Differential Diagnosis between Chronic Pancreatitis and Pancreatic Cancer: A Prospective Study of 156 Patients

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Key words: *diagnosis; pancreatic cancer; chronic pancreatitis.*

Summary. *The aim of this study was to evaluate prospectively the efficacy of different imaging methods in differentiating between chronic pancreatitis and cancer in focal pancreatic lesions and staging of adenocarcinoma.*

Material and Methods. Between June 2005 and October 2007, 156 consecutive patients were enrolled into the prospective clinical trial. The patients were randomized into two groups. Ultrasonoscopy and endoscopic ultrasound were performed in both the groups. Group A patients were additionally examined by computed tomography and tumor marker assay, while in the group B, intraoperative ultrasonoscopy with biopsy and urgent histological examination were done. Results of each imaging technique regarding differential diagnosis and cancer stage were compared with the findings of surgical and histological examination.

Results. Chronic pancreatitis and adenocarcinoma were documented in 58 (37.2%) and 78 (50%) patients, respectively. The size of the lesions and clinical presentation were similar in both the groups, but cancer patients were older than patients with pancreatitis (P<0.001). Preoperatively endosonoscopy had the highest accuracy in assessing differential diagnosis (92.1%) and adenocarcinoma (91.8%), whereas computed tomography had the highest accuracy in assessing tumor size (84.5%) and transabdominal ultrasonography in assessing lymph node involvement (78.9%) and distant metastases (88.6%). Intraoperative ultrasound was the most accurate imaging technique in the assessment of differential diagnosis (100%), adenocarcinoma (98.5%), extent of primary tumor (84.8%), lymph node involvement (87.9%), and distant metastases (100%).

Conclusions. In the differential diagnosis between chronic pancreatitis and adenocarcinoma, preoperative ultrasonography and intraoperative ultrasound are the best imaging methods. When ultrasonography is nondiagnostic, computed tomography and endoscopic ultrasound are alternative techniques.

Introduction

Differential diagnosis of pancreatic masses can be challenging in clinical practice because the patients with chronic pancreatitis may present with clinical symptoms and radiographic findings that can be difficult to distinguish from those of pancreatic adenocarcinoma (1–3). Up to 6% of the cases suspected to be malignant were found to be benign at surgery; this was associated with a postsurgical complication rate of up to 21% (2). Although ultrasonography (US) and computed tomography (CT) remain to be the initial tests of choice for the differential diagnosis of pancreatic masses, improved imaging technologies, including endoscopic ultrasonography (EUS) and intraoperative ultrasound (IOUS), provide opportunities to detect early morphologic changes (4–9). The literature data of the sensitivity of various imaging methods in the differential diagnosis of chronic pancreatitis and pancreatic adenocarcinoma is presented in Table 1 (10–17). However, no consensus about the best approach to assess differential diagnosis, tumor stage, and resectability has been reached so far (1, 3, 8, 9). In fact, reliable data are limited to very few prospective studies, whereas most of noncomparative analyses only reflect the expertise of a group in one particular technique, thus making it difficult to extrapolate their results (18). Finally, an appropriate gold standard based on the surgical and histopathological findings is lacking in many studies.

The aim of this prospective study was to evaluate the ability of different imaging techniques to establish the diagnosis of focal pancreatic lesion in assessing the differential diagnosis between chronic pancreatitis and pancreatic cancer and staging of adenocarcinoma.

Materials and Methods

Study Design. The imaging entrance criterion for the study was the presence of a pancreatic mass on

Table 1. Sensitivity of Imaging Techniques in Diagnosing Focal Pancreatic Masses

Technique	Sensitivity, %
CT/MRI	77
PET	88
EUS	63–76
EUS-FNAB	54–74

CT, computed tomography; MRI, magnetic resonance imaging; PET, positron emission tomography; EUS, endoscopic ultrasonography; EUS-FNB, endoscopic ultrasonography-guided fine-needle aspiration biopsy.

