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Authors

Sachedina, Archana
Choi, Patrick

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Postcholecystectomy Syndrome due to Prominent Remnant of the Cystic Duct and Choledocholithiasis: A Case Report

Sachedina A, MD[1] | Choi P, MD[1]

Author Affiliation: [1] Department of Radiology, Los Angeles County-Harbor-UCLA Medical Center

Corresponding Authors: P.C. (PChoi@dhs.lacounty.gov)

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Abstract: Postcholecystectomy syndrome is a group of common upper abdominal symptoms manifesting in patients who have undergone cholecystectomy. These symptoms may mimic some or all of the symptoms the patient had prior to cholecystectomy. The symptoms may be due to biliary or nonbiliary conditions. Patients may present with the syndrome during the early postoperative period or in the months to years after the surgery. We report a case of postcholecystectomy syndrome that appeared fifteen months after laparoscopic cholecystectomy in a patient with residual choledocholithiasis and a prominent remnant of the cystic duct with low, medial insertion. We also discuss the causes of postcholecystectomy syndrome and some algorithmic approaches to imaging workup on patients with the syndrome.

Keywords: *cholecystectomy, postcholecystectomy syndrome, cystic duct anatomy, cystic duct remnant*

Key Points

- Postcholecystectomy syndrome is a group of common, nonspecific heterogenous symptoms that occur after cholecystectomy.
- Diagnosis of patients with postcholecystectomy syndrome should be approached in a stepwise fashion based on the assessment of symptoms, the results of blood tests, and initial ultrasonography findings.
- Radiologists must be aware of variant cystic duct anatomy to be able to identify relevant potential complications of cholecystectomy and to provide timely help with surgical planning.

Case Presentation

A 54-year-old man presented to the emergency department (ED) with worsening midabdominal pain and nausea. For three months prior to presentation, the patient experienced intermittent upper abdominal pain radiating to the back and increasing in severity on the day of presentation to the ED. The patient denied having fever, pruritus, or skin discoloration and reported having a laparoscopic cholecystectomy for acute cholecystitis fifteen months preceding the onset of presenting symptoms. Additional surgical history included a hemicolectomy for colon cancer diagnosed 22 years ago. At the time of presentation, the patient was afebrile and had diffuse abdominal tenderness, most pronounced in the right upper quadrant. A comprehensive metabolic panel test showed elevated aspartate aminotransferase – 875 U/L (reference range, 13-62 U/L), alanine aminotransferase – 641 U/L (reference range, 8-70 U/L), and alkaline phosphatase – 185 U/L (reference range, 37-113 U/L). The total bilirubin was mildly elevated, at 2.6 mg/dL (reference range, 0.1-1.2 mg/dL), with direct bilirubin at 1.4 mg/dL (reference range, 0.0-0.3 mg/dL). White blood cell count was within normal limits, at 9100/μL (reference range, 4160/μL-9950/μL). Serum lipase was within normal limits.

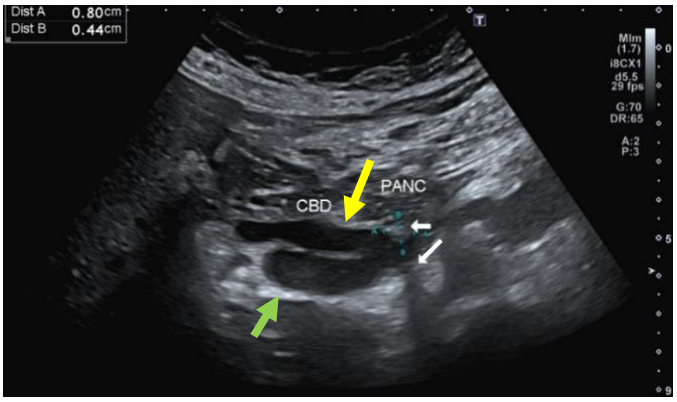
Transabdominal ultrasonography (TAUS) revealed a dilated cystic duct remnant and a diffusely dilated, 11-mm-diameter, common bile duct

Abbreviations
CBD: common bile duct
CD: cystic duct
CT: computed tomography
ED: emergency department
ERCP: endoscopic retrograde cholangiopancreatography
EUS: endoscopic ultrasonography
HIDA: hepatobiliary iminodiacetic acid
LFT: liver function test
MRCP: magnetic resonance cholangiopancreatography
PCS: postcholecystectomy syndrome
SOD: sphincter of Oddi dysfunction
TAUS: transabdominal ultrasonography

