

Imaging of Biliary Tract Emergencies in 2011

Jorge A. Soto, MD
Professor of Radiology
Boston University Medical Center



Introduction

- Biliary emergencies are:
 - Common
 - Come in many flavors
 - Deceiving: frequent source of devastating mistakes
- Best friends:
 - Caution
 - Careful clinical evaluation
 - Time

Context: Clinical

- Acute disorders affecting biliary tract are exceedingly common
- Biliary tract is often suspected cause of abdominal pain:
 - Specific signs and symptoms
 - Non-specific symptoms
- Biliary tract often **found** to be unsuspected cause of abdominal symptoms

Ultrasonography

- Increasingly performed by non-radiologists
- Lack of supervision by physicians
- Practice: standard sets of static images/sweeps
- Common discrepancies with other tests/surgery
- Unlikely to change in near future
- **Losing credibility**

CT in Acute Abdominal Pain

- MDCT: ubiquitous, fast, **not** operator dependant
- Most importantly... **very powerful tool**
- Radiologists less involved in imaging decision-making process: appropriateness of tests
- Result: large number of patients undergo CT as first test
- Numbers have dropped slightly...? transient

MR in the ER

- Also growing...
 - MR scanners in or adjacent to ER
 - Increasing clinical applications
 - Neurological emergencies: trauma and non-trauma
 - Orthopedic emergencies
 - Obstetric emergencies
 - Growing concern about untoward effects of CT-generated radiation: medical and non-medical community

Objectives

- MDCT findings of biliary emergencies
- Technical Considerations of 64 MDCT:
 - Contrast, reformations, radiation
- MRCP: when and how in the ER
- Current use of ERCP relative to MDCT and MRCP
- Pitfalls of all modalities

Imaging Biliary Tract Emergencies

- What are they?
 - Acute biliary obstruction...obstructing stone
 - Ascending cholangitis/other complications of stones
 - Acute calculous cholecystitis
 - Acute acalculous cholecystitis
 - Gangrenous/emphysematous cholecystitis
 - Gallbladder hemorrhage
 - Gallbladder rupture
 - Gallstone ileus
 - Biliary tract trauma

Choledocholithiasis

- Occurs in 6-12% of patients undergoing cholecystectomy (at time of or subsequently)
- Imaging study for detection depends upon clinical presentation/index of suspicion:
 - US: RUQ pain, biliary obstruction
 - CT: Abdominal pain, fever/infection
 - MRCP: Inconclusive US/CT, post-CCY
 - ERCP: High pre-test probability

Gallstones and CT

- Detection depends upon:
 - Stone composition: pigment/cholesterol, some are isoattenuating!
 - Stone size/slice thickness: thin is better!
 - Oral/IV contrast: both decrease performance!
 - X-ray tube peak voltage: 140 kVp increases conspicuity (implications for dual energy CT)
[Chan, W. C. et al. Radiology 2006;241:546-553](#)

Performance of CT

1 st Author	Year	Journal	Technique	Sensit	Spec
Neitlich J	1997	Radiol	HCT/I-/O-	88%	97%
Soto JA	2000	AJR	HCT/I-/O-	72%	84%
Pickuth D	2000	Hepatog	HCT/I-/O-	86%	98%
Moon JH	2005	Am J G	4DCT	40%	n/a
Anderson SA	2006	AJR	4DCT/I-/O+ 4DCT/I+/O+	70,87% 87,87%	92,92% 83,88%
Anderson SA	2008	Radiol	64DCT/ I+/O+	72,78%	96%

Ascending Cholangitis

- Acute infection → high WBC, fever, shock
- Biliary obstruction, stasis, +/- Dilatation
- Stones: most common cause
- CT:
 - Biliary gas, Liver abscess
 - Peri-biliary enhancement
 - Bile duct wall thickening
 - Peri-biliary fat stranding

Mirizzi's Syndrome

- Impaction of gallstone in cystic duct or Hartmann pouch
- Inflammation leads to adherence with bile duct
- Imaging:
 - Dilated common hepatic duct
 - Normal caliber common bile duct
 - Narrowing at junction of CHD and cystic duct
 - ? Impacted stone

Acute Cholecystitis: Pathophysiology

- Calculous:
Obstruction→distension→edema→infection→
↑blood flow→↑pressure→thrombosis→
ischemia→necrosis→rupture
- Acalculous:
 - NO obstruction
 - Typically hospitalized patients, debilitated, comorbidities

Acute Cholecystitis: Imaging

- Luminal distension >5 cm diameter
- Wall thickening >3 mm
- Wall/GB fossa hyperemia
- Stones: CT 75%, US 95%(?), MR (?)
- Pericholecystic fluid
- Inflammatory stranding pericholecystic fat
- Hyperemia adjacent liver parenchyma
- Murphy's sign (US): 85% sensit, 35% spec
- All non-specific and prone to pitfalls

Clinical Scenarios and Imaging

- Typical symptoms: US, ?HIDA scan
- Atypical symptoms: US, CT
- Increasingly common:
 - Nonspecific clinical findings and equivocal imaging findings
 - Suspicious imaging findings without clinical correlate
- MR: problem solver, investigation of other conditions

Complicated Cholecystitis

- Approximately 20-25%
 - Gangrene
 - Rupture
 - Bleeding
 - Emphysematous cholecystitis
- Higher mortality and post-operative complications
- Not amenable to initial medical therapy

Gangrenous Cholecystitis

- Usually in diabetics, elderly, or immunocompromised patients
- Signs:
 - Striated wall, sloughed mucosa: US
 - Pericholecystic abscess
 - Hyperdense wall on I- CT: hemorrhage
Cheng SM Clin Imaging '04
 - Interrupted wall enhancement on MR or CT
Pedrosa I JMRI '03, Singh AK Abdom Imag '05

Pitfalls

- Clinical/Imaging mismatch: additional tests, wait and repeat US, explore
- Acute cholecystitis but... no stone seen: Repeat US, look carefully
- FN and FP tests: no test is perfect

Biliary Tract Trauma

Intrahepatic Bile Duct Injury

- Complication of hepatic parenchymal injury
- Bile leak increases morbidity and mortality
- Difficult to predict which patients will develop a bile leak
- Liberal use of HIDA scans and ERCP

Predicting Bile Leaks after Liver Injuries

- Location better than size of lacerations predicts bile leak following hepato-biliary injury
- Peripheral lacerations more likely to result in free leaks

*Fleming K, et al. Emer Rad '05

Summary

- Biliary **emergencies** are:
 - Common
 - Deceiving
- Best friends: caution, look at the patient!
- Non-conclusive US:
 - Wait...and repeat US
 - MDCT or MR
- Trauma: early use of HIDA



Boston University
Radiology

Thank you!

