

## The Diagnostic yield of endoscopic ultrasound in asymptomatic patients with unexplained dilated common bile duct, or double duct sign with normal transaminases A retrospective study from a single urban-based university endoscopy center

Mina Fransawy Alkomos

*Gastroenterology Department, Saint Joseph's University Medical Center, Paterson, NJ, USA,*  
minafransawyalkomos@gmail.com

Shaker Barham

*Gastroenterology Department, Saint Joseph's University Medical Center, Paterson, NJ, USA*

Youssef Botros

*Gastroenterology Department, Saint Joseph's University Medical Center, Paterson, NJ, USA*

Nader Mekheal

*Internal Medicine Department, Saint Joseph's University Medical Center, Paterson, NJ, USA*

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Internal Medicine Department, Saint Joseph's University Medical Center, Paterson, NJ, USA.

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DOI: 10.55729/2000-9666.1298

Available at: <https://scholarlycommons.gbmc.org/jchimp/vol14/iss1/5>

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None

**Authors**

Mina Fransawy Alkomos, Shaker Barham, Youssef Botros, Nader Mekheal, Ariana Tagliaferri, Alisa Farokhian, Hardikkumar M. Shah, Gabriel Melki, Yana Cavanagh, Walid Baddoura, and Matthew Grossman

# The Diagnostic Yield of Endoscopic Ultrasound in Asymptomatic Patients with Unexplained Dilated Common Bile Duct, or Double Duct Sign with Normal Transaminase a Retrospective Study from a Single Urban-based University Endoscopy Center

Mina F. Alkomos <sup>a,\*</sup>, Shaker Barham <sup>a</sup>, Youssef Botros <sup>a</sup>, Nader Mekheal <sup>c</sup>, Ariana Tagliaferri <sup>c</sup>, Alisa Farokhian <sup>a</sup>, Hardikkumar M. Shah <sup>a</sup>, Gabriel Melki <sup>a</sup>, Yana Cavanagh <sup>a</sup>, Walid Baddoura <sup>a</sup>, Matthew Grossman <sup>b</sup>

<sup>a</sup> Gastroenterology Department, Saint Joseph's University Medical Center, Paterson, NJ, USA

<sup>b</sup> Gastroenterology Department, Morristown Medical Center, Morristown, NJ, USA

<sup>c</sup> Internal Medicine Department, Saint Joseph's University Medical Center, Paterson, NJ, USA

## Abstract

**Background:** Common bile duct dilatation alone or double duct sign (both CBD and dilated pancreatic duct dilatation) and abnormal liver enzymes are highly predictive of biliary disease. This can be identified on ultrasound (US), CT scan, and/or magnetic resonance cholangiopancreatography (MRCP). Unexplained dilatation on imaging might warrant endoscopic ultrasound (EUS) to identify any occult causes. Supporting literature about the importance of using EUS in these conditions is evolving with no clear evidence-based approach to evaluate asymptomatic dilated ducts.

We aim to investigate the diagnostic yield of EUS in unexplained CBD dilatation or double duct sign with normal liver enzymes.

**Method:** A retrospective data analysis was conducted from January 2015 to October 2021 on asymptomatic patients with a dilated CBD of 7 mm or more and 9 mm if the patient had a cholecystectomy history or double duct sign with normal liver enzymes.

**Result:** 32 EUS procedures were indicated for unexplained dilated CBD or double duct sign on imaging with normal liver enzymes. 23 had CBD dilatation alone (72 %), and 9 had a double duct sign (28 %). 20 of the included patients were females (63 %), and 12 were males (37 %), with a mean age of  $63.8 \pm 17$  and  $68.2 \pm 14$  years old, respectively ( $p = 0.424$ ). The diagnosis after EUS in CBD dilatation alone showed a yield of 56 % as follow; no pathology in 10 (44 %), sludge in 9 patients (39 %), CBD stone in 3 (13 %), malignant stricture in 1 (4 %) (Fig. 1). On the other hand, EUS in those with double duct signs showed a diagnostic yield of 55 %; no pathology in 4 (45 %), pancreatic head adenocarcinoma in 3 patients (33 %), Biliary stone in one patient, and malignant CBD stricture in one patient (11 % each) (Fig. 2).

