Section: Anatomy

Original Research Article

STUDY OF CYSTIC ARTERY IN CALOTS TRIANGLE AND COMMON HEPATIC DUCT (CADAVERIC STUDY)

Rahul Kharate[1]

[1]Associate Professor, Department of Anatomy, Vedanata Institute of Medical Sciences, Village Saswand, Dhundalwadi, Dahanu, Palgarh, Maharashtra, India

Received : 14/05/2026
Received in revised form : 05/07/2026
Accepted : 20/07/2026

Keywords:
Cystic artery, calots triangle, hepatic duct

Corresponding Author:
Dr. Rahul Kharate,
Email: rahul03@yahoo.com

DOI: 10.47009/jamp.2026.8.4.103
Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2026; 8 (4); 598-600

ABSTRACT

Background: Variability of the cystic artery in its origin, number, course, and relationship to adjacent biliary structures must be known to the surgeon during laparascopic cholecystectomy. **Materials and Methods:** 30 specimen gallbladders with intact cystic ducts were studied. Variations of the cystic artery were noted, especially concerning the position of calots triangle. **Result:** 27 (90%) cystic artery crossing over the CHD, 2 (6.6%) crossed behind the CHD, 1 (3.3%) crossing below the cystic duct, 84.2% of cystic artery was in the calots triangle and 15.8 outside the calots triangle. **Conclusion:** Anatomical knowledge of the cystic artery is necessary to prevent any iatrogenic complications during cholecystectomy.

INTRODUCTION

The chief source of blood supply to the gallbladder and cystic duct is the cystic artery, which commonly arises from the right hepatic artery in the angle between the common hepatic duct and cystic duct.[1] The cystic artery may arise from left hepatic artery, the proper hepatic artery, the common hepatic artery, the gastroduodenal artery, the superior pancreaticoduodenal artery, and the superior mesenteric artery.[2]

Laparoscopic cholecystomy (LC) is the gold standard method for symptomatic cholelithiasis and inflammatory gallbladder diseases globally.[3] Although it is considered a safe, routinely performed procedure, vascular and biliary injuries remain significant complications, particularly during dissection of calots triangle. Among the anatomical components of calots triangle, the cystic artery demonstrates considerable variability in its origin, course, and relationship adjacent to biliary structures, thereby increasing risk of hemorrhage and inadvertent ductal injury.[4]

Hence an attempt is made to evaluate the variations of the cystic artery and anatomical knowledge of calots triangle.

MATERIALS AND METHODS

30 (thirty) cadavers present in the anatomy departments of Vedanata Institute of Medical Sciences, Village Saswand, Post Dhundalwadi, Tal: Dahanu, Dist: Palgarh, Maharashtra-401606 were studied during dissection of abdomen.

Inclusion Criteria

Well preserved in formalin cadavers were selected for study.

Exclusion Criteria

Pathological cadavers and not properly injected with formalin cadavers were excluded from the study.

Method: Dissecting instruments scissors, forceps, scalpel, were used. The abdomen was opened and fat in the liver, gall bladder and duodenum was cleared. The boundaries of calots triangle were traced. The origin and course of cystic artery and its variation were noted. The following parameters were also recorded.

- Source of origin of the cystic artery
- Relations of the cystic artery to the calots triangle
- Relations of the cystic artery to the cystic duct and common hepatic duct and common hepatic duct were noted.
- Contents of calots triangle.

The duration of study was from April 2024 to May 2026.

Statistical Analysis: Relationship of cystic artery to cystic duct and bile duct were classified with the percentage presence of cystic artery in relation to calots triangle was classified with a percentage. The statistical analysis was carried out SPSS software. The ratio of males and females was 3:1.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

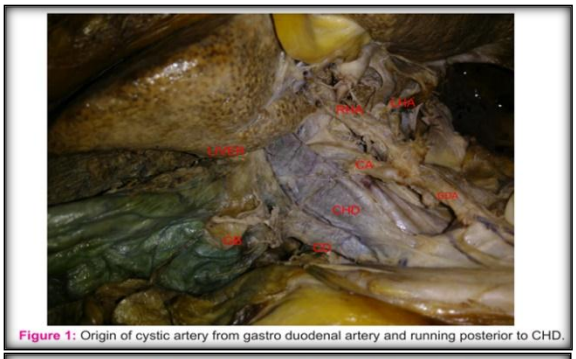

Figure 1: Origin of cystic artery from gastro duodenal artery and running posterior to CHD.

