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Case Report

Choledochal Cyst Type Three Diagnostic and Management Approach

Ali Hassan Abdulla[1], Ahmed Jaber[2], Rola Mahmood[3], Jawad Khamis[4] and Yusuf Barhoom[5]*

[1]MBBS General Surgery, Senior Resident at Salmaniya Medical Complex, Kingdom of Bahrain

[2]MBBS General Surgery, Junior Resident at Governmental Hospitals/Salmaniya Medical Complex, Kingdom of Bahrain

[3]Consultant Radiologist at Governmental Hospitals/Salmaniya Medical Complex, Kingdom of Bahrain

[4]Gastroenterology and Hepatology Consultant at Governmental Hospitals/ Salmaniya Medical Complex Kingdom of Bahrain

[5]MD, CABS, MSc, MS Transplant, FEBS (Transplantation Surgery), FSSO, FACS General Surgery and HBP Surgeon at Governmental Hospitals/Salmaniya Medical Complex, Kingdom of Bahrain

***Corresponding Author:** Yusuf Barhoom, MD, CABS, MSc, MS Transplant, FEBS (Transplantation Surgery), FSSO, FACS General Surgery and HBP Surgeon at Governmental Hospitals/Salmaniya Medical Complex, Kingdom of Bahrain.

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Abstract

Choledochal cysts are biliary tree congenital cysts that could be extrahepatic or intrahepatic and have premalignancy potential depending on their type and pathophysiological consequences. Though usually asymptomatic, patients may present with palpable masses or cholestasis-related symptoms. The therapeutic intervention depends on the cyst type.

We present a rare case of type three, Todani classification, choledochal cyst in a 26-year-old male patient who presented with acute on top of chronic pancreatitis. The aim is to present rare case therapeutic approaches based on the current literature.

Acute obstruction-related cystic dilatation impacts the decision on the best therapeutic approach for such patients, and hepatobiliary surgery experts' elaboration and longer follow-up are needed.

Core Tip: Malignant transformation assessment is an essential element in the type three choledochal cyst management plan, as there is no guideline that facilitates the selection of the best therapeutic intervention.

Keywords: Choledochal Cysts (CCs); Gallbladder

Introduction

The overall incidence of choledochal cysts is 1 in 100,000-150,000 in the Western population and 1 in 1,000 in the Asian population. Type 1 and 4 occur more commonly in females. Choledochal cysts (CCs) are rare congenital dilatations of the extra-hepatic and intrahepatic biliary tree without acute obstruction [1,2] but have significant morbidity [3].

The association between CCs and pancreatitis is well-established and is attributed to the reflux of pancreatic secretion and its inflammatory consequences [5,8,9]. Here, we present a case of pancreatitis secondary to a choledochocele in a young male patient. By presenting the case, we aim to draw clinicians' attention to this rare condition, discussing possible therapeutic approaches based on the current literature.

Case

A 26-year-old previously healthy Ugandan male, not known to have any chronic medical illnesses, was referred to our emergency department on March 2024 with an acute pancreatitis diagnosis based on high serum lipase of (1070 U/L). Referral ultrasound showed a bulky pancreas, suggesting acute pancreatitis, mild peripancreatic fluid, distal common bile duct dilatation of 0.9mm, and a distended gallbladder with no cholelithiasis or cholecystitis.

The patient presented with abdominal pain that lasted for two days in the epigastric region, radiating to the back, and associated with nausea and vomiting. The patient reported dark urine, denying changes in bowel habits or fever. Vitally, the patient had a pulse of 109 beats per minute, blood pressure of 132/89 mmHg, temperature of 37.2, respiratory rate of 22, and oxygen saturation of 99% on room air. On examination, the patient had scleral icterus. Abdominal examination was unremarkable except for epigastric tenderness. Table 1 demonstrates the laboratory findings during emergency attendance.

