Case 9505

Contained gallbladder perforation complicating acute cholecystitis
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Section: Abdominal imaging
Area of Interest: Biliary Tract / Gallbladder
Procedure: Cholangiography
Imaging Technique: MR
Imaging Technique: CT
Special Focus: Acute Case Type: Clinical Cases
Authors: Tonolini Massimo, MD
Patient: 49 years, male

Clinical History:

Middle-aged male patient with long-standing HIV infection, in good clinical and immunological conditions under antiretroviral therapy. Complains of epigastric and right hypocondrium pain, nausea and vomiting for five days. Positive Murphy’s sign, mild jaundice (5.8 mg/dL serum bilirubin) at physical examination. Severe inflammatory markers (33,000/mmc neutrophils, C-Reactive Protein 440 mg/L).

Imaging Findings:

Ultrasound (not shown) detected overdistended gallbladder with positive sonographic Murphy’s sign, mural thickening, diffusely echogenic luminal content due to sludge and microlithiasis, consistent with acute cholecystitis. Hours later, urgent CT (requested due to persistently elevated inflammatory markers) confirmed gallbladder dilatation with mural enhancement, surrounding fat inflammatory stranding; furthermore, a well-demarcated fluid-like collection was seen abutting the fundus.

MRI with MRCP, performed the next day, confirmed diffusely T1-hyperintense gallbladder lumen consistent with biliary sludge and microlithiasis, mural thickening, oedematous changes in the adjacent fat and liver parenchyma; similar, stratified signal with fluid-fluid level was observed in the 3 cm collection surrounding the fundus, which was interpreted as localised pericholecystic abscess due to contained perforation (type 2). Moderate intrahepatic biliary dilatation was attributed to the distended gallbladder neck compressing the common hepatic duct.

Laparotomic surgery and pathologic findings confirmed mixed acute and chronic cholecystitis with some mural necrosis, pericholecystic collection due to microperforation.

Discussion:

Gallbladder perforation (GBP) is a rare, serious and possibly life-threatening complication during or after acute cholecystitis. Incidence decreased from a 15% rate in historical series to less than 1-2% today. Risk factors include long history of cholelithiasis, advanced age, arteriosclerosis, diabetes, immune suppression and steroid usage [1, 2]. Most perforations involve the gallbladder fundus. Pathogenesis involves intraluminal hyperpression (following cystic duct obstruction) exceeding arterial pressure and causing mural ischemia and gangrene, ultimately leading to perforation; cystic artery thrombosis and bacterial wall invasion may act as cofactors [3-5].

Still credited, the classical 1934 categorisation by Niemeier distinguishes type 1 (16% of cases) spontaneous GBP with bile peritonitis and highest mortality, from type 2 perforations with pericholecystic abscess formation (68%) and type 3 with chronic fistulisation between the gallbladder and adjacent organs (16%). Clinical presentation is acute with intense abdominal pain and signs of peritonitis in type 1, subacute with local tenderness, fever and positive
Murphy’s sign in type 2; not unusually, malaise, anorexia and weight loss associated with a palpable hypocondrium mass suggest an underlying neoplastic process [2, 3, 6].

In the past, GBP were rarely diagnosed preoperatively. As first-line imaging, in GBP cases ultrasound confirms cholecystitis signs including overdistension, gallstones or coarse intraluminal echogenic debris, thickened oedematous walls, pericholecystic fluid and Murphy’s sign; ultrasound only exceptionally detects gallbladder mural defect as direct sign of perforation [2, 5, 6].

Differentiating simple versus complicated cholecystitis serves to plan approach and timing of surgery, and clinical or sonographic suspicion of complicated cholecystitis usually requires further investigation. Although CT is inferior to ultrasound for identifying gallstones, it is considered the best technique for imaging complicated gallbladder conditions and may contribute to the preoperative diagnosis of GBP [4, 7, 8]. Careful examination of gallbladder wall may identify intramural gas, abscess or haemorrhage, intraluminal sloughed membranes. As direct indicator of perforation, a focal wall rupture is detected in up to 70% of cases. As in this patient, unilocular or septated pericholecystic abscess appear as rim-enhancing fluid collections, whereas extraluminal calculi, biloma, free air or ascites are rare findings [2-4, 7-9].

As demonstrated with this case, MRI is increasingly reported to be useful with equivocal ultrasound findings, since it readily depicts acute cholecystitis and its complications, particularly pericholecystic abscesses resulting from GBP that appear as localised fluid collections with peripheral enhancement [6, 10].