(CBD) with an echogenic shadowing stone in the distal CBD (Figure 1). Same-day contrast-enhanced computed tomography (CT) of the abdomen and the pelvis showed a diffusely dilated CBD and a parallel to its course, 5-cm-long, dilated cystic duct (CD) remnant with low, medial insertion into the common hepatic duct (Figure 2). A magnetic resonance cholangiopancreatography (MRCP), endoscopic retrograde cholangiopancreatography (ERCP), and a consultation with a surgeon were recommended.

In addition to choledocholithiasis, differential diagnosis included consideration of autoimmune hepatitis, extrahepatic biliary obstruction secondary to adhesions, and drug-induced hepatitis secondary to recent addition of atorvastatin to the patient's treatment regimen. Given the imaging finding of ductal dilatation in the setting of a known history of a malignant tumor, an obstructive mass was also considered in the differential diagnosis. With the presence of residual choledocholithiasis and the possibility of a mass, the decision was made not to perform MRCP and to proceed with endoscopic ultrasonography (EUS) and ERCP. Endoscopic ultrasonography showed a dilated CD, a stone in the distal CBD, and sludge throughout both the CD and the CBD (Figure 3). During the following ERCP, a 10-mm stone impacted in the CBD was successfully removed with electrohydraulic lithotripsy (Figure 4). The patient was discharged two days later with satisfactory resolution of symptoms and a gradual decrease in liver enzymes levels.

Figure 1. Transabdominal Ultrasonography (TAUS) of a 54-Year-Old Man with Postcholecystectomy Syndrome



Transabdominal ultrasonographic image, a longitudinal (sagittal) view, shows a dilated cystic duct remnant (green arrow), a dilated common bile duct (CBD) (yellow arrow) with an echogenic stone (short white arrow) in the distal CBD, and the area of acoustic shadowing (long white arrow) caused by the stone. The stone measurements (10 mm) made on TAUS were concordant with those made on endoscopic retrograde cholangiopancreatography.

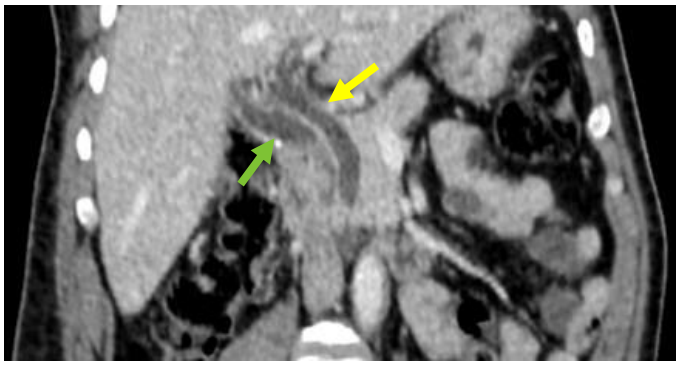
Discussion

Postcholecystectomy syndrome (PCS) was first described[1] in 1947 and has been reported in 5% to 63% of patients who had undergone cholecystectomy.[2] The syndrome is broadly defined as a group of common abdominal symptoms manifesting after cholecystectomy.[3,4] These symptoms include epigastric pain, nausea, vomiting, diarrhea, heartburn, flatulence, intolerance to fatty foods, and jaundice.[2,3,5] Patients may present in the early postoperative period or in months to years after the surgery.[3,5] The symptoms may mimic some or all of the symptoms the patient had prior to cholecystectomy.[3,6] The causes of PCS can be grouped into two categories – biliary and extrabiliary.[3,5] Biliary causes include retained, recurrent, or dropped gallstones, biliary stricture, biliary leak, cystic duct remnant, and sphincter of Oddi dysfunction (SOD).[3,4] Extrabiliary causes include gastroesophageal reflux disease, hiatus hernia, dyspepsia, peptic ulcer disease, chronic pancreatitis, pancreatic tumors, hepatitis, and inflammatory bowel disease.[3,4]

