

CASE REPORT

Subtotal cholecystectomy with omental pedicle plug for the challenging gallbladder: A case report and review of the literature

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Funding information

National Heart and Lung Institute, Grant/Award Number: T32 HL 007936

Key Clinical Message

If patient anatomy or disease does not allow for a traditional or partial cholecystectomy, an omental pedicle plug may be a viable option to limit the risk of postoperative uncontrolled bile leak from the cystic duct and to control patient symptoms.

KEYWORDS

common bile duct injury, critical view of safety, omentum, subtotal cholecystectomy

1 | INTRODUCTION

The gold standard for management of acute cholecystitis is surgical removal of the gallbladder, provided the patient is a good operative candidate. The incidence of common bile duct (CBD) injury during cholecystectomy ranges from 0.2% to 0.3%, which increases the risk of mortality.¹⁻³ This devastating complication has prompted guidelines from the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) regarding the critical view of safety (CVoS) to reduce the incidence of CBD injuries.^{4,5} When unable to achieve the CVoS, the surgeon may turn to a subtotal cholecystectomy.⁶ These procedures are effective at controlling sepsis but increase the

risk of bile leak and the need for secondary procedures.⁷ Surgical options beyond subtotal cholecystectomy are limited when conditions prevent a true fenestrated or reconstituting cholecystectomy. In patients who are poor operative candidates presenting with acute cholecystitis, a cholecystostomy tube may be used to control sepsis and temporize symptoms until definitive surgical treatment.⁸ Cholecystostomy tubes may become dislodged or clogged in upwards of 10% of cases.⁹ When the cholecystostomy tube does not function well, continued inflammation may persist, complicating the eventual cholecystectomy. In this case report, we present a subtotal cholecystectomy with an omental pedicle plug for the management of the difficult gallbladder.

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2 | CASE REPORT

2.1 | Preoperative course

The patient is a 74-year-old male with a history significant for coronary artery disease, pulmonary hypertension, heart failure with preserved ejection fraction, and atrial fibrillation on warfarin. While undergoing outpatient workup for dyspnea on exertion and atypical chest pain, he developed acute-onset, progressive abdominal pain. He presented to the emergency department with tenderness to palpation in the right upper quadrant and a positive Murphy's sign. Laboratory results were remarkable for a leukocytosis of $10.7 \times 10^3/\mu\text{L}$ and total bilirubin of 1.6 mg/dL. Ultrasound and CT imaging demonstrated a dilated, edematous, and thickened gallbladder containing numerous calcified stones without abnormality of the common bile or intrahepatic bile ducts. He was admitted for acute cholecystitis and started on ceftriaxone and metronidazole. Given his cardiovascular history, cardiology was consulted, and he underwent cardiac catheterization, so operative management was deferred until after cardiac intervention. He was treated with a cholecystostomy tube placed by interventional radiology; however, his post procedure course was complicated by recurrent clogging of the catheter, requiring five additional interventions for up-sizing and repositioning (Figure 1). During this time, he had intermittent leukocytosis ranging from 9.5 to $12.8 \times 10^3/\mu\text{L}$ with normal bilirubin and liver function tests.

2.2 | Operative description

Two and a half months after initial presentation, following stabilization of his cardiac comorbidities, he was taken to the operating room for a scheduled laparoscopic cholecystectomy. Initial intraoperative survey revealed dense adhesions around the cholecystostomy tube, which were

taken down, and the tract surrounding the cholecystostomy tube was mobilized. During this adhesiolysis, purulent fluid and small stones were noted to be draining through a gap between the cholecystostomy tube and the gallbladder wall. Attention was then turned toward careful dissection of dense adhesive tissue to the gallbladder, during which there was found to be a perforation of the gallbladder contained by omentum and plastering of the transverse colon along anterior surface of the gallbladder. The team decided it would not be safe to proceed laparoscopically given the lack of a plane posteriorly between the liver and the gallbladder and anteriorly between the transverse colon and the anterior surface of the gallbladder; the procedure was converted to open with a subcostal incision in the right upper quadrant.

Despite converting to an open procedure, it was not possible to safely remove the anterior surface of the gallbladder from the transverse colon without injury to the colon using a dome-down technique or safely clip the cystic duct without injury to the colon and common bile duct in standard approach starting near the cystohepatic triangle. Given this risk, the decision was made to convert to a partial cholecystectomy. The gallbladder fundus was opened to evacuate stones and purulent fluid. Approximately 20% of the gallbladder dome and fundus was removed, which was the maximum amount possible without undue risk of injuring the bowel. This was followed by extensive cauterization of the mucosa and placement of Surgicel snow within the gallbladder to assist with hemostasis.

