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Case Report

"Honeycomb" appearance in large-duct type pancreatic ductal adenocarcinoma: Case report with radiologic–pathologic correlation ☆,☆☆

Ayaka Hara, MD[a], Yasunari Yamada, MD[a,], Kengo Fukuzawa, MD[b], Mitsuteru Motomura, MD[c], Yusuke Kuboyama, MD[d], Kazuhito Sakata, MD[b], Ryo Takaji, MD[e], Yoshiki Asayama, MD[e], Hajime Takaki, MD[a]*

[a] *Department of Radiology, Oita Red Cross Hospital, Chiyo-machi, Oita, Japan*
[b] *Department of Surgery, Oita Red Cross Hospital, Chiyo-machi, Oita, Japan*
[c] *Department of Hepato-Biliary-Pancreatic Internal Medicine, Oita Red Cross Hospital, Chiyo-machi, Oita, Japan*
[d] *Department of Pathology, Oita Red Cross Hospital, Chiyo-machi, Oita, Japan*
[e] *Department of Radiology, Oita University Faculty of Medicine, Yufu, Oita, Japan*

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ABSTRACT

Large-duct type pancreatic ductal adenocarcinoma (PDA) is a rare morphologic variant forming large duct elements. This case report, to our knowledge, is the first report of a large-duct type PDA with a "honeycomb" appearance resembling a serous cystic neoplasm (SCN) on CT and MRI. The patient is an 82-year-old woman who presented with upper abdominal pain. Dynamic contrast-enhanced CT revealed a multilocular cyst with honeycomb loculi, in which the cyst walls showed gradual enhancement. On T2-weighted MRI, the mass displayed inhomogeneous hyperintensity characterized by a honeycomb appearance with irregular and thick hypointense cyst walls. The patient underwent distal pancreatectomy; histopathological diagnosis was large-duct type PDA. Although the imaging features of large-duct type PDA may resemble those of SCN, this distinction between PDA and SCN is important because the treatment options are very different.

Abbreviations: PDA, pancreatic ductal adenocarcinoma; SCN, serous cystic neoplasm; CE-CT, Contrast-enhanced CT; MPD, main pancreatic duct; DWI, diffusion-weighted imaging.

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* Correspondence author.
E-mail address: yasunari@oita-u.ac.jp (Y. Yamada).

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Introduction

Large-duct type pancreatic ductal adenocarcinoma (PDA) is a rare morphologic variant of ductal adenocarcinoma. After a recent systematic study of PDAs, the large-duct type has been classified as one of the variants with cystic features [1]. The tumor is characterized by multiple dilated malignant ducts ranging from 5 to 7 mm in diameter, occasionally exceeding 10 mm [1–3]. Radiological investigations are valuable for diagnosis of large-duct type PDA but, to our knowledge, there have been only a few reports concerning the imaging features of this tumor [2,4,5]. Here we report the case of a large-duct type PDA with a "honeycomb" appearance on CT and MRI. In addition, we review of the current literature on this tumor.