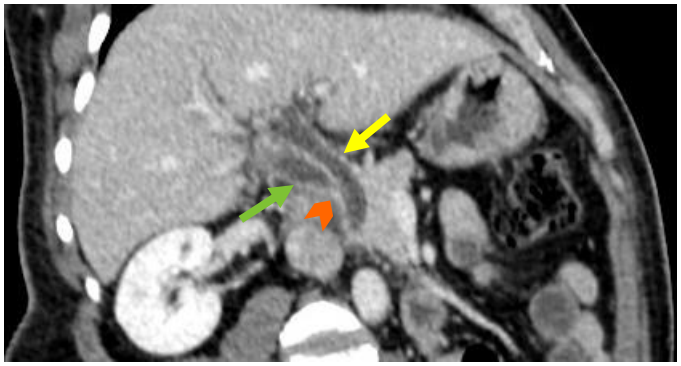
Isherwood et al[4] found that early (during the first three years after cholecystectomy) PCS was the

Figure 2. Contrast-Enhanced Computed Tomography (CT) of a 54-Year-Old Man with Postcholecystectomy Syndrome

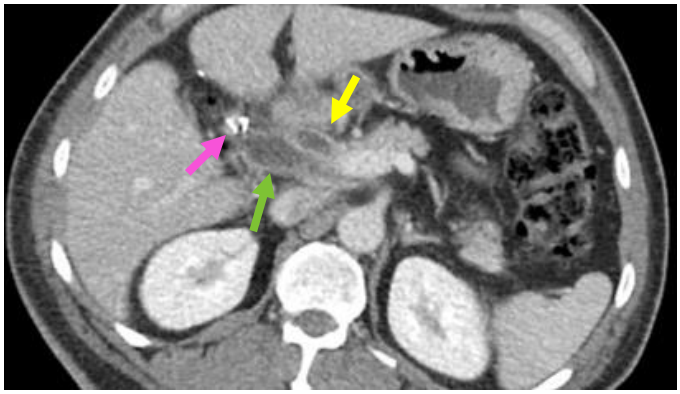
A CT image of the abdomen, coronal view, multiplanar reconstruction (MPR)



B CT image of the abdomen, coronal view, MPR



C CT image of the abdomen, axial view



(A) (B) CT of the abdomen, coronal views, MPR, show the diffusely dilated common bile duct (CBD) (A and B, yellow arrow) and a parallel to its course, 5-cm-long, dilated cystic duct (CD) remnant (A and B, green arrow) with low, medial insertion (B, orange arrowhead). (C) CT of the abdomen, axial view shows a dilated CD remnant (C, green arrow) with surgical clips at the CD stump (C, magenta arrow). A dilated CBD (C, yellow arrow) is also seen. A radiolucent stone that is visible on transabdominal ultrasonography (Figure 1) is not visible on CT images, although its presence is presumed, given the severity of the CBD dilatation.

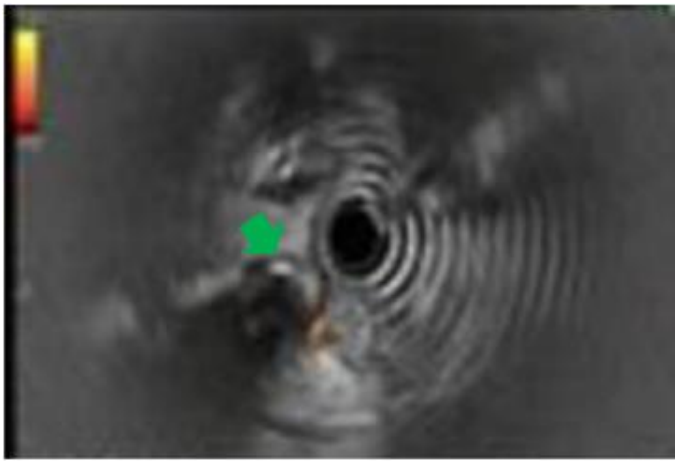
result of gastric-related causes while late (in more than three years after cholecystectomy) PCS was often associated with biliary pathology, such as retained or recurrent stones, strictures, SOD, and/or CD remnant. The pathogenesis of PCS was identified as the postsurgical loss of the pressure-reservoir function of the gallbladder followed by the increase of intraductal biliary pressure, the constriction of the sphincter of Oddi, and the rise of biliary pain.[4,6] The absence of the gallbladder can also result in compensatory dilatation of the biliary tree creating a milieu for biliary stasis, stones, and infection.[4] In addition, a low, medially inserted and longer than 15 mm cystic duct remnant, especially with its course parallel to that of the CBD, is a common source of retained or recurrent bile stones and consequently of PCS.[7,8] We believe that a 5-cm-long and parallel to the CBD cystic duct remnant with low, medial insertion was a cause of PCS in our patient, even though the syndrome occurred within 15 month after the surgery.

