

# Cystic Duct Anomalies Encountered During Laparoscopic Cholecystectomy

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## ABSTRACT

**Objective:** To determine frequency of cystic duct anomalies and its common types in patients during laparoscopic cholecystectomy.

**Study design:** Descriptive / cross sectional study.

**Place and duration of study:** This study was conducted at Liaquat University of Medical and Health Sciences, Jamshoro and in Rajputana Hospital, Hyderabad from July 2014 to December 2014.

**Materials and Methods:** After all relevant investigations, patient with diagnosis of cholelithiasis was submitted for laparoscopic cholecystectomy. Final outcome of cases operated in terms of cystic duct (C.D) anomalies were entered on proforma provided to all operating surgeons having >5 years of experience.

**Results:** A total of 301 patients were included in this study. The mean age of the patients was  $40.58 \pm 16.82$  years (range is 31-60 years) . Most of the patients were lie < 46 years 175(58.1%)only. Out of 301 numbers of cases 116(38.6%) patients were male and 185(61.4%) were females. Cystic duct anomalies were noted in 38 (12.6%) cases only. In the present study the most common and higher incidence rate of anomalies like Spiral cystic duct were observed. Statistically the Incidence was found to be higher than in the previous studies.

**Conclusion:** In this study the most common & higher incidence rate of anomalies like Spiral cystic duct were observed. Statistically the Incidence was found to be higher previous studies. Identification and careful dissection especially with anomalies prevent the damage to biliary tree during laparoscopic cholecystectomy.

**Key Words:** Bile duct injury, Laparoscopic cholecystectomy, Cystic duct, Spiral cystic duct

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## INTRODUCTION

Cholecystectomy is one of very common operations being performed in Pakistan. Laparoscopic cholecystectomy (LC) is now considered as the gold standard surgical option for treatment of cholelithiasis and nowadays it is also being widely accepted by our society<sup>1</sup>. Variations have been observed in the anatomy of gallbladder, intrahepatic as well extra hepatic ductal system and vasculature supplying them and liver. It is important for the surgeon to know these variations, because failure to recognize these anomalies may lead to inadvertent ductal ligation, biliary injuries, leaks and stricture after laparoscopic cholecystectomy<sup>2</sup>. In biliary surgery though ductal injury is an uncommon complication but with increasing use of LC, there has been an associated rise in the incidence of biliary ductal injury<sup>3</sup>. Therefore a surgeon should know and be aware of variations in anatomy in order to avoid significant ductal injury during biliary surgery.<sup>4</sup>

The incidence and variety of biliary anomalies have been reported to be as high as 47% of the population, based on operative, cholangiography, and autopsy studies. Within a 3-cm critical zone along the cyst-hepatic angle, 85% of all aberrant bile ducts are found<sup>5</sup>. Incidence of cystic duct anomalies in study is (4.33%)<sup>2</sup>. Incidental finding have been reported in the literature as case reports, unique anomalies of cystic duct (CD)<sup>6</sup>. Anomalies found in literature are spiral cystic duct (7.9%)<sup>7</sup>, low insertion of the cystic duct (9%)<sup>4,8</sup> and aberrant right hepatic duct draining into common bile duct (CBD) and common hepatic duct (4.6-8.4%)<sup>3</sup>. However, drainage of aberrant right duct into cystic duct is rare and only four cases reported<sup>3</sup>. Most of these cases were reported from United State of America (USA) and from United Kingdom (UK). Little is known about its rate of occurrence and varieties in our population.

Therefore, this study is planned to assess types of anatomical variations of the cystic duct morphology during laparoscopic cholecystectomy, in our society, in order to help the future surgeons to avoid serious complications during laparoscopic cholecystectomy.

## MATERIALS AND METHODS

Study was conducted in department of surgery of Liaquat University of Medical & Health Sciences (LUMHS), Jamshoro and in Rajputana Hospital, Hyderabad. It is a descriptive cross sectional study.

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Non-Probability Consecutive sampling technique applied where every patient meet the inclusion criteria will be recruited. All cases of elective laparoscopic cholecystectomy after confirmation of diagnosis of cholelithiasis by history, clinical examination and investigations were included in study . Investigation for confirmation of diagnosis includes ultrasound abdomen , LFTs and if needed CT scan upper abdomen or MRCP is also performed. All patients with acute cholecystitis, empyema of gall bladder, acute pancreatitis, obstructive jaundice and carcinoma of gall bladder were excluded from the study. This was conducted from July 2014 to December 2014 after ethical committee approval. Data was collected using structured proforma including all variables like age, gender, cystic duct anomaly and its common types which will be filled by principle investigator and by all operating surgeons having > 5 years experience.

Data was entered and analyzed by SPSS version 20. Descriptive statics was calculated. Where mean and standard deviation was calculated for age of patient respectively. We arrest frequency and percentages of ages was calculated for gender distribution, cystic duct anomalies (yes/no) and its outcome variables: spiral cystic duct (yes/no), low insertion of cystic duct (yes/no), aberrant hepatic duct (yes/no). To see the effect modifier of outcome variables was controlled through stratification like age & gender. Chi square test was applied when frequency found to be less than 5. Fisher exact test was applied and p value <0.05 will be taken as significance.

**RESULTS**

A total of 301 admitted in the department of general meeting the inclusion and exclusion criteria were included in the study. The mean age was 40.58±16.82 (range 31-60 years). Most of the patients were lie < 46 years 175(58.1%). Median age was 46.2 years. Out of 301 number of cases 116(38.6%) patients were male and 185(61.4%) were females.

