

## Comparative Study between Use of Endoscopic Ultrasound before Endoscopic Retrograde Cholangio Pancreatography Versus Endoscopic Retrograde Cholangio Pancreatography Alone

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### Abstract

**Background:** Endoscopic Ultrasound (EUS) could be used as non-invasive procedure instead of Endoscopic Retrograde Cholangiopancreatography (ERCP) in pancreatico-biliary disorders diagnosis. The impact of EUS use before ERCP need to be evaluated.

**Aim of Study:** The aim of this study was to determine the impact of EUS use before ERCP in patients of pancreatico-biliary disorders as regard, the procedure accessibility, duration, success rate and rate of complications.

**Methods:** This study was conducted on fifty patients with pancreatico-biliary disorders prepared to ERCP procedure. Randomly, 25 patients were subjected to ERCP directly (group-I) and for the remaining 25 patients EUS was done before ERCP (group-II).

**Results:** There was no significant difference between patients of both groups regarding age and sex, clinical features, laboratory parameters, sonographic and diagnostic findings and post ERCP complications. Use of EUS before ERCP showed significant higher rates of successful stone extraction without lithotripter and reduced the procedure duration.

**Conclusion:** Our study supports the idea that use of EUS before ERCP showed significant reduction of procedure time and higher rates of successful stone extraction by balloon or basket without use of lithotripter and did not alter the rate of procedure complications.

**Key Words:** Endoscopic Ultrasound (EUS) – Endoscopic Retrograde Cholangiopancreatography (ERCP) – Pancreatico-biliary disorders.

### Introduction

**TREATMENT** of patients with symptomatic choledocholithiasis with no suspicion of Common

Bile Duct (CBD) stones is straight forward and includes planned elective laparoscopic cholecystectomy. In contrast, the management of patients with suspected choledocholithiasis is technically more challenging and usually requires pre-operative or intraoperative visualization of the biliary tree with the aim of detecting the stones in the bile duct [1].

For years, the 'gold standard' for preoperative visualization of the bile duct has been ERCP [2]. However, the non-selective use of ERCP in all patients with suspected choledocholithiasis detects CBD stones in less than 50 percent [13].

This method may, of course, be both a diagnostic and a treatment modality, but it results in over half of patients undergoing an unnecessary invasive procedure, with its attributable morbidity and mortality. The first publications on the usefulness of the alternative, non-invasive modality EUS in diagnosing CBD stones appeared around 1990 [4].

Since then, numbers of studies, incorporating patients with suspected choledocholithiasis, have shown excellent accuracy for EUS, coupled with safety [4].

Endoscopic ultrasound has emerged as an important diagnostic and therapeutic modality in the field of gastrointestinal endoscopy. EUS provides access to many organs and lesions which are in proximity to the gastrointestinal tract and thus giving an opportunity to target them for therapeutic and diagnostic purposes. This modality also provides a real time opportunity to target the required area while avoiding adjacent vascular and other structures [5].

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Percutaneous Transhepatic Cholangiography (PTC) has also been established as an alternative method for biliary drainage. However, PTC is associated with several complications, such as cholangitis, bile leakage, and pneumothorax. Moreover, the frequency of major complications, leading to prolonged hospital stay and permanent adverse sequelae, is 4.6%-25%, and that of procedure-related deaths is 0%-5.6% [6].

Therapeutic EUS has found role in management of pancreatic fluid collections, biliary and pancreatic duct drainage in cases of failed endoscopic retrograde cholangiopancreatography, drainage of gallbladder, celiac plexus neurolysis/blockage, drainage of mediastinal and intra-abdominal abscesses and collections and in targeted cancer chemotherapy and radiotherapy [5].

Interventions using EUS have been developed not only for obtaining cytological and histological diagnosis, but also for biliary drainage. EUS-guided biliary drainage (EUS-BD) was first reported by [7].

EUS-BD broadly includes EUS-guided rendezvous technique (EUS-RV) [8]. EUS-guided choledochoduodenostomy (EUS-CDS) and EUS-guided hepaticogastrostomy (EUS-HGS) [9].

Moreover, EUS-guided antegrade stenting (EUS-AS) and EUS-guided gallbladder drainage (EUS-GBD) have also been reported [10].

#### Aim of the work:

The aim of this study was to determine the impact of EUS use before ERCP in patients of pancreaticobiliary disorders regarding, the procedure accessibility, duration, success rate and rate of complications.

