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Original Article

Endoscopic Ultrasound-Guided Tissue Acquisition of Mediastinal-Abdominal Lymph Nodes and Pancreatic Mass Lesions: A Comparative Study of Fine-Needle Aspiration and Fine-Needle Biopsy

Zeynep Gök Sargın, Gizem Açıkgöz, Yücel Üstündağ

Department of Gastroenterology and Hepatology, Zonguldak Bülent Ecevit University, Faculty of Medicine, Zonguldak, Turkey

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Corresponding author: Zeynep Gok Sargin, e-mail: drszeynepgok@yahoo.com

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Abstract

Objective: This study aimed to assess the diagnostic adequacy and accuracy of endoscopic ultrasound-guided fine-needle biopsy and fine-needle aspiration procedures.

Methods: The data of patients who underwent combined endoscopic ultrasound-guided fine-needle aspiration and endoscopic ultrasound-guided fine-needle biopsy between July 2018 and January 2022 due to mediastinal or abdominal solid mass were retrospectively analyzed. The primary endpoint for diagnostic accuracy was the malignant or benign outcome and classification according to the Bethesda nomenclature system.

Results: A total of 42 patients who underwent fine-needle aspiration and fine-needle biopsy in the same session were enrolled. It was found that the samples were taken diagnostically sufficient in 95% (40/42) of the patients with endoscopic ultrasound-guided fine-needle aspiration, and 64.3% (27/42) of that yielded the correct diagnosis. Diagnostic adequacy was observed in 71.4% (30/42) of the patients with endoscopic ultrasound-guided fine-needle biopsy, and diagnostic accuracy was found to be 52.4% (22/42). A statistically significant difference was observed between 3 pass endoscopic ultrasound-guided fine-needle aspiration and 1 pass endoscopic ultrasound-guided fine-needle biopsy regarding diagnostic adequacy ($P = .003$); no significant difference was observed between the 2 procedures regarding diagnostic accuracy ($P = .268$). The diagnostic adequacy and accuracy rates between endoscopic ultrasound-guided fine-needle aspiration and endoscopic ultrasound-guided fine-needle biopsy for each pass were statistically similar, $P = .617$ and $P = .230$, respectively. For lymphadenopathy or solid pancreatic masses, the diagnostic accuracy of endoscopic ultrasound-guided fine-needle aspiration and endoscopic ultrasound-guided fine-needle biopsy was statistically similar, $P = .219$ and $P = 1.00$, respectively. In lesions smaller than 30 mm and larger than 30 mm, the diagnostic accuracy of endoscopic ultrasound-guided fine-needle aspiration and endoscopic ultrasound-guided fine-needle biopsy, respectively, was found to be statistically similar ($P = .063$, $P = 1$).

Conclusion: Our center's overall diagnostic results for mediastinal-abdominal lymphadenopathy and pancreatic solid mass lesions were comparable and safe for fine-needle aspiration and fine-needle biopsy procedures.

Keywords: Endoscopic ultrasound, fine-needle aspiration, fine-needle biopsy, lymph nodes, pancreatic mass

INTRODUCTION

Either endoscopic ultrasound-guided fine-needle aspiration (EUS-FNA) or endoscopic ultrasound-guided fine-needle biopsy (EUS-FNB) can be used for EUS-guided tissue samples.[1] Endoscopic ultrasound-guided fine-needle aspiration usually requires rapid on-site evaluation (ROSE) to improve diagnostic ability[2] and is the standard procedure for solid pancreatic mass, lymph node, and subepithelial lesion sampling, and the European Society of Gastroenterology and the American Society of Gastroenterology recommend EUS-FNA as the first step in the diagnosis of pancreatic lesions.[3,4] Endoscopic ultrasound-guided fine-needle biopsy seems to be a more guaranteed way of obtaining core tissue samples which are especially important for the pathologic diagnosis of lymphomas, gastrointestinal stromal tumors, and autoimmune pancreatitis. Core tissue samples cannot be achieved with EUS-FNA, which mainly produces a cytological sample. Other properties, such as molecular analysis and immunohistochemical staining, may not be adequately evaluated with cytological aspirates.[5] Fine-needle biopsy also decreases the number of needle passes to provide a correct pathologic diagnosis of mediastinal lymphadenopathies (LAPs) and pancreatic mass lesions, and it also obviates the necessity of ROSE[1,6] and possibly macroscopic on-site evaluation in the setting of FNA.[7]

