Laparoscopic and ultrasound assisted management of gallstone ileus after biliointestinal bypass
Case report and a review of literature

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AIM: To report about an additional case of biliary ileus after bariatric surgery is reported and extensively reviewing the literature on this topic.

MATERIAL OF STUDY: We reviewed the literature and found three cases of gallstone ileus (GI) that occurred after bariatric surgery.

DISCUSSION: A 41 year old patient presented a GI eight years after a biliointestinal bypass (BIB) for morbid obesity. The patient complained of abdominal pain for two weeks. Computed tomography (CT) and abdominal ultrasound (US) allowed a preoperative diagnosis of GI and planning of surgical strategy. Surgical treatment was carried out through laparoscopic-assisted enterolithotomy alone procedure. This choice is supported discussing the related issues: morbidity, potential recurrence, eventual developing of gallbladder carcinoma.

CONCLUSION: It is the first reported case of GI after BIB preoperatively diagnosed through CT scan and US, and treated with a laparoscopic assisted approach. Additional considerations concerning preoperative diagnosis, surgical strategy, technical details and follow-up can be usefully applied even in non post-bariatric biliary ileus.

KEY WORDS: Biliointestinal bypass, Gallstone ileus, Laparoscopy, Ultrasonography

Introduction

Gallstone ileus (GI) is a surgical emergency first described by Dr. Bartholin in 1654. It is a rare and potentially severe complication of gallbladder inflammation followed by the formation of a fistula into the bowel. Large gallbladder stones (>2 cm of diameter) impacted in the bowel represent 4% of non-strangulated small bowel mechanical obstructions and up to 25% in patients over 65, with a female to male ratio of 3.5-6:1. Reported mortality rate is high (15-18%) because patients are usually older with comorbidities and diagnosis is often delayed due to a non-specific clinical presentation. Although, in a more recent study, a 6.6% in-hospital mortality rate was reported. Radiologic diagnosis defined by Rigler's triad (pneumobilia, ectopic gallstone and signs of bowel obstruction like air-fluid levels) is pathognomonic, but quite rare. According to the analysis of Lassandro et al over 27 cases, it occurs only in 14.8% of plain abdominal film, 11.1% of abdominal US, and in 77.8% of CT scans.
The most frequent site of stone impaction is the ileum (60.5%), followed by the jejunum (16.1%), stomach (14.2%), colon (4.1%), duodenum (3.5%) and only in 1.3% cases, the stone spontaneously passes through the bowel.

The gallbladder fistulates mainly in the duodenum (69%), more rarely in the colon (14%) and the stomach (6%) 1.

In morbidly obese patients with a biliointestinal bypass (BIB), an anastomosis between the gallbladder and the jejunum is surgically performed in order to preserve enterohpatic bile circulation and decrease the consequences of malabsorption 4.

Even though BIB was a frequently employed operation for bariatric patients in the last decades 4, the incidence of biliary ileus after this procedure is, nonetheless, quite rare. After an extensive literature review, only two papers, concerning gallstone ileus after bariatric surgery were found and just one was specifically related to BIB 5,6.

Herewith, we report an additional case of gallstone ileus after BIB, with some particular aspects concerning preoperative diagnosis, ultrasound (US) assessment and laparoscopic assisted treatment.

### Case report

A 41 year old female patient was admitted to the emergency room complaining about diffuse colicky abdominal pain lasting for two weeks, with increasing discomfort in the last few days before hospitalization. She had a past medical history of appendectomy and a caesarian section.

Due to morbid obesity (BMI 43 kg/m²), eight years earlier she underwent a laparoscopic BIB with antirefluxvalvular system, followed by an abdominoplasty. Follow-up was discontinued five years after BIB surgery. On admission, the patient's blood tests were unremarkable except for a slight PCR increase (1.51 mg/dl). BMI was 31 kg/m². Upon examination, her abdomen was moderately distended, with a mild tenderness in the right abdominal quadrant. A CT scan revealed distension of the biliary intestinal loop and a 2 cm large stone impacted a few centimeters above the previous jejuno-ileo-anastomosis (Fig. 1). The diagnosis of gallstone ileus was made preoperatively. In order to better plan the urgent operation, an abdominal US was performed which showed a distended gallbladder, with no calculi inside, except for biliary sludge (Fig. 2). CT landmarks helped detect the impacted stone, although its location was too deep for a direct tailored laparotomic approach (Fig 3).

