



EXTRA CALOT'S CYSTIC ARTERY DURING LAPAROSCOPIC CHOLECYSTECTOMY- ARE THEY UNCOMMON?

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ABSTRACT

Laparoscopic cholecystectomy is the gold standard treatment for gallstone diseases. Cystic artery anomalies are commonly encountered of less than 50% in during gallbladder surgeries. Any untoward bleeding in the calot's triangle area during cholecystectomy causes brisk bleeding, bile duct injuries and long term sequelae like biliary stricture. This dangerous and serious complication can also lead to serious lawsuit issues against the operating surgeon. Most of these anomalies are overlooked by the surgeon. Hence a thorough hepatobiliary vascular anatomical knowledge, careful Calot's triangle dissection, anatomical demonstration of vessels and duct during surgery are the safety tips for the successful outcome. We report two cases of cystic artery anomalies from our institute, review of its variant origin, course and its management.

KEYWORDS: cystic artery anomaly, laparoscopic cholecystectomy, extracalots cystic artery biliary anomaly.

INTRODUCTION

Sir Calot's described the famous triangle in the year 1891. He demonstrated cystic artery, lymph node, connective tissue and lymphatics.^[1] The cystic artery usually arises from right hepatic artery which passes dorsal (posterior) to common hepatic duct, enters the Calot's triangle and finally divides into anterior branch and posterior branch on the surface of gallbladder. The cystic artery develops from the hepatic diverticulum of foregut which is abundantly supplied by cystic abdominal aorta and its branches. Later, degeneration happens and forms the mature vascular tree. Anomalies of cystic artery are often detected intraoperatively and it is the key artery to be divided in laparoscopic cholecystectomy. In some instances, impaired degeneration pattern leads to formation of anomalies. CT abdomen or angiography is not routine investigations prior to laparoscopic cholecystectomy to detect vascular anomalies. The operating surgeon should have a thorough knowledge and should suspect abnormal anatomy in every case of laparoscopic cholecystectomy surgery.

Case 1

A 36 yr -old female with symptomatic gall stone disease underwent laparoscopic cholecystectomy. During surgery, we found a long course of extracalots cystic artery. The artery arises from the left hepatic artery, runs anterior to common hepatic duct, occupies extracalots

position and finally enters the body of gallbladder. A flimsy adhesion noted between the anomalous artery and liver surface. Calot's triangle was free of vasculature. No cystic duct abnormality. Once the abnormal course of cystic artery was confirmed by its entry into the body of gallbladder, it was dissected, doubly clipped and cut as shown in figure 1. cholecystectomy was completed and postoperative period uneventful.

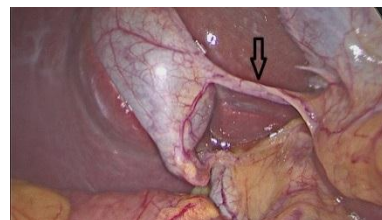


Figure 1: (pointed arrow –cystic artery).

Case 2

A 46 yr-old female with cholecystitis was planned for laparoscopic cholecystectomy. The gall bladder was covered with greater omentum. The omental adhesions were released using bipolar dissecting forceps. A long extracalots cystic artery was noted. It arises posterior to the first part of duodenum proximally, runs anterior to the common bile duct, enters the fundus of the Gallbladder. It was dissected and found to arise from Gastroduodenal artery. The abnormally positioned cystic

artery was doubly clipped and cut. The surgery was completed successfully.

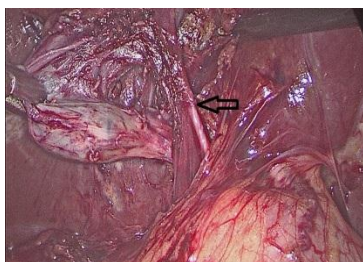


Figure 2: (pointed arrow-cystic artery).

DISCUSSION

You-Ming ding^[2] et al has analyzed the anatomical variants of cystic artery during laparoscopic cholecystectomy and devised a “Chinese classification”.

Group 1: calots triangle cystic artery.

- a.classical single CA. (73.3%)
- b.Double CA.(12%)

Group 2: Extracalots cystic artery (13%)

- a.CA from Gastroduodenal artery. b.CA from variant rights hepatic artery.
- c.CA from liver parenchyma.
- d.CA from left hepatic artery.

Group 3: Compound Cystic artery. (cystic artery arises within and outside Calots triangle)(1.5%).

First case is in group 2d as it arises from left hepatic artery.

Second case is categorized in group2a as it arises from gastroduodenal artery.

