

CASE REPORTS

## The Role of Magnetic Resonance Cholangiopancreatography in Diagnosing Biliary Tract Variants and Anomalies: A Case Report of a Choledochal Cyst

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### Abstract

**Introduction:** Choledochal cysts are rare congenital anomalies of the biliary tree with significant risks of cholangitis, pancreatitis, and malignant transformation if not diagnosed early. Magnetic resonance cholangiopancreatography, a noninvasive, radiation-free technique, offers high-resolution multiplanar imaging of the entire biliary tree. This risk-free technique provides a safe diagnosis and extensive preoperative mapping, without the hazards of ionizing radiation and procedure-related complications, such as pancreatitis, that are commonly associated with other diagnostic techniques.

**Case Report:** A 67-year-old female presented with six months of intermittent right upper quadrant discomfort, some having had episodes of jaundice with pruritus. Laboratory studies were positive for hyperbilirubinemia (3.2 mg/dL) with a cholestatic enzyme pattern (alkaline phosphatase 320 U/L and  $\gamma$ -glutamyl transferase 190 U/L). Abdominal ultrasound revealed gallbladder sludge but was inconclusive for ductal anatomy. Magnetic resonance cholangiopancreatography revealed an extrahepatic bile duct fusiform dilation up to 2.5 cm, consistent with a Todani type Ib choledochal cyst, with no intrahepatic bile duct dilatation or intraductal stones.

**Conclusion:** Magnetic resonance cholangiopancreatography is used for the early identification and description of biliary tract abnormalities, like choledochal cysts. Its non-invasive nature and global ductal mapping with a safety profile maximize surgical planning and potentially anticipate severe complications.

**Keywords:** Magnetic resonance cholangiopancreatography; choledochal cyst; biliary tract anomalies; Todani classification;

### Introduction

Choledochal cysts, a rare congenital dilation of the biliary tract, are a significant medical anomaly, occurring in approximately 1:100,000 to 1:150,000 in Western populations, with a higher incidence reported in Asian

countries. [1, 2]

Choledochal cysts (CC) are a rare congenital cystic dilation of the biliary tract, first described by Vater and Ezler in 1723.[3]

The female-to-male ratio is reported to be between 3:1 and 4:1. [4] They can be associated with biliary atresia or hepatic fibrosis.[5, 6] Although the exact etiology is unknown, anomalous pancreaticobiliary duct union (APBDU) is seen in 30% to 70% of all CC where the common bile duct (CBD) and pancreatic duct junction occurs outside the duodenum, allowing reflux of pancreatic fluid into the biliary tree.[7-10]

The classification system proposed by *Todani et al.* divides these cysts into five major types based on their anatomical location and extent.[11]

Timely diagnosis of choledochal cysts is critical due to the potential risk of severe complications such as cholangitis, pancreatitis, biliary cirrhosis, and even cholangiocarcinoma. [13]

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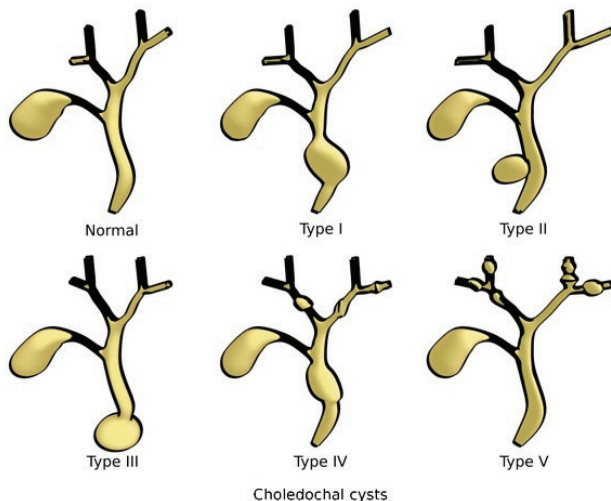


Figure 1. Illustration of bile duct cyst types  
Choledochal cyst types  
(Todani classifications).[12]

Imaging plays an essential role in detection, characterization, and preoperative assessment. While ultrasonography (US) and computed tomography (CT) are often initial modalities, they may not be sufficient to determine the biliary anatomy or the extent of ductal involvement.[14]

While MRCP provides a comprehensive, non-invasive evaluation of the biliary tree and is increasingly recognized as the imaging modality of choice for this purpose, it is important to note that it may not always provide a definitive diagnosis. In some cases, additional imaging or invasive procedures may be necessary for a complete assessment.

This case report aims to underscore the diagnostic value of MRCP in identifying choledochal cysts, illustrated by a case successfully diagnosed in our institution.

### Case Presentation

A 67-year-old female presented to the emergency department with a three-month history of intermittent, colicky right upper quadrant (RUQ) abdominal pain accompanied by nausea and persistent pruritus. Over the week preceding her visit, she denied experiencing fever, weight loss, or diarrhea. The chronicity and episodic nature of her symptoms prompted further evaluation for an underlying hepatobiliary disorder.

