

Radiology of acute abdomen (common causes)

ACUTE ABDOMEN

a clinical condition characterized by severe abdominal pain, requiring the clinician to make an urgent therapeutic decision.

This may be challenging, because the differential diagnosis of an acute abdomen includes a wide spectrum of disorders, ranging from life-threatening diseases to benign self-limiting conditions .

MANAGEMENT

- **Indicated management may vary from emergency surgery to reassurance of the patient and misdiagnosis may easily result in delayed necessary treatment or unnecessary surgery. Sonography and CT enable an accurate and rapid triage of patients with an acute abdomen**

Natural history of frequent causes of an acute abdomen

Life-threatening



Self-limiting

Aortic aneurysm rupture
Pancreatitis
Bowel ischemia
Perforated peptic ulcer
Perforated diverticulitis

Appendicitis
Cholecystitis
Sigmoid diverticulitis
Salpingitis

Gastroenteritis
Lymphadenitis
Epiploic appendagitis
Omental infarction
Cecal diverticulitis

Before you perform an examination, *obtain relevant information from the referring clinician.*

Don't let the clinician simply 'order' a sonogram or CT, but discuss the patient's age and posture, laboratory results and the number one clinical diagnosis and differential diagnosis.

Based on that information and your own degree of confidence with the modalities *decide for yourself whether to perform sonography or CT.*

Sonography has the advantage of close patient contact, enabling assessment of the spot of maximum tenderness and the severity of illness without ionizing radiation.

In general the diagnostic accuracy of CT is higher than sonography.

In patients with inconclusive US-results, CT can serve as an adjunct to sonography, and vice versa.

We advocate the following two-step radiological approach of an acute abdomen.

- 1. Confirm or exclude the most common disease**
- 2. Screen for general signs of pathology**

Plain abdominal film

- Normal plain abdominal film does not exclude ileus or other pathology
- Plain abdominal film is useful for:
 - Kidney stone detection
 - Pneumoperitoneum detection
- All other indications: use Sonography or / and CT

Appendicitis

Pain in the RLQ, regardless of any other symptom or laboratory results, should be considered to be appendicitis until proven otherwise.

If you are unable to find the appendix you cannot rule out the diagnosis of appendicitis unless a good alternative diagnosis is found.

If you do not find the appendix and there is no alternative diagnosis call the results of the examination indeterminate. Do not call it: 'no appendicitis'.

Signs of appendicitis

- Outer-to-outer diameter $>6\text{mm}$
- Inflamed periappendiceal fat
- Fecolith
- Hypervascularity on power Doppler

Normal Appendix.

Your first task is to identify the appendix.

At sonography and CT the appendix is seen as a blind-ending nonperistaltic tubular structure arising from the base of the cecum.

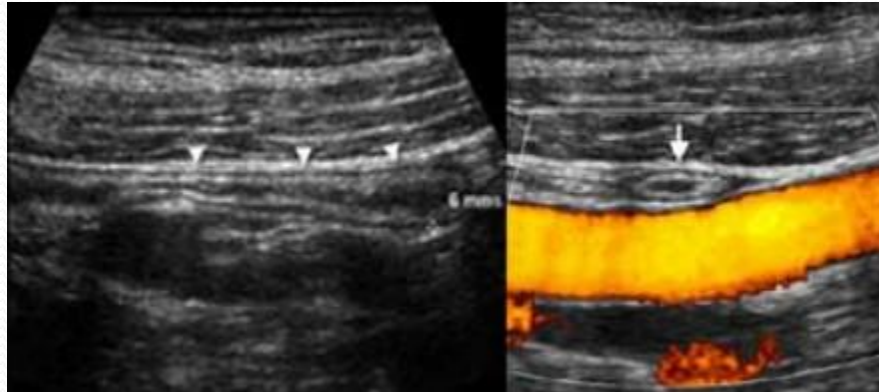
Do not mistake a small bowel loop for the appendix.

Secondly determine if the appendix is normal or inflamed.

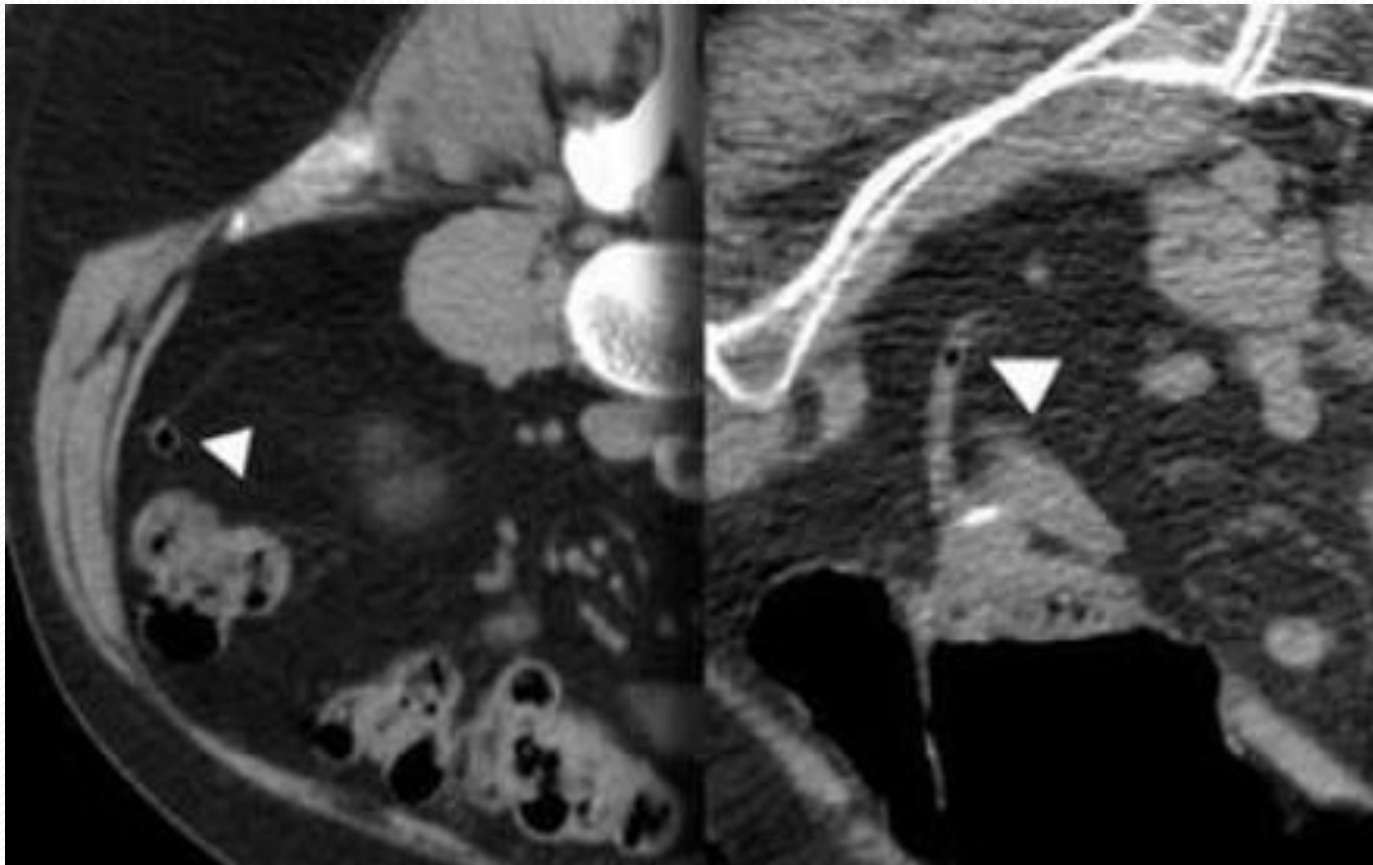
The outer-to-outer diameter of the appendix is the most important imaging criterium.

