lobe, posterior segments, low-level internal echoes, close to liver capsule
- **Extrahepatic extension** – diaphragmatic rupture, right pleural effusion, pericardial effusion, intraperitoneal rupture, gastric or colonic involvement, RP extension



# Amebic Liver Abscess



Contrast-enhanced CT images showing hypoattenuating cystic lesion with thick-irregular walls. Also seen is thickening of ascending colon (Amoeboma)

# Hydatid Cyst

- *Echinococcus granulosus*
- Developing and underdeveloped regions, contact with sheep
- **Four patterns:** simple cyst with no internal architecture, cyst with daughter cysts and a matrix, calcified cyst, complicated cyst
- Cysts appear in liver 3-4 weeks after infection

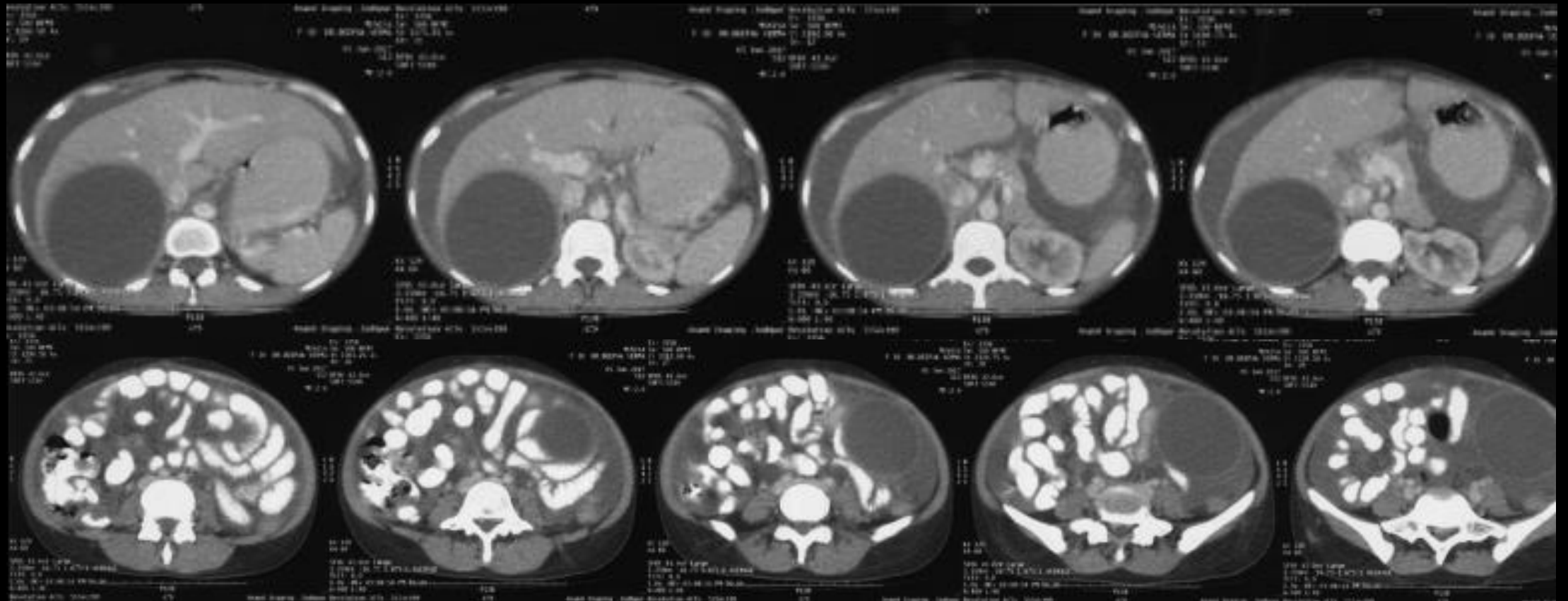
Cystic lesion (CL)	Unilocular cyst, no wall (active)
<i>E granulosus</i> cyst (CE) type 1	Unilocular cyst, wall +, hydatid sand “snowstorm sign” (active)
CE type 2	Daughter cysts “spoke-wheel pattern” (active)
CE type 3	Unilocular cyst with floating membranes “water lily sign” (active)
CE type 4	Cyst with mix hypo and hyperechoic contents “ball of wool sign” (inactive)
CE type 5	Cyst with partial/complete calcification (inactive)

# Hydatid Cyst

## (Differential Diagnosis and Pitfalls)

Simple liver cyst	Hydatid - hydatid sand, focal or segmental thickening of the cyst wall, coexistent echinococcal cysts in the spleen or lungs, pericystic biliary dilatation, segmental or lobar liver atrophy, satellite cysts, and oval cyst shape
Complicated or hemorrhagic liver cyst	Hydatid - bleeding into a hydatid cyst is an extremely rare complication
Giant Biliary hamartoma	> 2cm, propensity to bleed, adjacent small hamartomas in liver, lobulations, peripheral enhancement
Biliary cystadenoma	Hydatid – avascular Enhancement of internal septa and wall nodules

# Hydatid Cyst (CE Type 1)



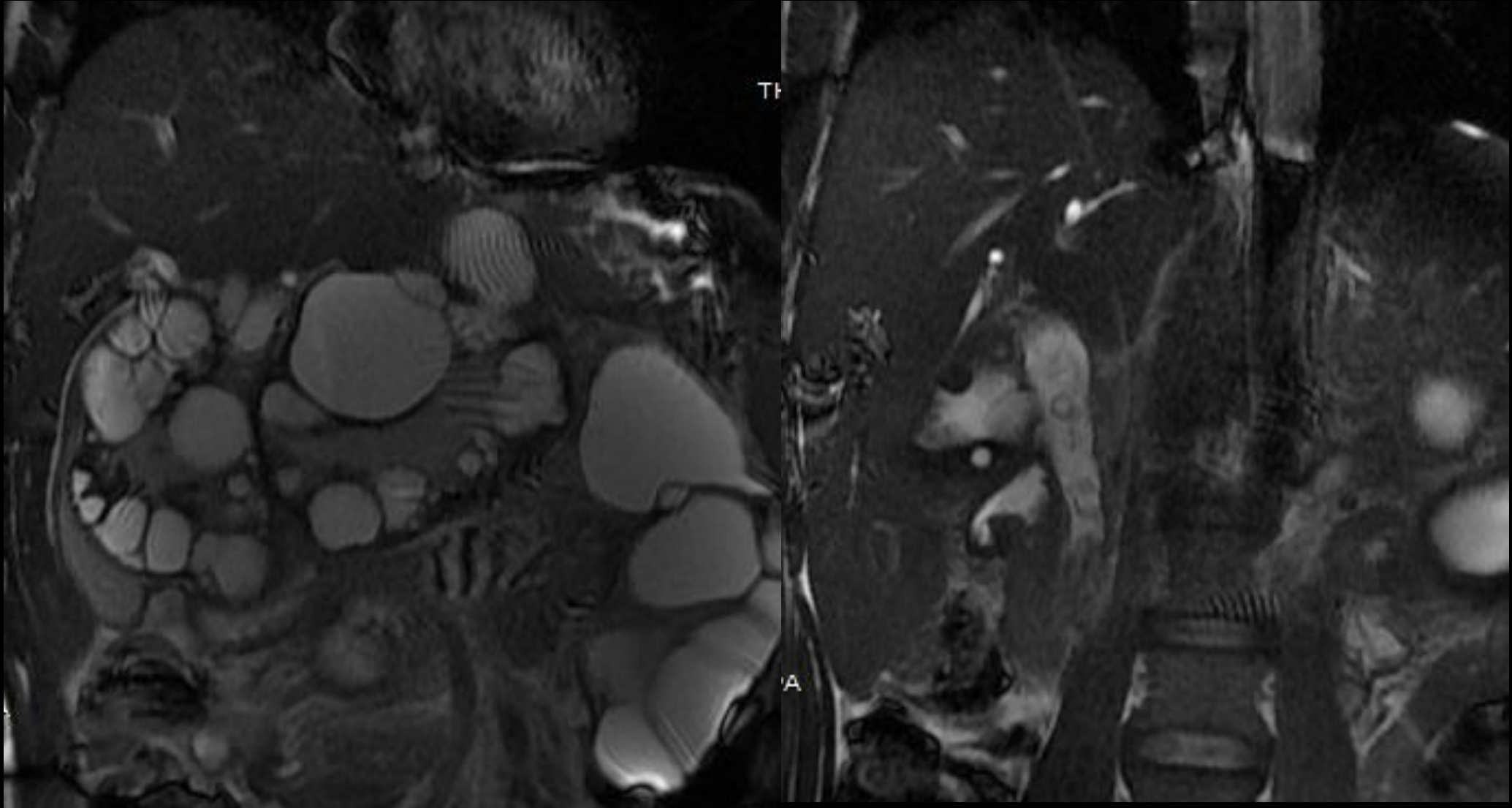
# Hydatid Cyst (CE Type 1)

