CASE REPORT

Double common hepatic duct: A rare anatomical variant

M J S Jayarathna, H A Amaratunga

Department of Anatomy, Faculty of Medicine, University of Peradeniya, Sri Lanka

Abstract

Duplication of the extrahepatic biliary tract is rare and may complicate procedures involving the biliary tract while increasing the chance of iatrogenic injuries. The anomaly is thought to have an embryological origin involving the recanalization process of the biliary tract and the rapid proliferation and remodeling process of the hepatic hilum. several classification systems have been described to express the cases with duplicated extrahepatic biliary tract, although the true duplication of common hepatic duct is extremely rare. We report a case of duplicated common hepatic duct in an adult Sri Lankan female cadaver. Proximally, there is a communicating channel that connects the right and left hepatic ducts. The common hepatic duct arises from this communicating channel, and then divided into two ducts, only to join back just before draining the gallbladder. The extrahepatic biliary system drains into the duodenum by a single common bile duct. Knowledge of such anomalies is important to prevent surgical complications as well as to increase diagnostic accuracy in imaging studies.

Keywords: Double common hepatic duct, Double common bile duct, Extrahepatic biliary tract duplication, Bile duct variation

DOI: https://doi.org/10.4038/slaj.v9i2.281

Sri Lanka Anatomy Journal 2025; 9(II): 112–119

Corresponding author

MJS Jayarathna
E-mail: jayamini.jayarathna@med.pdn.ac.lk
https://orcid.org/0000-0002-4716-290x

Introduction

Duplication of the extrahepatic biliary tract is a rare phenomenon among biliary tract variations, first described by Andreas Vesalius in 1543, and finding such an anomaly would come as a surprise to an attending surgeon (1, 2). The knowledge of normal anatomy of the biliary tract, as well as this rare anomaly, is critically important in clinical practice to avoid making mistakes. So far, around ten variations of duplication of the extrahepatic biliary tract have been described and were incorporated into different classification systems by several authors (3, 4).

Such anomalies are commonly recognized as a duplicated or double common bile duct (DCBD). In such cases, two common bile ducts (CBD) are present, from which one drains to the duodenum as usual, and the other drains into different parts of the gastrointestinal tract. The anomaly is reported to show female predominance (5, 6). However, when we review the existing literature, it is evident that this term of DCBD is used even when the duct starts to duplicate at the hepatic hilum and continues throughout the course up to the duodenum, irrespective of the site of insertion of the cystic duct (CD). Although duplications of the extrahepatic biliary tract are reported, true duplication of the CHD itself is exceedingly rare and poorly represented in existing classifications.

Here, we report a rare case of double common hepatic duct (DCHD) in a Sri Lankan adult female cadaver, which has previously only been reported once.

Case report

During a research project involving the biliary tract at the Department of Anatomy, Faculty of Medicine, University of Peradeniya, a rare variant of DCHD was observed in a 79-year-old adult Sri Lankan female cadaver of Sinhalese ethnic origin.

No surgical scars were observed on the abdomen before dissection, and no evidence of biliary surgery was seen. The liver had a small Ridel's lobe, and the gallbladder (GB) had a mesentery. Other than that, the intrahepatic and extrahepatic biliary systems, biliary blood supply, and intestines were normal in gross appearance.

The right anterior and posterior hepatic ducts joined to form the right hepatic duct (RHD). RHD and left hepatic duct (LHD) joined at the porta hepatis by a communicating duct, which was 3.03 mm wide, to form the common hepatic duct (CHD). The two CHDs, which were almost equal in size (CHD –1 and CHD - 2), ran 14 – 15 mm downwards and then joined to become one duct. Just after this union, the CD was seen to connect with it to form the CBD. The angle of CD with CHD was almost 90 degrees (Figure 1). The CBD was seen to run downward and then to enter the second part of the duodenum. The right hepatic artery was seen running posterior to the union of the two CHDs and then seen to give off the cystic artery. Table 1 summarizes the morphometric data of the ducts.

