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Accuracy of Endoscopic Ultrasound in Diagnosis of Upper Gastrointestinal Diseases

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ABSTRACT

Endoscopic ultrasound (EUS) is a useful technique to diagnose lesions that are located in the upper gastrointestinal tract. Assessment the accuracy of endoscopic ultrasound in the diagnosis of upper gastrointestinal diseases in comparison to other imaging techniques in Egypt. 62 patients with upper gastrointestinal and pancreatic lesions who underwent EUS for further detection or confirmation of the diagnosis. The participants were subjected to full history taking, clinical examination, laboratory tests (S. albumin, ALT,AST,CBC,....etc). abdominal ultrasound and abdominal computed tomography. Endoscopy was done according to the presenting complaint and site of lesion, patients were subjected to either an upper gastrointestinal (GIT) endoscopy or an endoscopic retrograde cholangiopancreatography (ERCP). The included patients were 36 males (58.1%) and 26 females (41.9%) with mean age 51.84±13.39 years. Obstructive jaundice was the most common presenting complaint (30 patients, 48.4%), vomiting (9 patients, 14.5%), hematemesis (8 patients, 12.9%), epigastric pain (6 patients, 9.7%), dysphagia (3 patients, 4.8%), and elevated tumor markers (3 patients, 4.8%). CT was more accurate in detecting pancreatic lesions especially focal lesions in head of pancreas. EUS was significantly more accurate than abdominal CT in diagnosing esophageal and gastric submucosal lesions, 15 patients all were detected by EUS (100%) while only 9 patients were detected by using abdominal CT (60%) ($\chi^2 4.7$, $p < 0.05$). Out of 40 cases confirmed diagnosis by histopathology, EUS alone missed 3 cases with sensitivity 96%, specificity 85%, PPV 92%, NPV 92% and accuracy 92% in detecting upper gastrointestinal and pancreatic lesions. EUS is a sensitive diagnostic tool of upper GI and pancreatic lesions with overall accuracy of 92%.

Keywords: Endoscopic ultrasound, upper gastrointestinal lesions, pancreatic lesions, diagnostic techniques.

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INTRODUCTION

Endoscopic ultrasound (EUS) is a technique used to diagnose lesions that are located in the upper gastrointestinal tract either within or adjacent to the walls [1]. EUS is considered one of the most sensitive diagnostic imaging methods for upper gastrointestinal diseases [2]. Moreover, EUS is a unique clinical method that permits the visualization of the gut wall in detail with high accuracy [2,3]. Particularly, interventional EUS, after the development of EUS-guided fine-needle aspiration (EUS-FNA)[4] has firmly established its place as an essential endoscopic procedure. According to the literature, the global sensitivity of this technique varies between 76% and 91%, the specificity varies from 84% to 100%, and the accuracy varies from 78-94% [2,5].

Aim of work:

This study aimed to assess the accuracy of endoscopic ultrasound in the diagnosis of upper gastrointestinal diseases in comparison to other imaging techniques in Egypt.

MATERIALS AND METHODS

The current study was conducted on 62 patients with upper gastrointestinal and pancreatic lesions who underwent EUS for further detection or confirmation of the diagnosis. This study has been performed in accordance with the ethical standards. Faculty of Medicine, Ain Shams University ethical committee approval was taken before starting the study. Written informed consent was obtained from all participants before enrollment in the study.

All the included participants were subjected to full history taking, clinical examination, laboratory tests including complete blood count, serum albumin, bilirubin, prothrombin time, alanine transaminases (ALT), aspartate transaminases (AST), alkaline phosphatase, hepatitis C virus antibody, hepatitis B surface antigen, carcinoembryonic antigen (CEA), cancer antigen 19.9 (CA 19.9), abdominal ultrasound and abdominal computed tomography.

Endoscopy was done according to the presenting complaint and site of lesion, patients were subjected to either an upper gastrointestinal (GIT) endoscopy or an endoscopic retrograde cholangiopancreatography (ERCP).

All the enrolled patients were subjected to EUS by single operator using an electronic Pentax linear array machine type EUB-5500. Patients with diagnosed operable upper GIT and pancreatic tumors were subjected to EUS for pre-operative staging. Patients with undiagnosed upper GIT or pancreatic masses were subjected for EUS guided fine needle aspiration (FNA). The definite diagnosis of the enrolled patients was confirmed by EUS-FNA biopsy, post-operative pathological diagnosis or follow up EUS (according to the case).