## Dumbbell shaped cystic lesion with biliary dilatation

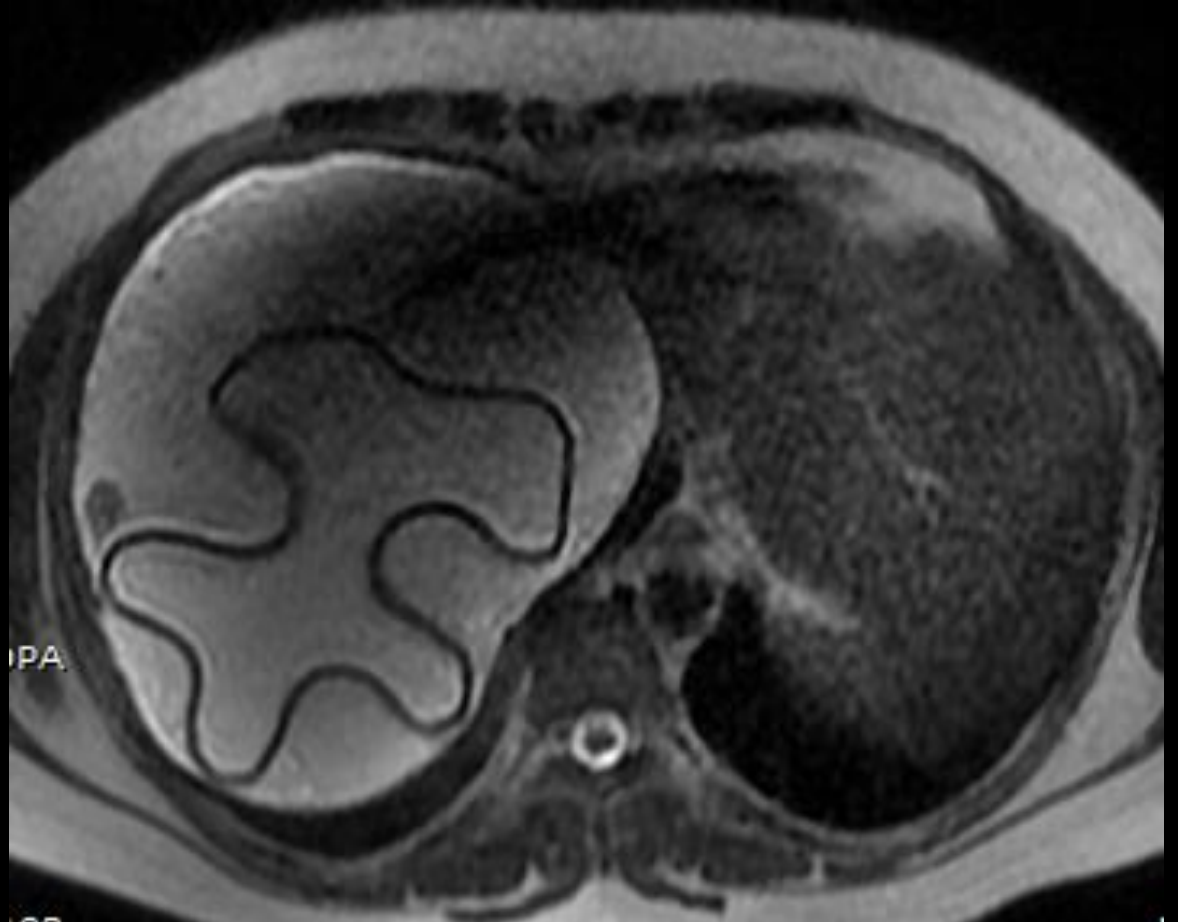
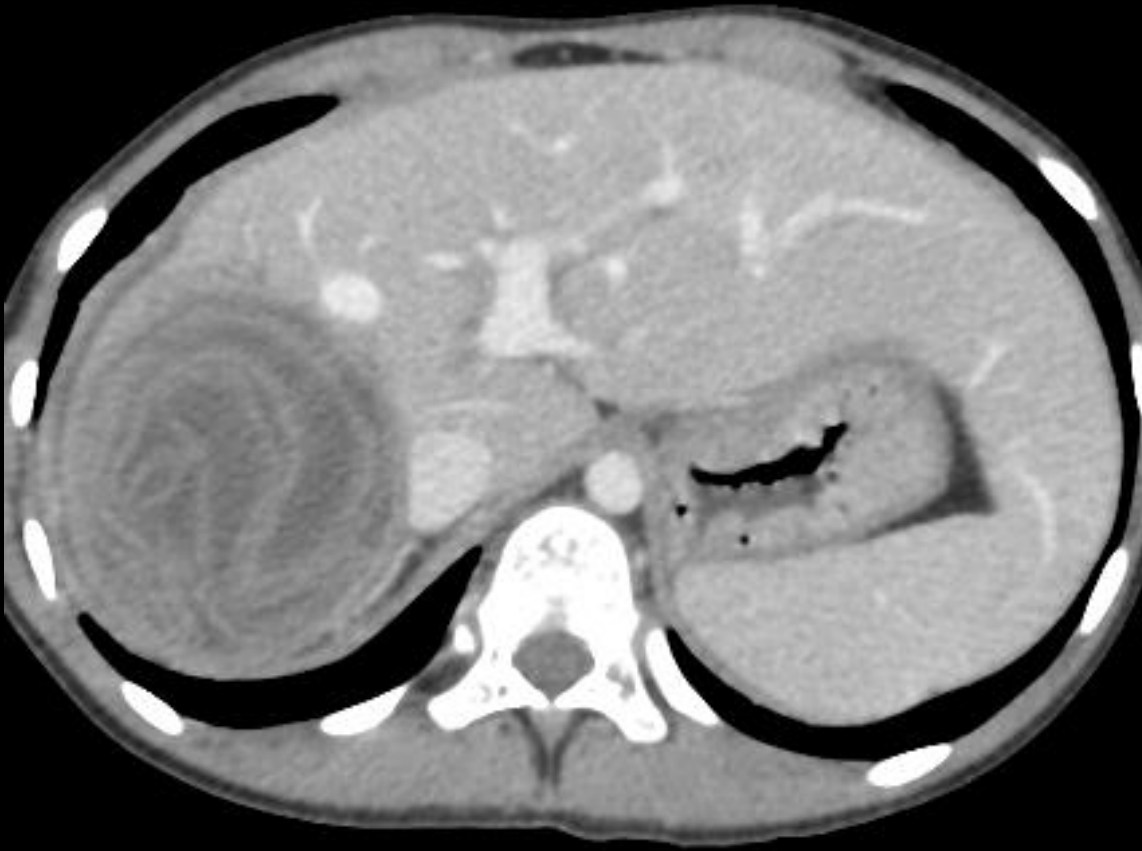




