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Dr. Zainab Sattar Mohammed
Diyala Health Directorate, Diyala, Iraq

Dr. Sazan Abdulwahab Mirza
College of medicine, University of Baghdad, Iraq

Corresponding Author:
Dr. Zainab Sattar Mohammed
Diyala Health Directorate, Diyala, Iraq

The role of endoscopic ultrasound: Guided fine needle core biopsy for diagnosis of pancreatic lesions: A clinicopathological study

Dr. Zainab Sattar Mohammed and Dr. Sazan Abdulwahab Mirza

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Abstract
Introduction: EUS-FNB can detect pancreatic cancer. It preserves tissue for histologic grading and molecular biology. Aim: to investigate the role of endoscopic ultrasound guided fine needle core biopsy in histopathological diagnosis of pancreatic lesions, differentiating malignant from benign lesions, and correlating histopathology results with clinico-pathological parameters like age, sex, location, size, and lesion type (homogeneous or heterogeneous).
Methods: EUS-FNB pancreatic core biopsy retrospective investigation of 60 patients. The Baghdad gastroenterology and hepatology teaching hospital gathered cores from March to December 2022. Histopathological findings scored histological specimens 0-3: 0: Non-representative: cores, blood clots, fibrosis, or strips of bland intestinal or stomach mucosa alone.
1. Suspicious: Typical doubtful (poorly preserved, crush artefacts, overlapping cell groupings).
2. Suggestive: Few diagnostic cells. Representative: definitive diagnosis. H & E-stained paraffin slides are reviewed for diagnostic criteria.
Results: Regarding the sixty cases of pancreatic lesions: age range was (22-75) years, 30 (50%) of cases were males, 30 (50%) of them were females, 21 (35%) of the cases the quality of histological specimen was score 3. Twenty-one (35%) of the cases were diagnosed as adenocarcinoma (20 cases moderately differentiated and 1 case was poorly differentiated), other cases, neuroendocrine tumors 5 cases (8.3%), solid pseudo papillary neoplasm 2 cases (3.3%), chronic pancreatitis 2 cases (3.3%), mucinous cystic neoplasm one case (1.7%). Thirty-eight (63.3%) of the lesions located in the head of the pancreas, 44 (73.3%) of the lesions were heterogeneous in nature, 48 (80%) of the cases, the number of pieces taken by EUS-FNB was ≥ 5.
Conclusion: EUS-FNB is effective and safe for diagnosing pancreatic lesions. 80% of cases yielded suitable samples for histological evaluation. Most lesions were in the pancreatic head (63.3%). Specimens with quality 2 or 3 had a definite diagnosis (P = 0.001). EUS-FNB showed 93.1% sensitivity and 100% specificity in diagnosing pancreatic lesions.

Keywords: Role, endoscopic ultrasound, fine needle core, biopsy, diagnosis, pancreatic lesions

Introduction
Patients with pancreatic cancer have a 5-year survival rate of around 5%. Therefore, a timely and precise identification of a pancreatic mass is essential to inform further patient therapy. The current gold standard for identifying pancreatic masses is fine needle biopsy (FNB) guided by endoscopic ultrasonography (EUS) [1-3]. Several benign and malignant exocrine and endocrine neoplasms may manifest as solid pancreatic aggregates. When a diagnosis is unclear or a patient cannot undergo surgery because of severe illness or co-morbidities, a tissue diagnosis is often required to guide treatment. High-frequency ultrasound (US) and endoscopy are both used in endoscopic ultrasound (EUS) [4]. The stomach's body and tail, as well as the pancreatic head and uncinate from the duodenum, are all imaged during an EUS. It has been shown to be a very sensitive way to find pancreatic masses. It is superior to computed tomography (CT) imaging and extracorporeal ultrasonography, especially when the pancreatic tumour is smaller than 2 to 3 cm in diameter. Despite having a great sensitivity for finding pancreatic solid masses, EUS cannot differentiate inflammatory masses from malignant illness. Endoscopic retrograde cholangiopancreatography (ERCP) brushing, CT-guided biopsies, and transabdominal ultrasound (US) have been the standard nonsurgical methods for obtaining a tissue diagnosis of pancreatic lesions, but a significant false-negative rate has been reported [4].

