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Radiologic evaluation of RUQ pain: Hepatic and Biliary possibilities

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Patient History

Mr. S is a 37y/o male with Type I DM, ESRD, hepatitis C who presents with fevers to 104 F, GNR bacteremia and RUQ tenderness

- RUQ pain
  - DDx (what lives there)
    - Gallbladder
    - Biliary tract
    - Liver
    - Subprhenic spaces
    - GI
    - GU

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Simplifying RUQ pain

I. RUQ pain with positive clinical Murphy's sign *(arrested inspiration or gasping on palpation of RUQ)*

II. RUQ pain with fever with negative Murphy's sign

III. RUQ pain with*out* fever and negative Murphy's sign

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I. RUQ pain with positive clinical Murphy's sign *(arrested inspiration or gasping on palpation of RUQ)*

Biliary (acute cholecystitis, biliary colic)

Sonography

- Reliable for detection of gallstones
- Image entire abdomen
- Blood flow analysis without contrast (Doppler)
- Determine if stone impacted by moving patient
- Radiologic Murphy's sign (patient's site of max. tenderness by compression with transducer). High positive predictive value for acute cholecystitis in patient with RUQ pain, fever and leukocytosis. Can be absent in gangrenous cholecystitis

Biliary Scintigraphy (use if ultrasound inconclusive, few false-negatives)

II. RUQ pain with fever with negative Murphy's sign

- Cholangitis
- Hepatic abscess
- Subphrenic abscess
- Gangrenous cholecystitis
- Perforated duodenal ulcer
- Pancreatitis
- RLL pneumonia

Sonography
Contrast enhanced CT
ERCP and MR for common bile duct stones

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III. RUQ pain with*out* fever and negative Murphy's sign

Hepatic tumor
(internal hemorrage/rupture into peritoneal cavity)

CT
MR

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Our patient, Mr. S, falls into:

II. RUQ pain with fever with negative Murphy's sign

- Cholangitis
- Hepatic abscess
- Subphrenic abscess
- Gangrenous cholecystitis
- Perforated duodenal ulcer
- Pancreatitis
- RLL pneumonia

→ Sonography
Contrast enhanced CT
ERCP and MR for common bile duct stones

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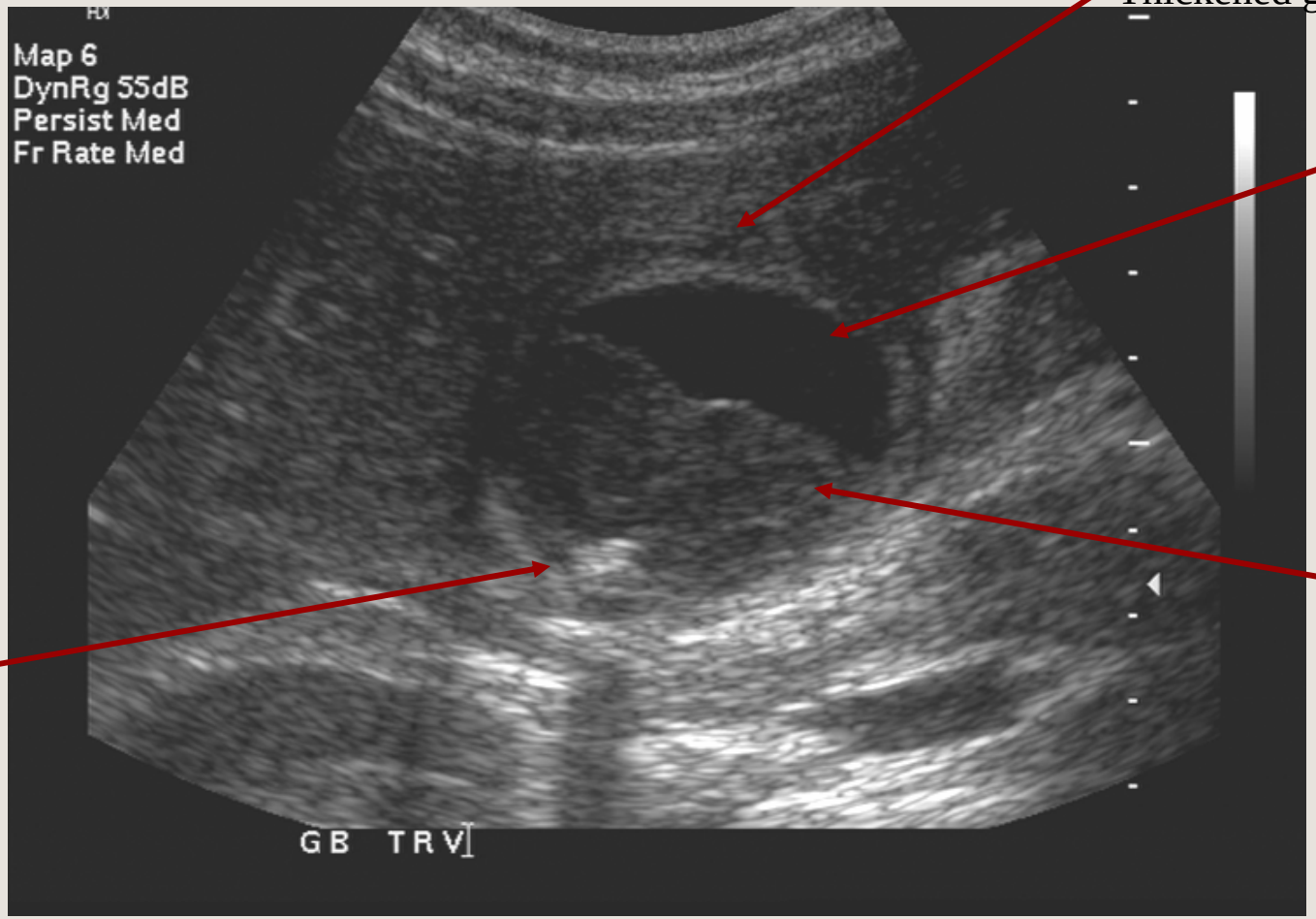
Mr. S's Ultrasound: Transverse view

Thickened gallbladder wall

anechoic area within gallbladder

DDx
Fluid
bile



echogenic material within gallbladder

round hyperechoic signal with acoustic shadowing

DDx
-gallstone
-adenomyomatosis
-polyp

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DDx
Pus
sludge
hematoma
Carcinoma
Adenomyomatosis
Polyp, cholesterol