# Hydatid Cyst (CE Type 2)



# Hydatid Cyst (CE Type 3)





# Hydatid Cyst (CE Type 4 and 5)

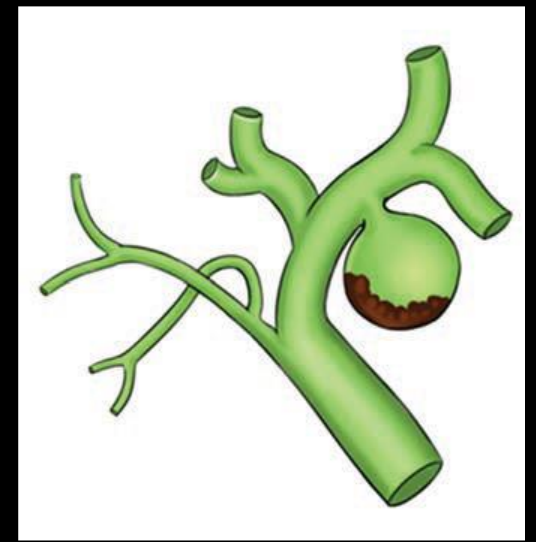
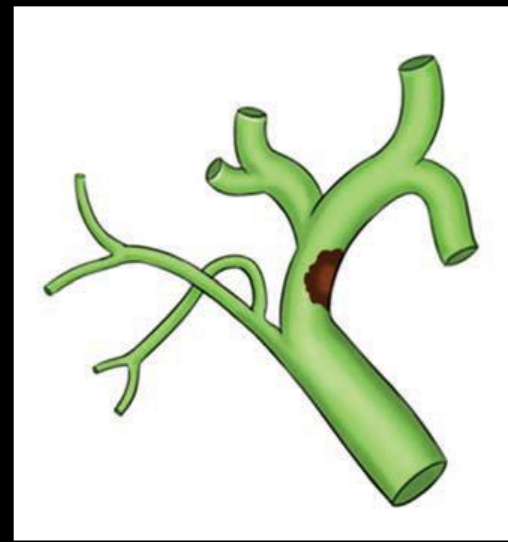
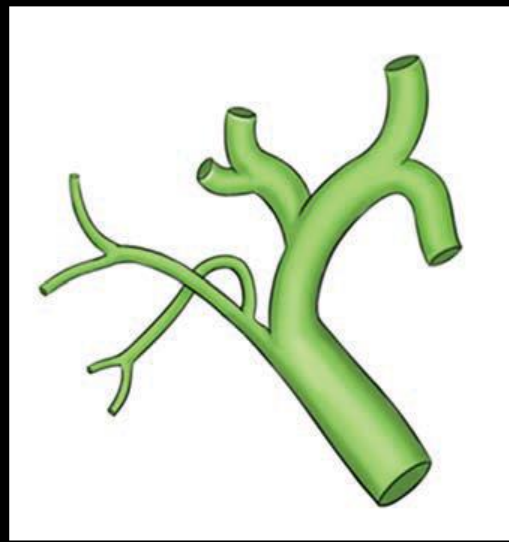
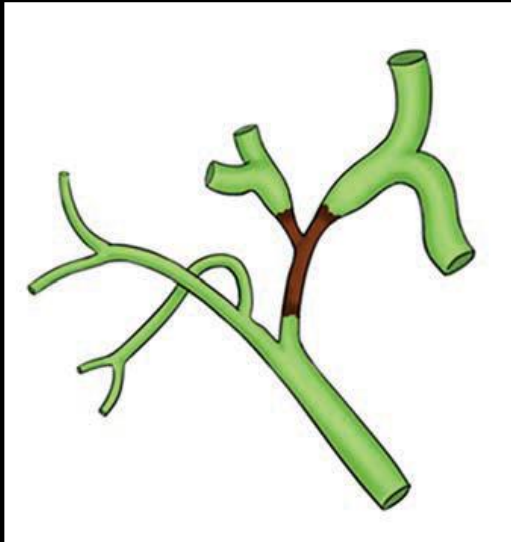


# Neoplastic cysts

- Mucinous cystic neoplasm - Biliary cystadenoma, cystadenocarcinoma, intraductal papillary neoplasms (IDPNs)
- Cystic HCC
- Cystic metastases
- Undifferentiated embryonal sarcoma

# Mucinous cystic neoplasm

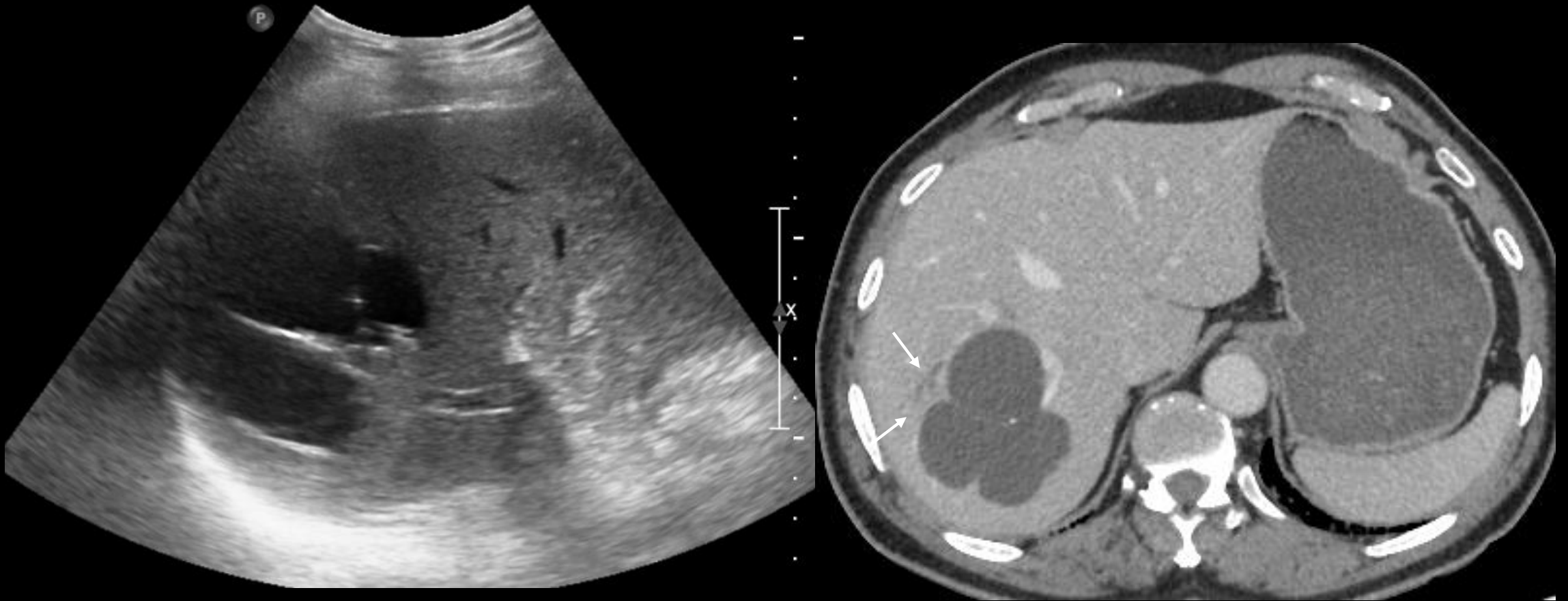
- BCA and BCAs - mucin-producing epithelium, ovarian-type stroma
- IDPNs - lack ovarian-like stroma in the cyst wall, communication with bile duct



# Mucinous cystic neoplasm

Features	Mucinous cystic neoplasm	IDPN of bile duct	Simple cyst
Septa	+	+	+
Central septa	+	+	±
Mural nodules	+	++	-
Upstream bile duct dilatation	+	++	±
Downstream bile duct dilatation	-	+	-
Calcification	±	±	±
Bile duct communication	-	+	-
Mosaic pattern	+	-	-
THAD	+	-	-
More than 3 cysts in liver	-	-	++

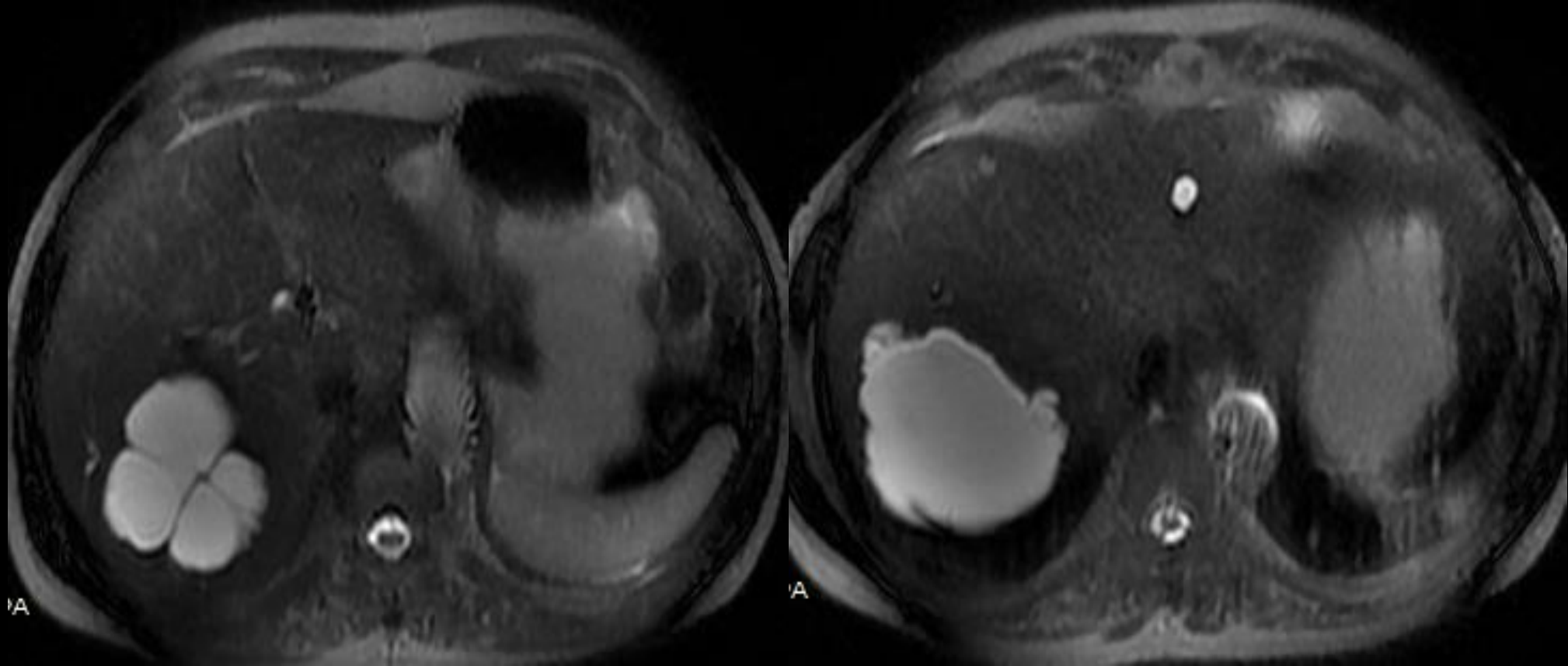
# Biliary Cystadenoma



US showing lobulated complex cystic lesion with thin septations  
Contrast-enhanced CT images showing lobulated cystic lesion with thin septations and fine speck of calcification with surrounding mild biliary dilation (arrows)