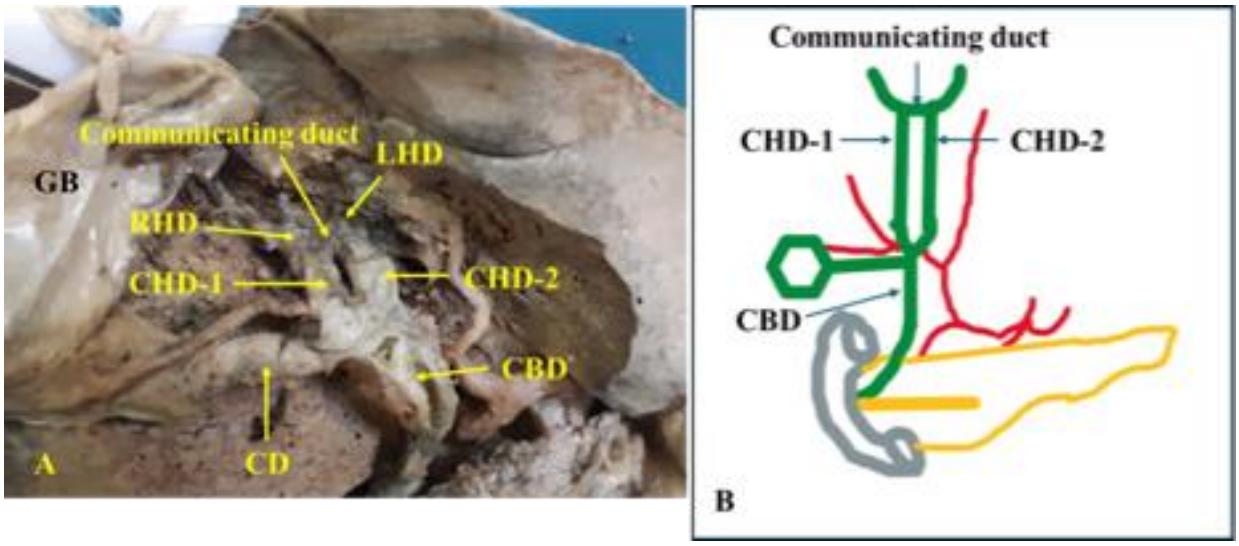

Figure 1: Duplicated common hepatic duct: A – Real cadaveric specimen, B – Schematic diagram depicting the anatomy (RHD: Right hepatic duct, LHD: Left hepatic duct, CHD – 1: first common hepatic duct, CHD – 2: second common hepatic duct, CBD: common bile duct, CD – cystic duct)

Table 1: Duct morphometry

Duct	Diameter	Length
RHD	5.32	7.44
LHD	4.44	4.84
Communicating duct	3.03	
CHD-1	4.54	14.07
CHD-2	5.18	15.10
CBD	6.22	55.10

*All measurements are in millimeters (mm)
(RHD – Right hepatic duct, LHD – Left hepatic duct, CHD – Common hepatic duct, CBD – Common bile duct)

A rare variation like the reported case can have several clinical implications if the patient was subjected to surgical procedures during life. It can be the cause of bile duct injury during a laparoscopic cholecystectomy due to misidentification for CD (1), complicate pancreatic surgeries, entering into the wrong duct during endoscopic retrograde cholangiopancreatography (ERCP) exploration of biliary stones (6), multiple anastomotic sites during hepatic resection leading to biliary leaks, and sudden alteration of surgical plan.

Discussion

Normal anatomy of the hepatobiliary system

The common hepatic duct (CHD) is a part of the extrahepatic biliary tract that is formed by the combination of the right and left hepatic ducts (RHD and LHD) at the porta hepatis. It runs in the free margin of the lesser omentum together with the portal vein and the proper hepatic artery. During its descent, it is joined by the cystic duct (CD) on its right side and becomes the common bile duct (CBD). Here, the CHD lies on the right side of the proper hepatic artery and anterior to the portal vein (7, 8). The length of the CHD ranges from 10 to 40 mm and CHD diameter ranges from 4 to 8 mm (9, 10, 11).

