



## Morphological Variations of Cystic Artery in Triangle of Calot in Laparoscopic Cholecystectomy: Experience in Tertiary Care Surgical Unit in South Asian Country.

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### ABSTRACT

**Introduction:** The knowledge and realization of the frequency and multiplicity of abnormalities of the cystic artery is a prerequisite for safe laparoscopic cholecystectomy.

**Objective:** To describe the morphological characteristics of the cystic artery in the triangle of Calot.

**Methods:** Descriptive-prospective cross sectional study was performed in 200 patients, who underwent laparoscopic cholecystectomy for symptomatic gallbladder disease, to observe variations cystic artery.

**Results:** Eighty-nine percent (178/200) of the cystic arteries originated as a single artery from the right branch of the hepatic artery. Five percent (10/200) had two cystic arteries originating separately from right hepatic artery while 5 % (10/200) of cystic arteries passed anterior to the common hepatic duct and 1%(2/200) traversed over cystic duct. Majority, 41%(82/200) of the patients right hepatic artery was lying in the triangle of Calot's. Two percent (4/200) of the patients had right hepatic artery running over the common hepatic duct.

**Conclusion:** It has been observed that the variation of the cystic artery in the triangle of Calot is not infrequent and this knowledge will enhance the safe laparoscopic cholecystectomy.

**Keywords:** Cystic artery, Laparoscopic cholecystectomy, Triangle of Calot

### I. INTRODUCTION

In laparoscopic cholecystectomy surgeon should have an appreciation for the distortions in the anatomy of cystic artery which runs through the Calot triangle to perform a safe retraction of the gallbladder. Patients with anomalies in cystic artery were frequently noted during cholecystectomy. These variations have sufficient importance that, because of the technical difficulties and dangers incidental to their presence, no surgeon who operates on the gallbladder and bile ducts can afford to be unaware of their existence<sup>1</sup>.

#### Normal anatomy

The cystic artery arises from the right branch of the hepatic artery and may pass anterior or posterior to the common hepatic duct, in the left border of the triangle of Calot. The boundaries of Calot's triangle are the inferior surface of the right lobe of the liver (upper boundary) and the cystic duct (lower boundary) and common hepatic duct (left border). Calot's triangle contains the cystic artery, often the right hepatic artery and occasionally a bile duct and is of key significance during dissection for a Cholecystectomy<sup>2,3,4</sup>.

The blood supply to the gallbladder is via the cystic artery which has multiple and often common variations. The typical course is from right hepatic artery and lies in the Calot's triangle. The cystic artery may arise from the common or left hepatic artery and may course anterior or posterior to the common hepatic duct. Occasionally the cystic artery arises as a branch of the gastroduodenal artery<sup>3,5</sup>.

#### Methodology

Descriptive-prospective cross sectional study was carried out at Colombo North Teaching Hospital with a study population consists of two hundred patients who underwent laparoscopic cholecystectomy for symptomatic gallbladder disease. Data collection was done by the principal investigator and observed at the

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time of the surgery. The observational findings were confirmed with relevant consultants. Data was analyzed using Statistical Package for Social Sciences 11 (SPSS). Appropriate statistical test will be applied for comparison of variables.

## **II. RESULTS**

Eighty-nine percent (178/200) of the cystic arteries originated as a single artery from the right branch of the hepatic artery and passed posterior to the common hepatic duct, in the left border of the triangle of Calot and divided into anterior and posterior branches near the body of the gallbladder. 5% (10/200) had two cystic arteries originating separately from right hepatic artery. Five percent (10/200) of cystic arteries passed anterior to the common hepatic duct and 1% (2/200) traversed over cystic duct. Forty-one percent (82/200) of the patients right hepatic artery was lying in the triangle of Calot's. Four (2%) patients had right hepatic artery running over the common hepatic duct. Origin of the cystic artery from the left hepatic artery or right hepatic artery crossing anterior to common hepatic duct or right hepatic artery traveling posterior to the portal vein were not noted.

## **III. DISCUSSION**

Many of the classical textbooks up to some extent describe the common, also, known as the normal, the regional variation of morphometry of the cystic artery. Available literature revealed 75.5% of the cystic arteries originated as a single artery from the right branch of the hepatic artery and passed posterior to the common hepatic duct, in the left border of the triangle of Calot and divided into anterior and posterior branches near the body of the gall bladder, whereas in our study it was 89%.

The incidence of the cystic artery traverse anterior to the common hepatic duct was 13.1%, 2.1% and 2.6% respectively which is in relation to its origin which can be either from the right hepatic, the proper hepatic or from the gastro duodenal artery respectively. In our study 5% (10/200) of the cystic arteries passed anterior to the common hepatic duct and 1% (2/200) traversed over the cystic duct, which were all originating from the right hepatic artery. Also 5% (10/200) had two cystic arteries originating separately from the right hepatic artery.

## **IV. CONCLUSIONS**

Abnormalities of cystic artery are common. Presences of rare anomalies are not infrequent. The anatomy facing a surgeon during cholecystectomy involves complex relationships in biliary vasculature. A sound knowledge and awareness of variations in related to variations of cystic artery in triangle of Calot is essential in preventing iatrogenic injury to the duct and vascular system during cholecystectomy especially in laparoscopic cholecystectomy. Establishment of norms in morphological characteristics of cystic artery in Sri Lankan population is lagging behind since the extreme dearth of studies in Sri Lanka are with relevance to the morphology of extra-hepatic biliary system among Sri Lankan population. Facilitating, enhancing and creating awareness of the need of scientific research in this regional anatomy would be beneficial.

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