**Conclusion:** Unexplained CBD dilatation or Double duct sign on imaging in patients with normal liver enzymes should warrant further investigation with EUS to avoid missing serious pathological conditions such as stones, sludge, stricture, or a mass.

**Keywords:** Endoscopic ultrasound, Common bile duct, Double duct sign

Received 9 July 2023; revised 20 October 2023; accepted 9 November 2023.  
Available online 12 January 2024

\* Corresponding author at: 703 Main Street, Paterson, NJ, 07503, USA. Fax: +973 754-2044.  
E-mail address: [Minafransawalkomos@gmail.com](mailto:Minafransawalkomos@gmail.com) (M.F. Alkomos), [r\\_barhams@sjhmc.org](mailto:r_barhams@sjhmc.org) (S. Barham), [gibotros1@gmail.com](mailto:gibotros1@gmail.com) (Y. Botros), [n.mekheal@saba.edu](mailto:n.mekheal@saba.edu) (N. Mekheal), [axt173@jefferson.edu](mailto:axt173@jefferson.edu) (A. Tagliaferri), [Alisafarokhian@yahoo.com](mailto:Alisafarokhian@yahoo.com) (A. Farokhian), [r\\_shahh@sjhmc.org](mailto:r_shahh@sjhmc.org) (H.M. Shah), [gabriel.melki@mail.mcgill.ca](mailto:gabriel.melki@mail.mcgill.ca) (G. Melki), [cavanaghy@sjhmc.org](mailto:cavanaghy@sjhmc.org) (Y. Cavanagh), [baddourw@sjhmc.org](mailto:baddourw@sjhmc.org) (W. Baddoura), [GrossmanM@sjhmc.org](mailto:GrossmanM@sjhmc.org) (M. Grossman).

<sup>1</sup> LinkedIn profile <https://www.linkedin.com/in/mina-effat-fransawy-alkomos-759604E137/>

<https://doi.org/10.55729/2000-9666.1298>

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## 1. Introduction

A dilated common bile duct (CBD) alone or double duct sign (both CBD and dilated pancreatic duct dilatation) along with elevated liver enzymes is strongly indicative of biliary disease.<sup>1,2</sup> Technological advancements and affordability of imaging studies have improved over the years resulting in a higher frequency of incidental findings, including bile duct dilation with or without pancreatic duct dilation in patients who otherwise have no signs or symptoms of pancreaticobiliary disease.<sup>2,3</sup> Alteration in bile duct size can occur in many benign and malignant conditions including aging, post-cholecystectomy, stone disease, sphincter of Oddi dysfunction, strictures, chronic pancreatitis, chronic opioid usage and malignancies. Despite comprising the lowest percentage of these etiologies, earlier identification of malignancies can result in a more favorable prognosis. The acceptable normal size of the bile duct varies by age and in the post-surgical state.<sup>1,2</sup> When no identifiable cause of dilated ducts is seen on ultrasound (US), CT scan, or magnetic resonance cholangiopancreatography (MRCP), evaluation with endoscopic ultrasound (EUS) may be able to detect occult causes.<sup>2,4,5</sup> The decision to proceed with EUS must be carefully considered while keeping in mind the potential risks of the intervention. Although EUS and MRCP have similar sensitivities in detecting choledocholithiasis, EUS has a higher ability to detect small stones.<sup>6</sup>

There is limited literature on the yield of EUS in unexplained dilated CBD or double duct signs with normal liver enzymes. In this study, we will review a single center's experience and analyze the yield of EUS in those situations and perform multiple logistic regression analyses to investigate the association of multiple variables and duct dilatation.

