Contrast-enhanced Ultrasound for Diagnosing Pancreatic Solitary Fibrous Tumor: A Case Report

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Received January 25, 2021; revision received April 19, 2021; accepted April 25, 2021

Abstract: Solitary fibrous tumors (SFTs) are rare, especially in the pancreas. Here, we present a case of pancreatic SFT in a 45-year-old woman for its imaging characteristics on contrast-enhanced ultrasound (CEUS). On gray-scale imaging, the lesion was a regular, well-defined, and extremely hypoechoic mass in the body of the pancreas. On CEUS, it manifested as a slightly "slow wash-in and quick wash-out" heterogeneous enhancement. The patient underwent laparoscopic partial pancreatectomy, and the pathological findings confirmed the diagnosis of SFT with malignant potential. CEUS enabled real-time observation of the microcirculatory perfusion of the lesion, which is very useful when a differential diagnosis of pancreatic SFT is suspected.

Key words: Solitary fibrous tumor; Contrast-enhanced; Ultrasound; Pancreas

Advanced Ultrasound in Diagnosis and Therapy 2021; 03: 265-267 DOI: 10.37015/AUDT.2021.210004

A solitary fibrous tumor (SFT) is a rare fibroblastic neoplasm typically occurring in the pleura. Pancreatic SFT is rarer, with approximately 30 cases published so far [1,2]. In most cases, computed tomography (CT) and magnetic resonance imaging were used for preoperative imaging diagnosis, and no contrast-enhanced ultrasound (CEUS) features have been documented. CEUS, with the application of a time-intensity curve (TIC) analyzing software, can reveal the microcirculatory perfusion of the lesion in real-time and plays an increasingly important role in the diagnosis and differential diagnosis of pancreatic lesions. Here, we present the findings of CEUS in a case of pancreatic SFT and analyze the features of CEUS in the diagnosis of this rare disease.

Case Report

A 45-year-old woman was referred to our hospital for further evaluation after CT revealed a mass in the body of the pancreas and multiple nodules in both lungs. The lung nodules had been pathologically diagnosed as SFT after aspiration biopsy. The patient presented with vague upper abdominal pain for 3 months and had a 4-year history of a right calf tumor resection with pathological diagnosis of malignant SFT. After admission, the results of physical and routine laboratory examinations were unremarkable. There was a mild elevation in the level of CYFRA 21-1 at 3.52 ng/mL, and other tumor markers, including CA19-9 and CEA, were within normal limits.

Imaging

Preoperative ultrasound (US) was performed using an Aplio 500 scanner (Toshiba Medical Systems Corp., Tochigi, Japan) with a 3.5-MHz convex and a 12-MHz linear probe. The gray-scale US showed an approximately 19 mm × 16 mm, regular, well-defined, extremely hypoechoic lesion with posterior acoustic enhancement located in the body of the pancreas. Dilatation of the main pancreatic duct and regional lymphadenopathy were not observed. Color Doppler flow imaging (CDFI) revealed a few blood flow signals in the periphery of the lesion (Fig. 1). It was difficult to accurately identify the mass as solid or cystic due to remarkable hypoechogenicity. CEUS was performed by the same scanner with a 2.5 ml bolus injection of SonoVue (Bracco, Milan, Italy) through the antecubital vein followed by a 5 ml normal saline flush. The initial

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first 30 s after contrast administration was defined as the vascular phase of enhancement, the next 30 s (31–60 s) was defined as the early parenchymal phase, and the next 60 s (61–120 s) was defined as the delayed parenchymal phase. Real-time contrast imaging was recorded up to 180 s. The TIC of the lesion was measured by SonoLiver software (TomTec GmbH, Munich and Bracco Research SA, Geneva) (Fig. 2). The heterogeneous enhancement started at 17 s in the peripheral region of the lesion, appearing slightly later than in the pancreatic parenchyma (16 s). The enhancement intensity of the lesion peaked at 26 s with a peak intensity of 3.2×10^{-4} power, which was slightly weaker than that of the adjacent pancreatic parenchyma (3.7×10^{-4} power). The average transit time of the contrast agent in the lesion was 28 s, which was slightly shorter than that in the pancreatic parenchyma (31 s). The 18F-fluorodeoxyglucose (FDG) positron emission tomography/computed tomography images showed medium-level FDG uptake in the lesion (Fig. 3).

