INTRODUCTION

Solitary fibrous tumor (SFT) is a very rare benign potential neoplasm. SFT is a mesenchymal origin tumor, characterized by fibroblast like cells and variable types of hyalinized collagen proliferation (1). Most SFTs typically originate from pleura, but in very extreme cases, SFTs have been found to have originated from non-pleural tissues (1-3). Among these non-pleural cases, only a few cases involving the pancreas have been described worldwide (3). Herein, we report a case of non-pleural SFT arising from the pancreas, with particular emphasis being placed on the imaging features involved.

CASE REPORT

A 53-year-old woman was transferred our hospital for further evaluation of an incidentally found pancreatic head mass shown on CT scan at a local clinic. At admission, the patient did not have any symptoms. The physical examination and laboratory test results were not remarkable. As a tumor marker, the carbohydrate antigen 19-9 test result was also within the normal range. Dynamic abdominal CT scan and pancreatic dynamic MRI had been performed previously.

The CT scan showed a relatively well defined mass with multilobulated contour in the pancreas head (Fig. 1). This mass showed heterogeneous isoattenuation with pancreas parenchyma and some calcified areas on the non-enhanced image. On contrast enhanced CT image, this mass showed progressively heterogeneous early strong enhancement during the arterial-portal phase. During the equilibrium phase, this mass still showed prolonged enhancement, compared to that for pancreas parenchyma. Likewise, on MRI image this mass showed low signal intensity on T1-weighted images and high signal intensity on T2-weighted images (Fig. 2). On gadolinium enhanced dynamic MRI, the
mass was originally thought to be one piece, but were found to be detached during the operation. Histologically, these masses were composed of variably cellular spindle cells, which for the most part comprised quite uniform fibroblastic spindle cells arranged without any clear pattern (Fig. 3). There was also stromal hyalinization and extensive metaplastic ossification. There were focally notable branching hamangiopericytoma like vascular channels in some areas. Likewise, there was no visible extension of tumor infiltration at the resection margin. Immunohistochemically, this tumor tested positive for cluster of differentiation (CD) 34, CD99, B-cell lymphoma 2 (bcl-2), smooth muscle actin, CD10, estrogen receptor (ER), and progesterone receptor (PR), and negative for CD117, DOG-1, caldesmon, desmin, epithelial membrane antigen (EMA), S100, and AE1/AE3 cytokeratin. This mass was finally diagnosed as a solitary fibrous tumor of the pancreas.

mass showed prolonged heterogeneously hyperintense enhancement during the arterial and venous phases. Abnormal lymphadenopathy was not noted on either CT or MRI. MR cholangiopancreatography also did not show any notable abnormalities.

Based on these imaging findings, the mass was firstly considered to be a solid pseudopapillary epithelial neoplasm (SPEN) or unusual islet cell tumor. Duodenal preserving partial pancreatic head resection operation was carried out.

At operation, the exophytic mass was located in pancreatic head and had extension to mesocolon with calcification and fibrosis. The resected masses comprised two separate pieces. One was 1.8 × 1.6 × 0.8 cm in size and another was 5.2 × 4.5 × 4.0 cm in size. The smaller one was an ovoid and lobulated shaped firm mass with well defined smooth margin. The larger one was also a multilobulated mass with well defined margin. These two masses were originally thought to be one piece, but were found to be detached during the operation. Histologically, these masses were composed of variably cellular spindle cells, which for the most part comprised quite uniform fibroblastic spindle cells arranged without any clear pattern (Fig. 3). There was also stromal hyalinization and extensive metaplastic ossification. There were focally notable branching hamangiopericytoma like vascular channels in some areas. Likewise, there was no visible extension of tumor infiltration at the resection margin. Immunohistochemically, this tumor tested positive for cluster of differentiation (CD) 34, CD99, B-cell lymphoma 2 (bcl-2), smooth muscle actin, CD10, estrogen receptor (ER), and progesterone receptor (PR), and negative for CD117, DOG-1, caldesmon, desmin, epithelial membrane antigen (EMA), S100, and AE1/AE3 cytokeratin. This mass was finally diagnosed as a solitary fibrous tumor of the pancreas.