According to Filip et al[3] and Terhaar et al,[9] the diagnostic algorithm for patients with PCS starts with liver function tests (LFTs) and a transabdominal ultrasonography (TAUS). As both Filip et al and Terhaar et al suggest, if the results of the LFTs are within normal limits, the result of TAUS is negative for CBD obstruction, and the CBD diameter is < 10 mm, no further imaging workup is necessary. However, in cases when the results of LFTs are abnormal and the diameter of the CBD is ≥ 10 mm, for diagnostic imaging, Filip et al suggest using endoscopic ultrasonography (EUS) while Terhaar et al recommend using MRCP. Because of the invasiveness and relatively high morbidity caused by ERCP, both algorithms were developed to utilize the procedure only as the last step, when either the results of EUS or MRCP are abnormal or bile stones in the CBD are visualized on TAUS.[3,9] Although some authors[4] noted that blood tests in general have negative predictive value in patients with PCS, we included the complete blood cell count test in the first step of the workup to examine our patient for the presence of infection.

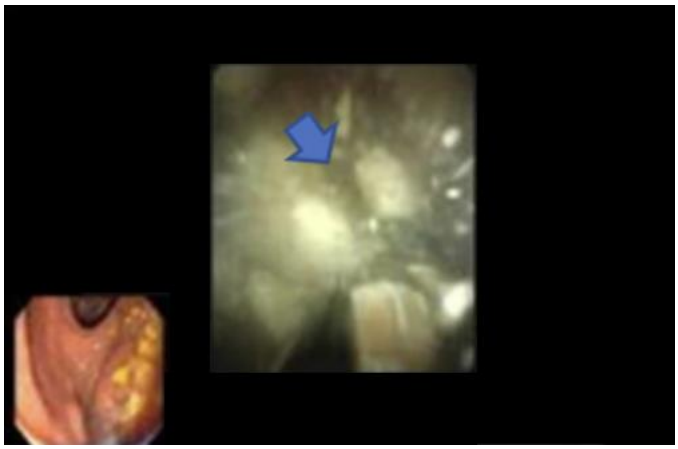
A contrast-enhanced CT of the abdomen will benefit patients whose body habitus and overlaying bowel gas limit the quality of abdominal ultrasonography. As TAUS has a lower probability

Figure 3. Endoscopic Ultrasonography of a 54-Year-Old Man with Postcholecystectomy Syndrome