Case report

An 82-year-old woman with a past medical history of breast cancer approximately 5 years prior to presentation was admitted to a local clinic with the complaint of upper abdominal pain. She was sent to our hospital for further examination. Laboratory examination demonstrated elevated carbohydrate antigen 19–9 (CA19-9; 185 U/mL; reference limit <37 U/mL). Levels of serum amylase, carcinoembryonic antigen, DUPAN-2, and SPAN-1 were not elevated. Noncontrast CT revealed a lobulated hypoattenuating mass without calcification in the pancreatic tail. Contrast-enhanced CT (CE-CT) images revealed an ill-defined multilocular cystic mass measuring 52 × 37 mm (Fig. 1). The main pancreatic duct (MPD) was not dilated and identified in the mass. The splenic vein was obstructed by the mass, and the gastroepiploic vein was dilated at the hepatopetal collateral vessels. The splenic artery was involved and showed stenotic change by the mass (Fig. 1). The cyst walls showed gradual enhancement on arterial, portal venous, and equilibrium phases in CE-CT images (Fig. 2). Equilibrium phase images revealed most clearly a multilocular cystic mass with honeycomb appearance. No definite lymphadenopathy was recognized in the peripancreatic area. On subsequent MRI, the mass showed hypointensity on T1-weighted images (T1WI; Fig. 3). On T2WI, the mass showed inhomogeneous hyperintensity with multiple cysts with honeycomb loculi from 2 mm to 15 mm in diameter. The multiple cysts had irregular and thick walls with hypointensity (Fig. 3). The mass demonstrated no restriction of diffusion on diffusion-weighted imaging (DWI) and apparent diffusion coefficient (ADC) mapping. Heavily T2WI and MR cholangiopancreatography (MRCP) showed a multilocular cyst with honeycomb appearance (Fig. 4). These findings were suspicious for a serous cystic neoplasm (SCN) or, less likely, an intraductal papillary mucinous neoplasm (IPMN). Though a definitive diagnosis could not be made, distal pancreatectomy with splenectomy was performed because CA19-9 was elevated, and the splenic artery and vein were involved by the mass. Macroscopically, a well-circumscribed tumor, measuring 50 × 35 mm, was located in the pancreatic tail and showed a multiple cysts with honeycomb loculi. Microscopically, the mass was composed of dilated malignant glands (varying sizes, maximum diameter of 14 mm) surrounded by dense, fibrotic stroma containing fewer vessels and the glands were jagged and irregular (Fig. 5). From these histopathologic findings, the mass was diagnosed as large-duct type PDA (well-differentiated adenocarcinoma). The tumor showed slight local invasion of the anterior and posterior peripancreatic adipose tissue and the

