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## Cystic Duct Remnant Syndrome

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### Abstract

Post-cholecystectomy syndrome (PCS) is a common manifestation in patients with cholecystectomy. The patients exhibit a heterogeneous group of symptoms, such as upper abdominal pain, vomiting, gastrointestinal disorders, jaundice, and dyspepsia. Choledocholithiasis, biliary dyskinesia, and dilation of cystic duct remnants are common causes of these symptoms. The symptoms can recur after a symptom-free period following cholecystectomy or they can persist after surgery. Ultrasonography, computed tomography (CT), and magnetic resonance imaging scan, which are non-invasive methods of imaging, have a high sensitivity in detecting the causes of PCS. We report a case of an 84-year-old lady who came to the Ultrasound Department with recurrent episodes of abdominal pain following cholecystectomy. The gray-scale sonography showed a dilated cystic structure, which was confirmed as the duct remnant in follow-up contrast-enhanced CT.

**Keywords:** Biliary dyskinesia, choledocholithiasis, cystic duct remnant, post-cholecystectomy syndrome

### INTRODUCTION



Cholecystectomy is the most common method of choice for treating symptomatic gall stones. It can either be performed laproscopically or by open cholecystectomy. Ten percent to 15% of the patients with cholecystectomy experience post-cholecystectomy syndrome (PCS). The patients of PCS present with continuation of symptoms that they experienced before cholecystectomy, or they can present with new symptoms after a disease-free period. The main symptoms of PCS include upper abdominal pain and dyspepsia. Ninety percent of the time, the etiology of PCS is identifiable.

## CASE REPORT

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An 84-year-old patient with a past history of cholecystectomy came to the Emergency Department with right hypochondriac pain. An ultrasound scan of the upper abdomen was performed that demonstrated a dilated cystic duct remnant measuring 2.0 cm × 2.3 cm in size [Figure 1 a and b]. The patient was followed-up with a contrast-enhanced computed tomography (CT) scan of the abdomen, which confirmed the presence of the dilated cystic duct remnant in the gall bladder fossa. The dilated common bile duct was seen medially and no choledocholithiasis was identified [Figures 2 and 3]. Urine and blood investigations performed, showed normal values.

The patient had experienced a similar episode of abdominal pain in the past, which was investigated to rule out complications of cholecystectomy. CT scan performed at that time showed a dilated cystic duct remnant.

## DISCUSSION

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### Imaging anatomy

The normal cystic duct connects the gall bladder to the common hepatic duct to form the common bile duct, and is considered the most important structure to be identified during cholecystectomy.[1] The normal cystic duct usually measures 4-6 cm in length and contains concentric folds known as the spiral valves of Heister.[2] Cystic ducts shorter than 2 cm can also be found, which can present a significant challenge in the dissection and placement of clips during laparoscopic cholecystectomy. The diameter of the cyst duct ranges from 1 to 5 mm. The cystic duct usually joins the extrahepatic bile duct approximately half-way between the porta hepatis and ampulla of Vater, commonly to its medial aspect.[2] The triangle of Calot is an important landmark in identifying the cystic artery and the cystic duct [Figure 4]. The

boundaries of the Calot's triangle consist of the common hepatic duct medially, cystic duct laterally, and inferior margin of the liver superiorly.[1]

On gray-scale ultrasonography, the normal cystic duct is seen only in 50% of the patients as an anechoic tubular structure connecting the gall bladder and the extrahepatic duct.[2] The normal cystic duct is usually not visible on CT scans and may sometimes be seen as a low attenuating tubular structure with a thin enhancing wall.[2]

Magnetic resonance cholangiopancreatogram (MRCP) can routinely demonstrate entire course of the normal cystic duct. A normal cystic duct appears bright on T2 weighted MR sequences and dark on T1 weighted MR sequences. Sometimes cystic duct may appear bright on T1 weighted sequences when it contains concentrated bile.[2]

The gold standard method of demonstrating biliary tree is direct cholangiography, where injection of contrast is performed with percutaneous transhepatic cholangiography, endoscopic retrograde cholangiopancreatography, or T tube cholangiography.[2]