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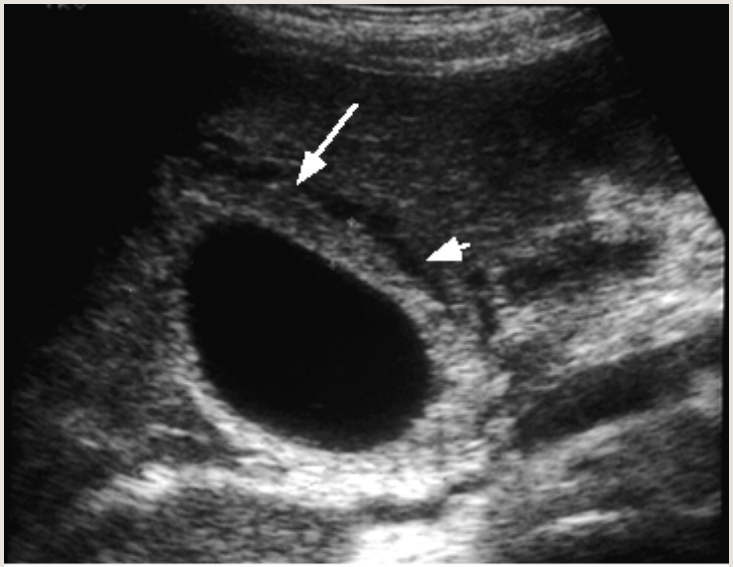
Ultrasound findings in acute cholecystitis:



Acute cholecystitis Ultrasound of the right upper quadrant in a patient with acute cholecystitis reveals marked thickening of the gallbladder wall (arrow) with fluid surrounding the distended gallbladder (arrowhead). Courtesy of Jonathan Kruskal, MD.

Up-to-date

- Thickened wall (greater than 4 or 5 mm, double wall sign)
- Radiologic Murphy's sign
- Pericholecystic fluid
- Gallstones

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Acute Cholecystitis

- Pathogenesis:
  - Mechanical inflammation (obstruction, distension)
  - Chemical inflammation (lysolechitin→phospholipase A on lechitin in bile)
  - Bacterial inflammation (most common organisms found: Escherichia coli, Enterococcus, Klebsiella, and Enterobacter)

- Complications of untreated acute cholecystitis:Edema and inflammation can progress to necrosis and gangrene
  - Empyema→gangrenous cholecystitis (especially in diabetics, with sepsis)
  - Gallbladder perforation
  - Chloecystoenteric fistula
  - Gallstone illeus (gallstone through cholecystoenteric fistula)
  - Emphysematous cholecystitis (Clostridium welchii)

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Mr. S's Ultrasound: Transverse view

DDx of heterogeneous liver mass:
Abscess
Focal nodular hyperplasia
Hepatocellular carcinoma
Hyatid cyst
Metastasis
Neoplasm
lymphoma

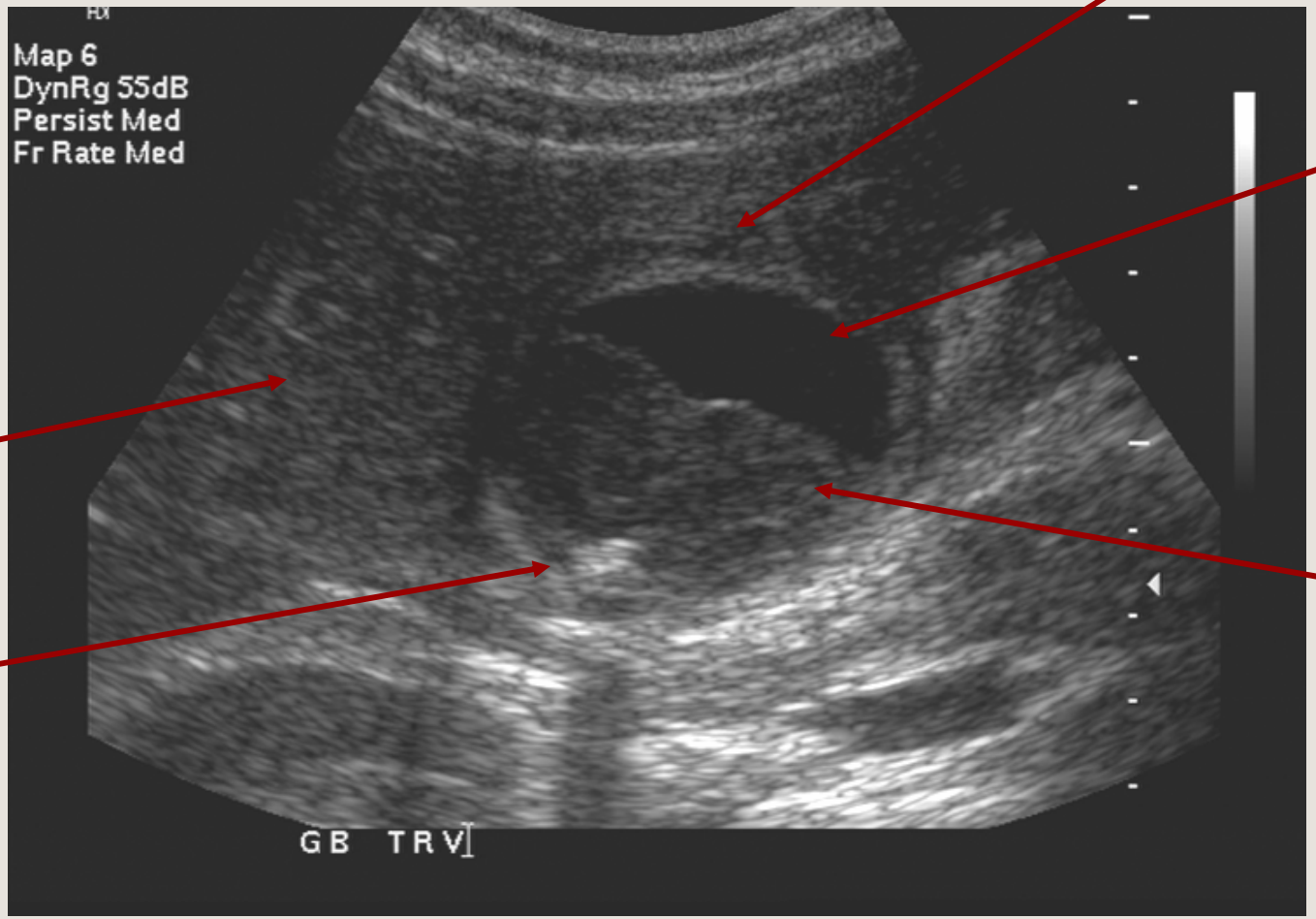
Thickened gallbladder wall

anechoic signal

DDx
Fluid
bile

heterogeneous echogenic mass
no defined border

round hyperechoic signal with acoustic shadowing



echogenic material within gallbladder

DDx
Pus
sludge
hematoma
Carcinoma
Adenomyomatosis
Polyp, cholesterol

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DDx
-gallstone
-adenomyomatosis
-polyp