### Patients and Methods

This randomized prospective comparative study was conducted at El-Hussien University Hospitals from Septamper 2015 to August 2017 on fifty patients with pancreatico-biliary disorders admitted for ERCP. Randomly, 25 patients were subjected to ERCP directly (group-I) and for the remaining 25 patients EUS before ERCP was done (group-II). For minimizing grouping bias, the studied patients were alternatively divided into the 2 parallel groups under the odd-even role. Any patient with history of pancreatico-biliary surgery except cholecystectomy or history of failed or repeated ERCP within the last 3 months were excluded from our study. For all patients clear written consent,

full clinical and routine laboratory assessment and abdominal sonography were done.

Endoscopic ultrasound was performed by a Pentax EG 3870-UTK radial echoendoscope in the endoscopy unit under general anesthesia in match with sonographic machine Hitachi 500.

All ERCP procedures were performed by high volume endoscopist (who perform more than two sphincterotomies per week) [11] using the Fuji lateral view endoscope (ED-530XT8), during procedure, duration, accessibility, successful cannulation and rate of complications were recorded.

All patients were monitored at least for six hours after the procedure to detect symptoms and signs of complications (e.g. tachycardia, hypotension, fever, vomiting and abdominal pain). Serum amylase was done four hours post-ERCP. Patients were then either hospitalized or followed-up by phone contact.

Calculation of the Mean (M), Standard Deviation (SD), *t*-student test and Chi-square test ( $\chi^2$ ) were used for statistical evaluation.

### Results

There was no significant difference between patients of both groups regarding age and sex, clinical features, laboratory parameters, sonography and ERCP diagnostic findings as the two groups were randomly divided.

Table (1): Demographic features of the studied patients.

	ERCP Group I (25)	EUS & ERCP Group II (25)	<i>p</i> -value ( <i>t</i> -test or chi square)
Age (Mean $\pm$ S.D)	56.0 $\pm$ 13.9	45.9 $\pm$ 18.4	<i>t</i> =0.09
Sex:			
Eemale	14 (56.0%)	16 (64.0%)	$\chi^2$ =0.56
Male	11 (44.0%)	9 (36.0%)	

Table (2): Indications for ERCP.

	ERCP Group I (25)	EUS & ERCP Group II (25)	<i>p</i> -value (chi square)
• Obstructive jaundice	19 (76%)	20 (80%)	0.9
- Detected stone by ultrasound	12 (48%)	12 (48%)	
- Mass	2 (8%)	3 (12%)	
- Undetected cause	5 (20%)	5 (20%)	
• Asymptomatic with dilated biliary tree	2 (8.0%)	3 (12.0%)	0.5
• Abdominal pain with dilated biliary tree	1 (4%)	2 (8%)	0.4
• Cholangitis	2 (8.0%)	0 (00.0%)	0.1
• Gall stone pancreatitis	1 (4.0%)	0 (00.0%)	0.3

Table (3): Laboratory parameters among the studied patients.

	ERCP Group I (25) Mean ± SD	EUS & ERCP Group II (25) Mean ± SD	p-value (t-test or chi square)
ALT	93.6±76.3	136.5±89.4	t=0.19
AST	79.3±52.1	118.1±67.4	t=0.09
ALP	465.4±195.6	475.2±210.4	t=0.93
GGT	311.6±89.4	282.1±83.9	t=0.74
T.Prot.	7.0±0.7	7.2±0.8	t=0.46
Alb	3.5±0.6	3.6±0.5	t=0.25
T.Bil.	8.4±3.7	6.3±4.2	t=0.42
D.Bil.	6.2±2.5	4.6±1.7	t=0.46
HB	11.7±1.3	12.6±1.7	t=0.1
WBCs	7.5±3.6	7.2±1.5	t=0.66
Platelets	243.4±105.7	292.2±101.5	t=0.1
PC	82.5±12.7	85.4±12.3	t=0.41
INR	1.1±0.1	1.1±0.1	t=0.88
PT	13.4±1.4	13.2±1.0	t=0.55
Urea	27.8±8.7	24.0±6.7	t=0.09
Creat.	0.9±0.4	0.9±0.2	t=0.69
HCV Ab	5 (20.0%)	3 (12.0%)	χ <sub>2</sub> =0.3
HBs Ag	1 (4.0%)	0 (0.0%)	χ <sub>2</sub> =0.3

Table (4): Sonographic findings among the studied groups.