The transabdominal ultrasound-guided fine-needle biopsy (US-FNB) has been used to diagnose tissue in patients suspected of having pancreatic cancer. It has been shown to be very specific and to provide no false-positive outcomes. The ability to perform transgastric and transduodenal EUS-FNB of the pancreas has been made feasible by the development of echoendoscopes with curved tips. The capacity to identify and assess pancreatic and gastrointestinal cancers has been transformed by EUS with FNB. The depth to which gastrointestinal tumours have penetrated the intestinal wall may be assessed using EUS. Suspicious-appearing lymph nodes may be biopsied with EUS/FNB [4]. The pancreas may be seen well with EUS. Tumours and cysts on the pancreas may be carefully assessed using EUS and biopsied with FNB. Numerous fresh EUS apps make use of FNB. Chemotherapeutics are being administered to microscopic tumours and pancreatic lesions [4]. Tumour imaging is provided by endoscopic ultrasonography (EUS), which also increases the precision of TNM staging [5]. It is a very efficient, productive, and economical approach for assessing a variety of benign and malignant gastrointestinal disorders [6]. The aim of study is to investigate the role of fine needle core biopsy guided by endoscopic ultrasound in the histological diagnosis of pancreatic lesions and distinguishing between malignant and benign lesions and correlating the findings of histopathology with clinicopathological parameters, such as age, sex, location, size, and lesion type.

Method

This retrospective study included 60 cases of pancreatic core biopsy performed by EUS-FNB at a gastroenterology and hepatology teaching hospital in Baghdad, Iraq, between March 2022 and December 2022. The entire material obtained from EUS-FNB was used for histopathological examination. Paraffin blocks were prepared, and slides were stained with H & E for diagnostic evaluation (more than three-five sections were taken from each block). Histological specimens were rated on a scale of 0-3 based on histopathological results:

0: Non-representative
1: Suspicious
2: Suggestive
3: Representative (definite diagnosis).

The age of patients ranged from 22 to 75 years. The correlation between correct diagnosis (malignant vs. benign) and various clinic-pathological parameters was studied, including age, sex, EUS-radiological criteria (lesion size, location in the pancreas, nature of the lesion - homogenous or heterogeneous), EUS-elastography, EUS-staging, vascular invasion, EUS-diagnosis, and the number of pieces taken by EUS-FNB. Inclusion criteria for case collection were biopsies obtained under the endoscopic ultrasound fine needle biopsy technique with available clinical data and material blocks. Cases with incomplete clinical data were excluded. Data from all patients, including basic characteristics (age, gender), and procedural or lesion-related characteristics, were recorded. This included EUS-radiological criteria, EUS-elastography, EUS-staging, vascular invasion, EUS-diagnosis, and the number of pieces taken by EUS-FNB (19 gauge for lesions in the body or tail of the pancreas, and 22 gauge for lesions in the head, uncinate, and neck of the pancreas). The staining procedure involved formalin fixation, paraffin embedding, obtaining 5-micrometer-thick tissue sections, deparaffinization, and staining with hematoxylin eosin. Statistical analysis was performed using SPSS version 26. The data were presented as mean, standard deviation, and ranges. Categorical data were presented as frequencies and percentages. Independent t-test was used for comparing continuous variables, while Chi-square or Fisher exact test was used to assess associations between reaching a definite diagnosis and certain information. A significance level of $p< 0.05$ was considered statistically significant.

Results

Table 1 shows the distribution of study patients by characteristics of lesion. In this study, number of pieces taken was ≥ 5 in (80%) of cases.

Regarding lesions, they were heterogeneous in (73.3%) of patients, (35%) of cases were ranked 3 in quality, the most common site was head, and elastography was blue in (20%).

