Imaging Findings of Acute Pancreatitis Secondary to Pancreatic Tumors

Hyun Young Han[1], Kyung Sook Shin[2], Dong-Wook Kang[3]

Department of Radiology, Eulji University Hospital, Korea[1].

Department of Radiology, Chung Nam National University Hospital, Korea[2].

Department of Pathology, Eulji University Hospital, Korea[3]

Learning Objectives

- Evaluate the characteristic image findings;
  - Pancreatic tumors

    that are presented with acute pancreatitis

    as initial clinical manifestation.

Background

- Causes of acute pancreatitis
  - Cholelithiasis or alcohol consumption
    - Majority of acute pancreatitis

  - Pancreatic tumors
    - Rare cause of acute pancreatitis

Background

- Pancreatic tumors
  - Difficult to be early detected because;
    - Related symptoms are often
      - Non-specific
      - Subtle or even absent

- If they are manifested in acute pancreatitis
  - without history of alcohol abuse, biliary stone

→ we can find those tumors more easily

Imaging Findings Or procedure Details

from January 2004 to December 2017.

All 1065 cases of acute pancreatitis by any causes

Excluded

- Alcoholic pancreatitis
- Gallstone pancreatitis
- Other causes
  - Hypercalcemia, hyperlipidemia
  - Infection, trauma, medication
  - Congenital or hereditary abnormalities

Enrolled 19 cases

acute pancreatitis secondary to pancreatic tumor
without history of alcohol abuse and biliary stone

Imaging Findings Or procedure Details

- Reviewed;
  - Past medical & social history
  - Histopathologic results
    - If surgery was performed.
  - Performed Image

- CT
- MR
- MR cholangiopancreatigraphy (MRCP)
- Endoscopic Retrograde Cholangiopancreatography (ERCP)
- Endoscopic US (EUS)
- PET/CT

Imaging Findings Or procedure Details

- The analysis of the image findings:
  - Location of pancreatic tumor
  - Tumor size (maximum diameter)
  - Presence of P-duct dilatation
  - Parenchymal swelling adjacent tumor
  - Peripancreatic fluid collection
  - Regional or metastatic lymphadenopathy
  - Vascular invasion / encasement
  - Venous thrombosis

Imaging Findings Or procedure Details

Table 1. Characteristics of 18 patients
who had acute pancreatitis secondary to pancreatic tumor.

Characteristic	Value
No. of patients	19
Men	13 (67)
Women	6 (34)
Patient mean age (y)	60.3
Range	31-83

Note.—All except age data are numbers of patients, with percentages in parentheses.

Imaging Findings Or procedure Details

Table 2. Types of pancreatic tumor that were presented acute pancreatitis in this retrospective study.

Types of pancreatic tumor	Value
Intraductal papillary mucinous neoplasm	12 (61)
Benign	10
Malignant	2
Metastatic pancreatic tumor	5 (28)
From lung cancer	4
From rectal cancer	1
Mucinous cystadenoma	1 (5.5)
Pancreatic adenocarcinoma	1 (5.5)

Note.—All except age data are numbers of patients, with percentages in parentheses.

Imaging Findings Or procedure Details

Table 3. Analyzed image findings in acute pancreatitis due to pancreatic tumors

Image findings		Data
Mean size (cm)		2.4 (1.1-5.8)
Distribution	Head	11 (55)
	Neck	0 (0)
	Body	3 (17)
	Tail	5 (28)
Localized ductal dilatation (cm, upstream or downstream duct at tumor site)		0.4-0.9
Parenchymal swelling	without peripancreatic fluid collection (c/w acute pancreatitis, CT grade C or below)	10 (55)
	with peripancreatic fluid collection (c/w acute pancreatitis, CT grade D or above)	8 (45)
Venous Thrombosis		1 (6)
Lymphadenopathy		0 (0)
Vascular invasion / encasement		0 (0)

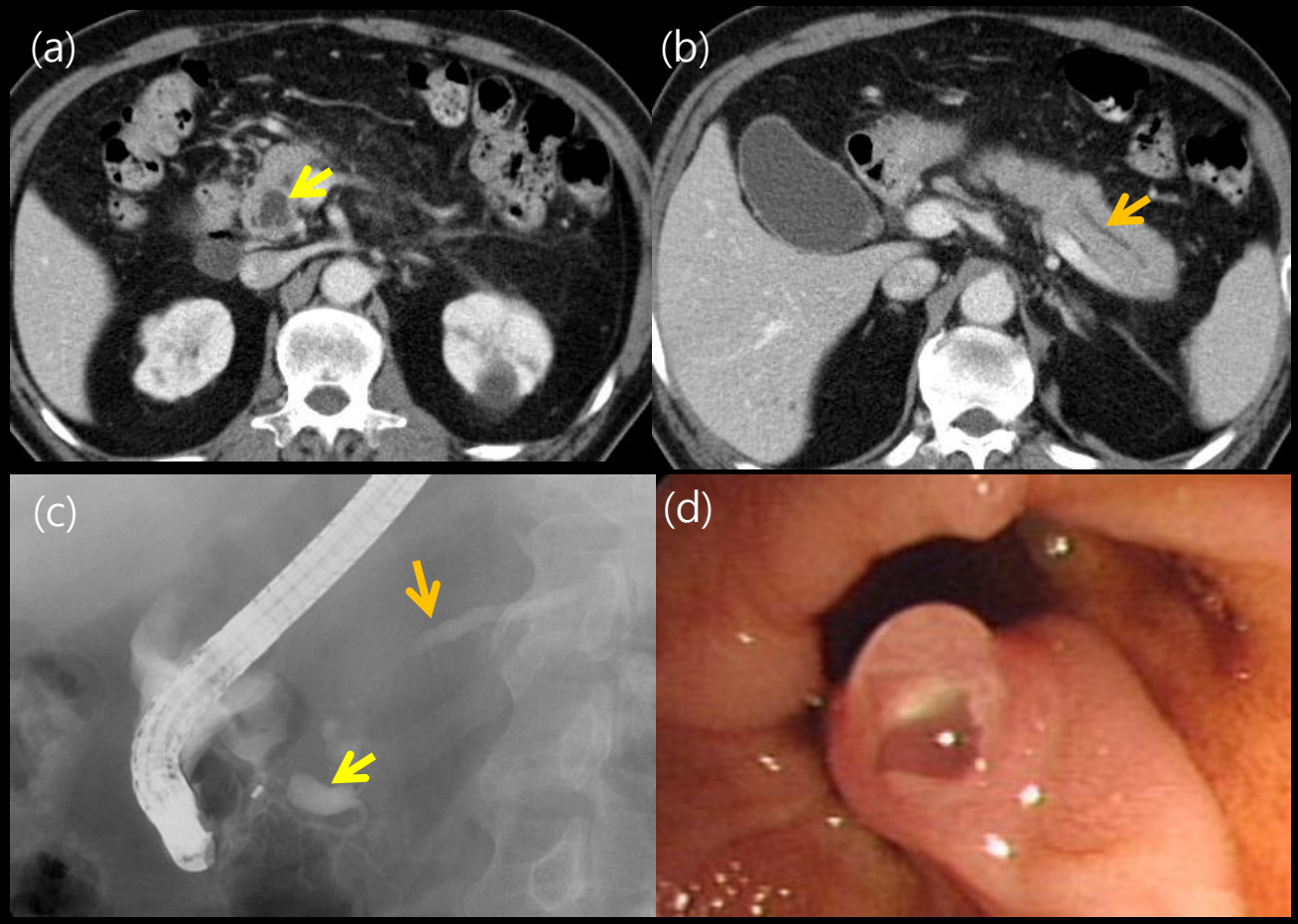
Note.—All except age data are numbers of patients, with percentages in parentheses.

