Gallbladder Disorders

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Topic Based Lecture
April 9, 2015
Case

67 y/o W presents with 2-day history of fever and abdominal pain. Pain is intermittent and localized to RUQ with radiation to right scapula. Pt’s daughter states that the patient is more confused today. V/S are T 39.1, BP 100/40, HR 122, and RR 26. PE notable for scleral icterus and lethargy.

What now?
Learning Objectives

• Understand the pathophysiology of gallbladder disorders
• Recognize the varied clinical presentations of these disorders
• Develop an evidence based diagnostic strategy to guide your workup of gallbladder disease
• Understand treatment and management, with appropriate utilization of resources
• Cases
Differential Diagnosis of RUQ/Epigastric Pain

- Biliary: cholelithiasis, acute cholecystitis, chronic cholecystitis, choledocholithiasis, ascending cholangitis
- GI: mallory weiss tear, boorhave’s, gastritis, gastroenteritis, PUD, duodenal ulcer, perforation, mesenteric ischemia, ileus, bowel obstruction, hernia, volvulus, GERD, pancreatitis, hepatitis, hepatic abscess, appendicitis
- Cardiac: ACS, pleurisy, AAA, aortic dissection,
- Resp: RLL Pna, PE
- GU: pyelonephritis, nephrolithiasis
Anatomy

- Fundus, body, and neck
- Cystic aa.
- Cystic vv.
- When fully distended: 8 x 4 cm; ~100mL

www.ultrasound-images.com 2013
Common anatomic variant called a "Phrygian cap"
Hartmann's Pouch: out pouching where the neck of the gallbladder meets the cystic duct.

Dr. Henry Albert Hartmann (1860-1952)
Bile

- Produced in hepatic canaliculi
- Composition: bile salts, phospholipids, cholesterol, bilirubin
- Required for absorption of fats and fat soluble nutrients
- Gallbladder stores ~50% bile produced, which serves to acidify and concentrate bile
- Removal of gallbladder is generally not associated with measurable changes in intestinal fat absorption or in clinical symptoms
Biliary Tract Disorders

- Cholelithiasis
- Cholecystitis
- Choledocholithiasis
- Ascending Cholangitis

- Sclerosing Cholangitis, AIDS Cholangiopathy, Porcelain Gallbladder, malignancy
Cholelithiasis

I maked these!
Cholelithiasis - Epidemiology

- Gallstones present in 17% women and 8% men (in elderly 27%)
- >500,000 operations annually
- Of pts with gallstones, 80% are asymptomatic
- Of asymptomatic pts, 15-30% develop symptom within 15 years
Types of Gallstones

**Cholesterol Stones (90%)**
- elevated [cholesterol] forms crystals which act as nidus to stone formation
- Risk factors:
  - “Female, Fat, Forty, Fertile”
  - increased age, massive obesity, rapid weight loss, cystic fibrosis, parity, drugs (e.g. clofibrate, OCPs), and familial tendency

**Pigmented Stones (10%)**
- Black Stones (Ca bilirubinate)
  - Seen in elders, intravascular hemolysis* (sickle cell, hereditary spherocytosis), cirrhosis, hepatitis, chronic liver disease
- Brown Stones
  - Seen in bile duct infection typically bacterial > parasites (ascaris lumbricoides)

*Rare in pediatrics, but if present, typically due to hemolytic disease.
Cholelithiasis – Clinical Features

- Transient obstruction of cystic duct by stone
- **Biliary colic** (can be steady, rather than intermittent), RUQ → upper abdomen, epigastric possible radiation to base of scapula or shoulder; lasts <6 hours, typically 30min - 3 hours
- Nausea and Vomiting
- Symptomatic cholelithiasis can elicit an attack of acute cholecystitis, ongoing chronic cholecystitis, or may resolve
Cholelithiasis – Clinical Features

• Physical exam: mild tenderness to palpation without guarding or rebound in RUQ or epigastrium; no fever

• Labs: should be normal
  – Typically no leukocytosis
  – ALT/AST to evaluate for hepatitis
  – Bilirubin and alk phos to look for evidence of common bile duct obstruction
  – Lipase to assess for pancreatitis
Cholelithiasis - Diagnosis

- Clinical +/- demonstration of stones in the gallbladder
- Ultrasound
  - rapid, highly sensitive, and evaluates surrounding structures
  - Stones without findings of acute cholecystitis (thickened gallbladder wall, pericholecystic fluid, biliary sludge)
Cholelithiasis - Treatment

• Symptomatic - correct fluid and electrolyte disturbances and relief of symptoms
  – Anti-emetics, antispasmodics (glycopyrrolate), NSAIDs, +/- opiates

