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A rare case of exophytic pancreatic ductal adenocarcinoma with multiple metastases shown on ^{18}F-FDG PET/CT

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Abstract

Exophytic pancreatic cancer is an extremely rare subtype of pancreatic cancer that has not been strictly defined but is based on morphological origin. Herein, we reported a 69-year-old man who presented with an unexplained elevation of CA199. He was diagnosed with exophytic pancreatic cancer by β-2-Fluoro-2-deoxy-D-Glucose (^{18}F-FDG) Positron Emission Tomography (PET)/Computed Tomography (CT), which exhibited a high ^{18}F-FDG-avid mass behind the body of the pancreas. In addition, multiple metastases, including liver, lung, and lymph nodes, were apparently detected. Finally, Pancreatic Ductal Adenocarcinoma (PDAC) was pathologically confirmed. A posterior pancreatic mass attached to the pancreas and accompanied by elevated CA199 and hyperglucose metabolism could be linked to exophytic pancreatic cancer, which is significant to be aware of for early diagnoses and treatment.

Keywords: Pancreatic cancer; Pancreatic ductal adenocarcinoma; Exophytic; ^{18}F-FDG, PET/CT.

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Introduction

Pancreatic cancer has remained one of the most lethal tumors despite the advancement of medical care, and 80-90% of which is made up of Pancreatic Ductal Adenocarcinoma (PDAC) pathologically. Exophytic pancreatic cancer is a rare subtype of pancreatic cancer. Until now, there is no well-defined notion and derived from morphology instead. That is, the tumor shows the characteristics of large or all of it located outside the pancreas and infiltrating outward [1]. At the same time, the pancreas appears normal without mass. Exophytic pancreatic cancer mostly originates from the uncinate process of the pancreatic head and a few from the body of the pancreas [2]. Patients with exophytic pancreatic cancer often exhibit hidden attack and atypical symptoms, resulting in difficulty in identification and diagnosis. Imaging is imperative to diagnosis and is required to obtain accurate information about anatomy, infiltration, and metastasis. In this paper, we report an unusual case of exophytic PDAC in a patient with multiple metastases in β-2-Fluoro-2-deoxy-D-glucose (^{18}F-FDG) Positron Emission Tomography (PET)/Computed Tomography (CT).

Case presentation

A 69-year-old man was admitted to the hospital for reactive arthritis three months ago. Laboratory tests showed an elevated carbohydrate antigen 199 (CA199) (1167 U/ml) during his hospitalization. A good performance status was presented during his physical examination. The patient underwent a contrast-enhanced Computed Tomography (CT) of the chest and abdomen to look for possible causes. Axial images of contrast-enhanced CT (Figure 1) showed a strip-shaped soft tissue around the coeliac artery with mild enhancement. No noticeable abnormalities were found in other tissues and organs. Subsequently, the patient was discharged and requested follow-up.

Two months later, the patients began to present with persistent stretching pain throughout the abdomen and a marked decrease in body weight (10 kg). Meanwhile, he had significantly increased level of CA199 (>12000 U/ml) and other elevated tumor markers, including Carcinoembryonic Antigen (CEA) (7.43 ug/L), Carbohydrate Antigen 125 (CA125) (179.3 U/ml), and Carbohydrate Antigen 153 (CA153) (37.2 U/ml), strongly suggestive of neoplastic lesions. Therefore, ^{18}F-FDG PET/CT (GE Discovery 710, the United States) was performed for diagnosis and staging. Images revealed that an ^{18}F-FDG-avid soft tissue lump (Figure 2) in the posterior of the pancreatic body with maximum standardized uptake value (SUV_{max}) of 7.7, which was poorly demarcated from the pancreatic body, coeliac artery, and superior mesenteric artery, and was noticeably larger compared with two months earlier. In addition, metastatic lymph nodes in the abdominal cavity, retroperitoneal, and left supraclavicular fossa with high ^{18}F-FDG uptake (SUV_{max} 5.9), multiple liver metastases with high ^{18}F-FDG uptake (SUV_{max} 9.5), and lung metastases with mild ^{18}F-FDG uptake (SUV_{max} 1.5) were detected simultaneously. Given clinical and imaging findings, ^{18}F-FDG PET/CT suggested a rare diagnosis of exophytic pancreatic cancer with liver, lung, and lymph node metastases. Consequently, the needle biopsy was performed with the liver lesion, and the liver metastases of PDAC were pathologically confirmed (Figure 3, low-to-moderate differentiation). The man ultimately received palliative care with serplulimab (200 mg) immunotherapy because of the advanced stage.

