

Original Research Article

Post cholecystectomy common bile duct dilatation: a study from upper hills of Himachal Pradesh, India

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ABSTRACT

Background: Relationship between cholecystectomy followed by postoperative dilatation of the common bile duct is uncertain. Various studies have shown variable results regarding the dilatation of common bile duct after cholecystectomy.

Methods: This study was a 1-year prospective study conducted at IGMC, Shimla with consent and ethical approval from the committee. Total 50 cases of symptomatic cholelithiasis belonging to either sex admitted in Surgical Wards of IGMC Shimla for elective surgery were selected for the present study. Cholecystectomy was done in all cases, after doing all the investigations.

Results: The mean preoperative CBD diameter in the study group was 4.2mm, 48 hours postoperatively was 5.58mm and at 1-month interval following cholecystectomy was 6.02mm, so the mean postoperative diameter observed was $(6.02+5.58=5.8\text{mm})$.

Conclusions: Significant dilatation does occur in CBD which is purely compensatory as there was no evidence of any pathological dilatation. This dilatation occur only in early post-operative period till the CBD adapts to contain bile equal to the Gall Bladder.

Keywords: Bile duct, Cholecystectomy, Post-operative

INTRODUCTION

Cholelithiasis is the most common acquired disease of the biliary system. The enormous interest which has been displayed of Gall bladder is because it afflicts a large section of the population. In most patients the disease remains asymptomatic. It may cause biliary colic by mechanical obstruction of the cystic duct and common bile duct. More frequently stones lead to acute or chronic inflammation and other complications within the biliary tree which cause symptoms. Prevalence of the disease certainly increases with age from 4% of the people in the 3rd decade to 27% in 7th decade with women more likely

to develop gallstones.¹ Cholecystectomy is a gold standard treatment for cholelithiasis.

Relationship between cholecystectomy followed by postoperative dilatation of the common bile duct is uncertain. Various studies have shown variable results regarding the dilatation of common bile duct after cholecystectomy. Quist in 1957 found an average increase in CBD width by 1-5 mm post-operatively by I.V. cholangiography.² Gylstorff et al, observed that around 42% of patients had an increase in diameter of CBD by 2-5 mm³ whereas Brend Wedmann et al, concluded that in patients with strictly uncomplicated biliary calculus disease confined to gall bladder, CBD

diameter showed tendency to increase after cholecystectomy.⁴

Before the technique of radiographic measurement of duct size the experimental animals were re-operated after recovery from previous operations to assess the common bile duct dimensions or the findings were recorded at the time of autopsy. With the development of intravenous cholangiography, it became possible to measure the duct size after surgery, but these cholangiography techniques were associated with some risk factors like hypersensitivity reaction.⁵⁻⁷ Recent reports in ultrasound literature have rekindled the controversy as to the occurrence of compensatory dilatation of the common bile duct after cholecystectomy. Contrary to intravenous cholangiography, sonography clearly provides a complete physiologically noninvasive means for delineating common bile duct anatomy.⁸

Aims and objectives of the study was to find any change in the diameter of CBD after cholecystectomy.

METHODS

The study was conducted in the Department of Surgery at IGMC, Shimla. The present study included, 50 cases of either sex of symptomatic cholelithiasis, admitted to surgical wards of I.G.M.C Shimla w.e.f. 1-05-2005 to 30-04-2006. Prior informed and written consent of all the patients was taken. These cases were chosen randomly, and all were USG proven cases of cholelithiasis. Pre-operative biochemical investigations and ultrasound scanning were done in order to rule out any associated liver or extra- hepatic biliary disorder. All of these 50 cases were then subjected to open Cholecystectomy.

Exclusion criteria

- Acute Cholecystitis
- Choledocholithiasis
- Malignant Tumour of Gallbladder.
- History of Jaundice.
- Cholecystectomy with sub-hepatic drain.
- CBD Exploration and biliary drainage.