A Radial (long axis) view



B Endoscopic view after stone extraction

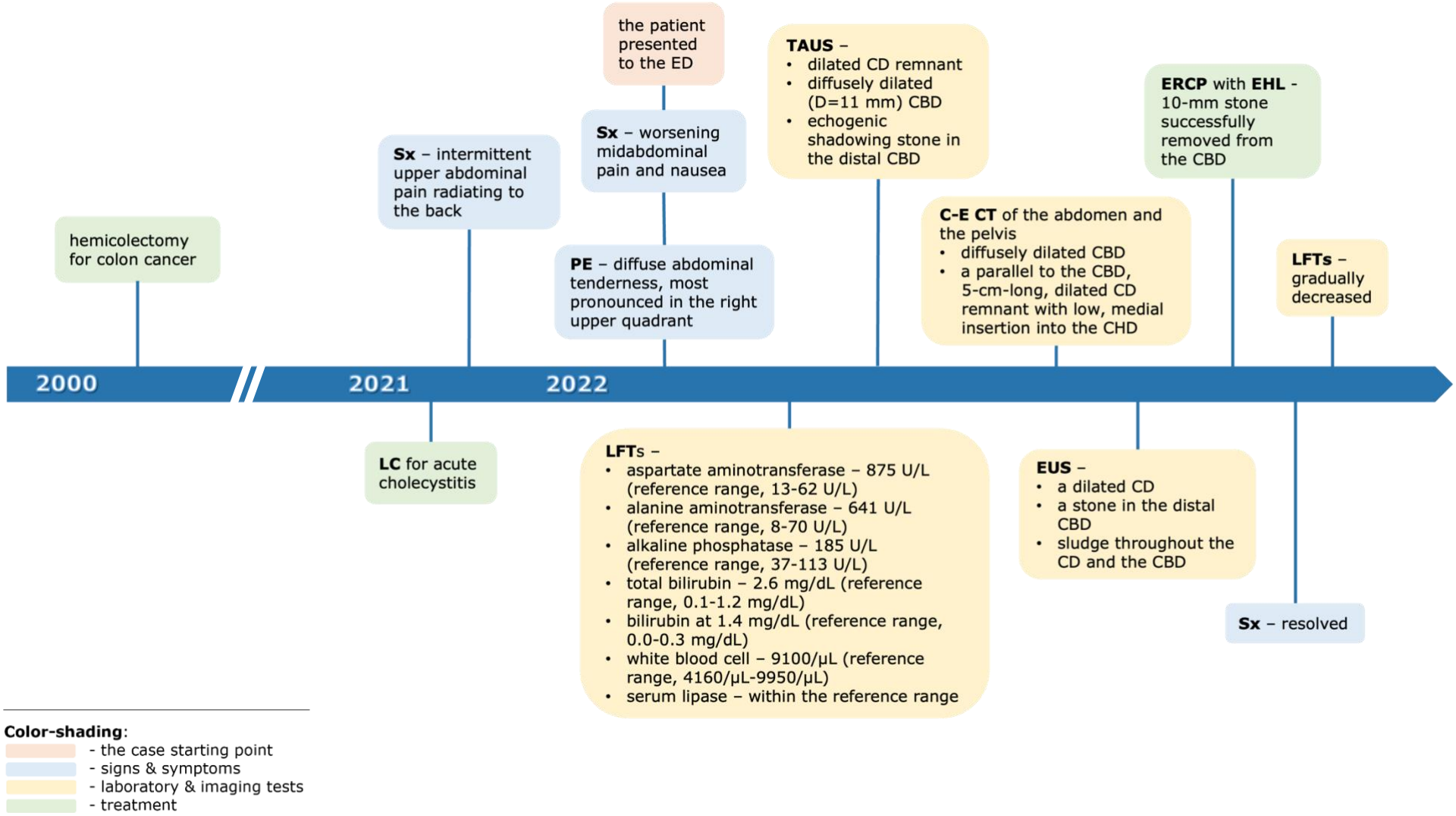


(A) The image shows a stone in the common bile duct (A, green arrow). (B) The stone was subsequently removed by electrohydraulic lithotripsy (B, blue arrow).

of directly showing CBD stones[9] or cystic duct stones and tortuous cystic ducts of a small caliber[7] and may produce false-negative results in detecting intrahepatic or hilar lithiasis,[3] it might be necessary to use contrast-enhanced CT along with TAUS as a first-line diagnostic tool for assessing patients with PCS. Furthermore, negative findings on TAUS in a symptomatic patient with abnormal results of LFTs may require a contrast-enhanced CT of the abdomen/pelvis to evaluate for the presence of abdominal pathologies, such as liver pathology, intrahepatic biliary dilatation, calcified gallstones,[10] and pancreatitis[11] that may mimic PCS. Therefore, in our patient, after finding a dilated cystic duct remnant, a diffusely dilated, 11-mm-diameter CBD, and a 10-mm echogenic shadowing stone in the distal CBD on TAUS, we used contrast-enhanced CT of the abdomen and the pelvis to visualize the details of the biliary anatomy as well as to eliminate the possibility of sequelae of colon cancer mentioned in the patient's medical history.

