

Research application of endoscopic ultrasound - fine needle aspiration in diagnosis pancreas tumors

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Background: Pancreatic diseases is very multiform and complex, in which pancreatic tumors have often poor prognosis, especially pancreatic cancer. Early detection and diagnosis of pancreatic tumors have great significance in improving the quality of treatment and prognosis for patients. Endoscopic ultrasound has the advantage of high-frequency ultrasound, an optimal approach to provide a possibility of EUS-FNA. This is important evidence to confirm the diagnosis, guide to treatment and prognosis. This study was aimed at: (1) To describe the characteristics of the pancreatic tumor by endoscopic ultrasound; (2) To evaluate the efficacy and safety of endoscopic ultrasound fine needle aspiration in the diagnosis of pancreatic tumors. **Subject and methods:** Cross-sectional study concludes 41 pancreatic tumor patients, which indicated endoscopic ultrasound fine needle aspiration in Gastroenterology - Endoscopy Center, Hue University of Medicine and Pharmacy Hospital from 2/2010 to 10/2022. **Results:** The size of the tumor was more than 2cm, tumors in the pancreatic head accounted for 80.5% and solid tumors accounted for 80.5%. Besides, the main pancreatic duct dilatation accounts for 39.0%, the biliary tract dilatation accounts for 46.3%, pancreatic tumor invades adjacent organs accounts for 29.3%, vascular invasion accounts for 24.4%, with lymph nodes accounting for 51.2%. Endoscopic ultrasound-guide fine needle aspiration pancreatic tumor was performed in 37/41 cases (90.3%). Pathological of pancreatic tumor: pancreatic cancer is highest about 59.5%, benign pancreatic tumors accounted for 10.8%, mucinous cysts accounted for 5.4% and pancreatic tuberculosis accounted for 2.7%. The complication rate of the procedure was 5.4%. **Conclusion:** Endoscopic ultrasound fine needle aspiration pancreatic tumors showed relative safety and efficacy, the technical failure rate is very low.

Keywords: Pancreatic tumor, Endoscopic ultrasound fine needle aspiration.

1. INTRODUCTION

Pancreatic diseases are very diverse and complex, in which pancreatic tumors have a very important position, especially pancreatic cancer. Pancreatic cancer is the seventh leading cause of cancer death and one of the gastrointestinal cancers with the worst prognosis [1]. Pancreatic cancer patients have a 5-year survival rate lower than 10.0% even with treatment [2]. Pancreatic tumor disease has often asymptomatic in the early stages. Therefore, most diseases are detected at a late stage due to treat difficulty and have a poor prognosis [3]. Especially for pancreatic cancer, if detected and treated early (size ≤ 2 cm), the survival rate over 5 years is quite high (about 60.0%) [4]. Therefore, the pancreatic tumor must detect and diagnose early which improves the prognosis of the patient's survival. Currently, there are many methods to diagnose pancreatic tumors, endoscopic ultrasound has the advantage of high-frequency ultrasound, which has approached near the tumor and can biopsy pancreatic tumors to help diagnose the tumor. This is important evidence to confirm the diagnosis, guide to treatment and prognosis for patients. There are not many studies on

endoscopic ultrasound with fine needle aspiration to diagnose pancreatic tumors in Vietnam, especially in the central region. We made the study: *"Research application of Endoscopic ultrasound- fine needle aspiration in diagnosis pancreas tumors"* This study was aimed at: (1) To describe the characteristics of the pancreatic tumor by endoscopic ultrasound; (2) To evaluate the efficacy and safety of endoscopic ultrasound fine needle aspiration in the diagnosis of pancreatic tumors.

2. SUBJECTS AND METHODS

2.1. Research subjects

Including 41 patients who treated at Hue University of Medicine and Pharmacy Hospital from 2/2020 to 10/2022.

