

Study of Anatomical Variations of Extra Hepatic Biliary System Found during Cholecystectomy

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Abstract: ***Background:** Extra hepatic biliary system anatomy is of great importance for the surgeons since extra hepatic biliary system is one of the common sites of anatomical variations and it is most common sites for surgical dissection during cholecystectomy. Objective was to identify the complications occurring during and after cholecystectomy in patients with anatomical variations. Aim of study was to identify the most common anatomical variations of extra hepatic biliary system found during cholecystectomy. **Methodology:** This study was a prospective observational study carried out from January 2019 to December 2019 in Dr. B.R.A.M Hospital Raipur C.G. The study carried out in 60 patients diagnosed as cholelithiasis and under elective open, Lap, Lap to open cholecystectomy. **Results:** In present study, Out of 60 patients of cholelithiasis, 34 (56.66%) patients were females and 26 (43.33%) were males with female to male ratio is 1.5:1. The mean age of patients was 42.5 years and median age was 41.5 years. Most of the patients presented with upper abdominal pain in the form of right hypochondrium pain (73.33%), pain in right hypochondrium with pain in epigastrium (20%) and epigastrium pain (6.66%). Multiple stones were present in 78.33% and 21.66% had single stone. In all operated patients, normal anatomy was found in 49 patients (81.60%) and anatomical variations of EHBS was found in 11 patients (18.33%) in which cystic duct variations (8.33%) was most common variations in the study followed by gall bladder variations (6.67%). No variations of right and left hepatic artery and hepatic duct encountered during surgery. Intra operatively, bleeding occurred in only 2 cases. All the patients were followed up for post operative complications for 7 days in which only in 3 cases, wound infection was found. **Conclusion:** Variations of anatomy of EHBS was found to be 18%. The most common variations is short cystic duct followed by intra hepatic gall bladder. So every surgeon should look for these variations during laparoscopic and open cholecystectomy in order to prevent inadvertent ductal clipping, ductal injuries and bleeding problems. Awareness to these variations will decrease morbidity, conversion and re-exploration in these patients.*

Keywords: Extra hepatic biliary system, cholecystectomy, cystic duct, gall bladder

1. Introduction

Extra-hepatic biliary system is one of the most common sites of surgical dissection during cholecystectomy. It is important for the surgeon to be aware of the extra-hepatic biliary system anatomy and be able to identify its possible abnormal anatomical variations, as the presence of these variations may increase the biliary tract injuries during surgery. Incidence of anatomical variations extra hepatic biliary system is highly variable and is reported as low as 7.3%^{5, 6, 7, 8} to be as high as 47%^{5, 6, 7, 8}. These anomalies include gall bladder anomalies, aberrant or accessory biliary ducts, aberrant cystic duct, right hepatic artery anomalies, left hepatic artery anomalies, common hepatic artery anomalies, cystic artery anomalies⁹. The incidence of different anatomical variation include gall bladder anomalies (2%), cystic duct anomalies (4.33%), Right hepatic artery anomalies (2.67%), Common hepatic artery anomalies (0.67%), Cystic artery anomalies (10.67%). Variations in the anatomy of gallbladder, bile duct, the arteries that supply them and liver are important to the surgeon because failure to recognise them may lead to ductal ligation, biliary leaks and strictures after cholecystectomy and various complication^{10, 11}. Variations of extra hepatic biliary system are not so uncommon and may be of clinical importance⁷.

2. Methodology

Study sample consist of 60 patients diagnosed of cholelithiasis from department of surgery of Dr. B.R.A.M. Medical College.

Inclusion criteria

- All patients who have given consent for the study.
- Patients Undergoing elective and emergency cholecystectomy.
- Age 18 to 75 years of age.

Exclusion criteria

Patients undergoing cholecystectomy for empyema gall bladder, gall bladder cancer, pancreatitis or any neoplastic or inflammatory condition which causes obscuring of extra hepatic biliary system.

3. Procedure

All the patients of cholelithiasis admitted for cholecystectomy. Base line investigations along with ultrasound abdomen were carried out in all cases and no other special investigations were done to evaluate the patients.

All cases undergoing routine open and laparoscopic cholecystectomy were assessed for different extra hepatic biliary ductal and vascular variations accessible during the procedure. At the time of operation, careful dissection was performed, the anatomy of calot's triangle was displayed and common hepatic-cystic duct junction was identified and any variant of cystic duct was searched. Structures mainly assessed were gall bladder, cystic duct, cystic artery, hepatic artery and hepatic duct which are easily handled during cholecystectomy. All the operated patients were followed up post operatively for 7 days for any complications. All the

findings documented on proforma and subjected to statistical analysis of data.

