Learning objectives

Gallstones are a common pathology and are often an incidental finding. In 2012 they were diagnosed in 10-15% of adult patients in the western world. This often harmless condition can have serious complications with complex imaging findings that need prompt recognition and management.

Using a pictorial review we aim to illustrate a range of unusual complications that we have encountered in our clinical practice secondary to gallstones covering:

- Clinical presentation
- Pathophysiology
- Imaging findings
- Highlighting the implications for the patient.

Background

Gallstones are a common pathology. In 2012 they were diagnosed in 10-15% of people in the Western world. Often they are found incidentally, for example during an outpatient ultrasound scan for unrelated symptoms and frequently they are left untreated throughout the patients lifetime.

When gallstones manifest acutely they most commonly present as acute cholecystitis with plus or minus choledocholithiasis. These patients tend to be treated conservatively and then undergo an elective cholecystectomy or ERCP after the acute episode has subsided.

The aim of this poster is to illustrate a selection of cases that we have encountered in clinical practice that have presented both acutely and chronically as complications secondary to gallstones. These conditions have needed to be recognised by the radiologist to allow efficient management of the patient to occur. The patients often present very unwell and the serious nature of gallstones is often underestimated.
Findings and procedure details

1. **Emphysematous Cholecystitis**

**Presentation:**

Patient on haemodialysis presented with abdominal pain and sepsis. Ultrasound revealed a gas and fluid containing structure in the sub-hepatic space originally thought to be a hepatic abscess.

**Pathophysiology:**

In cases attributable to gallstones; inflammation and oedema of the gallbladder causes occlusion of the venous and lymphatic return from the gallbladder. As the oedema increases the arterial supply to the gallbladder is compromised, most commonly via the cystic artery. This leads to ischaemia and gangrene followed by infection by gas forming organisms[1] on page [ii] on page  .

**Imaging Findings:**

Ultrasound - Gas and fluid containing structure in the sub-hepatic space thought to be a hepatic abscess (Fig. 1)

CT - Confirmed intra-luminal gallstones. Gas in the gallbladder lumen and wall, CBD and intra-hepatic bile ducts. The gallbladder wall was thickened with inflammatory change in the peri-cholecystic fat. Additional gas containing hepatic abscess in segment 8 of the liver (Fig 2).

**Management:**

Patients are at high risk of gallbladder perforation and emphysematous cholecystitis if often considered a surgical emergency. Urgent antibiotics, fluids and even emergency cholecystectomy can be warranted. Radiologically percutaneous cholecystostomy can be performed if the patient is septic and too unstable for theatre.

2. **Hepatic Abscess**

**Presentation:**
Patient presented with acute cholecystitis. Inflammatory markers continued to rise and she experienced ongoing fevers 3 days after commencing antibiotics.

Pathophysiology:

Perforation of the gallbladder wall causes infection to track into the adjacent liver parenchyma and form an organised abscess.

Imaging findings:

Appearances consistent with acute cholecystitis, there is discontinuity of the gallbladder wall and a trace of peri-cholecystic fluid in keeping with likely perforation (Fig 3). In the adjacent liver parenchyma there is an ill-defined low attenuation area consistent with a hepatic abscess (Fig 4). In Fig 5 gallstones can be identified within the abscess and within the gallbladder.

Management:

Percutaneous drainage can often be performed radiologically guided to allow treatment of the acute sepsis and subsequent cholecystectomy to be performed after the acute episode.

3. Cholecystoduodenal fistula +/- Gallstone ileus

Presentation:

In our case the patient presented with symptoms of a small bowel obstruction as they had developed an ileus.

Pathophysiology:

Cholelithiasis and recurring cholecystitis secondary to biliary obstruction from a longstanding impacted stone can causes focal gallbadder perforations that can fistulate into the surrounding viscera. When this happens with the duodenum or ileum a gallstone can pass through the fistula and cause subsequent small bowel obstruction. When this occurs in the duodenum it is called Bouveret's syndrome and manifests as a gastric outlet obstruction.

Imaging findings:
Barium meal - Demonstrated the fistula track filling from the duodenum (Fig 6). Pneumobilia is also seen (Fig 7).

CT - Pneumobilia and gas within a collapsed gallbladder that is adjacent to a thickened duodenum (Fig 8). Dilated small bowel with a calcified, intra-luminal abnormality at the point of transition (Fig 9).

Management:

With ileus - urgent surgical review to relieve the acute small bowel obstruction.