During cholecystectomy, a variable length of the cystic duct is left as a remnant. Usually, a cystic duct remnant measuring 1-2 cm in length is left, although remnants can be seen up to 6 cm in length. Complications associated with the remnant cystic duct are retained stones in cystic duct, bile leakage, stricture, fistula formation, dilatation of the cystic duct remnant, amputation neuromas, and suture granuloma of the cystic duct. Cystic duct mucocele is a rare complication, where the remnant of the cystic duct is distended with mucus.[2]

Following cholecystectomy, the cystic duct caliber in an asymptomatic patient is often the same as in a normal patient. The caliber of the normal remnant measures approximately 4 mm and the length is 5-25 mm. A cystic duct measuring > 5mm is considered abnormal (Dilated). The terminal end of the cystic duct remnant is described as resembling a "leaf bud" in normal post-cholecystectomy patients. When the remnant is pathologically dilated, it is described as having the appearance of a "flashlight bulb".[3] The dilatation or the pouch formation of the cystic duct remnant is thought to be due to an inflammatory reaction.[3] In 1936, Beye reported 14 cases of dilated cystic ducts as "reformed gall bladder" and concluded that the symptoms are due to this remnant cystic duct.[4] It is important to identify these cystic duct remnants as they act as a cul-de-sac with a potential source of infection and are frequently associated with the presence of stones.[5] Brown stated that all the resected cystic duct remnants show evidence of chronic inflammation without evidence of neoplastic changes. [Brown MJ, Diseased cystic duct remnant: (Presented at the 16<sup>th</sup> annual meeting of the central surgical association, Montreal, Feb 20 1959).]

### Post-cholecystectomy syndrome

PCS was first described by Womack and Crider in 1947.[6] Patients with PCS may present with symptoms in the immediate post-operative period or may present with PCS many months or years after the surgery [ [Table 1](#)].

The patients with PCS display complex heterogeneous symptoms, consisting of upper abdominal pain, dyspepsia, gastrointestinal disorders, vomiting, and jaundice with or without fever.[7]

### Choledocholithiasis

Choledocholithiasis is the most common cause of PCS. It can involve the common bile duct or the cystic duct remnant. Choledocholithiasis is classified as retained, if found within 2 years of cholecystectomy or recurrent, if the calculi are found 2 years after surgery. Recurrent stones formed as a result of biliary stasis are often caused by strictures, papillary stenosis, and biliary dyskinesia. Ultrasonography is a non-invasive technique that can be used as the first line of investigation to detect choledocholithiasis. The sensitivity for detecting common bile duct stones by ultrasonography has been reported to range from 22% to 82%. The extrahepatic bile ducts are difficult to assess ultrasonically due to the overlying bowel shadows. The dilated common bile duct can instead be used as an indirect sign, and is useful in detecting choledocholithiasis. Calculus within the extrahepatic bile ducts would classically appear as a rounded, echogenic lesion with a posterior acoustic shadow. Smaller calculi may appear as reproducible, bright linear echogenicity without a posterior acoustic shadow. MRCP has a higher sensitivity of 95-100% and

specificity of 88-89% in detecting calculi in the remnant cystic duct or common bile duct.[7] On MRCP, the calculi appear as smoothly margined filling defects within the ducts usually in the dependent position, surrounded by a thin rim of hyperintense bile [Figures 5 a and b].[7]

### Biliary dyskinesia

Biliary dyskinesia is diagnosed in 9-11% of the patients with PCS. Biliary dyskinesia is defined as a disorder of tone or motor activity of sphincter of Oddi and the patients usually present with upper abdominal pain.[7,8] Abdominal pain in biliary dyskinesia is thought to be due to impeded flow, resulting in ductal distention and inflammation. Sphincter of Oddi manometry is the gold standard method to diagnose sphincter of Oddi dysfunction and stratify treatment. Dynamic hepatobiliary scintigraphy with Tc-99M disofenin (DISIDA) or Tc-99M lidofenin (HIDA) and stimulation with cholecystokinin is also a reliable, non-invasive method in assessing sphincter of Oddi activity.[8,9]

### Remnant cystic duct inflammation

Cystic duct remnant harboring inflammation or stones can cause symptoms, and these patients present symptoms associated with the late stage of PCS.[7]

## CONCLUSION

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Most patients with PCS often have an identifiable cause. Dilated cystic duct remnant is one of the common causes of PCS and currently used non-invasive methods of imaging such as ultrasonography, CT, and MRCP often identify the cause for PCS.

