



Lauren Chang Sen, MD  
University of Pittsburgh  
Pittsburgh, PA

**Clinical History**  
66 year-old man presented with right upper quadrant abdominal pain.

**Figures**

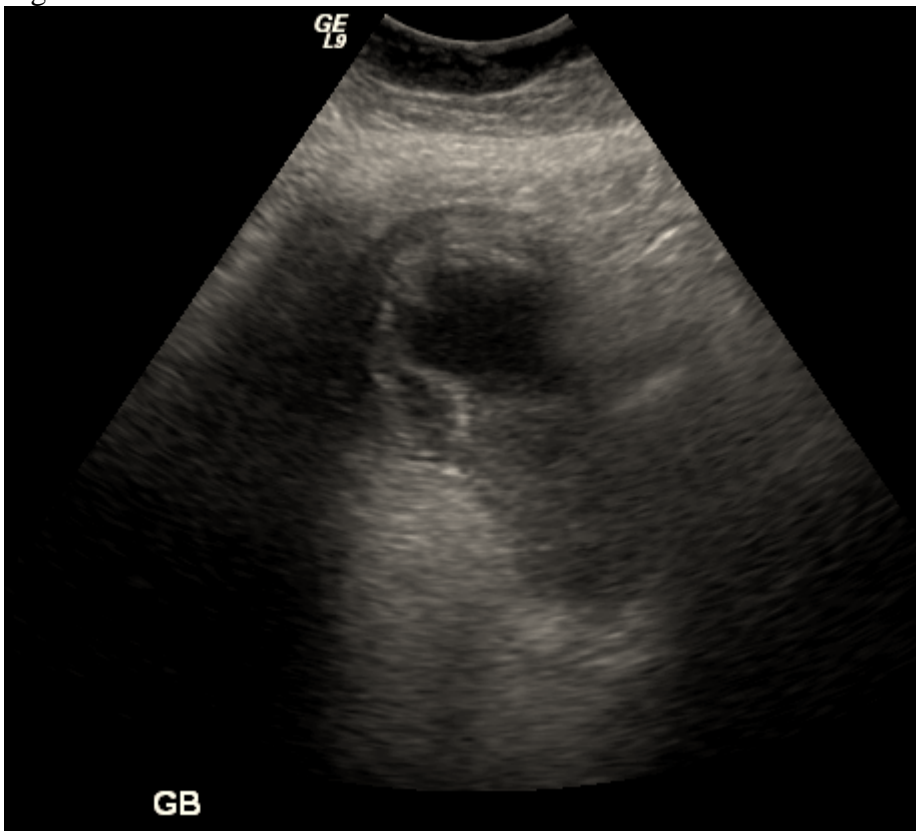


Figure 1a. The gall bladder wall is markedly irregular and thickened

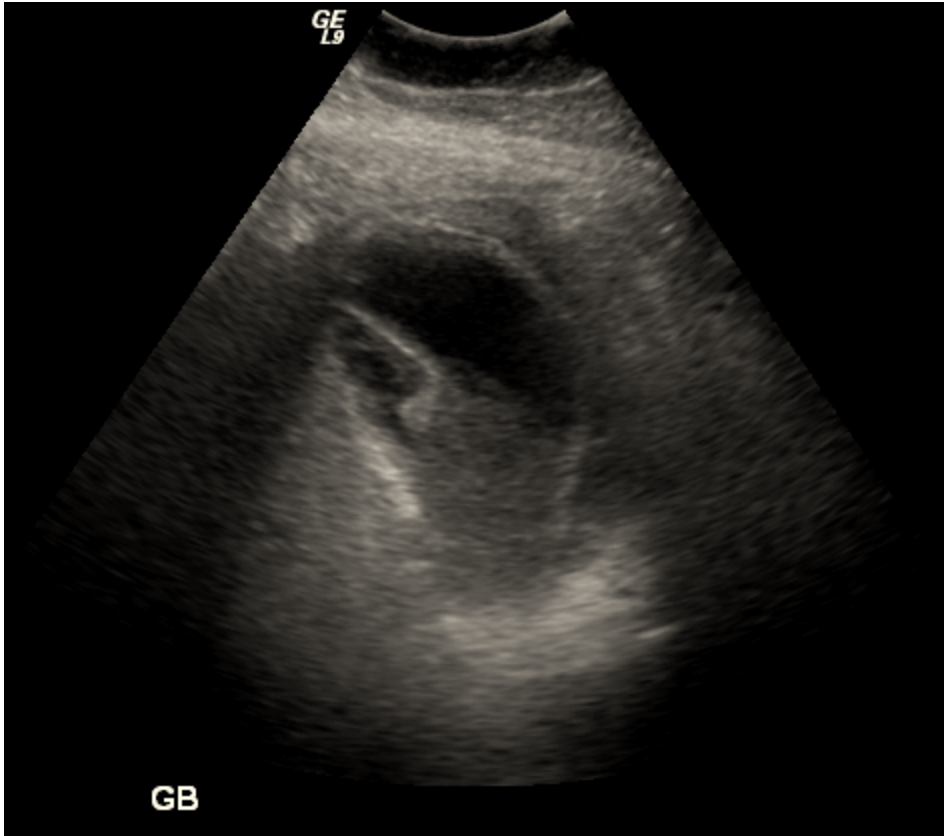


Figure 1b. There is a suggestion of membranes and layering debris within the gallbladder lumen.