Criteria for choosing a disease

- There is a lesion in the pancreas or indirect signs of pancreatic tumor on endoscopic ultrasound.
- All patients who perform endoscopic ultrasound with fine needle aspiration

Exclusion criteria

- Patient does not agree to participate.
- Contraindications for upper gastrointestinal

endoscopy (heart failure, respiratory failure, myocardial infarction...).

- Pyloric stenosis, duodenal stenosis.
- Coagulation disorders: Prothrombin ratio <50%, INR >1.5.
- Platelet count: <50.000 G/L.
- Patients with contraindications to anesthesia.

2.2. Research Methods

Study design: Cross-sectional descriptive study

Data collected included patient demographics (gender, age, and mass lesion location) and procedure details (tumor characteristics and the number of needle passes), pathological of tumor, post-procedure complications were defined as any symptoms requiring emergency department evaluation, including bleeding, perforation, pancreatitis and other severe complications.

The procedure of fine needle aspiration under endoscopic ultrasound guidance was performed:

Step 1: Determine the lesion image at the optimal location.

Step 2: Insert the needle through the biopsy channel.

Step 3: Select the needle path into the lesion.

Step 4: Puncture the needle

Step 5: Moving the needle in the lesion

Step 6: Remove the needle from the endoscope [6].

Evaluation of results: Assessing the cytological results according to Bellizzi's standards [7].

+ No cells: only red blood cells, inflammatory cells, and gastrointestinal tract cells.

+ Cell poverty: the number of cells is too small to diagnose.

+ Benign cells: on the plate only benign cells.

+ Pancreatic cancer: enough cells are needed to diagnose pancreatic cancer.

2.3. Statistical analysis

A multivariable binary logistic regression model was created for variables that were statistically relevant in the univariate analyses. p-values <0.05 were considered statistically significant. All statistical analyses were conducted using SPSS Statistics.

3. RESULT

3.1. Patient characteristics

Table 1. Patient characteristics

Age, yr	Male		Female		Total	
	n	%	n	%	n	%
≤ 40	1	5.0	3	14.2	4	9.8
41- 60	8	45.0	6	28.5	14	34.1
≥ 61	11	55.0	12	57.3	23	56.1
Total	20	100.0	21	100.0	41	100.0

Comment: The majority of patients were above 61 years old, which accounted for 55% of males and 57.3% of females. The percentage of male patients was lower than females (48.7% versus 51.4%).

3.2. Characteristics of lesions by endoscopic ultrasound

Table 2. Characteristics of lesions by EUS

Characteristics		n	Rate %
Size (cm)	≥ 2	41	100.0
	< 2	0	0,0
Location	Head & neck	33	80.5
	Body	6	14.6
	Tail	2	4.9
Echoic	Hypoechoic	40	97.6
	Hyperechoic	1	2.4
Tumor border	Regular	20	48.8
	Irregular	21	51.2
Tumor structure	Solid	33	80.5
	Cystic	8	19.5
Total (%)		41	100.0

Comment: The tumor detected by EUS was greater than 2 cm. Most of the lesions located in the pancreatic head & neck region about 80.5%, hypoechoic about 97.6%, pancreatic tumor with irregular border accounting for 51.2%, and solid structure accounting for 80.5%.

Table 3. Characteristics of beside of lesions by EUS

	Characteristics	n	Rate %
Pancreatic parenchyma	Atrophy	3	7.3
	Normal	38	92.7
MDP dilation	Yes	16	39.0
	No	25	61.0
Pancreatic stone	Yes	2	4.9
	No	39	95.1
Tumor invades adjacent organs	Yes	12	29.3
	No	29	70.7
Tumor invades vessel	Yes	10	24.4
	No	31	76.6
Biliary tract dilation	Yes	19	46.3
	No	22	53.7
Gall bladder dilation	Yes	10	24.4
	No	31	75.6
Abdominal lymph nodes	Yes	21	51.2
	No	20	48.8
Total		41	100.0