CASE 1

A 65 years old man who presented with acute pancreatitis by benign IPMN.

- P-amylase 955 ↑
- Lipase 1985 ↑

CASE 1



- P-amylase 955 ↑
- Lipase 1985 ↑

Figure 1. 65 years old man who presented with acute pancreatitis by benign IPMN.
(a), (b) Axial contrast material–enhanced abdomen CT image shows diffuse pancreatic swelling, mild peripancreatic infiltration without peripancreatic fluid collection and multilobulated cystic lesion in uncinate process (yellow arrow) with main pancreatic duct dilatation. (orange arrow)
(c) In ERCP, pancreatogram shows the cystic lesion (yellow arrow) communicated with pancreatic duct in pancreatic head portion and dilated main pancreatic duct. (orange arrow)
(d) In ERCP, duodenoscopy depicts secretion of mucinous component with patulous orifice of ampulla of Vater adjacent duodenal diverticulum in second portion.

CASE 2

A 56 years old man presented with acute pancreatitis by benign IPMN.

- P-amylase 1899 ↑
- Lipase 924 ↑

CASE 2

- P-amylase 1899 ↑
- Lipase 924 ↑

Figure 2-1. 56 years old man presented with acute pancreatitis by benign IPMN.
(a) – (c) Axial contrast material–enhanced abdomen CT images & coronal oblique reconstructed image show mildly diffuse pancreatic swelling without peripancreatic fluid collection and cystic lesion (yellow arrow) with thin internal septation in uncinate process accompanied with dilated main pancreatic duct. (orange arrow)

