MDCT Imaging Findings for Characterization Pancreatic Cystic Lesion: Differentiation between Benign and Malignant Pattern

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Objective: *The purpose of the present study was to determine the characteristic imaging findings for diagnosis of the benign or malignant nature of pancreatic cystic lesions by 64 slice multidetector computed tomography (MDCT) for further investigation or treatment.*

Material and Methaod: *A retrospective study was performed in 33 patients with pancreatic cystic lesion who underwent 64 slice MDCT to characterize and establish the diagnosis. The patients were enrolled between January 2004 and March 2009. The MDCT scan of abdomen from patients with pancreatic cystic lesion was retrospectively evaluated by two gastrointestinal radiologists without knowledge of the patient's history, clinical data, and final diagnosis. Sensitivity, specificity, accuracy, PPV, and NPV of CT scan for discriminate benign and malignant pancreatic cystic lesion were calculated. Weighted-kappa statistics were used to estimate agreement between readers.*

Results: *Thirty -three patients with pancreatic cystic lesion were included in the present study. Benign pancreatic cystic lesion are pancreatic pseudocyst (n = 16), serous cystadenoma (n = 4) and benign intraductal papillary mucinous neoplasms IPMN (n = 2). Premalignant and malignant pancreatic cystic tumor are mucinous cystic tumor (n = 5) and include solid pseudopapillary epithelial neoplasm of pancreas (n = 3) and malignant intraductal papillary mucinous neoplasms IPMN (n = 3). The final diagnosis was established either by pathological diagnosis (20 patients), EUS with FNA (11 patients) or F/U clinical and imaging findings (2 patients). Pseudopod sign is a helpful finding for diagnosis pancreatic pseudocyst (3/16) and not observed in other types pancreatic cystic lesions. Type of cyst (unilocular, multilocular microcystic, multilocular macrocystic and solid component) is the only finding that has statistical significance for differentiating between the benign and malignant groups ($p < 0.005$). The overall sensitivity, specificity and accuracy of 64-slice MDCT to discriminate benign and malignant pancreatic cystic lesion were 36.3%, 100% and 78.8%, respectively. In addition, the PPV and NPV were 100% and 75.9%, respectively.*

Conclusion: *The 64 sliced MDCT is a noninvasive method that can be used for discriminating between benign and malignant pancreatic cystic lesions, which is an important finding for further investigation and proper treatment.*

Keywords: *Pancreatic cyst, Multidetector computed tomography, Serous cystadenoma, Mucinous cystadenoma, Pseudocyst, Intraductal papillary mucinous tumor, Solid pseudopapillary epithelial neoplasm*

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Pancreatic cystic tumor is a rare type of pancreatic lesion. It is found in only 10% to 15% of all pancreatic lesions, and in only 1% of all pancreatic neoplasms[1]. With the technical development of thin slice, fast scan and multiplanar reformation, MDCT imaging is allowing more accurate clinical practice observation of these pancreatic cystic lesions. Characterization by using morphologic appearance of the lesion is helpful for diagnosis, prognosis, and further management in each patient. Although many types of cystic pancreatic neoplasm have been reported, serous cystadenoma, mucinous cystic neoplasm, and intraductal papillary mucinous neoplasms (IPMNs) account for 90% of all primary cystic pancreatic neoplasm[2]. Benign pancreatic cystic lesion includes pancreatic pseudocyst, serous cystadenoma, and benign types of IPMN, whereas premalignant and malignant pancreatic cystic tumors

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include mucinous cystic tumor, solid pseudopapillary epithelial neoplasm of pancreas (SPEN), and the malignant type of IPMN, which are recommended for surgical treatment. Imaging study in combination with serum tumor marker and ERCP findings were used for diagnosis of pancreatic cystic lesion.

The purpose of the present study was to identify the incidence of pancreatic cystic tumor in Siriraj Hospital institution, assess morphologic criteria by MDCT for diagnosis of pancreatic cystic lesion, and differentiate between benign and malignant patterns.

Material and Method

According to the local institutional review board, approval was obtained for this retrospective study and patient informed consent was not required. The ICD 10 database in Siriraj Hospital was searched for "serous cystadenoma of pancreas", "mucinous cystadenoma/carcinoma of pancreas", "intraductal papillary mucinous tumor/neoplasm of pancreas", "solid pseudopapillary epithelial neoplasm of pancreas", "pancreatic pseudocyst" between January 2004 and March 2009. Fifty patients were identified with available medical records, certain diagnosis and imaging data on the Picture Archiving and Communication System (PACS). Seventeen patients were excluded due to obvious pancreatitis pattern in CT scan study. The remaining 33 patients (16 women, 17 men; age range, 7-85 years; mean age, 54 years) were included in the present study population. Patient's symptoms, admission records, surgical records, follow-up records and pathologic findings were evaluated.

