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ORIGINAL RESEARCH

ASSESSMENT OF MORPHOLOGICAL VARIATION OF CYSTIC ARTERY

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ABSTRACT

Background: The main arterial supply to the gallbladder and the cystic duct (CD) is the cystic artery (CA). The present study was conducted to assess morphological variation of cystic artery.

Materials & Methods: 46 human liver specimens with intact gallbladder and extra-hepatic duct were fixed in 10% formalin and were finely dissected. The specimens were observed for parameters like the origin of the CA, its length and diameter, mode and level of termination, and its relation to the Calot's triangle, and the variations were noted, photographed, and studied.

Results: Artery of origin of cystic artery was aberrant right hepatic artery in 1, common hepatic artery in 2, coeliac trunk in 4, and gastroduodenal artery in 8, left hepatic artery in 12, persistent hypoglossal artery in 10, right hepatic artery in 6 and superior mesenteric artery in 3 cases. The difference was significant ($P< 0.05$). Site of origin of cystic artery was inside Calot's triangle in 83% and outside Calot's triangle in 17%. The difference was significant ($P< 0.05$).

Conclusion: Cystic artery present variation, hence a thorough knowledge is essential to avoid surgical complications.

Key words: cystic artery, cystic duct, gallbladde

Introduction

The main arterial supply to the gallbladder and the cystic duct (CD) is the cystic artery (CA). CA commonly arises from the right hepatic artery (RHA) in the angle between the common hepatic duct (CHD) and CD.[1] Normally, the CA presents as single in number but sometimes

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also as double.[2] The CA usually passes posterior to the CHD and anterior to the CD to reach the superior aspect of neck of the gallbladder, then it divides into superficial and deep branches and supplies the gallbladder.[3,4] The most common variation of CA is, when it originates from the common hepatic artery (CHA) and when its origin is in the lower down, sometimes from the left hepatic or gastroduodenal artery (GDA), and rarely from the superior pancreaticoduodenal, celiac, right gastric, or superior mesenteric arteries.[5] In these cases, it crosses anterior (or less commonly posterior) to the common bile duct (CBD) or CHD to reach the gallbladder. An accessory CA may arise from the CHA or one of its branches. The CA when presents as double, it often bifurcates close to its origin, giving rise to two vessels before approaching the gallbladder.[6]The present study was conducted to assess morphological variation of cystic artery.

Materials & Methods

The study was conducted on 46 human liver specimens with intact gallbladder and extra-hepatic duct. The study was approved from institutional ethical clearance committee.

The specimens obtained were fixed in 10% formalin and were finely dissected. The specimens were observed for parameters like the origin of the CA, its length and diameter, mode and level of termination, and its relation to the Calot's triangle, and the variations were noted. Results of the study was compiled and assessed statistically. P value less than 0.05 was considered significant.

Results

Table I Artery of origin

Origin	Number	P value
Aberrant right hepatic artery	1	0.02
common hepatic artery	2	
Coeliac Trunk	4	
gastroduodenal artery	8	
left hepatic artery	12	
persistent hypoglossal artery	10	
right hepatic artery	6	
superior mesenteric artery	3	

Table II, graph I shows that artery of origin of cystic artery was aberrant right hepatic artery in 1, common hepatic artery in 2, coeliac trunk in 4, and gastroduodenal artery in 8, left hepatic artery in 12, persistent hypoglossal artery in 10, right hepatic artery in 6 and superior mesenteric artery in 3 cases. The difference was significant ($P< 0.05$).