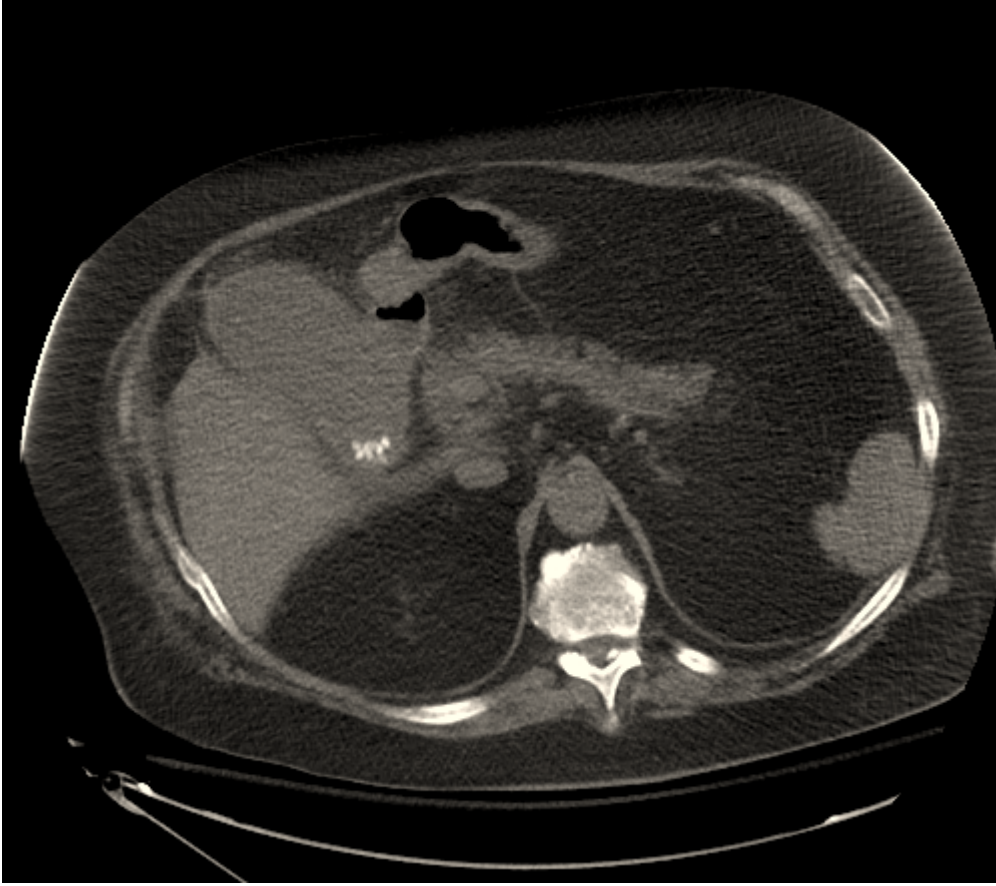


Figure 2a. CT performed one day earlier. The gallbladder was distended containing multiple layering calculi.

