

CT在胰腺浆液性寡囊性腺瘤与非浸润性黏液性囊性肿瘤中的 诊断价值

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摘要:【目的】探讨 CT 在胰腺浆液性寡囊性腺瘤(SOA)与非浸润性黏液性囊性肿瘤(MCN)中的诊断价值。【方法】回顾性分析 37 例经病理证实为胰腺 SOA(18 例)或非浸润性 MCN(19 例)患者的临床及 CT 影像资料,对两组病例病变发生部位、病变形态、囊腔最大径、囊壁厚度、囊液 CT 值、壁结节或乳头状突、胰管扩张及钙化进行评价分析。采用 *t* 检验、卡方检验、Fisher 确切概率法以及 Mann-Whitney U 检验进行统计分析。【结果】两组病例在病变发生部位、病变形态、囊壁厚度这些方面的差异具有统计学意义($P < 0.033$)。SOA 常发生于胰头颈部(11/18 例),病变形态多表现为不规则分叶状(14/18 例),囊壁菲薄均匀,平均厚度为(1.1 ± 0.2)mm。而非浸润性 MCN 多位于胰体尾(14/19 例),病变形态多表现为类圆形(14/19 例),囊壁厚薄不均,平均厚度为(2.1 ± 1.0)mm。【结论】胰腺 SOA 与非浸润性 MCN 在病变发生部位、病变形态及囊壁厚度这些方面各有特点;CT 在鉴别诊断胰腺 SOA 与非浸润性 MCN 具有一定价值。

关键词: 胰腺;浆液性寡囊性腺瘤;非浸润性黏液性囊性肿瘤

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Characteristic Features of CT in Differentiating Pancreatic Serous Oligocystic Adenomas with Noninvasive Mucinous Cystic Neoplasms

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Abstract:【Objective】 The purpose of our study was to determine useful CT features for differentiating serous oligocystic adenomas (SOA) of the pancreas with noninvasive mucinous cystic neoplasms (MCN). 【Methods】 Retrospectively included 37 patients with pathologically proven cystic pancreatic neoplasms: SOA in 18 patients and noninvasive MCNs in 19; location, shape, greatest diameter, thickness of the cystic wall, CT value of the cystic fluid, presence of mural nodules and calcification, dilation of main pancreatic duct were analyzed by CT. T-test, chi-square test, Fisher's exact test and Mann-Whitney U test were performed. 【Results】 Significant differences were found in lesion location ($P = 0.033$), shape ($P = 0.002$) and thickness of the cystic wall ($P = 0.000$) between SOA and noninvasive MCN. SOA located in the head and neck of the pancreas ($n = 11$; 61%), with lobulated contour ($n = 14$; 78%) and thin cystic wall (1.1 ± 0.2 mm). However, most of the noninvasive MCN arisen in the body and tail ($n = 14$; 74%) of the pancreas, showed smooth round contour ($n = 14$; 74%) and the cystic wall were much thicker and uneven (2.1 ± 1.0 mm). No significant difference was apparent between SOA and noninvasive MCN in other CT features. 【Conclusions】 There are significant characteristic CT features of serous oligocystic adenomas and noninvasive mucinous cystic neoplasms: location, shape and thickness of the cystic wall could be sensitive features for distinguishing these two lesions.

Key words: pancreas; serous oligocystic adenoma; noninvasive mucinous cystic neoplasms

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Introduction

Mucinous cystic neoplasms (MCN) and serous cystic neoplasms (SCN) are commonly found as primary pancreatic cystic neoplasms. All the MCNs are classified as malignancy or lesions with malignant potential (noninvasive MCN). Currently, based on the number and size of the cyst, benign SCN of the pancreas are subclassified into serous microcystic adenomas (SMA), serous oligocystic adenomas (SOA), serous solid adenomas, von-Hippel-Lindau correlative neoplasms (VHL-CN) and mixed serous cystic neoplasms by the World Health Organization in 2010. SOA, a synonym for serous macrocystic adenoma, constitute 30% of SCN and are mostly manifested as a lesion with larger and fewer cysts which are quiet difficult for differential diagnosis with noninvasive MCN^[1-3]. Hence, it is important to discriminate SOA from noninvasive MCN before surgery since their clinical managements are different. SOA could be safely observed while MCN deserve surgical resection^[4-5].