**Medical and Surgical History:** The patient had no known prior history of biliary disease or cholelithiasis. She had not undergone any previous abdominal surgeries and did not report a history of similar symptoms, aside from occasional, brief episodes of RUQ discomfort in the past. Her medication history was unremarkable, and she was not on any long-term hepatotoxic medications.

**Physical Examination:** Upon examination, the patient appeared mildly distressed due to her discomfort. Her vital signs were stable. Abdominal palpation revealed tenderness localized to the RUQ. Notably, a palpable, non-mobile mass

was felt near the liver edge, and hepatomegaly was evident. There were no signs of peritoneal irritation, such as rebound tenderness, and there were no stigmata suggestive of chronic liver disease on general inspection.

**Laboratory Investigations:** Initial laboratory workup revealed a cholestatic pattern. Total bilirubin was elevated at 2.1 mg/dL, with a direct (conjugated) bilirubin of 1.6 mg/dL. Liver enzymes were deranged, with an alkaline phosphatase (ALP) level of 280 U/L and gamma-glutamyl transferase (GGT) at 190 U/L. Mild elevations in transaminases were also noted. Additionally, the patient demonstrated leukocytosis with a white blood cell count of 15,000/mm<sup>3</sup>, suggesting an ongoing inflammatory process.

**Initial Imaging:** An abdominal ultrasound was performed as the primary imaging modality. The study did not show dilation of the intrahepatic bile ducts; however, it identified a cystic lesion situated near the porta hepatis. The ultrasound was unable to determine the origin of the lesion definitively or to ascertain whether it communicated with the biliary tree. Furthermore, the gallbladder appeared markedly distended with a thickened wall and contained intraluminal sludge, findings that raised the possibility of chronic inflammation.

**Advanced Imaging with MRCP:** Owing to the inconclusive ultrasound findings, Magnetic Resonance Cholangiopancreatography (MRCP) was crucially performed. This advanced, non-invasive imaging technique provided high-resolution visualization of the biliary anatomy, which was instrumental in revealing the choledochal cyst. MRCP revealed a well-circumscribed cystic dilation of the common bile duct, consistent with a Type I Todani choledochal cyst. (Fig. 2, 3)

There was no evidence of intrahepatic ductal involvement, no signs of malignant transformation, and, importantly, no pancreaticobiliary maljunction was identified.

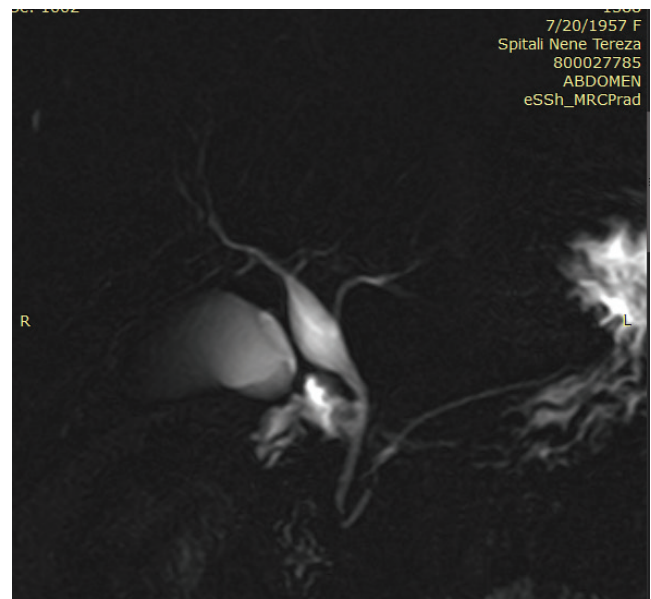


Figure 2: MRCP sequence that shows focal dilatation of common biliary duct.