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Graph I Artery of origin

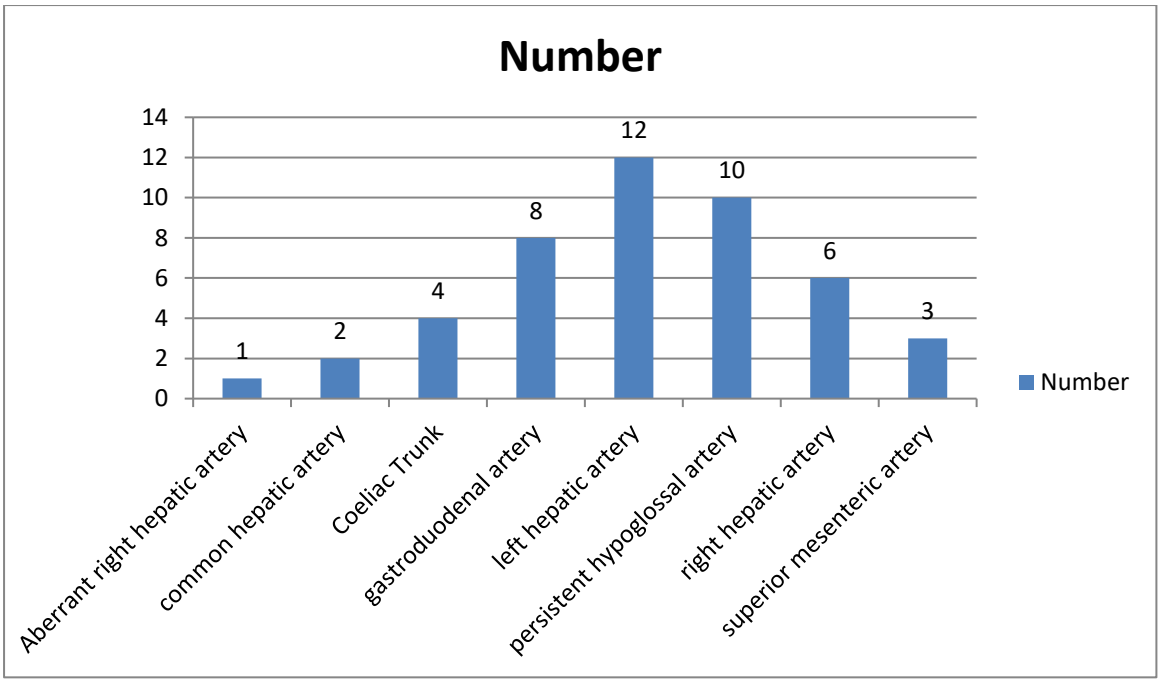
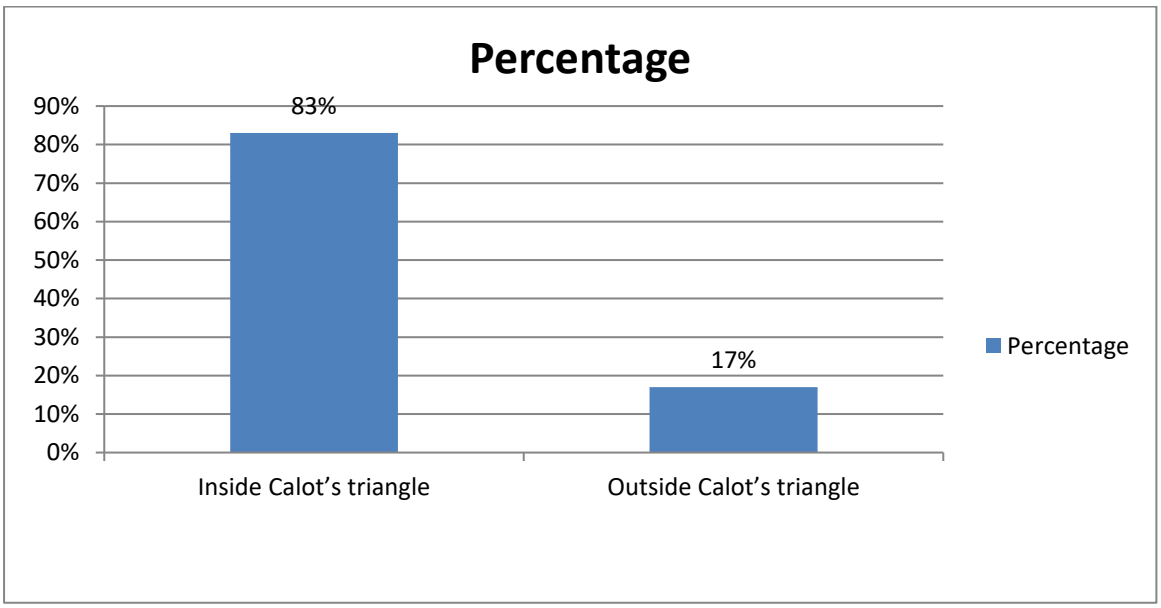