**Fig. 1.** CT findings of 53-year-old woman with solitary fibrous tumor in pancreatic head.  
*A.* An axial precontrast CT scan shows relatively well-defined, multilobulated mass (white arrows) in pancreatic head. The mass has calcified portion (black arrow).  
*B-D.* An axial contrast enhanced CT scans, the mass shows progressively heterogeneous enhancement during arterial (B) and portal phase (C). This mass still reveals slightly strong enhancement on delayed phase (D). Non-enhanced portions of mass indicate necrosis or cystic change.
The most common type of pancreatic neoplasm is adenocarcinoma (4), with mesenchymal tumors or endocrine tumors being relatively uncommon (1-4). Neoplasms originating from mesenchymal tissue include lymphangioma, hemangioma, schwannoma, adenomatoid tumor and so on (2). Among these, SFT is a mesenchymal origin tumor, but is a more uncommon neoplasm with extrapleural SFT being particularly rare (1-3). SFT is a benign potential neoplasm, typically arising at the thoracic cavity, pleura. However, extrapleural SFT has been described in the lung, thymus, thyroid gland, mediastinum, pericardium, paranasal sinus, peritoneum, pancreas and other organs. SFT occurs during the fourth to seventh decades of life, with equal incidence rates by sex. By contrast, extrapleural SFT has a slightly higher incidence in the male sex, but pancreatic SFT is more common in females (3, 5-7). The symptoms of SFT usually depend on its mass effect. According to the mass size and location,
symptoms such as abdominal pain, constipation, jaundice and weight loss can occur, however there are generally no symptoms because it is a benign neoplasm and a slow growing tumor (1, 8). As such, most cases are incidentally found during health care examination. On CT scan, SFT appears as solid mass with well defined margin, with cystic or necrotic portions being commonly visible. However, calcification is relatively rare. On MR imaging, SFT usually has a low signal in T1-weighted image, and a relatively high signal in T2-weighted image. On CT and MRI dynamic image, SFT shows variable enhancement in the arterial phase and progressively delayed enhancement in the portal and equilibrium phases. As SFT involves mainly fibroblast like spindle shaped cells and variable amount of hyalinized collagen fiber, there will be fibrotic tissue in most portions. These fibrous tissues show progressive delayed enhancement on dynamic imaging. In our case, the lesion appeared as relatively well defined mass with multi-lobulated contour in the pancreas head, and with cystic portion and notably exophytic calcified portions on pre-contrast CT scan. This mass also showed early strong enhancement on the arterial phase near the housfield of renal cortex level and prolonged enhancement on the equilibrium phase. The mass also had low signal in the T1-weight image, high signal in the T2-weight image and progressive enhancement in the arterial, portal and equilibrium phases in CT and MRI scan on dynamic imaging (1, 3). Considering the common pattern for extrapleural SFT, our case showed typical imaging findings in principle, but also showed uncommon imaging features, such as calcified portion and very strong enhancement on dynamic study. Given that our case showed extensive metaplastic ossification portion and that a considerable extent of vascular channels were seen on the histologic findings, it can be considered as an unusual case. On the basis of the radiologic findings, other types of neoplasm can mimic SFT, such as islet cell tumor and SPEN. However, islet cell tumors are usually larger than SFT and there is a predilection for the pancreatic head. It is fundamentally a neuroendocrine tumor, and as such hormonal exchange may be detected (1, 3, 9). There may also be a well margined mass with cystic or necrotic portion that shows variable degree of enhancement on dynamic imaging with CT and MRI, especially in the case of a nonfunctioning tumor.

SPEN is also larger than is SFT and occurs predominantly in young Asian women. It also shows a well margined mass with cystic or necrotic portion and variable enhancement on CT and MRI. However it differs in that it will show relatively peripheral enhancement and central located cystic portion (1, 3). Other rare tumors such as primary leiomyosarcoma or GIST of the pancreas could also be considered. These tumors have similar histologic characteristics to SFT, such as interlacing spindle-shaped cells. The imaging findings for these tumors will accordingly show similarity to SFT. However, these tumors have a relatively larger sized cystic portion compared with that for SFT.

On the microscopic findings, SFT is usually composed of fibroblast like spindle shaped cells and variable amounts of hyalinized collagen fiber. On immunohistochemical study, SFT showed positive signs for CD34, CD99 and negative signs for desmin, CD117, chromogranin, synaptophysin with variable positive sign in bcl-2, smooth muscle actin, S100 and so on. In our case, there were positive signs for CD34, CD99, bcl-2, smooth muscle actin, ER, PR and CD10 and negative signs for desmin, CD117, S100, cytokeratin (AE1/AE3), DOG-1, caldesmin and EMA (4, 5, 8, 9). SFT is generally a benign potential neoplasm, but it can rarely show malignant potential. About 5-20% of thoracic SFT cases are malignant with atypical histologic features such as nuclear atypia, hypercellularity, large necrosis portion and high mitotic activity (> 4/10 HPF) (10).

In our case, malignant features were not noted. At six months post operation, follow-up CT scan was carried out and neither tumor recurrence nor distant metastasis was noted. In conclusion, radiologic imagery such as CT and MRI may be helpful in the diagnosis of SFT on the pancreatic head, but several other types of tumor should be ruled out, including non functioning islet cell tumors and SPEN. Likewise, for accurate diagnosis, microscopic and immunohistochemical study must be performed.

REFERENCES

3. Ginat DT, Bokhari A, Bhatt S, Dogra V. Imaging features of

53세 여자가 CT상 우연히 발견된 췌장 두부의 종괴를 주소로 전원되었다. MRI를 추가로 실시하였고 췌장두부에서 내부에 남성 부분 및 석회화 부분을 보이는 경계가 명확한 종괴가 관찰되었다. 역동적 조영증강 영상에서 동맥기에서 강한 조영증강을 보이고 평형기까지 불균일하게 조영증강이 유지되는 양상을 보였다. 수술로 절제하였고 병리학적으로 췌장 두부의 고립섬유 종양으로 확진되었다. 췌장 두부의 고립섬유 종양은 아주 드문 경우로 증례보고를 통해 소개하고자 한다.

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