# Biliary Cystadenoma



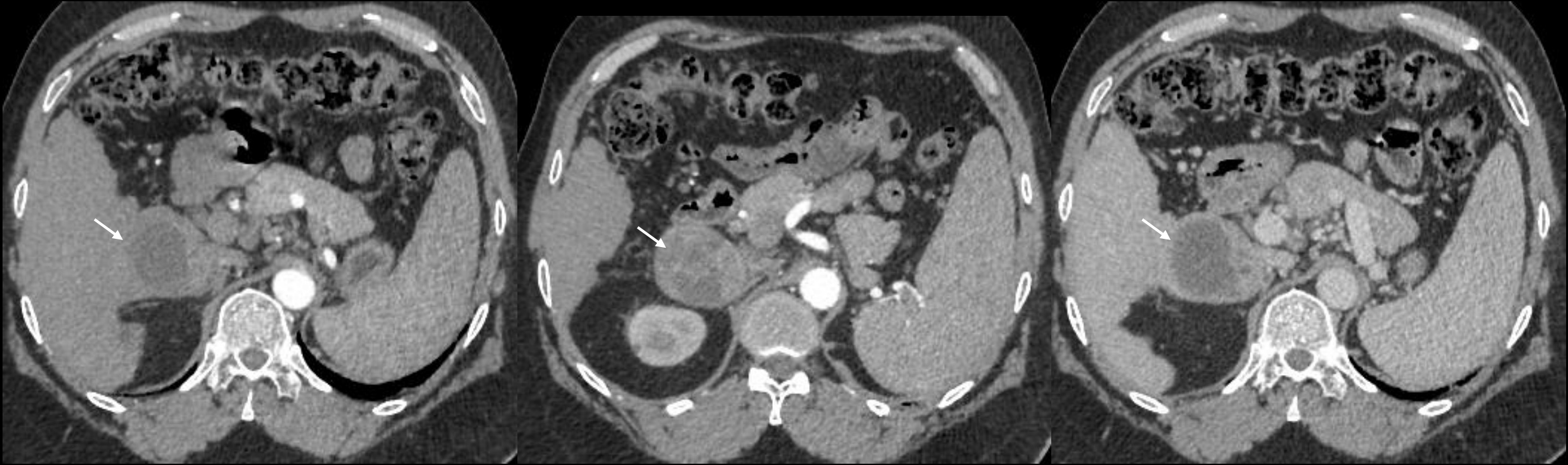
T2-weighted axial MR images showing lobulated T2-hyperintense cystic lesion with thin septations and surrounding ectatic bile ductules

# Cystic Hepatocellular Carcinoma

- Very rare presentation of HCC
- Extensive necrosis/hemorrhage
- Liquefactive necrosis after locoregional treatment
- Peripheral enhancement, solid component enhancement similar to HCC, abnormal internal vessels or a variegated pattern in nodule, background liver disease



# Cystic Hepatocellular Carcinoma



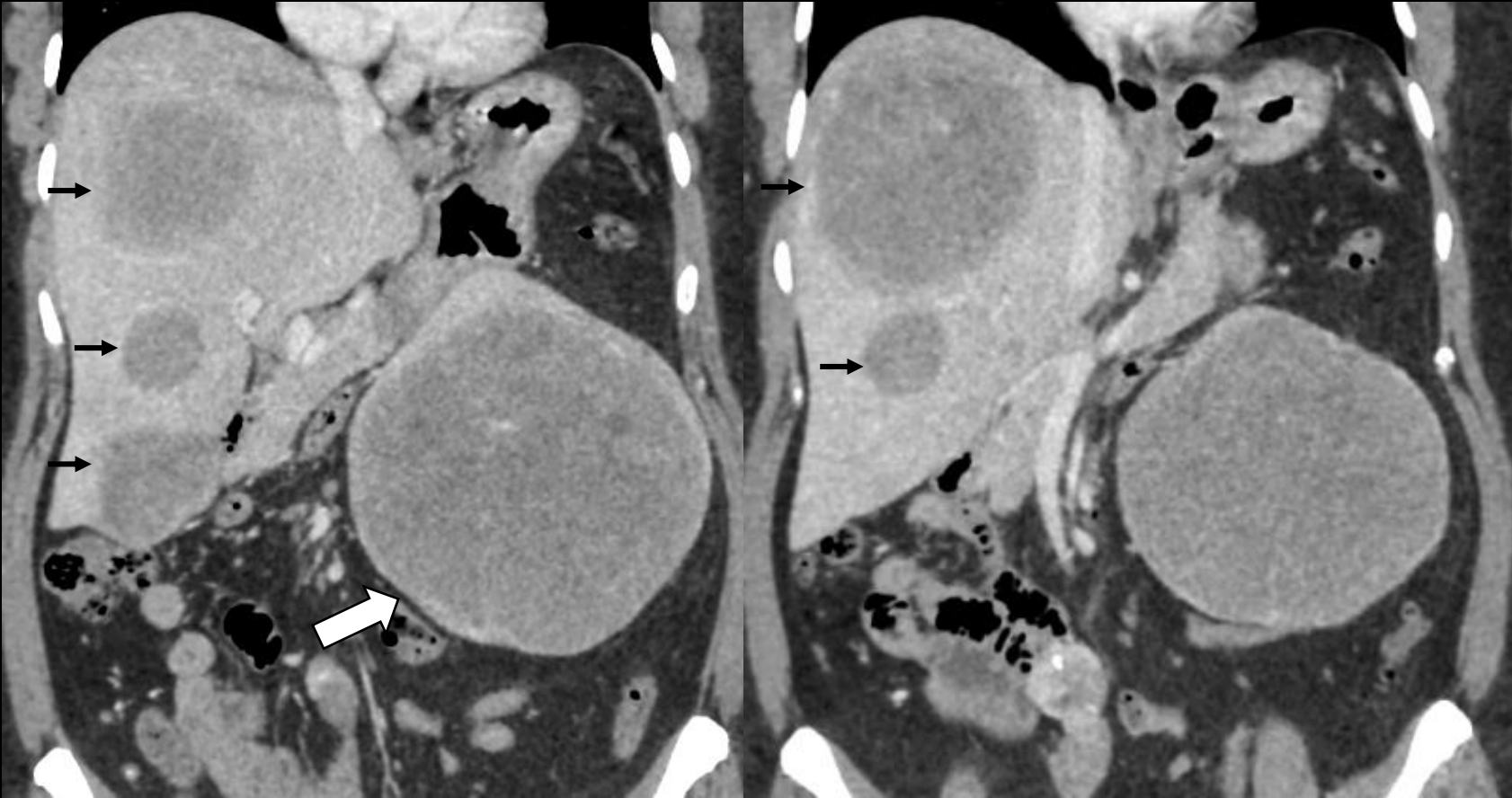
Contrast-enhanced CT images showing hypoattenuating exophytic solid-cystic lesion showing peripheral nodular arterial enhancement and washout in venous phase. Note is made of changes of chronic liver disease with portal hypertension

# Cystic Liver Metastases

- Known primary
- Hypoattenuating lesion, irregular walls, peripheral enhancement