	ERCP Group I (25)	EUS & ERCP Group II (25)	p-value (chi square)
<i>CBD diameter (mm):</i>			
• Non calcular CBD dilatation	13 (52.0%)	13 (52.0%)	N.A
• Calcular CBD dilatation	12 (48.0%)	12 (48.0%)	
<i>Gall bladder stone:</i>			
• No stones	16 (64.0%)	9 (36.0%)	0.1
• Single stone	1 (4.0%)	4 (16.0%)	
• Multiple stones	8 (32.0%)	12 (48.0%)	

Table (5): Diagnostic findings of EUS in group II.

EUS in group II	Yes
Choledocholithiasis	18 (72%)
Biliary stricture	3 (12%)
Pancreatic mass	3 (12%)
Dilated biliary tree without cause	1 (4%)

Table (6): Interventions during ERCP.

	ERCP Group I (25)	EUS & ERCP Group II (25)	p-value (t-test or chi square)
• Duration of procedure (M ± S.D)	48.5±0.7	31.2±0.7	t=0.001 **
• Bile duct cannulation	22 (88%)	24 (96%)	χ <sub>2</sub> =0.7
• Stone extraction without lithotripter	10 (40%)	17 (68%)	χ <sub>2</sub> =0.01 *
• Stone extraction with lithotripter	2 (8%)	0 (0.00)	χ <sub>2</sub> =0.1
• Biliary stent placement	4 (16%)	1 (4%)	χ <sub>2</sub> =0.3
• Balloon dilatation of stricture	1 (4%)	2 (8%)	χ <sub>2</sub> =0.4
• Biliary stent with pancreatic mass	2 (8%)	2 (8%)	χ <sub>2</sub> =N.A
• Failed biliary stent with pancreatic mass	1 (4%)	1 (4%)	
• Failed cannulation	3 (12%)	1 (4%)	χ <sub>2</sub> =0.3
• Dilated biliary tree without cause	2 (8%)	1 (4%)	χ <sub>2</sub> =0.4

\*: Significant.

Use of EUS before ERCP showed significant reduction of procedure time and higher rates of successful stone extraction by balloon or basket without use of lithotripter.

Table (7): Diagnostic findings of ERCP.

	ERCP Group I (25)	EUS & ERCP Group II (25)	p-value (chi square)
Periampullary diverticulum	2 (8%)	1 (4%)	0.3
Choledocholithiasis	14 (56%)	17 (68%)	0.6
Biliary stricture	3 (12%)	3 (12%)	N.A
Pancreatic mass	3 (12%)	3 (12%)	N.A
Dilated biliary tree without cause	2 (8%)	1 (4%)	0.3
<i>Failed ERCP:</i>			
• Duodenal obstruction	2 (8.0%)	0 (0.00%)	0.3
• Tight papilla	1 (4.0%)	1 (4.0%)	

Table (8): Post ERCP complications.

Procedure complication	ERCP Group I (25)	EUS & ERCP Group II (25)	p-value (chi square)
Pancreatitis	1 (4.0%)	2 (8.0%)	0.8
Sphincterotomy bleeding	1 (4.0%)	1 (4.0%)	
Transient oxygen desaturation	1 (4.0%)	0 (0.0%)	

Post ERCP complications were recorded in 6 patients with over all complication rate 12%, extended hospital stay was needed in one patient and no mortality was reported. Use of EUS before ERCP did not alter the rate of complications.

### Discussion

The need of EUS has been increasing in recent years. When reviewing the history of EUS, it had almost gone out of use, since the significant impact in daily practice had not been clear [12].

Endoscopic ultrasound is the most sensitive and specific imaging modality for the diagnosis of pancreaticobiliary disorders and gastrointestinal malignancies. EUS guidance is potentially advantageous in complex ERCP, and it can improve outcomes and minimize complications [13].

EUS is an extremely accurate test for diagnosis of common bile duct stones and can be used to select patients who should undergo a therapeutic ERCP, thus avoiding the risk of complications associated with diagnostic ERCP [14].

Fifty patients with pancreatico-biliary disorders were prepared for ERCP, half of them randomly subjected to EUS before ERCP for evaluating the impact of EUS use before ERCP regarding, the procedure accessibility, duration and success and complications rates.

As the two groups were selected randomly, there was no any significant differences between them regarding, age and sex of patients, clinical, laboratory and sonographic findings.