Four patients had serous cystadenoma (2 women, 2 men; age range, 54-66 years; mean age, 58.75 years). In each patient, the lesion was detected because of abdominal pain (n = 3) or an incidental finding by check up imaging (n = 1). Five women had mucinous cystadenoma (age range, 20-76 years; mean age, 47.6 years) including clinical presentation by abdominal pain (n = 3) and palpable abdominal mass (n = 2). Two patients with mucinous cystadenoma had a history of DM. Five patients had intraductal papillary mucinous tumor (IPMT): benign IPMT in two patients and malignant IPMN in three patients. In the benign IPMN group, two patients (one woman, one man; age range, 71-78 years; mean age, 74.75 years) presented with abdominal pain (n = 1) and jaundice (n = 1). Two women and one man were malignant IPMT (age range, 54-80 years; mean age, 64.67 years) and two presented with abdominal pain. Another one presented with abdominal mass. Three patients had solid pseudopapillary epithelial neoplasm (2 women, one man; age range, 37-62 years; mean age, 49.67 years). Two patients had a history of abdominal pain and one had palpable abdominal mass. Finally, 16 patients had pancreatic pseudocysts (4 women, 12 men; age range, 7-85 years; mean age, 51.06 years). All patients were symptomatic (abdominal pain, n = 12; abdominal mass, n = 2; cholestatic jaundice, n = 1; chronic diarrhea and steatorrhea, n = 1).

CT studies were performed using 64-slice MDCT (LightSpeed 64 scanner, GE Healthcare or Somatom Sensation 64, Siemens Medical Solutions) (n = 33) included non-enhanced and contrast material-enhanced imaging. All patients received 100 ml iodinated contrast material (non-ionic water soluble contrast medium) administered intravenously with power injection at rate 3 ml/s and followed by water 20 cc, 2 cc/sec. Three glasses of contrast (250 cc/glass) were administered orally, each of the first two glasses 15 minutes apart, and the last glass just before entering the CT room. In 31 patients, arterial images were also acquired with 1.25 mm collimation at 40 seconds after initial intravenous contrast injection (using the CARE bolus-triggering program). All scans included acquisition of porto-venous phase images with 1.25 mm and reconstruction at 5 mm collimation at 80 seconds after initial intravenous contrast injection. In one patient, delayed image was also obtained at 5 minutes after initial intravenous contrast injection. Images were obtained from the dome of the liver to the lower margin of the lower pole of kidneys during a single breath-hold. Images were reconstructed at 1.25 mm intervals with soft-tissue algorithm. Coronal and sagittal reformations from original axial images at workstation were performed for evaluated findings in each case.

The CT scans were selected by a coordinator (resident) who was not involved in the retrospective blinded interpretation of images by PACS. All patients were reviewed by consensus of two experienced abdominal radiologists (4 and 7 years of experience, respectively). These radiologists were provided with the diagnosis of "cystic lesion of the pancreas" but were blinded to the specific diagnosis and clinical information. The size, location (uncinate or head, neck or body or tail, or diffuse if all parts of the pancreas were involved), main pancreatic duct dilatation, calcification (central or peripheral), mural nodule, contour (round or oval, or lobulated, or speudopod). Lobulation was defined as the presence of rounded

contours that could not be described as the borders of the same circle. Pseudopod was defined as focal beak-appearance of cyst wall (Fig. 1). The wall of the cyst was considered thin if it was 2 mm or less and it was considered thick if it was more than 2 mm in diameter for maximum wall thickness. The septal enhancement, type of the cyst (unilocular, multilocular microcystic, multilocular macrocystic, or solid component), vascular involvement and cyst-duct communication were also recorded.

Images obtained in the arterial phase and portal venous phase were evaluated together. One patient had delayed image, five minutes after intravenous contrast injection and was evaluated. Another one had no arterial phase in CT study so the evaluation included both non-contrast and portal venous phases. The content of cyst was measured by region-of-interest in Hounsfield Unit (HU). The associated findings such as calcification in pancreatic parenchyma, IHD or CBD dilatation, peripancreatic fat stranding (peripancreatic adipose tissue increased attenuation relative to that of subcutaneous fat) or varices (abnormally enlarge collateral veins) were also evaluated.