Table 1: Distribution of study patients by radiological characteristics and location of lesion

Variable	No. (n=60)	Percentage (%)
No. of pieces taken (FNB)		
<5	12	20.0
≥5	48	80.0
Nature of lesion by EUS examination		
Heterogeneous	44	73.3
Homogeneous	13	21.7
Cystic	3	5.0
Quality of histological specimen		
0	19	31.7
1	11	18.3
2	9	15.0
Location of lesion by EUS	21	35.0
Head	38	63.3
Body	6	10.0
Neck	5	8.3
Elsewhere	5	8.3
Not mentioned	6	10.0
EUS Elastography		
Mixed pattern	10	16.7
Blue	12	20.0
Not mentioned	38	63.3

Table 2: Cases with no definite diagnosis (clinicopathological correlation):

Criteria	Total number of cases	29
	Age range	**22-75 years**
Sex	Male	15
	Female	14
Nature in radiology	Homogenous	5
	Heterogeneous	22
	Cystic	2
Location	Head	20
	Body	2
	Neck	2
	Elsewhere	5
EUS-staging	T1	1
	T2	2
	T3	13
	T4	2
	Not mentioned	11
	N0	16
	N1	2
	Not mentioned	11
Vascular invasion	Yes	20
	No	3
	Not mentioned	6
Elastography	Blue	5
	Mixed pattern	7
	Not mentioned	17

No statistically significant association between reaching definite diagnosis and both of age and gender (Table 3).

Table 3: Association between reaching definite diagnosis and both of age and gender

Age and gender	Definite diagnosis		Total (%) n= 60	P-value
	Yes (%) n = 31	No (%) n = 29		
Age (years)				
<40	5 (62.5)	3 (37.5)	8 (13.3)	0.113
40-59	19 (61.3)	12 (38.7)	31 (51.7)	
≥60	7 (33.3)	14 (66.7)	21 (35.0)	
Gender				
Male	15 (50.0)	15 (50.0)	30 (50.0)	0.796
Female	16 (53.3)	14 (46.7)	30 (50.0)	

No statistical significant association between reaching definite diagnosis and other characteristics of lesion (Table 4).

Table 4: Association between reaching definite diagnosis and radiological characteristics and location

Characteristics of lesion	Definite diagnosis		Total (%) n= 60	P-value
	Yes (%) n= 31	No (%) n= 29		
No. of pieces taken				
< 5	8 (66.7)	4 (33.3)	12 (20.0)	0.245
≥ 5	23 (47.9)	25 (52.1)	48 (80.0)	
Nature of lesion				
Heterogeneous	22 (50.0)	22 (5.0)	44 (73.3)	0.619
Homogeneous	8 (61.5)	5 (38.5)	13 (21.7)	
Cystic	1 (33.3)	2 (66.7)	3 (5.0)	
Quality of histological specimen				
0	0 (0)	19 (100.0)	19 (31.7)	0.001
1	0 (0)	10 (90.9)	11 (18.3)	
2	10 (100.0)	0 (0)	9 (15.0)	
3	21 (100.0)	0 (0)	21 (35.0)	
Location	n= 28	n= 26	n= 54	
Head	18 (47.4)	20 (52.6)	38 (63.3)	0.777
Body	4 (66.7)	2 (33.3)	6 (10.0)	
Neck	3 (60.0)	2 (40.0)	5 (8.3)	
Elsewhere	3 (60.0)	2 (40.0)	5 (8.3)	
EU- elastography				
Mixed pattern	3 (30.0)	7 (70.0)	10 (16.7)	0.318
Blue	7 (58.3)	5 (41.7)	12 (20.0)	
Not mentioned	21 (55.3)	17 (44.7)	38 (63.3)	

	Mean± SD	Mean ± SD		
Size	4.08 ± 1.8	3.86 ± 1.9		0.673

Histopathological diagnosis of the pancreatic lesions: Total number of cases 60 cases of pancreatic lesions. Figure 1 shows the diagnosis of lesions.