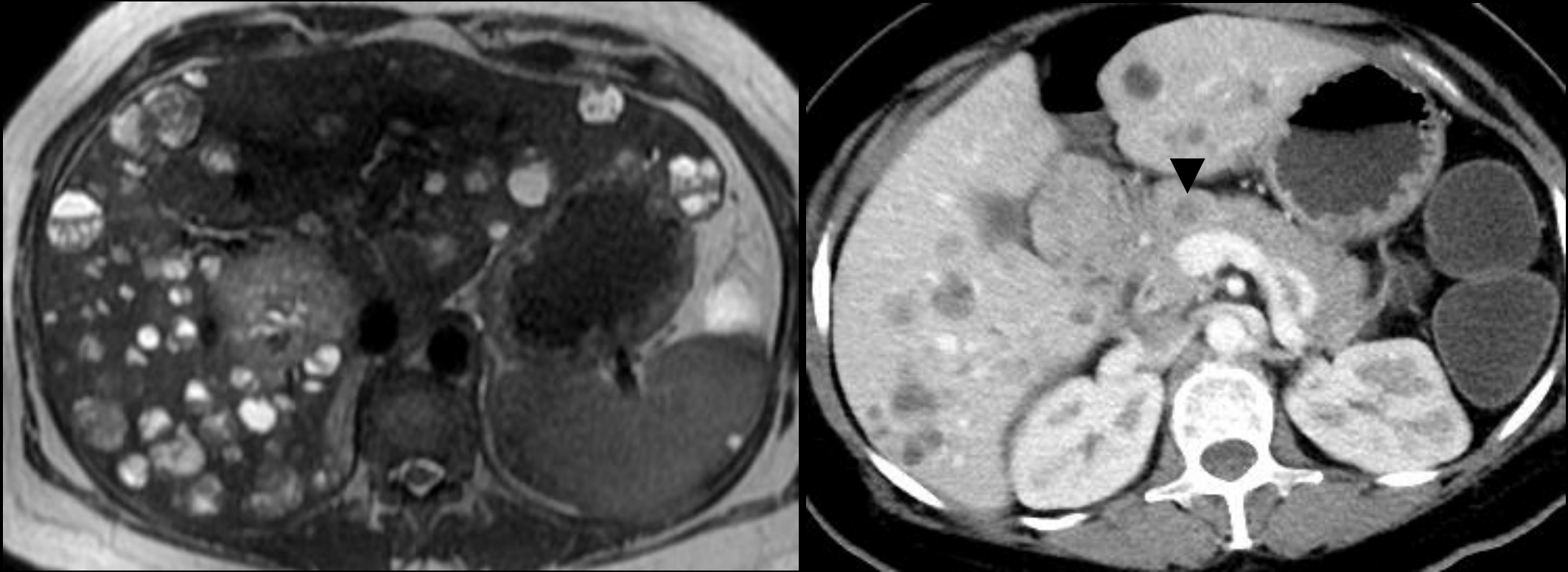
- Neuroendocrine tumors
- Gastrointestinal stromal tumor (GIST)
- Lung adenocarcinoma
- Breast carcinoma
- Colorectal carcinoma
- Transitional cell carcinoma
- Adenoid cystic carcinoma
- Ovarian carcinoma
- Choriocarcinoma
- Sarcoma
- Melanoma
- Lesions treated with chemotherapy

# Cystic Liver Metastases



Coronal contrast-enhanced CT images showing hypoattenuating metastatic lesions in liver (arrows) from malignant jejunal GIST (arrowhead)

# Cystic Liver Metastases



Axial T2-weighted MR image showing multiple metastatic cystic lesions with hemorrhage-fluid levels in liver parenchyma from a pancreatic neuroendocrine tumor (arrowhead) which is seen in corresponding axial contrast-enhanced CT image

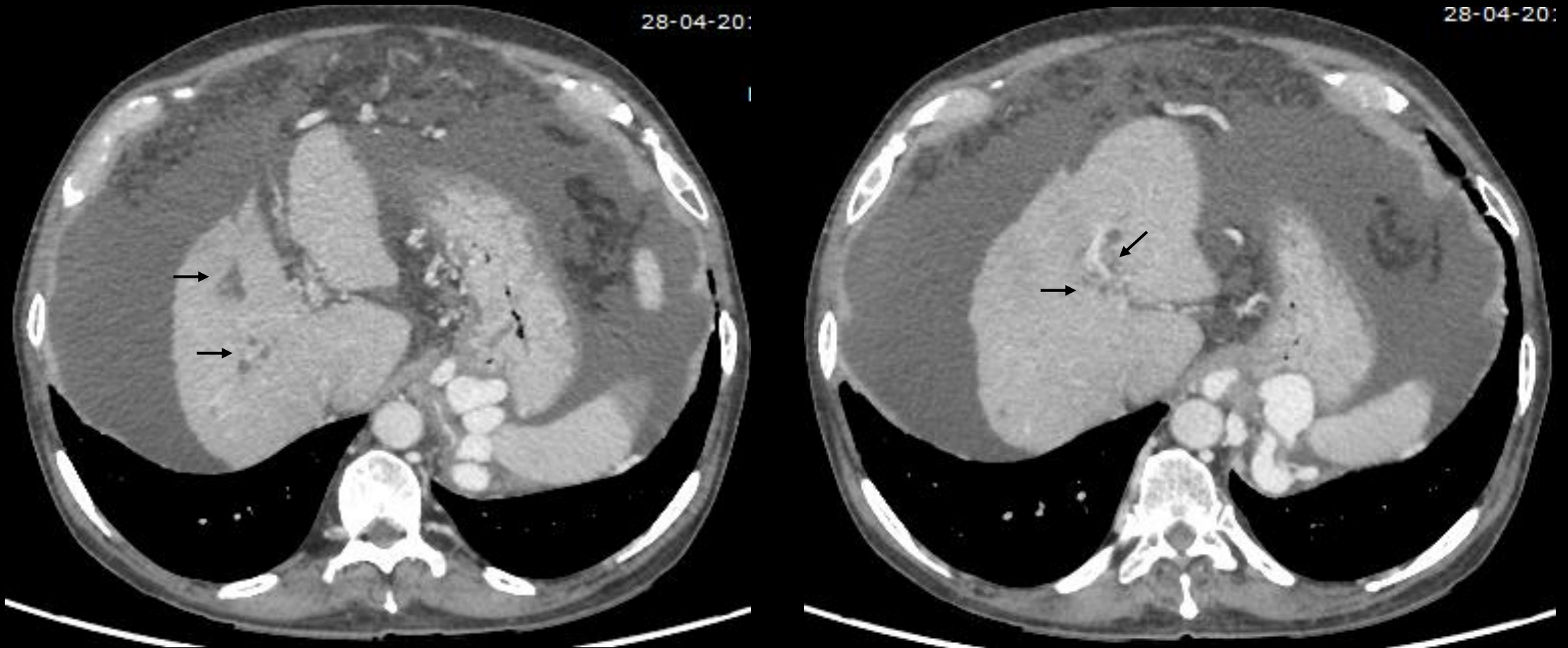
# Miscellaneous Lesions

## *Peribiliary cyst*

- *Obstruction of the periductal glands*
- Cirrhosis, portal hypertension, PCLD
- *Types- discrete, clustered, confluent*
- *Along the portal tracts at the hilum, large intrahepatic ducts*
- *Distribution on both sides of portal vein*
- *“String-of-beads”; thin septa*



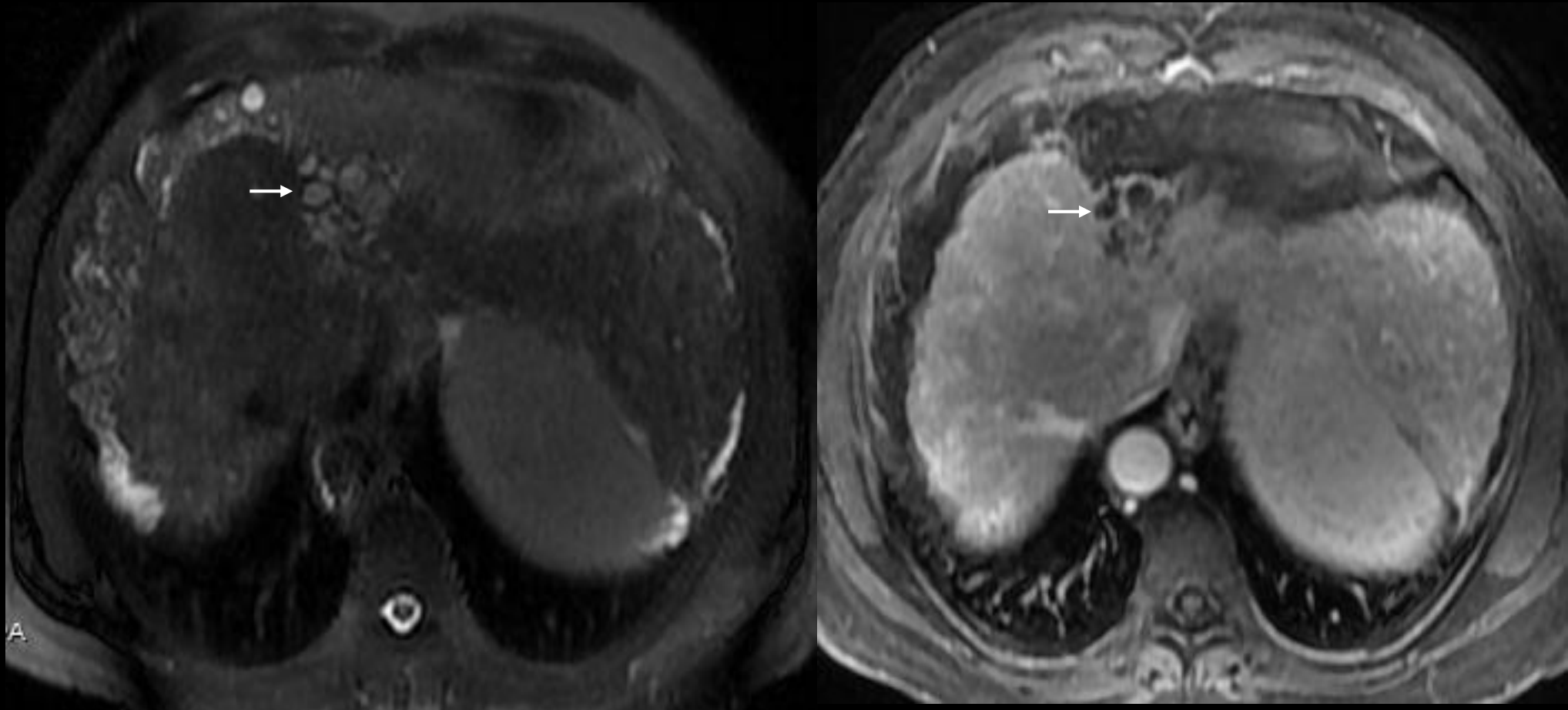
# Peribiliary cysts – Discrete variety



Coronal contrast-enhanced CT images showing discrete cysts along both sides of portal vein in a patient of chronic liver disease