Although an overlap of appendiceal diameters in normal and inflamed appendices can incidentally be found, a threshold value of 6-7 mm is generally used.

normal appendix longitudinal sonogram depicts a blind ending tubular structure with a maximum outer diameter of 6mm with non inflamed surrounding fat . on axial view the appendix can be compressed crossing the iliac vessels



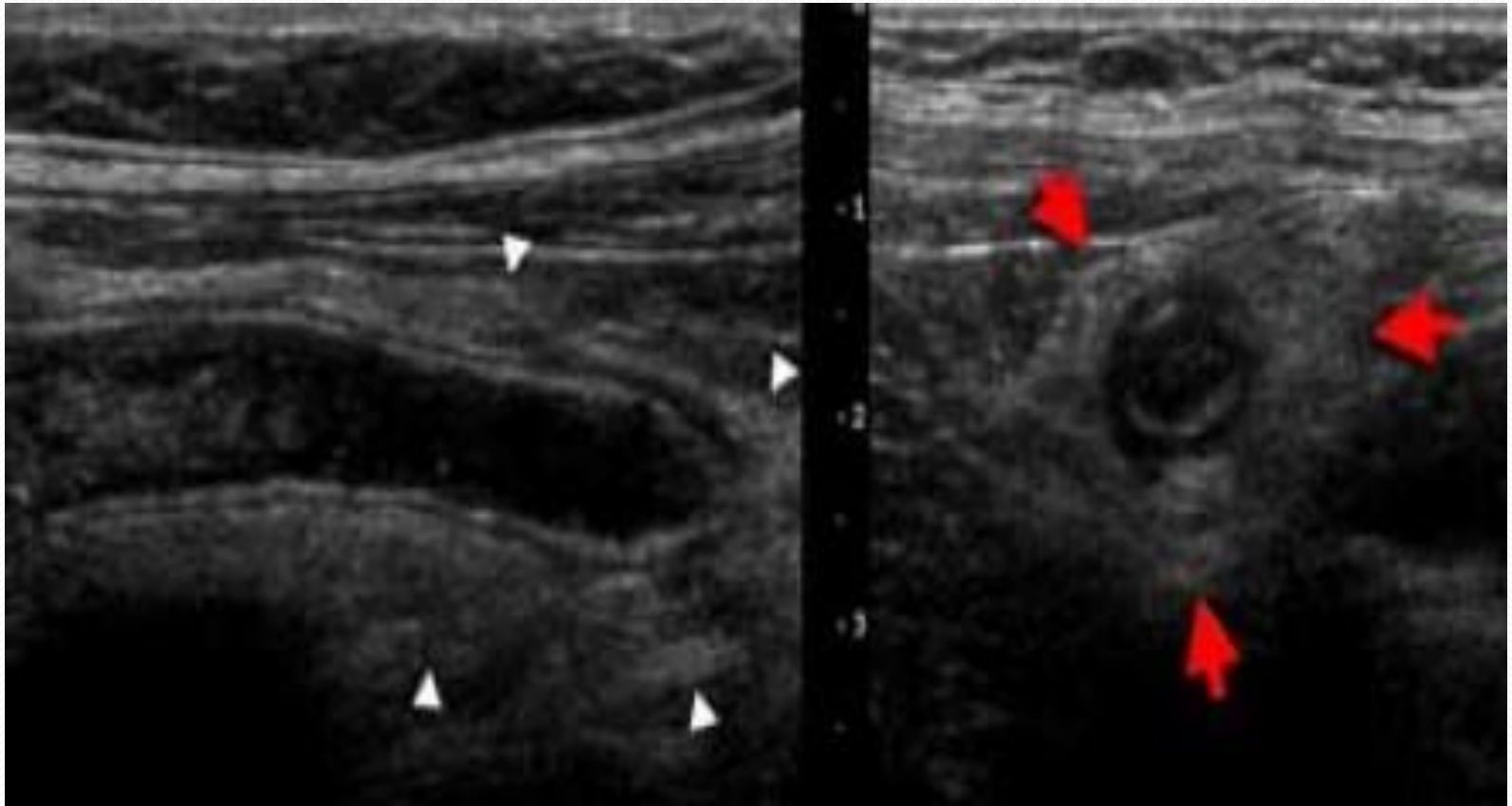
A normal appendix has a maximum diameter of 6 mm, is surrounded by homogeneous non-inflamed fat, is compressible and often contains intraluminal gas.



Inflamed Appendix

An inflamed appendix has a diameter larger than 6 mm, and is usually surrounded by inflamed fat. The presence of a fecolith or hypervascularity on power Doppler strongly supports inflammation.

Inflamed appendix at sonography shows distended non compressible appendix surrounded by hyper echoic inflamed fat

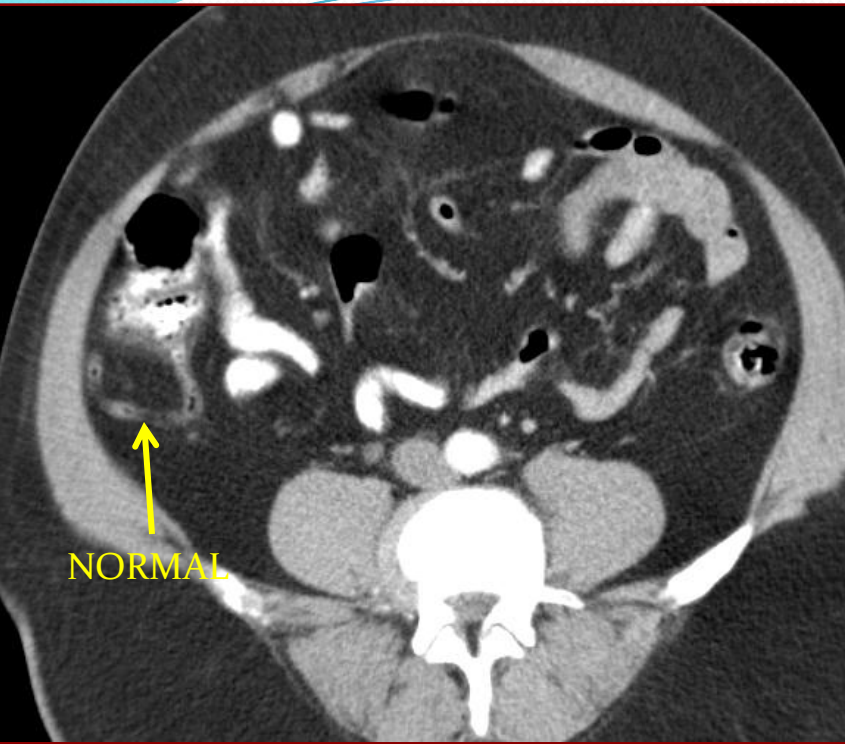


CT Features of acute appendicitis

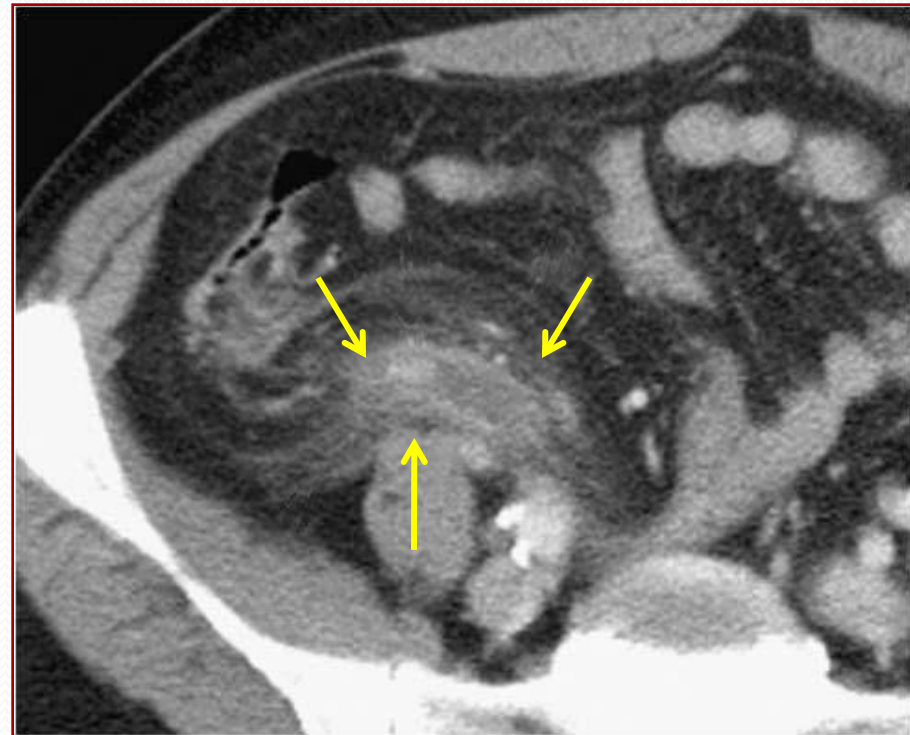
CT depicts an inflamed appendix as a fluid-filled blind-ending tubular structure surrounded by fat-stranding.