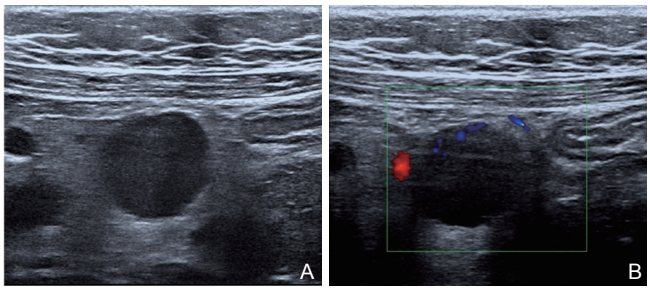

Figure 1 (A) High-frequency ultrasound revealed a regular, well-defined, and extremely hypoechoic mass with posterior acoustic enhancement located in the body of the pancreas; (B) The blood flow signals in the periphery of the lesion was observed on color Doppler flow imaging.

Surgery and pathological examination

Based on the patient's medical history and imaging findings, a preoperative diagnosis of SFT in the pancreas could not be ruled out. Later, the patient underwent laparoscopic partial pancreatectomy with spleen preservation, and the pathological findings confirmed the diagnosis of SFT. The tumor measured 23 mm × 21 mm in size, and microscopically exhibited high cellularity with atypia and 2 mitoses per 10 high-power fields, indicating its malignant potential (Fig. 4). Upon immunohistochemical staining, it was positive for CD34, Bcl-2, and vimentin and negative for CD117, s-100, cytokeratin, SMA, desmin, and DOG-1. The Ki-67 index was approximately 20%.

Discussion

Pancreatic SFT is rare and mostly has an indolent clinical course. Patients tend to present with abdominal pain or can even be asymptomatic; typically, detection occurs incidentally by US or CT scans [3]. Transabdominal US imaging could reveal well-demarcated hypoechoic lesions with varying amounts of blood flow signals on CDFI.

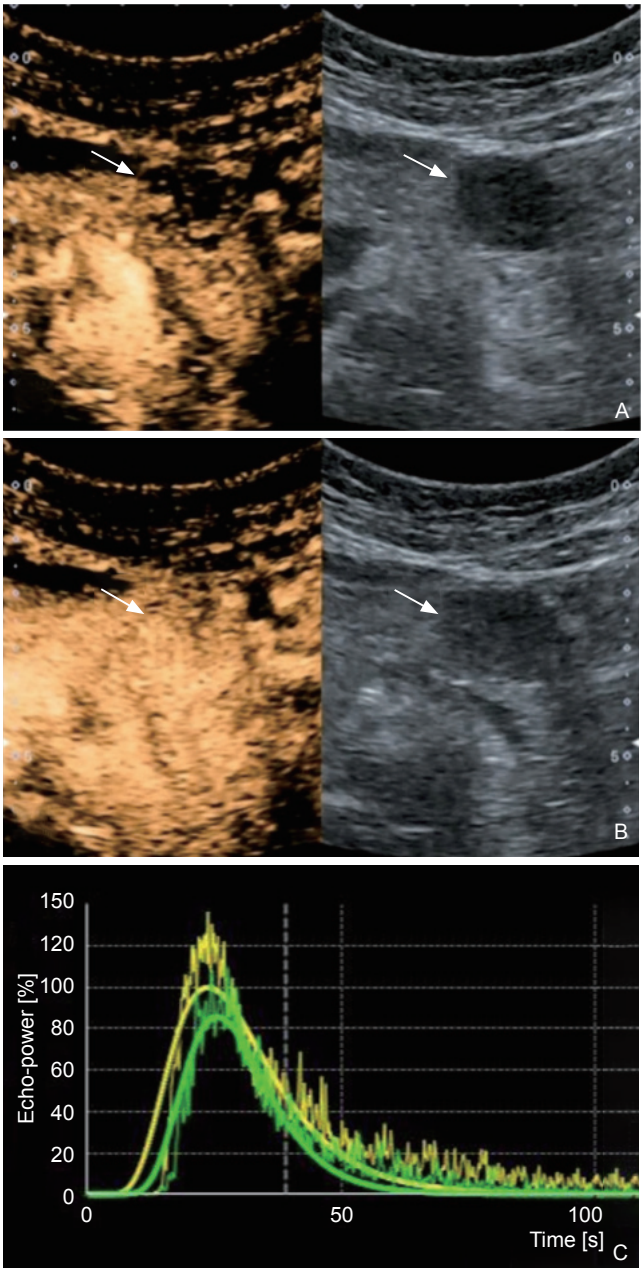

Figure 2 (A) At 17 s, the contrast-enhanced ultrasonography of the lesion (arrows) exhibited peripheral enhancement heterogeneously; (B) The enhancement intensity of the lesion (arrows) peaked at 26 s; (C) The time-intensity curves were presented (green curve, tumor; yellow curve, normal pancreatic parenchyma).