# Peribiliary cysts – clustered variety



Axial T2-weighted MR and T1 contrast enhanced MR showing clustered variety of peribiliary cysts in a patient with chronic liver disease mislabeled as cholangiocarcinoma previously

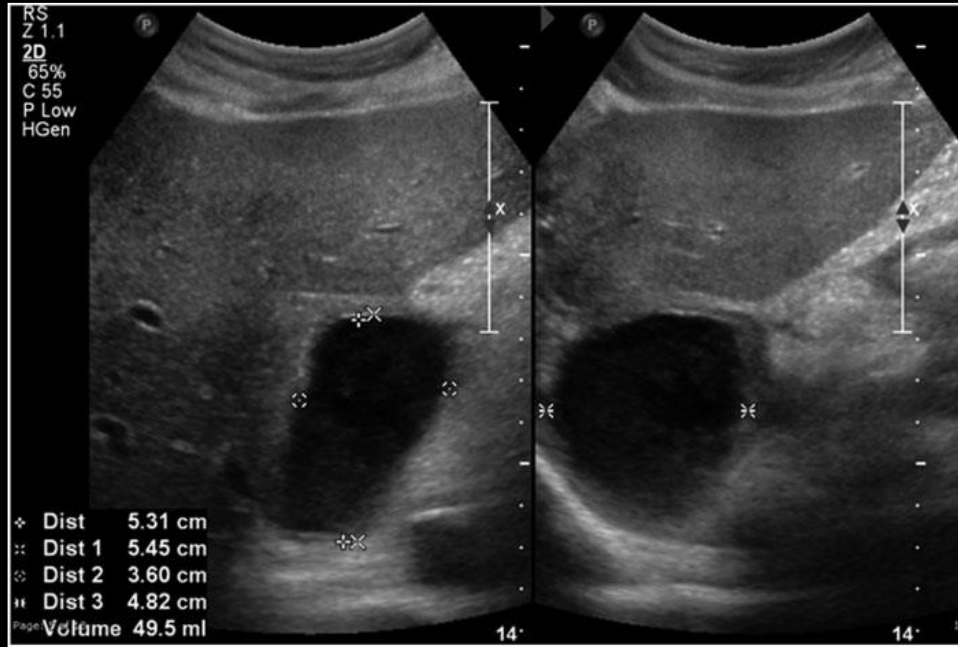
# Miscellaneous Lesions

## *Intrahepatic pseudocyst*

- *Ancillary features of pancreatitis*
- *Spread of fluid along the hepatogastric and hepatoduodenal ligaments, portal triad*
- *Spontaneous resolution, cyst with capsule*

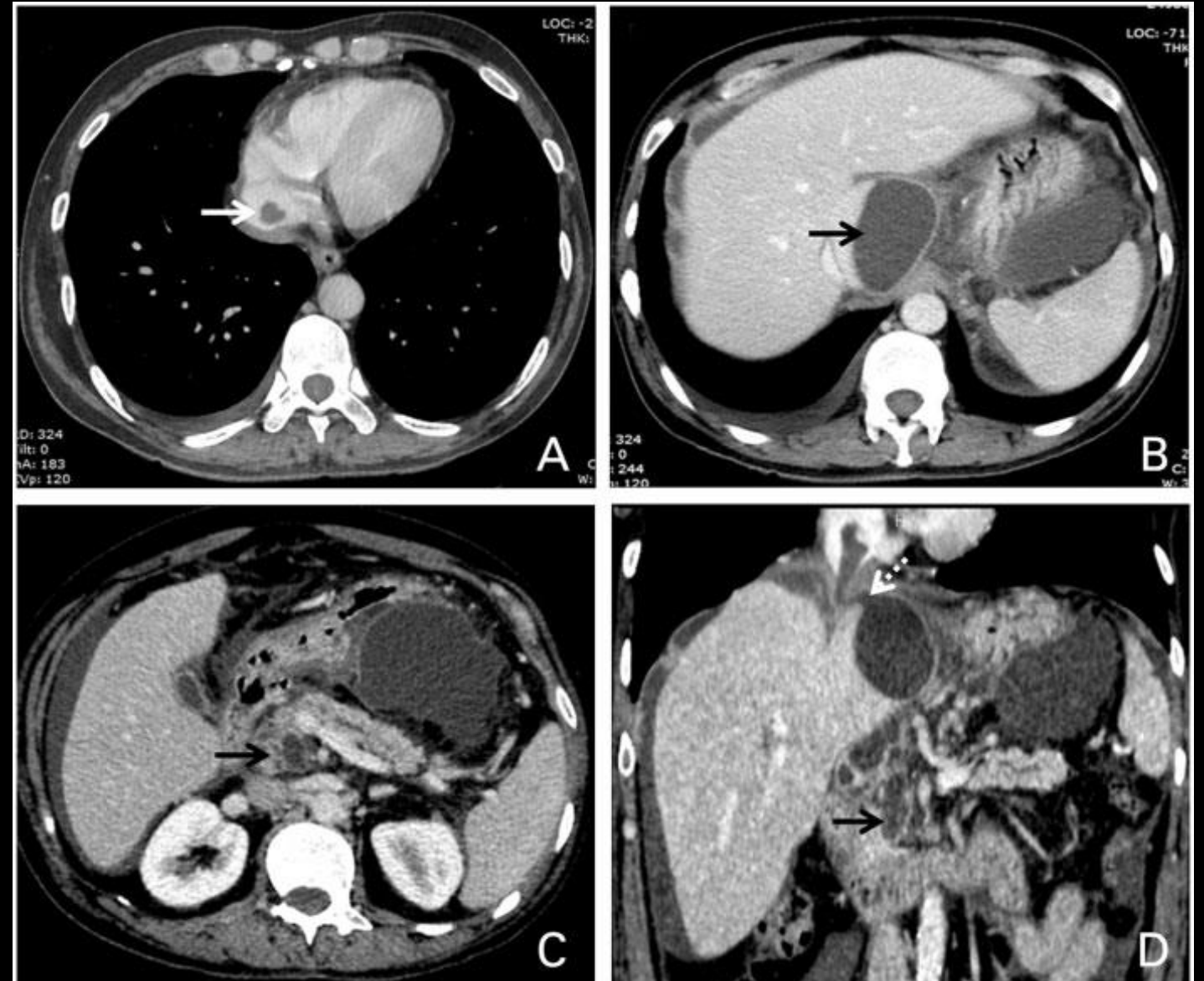
## Spontaneous rupture of intrahepatic pseudocyst into the inferior vena cava

Yashwant Patidar, Binit Sureka\*, Vaibhav Pratap Singh, Kalpana Bansal and Rakhi Maiwall