In patients who lack intra-abdominal fat the use of iv. contrast can be helpfull in depicting the inflamed appendix.

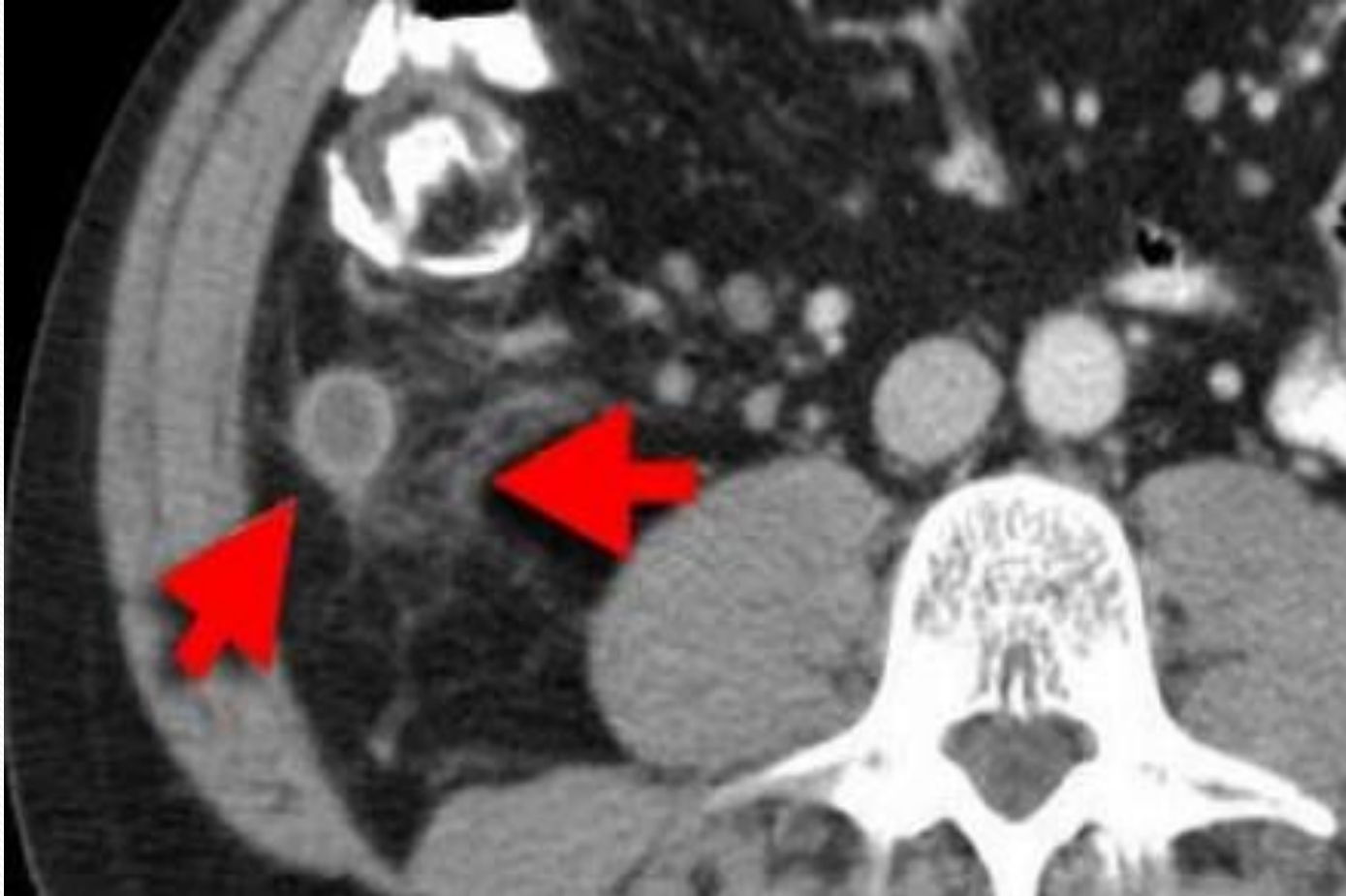
ACUTE APPENDICITIS



**DISTENDED APPENDIX WITH
LOCAL
INFLAMMATION.**



In this case hyper-attenuating wall is seen on the enhanced CT.

