ANATOMICAL VARIATIONS OF CYSTIC DUCT ENCOUNTERED DURING OPEN CHOLECYSTECTOMY

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ABSTRACT

Objective: *To determine the frequency of various anatomical variations of the cystic duct observed during open cholecystectomy in our set up.*

Methodology: *This study was conducted at department of surgery, Khyber Medical University (KMU), Institute of Medical Sciences (KIMS), Kohat, and a private surgical centre at Kohat, Pakistan. Adult patients of both genders, who underwent open cholecystectomy from January 2009 to February 2011, were included in the study. A structured proforma was designed including patients' demographics, history, clinical examination, relevant investigations, peroperative findings and post operative complications. Data was analyzed statistically by using SPSS version 14.*

Results: *Out of three hundred operated patients, 248 (82.7%) were females and 52 (17.3%) were males. Mean age was 46.13±7.77 years. Short cyst duct (n=7; 2.3%), long cystic duct (n=5; 1.7%), cystic duct arising from right hepatic duct (n=5; 1.7%) and double cystic duct (n=4; 1.3%) were the most frequent anatomical variants. The frequency of various anatomical variations of cystic duct was found to be 8.33 % (n=25/300). The cystic duct branched off from the common hepatic duct in 95% of the patients. Wound infection was the most common complication and was found in 9 (03%) cases. No mortality was observed in the series. Mean hospital stay was 3.6±1.5 days.*

Conclusion: *Anatomic variations of cystic duct are not uncommon in our set up. Short cyst duct, long cystic duct, cystic duct arising from right hepatic duct and double cystic duct are the common anatomic variants in our patients.*

Key Words: *Cystic duct, Anatomical variations, Open Cholecystectomy.*

This article may be cited as: Khan AS, Paracha SA, Shah Z, Tahir M, Wahab K. Anatomical variations of cystic duct encountered during open cholecystectomy. Khyber Med Univ J 2012; 4(1): 19-22

INTRODUCTION

Laparascopic and open cholecystectomy are the two surgical options for symptomatic gall stones with a cure rate of up to 95%[1,2]. The success and safety of laparoscopic and open cholecystectomy depends upon the basic knowledge of normal anatomy and common variants of extra-billiary system and cystic duct[3]. Anatomic variants of the cystic duct are common with an incidence of 18%-23% and these variants have always attracted both the anatomists and surgeons but are usually of no clinical significance[4-9]. These variants are usually detected accidently or seen in imaging to investigate complication after extrabilliary surgery or rarely in preoperative assessment of extra billiary tree surgery. It is important to look for anatomic variations by proper identification of the common hepatic-cystic duct junction during surgery. Classical bookish picture of extrahepatic billiary system may not be seen in half of the cases and presence of anatomic variation can increase the likelihood of injury during the surgery for gall baldder[3]. The reported rate of accidental cystic duct injury varies from 0% to 1%[10]. The common types of cystic duct variations found in the medical literature are given in Table 1[11-14].

Various special investigations like computed tomography (CT), percutaneous transhepatic cholangiography (PTC), endoscopic retrograde cholangiopancreatography (ERCP), and magnetic resonance cholangiopancreatography (MRCP) are of value in delineation of normal anatomy as well as variants of the cystic duct. Abdominal ultrasound is of limited value in preoperative diagnosis of these variants[15]. These are usually detected accidentally during operation and in case of suspicion can be assessed in detail by peroperative cholangiogram.

Although much has been written about the normal anatomy and related anomilies of extrahepatic billiary tree but few studies have focused on the cystic duct variants[11-14]. These variants are common and an unrecog-

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Date Received: May 22, 2011
Date last revised: February 27, 2012
Date Accepted: March 04, 2012

nized variant can be a source of major challenge to an unprepared and unaware surgeon.Though the incidence of extrahepatic billary injury due to variations of cystic duct is very low in open cholecystectomy as compared to laparoscopic cholecystectomy yet can be a source of accidental trauma leading to serious morbidity. This study was aimed to determine the frequency of anatomical variations in cases of open cholecystectomy in our set up.

