

Treatment of Persistent Bile Leak at the Cholecystectomy Stump Using Coil and Glue: A Case Report

Ryun Gil, MD, Dong Jae Shim, MD, PhD*

Department of Radiology, Incheon St. Mary's Hospital, College of Medicine, The Catholic University of Korea, Republic of Korea

*Correspondence: Dong Jae Shim, Department of Radiology, Incheon St. Mary's Hospital, College of Medicine, The Catholic University of Korea, 56 Dongsu-ro, Bupyeong-gu, Incheon, 21431, Republic of Korea

 interv@catholic.ac.kr

Radiology Case. 2025 October; 19(10):1-6 :: DOI: 10.3941/jrcr.5756

AUTHORS' CONTRIBUTIONS

Ryun Gil drafted the manuscript and collected patient data. Dong Jae Shim supervised the case management and edited the manuscript.

DISCLOSURES

The authors declare no conflicts of interest.

CONSENT

Yes, informed consent was obtained from the patient.

HUMAN AND ANIMAL RIGHTS

All procedures followed ethical standards of the institutional and national research committee and with the 1964 Helsinki Declaration and its amendments.

ABSTRACT

Persistent bile leak after cholecystectomy is a challenging complication, especially when endoscopic management is not feasible due to altered anatomy. We report a 73-year-old female with prior total gastrectomy who developed bile leakage following laparoscopic partial cholecystectomy. Bile leakage was confirmed on contrast-enhanced computed tomography and percutaneous transhepatic cholangiography. After two weeks of unsuccessful biliary drainage, transcatheter embolization was performed. Direct fluoroscopy-guided percutaneous access to the cystic duct stump was achieved, and embolization using detachable coils, autologous blood, and n-butyl-2-cyanoacrylate with Lipiodol was successful. Follow-up cholangiography showed complete resolution without complications. This case highlights transcatheter embolization as an effective and minimally invasive treatment option for persistent bile leaks when standard approaches are not applicable.

CASE REPORT

BACKGROUND

Persistent bile leakage after cholecystectomy is a rare but serious complication that may result in significant morbidity if not appropriately treated. While endoscopic or surgical interventions are often considered standard approaches, they may not be feasible in patients with altered anatomy, such as those with a history of total gastrectomy. This case highlights the successful use of transcatheter coil and glue embolization, a minimally invasive technique, to manage persistent cystic duct stump leakage when traditional methods were not applicable. By demonstrating the effectiveness and safety of this technique, this report adds to the growing evidence supporting interventional radiology as a viable alternative in treating complex biliary leaks, potentially reducing the need for surgery and shortening hospital stays.

CASE REPORT

A 73-year-old female with a history of total gastrectomy for advanced gastric cancer 3 years ago, presented with right upper quadrant pain lasting for 5 days.

Contrast-enhanced computed tomography (CT) revealed cholecystitis (Figure 1a), and the patient underwent laparoscopic cholecystectomy. Postoperatively, the patient experienced persistent right upper quadrant pain accompanied by bile drainage through a Jackson-Pratt catheter, raising concern for a bile duct injury. Follow-up contrast-enhanced CT revealed a localized fluid collection in the gallbladder fossa, supporting the suspicion of bile leak (Figure 1b). Owing to the presence of a long afferent loop following total gastrectomy, endoscopic intervention was not feasible, and the patient was referred to the Department of Interventional Radiology.

Percutaneous transhepatic cholangiography revealed contrast extravasation from the cystic duct stump into the subhepatic space, consistent with a cystic duct stump injury (Figure 2a). A percutaneous transhepatic biliary drainage (PTBD) catheter was placed for 2 weeks to divert bile. However, the diversion was ineffective, as follow-up cholangiography revealed persistent contrast leakage. Transcatheter access to the cystic duct via PTBD catheter was unsuccessful due to the acute angulation of the cystic duct from the common bile duct. Therefore, direct transhepatic access to the cystic duct stump was achieved under fluoroscopic guidance. The leakage point was punctured directly with a 21-gauge Chiba needle. A 19-gauge 30 cm catheter introducer (Pre-sheath, ANA Medical Device Company, Seongnam-si, Korea) was then inserted, and a microcatheter was advanced into the cystic duct. Four detachable coils (4–8 mm; Concerto, Medtronic, MN, USA) were deployed. Gelfoam particles (1000–1400 μm) were used to fill the interstices between the coils, followed by a 2-mL injection of autologous blood obtained via venous sampling, and NBCA with Lipiodol in a 1:1 ratio (Figure 2b). Postprocedural cholangiography confirmed complete sealing of the cystic duct leak site (Figure 2c).