A four port approach (three 3 mm trocars and one 5 mm trocar) with a 5 mm scope was used. The operation started by an exploratory laparoscopy, with an open access and the placement of the first trocar in the left flank. The impacted stone was easily recognized and located in correspondence of a dilated jejunal loop (Fig. 4). A laparoscopic enterotomy was initially performed, but a consistent volume of clear fluid and biliary sludge poured out, notwithstanding gentle clamping of the dilated loop. In order to avoid peritoneal contamination, a tailored laparotomy was preferred. A 5 cm mini-laparotomy, in correspondence of the impacted stone, allowed loop extraction and enterolithotomy. The stone was removed (Fig. 5) and the enterotomy closed transversely with an absorbable barbed continuous suture (Filbloc®, Assut Europe). The procedure lasted 75 minutes. Patient's recovery was uneventful with a hospital stay of six days.

### Discussion and Comments

Gallstone ileus is a rare complication of cholelithiasis and even rarer in patients under 65. Obesity, rapid weight loss and malabsorptive surgery are well known predisposing factors for gallstone formation 7.

Many studies have been reporting data on cholelithiasis after bariatric surgery, although, due to a lack of prospective controlled data, there is no standard consensus yet, on the prevention and treatment of gallstone formation in these patients 8-10. Some studies show a 36% gallstone formation within 6 months after bariatric

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**Fig. 1:** CT findings. A) Coronal view of the bilio-enteric mechanical anastomosis (arrow) B) Axial, and C) Coronal view of the impacted stone (arrows).
surgery\textsuperscript{11,12}, while in a more recent article, a 28.9\% is reported\textsuperscript{9}.

Cholecystectomy occurs most frequently in the first six months after bariatric surgery, subsequently, it declines to < 1\% per year after 3 years\textsuperscript{13}.

Only one report including two cases of GI after BIB was found in literature, out of a total of 3 cases of GI after bariatric surgery. Even considering the bias of unpublished cases, the incidence of GI after bariatric surgery is quite low. In the two cases after BIB found in literature, GI occurred respectively 10 and 12 years after bariatric surgery.

Biliointestinal bypass, due to the bilio-enteric anastomosis, could theoretically predispose to this complication, but our case is only the third one reported in literature.

In a large review of a long-lasting nationwide experience with BIB, a 3.8\% incidence of gallstones was reported. In 2/3 of these patients, cholelithiasis was associated with a stricture of the bilio-digestive anastomosis and treated by stone removal and enlargement of the anastomosis\textsuperscript{4}.

In our patient, the impacted stone was located in the excluded loop, proximally to the anti-reflux valvular system, in a similar position where it was found in the other two patients\textsuperscript{5}. This valvular system is surgically created in order to avoid reflux in the excluded loop\textsuperscript{4}.

Although in a more recent study, the same group showed that there was no significant difference in the clinical and metabolic results between patients with or without the anti-reflux system, it was decided not to perform it anymore\textsuperscript{5}.
In general, GI is rarely diagnosed preoperatively because of a non-specific bowel obstruction clinical presentation. The average rate of GI preoperative diagnosis is around 50% \(^1\). Both previously reported cases of GI after BIB were not diagnosed preoperatively \(^5\). In the first patient, a plain abdominal film showed air-fluid levels and an abdominal US detected cholelithiasis. No further imaging was done before surgery. In the second patient, no significant alterations were seen on plain abdominal film, while CT only showed a slight jejunal loop distension and no air-fluid levels. The migrated stone was not detected by CT. Rigler's radiologic triad is even less likely to be present in patients who underwent BIB, because there is no direct communication between an alimentary small bowel segment (containing swallowed air) and the gallbladder: the air theoretically, should pass through the jejuno-ileal anastomosis and cross the impacted stone before reaching the biliary system. Also, the small bowel obstruction radiological signs, when present, are confined to the biliary loop. Both patients were admitted to emergency surgery without a specific bowel obstruction diagnosis whose etiology was discovered intraoperatively.

Our patient's preoperative work-up included a CT scan that allowed a prompt preoperative diagnosis. Nowadays, CT scan is considered the most sensitive exam in the suspicion of bowel obstruction or, in general, when facing an acute abdomen of unclear etiology \(^{14,15}\) and its sensitivity is around 97% in detecting stone impaction in GI \(^{16}\).

In our case, a CT scan allowed the impacted stone detection and the recognition of its location in the biliary loop. An accurate revision of all axial, sagittal and coronal views, by both the radiologist and the surgeon, can play a role in increasing CT accuracy. Concerning instrumental diagnosis, US is considered more helpful than plain abdominal film in diagnosing GI \(^{17-19}\). Compared to CT scans, US assessment has also shown a higher sensitivity to gallbladder stone detection \(^{14}\). For these reasons we performed US before surgery.