Despite the recent advances in MSCT, the accurate characterization and differentiation between SOA and noninvasive MCN before surgery remain difficult because of their overlapping imaging features. Several studies^[6-8] have showed that a fraction of SOA had been misdiagnosed as noninvasive MCN and inappropriately managements were given to those patients. And overview recent literatures there were few papers with specific CT features of SOA that helpfully differentiate it from noninvasive MCN. Thus, the purpose of our study was to determine the useful CT imaging features for differentiating SOA of the pancreas with noninvasive MCN.

1 Materials and methods

1.1 Data collection

In accordance with ethical guidelines for human research and compliant with the Health Insurance Portability and Accountability Act (HIPAA), this

study was approved by the research ethical committee of The First Affiliated Hospital, Sun Yat-Sen University. Written informed consent was obtained from each adult patient or from the parents of the patients younger than 18 years old.

Patients in January 2010 to November 2015 were retrospectively recruited in our study. They all met the following criteria: pathologically proved SOA (number of cysts: ≤ 6 ; greatest diameter: ≥ 2 cm) and noninvasive MCNs. The pathological results were reconfirmed by a pathologist with 20 years experience. Finally 37 patients (Male: 7; female: 30; mean age: 47 years) were retrospectively enrolled in our study (18 patients with SOA and 19 patients had noninvasive MCN).

1.2 CT protocols

All patients were fasted for six to eight hours and drank 2.5% Mannitol (150-300 mL) in twenty minutes before scanning for achieving the adequate distension of gastrointestinal tract. CT scan was performed from the dome of the diaphragm to the lower level of kidney with the patients in a supine position in a 64-detector-row scanner (Aquilion64, Toshiba Medical System, Tokyo, Japan). Tri-phasic images were acquired before and after (35 s and 70 s, respectively) intravenous administration of 1.5 mL/kg of iodinated contrast medium (Ultravist 300, Schering, Berlin, Germany) at the rate of 3 mL/s. The acquisition parameters were 120 kV, 250 mA, 64 \times 0.5 mm collimation, 0.9 pitch, and 1 mm slice thickness.

1.3 Image analysis

Two experienced abdominal radiologists who were blinded to the diagnosis and clinical information reviewed the CT images by consensus in terms of the following morphologic features of the lesion: location (head and neck, or body and tail), shape (smooth round contour, or lobulated contour), greatest diameter (measured in centimeter), thickness of the cystic wall (measured in millimeter), CT value of the cystic fluid (measured in HU), presence of mural nodules and calcification (present or absent), dilation of the main pancreatic duct (normal or

dilated; the main pancreatic duct was considered abnormally dilated when the diameter was more than 3 mm).

All CT features were reviewed through PACS and coronal/sagittal reconstructed images of each patient were reviewed. CT values of the cystic fluid and presence of cystic wall calcification were observed on unenhanced images. The greatest diameter and dilation of main pancreatic duct were measured in the arterial phase. Thickness of the cystic wall was defined as the thickest portion of wall which should be measured in portal venous phase and devoid of pancreatic parenchyma, mural nodule and internal septa. It was recorded as 1 mm if the cystic peripheral wall was less than 1mm.

1.4 Statistical analysis

Statistical analysis was performed by SPSS 13.0 (Illinos, USA). Mean greatest diameters and CT value of the cystic fluid of two types of lesions were comply with normal distribution which were compared by t-test, while the data of mean thickness of the cystic wall was not in consistent with normal distribution was compared using Mann-Whitney U test. Chi-square test was used to compare the lesion location and Fisher's exact test was employed to comparing other CT morphologic features. $P < 0.05$ was considered to indicate a statistically significant difference.

2 Results

2.1 Patients

18 patients (Male : 3; female : 15) with SOA , ranging in age from 26 to 58 years with a mean age of 44 years, and with abdominal pain in eight patients. 19 patients (Male : 4; female : 15) were diagnosed as noninvasive MCN, ranging in age from 26 to 79 years with a mean age of 50 years. Of the patients with noninvasive MCN, ten patients had a history of abdominal pain and one patients suffered from acute pancreatitis. Laboratory examination results and serum tumor markers were within the normal limits in all patients. There were no significant differences in

clinical characteristics of the patients with SOA and noninvasive MCN. (Table 1).