At this stage of the procedure, a fenestrating or reconstructing cholecystectomy was considered. A reconstituting subtotal cholecystectomy was not favored as there was a large volume of remnant gallbladder and the patient would have been at high risk for recurrent disease. Similarly, a fenestrating subtotal cholecystectomy was not a viable option as there was not a plane to remove the anterior surface of the gallbladder to access the os of the cystic duct, and the risk of injury to the transverse colon or duodenum was not insignificant. Therefore, the remaining 80% of the gallbladder was not closed due to the

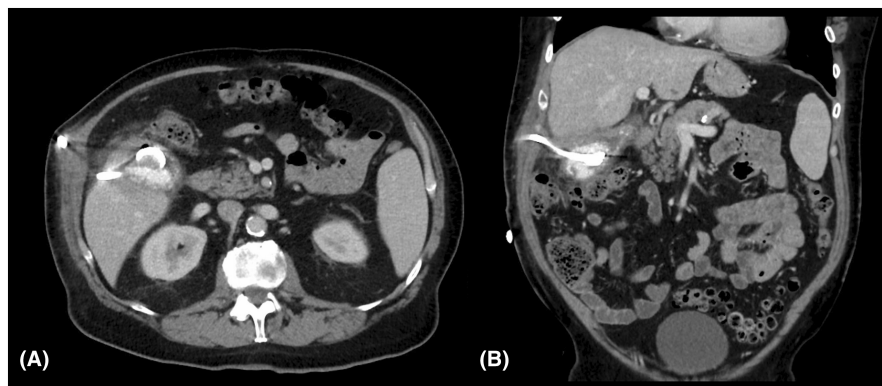


FIGURE 1 Preoperative CT imaging demonstrating the presence of several small, calcified stones with the gallbladder lumen and evidence of ongoing inflammation despite cholecystostomy tube placement and optimization. (A) Axial. (B) Coronal.

large volume of remaining gallbladder nor was a purse string suture placed intraluminally around the cystic duct given poor visualization. To mitigate the risk of postoperative bile leak, a pedicle of omentum was mobilized using electrocautery to create a finger-like projection that could reach within the gallbladder lumen without tension. It was packed within the gallbladder lumen to facilitate scarring and occlusion of the cystic duct. A drain was left in the right upper quadrant around the dome of the gallbladder where the omentum was inserted, and the incisions were closed in the standard fashion.

2.3 | Outcome and follow-up

Bowel function returned on postoperative day 4, and drain output remained serosanguinous through discharge on postoperative day 5. On postoperative day 20, during his follow-up, concern for bilious drain output prompted sampling of the drain fluid as well as cross-sectional imaging; drain bilirubin of 0.6 mg/dL and unremarkable CT (Figure 2). On postoperative day 35, the drain was removed as he had minimal drain output, was asymptomatic, and had a benign physical exam. Approximately 15 months after partial cholecystectomy, he developed choledocholithiasis secondary to intrinsic common bile duct stones,

requiring ERCP and sphincterotomy. Across the CTs performed in the 26 months following partial cholecystectomy, his gallbladder has remained decompressed, without findings concerning for reconstitution (Figure 3).

3 | DISCUSSION

Laparoscopic cholecystectomy requires achievement of the CVoS to mitigate the risk of CBD injury, as recommended by SAGES.⁴ In cases where achieving the CVoS is not possible, current recommendations are to perform a subtotal cholecystectomy by reconstituting or fenestrating cholecystectomy.^{6,7,10} These methods are more commonly used in acute cholecystitis when inflammation obscures the dissection planes and completing the cholecystectomy is unsafe. When it is unsafe to perform a subtotal cholecystectomy, surgical options are limited.

In the case presented, the cholecystostomy tube failed to control the local inflammation surrounding the gallbladder despite repeated attempts at upsizing or repositioning. The resulting dense adhesions and continued inflammation at the time of cholecystectomy prevented safe dissection of the critical structures despite converting to an open procedure; the decision was made to instead perform a partial cholecystectomy. Performing a

FIGURE 2 CT imaging on postoperative day 20 demonstrating a collapsed gallbladder lumen (arrows). (A) Axial. (B) Coronal.

