Xanthogranulomatous Cholecystitis: Ultrasound, CT, and MRI findings

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Agenda

- **Patient:** 53yo M with RUQ abd pain
- **DDx:** RUQ abd pain
- **Imaging Modalities:** available to image our patient
- **Radiologic Findings:** US, CT, MRI
  - gangrenous cholecystitis, adenomyomatosi
  - review of anatomy and pathophysiology
- **Pathology Dx:** Xanthogranulomatous cholecystitis
- **Management:** Depends on radiologic Dx!
- **Take-Home Points**
Our Patient:
History & Physical Exam

- **Hx:** 53yo M with intermittent RUQ abd pain for 2 years; no fever/chills, nausea/vomiting, weight loss, or food association
- **PMH:** DM 2, hyperlipidemia, HTN
- **Meds:** Metformin, ASA, lisinopril, atorvastatin
- **SH:** Plumber married w/ children; (+) smoking, (-) EtOH
- **Exam:** (+) Murphy sign, (+) guaiac
- **Labs:** Leukocytosis, ↑ Alk Phos, ↑ LFTs, ↑ GGT
Clinical DDx: RUQ abd pain (by mnemonic)

**V**ascular
Infarct
Pyelophlebitis
Mesenteric thrombosis
Adrenal infarct
Occlusion
Embolism
Renal vein thrombosis

**I**nflammation/Infection
Cellulitis, Osteomyelitis
Diaphragmatic abscess
Trichinosis, TB, Herpes zoster
Hepatitis, Hepatic abscess
Cholecystitis, Cholangitis
Duodenitis, Diverticulitis, Colitis
Pancreatitis, Pyelonephritis
Ulcer, Mesenteric adenitis
Waterhouse-Friderichsen syndrome

**N**eoplasm
Carcinoma
Cholangioma
Pancreatic carcinoma
Hodgkin disease
Lymphosarcoma
Neuroblastoma
Adrenal carcinoma
Multiple myeloma

**D**egenerative
Osteoarthritis

**I**ntoxication/Idiopathic
Alcoholic hepatitis
Ulcer
Gout

**A**llergic/Autoimmune
Rheumatoid spondylitis

**C**ongenital/Acquired Anomaly
Ventral hernia
Incisional hernia
Diverticulum
Obstruction
Cyst
Hydronephrosis

**E**ndocrine
Hyperparathyroidism

**T**rauma
Contusion
Cough
Hemorrhage
Laceration
Rupture
Herniated disc
Spine fracture

by mnemonic
"V I N D I C A T E"
DDx: RUQ abd pain (by anatomy)

Our patient’s main DDx, based on:

→ RUQ pain

→ (+) Murphy Sign

→ leukocytosis,

would be most likely centered on which organ?

Thus, would involve which conditions?
Imaging Modalities: Available/Applicable to Our Patient with RUQ pain, ↑ WBC, (+)Murphy

- **Ultrasound (US):** abdomen/gallbladder to look for gallstones, aneurysm
- **Nuclear Medicine:** cholescintigraphy (or HIDA scan) with or w/out cholecystokinin to evaluate the function of the gallbladder and the bile ducts
- **X-ray:** Upper GI series to rule out stomach/duodenum conditions; abdomen; colon barium enema; chest x-ray to rule out pneumonia
- **Computed Tomography (CT):** abdomen to further evaluate the gallbladder for mass/carcinoma as well as other abd organs such as the nearby pancreas
- **Magnetic Resonance Imaging (MRI):** T1 with fat saturation, T2 to assess soft tissue changes such as fluid, inflammation, edema; MR cholangiopancreatography (MRCP) to visualize the biliary tract and pancreatic ducts
- **Invasive:** cholangiography, percutaneous cholecystostomy, endoscopic retrograde cholangiopancreatography (ERCP)
Arrive at Our Dx, Step by Step ...

**H&P:**
- **Hx** – RUQ abd pain
- **Exam** – (+) Murphy sign
- **Labs** – Leukocytosis

**Clinical DDx:**
- Cholecystitis
- Cholelithiasis
- Choledocholithiasis
- Cholangitis
- Hepatitis
- Pancreatitis

**Imaging:** Ultrasound
Our Patient:
Findings on Ultrasound

Film Findings: hyperechoic fatty liver, markedly thickened gallbladder wall, cholelithiasis with (+) US Murphy sign

Impression: Gangrenous cholecystitis vs GB carcinoma
Arrive at Our Dx, Step by Step ...