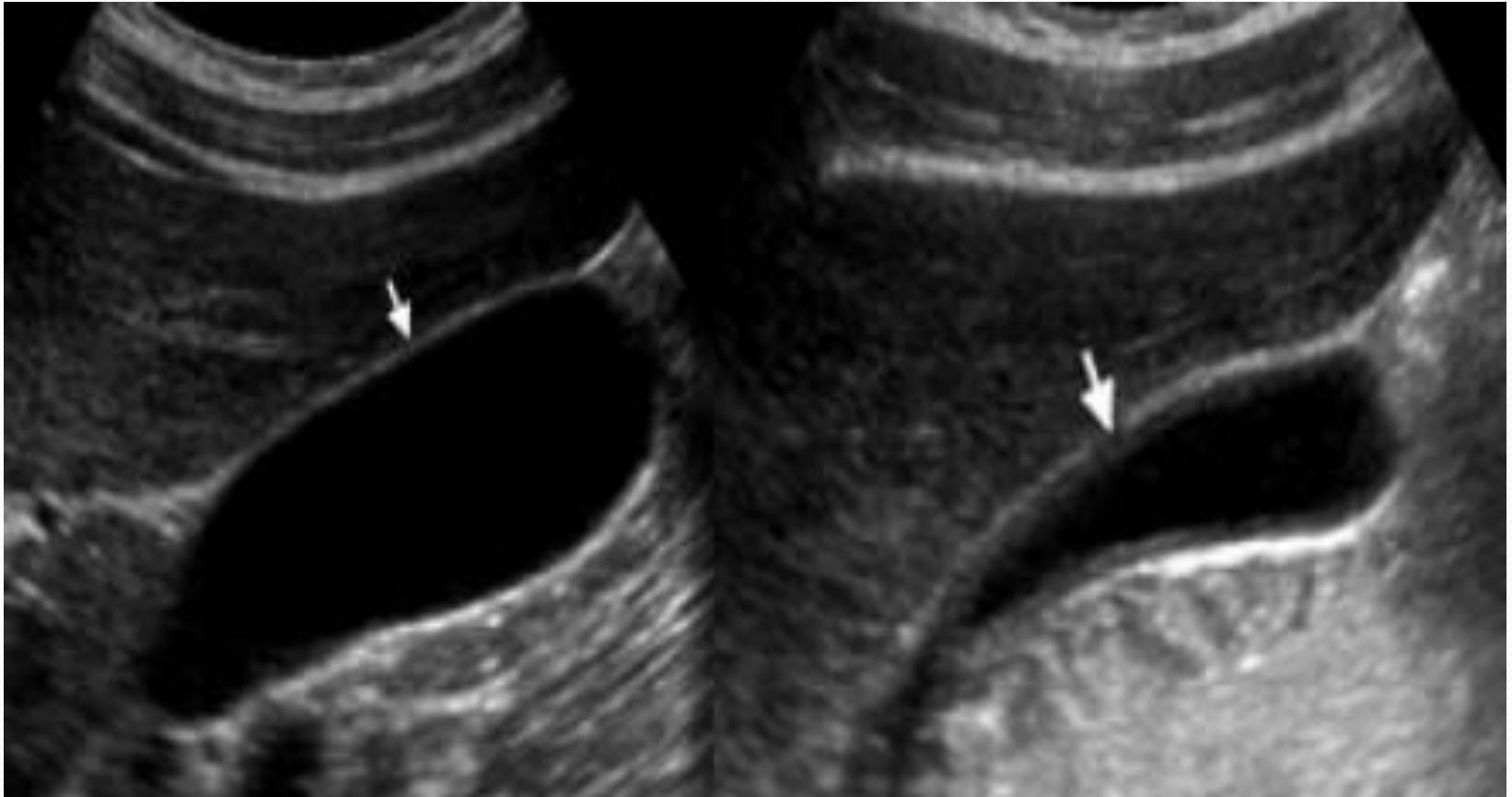


Normal gallbladder

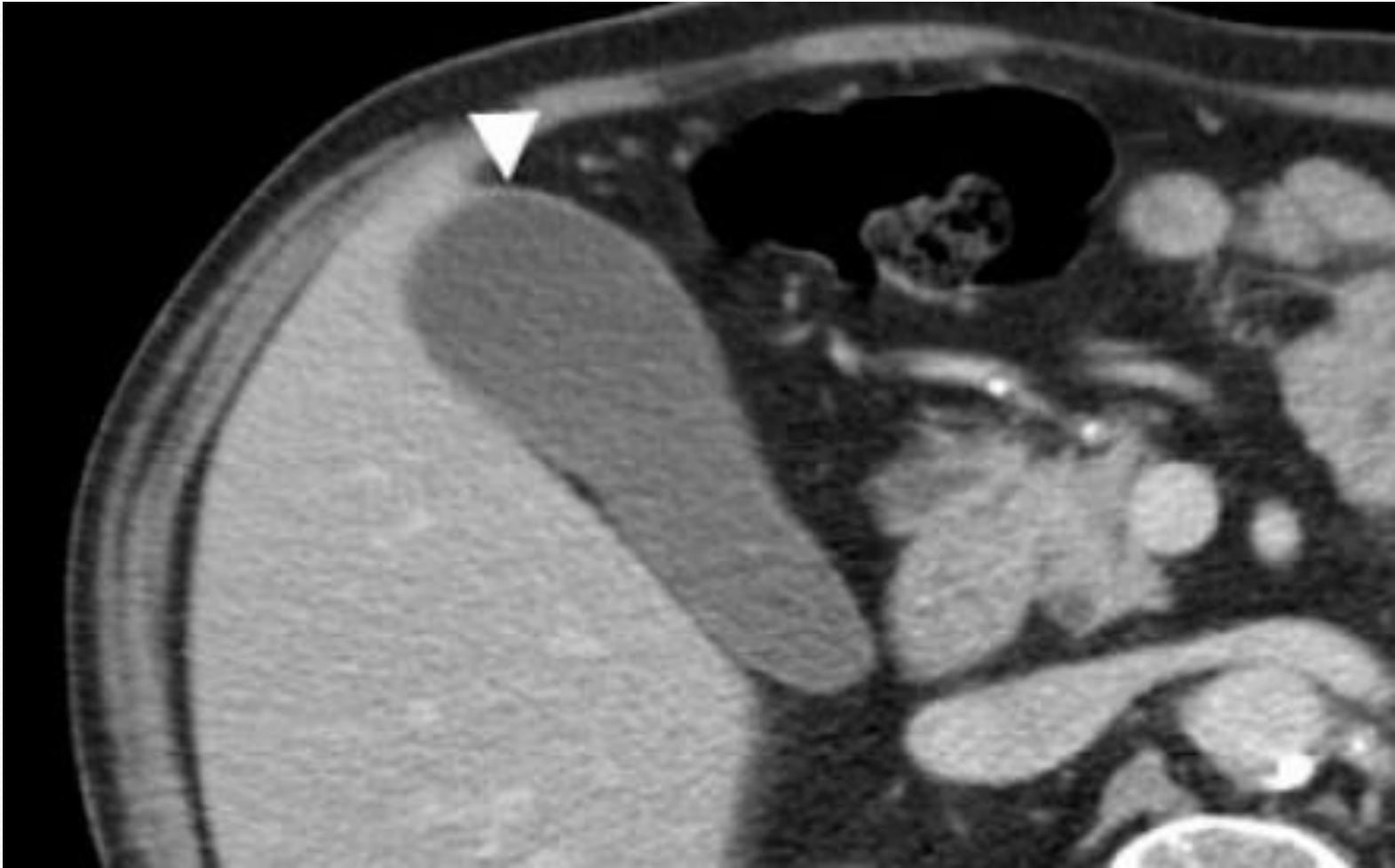
The normal gallbladder wall appears as a pencil-thin echogenic line at sonography.

The thickness of the gallbladder wall depends on the degree of gallbladder distention and pseudothickening can occur in the postprandial state.

Normal gall bladder



Normal gall bladder



Gallbladder wall thickening

Cholecystitis

- acute
- chronic
- acalculous
- xanthogranulomatous

Gallbladder carcinoma

Adenomyomatosis

Livercirrhosis

Hepatitis

Congestive right heart failure

Renal failure

Pancreatitis

Cholecystitis

Cholecystitis occurs when a calculus obstructs the cystic duct. The trapped bile causes inflammation of the gallbladder wall.

As gallstones are often occult on CT, sonography is the preferred imaging method for the evaluation of cholecystitis, also allowing assessment of the compressibility of the gallbladder.

The diagnosis of a hydropic galbladder is solely made on the non-compressability of the galbladder. Do not rely on measurements. Some galbladders happen to be small and others are large.

Cholecystitis

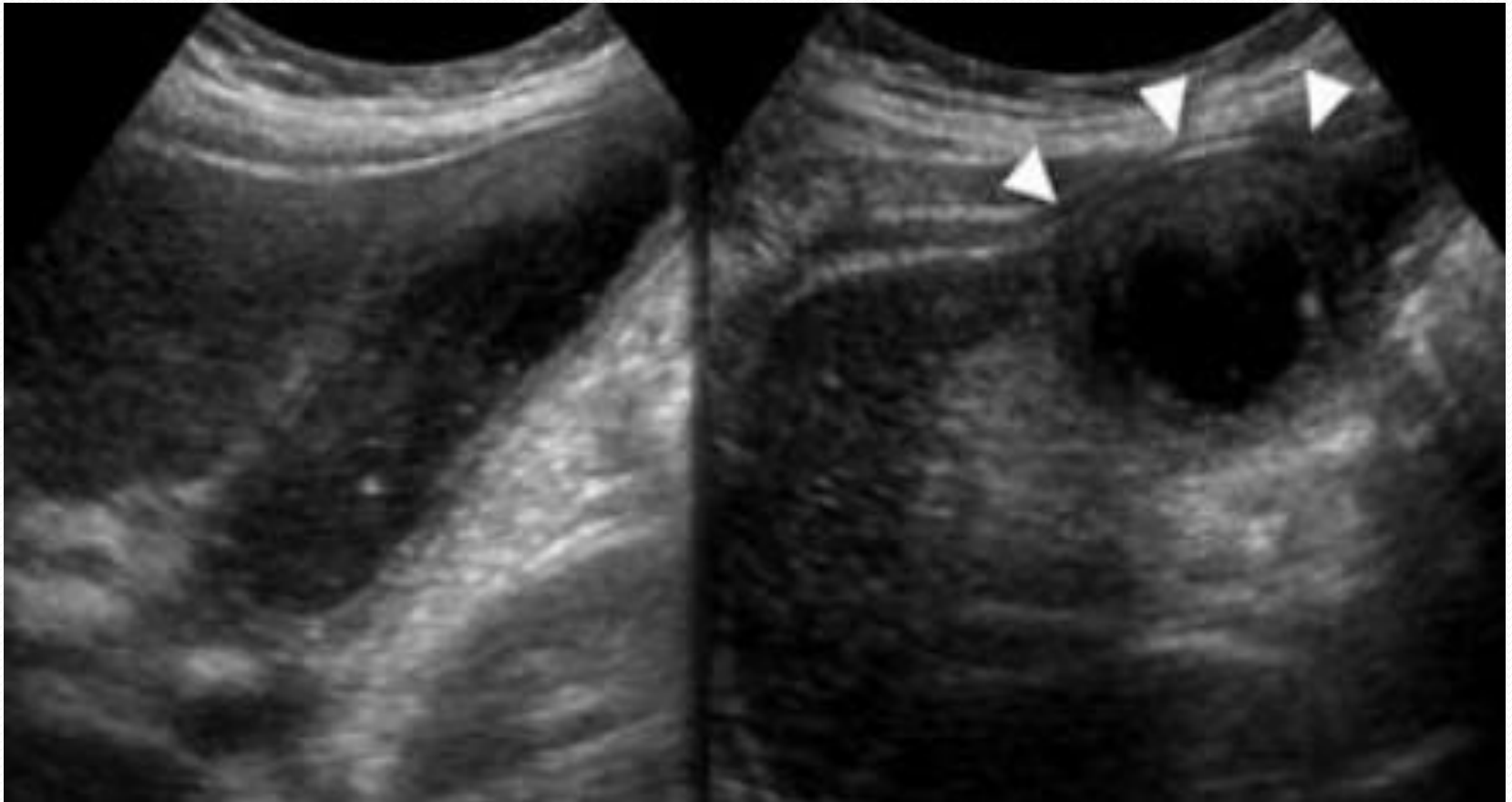
The inflamed gallbladder usually contains stones or sludge, whereas the obstructing calculus itself may or may not be identified because it is located deep within the gallbladder neck or cystic duct.

