

An assessment of the yield of EUS in patients referred for dilated common bile duct and normal liver function tests

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ABSTRACT

Objective: This study aims to determine the yield of EUS in patients with common bile duct (CBD) dilation and normal liver function tests (LFTs). **Materials and Methods:** Between October 2000 and December 2016, all patients referred for EUS for unexplained CBD dilatation (CBD ≥ 7 mm), with normal aspartate aminotransferase, alanine aminotransferase, alkaline phosphatase, and bilirubin and no history of sphincterotomy, were eligible. Linear-array EUS was performed by one of the two experienced endosonographers. Data were extracted from a prospectively maintained database. **Results:** Of 29,920 upper gastrointestinal EUS procedures performed, 840/29,920 (3%) were for unexplained CBD dilation. Of 840 patients, 199 (24%) had normal LFTs, 99% were Caucasian, 46% had biliary-type abdominal pain, and 41% were postcholecystectomy. EUS diagnosed choledocholithiasis (CDL) or sludge in 18/199 (9%) patients (7/18 had CBD sludge only). No other pathology was diagnosed. Of 18 CDL patients, 15 (83%) had an intact gallbladder, and all 15 patients had cholelithiasis. The frequency of CDL or sludge in postcholecystectomy patients was only 3.7% (3/82); none of these patients were younger than 69 years of age. Regression analyses showed no associations between EUS diagnosis of CDL or sludge and biliary-type abdominal pain, other symptoms, sex, or race. Each additional year of age was associated with an increase in the risk of CDL or sludge by a factor of 1.05 (odds ratio: 1.05; $P = 0.034$). **Summary:** In patients with CBD dilation and normal LFTs, the only significant pathology identified is CBD stones or sludge (almost exclusively in elderly patients with cholelithiasis). **Conclusion:** EUS should be avoided in patients with dilated bile ducts and normal LFTs, especially if under 65 years of age and postcholecystectomy.

Key words: Bile duct, EUS, stones

INTRODUCTION

EUS has an established role in the diagnosis of choledocholithiasis (CDL) and biliary tract disease.^[1-3] The accuracy of EUS is superior to endoscopic retrograde cholangiography, without the associated risks, especially pancreatitis.^[4-7] A dilated

common bile duct (CBD) is defined as having a diameter of >7 mm and is common in older people and those with previous cholecystectomy or chronic narcotic use.^[6-9] Patients with dilated CBD and abnormal liver function tests (LFTs) generally merit noninvasive

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bile duct imaging by EUS; however, data are limited regarding the yield of such EUS in patients with CBD dilation and normal LFTs, who are unlikely to harbor significant pathology.^[1-3,10-14] Furthermore, little is known about the predictive factors and natural history of asymptomatic CDL in patients with normal liver serum enzymes and CBD dilatation.^[1-3] The purpose of this study is to determine the frequency and predictive factors of significant pathology in patients with CBD dilation and normal LFTs in whom EUS is requested.

MATERIALS AND METHODS

Study design

All patients referred to the University of Montreal Hospital Center (a tertiary EUS referral center) between October 2000 and December 2016, for EUS for unexplained CBD dilatation (defined as CBD diameter ≥ 7 mm at any place) and normal LFTs (alanine aminotransferases, aspartate aminotransferase, G-glutamyl transpeptidase, alkaline phosphatase, and bilirubin), and no history of biliary sphincterotomy, were eligible for this retrospective study.

EUS was performed using the linear-array echoendoscope (Pentax Medical, Melville, NJ, USA), by one of the two experienced endosonographers ($>10,000$ EUS procedures performed each), under conscious sedation. All patients signed informed consent for the procedure before undergoing EUS exploration. All the data were extracted from a prospectively maintained database where the data were entered by one of the two attending endosonographers, on a case-by-case basis. Prospectively collected data included patient demographics, symptoms, cholecystectomy history, and EUS findings. Our institutional review board approved this retrospective study.

Data analysis

Univariate, bivariate, and multivariate logistic regression analyses were applied to determine the relationship between any significant pathology identified and the above-mentioned variables.

