Radiological findings of gallstone ileus

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Learning objectives

To review the radiological findings of gallstone ileus on the several imaging modalities such as radiography, ultrasound, and computed tomography.

To become familiar with the radiological appearance of gallstone ileus.

To increase the level of awareness that achieves a correct diagnosis.

Background

EPIDEMIOLOGY

Gallstone ileus accounts for 1-4% of mechanical bowel obstruction and usually affects elderly patients with important comorbidities. It is more common in women, and the ratio of females to males is 3.5 to 1.

PHYSIOPATHOLOGY

The physiopathology of this rare complication of cholelithiasis is related to the presence of a bilio-enteric fistula. Acute cholecystitis episodes and gallbladder-bowel adhesions are the basis of the formation of a bilio-enteric fistula.

The migration of a gallstone through the Vater papilla followed by the 'in situ' growth can cause bowel obstruction without the intraoperative finding of a bilio-enteric fistula.

The gallstone passes into the small bowel and most frequently impacts on the terminal ileum although other locations are also encountered such as colon and duodenum/stomach (Bouveret's syndrome).

It is commonly agreed that a gallstone must be at least 2.5 cm to cause an intestinal obstruction.
CLINICAL PRESENTATION

Clinical presentation is typically non-specific. Patients often present intermittent symptoms of nausea, vomiting, abdominal distension, pain and sometimes haemetemesis.

TREATMENT AND PROGNOSIS

The gallstone ileus treatment is mainly a surgical procedure which implies the removal of the ectopic gallstone, the repair of the bilio-enteric fistula and a cholecystectomy.

Recurrent gallstone ileus has been reported at a rate of 4.7% and it may be due to the presence of overlooked stones in the bowel or to the migration of other stones.

In spite of the fact that gallstone ileus is a rare condition, mortality ranges between 12% and 27%, often because of misdiagnosis or delayed diagnosis. So it is important to know the main radiological findings in order to make an early and precise preoperative diagnosis.

Findings and procedure details

Between 2010 and 2014, 11 patients (3 men, 8 women; age range, 72-89 years; mean age, 83.7 years) with surgically proven gallstone ileus were identified in our hospital. The location of gallstone impaction was: duodenum (n=2), jejunum (n=4), ileum (n=3) and colon (n=2).

Besides, one of these patients had a recurrent gallstone ileus (case number five). Recurrence was due to the migration of another stone in a patient who have not previously undergone cholecystectomy.

We present our experience and review the radiological findings of this entity.

PLAIN FILM:
Plain abdominal radiography is often the first diagnostic study performed in these patients. The classic findings on abdominal x-rays are: pneumobilia, small bowel obstruction and ectopic gallstones (Figure 1). These three findings are known as Rigler's triad.

ABDOMINAL ULTRASOUND:

Overlying bowel gas may complicate the ultrasound interpretation.

The "double-arch" sign is considered pathognomonic. It consists of two hyperechoic lines: the external line makes reference to the bowel mucous and the internal line corresponds to ectopic gallstone which presents a back acoustic shadow.

Residual gallstones, a bilio-enteric fistula, bowel distension, ectopic gallstone impacted and even pneumobilia can be diagnosed by ultrasound (Figures 2 and 3).

COMPUTED TOMOGRAPHY:

A correct diagnosis of Rigler's triad (pneumobilia, occlusive bowel and ectopic gallstone in the bowel lumen), a bilio-enteric fistula and chronic colecystitis can be accurately carried out by an abdominal CT scan. The bilio-enteric fistula is often visible, even a cholecystocolonic and cholecystogastric fistula can also be shown. Volume-rendered sagittal and coronal CT scans may improve the visualization of the fistula. In this way, visualization of a biliary-enteric or cholecystocolonic fistula was possible in all except one of our patients (Figures 4-8).

Rigler's triad is usually better seen on CT than on plain film. Furthermore, the size of the obstructive gallstone and the transition point between dilated and collapsed bowel is more frequently observed using CT than in previous diagnostic studies.

Possible complications such as strangulation of bowel or an underlying neoplastic process can be detected.

The review of CT images in our series is shown in table 1 (Figure 9).