Comment: the proportions of abdominal lymph nodes, main pancreatic duct dilatation, and biliary tract dilatation were 51.2%, 39%, and 46.3% respectively

3.3. Efficacy and safety of EUS-FNA for diagnosing the pancreatic tumor

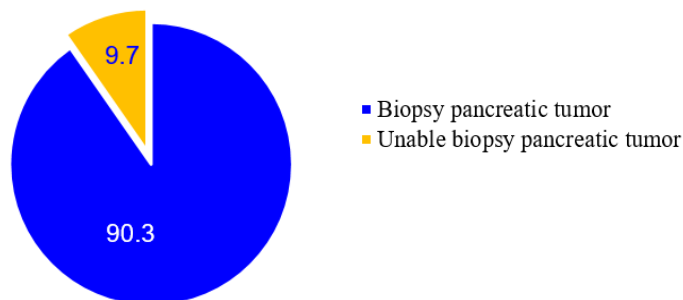


Figure 1. Tenichque of EUS - FNA for diagnosing pancreatic

Comment: In 41 patients were ordered to perform FNA, but only 37 patients were able to perform EUS - FNA (90.3%).

Table 4. Characteristic of pancreatic tumor biopsy by endoscopic ultrasound

	Characteristics	n	Rate %
Location	Head & neck	29	78.4
	Body	6	16.2
	Tail	2	5.4
Total		37	100.0

Tumor structure	Solid	29	78.4
	Cystic	8	21.6
Total		37	100.0

Comment: The most popular locations were the pancreatic head & neck (78.4%), followed by the pancreatic body (16.2%). The pancreatic solid tumor accounted for 78.4%, the remainings were cystic tumors (21.6%).

Table 5. Characteristics and results of aspiration cytology

	Characteristics	n	Rate %
Needle	19G	9	24.4
	22G	28	75.6
Cytological	No cells	2	5.4
	Cell poverty	11	29.7
	Benign cells	9	24.4
	Pancreatic cancer	15	40.5
Pathological	Yes	31	83.8
	No	6	16.2
Total		37	100.0

Comment: Among 37 patients who are performing FNA, the 22G needle was used in 75.6% of cases, 24/37 cases have significant cytological results (64.9%) and 11/37 cases have poor cytological results (29.7%), 31/37 cases (83.8%) obtained adequate tissue samples for histopathology

Table 6. Pathological results

	n	Rate %
Pancreatic cancer	22	59.5
Benign pancreatic tumor	4	10.8
Mucinous cystic neoplasm	2	5.4
Pancreatic tuberculosis	1	2.7
Chronic pancreatitis	1	2.7
Unknown diagnosis	1	2.7
Small samples	6	16.2
Total	37	100.0

Comment: Pancreatic cancer was 22/37 (59.5%), 4 cases of benign pancreatic tumor (10.8%), 2 cases of mucinous cyst neoplasm (5.4%), 1 case with pancreatic tuberculosis, chronic pancreatitis and unknown diagnosis (2.7%) and 6 cases without clear pathology results due to small samples.

Table 7. Complication of EUS-FNA

Complication	n (%)
Acute pancreatitis	Yes 1 (2.7)
	No 36 (97.3)
Bleeding	Yes 1 (2.7)
	No 37 (97.3)
Death	Yes 0 (0.0)
	No 37 (100.0)
Total	37 (100.0)

Comment: In most cases, EUS-FNA is performed without complications.

4. DISCUSSION

4.1. Patient Characteristics

In our study, the majority of patients were above 61 years old, which accounted for 55% of males and 57.3% of females. The research from Okano and Trinh Pham My Le also reported that the average age of patients with pancreatic cancer was 65 and 63.5, respectively [8], [9].

The percentage of male patient was lower than the female (48.7% versus 51.4%), included pancreatic cancer and benign pancreatic tumors. Several risk factors (such as alcohol consumption and smoking), which are commonly seen in male patients, have been proved to be related to pancreatic disease, especially pancreatic cancer [10].