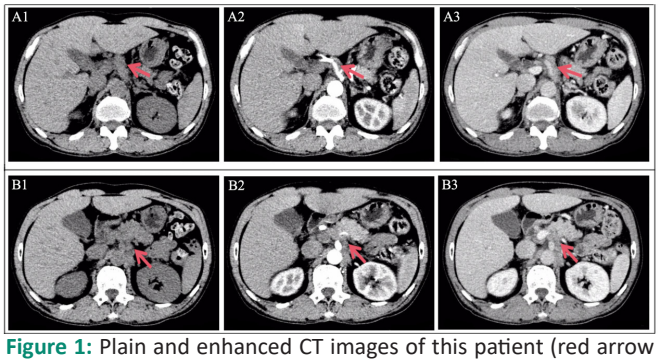

Figure 1: Plain and enhanced CT images of this patient (red arrow indicating the lesion). (**A1-A3** and **B1-B3**) Axial CT images of non-contrast scanning, arterial phase and venous phase of enhancement, respectively, show a strip-shaped soft tissue around the coeliac artery with mild enhancement.

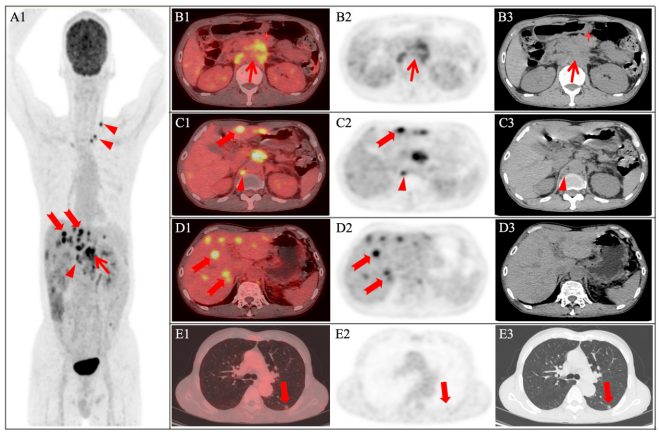

Figure 2: ^{18}F-FDG PET/CT images of the patient with exophytic PDAC and multiple metastases to lymph nodes, liver and lung. (A1) The maximum intensity projection (MIP) image of ^{18}F-FDG PET/CT shows multiple and intense ^{18}F-FDG-avid lesions in the mid-abdomen, liver, and left supraclavicular area. (B1-B3) Axial fused PET/CT, PET, and CT images indicate a soft tissue mass (thin red arrows) in the posterior of the pancreatic body with SUV_{max} of 7.7. A red asterisk represents a normal pancreatic body. (C1-C3) Axial fused PET/CT, PET, and CT images detect metastatic lymph nodes (red triangles) in the abdominal cavity and retroperitoneal with SUV_{max} of 5.9. (C1-C2 and D1-D3) Axial fused PET/CT, PET, and CT images display multiple liver metastases (red dovetail arrows) with SUV_{max} of 9.5. (E1-E3) Axial fused PET/CT, PET, and CT images show lung metastases (thick red arrows) with SUV_{max} of 1.5.

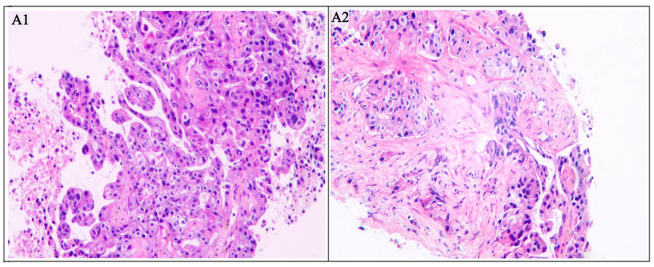

Figure 3: Pathological pictures of liver biopsy in the patient with exophytic PDAC. (A1-A2) Abundant atypical tumor cells are shown in a light microscope (HE×20).