H&P:
• Hx – RUQ abd pain
• Labs – Leukocytosis
• Exam – (+) Murphy sign

Clinical DDx:
• Cholecystitis
• Choledocholithiasis
• Cholangitis
• Hepatitis
• Pancreatitis

Imaging: CT → to evaluate gallbladder wall thickening vs “mass”; why?
• gallbladder carcinoma has a poor prognosis of 85% mortality within 1 year of diagnosis
• need to further evaluate the US findings with more imaging studies before embarking on any treatment

US Findings:
• Irregular gallbladder wall thickening

US DDx:
• Gangrenous cholecystitis
• Gallbladder carcinoma
**Our Patient: Findings on CT scan**

- Axial, oral C+

**Cystic structure**

- Irregular wall thickening involving the gallbladder fundus

- Heterogeneous low density in the adjacent liver

**Film Findings:** Irregularly thickened wall at the gallbladder fundus, low attenuation in liver adjacent to the gallbladder, cyst at the fundus.

- Cystic duct
- Common hepatic duct
- Gallbladder
- Body
- Neck
- Common bile duct

www.wiltshiresurgery.com
Our Patient: Pertinent negative findings on CT scan

Coronal, oral and IV C+

Cystic structure

No pericholecystic fluid or inflammation

Irregular wall thickening involving the gallbladder fundus

No intra or extrahepatic biliary ductal dilatation

No wall thickening in the inferior and medial aspect of the gallbladder

Impression: CT findings suspicious for malignancy. Infection much less likely given no pericholecystic fluid or inflammation.
Arrive at Our Dx, Step by Step …

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- Choledocholithiasis
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- Hepatitis
- Pancreatitis

**US Findings:**
- Irregular gallbladder wall thickening

**US DDx:**
- Gangrenous cholecystitis
- Gallbladder carcinoma

**CT Findings:**
- Irregular wall thickening at the gallbladder fundus
- Cystic structure at the gallbladder fundus
- No pericholecystic fluid or inflammation
- No biliary ductal dilatation

**CT DDx:** gallbladder malignancy

**Imaging:** MR to further evaluate soft tissue changes in the gallbladder and the adjacent liver to assess inflammatory changes and confirm or rule out malignancy.
Our Patient:
Findings on MR imaging

Axial T1-weighted Gradient Echo with Fat Sat; Post-Gadolinium Arterial Phase
Axial T1-weighted Hi-Resolution with Fat Sat; Post-Gadolinium

Wall thickening along the fundus measuring up to 15mm in maximum thickness
Slight enhancement of GB wall mucosa, most prominently involving the fundal portion

Film Findings: thickened gallbladder wall with hyper-intensity of the mucosa mostly involving the fundus
Our Patient:
Findings on MR imaging

Axial T1-weighted Gradient Echo with Fat Sat; Post-Gadolinium, Arterial Phase

Axial T1-weighted Hi-Resolution with Fat Sat; Post-Gadolinium

Small cystic area adjacent to the fundus measuring up to 2.0 cm, (+) rim enhancement. No clear communication between the fundus and this cystic collection could be demonstrated.

Film Findings: small cyst at the fundus with ? communication to the gallbladder that cannot be clearly identified on MR.
Our Patient:
Findings on MR imaging

Axial T2-weighted with Fat Saturation

Coronal T2-weighted Single-Shot Fast Spin Echo (SSFSE)

Irregular wall thickening involving the gallbladder fundus

Film Findings: Gallstones and, again, irregularly thickened gallbladder wall involving the fundus
Our Patient: Findings on MR imaging

Coronal 2D Thick-Slab Abdomen (MR Cholangiopancreatography, or MRCP)

Right hepatic duct  
Left hepatic duct

Cystic duct

Common hepatic duct

Common bile duct

Gallbladder

Pancreatic duct

Hepatopancreatic ampulla

Major duodenal papilla

Main pancreatic duct

Hepatopancreatic ampulla

Major duodenal papilla

Film Findings: No biliary/pancreatic duct obstruction/dilatation
Impression: Normal biliary/pancreatic ductal system.
(1) R and L hepatic ducts merge to form a common hepatic duct

(2) Common hepatic and cystic ducts merge to form a common bile duct

(3) Pancreatic duct merges with common bile duct at the hepatopancreatic ampulla

(4) Bile and pancreatic juices enter duodenum at the major duodenal papilla
Our Patient:
Findings on MR imaging

Axial T2-weighted with Fat Saturation

↑ T2 signal abnormality (hyper-intensity) surrounding the gallbladder and adjacent liver parenchyma

No enlarged lymph nodes.
Patent hepatic vasculature.
No ascites.

Film Findings: ↑ T2 signal surrounding the fundus, patent hepatic vasculature, no lymphadenopathy or ascites

Impression: Overall MRI findings suggestive of fatty infiltration, adenomyomatosis likely complicated by chronic cholecystitis; gallbladder adenocarcinoma cannot be entirely excluded.
MRI Dx: What is Adenomyomatosis?

