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Case Report

Sub-branch and mixed-type intraductal papillary mucinous neoplasms of the pancreas: 2 case reports

Zafer Ozmen MD[a,*], *Fatma Aktas MD*[a], *İsmail Okan MD*[b], *Zeki Özsoy MD*[b], *Akgül Arıcı MD*[c]

[a] *Department of Radiology, Gaziosmanpaşa University, School of Medicine, Gaziosmanpaşa St, Tokat, Turkey*
[b] *Department of General Surgery, Gaziosmanpaşa University, School of Medicine, Gaziosmanpaşa St, Tokat, Turkey*
[c] *Department of Pathology, Gaziosmanpaşa University, School of Medicine, Gaziosmanpaşa St, Tokat, Turkey*

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ABSTRACT

Intraductal papillary mucinous neoplasia (IPMN) is one of the cystic neoplasias of the pancreas. The imaging findings provide that these tumors are differentiated from the other cystic lesions of the pancreas, especially from the chronic pancreatitis, where the treatment protocol is completely different. Therefore, the correct diagnosis and classification of the IPMN ensures that the patient receives the correct approach and the appropriate surgery, if necessary. The purpose of this study is to emphasize the imaging findings of the different types of the IPMN and the changes in the management protocol of the patients according to these radiological findings.

Introduction

Intraductal papillary mucinous neoplasia (IPMN) of the pancreas are the subgroup of neoplasms formed by mucinous cells that are located in the main pancreatic duct or in its branches. It is a premalignant disease also called mucinous ductal ectasia or ductectatic cystadenoma [1,2]. Different from the other common cystic lesions of the pancreas, there is no gender discrimination in IPMN, and it is most frequently observed in the sixth decade of life. Acute pancreatitis is defined as one of the main symptoms of IPMN. It has been reported in different studies that the incidence of acute pancreatitis in patients with IPMN varies between 12% and 67% [3]. Patients have recurrent pancreatitis attacks and abdominal pain that are because of duct obstruction formed due to intense mucin production or tumor. The dilated ducts those are full of mucin show high T2 and variable T1-signal intensity in magnetic resonance (MR) depending on the fluid content of the mucin. The aim of this study is to present 2 patients who had IPMN diagnosis of different types and who had surgeries due to different imaging findings.

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* *Corresponding author.*
E-mail address: doktor.zafer@mynet.com (Z. Ozmen).

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Case 1

A 49-year-old male patient was admitted to our department with recurrent abdominal pain and was evaluated. The patient had been to another hospital 3 years prior with an abdominal pain complaint. In the blood analyses of the patient, the amylase and lipase values were observed as being elevated, and as a result, the patient was diagnosed with pancreatitis. In the ultrasonography (US), computerized tomography (CT), and MR examinations in that hospital, a cystic lesion was observed and was diagnosed as a pancreatic pseudocyst developed secondary to the pancreatitis attacks in the pancreas body. The patient was given treatment for pancreatitis and was followed up for a pancreatic pseudocyst diagnosis. The patient had MR and endoluminal US imaging performed in various hospitals and was controlled. However, meanwhile, the abdominal pain and pancreatitis attacks continued. The patient then was admitted to the general surgery department of our hospital with abdominal pain complaint. In the biochemical analysis of the patient, the amylase and lipase values were determined to be 1,800 U/L and 923 U/L, respectively. The other biochemical parameters were normal. No abnormalities were determined in the physical examination other than the pain that stretched along the epigastrium like a belt. When the physical examination and laboratory analyses were evaluated together, the patient was diagnosed with acute pancreatitis. The patient then was guided to our department for abdominal US evaluation. US examination was applied using Toshiba Aplio 500 2012 US device and 3.5 MHZ pvt-375BT convex probe. In the US examination, it was determined that there was segmental cystic dilation causing lobulated contour of the size of 55 × 45 mm at the pancreatic duct on the body of the pancreas, associated with the dilated pancreatic duct, with thick septa in the periphery and solid nodular components that projected into the lumen, the largest of which was 13 × 12 mm in size; and in which no color fills or spectral flow forms were observed in colored Doppler US (Fig. 1). The pancreatic duct showed dilation that was up to 4.8 mm (Fig. 1D). Upon these findings, dynamic contrast abdomen MR and MR cholangiopancreatography (MRCP) were planned for further examinations. Dynamic contrast-enhanced MR examination of the upper abdomen was performed with the 1.5 Tesla General Electric MR device by using an abdominal coil. In dynamic MR, there was segmental cystic dilation causing lobulated contour of the size 55 × 45 mm at the pancreatic duct on the body of the pancreas. Segmental cystic dilation had solid nodular components in its periphery, projecting into the lumen, the largest of which was 13 × 12 mm in size; and containing septa, showing hypointense signal properties in T1-weighted (W) series and showing clear hyperintense signal properties in T2W series, whose nodular solid components were contrasted after paramagnetic contrast matter application (Figs. 2, 3). It was observed that the main pancreatic duct was dilated in the MRCP bulk proximally and distally; and it was also observed that, especially in the distal section, the dilation in the pancreatic duct continued in the form of millimetric expansions in the sub-branches. There were filling defects representing solid components in the cystic bulk lesion periphery (Fig. 4). The visual properties in the dynamic MR and MRCP were evaluated as being consistent with intraductal papillary mucinous neoplasia (IPMN).