METHODOLOGY

This descriptive study was carried out in department of surgery Khyber Medical University (KMU), Institute of Medical Sciences (KIMS), Kohat, and a private surgical centre at Kohat, Pakistan from January 2009 to February 2011. Total of 300 adult patients of both genders were studied and convenient sampling technique was used for collection of sample. The study was duly approved by the institutional review board of college. Data was collected from the patients on a structured proforma including detailed history, complete clinical examination and baseline investigations including abdominal scan. Inclusion criteria included diagnosed patients of cholelithiasis who were subsequently managed by open cholecystectomy. All the patients having acute cholecystitis, jaundice, interercurrent illnesses, unfit for general anesthesia or where anatomy was difficult to define due to adhesions were excluded from the study. Informed consent was taken and all the patients were admitted one day before surgery. All the cases were subjected to standard open cholecystectomy 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 suspected was searched. All the operated patients were followed up postoperatively for any complication. All the findings were documented on proforma and were subjected to statistical analysis by using software SPSS version 14.0.

RESULTS

Out of 300 patients, 248 (82.7%) were females and 52 (17.3%) were males, with female to male ratio of 5:1. Majority (53.33%) of the patients were in their fourth and fifth decades of life. Mean age was 46.13 $\pm$ 7.77 years. Age distribution of the patients is shown in Table II. The mean duration of symptoms was 08 months. Normal anatomy was found in 216 patients (72%). Short cystic duct (2.33%) was the most common variation observed in the study. The rest of the observed anatomical variations are shown in Table III. All the operated patients were regularly followed up for complications and no mortality was recorded in the study. The complications encountered are shown in Table IV. Majority of the complications were managed conservately except in three cases who were re- explored. One case of short cystic duct was identified postoperatively who presented with obstructive jaundice due to ligation of common bile duct

THE COMMON TYPES OF CYSTIC DUCT VARIATIONS[11-14]

(1)	Long cystic duct in which the cystic duct courses parallel to common hepatic duct and is lowly inserted into common hepatic duct
(2)	Cystic duct originates from right or left hepatic duct or from their bifurcations
(3)	Accessory cystic duct
(4)	Left sided insertion of cystic duct with anterior or posterior spiral course
(5)	Cystic duct connected with parahepatic duct and itself opening into common hepatic duct
(6)	Absent or short cystic duct (length < 5 mm)
(7)	Doubling of cystic duct
8)	Right hepatic duct draining into the cystic duct
9)	Hepaticocystic duct, a rare congenital anomaly in which the left, right, and common hepatic ducts are all defective, with the cystic duct draining the entire biliary system into the duodenum and the common hepatic duct enters the gallbladder.

Table I

AGE DISTRIBUTION OF THE PATIENTS

Age groups	Number of patients (n=300)	Percentage
30-40 Years	80	26.67
41-50 Years	160	53.33
51-60 Years	45	15
61-70 Years	15	5

Table II

PROFILE OF ANATOMICAL VARIATIONS OF CYSTIC DUCT

Observed anatomical variations	Frequency (n=300)	%age
Short cystic duct	7	2.33
Long cystic duct	5	1.66
Cystic duct arising from right hepatic duct	5	1.56
Double cystic duct	4	1.33
Accessory cholecysto-hepatic duct	4	1.34

Table III

POSTOPERATIVE COMPLICATIONS ENCOUNTERED IN THE STUDY

Complications	Frequency (n=300)	%age
Wound infection	9	03
Atelactasis	8	2.66
Biliary peritonitis	2	0.66
Obstructive jaundice	1	0.33
Deep venous thrombosis	1	0.33
Incisional hernia	1	0.33

Table IV

(CBD) and was managed by redo and hepaticojejonostomy. The recovery was uneventful in this case.

Median hospital stay was 3 days and mean hospital stay was 3.6 ± 1.5 days. Seventy five percent of cases were discharged within 03 days except 10 cases who stayed for one to two weeks for the reason of management of their respective complications while patients with re-exploration remained in hospital for more than three weeks.

