

## Original Research

### Evaluation of anatomical variations and anomalies of extra hepatic biliary system in patients undergoing elective laparoscopic cholecystectomy

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#### Abstract

**Background:** The present study was conducted for evaluating anatomical variations and anomalies of extra hepatic biliary system in patients undergoing elective laparoscopic cholecystectomy. **Materials & methods:** 100 subjects who were scheduled to undergo Laparoscopic cholecystectomy were enrolled. Complete demographic and clinical details of all the patients was obtained. All cases were performed by experienced laparoscopic surgeons. Patients were followed upto one week when stiches were removed. Note was made of any wound infection or any other complaint. A Performa was made and all the results were recorded. Statistical analysis was done using SPSS software. **Results:** Buried or intrahepatic gall bladder and Phrygian cap was seen in 4 percent of the patients each. Short cystic duct and long cystic was seen in 3 percent and 5 percent of the patients respectively. Moynihan's hump and Abnormal origin of RHA were seen in 2 percent and 1 percent of the patients respectively. Artery arising above calot's triangle, Artery anterior to cystic duct and Double cystic Artery were seen in 2 percent, 8 percent and 1 percent of the patients respectively. **Conclusion:** Although while congenital malformations and extra-hepatic biliary tree variants are frequent, they can have clinical significance and surprise an unsuspecting surgeon if they are present. To avoid unintentional ductal cutting, ductal injuries, strictures, and bleeding issues during laparoscopic cholecystectomy, every surgeon should check for these anomalies.

**Key words:** Laparoscopic cholecystectomy, Hepatic, Biliary

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#### INTRODUCTION

Laparoscopic cholecystectomy was first introduced by Muhe in 1986, and has now evolved to the point where it has replaced the open technique in many medical centers around the world. Today, laparoscopic cholecystectomy, rather than the open technique, is considered as the treatment of choice for gallstone disease.<sup>1, 2</sup> Perceived advantages of laparoscopic cholecystectomy, compared with the open technique, include earlier return of bowel motility, less post-operative pain, better cosmetic result and shorter hospital stay resulting in equal or lower hospital costs, as documented by various randomized control trials.<sup>3</sup>

One of the most typical sites for surgical treatments is the extra-hepatic biliary tract (EHBT). The surgeon must be familiar with the anatomy of the EHBT and

be able to spot any potential aberrant anatomical variations because the existence of these differences may increase the risk of biliary tract injury during surgery.<sup>4</sup> There have been reports of up to 47% of EHBT anatomical variants. These variations include: accessory hepatic ducts; aberrant ducts communicating liver directly to the gall bladder (accessory cysticohepatic ducts) or ducts of Luschka; low insertion of the cystic duct (CD), insertion of the cystic duct into right or left hepatic duct (RHD or LHD); CD insertion in the left side of the common hepatic duct (CHD) or left CD insertion; short CD, long CD and double CD.<sup>5, 6</sup> Hence; the present study was conducted for evaluating anatomical variations and anomalies of extra hepatic biliary system in patients undergoing elective laparoscopic cholecystectomy.

## MATERIALS & METHODS

The present study was conducted in the department of human anatomy and general surgery for evaluating anatomical variations and anomalies of extra hepatic biliary system in patients undergoing elective laparoscopic cholecystectomy. 100 subjects who were scheduled to undergo Laparoscopic cholecystectomy were enrolled. Complete demographic and clinical details of all the patients was obtained. All cases were performed by experienced laparoscopic surgeons. Any medical illness which makes the patient unfit for anaesthesia were excluded from the present study. Also; patients with documented stones in CBD or CBD diameter of >10mm was excluded from present study. Patients were followed upto one week when

stiches were removed. Note was made of any wound infection or any other complaint. A Performa was made and all the results were recorded. Statistical analysis was done using SPSS software.

## RESULTS

Buried or intrahepatic gall bladder and Phrygian cap was seen in 4 percent of the patients each. Short cystic duct and long cystic was seen in 3 percent and 5 percent of the patients respectively. Moynihan's hump and Abnormal origin of RHA were seen in 2 percent and 1 percent of the patients respectively. Artery arising above calot's triangle, Artery anterior to cystic duct and Double cystic Artery were seen in 2 percent, 8 percent and 1 percent of the patients respectively.