CASE 2

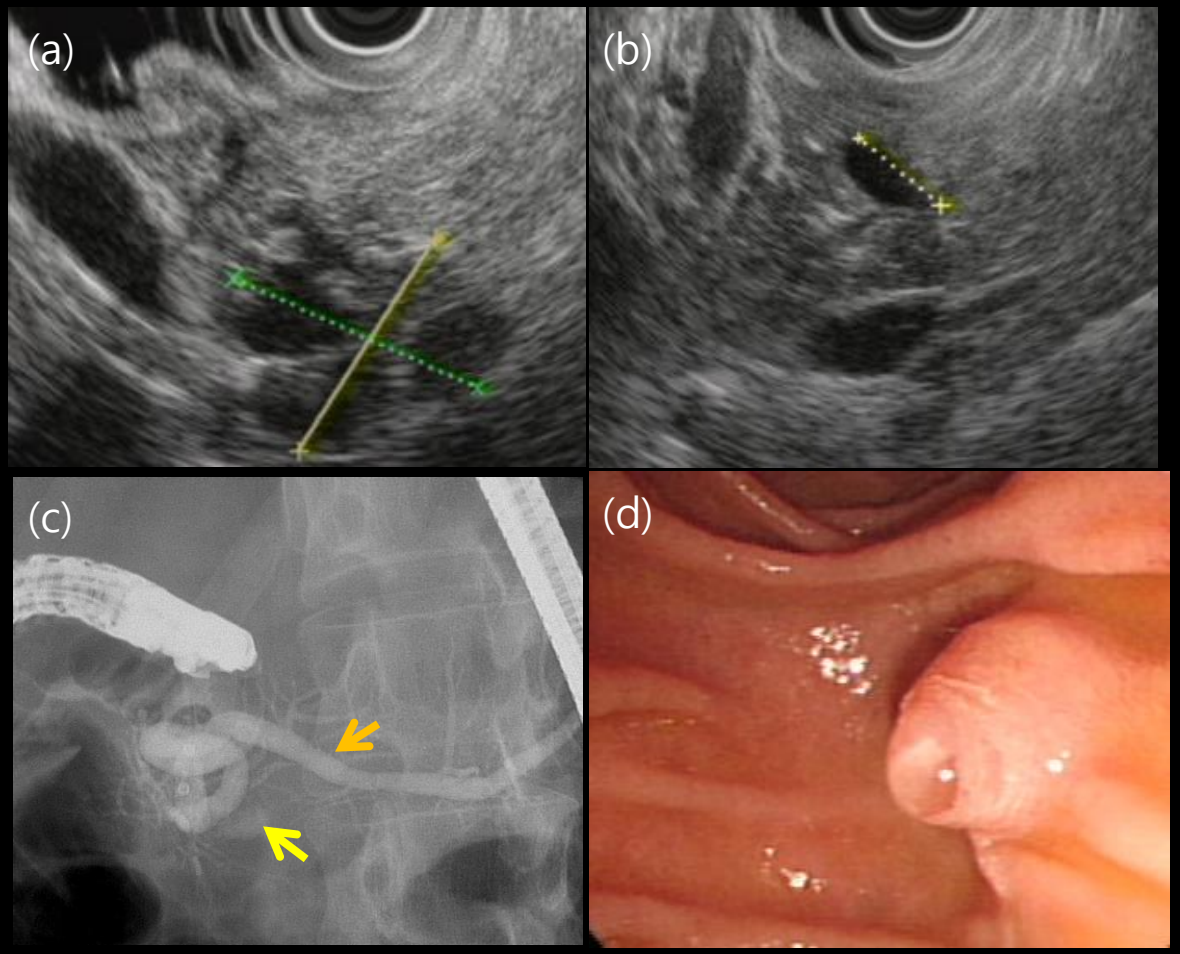


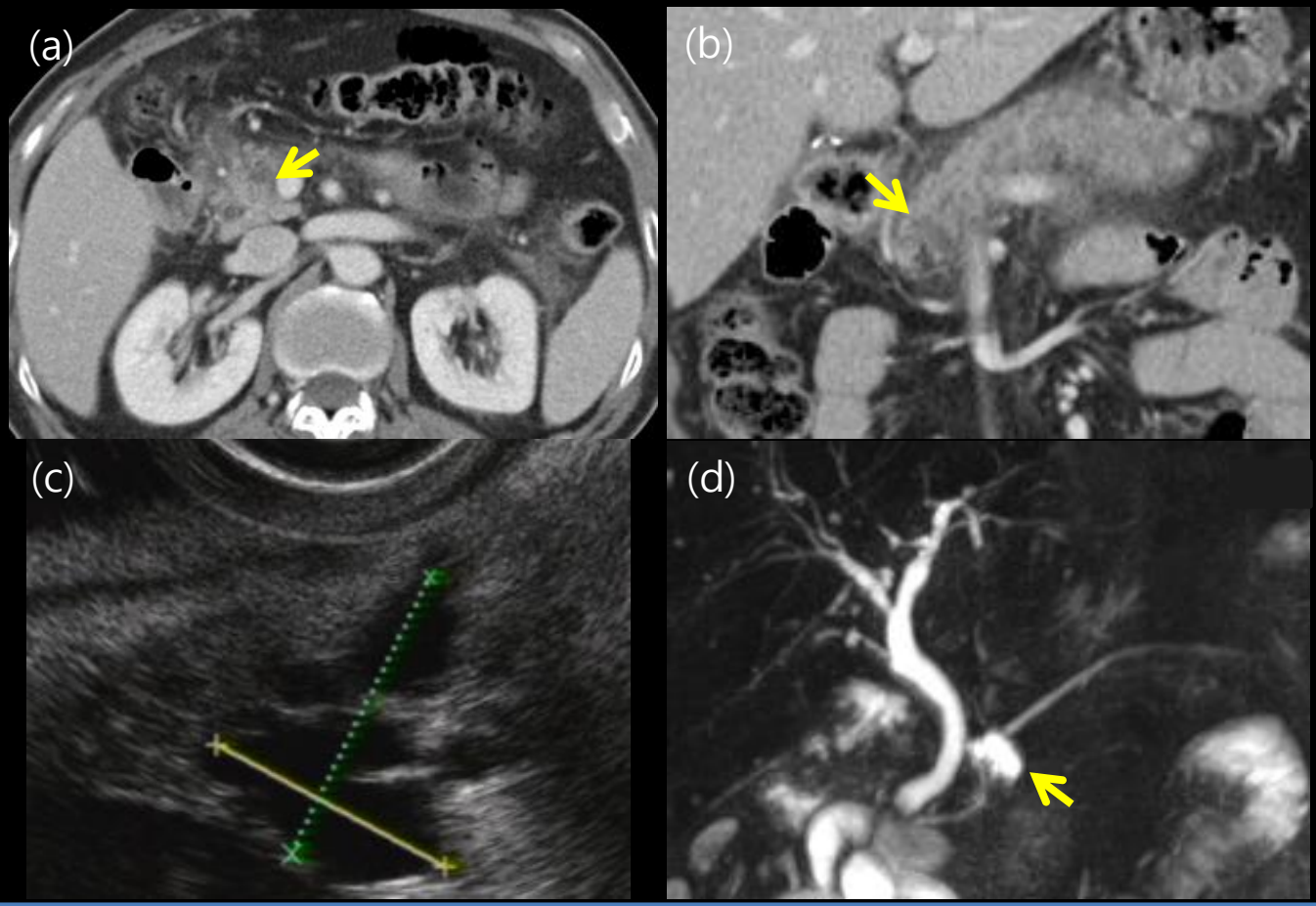
Figure 2-2. 56 years old man presented with acute pancreatitis by benign IPMN.
(a), (b) Endoscopic ultrasonography images depict the multilobulated cystic lesion with internal septation (about 2.2 x 2.1 cm) in uncinate process and dilated pancreatic duct. (about 0.9cm)
(c) In ERCP, pancreatogram shows dilated pancreatic duct (orange arrow) and amorphously contrast filling lesion (yellow arrow) suggesting the cystic lesion detected in CT and
(d) In ERCP, duodenoscopy shows secretion of mucinous component with patulous orifice of ampulla of Vater.

CASE 3

A 62 years old man presented with recurrent pancreatitis by benign IPMN

- P-amylase 867 ↑
- Lipase 1955 ↑

CASE 3



- P-amylase 867 ↑
- Lipase 1955 ↑

Figure 3. 62 years old man presented with recurrent pancreatitis by benign IPMN.
(a), (b) Axial contrast material–enhanced abdomen CT images & coronal oblique reconstructed image show diffuse pancreatic swelling with peripancreatic infiltration, fluid collection and cystic lesion in pancreatic head. (yellow arrow) The lesion didn't exist in previously performed contrast-enhanced abdomen CT for about 4 months.
(c) In endoscopic ultrasonography, multilocular anechoic lesion (yellow arrow) with internal echogenic material is detected.
(d) MRCP depicts multi-septated cystic lesion communicated with pancreatic duct in pancreatic head. (yellow arrow) Main pancreatic duct is not dilated.

CASE 3

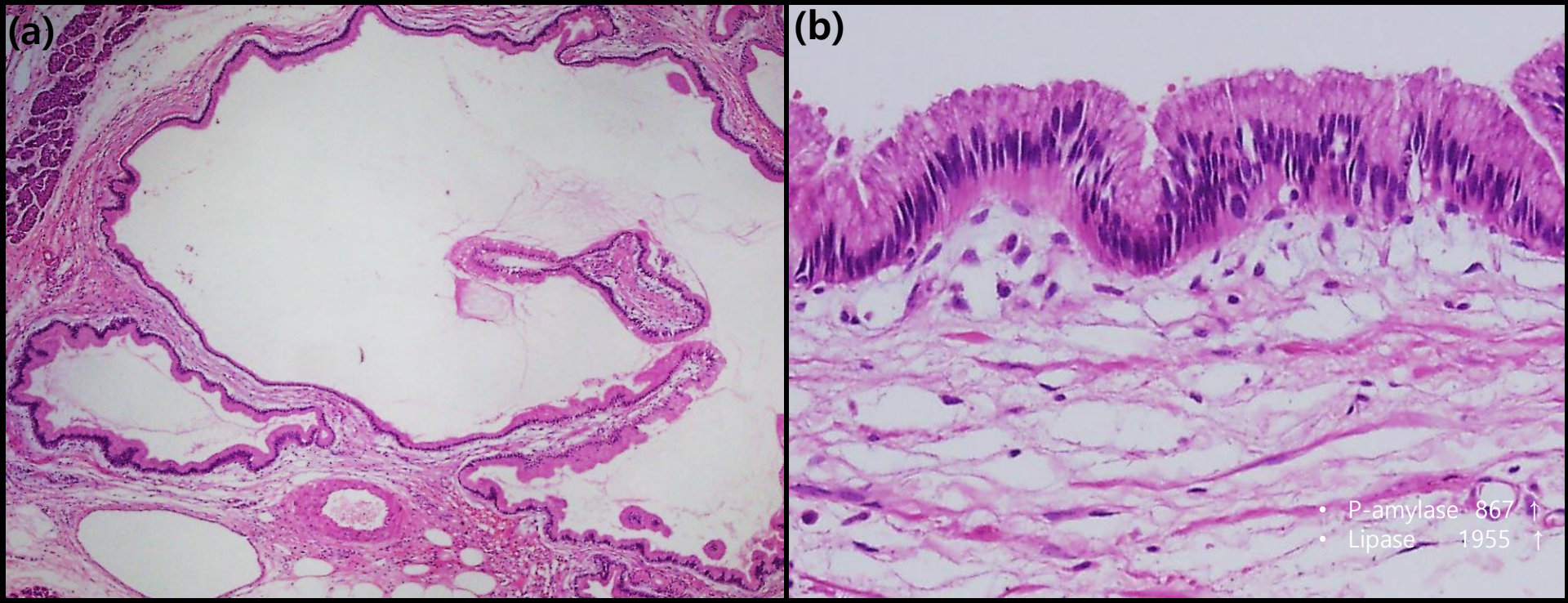


Figure 3-1. Histologic features of benign IPMN.
(a) Low power view of benign IPMN shows uniform monolayer of columnar epithelial cells.
(b) High power view of benign IPMN shows tall columnar non-invasive epithelium with basal nuclei exhibiting mild cytologic atypia.

