

# Prevalence of anatomical variation of cystic duct among south Indian population - A cadaveric study

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## Abstract

**Background:** As recent surgical intervention around the extra hepatic biliary system is increased, a thorough knowledge of anatomy of biliary system is important to reduce the post-operative complications. The present study explains the variation around cystic duct. **Materials and Methods:** 50 cadavers were dissected to see the variation of cystic duct based on union, number and relation of cystic artery in calot's triangle. **Results:** One cadaver showed double cystic duct and the cystic artery was passing superficial to cystic duct in calot's triangle. **Conclusion:** Any deviation from the normal anatomy leads to increased incidence of post-operative complication and misidentification during cholecystectomy. The variation of cystic duct is not only important for anatomist but it is also useful for surgeons and patients.

**Key Words:** Cystic duct, cystic artery, hepatic duct, biliary tree.

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## INTRODUCTION

Extra hepatic biliary system consists of common hepatic duct formed in porta hepatis by union of right and left hepatic duct. Gallbladder along with cystic duct unites with common hepatic duct to form common bile duct. The knowledge of normal anatomy and the variations of extra hepatic biliary system is not only interesting but also useful for laparoscopic surgeons performing Cholecystectomy and radiologist for recent investigation like magnetic Resonance Cholangio-pancreatography (MRCP). As anatomist we were interested in studying the variation of cystic duct to reduce the post-operative complication like fistula, bile leakage.

## MATERIALS AND METHODS

During routine dissection for undergraduates in the department of Anatomy of Karpaga Vinayaga Institute of Medical Sciences, 50 embalmed cadavers were dissected and examined for the period of three years. The hepatoduodenal ligament was traced upwards to expose the bile duct and the union of cystic duct with the hepatic duct was visualized and noted. The cystic duct was traced up to the neck of gall bladder to see any anomalies. The boundaries of Calot's triangle were dissected and the cystic artery was noted for any variations. The study was cleared by the internal ethical committee.

## RESULTS

Table 1: Shows union of cystic duct

No of cadavers	Union of Cystic duct with hepatic duct		
	Angular	Parallel	Spiral
50	50	nil	nil

The union of cystic duct with hepatic duct was angular in all the 30 cadavers

Table 2: Shows number of cystic duct

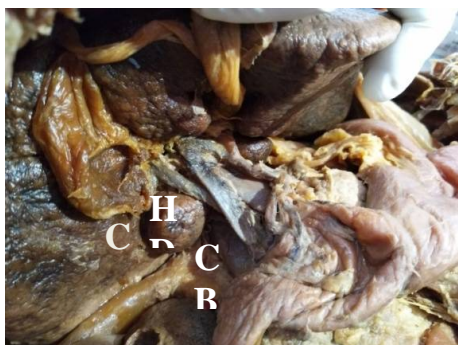
No of cadavers	Number of cystic duct	
	single	double
50	49	1

Number of cystic duct in 29 cadavers were single, in one cadaver the cystic duct was double

**Table 3:** Relation of cystic artery

No of cadavers	Cystic artery	
	Within calot's triangle	Superficial to calot's triangle
50	49	1

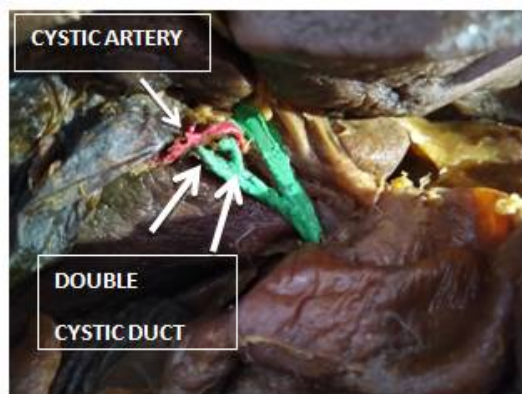
Cystic artery was present within the calot's triangle in 29 cadavers. In one cadaver the cystic artery was superficial to the calot's triangle



**Figure 1:** Showing the union of cystic duct with hepatic duct  
CD-Cystic Duct, HD-Hepatic duct, CBD-Common Bile Duct



**Figure 2:** Showing Cystic Artery within The Calot's Triangle  
Green –cystic duct, Hepatic duct, Bile duct Red-Cystic Artery



**Figure 3:** Showing double cystic duct and cystic artery is present outside the calot's triangle passing anterior to cystic duct

## DISCUSSION

Development of hepatic diverticulum starts at 4<sup>th</sup> week<sup>1</sup>. Any changes in in the development per se produce derangement of biliary tree<sup>2</sup>. The incidence of variation of cystic duct has been studied by many pioneers. These variations in cystic duct anatomy are of considerable importance during surgical excision of the gallbladder. Ligation or clip occlusion of the cystic duct must be performed at an adequate distance from the common bile duct to prevent angulation or damage to it. Accessory ducts must not be confused with the right hepatic or common hepatic ducts<sup>3</sup>. Edward v Johnson *et al* in his study of 35 specimens showed the angular union of cystic duct with common hepatic duct was 51%<sup>4</sup>. Thomson in 1933 have showed 90% angular type of union<sup>5</sup>. Eisendnath in his study showed 75% angular type of union using 100 specimens<sup>6</sup>. Rugsy *et al* showed 35% angular type of union in 43 cadavers<sup>7</sup>. Anupama *et al* in his study showed 86% of angular type of union<sup>8</sup>. In the present study all 30 cadavers showed angular type of union (100%). The incidence of angular type of union is higher in this study as compared to previous studies. Abesha ambaye *et al* in study has showed a rare variation of cystic duct uniting with right hepatic duct to form common cystic duct which in turn units with left hepatic duct<sup>9</sup>. No such anomaly was found in the present study. Schanchner in his study showed 2 cases (2.6%) of double cystic duct out of 76 specimens<sup>10</sup>. The present study showed single double cystic duct of 30 cadavers (3%). the incidence of presence of double cystic duct is approximately same compared to previous study. Hollinstead states that calot's triangle in bounded cystic duct on right side, common hepatic duct on left side and hilum of liver above and the main content inside the triangle is cystic artery and right hepatic artery<sup>11</sup>. Sobha Devi *et al* in his study showed 10% of abnormal relation of cystic artery with hepatic duct in 50 cadavers<sup>12</sup>. The present study showed abnormal relation of cystic artery which passing superficial to cystic duct as shown in figure 3. The knowledge of variation of cystic duct helps the laparoscopic surgeons to prevent post-operative complications.

## CONCLUSION

A thorough dissection of cystic duct in all the 50 cadavers showed 100% angular type of union of cystic duct with hepatic duct. The frequency of occurrence of double cystic duct was 3% and the cystic artery was passing superficial to cystic duct. The variation of cystic duct is useful for laparoscopic surgeons and radiologist, as it adds to surgical precaution which reduces surgical stress for the surgeons and produce a complication free post surgical period to the patients.

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