The Whipple operation was performed on the patient. After the operation, the specimen was evaluated in terms of histopathology. In macroscopic examination, dilation in

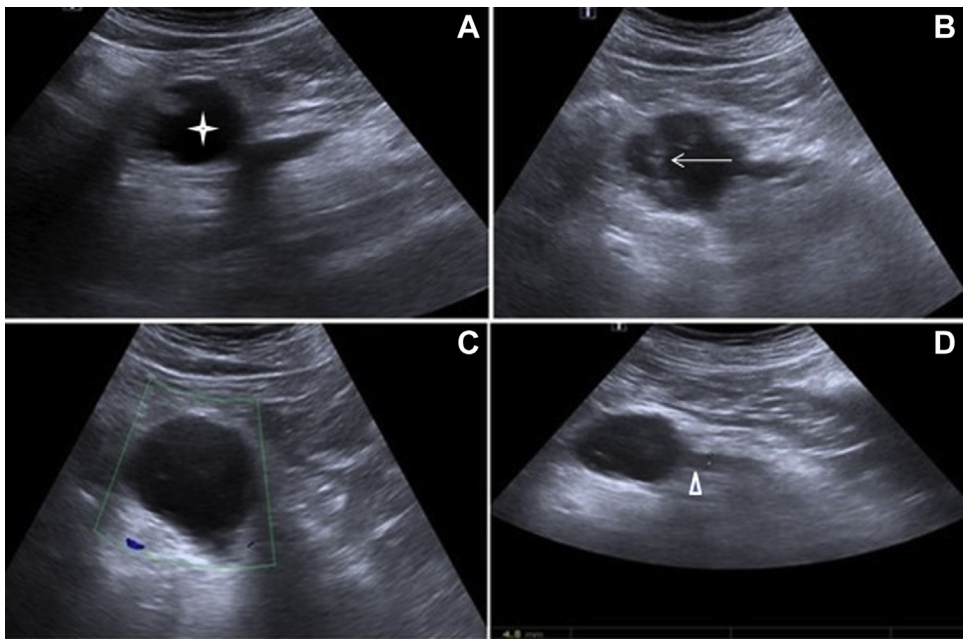

Fig. 1 – The segmental cystic dilation of the main pancreatic duct in the abdominal US (A, B) on the body of the pancreas, bordering the lobule, associated with the dilated pancreatic duct (asterisks); solid components projecting into the lumen in the periphery (long arrow). No flow was observed within the lesion in colored Doppler US (C). The main pancreatic duct is 4.8 mm in width (arrow head) in the US (D). The sub-branch dilation seen in the MR cannot be distinguished.

