Title: A comprehensive comparison of clinicopathologic and imaging features of incidental/symptomatic non-functioning pancreatic neuroendocrine tumors: a retrospective study of a single center

Authors: Guopei Luo [a,c,*], Zuqiang Liu [b,*], Meng Guo [c], Kaizhou Jin [b], Zhiwen Xiao [b], Liang Liu [a,c], Chen Liu [a,c], Jin Xu [a,c], Quanxing Ni [a,c], Jiang Long [a,b,c,#] and Xianjun Yu [a,b,c,#]

*** These authors contributed equally to this work.**

Author Affiliations: [a]Department of Pancreatic and Hepatobiliary Surgery, Fudan University Shanghai Cancer Center; [b]Department of Oncology, Shanghai Medical College, Fudan University; [c]Pancreatic Cancer Institute, Fudan University, Shanghai 200032, P.R. China.

Running head: Clinicopathologic and imaging features of incidental pNET

Author contribution: Guopei Luo, Zuqiang Liu and Xianjun Yu designed study. Zuqiang Liu, Guopei Luo, Meng Guo, Kaizhou Jin, Zhiwen Xiao, Liang Liu, Chen Liu, Jin Xu, Quanxing Ni, Jiang Long and Xianjun Yu collected and analyzed data. Zuqiang Liu wrote the draft. Guopei Luo and Xianjun Yu revised it critically. All the authors approved the version to be published.

 # Corresponding Authors:

#Xianjun Yu, MD, PhD, Department of Pancreatic & Hepatobiliary Surgery, Fudan University Shanghai Cancer Center; Department of Oncology, Shanghai Medical College, Fudan University; Pancreatic Cancer Institute, Fudan University; Shanghai 200032, P.R. China (Tel: 021-64175590 ext 1307; Fax: 021-64031446; E-mail: yuxianjun88@hotmail.com).

#Jiang long, MD, PhD, Pancreatic Cancer Institute, Fudan University; Department of Pancreatic & Hepatobiliary Surgery, Fudan University Shanghai Cancer Center; Department of Oncology, Shanghai Medical College, Fudan University, Shanghai 200032, P.R. China (Tel: 021-64175590 ext 1307; Fax:

021-64031446; E-mail: surgeonlong@fudan.edu.cn)

ABSTRACT

Background: Incidentally discovered, nonfunctioning pancreatic endocrine tumors (NF-pNETs) are being increasingly diagnosed with the widespread use of imaging examination. The objective of this study was to analyze the different clinicopathologic and imaging features between incidentally discovered and symptomatic NF-pNETs.

Methods: From March 2010 to October 2014, we retrospectively analyzed 102 patients with pathologically confirmed sporadic NF-pNETs, among which 49 (48.0%) had lesions that were discovered incidentally. Differences in clinicopathologic features and various computerized tomography (CT) and endoscopic ultrasonography (EUS) findings were evaluated between incidental and symptomatic NF-pNETs.

Results: Among 102 patients with NF-pNETs, 49 (48.0%) had lesions that were discovered incidentally. Incidental NF-pNETs were more highly associated with low tumor grades, stages and lymphatic metastasis compared with symptomatic tumors (p = 0.007, 0.029 and 0.003, respectively). Moreover, incidental NF-pNETs had a lower rate of hypoenhancement (p = 0.018), main pancreatic duct dilatation (p = 0.043), and unclear border (p = 0.022). In addition, hypoechoic lesion was the most common and had a slightly higher rate in symptomatic tumors (p = 0.032).

Conclusions: Incidental NF-pNETs are associated with lower rates of aggressive behaviors of clinicopathologic and imaging features compared with symptomatic tumors.

Keywords: imaging features, incidental, non-function pancreatic neuroendocrine tumors

1. Introduction

Pancreatic neuroendocrine tumors (pNETs) account for approximately 3% of pancreatic neoplasms and are extremely heterogeneous for various behaviors in comparison with pancreatic ductal adenocarcinoma [1,2]. In recent years, their incidence, particularly for incidentally discovered nonfunctioning pNETs (NF-pNETs), has rapidly increased due to the widespread use of endoscopic and cross-sectional imaging [1,3].