4.2. Characteristics of lesions by endoscopic ultrasound

In table 2, all of the tumors detected by EUS were greater than 2 cm. The size of the lesions is a strong predictor for malignancy, according to American Joint Committee on Cancer 2017 [11]. In the report of WHO, the size of pancreatic cancer ranges from 2.5 to 3.5 cm [12]. The advantages of EUS were direct assessment, high-frequency probe, which facilitate assessment small lesions. A recent meta-analyses show that the sensitivity and specificity were 92 - 100% and 89 - 100%, respectively, in detecting malignant characteristics of pancreatic tumors, especially small lesions [13]. Most of lesions located in the pancreatic head region (80.5%), which was a common site of pancreatic tumor and cancer, in particularly. According to Meng et al, the proportion of pancreatic tumor in the pancreatic head accounted for 73.5% [14]. In addition, in our study, pancreatic tumor with irregular border accounting for 51.2% and solid structure accounting for 80.5% are the features suggestive of malignancy on endoscopic ultrasound.

In our study, the proportions of abdominal lymph nodes, main pancreatic duct dilatation, and biliary tract dilatation were 51.2%, 39%, and 46.3% respectively. According to a study by Nguyen Truong Son and Trinh Pham My Le on a group of pancreatic cancer patients, the percentage of patients with abdominal lymph nodes was 48.2% and 46.6%, with the main pancreatic duct dilatation was 58.9% and 58.6%, with biliary dilatation was 55.4% and 37.9%, respectively [8], [15].

4.3. Efficacy and safety of EUS-FNA for diagnosing pancreatic tumor

In our study, 41 patients were ordered to

perform FNA pancreatic tumors, but only 37 patients were able to perform EUS - FNA. 4 patients who could not go through the procedure were those with a history of previous biliary-intestinal anastomosis, so it was difficult to choose a favorable site to access pancreatic tumors. Apart from general contraindications of biopsy, the procedure also depends on others factors. The procedure can be performed step-by-step: the first step is to determine the optimal location to approach the lesion, which is the most important factor in deciding whether to needle biopsy or not. The position is ideal if lesions was visible at the largest size, the ultrasound probe is closest to the lesion, especially there should be nothing between the needle and the lesion (for example: blood vessels, main pancreatic duct, and biliary tract) [6].

In Table 4, 37/41 patients in our study had been performed EUS-FNA. The most popular locations that was accessible to the lesion was pancreatic head (78.4%), followed by body of the pancreas (16.2%). The pancreatic solid tumor accounted for 78.4%, the remainings were cystic tumor (21.6%). Our results are similar to that of Nguyen Truong Son et al.; 90.4% of pancreatic tumors had been performed FNA in the head and body of the pancreas, and 92.7% (n = 51) cases were solid tumor [15]. With the ability that almost directly approach the tumor, EUS-FNA has great advantages in diagnosis and intervention with small lesions under 2 cm [13].

Among 37 patients gone through the FNA, 22G needle was used in 75.6% of cases. Technically, the choice of needle depends on the location and the nature of the lesions. Each type of needle did have its pros and cons in approaching the lesions in the pancreatic head and uncinate process, the ability to puncture the tumor, the quality of the collecting samples, and rate of adverse events. The 19G needle obtains better tissue samples due to its large size, but conversely, it is difficult to control and has more complications when compared to the smaller 22G needle, which is easy to control but has less tissue samples. While the 25G needle is extremely safe but is mainly used for obtaining cytology [16].

Our study uses two types of needles, 19G and 22G, in which the latter is used more. Both enable us to not only obtain great tissue samples but also ensure safety and control complications. The 19G needle is preferable if the tumors are in easy-to-access locations or previously usage 22G were unable to obtain adequate sample. According to Diogo T.H and CS (2020), the effectiveness of 19G

needles compared with other types of needles in performing FNA solid tumors is still controversial, but the number of needle passes and the puncture time was significantly lower in the 19G as well as it can be effective in cases prior aspiration results are not clear [17].