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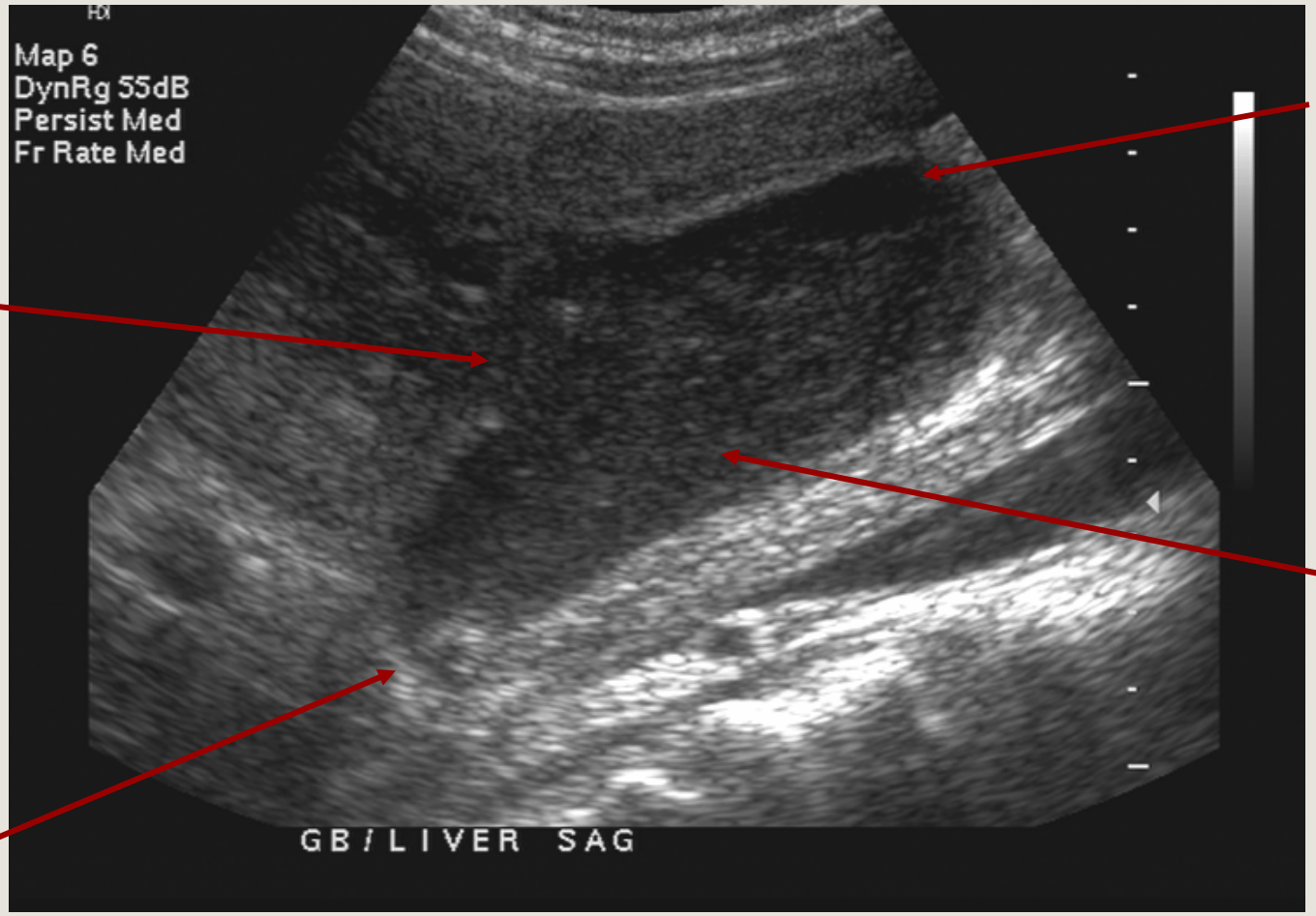
Mr. S's Ultrasound: Oblique sagital view



anechoic signal

Continuation of heterogeneous echogenic mass and gallbladder

Echogenic material within gallbladder

Gallstone

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DDx for a hypoechoic liver mass on ultrasound

Abscess (pyogenic, amebic, fungal)
adenoma
focal nodular hyperplasia
hepatocellular carcinoma
hyatid cyst
lymphoma
metastasis
Hepatocellular carcinoma

→ Contrast enhanced MR or CT to further evaluate…

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Differential Diagnosis for our Patient after Ultrasound

RUQ pain with fever with negative Murphy's sign

- Cholangitis
- Hepatic abscess
- Subphrenic abscess
- Gangrenous cholecystitis
- Perforated duodenal ulcer
- Pancreatitis
- RLL pneumonia

Ultrasound:

- •heterogeneous liver mass
- •thickened gallbladder wall with echogenic material and gallstones
- •apparent continuation between liver mass and gallbladder lumen

With history of Type I DM and gram negative rod bacteremia…

Most likely DDx:

1. Acute suppurative cholecystitis with comunicating intrahepatic liver abscess

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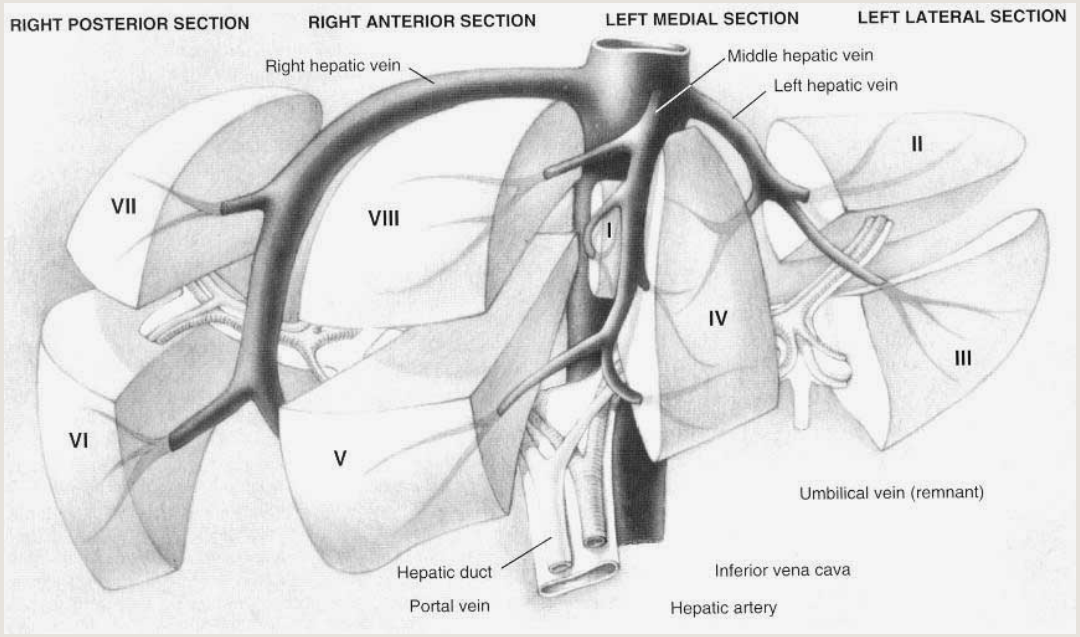
Contrast-enhanced CT for further evaluation of heterogeneous liver mass