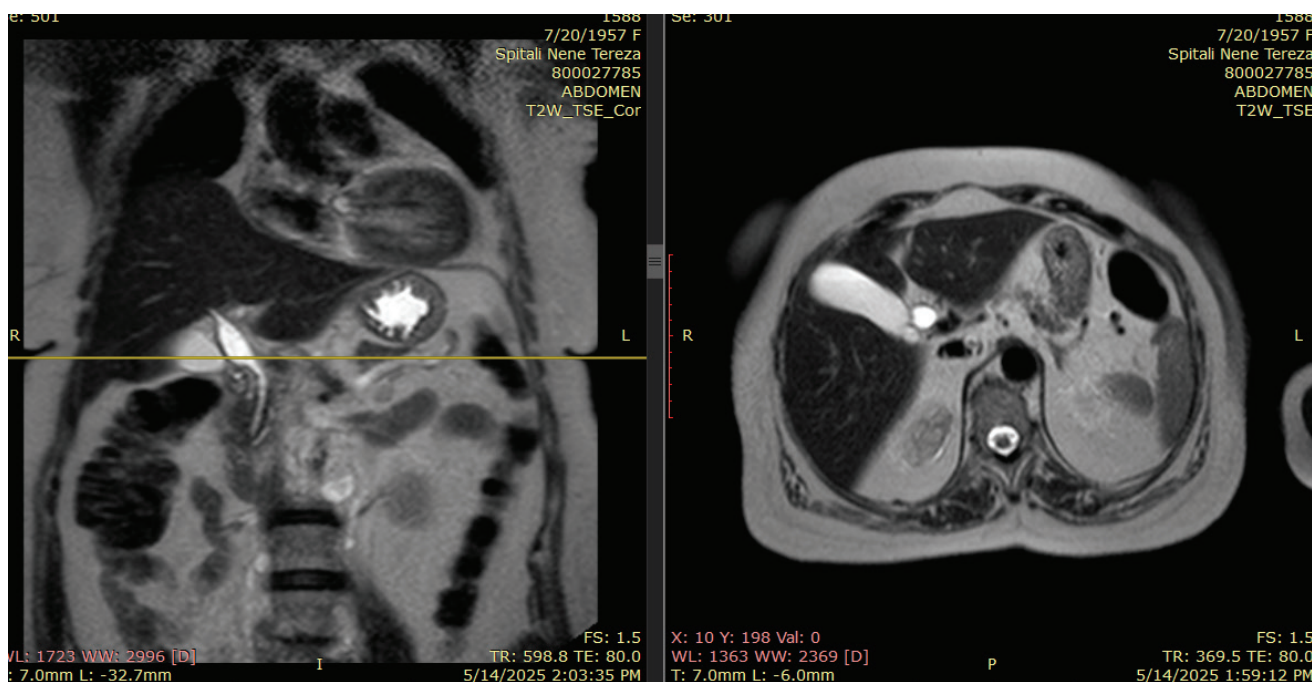


Figure 3: T2 sequence that shows dilatation of common biliary duct and gallbladder sludge.

## Discussion

Choledochal cysts, although rare congenital anomalies, demand precise preoperative diagnosis to prevent severe complications such as cholangitis, pancreatitis, and, ultimately, malignant transformation. [5]

Early detection of choledochal cysts is pivotal as it not only guides surgical planning but also significantly reduces morbidity and enhances long-term prognosis—a concept supported by numerous studies emphasizing the importance of timely intervention in biliary disorders. [16]

Magnetic Resonance Cholangiopancreatography (MRCP) has revolutionized the evaluation of hepatobiliary pathology due to its non-invasive nature, absence of contrast injection, and superior spatial resolution for visualizing the biliary and pancreatic ducts. [17]

In the present case, MRCP played a crucial role in confirming the diagnosis of a choledochal cyst while effectively ruling out the presence of an associated pancreaticobiliary maljunction or intrahepatic ductal disease.

These findings resonate with several reports in the literature that underscore MRCP's high diagnostic accuracy in delineating biliary anatomy and characterizing cystic lesions [16, 17]

When compared to conventional imaging modalities, such as ultrasonography (US) and computed tomography (CT), MRCP offers distinct advantages. [18]

The US is often limited by operator dependency and suboptimal penetration in patients with complicated anatomy. At the same time, CT, although useful, may expose patients to ionizing radiation and sometimes fails to define the intricate architecture of the biliary tree clearly. [18]

Consequently, MRCP is increasingly recognized as the modality of choice for evaluating suspected biliary tract anomalies, thereby reducing the need for invasive procedures such as endoscopic retrograde cholangiopancreatography (ERCP) unless therapeutic intervention is indicated. [17, 18]

It is essential to recognize that MRCP has certain limitations—most notably, its reduced sensitivity in detecting small stones or subtle strictures. [17]

However, these drawbacks were not significant in the current case, where the primary concern was the clear identification of a choledochal cyst.

Surgical excision remains the gold standard treatment for such cysts, and early management is associated with a favorable prognosis. [19]

Thus, our findings, in line with published literature, support the routine use of MRCP in the diagnostic algorithm for biliary anomalies to optimize patient outcomes. [20]

Limitations include reduced sensitivity for small stones or strictures, but these were not pertinent in our case.

## Conclusion:

This case highlights the crucial role of MRCP in accurately diagnosing choledochal cysts. The accurate imaging provided by MRCP is not only required for diagnosis but also optimal surgical planning, potentially preventing serious complications such as cholangitis and biliary malignancy.

## Declarations

**Consent for Publication:** Written informed consent was obtained from the patient for publication of this case report and accompanying images.

**Conflict of Interest:** The authors declare no conflicts of interest.

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### Abbreviations

APBDU - Anomalous Pancreaticobiliary Duct Union; BA - Biliary Atresia; CBA - Cystic Biliary Atresia; CBD - Common Bile Duct; CC - Choledochal Cyst; CHD - Common Hepatic Duct; MRCP - Magnetic Resonance Cholangiopancreatography; OLT - Orthotopic Liver Transplant; RYHJ - Roux en Y Hepaticojejunostomy

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