Despite neither MRCP nor hepatobiliary iminodiacetic acid (HIDA) was used in our case, we believe that a brief description of the strength and limitations of these imaging modalities is warranted here as they are valuable tools in the diagnosis of patients with PCS. Secretin-enhanced MRCP is used for diagnosing SOD in patients with PCS as an alternative to manometry, an invasive procedure carrying a significant risk of pancreatitis.[12] Although not being as accurate as manometry, secretin-enhanced MRCP is effective in depicting the whole pancreatic duct system, the biliary tree, the papillae, and the duodenum and in diagnosing underlying diseases, specifically chronic asymptomatic hyperenzymemia, acute and chronic pancreatitis, and main pancreatic duct stenosis.[12] Having the advantage of being a noninvasive procedure, MRCP may be a more feasible option in patients who are unable or unwilling to undergo EUS and/or a diagnostic ERCP. In addition, MRCP can provide a road map for planned interventional procedures.[11] As it could closely relate to our case, MRCP allows to optimally visualize and differentiate the cystic duct and the ductal anatomy in the coronal plane along the long axis of the duct,[7] to depict the biliary tract as high-signal-intensity structures, and to detect cystic duct stones as low-signal-intensity defects in the high-signal-intensity bile on T2-weighted sequences.[7,9] In-phase and out-of-phase T1-weighted sequences are effective for visualization of cholesterol and pigment dropped gallstones.[11] Furthermore, MRCP is effective in detecting biliary dilatations,[10] retained stones,[9,11] and underlying masses.[11] The combination of MRCP with gadoxetate disodium–enhanced MR imaging is highly sensitive and specific for identifying the biliary anatomy and the location of bile leaks.[10,11] Hepatobiliary iminodiacetic acid scintigraphy is another noninvasive and highly specific imaging modality to evaluate functional causes of postcholecystectomy syndrome, such as bile leaks, bilomas,[10,11] as well as SOD, obstruction of

Case report timeline



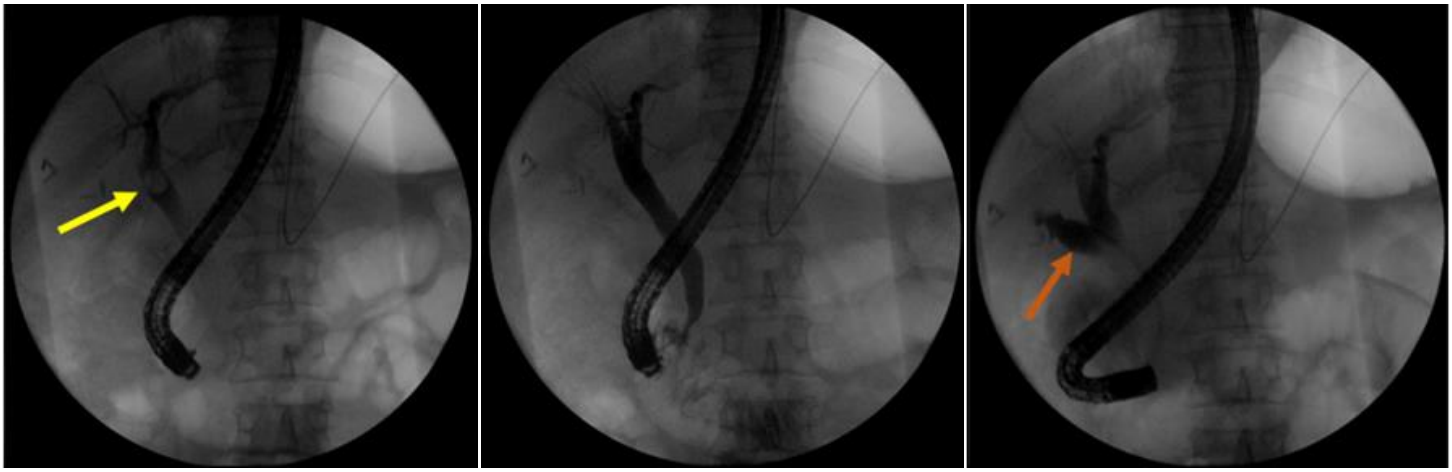
Abbreviations: CBD, common bile duct; CD, cystic duct; C-E CT, contrast-enhance computed tomography; CHD, common hepatic duct; ED, emergency department; EHL, electrohydraulic lithotripsy; ERCP, endoscopic retrograde cholangiopancreatography; EUS, endoscopic ultrasonography; LC, laparoscopic cholecystectomy; LFT, liver function test; PE, physical examination; Sx, symptoms; TAUS, transabdominal ultrasonography.