RESULTS

Between October 1, 2000, and December 31, 2015, 29,920 upper gastrointestinal EUS procedures were performed and 840/29,920 (3%) were for unexplained CBD dilation. Of 840 patients, 99% were Caucasian, 199 (24%) had

normal LFTs 46% had biliary-type abdominal pain, and 41% were postcholecystectomy [Table 1]. EUS diagnosed CDL or sludge in 18/199 (9%) patients (7/18 had one CDL [5, 7, 8, 8, 9, 13, and 15 mm, respectively]; 2/18 had two CDL [5 and 3 mm for the first patient and 8 and 10 mm for the second patient]; and 2/18 had multiple CDL [<5 mm in size]). Of 18 patients, 7 had CBD sludge only. No significant pathology other than CDL or sludge was diagnosed. Of 18 CDL patients, 15 (83%) had an intact gallbladder, and all 15 patients had cholelithiasis without additional findings besides the presence of stones. Concomitant cholelithiasis increased the likelihood of finding CDL or sludge four-fold (15/18 [83%] *vs.* 3/18 [17%]; odds ratio [OR] = 3.9). The frequency of CDL or sludge in postcholecystectomy patients was only 3.7% (3/82); none of these patients were younger than 69 years of age. Univariate, bivariate, and multivariate logistic regression analyses showed no associations between EUS diagnosis of CDL or sludge and biliary-type abdominal pain, other symptoms, sex, or race. Each additional year of age was associated with an increase in the risk of CDL or sludge by a factor of 1.05 (OR: 1.05; $P = 0.034$).

Univariate, bivariate, and multivariate logistic regression analyses were applied to assess the relationship between selected outcomes and collected variables [Tables 2 and 3]. No associations were found between EUS diagnosis of CDL or sludge and biliary-type abdominal pain, other symptoms, sex, or race. Conversely, significant negative associations were found between finding CDL or sludge with a history of cholecystectomy (OR: 0.231, $P = 0.030$) and age <65 years (OR: 0.052, $P = 0.034$) [Table 3]. The mean age tended to be higher in patients with CDL or sludge (77.9 *vs.* 66.1 years, $P = 0.066$).

DISCUSSION

EUS allows extremely precise endoscopic and ultrasound evaluation of ampullary, duodenal, pancreatic, and biliary structures. In our experience, EUS is often requested in patients with unexplained CBD dilation and normal LFTs. CBD dilation is not unusual in postcholecystectomy patients, can be congenital (choledochal cysts), or can be caused by chronic narcotic use. Therefore, the yield of EUS for significant obstructive pathologies such as stones, sludge, or cancer appeared to be questionable. To our knowledge, this is the first series to specifically address this issue.

Table 1. Clinical and demographic characteristics of the population

	n (%)
CDL	18 (9)
Gall bladder out	82 (41.2)
Sex (male)	38 (19.5)
Biliary-type abdominal pain	91 (45.7)
Others symptoms	17 (8.5)
Race (white)	194 (98.9)
Age (mean±SD)	67±14.2

CDL: Cholelithiasis, SD: Standard deviation

Table 2. Initial model

	B	SE	Statistic	P
Intercept	-6.124	1.855	-3.302	0.001
GB out	-1.456	0.671	-2.169	0.030
Others symptoms	0.470	0.906	0.519	0.604
Pain	0.697	0.619	1.126	0.260
Sex (male)	0.925	0.645	1.434	0.151
Age	0.052	0.025	2.118	0.034

SE: Standard error, GB: Gallbladder

Table 3. Final model

	B	OR: Exp B	SE	Statistic	P
Intercept	3.028		4.001	0.757	0.449
GB out	-1.462	0.231	0.683	-2.142	0.032
Age	-0.214	0.81	0.127	-1.694	0.090
Age square	0.002	1.002	0.001	2.029	0.042

OR: Odds ratio, SE: Standard error, GB: Gallbladder

The robustness of our findings is limited by the inherent weakness of all retrospective database studies and the potential for false-positive or false-negative EUS examinations. However, our database is populated and maintained by only two individuals, both of whom are very experienced endosonographers, and the inclusion criteria for this study were not subjective. Therefore, we do not suspect any systemic bias that may have influenced our results in either way. However, the external validity and generalizability of the results may be compromised because 99% of the patients were caucasian.

Altogether, potentially clinically significant pathology was found in 9% of patients referred for EUS with dilated CBD and normal LFTs. Interestingly, the only pathology identified was CBD stones or sludge. No other obstructive pathology was found – most notably, no neoplastic disease such as ampulloma. However, CBD stones or sludge was extremely rare in the absence of concomitant cholelithiasis (3.6%). It is debatable whether the CBD stones diagnosed in patients with CBD dilation and normal LFTs are

responsible for CBD dilation and/or symptoms and whether treatment would be helpful – particularly because we found no correlation between symptoms and bile duct stones.

CONCLUSION

In patients with normal LFTs and dilated bile duct, EUS never found any significant pathology unless patients were older than 65 years of age and/or had gallstones. We, therefore, conclude that EUS can be avoided unless these features are present.

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Conflicts of interest

There are no conflicts of interest.

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