### Footnotes

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**Conflict of Interest:** None declared.

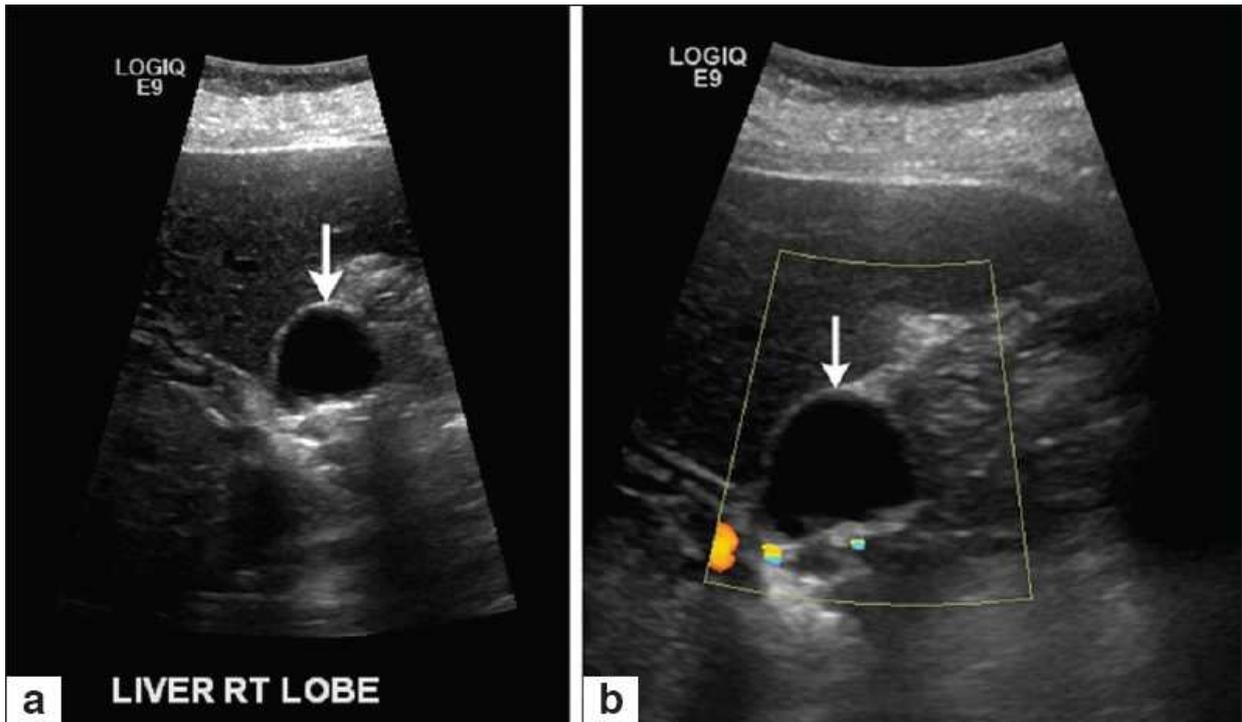
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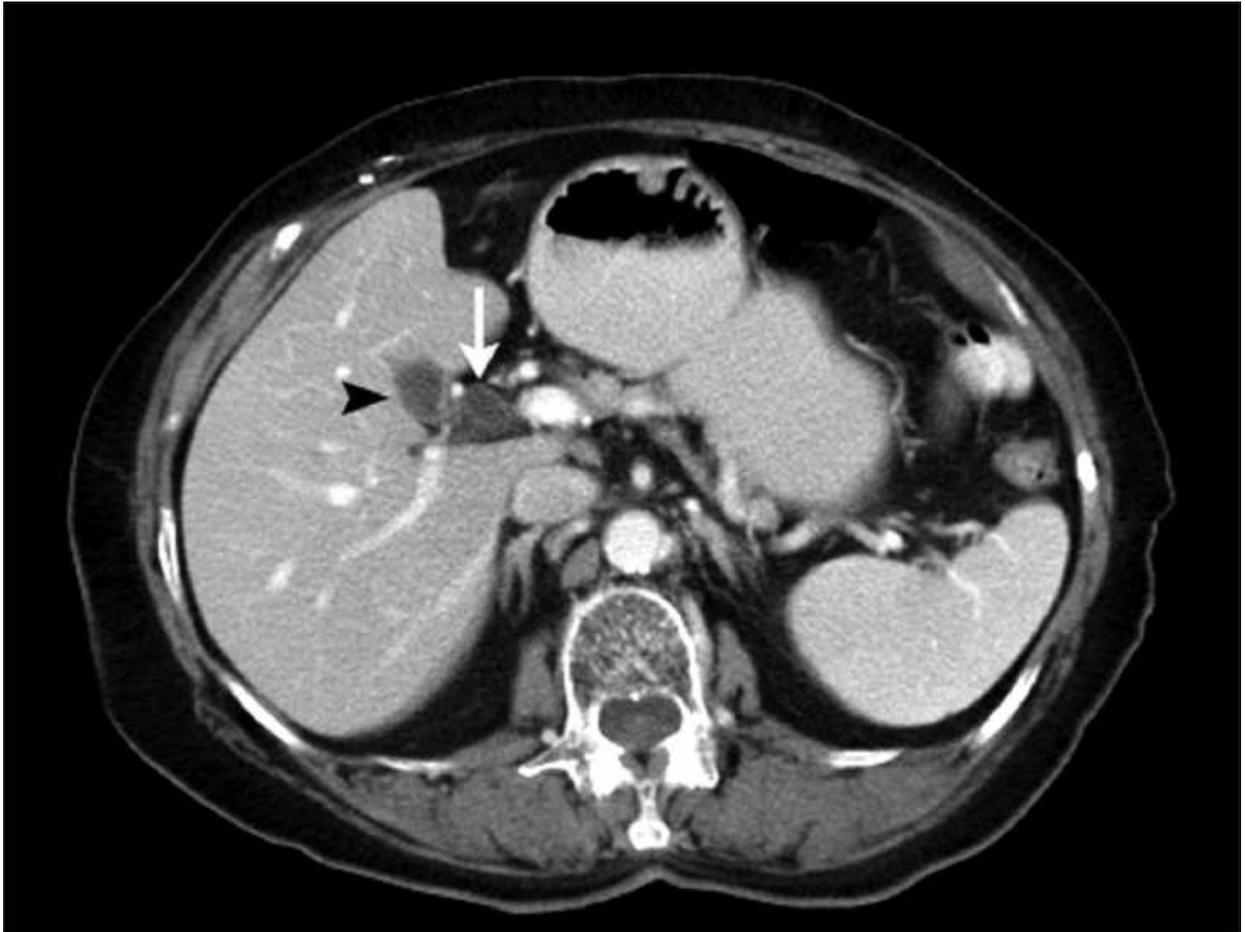
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### Figures and Tables