The gallbladder may be surrounded by inflamed fat, but on sonography this frequently is not seen, while CT sometimes does show fat-stranding.

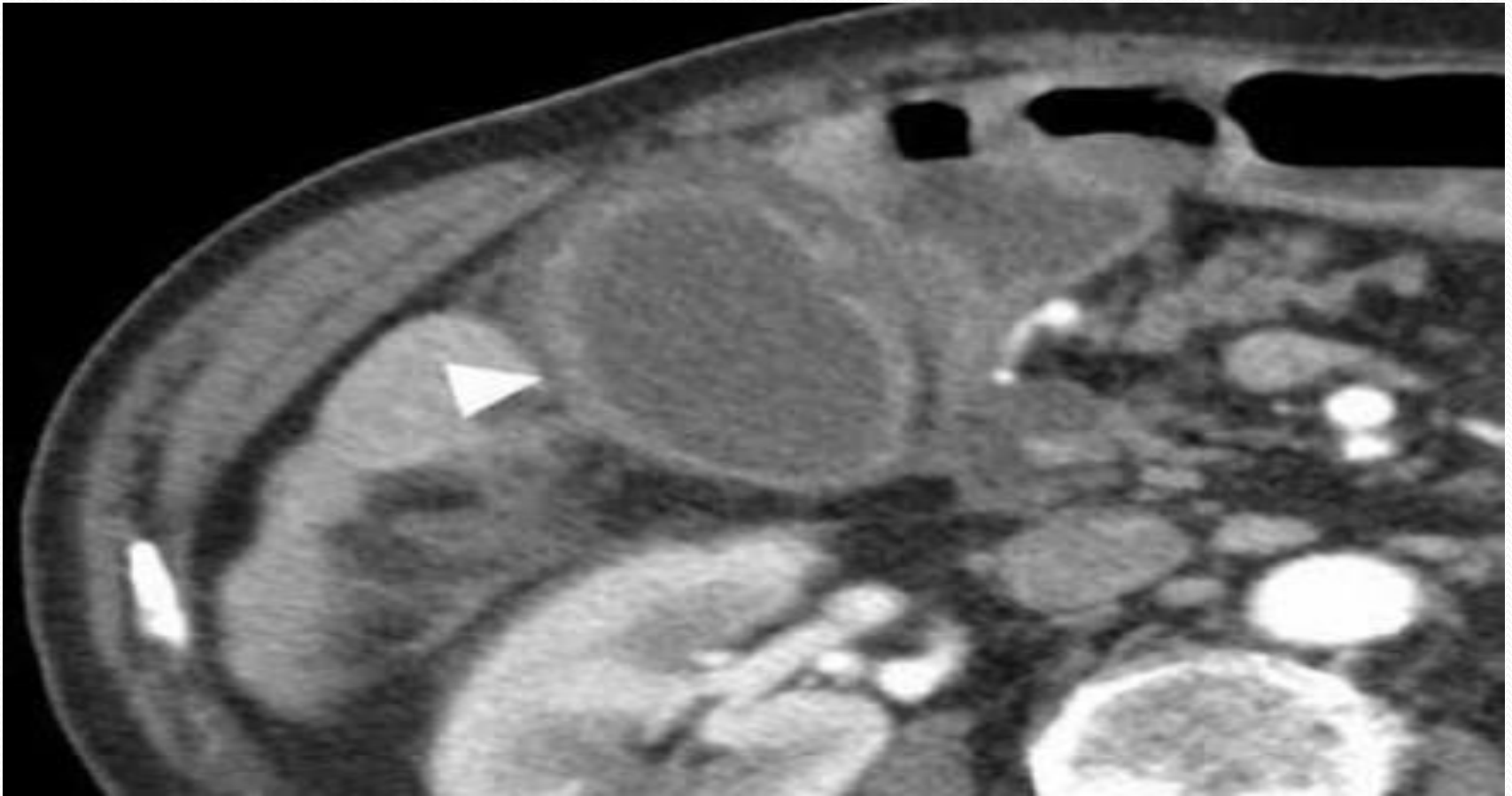
Potential pitfalls are pancreatitis, hepatitis or right-sided heart failure, which all may lead to thickening of the gallbladder wall without cholecystitis.

Therefore be certain that hydropic obstruction of the gallbladder is present before assigning the diagnosis of cholecystitis.

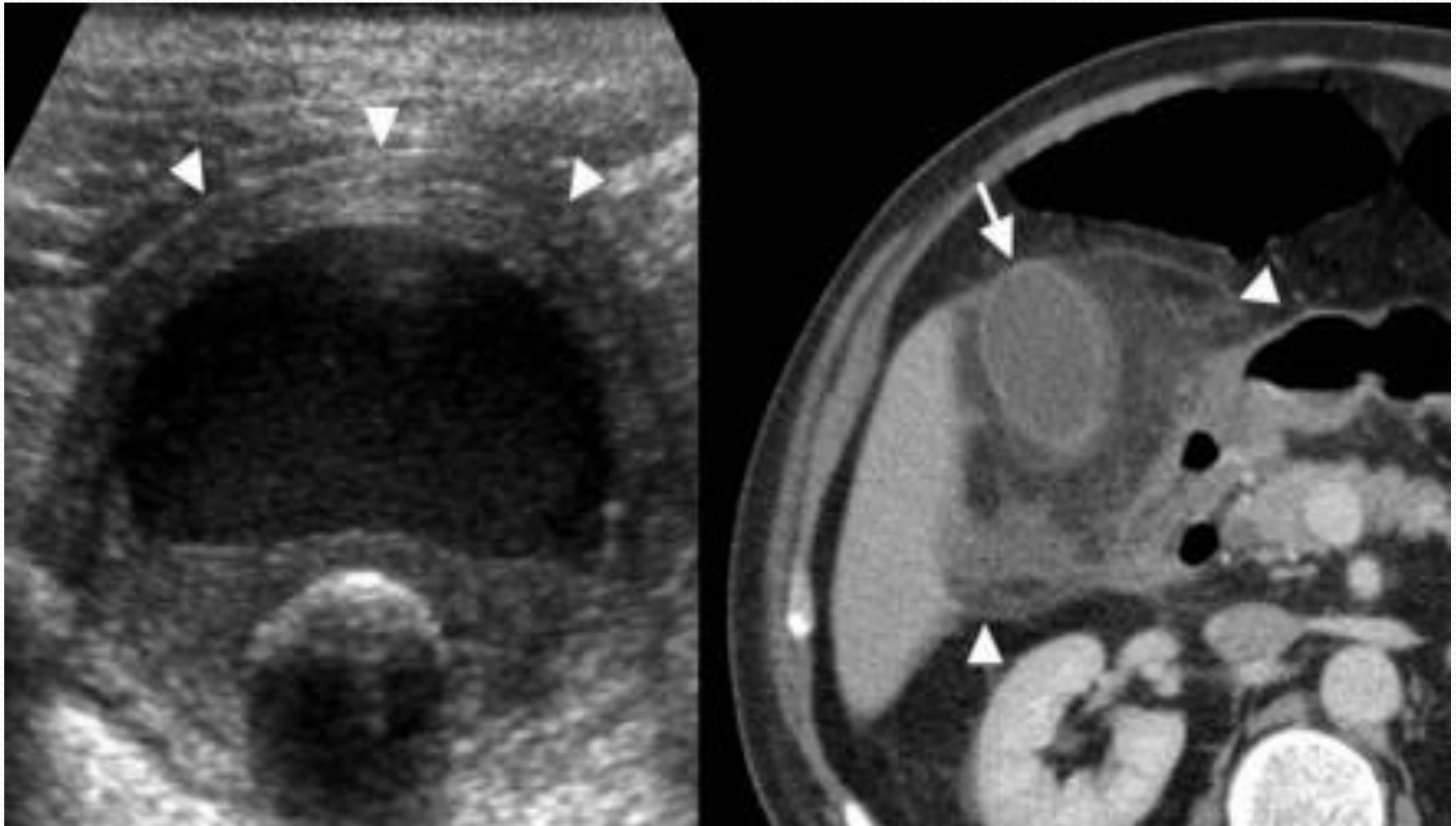
A calculous cholecystitis



A calculous cholecystitis



Calculous cholecystitis



Chronic cholecystitis

• This patient had fasted overnight, so the wall-thickening does not represent physiologic contraction.

