

## Cholecystectomy without Operative Cholangiography.

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**Background:** Cholelithiasis is a very common condition which may be complicated by the presence of gallstones. Assessing the ability of non-invasive tests as useful predictors of Common Bile Duct stones (Choledocholithiasis). This prospective descriptive study was aimed at assessing the ability of non-invasive tests as useful predictors of Common Bile Duct Stones (CBDS) in a resource limited environment. The setting was a hospital-based cohort over a six year period in Jos University Teaching Hospital, Jos, Nigeria.

**Methods:** A total of 40 consecutive patients (16 males and 24 females), aged between 12 and 67 years with gall bladder stones; 7 of whom had clinical, morphologic and biologic indices of CBDS underwent open cholecystectomy without operative cholangiography. Selection of patients for common bile duct exploration can be achieved using the three predictive criteria (clinical, morphologic and biologic) where facilities for intraoperative cholangiography are not available. A short and dilated cystic duct, a dilated common bile duct and/or palpable common bile duct stones found at surgery are complementary predictive indices.

**Results:** The overall prevalence of CBDS was 17.5%. The prevalence was 15% in patients over 50 years of age and 2.5% in patients under 50 years of age. In those over 60 years, it was 5%. Age and the existence of jaundice, recurrent low grade fever and abdominal pain were found to be associated with CBDS. Serum bilirubin, aspartate aminotransferase, alanine aminotransferase and alkaline phosphatase were increased 7.8, 1.6, 2.95 and 3.85 times beyond their average normal reference values. The mean CBD diameter was 1.74cm. All CBDS were palpated at operation. Serum amylase was normal in all our patients including those with CBDS. All patients who had gall bladder stones but no CBDS had normal serum bilirubin, aspartate aminotransaminase, alanine aminotransaminase and alkaline phosphatase. They also had no jaundice, fever, abdominal pain or a dilated CBD and/or CBDS.

**Conclusion:** Evaluation of patients at risk for choledocholithiasis can be achieved with safety using clinical, sonographic and biologic parameters. Such parameters might contribute to reducing unnecessary costly or invasive investigations and help rationalize the diagnostic strategy for choledocholithiasis in countries with limited resources.

## Introduction

Gallstone disease is a very common condition involving roughly 15% of the population in Europe and North America.<sup>1,2</sup> In 10 to 15% of cases, cholelithiasis is complicated by the presence of common bile duct stones (CBDS).<sup>3</sup> Although there is no consensus on what to do with stones in the CBD, many investigators believed that ductal stones should always be removed because of the risk of complications such as cholangitis or acute pancreatitis.<sup>3,4,5</sup> Since the introduction of cholecystectomy by Karl Langenbuch in 1882, the diagnosis and treatment of CBDS has been a challenge for surgeons, radiologist and gastroenterologist.<sup>6,7,8</sup>

In 1890, Courvoisier first performed surgery on the common bile duct (CBD).<sup>9</sup> At that time most surgeons tried to push CBDS into the duodenum.<sup>8,9,10</sup> The rate of retained stones then could be as high as 25% in patients undergoing common bile duct exploration (CBDE). Retained CBDS can be a vexing problem despite the advent of endoscopic extraction methods. To safeguard against missing calculi in the CBD, routine intraoperative cholangiography (IOC) was introduced in 1931 by Pablo Mirizzi.<sup>1,6,9,10</sup> This drastically reduced the rate of retained choledocholithiasis to 11%. Further reduction to 3% were noted with the introduction of rigid choledochoscopy by McIver in 1970.<sup>9,10</sup> Intraoperative cholangiography is at present generally regarded as the gold standard for the evaluation

of CBD during cholecystectomy.<sup>11</sup> Two developments have questioned the wisdom of routine IOC.<sup>12,13</sup> First is the intrinsic problem of IOC itself and second the development of sonology with its preoperative evaluation of the biliary tree. This paper reports our experience of cholecystectomy using clinical and non-invasive morphologic and biologic tests in place of IOC as predictors of CBDS.