We found no statistically significant difference between both groups regarding post-ERCP complications. Similarly, Chu et al., [15] stated that no

significant differences were found among the groups in cardiopulmonary or endoscopic complications. Also, Petrov and Savides, [4]. Reported that there was no difference between the groups regarding the risk of complications per ERCP procedure.

Vandervoort et al., [16] reported that, adverse events of ERCP include pancreatitis, bleeding, infection, perforation and sedation-related cardiopulmonary events. The literature focusing on patient-, procedure-and operator-related factors that are associated with outcomes in ERCP is vast. Procedure-related factors such as multiple cannulation attempts, contrast injection into pancreatic duct, pancreatic brush cytology, minor papilla sphincterotomy and trainee involvement are associated with higher numbers of adverse events.

In the current study we found that, use of EUS before ERCP showed significant reduction of procedure time and higher rates of successful stone extraction by balloon or basket without use of lithotripter.

Equivalent results were detected by Cotton et al., [17] who reported that, the excellent diagnostic accuracy of EUS for CBD stones, together with its findings regarding stone number and size, will prove useful in planning the best treatment strategy. Performing EUS before ERCP allows predicting the expected grade of complexity of ERCP procedure. Also, Madhotra et al., [18] and Oana et al., [19] reported that removal of small stones is associated with easier procedures and higher technical success rates while large or multiple CBD stones may result in more complex ERCP. In these cases, physicians may consider referral to tertiary centers and ancillary techniques (such as large balloon dilation, electrohydraulic or laser lithotripsy, cholangioscopy, and even surgical exploration of the CBD) or in order to improve the success rates and reduce the complications rates.

Endoscopic Retrograde Cholangiopancreatography (ERCP) differs from many other endoscopic procedures, as its intention is usually primarily therapeutic. Diagnostic ERCP has mostly been replaced by less invasive methods such as (endoscopic) ultrasonography, computed tomography, or magnetic resonance tomography/MR Cholangiopancreatography (MRCP). In contrast, therapeutic ERCP for treatment of biliary or pancreatic stones and strictures and for palliative therapy of malignant diseases has been growing rapidly [20].

**Conclusion:** From this study it was concluded that that use of EUS before ERCP showed signif-

icant reduction of procedure time and higher rates of successful stone removal without use of lithotripter and did not alter the rate of procedure complications.

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## دراسة مقارنة بين إستعمال منظار الموجات الصوتية قبل منظار القنوات المرارية ضد إستعمال منظار القنوات المرارية منفردا

مقدمة: يمكن إستخدام منظار الموجات الصوتية بدلا من منظار القنوات المرارية في تشخيص إضطرابات القنوات المرارية والبنكرياس. يجب تقييم تأثير إستخدام منظار الموجات الصوتية قبل منظار القنوات المرارية.

الهدف من هذا البحث: دراسة تأثير إستخدام منظار الموجات الصوتية قبل منظار القنوات المرارية فيما يتعلق بإمكانية الوصول، والوقت، ومعدل النجاح ومعدل المضاعفات.

طريقة البحث: لقد أجريت هذه الدراسة على خمسون من المرضى بإضطرابات القنوات المرارية والبنكرياس والذين تم إعدادهم لعمل منظار القنوات المرارية. مقسمين عشوائيا إلى مجموعتين، ٢٥ مريض سوف يقوموا بمنظار القنوات المرارية مباشرة كمجموعة أولى و٢٥ سوف يقوموا بمنظار الموجات الصوتية قبل منظار القنوات المرارية كمجموعة ثانية.

نتائج البحث: لقد وجدنا أنه لا يوجد فرق كبير بين المرضى فيما يتعلق بالعمر، الجنس، المظاهر السريرية، الإختبارات المعملية، التشخيص بالأشعة التليفزيونية ونتائج التشخيص بمنظار القنوات المرارية ومعدل المشاكل. إن إستخدام منظار الموجات الصوتية قبل منظار القنوات المرارية قد أدى إلى إنخفاض وقت العملية ومعدل نجاح أعلى في إستخراج حصوات القناة المرارية بالبالون والسلة بدون الحاجة إلى مفتت الحصوات.

الإستنتاجات: إن هدف الدراسة تدعم فكره أن إستخدام منظار الموجات الصوتية قبل منظار القنوات المرارية قد أدى إلى إنخفاض وقت العملية ومعدل نجاح أعلى في إستخراج حصوات القناة المرارية بدون الحاجة إلى مفتت الحصوات ولا يغير معدل حدوث المشاكل.