• Definite management: cholecystectomy
  – Bile acids (ursodiol, Actigall) can dissolve small to medium sized stones over months-years
  – Elective surgery considered in asymptomatic cholelithiasis in pts with DM, porcelain gallbladder, or a history of biliary pancreatitis
  – Extracorporeal shock wave lithotripsy may be successful in some groups
Cholecystitis – Pathophys

• = bacterial overgrowth and inflammation of gallbladder due to obstructed cystic duct
  – 90-95% due gallstones
  – <10% acalculus (also tumor, lymphadenopathy, fibrosis, parasites, kinking of duct)
• Acute cholecystitis = sudden inflammation of the gallbladder
• Chronic cholecystitis = recurrent bouts of colic or acute cholecystitis leading to chronic GB wall inflammation/fibrosis [typically no fever, leukocytosis]
• Risk factors: same as cholelithiasis (4 F’s)
• Bacteria are isolated from the bile of inflamed gallbladders in the majority of cases
  – MC: E.coli, Klebsiella, Enterobacter (anaerobes identified in as many as 40% of cases)
Cholecystitis – Clinical Features

- RUQ pain – colicky, with progression to constant; >6 hours
- Nausea, Vomiting
- +/- fever (29% of pts)
- +/- history of similar but less severe and shorter episodes
- PE: RUQ or epigastric tenderness, often with guarding or rebound
  - *Murphy’s sign* = tenderness and an inspiratory pause elicited by palpation of the RUQ during a deep breath
    - 97% sensitive, but NOT specific for gallbladder inflammation
    - >60 yrs, 48% sensitive
Cholecystitis - Diagnosis

- Labs:
  - Leukocytosis (wnl in 40%)
  - LFTs +/- slightly elevated AST, ALT, alk phos, bilirubin
  - If increased lipase → pancreatitis +/- cholecystitis

- Imaging:
  - Plain films: calcified stones, gas in the gallbladder, or an upper quadrant sentinel loop
  - US: best in ED (94% sensitive, 78% specific)
  - HIDA: gold standard
  - CT: helpful in emphysematous or hemorrhagic cholecystitis
Cholecystitis - Ultrasound

Signs:
• Gallstones (> 2mm can be detected directly or with acoustic shadowing)
• Thickened gallbladder wall (>3mm)
• Pericholecystic fluid (fluid around the gallbladder)
• Biliary sludge

*Sonographic Murphy’s Sign*: positive when the point of maximal tenderness is identified in the RUQ when the gallbladder is on the screen (so it is clearly gallbladder that is the tender structure)
Cholecystitis – HIDA Scan

- = Hepatobiliary Iminodiacetic Acid; Nuclear scintigraphy with technetium-99m-labeled iminodiacetic acid (IDA)
- IV IDA is taken up by hepatocytes and excreted into bile canaliculi, imaging taken 1 hour later

Talley, 2010
Cholecystitis - Treatment

• Supportive care – IV crystalloids, correct electrolyte disturbances
• Antiemetics +/- NG suction to diminish stimulus for bile excretion
• Analgesics
• Antibiotics (2nd or 3rd gen cephalosporin is adequate unless clinical evidence of sepsis exists)
• Surgery
  – Optimal timing is not certain - often times after symptoms have subsided, but while pt is still hospitalized
  – Immediate cholecystectomy or cholecystectomy is reserved for complicated cases in which the patient has gangrene or perforation
Antibiotic Coverage

| Intra-abdominal infection, community-acquired (e.g. cholecystitis, cholangitis, diverticulitis, abscess) | Enterobacteriaceae, Bacteroides sp., Enterococci, Streptococci | Ceftriaxone + metronidazole  
Cefoxitin  
Ertapenem (prior history of ESBL within 12 months, but low risk for Pseudomonas)  
Ciprofloxacin + metronidazole (severe β-lactam allergy) |
|---|---|---|
| Intra-abdominal infection, spontaneous bacterial peritonitis | Staphylococci, Streptococci, Enterobacteriaceae | Ceftriaxone  
Moxifloxacin (beta-lactam allergy) |
| Intra-abdominal infection, healthcare-associated  
**NOTE:** Add tobramycin for patients with severe sepsis or septic shock. Stop after 3 days if a beta-lactam/monobactam resistant organism is not isolated or if cultures were not obtained. | Enterobacteriaceae, Bacteroides sp., P. aeruginosa, Enterococci, Staphylococci, Streptococci | Piperacillin/tazobactam ± tobramycin  
Cefepime + metronidazole ± tobramycin  
Aztreonam + metronidazole + vancomycin ± tobramycin (severe β-lactam allergy) |
Acalculus Cholecystitis

