

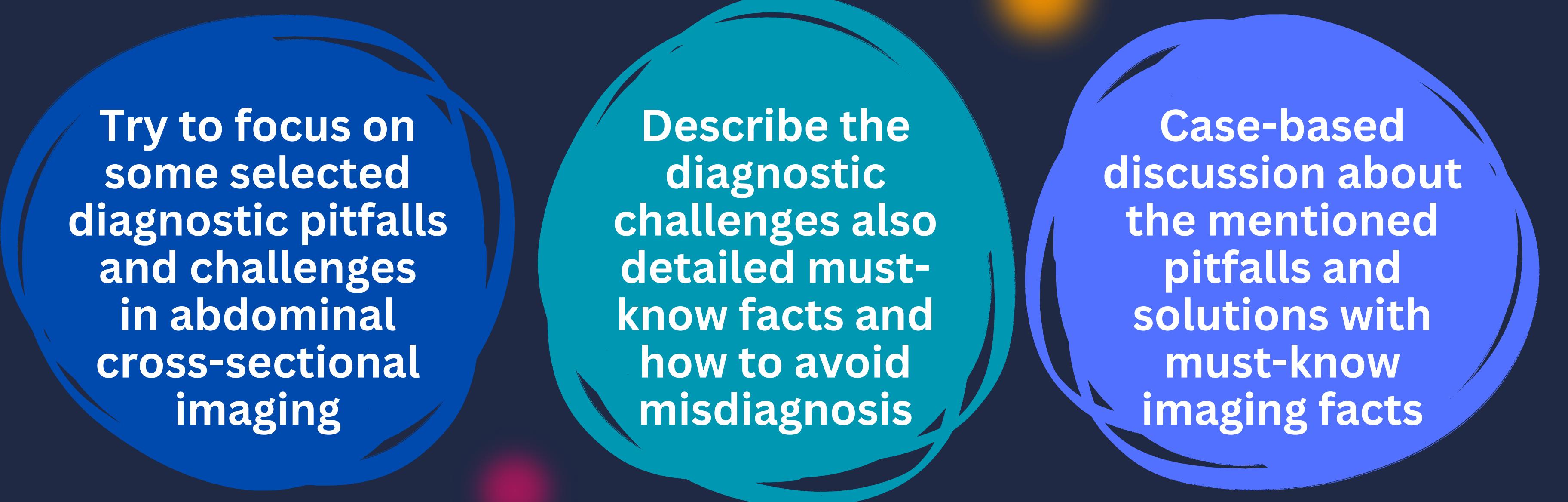
# 10 Must-Know in Abdominal Imaging



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# Learning Objectives



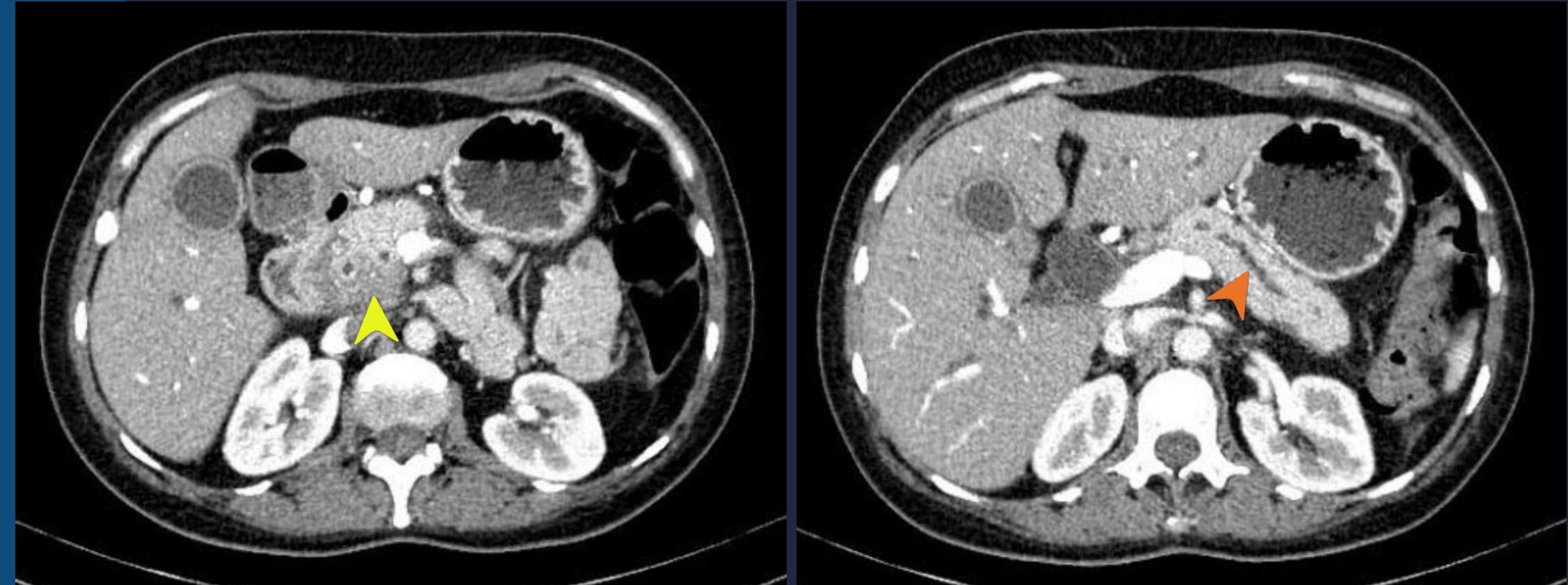
Try to focus on some selected diagnostic pitfalls and challenges in abdominal cross-sectional imaging

Describe the diagnostic challenges also detailed must-know facts and how to avoid misdiagnosis

Case-based discussion about the mentioned pitfalls and solutions with must-know imaging facts

# Iso-attenuating pancreatic ductal adenocarcinomas (PDACs)

The **primary sign** of dual-phase contrast-enhanced MDCT for diagnosis of PDAC is an **irregular or ill-defined hypo-attenuating mass** compared to the normal pancreas parenchyma, associated with an abrupt cut-off of the MPD and **upstream MPD dilatation**.



Case: Mohammad Taghi Niknejad rID: 96054

# Iso-attenuating pancreatic ductal adenocarcinomas (PDACs)

About 11% of pancreatic ductal adenocarcinomas (PDACs) in all-size tumours and 27% in  $\leq 2$  cm tumours are **iso-attenuating** on dual-phase contrast-enhanced MDCT, which is a diagnostic challenge that can be overlooked.

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Iso-attenuating PDACs, compared to the usual hypo-attenuating masses, are well-differentiated, have lower tumour cellularity and less frequent tumour necrosis, with **better** survival rates after surgical resection.

So,

Early detection of subtle iso-attenuating PDACs is important, and **secondary signs** for diagnosis are a must-know!

## Iso-attenuating pancreatic ductal adenocarcinomas (PDACs)

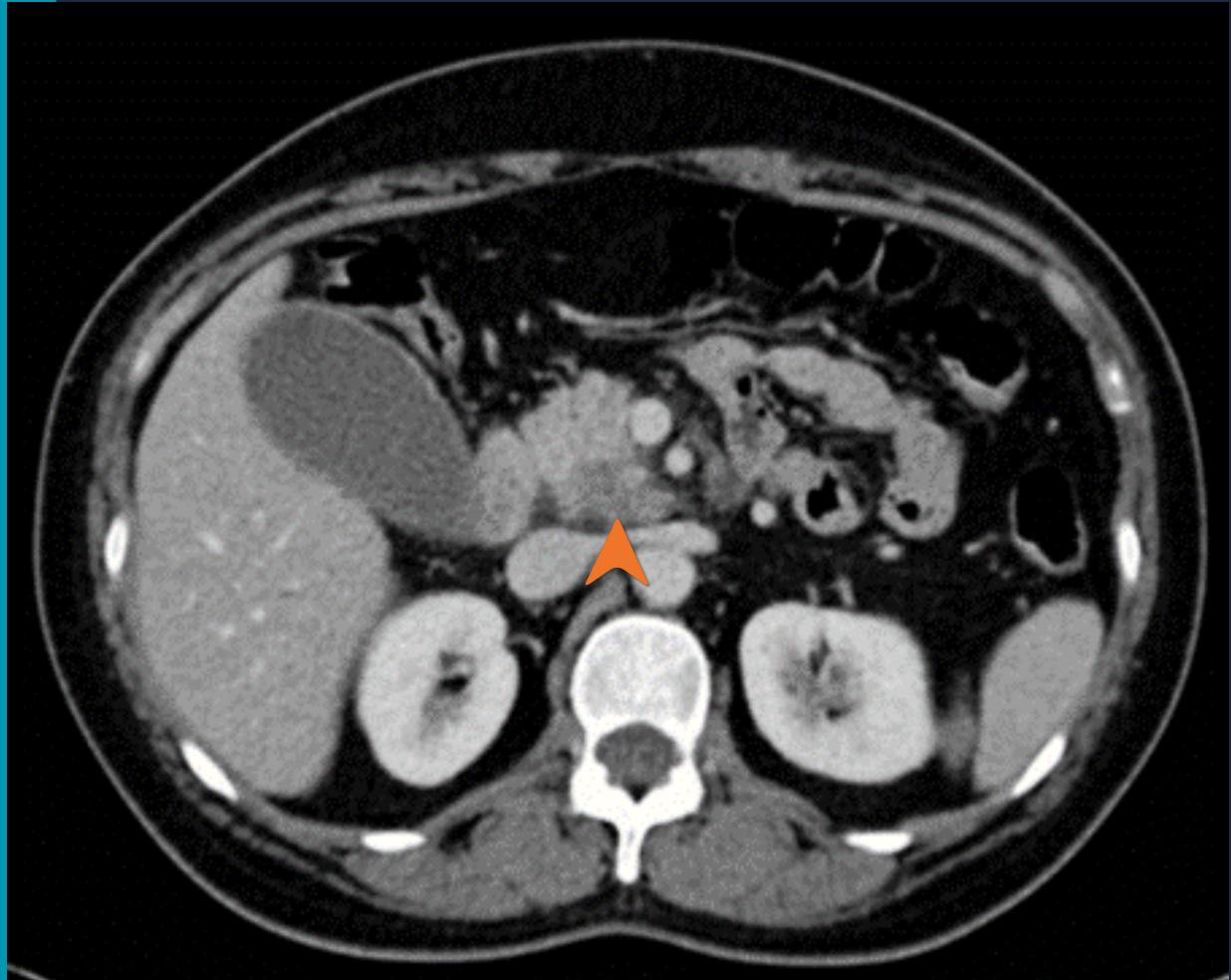
The **secondary signs** of MDCT that are seen in the majority (88%) of iso-attenuating PDACs include:

1. abrupt cut-off of MPD ± upstream ductal dilatation
2. dilated MPD and CBD known as double duct sign
3. focal or distal pancreatic parenchymal atrophy
4. irregular pancreatic contour at the site of the tumour
5. focal loss of normal pancreatic parenchymal lobulation
6. peri-pancreatic vascular encasement or narrowing

The mentioned secondary signs are **must-know** facts that require further evaluation with **MRI** or **EUS** rather than imaging follow-up.

## Uncinate process PDAC

About 2.5-11% of all PDACs are located in the uncinate process, which is relatively distant from the pancreatic and common bile ducts and closer to the SMA, SMV, and main portal vein (MPV) than the remaining pancreas. So, abdominal pain, rather than jaundice, is the most frequent presenting symptom, and vascular invasion may occur in early stage and small size.