Figure 4. Endoscopic Retrograde Cholangiopancreatography of a 54-Year-Old Man with Postcholecystectomy Syndrome

A Prelithotripsy view of the common bile duct (CBD)

B Postlithotripsy view of the CBD

C Postlithotripsy view of a cystic duct (CD) remnant



(A) Cholangiogram shows a stricture and a filling defect (A, yellow arrow) in the CBD, suggesting residual choledocholithiasis. (B) Postlithotripsy cholangiogram shows no calculus in and complete clearance of the CBD. (C) The image shows a dilated CD remnant (C, orange arrow), likely the source of the residual stone.

the cystic duct, and acute cholecystitis.[7] However, HIDA scintigraphy lacks spatial resolution and is less accurate than gadoxetate disodium-enhanced MRCP and SPECT/CT in identifying biliary anatomy and the location of bile leaks.[11] As it relates to diagnosing SOD, the direct measurement of sphincter pressure by manometry is still considered the reference standard investigation.[12]

Conclusion

We reported a case of PCS manifested 15 months after cholecystectomy and likely caused by a long, parallel to the CBD, CD remnant with low, medial insertion into the CBD. We would like to underscore the importance for radiologists to be aware of variant cystic duct anatomy, and timely communicate with surgeons when this type of CD anatomy is identified on preoperative CT or MR images to help with surgical planning. Radiologists should be also familiar with the imaging appearance of biliary, stone-related, and iatrogenic postcholecystectomy complications. Because PCS manifests as a multitude of common, nonspecific abdominal symptoms of biliary and/or extrabiliary etiology, its clinical diagnosis is often challenging and requires multimodality imaging. Imaging workup of patients with PCS should be approached in a stepwise fashion with consideration of individual symptoms, the results of blood tests, and the findings on initial ultrasonography.

Author Contributions

Conceptualization, P.C. and A.S.; Acquisition, analysis, and interpretation of data, A.S. and P.C.; Writing – original draft preparation, A.S.; Review and revisions, A.S. and P.C.; Supervision, P.C. All authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All authors had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

Disclosures

None to report.

References

1. Womack NA, Crider RL. The persistence of symptoms following cholecystectomy. *Ann Surg*. 1947;126(1):31-55. doi: 10.1097/00000658-194707000-00004
2. Arora D, Kaushik R, Kaur R, Sachdev A. Post-cholecystectomy syndrome: a new look at an old problem. *J Minim Access Surg*. 2018;14(3):202-207. doi: 10.4103/jmas.JMAS_92_17

3. Filip M, Saftoiu A, Popescu C, et al. Postcholecystectomy syndrome–an algorithmic approach. *J Gastrointestin Liver Dis*. 2009;18(1):67-71.
4. Isherwood J, Oakland K, Khanna A. A systematic review of the aetiology and management of post cholecystectomy syndrome. *Surgeon*. 2019;17(1):33-42. doi: 10.1016/j.surge.2018.04.001
5. Jaunoo SS, Mohandas S, Almond LM. Postcholecystectomy syndrome (PCS). *Int J Surg*. 2010;8(1):15-17. doi: 10.1016/j.ijsu.2009.10.008
6. Tanaka M, Ikeda S, Nakayama F. Change in bile duct pressure responses after cholecystectomy: loss of gallbladder as a pressure reservoir. *Gastroenterology*. 1984;87(5):1154-1159.
7. Turner MA, Fulcher AS. The cystic duct: normal anatomy and disease processes. *Radiographics*. 2001;21(1):3-22. doi: 10.1148/radiographics.21.1.g01ja093
8. Burckhardt O, Peisl S, Rouiller B, Colinet E, Egger B. Length of the remnant cystic duct and bile duct stone recurrence: a case–control study. *J Gastrointest Surg*. 2023;27(6):1122-1129. doi: 10.1007/s11605-023-05607-x
9. Terhaar OA, Abbas S, Thornton FJ, et al. Imaging patients with "post-cholecystectomy syndrome": an algorithmic approach. *Clin Radiol*. 2005;60(1):78-84. doi: 10.1016/j.crad.2004.02.014
10. Kazi IA, Siddiqui MA, Thimmappa ND, et al. Post-operative complications of cholecystectomy: what the radiologist needs to know. *Abdom Radiol (NY)*. Published online June 28, 2024. doi: 10.1007/s00261-024-04387-5
11. Patel N, Jensen KK, Shaaban AM, Korngold E, Foster BR. Multimodality imaging of cholecystectomy complications. *Radiographics*. 2022;42(5):1303-1319. doi: 10.1148/rg.210106
12. Manfredi R, Pozzi Mucelli R. Secretin-enhanced MR imaging of the pancreas. *Radiology*. 2016;279(1):29-43. doi: 10.1148/radiol.2015140622