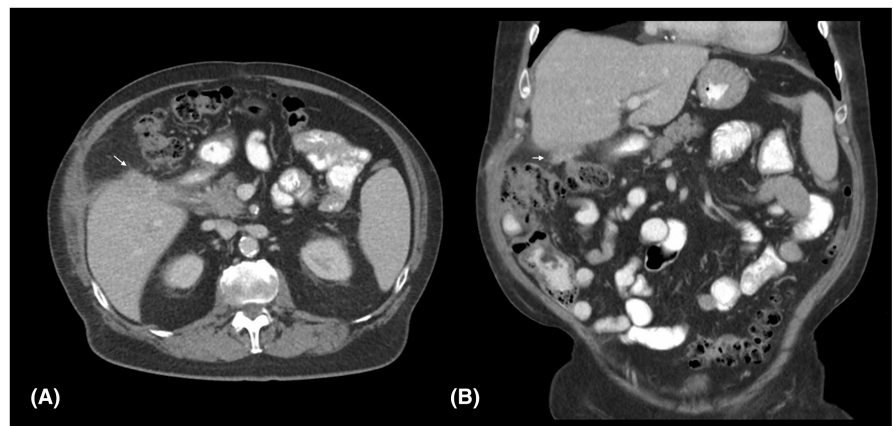
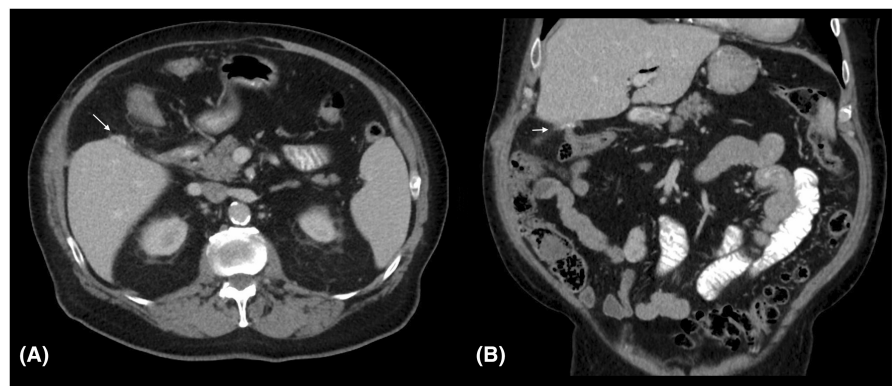


FIGURE 3 Postoperative CT imaging 1 year following surgery demonstrating durability of the omental pedicle plug in collapsing the gallbladder lumen (arrows). (A) Axial. (B) Coronal.



reconstituting cholecystectomy would the patient to repeat cholecystitis as the remnant gallbladder remained large because only a small portion of gallbladder was safe for resection. Instead, the gallbladder mucosa was cauterized, the omentum was mobilized, and a pedicle was created. This was then packed within the lumen of the gallbladder, abutting the cystic duct. Over time, this has scarred into the gallbladder lumen and prevented it from reconstituting, even 1 year after the index operation.

To our knowledge, this methodology has not previously been described in the literature. A report from Kato et al.¹¹ utilized omentopexy to reinforce the closed gallbladder stump in a subtotal cholecystectomy that was effective in mitigating bile leakage. In a report by Matsui et al.,¹² the gallbladder was opened, the anterior wall was resected, and a 2 cm × 3 cm piece of omentum was resected and used to plug the cystic duct opening, resulting in decreased bile leakage following subtotal cholecystectomy. The extensive adhesions and proximity to critical structures in our patient prevented safe removal of the anterior portion of the gallbladder wall, prohibiting access to the gallbladder internal ostium. As leaving the gallbladder open would result in an unacceptable risk of bile leak, the partial cholecystectomy was successfully plugged with an omental pedicle.

Technique improvements, such as this methodology, are essential as the rate of subtotal cholecystectomies has increased by a factor of 2–5 between 2003 and 2014.¹³ Patients undergoing subtotal cholecystectomy are at risk of significant morbidity from an uncontrolled cystic duct, including but not limited to bile leak, prolonged hospitalization, and the need for secondary procedures. Reports of bile leak in subtotal cholecystectomies have been reported as high as 18.3%, with up to 38.5% of patients require a secondary procedure.^{7,14,15} Our patient's postoperative course, including cross-sectional imaging over 15 months and analysis of drain output at 20 days, had no evidence of bile leak or gallbladder reconstitution.

4 | CONCLUSION

Laparoscopic cholecystectomy remains the gold standard for management of acute cholecystitis. In cases where this is not possible and attempts at subtotal cholecystectomy via a reconstituting or fenestrated method are not feasible, an omental plug may be a viable option to alleviate the patient's symptoms, control infection, and mitigate the risk of postoperative bile leak.