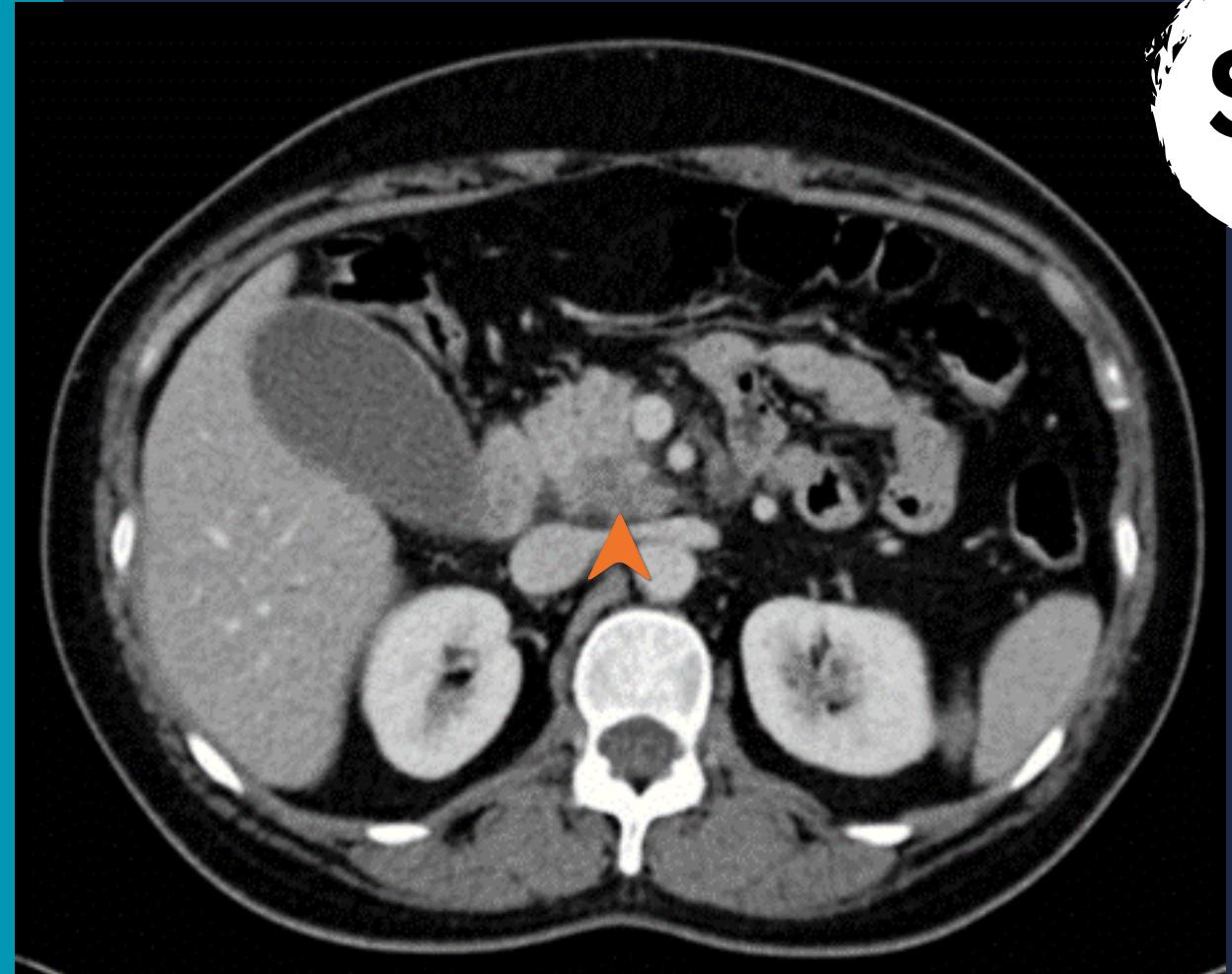
Case: Natalie Yang rID: 7115

An ill-defined low-enhancing **mass** in the uncinate process of the pancreas. Notice the proximity of the mass with vascular structures and duodenum.

## Uncinate process PDAC

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So, abdominal pain, rather than jaundice, is the most frequent presenting symptom, and vascular invasion may occur in early stage and small size.



**So,**

Early-stage uncinate process PDAC can be easily missed on imaging because of the tumour's subtlety and the absence of secondary signs of ductal dilatation.

Case: Natalie Yang rID: 7115

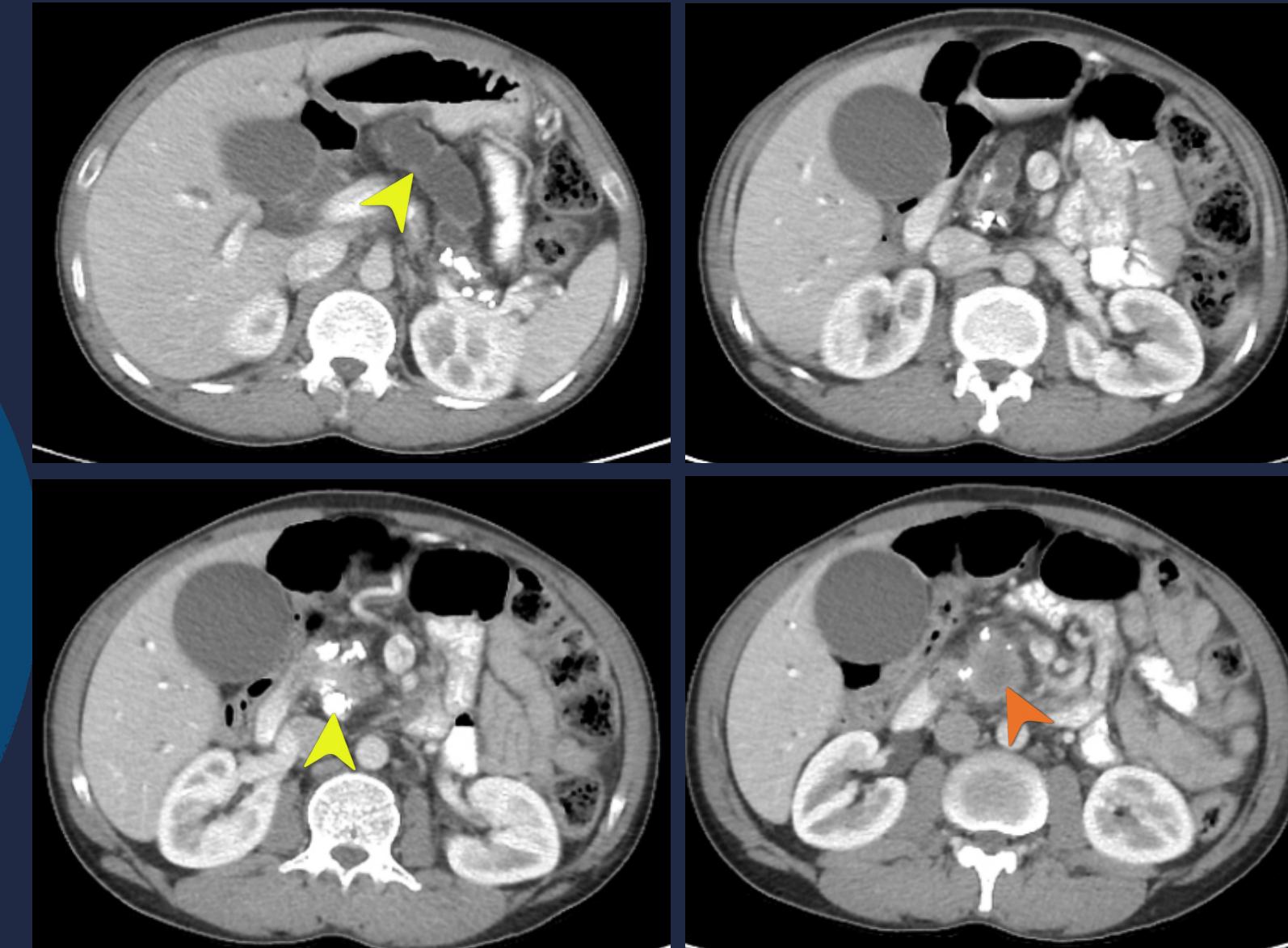
# Mass-forming chronic pancreatitis or PDAC?

Mass-forming chronic pancreatitis occurs in around 30% of cases of chronic pancreatitis, and about 70% manifest in the pancreatic head.

On the other hand, in chronic pancreatitis, there is a 6% cumulative risk of developing PDAC.

So,

there is a diagnostic challenge.

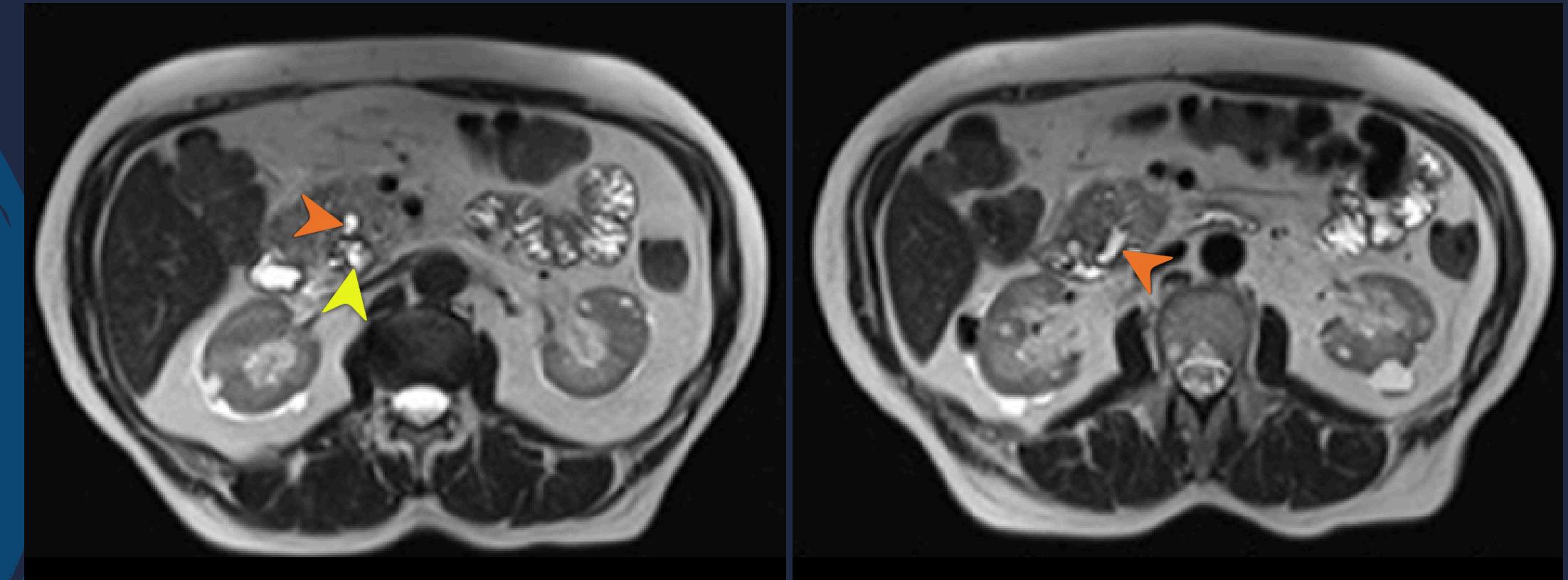


There is evidence of **chronic pancreatitis** with an ill-defined low-enhancing **mass** in the pancreatic head.