transabdominal US examination in clinically selected patients. Patients with pancreatic focal lesion detected on US were prospectively studied to compare two different protocols of diagnostic tools. Given that the gold standard for all comparisons was histopathologic and surgical findings, patients judged unfit for either curative or palliative surgery due to impaired physical condition or associated severe diseases and older than 80 years were not included. All imaging techniques as well as surgical examination were performed following a pre-established protocol. The study protocol was approved by the Lithuanian Bioethics Committee (No. 28, May 27, 2005) in accordance with the ethical guidelines of the World Medical Association Declaration of Helsinki. Written informed consent was obtained from each patient. After signing informed consent and agreement to participate in the study, the patients were randomized in two groups. In group A patients, US, EUS, CT, and tumor marker (carbohydrate antigen 19-9 [CA 19-9], carcinoembryonic antigen [CEA]) assays were performed before the surgery, while the group B patients underwent preoperative US, EUS, and IOUS, intraoperative biopsy (IOB) with urgent histological examination. After the surgery, the postoperative diagnosis (POD) was established by the operating surgeon for all the patients in both groups with adenocarcinoma stage according to the TNM staging system. The results of every diagnostic method were compared with the surgical findings, which were complemented by histopathologic examination of the resected specimens (n=142). For the patients who were judged in consensus to have unresectable pancreatic adenocarcinoma, diagnosis was histologically proved by percutaneous biopsy (n=14). Specific technical details of each imaging technique are summarized below. The patients underwent the following diagnostic procedures at the same hospital and with the same equipment:

– CA 19–9 and CEA assay was performed with a chemiluminescent microparticle immunoassay technique (Architect system, Abbott Ireland Diagnostic Division, Sligo, Ireland); cutoff values of 37 U/mL for CA 19–9 and 10 ng/mL for CEA were applied;

– Transabdominal US was performed with 3.5-, 5.0-, and 7.5-MHz sector scanner convex and linear probes (Sonoline Elegra, Siemens Medical Systems Inc., Issaquah, USA, Siemens AG, Erlangen, Germany). Our standard procedure included imaging performed by a staff radiologist in transverse, sagittal, and coronal planes;

– Abdominal CT was performed with the General Electric Lightspeed 16 and VCT 64 scanners (GE Healthcare, Milwaukee, WI, USA), during an intravenous injection of 100–150-mL bolus of nonionic contrast medium iohexol (Omnipaque 350, Amersham Health, Amersham, UK) or iopromide (Ultravist 370; Schering AG, Germany); 1.25-mm and 2.5-mm contiguous axial scanning was performed in the arterial and portovenous phases, respectively, and scans were obtained in the areas of interest;

– EUS was performed with the Olympus GF-UM30P ultrasonic linear gastrofiberscope and endoscope ultrasound center EU-M30 (Olympus Inc., Hamburg, Germany). Ultrasound frequencies of 7.5 and 12.0 MHz were used;

– IOUS was performed with a 7.5-MHz scanner linear intraoperative probe (Panther 2002, B-K Medical, Gentofte, Denmark);

– IOB of the pancreatic mass was performed by an 18-gauge Tru-cut automated biopsy needle (Guillotine needle GBL 18/15 Bloodlini S.p.A., Medolla [MO], Italy) under IOUS guidance. IOB was performed after the exact location of the focal lesion area during IOUS examination had been established. Specimens were taken with 18-gauge Tru-cut automated needles. The urgent histological examination of specimens obtained was done by the pathologist. The results were expressed as either positive for malignant tumor, negative for malignant tumor, or indeterminate because of inadequate material;

– US, EUS, CT, and IOUS were evaluated by staff radiologists and classified as diagnostic (positive for neoplasm or negative for neoplasm, positive for chronic pancreatitis or negative for chronic pancreatitis) or nondiagnostic. The US, EUS, CT, and IOUS criteria of evaluation were as follows: presence and location of the mass, echogenicity and attenuation of the mass, homogenicity of the mass, presence of extrapancreatic disease (fat tissue, duodenal, and/or vascular involvement), regional node involvement, presence of hepatic metastases, ascites. In addition, each examiner was asked to establish the tumor stage according to the Union Internationale Contre le Cancer (UICC) TNM staging system (19).

Patients. Between June 2005 and October 2007, 156 consecutive patients, 98 men and 58 women (mean age, 57.2 years; range, 30–80 years), in whom

a pancreatic mass was diagnosed with US and who had clinical signs of chronic pancreatitis or pancreatic cancer were included in this prospective study.