Lab parameter	Value	Unit	Normal Range
White Blood Cells	15.15	$x10^9$/L	3.6 - 9.6
Hemoglobin	17.40	$x10^{12/L}$	12.0 - 14.5
Platelets	183	$x10^9$/L	150.0 - 400.0
Amylase (serum)	365	U/L	30 - 118
Amylase (urine)	7331	U/L	≤ 650
Glucose (random)	7.0	mmol/L	3.6 - 8.9
Urea	4.0	mmol/L	3.2 - 8.2
Creatinine	70.00	µmol/L	65 - 104
Albumin	39	g/L	35 - 52
Bilirubin (total)	107	µmol/L	5 - 21
Bilirubin (direct)	80	µmol/L	≤ 5
Bilirubin (indirect)	26.9	µmol/L	≤ 18
Alkaline phosphatase	87	U/L	56 - 116
Alanine Aminotransferase	79	U/L	≤ 41
G-Glutamyl Transferase	167	U/L	≤ 73
Protein (total)	68	g/L	57 - 82
Globulin	29	g/L	15 - 30

Table 1: Emergency Laboratory Findings with reference values.

In 2020, he was admitted with acute non-complicated interstitial pancreatitis documented on abdominal CT. 2020 CT scan showed a cystic structure arising from the common bile and thesecond part of the duodenum compatible with choledochal cyst type 3. After the management of acute pancreatitis, there was no clear documentation of a choledochal cyst management plan, and the patient missed follow-up during the COVID-19 pandemic.

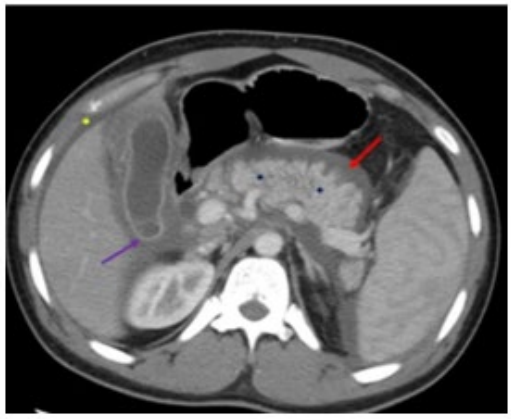

Figure 1

Axial IV enhanced CT abdomen at the level of the pancreas, depicting acute interstitial pancreatitis: characterized by peri-pancreatic edema (red arrow), with diffuse parenchymal enlargement (blue asterisk), with no necrosis, abscess formation or calcifications. Reactive changes with peri-cystic fluid (purple arrow) and perihepatic fluid collection (yellow asterisk).

Axial (A-B) and Coronal (C), sagittal (D) IV enhanced CT abdomen images at the level of the 2nd part of the duodenum

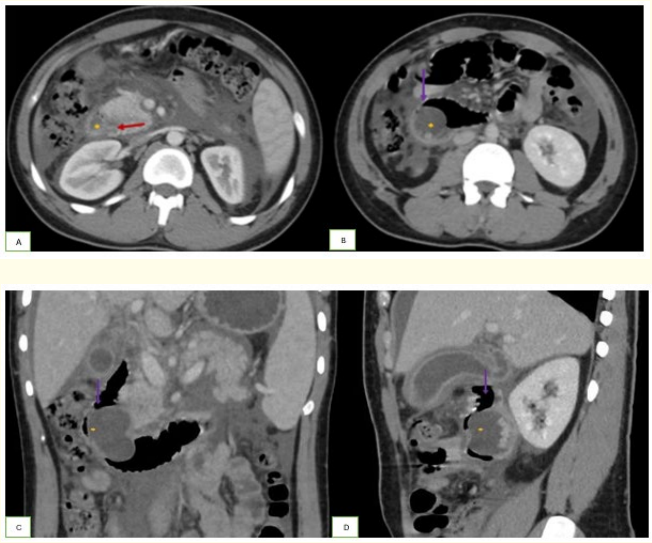

Figure 2

showing a cystic structure (yellow asterisk) arising from the common bile duct (red arrow) and the 2nd part of the duodenum (purple arrow), compatible with Choledochal cyst type 3.