Images for this section:
Fig. 1: A 78-year-old woman presenting with abdominal pain, vomiting and constipation. Supine and erect plain abdominal radiographies show an ectopic gallstone in the left lower quadrant of the abdomen (red arrow), colonic dilatation (green arrows) with competent ileocecal valve and pneumobilia (blue arrow). A calcified adenopathy is also shown (black arrows).
Fig. 2: A 79-year-old woman who complaints of abdominal pain. Abdominal ultrasound shows air bubbles in the gallbladder area (blue arrows) and an ectopic gallstone located in small bowel (red arrows).
Fig. 3: A 87-year-old woman presenting with vomiting and constipation. Abdominal ultrasound reveals fluid overdistension of the loop above the impacted endoluminal stone (red arrow).
**Fig. 4:** A 89-year-old man presenting with vomiting and abdominal pain. Abdominal TC scan shows pneumobilia (blue arrow) and air in the gallbladder due to a bilio-enteric fistula (white arrows). An inguinal hernia containing small bowel dilatation (green arrow) and a gallstone in jejunum (red arrow) are also shown.
**Fig. 5:** A 89-year-old woman who presents with vomiting and abdominal pain. CT scan shows the classic Rigler’s triad: pneumobilia (blue arrow) with dilatation of the intrahepatic bile ducts, ectopic gallstone in terminal ileum (red arrow), and small bowel dilatation (green arrow). A bilio-enteric fistula is also shown (white arrows).
Fig. 6: CT of same patient in figure 1 shows: pneumobilia (blue arrow), cholecystocolonic fistula (white arrow), ectopic gallstone in sigmoid colon (red arrow), and colonic dilatation (green arrows).
Fig. 7: A 77-year-old woman who presents with abdominal pain. CT scan shows an ectopic stone impacted in the duodenum (Bouveret's syndrome). Note air in the gallbladder from biliary-enteric fistula and gallbladder wall thickening.
**Fig. 8:** A 86-year-old man who complains of abdominal pain and vomiting. The CT shows an ectopic stone impacted in the duodenum (Bouveret's syndrome). Air in the gallbladder is also shown.
Fig. 9: Table 1. CT findings in our series.

<table>
<thead>
<tr>
<th>Patient No.</th>
<th>Age (years)</th>
<th>Sex</th>
<th>Location of ectopic stones</th>
<th>Size of ectopic stones (cm)</th>
<th>Other findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>83</td>
<td>Woman</td>
<td>Jejunum</td>
<td>4.5</td>
<td>Pneumobilia, air in gallbladder, mechanical obstruction, biliary-enteric fistula.</td>
</tr>
<tr>
<td>2</td>
<td>77</td>
<td>Woman</td>
<td>Duodenum</td>
<td>4</td>
<td>Air in gallbladder, biliary-enteric fistula.</td>
</tr>
<tr>
<td>3</td>
<td>86</td>
<td>Man</td>
<td>Duodenum</td>
<td>3</td>
<td>Pneumobilia, air in gallbladder, biliary-enteric fistula.</td>
</tr>
<tr>
<td>4</td>
<td>87</td>
<td>Woman</td>
<td>Ileum</td>
<td>2.5</td>
<td>Pneumobilia, air in gallbladder, mechanical obstruction, biliary-enteric fistula.</td>
</tr>
<tr>
<td>5</td>
<td>72</td>
<td>Man</td>
<td>Ileum</td>
<td>2.5</td>
<td>Pneumobilia, air in gallbladder, mechanical obstruction.</td>
</tr>
<tr>
<td>6</td>
<td>89</td>
<td>Man</td>
<td>Jejunum</td>
<td>3</td>
<td>Pneumobilia, air in gallbladder, mechanical obstruction, biliary-enteric fistula.</td>
</tr>
<tr>
<td>7</td>
<td>78</td>
<td>Woman</td>
<td>Colon</td>
<td>2.8</td>
<td>Pneumobilia, air in gallbladder, mechanical obstruction, cholecystocolonic fistula.</td>
</tr>
<tr>
<td>8</td>
<td>92</td>
<td>Woman</td>
<td>Jejunum</td>
<td>4.5</td>
<td>Air in gallbladder, mechanical obstruction, biliary-enteric fistula.</td>
</tr>
<tr>
<td>9</td>
<td>79</td>
<td>Woman</td>
<td>Jejunum</td>
<td>2</td>
<td>Air in gallbladder, mechanical obstruction, biliary-enteric fistula.</td>
</tr>
<tr>
<td>10</td>
<td>89</td>
<td>Woman</td>
<td>Ileum</td>
<td>3</td>
<td>Pneumobilia, air in gallbladder, mechanical obstruction, biliary-enteric fistula.</td>
</tr>
<tr>
<td>11</td>
<td>89</td>
<td>Woman</td>
<td>Colon</td>
<td>5 and 0.8</td>
<td>Pneumobilia, air in gallbladder, cholecystocolonic fistula.</td>
</tr>
</tbody>
</table>
Conclusion

Although gallstone ileus is a rare condition, it is associated with high mortality. The radiologist should be familiar with the radiological findings and be able to recognize them. In this way, radiologists may have an important role, in first suggesting the diagnosis in order to guide the appropriate treatment.

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References