Pancreatic adenocarcinoma

21/60 (35%) cases, moderately differentiated 20/21 cases as seen in figure (1), and poorly differentiated 1/21 case as seen in figure (2).

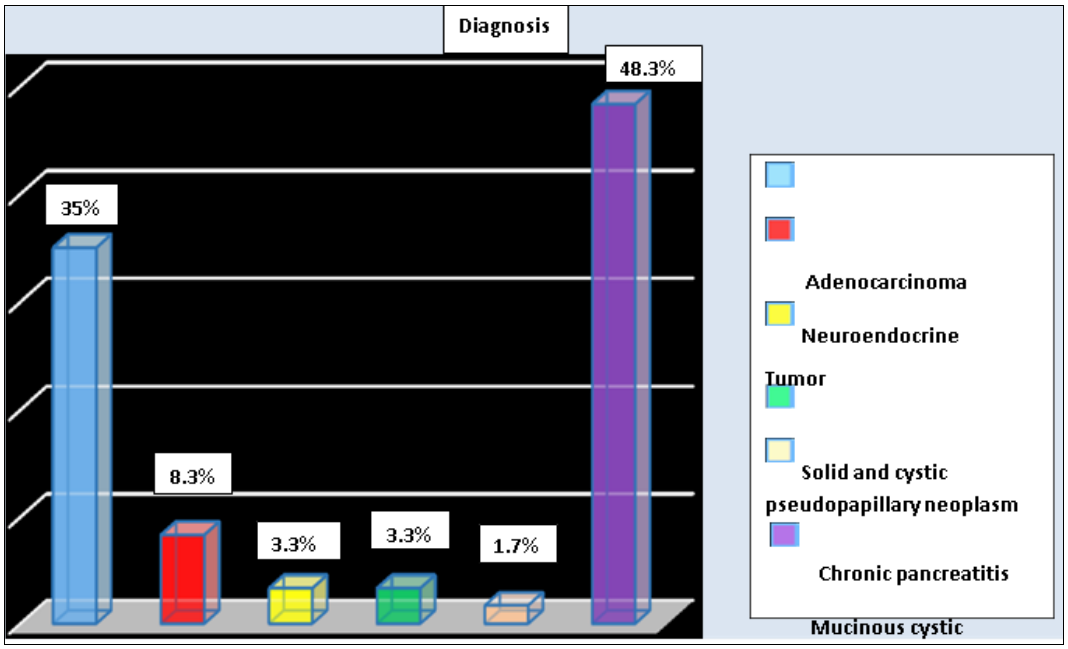

Fig 1: Histopathological diagnosis of the pancreatic lesions

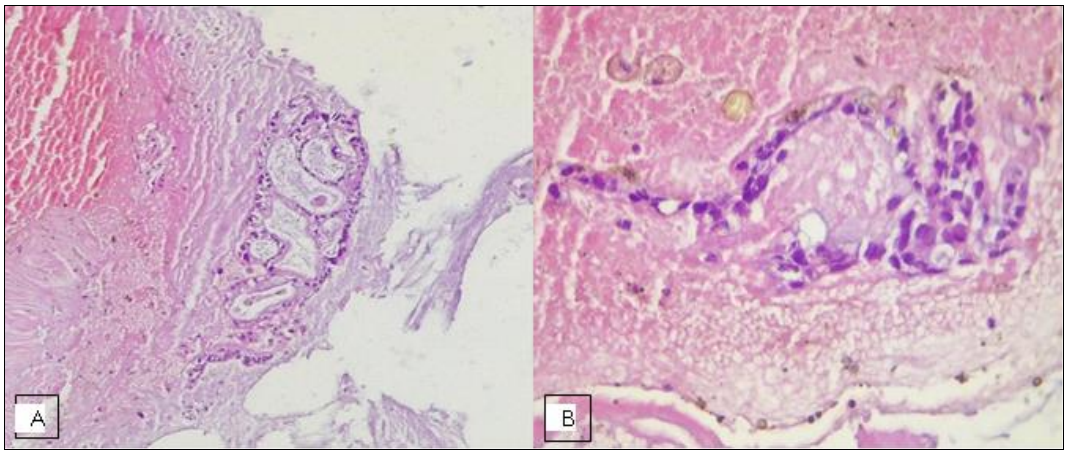

Fig 2: H & E microphotographs showed moderately differentiated pancreatic ductal adenocarcinoma (score 2 & 3), A: 100x, B: 400x