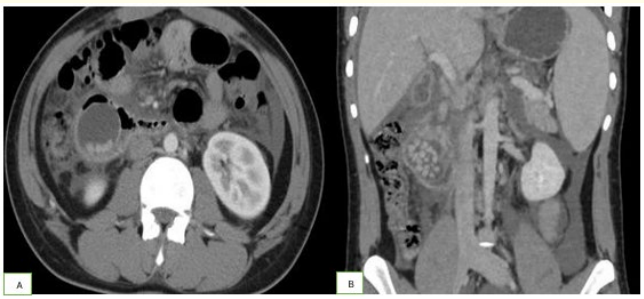

Figure 3

Axial (A) and Coronal (B), IV enhanced CT abdomen images at the level of the 2nd part of the duodenum , showing a cystic structure compatible with Choledochal cyst type 3 with multiple stones impacted inside the cyst.

2024 admission abdominal CT scan reported distal common bile duct (CBD) choledochal cyst with total intraluminal extension in the second part of the duodenum, not protruding from the duodenum, containing multiple calculi and air pockets and measuring 55 x 48 mm compared to 2020 abdominal CT scan measurement of 43 x 39 x 60 mm (AP x ML x CC). There is fat stranding with mass effect and reactionary fluid suggestive of reactive duodenitis.The CBD was 10mm with intrahepatic biliary dilatation and wall enhancement, suggesting underlying cholangitis. There was minimal bilateral pleural effusion and collapse consolidation.

On day three, endoscopic retrograde cholangiopancreatography (ERCP) documented a cystic lesion arising from the ampulla of Vater. After cannulation of the ampulla of Vater, sphincterotomy was done to facilitate the extraction of multiple stones. A plastic stent was inserted uneventfully. The plan is to replace the stent in two weeks. After ERCP, the patient's total bilirubin decreased to 17 (from 107), and his abdominal pain improved.

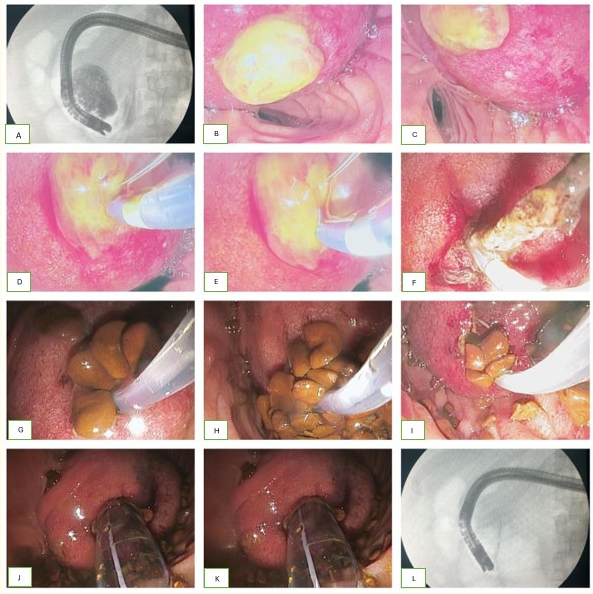

Figure 4 :

A) Cholangiography showing a cystic lesion with multiple stones impacted within the cyst.

B) And C) Image from ERCP demonstrate a large regular soft mass at the ampulla.

D) Cannulation of the ampulla of Vater.

E) Sphincterotomy was done to facilitate the extraction of multiple stones.

G), H) and I) multiple stones were extracted from the cyst.

J) And K) Balloon dilation done for the Ampulla Of Vater.

Discussion

Todani classification, a modified Alonso-Lej., *et al*. classification [5,18], is the widely used choledochal cysts classification system. The five types of the classification are based on the location of the cyst and related duct dilatation [19]. The differences concerning age, sex, complications, and even management between type III CCs and other subtypes have led someto conclude that choledochoceles should not be included in the classification of CCs [21].

CCs are considered rare anomalies with an incidence of 1 in 100,000 – 150,000 in the western population [5,10]. The reported incidence is higher in the Asian population, especially inJapan, reaching 1 in 1,000 [5,11]. The incidence is much lower in the African population, with only three documented cases over 18 years, as reported by Akinyinka., *et al*. from Nigeria [12-14]. A remarkable female predominance has been outlined in the existing literature ranging from 3:1 to 8:1 [5,8,12-15]. Interestingly, our patient is an African male.