CASE 4

A 52 years old man presented with acute pancreatitis by malignant IPMN

- P-amylase 1373 ↑
- Lipase 1930 ↑

CASE 4

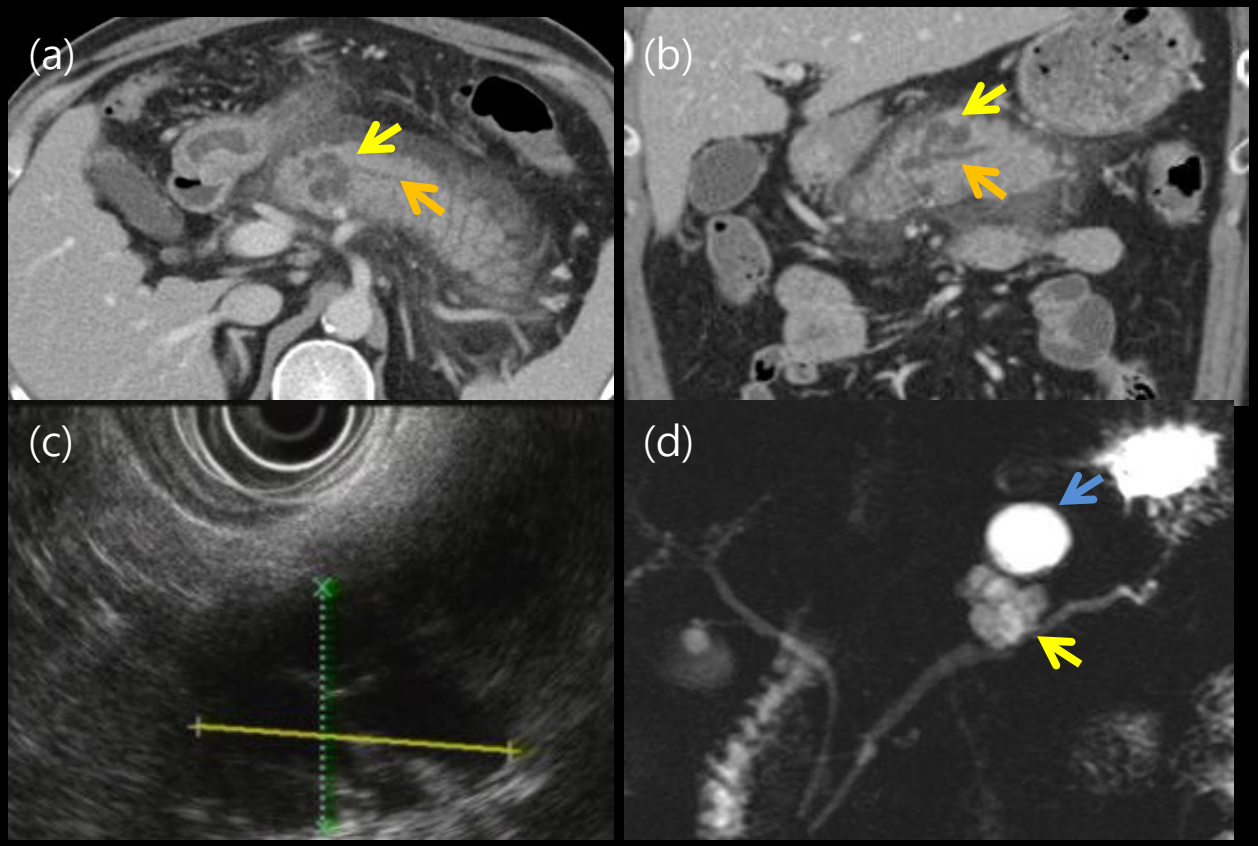


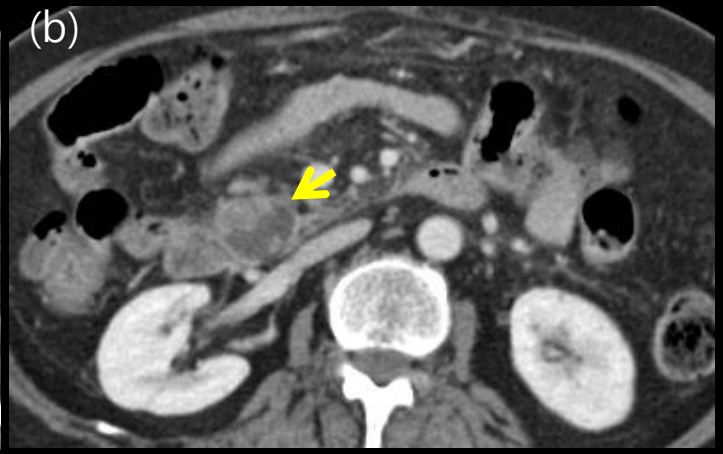
Figure 4. 52 years old man presented with acute pancreatitis by malignant IPMN.
(a), (b) Axial contrast material–enhanced abdomen CT images & coronal oblique reconstructed image show diffuse pancreatic swelling with peripancreatic infiltration, fluid collection and multi-loculated cystic lesion (yellow arrow) in pancreatic body with dilated pancreatic duct of lesion. (orange arrow)
(c) Endoscopic ultrasonography depicts well defined multilocular cystic mass (about 2.6 x 2.0 cm in size)
(d) Multi-lobulating septated cystic lesion with communicating with pancreatic duct (yellow arrowed) in MRCP. Unilocular cystic lesion (blue arrow) with brighter signal intensity is suggested pseudocyst.

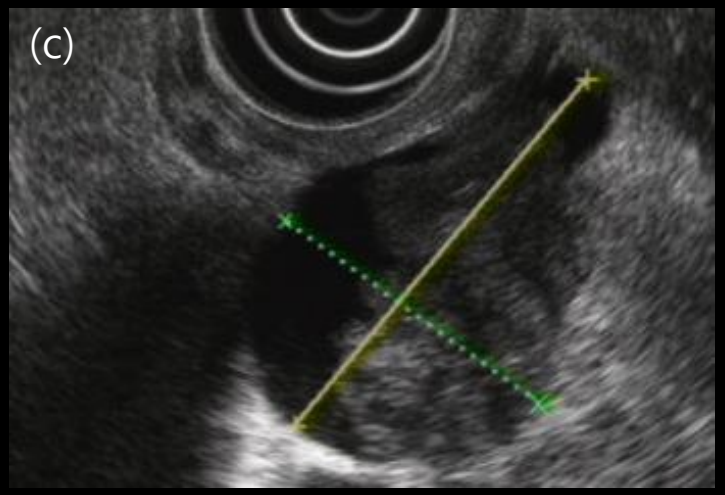
CASE 5

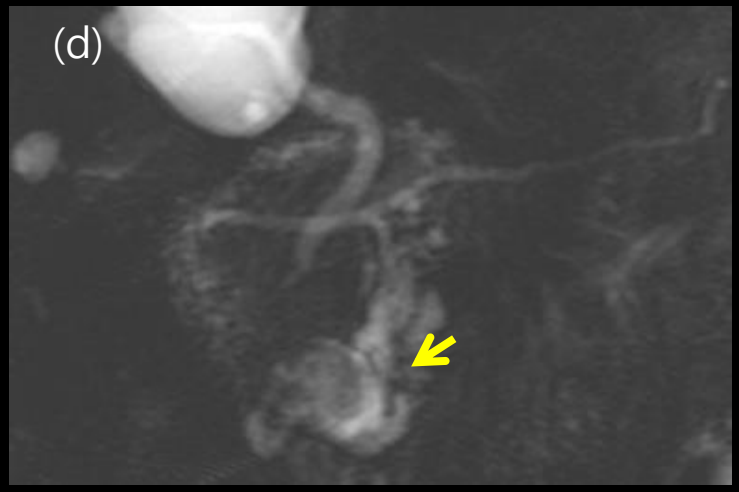
A 76 years old woman presented with acute pancreatitis by malignant IPMN

P-amylase	27357	↑
Lipase	284	↑

CASE 5







P-amylase 27357 ↑
Lipase 284 ↑

Figure 5. 76 years old woman presented with acute pancreatitis by malignant IPMN.
(a), (b) Axial contrast material–enhanced abdomen CT images show diffuse pancreatic swelling with with peripancreatic infiltration, fluid collection and cystic lesion with internal eccentric enhancing solid portion (yellow arrow) in between duodenum 2nd, 3rd portion with pancreatic head.
(c) Endoscopic ultrasonography depicts anechoic cystic lesion with internal polypoid heterogeneously hypoechoic portion (about 3.4 x 2.4 cm in size) in pancreatic head.
(d) In MRCP, cystic lesion (yellow arrow) with internal solid nodular portions has communication with tortuous duct.