Our knowledge of the natural history of incidentally discovered NF-pNET is limited. Some institutes have demonstrated that incidental NF-pNETs are usually smaller than their counterpart symptomatic tumors and are associated with earlier stages, so more curative resections could be performed [4-6]. In addition, several studies have focused on the prognostic impacts of incidentally discovered NF-pNET compared with symptomatic neoplasm [5,7,8], and they confirmed improved survival for incidentally discovered NF-pNET after pancreatic resection. However, in contrast with some studies on prognosis, little research has been done on imaging features, regardless of the widespread use and high accuracy of CT and EUS.

At present, it is unclear whether imaging features of CT and EUS are different between incidental and symptomatic NF-pNETs. Therefore, we aim to investigate the clinicopathologic and imaging features of incidentally detected pancreatic NETs compared with their symptomatic counterparts and to explore features that can predict biological and aggressive behavior.

2. Material and methods

2.1. Patients cohort

We retrospectively analyzed clinical and pathologic features of all consecutive patients with histological or cytological confirmed pNETs at Shanghai Cancer Center, Shanghai, China (single institution). From March 2010 to October 2014, of all 133 consecutive patients with pNETs, 102 patients were defined as NF-pNETs without distinct clinical syndrome or hormone alterations. Patients were defined as having symptomatic lesions if clinical manifestations related to the mass were present at the initial diagnosis. Patients with incidentally detected lesions were classified as tumors that were incidentally discovered in asymptomatic patients who underwent diagnostic evaluations for unrelated causes, or as patients with clinical symptoms not associated with the mass.

2.2. Evaluation of the clinical data and pathology work-up

Comprehensive clinical data that were collected included demographic characteristics, clinical presentation, preoperative work-up, and intraoperative information. Surgical resection with radical intent was performed whenever possible. Adjacent organs or liver metastases were routinely removed when involved with tumors. For patients with unresectable or widely metastatic lesions, fine-needle biopsy of the primary or metastatic lesions was performed in order to achieve pathological confirmation. This study was approved by the Ethics Board, Shanghai Cancer Center, Fudan University.

Pathologic diagnosis of pNET was determined on the basis of conventional histological and

immunohistochemical examinations. All immunohistochemical evaluations were performed including chromogranin A, synaptophysin, neuron specific enolase and Ki-67 proliferation index. The TNM staging of PNETs was classified according to the newest edition of the AJCC Cancer Staging Handbook [9]. Histopathologic grade was defined as low (G1), intermediate (G2), and high (G3), according to the 2010 WHO consensus [10]. Overall survival was determined from the time of diagnosis to death or the most recent follow-up. Survival information was obtained by electronic medical records or phone call follow-up.

2.3. Image acquisition and analysis

All CT images were reassessed via the Centricity PACS (picture archiving and communication system; General Electric, Fairfield, CT, USA). All images were reviewed in consensus by a blinded read of two radiologists with more than three years of experience in the imaging of pNETs. For each case, the following characteristics were assessed on the imaging: degree of tumor enhancement, presence of calcifications, dilatation of main pancreatic duct (MPD), tumor pattern and border. As a surrogate parameter for vascularization, the degree of lesions enhancement was defined compared with the normal pancreatic parenchyma during the arterial phase. The presence of calcifications was recorded by unenhanced CT scanning. The dilatation of the MPD was defined as 4 mm or greater.

To increase the sensitivity of diagnosis and provide a gold standard for preoperative tumor location, EUS examinations were performed under conscious sedation with fentanyl and midazolam. Fine-needle aspiration biopsy by EUS (EUS-FNA) was carried out for patients who were unable to undergo surgery [11]. EUS procedures were generally performed by two experienced endoscopists with

more than 8 years of experience via curvilinear echoendoscope (GF-UCT 260; Olympus, Japan).

2.4. Statistical methods

Categorical variables are expressed as numbers (percentages) and were calculated using chi-square or Fisher's exact probability tests as appropriate. The distribution of continuous variables is presented as median (range) and was analyzed by a two-sample Student t-test or Mann-Whitney U test when possible. Univariate Kaplan–Meier analysis was calculated comparing by the log-rank test. Multivariate analysis was calculated by Cox's proportional hazards regression model for variables significant in univariate analysis. The statistical analysis was conducted by dedicated software (SPSS Inc., version 17.0, Chicago, IL, USA). A $p < 0.05$ was considered statistically significant.