The present statistic data were analyzed by SPSS version 15. Positive predictive value (PPV), negative predictive value (NPV), sensitivity, specificity, and accuracy of CT scan for diagnosis pancreatic cystic lesion were also calculated. P-value was also calculated in each finding by Chi-square test or Fishers' exact test where appropriate. P-value of 0.05 or less was considered statistically significant. Inter-observer agreement was assessed with weighted-kappa statistic and was interpreted by using the following scale: fair agreement, 0.21-0.40; moderate agreement, 0.41-0.60; substantial agreement, 0.61-0.80; and almost perfect agreement, 0.81-1.0.

Results

Inter-observer agreement for favorable diagnosis (benign vs. malignant) was assessed with weighted-kappa statistic that is 0.716 (substantial agreement). The rest of the agreements in other radiographic findings are displayed in Table 1. CT findings in each pancreatic cystic lesion are also demonstrated in Table 2. Accuracy of reviewer 1 and 2 for diagnosis specific type of pancreatic cystic lesions was 78.78% (26/33) and 75.75% (25/33), respectively.

About half of the patient population in the present study was pancreatic pseudocysts with mean size 6.89 cm round or oval shape (13/16) with unilocular pattern (13/16), usually observed at body-tail and homogeneous content. Pseudopod contour was found in three patients (18.75%) (Fig. 1). About 25% of pseudocyst group had vascular thrombosis or compression. It is rarely seen in cyst-duct communicate (2/16 pt, 12.5%). Three lesions were misdiagnosed as mucinous cystic neoplasm (one lesion from reviewer1, two lesions from reviewer 2) and one lesion was misdiagnosed as benign IPMN from reviewer 2.

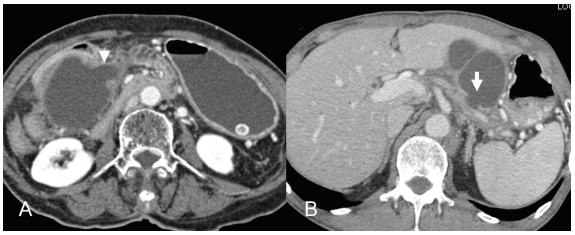

Fig. 1 A 78 year-old female with abdominal pain and palpable abdominal mass: Axial post contrast CT scan (A) show unilocular cystic lesion with pseudopod sign (arrow head) at head of pancreas. Axial post contrast CT scan of another patient (B) demonstrated the same appearance of pseudopod sign in pseudocyst at body of pancreas

Serous cystadenoma were found in four patients with a mean diameter about 4.2 cm, more common at body (2/4 pt), central calcification (2/4 pt, Fig. 2), lobulated contour (4/4 pt), multilocular micro-cystic pattern (3/4 pt), homogeneous content (4/4 pt), septal enhancement (4/4 pt) and thin wall (3/4 pt). Central scar was identified in one patient. One patient was misdiagnosed as mucinous cystic neoplasms from both reviewers due to atypical multilocular macrocystic pattern. Another one patient was misdiagnosed as benign branch duct type IPMN from reviewer 1.

Table 1. Kappa value in each CT finding

Sign	Kappa value
Contour of cyst	1.000
Location of tumor	1.000
Calcification	0.929
Mural nodule	-
Septal enhancement	1.000
Type of cyst	0.956
Vascular involvement	0.926
Cyst duct communication	0.676
Content of cyst	1.000
Favorable diagnosis (benign vs. malignant)	0.716

Table 2. Pattern of MDCT findings in each type of pancreatic cystic lesion

MDCT findings	Pseudocyst (n = 16)	Serous cystadenoma (n = 4)	Benign IPMN (n = 2)	Malignant IPMN (n = 3)	SPEN (n = 3)	Mucinous cystadenoma (n = 5)
Mean size (cm)	6.89	4.2	5.45	4.65	5.95	11.68
Location						
Uncinate process	3	0	0	1	0	0
Head	3	1	1	2	2	0
Neck	1	0	1	0	0	0
Body	4	2	0	0	0	2
Tail	5	1	0	0	1	3
Main pancreatic duct dilatation	7	0	1	3	0	0
Maximal diameter of main pancreatic duct dilatation (cm)	0.72	-	1.07	1.47	-	-
Calcification						
Central	0	2	0	1	0	0
Peripheral	2	1	0	0	1	2
No	14	1	2	2	2	3
Central scar	0	1	0	0	0	0
Mural nodule	0	0	1	1	0	0
Contour						
Round or oval	13	0	0	0	3	5
Lobulated	0	4	2	3	0	0
Pseudopod	3	0	0	0	0	0
Type of cyst						
Unilocular	13	0	0	0	0	1
Multilocular micro (< 2 cm)	0	3	1	1	0	0
Multilocular macro (> 2 cm)	3	1	1	1	1	4
Solid component	0	0	0	1	2	0
Content of cyst						
Homogeneous	13	4	2	1	1	5
Heterogeneous	3	0	0	1	2	1
Septal enhancement						
Enhancement	3	4	2	2	1	4
Non enhancement	13	0	0	2	2	0
Wall thickness						
Thin (≤ 2 mm)	4	3	2	3	1	1
Thick	10	1	0	0	2	4
Vascular involvement	4	0	0	1	0	4
Cyst-duct communication	2	0	2	2	0	0
Peripancreatic fat stranding	6	0	0	0	0	0
Calcification of pancreatic parenchyma	4	0	0	1	0	0