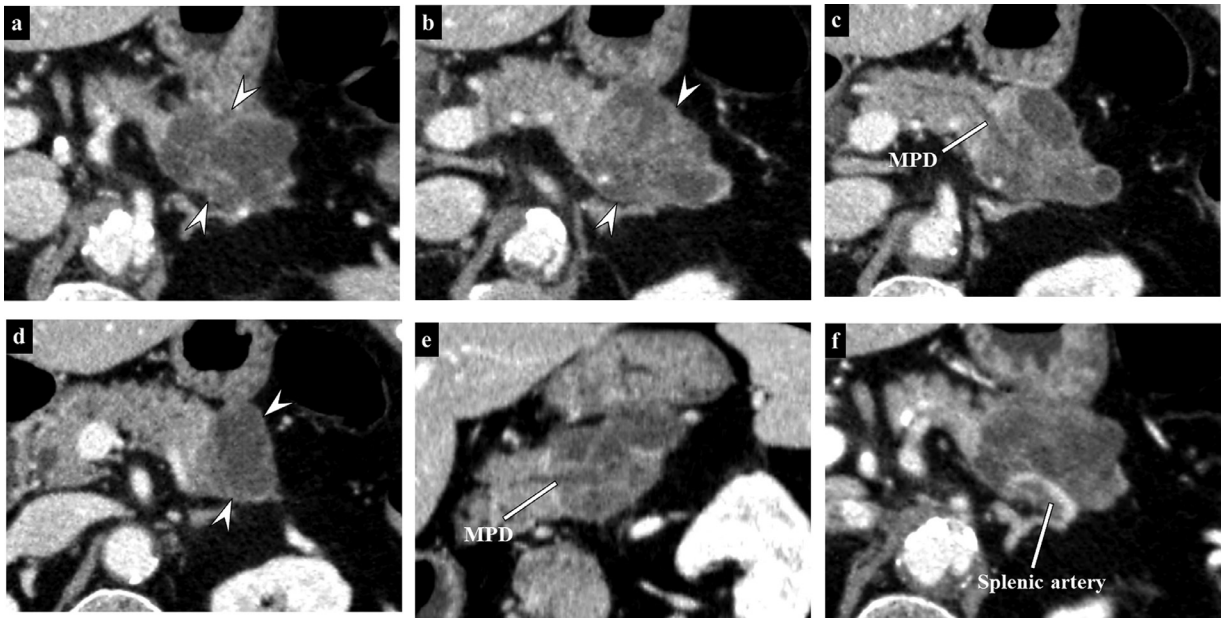

Fig. 1 – Equilibrium phase axial (a–d) and paracoronal CT (e) images, and arterial phase axial CT image (f) of the first resected mass. The mass of the pancreatic tail is 52 × 37 mm in diameter. The mass shows an ill-defined multilocular cystic appearance (arrowheads in a–e). The main pancreatic duct (MPD) was not dilated and identified in the mass (c, e). The splenic artery is involved and shows stenotic change by the mass (f).

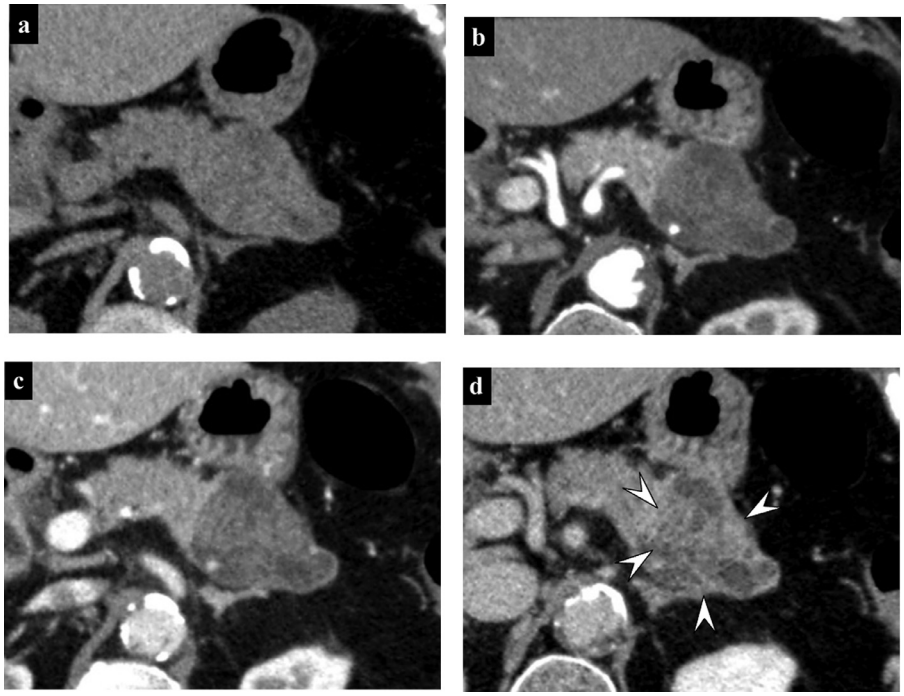

Fig. 2 – Triple-phase contrast-enhanced CT of the mass showing non-contrast (a), arterial phase (b), portal venous (c), and equilibrium phase (d) CT images. The cyst walls in the mass show gradual enhancement on triple-phase contrast-enhanced CT (a–c). The equilibrium phase image reveals most clearly a multilocular cystic mass with honeycomb appearance (d: arrowheads).