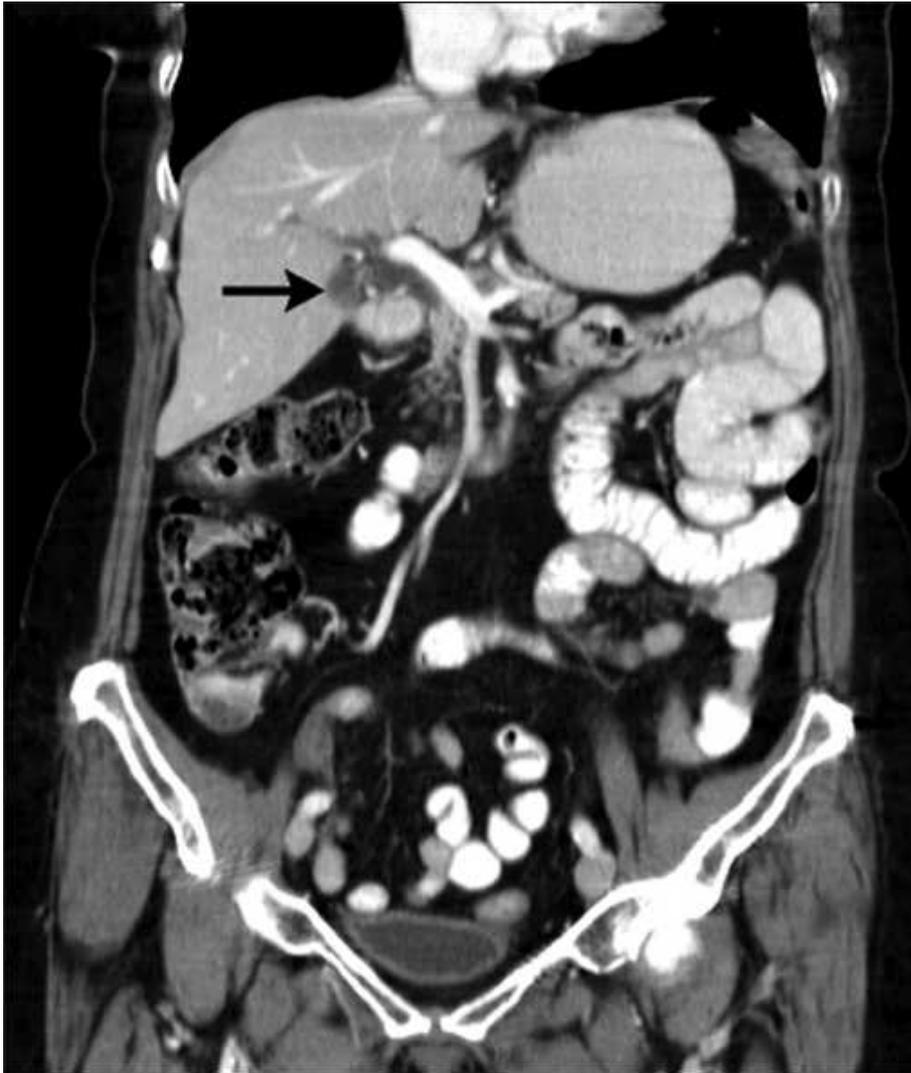
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**Figure 1**