## 2. Method

A retrospective analysis was conducted from January 2015 to October 2021 on patients that met the following criteria.

### 2.1. Inclusion criteria

- Dilatated CBD of 7 mm or more and 9 mm in patients with a history of cholecystectomy
- Unexplained double duct sign on imaging (ultrasound or computed tomography scan of the abdomen or MRCP to exclude the cause of dilatation).

- Asymptomatic patients with normal liver enzymes (ALT <33 and AST <40).

### 2.2. Exclusion criteria

- Chronic opioid use.
- History of prior endoscopic pancreaticobiliary intervention.
- Chronic pancreatitis.

### 2.3. Statistical analysis

Univariate, bivariate, and multivariate logistic regression analyses assessed the relationship between EUS findings and different variables. These variables include age, gender, ethnicity, and CBD size. The patients' demographics and EUS findings were analyzed as simple mean and standard deviation. This data was collected and plotted into a Microsoft Excel sheet. At least two team members interpreted the data for each patient.

## 3. Result

A total of 1131 EUS procedures were carried out during this period. A total of 32 (3 %) EUS procedures were indicated for unexplained dilated CBD or double duct sign on imaging with normal liver enzymes. 23 had CBD dilatation alone (72 %), and 9 had a double duct sign (28 %). 20 of the included patients were females (63 %) and 12 were males (37 %), with a mean age of  $63.8 \pm 17$  and  $68.2 \pm 14$  years old, respectively ( $p = 0.424$ ). 16 of the included patients were white (50 %), 12 Hispanic (38 %), 3 African American (9 %), and 1 Asian (3 %) (Table 1).

EUS performed in those with CBD dilatation alone provided a diagnostic yield of 56 % as follow; no pathology in 10 (44 %), sludge in 9 patients (39 %), CBD stone in 3 (13 %), malignant stricture in 1 (4 %) (Fig. 1). 13 patients in the CBD dilation group underwent ERCP that confirmed the diagnosis.

Logistic regression analyses were used to assess the association between the dependent variable of CBD stone or sludge and collected outcomes. No association was found between the diagnosis of CBD sludge/stone and the patient's age, gender, or CBD size.

On the other hand, EUS in those with double duct signs showed a diagnostic yield of 55 %; no pathology in 4 (45 %), pancreatic head adenocarcinoma in 3 patients (33 %), Biliary stone in one patient, and malignant CBD stricture in one patient (11 % each) (Fig. 2).

Table 1. Clinical characteristics of the included patient and etiologies for duct dilatation.

Gender (n, %)	
Female	20, 63 %
Male	12, 37 %
Age (mean, SD)	
Female	63.8 ± 17
Male	68.2 ± 14
	p = 0.424
Ethnicity (n, %)	
White	16, 50 %
Hispanic	12, 38 %
African American	3, 9 %
Asian	1, 3 %
Number of patients with CBD dilatation alone, or double duct sign (n, %)	
CBD dilatation alone	23, 72 %
Double duct sign	9, 28 %
Diagnosis after EUS in CBD dilatation alone (n, %)	
EUS yield for identifiable causes	13/23, 56 %
No pathology	10, 44 %
Sludge	9, 39 %
CBD stone	3, 13 %
Malignant stricture	1, 4 %
Diagnosis after EUS in double duct sign (n, %)	
EUS yield for identifiable causes	5/9, 55 %
No pathology	4, 45 %
Pancreatic head adenocarcinoma	3, 33 %
Biliary stone	1, 11 %
Malignant CBD stricture	1, 11 %

#### 4. Discussion

CBD dilation can result from a variety of causes, including sludge, stones, strictures, cholangiocarcinoma, periampullary lesions, sphincter of Oddi dysfunction, chronic pancreatitis, chronic opioid usage, etc.<sup>3,5,7</sup> Patients with these pathologies will

most likely present with signs or symptoms such as jaundice, abdominal pain, or elevated liver enzymes.<sup>5,7</sup> CBD dilation on imaging and elevated liver enzymes has a high pre-test probability of pathological finding on EUS.<sup>5,7–9</sup> Incidentally discovered biliary dilation without clinical, laboratory, or identifiable cause on imaging is