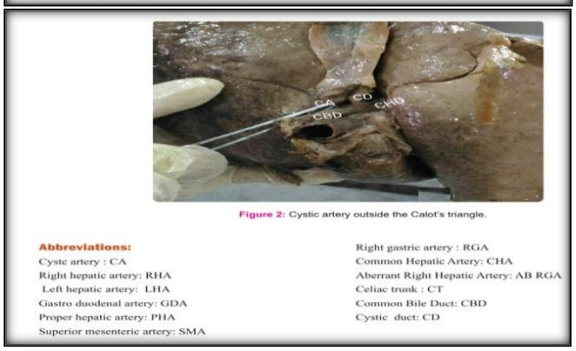

Figure 2: Cystic artery outside the Calot's triangle.

Abbreviations:

Cystic artery : CA
Right hepatic artery: RHA
Left hepatic artery: LHA
Gastro duodenal artery: GDA
Proper hepatic artery: PHA
Superior mesenteric artery: SMA
Right gastric artery : RGA
Common Hepatic Artery: CHA
Aberrant Right Hepatic Artery: AB RGA
Celiac trunk : CT
Common Bile Duct: CBD
Cystic duct: CD

RESULTS

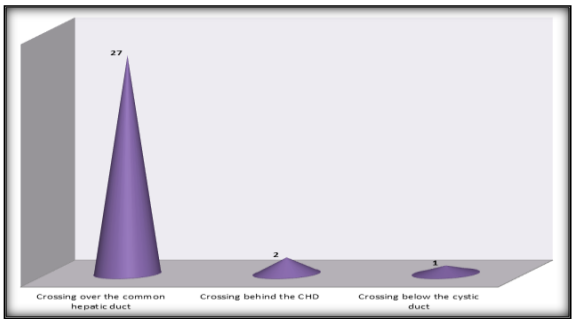

Figure 1: Relationship of cystic artery to the cystic duct and bile duct

[Table 1] Relationship of cystic artery and hepatic duct

27 (90%) crossing over the common hepatic duct, 2 (6.6%) crossing behind CHD, 1 (3.3%) crossing below the cystic duct

[Table 2] Out of 30 (84.2%) of cystic artery present within the calots triangle 15.8% outside the calots triangle.

[Table 3] Present study is compared with previous studies.

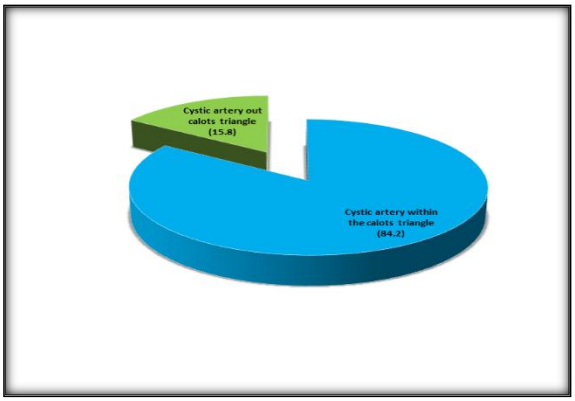

Figure 2: Presence of cystic artery in relation to calots triangle

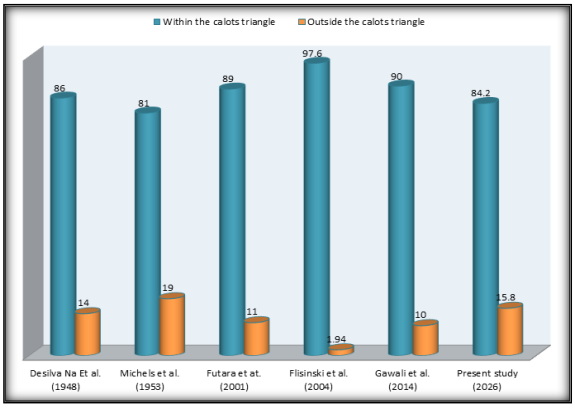

Figure 3: Comparison of present study with previous workers presence of cystic artery within or outside the calots triangle.

Table 1: Relationship of cystic artery to the cystic duct and bile duct. Total No. of cadavers: 30

Cystic artery	Number of specimen	Percentage (%)
Crossing over the common hepatic duct	27	90
Crossing behind the CHD	2	6.6
Crossing below the cystic duct	1	3.3

Table 2: Presence of cystic artery in relation to calots triangle

Number of specimen	Cystic artery within the calots triangle percentage (%)	Cystic artery out calots triangle Percentage (%)
30	84.2	15.8

Table 3: Comparison of present study with previous workers presence of cystic artery within or outside the calots triangle

Name of the worker with date	Within the calots triangle	Outside the calots triangle
Desilva Na Et al. (1948)	86	14
Michels et al. (1953)	81	19
Futara et at. (2001)	89	11
Flisinski et al. (2004)	97.6	1.94
Gawali et al. (2014)	90	10
Present study (2026)	84.2	15.8

