POCUS for Acute Cholecystitis

Case Presentation

Efficacy of POCUS for early detection of acute calculous cholecystitis for Right Upper Quadrant Pain

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Case Presentation

72 year old man presents to the ED for a 3 weeks history of intermittent “hard ache” localized as a band across the abdomen underneath the ribcage. Now 9/10 arrived via EMS. Initially this pain radiated to his jaw. His pain is not related to movement/meals, has no known triggers. Recent history of possible portal vein thrombosis newly started on apixaban. On gabapentin, atorvastatin, omeprazole, tamsulosin.

PMH: HLD, BPH, 2x neck surgery, no substance overuse problems.

ROS: Positive mild fever 100.4, chills. no nausea, vomiting, bowel changes.

Exam: 98.3F 81HR 140/63 95%O2, reassuring heart and lungs. Abd: mild TTP RUQ, epigastrium.
Differential?

- Acute coronary syndrome
- Spinal trauma
- Pulmonary embolism
- Prostatic neoplasia w/metastasis to lumbar spine
- Pancreatitis
- Pyelonephritis
- Hepatic
  - Liver Abscess, Budd chiari/Portal Vein Thrombosis
- Biliary etiologies
  - Cholecystitis, Biliary colic, Cholangitis, Sphincter of Oddi dysfunction
Prior Workup: Outside Hospital s/p 3 days

Negative cardiac workup including CT angiogram thorax and CT abdomen, cardiac enzymes, EKG.

Repeat CT reveals no further portal vein thrombosis, spinal degeneration, pulmonary embolism, pancreatic abnormalities, hepatic/biliary findings.

Upper endoscopy for possible GI source of pain, resulted negative. Labs broadly reassuring and WNL.

Discharged on cyclobenzaprine for pain control.
### CBC
- **HCT**: 44.6
- **HGB**: 15.0
- **MCH**: 29.6
- **MCHC**: 33.6
- **MCV**: 88.1
- **MPV**: 10.2
- **PLT**: 187
- **RBC**: 5.06
- **RDW**: 13.2
- **RDW-SD**: 42.5
- **WBC**: 20.3 H
- Lipase
- Lipase < 4 L (00:00)

### Chemistry Panel
- **ALP**: 76
- **ALT**: 17
- **AST**: 12
- Albumin: 3.00 L
- Anion Gap: 10.0
- BUN: 11.0
- **Tbili**: 1.60 H
- CO2, Tot: 21
- Ca, Corr: 9.3
- Calcium: 8.5
- Chloride: 104
- Creat: 0.78
- Glucose: 115 H
- K: 4.1
- Osmol, C: 270

### Chemistry Panel cont.
- **TProtein**: 6.4
- Sodium: 135 L
- eGFR-AA > 60
- eGFR-nAA > 60

### Urinalysis With Micro
- **Appearance, U**: Clear
- Ascorbic Acid: Negative
- Bili, U: Negative
- Blood, U: Moderate A
- Color, U: Yellow
- Glucose, U: 50
- Ketones, U: 20 A

### Leuko, U
- **Negative**
- Micro: Performed
- Nitrite, U: Negative
- **Protein, U**: 30 A
- RBC, U: 5 H
- SG, Urine: 1.015
- Urobilinogen, U: 2.0 A
- WBC, U: 1
- pH, Urine: 6.0
ED Labs

- CBC with WBC 20.3 otherwise wnl
- Normal Lipase
- Increase in bilirubin to 1.6, CMP otherwise wnl
- UA negative
EKG: Normal sinus rhythm at 81bpm, PR 136ms, QRS 78ms, QTC 408ms, no ST elevation or changes to indicate ischemia or current injury.
Narrow Differential?

- Acute coronary syndrome
- Spinal trauma
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- Pancreatitis
- Pyelonephritis
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72 yo M with Hx HLD, BPH here for intermittent bandlike abdominal pain for 3 weeks with RUQ and epigastric TTP on exam and a workup significant for leukocytosis with a reported fever for EMS. Negative UA, EKG, prior CT for any recurrence of portal vein thrombosis.

What do we do next?

Empiric antibiotics: Piperacillin/tazobactam

Pain control: Dilaudid

Review CT Scans from outside hospital

Order US scan!
Clinical Question

How useful is point of care ultrasound for the rapid early detection of acute calculous cholecystitis in patients with right upper quadrant pain?
"1. No evidence of portal vein thrombosis. 2. Gallbladder is distended with a little bit of sludge. Common bile duct 5mm"
POCUS - Sagittal

Please click here to view the video of this acquisition.
POCUS - Transverse

Please click here to view the video of this acquisition.
“Gallbladder not seen. In the appropriate clinical setting this could represent cystic duct obstruction and acute cholecystitis.”
RUQ Pain: Ultrasound First!

Ultrasound should be considered first line diagnostic imaging.

Gallstones present in 90-95% of Acute Cholecystitis
Gallbladder wall distention >3mm
Murphy’s sign not significant alone, but can complete diagnosis
A well-seen gallbladder without stones, wall inflammation, or Murphy’s sign reassuring for no acute cholecystitis.

Absence of Gallstones can Rule out Calculous Cholecystitis.

No gallstones visualized on gallbladder ultrasound has excellent NPV.

Prior studies have showed POCUS is useful for acute cholecystitis via gallstones + sono-Murphy’s/peri-chole fluid/wall thickening with sn/sp = 87%/82%

Further reinforcement of absence of gallstones as a 100% sensitivity and negative predictive value for calculus cholecystitis.

Limited by small center study, useful for outpatient care.

Evaluation of the CT Scan as the First Examination for the Diagnosis and Therapeutic Strategy for Acute Cholecystitis

Ultrasound has better sensitivity for cholecystitis but CT has better specificity.

CT scans found to have sensitivity of 52% for cholecystitis as compared to 79.4% for US.

Use POCUS to evaluate for simple cholecystitis.

US can indicate where to escalate to CT or HIDA scanning for complicated cases.

Acute cholangitis: Diagnostic Imaging Approach

Ultrasound – High specificity, low sensitivity for bile duct dilation. Useful low cost approach for gallstone related cholangitis

CT- Low sensitivity for stones, high sensitivity for biliary stenosis/dilation

Ultrasound inefficient at diagnosing cholangitis related to stricture, stenting, or non-stone etiologies

MRCP gold standard for imaging, poor access.

Role of Ultrasound and CT in the Workup of Right Upper Quadrant Pain in Adults in the Emergency Department: A Retrospective Review of More Than 2800 Cases

Just CT Everything?

- CT was found to be noninferior to US for the diagnosis of cholecystitis
- Similar CT vs US sensitivity: 61% vs 55%
- Similar CT vs US specificity: 91% vs 92%
- CT is superior at detection of non-gallbladder etiologies of RUQ abdominal pain
- CT limited by length of study, radiation exposure, and cost

POCUS Ultrasound is useful for accessibly ruling out calculous cholecystitis, less useful than CT for other biliary/nonbiliary etiologies.

1. Gallstones/gallbladder wall thickening/sono-Murphy’s sign = 95% PPV for AC
2. Gallstones/sono-Murphy’s or perichole fluid or wall thickening = 87% sensitivity and 82% specificity.
   1. Simplifies to 100% Sensitivity and 100% NPV by presence of gallstones alone!
3. Ultrasound has a better sensitivity than CT scan for acute cholecystitis, but CT is better for complicated cholecystitis.
Case Resolution

Patient had his gallbladder removed which was described as “very gangrenous” during surgery. He recovered well and was discharged to home on oral antibiotics.