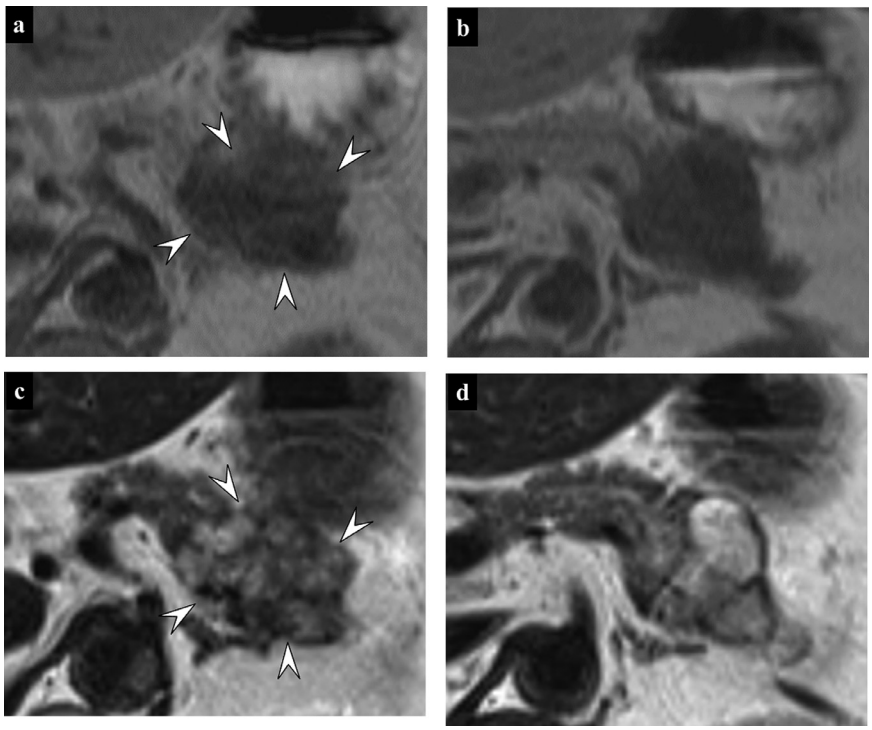

Fig. 3 – T1-weighted images (T1WI) (a, b) and T2-weighted images (T2WI) of the mass (c, d). The mass shows hypointensity on T1WI (a, b) and inhomogeneous hyperintensity with multiple cysts and honeycomb loculi from two mm to 15 mm in diameter on T2WI (c, d). The multiple cysts have irregular and thick walls with hypointensity on T2WI.

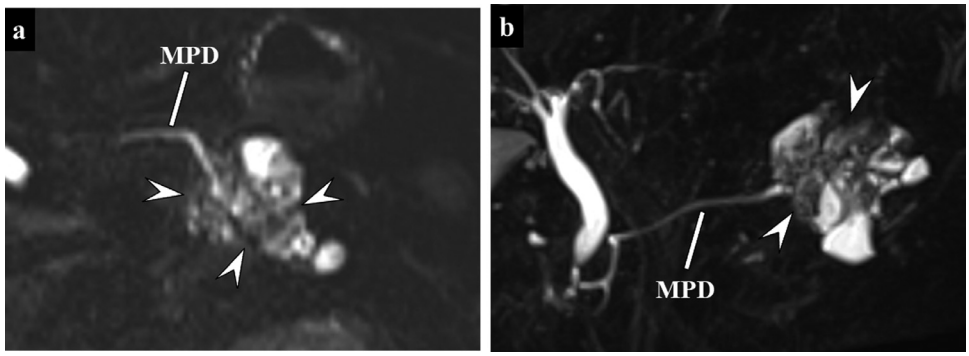

Fig. 4 – Heavily T2-weighted image (a) and MR cholangiopancreatography of the mass (b). The mass shows a multilocular cyst with honeycomb appearance (a, b: arrowheads). The main pancreatic duct (MPD) is not dilated.