The patient remained asymptomatic, with no complications or recurrence during the 5-month follow-up.

DISCUSSION

Etiology & demographics

Bile duct injury following cholecystectomy occurs in approximately 0.2–2% of cases, with the cystic duct stump being the most common site of bile leak, accounting for about 94.5% of cases [1]. Persistent bile leak increases the risk of complications such as bile peritonitis and sepsis, potentially leading to prolonged hospitalization and the need for additional treatment [2].

Clinical & imaging findings

Patients with bile duct injury after cholecystectomy will be unspecific and may include fever, pain, and mild hyperbilirubinemia (2.5 mg/dl) from biloma or bile peritonitis [3]. Biliary leakage will be suspected in the case of bile appearance from either percutaneous drainage of abdominal collection or abdominal drain placed at the time of cholecystectomy. In the case of a suspected bile leak, ultrasound and/or an abdominal computed tomography (CT) scan will identify peritoneal fluid, biloma, or an abscess, and cholangiography confirms leakage site [4].

Treatment & prognosis

Endoscopic sphincterotomy combined with temporary stent placement is considered the first-line approach for bile diversion; however, its effectiveness may be limited in patients with surgically altered anatomy [5]. When conventional endoscopic interventions fail, often due to anatomical challenges, as observed in this case, transcatheter embolization can be considered a therapeutic alternative [6, 7]. Leakage occlusion

can be achieved using various embolic agents including NBCA (glue), ethanol, ethylene-vinyl alcohol copolymer (Onyx), vascular occluders, and occlusion balloons. Although NBCA polymerizes slowly in bile, the infusion of autologous blood accelerates polymerization. This enhances solid cast formation, thereby reducing the risk of unintended common bile duct embolization [8]. In this case, a combination of coil and NBCA with autologous blood successfully occluded the cystic duct.

Several reports highlighted percutaneous coil embolization as an effective technique for managing bile leak [7,9]. This technique offers multiple advantages, including minimal invasiveness under local anesthesia. Utilizing an existing percutaneous biliary drainage catheter for embolization eliminates the need for an additional entry site, thereby reducing the risks of infection, bleeding, and pain [9]. However, when this approach is unsuccessful or unsuitable, direct percutaneous access remains a reliable alternative for managing bile leak. Coil migration is reported in one case as a complication of coil embolization, and was removed endoscopically [10]. In order to prevent migration in our case, coils were deployed at the narrowest point of the cystic duct on the gallbladder side.

Differential Diagnoses

The differential diagnoses of bile duct injury after cholecystectomy, especially in the early postoperative period, includes seroma, hematoma, abscess, lymphocele, liver cyst, and pseudocyst. Clinical history is of great aid to interpreting radiologists, and further imaging for additional characterization, including CT imaging and cholangiography [11].

TEACHING POINT

Transcatheter embolization using coils, autologous blood, and glue offers an effective and minimally invasive treatment for persistent bile leaks after cholecystectomy, especially when endoscopic access is not feasible. This technique may reduce the need for surgical intervention and shorten hospitalization.

QUESTIONS

Question 1: Which of the following statements about bile leakage is true?

1. It is seen in over 10% of cholecystectomy cases.
2. The cystic duct stump is the most common source. (applies)
3. It typically resolves without intervention in all cases.
4. Bile leak always leads to sepsis.
5. Only surgical revision is an effective treatment.

Explanation:

1. Bile leak occurs in 0.2–2% of cholecystectomy cases. [Bile leak occurs in 0.2–2% of cholecystectomy cases, with the cystic duct stump being the most common site.]

2. The cystic duct stump is the most common source of bile leak after cholecystectomy. [Bile leak occurs in 0.2–2% of cholecystectomy cases, with the cystic duct stump being the most common site.]

3. Observation without intervention can cause severe complications. [Persistent bile leak can lead to severe complications, including biloma, abscess, generalised peritonitis, and sepsis.]

4. Persistent bile leak can cause sepsis but not always. [Persistent bile leak can lead to severe complications, including biloma, abscess, generalised peritonitis, and sepsis.]