The findings of studies comparing EUS-FNA and EUS-FNB are inconclusive. Despite some studies showing no difference in diagnostic adequacy and accuracy between EUS-FNB and EUS-FNA,[2,6,8] other studies show that EUS-FNB compared to EUS-FNA requires less needle pass to obtain an optimal specimen, and the diagnostic accuracy and adequacy are also better in EUS-FNB.[5,8,9] Studies also underlined that using EUS-FNB as part of the conventional pancreatic sampling method reduces the requirement for ROSE. They emphasized a unique role for FNB in cases when prior EUS-guided sampling results were inconclusive.[10]

However, most of these studies compare patients with only EUS-FNA and EUS-FNB. In the present study, we retrospectively aimed to assess the tissue adequacy and diagnostic accuracy of histological samples obtained from the same patient with FNA and FNB for the pathologic diagnosis of mediastinal and abdominal lymph nodes and solid pancreatic lesions.

METHODS

Patients and Lesions

The consecutive 42 patients having mediastinal lymph nodes and pancreatic solid mass lesions referred to our gastroenterology clinics in Zonguldak Bulent Ecevit University Hospital for a tissue diagnosis were included in this study. The EUS exam was carried out by 1 experienced endosonographist who did more than 500 EUS-guided tissue samplings. The linear EUS scopes (Fuji, EG-530UT) were used, and 3 passes during EUS-FNA with a 22-gauge FNA needle (Expect; Boston Scientific Co. with Natick, Mass, USA) were taken from the lesion. After that, only 1 pass EUS-FNB with a 22-gauge FNB needle was applied from the same lesion (Acquire; Boston Scientific). There was no on-site pathology facility, and macroscopic specimen adequacy evaluation was not performed either. Obtained samples were smeared onto the lams, and the samples were fixed with ethanol. All the patients were over the age of 18 years. Patients with cystic pancreatic lesions and a diameter of less than 1 cm were excluded.

Endoscopic Ultrasound-Guided Fine-Needle Aspiration and Endoscopic Ultrasound-Guided Fine-Needle Biopsy Techniques

The style was removed after pushing the needle into the lesion under simultaneous EUS evaluation. By applying continuous suction with a 5 mL injector, the needle was moved back and forth in various parts of the lesion with a fanning method. The aspirated tissue was evacuated from the needle when removed from the lesion by reinserting the stylet or air flushing. Slides were fixed with alcohol for cytologic investigation and prepared with Papanicolaou stain. Cellblock material was fixed with formalin and stained with hematoxylin and eosin (H&E) for histological examination.

MAIN POINTS

- Similar results were found regarding diagnostic accuracy between 3 pass endoscopic ultrasound-guided fine-needle aspiration (EUS-FNA) and 1 pass endoscopic ultrasound-guided fine-needle biopsy (EUS-FNB) sample for each patient.
- Diagnostic adequacy of total FNA samples was significantly higher than FNB samples in each patient.
- The diagnostic accuracy and adequacy of both procedures were similar for each pass.
- The diagnostic accuracy of EUS-FNA and EUS-FNB was similar in mediastinal-abdominal lymphadenopathies and solid pancreatic masses and lesions smaller than 3 cm and larger than 3 cm.

Tissue Adequacy and Accuracy Definitions

The tissue adequacy of the biopsy materials was recorded by evaluating the pathology evaluation records (EUS-FNA and EUS-FNB). In addition, pathology results of EUS-FNA and EUS-FNB, other conventional imaging modalities, positron emission tomography (PET-CT) imaging, biochemistry tests, tumor markers, and pathology results of biopsies acquired through either surgery or other modalities and follow-up treatments were examined to determine the cytological material and diagnostic accuracy rates. The primary endpoint for diagnostic accuracy was the malignant or benign outcome and classification according to the Bethesda nomenclature system (non-diagnostic, benign, atypical/suspicious of malignancy, or malignant). Atypical/suspicious specimens were not considered malignant. Insufficient samples or samples containing blood elements were considered non-diagnostic.

Statistical Analysis

Statistical analyses of the study were performed in the Statistical Package for Social Sciences (IBM SPSS Corp., Armonk, NY, USA), version 22.0 package program. Descriptive statistics of continuous variables in the study are shown with mean, standard deviation, median, minimum and maximum values, and categorical variables are shown with frequency and percentage. The Shapiro–Wilk test was used to examine the suitability of continuous variables for normal distribution. The McNemar test was used for rate comparisons in dependent groups. A *P*-value of less than .05 was considered statistically significant.