Development of the hepatobiliary system

The hepatobiliary system begins to develop in the 3rd week of intrauterine life (IUL), as an endodermal diverticulum of the distal foregut, known as the hepatic diverticulum or liver bud (12, 13, 14). The liver and hepatic ducts develop from the cranial end of the hepatic diverticulum, while the GB, CD, and CBD, right and left ventral pancreatic buds develop from the caudal bud (14, 15, 16). The rapidly proliferating hepatic diverticulum invades the septum transversum, narrowing and elongating the connection between the developing liver and foregut, eventually forming the bile duct (12, 14). By the 5th week of IUL, the CHD is funnel-shaped and undergoes rapid remodeling and proliferation to give rise to several new channels at the porta hepatis. These new channels generally become RHD and LHD. According to some authors, this remodeling is thought to give rise to anatomical variations in the hepatic ducts at the porta hepatis with a real duplication process, which is due to the presence of a double bud or an analge (6) (Roskams and Desmet, 2008) (Tan and Moscoso, 1994), while according to some others, the inadequate or abnormal recanalization process of the biliary tract is responsible for the development of DCBD (5, 15).

Duplication variations of the extrahepatic biliary tract

When considering the duplication of the extrahepatic biliary tract, the GB and CD duplications have more descriptions than the others (17). Choi et al. described seven variations of duplication of the extrahepatic biliary tract in their classification into five subtypes (3). However, these seven types did not include the variation that we have reported here. The CD in the present case joins the CHD after the two CHDs become a single duct, wherein Choi Type V b, the variant that could be closely placed, the CD joins one extrahepatic duct, before it becomes a single duct (3).

Other authors have described three different variations of the duplicated extrahepatic biliary tract (1, 2, 6, 18). Our specimen had an extrahepatic biliary tract that was duplicated and connected by a proximal communicating channel at the point of the hepatic confluence, where the connections of the distal ends of RHD and LHD were. A similar variant was reported by Nuamah et al, where they encountered the variation post-operatively by a cholangiography following a bile duct injury (1). Indian authors reported a variant where the true CBD was duplicated after its formation, following CHD connected with the CD (2). A similar case was described in Greece as well (6). Turkish authors reported a case with DCBD where the CD was fused with the left-sided CBD (18). An intrapancreatic accessory CBD was observed during a pancreatic islet isolation procedure in a brain-dead patient in Japan (19). While reporting a new variant of diaphragmatic common bile duct duplication type I, Sheng et al. formed a new classification incorporating all newly found DCBD variants into the existing Choi classification. This describes ten variants with five types and subtypes (Table 2 and Figure 2) (4). Our case can be grouped under Sheng Type Vb. A comparison between these cases is given in Table 3.