CASE 5

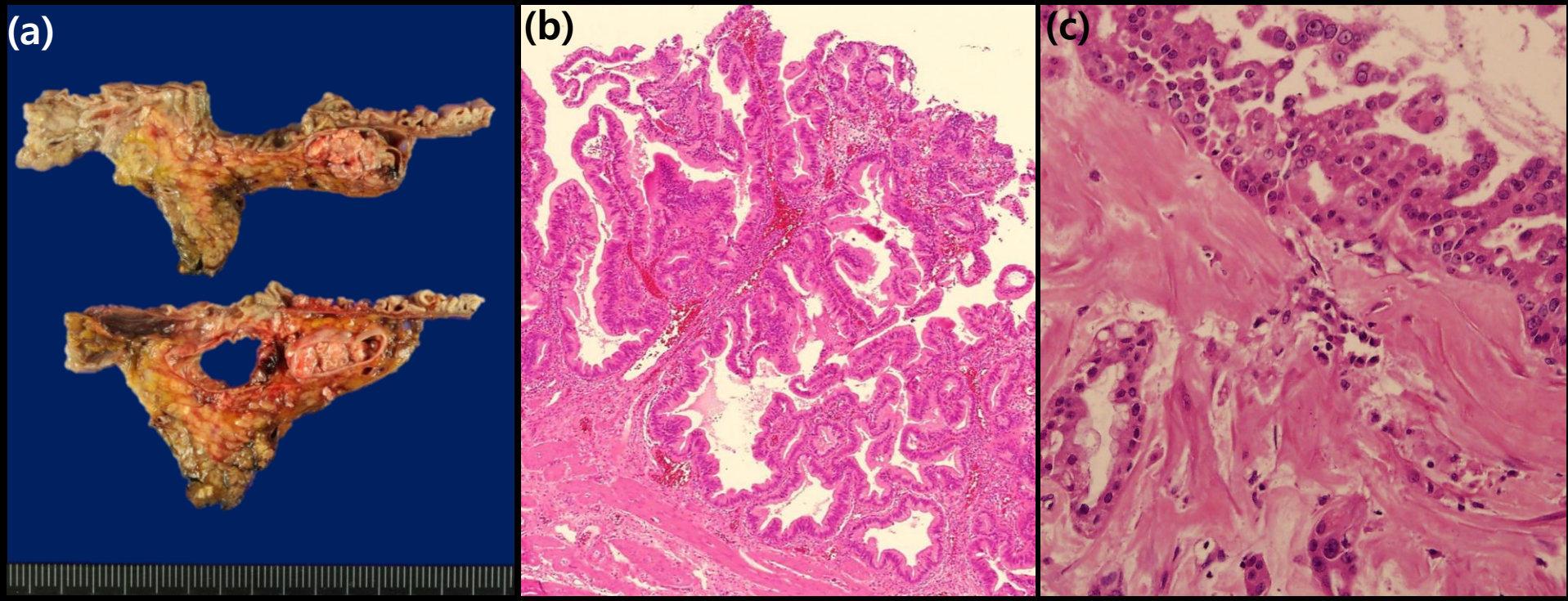


Figure 5-1. Gross and histologic features of IPMN with associated invasion
(a) Gross finding of IPMN with associated invasion
(b) Lower power view of intermediated grade of IPMN and (c) high power view of high grade IPMN with focal invasive neoplastic epithelium, displaying IPMN with associated invasion.

CASE 6

A 57 years old man presented with acute pancreatitis by metastatic tumor from lung cancer

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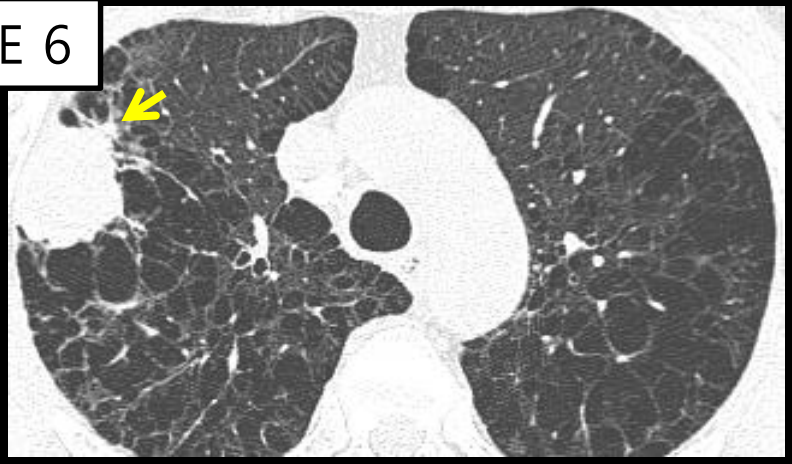
P-amylase
122 ↑

CASE 6



P-amylase
122 ↑

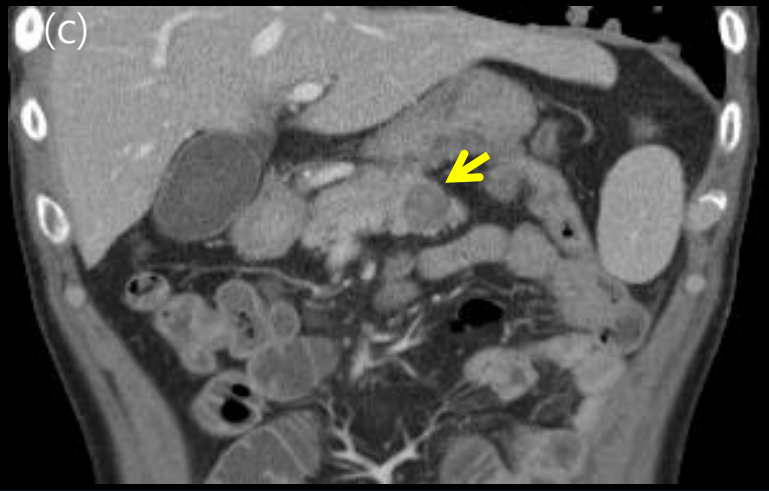
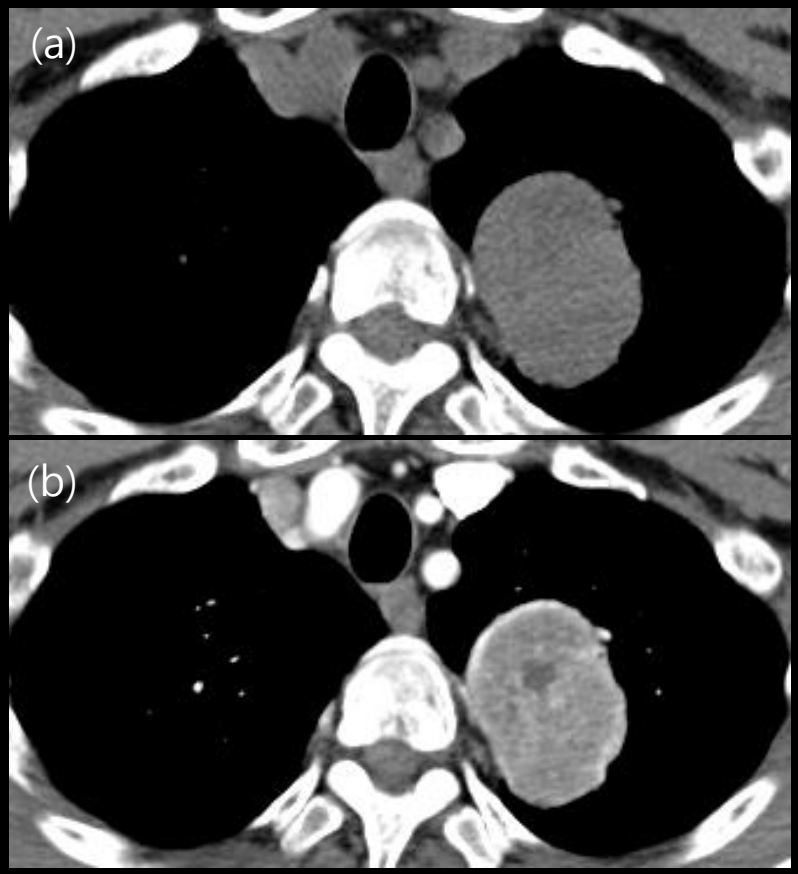