MDCT = multi detector computed tomography

Benign IPMN were found in two patients with mean size about 5.4 cm, at body and tail. They had lobulated contour, homogeneous content, thin enhanced septum, and cyst-duct communication. Main pancreatic duct dilatation was found in one patient with maximal diameter of duct about 1.02 cm. Multilocular microcystic pattern (1pt) and multilocular macrocystic pattern (1pt) were classified. No calcification or central scar was observed.

Three patients were categorized as malignant IPMN. The tumor mean diameter was about 4.65 cm. Two tumors were localized at pancreatic head and one tumor at uncinate process. Main pancreatic duct dilatation was found in all patients with mean maximal

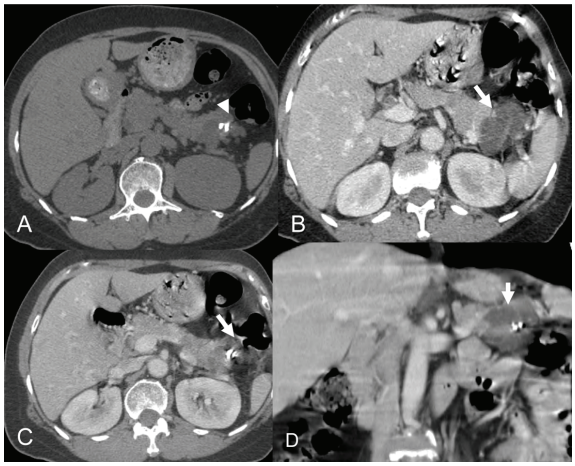

Fig. 2 A 54 year-old female with epigastruim pain. Axial non contrast CT scan (A), axial post contrast CT (B, C) and post contrast coronal view (D)show multilocular microcystic lesion (arrow in B, C, D) with central calcification (arrow head in A) at tail of pancreas. The EUS finding (not shown) reveals lobulated mass contained numerous microcyst showing honeycomb appearance at tail of pancreas, compatible with serous cystadenoma

diameter of duct about 1.47 cm. All tumors had lobulated contour and thin septation. One patient with small enhancing mural nodule and multilocular macrocystic pattern at uncinate process of pancreas was wrongly interpreted as benign IPMN from both reviewers (Fig. 3). The pathological finding revealed borderline malignant potential in this patient. One patient with heterogeneous enhancing solid-cystic pattern at pancreatic head region was missing interpreted from reviewer 1 as solid pseudopapillary epithelial neoplasm.

Three patients with diagnosis as solid pseudopapillary epithelial neoplasms were identified in the present study. Mean diameter was calculated about 5.95 cm. Two lesions were found at the pancreatic head and one lesion was found at the tail. No associated main pancreatic duct dilatation or central scar, vascular involvement, pancreatic parenchymal calcification, cyst-duct communication or peripancreatic fat stranding was observed. One tumor with atypical multilocular macrocystic pattern was wrongly interpreted as mucinous cystic neoplasm from both reviewers. One tumor was misdiagnosed as serous cystadenoma by reviewer 1 and malignant IPMN by reviewer 2. The last lesion was falsely diagnosed by reviewer 2 as mucinous cystic neoplasm (Fig. 4).

Five lesions of mucinous cystadenoma were pathological diagnosis in the present study. All lesions were found in females, mean age about 46.7 years. Two lesions were found in the body and three lesions were found at the tail region. The mean diameter of lesion was 11.68 cm. All tumors had round or oval contour with homogeneous content, four lesions in multilocular macrocystic pattern (Fig. 5), thick wall and vascular involvement, and one lesion in unilocular pattern (Fig. 6). Vascular involvement is splenic vein compression by the large size of cyst causing appearance of collateral vessels around lesion and stomach. Main pancreatic duct dilatation, central scar, mural nodule, cystic-duct communication, calcified pancreatic parenchyma, or peripancreatic fat stranding was not demonstrated in this group. One lesion was wrongly interpreted as serous cystadenoma by reviewer 2.

