Case Reports in Gastroenterology

Case Rep Gastroenterol 2017;11:389–395

DOI: 10.1159/000475749
Published online: June 15, 2017

Case and Review

Gallstone Ileus: An Unlikely Cause of Mechanical Small Bowel Obstruction

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Keywords
Gallstone ileus · Intestinal obstruction · Pneumobilia · Enterolithotomy · Cholecystoduodenal fistula

Abstract
Gallstone ileus is a rare disease that accounts for 1–4% of intestinal obstructions. Almost exclusively a condition in the older female population, it is a difficult diagnosis to make. We report the case of gallstone ileus in a 94-year-old Caucasian female, who presented to the emergency department with acute-onset nausea, coffee-ground emesis, lack of bowel movement, and abdominal distension. On CT scan, the diagnosis of gallstone ileus was made by the presence of a cholecystoduodenal fistula, pneumobilia, and small bowel obstruction. Emergent laparotomy with a one-stage procedure of enterolithotomy and stone removal by milking the bowel distal to the stone were performed. The postoperative course was uneventful until postoperative day 4 when the patient was found tachycardic, lethargic, and unresponsive. We reviewed the literature on the diagnosis and treatment of gallstone ileus.

Introduction

The most common causes of mechanical small bowel obstruction are postoperative adhesions and hernias. Other etiologies of small bowel obstruction include disease intrinsic to

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the wall of the bowel such as tumors or stricture and processes that cause intraluminal obstruction such as intussusception, gallstones, and foreign bodies [1]. A gallstone-induced mechanical obstruction of the small bowel is known as "gallstone ileus." Gallstone ileus is a rare complication of cholelithiasis [2]. It accounts for 1–4% of all cases of mechanical intestinal obstruction, but up to 25% of the cases are comprised of patients over 65 years of age with a female:male ratio of 3.5–6:1 [3–6]. The morbidity and mortality of gallstone ileus remain remarkably high, most likely due to misdiagnosis and delayed diagnosis [7]. Early diagnosis and prompt treatment can reduce the mortality rate. Here we report a case of gallstone ileus and review the literature of this rare disease.

Case Presentation

A 94-year-old woman presented to the emergency department with acute onset of nausea, 5 episodes of coffee-ground emesis, lack of bowel movement, and abdominal distension. During the interview in the emergency department, she had 3 more episodes of coffee-ground emesis. The patient had a past medical history of atrial fibrillation, coronary artery disease, congestive heart failure, hypertension, and COPD. Her past surgical history included an appendectomy, hysterectomy, tonsillectomy, and bilateral total knee replacements. The patient had dementia; therefore, all her history was obtained from her son and her medical records. Her son reported no alcohol or NSAID use. Laboratory values were remarkable for Na 132, K 4.1, glucose 162, WBC 16.5, with a left shift, and lactic acid 4.2 (Fig. 1). CT scans showed dilation of the stomach and proximal small bowel to the level of the proximal jejunum with air-fluid levels, communication between a collapsed gallbladder and the second part of the duodenum with associated pneumobilia consistent with cholecystoduodenal fistula, and a large (2.4 cm) calcified stone within the proximal jejunum, findings consistent with gallstone ileus (Fig. 2, Fig. 3). She was referred to surgery for emergent laparotomy. Under general anesthesia, a periumbilical incision was performed. Upon entering the abdomen, the small bowel was visibly dilated proximally. A loop of proximal jejunum was brought into the operative field and ran distally; we were able to very quickly get to the point of the obstruction which clearly showed a gallstone in the lumen of the jejunum that appeared to be at least 2.5 cm to approximately 3 cm in size blocking the lumen of the jejunum. The lumen itself was healthy and viable with no evidence of ischemia. This loop of bowel was brought out of the abdomen, and two stay sutures were placed on either side. Then an enterotomy was made just proximal to the area of obstruction, and the gallstone was milked proximally and removed. The enterotomy was closed in two layers. The bowel was placed back into the abdomen, and a general survey of the abdomen was performed during which no evidence of malignancy was found. The fistula was not repaired. The patient tolerated the procedure well. The final pathology of the specimen was reported as a gallstone: 11.5 g, olive green-black colored, ovoid shaped, finely granular calculus that measured 2.9 × 2.7 × 2.5 cm (Fig. 4). The postoperative course was uneventful until postoperative day 4 when the patient was found tachycardic and unresponsive. Leukocytosis and subsequent chest X-ray revealed new right base infiltrate due to possible aspiration, and she developed AKI with no prior history of CKD. The patient deteriorated rapidly and passed away on postoperative day 6.

