Journal of Morphological Sciences
J Morphol Sci
Brazilian Society of Anatomy

Case Report
J Morphol Sci 2022;39:170-172

Variant Origin of Cystic Artery and a Branch of it Supplying the Caudate Lobe of Liver: a Case Report

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Disclose and conflicts of interest: none to be declared by all authors

ABSTRACT

Introduction: Cystic artery usually arises from the right hepatic artery and passes posterior to the common hepatic duct and anterior to the cystic duct to reach the superior aspect of the neck of the gall bladder and divides into superficial and deep branches. The most common variant is an origin from the common hepatic artery, sometimes from the left hepatic, celiac trunk During routine dissection of the abdomen for undergraduate students in a 50years old male cadaver, we observed a cystic artery arising from the common hepatic artery and it was passing anterior to the CHD and CD before it supplies to the gall bladder it gave branch to the caudate lobe of the liver. The knowledge of such variations is important during cholecystectomy, and during procedure Pre and intraoperative evaluation of the biliary duct and awareness of bile duct variations are important in preventing ductal injury.

Keywords: Common hepatic duct; Cystic duct; Cystic artery; Common bile duct.

Introduction

The cystic artery is commonly known as the bachelor artery usually arises from the right hepatic artery and passes posterior to the common hepatic duct and anterior to the cystic duct to reach the superior aspect of the neck of the gall bladder and divides into superficial and deep branches. The superficial branch divides on the inferior surface of the body of the gall bladder, supplies the peritoneal covered inferior surface and the deep branch divides on the superior surface, supplies the non-peritoneal superior surface of the gall bladder respectively. The most common variant is an origin from the common hepatic artery, sometimes from the left hepatic artery or gastroduodenal artery, and rarely from the superior pancreaticoduodenal, celiac, right gastric, and superior mesenteric arteries. The cystic artery gives numerous fine branches which supply the common and right and left hepatic ducts and upper part of the common bile duct. The triangular space between the cystic duct, the common hepatic duct, and the inferior surface of segment V of the liver is commonly referred to as Calot's triangle or hepatobiliary triangle. This space usually contains the cystic artery, cystic lymph node, and lymphatics from the gall bladder. The caudate lobe is visible as prominence on the inferior and posterior surfaces to the right of the groove for the ligamentum venosum. It lies posterior to the porta hepatis. In gross anatomical descriptions, this lobe is said to arise from the right lobe, but it is functionally separate. It includes the spiegel lobe, paracaval portion, and caudate process portion. It is supplied by both right and left branches of the portal vein and biliary tract. Hence its anatomy is important in hepatectomy and hilar cholangiocarcinoma surgery.

Case Report

During routine dissection of extrahepatic biliary apparatus in abdomen region for undergraduate students in male cadaver aged about 50years, we observed that cystic artery was arising from the common hepatic artery. After opening the peritoneal cavity, the anterior layer of the lesser omentum was removed from the lesser curvature of the stomach. The left gastric artery was identified and traced to the celiac trunk (Fig 1). A right gastric artery was identified and traced to the common hepatic artery. The common hepatic artery was dissected till it divides into the gastroduodenal artery and the proper hepatic artery. The right and left hepatic arteries were identified and the cystic artery was traced. It was passing anterior to the common hepatic duct and cystic duct, before it supplies the gall bladder it gave a branch to the caudate lobe of the liver (Fig 2) and it was present within the Calot's triangle.

DOI: 10.51929/jms.39.170.2022
ISSN 2177-0298

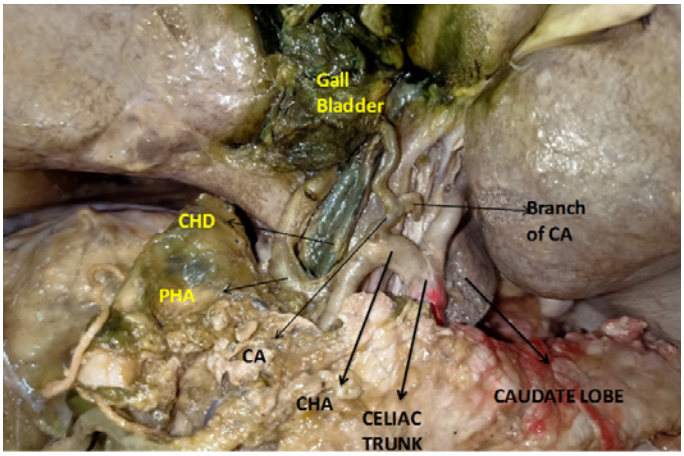

Figura 1. CHA (Common Hepatic Artery), CA (Cystic Artery), PHA (Proper Hepatic Artery), CHD (Common Hepatic Duct).