Feldman: Sleisenger & Fordtran's Gastrointestinal and Liver Disease, 7th ed.,

Three phases of hepatic contrast enhancement:

1. No contrast
2. Arterial phase: 20 second delay
3. Portal venous phase: 45-60 second delay

Liver lessions will have a different patterns of enhancement in the various phases

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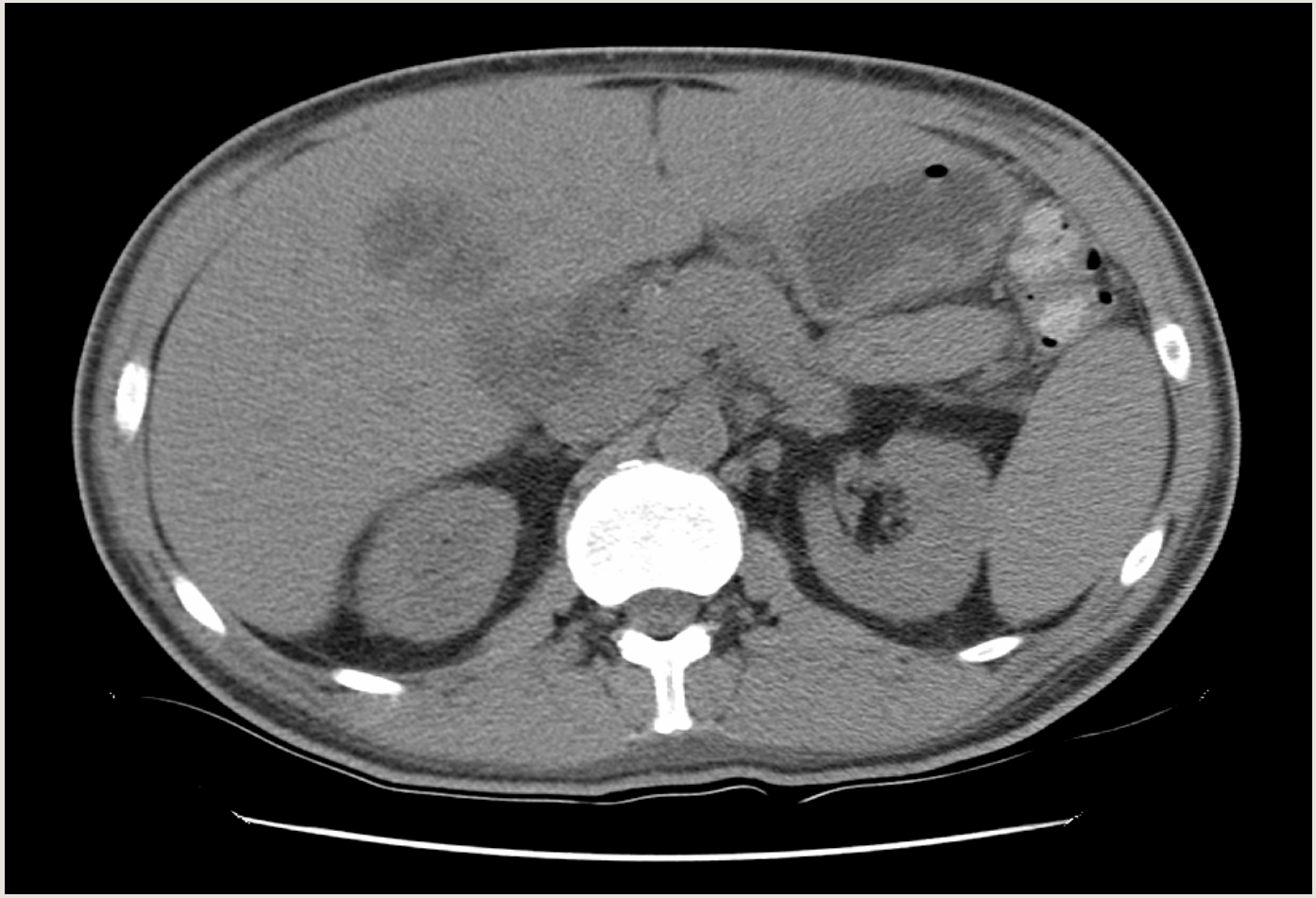
Mr. S's no-contrast CT



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Difficult to appreciate fine details of lession

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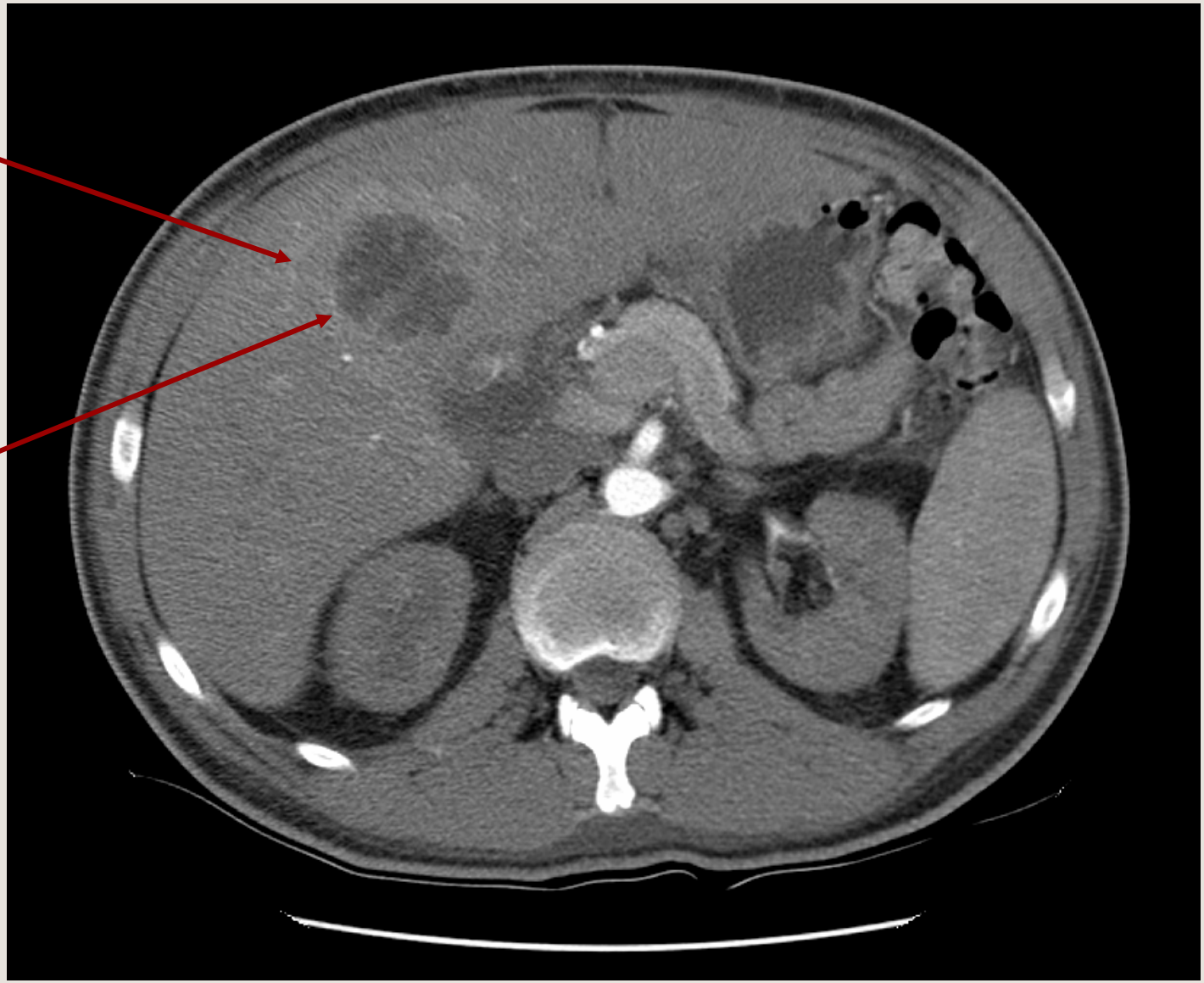
Mr. S's CT with contrast: arterial phase