**Differential Diagnosis List:** Contained gallbladder perforation due to acute cholecystitis, Uncomplicated acute cholecystitis, Gangrenous cholecystitis, Emphysematous cholecystitis, Xanthogranulomatous cholecystitis, Gallbladder adenomyomatosis, Gallbladder cancer, HIV-related cholangiopathy, Infectious cholangitis, Acute pancreatitis

**Final Diagnosis:** Contained gallbladder perforation due to acute cholecystitis

**References:**


Description: Unenhanced (a) and portal venous phase enhanced (b,c) images confirm overdistended gallbladder with enhancing mural thickening, marked inflammatory changes of the surrounding fat consistent with acute cholecystitis. Origin: Tonolini M, Radiology Department, “Luigi Sacco” University Hospital, Milan (Italy)
Description: Unenhanced (a) and portal venous phase enhanced (b,c) images confirm overdistended gallbladder with enhancing mural thickening, marked inflammatory changes of the surrounding fat, plus hypodense collection surrounding the fundus. Origin: Tonolini M, Radiology Department, “Luigi Sacco” University Hospital, Milan (Italy)

Description: Axial unenhanced (d) and portal venous phase enhanced (e) images show a 3 cm non-enhancing hypodense collection abutting the gallbladder fundus, consistent with abscess due to contained perforation. Origin: Tonolini M, Radiology Department, “Luigi Sacco” University Hospital, Milan (Italy)
Description: Axial unenhanced (d) and portal venous phase enhanced (e) images show a 3 cm non-enhancing hypodense collection abutting the gallbladder fundus, consistent with abscess due to contained perforation. Origin: Tonolini M, Radiology Department, "Luigi Sacco" University Hospital, Milan (Italy)
Figure 2

**a**

**Description:** Axial T2- (a) and T1-(b) weighted images show overdistended gallbladder neck abutting the hepatic hilum, with hyperintense oedematous signal in the adjacent liver parenchyma. **Origin:** Tonolini M, Radiology Department, “Luigi Sacco” University Hospital, Milan (Italy)

**b**

**Description:** Axial T2- (a) and T1-(b) weighted images show overdistended gallbladder neck abutting the hepatic hilum, with hyperintense oedematous signal in the adjacent liver parenchyma. **Origin:** Tonolini M, Radiology Department, “Luigi Sacco” University Hospital, Milan (Italy)
**Description:** Axial T1-weighted image confirm overdistended gallbladder with diffuse luminal hyperintensity consistent with biliary sludge and microlithiasis. **Origin:** Tonolini M, Radiology Department, “Luigi Sacco” University Hospital, Milan (Italy)

**Description:** Axial T2-weighted image shows distended gallbladder with mural thickening and inflammatory changes of the surrounding fat planes. **Origin:** Tonolini M, Radiology Department, “Luigi Sacco” University Hospital, Milan (Italy)
**Description:** Coronal (e) and axial (f,g) T2- plus axial T1-weighted (h) images show overdistended gallbladder with biliary sludge and lithiasis, and a 3 cm collection abutting its fundus. **Origin:**
Tonolini M, Radiology Department, “Luigi Sacco” University Hospital, Milan (Italy)
Description: Pericholecystic collection shows stratified signal intensity analogous to that of the gallbladder lumen on both T1- (g) and T2-weighted (h) detailed images. Origin: Tonolini M, Radiology Department, “Luigi Sacco” University Hospital, Milan (Italy)
Description: MIP-reformatted (a) and native thin-slab (b) images confirm overdistended gallbladder with sludge and lithiasis, plus fluid-like collection abutting its fundus consistent with contained perforation. **Origin:** Tonolini M, Radiology Department, “Luigi Sacco” University Hospital, Milan (Italy)
Description: MIP-reformatted (a) and native thin-slab (b) images confirm overdistended gallbladder with sludge and lithiasis, plus fluid-like collection abutting its fundus consistent with contained perforation. Origin: Tonolini M, Radiology Department, “Luigi Sacco” University Hospital, Milan (Italy)
Description: Oblique-coronal thick-slab MRCP image show moderate intrahepatic biliary dilatation due to overdistended gallbladder neck compressing the common bile duct, normal-sized choledochus and main pancreatic ducts. Origin: Tonolini M, Radiology Department, “Luigi Sacco” University Hospital, Milan (Italy)