5. Surgical revision can be used when minimal invasive techniques fail. [This minimally invasive technique is a viable alternative when spontaneous resolution fails or endoscopic methods prove unsuitable, preventing the need for further surgical intervention or prolonged hospitalization.]

Question 2: What are the possible complications of persistent bile leak from cystic duct remnant after cholecystectomy?

1. Subhepatic abscess (applies)
2. Biloma (applies)
3. Biliary peritonitis (applies)
4. Portal vein thrombosis
5. Pulmonary embolism

Explanation:

1. Persistent bile leak can cause subhepatic abscess. [Persistent bile leak can lead to severe complications, including biloma, abscess, generalised peritonitis, and sepsis.]
2. Persistent bile leak can cause biloma. [Persistent bile leak can lead to severe complications, including biloma, abscess, generalised peritonitis, and sepsis.]
3. Persistent bile leak can cause biliary peritonitis. [Persistent bile leak can lead to severe complications, including biloma, abscess, generalised peritonitis, and sepsis.]
4. Portal vein thrombosis is not a complication of persistent bile leak. [Persistent bile leak can lead to severe complications, including biloma, abscess, generalised peritonitis, and sepsis.]
5. Pulmonary embolism is not a complication of persistent bile leak. [Persistent bile leak can lead to severe complications, including biloma, abscess, generalised peritonitis, and sepsis.]

Question 3: Which of the following technique is useful for persistent bile leak from cystic duct remnant after cholecystectomy?

1. Endoscopic retrograde cholangiopancreatography with stenting (applies)
2. Surgical revision (applies)
3. Percutaneous transhepatic biliary drainage (applies)
4. Transcatheter coil and glue embolization (applies)
5. Observation without intervention

Explanation:

1. Endoscopic retrograde cholangiopancreatography with stenting is a first-line approach. [Endoscopic sphincterotomy combined with temporary stent placement is considered the first-line approach for bile diversion.]
2. Surgical revision can be used when minimal invasive techniques fail. [This minimally invasive technique is a viable alternative when spontaneous resolution fails or endoscopic methods prove unsuitable, preventing the need for further surgical intervention or prolonged hospitalization.]

3. Percutaneous transhepatic biliary drainage and bile diversion can be used as a minimal invasive technique for persistent bile leak. [A percutaneous transhepatic biliary drainage (PTBD) catheter was placed for 2 weeks to divert bile.]

4. Transcatheter coil and glue embolization was used in this case as a minimal invasive technique for persistent bile leak. [This report presents the successful treatment of persistent bile leak following laparoscopic cholecystectomy using transcatheter embolization with coils, autologous blood, and n-butyl-2-cyanoacrylate (NBCA).]

5. Observation without intervention can cause severe complications. [Persistent bile leak can lead to severe complications, including biloma, abscess, generalised peritonitis, and sepsis.]

Question 4: Which of the following material can be used for transcatheter embolization of cystic duct remnant after cholecystectomy?

1. n-butyl-2-cyanoacrylate (applies)
2. vascular occluders (applies)
3. occlusion balloons (applies)
4. ethanol (applies)
5. ethylene-vinyl alcohol copolymer (applies)

Explanation:

1. NBCA (glue) can be used for embolization. [Leakage occlusion can be achieved using various embolic agents including NBCA (glue), ethanol, ethylene-vinyl alcohol copolymer (Onyx), vascular occluders, and occlusion balloons.]
2. Vascular occluders can be used for embolization. [Leakage occlusion can be achieved using various embolic agents including NBCA (glue), ethanol, ethylene-vinyl alcohol copolymer (Onyx), vascular occluders, and occlusion balloons.]
3. Occlusion balloons can be used for embolization. [Leakage occlusion can be achieved using various embolic agents including NBCA (glue), ethanol, ethylene-vinyl alcohol copolymer (Onyx), vascular occluders, and occlusion balloons.]
4. Ethanol can be used for embolization. [Leakage occlusion can be achieved using various embolic agents including NBCA (glue), ethanol, ethylene-vinyl alcohol copolymer (Onyx), vascular occluders, and occlusion balloons.]
5. Ethylene-vinyl alcohol copolymer (Onyx) can be used for embolization. [Leakage occlusion can be achieved using various embolic agents including NBCA (glue), ethanol, ethylene-vinyl alcohol copolymer (Onyx), vascular occluders, and occlusion balloons.]

Question 5: What are benefits of transcatheter embolization for bile leaks?