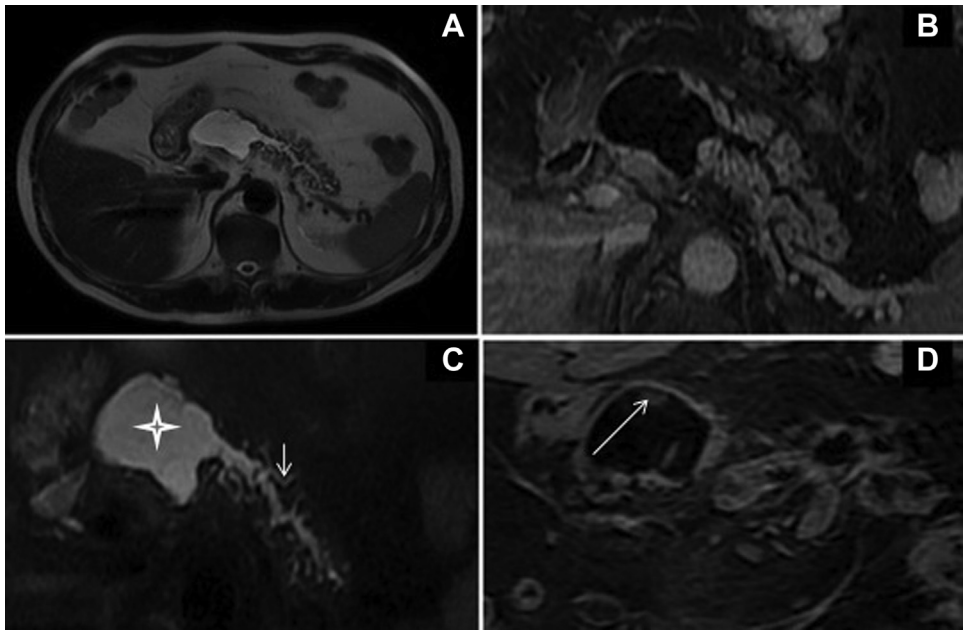

Fig. 2 – The segmental cystic dilation of the main pancreatic duct on the body of the pancreas (asterisk), bordering the lobule in axial T2W (A) and axial contrasted T1W (B) series, with smooth borders, associated with the dilated pancreatic duct. There are sub-branch dilations (short arrow) associated with the main pancreatic duct (A-C). There are contrasted solid nodular components (long arrow) and septa in the T1W (D) series after the contrast administration, in the periphery projecting into the lumen.

pancreas main ducti and in accessory ductus lumens, segmental cystic dilation of the size of 8 × 4.5 × 3 cm in the main ductus structure and villiform mucosal projections were detected (Fig. 5).

In terms of histopathology, tumoral formation that created papillary proliferations in the pancreatic duct lumen showing segmental cystic dilation was observed. The papillary structures were located on the pseudostratified columnar epithelium, contained dysplasia at a medium level, and were mainly in the form of intestinal epithelial morphology. No areas were observed in the sections that would make us consider invasion (Fig. 6). With these findings, the case was diagnosed as IPMN.