• 5-10% of case of acute cholecystitis
• Gallbladder inflammation due to biliary stasis
• Seen in: elderly, post-op, AIDS (2/2 CMV or cryptosporidium), and critically ill
• Typically more acute and malignant course with higher mortality
• Same findings on u/s or scintigraphy
• Treatment: emergent chole (typically open), however if pt too sick, perc cholecystostomy tube with interval cholecystectomy
Cholecystitis - Complications

- Gangrene of gallbladder with necrosis or perforation →
  - pericholecystic abscess
  - cholecystoenteric fistula → gallstone ileus
- Emypema of gallbladder
- Emphysematous cholecystitis

radiopaedia.org/cases/gallstone-ileus-ct-findings
Emphysematous Cholecystitis

- ~1% cases of cholecystitis
- Invasion of mucosa by gas producing organisms (e. coli, klebsiella spp., Clostridium perfringens) → air in gallbladder wall
- High incidence of gangrene and perf
- Seen in vascular insufficiency, severe burns, trauma, diabetics
- Acalculus in up to 50% cases
- Tx: broad spectrum abx + emergency cholecystectomy
- Mortality rate 15%
Choledocholithiasis
Choledocholithiasis

- Common bile duct obstruction +/- cholecystitis +/- pancreatitis
  - Primary = gallstone originated in CBD
  - Secondary = gallstone originated in GB
- Presents similar to cholelithiasis, with the addition of jaundice
- Labs with elevated alk phos and bilirubin
- Tx: ERCP with stone extraction and sphincterotomy, followed by interval cholecystectomy
Ascending Cholangitis
Ascending Cholangitis – Pathophys

• Common duct obstruction → elevated intraluminal pressure → bacterial infection of biliary tree (retrograde from duodenum, via lymphatics, or from portal vein blood)

• Gallstone > malignancy or benign stricture

• Incomplete obstruction occurs more commonly than complete blockage

Dr. Jean-Martin Charcot (1825-1893)
Described “acute obstructive cholangitis” in 1877
Ascending Cholangitis - Presentation

- Tend to appear more ill than cholecystitis
- Charcot’s Triad: fever, jaundice, RUQ pain
  - Seen only 25%
  - also seen in cholecystitis and hepatitis
- Reynolds’ Pentad: Charcot's triad + hypotension + AMS
- Labs: leukocytosis, hyperbilirubinemia, elevated alk phos, moderately increased aminotransferases
Ascending Cholangitis - Imaging

- Ultrasound: common and intrahepatic ductal dilation
  - can be helpful, but a clinical dx
  - CBD dilated when diameter >8mm
- Scintigraphy not as helpful
- Also helpful: CT scan
- Percutaneous transhepatic cholangiography (THC), and endoscopic retrograde cholangiopancreatography (ERCP)

http://pixgood.com/cholangitis.html
Ascending Cholangitis - Treatment

- Hemodynamic stabilization, IV crystalloid
- Broad spectrum abx with coverage for enteric microbes
  - Combination therapy: extended spectrum cephalosporin, metronidazole, and ampicillin
- Early biliary tract decompression: achieved with THC, ERCP, or surgery (used to require emergency laparotomy)
  - At HFH: ERCP is performed by GI

http://www.swjpcc.com/imaging
Gallbladder Disorders in Pregnancy

- Cholelithiasis present in 5% pregnancies
- 2nd MC non-obstetric surgical condition in pregnancy (after appy)
- DDx: pyelonephritis, appendicitis (RUQ in 3rd tri), hepatitis, fatty liver, spontaneous intra-hepatic bleeding
- Difficult to diagnose given N/V of 1st trimester and enlarged uterus altering anatomic relationships
- Surgery typically delayed until after delivery
Primary Sclerosing Cholangitis

- Idiopathic inflammatory disorder affecting the biliary tree
- Diffuse fibrosis and narrowing of intra and extrahepatic bile ducts
- Commonly associated with inflammatory bowel disease, esp. UC
- Rarely can progress to infective cholangitis which must be diagnosed by ERCP or surgical exploration (diagnostically challenging because of sclerotic nature of bile ducts and the absence of duct dilatation on u/s)
AIDS Cholangiopathy

- A group of disorders that include: bile duct stricture, papillary stenosis, and sclerosing cholangitis
- Typically associated with CD4+ counts <200/mm3
- Precise pathophysiology not completely understood, but related to infection with CMV, cryptosporidium, microsporidia, or MAC
- Presents similar to other causes of cholangitis
- Tx: endoscopic sphincterotomy or stent placement in conjunction of treatment of underlying infection
Porcelain Gallbladder

