

Common Bile Duct Dilation With Unknown Cause in Bowel Obstruction Patients

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Abstract- Common Bile Duct (CBD) dilation is detected in many patients, both symptomatic and asymptomatic. It can be challenging to diagnose unexplained dilated CBD. The purpose of this study was to investigate the causing factors of CBD dilation in bowel obstruction and their relationship to one another. The prospective cross-sectional study included patients with bowel obstruction referred to two tertiary referral hospitals between 2019 and 2021. All patients in the emergency unit were examined by colorectal surgeons, and they were given IV and oral contrast-enhanced CT scans. We included patients with a dilated common bile duct and bowel obstruction. After that, we determined the causes of CBD dilatation in patients with obstruction. In cases without a specific cause, we investigated its relationship to the bowel loop diameter. Of 226 patients with intestinal obstruction referred to our hospital, 97 underwent CT scans of the abdomen, of which 35 (36%) had dilated CBDs. The mean age of the patients was 58±13 years; 66% of patients were male. CBD dilatation was commonly associated with aging (18 cases, 51%), addiction (4 cases, 11%), and cholecystectomy (3 cases, 9%). A CT scan showed dilated CBD in eight patients (23%) without a specific cause. CBD diameter and, sex did not differ significantly. Patients with unknown causes have a mean bowel diameter of 53.75±11.97 mm. CBD diameter correlated considerably with bowel diameter ($P=0.001$). This cross-sectional study suggests a possible association between CBD and bowel loop dilation, rather than establishing a cause-and-effect relationship.

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Introduction

Picture Archiving and Communication System (PACS) has led to an increase in incidental findings in recent years. Incidental findings are usually benign. This may lead to additional investigations and follow-up examinations. Medical costs and anxiety may result from investigating benign incidental findings in otherwise asymptomatic patients. (1-4). However, sometimes incidental findings are clinically significant and even

reveal life-threatening conditions like aneurysms and malignancies (5).

The common bile duct (CBD) size may vary depending on the imaging modality (6). The cutoff for biliary dilation is generally 7 mm or greater (6-8). The most common causes are benign, age-related, drugs, post-cholecystectomy, choledochal cysts, chronic and acute pancreatitis (9-11). Despite this, CBD dilation can occur in asymptomatic individuals without evidence of obstructive lesions (12). There is no apparent pathology

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associated with biliary dilation in asymptomatic patients. Further investigation and follow-up should be guided by risk stratification in patients with this finding (11).

Unexplained dilated CBD can pose a diagnostic dilemma (13). Incidental biliary tract dilation may indicate serious biliary tract conditions, including malignancy. Early studies adequately characterized patients with isolated CBD dilation. However, CBD dilation in bowel obstruction patients has been scarcely described in the literature.

This prospective study investigated causes, predictors, and short-term outcomes associated with incidentally detected CBD dilation in patients with bowel obstruction.

Materials and Methods

This prospective cross-sectional study included patients with complete and incomplete bowel obstruction referred to two tertiary referral hospitals between 2019 and 2021. Colorectal surgeons examined all patients in the emergency unit and performed IV and oral contrast-enhanced abdominal and pelvic CT scans.

All patients with small bowel obstruction who had a dilated common bile duct were included in the study sample. The inclusion criteria for the study group of addicts were as follows: confirmed opium addiction for a minimum of one year and regular opium use at least twice a week. Patients having a history of or known hepatobiliary disease, cardiac disorders, splenomegaly, portal hypertension, acute pancreatitis, undergoing endoscopic intervention, or using medications like calcium channel blockers were not included in the study. Once idiopathic CBD dilation was suspected, a follow-up ultrasound was performed after four weeks.

A radiologist interprets all CTs prospectively without knowledge of laboratory results or other examinations. In axial sections, the diameter of the common bile duct (CBD) was measured at its widest point. A CBD diameter of 7 mm or greater (in people with previous cholecystectomies ≥ 9 mm) is considered a dilated CBD (8). Three segments of the intestinal loop underwent measurement, and the most substantial diameter was documented. The dimensions of the large intestine were

assessed in the ascending (Cecum), descending (Sigmoid), and transverse colons, as well as in the duodenum, jejunum, and ileum of the small intestine within the axial sections. It is generally considered dilated when the small bowel exceeds 3 cm, the large bowel exceeds 6 cm, and the cecum exceeds 9 cm. We used a CT scanner for all examinations (Somatom Plus; Siemens, Erlangen, Germany), and the acquisition information was acquired helical. The patient was administered by oral contrast agents (2% iohexol or 2% diatrizoate meglumine and diatrizole sodium solution 500-1000 mL at a time as tolerated). Patients without medical contraindications were injected with 100-150 mL of a 320 mg/1 mL iodinated agent at a rate of 2 mL. There was a delay phase in imaging about 70 seconds after injection. Furthermore, the prevalence of dilated CBD with a particular cause and without a specific cause was evaluated separately on CT scans of patients. An ultrasound examination was performed four weeks after discharge for patients with idiopathic dilated CBD.