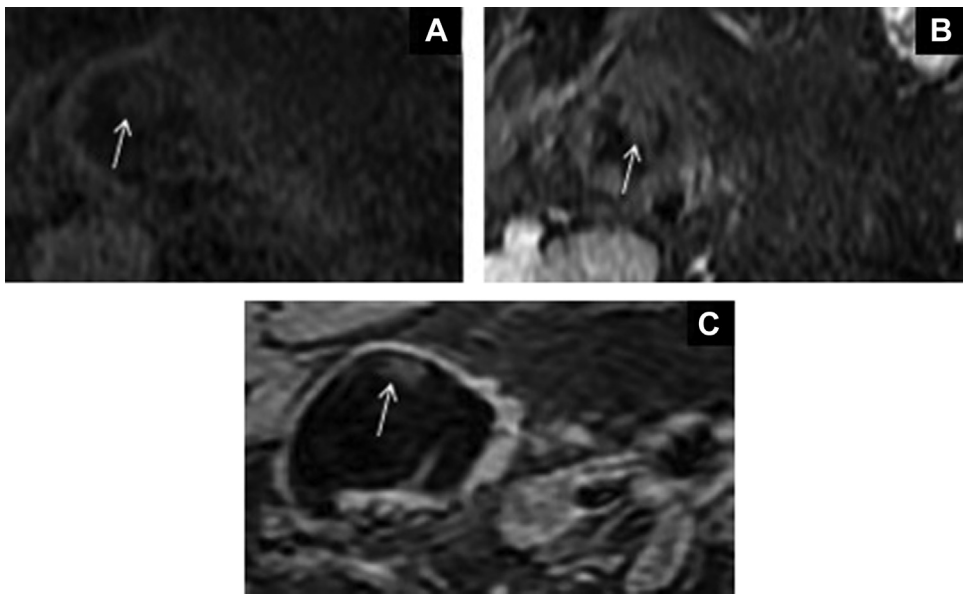

Fig. 3 – Nonenhancing areas of axial fat saturated without contrast T1W in the periphery of segmental cystic dilation, which is seen in the pancreatic duct in the body of the pancreas (A); axial fat saturated with contrast T1W (B); and the solid component (short white arrows), which shows the homogeneous contrast in the series of coronal fat saturated with contrast T1W (C).

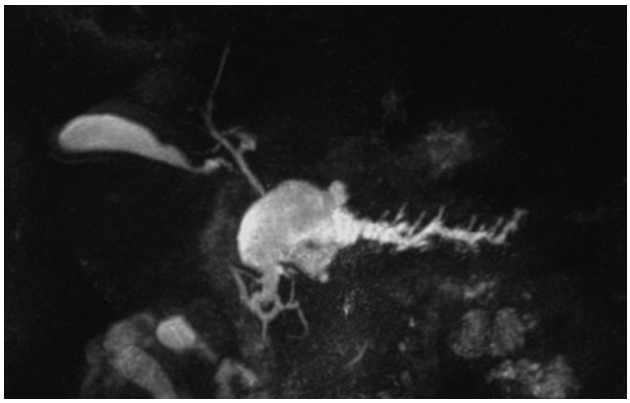

Fig. 4 – There is dilation in the proximal and distal main pancreatic duct and the sub-branches of the segmental cystic dilation in MRCP.

Case 2

The 71-year-old female patient was admitted to the general surgery polyclinic with an abdominal pain complaint. In the physical examination, the abdominal pain did not reveal any characteristics. Because the alanine aminotransferase: 52, aspartate aminotransferase: 63, and alkaline phosphatase: 275 levels were found to be higher than the normal values in biochemical analysis, she was guided to our department for abdominal US examination. However, due to intense gas, the pancreas could not be evaluated. MRI was applied, as the patient did not consent to have CT performed due to the radiation. Therefore, a dynamic contrast abdomen MR and MRCP were planned for the patient. This process was performed with the 1.5 Tesla General Electric MR device by using an abdominal coil. In the dynamic abdomen MR and MRCP, it was observed that there were multiple cysts that began in the uncinated process and proceeded through the whole of the pancreas till the pancreatic tail. They did not cause any clear lobulation in the pancreas contour and reached a greater size in the beginning of the pancreas and in the uncinated process; the largest was 26 mm in size. Their boundaries could not be distinguished from each other. They showed hypointense signal characteristics in T1W series and hyperintense signal characteristics in T2W series, which were contracted in T1W series after paramagnetic contrast substance application, and they did not have solid components. These cysts were clearly associated with the main pancreatic duct. No clear dilation was detected in the pancreatic duct. There were no contrast enhanced solid components within the cysts (Fig. 7). The proximal choledoch showed dilation reaching up to 11 mm at its widest. The gallbladder was distended, and the intrahepatic bile ducts were in the central area and were dilated in both lobes secondary to the pressure of the cysts (Fig. 8). The lesion was evaluated as being a sub-branch IPMN of the pancreas. After the patient was evaluated again, it was observed that she had obstructive jaundice, and she was operated on in another medical center for cysts on the upper section of the pancreas. Upon histopathologic examination of the sample taken from her, the diagnosis was IPMN.

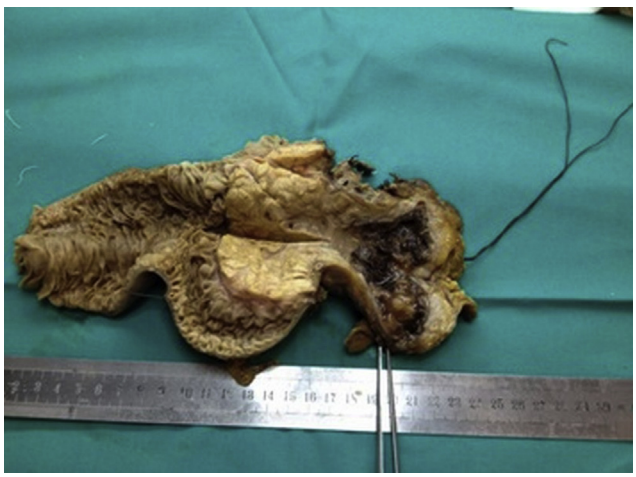

Fig. 5 – Segmental cystic dilation in the main pancreatic ductus lumen, erosion in the mucosa, ulcer bleeding, and mucosal projections.