3. Results

3.1. Clinicopathological characteristics

Detailed clinicopathological characteristics of incidental and symptomatic patients are showed in Table 1. Of all 102 cases with histologically or cytologically confirmed NF-pNETs, 49 (48.0%) were incidentally detected. The entire group had a median age of 56 (16-77), and 47.1% were male (n = 48). Most patients had tumors located at the body and tail of the pancreas (n = 58, 56.9%), whereas 40 (39.2%) were located at the head, and only 4 (3.9%) had multifocal tumors. A total of 91 patients (89.2%) underwent surgical resection (80 curative and 11 palliative), compared with 11 cases without

operation. The incidental tumors were more highly associated with small diameters (p = 0.030), early stage (p = 0.029), low grade (p = 0.007), curative operations (p = 0.011) and body or tail lesions (p = 0.032), but were less associated with lymphatic metastasis (p = 0.003), compared with their symptomatic counterparts. The incidental and symptomatic NF-pNETs groups were statistically similar in other clinicopathological characteristics, including gender, age-. For symptomatic patients, the most commonly presenting symptoms were abdominal pain (n = 23, 43.4%), postprandial fullness (n = 7, 13.2%), back pain (n = 6, 11.3%), vomit (n =4, 7.5%), jaundice (n = 4, 7.5%), palpable mass (n = 3, 5.7%), diarrhea (n = 3, 5.7%) and weight loss (n = 3, 5.7%). To note, there were 9 symptomatic NF-pNETs with diameter less than 2cm, including 5 abdominal pain patients, 3 postprandial fullness patients and one back pain patient.

3.2. Imaging characteristics

Among 102 patients, 88 received CT scan, while only 24 underwent further EUS detection. Tumors were not detected by CT scan in six cases (sensitivity, 93.0%). All patients were shown to have lesions by EUS examination (sensitivity, 100.0%). The indications of these examinations varied. Several cases suffered from gastrointestinal symptoms, while other common indications came from routine medical examination, including imaging procedures or follow-up of other diseases.

The CT characteristics of the entire cohort with positive CT findings are described in Table 2. Eleven (13.4%) cases presented with calcified changes, and a solid, cystic and cyst-solidary changed pattern was observed in 41 (50.0%), 13 (15.9%), and 28 (34.1%) tumors, respectively. Tumor pattern and calcification were similarly distributed in incidental and symptomatic patients, (p = 0.912 and

0.424, respectively). Defined as more than 4 mm, (MPD) dilatation was observed in 21 patients, of which most occurred in symptomatic tumors (p = 0.043). Most incidental tumors had a normal sized MPD. Twenty patients had tumor hypoenhancing, 12 had isoenhancement, and 50 had hyperenhancement. Symptomatic tumors tended to be hypoenhancing (n = 14, 32.6%), while more than half of the incidental tumors were hyperenhanced (n = 30, 76.9%, p = 0.018). In addition, the hypoenhancing tumors tend to be a lower grade (p < 0.001), more lymph node metastases (p = 0.052) and distant metastases (p < 0.001) compared with hyperenhancing tumors. Fig. 1 shows typical CT scans of incidental and symptomatic tumors.

Tumor echogenicity was defined as hypoechoic, anechoic, and hyperechoic. Hypoehoic lesion was the most common and was slightly higher in symptomatic tumors (85.7 vs. 70%, p = 0.032，Table 2，Fig. 1). EUS-FNA was performed in 12 patients. FNA was not attempted in patients when a specific indication, such as preparing the operation. Two tumors that were not visualized on pre-operative CT were further detected by EUS. Six patients were initially considered as pancreatic adenocarcinoma on CT but were confirmed as pNET by cytology of the EUS-FNA.

3.3. *Overall survival*

All the patients had complete follow-up and the median follow-up time was 20 months. Fourteen patients died in the final follow-up. Five-year survival rate was 86%. Univariate analysis indicated that overall survival of incidental NF-pNETs was much better than symptomatic counterpart (HR = 0.247, p = 0.019, Figure 2). Besides this, other significant characters in univariate analysis included tumor location (p = 0.001), operation (p < 0.001), TNM stage (p = 0.002), grade of differentiation (p < 0.001),

and nodal status (p = 0.001). However, no significant difference between incidental and symptomatic NF-pNETs was observed in multivariate analysis (HR = 0.564, p = 0. 535).