Without ileus - diagnosis of a fistula is important as this needs repairing to reduce the risk of a subsequent ileus, the formation of a fistula can also change the surgery to an open procedure rather than laparoscopic.

4. **Pseudo-aneurysm of the hepatic artery**

Presentation:

Several weeks after an episode of acute cholecystitis patient collapsed and had an acute drop in their haemoglobin.

Pathophysiology:

Ongoing inflammation can penetrate the gallbladder wall and cause damage to the adventitia of the surrounding arteries - most commonly the cystic artery however this case involved the right hepatic artery. Vessel wall damage precipitated the formation of a pseudo-aneurysm.

Images:

Ultrasound - ‘Yin and Yang’ sign on colour Doppler signifying turbulent flow within a pulsatile fluid collection (Fig 10)

CT - arterial and venous enhancement of an abnormal structure within the gallbladder lumen. Surrounding inflammatory change and a calcified gallbladder stone (Fig 11).

Management:
Patient had urgent intervention due to risk of bleeding, the aneurysm was coiled by the interventional radiologists.

5. **Porcelain Gallbladder**

**Presentation:**
Asymptomatic - scanned for a separate indication.

**Pathophysiology:**
Chronic low grade inflammation of the gallbladder causes fibrosis of the gallbladder wall with intra-mural calcium deposition. This can be broad bands of calcification in the muscularis or punctate calcification in the mucosa or glandular spaces. Gallstones are present in 90%.[iii]  on page .

**Imaging features:**
Ill-defined diffuse calcification of the gallbladder wall (Fig 12, 13).

**Management:**
Prompt cholecystectomy is often required due to the increased risk of developing gallbladder carcinoma which is estimated to be between 5-12%.[iv]  on page .

6. **Intra-peritoneal abscess secondary to dropped gallstones**

**Presentation:**
Several week history of right upper quadrant pain and sweating episodes. Previous laparoscopic cholecystectomy 8 months previously. Raised inflammatory markers and ongoing fevers prompted an abdominal CT.

**Pathophysiology:**
At laparoscopic cholecystectomy a rare intra-operative complication when dropped gallstones can fall into the peritoneal cavity develop into gallstone abscesses.
Imaging findings:

Sub-hepatic fluid collection containing several calcified gallstones tracking around the liver (IM 14,15). Previous cholecystectomy.

Management:

Percutaneous drainage and antibiotics to treat the septic episode, once drained, the drain track was dilated and a nephroscope inserted to retrieve the gallstones.

Images for this section:

Fig. 1: Echogenic material in the gallbladder wall and intra-hepatic bile ducts with posterior acoustic shadowing in keeping with pneumobilia and intra-mural gas.
**Fig. 2:** Gas within the gallbladder wall in keeping with emphysematous cholecystitis. Gas containing collection in the adjacent liver parenchyma in keeping with an associated liver abscess.
Fig. 3: Focal defect in a thickened gallbladder wall with peri-cholecystic fluid suggesting gallbladder perforation.
Fig. 4: Ill-defined low attenuation abnormality in the right lobe of liver consistent with a hepatic abscess.
Fig. 5: Large, peripherally enhancing thick-walled fluid collection in continuation with the gallbladder and containing several gallstones.
**Fig. 6:** Barium meal demonstrating fistula track arising from the duodenum.
Fig. 7: Pneumobilia demonstrated around and distal to the fistula track.
Fig. 8: Collapsed, gas containing gallbladder in contact with a thickened duodenum.
**Fig. 9:** Calcified intra-luminal gallstone in the small bowel with upstream small bowel dilatation in keeping with an ileus.
**Fig. 10:** 'Yin and Yang' sign in fluid collection consistent with turbulent flow seen within a pseudo-aneurysm.
Fig. 11: Enhancing structure in the gallbladder consistent with a pseudo-aneurysm.
Fig. 12: Diffuse, coarse gallbladder wall calcification.
Fig. 13: More punctate calcification in the gallbladder wall demonstrating a variability in the appearance of porcelain gallbladder.
**Fig. 14:** Peripherally enhancing fluid collection in the sub-hepatic space that tracks around the liver and contains multiple dropped gallstones. Evidence of a cholecystectomy.
Conclusion

Discussion/impact

Although often harmless, gallstones can have serious complications and it is important for the radiologist to be aware of the more unusual complications that need early recognition and diagnosis. The patients are often very unwell at presentation and need urgent intervention/treatment.

Personal information

References


[iii] on page www.emedicine.com