Discussion

IPMN of the pancreas is one of the cystic tumors of the pancreas that is observed very rarely. It has 3 sub-branches: main duct IPMN; IPMN of the sub-branches; and mixed-type, in which both forms are found together [4]. The main duct type IPMN is characterized by the widespread or segmented dilation of the pancreatic duct. Since this situation is similar to the clinical and radiological findings of chronic pancreatitis, it is not always possible to recognize main pancreatic duct IPMN. Since the duct is greatly expanded, it may be mistaken as cysts.

In recent years, a common view about the normal values of the pancreatic duct has been established in the guidelines. According to this view, the upper limit of the normal pancreatic duct is accepted as 5 mm. That common view has increased the sensitivity for the radiological diagnosis of main duct type IPMN without decreasing its specificity. It is suggested in the guidelines that, if the width of the main pancreatic ductus is between 5 and 9 mm, it should be considered as a suspicious (risky) feature. If the diameter of the main pancreatic ductus is above 10 mm, it should be accepted as a high-risk factor for the main duct type IPMN. Pancreatic pseudocysts should be taken into consideration in the differential diagnosis because patients with IPMN have pancreatitis attacks in their history [5].

In our first case, who had pancreatic attacks in his history, the dilation in the pancreatic duct had taken the shape of a cyst, and as a result, the patient was diagnosed with pancreatic pseudocyst and had been followed for 3 years by various hospitals. During the follow-ups, the patient received US, CT, MRCP, and endoluminal US examinations. It has been proven that MRCP and MR are more effective than endoscopic retrograde cholangiopancreatography and CT in imaging of the ductal system in patients with IPMN [6,7]. The dilated main pancreatic duct may be visualized especially with T2W MR

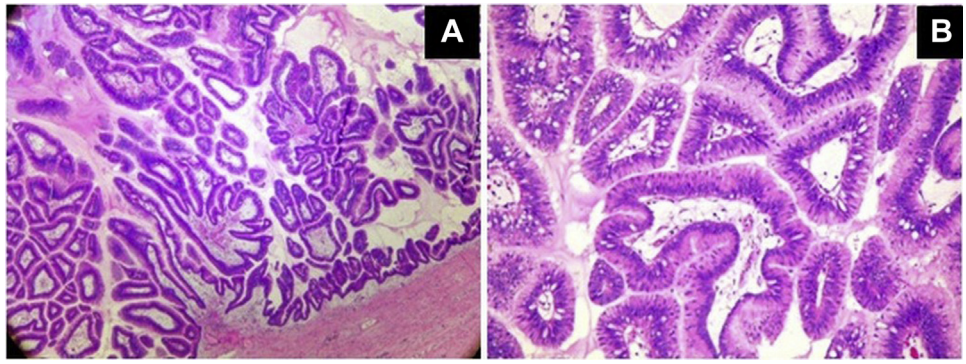

Fig. 6 – The papillary tumoral formation (H.E. × 40), which stretches to the ductus lumen (A), showing villous structure in some places. Papillary structures (H.E. × 100) with pseudostratified columnar cells (B). In some places, the intracytoplasmic mucin content is clear. H. E., hematoxylin eosin.