Preoperative USG was done between 15 to 1 day prior to surgery to know the status of gallbladder, liver, extra-hepatic tree, pancreas, kidney and other abdominal organs and also to know the CBD diameter both in supine and left lateral decubitus position. All ultrasonographic examinations were done on the same machine of the Department of Radiology IGMC, Shimla G.E. RT 3200 Advantage II . Postoperative CBD diameter was taken at 48 hrs and 1 month following surgery.

Open Cholecystectomy was performed by applying right sub-costal or right upper quadrant transverse rectus splitting incision. Posterior rectus sheath and peritoneum opened longitudinally to enter in abdominal cavity for preliminary exploration. The stomach and duodenum

examined first by looking and by palpation and then packed off out of the way. Gall bladder palpated for stones with special attention at infundibulum, where calculus may be overlooked. Cystic duct was examined by palpation down to the point where it joins the common hepatic duct to form the common bile duct. The condition of these ducts were also noted for any anomaly, stones or strictures. The supraduodenal part of the common duct lying in the right free border of the lesser omentum palpated between the index finger in epiploic foramen and thumb in front. Cholecystectomy was done by one of the two principal methods. In the generally advocated retrograde method cystic duct and cystic artery were divided first and the gallbladder was then stripped off towards the fundus. In the fundus first method gallbladder was commenced at the fundus first and proceeded towards neck. After completing the operation by standard method hemostasis was ensured and no drain was kept in subhepatic space.

All patients were examined postoperatively for any complications like fever, vomiting, rigor and jaundice and managed accordingly. If bowel sounds were present, the next morning, they were allowed to take oral liquids and were made ambulatory. After 48 hours primary dressing was opened and wound assessed. Postoperative waterproof dressing was done after cleaning the wound with antiseptic so that the postoperative ultrasound transducer could be moved over wound site. Ultrasound was done at 48 hours postoperatively to know the CBD size.

Statistical analysis

Collected data were entered in the MS Excel spreadsheet, coded appropriately and later cleaned for any possible errors in a SPSS (Statistical Package for Social Studies) for Windows version.20.0. Analysis was carried out using SPSS (Statistical Package for Social Studies) for Windows version.20.0 and online GraphPad software (Prism 5 for Windows) version 5.01. Categorical data was presented as percentage (%). Pearson's chi square test was used to evaluate differences between groups for categorized variables. In case, the expected cell count was less than 5 in >20% cells, fisher's exact test was used. Normally distributed data was presented as means and standard deviation, or 95% confidence intervals (CI).

RESULTS

Total 50 cases of symptomatic cholelithiasis belonging to either sex admitted in Surgical Wards of IGMC Shimla for elective surgery were selected for the present study. Cholecystectomy was done in all cases, after doing all the investigations. The following observation were made.

Age and sex

In the present study mean age of the patients were 40.2 years and ranging from 21-74 years. 3 groups were made

on the basis of age (Table 1). Sex distribution: 46 patients (92 per cent) were female and 4 patients (8 per cent) were male.

Table 1: Distribution of patients among 3 age groups.

Group	Group-I	Group-II	Group-III
Age	<30 years	30-50 years	>50 years
No. of patients	8	30	12

Pain

All 50 patients had a history of pain in the past which ranged from 2 years to one month before operation. No patient with acute pain was operated. 38 patients had a history of biliary colic from 2 years to 1 week before admission and 12 patients had acute attack of pain more than 4 weeks from the time of admission as shown in Table 2.

Table 2: Distribution of patients with type of pain.

Type of pain	Biliary colic	Acute pain	Total
No. of patients	38	12	50

Table 3: Mean pre and post operative CBD diameter.

Mean Preoperative CBD Diameter	Mean Postoperative CBD Diameter (48 hours)	Mean Postoperative CBD Diameter (1 month)
4.2mm	5.58mm	6.02mm

Dyspepsia

Total 32 patients (64 per cent) in the present study had dyspeptic symptoms seen in cholelithiasis.

Mean CBD diameter

The mean preoperative CBD diameter in the study group was 4.2 mm, 48 hours postoperatively was 5.58mm and at 1-month interval following cholecystectomy was 6.02mm (Table 3). So, the mean postoperative diameter observed was $(6.02+5.58=5.8 \text{ mm})$.