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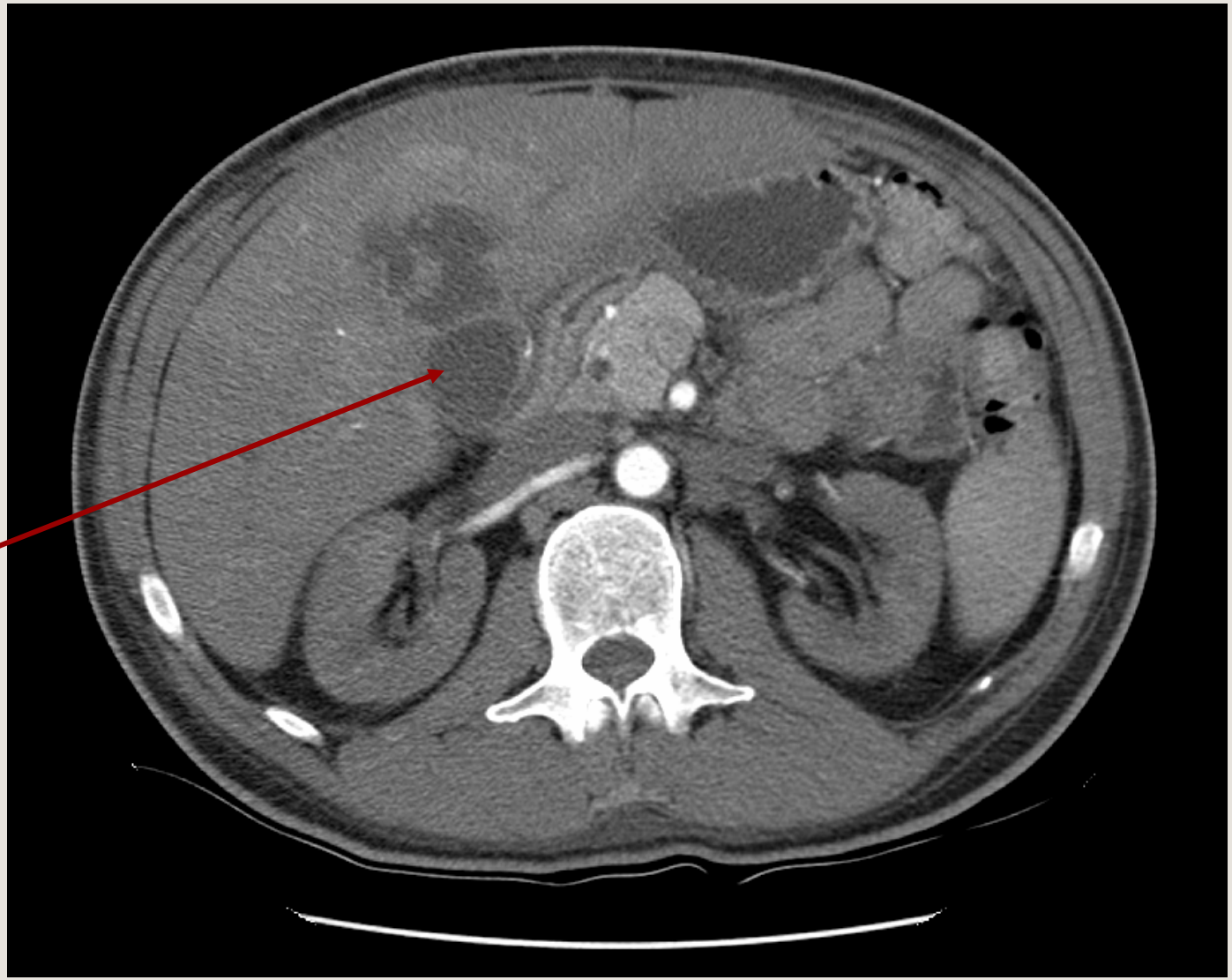
Mr. S's CT with contrast: arterial phase