In the first case, the cystic artery runs extracalots in position, originated from the left hepatic artery. There was flimsy adhesion noted between the cystic artery and the liver surface. Excessive undue fundal traction is to be avoided in such scenario and tearing of the vessel can be prevented. We also made sure that this abnormal vessel goes directly reaches onto the surface of the gall bladder. The incidence of origin of cystic artery from left hepatic artery is only <7% in cadaveric study as shown in table 1.

In our second case scenario, the artery takes its origin from gastroduodenal artery which is also named as “low-lying cystic artery” “It was highly vulnerable to get damaged in our patient as it was hidden in the omental cake which was covering the gallbladder. Meticulous dissection prevented a major bleed in this case. Also, it was noted a band fibrous tissue accompanied the course of cystic artery in our patient. Similar incidences were reported by several authors^[3,4,5] This peculiar anomaly can easily tear the abnormally positioned vessel once the gallbladder retracted cranially at the start of surgery. The reason is that the attachment of hepatoduodenal ligament to the gallbladder or cystic duct and it gets stretched in this maneuver. Hence, a careful fundal retraction is

anticipated in every case at the start of gallbladder surgeries. The incidence of cystic artery origin from gastroduodenal artery was 1-30%, studied by a group of Japanese surgeons during laparoscopic cholecystectomy.

Both the anomalies were rarely reported in the literature. We successfully completed the surgery by laparoscopic route without any injury to the abnormal vessel.

Cystic artery syndrome

In this condition, the cystic artery arises from right hepatic artery in the calot's triangle, but it takes an abnormal course in which it wraps around the cystic duct from behind and the reappears anteriorly near the neck of gallbladder.^[6]

A very large study of cystic artery origin and its abnormal course from 9800 cadavers by Andall et al found the following findings.

81.2 % arises from right hepatic artery; 23 5% courses anterior to common hepatic duct (extracalots position), inferior to cystic duct in 4.9%.^[7]

Saidi et al from Kenya had a similar study with CT abdomen and reported cystic artery was a single vessel in 92% of patients.^[8] Another large cadaveric study from Usha et al compared different authors study in relation to the source of origin of the cystic artery in the following tabular column.^[9]

In1992, Hugh named tiny twigs of cystic arteries runs along the cystic duct in the Calot's triangle as Calot's arteries.^[10]

Cystic artery arises directly from hepatic parenchyma.

In this scenario, the cystic is not found in Calot's triangle, but there will be numerous short vessels arises directly from the hepatic parenchyma.

Table 1: Variation in Source of Origin of the Cystic Artery.									
Studies Source of Origin									
	Rha	Arha	Hap	Cha	Lha	Mha	Gda	Sma	Ct
Michels	77.5	12	0	1.5	5	0	4	0	0
Saidi Et Al.	92	20	7.8	0	0	0	0	0	0
Bakheit	78	0	0	17	2	0	3	0	0
Khalil Et Al.	90	0	5	0	3	0	2	0	0
Pushpalatha	54	2	22	12	0	0	8	2	0
Johnston Et Al	85.7	14.3	0	0	0	0	0	0	0
Tejaswi Et Al.	92	4	2	0	1	0	1	0	0
Daseler Et Al.	71.7	16.1	0	2.8	6.3	0	2.6	0.1	0.3
Flint	98	0	0	0	1.5	0	0.5	0	0
Gawali	90	3.3	0	0	3.3	0	3.3	0	0
Bhardwaj	75	0	0	0	5	13.3	6.7	0	0
Usha Et Al	79.3	12.1	3.7	2.5	1.2	1.2	0	0	0

RHA-right hepatic artery, ARHA- Accessory Right Hepatic artery, HAP- Hepatic Artery Proper, CHA-Common Hepatic artery, PHA- Proper Hepatic Artery, LHA- Left Hepatic Artery, RHA-Right Hepatic Artery. GDA- Gastroduodenal artery, SMA- Superior Mesentric Artery, CT-Coeliac Trunk.

We follow the five principles while doing cholecystectomy.

1. Beware-Anomaly of the hepatobiliary vasculature is a norm.
2. Patient, careful dissection is the key.
3. Demonstrate the Calot's triangle in every case to your assistant/staff nurse.
4. Use the gall bladder /gauze piece to compress the bleeding area/extra-ports may help.
5. Don't hesitate to call for help if necessary.

CONCLUSION

The surgeon should be aware of the varied cystic artery anomalies and be prepared of handling it during cholecystectomy surgery. It is important that the operating surgeon should look for anomalies in every case and so that can avoid untoward major disasters in gallbladder surgeries.

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