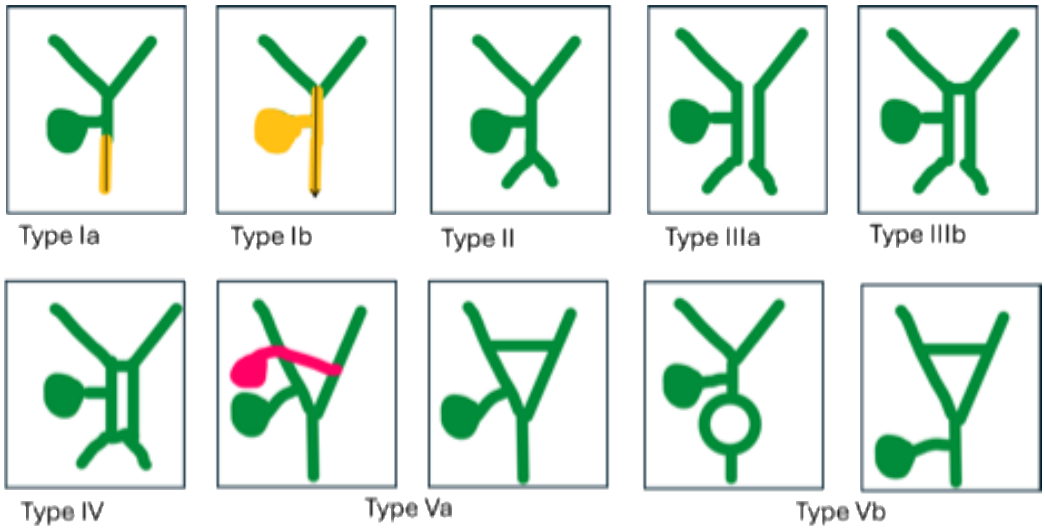

Figure 2: Sheng classification of double common bile duct

Table 2: Sheng classification of double common bile duct

Type	Description
Type Ia	Common bile duct with a septum within the lumen, partially
Type 1b	Common bile duct with a septum within the lumen, completely
Type II	Distal bile duct bifurcates to drain separately
Type IIIa	Double biliary drainage without any communication
Type IIIb	Double biliary drainage with an intrahepatic connection
Type IV	Double biliary drainage with extrahepatic communicating channels
Type V	Duplicated common bile ducts join as a single biliary drainage channel
Type Va	Gallbladder is attached to the repeated bile duct or the left/ right hepatic duct
Type Vb	Gallbladder is attached to the common bile duct before or after separation

Table 3: Comparison of previously reported variants vs. the present case.

Author	Country	Reported variant	Description
Sheng et al, 2022	China	Sheng Type Ib	Complete midline septum within the CBD lumen up to hepatic confluence
Choi et al, 2007	Korea	Choi Type Va/ Sheng Type Va	DCBDs join as a single biliary drainage channel; the GB is attached to the main extrahepatic bile duct
Imamura et al, 2017	Japan	Choi Type II/ Sheng Type II	Intrapancreatic accessory CBD, both opening into the duodenum
Kosar et al, 2010	Turkey	Sheng Type Va	DCBD joins as a single biliary drainage channel, CD is connected to the left-sided CBD
Sahu et al, 2014	India	Sheng Type Vb	DCBD joins as a single biliary drainage channel, GB is connected to the CBD before separation
Paraskevas et al, 2009	Greece	Sheng Type Vb	DCBD joins as a single biliary drainage channel, GB is connected to the CBD before separation
Fan et al, 2018	China	Choi Type Vb/ Sheng Type Va	DCBD joins as a single biliary drainage channel, connected at the proximal end by a communicating channel, GB is attached to right duct
Nuamah et al, 2017	Ghana	Sheng Type Vb	DCBD joins as a single biliary drainage channel, GB is connected to the CBD after separation
Present case	*Sri Lanka*	*Sheng Type Vb*	*DCBD joins as a single biliary drainage channel, GB is connected to the CBD after separation*

Clinical implications

Individuals with DCHD anomaly are mostly asymptomatic (20). However, double extrahepatic bile ducts can be associated with a higher incidence of biliary pathologies, including congenital duodenal obstruction and annular pancreas, duodenal diverticula, biliary stones, Choledochal cysts in non-ectopic CBD, absence of GB, cholangiocarcinoma, and pancreatic disease (1, 2, 5, 6). It can present with gallstone disease, cholangitis, cholecystitis, pancreatitis, or even liver abscesses as the entry point of the duplicated CBD into the duodenum can vary, resulting in reflux of pancreatic secretions (2, 20).

The presence of duplicated CHD or CBD increases the risk of intraoperative bile duct injuries, being mistaken for CD during cholecystectomy, and being ligated and resected (1, 6). It can also complicate procedures during endoscopic retrograde cholangiopancreatography (ERCP) (6).