Type III CC, choledochocele, is considered the rarest variant, with an overall incidence of 1.4-4.5% [4,5,19,20]. It represents a cystic dilatation in the distal part of the common bile duct (CBD) with a bulge in the duodenum. Radiological findings may overlap with duodenal duplication, for which some authors removed type three CC from CC classification as a single entity [6,7]. The question regarding the development of type III CCs remains unanswered, as the lining of these choledochoceles can be formed by either biliary or duodenal epithelium [6-8]. Lobeck., *et al*. reported in their literature review that the type of endothelium plays a significant role in the decision-making process in managing type three choledochal cysts, giving literature evidence for biliary epithelium as a risk factor for malignant transformation [16]. Choledochal epithelium biopsy was not done but planned in follow-up ERCP sessions.

The etiology of CCs remains unclear and is a subject of ongoing debate in the literature [5,8,16,17]. The "pancreaticoduodenal maljunction" and the "congenital stenosis of bile ducts" stand out as the most likely theories of the pathogenesis of CCs [8,16,17]. The pancreaticoduodenal maljunctions hypothesis, known as Babbitt's hypothesis, proposes an anomalous pancreaticobiliary duct junction (APCDJ) to explain CCs [5,8,17]. According to this explanation, joining the bile and pancreatic duct approximately 1-2 cm outside the duodenal wall leads to the sphincter of Oddi's failure, which leads to the regurgitation of the bile and pancreatic secretion [5,8,17]. The pancreatic enzymes get activated, intraductal pressure increases and chronic inflammation occurs. Eventually, it results in the bile duct dilatation [5,17]. Although this theory is backed up by findings of high amylase and trypsinogen in CCs bile, two other facts challenged this theory: the fact that APBDJ is present in only 50-80% of CC cases and the fact that CCs are sometimes detected antenatally knowing that neonatal pancreatic acini do not secrete pancreatic enzymes [5]. The other explanation is the congenital stenosis of bile duct theory, which proposes a reduced number of neurons and ganglions in the CBD, which leads to decreased and dysregulated contraction that results in increased proximal CBD pressure, resulting in CBD distension, and eventually CBD dilatation, first in the extrahepatic segment and then in the intrahepatic segment in the same manner as Hirschsprung's disease and achalasia [5,8,17].

The presentation of choledochal cysts has been found to differ depending on the age group [22]. In the pediatric population, the usual triad of symptoms includes painful abdominal mass, obstructive jaundice, and acholic stool [21]. While in adults, as a result of obstruction or ABPDU, the usual presentation is pancreatitis, cholangitis, and even portal hypertension [17,22]. Two factors play the most significant role in developing acute pancreatitis in CCs, one being the formation of CBD stones. The other is the formation of a protein plug in the pancreatic duct secondary to chronic inflammation, albumin-rich exudate, and mucin-rich secretions, all of which disrupt the normal flow of bile and pancreatic juices and lead to enzyme activation and subsequently to the development of pancreatitis [5,22]. The reported patient, in our case report, passed many stones after sphincterotomy during the ERCP session.

CCs are considered pre-malignant conditions, with malignant transformation incidence of 30% in adults with CC [23] which is 1000-2000 times higher than general population [8]. Cholangiocarcinoma occurs in 70.4% of cancers in patients with CCs, followed by pancreatic and gallbladder cancers [8]. The exact cause of cancer in CC patients is not entirely clear.

However, several factors have been proven to play an important role. The risk of malignancy was found to increase with age [1,8,23-

25], up to 40% in patients over 50 [8,26]. In young patients, the incidence of cancer is low [25] up to zero in younger than 30 years as reported by Nicholl., *et al*. [24] In our case report, the reported patient is 26 years old, which keeps our patient's CC at alow risk for malignant transformation.