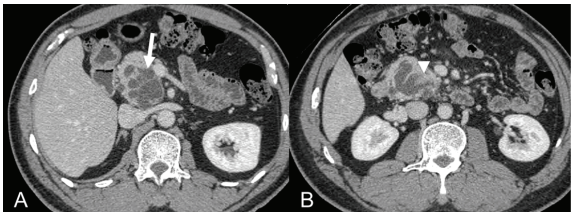

Fig. 3 A 54 year-old male with chronic abdominal pain and history of chronic pancreatitis. The axial post contrast CT scan showed multilocular macrocystic lesion at head of pancreas (arrow in A) with enhancing mural nodule (arrowhead in B). Diffused main pancreatic duct dilatation is observed (not shown). The pathology from Whipple operation revealed intraductal papillary mucinous neoplasm with borderline malignant potential

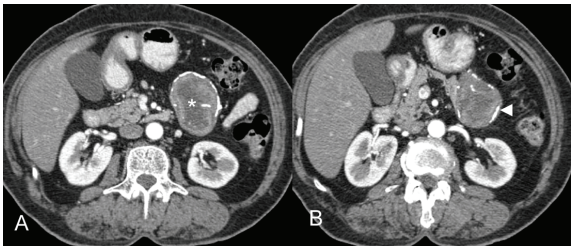

Fig. 4 A 62 year-old female with history of chronic dyspepsia. Axial post contrast CT scan (A, B) show solid and cystic mass with heterogeneous enhancement (*) at tail of pancreas with partially peripheral calcification (arrow head). Pathology reveal solid pseudopapillary tumor

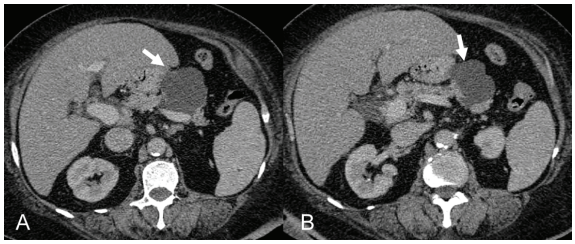

Fig. 5 A 76 year-old female with chronic dyspepsia. Axial post contrast CT (A, B) scan revealed multilocular macrocystic lesion with no mural nodule at body of pancreas (arrow). She had been distal pancreatectomy with splenectomy and pathology showed mucinous cystic neoplasm

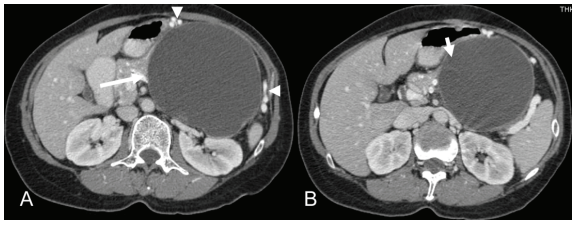

Fig. 6 A 45 year-old female with LUQ pain. Axial post contrast CT scan (A,B) showed large well-defined multilocular macrocystic lesion at body and tail of pancreas (long arrow in A). Splenic vein compression with collateral vessel (arrow head in A) and partially internal septation (short arrow in B) are noted. She had distal pancreatectomy and splenectomy and pathology revealed mucinous cystadenoma

These cystic pancreatic lesions were re-categories as two groups, benign and malignant. The benign group included pancreatic pseudocyst, serous cystadenoma, and benign IPMN due to no malignant potential, and can be conservatively treated or placed under observation in asymptomatic patients. Mucinous cystadenoma was premalignant potential tumor for which surgical treatment was recommended[3]. This lesion was then categorized into the malignant group. Still about 15% of solid pseudopapillary epithelial neoplasm showed metastasis disease and was characterized as being low grade potential for development of cancer[4,5]. This tumor was also categorized in the malignant group. Another malignant pancreatic cystic tumor was malignant type of IPMN. Characteristic of MDCT findings and p-value in benign and malignant groups are demonstrated in Table 3. According to this data, type of cyst is the only finding

Table 3. Pattern of MDCT findings in benign and malignant pancreatic cystic lesions