However, the anomaly can be detected preoperatively with proper imaging, such as ERCP and magnetic resonance cholangiopancreatography. Even an ultrasonography could provide a hint to a knowledgeable operator. Therefore, it is important to pay extra attention during surgical dissection around the area of the hepato-gastroduodenal ligament to avoid iatrogenic injuries (1, 2, 5, 20).

Management of duplicated extrahepatic biliary tract would be surgical or conservative and depends on the clinical presentation and the associated pathologies. If it is of Sheng Type I, simple surgical resection of the septum would be adequate. However, if the DCBD involves opening of the accessory CBD into the stomach or pancreas, surgical resection of the accessory duct and follow-up monitoring for possible occurrence of biliary cancer is recommended. For the types without accessory openings, such as Sheng Type Va and Vb, it is advisable to monitor the patient closely (5, 20).

Conclusion

True duplication of the CHD is extremely rare, a unique variation, and has only limited prior documentation, where we reported the second case in the literature. The presence of this anomaly may be asymptomatic or can present with biliary pathologies such as gallstones, cholangitis, and biliary malignancies. It is more prone to misdiagnosis and iatrogenic injuries. Therefore, vigilance with enhanced knowledge, close monitoring once the diagnosis is made, or prompt action is always vital.

Acknowledgments

The cadaver donors and their family members are acknowledged for their great contribution to medical education. The acknowledgement extends to the Department of Anatomy, Faculty of Medicine, University of Peradeniya, staff for their hard work in preserving and maintaining the donated cadavers.

Ethical approval: Ethical Review Committee, Faculty of Medicine, University of Peradeniya (2022/EC/59).

Conflict of interest: None

Funding: None

Author contributions: MJSJ - Conceptualization, Dissection of the specimen, Drafting the original manuscript, review and editing; HA - Conceptualization, Review and editing

References

1. Nuamah NM, Ibis C, Gok AFK, Ekiz F, Acunas B. Duplicated common bile duct: a recipe for biliary injury. Report of a new variant. Journal of Surgical Case Reports [Internet]. 2017 Feb 1 [cited 2025 Jul 11];2017(2). Available from: http://academic.oup.com/jscr/article/doi/10.1093/jscr/rjx021/2981906

2. Sahu SK, Kumar S, Ray J. Double common bile duct. Sri Lanka j Surg [Internet]. 2015 May 27 [cited 2025 Jul 11];32(3):27. Available from: https://sljs.sljol.info/article/10.4038/sljs.v32i3.8109/

3. Choi E, Byun JH, Park BJ, Lee MG. Duplication of the extrahepatic bile duct with anomalous union of the pancreaticobiliary ductal system revealed by MR cholangiopancreatography. BJR [Internet]. 2007 Jul [cited 2025 Jul 12];80(955):e150–4. Available from:

https://academic.oup.com/bjr/article/80/955/e150-e154/7443635

4. Sheng H, Chen G, Yang M, Guan H. A proposed feasible classification of common bile duct duplications based on a newly described variant and review of existing literature. BMC Pediatr [Internet]. 2022 Nov 8 [cited 2025 Jul 11];22(1). Available from: https://bmcpediatr.biomedcentral.com/articles/10.1186/s12887-022-03708-1
5. Djuranovic SP. Double common bile duct: A case report. WJG [Internet]. 2007 [cited 2025 Jul 11];13(27):3770. Available from: http://www.wjgnet.com/1007-9327/full/v13/i27/3770.htm
6. Paraskevas G, Papaziogas B, Ioannidis O, Kitsoulis P, Spanidou S. Double Common Bile Duct: A Case Report. Acta Chirurgica Belgica [Internet]. 2009 Jan [cited 2025 Jul 12];109(4):507–9. Available from: https://www.tandfonline.com/doi/full/10.1080/00015458.2009.11680471
7. Standring S, editor. Gray's anatomy: the anatomical basis of clinical practice. Forty-first edition. New York: Elsevier Limited; 2016. 1562
8. Sinnatamby CS, Last RJ, editors. Last's anatomy: regional and applied. 12th ed. Edinburgh; New York: Churchill Livingstone/Elsevier; 2011. 548
9. Eftekhar-Vaghefi SH, Shams-Ara A, Jamalizade M. A Study of the Anatomic Variations in Extrahepatic Bile Ducts in 50 Adults Referred to Kerman Forensic Medicine Organization. ASJ [Internet]. 2013 Feb 1;10(1):57–62. Available from: http://anatomyjournal.ir/article-1-37-en.html
10. Wineski LE, Snell RS. Snell's clinical anatomy by regions. Tenth edition. Philadelphia: Wolters Kluwer; 2019. 804 p.
11. Medişoğlu MS, Tuncay Ç, Ahmet Y, İsa Ç, Mesut S, Baltrak YA. Investigation of Biliary Canal Variations as a Cause of Stone Formation in the Choledochal Canal. Trop H Med Res [Internet]. 2020 Aug 26 [cited 2025 Jun 24];2(2):77–85. Available from: https://tropicalhealthandmedicalresearch.com/index.php/JAK/article/view/18
12. Sadler TW, Langman J. Langman's medical embryology. 12th ed. Philadelphia: Wolters Kluwer Health/Lippincott Williams & Wilkins; 2012. 384 p.
13. P. Lemaigre F. Development of the biliary tract. Mechanisms of Development [Internet]. 2003 Jan [cited 2025 Mar 25];120(1):81–7. Available from:https://linkinghub.elsevier.com/retrieve/pii/S0925477302003349
14. Roskams T, Desmet V. Embryology of Extra- and Intrahepatic Bile Ducts, the Ductal plate. The Anatomical Record [Internet]. 2008 Jun [cited 2025 Mar 25];291(6):628–35. Available from: https://anatomypubs.onlinelibrary.wiley.com/doi/10.1002/ar.20710
15. Ando H. Embryology of the Biliary Tract. Dig Surg [Internet]. 2010 [cited 2025 Mar 25];27(2):87–9. Available from: https://karger.com/DSU/article/doi/10.1159/000286463
16. Bergman RA, Tubbs RS, Shoja MM, Loukas M, editors. Bergman's comprehensive encyclopedia of human anatomic variation. Hoboken, New Jersey: John Wiley & Sons, Inc; 2016. 1432 p.
17. Goor DA, Ebert PA. Anomalies of the Biliary Tree: Report of a Repair of an Accessory Bile Duct and Review of the Literature. Arch Surg [Internet]. 1972 Mar 1 [cited 2025 Jul 12];104(3):302. Available from: http://archsurg.jamanetwork.com/article.aspx?doi=10.1001/archsurg.1972.04180030050012
18. Kosar I, Ataseven H, Yönem Ö, Çakmak E, Özer Ö, et al. A new variant of bile duct duplication with coexistence of distal cholangiocarcinoma. Nat Rev Gastroenterol Hepatol [Internet]. 2010 Sep [cited 2025 Jul 12];7(9):527–30. Available from:https://www.nature.com/articles/nrgastro.2010.118
19. Imamura H, Eguchi S, Shapiro AMJ, Kin T. A case of double common bile duct in a deceased donor for transplantation. Surg Radiol Anat [Internet]. 2017 Dec [cited 2025 Jul 11];39(12):1409–11. Available from: http://link.springer.com/10.1007/s00276-017-1874-3
20. Fan X, He L, Khadaroo PA, Zhou D, Lin H. Duplication of the extrahepatic bile duct: A case report and review of the literatures. Medicine [Internet]. 2018 Feb [cited 2025 Jul 12];97(8):e9953. Available from: https://journals.lww.com/00005792-201802230-00049