4. Observations

Table 1: Age Wise Distribution of the Patients (N=60)

Age Group	No. of Patients	Percentage
21-30 Years	9	15
31-40 Years	20	33.33
41-50 Years	16	26.67
51-60 Years	11	18.33
61-70 Years	3	5
71-80 Years	1	1.67
	TOTAL = 60	100%

Most common age group involved was 31-40 years.

Table 2: Symptoms of the Patients

Symptoms	Frequency of Patients	Percentage
Pain in right hypochondrium	44	73.33%
Pain in epigastrium	4	6.66%
Pain in right hypochondrium + epigastrium	12	20%
Dyspepsia	7	11.66%
Nausea and vomiting	11	18.33%

In this table most common presenting symptom is pain in right hypochondrium followed by Pain in right hypochondrium + epigastrium

Table 3: Variations in Gallbladder (N=60)

Type Of Variations	No. of Patients	Percentage
Buried or Intrahepatic Gall Bladder	3	5%
Floating Gall Bladder	0	0%
Bilobar gall bladder (double gall bladder)	1	1.6%
Septate gall bladder	0	0%
Diverticulum of gall bladder	0	0%
Phrygian Cap	0	0
Parallel to CBD	0	0

Out of 60 patients, 3 patients had intra hepatic gall bladder and 1 patient had double gall bladder.

Table 4: Variations in Cystic Duct

Type of Variations	No. of Patients	Percentage
Short cystic duct	3	5%
Long cystic duct	2	3.3%
Cystic duct parallel common bile duct	0	0%
Cystic duct crosses common bile duct and enters it on left	0	%
Accessory cholecystohepatic duct	0	0

Out of 60 patients, 3 patients had short cystic duct and 2 patients had long cystic duct

Table 5: Variations of Cystic Artery

Type of Variations	No. of Patients	Percentage
Cystic artery anterior to cystic duct	0	0%
Cystic artery posterior to cystic duct	0	0%
Cystic artery right to cystic duct	0	0%
Double cystic artery	0	0%
Short cystic artery	1	1.6%
Aberrant cystic artery	2	3.3%
Cystic artery arising above calot's triangle	0	0%

Out of 60 patients, 2 patients had aberrant cystic artery and 1 patient had short cystic artery

Table 6: Variations of Extra Hepatic Biliary System

Variation Of Extrahepatic Biliary System	No. of Patients	Percentage
Right hepatic artery variations	0	0%
Left hepatic artery variations	0	0%
Common hepatic artery variations	0	0%
Hepatic duct confluence variations	0	0%
Cystic duct variations	5	8.33%
Cystic artery variations	3	5%
Gall bladder variations	4	6.67%

Out of 60 patients, variations found in gall bladder, cystic artery, cystic duct but no variations found in hepatic artery and hepatic duct.

5. Result

Out of 60 patients of cholelithiasis, 34 (56.66%) patients were females and 26 (43.33%) were males with female to male ratio is 1.5:1. Age ranged from 20-80 years with highest incidence during 3rd, 4th, and 5th decades having mean age was 42.5years and median age was 41.5years. In our study most of the patients presented with upper abdominal pain in the form of right hypochondrium pain (73.33%), pain in right hypochondrium with pain in epigastrium (20%) and epigastrium pain (6.66%). Multiple stones were present in 78.33% and 21.66% had single stone. In all operated patients, normal anatomy was found in 49 patients (81.60%) and abnormal anatomy was found in 11 patients (18.33%) in which cystic duct variations (8.33%) was most common variations in the study followed by gall bladder variations (6.67%). No variations of right and left hepatic artery and hepatic duct encountered during surgery. Intra operatively, bleeding occurred in only 2 cases which is controlled intra operatively. All the patients were followed up for post operative complications for 7 days in which only in 3 cases, wound infection was found.