Case: Mohamed Saber rID: 87325

# Mass-forming chronic pancreatitis or PDAC?

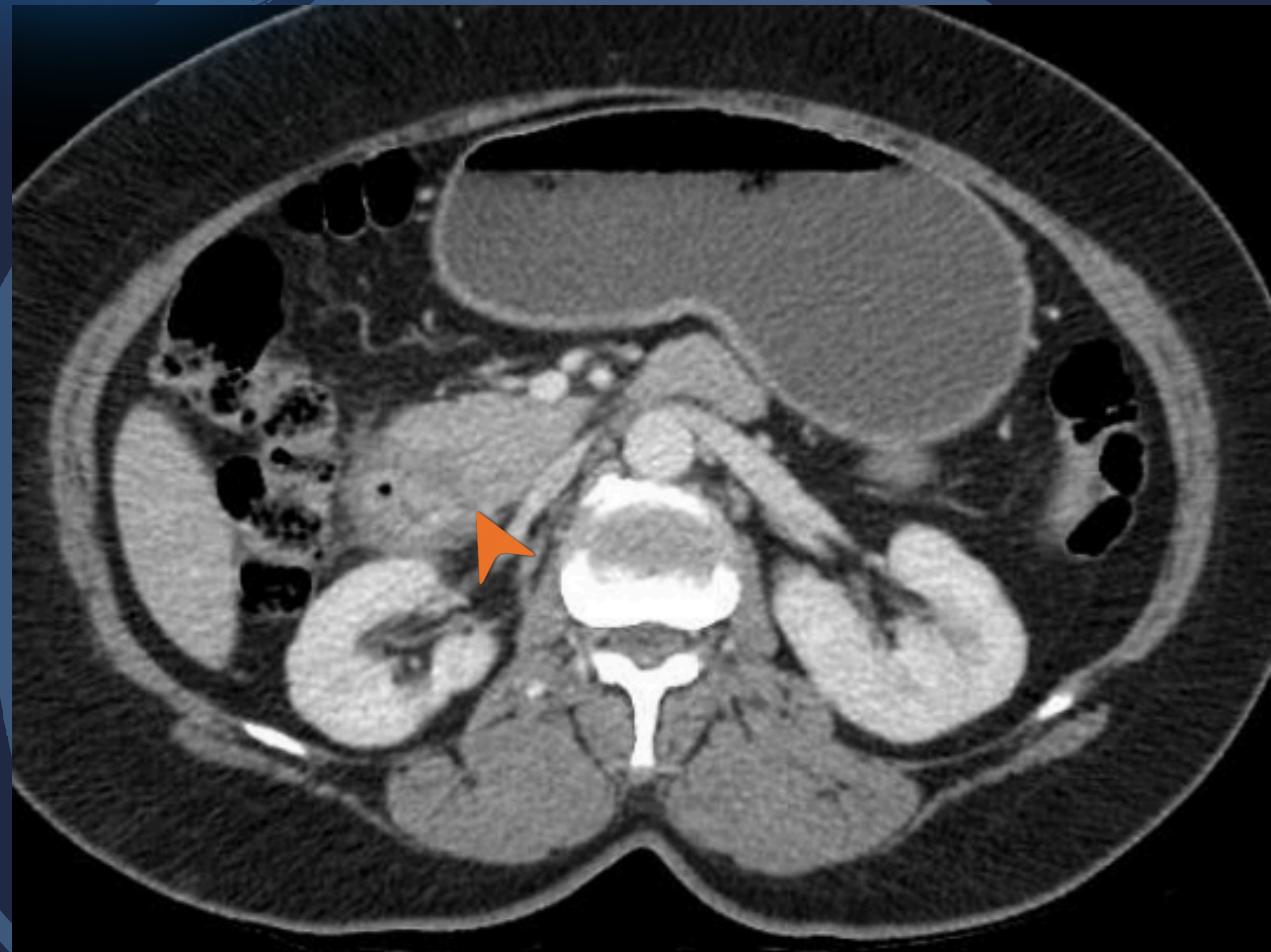
The main imaging finding that may help support an inflammatory process over malignancy includes the **duct penetrating sign**, which refers to an unobstructed pancreatic duct penetrating a mass. This makes focal pancreatitis the most likely cause rather than pancreatic carcinoma, and it is best appreciated on MRCP or ERCP.



Axial T2WI shows the **dilated main pancreatic duct** passing through the pancreatic mass without frank stricture and abutting a small **pancreatic pseudocyst**, suggesting mass-forming chronic pancreatitis rather than PDAC.

Case from ref 6

# Groove pancreatitis



Pure type GP

Case: Sebastian Tschauner rID: 42050

Groove pancreatitis (GP) is a rare type of chronic pancreatitis that affects the groove between the pancreatic head, duodenum, and common bile duct. Inflammation may be confined to the **groove** in the pure type or may spread to the **pancreatic head** in the segmental type that can mimic PDAC.

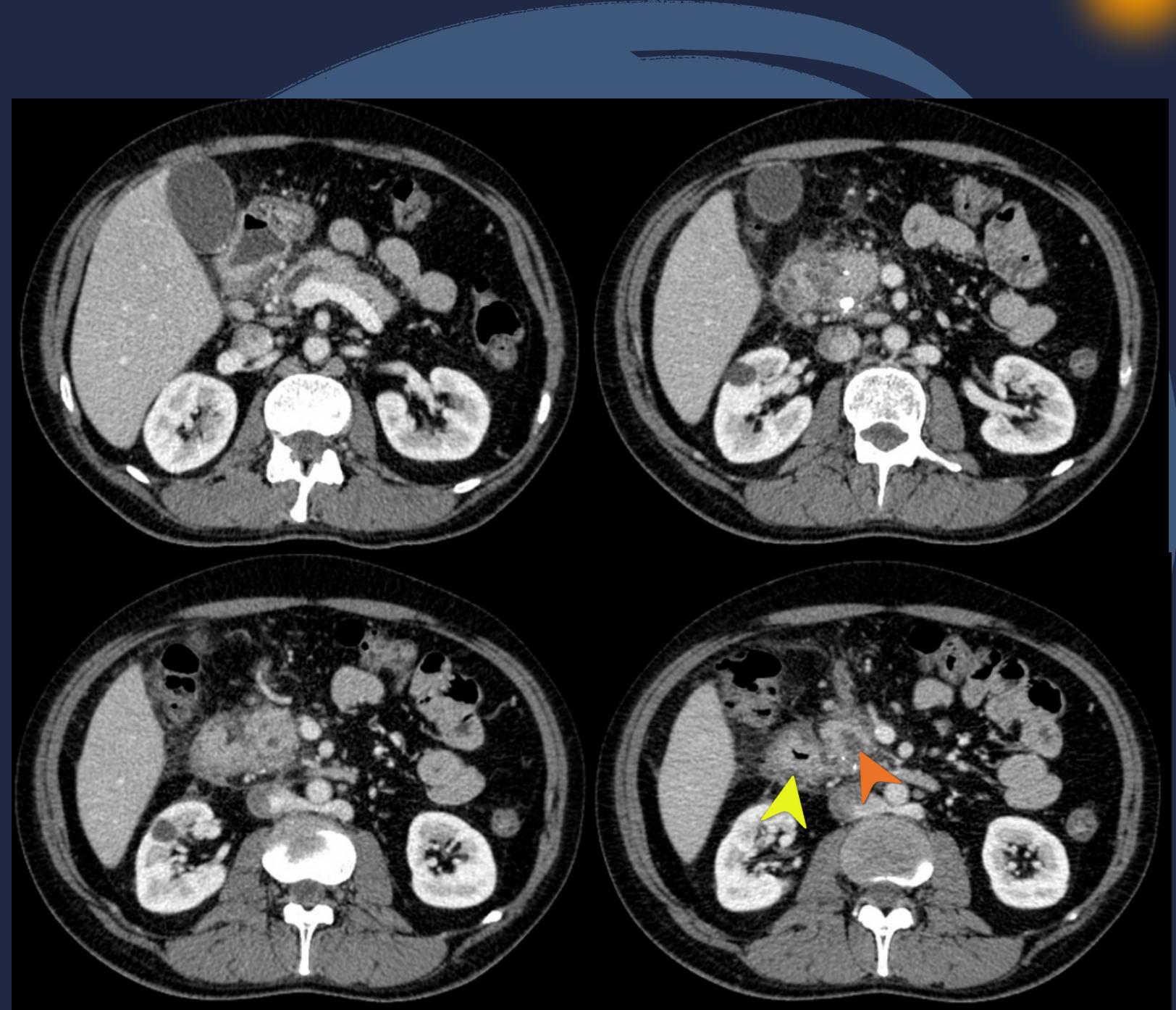


Segmental type GP

Case: Eric F Greif rID: 53788

The key imaging features primarily depicted in GP and may assist in differentiation from PDAC include:

- **cystic changes** around the pancreatic duct in association with **hyper-enhancing, thickened wall of the descending duodenum**
- smooth long stricture of the intrapancreatic CBD without marked upstream biliary dilatation
- displaced CBD and GDA away from the duodenal lumen due to pancreaticoduodenal groove inflammatory tissue

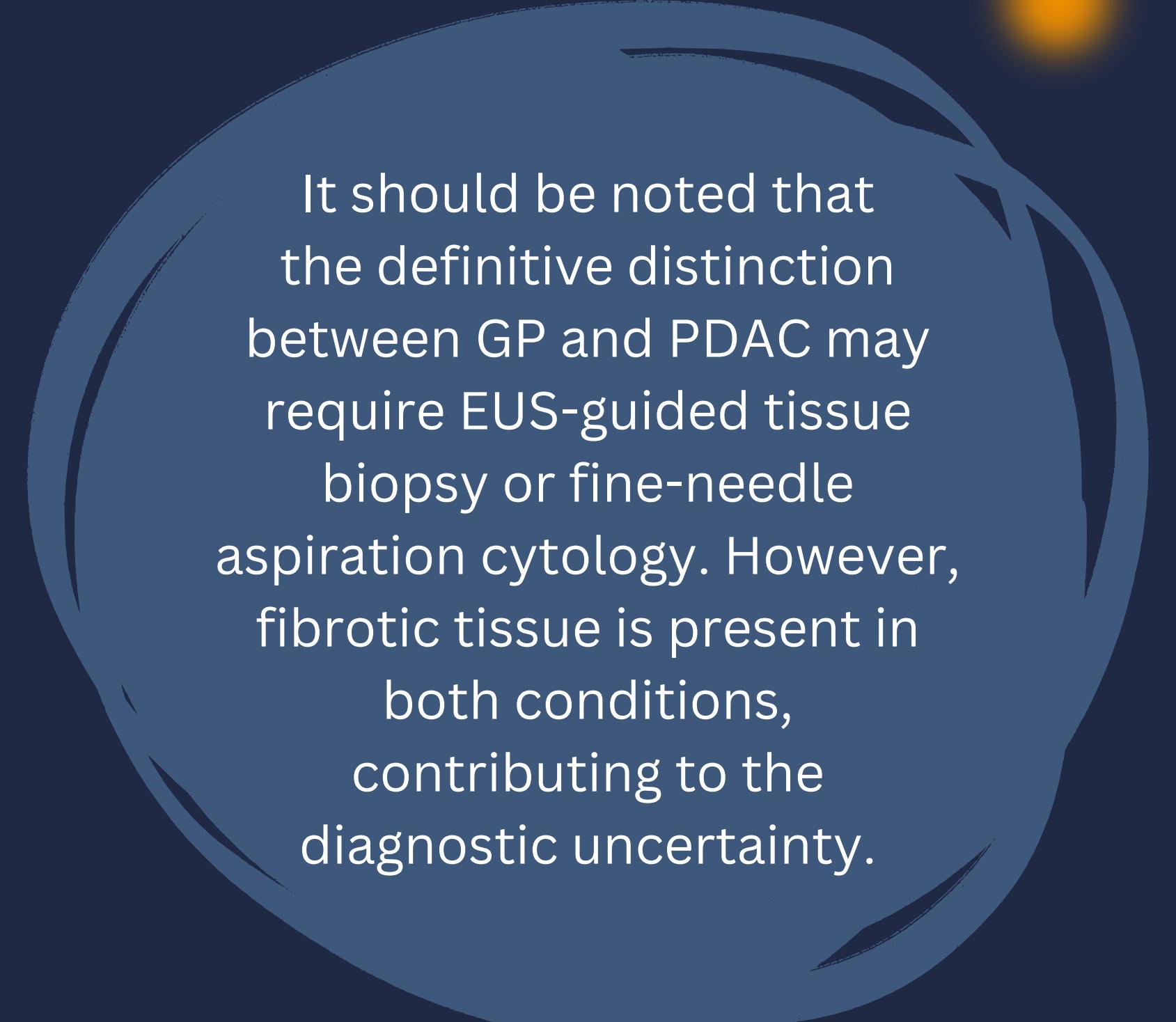


Case: Mostafa Elfeky rID: 149539

# Groove pancreatitis

The key imaging features primarily depicted in GP and may assist in differentiation from PDAC include:

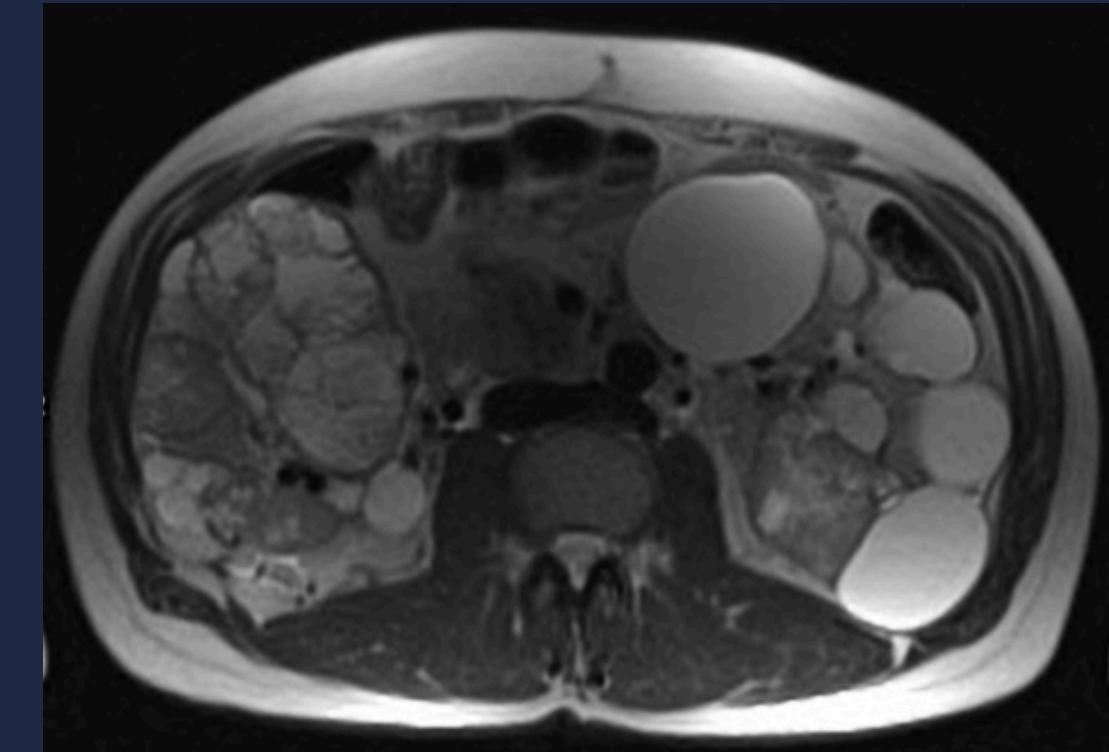
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It should be noted that the definitive distinction between GP and PDAC may require EUS-guided tissue biopsy or fine-needle aspiration cytology. However, fibrotic tissue is present in both conditions, contributing to the diagnostic uncertainty.

# Avoid using the Bosniak classification for renal cysts. When and why?

In patients with renal cell carcinoma syndromes, including von Hippel-Lindau syndrome, hereditary leiomyomatosis, and tuberous sclerosis, avoid the use of the Bosniak classification to predict the risk of malignancy of the renal cysts and cystic masses in which otherwise benign-appearing cysts either are or may become cancer.



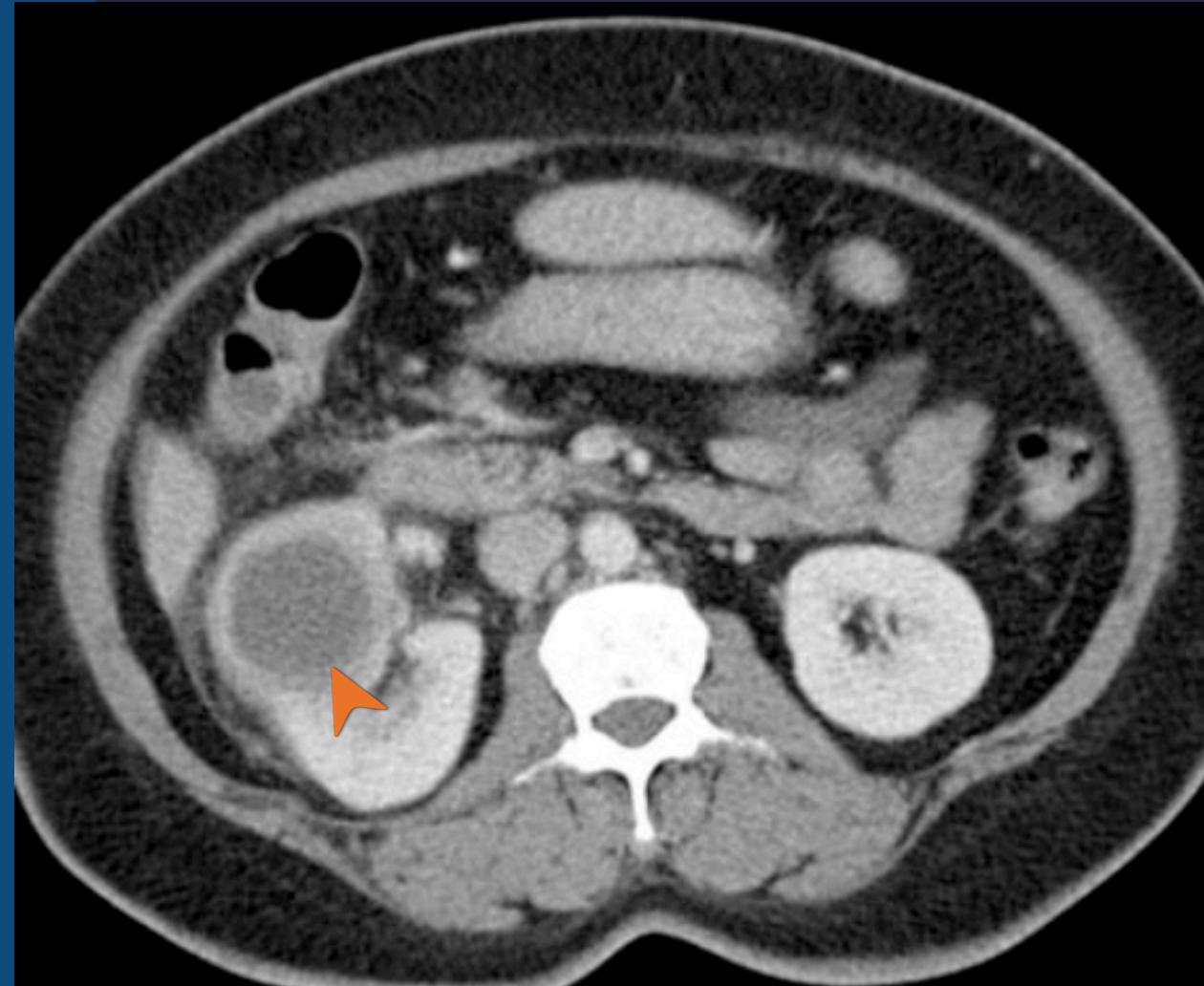
MR and CT images show multiple renal **cysts** and **cystic masses** in a known patient with von Hippel-Lindau syndrome.

Case: Mohammad Taghi Niknejad rID: 96186

# Avoid using the Bosniak classification for renal cysts. When and why?

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It should be noticed that in renal lesions with inflammatory, infectious, and vascular aetiology, Bosniak classification is not indicated and shouldn't be used.



CT images show a thick-walled, enhancing cystic mass in the midpole of the right kidney accompanied by a right perinephric inflammatory change and thickening of Gerota's fascia, suggesting a **renal abscess**.

Case: Ian Bickle rID: 29853

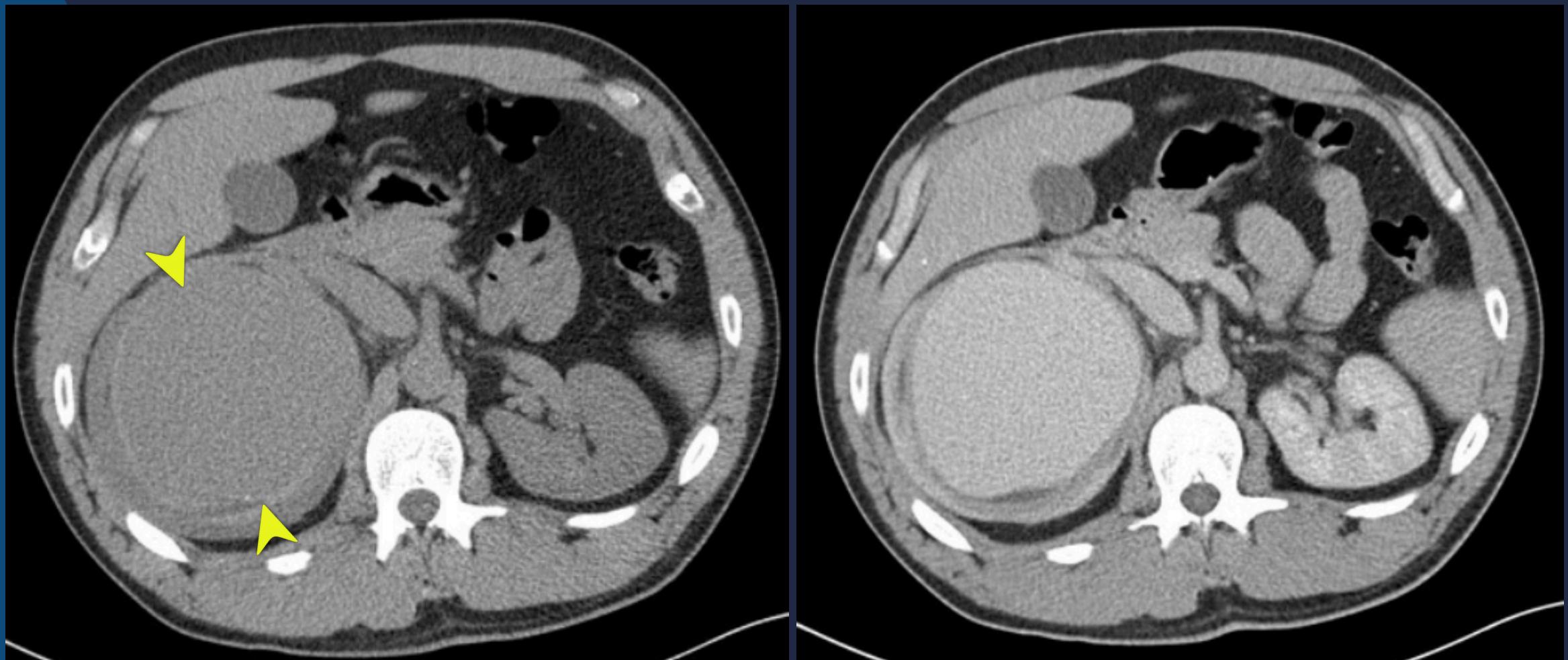
5<sup>th</sup>

Must-Know  
in Abdominal Imaging

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Bosniak classification is  
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Case: Hein Els rID: 45980

Pre and post-contrast CT show a giant  
**renal artery aneurysm** mimics a hyper-  
dense renal cyst in non-contrast image.