In our study, 24/37 cases have significant cytological results (64.9%) and 11/37 cases have poor cytological results (29.7%). 31/37 cases (83.8%) obtained adequate tissue samples for histopathology. Pathological results of our study composed 22 cases of pancreatic cancer (59.5%), 4 cases of benign pancreatic tumor (10.8%), 2 cases of mucinous cystic neoplasm (5.4%), 1 case with pancreatic tuberculosis, chronic pancreatitis and unknown diagnosis (2.7%) and 6 cases without a clear pathology results due to small samples.

The results of aspiration depend on number of subjective factors, such as the patient's comorbidities as well as the location, size, and structure of the pancreatic tumor, and some objective factors such as the experience and technique of endoscopists (type of needle, number of needle passes, the path needle pass). Therefore, there is obvious need to be further improved to limit the impact of objective factors on diagnostic efficacy [15].

In our study, the overall complication rate was 5.4%: 1 case of immediate bleeding after the intervention (2.7%) and 1 case of acute pancreatitis (2.7%). No case of fever or death was recorded. Our result was similar to other research. In Trinh Pham My Le's study, the overall complication rate is 5.2% (3/57 cases) [8]. A meta-analysis composed of 51 studies with 10,941 patients, the complication rate was 0.98% and the mortality rate was 0.02%. In which, the percentage of patients with acute pneumonia was about 0.44%, abdominal pain after the intervention was 0.34%, bleeding was 0.13%, fever was 0.11%, infection was 0.05% and the fistula was 0.02%. The risk of complications also depends on the nature of the tumor, because cystic tumor may imply a higher rate of complications than lesions with tumor nature and lymphadenopathy [18].

The technique of endoscopic ultrasound with fine needle aspiration cytology was performed with,

Several studies demonstrated that there was no difference between size of needles (19G, 22G and 25G needles) in the risk of complications in terms of solid lesions [19]. Thus, it can be concluded that EUS-FNA is a relatively safe procedure with low complication rate for diagnosing pancreatic tumors. However, EUS-FNA is an invasive technique and is difficult to implement, high cost, and requires experienced endoscopist, so it has not been widely developed in healthcare center.

5. CONCLUSION

- Characteristic of pancreatic tumor by endoscopic ultrasound

Characteristic of pancreatic tumor by endoscopic ultrasound: all detected tumor was > 2 cm in size (100%), 80.5% of those located in the pancreatic head. Nature of tumor: solid lesions accounted for 80.5%, irregular border was presented in 51.2% of cases, and 97.6% of lesions was hypoechoic.

Another findings: dilated main pancreatic duct (39.0%), main pancreatic stone (4.9%), dilated bile duct (46.3%), distended gall bladder (24.4%), invasion adjacent organ (29.3%) and vessel (24.4%), abnormal abdominal lympho nodes (51.2%).

- Efficacy and safety of EUS-FNA for diagnosing pancreatic tumor.

EUS - FNA was feasible in 37/41 cases (90.3%).

Favorable positions to access the lesions were mainly pancreatic head and body (78.4% and 16.2% respectively). The nature of lesions were solid tumor was solid in 78.4% and cystic in 21.6% of cases. About 64.9% of cases have significant cytological results, whereas 29.7% cases have poor cytological results. 83.8% of cases obtained adequate tissue samples for histopathology. Pathological results of our study composed 22 cases of pancreatic cancer (59.5%), 4 cases of benign pancreatic tumor (10.8%), 2 cases of mucinous cyst (5.4%), 1 case with pancreatic tuberculosis (2.7%).

The needle 22G was used in majority of cases (75.6%).

Overall rate of complication was 5.4, included 1 case of acute pancreatitis and 1 case with intermediate bleeding.

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