ISSN (O): 2687-5365; ISSN (P): 2753-6556

DISCUSSION

Present study of cystic artery in the calots triangle and common hepatic duct in the cadavers. In the relationship of cystic artery to cystic duct and bile duct 27 (90%) crossing over the common hepatic duct, 2 (6.6%) crossing behind CHD, 1 (3.3%) crossing below the cystic duct [Table 1]. The presence of cystic artery in relation to calots triangle out of 30 specimen (cadavers) 84.2% cystic artery was within the calots triangle 15.8% outside the calots triangle [Table 2 & Figure 1-2]. These findings are more or less in agreement with previous studies.[5-7]

It is reported that, prevalence of anatomical variations of the cystic duct ranges between 8.2% to 24%. The normal length of cystic duct is typically 2-4 cm and usually inserts into the middle third of common bile duct, mostly towards the right side.[8] Short cystic ducts have been reported in 1.3-2.6% of cases. Double and absence of cystic ducts were 0.3 – 0.4%.[9]

Cystic artery (CA) is usually branch of celiac RHA. It may arise from LHA, CHA, HAP, ARHA, GDA superior mesenteric artery (SMA), celiac trank, or aorta. Moreover there is a variation in the length of cystic artery (CA) 16.9mm and ranged between 2mm and 55mm.[10]

Majority of the CA in the present study located within the calots triangle has surgical importance. To avoid bile duct and vascular injury surgeon must be aware of this variations of CA.[11]

It is hypothesized that liver and gall bladder develop from same entity pars hepatica and pars cystica. During the rotation of gut there may be improper position of liver and gall bladder hence blood vessels supplying to these two structures may assume variations to supply these structures leading to variations in CA, CHD, bile duct etc. Moreover artery assumes variations to maintain its heamodynamic pressure against erect posture.

It is also noted that gall bladder also assumes various size and shape, some time intra hepatic to adjust with liver these variations in the morphometric character of gall bladder indicates that in foetal life, during rotation of gut it has to adjust with available location with the liver. Hence variations of cystic artery remain importance to the surgeon during cholecystectomy.

CONCLUSION

In the present study of cystic artery in calots triangle and common hepatic duct. The knowledge of cystic artery variability facilitates intra operative identification of vessels in both classical and laparoscopic surgery of cholecystectomy to prevent any iatrogenic complications during surgery. The present study demands further embryological, genetic, and environmental studies because exact cause of variations of CA is still unclear.

Limitation of study: Owing to remote location of research centre, small number of cadavers, lack of latest techniques, we have limited findings and results.

REFERENCES

1. Neri V, Ambrosi A: Antegrde dissection in laparoscopic cholecystectomy JSLS journal of society of laparoscopic surgeons 2007, 11 (2); 225-8.
2. Suzuki M, Akaishi S: Laparoscopic cholecystomy, calots triangle and variations in cystic arterial supply. J. of Surg. Endoscopy New York 2000, 14 (2); 141-144.
3. Sanjay N: Anatomy relevant to cholecystomy J of minimal acess to surgery 2005, 1 (20; 53-58.
4. Ibingira CBR: Gross anatomical variations and congenital anamolies of surgical important in hepatobiliary surgery in Uganda East and central African J. of surgery 2006, 12 (1); 93-98.
5. Patil S, Rana K: Clinico-anatomical study of blood supply of Extra hepatic biliary ductal system Br. Biomed. Bulletien 2014, 2 (2); 447-459.
6. Tejashwi HL, Dakshayani KR, Ajay N: Prevalance of anatomical variations of cystic artery in south Indian cadavers J. of Res. Med. Science 2013, 1; 424-8.
7. Gawali Rohan A: Study on variations of the origin and course of cystic artery and its relation to calots triangle Int J. Med. Phar. Sci. 2014, vol. 5 (3); 39-42.
8. Khaliur Rahaman MDI, Selima Anwar: Presence of cystic artery in the calots triangle and its relation with common hepatic duct Bangladesh J. Anat. 2012, 10 (2); 50-56.
9. Jones MW, Ferguson T: Minzzi Syndrome 2023 Available from http//www.ncbi.nim.nih.gov/booksNBK482491 viewed on 30th January 2026.
10. Singh S, Arora K: Anatomical variations of cystic artery in North Indian population cadavers study Clin. Anat. 2010, 23 (7); 778-784.
11. Iflazoglu N, Ozturk G: Anatomical variations of cystic artery and its surgical importance J. Morphol. Sci. 2013, 30 (1); 1-4.

ISSN (O): 2687-5365; ISSN (P): 2753-6556