Table 1 Clinical characteristics of patients

| | SOA (n=18) | Noninvasive MCN(n=19) | t/ χ^2 | P value |
|--------------------|---------------|--------------------------|-------------|---------------------|
| Sex(Male/Female) | | | 0.116 | 1.000 ¹⁾ |
| Male | 3 | 4 | | |
| Female | 15 | 15 | | |
| Age/year | | | -1.293 | 0.204 ²⁾ |
| Range | 26~58 | 26~79 | | |
| Mean | 44 | 50 | | |
| Symptoms | | | 2.089 | 0.653 ¹⁾ |
| asypomatic | 8 | 5 | | |
| abdominal pain | 8 | 10 | | |
| acute pancreatitis | 0 | 1 | | |
| others | 2 | 3 | | |

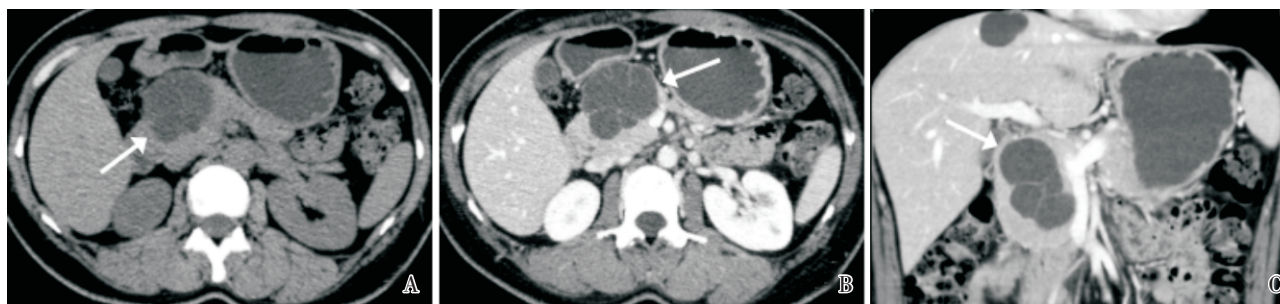
SOA: serous oligocystic adenomas; MCN: mucinous cystic neoplasms. Numbers in parentheses are percentages.

1)Fisher's exact test; 2)t-test. $P < 0.05$ was considered to indicate a statistically significant difference.

2.2 CT features

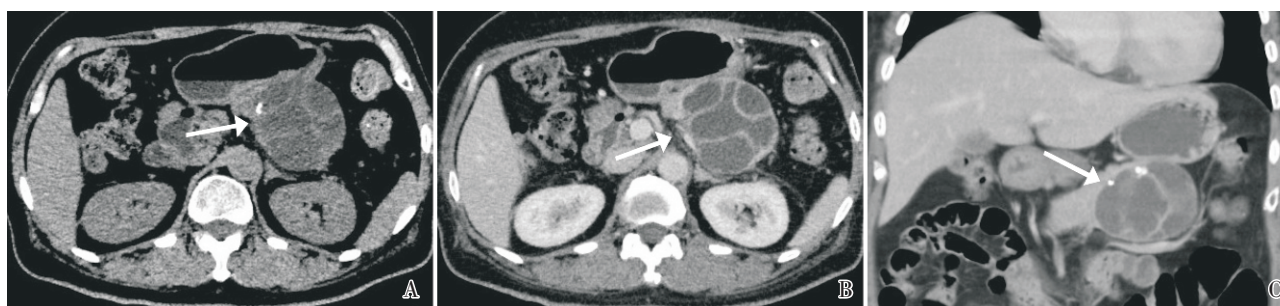
Of the patients with SOA, 11 of 18 (61%) lesions were located in the head and neck of the pancreas and 14 tumors(78%) had lobulated contour. Three lesions (17%) had mural nodules and four lesions (22%) presented calcification. Dilation of the main pancreatic duct was observed in four lesions (22%). The greatest diameter of SOA ranged from 2.3 to 8.8 cm (mean: 4.6 ± 1.8 cm). SOA lesions with even cystic wall (mean: 1.1 ± 0.2 mm) and the CT value of the cystic fluid was ranged from 5HU to 12 HU(mean: 8.1 ± 2.7 HU) (Fig.1; Table 2 and 3).