Of the 156 patients, 142 underwent surgery. A conclusive diagnosis was made in these 142 patients on histologic examination of the surgical specimens. Fourteen patients were not operated on – histological examination of the transabdominal Tru-cut biopsy specimens under US control was performed to confirm clinical diagnosis (12 adenocarcinomas, 1 chronic pancreatitis, and 1 B-cell lymphoma). The follow-up period for the patient with chronic pancreatitis was more than 3 years. Nonoperated patients were excluded for the evaluation of pancreatic adenocarcinoma stage according to the TNM staging system. Baseline demographic characteristics of patients included into the study are shown in Table 2. Both groups (A and B) were compared by patients' demographic data; the comparison showed no significant differences.

Statistical Analysis. Concerning the diagnosis obtained by imaging techniques, sensitivity, specificity, positive and negative predictive values, and accuracy were calculated with a 2×2 table. Continuous variables were expressed as mean values and ranges, and comparative analysis between them was performed by using the Mann-Whitney test. The significance level was 5% for all statistical procedures. Numerical variables were expressed as mean and standard deviation, and comparative analysis between them was performed by using the Student *t* test. All categorical data were expressed as absolute frequencies and percentages and were analyzed by using the chi-square and Fischer exact tests. Data were analyzed by means of the SAS 9.1 (SAS Institute Inc., Charlotte, NC, USA).

Results

The mean diameter of the lesions detected with US was 42.2 mm (range, 20–80 mm). The lesions were located in the head of the pancreas in 102 (65.4%), in the head and body in 4 (2.6%), in the body of the pancreas in 20 (12.8%), in the body and tail in 5 (3.2%), and in the tail of the pancreas in

23 patients (14.7%). In 2 patients (1.3%), the lesion involved the head, body, and tail of the pancreas. The conclusive diagnosis of patients included into the study is outlined in Table 3. Of the 156 patients enrolled into the study, 78 (50%) were histologically proven to have pancreatic adenocarcinoma, and 58 patients (37.2%) were proven to have chronic pancreatitis. Both groups (A and B) were compared by final clinical diagnosis; no significant differences were found. The size of the pancreatic lesions and clinical presentation were similar in patients with malignant and benign lesions (Table 4). However, the patients with cancer were significantly older than the patients with chronic pancreatitis. Pancreatic adenocarcinoma was found in 78 patients. Only 1 tumor (1.3%) was staged as T1, 3 (3.8%) as T2, and 35 (44.9%) as T3. The distribution of patients with adenocarcinoma according to the TNM stating system is presented in Table 5. More than half of our patients had locally advanced or metastatic disease: 46 (59.0%) of them had stage III or IV cancer. Only 4 patients (5.1%) had early-stage cancer (I A and I B).

Sensitivity, specificity, positive and negative predictive values, and diagnostic accuracy of every diagnostic method with respect to each evaluated parameter in both the groups separately and together were evaluated. Tumor marker CA 19–9 and CEA assays were always considered diagnostic. US, EUS, CT, IOUS, IOB with urgent histological examination, and POD were considered diagnostic in 93.6%,

Table 3. Conclusive Diagnosis of Patients Included in the Study

Diagnosis	Group A (n=76) n (%)	Group B (n=80) n (%)	Group A+B (n=156) n (%)
Pancreatic adenocarcinoma	35 (46.1)	43 (53.8)	78 (50)
Chronic pancreatitis	32 (42.1)	26 (32.5)	58 (37.2)
Benign pancreatic tumor	6 (7.9)	8 (10.0)	14 (9.0)
Other*	3 (4.0)	3 (3.8)	6 (3.9)

*Three patients with gastrointestinal stroma tumors, one patient with B-cell lymphoma, one patient with brachiogenic cyst, and one patient with multicystic benign mesothelioma.

Table 2. Demographic Characteristics of Patients Included Into the Study

Characteristic		Group A	Group B	Group A+B
Patients, n		76	80	156
Gender	Men, n	49	49	98
	Women, n	27	31	58
Age, mean (SD) [range], years		57.17 (12.22) [30–79]	57.18 (13.2) [32–80]	57.17 (12.69) [30–80]
Male age, mean (SD) [range], years		55.2 (11.52) [30–74]	53.65 (13.57) [32–80]	54.44 (12.52) [30–80]
Female age, mean (SD) [range], years		60.82 (12.86) [33–79]	62.65 (10.68) [35–80]	61.79 (11.68) [33–80]

Table 4. Demographic Data and Clinical Presentation of Pancreatic Lesions in Patients With Final Diagnoses
of Chronic Pancreatitis and Pancreatic Cancer