4. Discussion

Over the last decade, the wide use of imaging technology has led to the rising incidence of pNETs [12]. Functional pNETs, such as insulinomas or gastrinomas, are no longer the most common, but usually occur in early stages [13]. NF-pNETs haves become the majority of pNET cases diagnosed in each stage, and the increased detection of incidental tumors represents a large proportion. Such changes are in accordance with our study, as 49 (48.0%) patients had incidentally discovered NF-pNETs.

Recently, with limited understanding of the topic, several studies have focused on the natural history of incidentally diagnosed NF-pNET, and these studies found that sporadic incidentally diagnosed NF-pNET were commonly associated with less aggressive behaviors [4,6], which is similar to our findings. In addition, overall survival was significantly better among patients with incidentally detected diseases than patients with symptomatic tumors. For example, Alain Sauvanet [8] analyzed 108 patients and found that disease-free survival was better in patients with incidentally detected diseases, with a 5-year disease-free survival of 92% versus 82% for symptomatic diagnosed lesions (*p* = 0.003). Meanwhile, Massimo Falconi [7] summarized that the median disease-specific survival of incidentally detected diseases was substantially better than their symptomatic counterpart, regardless of the stage of the tumor. These findings were in accordance with our study in large extent (log-rank, p = 0.019). The no significant difference in multivariate analysis may be caused by the short follow-up and

the small numbers of patients. For example, Massimo Falconi [7] reviewed 355 patients in two large centers with median follow up 44 months. The scale and follow up were much better than our study (102 patients, median follow up 20 months). In addition, although Alain Sauvanet's [8] study had similar patient number to our study (108 vs. 102 patients), their follow up was much longer than ours (median follow up: 42 vs. 20 months). This may be the main limitation in this study. However, previous studies have mainly focused on the prognosis of NF-pNETs, rather than imaging features.

In our study, 88 patients underwent CT examination, with a sensitivity of 93.0%. Additionally, the sensitivity of EUS could be as high as 100%. These values represent the significant diagnostic value of routine enhanced CT and EUS in the preoperative work-up of patients suspected to have pNETs. Therefore, it is essential to summarize the features of CT and EUS. Recently, Sahani DV [12] et al. reviewed 60 incidentally diagnosed NF-pNETs and concluded that the CT features of local invasion, presence of calcification, vascular invasion, MPD dilatation and lymph node enlargement were related to malignancy and higher rates of recurrence. Lee JH [14] reviewed 81 patients who were suspected to have pNET and performed EUS-FNA. They concluded that the EUS-FNA is a reliable method for confirming suspected lesions, and more importantly, they further established tissue diagnosis. Those studies summarized the CT and EUS features to some degree, which were in line with our data; however, they failed to compare the difference of incidentally discovered and symptomatic NF-pNETs.

Compared with previous studies, our study more comprehensively evaluated the distinctions of cross-sectional imaging characteristics in incidentally diagnosed NF-pNET and their symptomatic counterpart. More frequently in the early stage, incidentally diagnosed NF-pNET is more inclined to have less MPD dilatation and unclear border. Interestingly, incidentally diagnosed NF-pNET also had

lower rates of hypoenhancing compared with symptomatic tumors and hypoenhancing tumors tend to be with lower grade ($p < 0.001$), more lymph node metastases ($p = 0.052$) and distant metastases ($p < 0.001$) compared with hyperenhancing tumors, which may indicate that hypoenhancing tumors are correlated with a more aggressive phenotype.

Nowadays, there are studies focused on the different treatment of the incidental NF-pNETs. For example, Alain Sauvanet [8] suggested standard pancreatic resections requiring extensive lymphadenectomy should be limited to large (>2 cm in diameter) tumors. Therefore, we suggested a more aggressive treatment would be performed in patients with hypoenhancing tumors, especially in symptomatic NF-pNETs with diameter more than 2 cm. As an example, an adequate resection of the primary tumor with wide lymph node dissection should be recommended in hypoenhancing symptomatic NF-pNETs with diameter more than 2 cm. After surgery, this group of patients should receive more aggressive follow-up. And relative adjuvant therapy and follow up will be the main task in our future work.