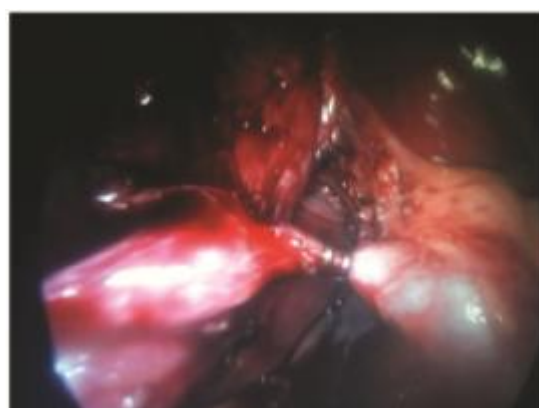


Figure: Short cystic Duct

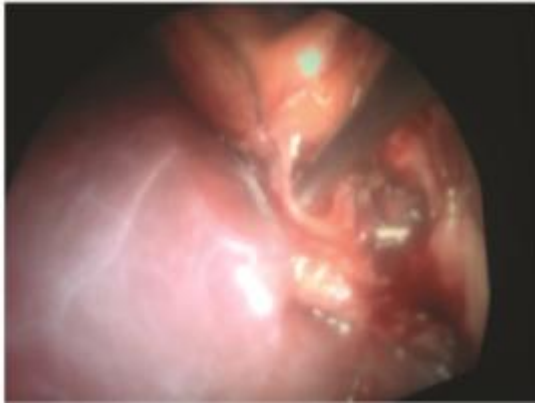


Figure: Aberrant Cystic



Figure: Aberrant Cystic Artery



Figure: Double Gallbladder

6. Discussion

The success and safety of laparoscopic and open cholecystectomy depends on the basic knowledge of normal anatomy and common variants of extra biliary system. Biliary tract has more anomalies in 1–13 cm of the space in the cystic duct region than in any other part of the body. In our study, mean age was 42.5 years and In Khan AS et al study, mean age was 46.13 years¹² but In a study by Khayat et al, mean age was 54 years¹³. In Khan AS et al study, 82.7% were female and 17.3% were males¹². Lutfii.G et al study, 38 patients (25.33%) were male and 112 patients (74.67%) were female but In our study, 56.66% patients were females while 43.33% were males. In our study, incidence was quiet similar in male and female but according to other study incidence of cholelithiasis was higher in female than male this difference could be due to small sample size. In our study, extra hepatic biliary aberrations were more commonly in male patients (30.77%)

than female (8.82%) patient but in Lutfii. G et al study, incidence of extra hepatic biliary aberrations more common in female (80%) than male (20%) patients. In our study, most common presenting symptoms was pain in right hypochondrium (73.33%) followed by pain in right hypochondrium with pain in epigastrium, epigastrium pain, nausea and vomiting and dyspepsia. In Talapur et al study, right hypochondrium pain (71.67%) was more common¹¹ but according to Sheikh et al study, pain in right hypochondrium with epigastrium pain (71.3%) was more common. Incidence of extra hepatic biliary system abnormal anatomy varies; it was reported to be low as 7% as high as 47%. In our study, we found that anatomical variations of extrahepatic biliary system was 18.33% similarly In a study by Kullman et al (1996), anatomical variations of extra hepatic biliary system were found in 19% of their patients. Another study by Hasan et al (2013) incidence of anatomical variations of extrahepatic biliary system was 15.2%. In Sharma et al. study, incidence of extra hepatic biliary system variations was 36%. In Shaikh et al. study, incidence of extra hepatic biliary system variations was 5.5%. It is important for the surgeons to be aware of the most common abnormalities in order to perform safe operation with no or minimal injuries. In our study, the most common extra hepatic biliary variations found was short cystic duct (<2 cm) which was found in 5% of patients due to which very little space to apply clips and ligatures and intra hepatic gall bladder also found in 5% of patients. This finding coincided with studies by Talpur et al (2010)¹¹ and Khan et al (2012)¹² where short cystic duct was reported as most common extra hepatic biliary system variations and Shaikh et al study, reported similar result that short cystic duct is most common variations. In Sharma et al study, Gall bladder variations seen in 4% of the patients in form of intra hepatic gall bladder and short cystic duct occur in 4% of cases. The second most common anatomical variations extra hepatic biliary system in our study was cystic artery a variation (5%) in which aberrant cystic artery is more common. This finding was similar to Shaikh et al study where second most common variations is cystic artery variations. In Sharma et al. study, aberrant cystic artery seen in 2% of cases. In Awazli LG et al study, 16% variations found in right hepatic artery and 3% variations found in common hepatic duct and 4% variations found in right hepatic duct but in our study no variations found in right hepatic artery, right hepatic duct and common hepatic duct. In our study, common intra operative complication was bleeding which occurred in 2 patients out of 60 patients and in both the patients had anatomical variations in EHBS. So, bleeding could be attributed to this variations. Chen et al. 1999¹⁵ and Torres et al. 2009¹⁴ study showed similar result as bleeding was common intra operative complication but in Kano et al. (1994)¹⁶, injury to the bile duct is most common intra operative complication. In our study, most common post operative complication was wound infection.

7. Conclusion

Extra hepatic biliary system anatomy is of great importance for the surgeons since extra hepatic biliary system is one of the common sites of anatomical variations and it is most common sites for surgical dissection during cholecystectomy. Extra hepatic biliary system variations are

found in 11 patients with significance P value of 0.034. Abnormal variations of extra hepatic biliary system was found in 18.33%. The most common variations is short cystic duct and intra hepatic gall bladder followed by cystic artery variations. Mostly anatomical variations of extra hepatic biliary system are found during cholecystectomy. So every surgeon should look for these variations during laparoscopic and open cholecystectomy in order to prevent inadvertent ductal clipping, ductal injuries and bleeding problems. Awareness to these variations will decrease morbidity, conversion and re-exploration in these patients.

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