# Renal cell carcinoma with cystic or necrotic changes vs Bosniak class IV cystic renal mass

About 15% of renal cell carcinomas (RCCs) have cystic components.

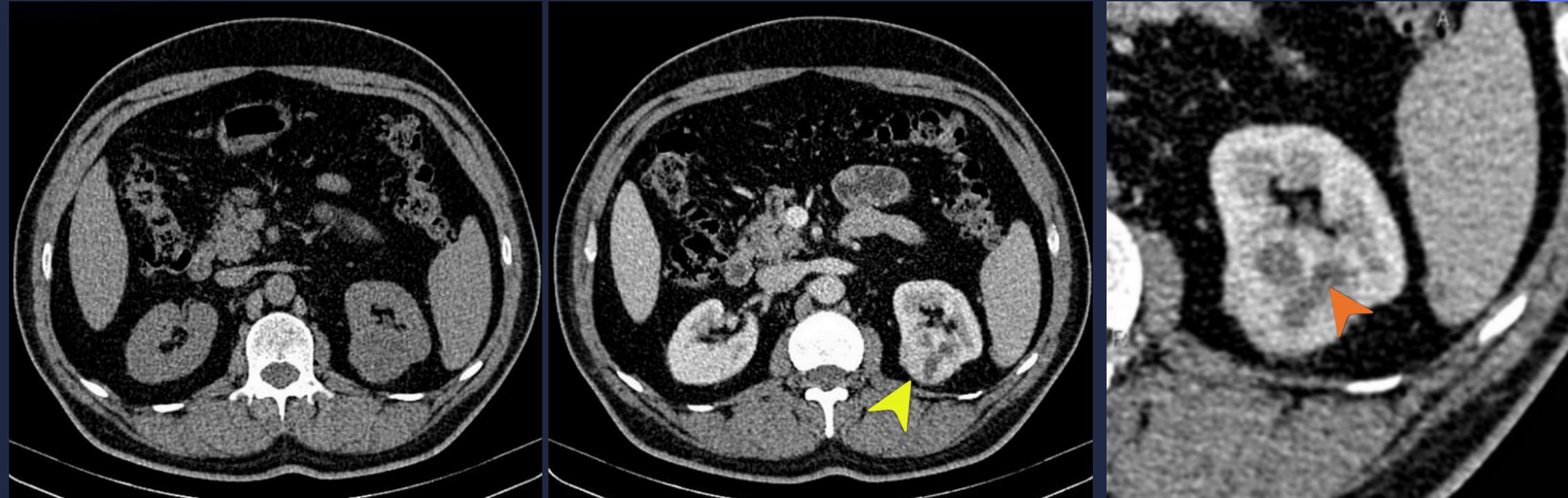
Additionally, aggressive RCCs may contain central necrosis and appear as cystic renal masses.

It's important to know that, a solid RCC with cystic or necrotic changes is **more aggressive** than a Bosniak class IV cystic renal mass, and the Bosniak classification should be applied **just** to cystic masses.

So,

**must-know,**  
according to the Bosniak classification version 2019, a Bosniak class IV cystic renal mass is one that **less than 25%** of the mass is formed of enhancing tissue, and the lesions with more than 25% enhancing solid components are likely solid masses with haemorrhagic, cystic or necrotic changes.

# Renal cell carcinoma with cystic or necrotic changes vs Bosniak class IV cystic renal mass

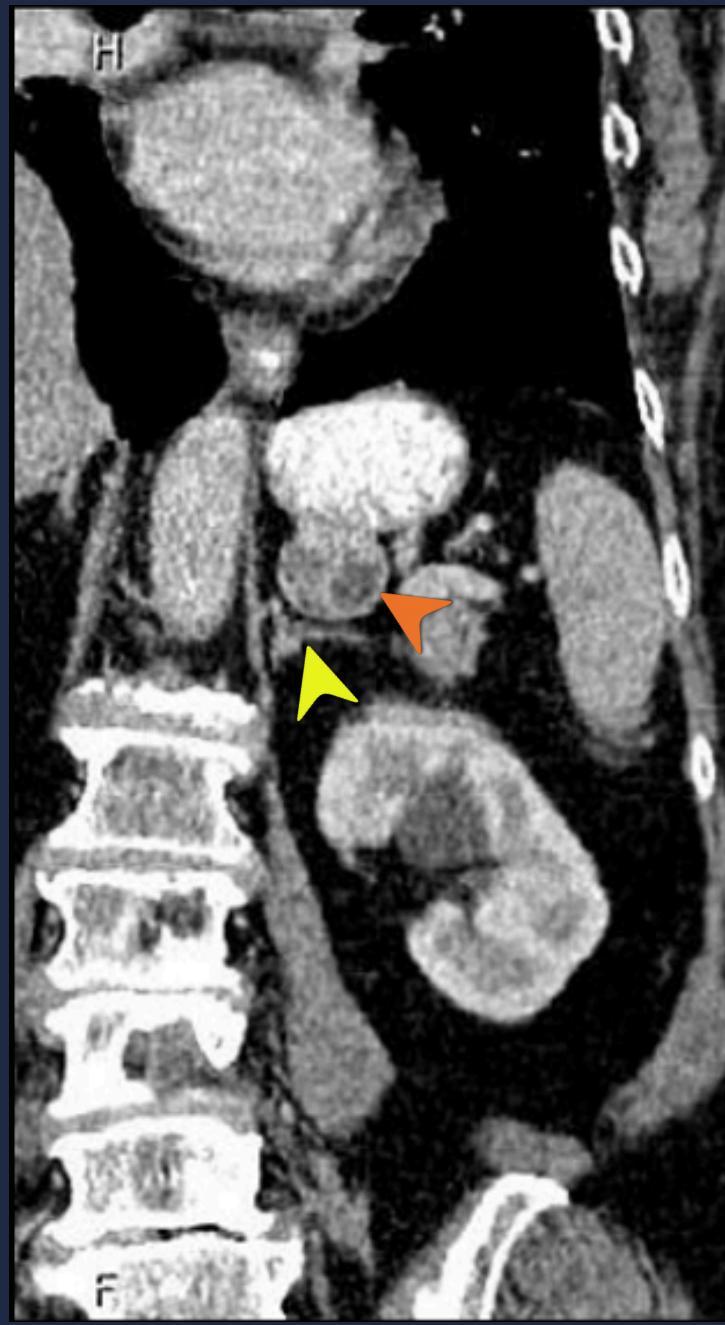
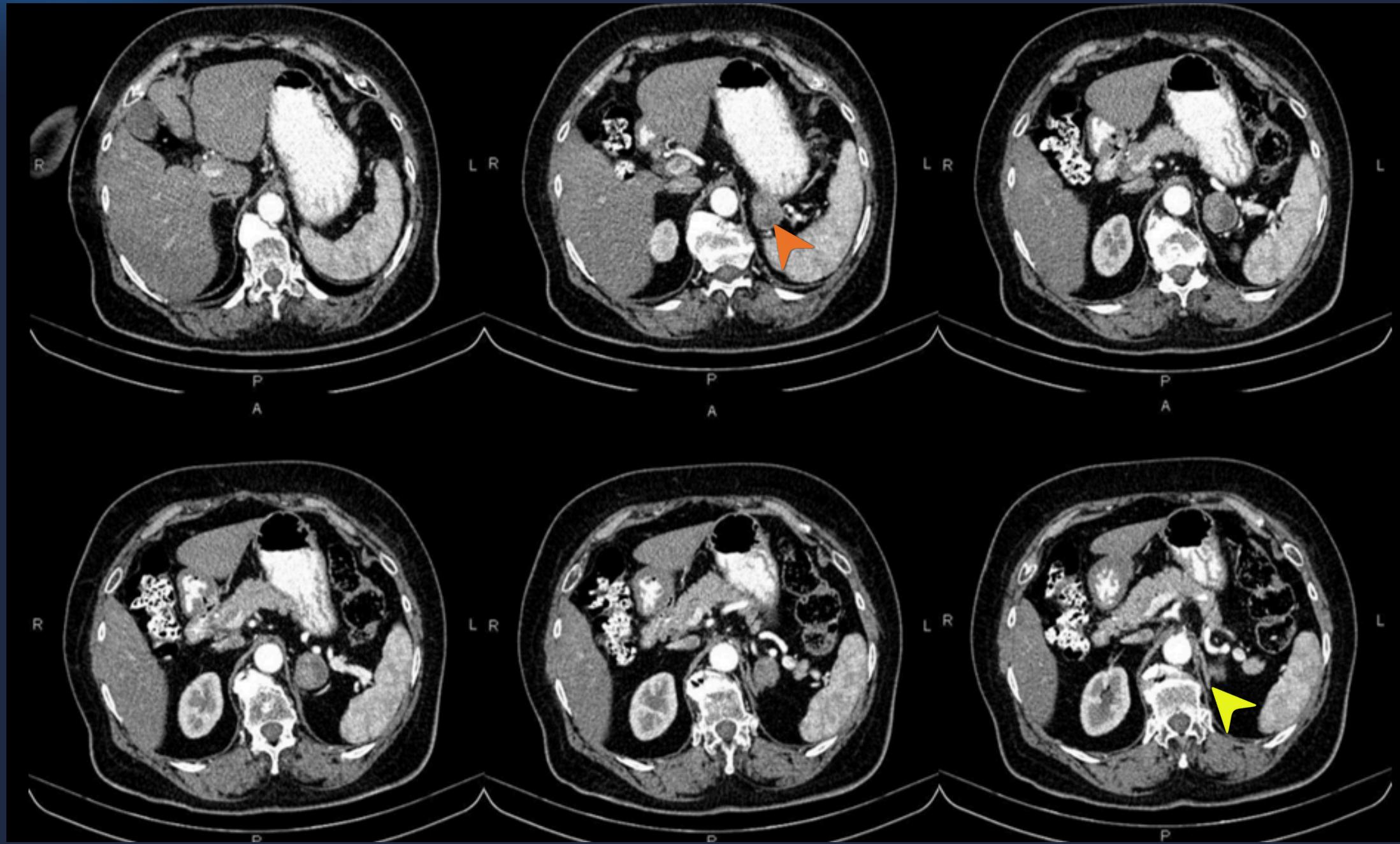


A 40 mm partially exophytic **predominantly solid enhancing mass** with **internal cystic components** is seen in the posterior aspect of the upper pole of the left kidney. There is no sign of local invasion, no vascular extension and no regional lymphadenopathy.

Because the enhancing solid components of the mass are **more than 25%** of the all mass volume, the Bosniak classification **shouldn't** applied to this lesion, and it's likely a solid mass with cystic or necrotic components that is more aggressive than a Bosniak class IV cystic renal mass.