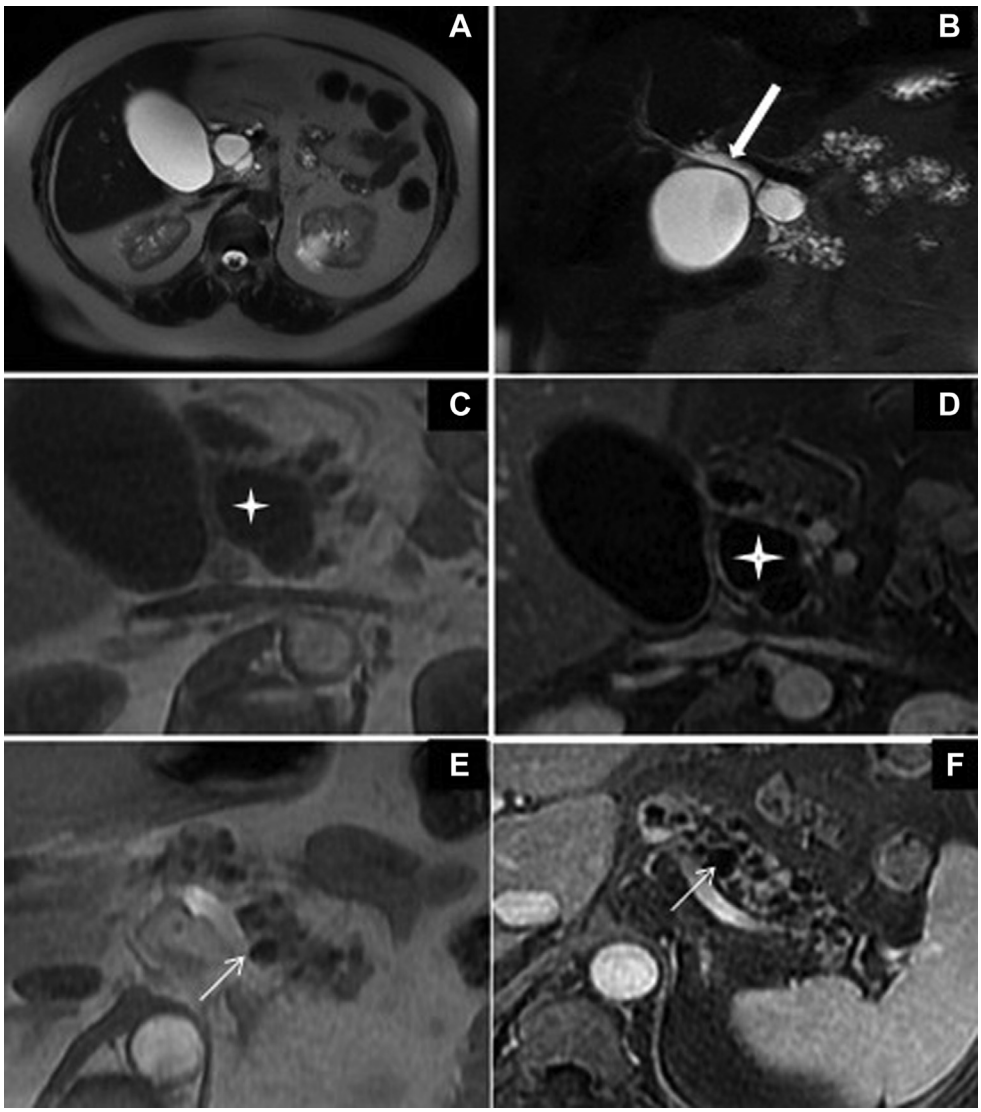

Fig. 7 – The gallbladder is hydropic in axial T2W (A, B) series, and the choledoch seems dilated (thick white arrow). The intrahepatic bile ducts have become clear in the central area. Neighboring hyperintense cysts in the pancreas are visible. These cysts are in bigger size in the uncinated process. The cysts are observed in hypointense form (asterisks) in axial T1W (C) series. In contrasted T1W (D) series, there is not an enhanced solid component (asterisks). In axial T1W (E) and contrasted T1W (F) series, many hypointense cysts that are associated with the pancreatic duct are visible and are smaller (thin white arrow) than those located in the uncinated process in the pancreas body and tail part and do not have solid component.