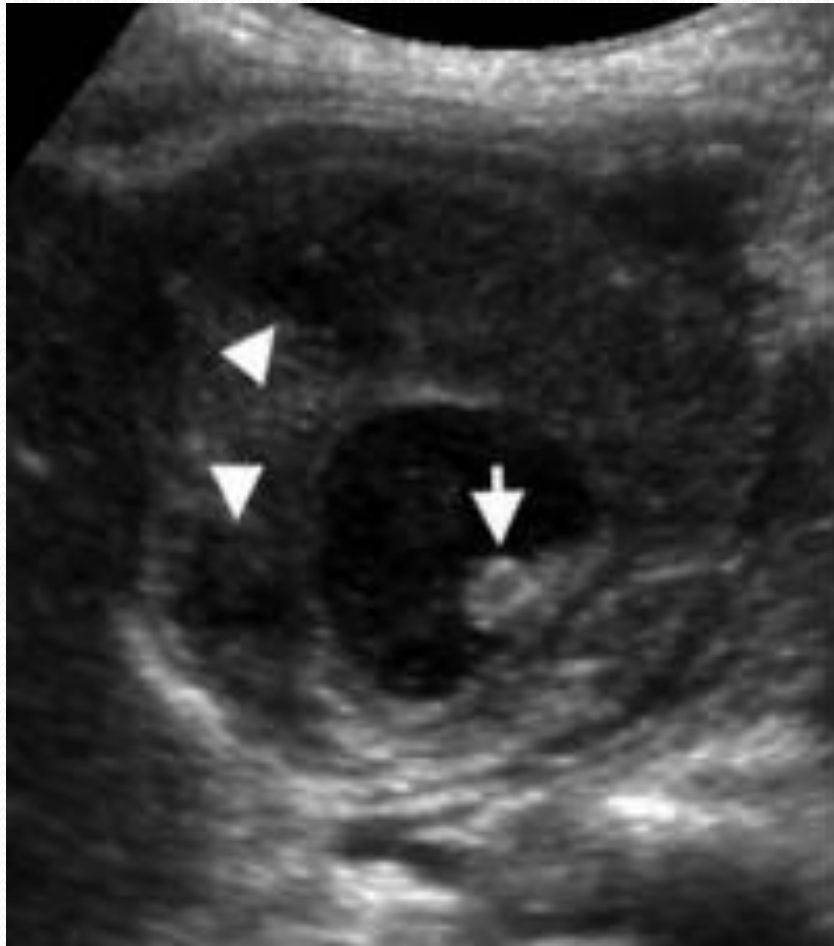
Correlation of these findings with her clinical history of recurrent colic-like right upper quadrant pain, due to transient gallbladder obstruction, is essential for the diagnosis.



Xanthogranulomatous cholecystitis

Imaging studies show marked gallbladder wall thickening, often containing intramural nodules that are hypoechoic at sonography and hypoattenuating at CT, representing abscesses or foci of xanthogranulomatous inflammation. These features overlap with those of gallbladder carcinoma, making preoperative distinction between these entities often impossible [6].

Xanthogranulomatous cholecystitis



pancreatitis

Etiology

Gallstones and alcohol abuse are the most common causes of acute pancreatitis, accounting for 80% of cases.

Post-ERCP pancreatitis is the third most common cause of pancreatitis, but usually has a mild course.

Normal pancreas



Abnormal CT Findings

Peripancreatic inflammation •

Diffuse or focal pancreatic edema •

Poor definition and heterogeneity of gland •

Fluid collections •

Necrosis •

Thickening of pararenal fascia •

Acute pancreatitis



Fluid collection replacing pancreatic body and tail in severe pancreatitis



CT scan obtained with intravenous and oral contrast material reveals a large, edematous, homogeneously attenuating (73-HU) pancreas (1) and peripancreatic inflammatory changes (white arrows). Although the attenuation values are low, there is no pancreatic necrosis. Calcified gallstones are seen (black arrow). 2 = liver (140 HU).



Acute necrotizing pancreatitis Large region of unenhancement (necrosis) involving most of body and tail of pancreas. Inflammatory fluid is present in anterior pararenal space. Note ascites around liver.



Hemorrhagic pancreatitis CT scan demonstrates hemorrhagic pancreatitis as a heterogeneous mass in the area of the pancreatic bed (*). Arrow indicates active extravasation (hemorrhage).