US showing anechoic cystic lesion in relation to caudate lobe of liver

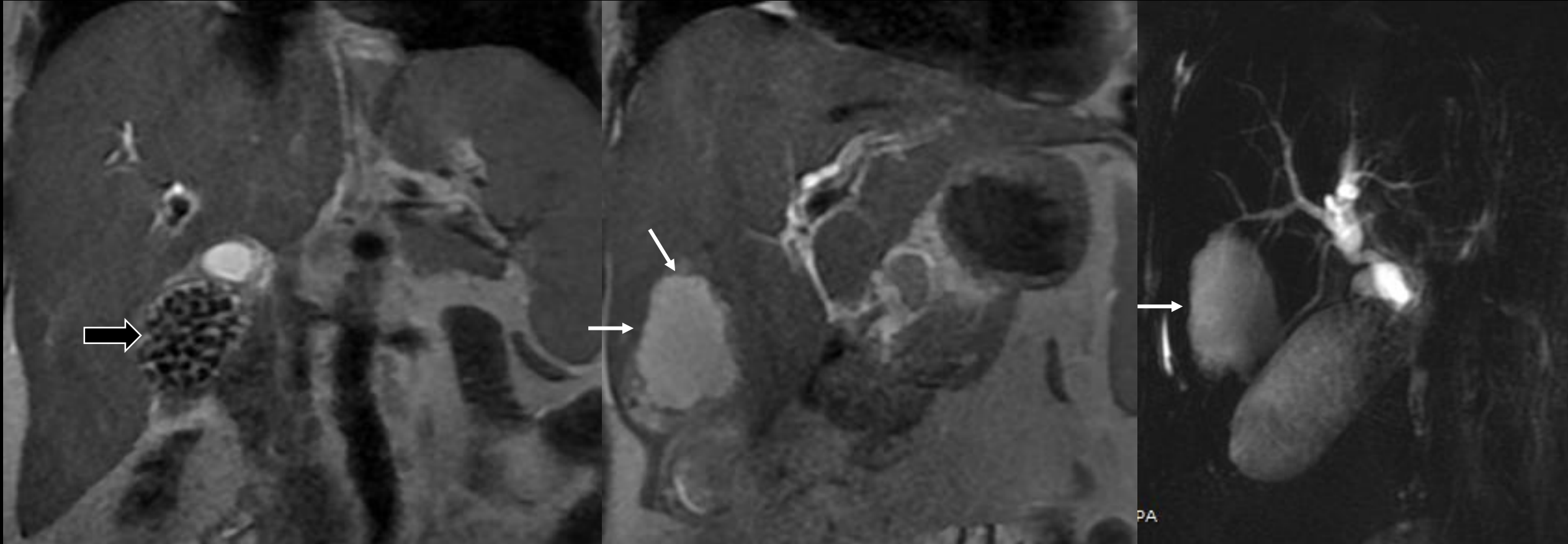
Coronal contrast-enhanced CT images showing pseudocyst rupture into IVC in a case of pancreatitis



# Trauma-related Lesions

- Biloma, seroma, hematoma
- H/o trauma, surgery, biopsy
- Simple cyst to complex collection
- MRI

# Biloma



Coronal T2-weighted MR and 2D-MRCP images showing T2-hypointense calculi (arrowhead) in the gallbladder lumen with T2-hyperintense cystic Biloma (arrows) in the adjacent liver parenchyma

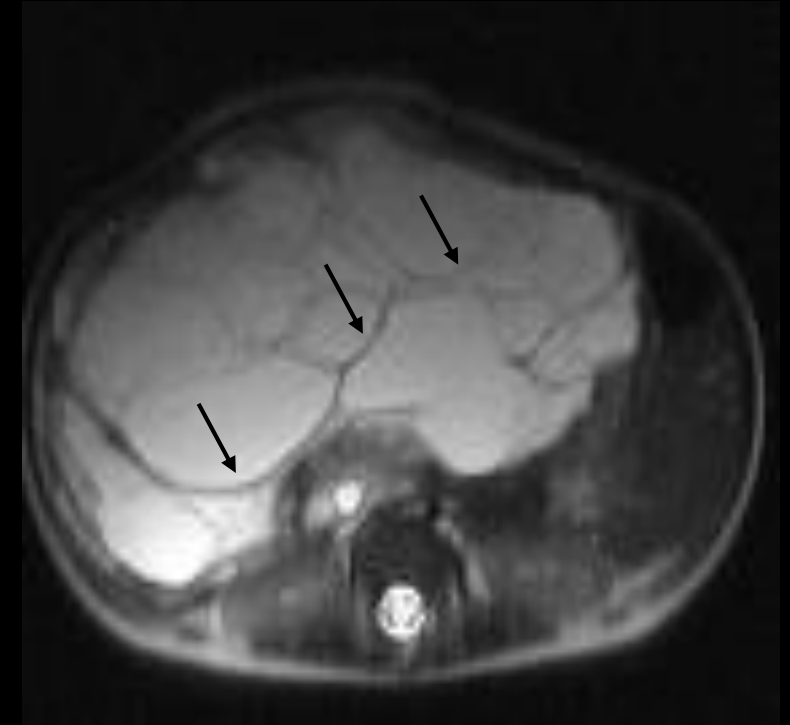
# Mimics

## *Undifferentiated Embryonal Sarcoma*

- *6-10 yrs of age*
- *3<sup>rd</sup> most common, 10% of pediatric hepatic malignancies*
- *Usually normal AFP levels*
- *CT – cystic, > 10cm in size, solitary lesion, septations, mural nodules, heterogeneous internal enhancement, **serpiginous vessels, blood***
- *USG – solid*



# Undifferentiated embryonal sarcoma



US showing multi cystic lesion in liver parenchyma

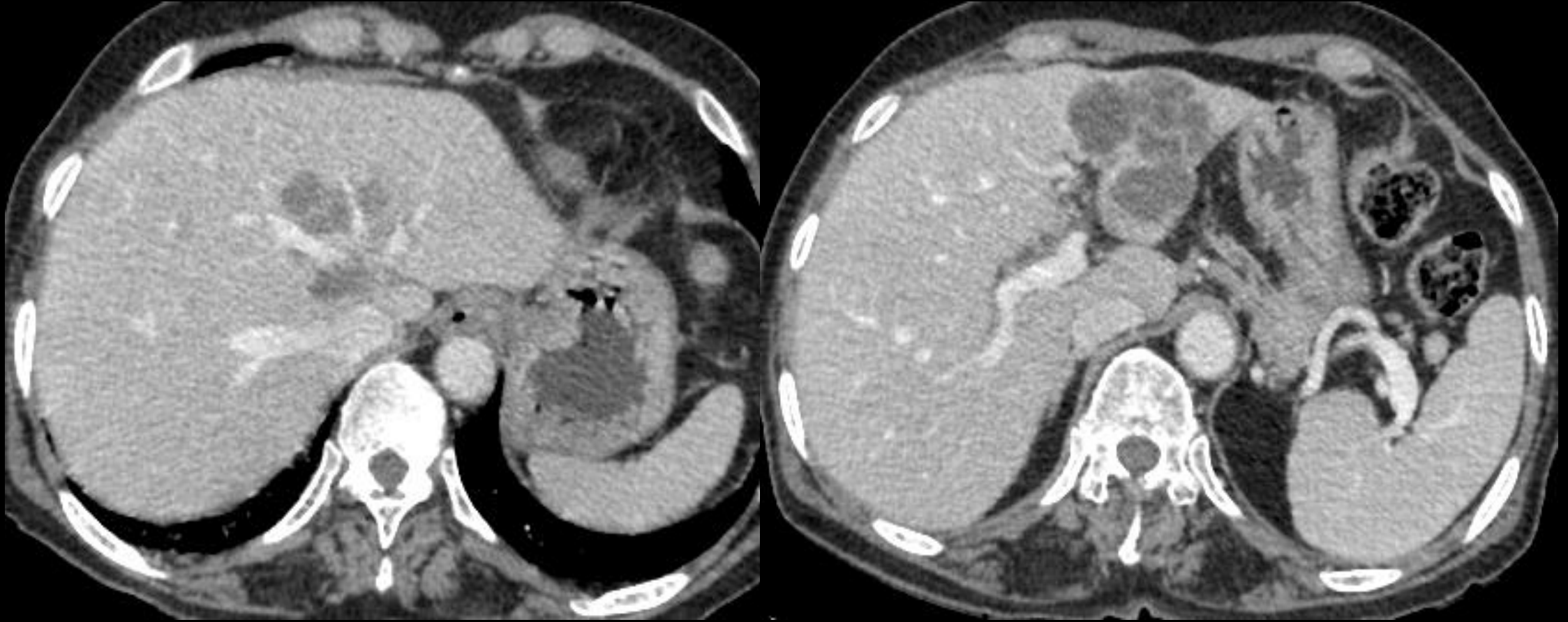
Axial contrast-enhanced CT image showing honey-combed cystic lesion in liver parenchyma mimicking liver abscess

Axial T2-weighted MR image showing thick septa (arrows) within this cystic lesion

# Mimics

- Pseudoaneurysm
- Focal steatosis – nodular variety
- Eosinophilic abscesses
- Atypical parasitic infestation