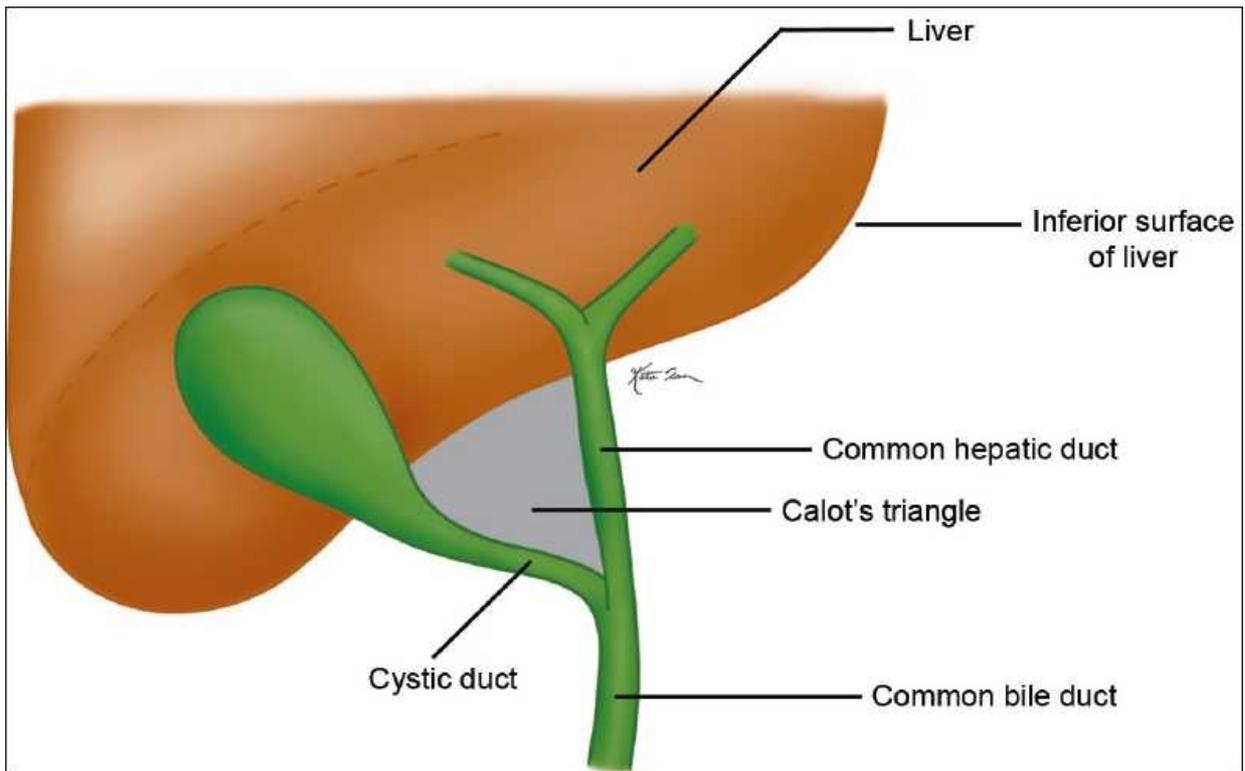
Gray scale ultrasound scan and (b) color Doppler image of the gall bladder fossa following cholecystectomy show a cystic structure with a well-defined echogenic wall indicating the presence of the dilated cystic duct remnant (arrow).