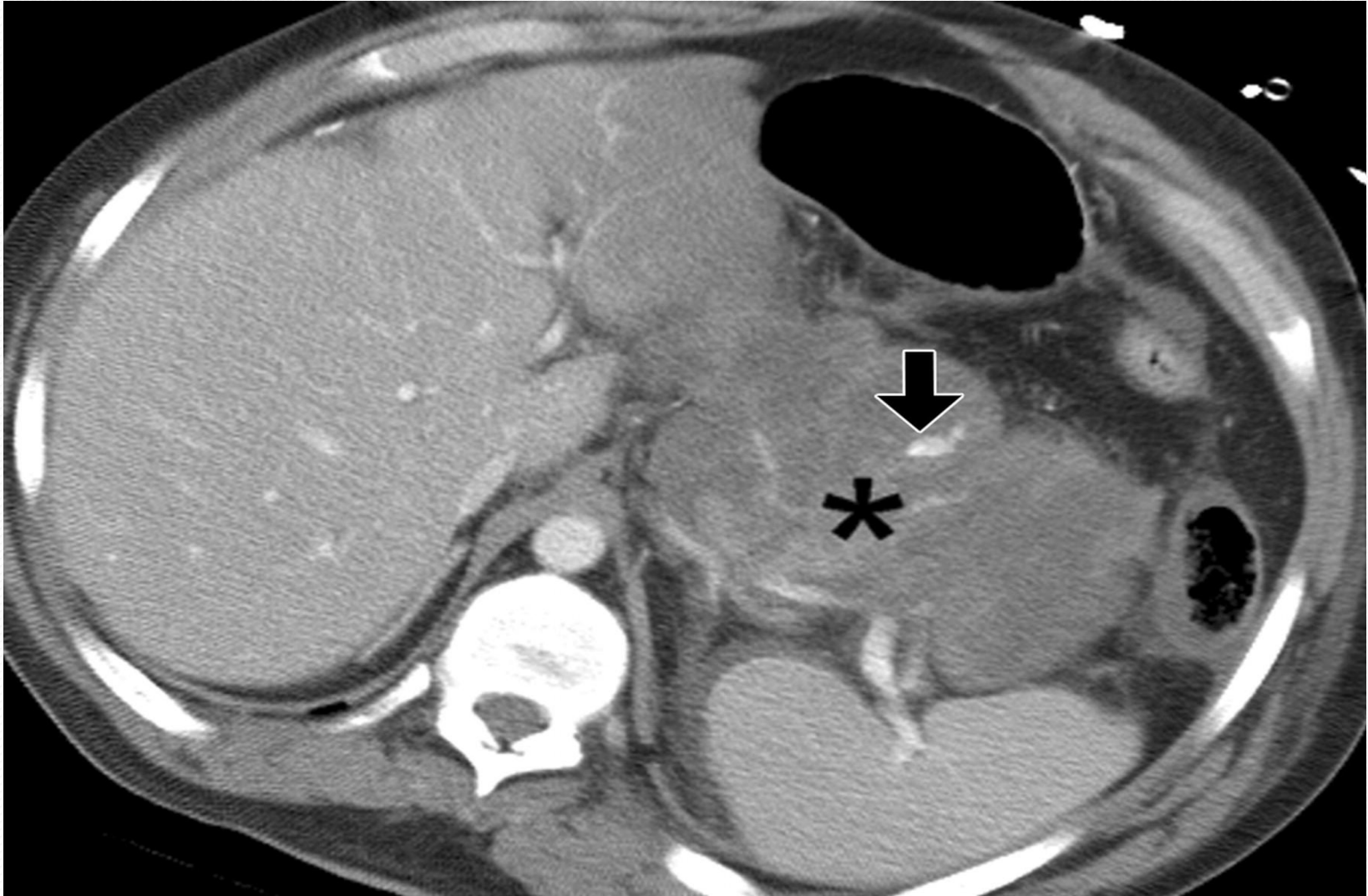
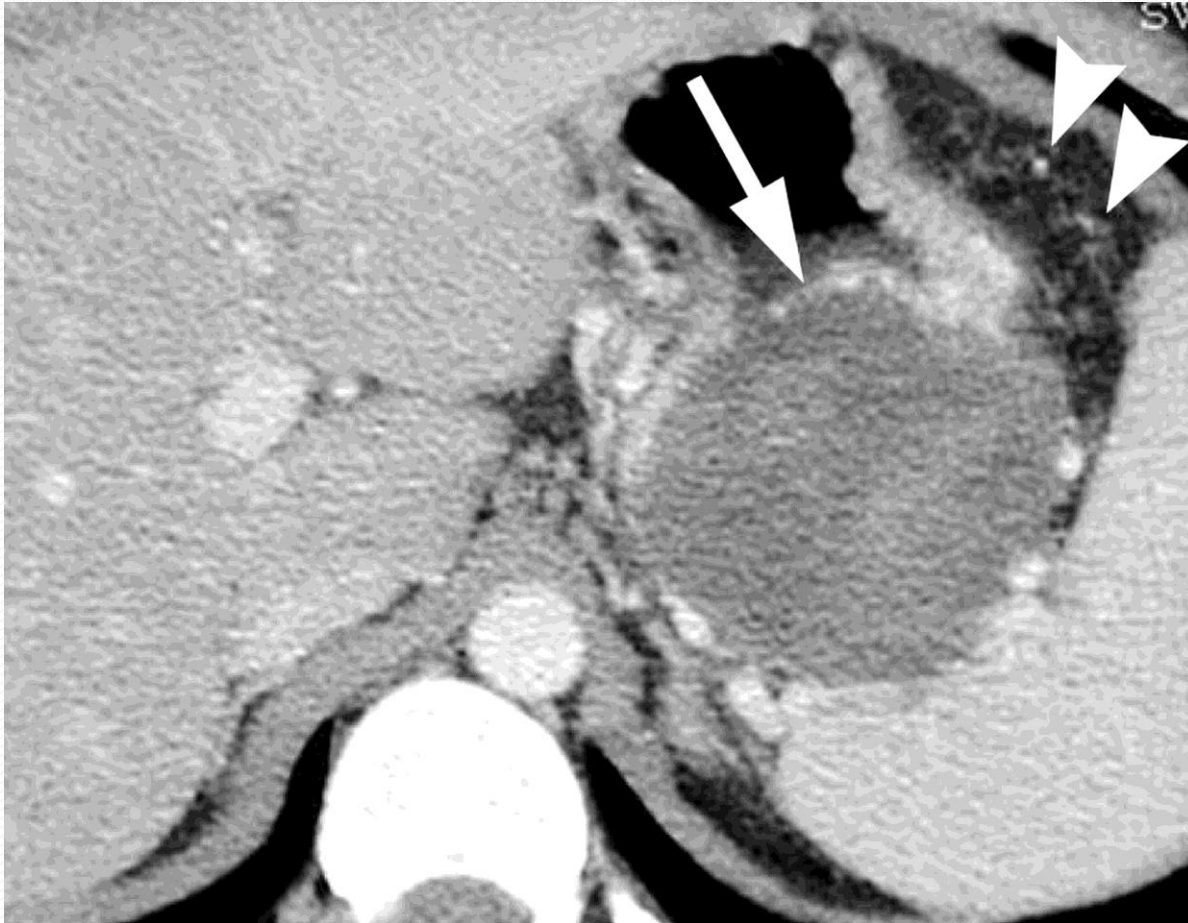
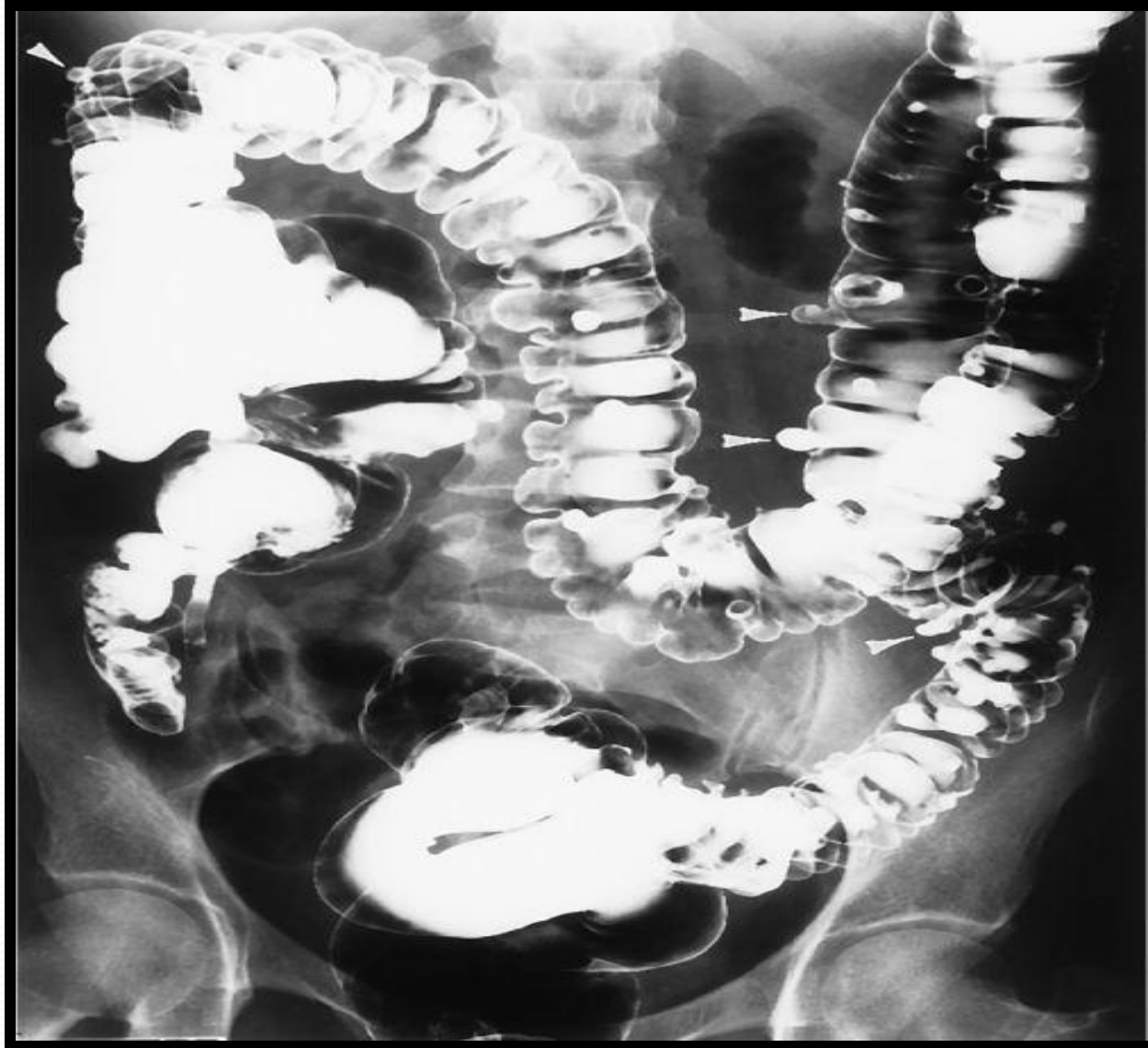


