CASE REPORT

Nagoya J. Med. Sci. **83**. 869–875, 2021
doi:10.18999/nagjms.83.4.869

A case of intraductal tubulopapillary neoplasm of the pancreas originating from the branch duct: cast in the mold sign

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ABSTRACT

A 59-year-old man with jaundice and lower common bile duct stenosis was referred to our institution for diagnosis and treatment. Computed tomography and magnetic resonance imaging showed a well-circumscribed smoothly marginated solid mass lesion in the pancreatic head. He underwent pyloric preserving pancreatoduodenectomy. Histopathological specimen revealed that the mass was located in the dilated branch duct of the pancreatic head, and an intraductal tubulopapillary neoplasm originating from the branch pancreatic duct was diagnosed. On magnetic resonance cholangiopancreatography, the mass within the dilated duct branch in the pancreatic head was similar to a "cast in the mold" image, which we retrospectively deemed, might be reflecting the nature of this tumor.

Keywords: intraductal tubulopapillary neoplasm, magnetic resonance, computed tomography, positron emission tomography, magnetic resonance cholangiopancreatography

Abbreviations:
ITPN: intraductal tubulopapillary neoplasm
CT: computed tomography
MRCP: magnetic resonance cholangiopancreatography

INTRODUCTION

Intraductal tubulopapillary neoplasm (ITPN) is one of the pancreatic intraductal neoplasms, which was introduced as a new type of pancreatic tumor in 2009.[1] It shows intraductal growth without mucin hypersecretion, and this growth pattern can be observed as a distinctive pattern

Received: January 6, 2021; accepted: February 19, 2021
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on imaging studies. The typical image pattern is called a two-tone duct sign,[2] which is easily observed when the tumor is in the main pancreatic duct.

There are few reports concerning ITPN originating from a branch duct; however, their imaging findings are not similar to previous findings. We present a case of an ITPN originating from a branch pancreatic duct based on radiological and pathological findings.

CASE REPORT

A 59-year-old man was referred to a local hospital complaining of jaundice. Abdominal computed tomography (CT) and endoscopic retrograde cholangiography revealed lower bile duct stenosis and diffuse upstream biliary duct dilatation.

His medical history included hyperuricemia and dyslipidemia. Physical examination revealed no remarkable findings. Laboratory examination revealed elevated values of total bilirubin and direct bilirubin levels of 1.8 mg/dL (normal range 0.2–1.2 mg/dL) and 0.4 mg/dL (0–0.3 mg/dL), respectively, alkaline phosphatase and gamma-glutamyl transpeptidase levels of 624 IU/L (104–338 IU/L) and 263 IU/L (<50 IU/L), respectively, carcinoembryonic antigen and carbohydrate antigen 19-9 levels of 5.8 ng/mL (< 5.0 ng/mL) and 351 U/mL (<37 U/mL), respectively.

A multiphase contrast-enhanced CT (CECT) showed a solid mass lesion measuring 3.7 cm in diameter in the pancreatic head. On pre-contrast CT, the mass lesion was isodense than the normal pancreatic parenchyma, and there were no calcifications. The mass lesion was isodense during the arterial phase, hypo-isodense during the pancreatic phase, hypodense during the portal-venous phase, and isodense during the delayed phase (Figure 1). Magnetic resonance imaging (MRI) showed a well-defined mass lesion in the pancreatic head that had an inhomogeneously iso-high intensity on T2 weighted image (T2WI), homogeneously low intensity on T1 weighted image (T1WI), and homogeneously hyperintense on diffusion-weighted image (DWI) as compared to normal pancreatic parenchyma (Figure 2). On magnetic resonance cholangiopancreatography (MRCP), mild dilatation of the bile duct and the main pancreatic duct (MPD) were seen (Figure 3A), considered to have been caused by the common bile duct stenosis and compression of the MPD by the mass. No dilation of the pancreatic duct suggesting mucin overproduction was seen. Positron emission tomography with 2-deoxy-2-[fluorine-18] fluoro- D-glucose integrated with computed tomography (^{18}F-FDG PET/CT) revealed focal uptake in the mass with a maximal standardized uptake value (SUVmax) of 6.9 (Figure 3B). In addition to the pancreatic lesion, a solid mass lesion suspected to be a renal cell carcinoma measuring 4.4 cm in diameter in the right kidney was seen on the images (not shown). Endoscopic ultrasonography (EUS) and endoscopic retrograde cholangiopancreatography (ERCP) were not performed.