1. Minimally invasive (applies)
2. Avoids general anesthesia (applies)
3. Prolongs hospital stay
4. Requires laparotomy
5. Offers an alternative when endoscopic treatment fails (applies)

Explanation:

1. Transcatheter embolization is a minimal invasive intervention technique. [Transcatheter embolization is a

minimally invasive alternative that can be performed under local anesthesia.]

2. Transcatheter embolization can be done under local anesthesia. [Transcatheter embolization is a minimally invasive alternative that can be performed under local anesthesia.]

3. Transcatheter embolization is a minimal invasive technique which can prevent further hospital stay. [This technique may reduce the need for surgical intervention and shorten hospitalization.]

4. Transcatheter embolization is a minimal invasive technique which can prevent surgical intervention. [This technique may reduce the need for surgical intervention and shorten hospitalization.]

5. Transcatheter embolization offers an alternative when endoscopic treatment fails. [Transcatheter embolization using coils, autologous blood, and glue offers an effective and minimally invasive treatment for persistent bile leaks after cholecystectomy, especially when endoscopic access is not feasible.]

REFERENCES

- [1] Salsano G, Paparo F, Valdata A, et al. Management of bile leak from Luschka ducts after laparoscopic cholecystectomy: an original procedure for coil embolization. *Cardiovasc Intervent Radiol*. 2016; 39(8): 483–486. PMID: 26474581.
- [2] Lee CM, Stewart L, Way LW. Postcholecystectomy abdominal bile collections. *Arch Surg*. 2000; 135(5): 538–542. PMID: 10807277.
- [3] Karanikas M, Bozali F, Vamvakierou V, et al. Biliary tract injuries after lap cholecystectomy - types, surgical intervention and timing. *Ann Transl Med*. 2016; 4(9): 163. PMID: 27275476.
- [4] Renz BW, Bösch F, Angele MK. Bile Duct Injury after Cholecystectomy: Surgical Therapy. *Visc Med*. 2017; 33(3): 184–190. PMID: 28785565.
- [5] Schmitz D, Mutignani M, Neumann UP, Wielpütz MO, Hagenmüller F, Rudi J. Percutaneous embolization of biliary leaks: a systematic interdisciplinary review and proposal for a new classification. *Digest Dis Intervent*. PMID: 36746789.
- [6] Nezami N, Jarmakani H, Arici M, et al. Selective trans-catheter coil embolization of cystic duct stump in post-cholecystectomy bile leak. *Dig Dis Sci*. 2019; 64(11): 3314–3320. PMID: 31123973.
- [7] Furkan Ö. A rare case: Transcatheter coil embolization in a patient with cystic duct stump injury following cholecystectomy. *Radiol Case Rep*. 2025; 20(1): 406–409. PMID: 39525920.
- [8] Hwang JM, Byeon JH, Shim DJ, Kim SK, Shin YR, Kim KJ. Transhepatic tract embolization after biliary intervention using n-Butyl cyanoacrylate and autologous blood: a retrospective analysis of 42 patients. *Cardiovasc Intervent Radiol*. 2019; 42(8): 1199–1203. PMID: 31073822.
- [9] Uyanik SA, Atlı E, Oguslu U, Cevik H, Yilmaz B, Gumus B. Percutaneous treatment of postoperative bile leaks with coil embolization after cholecystectomy. *Eurasian J Med Invest*. 2021; 5: 45–50.
- [10] Nezami N, Jarmakani H, Arici M, et al. Selective trans-catheter coil embolization of cystic duct stump in post-cholecystectomy bile leak. *Digest Dis Sci*. 2019; 64(11): 3314–3320. PMID: 31123973.
- [11] Copelan A, Tardy F, Kirsch M, Sokhandon F, Kapoor B. Etiology, Diagnosis, and Management of Bilomas: A Current Update. *Tech Vasc Interv Radiol*. 2015; 18(4): 236–243. PMID: 26615164.