Discussion

Gallstone disease is common, with a prevalence of 10% in the adult population in the USA [8]. Common complications of gallstone disease include acute cholecystitis, acute pancreatitis, choledocholithiasis with or without ascending cholangitis, and a gangrenous gallbladder. All these complications are heralded by notable clinical signs that allow clinicians to make prompt diagnoses and treatment plans. Other uncommon complications that are not so easy to diagnose include Mirizzi syndrome, cholecystocholedochal fistula, and gallstone ileus [2]. It is important to note, however, in a surgical series which included 5,673 cholecystectomies that 327 patients (5.7%) had Mirizzi syndrome and 105 of these patients had a cholecystoenteric fistula. Of the patients who had a cholecystoenteric fistula, 90% had Mirizzi syndrome. Thus, the presence of a cholecystoenteric fistula should also include Mirizzi syndrome in the differential diagnosis.

In 1654, Bartholin first named gallstone ileus and defined it as a mechanical obstruction due to impaction of one or more large gallstones within the gastrointestinal (GI) tract. A gallstone can enter the GI tract through a fistula between an inflamed, most commonly gangrenous gallbladder and the GI tract. Pressure necrosis by the gallstone against the biliary wall then causes erosion and fistula formation. Reisner and Cohen [5] reviewed 1,001 cases of gallstone ileus and reported that the most common locations of gallstone impaction are the terminal ileum and the ileocecal valve because of the anatomical small diameter and less active peristalsis. Other rare locations of impaction include the jejunum, the ligament of Treitz, stomach, and far less commonly the duodenum and colon [5].

Clinical features of gallstone ileus are variable but can classically present in an older woman with episodic subacute obstruction known as "tumbling obstruction." This is a result of the stone quite literally tumbling through the bowel lumen with transient gallstone impaction causing diffuse abdominal pain and vomiting. The symptoms resolve only to recur as the stone lodges in a more distal bowel lumen, classically the terminal ileum or ileocecal valve. As a result, clinicians can receive a vague picture of symptoms that have been present for days prior to evaluation. On physical examination, the patient may be febrile and appear dehydrated. Common abdominal signs include abdominal distension and hyperactive bowel sounds [4]. The biochemical abnormalities are also nonspecific but can include leukocytosis, electrolyte imbalance due to dehydration, and elevated aminotransferase levels [4].

The diagnosis of gallstone ileus is challenging, and in suspected patients abdominal imaging is usually needed to confirm the diagnosis. Rigler's triad, described by Leo George Rigler in 1941, is a combination of radiological findings specific for bowel obstruction by gallstones [9]. It includes mechanical obstruction, pneumobilia, and an ectopic gallstone within the bowel lumen [9]. Our patient had all three Rigler's findings in the CT examination. Plain abdominal films are usually nonspecific because significant calcification of the stone is necessary in order for it to be visualized radiographically. Abdominal US is useful to confirm the presence of cholelithiasis and may identify a fistula if present [10]. Abdominal CT is the best modality in diagnosing gallstone ileus because of its better resolution, and a study by Yu et al. [11] concluded that CT also offers information for a decision-making strategy and subsequent surgical planning. Lassandro et al. [12] compared the clinical value of plain abdominal film, abdominal US, and abdominal CT in diagnosing 27 cases of gallstone ileus and found that Rigler's triad presents 14.8% in plain abdominal film, 11.11% in abdominal US, and 77.78% in abdominal CT.

Emergency surgery is required once the diagnosis of gallstone ileus has been made. Enterotomy with stone extraction alone remains the most popular operative method [13]. Non-

surgical treatment of gallstone ileus has been suggested, including endoscopic removal and shockwave lithotripsy, but this depends on the location of the obstruction [14]. Furthermore, the prognosis of gallstone ileus is poor and worsens with age. Previous studies reported that the mortality rate is 7.5–15% [5, 6] largely due to delayed diagnosis and concomitant conditions such as cardiorespiratory disease, obesity, and diabetes mellitus. We believe that our patient's comorbid conditions played a major role in her subsequent deterioration postoperatively.

In conclusion, gallstone ileus is a rare cause of intestinal obstruction. It must be considered in intestinal obstructions especially in older female patients with a history of gallstone disease. Abdominal CT is the preferred modality because of its rapid diagnosis and better resolution when compared to plain abdominal films and abdominal US. Surgical treatment is emergent once the diagnosis of gallstone ileus has been made.

Statement of Ethics

Informed consent was received from the patient.

Disclosure Statement

The authors of this case report declare that there are no conflicts of interest.