EUS was also significant in the diagnosis of pNET and had a high sensitivity of 100% in our study. This is a little bit higher than other published data, which may be due to the limited number of patients who underwent EUS. Imperiale TF reviewed 11 observational studies and found that EUS was in general, more accurate for diagnosing pancreatic tumors and had a greater advantage for lesions smaller than 3 cm [15]. Of note, the hyperechoic was most commonly observed in incidentally diagnosed tumors, which may help to distinguish the imaging characteristics of EUS in incidentally diagnosed and symptomatic tumors.

This study has several shortcomings, the first being the retrospective nature of the study. The CT and EUS outcomes were achieved from the original reports, and the records may have been incomplete.

The second limitation is the small number and short follow-up of patients who underwent CT and EUS (especially EUS), thus leading to the possibility that some of the data may lack statistical power. One example is the no statistical significance between incidental and symptomatic NF-pNETs in multivariate analysis. Next, future studies with larger numbers and longer follow-up are necessary to further verify the results of recent clinical results.

5. Conclusion

In summary, incidental NF-pNETs are more commonly associated with less aggressive clinicopathologic and imaging features compared with symptomatic counterpart.

Funding

This study was supported in part by the Sino-German Center (GZ857), by the Science Foundation of Shanghai (13ZR1407500), by the Shanghai Rising Star Extension Program (12QH1400600), by the Fudan University Young Investigator promoting program (20520133403) and by the National Science Foundation of China (Grant Nos. 81101807, Nos.81001058, Nos. 81372649, Nos. 81372653, Nos. 81172276).

Acknowledgements None declared.

No conflicts of interest were reported.

References

[1] Yao JC, Hassan M, Phan A, Dagohoy C, Leary C, Mares JE, et al.: One hundred years after "carcinoid": Epidemiology of and prognostic factors for neuroendocrine tumors in 35,825 cases in the United States. J Clin Oncol 2008;26:3063-3072.

[2] Bettini R, Boninsegna L, Mantovani W, Capelli P, Bassi C, Pederzoli P, et al.: Prognostic factors at diagnosis and value of WHO classification in a mono-institutional series of 180 non-functioning pancreatic endocrine tumours. Ann Oncol 2008;19:903-908.

[3] Halfdanarson TR, Rubin J, Farnell MB, Grant CS, Petersen GM: Pancreatic endocrine neoplasms: Epidemiology and prognosis of pancreatic endocrine tumors. Endocr Relat Cancer 2008;15:409-427.

[4] Cheema A, Weber J, Strosberg JR: Incidental detection of pancreatic neuroendocrine tumors: An analysis of incidence and outcomes. Ann Surg Oncol 2012;19:2932-2936.

[5] Haynes AB, Deshpande V, Ingkakul T, Vagefi PA, Szymonifka J, Thayer SP, et al.: Implications of incidentally discovered, nonfunctioning pancreatic endocrine tumors: Short-term and long-term patient outcomes. Arch Surg 2011;146:534-538.

[6] Bettini R, Partelli S, Boninsegna L, Capelli P, Crippa S, Pederzoli P, et al.: Tumor size correlates with malignancy in nonfunctioning pancreatic endocrine tumor. Surgery 2011;150:75-82.

[7] Crippa S, Partelli S, Zamboni G, Scarpa A, Tamburrino D, Bassi C, et al.: Incidental diagnosis as prognostic factor in different tumor stages of nonfunctioning pancreatic endocrine tumors. Surgery 2014;155:145-153.

[8] Birnbaum DJ, Gaujoux S, Cherif R, Dokmak S, Fuks D, Couvelard A, et al.: Sporadic nonfunctioning pancreatic neuroendocrine tumors: Prognostic significance of incidental diagnosis. Surgery 2014;155:13-21.

[9] Strosberg JR, Cheema A, Weber J, Han G, Coppola D, Kvols LK: Prognostic validity of a novel American Joint Committee on Cancer Staging Classification for pancreatic neuroendocrine tumors. J Clin Oncol 2011;29:3044-3049.

[10] Klimstra DS, Modlin IR, Coppola D, Lloyd RV, Suster S: The pathologic classification of neuroendocrine tumors: A review of nomenclature, grading, and staging systems. Pancreas 2010;39:707-712.