Since the pancreas is located behind the peritoneum, it is sometimes difficult for transabdominal US to detect deep lesions, especially those located in the tail of the pancreas. In our case, US could not reveal the internal structure of the extremely hypoechoic lesion or even identify the nature of the lesion as solid or cystic. For

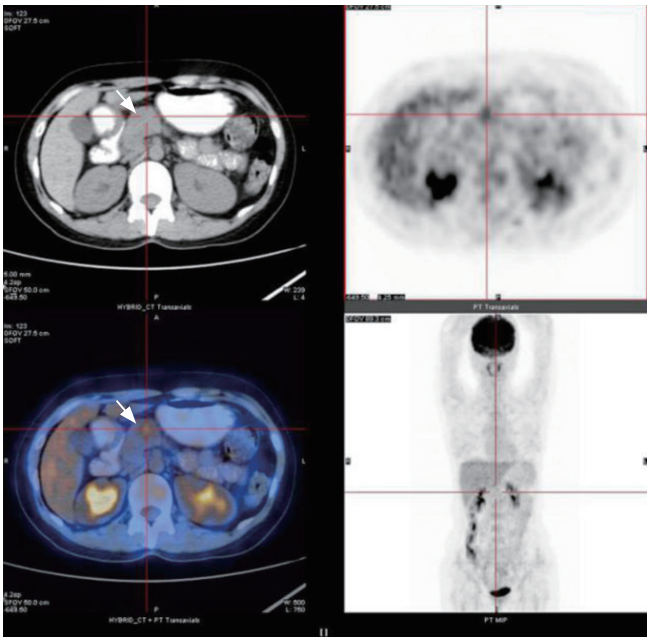

Figure 3 The 18F-fluorodeoxyglucose (FDG) positron emission tomography/computed tomography images revealed medium-level FDG uptake in the pancreatic lesion (arrows).

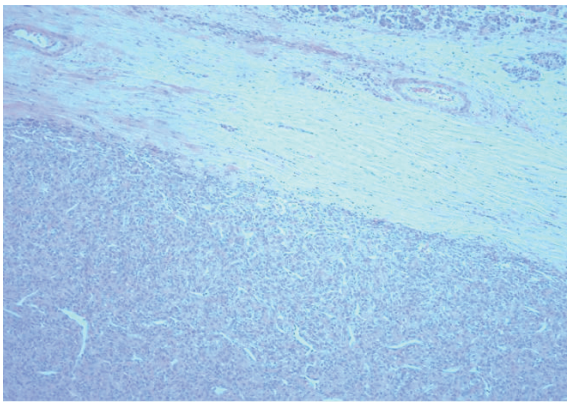

Figure 4 Under microscopy, the neoplasm was composed of diffuse spindle-shaped cells, staghorn vessels, and hyalinized collagen (hematoxylin and eosin staining, × 40).

further diagnosis and differential diagnosis, CEUS was performed. The images revealed markable perfusion, indicative of a hypervascular solid tumor. With TIC analysis, the lesion exhibited a slightly "slow wash-in and quick wash-out" enhancement, which was similar to that of pancreatic cancer. Meanwhile, the lesion was enhanced heterogeneously with peak intensity between normal pancreatic parenchyma and pancreatic cancer. The intensity with the time parameters of CEUS enhancement, as well as the medical history, gave an impression of pancreatic SFT or malignant tumor, which was consistent with the pathological findings of SFT with potential malignancy.

Pancreatic SFTs are often misdiagnosed preoperatively as neuroendocrine tumors. On US imaging, they often appear to be similar, as well-defined hypoechoic lesions with hypervascularity. CEUS is a useful imaging technique for pancreatic tumor diagnosis with its advantages of real-time imaging and a convenient and radiation-free procedure [4]. The CEUS appearances of pancreatic neuroendocrine tumors often show that enhancement starts slightly earlier than or simultaneously with the pancreatic parenchyma, and the peak intensity is usually higher than or equal to the adjacent pancreatic parenchyma, which is helpful for making differential diagnosis [5].

Conclusion

CEUS can determine whether the pancreatic lesions are cystic or solid by evaluating the vascular perfusion of the lesion. With the TIC analysis, it is helpful for the differential diagnosis of pancreatic SFTs and prediction of pathological characteristics.

Acknowledgments

This work was supported by the Joint Funds for the Innovation of Science and Technology, Fujian province (2019Y9066).

Conflict of interest

The authors have declared no conflicts of interest. The funders had no role in study design, data collection and analysis, decision to publication, or preparation of the paper.

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