CBD dilatation

The mean postoperative dilatation observed at 48 hours and at 1month interval is 1.38 mm and 1.82 mm respectively as shown in table 4 and found to be highly significant ($p<0.001$). The net dilatation (i.e. the average of the two post-operative readings of the CBD diameter - mean pre-operative CBD diameter) is 1.06 mm as shown in Table 4.

Effect of age on dilatation

CBD Dilatation was observed to be age dependent with mean post-operative diameter greatly increased in older age group patients. Among three age groups age dependent dilatation of CBD observed was as shown in Table 5.

No change or decrease in CBD diameter

It was observed that a total of 5 patients, 2 among group-I (25%) and 3 among group-II (10%) showed no dilatation of CBD post-operatively in the study group and 2 patients in group-II (6.6%) showed a decrease in mean CBD Diameter at 48 hours by 1 mm, and at one month interval reading of CBD was equal to preoperative level. So average CBD decrease in Diameter observed in these patients was 0.5 mm. In both of these patients' multiple adhesions were found at the time of surgery (Table 6).

Table 4: Post-operative dilatation at various intervals.

Preoperative CBD Diameter(mm)	Postoperative CBD Diameter at 48 hours (mm)	Dilatation(mm)
4.2	5.58	1.38
Pre- Operative CBD Diameter(mm)	Post- Operative CBD Diameter At 1 month(mm)	Dilatation (Post-op)-(Pre-op)
4.2	6.02	1.82
Pre- Operative CBD Diameter(mm)	Post- Operative CBD Diameter <u>48 hrs + 1month</u> 2	Net Dilatation Postop. - Preop.
4.2	$5.58 + 6.02/2 = 5.8$	1.60

Table 5: CBD Dilatation observed in different age groups.

Age Group	Mean Preoperative CBD Diameter (mm)	Mean Post-operative CBD Diameter (mm) 48 hrs +1month/2	Dilatation (mm)
Group I <30 years	3.5	$4.63+4.48/2 = 4.56$	1.06
Group II 30-50 years	4.4	$5.63+6.07/2=5.85$	1.45
Group III >50 years	4	$6.08+6.67/2=6.38$	2.38

Table 6: Patient with no change and decrease in CBD diameter.

Group	No change in CBD diameter	Decrease in CBD+diameter
I	2	Nil
II	3	2
III	Nil	Nil

Post cholecystectomy status of CBD

It was observed That the mean CBD Diameter after 1 month following Cholecystectomy was more than the mean CBD diameter 48 hours after Cholecystectomy (Table 7).

None of the patients had decreased CBD diameter from preoperative level at 1-month interval, either it is the same or increased from pre-operative level. Only 2 patients in group II showed decrease in CBD diameter at 48 hours by 1 mm each.

Table 7: Post Cholecystectomy status of CBD.

Mean CBD after 48 hours (mm)	Mean CBD after 1 month (mm)	Difference (mm)
5.58	6.02	=0.44

DISCUSSION

Gallstone is the commonest indication for Cholecystectomy. Its prevalence makes Cholecystectomy the 2nd most common intra-abdominal operation in Western countries (after Appendicectomy).⁹ Carl Langenbuch of Berlin on 15th July, 1882 performed first successful Cholecystectomy on a patient of recurrent biliary colic for last 16 years.¹⁰ Although cholecystectomy can safely be performed by the laparoscopic route, in many patients certain situations will make it safe for an open operation, like patients with previous upper abdominal operations, acute cholecystitis, cirrhosis, pregnancy, cholecystoenteric fistula, strong suspicion of Gallbladder carcinoma and when anatomical anomalies are suspected.⁹

This study "Post Cholecystectomy Common Bile Duct Dilatation" is to find the implications of Cholecystectomy on physiological and anatomical changes induced on hepatobiliary system. In this study 50 patients of chronic cholecystitis with cholelithiasis were randomly selected and investigated for elective Cholecystectomy, with female to male ratio of 11.5:1, as this disease is more common in females.^{11,12}

All the patients were having normal clinical and investigative parameters such as LFT, KFT, Chest X-ray, ECG and Haemogram.