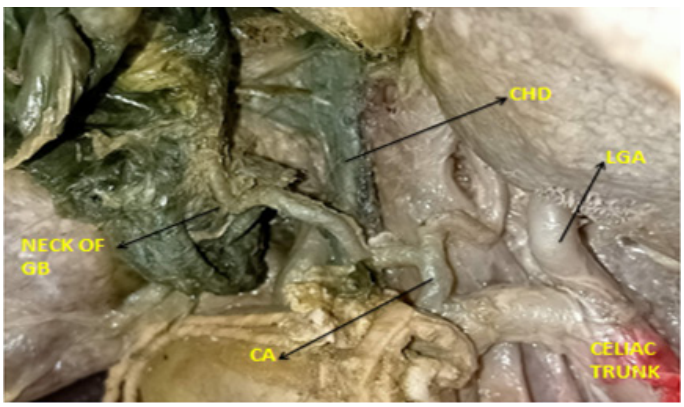

Figura 2. CHd (Common Hepatic Duct), CA (Cystic Artery), lies anterior to CHD and Cystic Duct, LGA (Left Gastric Artery).

Discussion

The cystic artery usually takes origin from the right hepatic artery in 79% of cases and was found in the Calot's triangle in 82% of cases.

Clinically important cystic artery variations are:

Cystic artery located anterior to the common hepatic duct and common bile duct found in 18% and 5% respectively

Cystic artery located inferior to the cystic duct in 5%

Short cystic arteries found in 10%.

Multiple cystic artery 9%[1].

According to Tejaswi HL *et al.*, in their study out of 100 specimens, reported that the commonest origin of the cystic artery was from the right hepatic artery in 92 cases, rarely from a right hepatic artery in 4 cases and very rarely from the left hepatic artery and gastroduodenal artery in 1 case each[2].

According to Pushpalatha K *et al.*, in their study out of 50 specimens, reported that the cystic artery was arising from the right hepatic artery only in 54% of cases which was comparatively less, hepatic artery proper in 22%, common hepatic artery in 12%, gastroduodenal artery in 8%, and superior mesenteric artery in 2% of cases[3].

According to FlisinskiP *et al.*, reported that the cystic artery was always (97.06%) a single artery and only in one case (2.94%) was it double. It arises usually (82.34%) from the right hepatic artery, rarely from the common hepatic artery (8.82%) or left hepatic artery (5.88%), and very rarely (2.94%) from the gastroduodenal artery. They also reported that the cystic artery was passing within Calot's triangle except for one case and this exceptional cystic artery was arising from gastroduodenal artery and lies outside the Calot's triangle. The cystic artery usually (67.66%) runs posterior to the common hepatic duct, rarely (29.40%) anterior to the common hepatic duct, and very rarely (2.94%) on the left side of the cystic duct. But cystic artery running anterior to the common hepatic duct was not observed in their study[4].

In the present case report, it was passing anterior to the common hepatic duct and cystic duct which is rare. When the cystic artery runs anterior to the common hepatic duct or cystic duct, the proximity increases the chances of injury to the common hepatic duct or common bile duct[5].

Laparoscopic cholecystectomies, classified anatomical variations of the cystic artery into three groups: (1) Calot's triangle type, found in 85.5% (2) outside Calot's triangle, found in 13%(3) compound type, observed in 1.5% of cases.The Cystic artery gives off direct branches to the Cystic duct. These vessels have to be divided to obtain a length of CD before division[6].

Arterial branches to the caudate lobe are variable, in 50% of cases it's from the right hepatic artery in some cases it comes from both right and left hepatic arteries. but from the cystic artery, it has not been reported[7].

To perform effective and safe chemoembolization the artery supplying the caudate lobe should be precisely recognized on angiography and selectively embolized. Surgical resection of hepatocellular carcinoma in the caudate lobe is associated with a high rate of early recurrence, because of deep location and adjoining large vessels it is technically difficult to perform special procedures[8].

It is proposed that all these variations be explained on a developmental basis. During development, the liver and gallbladder arise from the hepatic bud which arises at the junction between the foregut and midgut. The gallbladder is supplied initially by the coeliac and mesenteric arteries[9].

In intrauterine life, the liver receives arterial blood from three arteries: the proper hepatic artery from the common hepatic artery, the right hepatic artery from the superior mesenteric artery, and the left hepatic artery from the left gastric artery[10].

As development proceeds, arteries regress in a highly variable pattern resulting in anatomical variations in the origins and branching patterns of the hepatobiliary arterial system[11].

Conclusion

The knowledge of such variations is important during cholecystectomy, and during a procedure, preoperative and intraoperative evaluation of the biliary duct and awareness of bile duct variations is important in preventing ductal injury. Cystic artery passing anterior to CBD and CHD, thus it becomes the first structure encountered during exploration of calot's triangle having proneness for injury. The proximity also increases the chances of injury to CHD and CBD. The cystic artery is a key anatomical structure to be isolated and ligated during laparoscopic or conventional cholecystectomy. The possible hemorrhage or hepatobiliary complications are known to occur during the search, dissection, or ligation/clipping of the cystic artery. Thus, it is essential from the surgeon's viewpoint to have a thorough knowledge and awareness of variations of a cystic artery which will contribute to the safety of cholecystectomy.

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Received: March 12, 2022
Accepted: Marcht 24, 2022

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