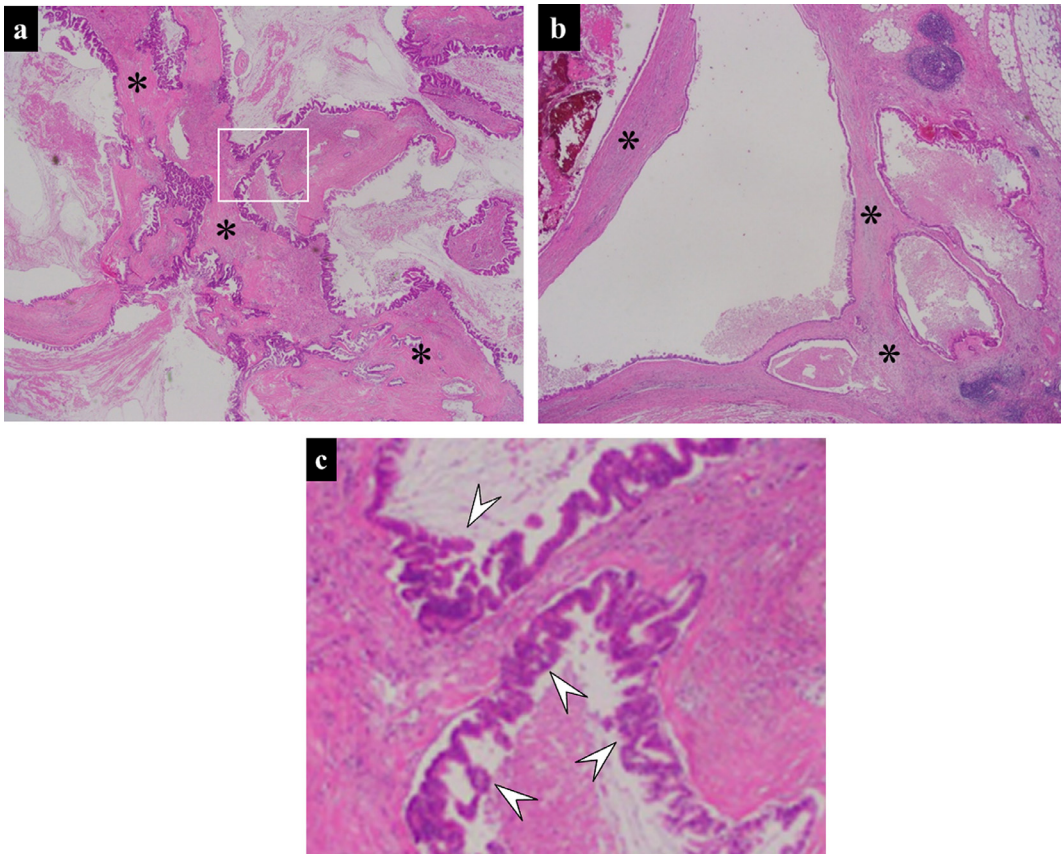

Fig. 5 – Hematoxylin and eosin stain of a section of the mass (a, b: low-power photomicrograph, c: high-power photomicrograph). The tumor is composed of variously sized (maximum diameter of 14 mm) dilated malignant glands surrounded by dense fibrotic stroma containing fewer vessels (a, b: ∗), and the glands are jagged and irregular (c: area in the box in a). The mass was diagnosed as large-duct type pancreatic ductal adenocarcinoma (well-differentiated adenocarcinoma).

splenic vein. On follow-up 13 months after the resection, arterial phase CT images revealed a hypoattenuating mass in the remnant pancreatic head. The mass exhibited persistent enhancement on portal venous and equilibrium phase CT images. Multiple cystic components were revealed most clearly on equilibrium phase images of the mass (Fig. 6). From these CT findings, the mass was suspected to be a large-duct type PDA. The patient underwent pylorus-preserving pancreatoduodenectomy. Microscopically, the mass was composed dilated malignant glands up to several millimeters, surrounded by dense, fibrotic stroma. The glands were jagged and irregular. From these histopathologic findings, the mass was diag-

