(e) ISSN Online: 2321-9599
(p) ISSN Print: 2348-6805

ORIGINAL ARTICLE

A STUDY OF ANATOMICAL VARIATIONS AND ANOMALIES OF EXTRA HEPATIC BILIARY SYSTEM IN PATIENTS UNDERGOING ELECTIVE LAPAROSCOPIC CHOLECYSTECTOMY

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ABSTRACT:
The objective is to study 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 this 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. In this study the aim was to assess the anatomy of biliary tract with the help of imaging before or during cholecystectomy, so that potential complications due to various anatomical variations could be prevented.
Key Words: Anatomical variations, extra hepatic biliary system, laparoscopic cholecystectomy.

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This article may be cited as: Sharma R, Singh MP, Kaur A, Mittal S. A study of anatomical variations and anomalies of extra hepatic biliary system in patients undergoing elective laparoscopic cholecystectomy. J Adv Med Dent Scie Res 2016;4(5):32-35.

Access this article online	
Quick Response Code	Website: www.jamdsr.com
	DOI: 10.21276/jamdsr.2016.4.5.8

INTRODUCTION:

Laparoscopic cholecystectomy has got major advantage over open cholecystectomy in that it provides clear understanding of the extrahepatic biliary tissue anatomy.Variations in the anatomy of gallbladder, bile ducts and the arteries that supply them and liver are important to the operating surgeonbecause failure to recognize them may lead to inadvertent ductal ligation, biliary leaks and strictures after laparoscopic cholecystectomy. Adequate exposure, careful dissection, and accurate knowledge of the regional anatomy plus a realization of the frequency and multiplicity of abnormalities of the extrahepatic biliary tree are requisites for safe biliary tract surgery. In this study we observed all of these anomalies while performing laparoscopic cholecystectomy

MATERIALS AND METHODS

This study was conducted in the Department of General Surgery, Government Medical College and Guru Nanak Dev Hospital, Amritsar during the period from 2011-2013. 50 patients who underwent elective laparoscopic cholecystectomy for symptomatic gall stone disease and satisfying the selection and exclusion criteria, were included in the study. All of the patients were reviewed prospectively. All cases were performed by experienced laparoscopic surgeons.

Exclusion criteria:

- Any medical illness which makes the patient unfit for anaesthesia
- Jaundiced patients
- Acute pancreatitis
- Pregnancy
- Documented stones in CBD or CBD diameter of >10mm
- Any Gall bladder mass
- Severe coagulopathy
- Peritonitis
- Acute cholecystitis
- Empyema

Follow up:

Patients were followed up at 7 days when stiches were removed. Note was made of any wound infection or any other complaint.

Statistical methods:-

Appropriate statistical tools were used for data analysis.

RESULTS:

Table 1: Congenital anomalies and variations observed intra operatively:

Type of Anomaly	No. of Patients	%Age
Buried Or Intrahepatic Gall Bladder	1	2%
Floating Gall Bladder	0	0
Phrygian Cap	1	2%
Parallel to CBD	0	0

Out of 50 patients, only 1 (2%) had buried or intrahepatic gall bladder and 1 (2%) had phrygian cap anomaly.

Table 2: Anomalies and variations in cystic duct

Type of Anomaly	No. of Patients	%Age
Short Cystic Duct	2	4%
Long Cystic Duct	3	6%
Accessory Cholecystohepatic Duct	0	0
Absent	0	0

Out of 50 patients, 2 (4%) had short cystic duct and 3 (6%) had long cystic duct. In rest of the cases the cystic duct was within normal range.

Table 3: Anomalies and variations of right hepatic artery

Type of Anomaly	No. of Patients	%Age
Moynihan's Hump	3	6%
Abnormal Orgin Of RHA	1	2%

Out of 50 patients 3 (6%) patients had Moynihan's hump or caterpillar hump. Whereas 1 (2%) case abnormal source of origin of right hepatic artery was seen.

Table 4: Anomalies and variations of common hepatic artery

Type of Anomaly	No. of Patients	%Age
Long and Tortuous	0	0
Abnormal Orign	0	0

Out of 50 patients, no anomaly of CHA could be noted.