All subjects underwent follow-up ultrasonography by the same expert radiologist to reduce observer bias. Using a Voluson E10 (GE Healthcare) with a curved transducer operating at 5-7 MHz, abdominal ultrasound was performed on fasted patients. The hepatobiliary system was examined by ultrasound in transverse, oblique, and longitudinal views. The AP diameter of the CBD was measured with the patient in a supine or left lateral decubitus position. Data collection was performed by a trained senior radiology resident using a pre-designed checklist that included demographic data (age, gender), symptom duration, the addiction status, CT scan, and ultrasound findings. We adjusted the CBD diameter based on the values presented in Table 1 (8). The data in Table 1 highlights the progressive increase in common bile duct (CBD) diameter with advancing age.

Data analysis was performed using the chi-square and ANOVA tests and the SPSS 26.0 software (SPSS Inc. Chicago II, USA). If necessary, other parametric or non-parametric statistical tests appropriate to the nature of the data were used. Any $P < 0.05$ was considered significant. All the patients gave informed written consent, and the study was approved by the local medical university ethics committee (IR.ZAUMS.REC.1399.113).

Table 1. Means, SDs, and Ranges of CBD Diameter in the 7 Age Groups

Age (years)	CBD Diameter, mm (Mean $\pm$ SD)	Range (mm)
20-30	2.735 $\pm$ 0.735	1.2-4.9
31-40	3.033 $\pm$ 0.808	1.5-4.8
41-50	3.476 $\pm$ 0.834	2.1-5.3
51-60	3.648 $\pm$ 0.838	2.1-6.8
61-70	4.069 $\pm$ 1.092	2.1-8.3
71-80	4.265 $\pm$ 1.008	2.1-6.5
≥ 81	5.033 $\pm$ 1.103	3.9-7.1

Results

226 patients with intestinal obstruction were referred to our hospital during the study period. Of these, 97 underwent CT scan of the abdomen, of which 35 patients (36%) had dilated CBD. The mean age of the patients was 58 ± 13 years; 66% of patients were male, and 34% were female. The mean CBD diameter of patients with intestinal obstruction and dilated CBD, measured via CT scan, was 7.8 ± 0.1 mm. The highest prevalence of dilated CBD was in the age group of 60-70 years (12 cases, 34%), followed by the age group of 70-80 years (8 cases, 23%) and the age group of 50-60 years (7 cases, 20%).

The most common correlations for CBD dilatation

were age over 60 years (18 cases, 51%), addiction (4 cases, 11%), and cholecystectomy (3 cases, 9%). However, eight patients (23%) who had dilated CBD on a CT scan did not have a specific cause (Table 2).

Based on the presence or absence of causal lesions, Table 3 compares clinical characteristics between groups. CBD diameter and sex did not differ significantly between the two groups.

In our investigation, we found that the average bowel diameter for individuals with unidentified causes is 53.75 ± 11.97 mm, with dimensions varying from 42 to 78 mm. In this patient cohort, a notable correlation was observed between the diameter of the bowel and the common bile duct (CBD), as evidenced by a significant P of 0.001.

Table 2. Clinical characteristics classified according to the presence of causative lesions.
Group I, causative lesions; group II, no causative lesions

Characteristics		Cause		<i>P</i>
		Group I	Group II	
Gender	Male	18	5	0.08
	Female	9	3	
CBD diameter		7.72 ± 0.90	8.37 ± 1.50	0.13
Total		27	8	

CBD: Common bile duct

Table 3. The relationship between CBD diameter and bowel diameter

Bowel Diameter			
CBD diameter	N	Mean	<i>P</i>
7.00	3	43.00 ± 1.00	<0.001*
8.00	2	55.50 ± 0.70	
9.00	1	51.00	
10.00	1	61.00	
11.00	1	78.00	
Total	8	53.75 ± 11.97	

*Statistically significant

Discussion

In the present study, the CBD diameter was measured in CT scans of patients with intestinal obstruction. We then evaluated the relationship between bowel obstruction and CBD diameter. Moreover, we sought the possible cause of CBD enlargement. To our knowledge, this is one of the first studies to consider intestinal obstruction as a definitive cause of CBD dilatation. It also investigates the correlation between them.