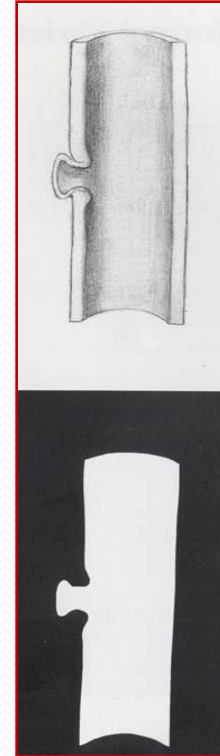
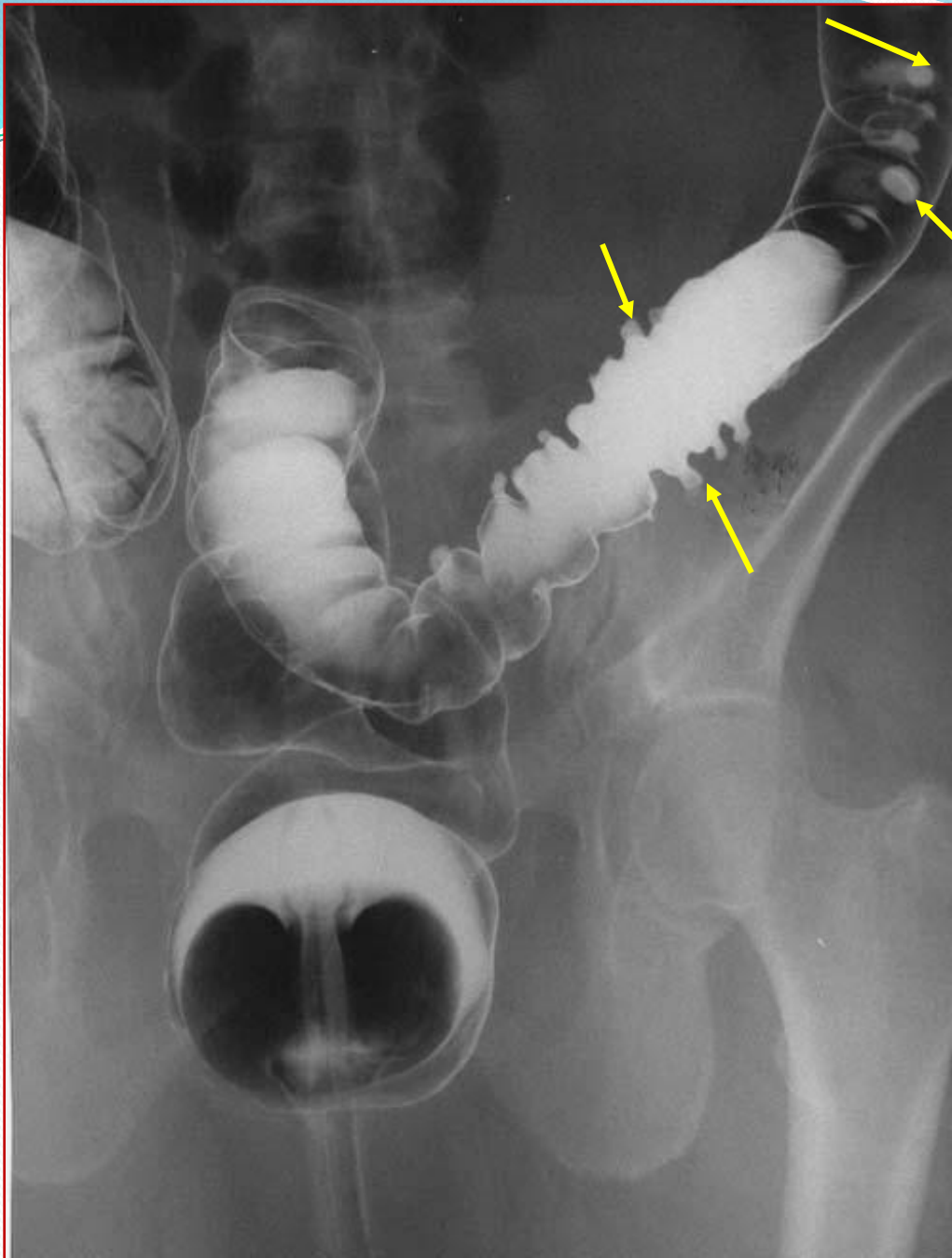
Image demonstrates a pseudocyst (arrow) in the tail of the pancreas surrounded by a thick enhancing wall. The lesion appears heterogeneous with central areas of higher attenuation, which is suggestive of fresh hemorrhage. Note infiltration (arrowheads) of the peripancreatic fat.



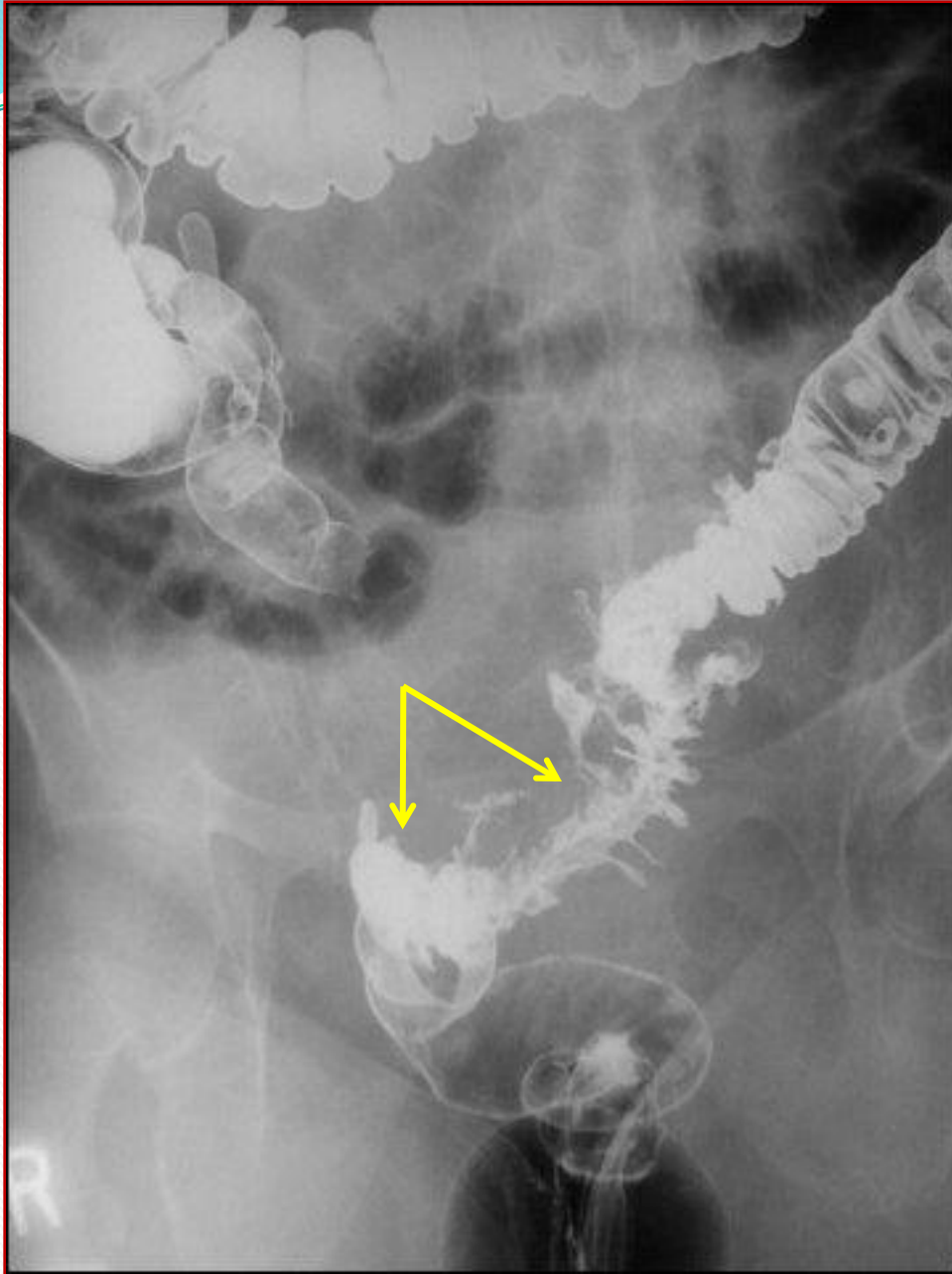
Diverticulosis



DIVERTICULOSIS



Barium extends from lumen outward into diverticulum.



DIVERTICULITIS

Extensive inflammation, wall thickening and spasm can simulate carcinoma with colonoscopy required to confirm.

DIVERTICULITIS