Based on the enhancement patterns on the multiphase CECT and smoothly marginated mass depicted on the MRI, we did not consider pancreatic ductal adenocarcinoma as a differential diagnosis; however, other malignant tumors such as neuroendocrine tumors or metastasis from co-existing renal cell carcinoma were not excluded. The patient underwent pyloric-preserving pancreaticoduodenectomy with right nephrectomy after we obtained his full informed consent.

Macroscopic examination revealed well-marginated mass in the pancreatic head (Figure 4A). The mass originated from the enlarged pancreatic branch duct. On microscopic examination (Figures 4B and 4C), few tumor cells protruded into the main pancreatic duct. No extraductal invasion of the tumor was observed. Neoplastic cells were identified in this mass, characterized by enlarged nuclei (Figures 5A and 5B). Immunohistochemical examination revealed positive staining of these cells for MUC-1 (Figure 5C) and MUC-6 (Figure 5D); however, they were negative for BCL-10 (Figure 5E), trypsin (Figure 5F), MUC-2, and MUC-5 AC (not shown). Based on these

results, an ITPN originating from the branch pancreatic duct was diagnosed. The mass in the right kidney was histologically diagnosed as a chromophobe renal cell carcinoma (not shown).

The patient has been uneventful for four years to date following the surgical removal of the lesion.

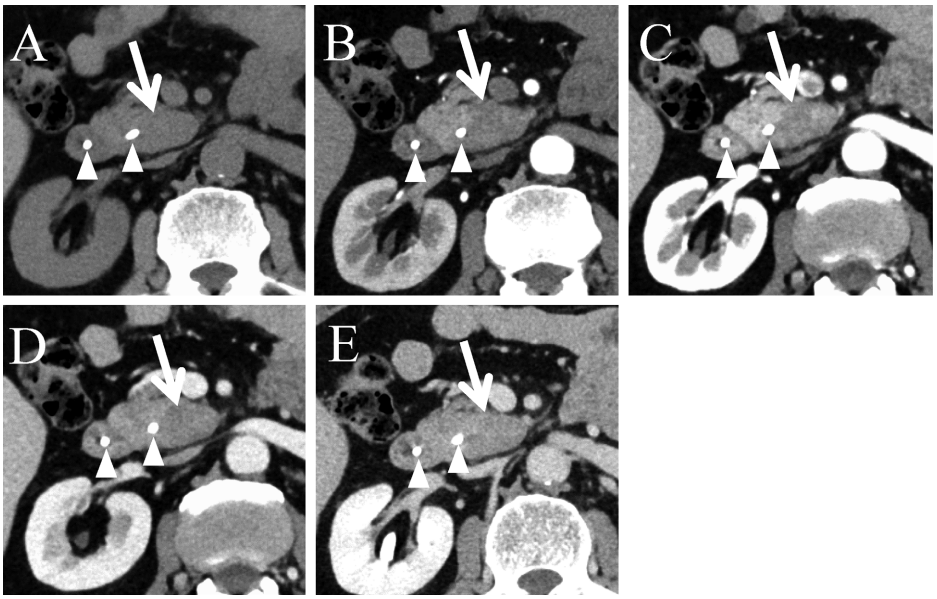

Fig. 1 Multiphase CECT

Fig. 1A: Precontrast.
Fig. 1B: Arterial phase.
Fig. 1C: Pancreatic phase.
Fig. 1D: Portal-venous phase.
Fig. 1E: Delayed phase.
A solid mass lesion is seen in the pancreas head (arrow). Arrowhead; Biliary stent. Compared with the normal pancreatic parenchyma, the mass lesion appears isodense on precontrast CT (A), isodense during arterial phase (B), hypo to isodense during pancreatic phase (C), hypodense during portal-venous phase (D), and isodense during delayed phase (E).