Discussion

Exophytic pancreatic cancer is a little-known entity, which is characterized by origination derived from the uncinate process of the pancreatic head mostly and a few from the body of the pancreas, tumor localization most or all outside the pancreas, and infiltrating growth. In addition to PDAC, less common pancreatic tumors of exophytic growth include Solid Pseudopapillary Tumor (SPT) and Acinar Cell Carcinoma (ACC) [3]. Unlike typical PDAC, most exophytic PDAC do not involve the pancreas and bile ducts. Thus, less jaundice and obstructive pancreatitis are observed, contributing to a silence onset. It is shown that abdominal pain and weight loss have been reported in 70% of tumors occurring in the uncinate process of the pancreatic head, while jaundice has been reported in less than 28% of patients [4]. Besides, there are no indirect signs such as the typical "two-tube sign", pancreatic parenchymal atrophy upstream of the tumor, and retentive cysts/pseudocysts on conventional imaging. It is worth noting that most patients would experience a markedly elevated CA199 prior to the development of a significant mass, which may be helpful in suggesting the origin of the tumor. Locally advanced/advanced PDAC often invades peripheral nerves and blood vessels of the pancreas, while exophytic PDAC is more pronounced. Importantly, exophytic PDAC is nourished by peripheral nerves and blood vessels and can grow and extend along nerve vessels in the early stage [4] (Figure 1), causing abdominal pain when tumor invades adjacent celiac plexus and diarrhea when it invades the superior mesenteric artery [5].

Microscopically, three components are mainly observed in PDAC, including tumor cells, tumor stroma and normal pancreatic tissue, and the ratio of them determines the imaging finding of the tumor. Tumors tend to appear as low- or iso-dense masses on CT and show a lower T1-Weighted Imaging (WI) signal than normal pancreas and a T2WI signal similar to or slightly higher than that of normal pancreas on Magnetic Resonance Imaging (MRI). Theoretically, PDAC is a hypovascular tumor with the features of obvious pro-connective tissue proliferation and interstitial fibrosis. As a result, it is mildly enhanced in the arterial phase of enhanced scanning (lower than normal pancreas) and gradually strengthened in the portal or delayed phase. Due to the special location of the tumor, exophytic PDAC commonly appears as a retroperitoneal soft tissue mass with progressive growth, irregular morphology, uniform density and

signal. Enhanced CT or MRI discovers the same enhancement modality as PDAC, which contributes to a clearer boundary to the pancreas. Moreover, exophytic PDAC is a high-grade malignant entity that often invades the adjacent celiac trunk artery and superior mesenteric artery (wrapping around the arterial wall >180°). A previous study showed that the exophytic PDAC is an FDG-avid tumor with a high uptake of ^{18}F-FDG [6], which is consistent with our report. In our case, ^{18}F-FDG PET/CT imaging not only identified the primary lesion but also detected multiple metastases in lymph nodes, liver and lungs, which provided a significant basis for accurate staging of patients. Because of atypical clinical symptoms and imaging manifestations, exophytic PDAC is easily misdiagnosed and needs to be distinguished from diseases such as retroperitoneal lymphoma and Retroperitoneal Fibrosis (RF). Retroperitoneal lymphoma, mainly affiliated with non-Hodgkin lymphoma, manifests as enlarged lymph nodes around the aorta preferring fusing into a clump, moving and surrounding adjacent blood vessels without invading, which is called an "aortic floatation sign". After the injection of contrast medium, the lesion often demonstrates uniform enhancement, and rare necrosis, cystic changes and hemorrhage occur. In terms of the ^{18}F-FDG PET, retroperitoneal lymphoma commonly appears with a significantly high uptake. RF is characterized by chronic nonspecific inflammation of retroperitoneal tissue with fibrous tissue hyperplasia. Typical imaging findings of RF include retroperitoneal irregular soft-tissue masses located anterior and lateral to the distal abdominal aorta or proximal common iliac artery, which can encircle and compress adjacent vessels without significant vascular displacement. Noticeably, RF is apt to involve the ureters, inferior vena cava, renal arteries, and mesenteric vessels [7]. There are a variety of enhancement modes observed in RF, which depends on the maturity of fibrosis. In addition, the uptake degree of the lesion is correlated with disease course and activity.

Conclusion

In summary, exophytic PDAC tends to present with an insidious onset and atypical clinical symptoms. On laboratory tests, it is often accompanied by an increased level of CA199. A retroperitoneal mass surrounding the blood vessel and connected to the pancreas, with the characteristics of infiltrative growth and lack of blood supply, is the specific and important imaging sign. Importantly, exophytic PDAC, a high degree of malignancy, exhibits a high FDG-avid pattern. To our knowledge, this is the first report showing exophytic PDAC with multiple metastases detected by ^{18}F-FDG PET/CT. Therefore, our study suggests that ^{18}F-FDG PET/CT is a promising and indispensable tool for diagnosis, differential diagnosis and staging of exophytic PDAC.

Declarations

Ethics and patient consent: Written informed consent has been obtained from the patient.

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Statement of ethics: The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Ethics Committee of The Second Affiliated Hospital of Guangzhou Medical University.

Conflict of interest: The authors report no conflicts of interest in this work.

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