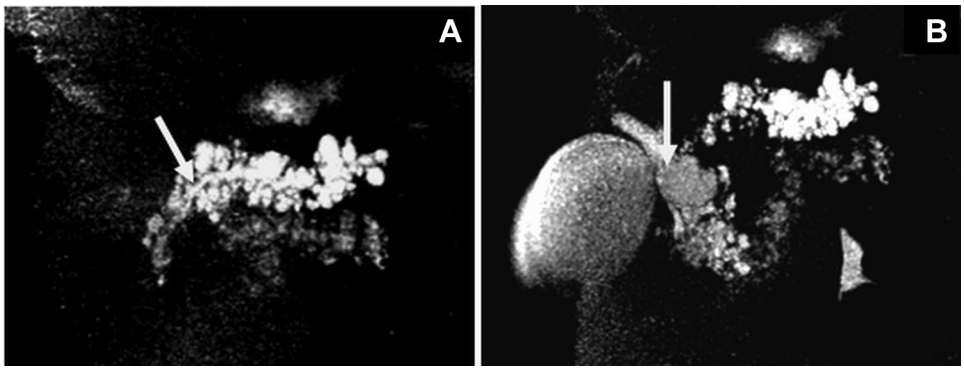

Fig. 8 – In MRCP (A, B), cysts characterized with hyperintense signal features in various sizes along the pancreas are visible. The pancreatic duct is of normal width (white arrow). The choledoch is dilated, and the gallbladder is observed in distention. The cyst has exerted pressure on the choledoch (white arrow).

Table 1 – Follow-up and treatment indications of IPMN.

Indications of surgery	Indications of EUS	Indications of follow-up
(1) Obstructive jaundice + cyst in the upper part of the pancreas. (2) The solid bulk that holds contrast within the cyst. (3) The width of the main pancreatic duct being more than 10 mm. (4) EUS (+).	(1) If indications of surgery (–). (a) Pancreatitis (+). (b) Cyst is bigger than 3 cm. (c) Main pancreatic duct is 5-9 mm. (d) Solid nodule that does not hold contrast. (e) Atrophy in pancreas distal.	(1) Indications of surgery (–). (2) EUS (–).

EUS, endoluminal US.
EUS (+) findings (a) definite mural nodule, (b) main pancreatic duct involvement, and (c) sitology doubtful or malignity.

sequences or MRCP. The filling defects with low signal intensity in the MRCP sequences represent the papillary structures and mural nodules. Papillary structures and mural nodules are closely related to malignancy development [6]. Main duct tumors may cause mild dilation in the pancreatic duct until the ampulla level.

Talamini et al. conducted a study of 473 patients with chronic pancreatitis and 45 patients with IPMN, and determined that 12% of the patients with IPMN had chronic pancreatitis. It was reported that the 2% of the patients with chronic pancreatitis were mistakenly diagnosed as IPMN. IPMN mistakenly being diagnosed as chronic pancreatitis may cause serious delays in treatment [8–10]. In our first case, despite the examinations and tests conducted, there was a delay of nearly 3 years.

Table 2 – Follow-up protocol of IPMN.

Cyst size			
Below 1 cm	1-2 cm	2-3 cm	Bigger than 3 cm
CT/MR Every 2-3 years	CT/MR Once a year	EUS every 3-6 months Later MR/EUS	Close follow-up EUS and MR every 3-6 months

CT, computerized tomography; EUS, endoluminal US.

Sub-branch type IPMN is more common in the uncinated process; however, it may also be observed in the body or in the tail; it is observed as small bunches of cysts with lobule sides and compartments [11–13]. No clear dilation in the pancreatic duct is observed.

In our second case, there were cysts that continued along the whole pancreas but were larger in size in the uncinated process of the pancreas. No dilation was detected in the pancreatic duct. Although there were no solid components, the patient had symptoms of obstructive jaundice, and the patient underwent surgery.

IPMN has a relatively better prognosis when compared with other pancreatic cystic neoplasms. The main ductus type and mixed-type IPMN have high malignancy potential and require surgical treatment [14]. IPMN treatment is determined by considering the size and location of the tumor, main pancreatic duct involvement, the nearby soft tissue component, the age of the patient, surgical risk factors, and similar variables [15–17]. The treatment and follow-up options for IPMN are given in detail in Tables 1 and 2 [17].

Teaching point

There are 3 types of intraductal papillary mucinous neoplasms of the pancreas: sub-branch type, main duct type and a mixed-type consisting of both sub-branch and main duct. Radiological imaging and treatment options may change

depending on the type and size of the tumor, width of the main pancreatic duct, and components of the accompanying soft tissue. Moreover, it can be misdiagnosed as diseases such as chronic pancreatitis and pancreatic pseudocyst.

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