Case report

Anomalous origin of cystic artery from common hepatic artery – a case report

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Abstract

Cystic artery is usually a branch of right hepatic artery given in the Calot's triangle. Variations in the origin of cystic artery have been previously reported. The present case report describes the origin of cystic artery from the common hepatic artery taking an unusual course, which was detected during routine dissection. These kinds of variations are expected to arise if anything goes wrong during the embryological development of biliary vasculature. An attempt has been made to discuss the surgical and embryological relevance of the reported anomaly.

Keywords: cystic artery; common hepatic artery, calot's triangle, laparoscopic cholecystectomy.

1 Introduction

Cystic artery normally arises from right hepatic artery within Calot's triangle and passes posterior to common hepatic duct. Anatomical variations of the cystic artery are very commonly encountered during cholecystectomy. Most of the variations results in cystic artery arising outside of Calot's triangle (to the left) and crossing anterior to common hepatic duct (MOORE, DALLEY and AGUR, 1999). Cystic artery may originate from right hepatic, left hepatic, hepatic proper, gastroduodenal, celiac, superior mesenteric artery (WILLIAMS, WARWICK, DYSON et al., 1989; PRICE and HOLDEN, 1993; HARRIS and PELLEGRINO, 1994). Uncontrolled arterial bleeding during laparoscopic cholecystectomy is a serious problem and may increase the risk of bile duct damage. Therefore, accurate identification of the anatomy of the cystic artery is important.

2 Case Report

During routine dissection of cadavers for undergraduate medical teaching program, we noticed a variation in the origin of cystic artery in a 45 year old male cadaver. The cystic artery was found to be originating from the common hepatic artery which was carefully dissected and delineated from the surrounding viscera, measured and photographed.

3 Observations

The celiac trunk (CT) measured 3mm and divided into 3 branches: left gastric artery (LGA:4.3cm), splenic artery (SA:9.3cm) and common hepatic artery (CHA:2.1cm). The CHA gave a gastroduodenal branch (GDA:4.2cm), hepatic artery proper (HPA:2cm) and a cystic artery (CA) outside the Calot's triangle. The cystic artery was unusually long (4.9cm) and was directed upwards for about 1.2 cm to the right of HAP and to the left of the common hepatic duct (CHD). The CA then entered the Calot's triangle passing posterior to the CHD and then turned down to supply the gall bladder (Figure 1 and 2). No other major artery was noted to the gall bladder from any of the branches of celiac trunk. No abnormality was noted in the remaining portion of the biliary tract or related blood vessels.

4 Discussion

The cystic artery originates from the following sources: right hepatic artery (63.9%), hepatic trunk (26.9%), left hepatic artery (5.5%), gastroduodenal artery (2.6%), superior pancreatoduodenal (0.3%), celiac trunk (0.3%) and superior mesenteric artery (0.8%) (ANSON, 1963). In our case the cystic artery originated from CHA, the incidence of which was not reported in the study conducted by Anson. The length of CA was also unusually long (4.9 cm). It has been reported in the previous studies that when the cystic artery originates outside the Calot's triangle, it usually passes anterior to the CHD (HUGH, KELLY and LI, 1992). But in our case it initially ran parallel to the HAP and CHD and was then passed posterior to the CHD.

The explanation for the variations in the cystic artery is reflected from the developmental pattern of the biliary system. During development, the extrahepatic biliary system arises from an intestinal diverticulum, which carries a rich supply of vessels from the aorta, coeliac trunk and superior mesenteric artery. Later most of these vessels are absorbed, leaving in place the mature vascular system. As the pattern of absorption is highly variable, it is not unusual for the cystic artery and its branches to derive from any other artery in the vicinity (NOWAK, 1977). Considering the complexity of this developmental scheme, it is easy to understand the large degree of anatomic variation within this vascular system.