**Figure 2**

Contrast-enhanced computed tomography scan of the abdomen demonstrating the common bile duct (arrow) and the laterally placed dilated cystic duct remnant (arrow head).

**Figure 3**

Computed tomography scan-reformatted coronal image depicts the dilated cystic duct remnant in the gall bladder fossa (arrow).

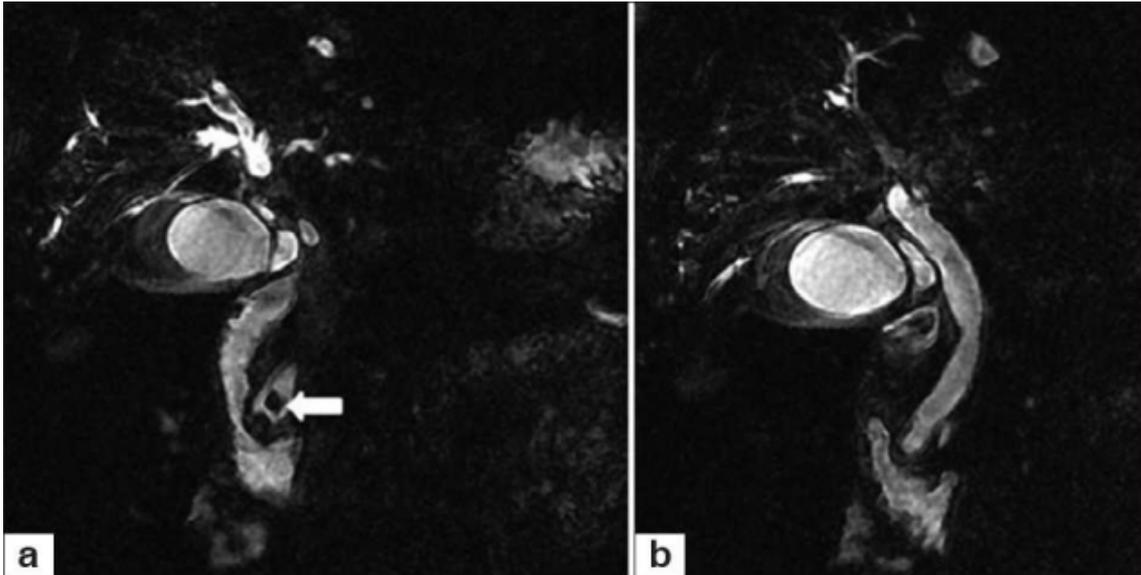
**Figure 4**

Line diagram depicting the triangle of Calot (shaded area). The boundaries are formed medially by the common hepatic duct, laterally by the cystic duct, and superiorly by the inferior margin of the liver.

**Table 1**

Early post-cholecystectomy syndrome:
Retained stones in the cystic duct stump and/or common bile duct
Bile duct injury or ligature during surgery
Bile leakage
Late post-cholecystectomy syndrome:
Recurrent stones in the common bile duct
Bile duct stricture
Cystic duct remnant harboring stone and/or inflammation
Gall bladder remnant harboring stone and/or inflammation
Papillary stenosis
Biliary dyskinesia

Causes of post-cholecystectomy syndrome in relation to their time of presentation

**Figure 5**

Two coronal images of a magnetic resonance cholangiopancreatogram study show (a) a gall stone within the dilated distal common bile duct, shown as a smoothly marginated filling defect (arrow) and (b) the dilated proximal common bile duct.

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