### Patients and Methods

Between January, 2003 and February 2009, 40 patients underwent cholecystectomy without intraoperative cholangiography in a General Surgical Unit of a tertiary health institution in Nigeria. The omission of IOC was prompted by the logistics of mobilizing the mobile x-ray unit for the procedure and the frequent malfunctioning of the equipment. The following elements were studied as potential predictive factors: Demographic (age, sex); clinical (abdominal pain, fever, jaundice); biologic tests (aspartate aminotransferase [AST], alanine aminotransferase [ALT], alkaline phosphatase, serum bilirubin, serum amylase) and morphologic data (from transcutaneous ultrasound). The biologic tests were expressed as the upper limits of normal reference values. Morphologic information with regards to the gallbladder were the presence of a normal gall bladder, a dilated gall bladder, gall bladder stones or cholecystitis. With regards to common bile duct (CBD) features, we considered a normal bile duct (below 10mm on transcutaneous ultrasonography), a dilated CBD (a diameter above this limit) or an intraductal image suggesting a stone on transcutaneous ultrasound.

Pancreatitis was defined as the association of upper abdominal pain with pancreatic enzymes (serum amylase) increased above the upper limit of the normal. All patients had their preoperative work-up and were subsequently admitted. On the morning of surgery all patients had a repeat transcutaneous ultrasound examination to review their previous findings and to ensure there was no change in their previous findings. At cholecystectomy choledochotomy was undertaken when, in addition to positive non-invasive test, there were:

- Palpable duct stones.
- Dilated common bile duct.

Patients who had exploration of the common bile duct and T-tube drainage were discharged on the 14th postoperative day after a tube cholangiogram. Those without CBD exploration were discharged on the 7th postoperative day. All patients were reviewed in 2 weeks, 6 weeks later and subsequently at 3 monthly intervals. At each visit, patients were questioned for features of biliary colics, jaundice, cholangitis and pancreatitis. The liver function tests were estimated and transcutaneous sonography done.

### Results

Forty patients (16 males and 24 females) age range 12 to 67 years (Table I) were included.

**Table 1.** Demographic characteristics of patients and the incidence of stone in the common bile duct

Age	Sex		Total CBDS	M : F
	M	F		
10-20	3	0	3	
21-30	5	0	5	1 : 0
31-40	3	9	12	0 : 0
41-50	1	8	9	0 : 0
51-60	3	3	6	1 : 3
61-70	1	4	5	0 : 2
Total	16	24	40	2 : 5

**Key:** CBDS - Common Bile Duct Stones

There were 4 male sicklers aged between 12-35 years

The overall prevalence of CBDS was 17.5% (7/40). The prevalence was 15% (6/40) in patients over 50 years of age and 2.5% (1/40) in patients under 50 years of age. The prevalence was 5% (2/40) in those over 60 years. Seven of forty patients with CBDS had abdominal pain, jaundice and recurrent low grade fever. None of the seven had features of pancreatitis. Serum bilirubin, aspartate aminotransferase, alanine aminotransferase and alkaline phosphatase were increased 7.8, 1.6, 2.95 and 3.85 times beyond their average normal reference values respectively in the seven patients. The mean common bile duct (CBD) diameter in them was 1.74cm. Common bile duct stones were palpated at operation in all seven patients with stones and in one only after mobilization of the duodenum. The cystic duct was short and wide (>5mm) in 6/7 patients with CBDS; and long and narrow (<5mm) in a 29 year old sickler with CBDS and the remaining 34 patients with no CBDS. The proportion of patients with strictly normal clinical morphologic and biologic parameters was 82.36% (34/40).

Thirty patients (75%) were followed-up for 4 years and 7 (17.5%) for 2 years 2 months. The remaining two were lost to follow-up after the initial few outpatient visits. One patient with an impacted stone at the Ampulla of Vater who had duodenotomy stone extraction and sphincteroplasty died from intraperitoneal haemorrhage secondary to clotting disorder on the third postoperative day.