Characteristic		Chronic Pancreatitis (n=58)	Pancreatic Cancer (n=78)	*P* Value
Gender, n (%)	Male	49 (84.5)	46 (60)	0.434**
	Female	9 (15.5)	32 (40)	0.0014**
Mean age (SD) [range], years		48.4 (10.4) [30–74]	63.4 (11.1) [31–80]	<0.001*
Mean age (SD) [range], years	Male	47.5 (8.9) [30–74]	61.6 (11.9) [31–80]	<0.001**
	Female	53.6 (15.8) [33–73]	65.95 (9.4) [49–80]	0.0504**
Lesion size, mean (range), mm		29.0 (20–60)	37.2 (21–80)	0.163*
Clinical presentation:				0.1322**
Abdominal pain, n (%)		56 (96.6)	78 (100)	
Weight loss, n (%)		25 (43.1)	57 (73.1)	
Jaundice, n (%)		21 (36.2)	49 (62.8)	

*Mann-Whitney test; **Fischer exact test.

Table 5. The Distribution of Patients With Pancreatic
Adenocarcinoma According to the TNM Stating System
(n=78)

Stage	TNM	Group A+B n (%)
IA	T1 N0 M0	1 (1.3)
IB	T2 N0 M0	3 (3.8)
IIA	T3 N0 M0	12 (15.4)
IIB	T1–3 N1 M0	16 (20.5)
III	T4 N0–1 M0	18 (23.1)
IV	T1–4 N0–1 M1	28 (35.9)

95.5%, 77.6%, 98.6%, 100%, and 100% of the patients, respectively. Data on the accuracy of various diagnostic procedures when a diagnosis was rendered are presented in Table 6. It shows the diagnostic values of differential diagnosis between pancreatic adenocarcinoma and chronic pancreatitis of US, EUS, CT, CA 19-9, CEA, IOUS, IOB with urgent histological examination, and POD. The patients with benign pancreatic tumors (n=14) and other pathology (n=6) were excluded from the analysis.

US, EUS, and POD were performed in both groups. Table 6 presents diagnostic values in each group separately (group A and group B) and both groups together (group A+B). The best results in preoperative differential diagnosis of pancreatic cancer and chronic pancreatitis were achieved with EUS and US. These diagnostic methods were more accurate as compared with CT, but the differences were not significant (*P*>0.05). IOUS showed the highest diagnostic values for differential diagnosis of pancreatic cancer and chronic pancreatitis. IOB with urgent histological examination failed to detect pancreatic adenocarcinoma in 4 patients. Differences in the POD diagnostic values comparing the groups A and B were not significant (*P*>0.05). The mean levels of tumor markers in patients with pancreatic adenocarcinoma and chronic pancreatitis are shown in Table 7. CA 19–9 level was significantly higher in patients with pancreatic cancer (*P*<0.001). The mean level of CA 19–9 and CEA in patients with benign pancreatic tumors was 4.9±2.5 U/mL

Table 6. Comparison of Value of Diagnostic Methods in the Differential Diagnosis of Pancreatic Cancer and Chronic Pancreatitis

Diagnostic method		Sensitivity, %	Specificity, %	Positive Predictive Value, %	Negative Predictive Value, %	Accuracy, %
US	Group A	88.2	91.2	90.9	88.6	89.7
	Group B	92.6	92.6	92.6	92.6	92.6
	Group A+B	90.4	91.9	91.8	90.6	91.2
EUS	Group A	90.4	92.3	92.2	90.6	91.3
	Group B	93.0	93.0	93.0	93.0	93.0
	Group A+B	91.6	92.6	92.6	91.7	92.1
CT		87.9	89.4	89.2	88.1	88.6
CA 19-9		71.4	71.4	71.4	71.4	71.4
CEA		57.1	57.1	57.1	57.1	57.1
IOUS		100	100	100	100	100
IOB with UHE		94.3	94.3	94.3	94.3	94.3
POD	Group A	96.4	98.2	98.1	96.4	97.3
	Group B	94.9	94.9	94.9	94.9	94.9
	Group A+B	95.6	96.5	96.5	95.7	96.1

CT, computed tomography; MRI, magnetic resonance imaging; EU, ultrasonography; EUS, endoscopic ultrasonography; CA 19-9, carbohydrate antigen 19-9; CEA, carcinoembryonic antigen; IOUS, intraoperative ultrasound; IOB, intraoperative biopsy; UHE, urgent histological examination; POD, postoperative diagnosis.