Most of the noninvasive MCN arisen in the body and tail (74%) of the pancreas and showed smooth round contour (74%). Eight tumors (42%) showed mural nodules and six (32%) had calcification. Three patients (16%) demonstrated dilated main pancreatic duct. The greatest diameter of noninvasive MCNs was ranged from 2.0 to 13.4 cm (mean: 6.0 ± 2.9 cm). Compared with the lesion of SOA, noninvasive MCN usually with much thicker and regular cystic wall (mean: 2.1 ± 1.0 mm) and the CT value of the



A 41-year-old woman with no discomfort. Unenhanced (A) and enhanced CT obtained during portal venous phase (B, C) showed a lobulated cystic mass with a single cyst in the head of pancreas. Mass had a sharp margin and consist of a few large cysts (C). The cystic peripheral wall was quite thin.

Fig.1 Serous oligocystic adenoma of pancreas



A 61-year-old woman with mild abdominal pain. Unenhanced (A) and enhanced CT obtained during portal venous phase (B, C) showed a smooth single cystic mass in tail of pancreas. Note that there was calcification (A) and enhanced internal septations (B, C). The uneven thick wall was clearly observed.

Fig.2 Noninvasive mucinous cystic neoplasms of pancreas

Table 2 Location, shape, presence of mural nodules and calcification and dilation of main pancreatic duct of SOA and noninvasive MCN

| CT Feature | SOA(n=18) | Noninvasive MCN(n=19) | χ^2 | P value |
|-------------------|-----------|-----------------------|----------|---------------------|
| Location | | | 4.560 | 0.033 ¹⁾ |
| Head and neck | 11(61) | 5(26) | | |
| Body and tail | 7(39) | 14(74) | | |
| Shape | | | 9.799 | 0.002 ²⁾ |
| Lobulated | 14(78) | 5(26) | | |
| Smooth round | 4(22) | 14(74) | | |
| Mural nodule | | | 2.863 | 0.151 ²⁾ |
| Present | 3(17) | 8(42) | | |
| Absent | 15(83) | 11(58) | | |
| Dilatation of MPD | | | 0.249 | 0.693 ²⁾ |
| Present | 4(22) | 3(16) | | |
| Absent | 14(78) | 16(84) | | |
| Calcification | | | 0.410 | 0.714 ²⁾ |
| Present | 4(22) | 6(32) | | |
| Absent | 14(78) | 13(68) | 4.560 | |

SOA: serous oligocystic adenomas; MCN: mucinous cystic neoplasms. Numbers in parentheses are percentages.

1)Chi-square test;2)Fisher's exact test. $P < 0.05$ was considered to indicate a statistically significant difference.

Table 3 Quantitative CT features of SOA and noninvasive MCN

| CT Feature | SOA(n=18) | Noninvasive MCN(n=19) | t/Z | P value |
|------------------------------|--------------|-----------------------|--------|---------------------|
| Greatest diameter | 4.6 ± 1.8 cm | 6.0 ± 2.9 cm | -1.727 | 0.091 ¹⁾ |
| Thickness of the cystic wall | 1.1 ± 0.2 mm | 2.1 ± 1.0 mm | -3.805 | 0.000 ²⁾ |
| CT value of the cystic fluid | 8.1 ± 2.7 HU | 10.3 ± 4.3 HU | -1.841 | 0.072 ¹⁾ |

SOA: serous oligocystic adenomas; MCN: mucinous cystic neoplasms. 1)t-test; 2)Mann-Whitney U test. $P < 0.05$ was considered to indicate a statistically significant difference.

cystic fluid were ranged from 4 to 17 HU (mean: 10.3±4.3 HU)(Fig. 2; Table 2 and 3).

Comparing the different CT features of SOA with noninvasive MCNs, significant differences were found in lesion locations ($P = 0.033$), shapes ($P = 0.002$) and thicknesses of the cystic wall ($P = 0.000$). SOA often located in the head and neck of the pancreas, had lobulated contour and even thin cystic wall. However, most of the noninvasive MCN arisen in the body and tail of the pancreas, showed smooth round

contour and the cystic wall were much thicker and uneven.