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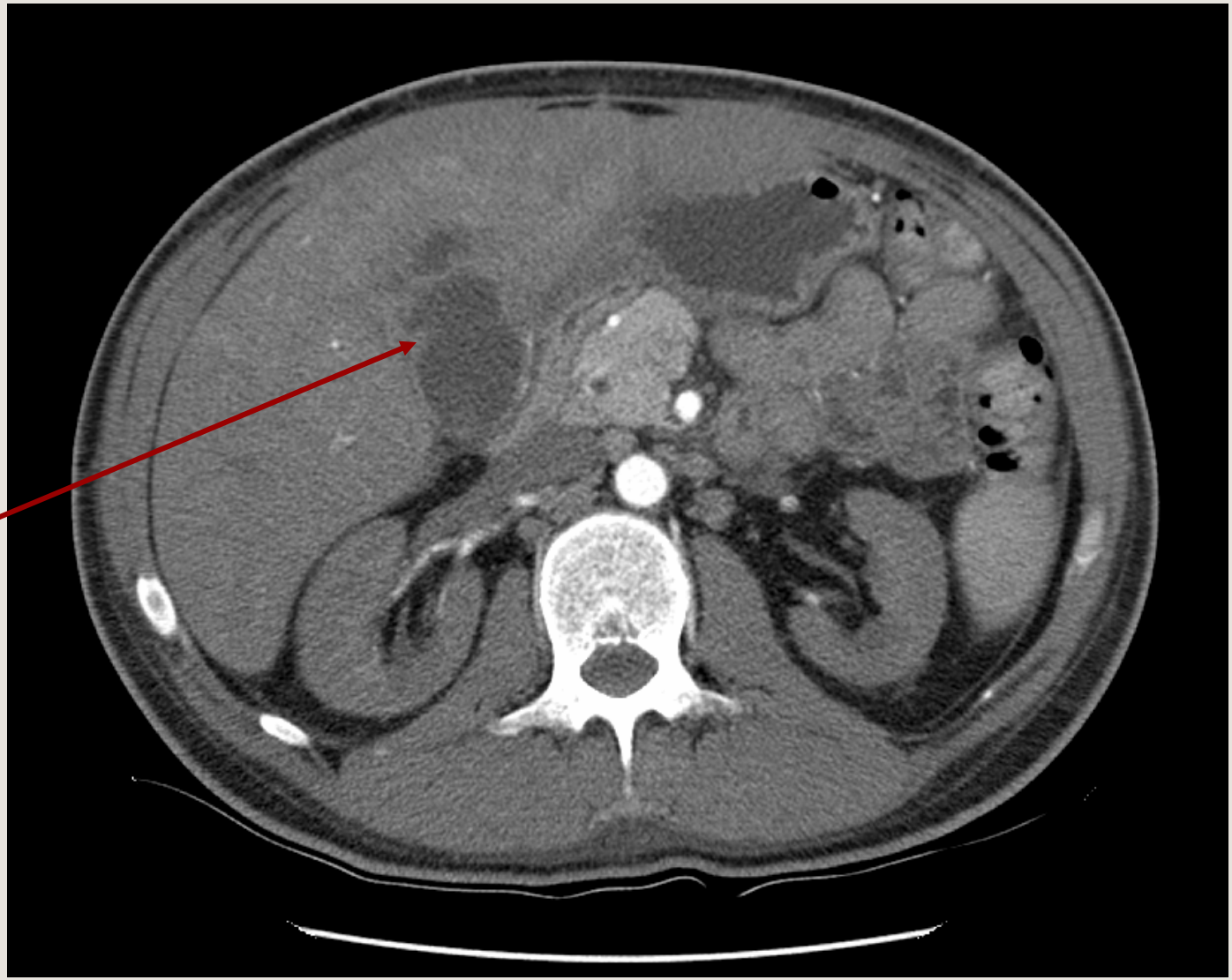
Mr. S's CT with contrast: arterial phase



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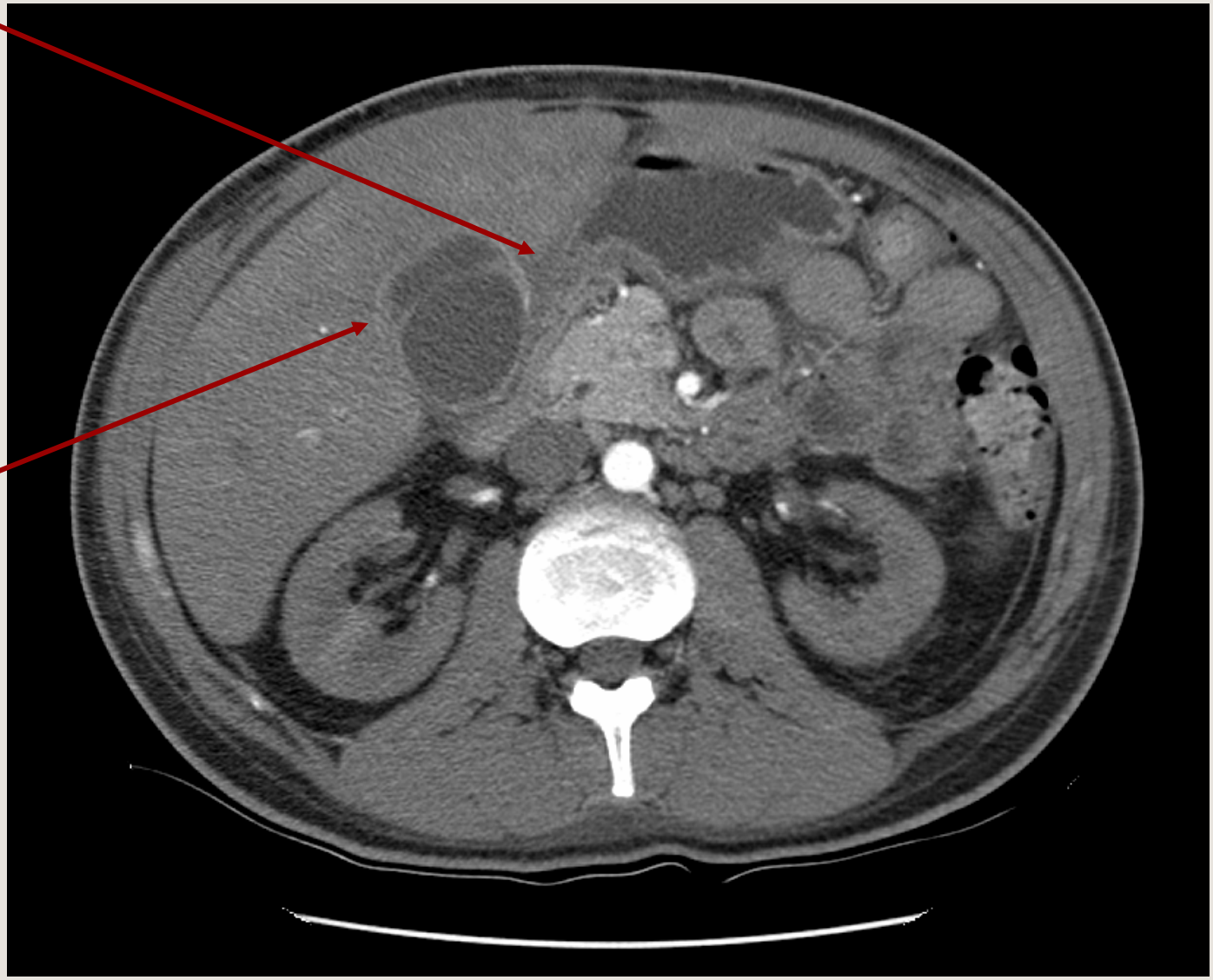
Mr. S's CT with contrast: arterial phase