Table 7. CA 19–9 and CEA Values in Patients With Pancreatic Adenocarcinoma and Chronic Pancreatitis

Tumor Marker	Pancreatic Adenocarcinoma (n=78)	Chronic Pancreatitis (n=58)	*P* Value
CA 19-9, mean (SD) [range], U/mL	1780.7 (3017.4) [1.71–12220]	438 (1396.3) [2.5–6834]	<0.001
CEA, mean (SD) [range], ng/mL	36.77 (134.25) [0.2–749]	7.33 (11.36) [0.2–49]	>0.05

CA 19-9, carbohydrate antigen 19-9; CEA, carcinoembryonic antigen.

(range, 2.5–9.6 U/mL) and 4±6.39 ng/mL (range, 0.98–21 ng/mL), respectively. The clinical impact and accuracy of serum CA 19–9 and CEA assessment for the differentiation of pancreatic masses and cancer staging were compared. The diagnostic values of both tests (Table 6) were low and not suitable for differential diagnosis, but differences in the CA 19–9 level were significant comparing the patients with T3 and T4 (*P*=0.0408), N0 and N1 (*P*=0.0032), and M0 and M1 (*P*=0.0062). Changes in CEA levels were not significant in all cases. Table 8 shows the values of diagnostic methods only for pancreatic adenocarcinoma and T, N, and M staging. EUS and US showed the best preoperative diagnostic accuracy for pancreatic cancer. The accuracy of CT was lower, but the differences were not significant. IOUS was found to be the best imaging method for detection of adenocarcinoma.

CT and US showed the highest accuracy for preoperative T staging, with the differences being not significant (*P*>0.05). IOUS yielded the highest overall accuracy of T staging. US had the best accuracy and specificity for the preoperative evaluation of lymph node metastases (N1). The accuracy, sensitivity, and specificity of EUS and CT were lower compared with US. The highest overall diagnostic values for staging lymph node metastases were achieved with IOUS. US had the highest preoperative accuracy and specificity for staging metastases (M1), but IOUS showed the highest overall diagnostic values for staging metastases.

Discussion

In this prospective study, we compared two different protocols of diagnostic tools to establish clinical diagnosis of chronic pancreatitis or pancreatic adenocarcinoma and obtained summary estimates of US, EUS, CT, CA 19–9, CEA, IOUS, IOB with UH, and POD for diagnosis and staging of pancreatic cancer. The strength of this study lies in several factors. First, this was a prospective study in which the most widely available imaging techniques were compared. Second, histopathologic examination constituted the gold standard for all comparisons in a large series of patients with chronic pancreatitis and pancreatic cancer. Third, although the efficacy

of individual tests was completely evaluated with respect to each parameter, this study specially focused on the potential advantage of combining different imaging techniques. On the other hand, we are also aware of the limitations of the study. First, although special attention was paid to avoid a selection bias, it cannot be ruled out. Indeed, about 60% of the patients had advanced pancreatic cancer. Second, the unambiguous comparison among imaging techniques is hampered by both the rapid advances in technology, with significant variances depending on which apparatus generation was used, and their dependence on the operator's expertise, a circumstance especially important for EUS and CT.

Although weight loss and jaundice were seen more commonly in patients with cancer, no significant difference was detected in relation to the clinical presentation of both diseases. However, patients with cancer were older than those suffering from chronic pancreatitis (*P*<0.001). The results of the present study indicate that US is the mainstay for differential diagnosis of chronic pancreatitis and pancreatic cancer preoperatively, with the best values in the evaluation of the primary diagnosis, tumor size, and metastatic spread in malignancy. This imaging technique was proved to be a safe and most successful procedure for differential diagnosis in pancreatic lesions and cancer staging in most of the patients (Fig.). For differential diagnosis and cancer staging, the diagnostic values of CT were lower compared with US. CT was the best preoperative imaging method in determining T stage pancreatic cancer, but the differences were not significant comparing it with US (*P*>0.05). These results deserve some comment. First, although CT was said to have potential advantages, it seems not to surpass US and EUS in differential diagnosis and pancreatic cancer staging. This fact, along with the greater availability, low cost, and noninvasiveness of US, favors the use of this procedure. Second, US have serious technical limitations, mainly because of the difficulty of visualizing the pancreas if a large amount of intestinal gas is present. These limitations were responsible for 10 nondiagnostic US cases (6.4%) in our study. When the pancreas is well-defined, it is usually possible to establish the nature of the lesion. US would therefore seem important in the differential diagnosis of chronic pancreatitis and pancreatic cancer when the lesion is visualized. CT is less affected by intestinal gas. However, 17 nondiagnostic cases (22.4%) with CT were identified because it was impossible to determine the exact nature of the lesion, due to the absence of specific criteria for diagnosis. Third, microscopic involvement of lymph nodes by tumor cells is not uncommon, even in small pancreatic cancer, thus explaining the relatively low sensitivity of all imaging techniques in its detection,