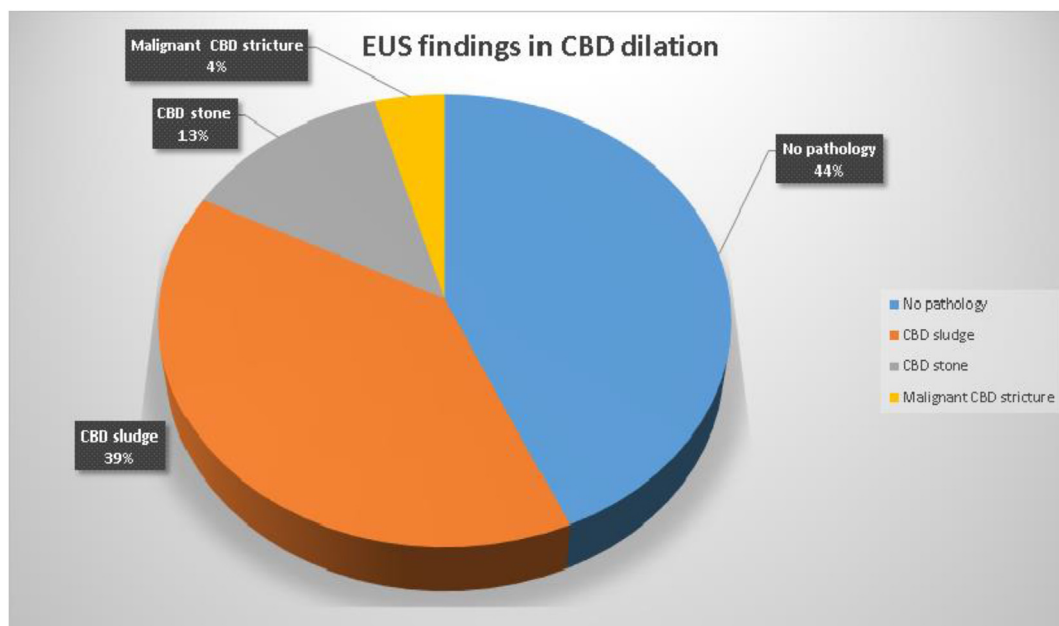


Fig. 1. Endoscopic ultrasound finding in common bile duct dilatation alone.