Ethics Approval

Approval was received from the Ethics Committee for Non-Interventional Clinical Research of the Faculty of Medicine of Zonguldak Bulent Ecevit University (Date: April 20, 2022, Decision No: 2022/08) for the study. The study protocol complies with the principles of ethics of the Helsinki Declaration in 1964.

RESULTS

Between July 2018 and January 2022, 42 patients who underwent FNA and FNB in the same session were enrolled in the study. The patients ranged in age from 36 to 91 years (mean, 65.7 ± 12.6 years). There were 15 women and 27 men. The most common comorbidities of patients were diabetes mellitus and hypertension (Table 1).

Twelve target lesions sampled with EUS-FNA and EUS-FNB were of pancreatic mass, 25 were of mediastinal LAP, and 5 were abdominal LAP. All patients had 3 passes in the FNA group and 1 in the FNB group. The lesions ranged from 13 to 138 mm (mean, 37 ± 23.7) (Table 2).

When the final diagnosis of the patients was reached by comparing other imaging methods and pathological samples, EUS-FNA yielded insufficient samples in 2 patients, benign results in 11 patients, suspicious results in 9 patients, and malignant results in 20 patients. In the samples

Table 1. Demographic Characteristics of Patients

		n (%)	Mean
Age			65.7 ± 12.6
Gender	Male	27 (64.3)	
	Female	15 (35.7)	
Comorbidities	Diabetes mellitus	13 (31)	
	Hypertension	23 (54.8)	
	Hyperlipidemia	11 (26.2)	
	Malignancy	2 (4.8)	

Table 2. Characteristic Features of the Lesions

		n (%)
Lesion type	Pancreatic mass	12 (28.6)
	Lymphadenopathy	30 (71.4)
Lesion size	≤30 mm	24 (57.1)
	>30 mm	18 (42.9)

taken with EUS-FNB, 12 patients had an insufficient sample, 7 patients had a benign result, 5 patients had a suspicious result, and 18 patients had a malignant result. It was found that the samples taken were diagnostically sufficient in 95% (40/42) of the patients with EUS-FNA, and 64.3% (27/42) of that yielded the correct diagnosis. Diagnostic adequacy was observed in 71.4% (30/42) of the patients with EUS-FNB, and diagnostic accuracy was found to be 52.4% (22/42). A statistically significant difference was observed between 3 pass EUS-FNA and 1 pass EUS-FNB regarding diagnostic adequacy ($P=.003$). No significant difference was observed between 3 pass EUS-FNA and 1 pass EUS-FNB regarding diagnostic accuracy ($P=.268$) (Table 3).

When the lesions sampled were divided into LAP and solid pancreatic masses, the samples taken with EUS-FNA and EUS-FNB were statistically similar in terms of diagnostic accuracy ($P=.219$ and $P=1.00$, respectively) (Table 3).

The median value of the sampled lesion sizes was 30 mm, and the lesions of 24 patients were below this value, and the lesions of 18 patients were above this value. When the samples of EUS-FNA and EUS-FNB in lesions smaller than 30 mm and larger than 30 mm were compared, they were found to be statistically similar in terms of diagnostic accuracy, respectively ($P=.063$ and $P=1$, respectively) (Table 3).

A total of 126 passes were taken with EUS-FNA, and 42 passes were taken with EUS-FNB. The diagnostic adequacy rate for each pass taken with EUS-FNA was 74.6% (94/126), and the diagnostic adequacy rate for each pass taken with EUS-FNB was 71.4% (30/42). While the diagnostic accuracy rate for each pass taken with EUS-FNA was 46% (58/126), the diagnostic accuracy rate for each one with EUS-FNB was 52.4% (22/42). The diagnostic adequacy and accuracy rates between EUS-FNA and EUS-FNB for each pass were statistically similar, respectively ($P=.617$ and P=.230, respectively) (Table 3).

We could not attain the possibility of on-site pathological evaluation during any sampling. None of the patients developed any complications during either procedure.