Table 8. Comparison of US, EUS, CT, IOUS, and POD for Pancreatic Adenocarcinoma
and Determining T, N, and M Stages

Diagnostic Method		Sensitivity, %	Specificity, %	Positive Predictive Value, %	Negative Predictive Value, %	Accuracy, %
US	Group A	88.9	85.4	84.2	89.7	87.0
	Group B	92.9	89.2	90.7	91.7	91.1
	Group A+B	91.0	87.2	87.7	90.7	89.1
EUS	Group A	83.3	94.1	90.9	88.9	89.7
	Group B	100	90.6	87.0	100	94.2
	Group A+B	90.9	92.4	88.9	93.8	91.8
CT		82.9	82.5	80.6	84.6	82.7
CA 19-9		68.8	80.0	73.3	76.2	75.0
CEA		28.1	87.5	64.3	60.3	61.1
IOUS		100	97.1	97.1	100	98.5
IOB with UH		87.9	100	100	90.0	94.2
POD	Group A	96.0	94.7	92.3	97.3	95.2
	Group B	100	91.9	91.7	100	95.7
	Group A+B	98.3	93.3	91.9	98.6	95.5
Determining T stage						
US	Group A	56.3	85.4	56.3	85.4	78.1
	Group B	74.4	91.5	74.4	91.5	87.2
	Group A+B	66.2	88.7	66.2	88.7	83.1
EUS	Group A	55.0	85.0	55.0	85.0	77.5
	Group B	65.0	88.3	65.0	88.3	82.5
	Group A+B	60.0	86.7	60.0	86.7	80.0
CT		69.0	89.7	69.0	89.7	84.5
IOUS		69.7	89.9	69.7	89.9	84.8
POD	Group A	79.2	93.1	79.2	93.1	89.6
	Group B	87.9	96.0	87.9	96.0	93.9
	Group A+B	84.2	94.7	84.2	94.7	92.1
Determining N stage						
US	Group A	71.9	71.9	71.9	71.9	71.9
	Group B	84.6	84.6	84.6	84.6	84.6
	Group A+B	78.9	78.9	78.9	78.9	78.9
EUS	Group A	75.0	75.0	75.0	75.0	75.0
	Group B	70.0	70.0	70.0	70.0	70.0
	Group A+B	72.5	72.5	72.5	72.5	72.5
CT		72.4	72.4	72.4	72.4	72.4
IOUS		87.9	87.9	87.9	87.9	87.9
POD	Group A	75.0	75.0	75.0	75.0	75.0
	Group B	78.8	78.8	78.8	78.8	78.8
	Group A+B	77.2	77.2	77.2	77.2	77.2
Determining M stage						
US	Group A	90.6	90.6	90.6	90.6	90.6
	Group B	86.8	86.8	86.8	86.8	86.8
	Group A+B	88.6	88.6	88.6	88.6	88.6
EUS	Group A	85.0	85.0	85.0	85.0	85.0
	Group B	80.0	80.0	80.0	80.0	80.0
	Group A+B	82.5	82.5	82.5	82.5	82.5
CT		86.2	86.2	86.2	86.2	86.2
IOUS		100	100	100	100	100
POD	Group A	95.8	95.8	95.8	95.8	95.8
	Group B	100	100	100	100	100
	Group A+B	98.2	98.2	98.2	98.2	98.2

CT, computed tomography; MRI, magnetic resonance imaging; EU, ultrasonography; EUS, endoscopic ultrasonography; CA 19-9, carbohydrate antigen 19-9; CEA, carcinoembryonic antigen; IOUS, intraoperative ultrasound; IOB, intraoperative biopsy; UHE, urgent histological examination; POD, postoperative diagnosis.