# Exophytic lesions may cause misdiagnosis

70 YO, known and operated case of breast cancer. Workup for metastasis.



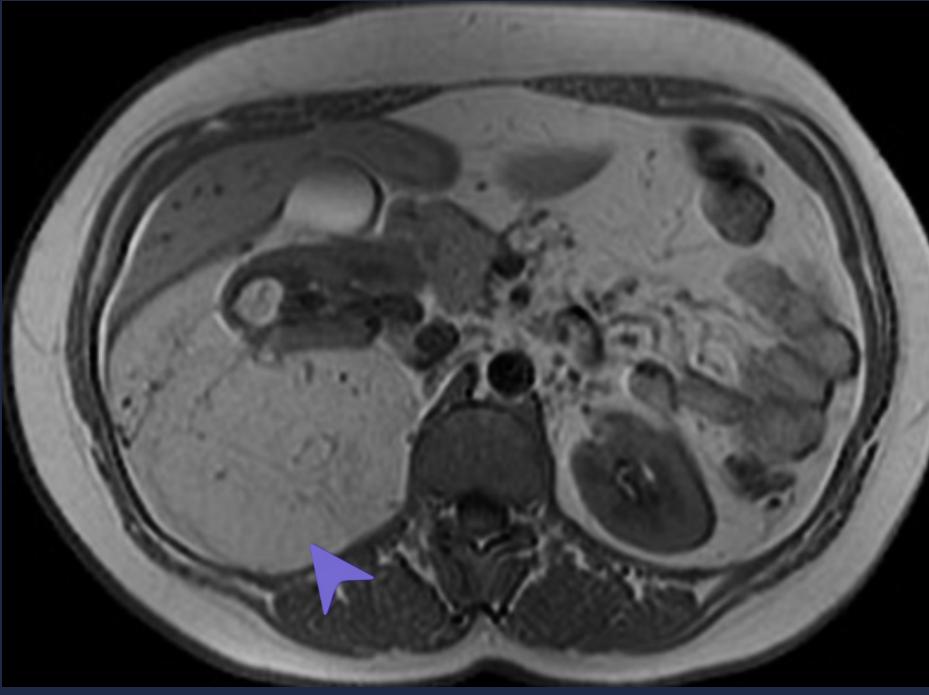
Exophytic **GIST** of the stomach mimics left adrenal metastasis. The **normal adrenal** can be defined separately, better seen in the coronal image.

# Exophytic lesions may cause misdiagnosis

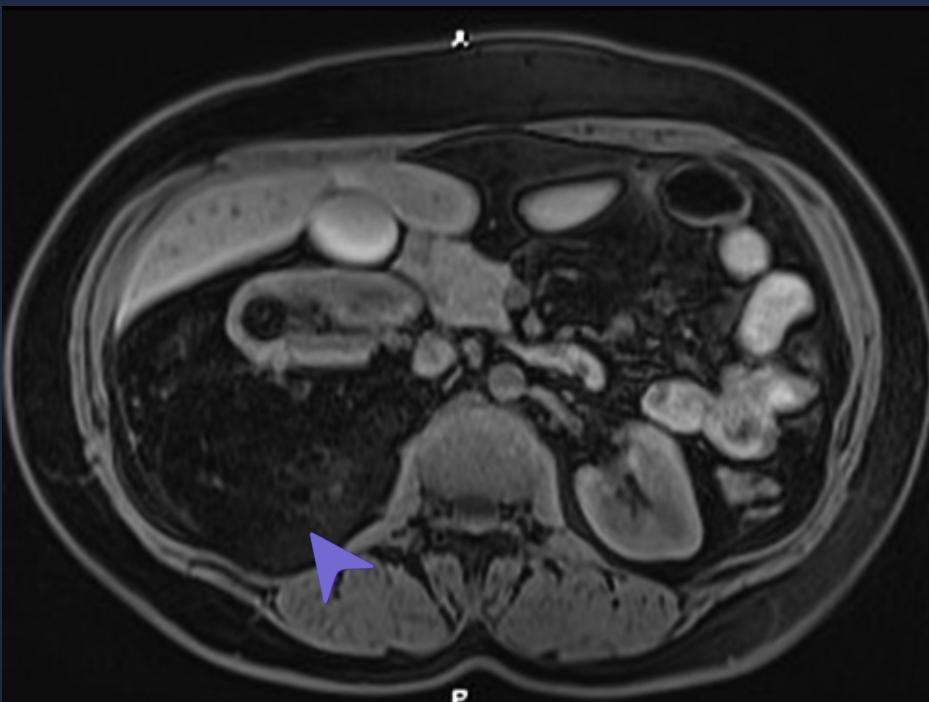


In the left adrenal gland, a **cyst-like structure** with an air-fluid level is found. It communicates with the gastric fundus and is **filled with iodinated oral contrast**, inferring a gastric diverticulum.

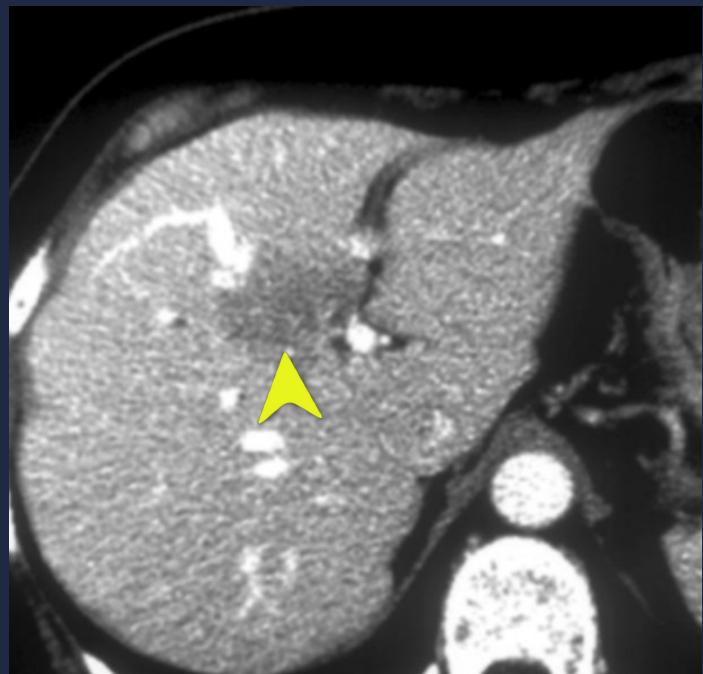
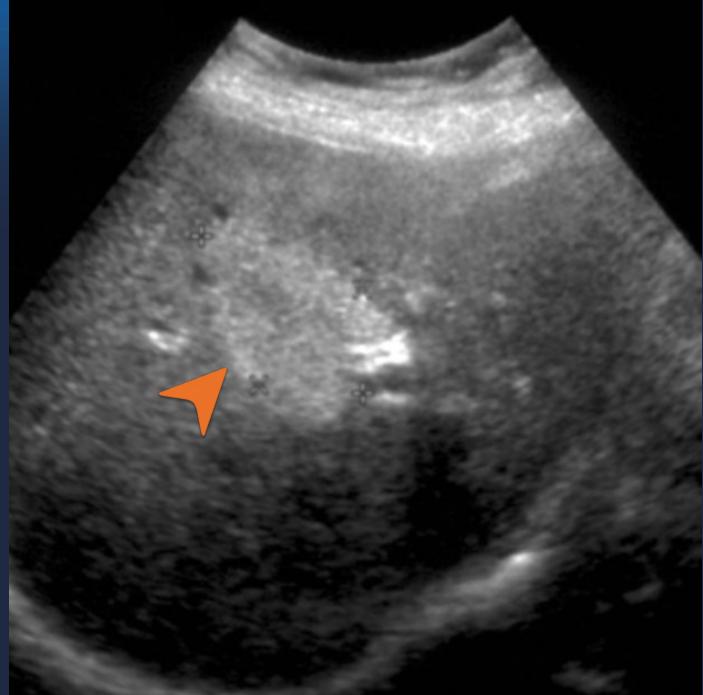
Also, beware of the fundal gastric diverticulum in the same location, which may cause misdiagnosis.



&  
Rarely,  
an **exophytic renal angiomyolipoma**  
could mimic a  
retroperitoneal fat-  
containing lesion  
such as  
liposarcoma.



# Focal mass-like steatohepatitis mimics neoplasms

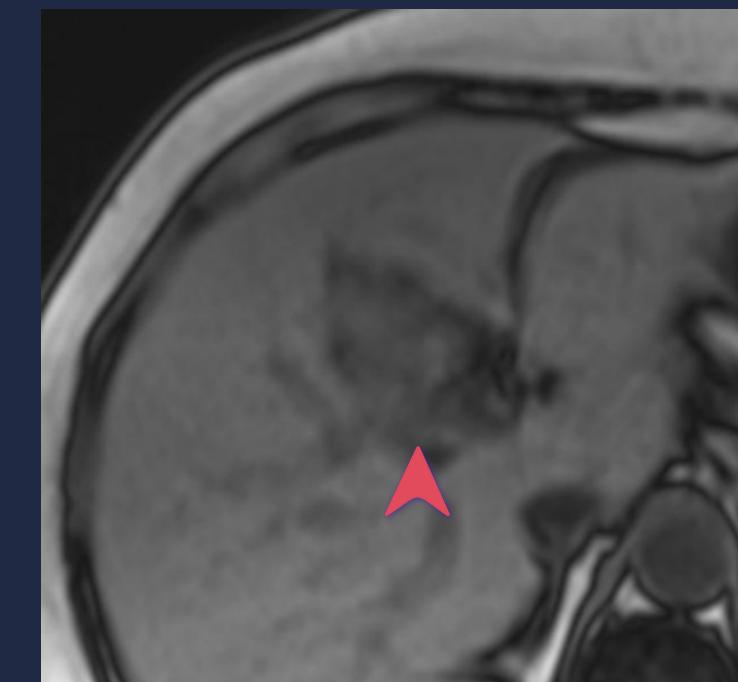
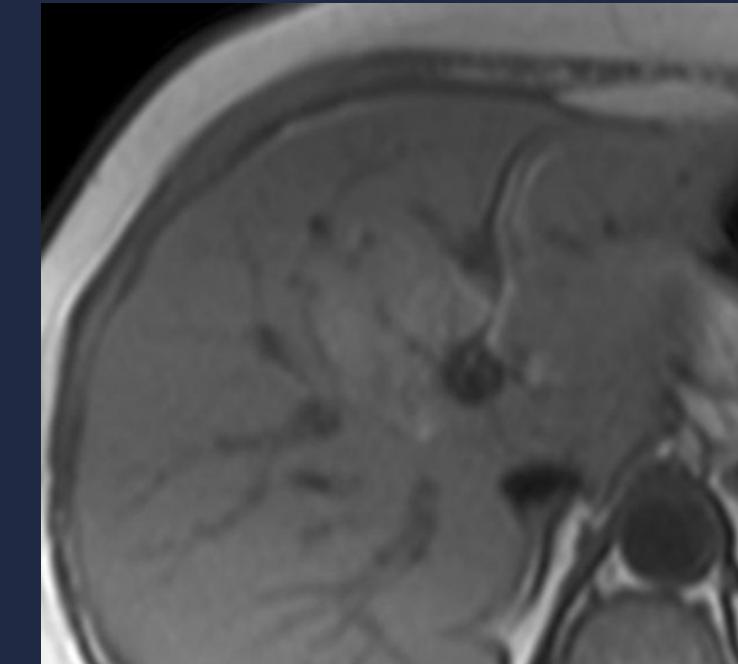


Focal hepatic steatosis often occurs in the peri-ligamentous and periportal regions and can mimic a focal neoplasm, particularly on **ultrasound** and **CT**. This phenomenon is thought to be linked to the haemodynamics of the third inflow.