Statistical Analysis:

IBM SPSS statistics (V. 19.0, IBM Corp., USA, 2010) was used for data analysis. Data were expressed as mean \pm SD for quantitative parametric measures in addition to median and percentiles for quantitative non-parametric measures and both number and percentage for categorized data. Student's t-test, Chi square test and Fisher exact test were used. The probability of error less than 0.05 was considered significant.

RESULTS

The included patients were 36 males (58.1%) and 26 females (41.9%) with mean age 51.84 ± 13.39 years.

Obstructive jaundice was the most common presenting complaint (30 patients, 48.4%), followed by vomiting (9 patients, 14.5%), hematemesis (8 patients, 12.9%), epigastric pain (6 patients, 9.7%), dysphagia (3 patients, 4.8%), and elevated tumor markers (3 patients, 4.8%).

Laboratory data of the studied patients were summarized in table 1.

Table (1) Laboratory data of the studied patients

Variables	Mean± SD	Range
ALT (IU/L)	62.1±40	9-243
AST (IU/L)	53.3±31	8-153
CA19.9 (U/mL)	325±500	1.3-7341
CEA (ng/mL)	5.9±7	0.5-48
Total bilirubin (mg/dl)	7.5±14	0.4-105
Direct bilirubin(mg/dl)	3.7±5	0.1-24.7

Radiological findings of the studied patients were summarized in (Table 2). Comparing the results CT was more accurate in detecting pancreatic lesions especially focal lesions in head of pancreas. Also, CT could detect other lesions that is missed by ultrasound. Those lesions were thickened gastric wall in 6 patients (9.7%), thickened esophageal wall in 3 patients (4.8%), abdominal lymph nodes in 6 patients (9.7%), hiatus hernia in 1 patient (1.6%), and lung metastasis in 1 patient (1.6%).

Table (2):Radiological findings of the studied patients.

Variables	Ultrasonography	Computed tomography
Liver		
Normal	37 (59.7%)	37 (59.7%)
Hepatomegaly	5 (12.5%)	8 (12.9%)
Liver cirrhosis	8 (12.8%)	12 (19.4%)
Focal lesion	5 (8.1%)	5 (8%)*
Splenomegaly	11 (17.7%)	11 (17.7%)
Biliary system		
Normal	35 (56.5%)	26 (41.9%)
Dilated	20 (32.3%)	12 (19.3%)
Previous stent	5 (8.1%)	24 (38.7%)
Pancreas		
Free	48 (77.4%)	40 (64.5%)
Bulky	2 (3.2%)	1 (1.6%)
Focal lesion head	8(12.9%)	17 (27.4%)
Focal lesion tail	2 (3.2%)	2 (3.2%)
Cyst	2 (3.2%)	2 (3.2%)

* 2 enhancing,3 non enhancing

Upper GI endoscopy was performed in 32 patients, findings were summarized in (Table 3).

Table (3) Upper gastrointestinalendoscopic findings:

Variable	No	%	
Esophagus	Normal	11	3.4
	Varices	6	19.3
	GERD	10	32.2
	Hiatus Hernia	6	19.3
	Mass	5	16.1
	Malignant ulcer	1	3.2
Stomach	Normal	8	25.8
	Erosions	12	38.7
	Mass	9	29
	Benign ulcer	2	6.45
	Malignant ulcer	2	6.45
	Fundal varix	4	12.9
Duodenum	Normal	18	58.1
	Erosions	6	19.4
	Mass	5	12.9
	Benign ulcer	1	4.8
	Malignant ulcer	2	3.2

ERCP was done in 31 patients. 27(87.1%) patients showed common bile duct stricture. Three (9.6%) patients showed dilated CBD with impacted stone. Swollen papilla was found in 9 patients (29%). Malignant CBD stricture or double duct sign which is suggestive of cancer pancreas was found in 7 cases (22.6%). Sphincterotomy was done in 26 patients (83.9%) and stent was inserted in 28 patients (90.3%).

EUS was done in all the included patients. Findings were summarized in (Table 4).

Table 4: EUS findings of the included patients.