but with the highest sensitivity and specificity for US in our study. Fourth, EUS had the highest positive predictive value (92.6%) in assessing differential diagnosis, but its clinical utility is limited by its low negative predictive value (91.7%) and invasiveness. Fifth, EUS figures regarding pancreatic cancer staging by T, N, and M appeared to be worse than those initially reported in the literature. The detection of distant metastases is beyond the scope of EUS because of the restricted depth of the field of view, thus favoring US or CT. Nevertheless, it is important to note that the initial enthusiasm for EUS staging of pancreatic cancer has diminished as a result of recent studies reevaluating this technique. These investigations indicated that EUS is not as accurate as it was earlier suggested (20, 21). CA 19–9 and CEA assays were not valuable for differential diagnosis of pancreatic cancer and chronic pancreatitis, but the levels of CA 19-9 were significant higher in patients with advanced malignancy (T4, N1, and M1). Serum CA 19–9 level was proved to be more useful in indicating prognosis for pancreatic cancer, and this corresponds to literature data (22). IOUS gave the best overall diagnostic values both in differential diagnosis, pancreatic cancer detection and the staging of malignancy. IOB with urgent histological examination was thought to be the method of choice for intraoperative histological diagnosis of pancreatic focal lesion. The sensitivity, however, is

never 100%, and a review of false-negative diagnoses shows most to be caused by sampling error and rarely because of interpretive results. In our study, UH gave four false-negative cases; all the patients had a final diagnosis of pancreatic adenocarcinoma. Technological advances in body imaging will probably change the proposed approach to assess differential diagnosis and pancreatic cancer stage in upcoming years. Among others, the local application of ultrasound devices through laparoscopy, portal vein, or biliary and pancreatic ducts, combination of CT, MRI, and PET, use of elastography, contrast-enhanced color Doppler sonography, and Tru-cut needle biopsy guided by EUS show promise and await stringent evaluation. Since then, a combination of US as preoperative imaging techniques, followed by IOUS as confirmatory test intraoperatively, seems to be the most reliable strategy for improving the overall accuracy of preoperative and intraoperative differential diagnosis of the focal pancreatic lesions and pancreatic cancer staging.

Conclusions

High-quality preoperative imaging of chronic pancreatitis and cancer of the pancreas is essential in selecting patients who are candidates for surgery. No consensus exists with regard to the optimal imaging test for evaluation of the pancreas. Analysis of these data based on histopatological findings showed
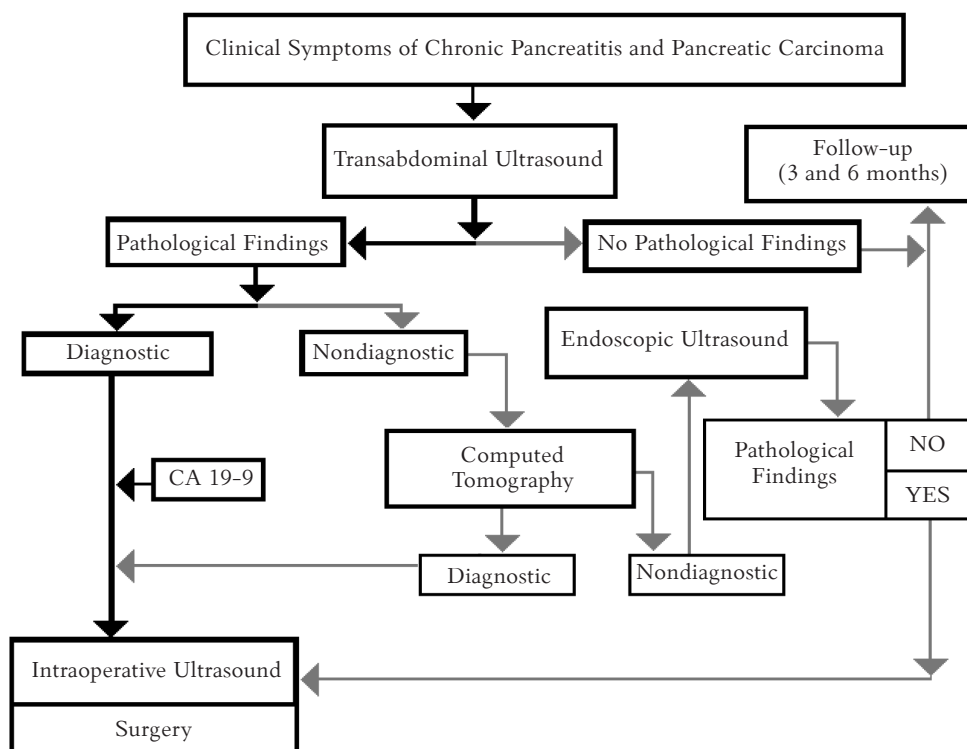

