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
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 without fever and negative Murphy’s sign
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
III. RUQ pain without fever and negative Murphy’s sign

Hepatic tumor
(internal hemorrhage/rupture into peritoneal cavity)

CT
MR
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
Mr. S’s Ultrasound: Transverse view

Thickened gallbladder wall
Anechoic area within gallbladder
Echogenic material within gallbladder

DDx
- Gallstone
- Adenomyomatosis
- Polyp

Round hyperechoic signal with acoustic shadowing

DDx
- Fluid bile
- Pus
- Hematoma
- Carcinoma
- Adenomyomatosis Polyp, cholesterol
Ultrasound findings in acute cholecystitis:

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

- Pathogenesis:
  - Mechanical inflammation (obstruction, distension)
  - Chemical inflammation (lysolechitin → phospholipase A on lecithin 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
  - Cholecystoenteric fistula
  - Gallstone ileus (gallstone through cholecystoenteric fistula)
  - Emphysematous cholecystitis (Clostridium welchii)
Mr. S’s Ultrasound: Transverse view

DDx of heterogeneous liver mass:
- Abscess
- Focal nodular hyperplasia
- Hepatocellular carcinoma
- Hydatid cyst
- Metastasis
- Neoplasm
- Lymphoma

heterogeneous echogenic mass no defined border

round hyperechoic signal with acoustic shadowing

DDx:
- Gallstone
- Adenomyomatosis
- Polyp

DDx of heterogeneous anechoic signal

Fluid bile

Anechoic signal

Echogenic material within gallbladder

Thickened gallbladder wall

DDx of liver mass:
- Abscess
- Focal nodular hyperplasia
- Hepatocellular carcinoma
- Hydatid cyst
- Metastasis
- Neoplasm
- Lymphoma

Fluid bile

Pus hematoma

Carcinoma

Adenomyomatosis

Polyp, cholesterol

Thickened gallbladder wall
Mr. S’s Ultrasound: Oblique sagittal view

- Echogenic material within gallbladder
- Continuation of heterogeneous echogenic mass and gallbladder
- Gallstone
- Anechoic signal
- Echogenic material within gallbladder
DDx for a hypoechoic liver mass on ultrasound

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

→ Contrast enhanced MR or CT to further evaluate…
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

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

Most likely DDx:

1. Acute suppurative cholecystitis with communicating intrahepatic liver abscess

Ultrasound:
  - heterogeneous liver mass
  - thickened gallbladder wall with echogenic material and gallstones
  - apparent continuation between liver mass and gallbladder lumen
Contrast-enhanced CT for further evaluation of heterogeneous liver mass

Three phases of hepatic contrast enhancement:
1. No contrast
2. Arterial phase: 20 second delay
3. Portal venous phase: 45-60 second delay

Liver lesions will have a different patterns of enhancement in the various phases
Mr. S’s no-contrast CT

Difficult to appreciate fine details of lesion
Mr. S’s CT with contrast: arterial phase

- Enhancing border
- Non-enhancing septated lesion
Mr. S’s CT with contrast: arterial phase

gallbladder
Mr. S’s CT with contrast: arterial phase

Comunication
Mr. S’s CT with contrast: arterial phase

- Pericholecystic fluid
- Fluid within gallbladder wall
Mr. S’s CT with contrast: arterial phase

Fluid within gallbladder wall
Mr. S’s CT with contrast: arterial phase

Fat stranding

Pericholecystic fluid
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 lesions. Gas within abscess can cause high intensity linear echoes with acoustic shadows and reverberations
• Contrast CT scan:
  • hypodense lesions
  • 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
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-unsuccessful
• Surgery: open cholecystectomy and incision and drainage of liver abscess
  • Thickened gallbladder with stones (Path: chronic cholecystitis 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 abscess
Also...

Echogenicity on ultrasound does not translate to density on CT
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…

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
References


Gamuts in Radiology


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