- **Definition:** benign, abnormal though non-premalignant gallbladder mucosal hyperplasia, muscular wall thickening, and formation of intramural diverticula or sinus tracts called Rokitansky-Aschoff sinuses

- **Radiologic Finding:** Pearl Necklace Sign

Arrive at Our Dx, Step by Step …

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- Exam – (+) Murphy sign

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- Cholangitis
- Hepatitis
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**US DDx:**
- Gangrenous cholecystitis
- Gallbladder carcinoma

**Pathology/Management:** Open cholecystectomy → to make the definitive, final Dx by histology and determine future management of our patient

**MR DDx:**
- Adenomyomatosis
- Gallbladder adenocarcinoma

**MR Findings:**
- Thickened gallbladder wall
- Fundus cyst with ?communication
- Gallbladder stones
- No biliary obstruction/dilatation
- ↑ T2 signal surrounding the fundus

**CT DDx:** gallbladder malignancy
Our Companion Patient:
Findings on Gross Pathology

Gross Pathology Findings:
(1) fibrosis and wall thickening
(2) disruption of gallbladder wall
(3) xanthogranulomatous foci

Our Companion Patients: Findings on Histology

- **Thickened, fibrotic wall**

- **Lipid-laden mø: 2 morphological types**
  - Spindle-shaped cells with more granular cytoplasm and elongated nuclei
  - Rounded foamy macrophages

- **Fibroblasts, inflammatory cells**

**Xanthogranulomatous cholecystitis**
- Focus (black arrows above)
- Contains:
  1. Bile pigment
  2. Chronic inflammatory cells
  3. Foamy pigment-laden macrophages (mø)

No dysplasia or malignancy!
Arrive at Our Dx, Step by Step ...

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**Clinical DDx:**
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**US DDx:**
- Gangrenous cholecystitis
- Gallbladder carcinoma

**Pathology (Final) Dx:**
Xanthogranulomatous cholecystitis

**Gross/Histologic Findings:**
- Wall thickening with fibrotic serosa
- Xanthogranulomatous foci
- Bile extravasation through disrupted wall
- Lipid-laden macrophages
- Chronic inflammatory cells

**MR DDx:**
- Adenomyomatosis
- Gallbladder adenocarcinoma

**CT DDx:** gallbladder malignancy
Dx: What is Xanthogranulomatous Cholecystitis?

- **Definition:** unusual form of benign, chronic cholecystitis with focal or diffuse destructive inflammatory process
- **Signs and symptoms:** RUQ abd pain, fever, leukocytosis, vomiting, (+) Murphy sign
- **Hallmarks:**
  1. thickened, fibrotic, disrupted gallbladder wall
  2. foamy histiocytes
  3. bile extravasation
**Dx:** What is Xanthogranulomatous Cholecystitis?

- **Pathophysiology:** gallbladder or cystic duct obstruction $\rightarrow$ ↑ gallbladder intraluminal pressure $\rightarrow$ rupture of Rokitansky-Aschoff sinuses or mucosal ulceration $\rightarrow$ extravasation of bile into the gallbladder wall

http://anatomy.iupui.edu/courses/histo_D502/D502f04/Labs.f04/digestive%20III%20lab/Lab13index.htm
**Management:** Significance of Xanthogranulomatous Cholecystitis

- **Significance:** may simulate malignancy clinically, radiologically, and pathologically

- **Management of XG cholecystitis:** open cholecystectomy with complete resection of the gallbladder due to dense fibrosis, extensive inflammation, ?coexistent malignancy

- **Management of GB carcinoma:**
  1. **aggressive surgery** – partial/segmental hepatic resection or Whipple procedure
  2. **no resection** at all with chemo/radiation instead
Take Home Points:

• **XG cholecystitis:** benign yet focally/diffusely destructive inflammatory gallbladder disease with (1) fibrosis and wall thickening, (2) bile extravasation, (3) lipid-laden mø, (4) acute/chronic inflammatory cells

• **XG cholecystitis vs GB carcinoma:** Patients with carcinoma are more likely to present with anorexia, weight loss, palpable mass, and jaundice

• **Preoperative Dx by radiographs:** may significantly alter therapy and patient prognosis – be careful!
What happened to Our Patient?

- Our patient underwent an exploratory laparoscopy that was converted to open cholecystectomy, which went successfully without any complications.
- His gallbladder was diagnosed with xanthogranulomatous cholecystitis without any associated malignancy by pathology and histology.
- Our patient is alive and well as of today in June, 2008.
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Srivastava M, Sharma A, Kapoor VK, Nagana Gowda GA. Stones from cancerous and benign gallbladders are different: A proton nuclear magnetic resonance spectroscopy study. Hepatol Res. 2008 May 27.


Slides 16 and 17 – http://academic.kellogg.cc.mi.us/herbrandsonc/bio201_McKinley/Digestive%20System.htm

Slide 25 – http://anatomy.iupui.edu/courses/histo_D502/D502f04/Labs.f04/digestive%20III%20lab/Lab13index.htm