- Dramatic radiographic findings caused by linear or punctate calcifications within the gallbladder wall
- MC in women with mean age in 50; also American Indians
- Gallstones commonly present, with palpable but non-tender gallbladder
- Referred for cholecystectomy because of high incidence (22%) of associated carcinoma

http://www.nwhealth.edu/
Malignancy

• Carcinoma of biliary tract is uncommon
• MC: Gallbladder carcinoma (5% of all cancers found at autopsy)
• Risk factors: same as cholelithiasis
• Sx: chronic RUQ pain and jaundice
• **Couvoisier’s Sign** = palpable mass in RUQ (in 1/3 cases)
• **Couvoisier’s Law** = palpable gallbladder in the setting of painless jaundice likely represents obstruction of CBD by malignancy, likely carcinoma of pancreatic head
• **Klatskin’s Tumor** = malignant tumor located where the hepatic ducts form the common bile duct
Prophylactic Choles for Astronauts?

• Since 1950s, Australia requires Antarctic explorers in winter to have prophylactic appendectomies

• “If it is not possible to provide [surgical] care on either the moon, or Mars, prophylactic excisional surgery is a reasonable alternative in spite of the extensive unresolved ethical issues associated”

What do our General Surgery Residents have to say?

• Must distinguish between biliary colic from surgical emergencies
  – If biliary colic, instruct pts to follow up in ACS clinic and avoid fatty foods
• Acute chole = pain, fever, WBC, ultrasound findings
• If otherwise healthy patient, ACS tends to do acute cholecystectomy day of presentation
• Some surgeons stop abx immediately after surg, others continue for 1 day post-op
• If concerned for gallbladder pathology, get LFTs, if bili elevated, could be choledocho
• If choledocho or ascending cholangitis, call GI and Acute Care Surgery, GI will do an ERCP with ACS standing by for biliary tree exploration
Rosh Review Question

67 y/o W presents with 2-day history of fever and abdominal pain. Pain is intermittent and localized to RUQ with radiation to right scapula. V/S are T 39.1, BP 100/40, HR 122, and RR 26. The daughter states that the patient appears confused today. PE notable for scleral icterus and lethargy. Which of the following are the next best step in management?

a) Initiate broad-spectrum IV antibiotic therapy
b) Obtain a white blood cell count to assess for leukocytosis with a left shift
c) Obtain an IV contrast-enhanced CT scan of the abdomen and pelvis
d) Obtain an ultrasound of the RUQ to assess gallbladder wall thickening and common bile duct diameter
e) Place a consultation to the surgical service for immediate percutaneous biliary drainage

Ascending Cholangitis

CHOLANGITIS
An infection in the common bile duct, usually resulting from a common bile duct stone
43 y/o W presents with right upper quadrant pain for 3 weeks. She states that she intermittently gets sharp pain that occurs after eating, associated with nausea, and occasionally vomiting. The pain lasts for 10-15 minutes and then spontaneously improves. Currently, she has no pain. Her vitals and blood work are normal. A RUQ ultrasound is shown, what management is warranted?

a) Administer antibiotics and admit for observation
b) Admit pt for cholecystectomy
c) Obtain CT scan of the abdomen and pelvis
d) Referral for surgical consultation and pain medication as needed
Rosh Review Question

Which of the following is most commonly seen in patients diagnosed with acute cholecystitis?

a) abdominal pain
b) documentation of previous gallstones
c) elevated liver enzymes
d) elevated WBCs
60 y/o W presents with 2 days of RUQ abdominal pain, constant in nature. Associated with subjective fever, nausea, and vomiting. Vital signs are temp of 38.1, HR 87, BP 140/80, RR 14, 99% on RA. Abdomen is soft with RUQ tenderness and a positive Murphy’s sign. Which of the following tests is most sensitive and specific in diagnosing the patient’s condition?

a) CT scan with IV contrast
b) HIDA scan
c) MRI with Gadolinium
d) Ultrasound
What are the ultrasound findings of acute cholecystitis?

- Gallstones (directly or with acoustic shadowing)
- Sonographic Murphy’s Sign
- Thickened gallbladder wall (>3mm)
- Pericholecystic fluid
- Biliary sludge
At what diameter is the CBD considered dilated?

>8mm
Bottom Line

• Symptomatic cholelithiasis: intermittent postprandial epigastric/RUQ pain due to transient cystic duct obstruction

• Acute Cholecystitis: acute GB inflammation due to cystic duct obstruction. Persistent RUQ pain +/- fever

• Choledocholithiasis: gallstone in the common bile duct

• Ascending Cholangitis: infection within the bile ducts typically due to obstruction
Questions?
Resources


• Radiopaedia.org

• Rosh Review

