

Comparison of Endoscopic Ultrasound (EUS) and Magnetic Resonance Cholangiopancreatography (MRCP) in Diagnosing Cholelithiasis in Acute Biliary Pancreatitis Patients

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ABSTRACT

Aim: To determine how endoscopic ultrasound (EUS) is compared to magnetic resonance cholangiopancreatography (MRCP) in diagnosing cholelithiasis in acute biliary pancreatitis.

Method: Five steps of evidence based medicine is conducted, they are: (1) Formulate the clinical question; (2) Search the evidence; (3) Appraise the study; (4) Apply the answer; (5) Assess the outcome. The search term in general is: (“cholelithiasis”) and (“EUS”) and (“MRCP”) and diagnosis.

Results: We searched in Pubmed and Cochrane library. We excluded articles that do not focus on answering our clinical question. There is one systematic review that is capable of answering our clinical question.

Conclusion: It can generally be concluded from this study that EUS and MRCP are useful techniques in the etiological diagnosis of acute pancreatitis of non-established cause. Endoscopic ultrasonography should be preferred for establishing a possible biliary etiology in patients who have not had a cholecystectomy.

Keywords: endoscopic ultrasound (EUS), magnetic resonance cholangiopancreatography (MRCP), diagnosing, cholelithiasis, acute biliary pancreatitis.

ABSTRAK

Tujuan: Untuk membandingkan ultrasonografi endoskopik/endoscopic ultrasound (EUS) dengan magnetic resonance cholangiopancreatography (MRCP) dalam mendiagnosis kolelitiasis pada pankreatitis bilier akut.

Metode: Lima tahap kedokteran berbasis bukti dilakukan, yakni: (1) Memformulasikan pertanyaan klinis; (2) Mencari literatur; (3) Menelaan kritis literatur; (4) Mengaplikasikan jawaban; (5) Menilai luaran. Kata kunci pencarian secara umum adalah (“cholelithiasis”) dan (“EUS”) dan (“MRCP”) dan diagnosis.

Hasil: Penelusuran literatur dilakukan menggunakan Pubmed dan Cochrane library. Artikel yang tidak fokus terhadap jawaban pertanyaan klinis dieksklusikan. Ditemukan sebuah artikel telaah sistematik yang mampu menjawab pertanyaan klinis kami.

Simpulan: Secara umum, dapat disimpulkan bahwa ultrasonografi endoskopik dan MRCP merupakan teknik yang bermanfaat dalam mengetahui etiologi pankreatitis akut yang tidak diketahui penyebabnya. Ultrasonografi endoskopik perlu dilakukan untuk mengetahui etiologi bilier pasien yang belum menjalani kolesistektomi.

Kata kunci: ultrasonografi endoskopik, magnetic resonance cholangiopancreatography (MRCP), diagnosis, kolelitiasis, pankreatitis bilier akut

INTRODUCTION

It has been estimated that in the United States there are 210,000 admissions for acute pancreatitis each year.¹ In Indonesia, this disease is increasing in number.² Most patients with acute pancreatitis experience abdominal pain that is located generally in the epigastrium and radiates to the back in approximately half of cases. The onset may be swift with pain reaching maximum intensity within 30 minutes, is frequently unbearable, and characteristically persists for more than 24 hours without relief.³ There is general acceptance that a diagnosis of acute pancreatitis requires two of the following three features: (1) Abdominal pain characteristic of acute pancreatitis, (2) Serum amylase and/or lipase ≥ 3 times the upper limit of normal, (3) Characteristic findings of acute pancreatitis on imaging (computed tomography, magnetic resonance (MR), ultrasonography).⁴ It is usually not difficult to determine the cause of an episode of acute pancreatitis. Excessive alcohol consumption and gallstone disease are responsible in most cases, and presence of these conditions can be established by the patient's history (alcohol abuse) and transabdominal ultrasound (gallstone disease).⁵

Gallstones are suspected as a cause of acute pancreatitis when there are elevations of liver chemistries (particularly alanine aminotransferase/ALT ≥ 3 times the upper limit of normal), when gallstones are visualized, and to lesser extent when the common bile duct is found to be dilated on the basis of ultrasound or computerized axial tomography. Gallstones can be documented within the common bile duct with accuracy similar to endoscopic retrograde cholangiopancreatography (ERCP) by endoscopic ultrasound (EUS) and magnetic resonance cholangiopancreatography (MRCP), and by intraoperative cholangiography at the time of laparoscopic cholecystectomy. Identification of a biliary etiology of acute pancreatitis is important because recurrent episodes will occur in one-third to two-thirds of these patients in follow-up periods of a short as 3 months unless gallstones are eliminated.⁴ The risk of cholecystitis is higher in patients with large solitary stones, whereas the risk of pancreatitis is higher in patients with small multiple stones and preserved gallbladder motility.⁶