Figure 6. 57 years old man presented with acute pancreatitis by metastatic pancreatic cancer.
(a) Known primary lung cancer lesion (yellow arrow) in axial contrast-enhanced CT image obtained with lung window setting previously confirmed by pathology.
(b), (c) Axial contrast material–enhanced abdomen CT images & coronal oblique reconstructed image show diffuse pancreatic swelling without peripancreatic infiltration, fluid collection and poorly enhancing nodular lesion (yellow arrow) in junction of pancreatic body & tail. Pancreatic duct are not remarkably dilated.
(d) Focal high FDG uptake (yellow arrow) in PET CT indicated metastatic mass lesion of pancreas.

CASE 7

A 54 years old man presented with acute pancreatitis by metastatic pancreatic cancer from the lung

CASE 7



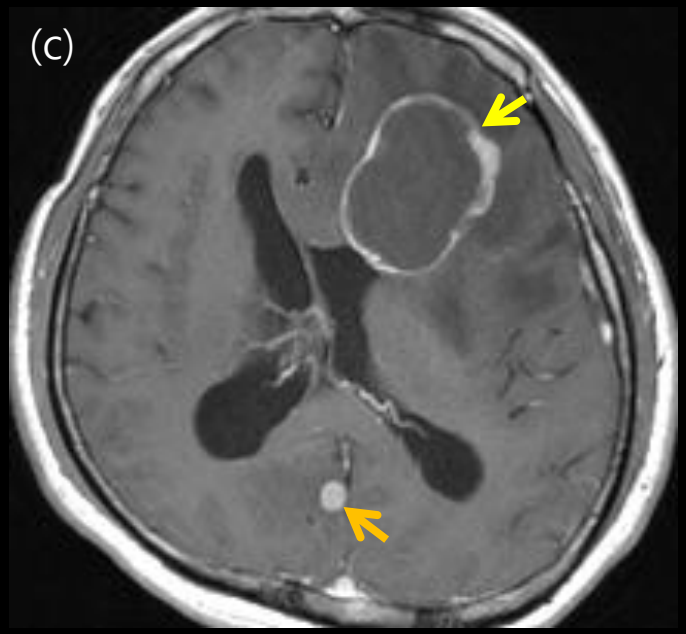


Figure 7-1. 54 years old man presented with acute pancreatitis by metastatic pancreatic cancer.
(a), (b) Known primary lung cancer lesion in axial contrast-enhanced CT image that was previously confirmed by pathology.
(c) Contrast-enhanced T1-weighted axial image shows multifocal central necrotic, peripheral enhancing masses at the Lt. anterior frontal white matter (yellow arrow), Rt. inferior paramedian parietal cortex (orange arrow), suggesting brain metastasis.

CASE 7

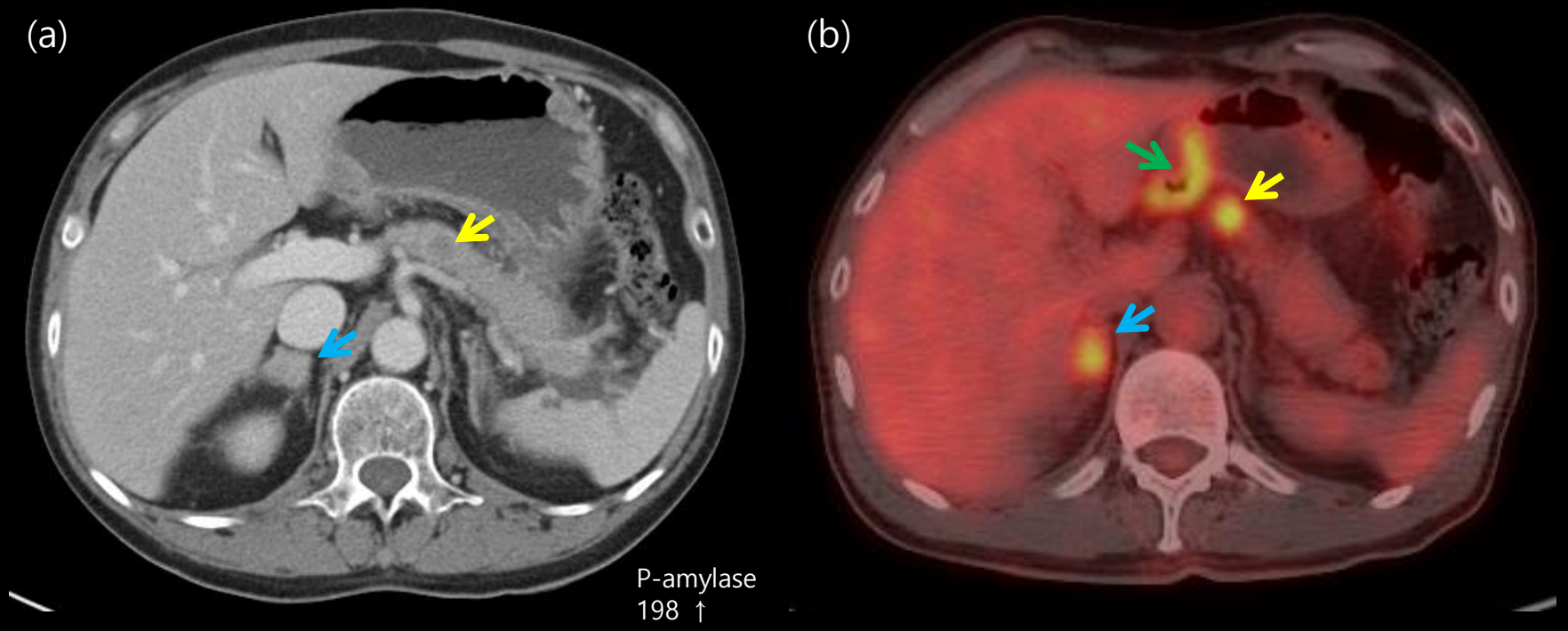


Figure 7-2. 57 years old man presented with acute pancreatitis by metastatic pancreatic cancer.
(a) Axial contrast material–enhanced abdomen CT images shows diffuse pancreatic swelling with peripancreatic infiltration, fluid collection and irregular low attenuating nodular lesion with enhancing rim in the pancreatic neck and enhancing solid mass in the Rt. adrenal gland.
(b) Multifocal high FDG uptake (yellow & blue arrows) in PET CT indicated metastatic mass lesion of pancreas and Rt. adrenal gland. FDG uptake in antral portion of stomach (green arrow) suggests benign physiologic uptake.