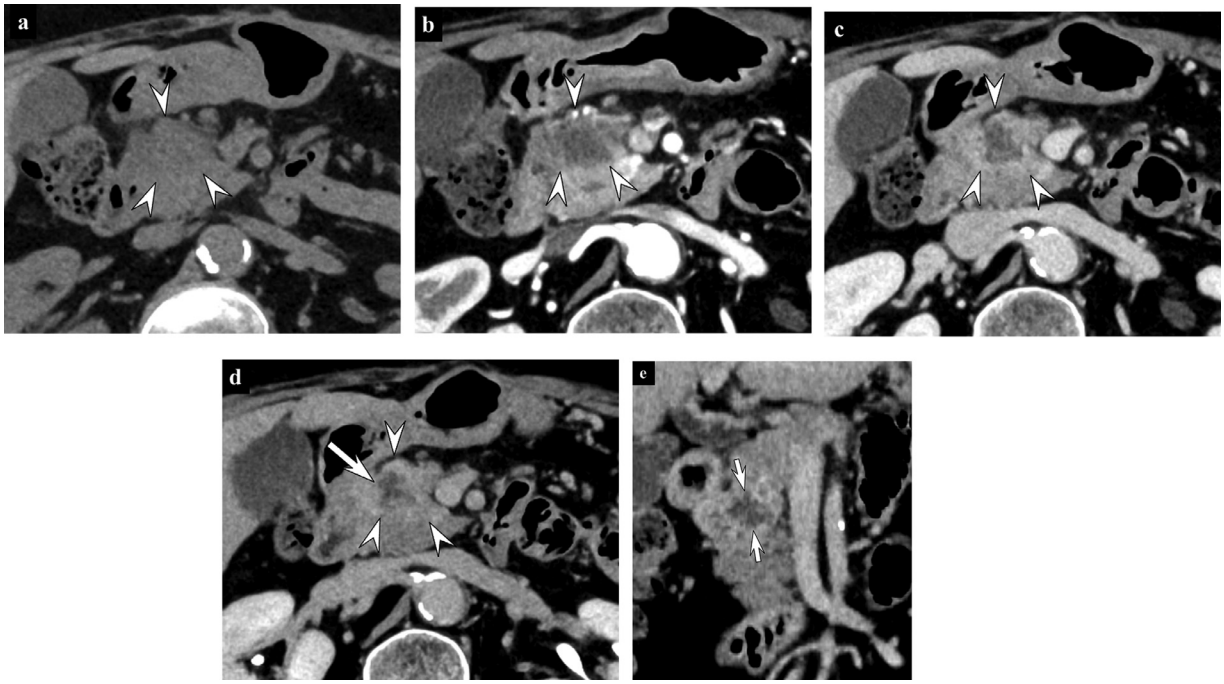

Fig. 6 – CT images of the second mass resected as noncontrast CT image (a), arterial (b), portal venous (c), and equilibrium phase (d) axial CT images and equilibrium phase paracoronal CT image (e). The slightly hypoattenuating mass measuring 27 x 13 mm is seen in the remnant pancreatic head on noncontrast CT image (a: arrowheads). The mass exhibits hypovascular and persistent enhancement on portal venous and equilibrium phase images (b–d: arrowheads). Multiple cystic components are revealed on equilibrium phase images in the mass (d, e: arrows).

nosed as large-duct type PDA (well- to moderately differentiated adenocarcinoma). At the last follow-up visit, approximately 3 months postoperatively, the patient underwent CE-CT and was disease-free.

Discussion

The prevalence of large-duct type PDA, based on histopathology, is reported to be between 3.5% and 12% [1,3,7]. On histopathologic examination, an ordinary PDA is composed of small-caliber glands infiltrating a desmoplastic stroma [6]. However, the large-duct type is one of the morphologic variants, characterized by more dilated malignant ducts forming a microcystic structure [1]. The size of cysts in the large-duct type PDA is usually 5-7 mm in diameter, occasionally exceeding 10 mm [1–3]. Bagci et al. categorize a case as the large-duct type PDA if more than 50% of the tumor sections available for examination contain infiltrative duct units with a diameter larger than 0.5 mm or have a macroscopically identifiable microcystic pattern. According to these criteria, this type was identified in 28 of 230 pancreatectomy specimens with PDA [3]. There were 8 (30%) males and 19 (70%) females with a mean age of 67 years (range: 51-87 years). The tumor locations were in the pancreatic head in 16 patients (59%) and in the body–tail in 11 patients (41%) [3].