In the current guideline, ERCP is indicated for clearance of bile duct stones in patients with severe pancreatitis, in those with cholangitis, in those who are poor candidates for cholecystectomy, in those who are postcholecystectomy, and in those with strong evidence of persistent biliary obstruction. ERCP should be performed primarily in patients with high suspicion of bile duct stones when therapy is indicated. Routine ERCP should

be avoided in patients with low to intermediate suspicion of retained bile duct stones, who are planned to have cholecystectomy. EUS or MRCP can be used to identify common bile duct (CBD) stones and determine need for ERCP in clinically ambiguous situations.⁴

CLINICAL QUESTION

A 54 years male came with chief complaint of upper right quadrant abdominal pain 1 hour prior to admission. He described the pain as throbbing pain, and it was not radiating anywhere. The pain exaggerated when he ate. There were also low-grade fever, nausea, and vomiting. He has had experienced the same kind of pain 1 month ago, the pain was intermittent, no specific trigger was known, and it recedes by itself. He felt his eyes turned yellowish. The urine seemed darker than usual, and sometimes he experienced diarrhea. He went to Urology Department, he was diagnosed and treated for urinary tract stone. But he still experienced the intermittent pain. He admitted he has lost 5 kg since 1 month.

On physical examination, his blood pressure was 180/100 mmHg, heart rate 100 bpm, respiratory rate 20x/minute, and temperature 39,3°C. His sclera was icteric. His abdomen was distended. There was upper right quadrant tenderness, but no sign of acute abdomen. The liver and spleen was not palpable. Laboratory workup showed leukocytosis (18.200/ μ L), elevated hepatic transaminase (aspartate aminotransferase/AST 285, ALT 328), hyperbilirubinemia (total bilirubin 8,04, direct bilirubin 5,58, indirect bilirubin 2,46), elevated amylase (742 U/L) and lipase (522 U/L). The patient underwent transabdominal ultrasound in ER. We found out that the patient had fatty liver, cholecystitis, minimal perihepatic and perispleen ascites. No specific sign that showed the cause of obstructive jaundice, like common bile duct stone or dilation.

From the data, we conclude he is septic ec acute pancreatitis, obstructive jaundice ec biliary stone, and stage 2 hypertension. He was given oxygen 3 L/minute, hydration with NaCl 0,9% 2000 cc/24 hour, parenteral nutrition with combiflex peri 1000 cc + ivelip/24 hour, cefoperazone sulbactam 2x2 gr IV, metronidazole 3x500 mg IV, paracetamol 3x1 gr IV, somatostatin 250 mcg IV bolus then followed by 3 mg/12 hour IV continuously. We use nasogastric tube to decompress the abdomen, and he was not allowed to take anything orally. Because we cannot find the cause of pancreatitis in this patient, we considered further examination such as MRCP or EUS. Because of the time taken for the patient to be scheduled for MRCP is longer than for

EUS, we decided for him to undergo EUS. From EUS, we found out that the patient had cholecystolithiasis.

He then underwent ERCP. We found from ERCP he had biliary obstruction probably due to distal common bile duct stricture. At the time the operator did sphincterotomy and CBD sweeping. After ERCP, the signs and symptoms ceased, and we discharged him from ward. Based on the above case, we formulated a question: “In patient with cholelithiasis, how is the specificity and sensitivity of EUS compared to MRCP for diagnosing cholelithiasis?”

METHOD

Journal searching was conducted using Pubmed database on November 14th, 2014 using clinical queries broad filter for diagnostic articles, with a search command containing the word “cholelithiasis AND EUS AND MRCP AND diagnosis”. There are 23 articles match these keywords. We searched for full text only and the year of published studies was limited from 5 years ago, so we excluded 19 articles. From 4 remaining articles, only one article entitled “Prospective Comparison of Endoscopic Ultrasonography and Magnetic Resonance Cholangiopancreatography in the Etiological Diagnosis of “Idiopathic” Acute Pancreatitis” by Ortega et al is able to answer our clinical question.



Figure 1. Flowchart of the evidence based research

RESULTS

In this EBCR, we appraise 1 prospective study, which was performed among patients who presented clinical and analytical data compatible with the diagnosis of idiopathic acute pancreatitis after completing a thorough clinical history, physical exploration, analytical study, abdominal ultrasound, and abdominal computed tomography. The inclusions criteria are: (1) Not having had the cause of acute pancreatitis identified including the existence of cholelithiasis or choledocholithiasis by means of conventional imaging explorations; (2) Absence of metabolic disorders including hyperlipidemia or hypercalcemia; (3) No previous history of surgery or abdominal trauma in the previous 3 months; (4) No recent consumption of toxic substances or medication related to the cause of acute pancreatitis; (5) No alcohol intake 2 weeks before the pancreatitis episode and/or patient history of chronic alcohol intake; (6) Absence of family history of pancreatitis or cystic fibrosis.