Fig. Diagnostic algorithm for the differentiation of chronic pancreatitis and pancreatic adenocarcinoma

that ultrasonography is the most useful preoperative diagnostic technique for differential diagnosis of chronic pancreatitis and pancreatic adenocarcinoma and staging of malignancy. If the pancreas is not well visualized on ultrasonography, computed tomography should be performed, and then, if the focal lesion is not evident, endoscopic ultrasonography can also be done. Serum CA 19–9 is useful in indicating prognosis for pancreatic cancer. Patients scheduled for surgery should be assessed by using intraoperative ultrasound. Application of the Trucut biopsy technique to intraoperative ultrasound has not specifically addressed its role in diagnosing malignancy: intraoperative biopsy with urgent histological examination does not improve the diagnostic values of intraoperative ultrasound, but can be used in the cases, classified as chronic pancreatitis.

Statement of Conflict of Interest
The authors state no conflict of interest.

Lėtinio pankreatito ir kasos vėžio diferencinė diagnostika: perspektyvusis 156 pacientų tyrimas

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Raktažodžiai: diagnozė, kasos vėžys, lėtinis pankreatitas.

Santrauka. *Tyrimo tikslas.* Prospektyvusis diagnostikos metodų vertinimas diferencijuojant lėtinį pankreatitą ir kasos vėžį bei nustatant adenokarcinomos išplitimą.

Tirtųjų kontingentas ir tyrimo metodai. Ištirti 156 pacientai, kuriems buvo diagnozuoti židininiai kasos pokyčiai. Tiriamieji atsitiktiniu būdu suskirstyti į dvi grupes. Transabdominalinė ultrasonoskopija ir endosonoskopija buvo atliekama abiejų grupių tiriamiesiems. A grupės tiriamiesiems papildomai buvo daryta kompiuterinė tomografija ir vėžio žymenys. B grupės tiriamiesiems atlikta intraoperacinė sonoskopija ir biopsija, taip pat skubus histologinis tyrimas. Palyginti visų tyrimo metodų rezultatai vertinant lėtinio pankreatito ir kasos vėžio diferencinės diagnostikos, adenokarcinomos nustatymo ir jos išplitimo tikslumą. Gauti duomenys patvirtinti operacijos radiniais ir galutinio histologinio tyrimo rodmenimis.

Rezultatai. Lėtinis pankreatitas diagnozuotas 58 (37,2 proc.), o kasos vėžys – 78 (50 proc.) tiriamiesiems. Židininių pokyčių dydis kasoje ir ligų klinikinės išraiškos buvo tapačios, tačiau sergantieji kasos vėžiu buvo vyresni (p<0,001). Pagal iki operacijos atliktos endosonoskopijos duomenis tiksliausiai diferencijuotos abi ligos (92,1 proc.) ir nustatyta kasos adenokarcinoma (91,8 proc.). Kompiuterinė tomografija tiksliausiai įvertino naviko dydį (84,5 proc.), o transabdominalinė ultrasonoskopija – limfmazgių pažeidimus (78,9 proc.) ir metastazes (88,6 proc.). Iš visų tyrimo būdų tiksliausia – intraoperacinė sonoskopija diferencijuojant (100 proc.), nustatant adenokarcinomą (98,5 proc.), naviko dydį (84,8 proc.), limfmazgių pažeidimus (87,9 proc.) bei metastazes (100 proc.).

Išvada. Tyrimas parodė, kad tiksliausias diagnostikos metodų, diferencijuojant lėtinį pankreatitą ir kasos vėžį bei vertinant adenokarcinomos išplitimą, derinys yra transabdominalinė ultrasonoskopija ir intraoperacinė sonoskopija. Jei ikioperacinis sonoskopinis ištyrimas yra neinformatyvus, taikytina kompiuterinė tomografija ir endosonoskopija.

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