Laparoscopic cholecystectomy has been accepted as the preferred method of treatment of gall bladder stones in healthy individuals. During laparoscopic cholecystectomy dissection of a limited field is magnified on the video monitor which indicates that a detailed anatomical knowledge of the possible variations in the anatomy of the cystic artery and its branch is very important to the surgeon (HUGH and KELLY, 1992). The importance of a thorough knowledge of arterial supply of extrahepatic biliary ductal system and its variations lies in the fact that it may help in reducing the uncontrolled

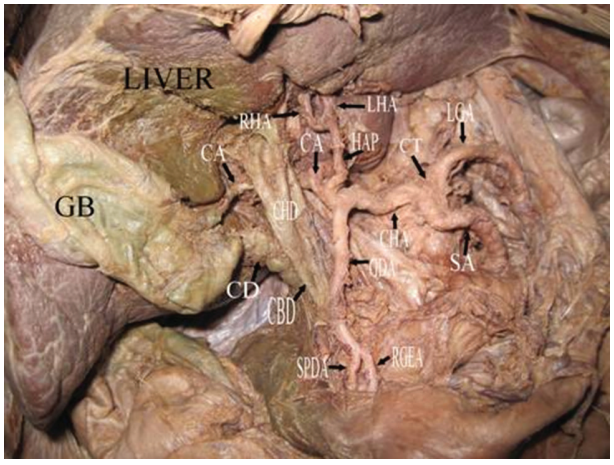

Figure 1. Photograph of the origin of cystic artery (CT) from common hepatic artery outside Calot's triangle. CA, Cystic artery; CT, Celiac trunk; SA, Splenic artery; LGA, Left gastric artery; CHA, Common hepatic artery; HAP, Hepatic artery proper; GDA, Gastroduodenal artery; SPDA, Superior pancreaticoduodenal artery; RGEA, Right gastric artery; CBD, Common bile duct; CD, Cystic duct; RHA, Right hepatic artery; LHA, Left hepatic artery; GB, Gall bladder.

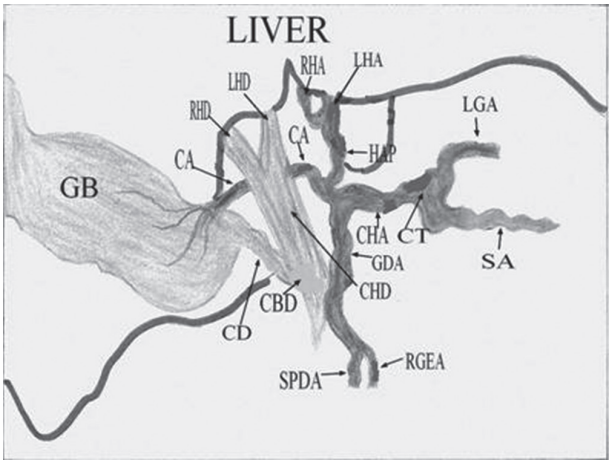

Figure 2. Diagram of the origin of cystic artery (CT) from common hepatic artery outside Calot's triangle. CA, Cystic artery; CT, Celiac trunk; SA, Splenic artery; LGA, Left gastric artery; CHA, Common hepatic artery; HAP, Hepatic artery proper; GDA, Gastroduodenal artery; SPDA, Superior pancreaticoduodenal artery; RGEA, Right gastric artery; CBD, Common bile duct; CD, Cystic duct; RHA, Right hepatic artery; LHA, Left hepatic artery; GB, Gall bladder.

bleeding that may increase the risk of intraoperative lesion to vital vascular and biliary structures. Hemmorhage and bile leakage usually occurs due to variants of structures of Calot's triangle and they constitute the most common cause of conversion of laparoscopic cholecystectomy to open cholecystectomy.Accidents involving vessels or the common bile duct during laparoscopic cholecystectomy, with or without choledochotomy, can be avoided by careful dissection of Calot's triangle and the hepatoduodenal ligament. Our findings should help the surgeons to reduce the incidence of bile duct injuries during laparoscopic cholecystectomy.

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Received June 26, 2012
Accepted September 7, 2013