Table 5: Anomalies and variations of Cystic Artery

Type of Anomaly	No. of Patients	%Age
ART. arising above calot's triangle	1	2%
ART. ant. to cystic duct	3	6%
ART. posterior to cystic duct	0	0
ART. right to cystic duct	0	0
Double Cystic Art	1	2%
Short Cystic ART	0	0
Abberent Cystic ART	1	2%

Out of 50 patients 1 (2%) had cystic artery arising outside and above the Calot's triangle. 3 (6%) patients had cystic artery anterior to CBD. 1 (2%) patient had double cystic artery. In 1 (2%), an aberrant cystic artery arising from an unknown source could be seen.

DISCUSSION:

The use of laparoscopy for gallstone disease because of its high resolution and magnification reveals clear anatomy of biliary tree as compared to open cholecystectomy. Therefore, extrahepatic biliary system can easily be assessed for its anatomical variations and congenital anomalies during laparoscopic cholecystetcomy. The overall incidence of anomalies of extrahepatic biliary system was 36%.The gall bladder anomalies were seen in 4% of the patients in the form of intrahepatic gall bladder and intraperitoneal floating gall bladder. Phrygian cap is the commonest anomaly of gall bladder but has no pathological significance.

Abnormal location of gall bladder has been described as intrahepatic, retrohepatic, within the falciform ligament, retroduodenal and retropancreatic. But apart from intrahepatic gall bladder, no other anomalous gall bladder was seen in this study. The condition may be suspected, if the cholecystogram or USG reveals a gallbladder in an unusually high position.

A floating gall bladder is characterized by its small attachment to the liver bed which can present as acute cholecystitis due to torsion around the pedicle. However, no case could be seen in this study.

The course of cystic duct is extremely variable. It classically joins the common hepatic duct below the confluence of right and left hepatic duct, in 92% cases. In 6% of cases it is long and runs parallel to CHD before it joins it to form CBD. In our study, in one case the cystic duct was inserted on the left side of CHD after spiralling around it.

The true absence of cystic duct is very rare, however, most cases are due to dense severe fibrosis due to stone in the gall bladder neck. In this study no case of absent cystic duct was seen. A congenital absence of the cystic duct is a rare entity with severe surgical implications & knowledge of this anomaly and its mode of presentation and preferred surgical approach should help avoid inadvertent biliary injuries and the complex biliary procedures which may be required to fix them.

Double cystic duct is another rare anomaly of cystic duct, that can lead to post operative biliary leaks. No double cystic duct was seen in this study. The incidence of accessory bile ducts varies from 1% to 30%. They can arise from right lobe of liver in majority of cases but occasionally form left lobe and caudate lobe as well and they can join right hepatic, common hepatic, cystic duct and gall bladder. In this study no cases were seen with hepato cholecystic channel which caused intra operative bile leak from bed of liver.

Around 20% of cystic ducts are less than 2 cm. Hence there may be very little space to apply clips or ligatures. The cystic duct is usually 2-3 mm wide. It can dilate in the presence of pathology (stones or passed stones). The normal bile duct is also around 5 mm and hence can look like a mildly dilated cystic duct. In general a cystic duct larger than 5 mm (or the need to use a very large clip to completely occlude the duct) should arouse a suspicion of mistaken identity with the bile duct before it is clipped or ligated. In this study a 4% (n=2) cases of short cystic duct could be seen, where it was also dilated and thus application of clip was difficult.

Choledochal cysts are congenital conditions involving cystic dilatation of bile ducts. However, they present as fever and jaundice. Diagnosis of choledochal cyst is mostly radiological rather than laparoscopic. So in any event, occurrence of choledochal cysts in a patient with cholecystitis must alarm the surgeon for the change in the management altogether. However, no cystic lesions of the CBD were seen in the present study.

Arterial anomalies must be recognised intraoperatively to prevent arterial bleed and hence iatrogenic injuries. The most dangerous is the anomalous tortuous course of common hepatic artery or the right hepatic artery in front of the origin of cystic duct, known as “caterpillar hump” or “Moynihan hump”. The right hepatic artery occasionally forms a sinuous tortuousity which occupies the major portion of Calot's triangle. Due to this variation, inadvertent injury to right hepatic artery may occur during surgical procedures. The vascular anomalies in the study were 20%. The most important thing is the short cystic artery arising from the looped right hepatic artery and most vulnerable to trauma during cholecystectomy. In 4% of cases right hepatic artery and cystic artery cross infront of the common hepatic and cystic duct, where as accessory cystic artery is found in none of cases. Variations in number of cystic artery like double cystic artery is seen in one case where as single cystic artery is present in 96% of cases. Aberrant cystic artery could be seen in 2% (n=1) of the cases. Due to these anatomical variations complications seen were bleeding in two cases and biliary leak from drain in one case. None of the patients were re-explored either for bleeding or for biliary leak.