Pericholecystic fluid

Fluid within gallbladder wall



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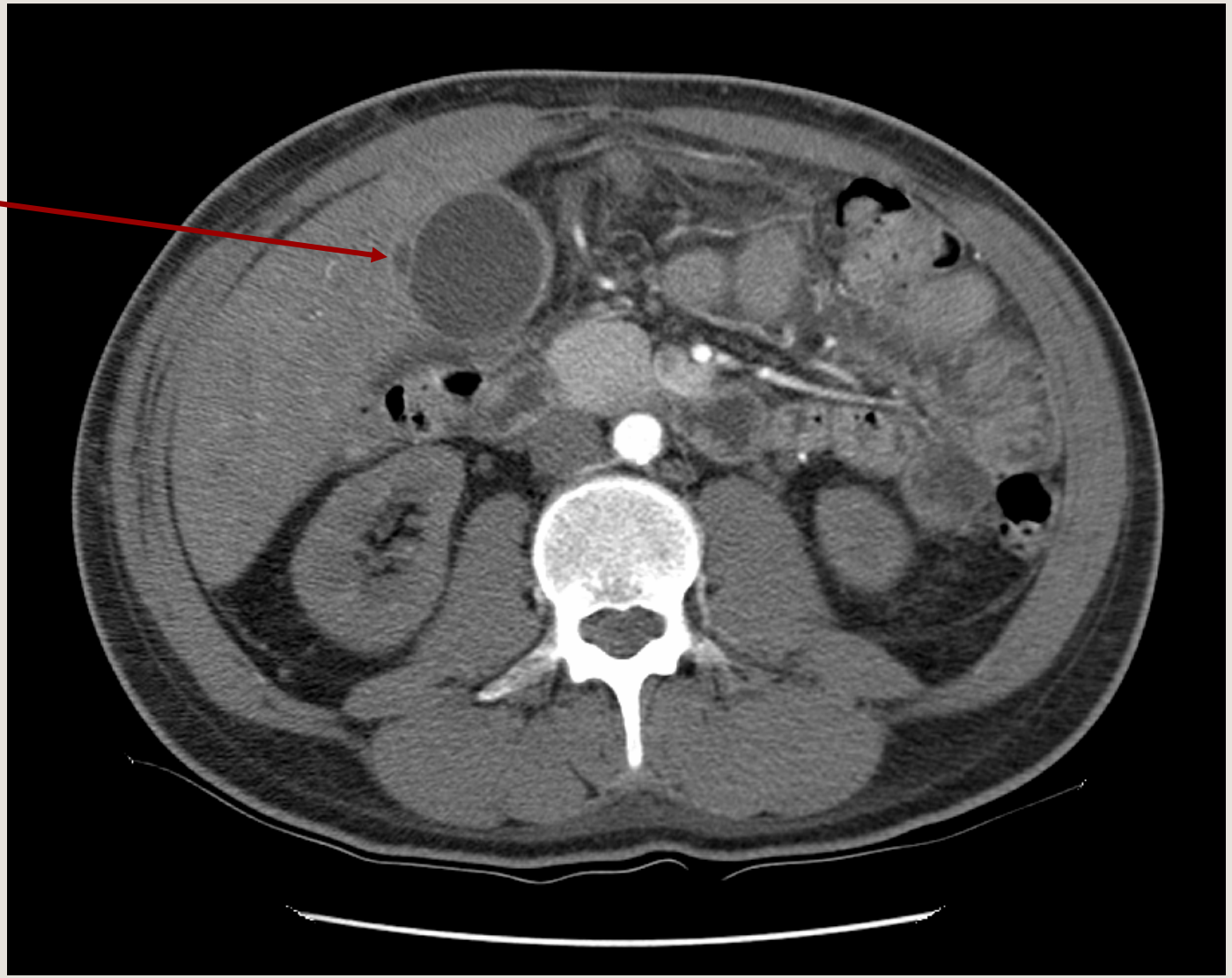
Mr. S's CT with contrast: arterial phase

Fluid within gallbladder wall



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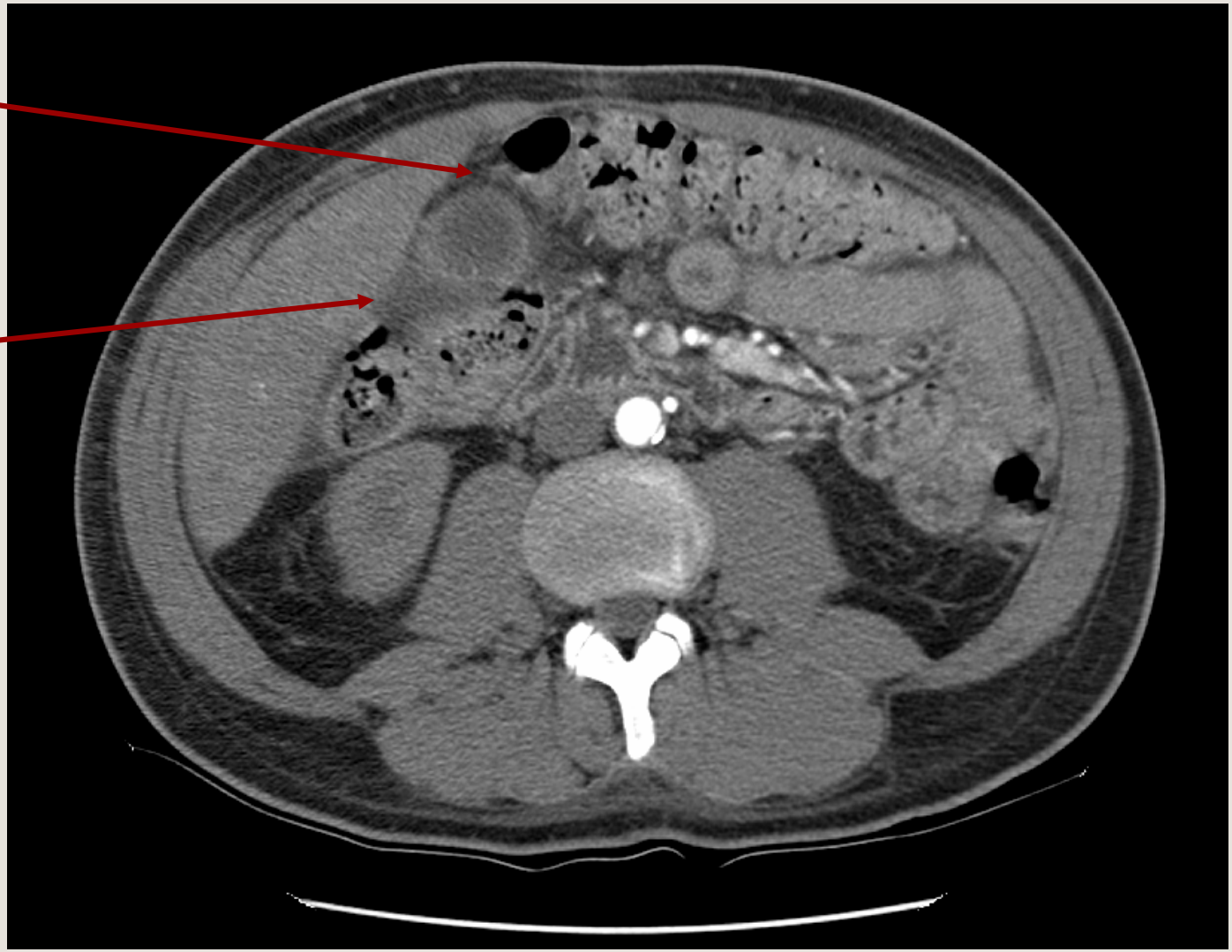
Mr. S's CT with contrast: arterial phase