CASE 7

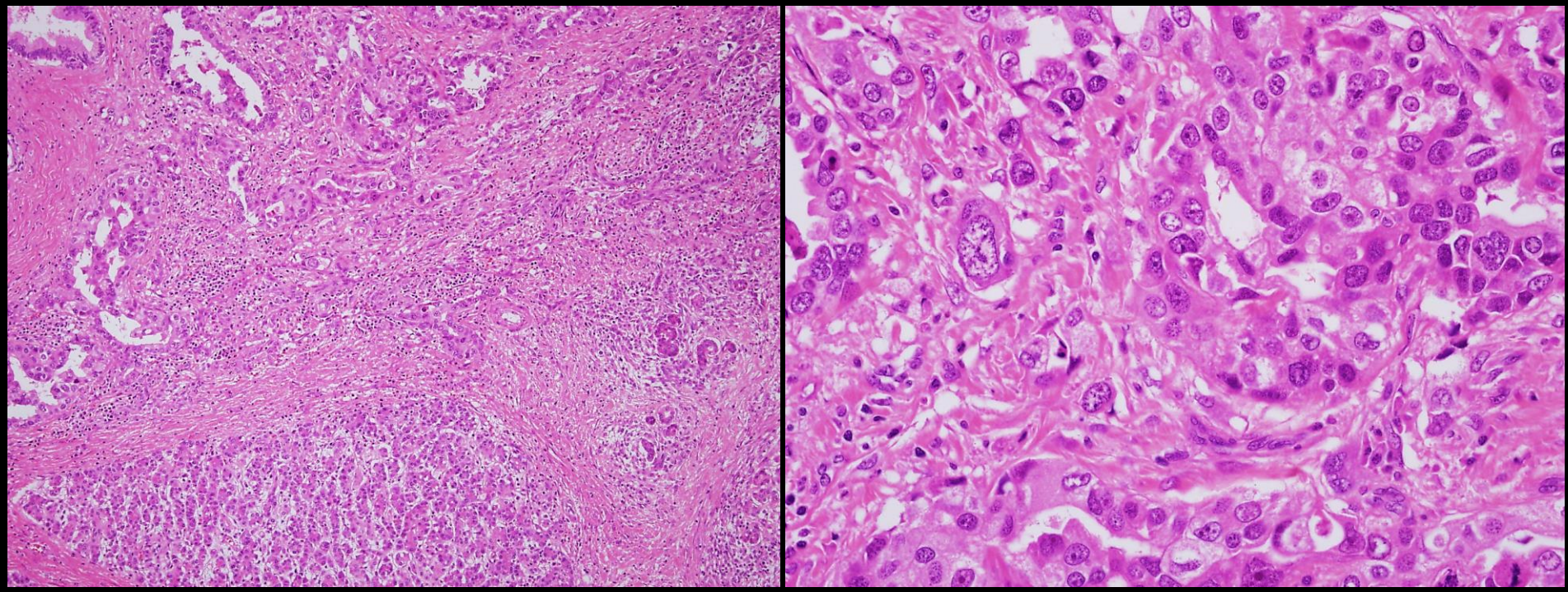


Figure 7-3. Histologic features of metastatic carcinoma from the lung
(a) Low power view of metastatic carcinoma from the lung.
(b) High power view of metastatic carcinoma. Tumor cells show pleomorphic tubular structures with large anaplastic nuclei.

CASE 8

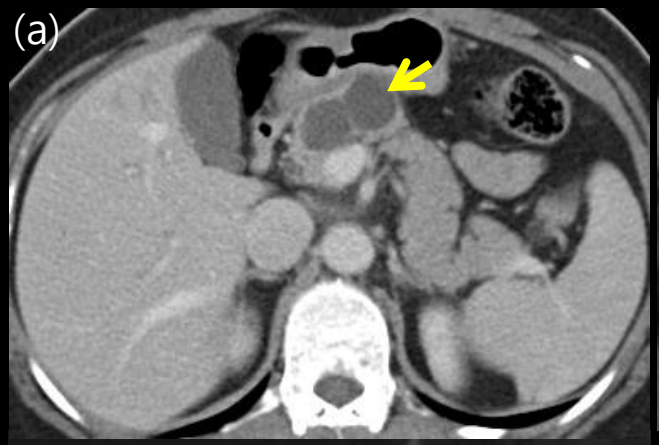
A 48 years old woman presented with acute pancreatitis by pancreatic mucinous cystadenoma

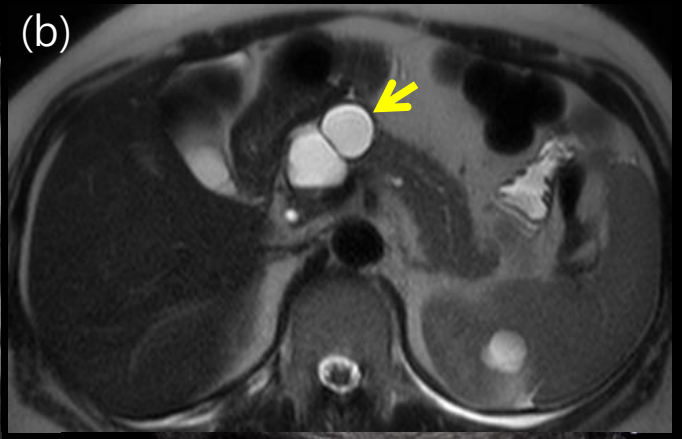
- P-amylase 258 ↑
- Lipase 487 ↑

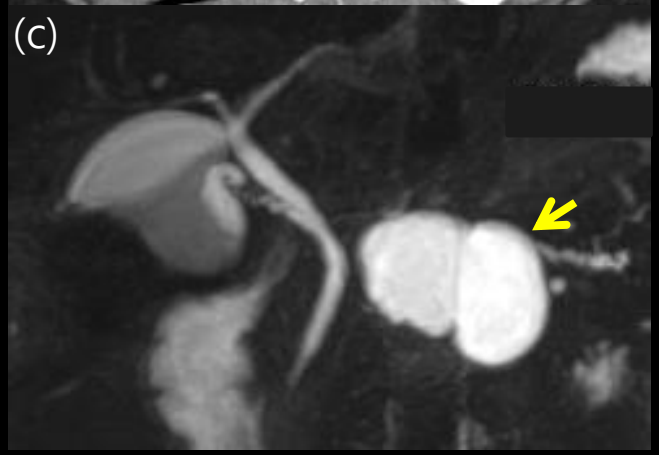
CASE 8

Bilobulated one cyst

Two cysts ???