**Table No.1: Types of Cystic Duct Anomaly according to their 38 number of Patient’s**

Types of Cystic Duct Anomaly	Frequency (f)	%ages
Spiral cystic duct	20	52.6%
Low insertion of cystic duct	13	34.2%
Aberrant right hepatic duct joining cystic duct	05	13.1%

In this study among 301 cases, Cystic duct anomalies were noted in 38 (12.6%) cases. In the present study the most common and higher incidence rate of anomalies like Spiral cystic duct were observed. Statistically the Incidence was found to be higher than in the previous studies. (Table 1)

When we compare age and gender with cystic duct anomalies we found both of the variable were statistically significant with p-value less than 0.05.(Table 2,3)

**Table No.2: Comparison of Cystic Duct anomaly with gender distribution (N=301)**

Gender	Cystic Duct Anomaly		Total	P Value
	Yes	No		
Male	08 (2.7%)	108 (35.9%)	116 (38.5%)	0.018* Significant
Female	30 (10%)	155 (51.5%)	185 (61.5%)	
Total	38 (12.6%)	263 (87.4%)	301 (100%)	

**Table No.3: Comparison of Cystic Duct anomaly with Age Group distribution (N=301)**

Gender	Cystic Duct Anomaly		Total	P Value
	Yes	No		
Age<46 Years	29 (9.6%)	146 (48.5%)	175 (61.5%)	0.000* Significant
Age>46 Years	9 (3%)	117 (38.9%)	126 (41.9%)	
Total	38 (12.6%)	263 (87.4%)	301 (100%)	

**DISCUSSION**

Cholelithiasis and cholecystitis commonly affecting our population especially the female patients. Laparoscopic cholecystectomy and also open cholecystectomy are the two surgical options for symptomatic gallstones with a cure rate of up to 95%.<sup>9</sup> In the present times laparoscopic cholecystectomy has become a very common procedure for patients with choleliathisis producing symptoms. The success and safety of laparoscopic cholecystectomy depends upon the basic knowledge of normal anatomy and common variants of extra-hepatic billiary system and cystic duct.<sup>10</sup> A thorough knowledge of the Extra-hepatic biliary apparatus could go a long way to minimize post-operative complications. As early as 1803 a study by Luschka showed the presence of accessory hepatic ducts. In a prospective study(1996) on 513 cholangiograms by Kullman E et al, anatomical aberrations of bile ducts were found in 98(19%) cases. In 8.4% cases the aberrant bile ducts opened into cystic duct.<sup>11</sup> Lamah M, et al(1999) also found anatomical variation by intra-operative cholangiography in twelve cases out of 2080 cases and commonest anomaly(n=5) was accessory bile duct followed by abnormal termination of cystic duct (n= 3).<sup>12</sup> Hence anomalies of the cystic duct was viewed with extra interest.

In this study the average age of patients was 40.58(16.82) years. Minimum age was 31 years and maximum age was 60 years. There were185 (61.4%) females and 116 (38.6%) males. A study from Sindh

Pakistan studied 300 cases of cholelithiasis reported the similar gender and age distribution<sup>13</sup> Another study from Iraq reported Patients' age ranged from 20-69 years, with a higher frequency during the third and fourth decade. Females constituted 84% of the patients<sup>14</sup>.

In our study 38 (12.6%) cases have cystic duct anomalies out of 301 cases. Out of thirty eight case spiral cystic duct anomaly was common and found in 20 (50.6 %) cases. While aberrant right hepatic duct joining cystic duct was found only in 5 (13.1 %) cases and low insertion of cystic duct was found in 13 (34.2%) cases. The incidence and variety of biliary anomalies have been reported to be as high as 47% of the population, based on operative, cholangiography, and autopsy studies. Incidence of cystic duct anomalies in study is (4.33%).<sup>2</sup> Incidental finding have been reported in the literature as case reports, unique anomalies of cystic duct (CD)<sup>6</sup> like spiral cystic duct, low lateral insertion and narrow-winding of the cystic duct reported with incidence of (7.9%)<sup>7</sup> and (9%)<sup>4,8</sup> respectively. Aberrant right hepatic duct draining into common bile duct (CBD) & in common hepatic duct with incidence of 4.6-8.4%, however, drainage into cystic duct is rare and only four cases reported.[3] A local study reported anatomical variation in 14% cases, among total anomalies of 14 cases, the Moynihan's hump (6%) ,accessory cystic artery (6%) , Double cystic duct (1%) and Long cystic duct (1%) were the total encountered variations<sup>15</sup> In another local study the operative findings revealed variations in 61 (20.33%) patients mainly involving cystic artery (10.67%), cystic duct (4.33%), right hepatic artery (2.67%) and gallbladder (2%).<sup>10</sup> Other studies reported incidence of accessory cystic duct from 1 to 30%.<sup>14,17</sup>

Anatomic variation of the extra hepatic biliary tree has been the subject of numerous investigations, the reported incidence of congenital anomalies varying from 1.6 to 47.2%. In this study, anatomical variation was noted in 12.6% (n=38)cases. Biliary tract has more anomalies in 1cm - 13cms of the space in the cystic duct region than in any other part of the body.<sup>5,18</sup> Careful exploration of Calot's triangle and exact identification of extra hepatic biliary tree and cystic duct anomalies such as spiral cystic duct, low insertion of cystic duct and aberrant right hepatic duct joining cystic duct is important to avoid biliary injuries during laparoscopic cholecystectomy.<sup>19,20</sup>

## CONCLUSION

In the present study the most common & higher incidence rate of anomalies like Spiral cystic duct were observed. Statistically the Incidence was found to be higher than in the previous studies. Identification and careful dissection especially with anomalies prevent the damage to biliary tree during laparoscopic cholecystectomy.

**Conflict of Interest:** The study has no conflict of interest to declare by any author.

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