The reported CCs cases in families as well as the association of CCs with some diseases such as familial adenomatous polyposis (FAP) and both autosomal dominant and autosomal recessive polycystic kidney disease (PKD) have led Ye., *et al*. to investigate the genetic contribution for CCs [8]. In their study, they were able to identify five chromosomal anomalies that were associated with CCs. Remarkably, the only subtype of CCs for which no chromosomal anomaly was identified is type III [8], which is the case scenario in this case report.

In their work about genomics and transcriptomics of the pathogenesis of CCs, Ye., *et al*. were able to identify several gene mutations such as TP53, RBM10, and KRAS, that are seen in patients with CCs, which could be what induces malignant transformation in these patients [8]. Another interesting explanation for the development of cancer is a hyperplasia-dysplasia- carcinoma sequence [1,25-28]. Similar to what happens in Barrett's esophagus, it is believed that prolonged reflux of bile and pancreatic secretions irritates biliary epithelium, which, with time, results in dysplasia, followed by metaplasia and malignant transformation [1,25-28]. This might explain why Types 1 and IV, which present as APBDJ -thus have high reflux- have the highest risk of malignancy, compared to types II and III, which do not have APBDJ, thus having very low to no reflux, and happen to have the lowest risk of malignancy,[1] whichis the case scenario in this case report.

Another well-established risk for malignant transformation is the type of management of CCs,whether undergoing drainage or complete cyst excision [1]. In our case report of type 3 CC, the patient had two reported presentations with cholangitis vs. pancreatitis over four years, which may be considered a malignant transformation risk based on hyperplasia-dysplasia-carcinoma sequence principles. Such an assumption questioned the strategic approach toward drainage vs complete cyst excision. As stated above, the malignant transformation risk that warrants complete cyst excision is mainly for types I and IV CC, even in asymptomatic patients, whichis not in our case scenario. Furthermore, Lobeck., *et al*. reported in their literature review that a cyst size of more than 3 cm plays a significant role in the decision-making process in managing type three choledochal cysts, giving literature evidence that cyst size is a risk factorfor malignant transformation [16]. However, considering trans-duodenal excision vs Whipple procedure and the possible need for hepaticojejunostomy keeps the patient at higher postoperative complications in terms of being a more complex procedure [1]. Also, the cyst size may be related to the current biliary obstruction due to stone impaction. Accordingly, cyst wall excision may be considered based on follow-up epithelium biopsy during ERCP stent change once the histopathology report is evident for biliary epithelium. Reporting intestinal epithelium supports the decision for long-term surveillance for malignant transformation.

Conclusion

Although Type 3 CC total intraluminal extension not protruding from the duodenum is a very rare entity, combined with our case and cases reported in the literature, the complexity of the strategic management plan is a cause for concern. To our knowledge, there is no well-written guideline or documented agreement. Careful risk factors assessment for malignant transformation is a favorable approach in such a dilemma, giving the patient the chance of a minimally invasive procedure, though the patient has longstanding obstruction and inflammatory process in a cyst size more than 3 cm, most likely due to mechanical obstruction. Long-term surveillance for malignant transformation is mandatory in such cases.

Bibliography

1. Ten Hove A., *et al*. "Meta-analysis of risk of developing malignancy in congenital choledochal malformation". *British Journal of Surgery* 105.5 (2018): 482-490.

2. Makin E and Davenport M. "Understanding choledochal malformation". *Archives of Disease Child* 97.1 (2012): 69-72.

3. Dhupar R., *et al*. "The changing presentation of choledochal cyst disease: an incidental diagnosis". *HPB Surgery* 2009 (2009): 103739.

4. Wu GZ., *et al*. "Diagnosis and minimally invasive treatment of type III choledochal cysts". *BMC Surgery* 22.1 (2022): 272.

5. Bhavsar MS., *et al*. "Choledochal cysts : a review of literature". *Saudi Journal of Gastroenterology* 18.4 (2012): 230-236.

6. Gorenstein L., *et al*. "Etiology of choledochal cysts: two instructive cases". *Canadian Journal of Surgery* 28.4 (1985): 363-367.