[11] Sun B, Yang X, Ping B, He Y, Zhang Z: Impact of inconclusive endoscopic ultrasound-guided fine-needle aspiration results in the management and outcome of patients with solid pancreatic masses. Dig Endosc 2014

[12] Gallotti A, Johnston RP, Bonaffini PA, Ingkakul T, Deshpande V, Fernandez-del CC, et al.: Incidental neuroendocrine tumors of the pancreas: MDCT findings and features of malignancy. AJR Am J Roentgenol 2013;200:355-362.

[13] Luo G, Liu Z, Guo M, Jin K, Xiao Z, Liu L, et al.: (18)F-FDG PET/CT can be used to detect non-functioning pancreatic neuroendocrine tumors. Int J Oncol 2014;45:1531-1536.

[14] Atiq M, Bhutani MS, Bektas M, Lee JE, Gong Y, Tamm EP, et al.: EUS-FNA for pancreatic neuroendocrine tumors: A tertiary cancer center experience. Dig Dis Sci 2012;57:791-800.

[15] Dewitt J, Devereaux BM, Lehman GA, Sherman S, Imperiale TF: Comparison of endoscopic ultrasound and computed tomography for the preoperative evaluation of pancreatic cancer: A systematic review. Clin Gastroenterol Hepatol 2006;4:717-725, 664.

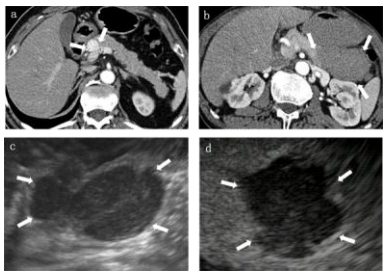
Figure titles and legends

Fig. 1. CT and EUS scans of incidental and symptomatic NF-pNETs.

Figure legends: The incidental lesion was typical aspect of clear border, hyperenhancement, less than 2cm (a) compared with unclear border, hypoenhancement, more than 2cm of the symptomatic pNETs (b). The EUS scans shows echogenicity lesion of incidental and symptomatic tumors, of which the incidental tumor (c) was slight hyperechoic and the symptomatic one (d) was hypoechoic.. The cases indicate the imaging features of incidental and symptomatic NF-pNETs.

Fig. 2. Prognosis of univariate analysis for entire cohort (incidental vs. symptomatic NF-pNETs)

Figure legends: Overall survival of incidental NF-pNETs is much better than symptomatic NF-pNETs (log-rank, $p = 0.019$).



