

ANATOMICAL VARIATIONS OF THE CYSTIC DUCT AND THEIR SURGICAL IMPLICATIONS IN SUDANESE POPULATION: A CADAVERIC STUDY

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ABSTRACT

Background: Anatomic variations of cystic ducts are common and continuously encountered during Surgical and radiological interventions. Failure to identify these clinically important variations may result in complications during surgical or endoscopic procedures.


Patients and methods: This is an observational descriptive cross-sectional study. 65 cadavers in the dissecting rooms of the medical colleges, in which the length and mode of insertion of cystic duct (CD) into common bile duct (CBD) were observed.

Results: The mean length of the CD in the cadavers examined was (2.06 ± 1.03) with a minimum length of d" 0.5 cm and a maximum of 5 cm. Regarding the mode of insertion of CD into the CBD; 53.8% were found to have a low junction between the CD and common hepatic duct (CHD) which is considered the normal insertion. 46.2% found to be abnormal variations of insertion; short CD (d"0.5 cm) observed in 10.8%; whereas in 13.8% of cadavers we found that the CD is adherent to the CHD and runs in parallel to it. In 7.8% there was a high junction between the CD and CBD and in 9.2% we found that CD courses anterior or posterior to CBD and joins it medially.

Conclusion: CD variations are not uncommon and it is important to identify these anatomical variations. A detailed knowledge of the extra hepatic biliary tract, as well as of its variations, is important for the diagnostic and therapeutic success in many clinical situations since they allow the surgeon prompt identification of certain pathologies, making surgical procedures more accurate and affective.

KEY WORDS: Cystic Duct, Common Bile Duct, Common Hepatic Duct, Anatomical Variations.

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INTRODUCTION

Anatomic variations of cystic duct (CD) are not uncommon and are continuously encountered during imaging and surgery. Failure to identify the clinically significant variations may result in complications during surgical, endoscopic, or percutaneous intervention procedures. The

purpose of this study is to identify the characteristics of various anatomical variants of cystic duct in Sudanese cadavers and to demonstrate the prevalence of cystic duct variations among Sudanese population.

The cystic duct joins the gallbladder to the extrahepatic biliary tree; its point of attachment

into the extrahepatic bile duct marks the division between the common hepatic duct (CHD) and the common bile duct (CBD). The CD length usually measures (2–4) cm and contains prominent concentric folds known as the spiral valves of Heister. The CD frequently follows a tortuous or spiral course. Its normal diameter is variable, ranging from 1 to 5 mm. The CD is usually attached to the extrahepatic bile duct approximately midway between the porta hepatis of liver and the ampulla of Vater in the duodenum. However, the point at which the CD joins the extrahepatic bile duct is variable, ranging from high at the level of the porta hepatis to low at the level of the ampulla [1-4]. Most commonly, the CD inserts from a right lateral position but may have an anterior or posterior spiral insertion, low lateral attachment with a common sheath enclosing the CD and CBD, proximal attachment, or low medial attachment at or close to the ampulla of Vater [3,5–7].

PATIENTS AND METHODS

This is an observational descriptive cross-sectional study Conducted in Dissecting rooms of the faculties of medicine in Khartoum state during the period from September 2017 till April 2018. All Well-dissected cadavers with no disruption of the concerned area in medical colleges at Khartoum state were included in the Study. Data was collected using a master sheet, Data analysis was done using the Statistical Package for Social Sciences (SPSS) version 22 software and result obtained expressed in tables and simple figures.

RESULTS

A total of 65 cadavers were examined for the length of the cystic duct and the mode of insertion of the cystic duct into common hepatic duct. 83.6% were males and 16.4% were females. The mean length of the CD in the cadavers examined was (2.06 ± 1.03) cm with a minimum length of 0.5 cm and a maximum of 5 cm. Regarding the mode of insertion of CD into CBD; 52% were found to have a low junction between the cystic duct and common hepatic duct which is considered the normal insertion. Forty-eight percent were found to have abnormal variations of insertion; short CD (≤ 0.5 cm)

was observed in 10.8%; whereas in 13.8% we found that the cystic duct is adherent to the common hepatic duct and runs in parallel to it. In 7.8% there was a high junction between the CD and CBD and in 9.2% we found that the CD courses anterior or posterior to CBD and joins it medially (table 1).

No significant association between the gender and length of the CD or gender and the mode of insertion were found with P values of (P=.385) (P= .212) respectively.

Table 1: Show the distribution of mode of insertion of CD into CBD in cadavers.