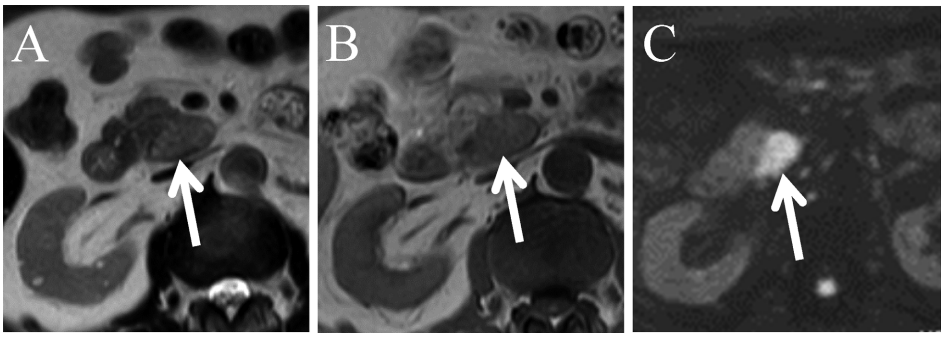

Fig. 2 Transaxial MRI

Fig. 2A: T2WI.
Fig. 2B: T1WI.
Fig. 2C: DWI.
A well-defined mass lesion is seen in the pancreas head (arrow). The lesion shows inhomogeneously iso-high intensity on T2WI (A), homogeneously low intensity on T1WI (B), and homogeneously hyperintensity on DWI (C) compared to the normal pancreatic parenchyma.

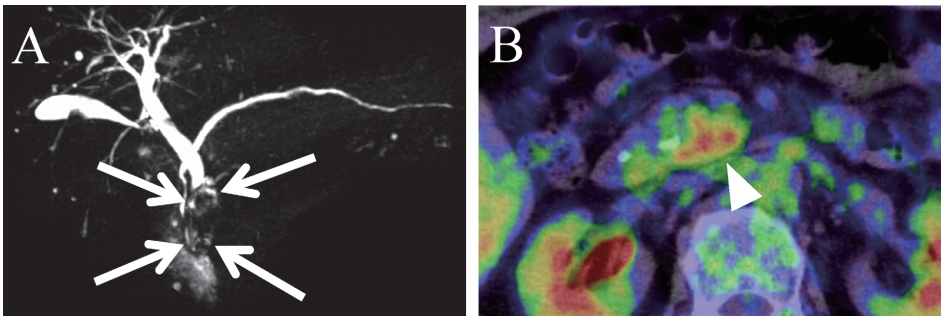

Fig. 3 Other imaging findings

Fig. 3A: MRCP.
Fig. 3B: FDG-PET/CT.
On MRCP (A), mild dilatation of the bile duct and the MPD are seen. There is a signal defect in the pancreatic head representing that the tumor itself is surrounded by a high-intensity area representing pancreatic fluid (arrow) in the dilated branch ducts on retrospective observation. On FDG-PET/CT (B), abnormally increased uptake of ^{18}F-FDG is seen in the pancreas head (arrowhead). The SUVmax is 6.9.