DISCUSSION

Cholelithiasis is one of the commonest diseases throughout the world. Anatomy of the biliary tract is very variable but the exact incidence of the biliary system anomalies is unknown[16]. Biliary tract has more anomalies in 1cm^3 of the space in the cystic duct region than in any other part of the body[17]. This anatomic variability usually creates difficulties for the surgeon, especially when the area is affected by various diseases. Careful exploration of Calot's triangle and exact identification of extra hepatic biliary tree is important to avoid biliary complications during open cholecystectomy. Improper identification may lead to injury, division or ligation of major bile ducts or arteries. To prevent these complications, surgeons need to have a sound knowledge of the basic anatomy of extrahepatic biliary tract as well as its surgical implications[18]. It is difficult to diagnose these variants before cholecystectomy by routine investigations of gall bladder diseases, however advanced imaging modalities are helpful in identifying these anatomic variants. MRCP, ERCP and CT cholangiography can demonstrate the anatomy and pathology of biliary tract. However the routine use of intraoperative cholangiography during laparoscopic cholecystectomy is still controversial[16].

Our results show that 72% of patients had normal anatomic configuration of extra billary tree. Overall frequency of the cystic duct variants in this study was 8.33%. The most common variation observed in the study was short cystic duct (2.33%) which is consistent with other reported surveys[19,20]. Mortelé KJ et al[21] described three common anatomic variants of the cystic duct; *low cystic duct insertion* (9%), *medial cystic duct insertion* (10-25%) and *parallel course of the cystic duct with the* common hepatic duct (1.5%–25%). In *low cystic duct insertion,* cystic duct is fused with the distal third of the extrahepatic bile duct and in medial cystic duct insertion, the cystic duct drains into the left side of the common hepatic duct (CHD). The parallel course of the cystic duct with the CHD is characterized by close adherence of the cystic duct to the CHD and courses parallels to it for at least 2 cm. Cachoeira E et al[22] measured the length of the cystic duct which ranged from 7.28 and 38.88 mm with mean length of 19.11 ± 6.77 mm. Turner MA et al[23] showed the length of cystic duct from 2-4 cm. In our study, 1.7% patients had long cystic duct running parallel to the CHD and joining it low in supraduodenal area. This finding is in accordance with similar studies done by other researchers in our country[19,20]. Jung-Ta K reported a prevalence rate of 5.4% for low insertion of cystic duct in patients with suspected biliary tract disease on ERCP[24]. Taourel P et al[25] showed low cystic duct insertion in 9% cases. Cystic duct was arising from right hepatic duct in 1.7% cases of our study. Aberrant cystic duct arising from right hepatic duct was reported by Suhocki' PV[26] in patients having injury to aberrant bile ducts during cholecystectomy. CBD is likely to be injured during surgery in such cases unless meticulous care is taken in dissection.

The fourth variation noticed was the double cystic duct found in 1.33% patients in our study. This observation was in accordance with figures of 1% observed by Khan AH et al[19]. Out of 04 cases found, one case was identified postoperatively who presented with mild biliary peritonitis. ERCP was performed which revealed double cystic duct with no distal obstruction and was managed conservately.

We found cholecystohepatic accessory duct in 1.33% cases. Talpur and colleagues found it in 1% cases[20]. Other studies reported incidence of accessory cystic duct from 1 to 30%[13,14]. In majority of cases it originates from right lobe of liver and is inserted into right hepatic, common hepatic, cystic duct or gall bladder. In our study 3 out of 4 cases of cholecystico-hepatic duct were identified during dissection of gall bladder bed and were ligated. One case was found postoperatively which was responsible for minor billary leak and was managed by re-exploration. The recovery was uneventful in this case.

The most common complication was wound infection in the series. Overall the morbidity rate was 1%. No mortality was found in the study. Median hospital stay was 3 days.

CONCLUSION

We conclude that anatomic variations of cystic duct are not uncommon in our set up. Short cyst duct, long cystic duct and double cystic duct are the common anatomic variants in our patients. These anatomic variants are prone to injuries during open cholecystectomy and

outcome of open cholecystectomy depends on a clear understanding of the normal anatomy and variants of the cystic duct. It is recommended that those surgeons doing open cholecystectomy should repeatedly refresh their knowledge of normal anatomy as well as those of variants of biliary tree.

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CONFLICT OF INTEREST

Authors declare no conflict of interest

GRANT SUPPORT AND FINANCIAL DISCLOSURE

NONE DECLARED