	Variable	No	%
Esophagus	Normal	51	82.2
	GIST	8	12.9
	Tumors involving 1 st 3 layers	6	9.6
Stomach	Normal	51	82.2
	GIST	7	11.3
	Tumors involving 1 st 3 layers	5	8
	Tumors extend beyond 4 th layer	5	8
	Fundal varix	1	1.6
Duodenum	Normal	49	79
	Swollen papilla	3	4.8
	adenocarcinoma	6	9.7
	Submucosal polyp	2	3.2
	Duodenal varices	1	1.6
	Duplication cyst	1	1.6
Pancreas	Normal	34	54.8
	Swollen pancreas	5	8.1
	Head mass	15	24.2
	Body mass	1	1.6
	Chronic pancreatitis	5	8.1
	Cystic neoplasm	1	1.6
	Simple cyst	1	1.6

EUS was significantly more accurate than abdominal CT in diagnosing esophageal and gastric submucosal lesions, 15 patients all were detected by EUS (100%) while only 9 patients were detected by using abdominal CT (60%) ($\chi^2 4.7, p < 0.05$).

Out of 28 patients with pancreatic lesions diagnosed by EUS, CT missed 6 cases (21.4%) ($\chi^2 4.9, p < 0.05$).

Comparing ERCP and EUS regarding diagnosis of biliary and pancreatic lesions, EUS diagnosed 15 cases with pancreatic head mass while ERCP was suggestive of pancreatic head mass in 7 cases by giving the finding of tight distal malignant CBD stricture or double duct sign which is suggestive of cancer pancreas ($\chi^2 33.9, p < 0.001$).

EUS has specificity of 100% and sensitivity of 70% with accuracy 71% in detection of periampullary lesions compared to ERCP (table 5).

Table (5) sensitivity and accuracy of EUS in comparison to ERCP for detection of periampullary lesions

Validity	Pancreas
Sensitivity	70%
Specificity	100%
PPV	100%
NPV	40%
Overall Accuracy	71%

The final diagnosis was confirmed in 40 patients using EUS guided fine needle aspiration, post operative pathological diagnosis or follow up EUS. Out of these 40 cases, EUS alone missed 3 cases with

sensitivity 96%, specificity 85%, PPV 92%, NPV 92% and accuracy 92% in detecting upper gastrointestinal and pancreatic lesions.

DISCUSSION

EUS is important in detection of upper GI and pancreatic lesions. In Egypt the technique is present in few centers. This study aimed to assess one year activities of Endoscopic Ultrasound in diagnosis of upper gastrointestinal and pancreatic lesions in National Hepatology and Tropical Medicine Research Institute with special stress on its accuracy in diagnosis of these lesions in comparison to other traditional available techniques.

In the present work, EUS was found to be more sensitive than abdominal CT in detection of gastroesophageal lesions. EUS detected 15 esophageal and gastric submucosal lesions, from those 15 lesions CT missed 9 cases (60%). This is in agreement with Goto et al (2012) who studied 93 patients with gastric submucosal lesions. Abdominal CT suspected the diagnosis in 35.5%. EUS was superior in diagnosing small lesions less than 1.5 cm (**Bhatia, 2010**). EUS is especially important in the evaluation of submucosal and subepithelial lesions involving GI tract. It demonstrates higher accuracy than CT in differentiating submucosal lesions from extraluminal compressions (Hwang and Kimmey, 2004).

In the present study, CT missed 21.4% of pancreatic lesions detected by EUS ($p < 0.05$). This is in line with Lovecek et al. (2012) who concluded that EUS diagnose ductal pancreatic adenocarcinoma in 96% of the enrolled patients by using EUS compared to 68% by using CT.

In the present work, EUS was more sensitive than ERCP in diagnosis of pancreatic lesions ($p < 0.001$). Many studies revealed that EUS is superior to ERCP in detecting pancreatic and biliary diseases. (Lee et al., 2008, Frossard et al., 2003).

Among 40 patients whose diagnosis was confirmed, EUS alone missed 3 cases with sensitivity 96%, specificity 85%, PPV 92%, NPV 92% and accuracy 92% in detecting upper gastrointestinal and pancreatic lesions.

Several studies reported accuracy from 80 to 88% for EUS compared to EUS guided FNA (Waston et al. 2011) (Kown et al., 2005), (Brand et al., 1987)

The higher accuracy in our study might be attributed to the usage of pathological diagnosis in addition to EUS guided FNA in confirming the diagnosis.

In conclusion: EUS is a sensitive diagnostic tool of upper GI and pancreatic lesions with overall accuracy of 92%.

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