Patients were evaluated prospectively with EUS and MRCP. Exclusion criteria were inadequate history, refusal to give consent for EUS or MRCP, or the inability to perform EUS or MRCP. Patients underwent EUS and MRCP to identify the possible cause of pancreatitis. Each operator was unaware of the result of the other modality. The procedures were done at least one month after the last episode of acute pancreatitis.

Patients diagnosed with choledocholithiasis underwent ERCP for therapeutic measure and also to prove real common bile duct stone. In patients with acute recurrent pancreatitis diagnosed with pancreas divisum, endoscopic minor papilla sphincterotomy was performed when no other cause of acute pancreatitis was identified. Once cholelithiasis and/or biliary sludge was diagnosed, patients underwent elective cholecystectomy. The resected gallbladder was inspected to confirm the presence of lithiasis. All patients included in the study were followed up during visits every 3 or every 6 months and with abdominal ultrasound every 6 or 12 months, depending on the evolution and diagnostic suspicion. The results of this study as follow.

Table 1. EUS results combined with MRCP results in 49 patients with acute pancreatitis initially diagnosed with idiopathic acute pancreatitis¹³

	n (%)
Cholelithiasis/ biliary sludge	12 (24)
Choledocholithiasis	3 (6)
Pancreas divisum	4 (8)
Other anatomical variants	1 (2)
Intraductal papillary mucinous carcinoma	1 (2)
Chronic pancreatitis	9 (18)
Total, including chronic pancreatitis	28 (57)

Table 2. Comparison of EUS results and MRCP results in 49 patients with idiopathic acute pancreatitis¹³

	Etiological diagnosis with EUS n (%)	Etiological diagnosis with MRCP n (%)	P
Cholelithiasis/ biliary sludge	12 (24)	2 (4)	< 0.05
Choledocholithiasis	3 (6)	2 (4)	0.64
Pancreas divisum	1 (2)	4 (8)	0.16
Other anatomical variants	1 (2)	0 (0)	0.31
Intraductal papillary mucinous carcinoma	1 (2)	1 (2)	1
Chronic pancreatitis	9 (18)	1 (2)	< 0.05
Total, including chronic pancreatitis*	25 (51)	10 (20)	< 0.05

*Included those patients who had EUS in which chronic pancreatitis was the only EUS diagnosis; EUS: endoscopic ultrasound; MRCP: magnetic resonance cholangiopancreatography

Table 3. Comparison of EUS results and MRCP results in 49 patients with idiopathic acute pancreatitis¹³

	Etiological diagnosis with EUS	No etiological diagnosis with EUS
Etiological diagnosis with MRCP	7 patients (14%)	3 patients (6%)
	Cholelithiasis/biliary sludge (n = 2) Choledocholithiasis (n = 2) Pancreas divisum (n = 1) Intraductal papillary mucinous carcinoma (n = 1) Chronic pancreatitis (n = 1)	Pancreas divisum (n = 3)
No etiological diagnosis with MRCP	18 patients (37%)	21 patients (43%)
	Cholelithiasis/biliary sludge (n = 10)* Choledocholithiasis (n = 1) Choledochocoele (n = 1) Chronic pancreatitis (n = 8)	Cholelithiasis (n = 1) Chronic pancreatitis (n = 1) No etiological diagnosis (n = 19)

*in 2 patients, 2 EUS diagnoses were done. We included one with chronic pancreatitis and biliary sludge and the other with biliary sludge in the gallbladder and common bile duct stone; EUS: endoscopic ultrasound; MRCP: magnetic resonance cholangiopancreatography

Table 4. Clinical and analytical characteristics of 49 patients with idiopathic acute pancreatitis who had an EUS done¹³

