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Malignant islet cell tumor of the pancreas associated with portal venous thrombus

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Abstract In this report, CT and MR findings of a malignant islet cell tumor of the pancreas associated with tumor thrombus in the portal vein is presented. Imaging findings revealed diffuse involvement of the body and tail of the pancreas by the tumor. The most unusual finding was that this invasive tumor was an insulinoma.

Keywords Islet cell tumor · CT · MR imaging · Portal vein thrombus

Introduction

Islet cell tumors are rare pancreatic malignancies. They are divided into functioning and nonfunctioning tumors. Hyperfunctioning tumors generally manifest earlier and are small compared with nonfunctioning tumors which present with mass effect, local invasion, or metastases [1]. Tumor thrombus is a rare feature of islet cell tumors of the pancreas [1, 2, 3]. In this report, radiological findings of a functioning islet cell tumor associated with tumor thrombus within the portal vein is presented.

Case report

A 61-year-old man was admitted to the hospital with blunted mental acuity, intermittent confusion, and loss of consciousness of 4 months. Blood glucose level was low (25 mg/dl), whereas insulin level was high (125–69–197 μU/ml). He had a history of splenectomy due to fundic varices. Abdominal ultrasound and computed tomography were performed. Gray-scale ultrasound demonstrated portal venous thrombus and a 10 × 3-cm mass in the middle of the abdomen. The origin of the mass could not be identified. Pancreas was evaluated as atrophic. Dual-phase spiral CT (Somatom AR Star, Siemens, Erlangen, Germany) was performed with a slice thickness of 5 mm and reconstruction of 5 mm, after 100 ml IV contrast administration. The CT scan showed a mass almost entirely occupying the pancreas and extending into the portal vein. The splenic vein could not be delineated and was considered to be thrombosed by the tumor. Transverse diamater of the mass was