In patients with bowel obstruction without known causes of CBD dilation, bowel diameter was correlated with CBD diameter. As CBD dilatation was not associated with a specific cause in these patients,

intestinal obstruction was expected to be the cause.

In this research, we enrolled 226 individuals experiencing intestinal obstruction. Among them, 97 participants underwent CT scans, revealing that 35 of them exhibited dilated CBD. The prevalence of common bile duct dilatation in CT scans of patients with intestinal obstruction was 36%. The prevalence of dilated CBD was most prevalent in patients over 60, followed by drug abusers and patients with a history of cholecystectomy. However, 23% of patients who had dilated CBD on CT scans did not have a specific cause. Similarly, Nadarajah *et al.* Reported more dilated CBD cases without other underlying causes in intestinal obstruction patients (14).

In a retrospective study by Malik *et al.*, 47 patients

with biliary dilatation identified by prior imaging studies (US, CT, or MRCP) were grouped into normal or abnormal liver biochemistry (15). EUS says that 6% of patients with normal liver biochemistry had a causal etiology. In contrast, this percentage rose to 53% among patients with abnormal liver biochemistry tests. There were no follow-up plans. In contrast, Kwok et al. discovered a greater incidence of abnormal EUS results in individuals exhibiting both dilated CBD, and normal liver biochemistry, accounting for 33% of the cases (16). There was no correlation between age, sex, prior cholecystectomy, clinical presentation, or CBD diameter and abnormal findings at EUS in their study. Other studies showed that dilated CBD in patients with abnormal liver function tests had abnormal EUS findings; in a study by Rana et al., all patients with abnormal liver function tests had detectable CBD pathology, whereas 20/30 (66.6%) patients with normal liver biochemistry had normal EUS findings (17). A study by J-E Kim showed that neither laboratory parameter was proper for discrimination (18).

Some studies suggested that both CBD and MPD dilatation require attention and further investigation (10). An EUS study by Krishna et al. found that only 5.9% of patients with double ducts without jaundice had a final diagnosis of malignancy (12). According to Jeon et al. Study in cases of marked IHBD dilatation or concomitant dilatation of CBD and IHBD detected on ultrasound; further evaluation and follow-up are recommended (19).

In a review article concerning gallstone ileus by Nuno-Guzman *et al.*, it has been found that the cholecodeodenal type of gallstone ileus accounts for 0.13-4% of these patients. Patients of this rare type have dilated CBD and small bowel obstruction simultaneously (20). Van der Spek *et al.*, reported intrahepatic and extrahepatic bile duct dilation due to duodenal polypoid mass in a patient with Peutz-Jeghers syndrome who suffered from small bowel obstruction due to multiple polypoid masses and intussusception (21). In another case reported by Kim *et al.*, a different scenario was described for simultaneous bile duct dilation and small bowel obstruction. In their report, a patient who had undergone a cholecystectomy developed bile duct dilation. The possible mechanism was food particles entering the bile duct. After that, it caused biliary phytobezoar formation, resulting in small intestine obstruction (22).

There are some limitations to this study. First, it was conducted in only one medical center. Second, the sample size in this study was small (n=35), which led to a small number of pathologies. The validity of the results may be affected by this. Consequently, it is suggested to conduct

multicenter studies with a larger sample size. Third, no prior imaging studies were available for comparison, which may affect the comprehensiveness of our findings. The lack of historical imaging makes it difficult to determine whether the observed CBD dilation coincides with the dilated bowel loops. Without previous imaging for comparison, we cannot establish a clear temporal relationship or assess the progression of these findings over time. This limitation restricts our ability to draw definitive conclusions regarding the coexistence or potential correlation between CBD dilation and bowel loop distension.

In conclusion, the prevalence of CBD dilatation in patients with bowel obstruction was about 40%. The cause of common bile duct dilatation in about 23% of patients was unknown. In patients with bowel obstruction without a known cause of CBD dilation, bowel diameter was correlated with CBD diameter. This cross-sectional study may indicate a possible association, but it does not establish a cause-and-effect relationship between CBD dilation and bowel loop dilation.

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