MDCT Findings	Benign n (%)	Malignant n (%)	p-value
Pancreatic duct dilatation			0.602
No	14 (63.64)	8 (72.73)	
Yes	8 (36.36)	3 (27.27)	
Central scar			-
No	21 (95.45)	11 (100)	
Yes	1 (4.54)	0	
Contour			0.424
Round or oval	13 (59.09)	8 (72.73)	
Lobulated	6 (27.27)	3 (27.27)	
Pseudopod	3 (13.64)	0	
Location			0.602
Uncinate process	3 (13.64)	1 (9.09)	
Head	5 (22.73)	4 (36.36)	
Body	6 (27.27)	2 (18.18)	
Neck	2 (9.09)	0 (0.00)	
Tail	6 (27.27)	4 (36.36)	
Calcification			0.626
No	17 (77.27)	7 (63.64)	
Central	2 (9.09)	1 (9.09)	
Peripheral	3 (13.64)	3 (27.27)	
Mural nodule			-
No	21 (95.45)	10 (90.91)	
Yes	1 (4.54)	1 (9.09)	
Septal enhancement			0.218
No	13 (59.09)	4 (36.36)	
Yes	9 (40.91)	7 (63.64)	
Type of cyst			0.005
Unilocular	13 (59.09)	1 (9.09)	
Multilocular (micro)	4 (18.18)	1 (9.09)	
Multilocular (macro)	5 (22.73)	6 (54.54)	
Solid component	0	3 (27.27)	
Vascular involvement			0.097
No	18 (81.82)	6 (54.54)	
Yes	4 (18.18)	5 (45.45)	
Cyst-duct communication			1.000
No	18 (81.82)	9 (81.82)	
Yes	4 (18.18)	2 (18.18)	
Content			0.132
Homogeneous	19 (86.36)	7 (63.64)	
Inhomogeneous	3 (13.64)	4 (36.36)	
Pancreatic calcification			0.492
No	18 (81.82)	10 (90.91)	
Yes	4 (18.18)	1 (9.09)	

MDCT = Multi detector computed tomography
Number pre parenthesis is representing number of patient in each finding. Number in parenthesis is representing percentage compared with all patients in each benign and malignant group

that has the statistical significance to differentiate between the benign and malignant groups ($p < 0.005$).

Discussion

Pancreatic cystic lesions are an uncommon finding, categorized as pancreatic pseudocyst and non-pseudocyst. The latter group is pancreatic cystic tumor, which is found in only 1% of all pancreatic tumors[1]. Current development of MDCT technology, which employs fast scan, thin slice, isotropic data and multiplanar imaging, increasingly facilitates identification of lesions in the pancreas and characterize pancreatic cystic lesions more accurately. Then, CT is the non invasive modality of choice to detect and characterize of pancreatic lesion.

Pancreatic pseudocysts comprise the majority of all cystic lesions within the pancreas, up to 75%[6]. In the present study, pancreatic pseudocyst was found in 16 patients. (48.5%), in which there was male predominance (12/16 patients). Most pancreatic pseudocysts in our study had a unilocular pattern with round- or oval-shape (13/16 patients, 81.25%) whereas the rest (3/16 patients, 18.75%) had multi-locular macrocystic pattern, a similar finding to that described by Young H. Kim et al[7]. Another three cases had unilocular-pseudopod pattern that had not been reported in any previous study. Pseudopod was defined as focal beak-appearance of cyst wall. In our study, this pattern was not found in other diseases so it is favorable for pancreatic pseudocyst. However, most of the present patients had a clinical history of recent acute pancreatitis, causing rather large in mean diameter (6.8 cm). The clinical usefulness of this pseudopod sign in small, asymptomatic pancreatic pseudocyst should be further investigated. Young H. Kim et al[7], described associated stigmata of chronic pancreatitis, such as parenchymal calcifications, ductal stones, pancreatic duct dilatation and atrophic change of parenchyma that found in pancreatic pseudocyst superimposed on chronic pancreatitis which were found in the present study in only 25% (4/16 patients). In the present study, the main pancreatic duct dilatation was found in 7/16 cases, with an average of 0.72 cm in diameter which is a smaller size than intraductal papillary mucinous tumor (IPMT) due to different in pathology. Cyst duct connection is found in a small number of cases in the present population (2/16 patients, 12.5%) which contrasts to a prior study that found up to 65%[8].

Serous cystadenomas have three morphologic patterns: polycystic, honeycomb and oligocystic[9]. Polycystic pattern (multiple microcyst less than 2 cm) are most commonly found in up to 70% of cases which is the same as the present study (3/4 patients, 75%). However, one patient had macrocystic lesion that was a very uncommon pattern and should be differentially diagnosed as mucinous cystic tumor. Calcified fibrous central scar was seen on CT, MRI in 30% of case and was highly specific and pathgnomonic for serous cystadenoma[10]. The present study found this typical calcified central stellate scar in one patient (1/4 patients, 25%). Shah et al[11] suggested that the combination of microcystic appearance and surface lobulations offers accuracy comparable to central scar with higher sensitivity. Serous cystadenoma was mostly found at head region. However, in the present study, it is located at the body or tail region (3/4 patients) and in another one at the head region. Atypical manifestations of serous cystadenoma includes giant tumors with ductal dilatation, intratumoral hemorrhages, solid variants, unilocular cystic tumors, interval growth and a disseminated form and are described in the literature[12]. Serous cystadenomas are generally considered as benign. However, about 3% of these groups have malignant potential with local invasion and distant metastasis[13]. Most lesions are slow growing tumors with median growth rate about 0.6 cm/year. In lesions smaller than 4 cm in diameter, growth rate is 0.12 cm/year whereas when tumors larger than 4 cm in diameter they grow about 1.98 cm/year[14]. Complete resection is considered in large size tumors when symptomatic and when suspicious as invasive form[14-16].