## Discussion

Cholelithiasis is a very common surgical problem in Europe and North America with cholecystectomy being one of the most frequently performed abdominal operations.<sup>14</sup> In 10 to 15% of cases cholelithiasis is complicated by the presence of CBDS.<sup>3</sup> Choledocholithiasis can be diagnosed in most cases preoperatively but unsuspected calculi occur in up to about 5% of patients.<sup>15</sup> Most of these calculi are expelled spontaneously, as only 1% of the patients who undergo cholecystectomy without evaluation of CBD with IOC will later have problem from retained stones.<sup>16,17</sup> Evaluation of the common bile duct during cholecystectomy is undertaken for two reasons. The first is to determine the presence or absence of bile duct stones. Secondly, it is increasingly important to demonstrate the biliary anatomy at operation to help avoid or recognize bile duct injury. Though rapidly developing medical technologies have prompted new and costly diagnostic strategies, IOC is at present generally regarded as the 'gold standard' for the diagnosis of CBDS and abnormal biliary anatomy.<sup>11</sup> Routine IOC improve surgical skills, especially during laparoscopic cholecystectomy.<sup>18</sup>

However, the need for routine IOC has been debated ever since its introduction in 1931.<sup>2,10,12,13</sup> Its false positive rate is 1.8% to 7.0%.<sup>12,13</sup> The consequent negative CBDE increases morbidity and mortality of cholecystectomy by 2.4 times; prolonged hospital stay and increases cost.<sup>19</sup> Good quality films are difficult to obtain and IOC requires exposure of the patients, operator and theatre personnel to radiation.<sup>20</sup> Operative cholangiogram are better evaluated when reported by radiologist rather than by the operating surgeon.<sup>21</sup> Almost always, it is the surgeon who reads the IOC, thus increasing the incidence of false positive and negative CBD explorations. Furthermore, manipulations and choledochotomy on an undilated CBD is often difficult and fraught with complications. Finally, iatrogenic operative biliary stricture occurred more frequently in patients who undergo routine IOC than in those who did not, refuting claims that routine IOC prevents inadvertent bile duct injuries.<sup>11,22</sup>

In the light of strong evidence against routine use of IOC, criteria for selective IOC have been suggested by various workers.<sup>15,17,19,21,23</sup> Multivariate analysis by two studies<sup>15,23</sup> has identified age greater than 60 years, serum bilirubin greater than 25mmol/L, size of CBD greater than 10mm, a demonstrable bile duct stone, gallstone greater than 10mm and a cystic duct diameter greater than 5mm to be the most reliable indicators for operative cholangiography or exploration of the CBD. A cystic duct diameter of less than 3mm virtually excludes the existence of CBDS.<sup>12,15,24</sup> Either the gallstone will be too large to pass through the cystic duct or one that gets through could easily pass

out via the sphincter of Oddi. In a world of rapidly developing medical technologies, new and often costly diagnostic options coexist with an increasing scarce financial resource. The optimal allocation of these scarce resources means that costly technologies should be used rationally when they are likely to improve patient care rather than indiscriminately. This phenomenon strengthens interest in low-cost non-invasive diagnostic test for such diseases as choledocholithiasis. Surgeons in resource limited environment such as ours have long been familiar with clinical, morphologic and biochemical criteria to predict to a lesser or greater degree, the presence of CBDS. We generally and wisely used these non-invasive parameters and combining it with operative indicators of CBDS have found all to be of comparable success in identifying and determining the presence of CBDS.

Residual stones may remain symptom free for more than a year.<sup>15</sup> Those detected more than two (2) years after cholecystectomy are considered recurrent rather than residual for patients in whom IOC had been omitted.<sup>25</sup> The long mean follow-up period of 37 months allowed for the representation of patients with missed stones. None of our patients had residual stones.

In an areas where cholelithiasis is rife and where facilities for IOC are not readily available, a simple evaluation of patients at risk for choledocholithiasis can be achieved with clinical, biologic and morphologic predictive criteria. Such tests might contribute to reducing unnecessary, costly or invasive investigations, and help rationalize the diagnostic strategy for choledocholithiasis. Even if facilities such as IOC, endoscopic ultrasonography (EUS), laparoscopic ultrasonography, etc. were available, its routine use is unnecessary when selective criteria are utilized, as is demonstrated by this small study.

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