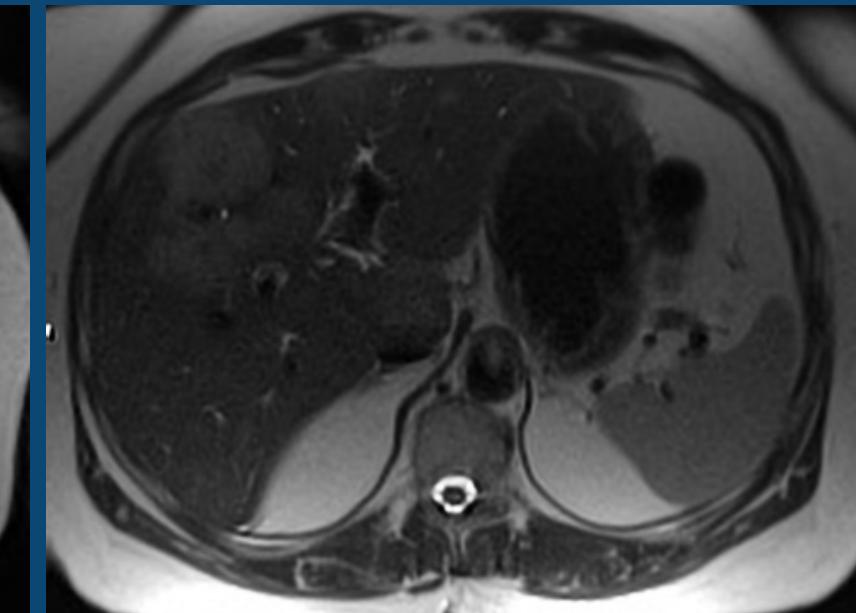
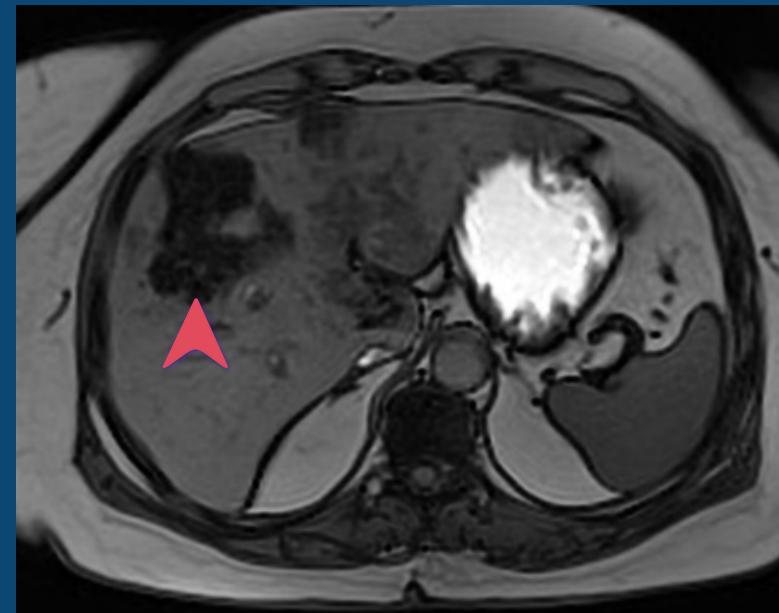
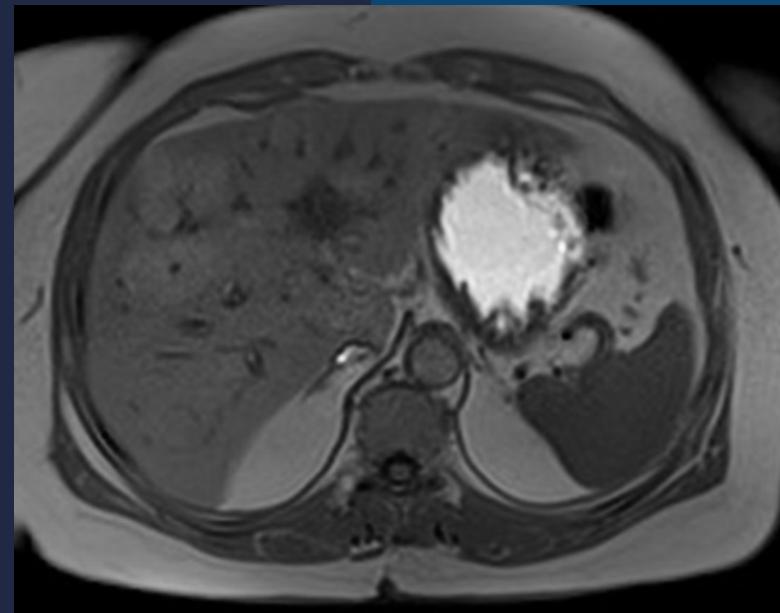
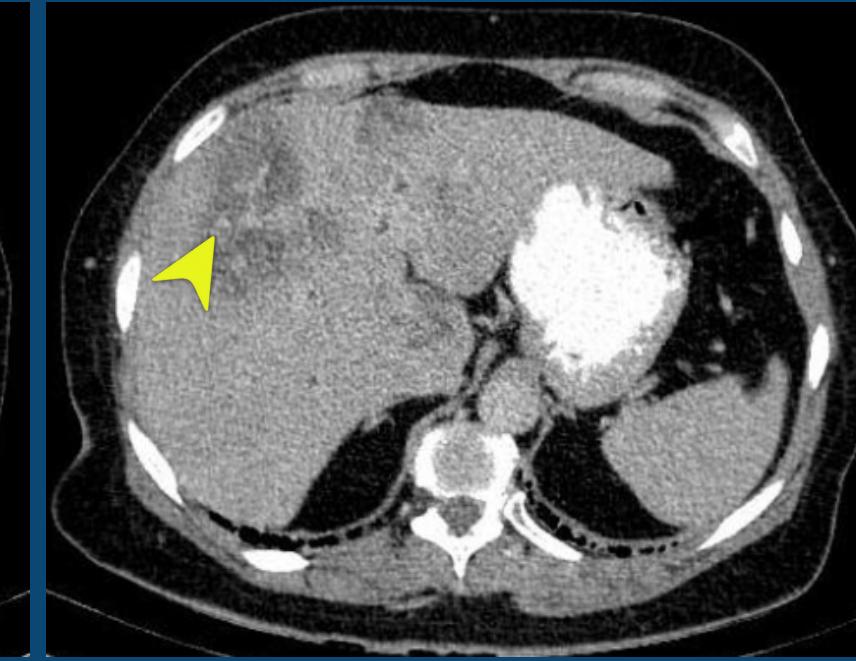
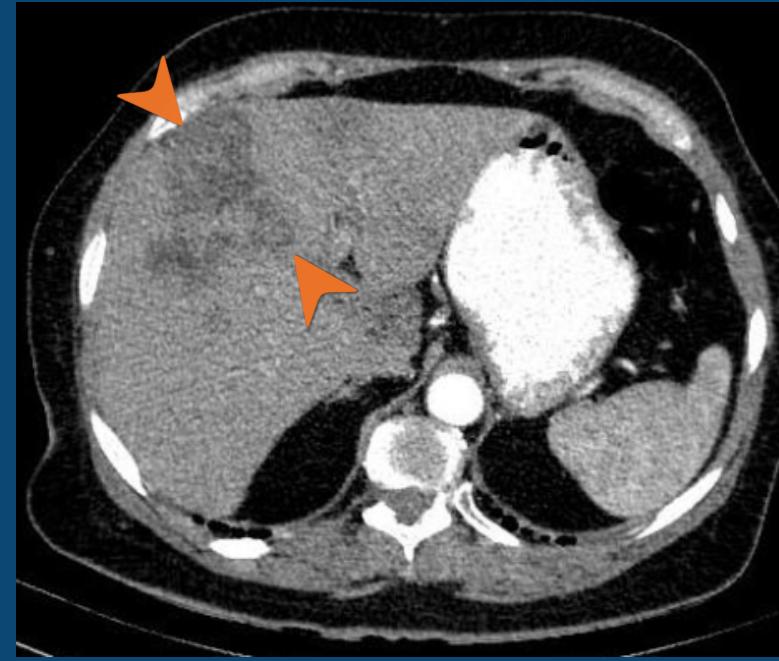
Loss of mass effect and presence of non-distorted, traversing blood vessels can help for diagnosis.

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MRI is the imaging modality of choice in cases where the diagnosis is less certain, showing increased T1 signal and **signal drop-out** on opposed-phase imaging.



# Focal mass-like steatohepatitis mimics neoplasms



On CT, a lobulated **geographic hypodense area** occupies parts of the central liver. The **blood vessels** transverse this region without interruption, and no mass effect could be detected.

On MRI, **signal dropout** on opposed phase T1W GRE images is noted in the same areas in favour of fatty infiltration.

# Biliary strictures, malignant or benign?

Biliary strictures pose a diagnostic challenge when the cause cannot be determined despite various evaluations, and many remain indeterminate. Missing a malignancy in these cases can have serious consequences, but up to 25% of patients who undergo surgery for suspected biliary malignancy actually have benign pathology.



Although there are no clinical or radiological features to reliably distinguish benign from malignant biliary strictures, some must-know may help:



The diagnostic approach involves thorough history and physical examination, followed by imaging to determine the level of obstruction and guide further investigations.

# Biliary strictures, malignant or benign?

It should be noted that bile duct strictures in obstructive jaundice patients should be presumed malignant unless proven otherwise.

Strictures without jaundice and with normal serum bilirubin levels are less likely to be malignant.



The following highlights feature that signify malignant biliary strictures:

- a narrowed segment with hyper-enhancement relative to the liver seen during the portal venous phase
- long length involvement ( $> 12$  mm)
- prominent bile duct thickening ( $> 3$  mm)
- obliterated bile duct lumen
- vascular encasement
- an indistinct outer margin
- luminal irregularity, and
- asymmetry



A **segmental irregular and asymmetric stricture** in the proximal extrahepatic bile ducts suggests a malignant stricture in a pathology-proven case of hilar cholangiocarcinoma.

Case: Hani Makky Al Salam rID: 8104

# Benign hepatocellular masses, Focal nodular hyperplasia (FNH) or not?

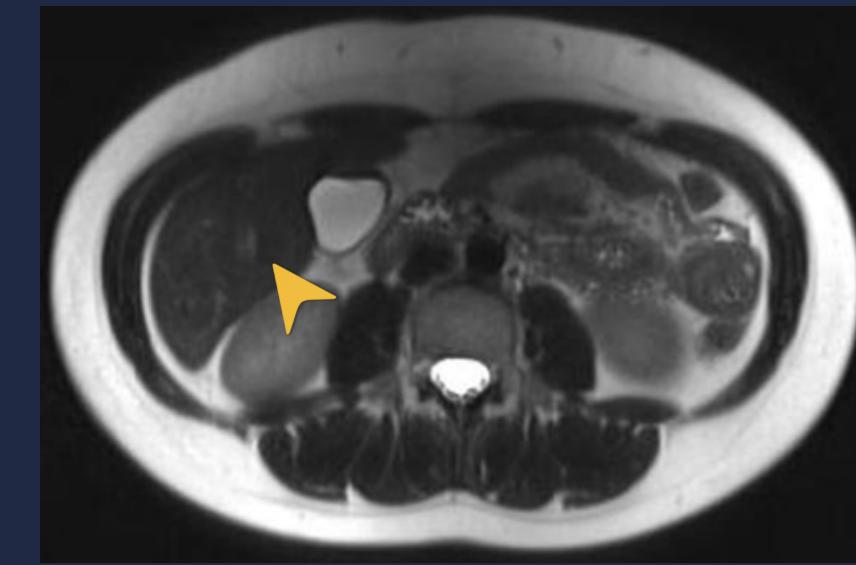
FNH is the second most common benign liver lesion after haemangioma.

Accurate imaging is crucial in preventing unnecessary intervention, as FNH is typically treated conservatively.