FIGURES

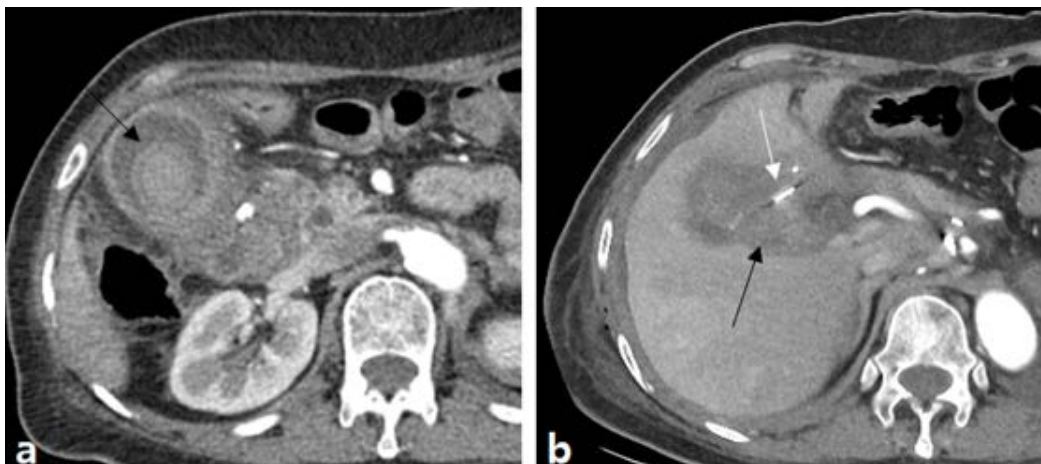


Figure 1: (a) Contrast-enhanced CT shows acute cholecystitis with a large gallbladder stone (arrow). (b) Contrast-enhanced CT following cholecystectomy reveals a fluid collection in the surgical bed (black arrow) and a Jackson-Pratt drainage catheter in place (white arrow).

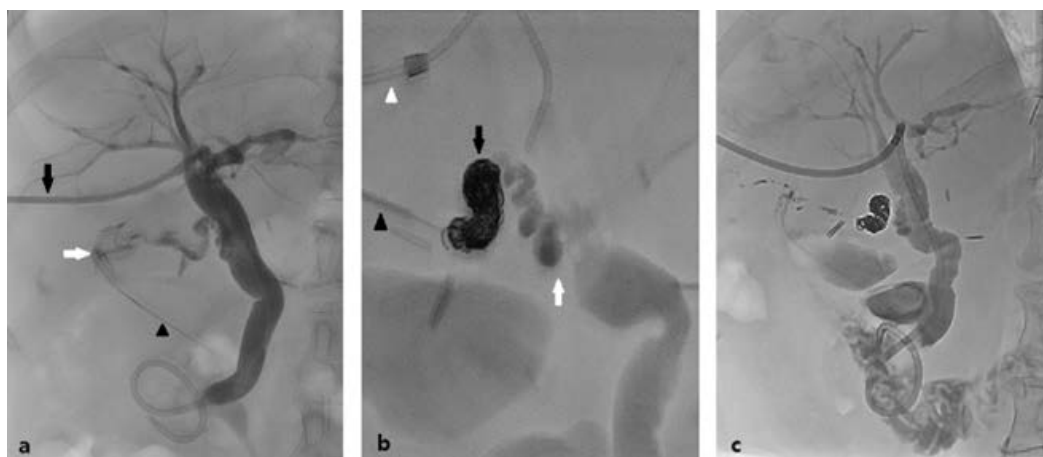


Figure 2: (a) Catheter-based cholangiography (black arrow) confirms bile leakage from the cystic duct stump (white arrow). A small volume of contrast medium is observed draining through a Jackson-Pratt catheter (arrowhead). (b) Following unsuccessful cannulation via percutaneous biliary drainage catheter (white arrowhead) due to acute angulation of the cystic duct, direct percutaneous access to the leakage site was achieved (black arrowhead) under fluoroscopic guidance. The cystic duct stump was embolized with microcoils (black arrow), autologous blood, and n-butyl-2-cyanoacrylate with Lipiodol (white arrow). (c) Immediate post-embolization cholangiography shows successful occlusion of the cystic duct stump.

KEYWORDS

embolization; bile leak; case report; coil; n-butyl-2-cyanoacrylate

ABBREVIATIONS

CT = Computed Tomography

PTBD = Percutaneous Transhepatic Biliary Drainage

NBCA = N-Butyl-2-Cyanoacrylate

Online access

This publication is online available at:

www.radiologycases.com/index.php/radiologycases/article/view/5756

Peer discussion

Discuss this manuscript in our protected discussion forum at:

www.radiopolis.com/forums/JRCR

Interactivity

This publication is available as an interactive article with scroll, window/level, magnify and more features.

Available online at www.RadiologyCases.com

Published by EduRad



www.EduRad.org