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Pyogenic Liver Abscess

•Two major mechanisms: local spread from contiguous infections within the peritoneal cavity or hematogenous seeding of the liver
•Usually polymicrobial
•Microabscesses from enteric organisms coalesce
•Hematogenously spread Staphylococcus results in diffuse microabscesses throughout the liver

•*Ultrasound*: from hypoechoic to hyperechoic ill-defined lessions. Gas within abscess can causes high intensity linear echoes with acoustic shadows and reverberations
•*Contrast CT scan*:
    •hypodense lessions
    •Range from unilocular with smooth borders to complex internal septations with irregular borders
    •Rim enhancement in 6%
    •Some are gas-containing. More common in diabetic population

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Diagnosis and Treatment

•Interventional Radiology: Ultrasound guided percutaneous drainage of gallbladder → purulent fluid →Cx: Klebsiella

Diagnosis: Suppurative Cholecystitis with Intrahepatic Liver Abscess

•Antibiotics

Patient continued to spike fevers, abdominal pain and tenderness…

•CT guided drainage of intrahepatic liver abscess-unsuccesfull
•Surgery: open cholecystectomy and incission and drainage of liver abscess
    •Thickened gallbladder with stones (Path: chronic cholecystits with focal acute inflammation).
    •Edematous wall, no evidence of perforation
    •2x3cm liver abscess contiguous with gallbladder

Patient did well post-operatively. Continued on antibiotics and was discharged to home.

Conclusions

- Learned:
  - Most useful radiologic tests to evaluate different types of RUQ pain
  - Radiologic findings of acute cholecystitis
  - Radiologic findings of pyogenic liver abcess

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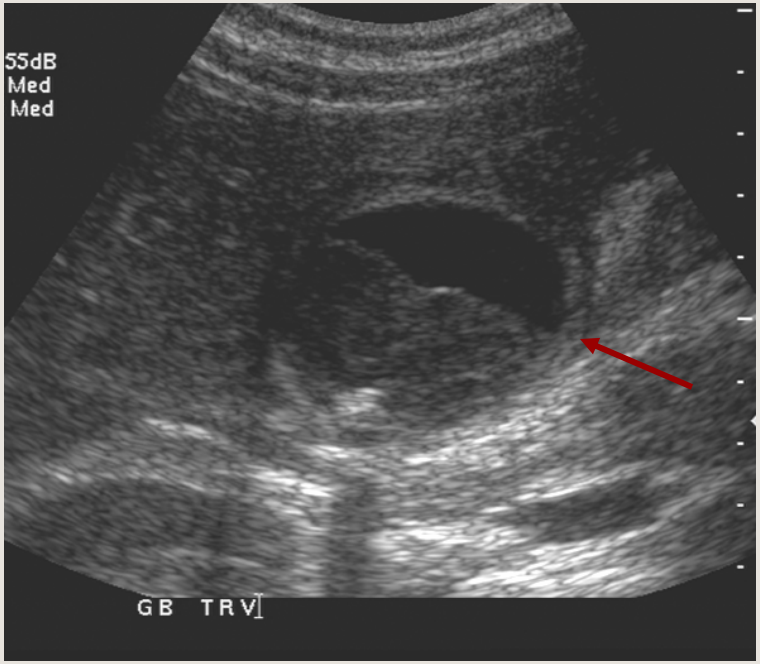
Also…



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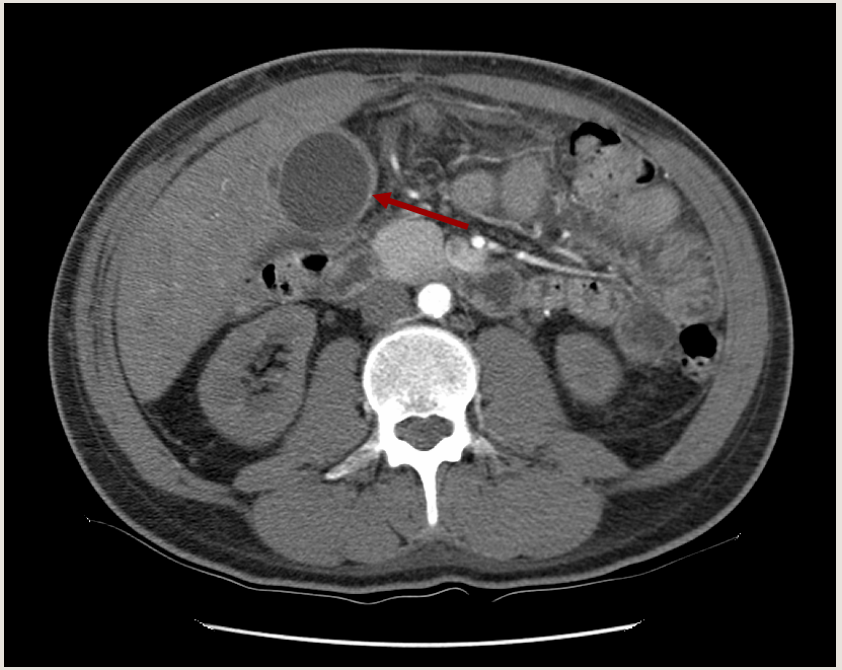

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Echogenicity on ultrasound does not translate to density on CT

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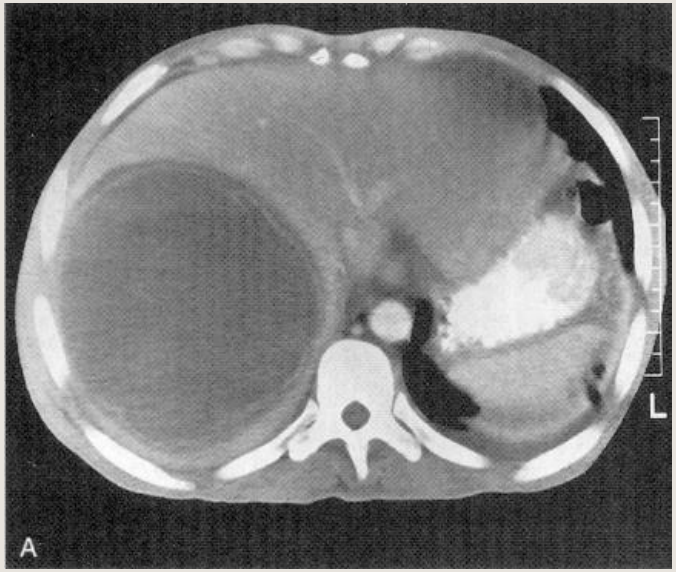
Amebic liver abscess

Also interesting to note the appearance of amebic liver abscesses on CT and that their clinical presentation can be similar to that of Mr. S…



Cecil Textbook of Medicine 21st Edition

Entamoeba histolytica

•10% of world population infected (Mexico, Central and South America, India, tropical Asia, Africa)

•Liver abscess: up to 5 months after diarrheal illness→fever, RUQ pain

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