Variation	Number Of Cadavers	percent
Low junction between CD and CHD	35	53.80%
CD adherent to the CHD run parallel together	9	13.80%
Absence of CD or very short CD (≤ 0.5 cm)	7	10.80%
CD crosses anterior or posterior to CHD and joins it medially	6	9.20%
High junction between the CD and the CHD	5	7.80%
CD drains into right hepatic duct	3	4.60%

DISCUSSION

Bile duct injury is a serious complication during cholecystectomy. One of the major causes of bile duct injury is failure to recognize the biliary anatomy, specifically in the presence of anatomical variants. Complete transection or ligation of common bile duct occurs when CBD is mistaken for cystic duct and it is one of the serious complications of laparoscopic and open cholecystectomy [8]. Pervious knowledge of the CD anatomy and its possible variations helps in proper interpretation of disease process and avoids iatrogenic injuries during surgery [8, 9]. Variations in the anatomy of extrahepatic biliary ducts have long been recognized and a wide range variability is noticed in the pattern of CD and its junction with extrahepatic bile duct. Classical anatomy of the CD joining the CHD at its middle third from the lateral aspect is seen in 58%–75% of cases in the literature [10,11] compared to this study which found only in 52% of the cases. The length of the cystic duct in previous studies ranged from 7 to 39 mm (mean 19 ± 7 mm) [12,13] In this study the length of the cystic duct fell within the range of 0.5- 5 cm (mean was 2.06 ± 1.03). According to Caroli-Bosc et al., there is a link between the length of the CD and it's left lateral attachment to the

gallbladder, so that most laterally attached ducts had more than 3 cm in length, whereas the left attachment of the CD would be associated with an increased incidence of biliary stones [14].

A long parallel CHD and CD were reported in 1.2–25% of the population, where the two ducts are enclosed by one fibrous sheath and show a parallel course for at least 2cm [3, 15-18].

This variation was noted in 13.8% of cases in this study. If this variant is not recognized, the extrahepatic bile duct can be mistaken for the CD and that can result in inadvertent transection or ligation of the extrahepatic bile duct and result in a postoperative complication. If the long parallel CD is clipped or transected too close to the CHD, the CHD may undergo strictures or narrowing at this site. In patients with long parallel CD and cases with medial insertion, usually a long cystic duct stump is left after cholecystectomy, which might get inflamed or get dilated with mucous and calculus disease leading to postcholecystectomy syndrome [19-21].

Medial insertion of the CD into CBD with posterior or anterior spiral course was observed in 9.2% of cases. Medial insertion of the CD was reported in 10–18% of cases in previous studies [3,15,22,23]. This variant is due to embryological malrotation of the which is due to faulty transfer of the choledochoduodenal junction during rotation of the duodenum. The twist of the duct during its formation may be either clockwise or counterclockwise causing the cystic duct to take a spiral course either anterior or posterior to the common hepatic duct [3].

Surgical Dissection of the medial CD up to its end is considered hazardous and it is advised to leave a long stump of cystic duct [16].

The presence of short or absent cystic duct is a rare but important variant and increases the chance of biliary injury, especially during laparoscopic cholecystectomy [24] and the congenital absence of CD necessitates open cholecystectomy [25].

Most cases of apparently absent or short cystic duct are due to severe fibrosis and impaction of stone at the junction of the duct and a contracted chronically inflamed gallbladder. The true congenital type of absent cystic duct is very rare

and results from failure of development of the proximal part of the caudal division of the hepatic diverticulum [26-29]. Short cystic duct which is defined as CD having a length of equal to or less than 5 mm was reported in 1.3%–2.6% of cases in previous studies [10, 15,30, 25]. This anomaly was reported in 7 (10.8%) of cases in this study which is much higher than previous Studies. During surgery when surgeons try to visualize the cystic duct by giving upward traction on gall bladder, the presence of short cystic may lead to tenting of the CHD or CBD and cause it to simulate the appearance of the CD. In such a situation, the common bile duct may be inadvertently ligated or transected [30].

There were five cases (7.8%) in which a high junction between the cystic duct and the common hepatic duct was observed and four cases (4.6%) with cystic ducts draining into the RHD. It is crucial to diagnose the high union of the CD into the CHD, aberrant cystic duct drainage into the right hepatic duct, and aberrant junction of intrahepatic bile ducts to the cystic duct as these variants can be missed during surgery, resulting in inadvertent transection and ligation of the right hepatic duct [31,32]. No double cystic cases was seen in this study. Cystic duct duplication in the presence of single gall bladder is a very rare anomaly and is associated with higher risk of complication during laparoscopic cholecystectomy and postoperative bile leakage [12,33].

ABBREVIATIONS

CD - Cystic duct.

CBD - Common Bile Duct.

CHD - Common Hepatic Duct.

RHD - Right Hepatic duct.

Conflicts of Interests: None

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