Intraductal papillary mucinous neoplasms (IPMNs) are a ductal type of mucinous pancreatic tumor. IPMNs can be divided in three subtypes, branch duct type, main duct type, and combined type. Enhancement of ductal nodule and severe dilatation of the main pancreatic duct are more frequent in the malignant form[17, 18]. Solid cystic appearance with heterogeneous enhancement is observed as malignant transformation of IPMN, which could be differentiated from solid pseudopapillary neoplasm, mucinous cystadeno-carcinoma and cystic change in neuroendocrine tumor.

Degenerative cystic changes are common in solid pseudopapillary epithelial neoplasms due to poor blood supply at the central area. Pathological features include solid, cellular, hypervascular regions without gland formation, and degenerative pseudopapillae[5]. The tumor has a slow growing rate, with uncommon metastases to the liver or peritoneum. Malignant form is commonly found in males of older age[19]. Even in the presence of disseminated disease, 5 year - survival rate

is 97%[4]. Aggressive behaviors in this tumor are venous invasion, extensive tumor necrosis, diffuse growth pattern, high mitotic rate, and significant nuclear atypia[20]. Morphologic appearances of solid pseudopapillary epithelial neoplasms in the present study are variable and may be confused with multilocular macrocystic pattern in mucinous neoplasm and solid like lesions in the honeycomb type of serous cystadenoma.

Mucinous cystic neoplasms are common in middle-aged women, located at body-tail and usually found in large size at first diagnosis[21,22]. The present mean size diameter is about 11.68 cm. Splenic vein compression with collateral venous drainage is usually an associated finding in the present study due to markedly enlarged tumor size. This imaging pattern is also similar to splenic vein thrombosis in pancreatic pseudocyst. Mucinous cystic neoplasm can be distinguished from intraductal papillary mucinous tumor by its lack of cyst-duct communication. It can be classified as adenoma, borderline tumor, noninvasive, and invasive carcinomas. Intramural nodules and papillary projection are findings in the malignant group[23]. Many researchers have assumed that most mucinous cystic neoplasms are histologically benign neoplasms, which if not removed, may become invasive adenocarcinoma. Therefore, complete excision is the recommended treatment for cystic mucinous pancreas neoplasms. The 5-year survival rate of patients with resected mucinous cystadenocarcinomas appears to be significantly better than that of ductal adenocarcinomas, ranging from 50% to 70%[24].

According to the present findings, that type of cyst (unilocular, multilocular microcystic, multilocular macrocystic and solid component) can be used for differentiating between benign and malignant pattern of pancreatic cystic lesion. However, overlapping of pattern of cystic type is usually observed. For example, unilocular macrocystic type in serous cystadenoma, mucinous cystadenoma and pseudocyst also have unilocular cystic pattern. Cohen-Scali et al[25] found that location in pancreatic head, lobulated contour, and absence of wall enhancement are specific for unilocular macrocystic serous cystadenoma. In equivocal cases or with atypical images pattern, endoscopic ultrasonography with fine-needle aspiration for cytology analysis and tumor maker evaluation are useful to guide management and confirmation of the diagnosis of pancreatic cystic lesions[26]. Large or symptomatic cysts in fit patients should undergo resection where possible. By the way, small asymptomatic cysts (less than 3 cm) may be safely followed-up with cross sectional imaging within four years. Increase in cyst size or development of symptoms should be advised for surgery[6].

Limitations of the present study are that it contains a small number of subjects, especially those with pancreatic cystic tumor. Second, this retrospective study may be cause bias in selective cases. Other rare types of pancreatic cystic lesion, such as acinar cell cystadenocarcinoma, lymphangioma, hemangioma, paraganglioma, solid pancreatic lesions with cystic degeneration, sarcoma, cystic teratoma, and true epithelial cysts are not included in the present study population. Third, pathological tissue was not derived from the present entire patient population. Further study with a larger number of patients who underwent MDCT is suggested. In conclusion, MDCT is the non-invasive imaging modality of choice for evaluation of cystic lesions of the pancreas.