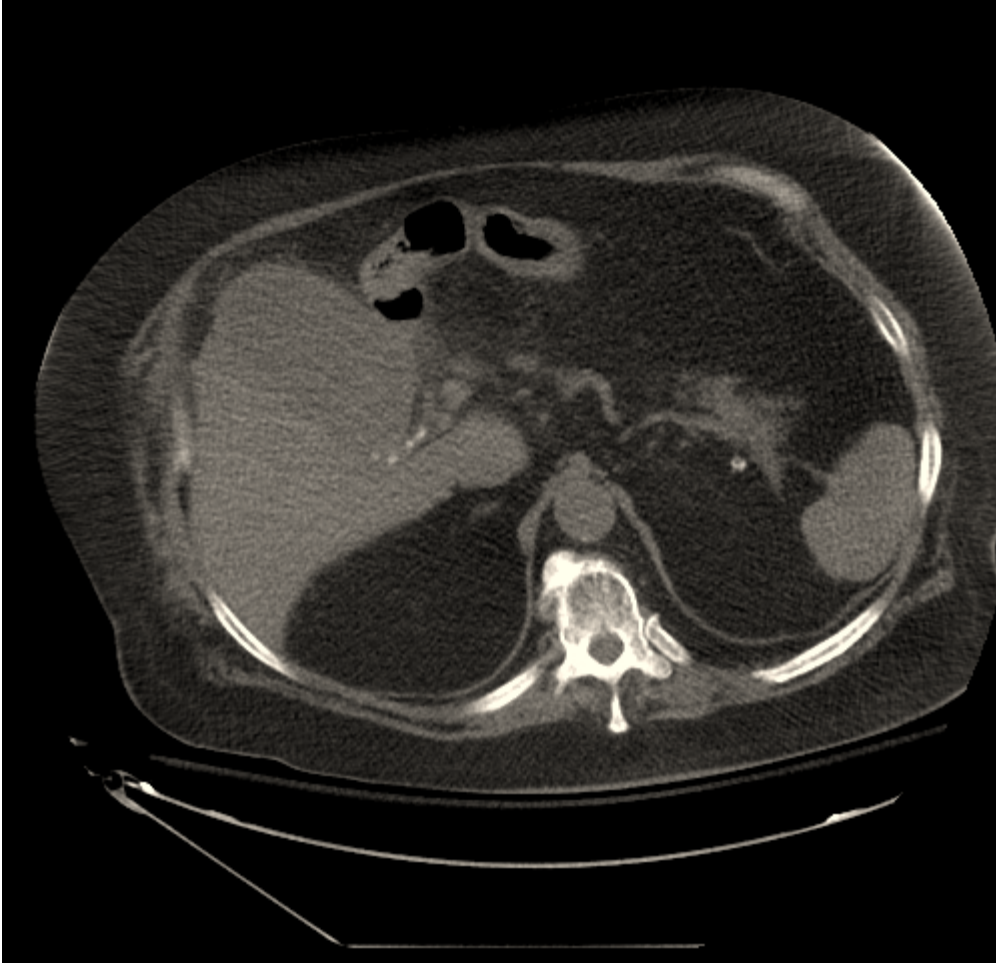


Figure 2b. Some calculi appear to reside within either the neck or the cystic duct. There is mild pericholecystic infiltration.

**Diagnosis:**

Gangrenous Cholecystitis (confirmed at surgery).

**Discussion:**

Approximately 2%-38% of patients with acute cholecystitis will develop gangrenous cholecystitis [1]. Gallbladder wall ischemia and eventually necrosis from elevated intraluminal pressure is a hypothesized mechanism [1]. The mortality and complication rates of gangrenous cholecystitis are up to 22% and 16-25% respectively in comparison to 0.5-6% and 6-15% of acute nongangrenous cholecystitis [2].

While diagnostic value of a sonographic Murphy sign had been stressed in nongangrenous cholecystitis, only 33% of patients with gangrenous cholecystitis have a positive sonographic Murphy sign [2]. The proposed mechanism is that in gangrenous cholecystitis, the visceral afferent nerves in the muscular and serosal layers of the gallbladder may die. As a result, compression of the distended gallbladder will not produce pain. Instead, inflammation of the adjacent parietal peritoneum due to

gallbladder transmural necrosis stimulates intercostal branches of the spinal nerves and causes generalized right upper quadrant pain. Additionally, referred right shoulder pain may occur secondary to stimulation of right hemidiaphragmatic branches of the phrenic nerve [2].

At ultrasound, signs of acute cholecystitis include gallstones, gallbladder wall thickening, gallbladder enlargement, pericholecystic fluid, a stone impacted in the gallbladder neck or cystic duct, and focal tenderness directly over the gallbladder [3]. Sonographic findings suggestive of gangrenous cholecystitis include intraluminal membranes or marked asymmetry of the gallbladder wall [4]. On pathologic examination of gangrenous cholecystitis, strands of fibrinous exudate and necrotic mucosa may be the cause of the intraluminal membrane, while marked asymmetry of the gallbladder wall may be related to ulcers, intramural hemorrhage, necrosis, and/or microabscess formation [4].

CT findings, such as luminal or intraluminal gas (100%), intraluminal membranes (99.5%), irregular or absent wall (97.6%) and abscess (96.6%), have the highest specificity [1].

Although surgical timing regarding uncomplicated cholecystitis maybe controversial, consensus is that suspected gangrenous cholecystitis requires emergent cholecystectomy [4].

References:

1. Hanbridge A, Buckler P, O'Malley M, et. al. From the RSNA Refresher Courses. Imaging Evaluation for Acute Pain in the Right Upper Quadrant. *RadioGraphics*. 2004; 24: 1117-1135.
2. Simeone J, Brink J, Mueller P, et. al. The Sonographic Diagnosis of Acute Gangrenous Cholecystitis: Importance of the Murphy Sign. *AJR*. February 1989. 152: 289-290.
3. Middleton WD, Kurtz AB and Hertzberg BS. GallBladder. In: *Ultrasound-The Requisites*, 2<sup>nd</sup> Ed. Mosby. An Imprint of Elsevier. 2004: 28-48.
4. Jeffrey R, Laing F, Wong W. et.al. Gangrenous cholecystitis: Diagnosis by Ultrasound. *Radiology*. July 1983. 148: 219-221.

Authors:

Resident: Lauren Chang Sen, MD

Faculty: Mitchell Tublin, MD

Institution:

University of Pittsburgh Medical Center

Department of Radiology