

# Gallstone Ileus and Meckel's Diverticulum in a Virgin Abdomen

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<b>Background</b>	Gallstone ileus is an uncommon disease that causes mechanical small bowel obstruction. It often occurs due to fistula formation between the biliary and gastrointestinal tracts, leading to gallstones becoming lodged in the terminal ileum. Management options include simple enterolithotomy, one-stage (enterolithotomy, cholecystectomy, and fistula repair), two-stage (enterolithotomy with delayed cholecystectomy and fistula repair one to six months later). Meckel's diverticulum (MD) is a congenital abnormality caused by failed obliteration of the omphalomesenteric duct and is frequently asymptomatic in adults.
<b>Summary</b>	We report a rare finding of gallstone ileus and concomitant incidental MD in a 69-year-old woman with abdominal pain, emesis, and obstipation. The patient was surgically treated with a one-stage procedure, including laparoscopic-converted-to-open small bowel resection, fenestrated subtotal cholecystectomy, and fistula repair. Following a relatively uneventful hospital course, the patient was discharged in stable condition. We searched previously reported cases of gallstone ileus and MD to determine the various approaches to management for this condition. A literature review was conducted to discuss the evidence behind prophylactic removal of incidental MD, simple enterolithotomy versus one-stage procedure for gallstone ileus, and subtotal cholecystectomy for difficult gallbladders.
<b>Conclusion</b>	There are currently four English reported cases of gallstone ileus and incidental MD, all of which underwent simple enterolithotomy and removal of the MD. Removal of incidentally discovered MD remains controversial, but in the setting of gallstone ileus, it is advantageous as removing the gallstone and MD can be combined into a single step. Current literature shows that simple enterolithotomy is the treatment of choice for gallstone ileus. However, one-stage procedures can be considered in healthy patients to decrease the risk of recurrence. Finally, subtotal cholecystectomy is a useful technique for gallbladders with unclear anatomy and can reduce the increased morbidity associated with one-stage procedures.
<b>Keywords</b>	Gallstone; ileus; Meckel's diverticulum; fenestrated cholecystectomy; subtotal cholecystectomy

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The authors have no conflicts of interest to disclose.

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## Case Description

A 69-year-old female with no significant medical history presented with three days of episodic abdominal pain after oral intake, emesis, and obstipation. The patient denied any history of prior gallbladder disease, abdominal surgeries, or medication use. On physical exam, there was generalized tenderness to palpation, worst in her epigastrium. An abdominopelvic CT (Figure 1) demonstrated dilated small bowel loops with a well-defined, calcified lesion in the distal ileum. The common bile duct was dilated to 9 mm, and a cholecystoduodenal or choledochoduodenal fistula was suspected.



**Figure 1.** Computed tomography of abdomen pelvis with contrast. A) Axial section demonstrating gallstone (arrow) in distal ileum; B) Coronal section demonstrating calcification and gallstone with transition point at distal ileum.

The patient was then taken to the operating room after appropriate nasogastric decompression and fluid resuscitation for a planned laparoscopic enterolithotomy and cholecystectomy pending intraoperative physiology. Upon laparoscopic entry into the abdomen, dilated bowels with bilious ascitic fluid were visualized, and the procedure was converted to an open exploratory laparotomy for better visualization. The small bowel was inspected from the ligament of Treitz to the ileocecal valve, and viable bowel was seen throughout. A Meckel's diverticulum was encountered in the distal ileum and was dilated due to the distal obstruction. A large gallstone was appreciated in the terminal ileum as the cause of the obstruction. The gallstone was milked back to the Meckel's, and a small bowel resection was performed with the gallstone and MD en bloc.

We next addressed the gallbladder and duodenal fistula. The gallbladder was shriveled and contracted. It was difficult to safely identify structures within Calot's triangle, so a fenestrated subtotal cholecystectomy was performed.

The dome of the gallbladder was opened, and no gallstones were seen. The cholecystoduodenal fistula was identified and closed in layers. Drains were placed, and the procedure was completed without complication. The patient was discharged without drains once tolerating a regular diet. The patient was doing well and symptom-free at follow-up.

Pathological analysis revealed an MD within a 5.1 cm segment of the ileum. The black, granular, ovoid gallstone measured 3.4 cm x 2.5 cm x 2.3 cm (Figure 2).



**Figure 2.** Gross specimen of Meckel's diverticulum with accompanying gallstone. A,B) Meckel's diverticulum found intraoperatively; C) Resected Meckel's diverticulum measuring 5.1 cm in length with gallstone; D) Gallstone specimen found measuring 3.4 cm x 2.5 cm x 2.3 cm.