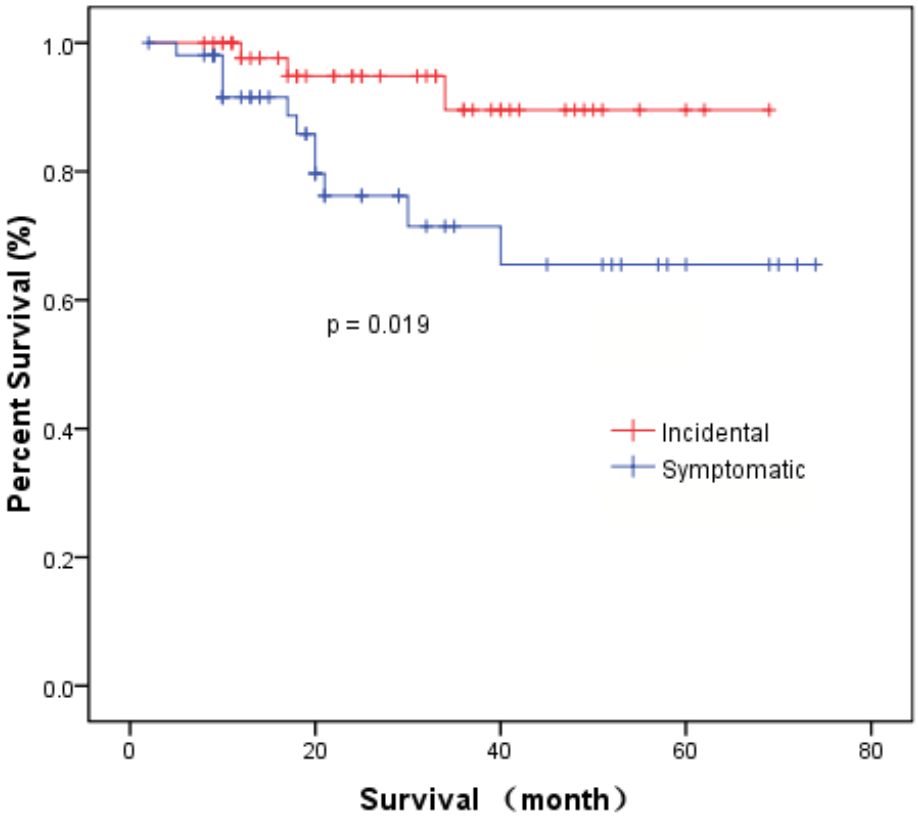

1.0
0.8
0.6
0.4
0.2
0.0
Percent Survival (%)
p = 0.019
Incidental
Symptomatic
0
20
40
60
80
Survival （month）

Table 1

Clinicopathologic characteristics

Variable	All pts	Symptomatic	Incidental	*p* Value
Male gender, n (%)	48(47.1%)	24(45.3%)	24(49.0%)	0.709
Median age, y(range)	56(16-77)	58(26-75)	51(16-77)	0.471
Location				0.032*
Head	40(39.2%)	24(45.3%)	16(32.7%)	
Body or tail	58(56.9%)	25(47.2%)	33(67.3%)	
Multicentric	4(3.9%)	4(7.5%)	0	
Operation				0.011*
Curative	80(78.4%)	36(67.9%)	44(89.8%)	
Palliative	11(10.8%)	10(18.9%)	1(2.0%)	
No operation	11(10.8%)	7(13.2)	4(8.2%)	
Mean diameters,(range)	4.2(0.5-15.0)	4.8(0.8-15.0)	3.5(0.5-10.2)	0.030
TNM stage				0.029*
I	38(37.3%)	15(28.3%)	23(46.9%)	
II	35(34.3%)	17(32.1%)	18(36.7%)	
III	4(3.9%)	4(7.5%)	0(0%)	
IV	25(24.5%)	17(32.1%)	8(16.3%)	
Grade of differentiation				0.007
G1	44(43.1%)	19(35.8%)	25(51.0%)	
G2	39(38.2%)	18(34.0%)	21(42.9%)	
G3	19(18.6%)	16(30.2%)	3(6.1%)	
Nodal status				0.003
N0	55(53.9%)	23(43.4%)	32(65.3%)	
N1	26(25.5%)	21(39.6%)	5(10.2%)	
Nx	21(20.6%)	9(17.0%)	12(24.5%)	

*calculated by Fisher's Exact Test

Nx was defined when the nodal status was unclear.

Table 2

MDCT and EUS characteristics

Variable	All pts	Symptomatic	Incidental	*p* Value
MDCT				
Sensitivity	93.0%	95.1%	91.5%	
Pattern				0.912
Solid	41(50.0%)	22 (51.2%)	19(48.7%)	
Cystic	13(15.9%)	6(14.0%)	7(17.9%)	
Cyst-solidary	28(34.1%)	15(34.9%)	13(33.3%)	
Border				0.022
Clear	46（56.1%）	19（44.2%）	27（69.2%）	
Unclear	36（43.9 %）	24（55.8%）	12（30.8%）	
Calcification, yes	11(13.4%)	7(16.3%)	4(10.3 %)	0.424
Main Pancreatic Duct Dilatation, ≥ 4 mm				0.043
Yes	21(25.6%)	15(34.9%)	6(15.4%)	
No	61(74.4%)	28(65.1%)	33(84.6%)	
Enhancement				0.018
Hypoenhancement	20(24.4%)	14(32.6%)	6(15.4%)	
Isoenhancement	12(14.6%)	9(20.9%)	3(7.7%)	
Hyperenhancement	50(61.0%)	20(46.5%)	30(76.9%)	
EUS				
Sensitivity	100%	100%	100%	
Echogenicity				0.032*
Hypoechoic	19（79.2%）	12（85.7%）	7（70.0%）	
Anechoic	2（8.3%）	2（14.3%）	0	
Hyperechoic	3（12.5%）	0	3（30.0%）	

*calculated by Fisher's Exact Test