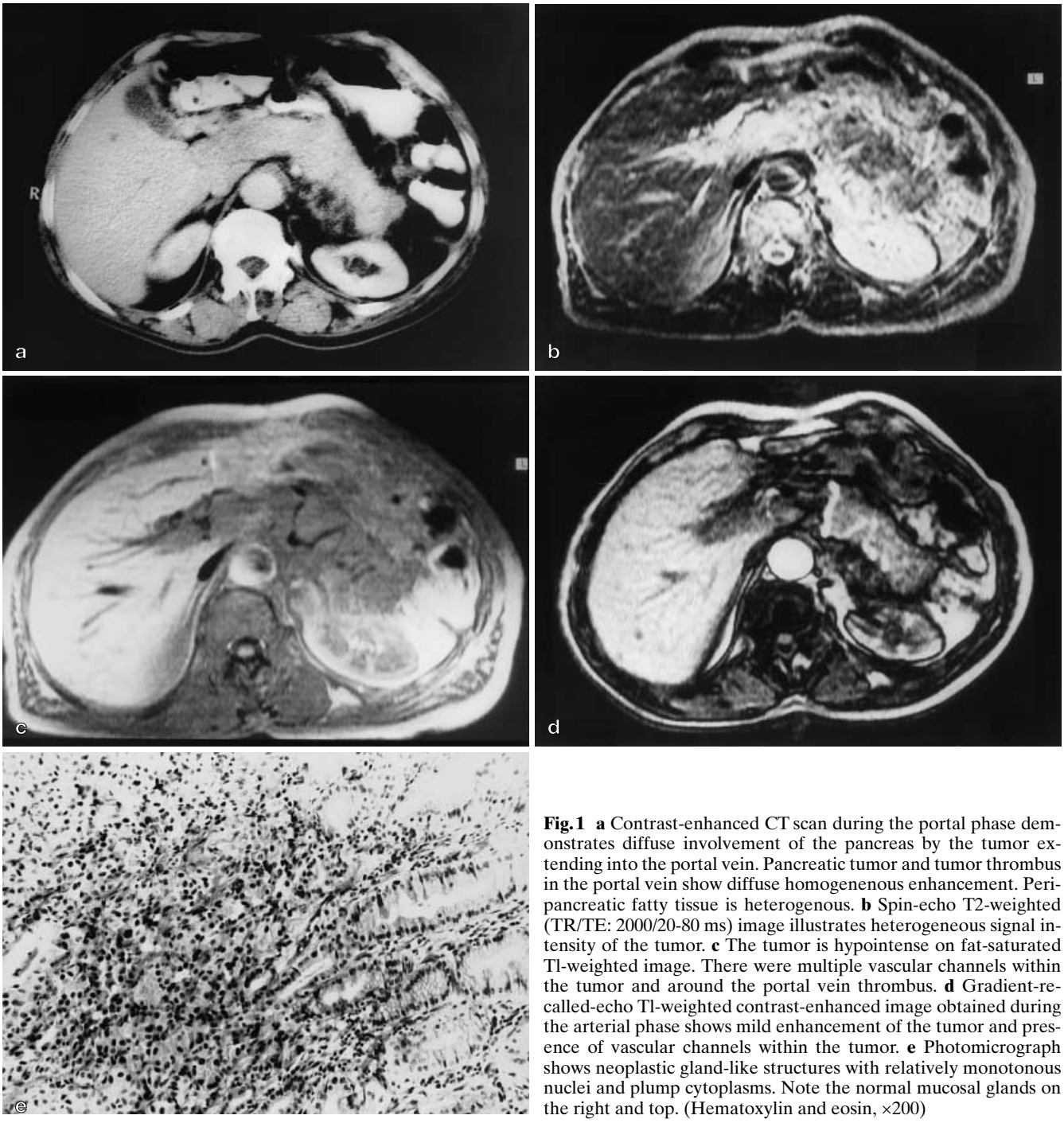

Fig. 1 **a** Contrast-enhanced CT scan during the portal phase demonstrates diffuse involvement of the pancreas by the tumor extending into the portal vein. Pancreatic tumor and tumor thrombus in the portal vein show diffuse homogenenous enhancement. Peripancreatic fatty tissue is heterogenous. **b** Spin-echo T2-weighted (TR/TE: 2000/20-80 ms) image illustrates heterogeneous signal intensity of the tumor. **c** The tumor is hypointense on fat-saturated Tl-weighted image. There were multiple vascular channels within the tumor and around the portal vein thrombus. **d** Gradient-recalled-echo Tl-weighted contrast-enhanced image obtained during the arterial phase shows mild enhancement of the tumor and presence of vascular channels within the tumor. **e** Photomicrograph shows neoplastic gland-like structures with relatively monotonous nuclei and plump cytoplasms. Note the normal mucosal glands on the right and top. (Hematoxylin and eosin, ×200)

3 cm. The tumor and portal venous thrombus enhanced homogeneously but was not hypervascular. To evaluate the relationship between the pancreas and the thrombus precisely, an MRI examination of pancreas was recommended.

Magnetic resonance imaging of the pancreas was performed with 1.0-T MR imager (Magnetom, Siemens, Erlangen, Germany) utilizing the body coil. Spin-echo T2-weighted (TR/TE: 2000/20–80 ms), spin-echo T1-weighted (TR/TE: 600/17 ms), spin-echo T1-weighted fat-suppressed, spoiled gradient-echo fast low-angle shot (FLASH; TR/TE/FA: 108/4 ms/65 °) breath-hold contrast-enhanced dynamic images were obtained in the transverse plane. The MR images showed the mass originating from body and tail of the pancreas and invading the splenic and portal veins. The mass was heterogeneous and mildly hyperintense on T2-weighted images and homogeneously hypointense on T1-weighted images. There were multiple fine vascular channels within the mass and collateral

vessels around the portal and superior mesenteric veins. The mass enhanced mildly during the arterial phase, but diffuse homogeneous enhancement was seen during the portal phase. Portal venous thrombus was reported as tumor thrombus based on the enhancement pattern similar to the pattern of pancreatic mass. There were multiple avascular lesions consistent with simple cysts within the liver. The patient underwent surgery; however, limited resection of the mass was performed because of extensive adhesions and venous thrombosis. Histopathology established the diagnosis of malignant islet cell tumor of the pancreas, but the type of tumor could not be identified.

Discussion

Islet cell tumors are less common than pancreatic adenocarcinomas. The lesions can occur anywhere in the pancreas and can be single or multiple, and benign or malignant. The most common islet cell neoplasms are insulinomas, typically small homogeneous masses measuring approximately 2 cm in diameter. Gastrinomas and nonfunctioning islet cell tumors are the second and the third most common types, respectively. Larger tumors more commonly demonstrate cystic changes, necrosis, calcification, local or vascular invasion and distant metastases, and are nonhyperfunctioning lesions; or are associated with a less clinically evident functional syndrome than that seen with insulinomas [1, 2, 3, 5]. In this case, there was a hyperfunctioning islet cell tumor which had a larger size and showed local invasion.

Computed tomography is limited in detecting non-contour-deforming pancreas tumors [2, 4]. Newer CT techniques with dual-phase rapid imaging have improved the sensitivity of CT for detecting smaller pancreatic tumors; however, recent studies still emphasize that MRI is more sensitive for tumor detection [6].

Due to high fluid content of islet cell tumors, they are well shown as high signal intensity lesions on T2-weighted images and appear as moderately low signal intensity masses on T1-weighted images. It has been reported that fat-saturated T1-weighted images are useful in the detection of pancreatic tumors. On fat-saturated T1-weighted images, respiratory motion and chemical shift artifacts reduce and the contrast between tumor and normal parenchyma definitely increases [2, 4, 7, 8]. Since the majority of islet cell tumors are also hypervascular, their conspicuity increases during arterial-phase MR images. Contrast enhancement patterns of these tumors are usually diffuse homogeneous or peripheral ring-like enhancement [1].

In contrast to typical insulinomas, our patient has a large tumor which invades venous structures. A CT scan showed a mass almost entirely occupying the pancreas and invading to splenic and portal veins. Differentiation between normal pancreas and tumor could not be performed with CT. On T2-weighted images tumor showed heterogeneous and mildly hyperintense signal intensity. Contrast between normal pancreas and the tumor was best on fat-saturated T1-weighted images. Tumor was not highly vascular during the arterial-phase MR images, but diffuse and homogeneously enhanced during the portal phase (Fig. 1).

An interesting feature of this pancreatic neoplasm was the presence of tumor thrombus. Although venous occlusion is a common feature of pancreatic ductal adenocarcinoma, tumor thrombus is rare feature of islet cell tumors; however, there are descriptions of tumor thrombus associated with islet cell tumors [1, 2, 3]. The enhancement of the thrombus similar to pancreatic tumor was suggestive of tumoral thrombus and was inconsistent with pancreatic ductal adenocarcinoma which is a hypovascular tumor.

A large insulinoma illustrating local invasive features, such as portal venous thrombus, is a rare occurrence. Among different imaging modalities, MRI is a superior modality in detecting and differentiating pancreatic tumors.

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