## Discussion

This is a reported case of gallstone ileus with an incidental Meckel's diverticulum (MD) managed by an open small bowel resection and fenestrated cholecystectomy. MD is a congenital anomaly caused by a persistent omphalomesenteric duct.<sup>1</sup> Such cases are often asymptomatic and are found in 2 percent of the general population.<sup>2</sup> MD can cause complications, and patients often carry a 4.2 to 6.4 percent lifetime risk of developing bleeding, infection, or obstruction.<sup>3,4</sup> Gallstone ileus is a rare cause of small bowel obstruction in the general population but is more common in elderly patients.<sup>5,6</sup> Gallstone ileus in the presence of an MD is exceedingly rare, and there are currently only four English-reported cases of concurrent MD and gallstone ileus, three of which showed impaction at the MD site (Table 1).<sup>7-10</sup>

Reference	Patient	Comorbidities	Presentation	Procedure
Lamba et al (2016) [7]	64F	Morbid obesity, diabetes, hypertension, atrial fibrillation	SBO secondary to three gallstones, two of which were impacted at a MD	Enterolithotomy alone – laparoscopic converted to open. MD resected.
Tan et al (2016) [8]	81F	Total abdominal hysterectomy, dementia, previous stroke	SBO secondary to single gallstone, incidental MD found during surgery	Enterolithotomy alone – stone milked to MD. MD resected.
Macleane et al (2013) [9]	82M	None specified	Impacted gallstone in MD causing perforation and localized peritonitis	Enterolithotomy alone – laparoscopic. MD resected.
Nakamoto et al (1998) [10]	75M	None specified	SBO secondary to impacted gallstone at MD	Enterolithotomy alone – MD resected.

**Table 1.** Previous cases of gallstone ileus with Meckel's diverticulum. (SBO = small bowel obstruction; MD = Meckel's diverticulum)

Patients often present with gallstone ileus at an advanced age and have multiple comorbidities that increase morbidity and mortality.<sup>11</sup> We present a unique case of a patient with gallstone ileus and incidental MD, despite no medical comorbidities. Furthermore, this is the first reported case describing the use of a subtotal cholecystectomy to complete a one-stage procedure in gallstone ileus.

The management of incidentally discovered MD remains controversial. Some studies argue that only symptomatic MD should be resected as the risk of producing surgical morbidity in symptomatic patients is significantly lower than treating all patients (0.04 percent to 4.6 percent).<sup>12,13</sup> However, others argue that all incidentally discovered MD should be removed as they progress to complications requiring surgical intervention 6.4 percent of the time while morbidity from prophylactic removal is only 2 percent.<sup>14</sup> In our review of all previously reported gallstone ileus and incidental MD cases, all MD were removed (Table 1).

In these cases, we believe removal is advantageous because patients already require an enterolithotomy necessitating the opening of the small bowel. Removing the MD and gallstone can be combined into a single procedure by milking the gallstone to the MD, which can then be resected. This procedure is also the method described by Tan et al.<sup>8</sup>

There are three options for management of gallstone ileus: one-stage (enterolithotomy, cholecystectomy, and fistula repair), two-stage (enterolithotomy with delayed cholecystectomy and fistula repair one to six months later)<sup>15–17</sup> and enterolithotomy alone. Proponents of the one-stage approach cite reduced risk of gallstone ileus recurrence and gallbladder carcinoma as major reasons for concurrent cholecystectomy and fistula repair.<sup>18–21</sup> There is an 8.2 percent risk of recurrence associated with 12 to 20 percent mortality when the fistula is not repaired.<sup>22</sup>

However, simple enterolithotomy has significantly lower mortality than one-stage procedures (11.7 percent to 16.9 percent). Some studies have found the risk of recurrence to be similar among all treatment modalities.<sup>11,16,23</sup> Despite these findings, a one-stage approach is still worth considering in healthy, hemodynamically stable patients to reduce visits to the OR.<sup>24–28</sup> Our patient was a healthy 69-year-old woman who tolerated the bowel resection well, so the decision was made to address the gallbladder and duodenal fistula simultaneously in a one-stage procedure.

Finally, we propose that subtotal cholecystectomy is an effective method to mitigate some of the risks of one-stage procedures, particularly in patients with unclear anatomy. Subtotal cholecystectomy is a technique that involves excision or ablation of the gallbladder while leaving the most inferior portion intact, thereby avoiding the need for dissection or ligation of structures in Calot's triangle. It has been increasingly used in patients with "difficult gallbladders" to avoid bile duct injuries.<sup>29–33</sup> Compared to total cholecystectomies, subtotal cholecystectomies are associated with significantly fewer common bile duct injuries (0 percent to 3.3 percent) and fewer severe complications (0 percent to 7.9 percent) in complicated cholecystitis.<sup>34,35</sup> In low-risk patients with gallstone ileus, this reduced complication rate is beneficial when deciding to undergo a one-stage procedure. There are already reports of subtotal cholecystectomies being utilized with success in one-stage operations for other types of gallbladder disease.<sup>36–38</sup> In the future, it would be worthwhile to determine if the use of subtotal cholecystectomy in one-stage procedures could decrease morbidity and mortality to levels seen in simple enterolithotomy while retaining the advantages of decreased gallstone recurrence and need for re-operation.

## Conclusion

Gallstone ileus is rare, especially in patients with no previous abdominal surgeries or medical comorbidities. Incidental MDs may be discovered during surgery, and management is controversial. In the setting of gallstone ileus, we recommend resection of incidental MD rather than simple enterolithotomy when feasible. Based on the literature, simple enterolithotomy is the current treatment of choice for gallstone ileus; however, a one-stage procedure can be considered for healthy, low-risk patients. Lastly, we describe the use of subtotal cholecystectomy in this case and propose that it can achieve similar outcomes and reduce complications associated with one-stage operations.

## Lessons Learned

Although rare, gallstone ileus and Meckel's diverticulum can be found, and it is important to have clearer guidelines on how to approach the management of MD and subsequent cholecystectomy. If the case is uncomplicated, a cholecystectomy with small bowel resection instead of an enterolithotomy alone can be considered.

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