7. Ziegler KM., *et al*. "Choledochoceles: are they choledochal cysts?" *Annals of Surgery* 252.4 (2010): 683-690.

8. Ye Y., *et al*. "Pathogenesis of Choledochal Cyst: Insights from Genomics and Transcriptomics". *Genes (Basel)* 13.6 (2022): 1030.

9. Kaye E., *et al*. "Choledochocele Presenting as Recurrent Pancreatitis". *Radiology Case Report* 3.3 (2015): 174.

10. Gigot J., *et al*. "Bile duct cysts: A changing spectrum of disease". *Journal of Hepato-Biliary-Pancreatic Surgery* 3 (1996): 405-411.

11. O'Neill JA Jr. "Choledochal cyst". *Current Problems in Surgery* 29.6 (1992): 361-410.

12. Akinyinka OO., *et al*. "Choledochal cysts in African infants: a report of 3 cases and a review of the literature". *Tropical Gastroenterology* 26.1 (2005): 34-36.

13. Sikhondze MM., *et al*. "Giant Choledochal Cyst in an Adult at a Teaching Hospital in South- Western Uganda: A Case Report". *International Medical Case Reports Journal* 14 (2021): 789-795.

14. Baison GN., *et al*. "Choledochal cysts: Similarities and differences between Asian and Western countries. *World Journal of Gastroenterology* 25.26 (2019): 3334-3343.

15. Jang SM., *et al*. "Clinical comparison of choledochal cysts between children and adults". *Korean Journal of Hepato-Biliary-Pancreatic Surgery* 15.3 (2011): 157-163.

16. Lobeck IN., *et al*. "The presentation and management of choledochocele (type III choledochal cyst): A 40-year systematic review of the literature". *Journal of Pediatric Surgery* 52.4 (2017): 644-649.

17. Machado NO., *et al*. "Choledochal Cyst in Adults: Etiopathogenesis, Presentation, Management, and Outcome-Case Series and Review". *Gastroenterology Research and Practice* 2015 (2015): 602591.

18. Hoilat GJ and John S. "Choledochal Cyst". 2023 Aug 28. In: StatPearls. Treasure Island (FL): StatPearls Publishing (2023).

19. Dumitrascu T., *et al*. "The Todani classification for bile duct cysts: an overview". *Acta Chirurgica Belgica* 112.5 (2012): 340-345.

20. Miron A., *et al*. "The Curious Case of the Choledochal Cyst-Revisiting the Todani Classification: Case Report and Review of the Literature". *Diagnostics (Basel)* 13.6 (2023): 1059.

21. Ziegler KM., *et al*. "Choledochoceles: are they choledochal cysts?" *Annals of Surgery* 252.4 (2010): 683-690.

22. Soares KC., *et al*. "Choledochal cysts: presentation, clinical differentiation, and management". *Journal of the American College of Surgeons* 219.6 (2014): 1167-1180.

23. Madadi-Sanjani O., *et al*. "Choledochal Cyst and Malignancy: A Plea for Lifelong Follow-Up". *European Journal of Pediatric Surgery* 29.2 (2019): 143-149.

24. Nicholl M., *et al*. "Choledochal cysts in western adults: complexities compared to children". *Journal of Gastrointestinal Surgery* 8.3 (2004): 245-252.

25. Ng DW., *et al*. "Metachronous cholangiocarcinoma 13 years post resection of choledochal cyst-is long-term follow-up useful?: a case study and review of the literature". *Surgery Case Report* 2.1 (2016): 60.

26. Søreide K and Søreide JA. "Bile duct cyst as precursor to biliary tract cancer". *Annals of Surgical Oncology* 14.3 (2007): 1200-1211.

27. Imazu M., *et al*. "Factors of biliary carcinogenesis in choledochal cysts". *European Journal of Pediatric Surgery* 11.1 (2001): 24-27.

28. Søreide K and Søreide JA. "Bile duct cyst as precursor to biliary tract cancer". *Annals of Surgical Oncology* 14.3 (2007): 1200-1211.