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Results

Laboratory Results

Lab Results for the past 24 hours

Order	Test	Value	Reference Range	Comments	Status	Collection
URINALYSIS RFLX MICRO AND CULT	COLOR	YELLOW	(YELLOW)		Final Result	11/07/2016 21:52:00
URINALYSIS RFLX MICRO AND CULT	CLARITY	CLEAR	(CLEAR)		Final Result	11/07/2016 21:52:00
URINALYSIS RFLX MICRO AND CULT	PH UR	7.00	(5.00-8.00)		Final Result	11/07/2016 21:52:00
URINALYSIS RFLX MICRO AND CULT	PROT	TRACE	(NEGATIVE)		Final Result	11/07/2016 21:52:00
URINALYSIS RFLX MICRO AND CULT	GLU UR	NEGATIVE	(NEGATIVE)		Final Result	11/07/2016 21:52:00
URINALYSIS RFLX MICRO AND CULT	KET	NEGATIVE	(NEGATIVE mg/dL)		Final Result	11/07/2016 21:52:00
URINALYSIS RFLX MICRO AND CULT	BILI UR	NEGATIVE	(NEGATIVE)		Final Result	11/07/2016 21:52:00
URINALYSIS RFLX MICRO AND CULT	BLOOD UR	NEGATIVE	(NEGATIVE)		Final Result	11/07/2016 21:52:00
URINALYSIS RFLX MICRO AND CULT	UROBILI	0.2	(0.1-1.0 mg/dL)		Final Result	11/07/2016 21:52:00
URINALYSIS RFLX MICRO AND CULT	SG	1.015	(1.000-1.030)		Final Result	11/07/2016 21:52:00
URINALYSIS RFLX MICRO AND CULT	NITRITE	NEGATIVE	(NEGATIVE)		Final Result	11/07/2016 21:52:00
URINALYSIS RFLX MICRO AND CULT	LEUKO	NEGATIVE	(NEGATIVE)		Final Result	11/07/2016 21:52:00
CBC WITH DIFFERENTIAL	WBC	16.5 H	(4.0-10.0 x10-3/uL)		Final Result	11/07/2016 21:41:00
CBC WITH DIFFERENTIAL	RBC	3.79	(3.70-5.30 x10-6/uL)		Final Result	11/07/2016 21:41:00
CBC WITH DIFFERENTIAL	HGB	12.4	(11.0-16.0 g/dL)		Final Result	11/07/2016 21:41:00
CBC WITH DIFFERENTIAL	HCT	36.7	(33-47)		Final Result	11/07/2016 21:41:00
CBC WITH DIFFERENTIAL	MCV	96.8	(80.0-100.0 fL)		Final Result	11/07/2016 21:41:00
CBC WITH DIFFERENTIAL	MCH	32.7 H	(27.0-31.0 pg)		Final Result	11/07/2016 21:41:00
CBC WITH DIFFERENTIAL	MCHC	33.8	(32.0-36.0 g/dL)		Final Result	11/07/2016 21:41:00
CBC WITH DIFFERENTIAL	PLT	275	(130-400 x10-3/uL)		Final Result	11/07/2016 21:41:00
CBC WITH DIFFERENTIAL	RDW	13.8	(12.8-16.4)		Final Result	11/07/2016 21:41:00
CBC WITH DIFFERENTIAL	MPV	10.3	(7.4-10.4 fL)		Final Result	11/07/2016 21:41:00
CBC WITH DIFFERENTIAL	ABS LYMPH	1.0	(1.0-3.5 x10-3/uL)		Final Result	11/07/2016 21:41:00
CBC WITH DIFFERENTIAL	ABS MONO	1.1 H	(0.3-0.9 x10-3/uL)		Final Result	11/07/2016 21:41:00
CBC WITH DIFFERENTIAL	ABS NEUT	14.3 H	(1.4-6.5 x10-3/uL)		Final Result	11/07/2016 21:41:00
CBC WITH DIFFERENTIAL	ABS EOS	0.0	(0.0-0.5 x10-3/uL)		Final Result	11/07/2016 21:41:00
CBC WITH DIFFERENTIAL	ABS BASO	0.1	(0.0-0.2 x10-3/uL)		Final Result	11/07/2016 21:41:00
CBC WITH DIFFERENTIAL	ABS IMMAT GRAN	0	(0.0 x10-3/uL)		Final Result	11/07/2016 21:41:00
CBC WITH DIFFERENTIAL	ABS NRBC	0.0	(0.0-0.0 x10-3/uL)		Final Result	11/07/2016 21:41:00
CBC WITH DIFFERENTIAL	LYMPH	5.8 L	(15.0-49.0)		Final Result	11/07/2016 21:41:00
CBC WITH DIFFERENTIAL	MONO	6.7	(5.0-12.0)		Final Result	11/07/2016 21:41:00
CBC WITH DIFFERENTIAL	NEUT	86.7 H	(37.0-74.0)		Final Result	11/07/2016 21:41:00
CBC WITH DIFFERENTIAL	EOS	0.0	(0.0-8.0)		Final Result	11/07/2016 21:41:00