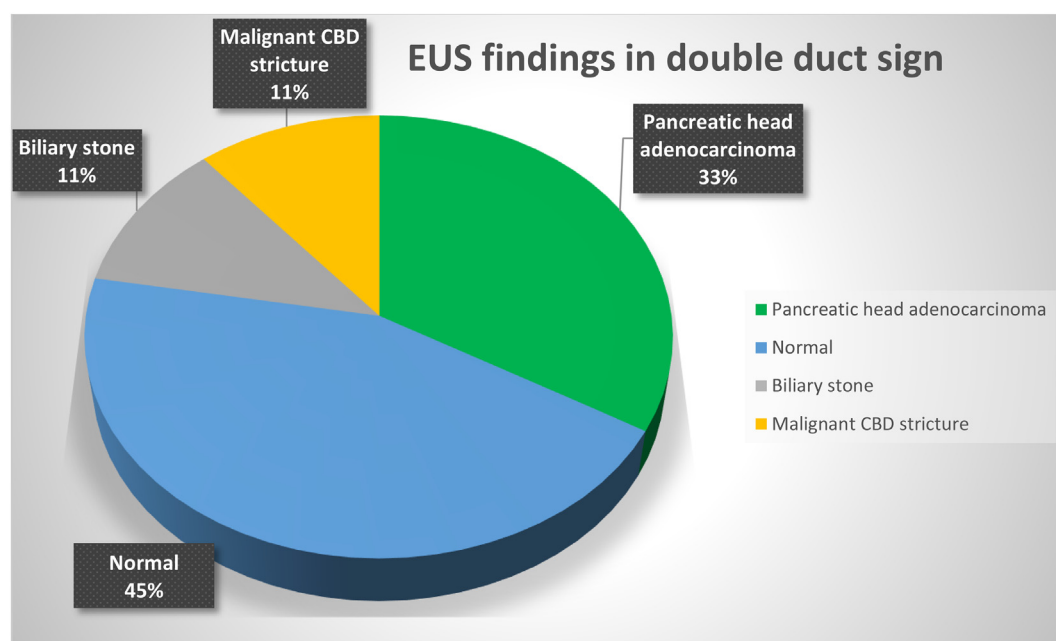


Fig. 2. Endoscopic ultrasound finding in double duct sign.

considered a benign condition that might not warrant further intervention.<sup>3</sup> Supporting literature about the importance of using EUS in these conditions continues to evolve with no clear evidence-based approach to evaluate asymptomatic patients with dilated ducts.<sup>3,5,7,10</sup>

In a study by Malik *et al.*<sup>7</sup>, the role of EUS in asymptomatic biliary dilation was evaluated in 47 patients, out of which only 15 patients had an MRCP. The study population was divided into 2 groups: one with normal liver enzymes ( $n = 32$ ) and another with abnormal liver enzymes ( $n = 15$ ). EUS showed low yield (6 %) with only 2 patients out of the 32 in the normal liver enzyme group had identifiable cause on EUS (CBD stone and perampullary diverticulum), with higher EUS yield in the abnormal liver enzyme group (8 patients had identifiable reasons out of the 15  $P = 0.001$ ). Rana *et al.*<sup>5</sup> conducted a retrospective study to evaluate the diagnostic accuracy of EUS in patients with unexplained CBD dilatation on MRCP. 40 patients were included, 30 had normal liver function tests, and 10 only out of 30 patients showed identifiable causes on EUS, including CBD stone or chronic pancreatitis (Yield 33.3 %). Bruno *et al.*<sup>11</sup> EUS yield in dilated CBD with the normal liver function was 21 % and can be adjusted to 10.5 % as per the author if we excluded chronic pancreatitis or perampullary diverticulum as a cause for dilatation that does not warrant intervention in asymptomatic patients with normal liver enzymes. Oppong *et al.*<sup>2</sup> had a yield of 20 % (8 patients; 3 biliary stones, 3 biliary

polyps, 1 portal vein compression, and 1 sludge (microlithiasis).

The diagnostic yield ranged from 6 % to 33 % in these previously mentioned studies,<sup>2,5,7,11</sup> unlike our study that showed a diagnostic yield of 56 % in patients with normal liver enzymes. However, the yield would drop to 17 % if microlithiasis (sludge) was considered as a secondary finding that does not warrant intervention in the setting of normal liver function.

## 5. Conclusion

Unexplained CBD dilation on imaging with normal transaminases does warrant further investigation by EUS, which increases the chance to identify etiologies such as choledocholithiasis, biliary stricture, and malignancy. By implementing this practice, besides improving the diagnostic yield of the conditions mentioned above, a negative EUS will reduce the unnecessary use of ERCP. On the other hand, EUS should also be considered in patients with a double duct sign even in the setting of normal imaging and liver enzymes due to the possibility of identifying malignant etiologies.

## 6. Limitations

First is the small sample size and its retrospective nature. Secondly, both EUS and MRCP can miss the diagnosis of papillary stenosis and sphincter of



Oddi dysfunction. Lastly, the cost-effectiveness of our approach was not factored in, and this must be evaluated in future studies.

### Financial disclosure or funding

None.

### Author contributions

All authors contributed equality to idea formation, IRB approval, data extraction, manuscript and statistical analysis.

### Conflicts of interest

None of the authors have any conflicts of interest to declare.

### Acknowledgement

None.

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