DISCUSSION

In the present study, similar results were found regarding diagnostic accuracy between total EUS-FNA and total EUS-FNB pass samples taken for each patient. However, it was observed that the diagnostic adequacy of total FNA samples was significantly higher in each patient compared to total FNB samples. Fine-needle aspiration passes were 3 times as FNB passes in almost every patient. And both procedures were found to be statistically similar in terms of diagnostic accuracy and adequacy for each pass. In this context, it has been concluded that both methods give similar results in terms of diagnostic accuracy. To improve diagnostic adequacy, it is necessary to increase the number of passes, whether FNA or FNB. In a single-center experience in solid pancreatic masses, EUS-FNA, EUS-FNB, and the combination of these 2 procedures were retrospectively compared. The diagnostic efficiency of the 2 procedures and the combination did not differ. In that study, the average number of passes was 4.0 in the FNA/FNB group (in combined cases), 3.3 in the FNA group, and 1.4 in the FNB group.[6] Fitzpatrick et al[11], in a retrospective study of 179 lesions, about half of which were of pancreatic origin, reported a diagnostic yield of 86% with FNB, regardless of lesion location, size, and needle gauge. Moreover, in the combined sampled lesions of FNA and FNB, in accordance with our study, the diagnostic efficiency between FNA and FNB did not differ. According to Bang et al[2], in a meta-analysis of 576 solid masses, no difference was observed between FNA and FNB regarding diagnostic adequacy, diagnostic accuracy, and histological core specimen rates.

Table 3. Endoscopic Ultrasound-Guided Fine-Needle Aspiration (EUS-FNA) Versus Fine-Needle Biopsy (EUS-FNB)

		EUS FNA, n %	EUS FNB, n %	*P*
All patients	Adequacy	40 (95)	30 (71.4)	**.003**
	Accuracy	27 (64.3)	22 (52.4)	.268
Lesion size	≤30 mm	19 (79)	14 (58)	.063
	>30 mm	8 (44)	8 (44)	1.000
Lesion type	Pancreatic mass	7 (58)	6 (50)	1.000
	Lymph node	20 (66)	16 (53)	.219
Each pass	Adequacy	94 (74.6)	30 (71.4)	.617
	Accuracy	58 (46)	22 (52.4)	.230

P-values <0.05 were considered statistically significant and indicated in bold

Since studies in the literature are heterogeneous, it is challenging to interpret conflicting results. For example, there are heterogeneities such as contradictory use of the terms "diagnostic accuracy" and "diagnostic adequacy," use of equipment (needle size), the number of passes specified, availability of an on-site pathologist, and different types of targeted lesions. Although studies emphasize that FNB is superior to FNA in specimen adequacy and diagnostic accuracy, requires fewer passes, and core biopsy is more obtainable with FNB for immunohistochemical evaluation,[5,10] there are also studies showing that diagnostic accuracy does not vary between the 2 procedures, but FNB is superior in specimen adequacy.[8,12]

Most of the lesions evaluated in our study consisted of mediastinal lymph node samples. The samples were taken with EUS-FNA and EUS-FNB in solid pancreatic masses, and LAP samples were found to be statistically similar in diagnostic accuracy. In 2 studies of lymph nodes, it was argued that there was no difference between FNA and FNB procedures in terms of diagnostic sensitivity and accuracy.[13,14] However, de Moura et al[13] showed superior sensitivity of FNB to FNA in abdominal lymph node sampling. In our study, no subgroup analysis was performed since only 5 patients underwent abdominal lymph node sampling.

In the present study, it was observed that lesions below and above 3 cm did not change the accuracy of diagnosis for both procedures when the median value as lesion size was based on 3 cm. According to Sweney et al[6], the lesion size was an independent factor that increases the efficiency of diagnosis. Fitzpatrick et al[11], on the other hand, suggested that the size of mediastinal and abdominal lesions did not affect the efficiency of diagnosis. No possibility of the on-site pathological evaluation was found during any sampling in this study. Still, in general, ROSE was evaluated as an essential factor that improved the results in the studies.[6,12,13] According to Nagula et al[14], on the other hand, most of their studies comprising masses and lymph nodes have argued that the presence of on-site pathologists did not change their results.

Our study differed from other studies because operator-related differences can be ignored due to the results being dependent on a single

operator. Both FNA and FNA were applied in combination to the same patients.

The main limitations of our study are that it was based on retrospective single-center study data conducted with a relatively small number of patients. Another limitation is that the targeted lesions are heterogeneous and finally, the inability to perform an on-site evaluation with pathologists and evaluate core biopsies.

In conclusion, our center's overall diagnostic results for mediastina l-abdominal LAPs and pancreatic solid mass lesions were comparable and safe for FNA and FNB procedures.

Ethics Committee Approval: Ethical committee approval was received from the Ethics Committee of Zonguldak Bulent Ecevit University (Date: April 20, 2022, Decision No: 2022/08).

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Declaration of Interests: The authors declare that they have no competing interest.

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