Liver function tests and cholecystectomy

Patients undergoing surgery for cholelithiasis require careful preoperative assessment of the status of bile duct. Ultrasound and LFT have proved to be of immense help in this regard. Relevance of estimation of Serum Alkaline Phosphatase, Serum Bilirubin, SGOT and SGPT in helping the diagnosis of various hepatic and extra-hepatic diseases is well established and these have been recognized as significant predictors.¹³

Serum bilirubin

Conjugated hyperbilirubinemia results from interference with biliary excretion of bilirubin by hepatocytes. Thus, cholestasis and increase in conjugated bilirubinemia occur only by impaired excretion and extra-hepatic biliary obstruction.¹³ As in the present study no patient developed hyperbilirubinemia and also the mean preoperative and postoperative bilirubin levels were within normal range. It can safely be concluded that Cholecystectomy for cholelithiasis with chronic cholecystitis does not affect serum bilirubin levels.

Post cholecystectomy CBD dilatation

All the patients included in the study had normal diameter of CBD on ultrasound and had no stone in CBD. The mean dilatation of CBD of both postoperative readings (48hrs and 1 month interval) is 1.38 and 1.82mm respectively and it is statistically significant ($p < 0.001$) The average of both post-operative readings is 1.60 mm as observed by other similar studies as well with all values less than 2.0 mm.^{4,8,14-19} This dilatation is explained by early published reports on animals, which found that the extra biliary system dilates to 2-3 times their normal caliber (found on reoperation on animals).^{20,21} These results were explained on the assumption that some powerful mechanism is there (sphincter of oddi) which opposes the continuous outpouring of bile in duodenum and causes the dilatation of bile ducts as a consequence of increased intraductal pressure due to continuous secretion of bile from liver and it will be maintained until the biliary tract will contain as much bile as a normal filling gallbladder.^{20,22}

It was also observed that the mean CBD diameter after one month is more than CBD diameter at 48 hours after Cholecystectomy as CBD continues to dilate in early postoperative period as observed by others.^{8,19} It is explained that the liver secretes bile constantly, although the rate varies. However, because of the action of the sphincter Oddi, bile is not passed into the duodenum at the same rate as it is secreted, and the excess accumulates in the gallbladder. After Cholecystectomy the sphincter attempts to maintain this difference between the rate of secretion and rate of discharge, with the result that bile accumulates in the biliary tract. As the sphincter is able to withstand a pressure upto 645 mm of water and secretory

pressure of the liver varies from 230 to 300 mm of water, the intraductal pressure is considerably increased. This increased intraductal pressure produces dilatation of the extra-hepatic ducts in early postoperative period. This process producing dilatation of the duct is maintained until the tract will contain as much bile as the gallbladder and it adapts in early postoperative period.²¹ Raptopoulos et al, also postulated that the extra-hepatic biliary dilatation will approach a plateau, approximately one month after total biliary obstruction due to damage of elastin fibers in its wall.²³

CBD dilatation in older age group

The mean CBD dilatation in the study observed in group-III (>50years) patients was 2.38 mm and in group-II (30-50years) patients was 1.45mm and group-I (<30years) patients was 1.06mm (Table 5). Although all the age group showed statistically significant dilatation but group -III (>50 years) age showed more dilatation after Cholecystectomy. Similar findings had been observed by others.^{24,25} This is explained by suggesting age related weakness of bile duct wall having sparse elastin fibers and smooth muscle fibres.¹⁹

No change or decrease in CBD diameter

Total 5 patients, 2 among group-I (25%) and 3 among group -II (10%) showed no dilatation of CBD diameter in study group and 2 patients in group -II showed (6.6%) decrease in CBD diameter by 0.5 mm. (Table 6). All the patients in which CBD diameter either remained the same or decreased after Cholecystectomy had history of acute attack of pain in recent past and per-operatively these patients had multiple adhesions of Gallbladder. A significant rise in pressure in CBD due to Papillary dysfunction was demonstrated in patients of acute cholecystitis even in the absence of organic CBD obstructions. Decrease in size or no change of CBD diameter after cholecystectomy is possibly due to reversion of transient papillary dysfunction.^{4,19}

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