Discussion

Endoscopic ultrasound-guided tissue acquisition (EUS-TA) using fine needle aspiration (FNA) or fine needle biopsy (FNB) has emerged as a valuable technique for diagnosing and staging various gastrointestinal (GI) and non-GI malignancies. EUS-TA plays a crucial role in the evaluation of solid pancreatic lesions, GI malignancies, and lymphadenopathy associated with GI and lung cancers, as well as in assessing subepithelial lesions and metastases to different organs [7-11]. Studies have reported pooled sensitivities of EUS-TA, particularly EUS-FNA, of around 85-89% for identifying pancreatic malignancies within solid pancreatic lesions [7-11]. EUS with FNB, particularly using specialized core needles such as the Franseen needle, has revolutionized the ability to diagnose and stage gastrointestinal cancers and assess the pancreas [12-14]. In the study under review, the authors evaluated the diagnostic performance of EUS-guided fine needle core biopsy in 60 patients with various pancreatic lesions. The mean age of the patients was 53.68 years, and the male-to-female ratio was 1: 1. Most of the lesions (63.3%) were located in the head of the pancreas, and the predominant diagnosis was adenocarcinoma (35%) followed by neuroendocrine tumors (8.3%), solid pseudopapillary neoplasms (3.3%), chronic pancreatitis (3.3%), and mucinous cystic neoplasm (1.7%). The diagnostic accuracy of EUS-FNB, as measured by sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV), was found to be comparable to or slightly higher than previous studies. However, the overall diagnostic accuracy of 68.8% in this study was lower than that reported in some other studies (above 80%), which may be attributed to different techniques, needle types, and scoring methods for histological quality evaluation [15-18]. The discrepancy in

diagnostic accuracy can be influenced by several factors. The quality of histological samples obtained during EUS-FNB is critical for accurate diagnosis. To ensure adequate samples, macroscopic on-site evaluation (MOSE) and techniques like slow-pull and fanning techniques were used in this study. Blood contamination can lower the sample quality, and the use of MOSE with filter paper has been suggested to improve the adequacy of histological core specimens while minimizing blood contamination [19, 20]. Chronic pancreatitis was associated with reduced sensitivity for identifying malignancy, which is consistent with previous research [21, 22]. Moreover, certain lesions, such as borderline lesions with no definite diagnosis, can contribute to the lower overall diagnostic accuracy in some cases. The study's strengths include its use of different needle types, gauges, and sampling techniques, which provide valuable insights into the diagnostic performance of EUS-FNB in various pancreatic lesions. However, some limitations, such as a relatively small sample size and variations in lesion size and nature, could have influenced the results.

Conclusion

This study aimed to assess the diagnostic performance and safety of endoscopic ultrasound-guided fine needle biopsy (EUS-FNB) in pancreatic lesions. The researchers evaluated 60 cases with various pancreatic lesions and obtained suitable histological samples (≥ 5 pieces) in 80% of the cases. Most of the lesions (63.3%) were located in the head of the pancreas. The quality of the obtained specimens showed a significant association with reaching a definite diagnosis, indicating that higher-quality specimens (score 2 or 3) had better diagnostic outcomes. The study demonstrated that EUS-FNB using different needle gauges [19, 22] was effective and safe for diagnosing pancreatic lesions. The sensitivity of EUS-FNB in diagnosing pancreatic lesions was 93.1%, and the specificity was 100%, highlighting the high accuracy of this technique.

Conflict of Interest

Not available

Financial Support

Not available

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