CBC WITH DIFFERENTIAL	BASO	0.4	(0-2)		Final Result	11/07/2016 21:41:00
CBC WITH DIFFERENTIAL	IMMAT GRAN	0.40 H	(0-0)		Final Result	11/07/2016 21:41:00
CBC WITH DIFFERENTIAL	NRBC	0.0	(0.0-0.0)		Final Result	11/07/2016 21:41:00
COMPREHENSIVE METABOLIC PANEL	NA	132 L	(136-144 mmol/L)		Final Result	11/07/2016 21:41:00
COMPREHENSIVE METABOLIC PANEL	K	4.1	(3.6-5.1 mmol/L)		Final Result	11/07/2016 21:41:00
COMPREHENSIVE METABOLIC PANEL	CL	91 L	(99-108 mmol/L)		Final Result	11/07/2016 21:41:00
COMPREHENSIVE METABOLIC PANEL	CO2	30	(24-31 mmol/L)		Final Result	11/07/2016 21:41:00
COMPREHENSIVE METABOLIC PANEL	ANGAP	11	(5-15 units)		Final Result	11/07/2016 21:41:00
COMPREHENSIVE METABOLIC PANEL	GLU	102 H	(70-110 mg/dL)		Final Result	11/07/2016 21:41:00
COMPREHENSIVE METABOLIC PANEL	BUN	24	(8-27 mg/dL)		Final Result	11/07/2016 21:41:00
COMPREHENSIVE METABOLIC PANEL	CREAT	1.5 H	(0.7-1.4 mg/dL)		Final Result	11/07/2016 21:41:00
COMPREHENSIVE METABOLIC PANEL	GFR	34.37	(> 60 mL/min/1.73m2)	Estimated GFR is calculated from plasma creatinine values using the MDRD equation. These estimates are valid only when kidney function is stable. Other equations, such as Cockcroft-Gault, may give different values. (AM J Kidney DIS 2002;39:524) PLASMA	Final Result	11/07/2016 21:41:00
COMPREHENSIVE METABOLIC PANEL	CA	9.6	(8.4-9.7 mg/dL)		Final Result	11/07/2016 21:41:00
COMPREHENSIVE METABOLIC PANEL	AST	16	(14-48 IU/L)		Final Result	11/07/2016 21:41:00
COMPREHENSIVE METABOLIC PANEL	ALK	70	(41-120 IU/L)		Final Result	11/07/2016 21:41:00
COMPREHENSIVE METABOLIC PANEL	T BIL	0.97	(0.20-1.60 mg/dL)		Final Result	11/07/2016 21:41:00
COMPREHENSIVE METABOLIC PANEL	TP	8.1 H	(6.8-8.0 g/dL)		Final Result	11/07/2016 21:41:00
COMPREHENSIVE METABOLIC PANEL	ALB	3.4 L	(3.5-4.5 g/dL)		Final Result	11/07/2016 21:41:00
COMPREHENSIVE METABOLIC PANEL	GLOBULIN	4.7 H	(2.5-4.5 g/dL)		Final Result	11/07/2016 21:41:00
COMPREHENSIVE METABOLIC PANEL	AG RATIO	0.7 L	(1.0-2.2)		Final Result	11/07/2016 21:41:00
COMPREHENSIVE METABOLIC PANEL	ALT	14	(8-60 IU/L)		Final Result	11/07/2016 21:41:00
LACTIC ACID	LACTIC ACID	4.2 H	(1.4-3.9 mmol/L)		Final Result	11/07/2016 21:41:00
LIPASE	LIPASE	110	(73-393 IU/L)		Final Result	11/07/2016 21:41:00
PARTIAL THROMBOPLASTIN	PTT	31.0	(26.1-34.6 sec)		Final Result	11/07/2016 21:41:00
PROTHROMBIN TIME WITH INR	PT	11.1	(9.4-11.1 sec)		Final Result	11/07/2016 21:41:00
PROTHROMBIN TIME WITH INR	INR	1.0	(0.9-1.1 SU)	INR REFERENCE INTERVALS Patients not on anticoagulant therapy 0.9 to 1.1 Routine anticoagulant therapy 2.0 to 3.0 Recurrent myocardial infarction or mechanical prosthetic 2.5 to 3.5	Final Result	11/07/2016 21:41:00
TROPONIN I	TROP I	< 0.020.02	(0.00-0.10 ng/mL)		Final Result	11/07/2016 21:41:00
ANTIBODY SCREEN	AB SCREEN	Negative	(Negative)		Final Result	11/07/2016 21:17:00
GROUP AND TYPE	ABO RH	A Rh Positive			Final Result	11/07/2016 21:17:00

EMERGENCY

Fig. 1. Laboratory results on initial presentation to the emergency department.