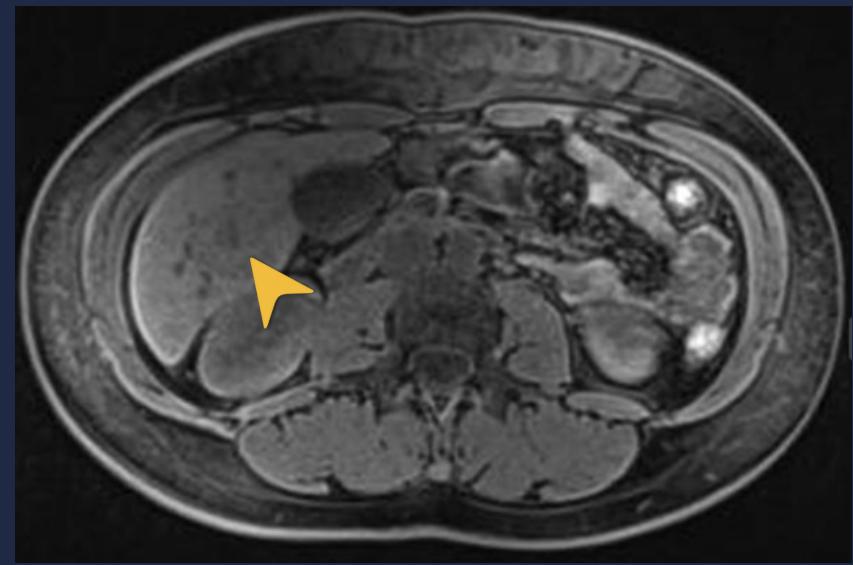
The hepatic adenoma is the main differential diagnosis, requiring a distinct approach and may need biopsy or resection.



In a patient with no background chronic liver disease or known malignancy, typical FNH diagnosis can be defined by a multiphase MRI if **all** the following criteria are met:



A lobulated mass with no capsule, iso or discreet high signal with a high signal central scar in T2WI, with homogeneity outside of the central scar



Iso or discreet low signal with a low signal central scar in T1WI

# Benign hepatocellular masses, Focal nodular hyperplasia (FNH) or not?

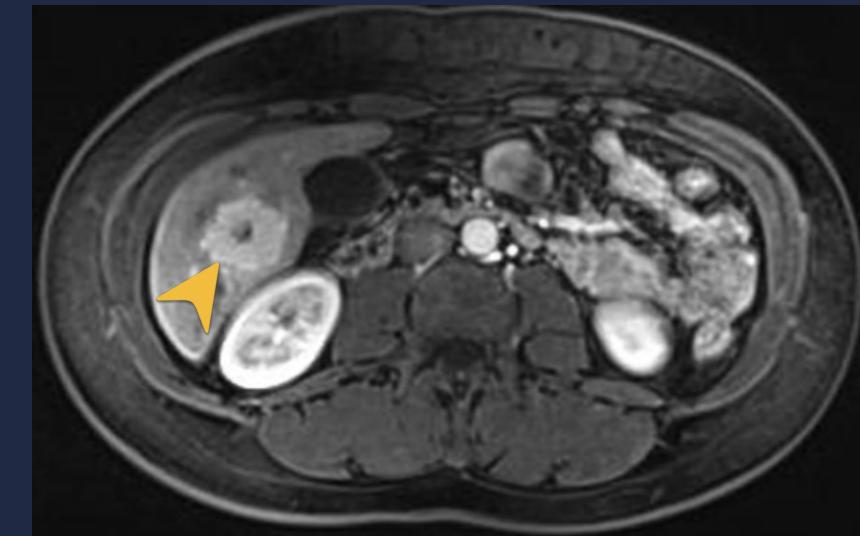
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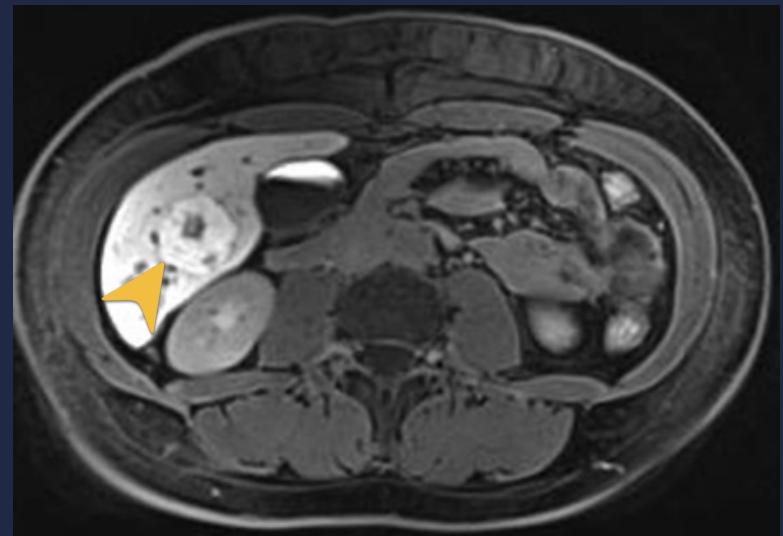
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In a patient with no background chronic liver disease or known malignancy, typical FNH diagnosis can be defined by a multiphase MRI if **all** the following criteria are met:



Vivid early enhancement of the mass that becomes iso signal on PVP and delayed images along with delayed enhancement of the central scar



FNH is one of the few entities that can hyperconcentrate hepatocyte specific contrast agents. The central fibrotic scar typically does not enhance

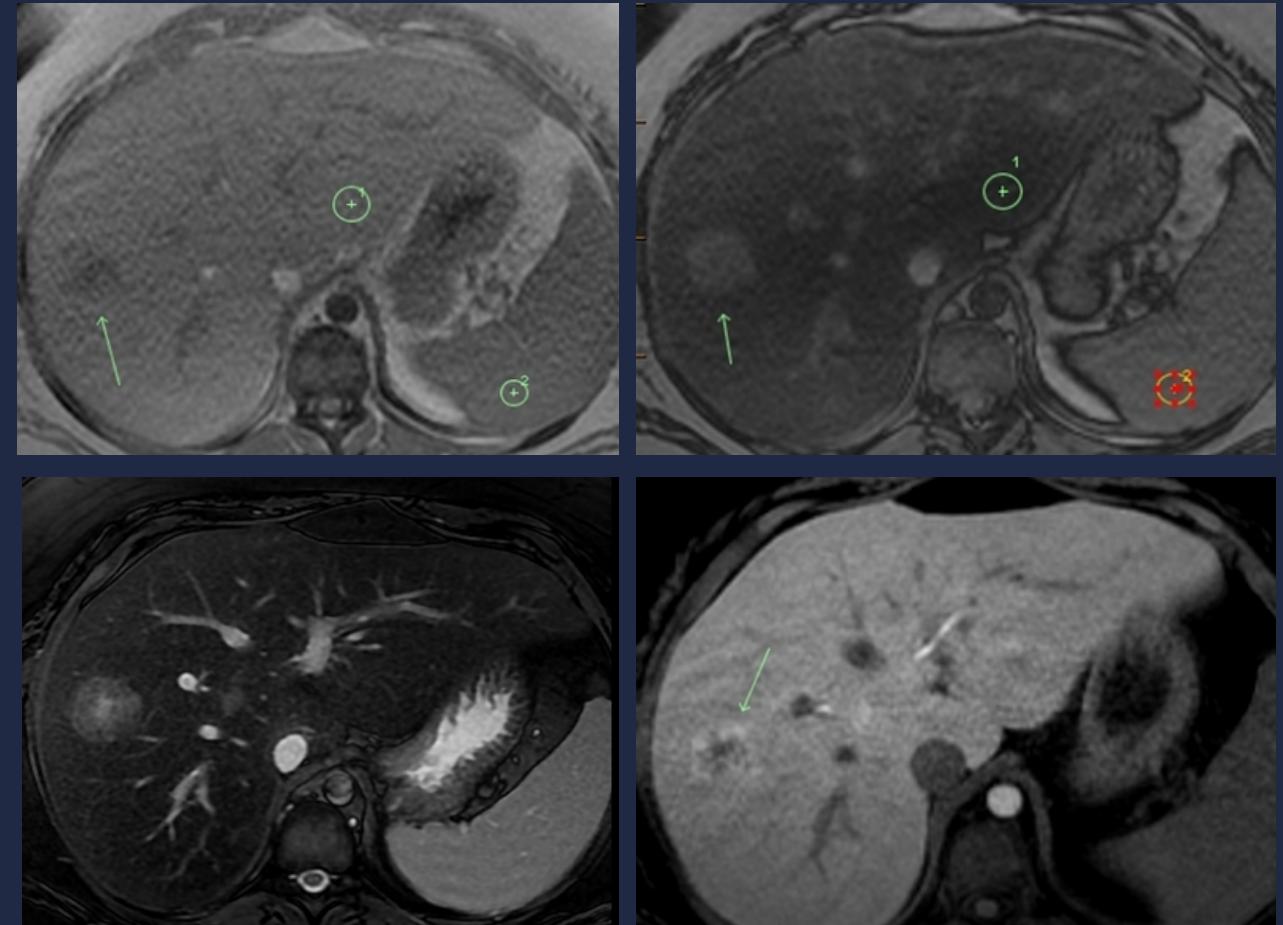
# Benign hepatocellular masses, Focal nodular hyperplasia (FNH) or not?

An **atypical** FNH refers to an FNH-like lesion which lacks one or more of the mentioned criteria. The main differential diagnosis may include:

1. hepatocellular adenoma particularly inflammatory or beta catenin mutated subtypes
2. fibrolamellar hepatocellular carcinoma (FLC)
3. hepatocellular carcinoma (HCC)
4. hypervascular metastasis
5. hepatic haemangioma
6. intrahepatic cholangiocarcinoma

**So,**

biopsy or surgical resection is needed.



An atypical FNH-like lesion that is a proven inflammatory hepatocellular adenoma.

Case: Chris O'Donnell rID: 43301



## Take home points:

- iso-attenuating PDACs may not be detected on contrast-enhanced MDCT. So, recognizing secondary signs, such as the abrupt cut-off of the main pancreatic duct with or without upstream ductal dilatation, is crucial and should be acknowledged
- regarding anatomical location, PDACs originating from the uncinate process frequently manifest with abdominal pain instead of jaundice. Vascular invasion can also occur early on, even in small-sized tumours. Therefore, early detection is essential
- mass-forming chronic pancreatitis can mimic PDAC, making imaging differentiation challenging. Nevertheless, the duct-penetrating sign and background chronic pancreatitis may offer valuable assistance
- groove pancreatitis, particularly segmental form, is in differential with pancreatic head PDAC, and imaging findings, including cystic changes in the pancreatic head, smooth long stricture of the intrapancreatic CBD, and displaced CBD and GDA, may help to distinguish
- avoid using the Bosniak classification for renal cysts and cystic masses in patients with renal cell carcinoma syndromes, as well as renal lesions with inflammatory, infectious, and vascular aetiology



## Take home points:

- according to the recent Bosniak classification, a Bosniak class IV cystic renal mass is one in which less than 25% of the mass is formed of enhancing tissue, and the lesions with more than 25% enhancing solid components are likely solid masses with haemorrhagic, cystic or necrotic changes
- beware of exophytic lesions such as GISTs and diverticula that may cause misdiagnosis
- focal hepatic steatosis is a great mimicker of hepatic neoplasms, particularly on ultrasound and CT. MRI is the imaging modality of choice, as it shows signal drop-out on opposed-phase imaging
- there are no clinical or radiological features to reliably distinguish benign from malignant biliary strictures, and the diagnostic approach involves thorough history and physical examination, followed by imaging to determine the level of obstruction and guide further investigations
- a multiphase MRI can establish a typical FNH diagnosis if all diagnostic criteria are met. An atypical FNH refers to an FNH-like lesion that lacks one or more of the diagnostic criteria and often needs a tissue exam



## Related Radiopaedia resources (*linked*):

- pancreatic ductal adenocarcinoma
- mass-forming chronic pancreatitis
- groove pancreatitis
- Bosniak classification of cystic renal masses (version 2019)
- gastrointestinal stromal tumour
- gastric diverticulum
- renal angiomyolipoma
- retroperitoneal liposarcoma
- focal hepatic steatosis
- bile duct stricture
- focal nodular hyperplasia
- hepatic adenoma
- inflammatory hepatic adenoma
- beta catenin mutated hepatic adenoma
- fibrolamellar hepatocellular carcinoma



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