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Diagnostic yield of endoscopic ultrasonography for a dilation of the common bile duct of an indeterminate cause

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ABSTRACT

Introduction: with the widespread use of abdominal imaging, common bile duct (CBD) dilation is a common problem in the daily practice. However, the significance of a dilated CBD as a predictor of underlying disease has not been well elucidated and there are currently no guidelines for its approach.

Methods: this was a retrospective study of patients who underwent endoscopic ultrasonography (EUS) from 2010 to 2017 due to a dilated CBD detected by transabdominal ultrasonography TUS (CBD ≥ 7 mm) or computed tomography (CT) (CBD ≥ 10 mm), with no identified cause (n = 56). The aims were to assess the diagnostic yield of EUS and to identify predictors for a positive EUS.

Results: the majority of patients (n = 39) had normal findings on EUS. Abnormal EUS findings were found in 30% (n = 17) of the patients, which included choledocholithiasis (n = 6), ampuloma (n = 3), choledochal cyst (n = 2), benign CBD stenosis (n = 2), cyst of the head of the pancreas (n = 1), cholangiocarcinoma (n = 1), chronic pancreatitis (n = 1) and CBD compression due to adenomegaly (n = 1). Factors that positively related with findings on EUS were increased levels of gamma glutamyl transferase (331 U/l *vs* 104 U/l, p = 0.039),

alkaline phosphatase (226 U/l *vs* 114 U/l, p = 0.041), total bilirubin (TB) (6.5 g/dl *vs* 1.2 g/dl, p = 0.035) and the presence of signs/symptoms (p = 0.042). Of the 21 patients (38%) who were asymptomatic with normal liver biochemical tests, four (19%) had findings on EUS.

Conclusions: the majority of patients with a dilation of the CDB have a normal EUS. Increased cholestasis enzymes, increased TB and the presence of signs and symptoms are predictors of a positive EUS.

Key words: Dilation common bile duct. Endoscopic ultrasonography. Predictors.

INTRODUCTION

With the widespread use of abdominal imaging, common bile duct (CBD) dilation is a common problem in the daily practice (1,2). However, the significance of a dilated CBD as a predictor of underlying disease and long-term outcomes has not been well elucidated. Furthermore, the upper limit of the CBD diameter is not well defined, which can change due to various conditions such as age, previous cholecystectomy, body mass index or drugs. In addition, there is a great diversity in the design and measurement techniques (2,3). Further investigation may be indicated when CBD dilation is found and initial imaging studies such as transabdominal ultrasound (TUS) or computed tomography (CT) scan are non-diagnostic (4).

Even though the decision to investigate is straightforward in patients with symptoms or abnormal liver biochemical tests, it may be more controversial in asymptomatic patients (3). Endoscopic ultrasonography (EUS) has emerged as an important tool for the evaluation of biliary disease. The primary aim of this study was to assess the diagnostic yield of EUS for CDB dilation in patients with a negative initial study via TUS or CT scan. The secondary aim was to identify predictors for a positive EUS.

METHODS

This was a retrospective study performed between January 2010 and December 2017 of consecutive patients that underwent EUS due to CBD dilation. The inclusion criteria were CBD ≥ 7 mm on TUS or CBD ≥ 10 mm on CT, with no identified causative lesion. The exclusion criteria were prior endoscopic retrograde cholangiopancreatography (ERCP), prior

pancreato-biliary surgery, a history of biliary obstruction or lithiasic pancreatitis and a lack of data. All EUS procedures were performed with a radial or linear echoendoscope (Olympus GF-UCT140, GF-UE160) by two experienced endoscopists with an experience of more than 200 EUS. All patients signed an informed consent before undergoing EUS exploration. Data were collected on patient demographics, symptoms, laboratory tests, TUS and CT features, EUS findings and follow-up.

The statistical analysis was performed using the Statistical Package for Social Sciences (SPSS) program version 20 (IBM Corporation, Armonk, NY). Categorical variables are presented as frequencies and percentages, whereas continuous variables are shown as the mean with the standard deviation. The Chi-square test or Fisher's test and Student's t test were used to compare non-continuous and continuous data, respectively. A p value < 0.05 was considered as statistically significant. The study was exempt from approval by the ethics committee as it was a retrospective study of the analysis of existing data and individual subjects that cannot be identified.