**Table 1: Congenital anomalies observed intraoperatively**

Type of anomaly	Number	Percentage
Buried or intrahepatic gall bladder	4	4
Phrygian Cap	4	4

**Table 2: Variation in cystic duct**

Type of anomaly	Number	Percentage
Short cystic duct	3	3
Long cystic duct	5	5

**Table 3: Variation in right hepatic artery**

Type of anomaly	Number	Percentage
Moynihan's hump	2	2
Abnormal origin of RHA	1	1

**Table 4: Variation in cystic artery**

Type of anomaly	Number	Percentage
Artery arising above calot's triangle	2	2
Artery anterior to cystic duct	8	8
Double cystic Artery	1	1

## DISCUSSION

Any surgical procedure must be performed safely, which requires an understanding of the pertinent anatomy. It has long been understood that, specifically in the setting of a cholecystectomy, anatomical deviations and incorrect interpretations of normal anatomy both contribute to the incidence of serious postoperative problems, particularly biliary injuries. Such harm can lead to substantial illness and, rarely, even fatality. In the developed world, these are also among the most typical reasons why abdominal surgeons are sued. There is currently enough evidence to say that the adoption of laparoscopic cholecystectomy (LC) as the norm has increased the number of bile duct damage. This appears to be somewhat attributable to the different anatomical exposure of the region surrounding the gallbladder during the laparoscopic treatment as opposed to the open procedure, particularly the Calot's triangle.<sup>7-9</sup>Hence; the present study was conducted for evaluating anatomical variations and anomalies of extra hepatic biliary system in patients undergoing elective laparoscopic cholecystectomy.

Buried or intrahepatic gall bladder and Phrygian cap was seen in 4 percent of the patients each. Short cystic duct and long cystic was seen in 3 percent and 5 percent of the patients respectively. Moynihan's hump and Abnormal origin of RHA were seen in 2 percent and 1 percent of the patients respectively. In a previous study conducted by Sharma R et al, studied the anatomical variations and anomalies of extra hepatic biliary system in patients undergoing elective laparoscopic cholecystectomy. These variations were tested upon 50 patients undergoing laparoscopic cholecystectomy. In their study various anomalies of biliary system; both congenital as well as acquired, including anomalies of cystic duct, cystic artery, gall bladder, supraduodenal CBD, right and left hepatic arteries were studied. They concluded that surgeons performing cholecystectomies should an intraoperative protocol that is similar to navigation have principles used in the aviation and maritime industry". The mastery of the possible surprises of occasional variations in the extra hepatic biliary system anatomy is essential.<sup>10</sup>In a similar study conducted by Khayat MF et al, authors determined the

most common abnormal anatomical variations of extra-hepatic biliary tract (EHBT), and their relation to biliary tract injuries and stones formation. This was a retrospective review of 120 patients, who underwent endoscopic retrograde cholangiopancreatography (ERCP) and/or magnetic resonance cholangiopancreatography (MRCP). Out of 120 patients, 50 were males (41.7%) and 70 were females (58.3%). The mean age was 54 years old (range 20 - 88). Abnormal anatomy was reported in 30% (n = 36). Short cystic duct (CD) was found in 20% (n = 24), left CD insertion in 5% (n = 6), CD inserted into the right hepatic duct (RHD) in 1.7% (n = 2), duct of Luschka in 3.33% (n = 4) and accessory hepatic duct in also 3.33% (n = 4). Biliary tract injuries were reported in 15% (n = 18) and stones in 71.7% (n = 86). Biliary tract injuries were higher in abnormal anatomy (P = 0.04), but there was no relation between abnormal anatomy and stones formation. Abnormal anatomy of EHBT was found to be 30%.<sup>11</sup>

In the present study, artery arising above Calot's triangle, Artery anterior to cystic duct and Double cystic Artery were seen in 2 percent, 8 percent and 1 percent of the patients respectively. Talpur et al, in another previous study, assessed the frequency of anatomical variations of extrahepatic biliary system in patients undergoing laparoscopic cholecystectomy. Three hundred cases of cholelithiasis comprising 255 (85%) females and 45 (15%) males with mean age of 39.85 +/- 18.82 years were included in the study. Patients mainly presented with upper abdominal pain including pain in right hypochondrium (71.67%), pain in right hypochondrium and epigastrium (19%) and pain in epigastrium alone (9.33%) as main symptoms. 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%). Postoperatively 3.67% revealed bleeding and 1.67% biliary leak from drain as main complications related to anatomical variations giving rise to 1% morbidity, however, no mortality was seen in their series.<sup>12</sup>

## CONCLUSION

Although while congenital malformations and extra-hepatic biliary tree variants are frequent, they can have clinical significance and surprise an unsuspecting surgeon if they are present. To avoid unintentional ductal cutting, ductal injuries, strictures, and bleeding issues during laparoscopic cholecystectomy, every surgeon should check for these anomalies.

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