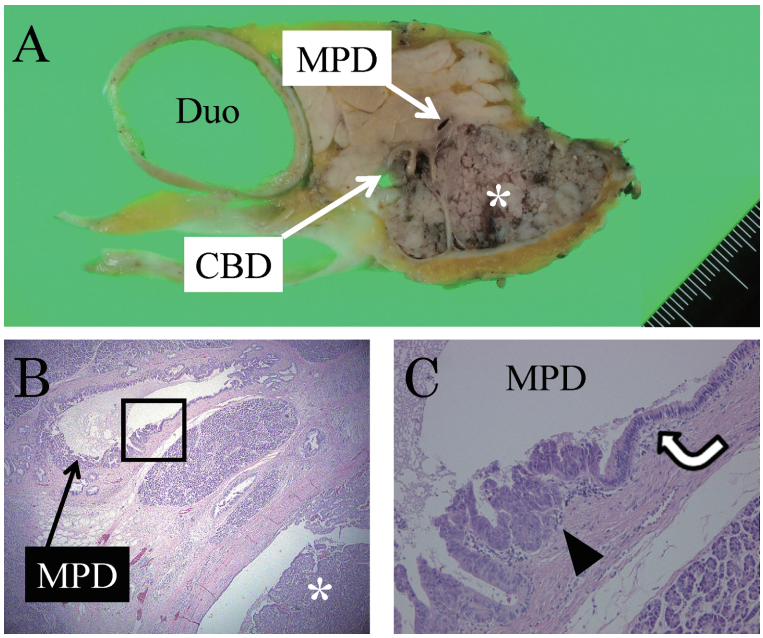

Fig. 4 Resected specimen

Fig. 4A: Macroscopic view.
Fig. 4B: Microscopic view of the tumor and MPD.
Fig. 4C: High-power view of the square on Fig. 4B.
Duo: duodenum
CBD: common bile duct
MPD: main pancreatic duct
On macroscopic view of the resected specimen (A), the mass is located in the enlarged branch pancreatic duct (asterisk) and is close to the MPD. A ruler (one scale is 1 mm) is on the lower right side. On microscopic view (B and C (high-power view of the square on image B): hematoxylin and eosin staining, magnifications are 12.5× and 100×, respectively), a small amount of tumor cells (arrowhead) protrude into the main pancreatic duct and collide with the main pancreatic duct epithelium (curved arrow). No invasion outside the duct is observed.