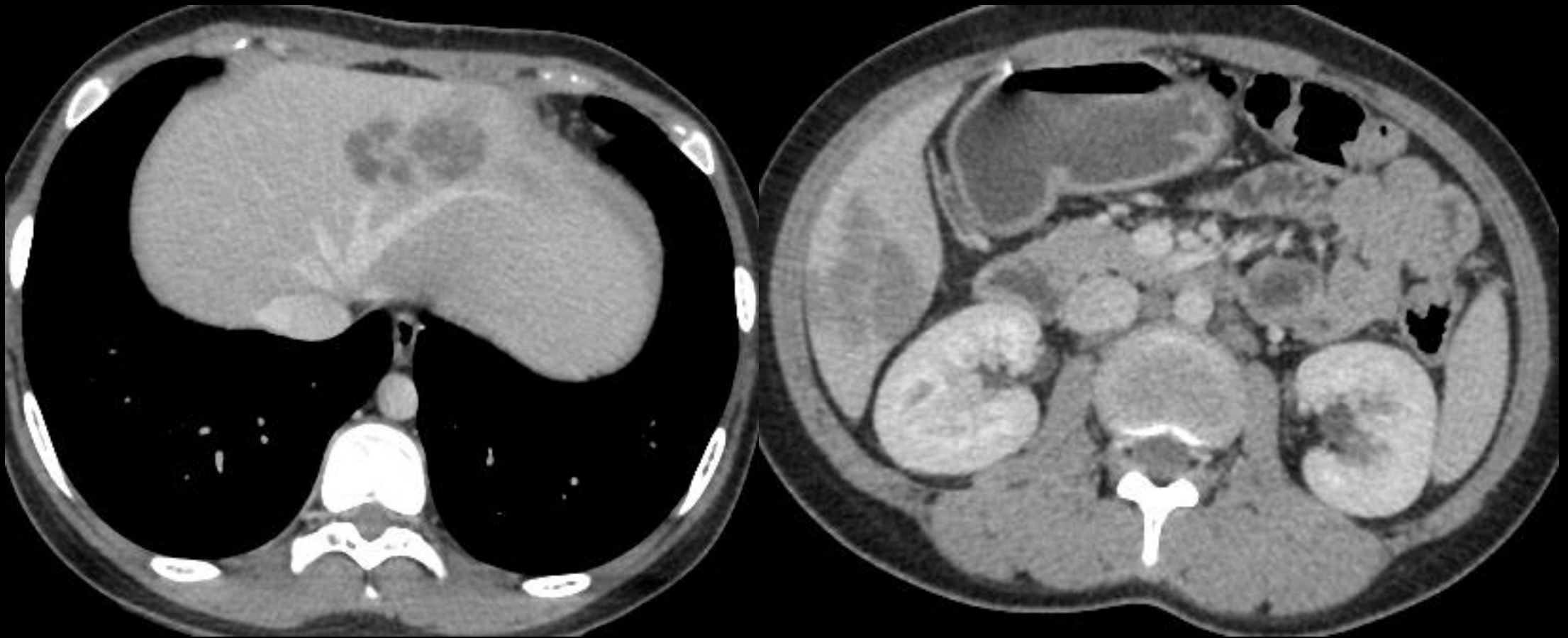
# Visceral larva migrans



Axial contrast-enhanced CT image showing honey-combed cystic lesion in liver parenchyma which are periportal and subcapsular in location turned out to be eosinophilic abscess on FNAC

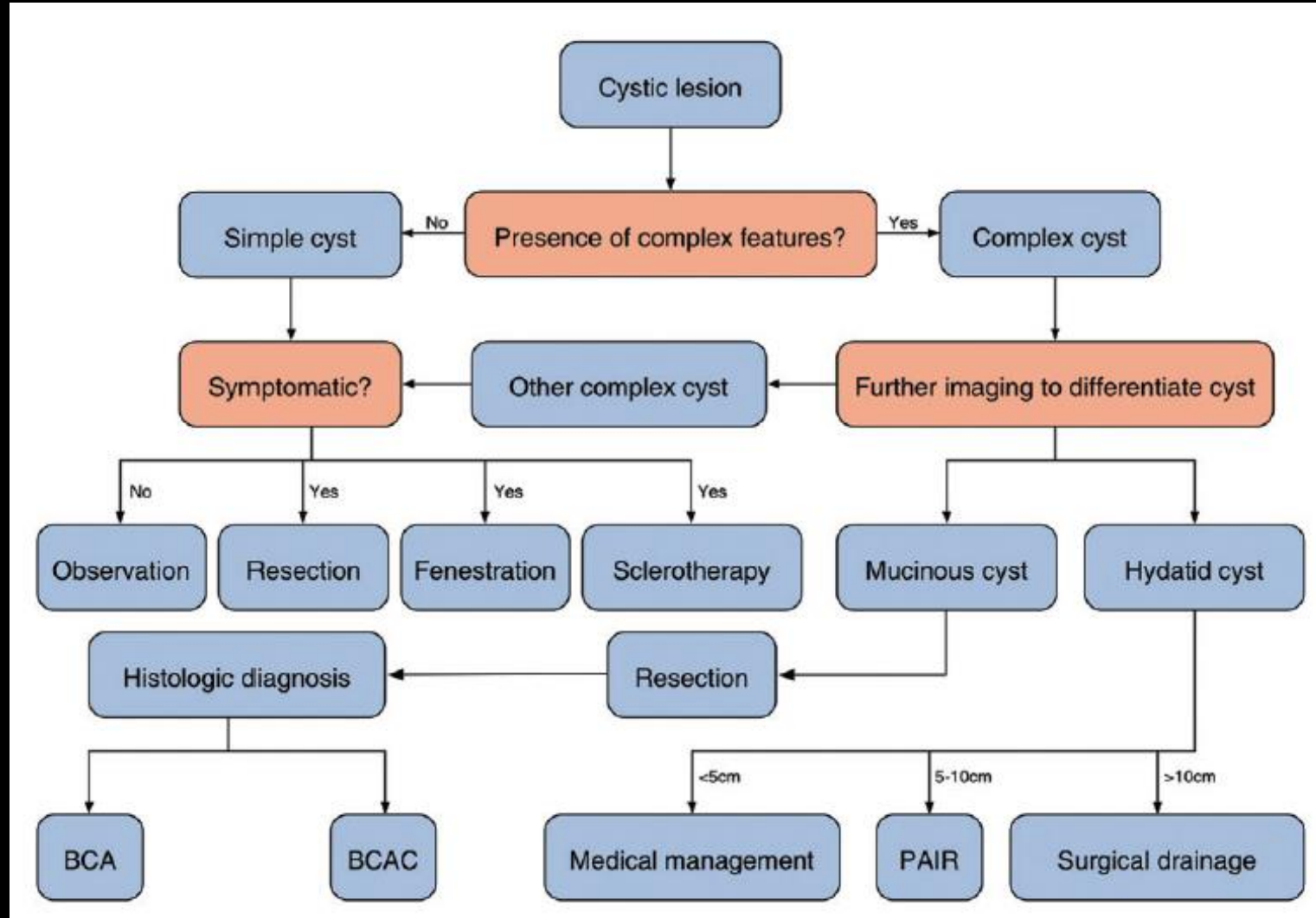
# Cystic Presentation of Hepatic Schistosomiasis

Vikrant Sood<sup>1</sup> • Sachin Ramesh Chaudhari<sup>2</sup> • Deeplaxmi Borle<sup>3</sup> • Binit Sureka<sup>4</sup> •  
Chhagan Bihari<sup>2</sup> • Senthil Kumar<sup>3</sup>



Axial contrast-enhanced CT image showing honey-combed cystic lesion in liver parenchyma turned out to be cystic schistosomiasis on HPE

# Management





# Tips and Tricks



- History of trauma/ surgery - *Biloma, seroma, hematoma*
- History of pancreatitis - *Intrahepatic pseudocyst*
- Subcapsular cyst in medial segment - *Ciliated foregut cyst*
- History of extrahepatic malignancy - *Metastatic lesion*
- Cirrhotic liver - *Cystic HCC, peribiliary cysts*
- H/o infection - *Pyogenic abscess, amebic abscess, hydatid cyst*
- Middle-aged woman - *BCA, BCAC*
- Central dot sign – *Caroli disease*
- Patient is immunocompromised - *Fungal microabscesses*
- Large cysts with or without renal cysts - *Polycystic liver disease*
- Small irregular cysts - *Biliary hamartoma*



# Tips and Tricks

## Complex cystic lesion

- Thick irregular walls
- Thick septa

- Double-target sign
- Cluster sign
- Turquoise sign
- Perilesional edema
- Restriction of central core on DWI
- Gas

**Abscess**

- Nodular wall
- No restriction of central core
- Central calcifications

**Necrotic  
Tumor**

- Multiple thin septa
- Non-nodular wall

- No septal enhancement
- Daughter cysts
- Peripheral calcifications
- Fibrous wall

**Hydatid Cyst**

- Septal or wall enhancement
- Nodular septa
- Wall thickening
- Calcification ±

**Cystic Biliary  
Neoplasm**

## Author Information:

Dr Binit Sureka (MD,DNB,MBA, Fellowship Abdominal Imaging)  
Associate Professor, Dept. of Diagnostic & Intervention Radiology  
All India Institute of Medical Sciences (AIIMS), Jodhpur, India  
Email: [binitsurekapgi@gmail.com](mailto:binitsurekapgi@gmail.com)  
[surekab@aiimsjodhpur.edu.in](mailto:surekab@aiimsjodhpur.edu.in) (Tel: +91-9013082292)