RESULTS

Fifty-six pancreatico-biliary EUS procedures were performed during the study period due to an indication of dilated CBD. The baseline characteristics of patients are shown in table 1. The mean age was 70 ± 13 years, 70% were female, 50% were asymptomatic and 29% were cholecystectomyzed. The initial imaging study provided was TUS in 75% of cases and CT scan in 25%; the mean diameter of the CBD was 12 ± 4 mm.

The majority of patients (n = 39) had normal findings on EUS. Abnormal EUS findings were found in 30% (n = 17) of patients. These included choledocholithiasis (n = 6), ampuloma (n = 3), choledochal cyst (n = 2), benign CBD stenosis (n = 2), cyst of the head of the pancreas (n = 1), cholangiocarcinoma (n = 1), chronic pancreatitis (n = 1) and CBD compression due to adenomegaly (n = 1) (Table 2). The predictors of EUS findings are summarized in table 3. Factors that positively related with findings on EUS were increased gamma glutamyl transferase (331 U/l *vs* 104 U/l, p = 0.039), alkaline phosphatase (226 U/l *vs* 114 U/l, p = 0.041), total bilirubin (TB) (6.5 g/dl *vs* 1.2 g/dl, p = 0.035) and the presence of signs/symptoms (p = 0.042). Age, gender and previous cholecystectomy were not predictors of positive EUS findings. Of the 21 patients (38%) who were asymptomatic with normal liver

biochemical tests, four (19%) had findings on EUS. These included a cyst in the pancreas head (n = 1), choledocholithiasis (n = 1), compression due to adenomegaly (n = 1) and benign CBD stenosis (n = 1).

During follow-up (25 ± 18 months), seven patients (13%) underwent another EUS and the findings were concordant with first study in 86% of cases. There was one case of an unidentified ampullary tumor in the first EUS and 46 (82%) cases underwent MRCP; concordant results were obtained in 76%. In the eleven patients where the EUS and MRCP imaging were non-concordant, MRCP did detect three cases of choledocholithiasis, two ampullary tumors and one CBD compression due to adenomegaly. The EUS imaging did not detect three cases of mild benign stenosis CBD, one choledocholithiasis and one cyst of the bile duct. The case of choledocholithiasis was not confirmed by ERCP and the three cases of mild benign stenosis did not undergo ERCP due to a lack of symptoms and abnormalities of the laboratory tests. A diagnosis was made in 39% of patients with the two techniques. There were no undiagnosed malignant pathologies during follow-up, which were defined by imaging, the need for surgery or death from pancreatico-biliary malignancy.

DISCUSSION

The approach for dilation of the CBD can be difficult and is not well defined (5). TUS is the initial diagnosis method for the assessment of the biliary tract when obstruction is suspected, mainly because it is non-invasive, cheap and easily accessible. Nevertheless, it has a low sensitivity for the detection of CBD stones as it is operator-dependent, and gas, tissues and abdominal fat, especially in the distal part, may diminish the quality of the image (6,7).

CT, although non-invasive, is more expensive and involves exposure to radiation. The visualization of CBD stones by CT varies with the composition of the calculi. Most are radiopaque but calculi with soft tissue may be difficult to visualize (6). Taking into account the limitations of these two techniques, EUS and MRCP represent excellent alternative techniques for the study of the CBD when a dilation is found with no identified cause. EUS can visualize the biliary tract due to the close proximity of the transducer placed in the duodenum that is close to the CBD. This provides a direct endoscopic view of the periampullary area and echographic evaluation of the extrahepatic biliary tract, pancreas

and duodenal wall (6).

Our study showed that the majority of patients with CBD dilation did not have an identified cause on EUS, and that patients with symptoms or abnormal LFT are more likely to have positive findings on EUS. These results are consistent with previous published data (5,6). Age, sex, prior cholecystectomy and/or CBD diameter were not predictors of abnormal findings on EUS according to our study.

Even though the percentage of findings was low in asymptomatic patients with normal liver biochemical tests, further diagnostic tests are recommended as biliary abnormalities were still observed (3,6). The agreement between EUS with MRCP was good. MRCP mainly missed choledocholithiasis and ampullary tumors, thus EUS may be preferable if these pathologies are suspected (8). Some studies have shown that the sensitivity of MRCP declines significantly with CBD stone size, while the sensitivity of EUS remains high (1,9).