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Potential conflicts of interest

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การวินิจฉัยก้อนถุงน้ำในตับอ่อนโดยใช้การตรวจเอกซเรย์คอมพิวเตอร์ 64 สไลด์แยกระหว่างถุงน้ำชนิดที่เป็นมะเร็งและไม่ใช่มะเร็ง

โสภา พงศ์พรทรัพย์, ศิริวรรณ ปิยพิทยานันต์, อภิญญา เจริญศักดิ์

วัตถุประสงค์: *เพื่อศึกษาลักษณะภาพเฉพาะในการวินิจฉัยแยกโรคก้อนถุงน้ำในตับอ่อนโดยใช้การตรวจเอกซเรย์คอมพิวเตอร์ 64 สไลด์แยกระหว่างถุงน้ำชนิดที่เป็นมะเร็งและไม่ใช่มะเร็ง เพื่อการรักษาโรคต่อไปได้อย่างถูกต้อง*

วัสดุและวิธีการ: *ศึกษาย้อนหลังจากผู้ป่วยที่ได้รับการตรวจเอกซเรย์คอมพิวเตอร์ 64 สไลด์จากผู้ป่วยจำนวน 33 คน ที่มีถุงน้ำในตับอ่อนในโรงพยาบาลศิริราชตั้งแต่เดือนมกราคม พ.ศ. 2547 ถึงมีนาคม พ.ศ. 2552 โดยรังสีแพทย์ 2 ท่าน ที่ไม่ทราบประวัติและการวินิจฉัยเพื่อศึกษาลักษณะที่พบในแต่ละโรค แยกระหว่างถุงน้ำชนิดที่เป็นมะเร็ง หรือมีแนวโน้มจะกลายเป็นมะเร็งจากกลุ่มที่ไม่ใช่มะเร็ง และหาความไว ความจำเพาะ ความแม่นยำของการตรวจ*

ผลการศึกษา: *ผู้ป่วย 33 คน ที่มีก้อนถุงน้ำในตับอ่อน แยกเป็นกลุ่มถุงน้ำที่ไม่ใช่มะเร็ง คือ pancreatic pseudocyst (16 คน), serous cystadenoma (4 คน) และ benign intraductal papillary mucinous neoplasms (IPMNs) (2 คน) ส่วนกลุ่มที่มีแนวโน้มที่จะกลายเป็นเนื้อร้ายและกลุ่มที่เป็นมะเร็ง ได้แก่ mucinous cystic tumor (5 คน), solid pseudopapillary epithelial neoplasm of pancreas (3 คน) and malignant intraductal papillary mucinous neoplasms (IPMNs) (3 คน) โดยผู้ป่วยจำนวน 20 คน ได้รับการผ่าตัดและได้ผลทางพยาธิวิทยายืนยัน ผู้ป่วย 11 คน ได้รับการตรวจด้วย endoscopic ultrasound (EUS) ร่วมกับการตรวจเจาะน้ำในรอยโรคและตรวจทางเซลล์วิทยา (FNA with cytologic analysis) และผู้ป่วย 2 คน ได้รับการตรวจติดตามลักษณะทางคลินิกและภาพเอกซเรย์ Pseudopod sign เป็นลักษณะภาพในเอกซเรย์คอมพิวเตอร์ที่พบและช่วยในการวินิจฉัย pancreatic pseudocyt (3 ใน 16 ราย) ซึ่งไม่พบในถุงน้ำชนิดอื่น ๆ ลักษณะของถุงน้ำ (unilocular, multilocular microcystic, multilocular macrocystic และ solid component) มีความสำคัญทางสถิติที่สามารถแยกระหว่างถุงน้ำชนิดที่เป็นมะเร็ง หรือมีแนวโน้มจะกลายเป็นมะเร็งจากกลุ่มที่ไม่ใช่มะเร็ง ($p < 0.005$) ค่าความไว, ความจำเพาะ และความถูกต้องในการแยกชนิดถุงน้ำในตับอ่อนที่เป็นมะเร็ง หรือ มีแนวโน้มจะกลายเป็นมะเร็งจากกลุ่มที่ไม่ใช่มะเร็ง โดยใช้เอกซเรย์คอมพิวเตอร์ 64 สไลด์ เท่ากับ 36.36%, 100% และ 78.78% ตามลำดับ นอกจากนี้ค่า PPV และ NPV เท่ากับ 100% และ 75.86%*

สรุป: *การตรวจวินิจฉัยถุงน้ำในตับอ่อนโดยใช้การตรวจเอกซเรย์คอมพิวเตอร์ 64 สไลด์ สามารถช่วยแยกระหว่างเนื้องอก/การอักเสบจากมะเร็งได้ ทำให้ผู้ป่วยได้รับการรักษาที่ถูกต้องมากขึ้น*