Large-duct type PDA has not been largely recognized among radiologists, and there have been only a few reports detailing the imaging features [2,4,5]. In a radiological report by Sato et al. [5], large-duct type PDA shows hypoattenuation in the pancreas on noncontrast CT. Postcontrast arterial phase CT images reveal multiple cystic masses without enhancement. The tumor shows multiple cystic masses in the pancreas with parenchymal enhancement on portal venous phase images and slight ring enhancement of the cystic masses on equilibrium-phase mages. On MRI, the tumor shows hyperintensity on T2WI and multiple cystic masses on MRCP. DWI reveals no significant signal increase/decrease in the mass [2,5]. In our case, large-duct type PDA arising from the remnant pancreatic head showed a similar appearance to the previous contrast-enhanced CT [5]. However, the large-duct type PDA arising from the pancreatic tail showed a multilocular cystic mass with honeycomb appearance on CT and MRI. One previous pathologic report described a large-duct type PDA case showing a honeycomb-like morphology [6]. However, to our knowledge, there have been no reports concerning honeycomb appearance of large-duct type PDA on radiological imaging. In the present case, the multilocular cystic mass replaced the pancreatic tail and contained honeycomb loculi on CT and MRI. The primary differential diagnosis based on CT and MRI with such findings is an SCN because the honeycomb appearance is one of the most characteristic imaging features of this neoplasm [8]. Based on the tumor components, SCNs are classified as microcystic, macrocystic (oligocystic), solid, or mixed type [9,10]. The microcystic type typically presents as a solitary, multilocular cystic lesion with a honeycomb appearance [11–13] and can be identified

as well-enhanced lesions on CE-CT and MRI because the cyst walls are characterized by abundant subepithelial micro- and macrovessels [14,15]. Cyst walls in most SCNs are thin and smooth on imaging because these walls are histopathologically lined by a single row of cuboidal or flattened epithelial cells [16]. The present case showed ill-defined irregular and thick cyst walls on CT and MRI, reflecting the microscopically jagged and irregular glands in the tumor. The SCN shows thin, well-enhancing cyst walls on dynamic CE-CT and MRI [11–13]. In the present case, the cyst walls showed thick and gradual enhancement on dynamic CE-CT, which reflected the dense fibrotic stroma containing fewer vessels surrounding malignant, dilated glands. Another differential consideration is the branch-duct type IPMN, which typically shows a multilocular appearance with clustered, dilated branch-ducts but not a honeycomb appearance [17,18].

In the management of large-duct type PDA, surgical treatment must be considered in all patients fit for surgery [5,19]. The clinical behavior of large-duct type PDA appears to be slightly better than that of ordinary ductal adenocarcinomas. The reason may be that large-duct type PDAs has the well-differentiated nature [3,19]. In the present patient, the histopathologic diagnosis was well-differentiated adenocarcinoma in the tail, and well- to moderately differentiated adenocarcinoma in the remnant head. At a follow-up visit approximately 3 months after the second resection, the patient was symptom-free and imaging studies revealed no evidence of no tumor recurrence.

Conclusion

Large-duct type PDA is a rare subtype of PDA with limited data on imaging features. When encountering a pancreatic multilocular cystic mass with honeycomb appearance resembling SCN, consider the important findings suggestive of large-duct type PDA. The differentiating features are the gradual enhancement of cyst walls on dynamic CE-CT and the ill-defined, irregular, and thick cyst walls with hypointensity on T2-weighted MRI. For treatment purposes, it is important for radiologists to recognize the large-duct type PDA and these imaging features.

Patient Consent

Informed written consent was obtained from the patient for the publication of this report and any accompanying images.

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