EUS mainly missed mild benign stenosis of CBD (n = 3). Nonetheless, mild biliary stenosis is difficult to define and diagnose. Furthermore, these patients did not require any intervention during follow-up, as they remained asymptomatic with normal liver function tests. There were no undiagnosed malignant pathologies via EUS for CBD dilation during follow-up. The diagnostic yield increased with the two techniques, which shows they are complementary in order to achieve the maximum diagnostic yield.

Our study, as any retrospective study, has some limitations which are as follows: a) imaging studies were performed in different centers with different operators; b) the decision to perform EUS/MRCP was based on the decision of the clinician and a protocol regimen was not used; and c) EUS findings should be compared to a gold standard such as surgery or ERCP, which were only available for a minority of our patients and was not included in the data set.

In conclusion, when index imaging (TUS or CT) does not reveal a cause for CBD dilatation, EUS is a good imaging tool for diagnosis. Furthermore, patients with symptoms and/or abnormal liver tests have a greater probability of positive findings.

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Table 1. Demographic data

Baseline characteristics	
Gender female (n, %)	39, 70%
Age (years, mean ± SD)	70 ± 13
TGO (mg/dl, mean ± SD)	49 ± 64
TGP (mg/dl, mean ± SD)	58 ± 94
ALP (IU/l, mean ± SD)	151 ± 180
GGT (mg/dl, mean ± SD)	188 ± 365
Total bilirubin (g/dl, mean ± SD)	3 ± 8
Symptoms	
None (n, %)	28, 50%
Abdominal pain	20, 36%
Jaundice	5, 9%
Weight loss	2, 4%
Itching	1, 2%
Previous cholecystectomy (n, %)	16, 29%
Initial imaging (n, %)	
TUS	42, 75%
CT scan with/without TUS	14, 25%
Diameter CBD on initial imaging (mm, mean ± SD)	12 ± 4
Follow-up (months, mean ± SD)	25 ± 18

ALP: alkaline phosphatase; CT: computed tomography; CDB: common bile duct; GGT: gamma-glutamyl transpeptidase; SD: standard deviation; TGO: glutamic oxalacetic transaminase; TGP: glutamic pyruvic transaminase; TUS: transabdominal ultrasound.

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Table 2. Findings on EUS in patients with a dilation of the CBD

Findings	*EUS (n = 56)*
Normal findings (n, %)	39 (70%)
Choledocholithiasis (n)	6
Ampuloma (n)	3
Choledochal cyst (n)	2
Benign stenosis (n)	2
Cyst head of pancreas (n)	1
Cholangiocarcinoma (n)	1
Chronic pancreatitis (n)	1
CBD compression due to adenomegaly (n)	1

CDB: common bile duct; EUS: endoscopic ultrasonography; MRCP: magnetic resonance cholangiopancreatography.

Table 3. Predictors of EUS findings

Predictors of EUS findings			
Predictor	*Normal EUS*	*EUS with findings*	*p value*
Gender female (%)	72	65	0.596
Age (years, mean ± SD)	69 ± 10	68 ± 10	0.819
TGO (mg/dl, mean ± SD)	41 ± 58	66 ± 75	0.193
TGP (mg/dl, mean ± SD)	46 ± 80	883 ± 117	0.173
ALP (IU/l, mean ± SD)	114 ± 138	226 ± 231	*0.041*
GGT (mg/dl, mean ± SD)	104 ± 271	331 ± 459	*0.039*
Total bilirubin (g/dl, mean)	1.2 ± 3	6.5 ± 14	*0.035*
Presence of symptoms (%)	18	43	*0.042*
Previous cholecystectomy (%)	26	35	0.262
Mean diameter of the CBD on initial imaging (mm, mean)	11 ± 3	13 ± 5	0.233

ALP: alkaline phosphatase; CT: computed tomography; CDB: common bile duct; EUS-endoscopic ultrasonography; GGT: gamma glutamyl transpeptidase; SD: standard deviation; TGO: glutamic oxalacetic transaminase; TGP: glutamic pyruvic transaminase; TUS: transabdominal ultrasound.