3 Discussion

With the widespread use of MSCT and the increasing awareness of people with health, it is not surprising that primary cystic pancreatic neoplasms with high frequency are found in asymptomatic patients. According to several papers^[4-5], asymptomatic SOA could be safely observed, whereas noninvasive MCN due to his malignant potential are all required surgical excision. As we written in introduction, it is difficult but necessary to differentiate SOA with noninvasive MCN before surgery in order to make an appropriate management. With a comprehensive analysis of our cases and integrated review of the literatures, we verified that the following CT features might be useful and feasible for the radiologists to improve the diagnostic accuracy of SOA and noninvasive MCN.

3.1 Location

In our series, we found that 11/18 (61%) of SOA were located in the head and neck of the pancreas. There was a statistically significant difference in comparison with the location of noninvasive MCN. This result is in accord with the findings of Cohen-Scali et al^[6] and Khurana et al^[4]. Cohen-Scali et al. found that SOA mostly located in the pancreatic head and, for unilocular SOA, the location of the lesion (pancreatic head) for the diagnosis had a very high specificity (90%). However, majority of the MCN were arisen from the pancreatic body and tail. This finding is in agreement with the theory expressed in histoembryology. It is believed that during the embryological stage, primordial ovarian cell could be incorporated within the pancreatic parenchyma owing to the proximity of the left primordial gonad and the dorsal pancreatic anlage. And the ectopic primordial ovarian cell might release hormone and growth factors which lead to the development of epithelial proliferation and cystic neoplasms of pancreas subsequently. In addition,

this process may be the reason of a thick peripheral wall^[1, 9-10].

3.2 Shape

Our study found that, in contrast with the smooth round contour of noninvasive MCN, a great portion (78%) of SOA showed lobulated contour in our patients. This result is similar with the findings of previous studies^[6-7, 11]. Sang Youn Kim et al^[7]. categorized the shape of pancreatic cystic neoplasms into seven morphologic features and they found that SOA usually had multicystic or lobulated contour while noninvasive MCN with smooth contour. Further, in a gross morphological view, SOA showed an irregular margin because of the thin cystic wall often extent into adjacent pancreas parenchyma. However, with noninvasive MCN, it appears as a well defined round mass with a fibrous capsule. The different gross morphology contributed to the different CT features of SOA and noninvasive MCN.

3.3 Thickness of the cystic wall

Another finding detected in our patients could be used to differentiate SOA with noninvasive MCN is the different thickness of the cystic wall and we found that SOA showed an even thin cystic wall but the noninvasive MCN with a nonuniform thicker wall. The mean cystic wall of SOA was thinner than the cystic wall of noninvasive MCN. We also found that the cystic wall of lesions usually well observed in portal venous phase. This finding also concordance with the finding of Khurana B et al^[4] and Manfredi R et al^[9] and the measured cystic wall of SOA in Khurana B et al group was less than 2 mm. Manfredi R et al analyzed 27 serous cystic adenomas and 26 mucinous cystic neoplasms and they found serous lesion had thinner cystic wall (2 mm vs. 4 mm). Therefore, the thickness of the cystic wall could be a useful CT feature for differentiation.

3.4 Others

Unfortunately, the greatest diameter, mural nodules, calcification and dilation of the main pancreatic duct of the lesion and CT value of the cystic fluid did not show any significant differences. However, there was a study^[12] showed that the cystic

fluid in SOA was different with that in MCN due to the different chemical component and Lin Xiao-zhu et al^[13] had a study on the cystic component by the gemstone spectral imaging and found that the quality of cystic fluid of MCN is higher than that of SOA. This result still need be confirmed by a large sample study. For mural nodules, a recent study^[9] had showed that it could appear in invasive and noninvasive MCN, since it stood for epithelial dysplasia rather than a malignant transformation. The mural nodules occurred in SOA probably due to the local bleeding of the cystic wall, which showed no enhancement in portal venous phase^[4,8]. In our study, only two lesions with mural nodules were observed in SOA group.

In conclusion, SOA usually located in the pancreatic head and neck, showed a lobulated contour with even thin wall while noninvasive MCN appeared as a smooth round contour lesion with a nonuniform thick wall in the body and tail. Those CT features (location, shape and thickness of the cystic wall) were helpful for differentiating SOA with noninvasive MCN before surgery in order to make an appropriate management.

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