Table II Site of origin of CA

Site of origin	Percentage	P value
Inside Calot's triangle	83%	0.01
Outside Calot's triangle	17%	

Table II, graph II shows that site of origin of cystic artery was inside Calot's triangle in 83% and outside Calot's triangle in 17%. The difference was significant (P< 0.05).

Graph II Site of origin of CA



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Discussion

Cystic artery is a key anatomical structure usually isolated and ligated during conventional cholecystectomy or laparoscopic cholecystectomy.[6,7] There is possibility of haemorrhage from cytic artery during surgery. Injuries to the duct when in close proximity can also occur in hepatobiliary surgeries.[8] Cystic artery most commonly arises from right hepatic artery which is a branch of hepatic artery proper.[9] Hepatic artery proper is a branch of common hepatic artery which arises form coeliac trunk. It is the major artery supplying gallbladder.[10,11]The present study was conducted to assess morphological variation of cystic artery.

We found that artery of origin of cystic artery was aberrant right hepatic artery in 1, common hepatic artery in 2, coeliac trunk in 4, and gastroduodenal artery in 8, left hepatic artery in 12, persistent hypoglossal artery in 10, right hepatic artery in 6 and superior mesenteric artery in 3 cases. A study by Ramakrishna et al[12] was undertaken to study the anatomy of arterial variations of cystic artery in the specimens of liver and gallbladder by exploring the extrahepatic duct system, and in addition the relations of cystic artery in the Calot's triangle were also studied and observed. The study was conducted on 50 human liver specimens with intact gallbladder and extrahepatic duct system, collected from the Department of Anatomy over a period of 5 years. The specimens obtained were fixed in 10% formalin and were finely dissected. The specimens were observed for parameters like the origin of the cystic artery, its length and diameter, mode and level of termination, relation to the Calot's triangle, and the extrahepatic duct system. Origin of the cystic artery was normal in 92% of cases and variations were seen in approximately 8% cases. The most common origin of the cystic artery was from the right hepatic artery, which was in 92% of the cases. In the present study, in 97% cases the cystic artery terminated by dividing into the superficial and deep branches. In the rest, the artery continued as a superficial branch, the deep branch being replaced by the accessory cystic artery. In 64% cases, the cystic artery was seen within the Calot's triangle, and in 36% of cases, it was outside the Calot's triangle. In 67% cases, the cystic artery was medial to the cystic duct, in approximately 63% cases the cystic artery was lateral to the common hepatic duct, and in 30% of the cases the cystic artery passed anterior to the cystic duct. Incidence of accessory cystic arteries in the present study was approximately 4%.

We observed that site of origin of cystic artery was inside Calot's triangle in 83% and outside Calot's triangle in 17%. Atharet al[13] evaluated morphological variations of the cystic artery to improve surgical safety. 40 human liver specimens with intact gallbladder and extrahepatic duct in the regular dissection were fixed in 10% formalin and were finely dissected. The specimens were observed for parameters like the origin of the CA, its length and diameter, mode and level of termination, and its relation to the Calot's triangle, and the variations were noted, photographed, and studied. Cystic artery of origin was right hepatic artery in 84%, persistent hypoglossal artery in 2%, left hepatic artery in 1%, gastroduodenal artery in 2%, common hepatic artery in 1% and aberrant right hepatic artery in 10%. The vascular relations of cystic artery was anterior to cystic duct in 4%, posterior to cystic duct in 6%, anterior to CHD in 2%, posterior to CHD in 12%, anterior to CBD in 1% and no relation in 75%. Site of origin of CA was inside Calot's triangle in 70% and outside calot's triangle in 30%. The difference was significant ($P< 0.05$)

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Conclusion

Authors found that cystic artery present variation, hence a thorough knowledge is essential to avoid surgical complications.

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