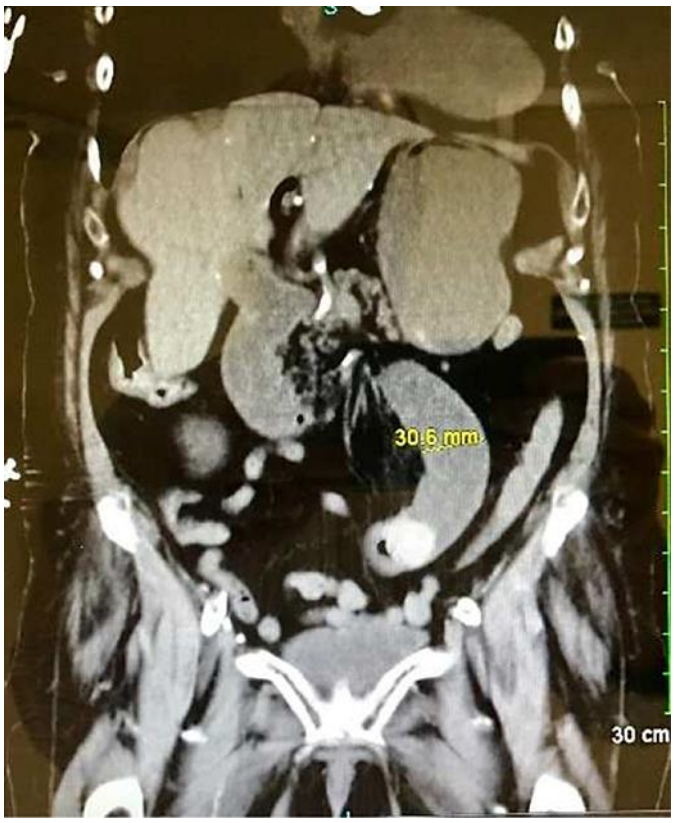

Fig. 2. CT scan showing cholecystoenteric fistula, calcification of the celiac trunk, and calcification of the gastroduodenal artery.

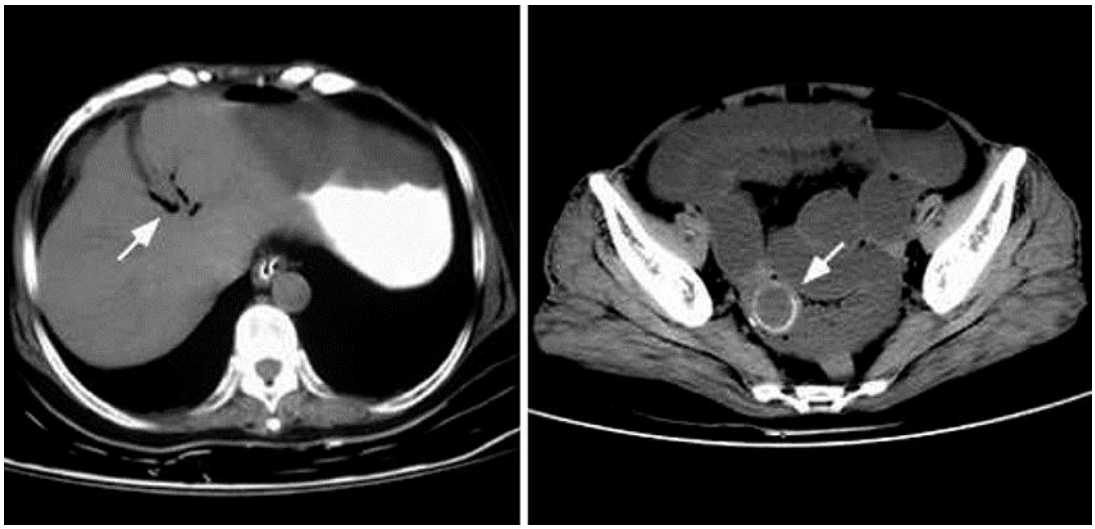

Fig. 3. CT scans showing pneumobilia (arrow in the picture on the left) and calcified gallstone lodged in proximal jejunum (arrow in the picture on the right).

Fig. 4. Gallstone milked from proximal jejunum measuring 2.5 cm in diameter.