Furthermore, US represented an extra tool in treatment planning, allowing a thorough preoperative strategy concerning the precise anatomic location of the stone, the ruling out of residual stones along the obstructed loop as well as in the gallbladder, the evaluation of the gallbladder wall thickness, the assessment of the depth of the stone in the abdominal cavity, and the planning of a rationale laparoscopic approach. Surgically performed, US was helpful by implementing the accuracy of preoperative planning.

Currently, there is no unanimous consensus regarding GI treatment and debate continues regarding the choice of optimal surgical procedures \(^{20-22}\). One stage procedure includes enterolithotomy, cholecystectomy and repair of the fistula in one surgical intervention. A two stage procedure includes enterolithotomy alone during the first operation, followed by cholecysto-enteric fistula repair with cholecystectomy after 4-6 weeks. Enterolithotomy alone, instead, is the most common operative management, especially in the emergency setting, because it is a fast procedure that allows a quick decompression of the obstructed bowel, with a low incidence of complications.

The first two procedures are mainly advocated because fistula repair should reduce the risk of GI recurrence and gallbladder carcinoma. In fact, when the biloenteric fistula, usually cholecysto-duodenal, is not removed, it is considered a risk factor for GI recurrence even though, spontaneous closure of the fistula occurs in at least, 50% of cases \(^{23}\). Also, the overall GI recurrence rate after surgical treatment leaving the fistula in place results in less than 5% \(^{20,23}\), and some of these cases could be related to stones already migrated in the bowel, but not recognized intraoperatively \(^{15}\). Moreover, as reported in a study that compares patients who underwent cholecystectomy and patients who underwent an enterolithotomy alone procedure, cholecystectomy showed to increase minor complications, the duration of operations, hospitalization, even though the overall morbidity rate did not register any significant difference \(^{24}\).

In general, due to lacking standard surgical approach guidelines, some authors suggest a one-step procedure in patients with low comorbidities and globally stable clinical conditions \(^{22}\), which is rarely the case of patients complaining of bowel obstruction. In our case, the choice of performing enterolithotomy alone is additionally justified by the fact that performing a cholecystectomy in a previous BIB determines the conversion to a jejunoileal bypass (JIB) and loss of enterohepatic circle, causing an increased risk of metabolic, liver and kidney complications, as well as bacterial overgrowth in the excluded loop, obliging the patient to resume nutritional and clinical follow-up.

Also, in our preoperative assessment, the absence of residual stones was clearly demonstrated by US, minimizing the risk of future recurrence \(^{23}\) and justifying the non-removal of the gallbladder.

Concerning gallbladder carcinoma, cholelithiasis is the main recognized risk factor, even though the rarity of this event does not justify a routine cholecystectomy neither in asymptomatic cholelithiasis nor in GI \(^{25}\). Although, in some case reports, it is described that during surgical treatment for GI, a diagnosis of gallbladder carcinoma was concomitantly made \(^{23,26}\). In our case, the preoperative US assessment of the gallbladder wall ruled out any pathologic thickness. Moreover, the fact that a bilo-enteric anastomosis was already established, excluded the pathogenetic mechanism of gallstone decubitus and subsequent chronic inflammation of the gallbladder wall which could potentially engender a neoplasm.

Surgical treatment of our patient was successfully carried out through laparoscopy. Even though a laparotomic approach is widely performed due to the emergency clinical presentation, the adoption of a laparoscopic approach...
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has been increasing over time. The first case of laparoscopic approach for surgical treatment of GI reported in literature goes back to 1994. Since then, many other experiences of successfully carried out, totally laparoscopic or laparoscopic assisted procedures for GI, are reported in literature.

In an article comparing laparoscopic-assisted versus open surgery for GI treatment, is shown that the main advantages of laparoscopy are attributed to its diagnostic purposes and minor complications compared to major complications occur after laparotomy.

Laparoscopic management of GI is considered feasible and safe and offers advantages such as reducing the risk of wound infections, major complications, incisional hernias and shorter hospital stays.

Conclusions

Gallstone ileus is a rare surgical emergency, its treatment is determined by the patient's global conditions because of the lack of standard treatment guidelines.

To our knowledge, this is the first GI reported in literature occurring in a young patient with a BIB and diagnosed preoperatively through a CT scan and a US assessment.

The patient was treated through a laparoscopic-assisted tailored minilaparotomy through which an enterolithotomy alone procedure was performed. Cholecystectomy was not considered a necessary option in order to avoid the conversion of the BIB to JIB. A laparoscopic-assisted approach was feasible and safe and the patient's recovery was uneventful.

References