	No patients	Etiological diagnosis with EUS* n (%)	No etiological diagnosis with EUS* n (%)	P	Etiological diagnosis with MRCP n (%)	No Etiological diagnosis with MRCP n (%)	P
Age							
≤ 40 year old	10	5 (50)	5 (50)	0.94	3 (30)	7 (70)	0.39
> 40 year old	39	20 (51)	19 (49)		7 (18)	32 (82)	
Sex							
Female	25	11 (44)	14 (66)	0.31	3 (12)	22 (88)	0.13
Male	24	14 (58)	10 (42)		7 (28)	17 (79)	
History of cholecystectomy							
Yes							
No	9	1 (11)	8 (89)	< 0.05	3 (33)	6 (67)	0.18
	40	24 (60)	16 (40)		7 (17.5)	28 (85)	
Recurrent acute pancreatitis							
Recurrent episode	16	11 (68)	5 (32)	0.08	5 (31)	11 (69)	0.18
First episode	33	14 (42)	19 (58)		5 (15)	28 (85)	
Severity							
Severe	5	2 (40)	3 (60)	0.6	1 (20)	4 (80)	0.98
Mild	44	23 (52)	21 (48)		9 (20)	35 (80)	

*included those patients who had EUS in which chronic pancreatitis was the only EUS diagnosis;

^included those patients who had EUS in which chronic pancreatitis was the only MRCP diagnosis; EUS: endoscopic ultrasound; MRCP: magnetic resonance cholangiopancreatography

Table 5. Therapeutics and evolutionary characteristics of 49 patients with idiopathic acute pancreatitis who had an EUS and MRCP done¹³

	No. Patients	Treatment	Follow up
Cholelithiasis/biliary sludge	10	Cholecystectomy, n = 8 No specific treatment, n = 2	Recurrence, n = 1 No recurrence, n = 7 No recurrence, n = 2
Common bile duct stone	2	ERCP, n = 2	No recurrence, n = 2
Gallbladder biliary sludge and common bile duct stone	1	ERCP, n = 1	No recurrence, n = 1
Gallbladder biliary sludge and chronic pancreatitis	1	Cholecystectomy, n = 1	No recurrence, n = 1
Pancreas divisum	4	ERCP, n = 1 No specific treatment, n = 3	No recurrence, n = 1 No recurrence, n = 3
Other anatomical variants	1	No specific treatment, n = 1	No recurrence, n = 1
Intraductal papillary mucinous carcinoma	1	Surgery, n = 1	No recurrence, n = 1
Chronic pancreatitis	8	No specific treatment, n = 8	Recurrence, n = 2 No recurrence, n = 6
No EUS/MRCP etiological diagnosis	21	Cholecystectomy, n = 2 No specific treatment, n = 19	No recurrence, n = 2 Recurrence, n = 3 No recurrence, n = 16

*Average time of follow up: 16 (SD, 9) months (range, 6-44 months); EUS: endoscopic ultrasound; MRCP: magnetic resonance cholangiopancreatography

Endoscopic ultrasonography sensitivity to diagnose biliary origin in patients with acute pancreatitis, initially diagnosed idiopathic, compared to ERCP as criterion standard for diagnosing bile duct stones, was 85%; specificity 97%; positive predictive value 92%; negative predictive value 94%; and diagnostic accuracy 94%. The authors considered ERCP the criterion standard for the diagnosis of common bile duct stones (3 patients). The analysis of the resected gallbladder was considered the reference for the diagnosis of cholelithiasis and/or biliary sludge (11 cases, excluding 2 patients diagnosed with gallbladder microlithiasis using EUS and finally not cholecystectomized owing to a high surgical risk). In those patients without an apparent biliary origin after EUS, the clinical evolution was considered the reference (33 patients).

Because of the better outcome in diagnosing biliary etiology, EUS should be preferred for establishing a possible biliary etiology. EUS allows us to visualize small lithiasis and small quantities of biliary sludge not visible with other imaging technique, including MRCP.¹⁴

DISCUSSION

The results from this prospective study is not different from recent reviews about EUS, which explained that in selected patients with acute pancreatitis, EUS can be safely replace diagnostic ERCP and select patients eligible for therapeutic ERCP with a higher success rate. In other study, EUS may prevent ERCP in 71% of patients with acute pancreatitis and offers a complication-free alternative.¹⁵ In a more recent guideline, the role of MRCP and EUS has changed to become a useful procedure for identifying retained common bile duct stones. According to this guideline, compare to EUS, MRCP has limited accuracy for detecting smaller gallstones

or sludge.⁷

Though the power is low, according to this study MRCP is better in diagnosing pancreas divisum. This is not different from previous study which stated MRCP is a very accurate method, comparable with ERCP, for diagnosing pancreas divisum and other anatomical variants and allows images of the whole pancreatic duct to be obtained at the same time and the identification and characterization of both the dorsal and ventral ducts, which is not always possible using EUS.¹²

CONCLUSION

It can generally be concluded from this study that EUS and MRCP are useful techniques in the etiological diagnosis of acute pancreatitis of non-established cause. Endoscopic ultrasonography should be preferred for establishing a possible biliary etiology in patients who have not had a cholecystectomy because of its sensitivity towards cholelithiasis/biliary sludge.

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