Portal cavernoma, also called cavernous transformation of the portal vein, consists of a network of venous channels, which replaces a previously stenosed or occluded portal vein. It functions as a portoportal shunting, so it is characterized by hepatopetal flow and signs of portal hypertension frequently co-exist.Biliary complications can occur in the late stages of the disease and are difficult to treat. Because of the relatively small number of the patients with cholangiopathy due to portal cavernoma, there is no current standardized treatment approach. No such finding was seen in our study.

During the course of follow up, only two patients had persistent pain at the operative site at 4 weeks. Out of the two patients, one had long tortuous cystic duct from which bile leak was present.

Presently there is no good alternative to meticulous dissection and accurate visual identification of the contents of the Calot's triangle especially the cystic artery and duct before they are divided. The routine use of intraoperative cholangiogram, laparoscopic Doppler study and light cholangiography is not validated due to high cost and unavailability.

One key difference between laparoscopic and open cholecystectomy is the anatomic view of the Triangle of Calot. It has been postulated that a perception error in

correctly identifying the structures seen and in interpreting the intraoperative cholangiogram contributes to these injuries..Thus the procedure has matured with time and is a safe surgical approach with proper dissection and selective use of intraoperative cholangiography. Also in fact, prompt recognition for the need to convert and perceptual skills that accompany this are likely a necessary component to ascend in the laparoscopic cholecystectomy learning curve.

CONCLUSION:

Congenital anomalies and variations of extra-hepatic biliary tree though are common but can be of clinical importance and surprise if present, for the unaware surgeon. So every surgeon should assess for these anomalies during laparoscopic cholecystectomy in order to prevent inadvertent ductal clipping, ductal injuries, strictures and bleeding problems. Awareness of these anomalies will decrease morbidity, conversion and re-exploration in these patients. In view of the importance of anatomy and it's variations in injuries caused during cholecystectomy it is logical to look at the possibility of assessing the anatomy accurately with the help of imaging before or during the performance of a cholecystectomy. The purpose of this study was to make surgeons aware about the surpises that the gall bladder anatomy has in store. Any unwanted event occurring during laparoscopic cholecystectomy can most likely be due to faulty technique, faulty equipment or even faulty 'gall bladder anatomy'. Hence concluding that "surgeons performing cholecystectomies should have an intraoperative protocol that is similar to navigation 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.

REFERENCES:

1. Rs JH, Gililions GD, Inmes JT, Nichols KE, Front ME, Roley SR. Complications in Laparoscopic Cholecystectomy 1991; 110(4):769-78
2. Suhocki PV, Meyers WC. Injury to aberrant bile ducts during cholecystectomy: a common cause of diagnosed error and treatment delay. Am J Roentgenol 1999;172:955-9
3. Lamah M, Karanjia ND, Dickson GH. Anatomical variations of extrahepatic biliary tree: review of world literature. ClinAnat 2001;14:167-72.
4. Bayraktar Y, Balalion HY, Arslan S, Balkanci F. Agenesis of gall bladder and multiple anomalies of biliary tree in a patient with portal thrombosis: a case report. Turk J Gastroenterol 2006; 17:212-5.
5. Yu J, Turner MA, Fulcher AS, Halvorsen RA. Cong. anomalies and normal variant of pancreaticobiliary tract and the pancreas in adults: part 1, Biliary tract. Am J Roentgenol 2006;187:1536-43.
6. Mortele KJ, Rocha TC, Streeter JL, Taylor AJ. Multimodality imaging of pancreatic and biliary cong. anomalies. Radiographics 2006;26:715-31.
7. Prinz RA, Howell HS, Pickleman JR. Surgical significance of extrahepatic biliary tree anomalies. Am J Surg 1976;13(6):755-7.
8. Arshad MM, Laghari AA, Talpur KAH. Extrabiliary complications during laparoscopic cholecystectomy: How serious is the problem. J Minimal Access Surg 2008; 4(1):5-8.
9. Molmenti EP, Pinto PA, Klein J, Klein AS. Normal and variant arterial supply of the liver and the gall bladder. Pediatr Transplant 2003; 7(1): 80-2.

Source of support: Nil **Conflict of interest:** None declared