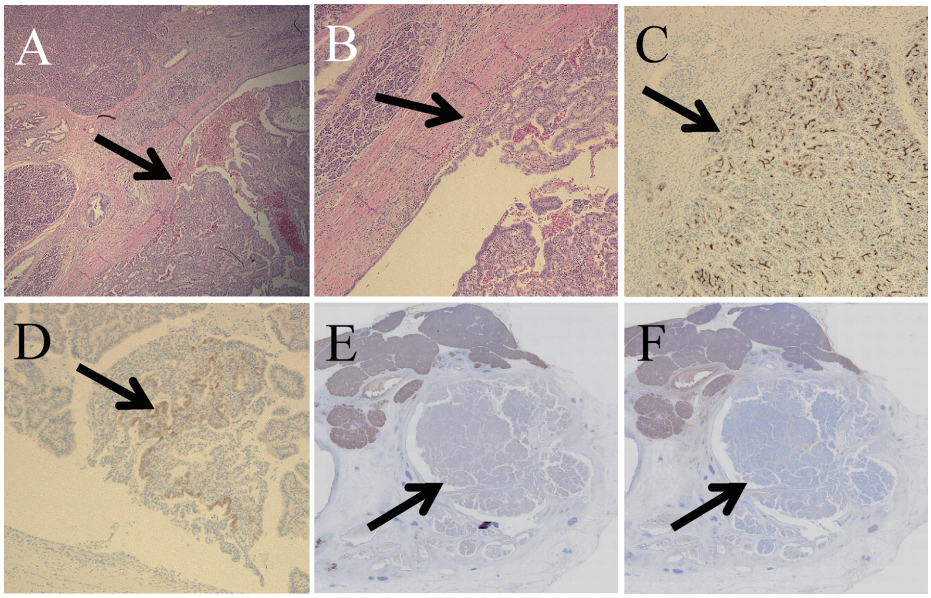

Fig. 5 Histology of the tumor
Fig. 5A: Hematoxylin and eosin staining (magnification, 12.5×).
Fig. 5B: Hematoxylin and eosin staining (magnification, 40×).
Fig. 5C: MUC-1 staining (magnification, 40×).
Fig. 5D: MUC-6 staining (magnification, 40×).
Fig. 5E: BCL-10 staining (magnification, 1×).
Fig. 5F: Trypsin staining (magnification, 1×).
The mass exists in the enlarged branch pancreatic duct (arrow on A, B) and shows tubulopapillary growth. The neoplastic cells are characterized by enlarged nuclei. Immunohistochemical examination reveals positive staining for MUC-1 and MUC-6, negative staining for BCL-10 and trypsin (arrow on C, D, E, F).

DISCUSSION

ITPN is a rare pancreatic tumor which was first reported by Yamaguchi et al[1] in 2009, and classified as one of the intraductal tumors of the pancreas in 2010 WHO classification. The prognosis of this tumor is better than that of pancreatic ductal cancer. Yamaguchi et al[3] reported that 7 of 10 ITPN were non-invasive, Basturk et al[4] reported that the 5-year survival rate of ITPN was 71%, which is markedly better than ordinary pancreatic ductal cancer.

The tumor is characterized by tubulopapillary growth of neoplastic cells filling the pancreatic duct. Unlike other intraductal papillary mucinous neoplasms (IPMN), ITPN does not show significant mucin secretion. In addition, ITPN is negative for MUC2 and MUC5AC on immunohistochemical staining; therefore, diffuse pancreatic duct dilatation is not a typical morphological feature of ITPN.

Considering its intraductal origin, the clue to accurate imaging diagnosis of ITPN should be focused on delineating its intraductal growth appearance. Typical ITPNs originating from the main pancreatic duct is a two-tone pattern, one representing the tumor and the other representing pancreatic juice in the dilated upstream duct. These appearances can be observed on CT, ultrasound, endoscopic retrograde cholangiopancreatography, or MRCP. The tumor shows isodensity or slightly high density compared to the adjacent pancreatic parenchyma on unenhanced CT and relatively low density in all the phases of the CECT.[2] On MRI, the signal intensity of the tumor

is high on T2WI and DWI, and low on T1WI. On ^{18}F-FDG-PET, abnormally increased uptake of ^{18}F-FDG may be seen in the tumor.[5]

There have been four case reports of ITPN originating from the pancreatic branch duct in the English literature.[6-9] Of these, Yoshida et al[6] reported the difficulty of diagnosing ITPN originating from the branch duct because of the rarity of the branch duct type and insufficient characteristic imaging findings such as two-tone pattern. In this case, neuroendocrine tumor or metastatic tumor were considered. However, a definitive diagnosis was not reached because the imaging findings were nonspecific, as in the case of Yoshida et al.[6]

In our case, we considered that CT and MRI showed a well-circumscribed solid tumor because the dilated branch pancreatic duct was filled with tumor cells. However, on MRCP, there was a signal defect surrounded by a high-intensity layer of pancreatic juice within the dilated branch ducts, which we term "Cast in the Mold Sign" (Figure 3A). This sign was unclear on conventional T2WI, probably because MRCP is more sensitive to fluid in the pancreatic duct than the conventional T2WI. The presence of this sign preoperatively may have assisted in distinguishing ITPN originating from the branch pancreatic duct. However, the specificity of this ITPN finding may require further detailed studies on future cases, due to the similarity of several other tumors such as acinar cell cancer[10] or neuroendocrine tumors[11] that occasionally present intraductal growth.

In conclusion, pancreatologists should note that ITPN originating from the branch pancreatic duct may be detected as a well-circumscribed mass in the pancreas; however, it may create a "Cast in the Mold" appearance on MRCP, which characterizes its nature of intraductal growth.

ACKNOWLEDGEMENT

None.

CONFLICTS OF INTERESTS

None.

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