AUTHOR CONTRIBUTIONS

Michael A. Stellon: Conceptualization; data curation; visualization; writing – original draft; writing – review

and editing. **Cullen J. Fleming:** Investigation; visualization; writing – original draft; writing – review and editing. **John E. Scarborough:** Conceptualization; investigation; writing – review and editing.

FUNDING INFORMATION

This investigation was supported by the National Institutes of Health, under Ruth L. Kirschstein National Research Service Award T32 HL 007936 from the National Heart, Lung, and Blood Institute to the University of Wisconsin-Madison Cardiovascular Research Center.

CONFLICT OF INTEREST STATEMENT

The authors have no conflict of interest to declare.

DATA AVAILABILITY STATEMENT

Data that support this report are available from the corresponding author upon request.

CONSENT

Written informed consent was obtained from the patient to publish this report in accordance with the journal's patient consent policy.

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REFERENCES

- Lilley EJ, Scott JW, Jiang W, et al. Intraoperative cholangiography during cholecystectomy among hospitalized medicare beneficiaries with non-neoplastic biliary disease. *Am J Surg.* 2017;214:682-686.
- Pucher PH, Brunt LM, Davies N, et al. Outcome trends and safety measures after 30 years of laparoscopic cholecystectomy: a systematic review and pooled data analysis. *Surg Endosc.* 2018;32:2175-2183.
- Fong ZV, Pitt HA, Strasberg SM, et al. Diminished survival in patients with bile leak and ductal injury: management strategy and outcomes. *J Am Coll Surg.* 2018;226:568-576.e1.
- Strasberg SM, Brunt LM. Rationale and use of the critical view of safety in laparoscopic cholecystectomy. *J Am Coll Surg.* 2010;211:132-138.
- Michael Brunt L, Deziel DJ, Telem DA, et al. Safe cholecystectomy multi-society practice guideline and state-of-the-art consensus conference on prevention of bile duct injury during cholecystectomy. *Surg Endosc.* 2020;34:2827-2855.
- Strasberg SM, Pucci MJ, Brunt LM, Deziel DJ. Subtotal cholecystectomy—"Fenestrating" vs 'reconstituting' subtypes and the prevention of bile duct injury: definition of the optimal procedure in difficult operative conditions. *J Am Coll Surg.* 2016;222:89-96.
- Lidsky ME, Speicher PJ, Ezekian B, et al. Subtotal cholecystectomy for the hostile gallbladder: failure to control the cystic duct results in significant morbidity. *HPB (Oxford).* 2017;19:547-556.

8. Suzuki K, Bower M, Cassaro S, Patel RI, Karpeh MS, Leitman IM. Tube cholecystostomy before cholecystectomy for the treatment of acute cholecystitis. *JSLs*. 2015;19:1-5.
9. Beland MD, Patel L, Ahn SH, Grand DJ. Image-guided cholecystostomy tube placement: short- and long-term outcomes of transhepatic versus transperitoneal placement. *AJR Am J Roentgenol*. 2019;212:201-204.
10. Elshaer M, Gravante G, Thomas K, Sorge R, al-Hamali S, Ebdewi H. Subtotal cholecystectomy for 'difficult gallbladders': systematic review and meta-analysis. *JAMA Surg*. 2015;150:159-168.
11. Kato H, Kinoshita H, Kawaguchi M, Yamazaki H, Sakata Y. Successful procedure with additional omentopexy to suture closure of gallbladder stump in laparoscopic subtotal cholecystectomy. *Asian J Endosc Surg*. 2022;15:372-375.
12. Matsui Y, Hirooka S, Kotsuka M, et al. Use of a piece of free omentum to prevent bile leakage after subtotal cholecystectomy. *Surgery*. 2018;164:419-423.
13. Sabour AF, Matsushima K, Love BE, et al. Nationwide trends in the use of subtotal cholecystectomy for acute cholecystitis. *Surgery*. 2020;167:569-574.
14. Kohga A, Suzuki K, Okumura T, et al. Risk factors for postoperative bile leak in patients who underwent subtotal cholecystectomy. *Surg Endosc*. 2020;34:5092-5097.
15. Nzenwa IC, Mesri M, Lunevicius R. Risks associated with subtotal cholecystectomy and the factors influencing them: a systematic review and meta-analysis of 85 studies published between 1985 and 2020. *Surgery*. 2021;170:1014-1023.

How to cite this article: Stellon MA, Fleming CJ, Scarborough JE. Subtotal cholecystectomy with omental pedicle plug for the challenging gallbladder: A case report and review of the literature. *Clin Case Rep*. 2024;12:e8757. doi:[10.1002/ccr3.8757](https://doi.org/10.1002/ccr3.8757)