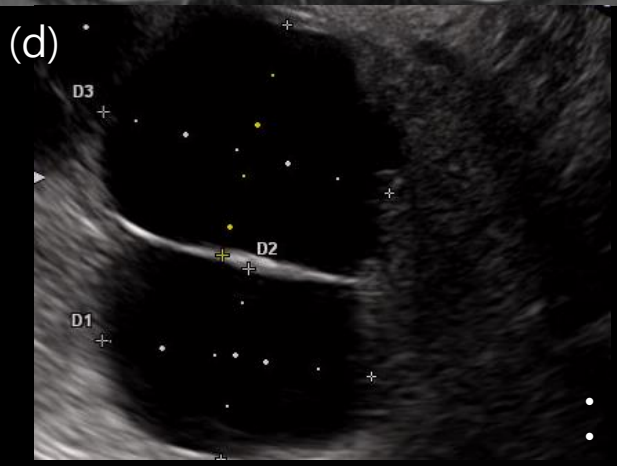


Figure 8. 48 years old woman presented with acute pancreatitis by pancreatic mucinous cystadenoma.
(a) Axial contrast material–enhanced abdomen CT images shows diffuse swelling in pancreatic body & tail without peripancreatic infiltration, fluid collection and two cystic lesions in pancreatic head. (yellow arrow)
(b) In T2 weighted axial MR image, two cystic lesion with high signal intensity and mildly dilated upstream pancreatic duct than head portion. (yellow arrow)
(c) In cholangiography, the cystic lesion doesn't communicate with pancreatic duct.
(d) Endoscopic ultrasonography depicts bilocular anechoic lesion without internal mural nodule. (about 25.8 x 18.3mm, 28.2 x 22.8mm in size)

CASE 9

A 31 years old man presented with acute pancreatitis by pancreatic adenocacinoma

- P-amylase 464 ↑
- Lipase 1246 ↑

CASE 9

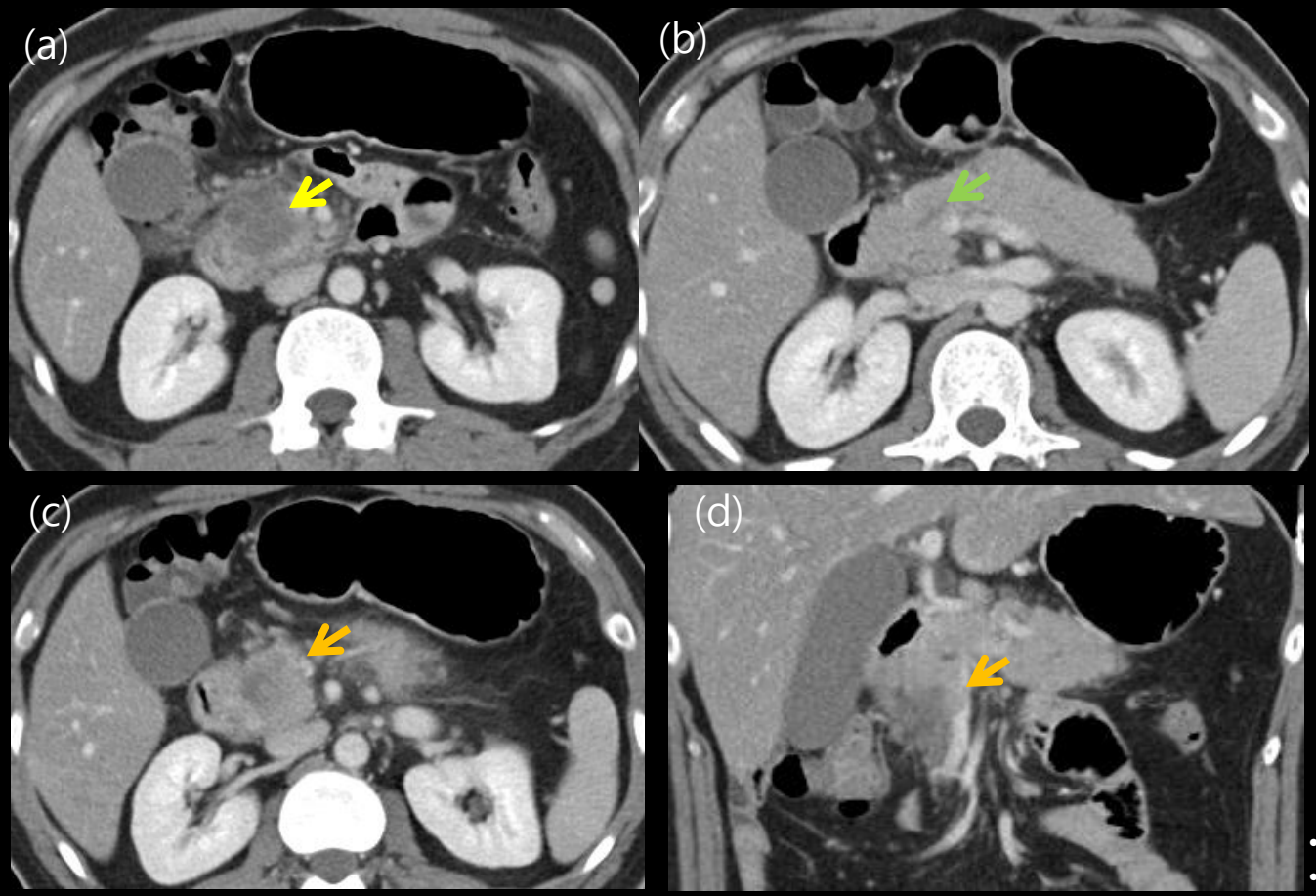


Figure 9-1. 31 years old man presented with acute pancreatitis by pancreatic adenocacinoma.
(a), (b) Axial contrast material–enhanced abdomen CT images shows diffuse pancreatic swelling without peripancreatic infiltration, fluid collection and heterogeneous ill-defined round hypodense lesion (yellow arrow) in pancreatic head with midly dilated pancreatic duct. (green arrow)
(c), (d) Axial contrast material–enhanced abdomen CT images & coronal oblique reconstructed image depict thrombus in superior mesenteric vein. (orange arrow)

CASE 9

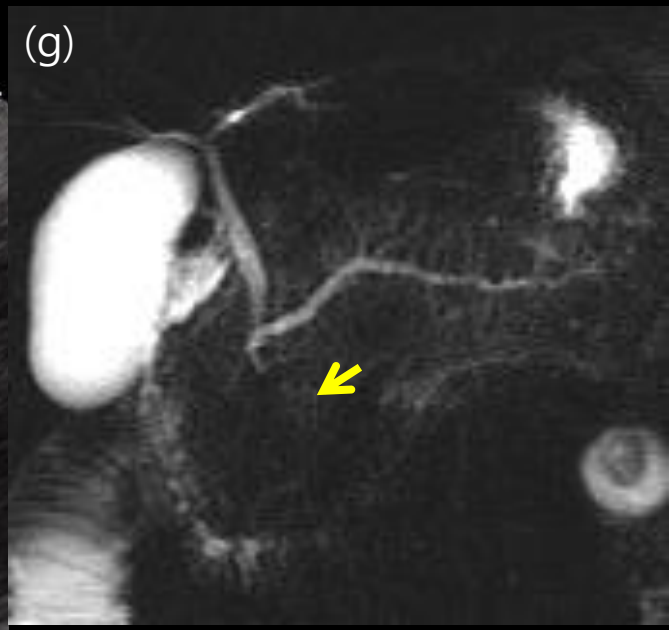


Figure 9-2. 31 years old man presented with acute pancreatitis by pancreatic adenocacinoma.
(e), (f) Endoscopic ultrasonography shows ill-defined heterogeneous hypoechoic lesion and dilated pacreatic duct. And edematous pancreatic contour with peripancreatic fluid collection is also seen.
(g) Heterogeneously low SI lesion without communication with pancreatic duct in cholangiography. Upstream pancreatic duct of the lesion is mildly dilated (about 0.5cm) and distal pancreatic duct and common bile duct are displaced posteriorly by the lesion.

CASE 9

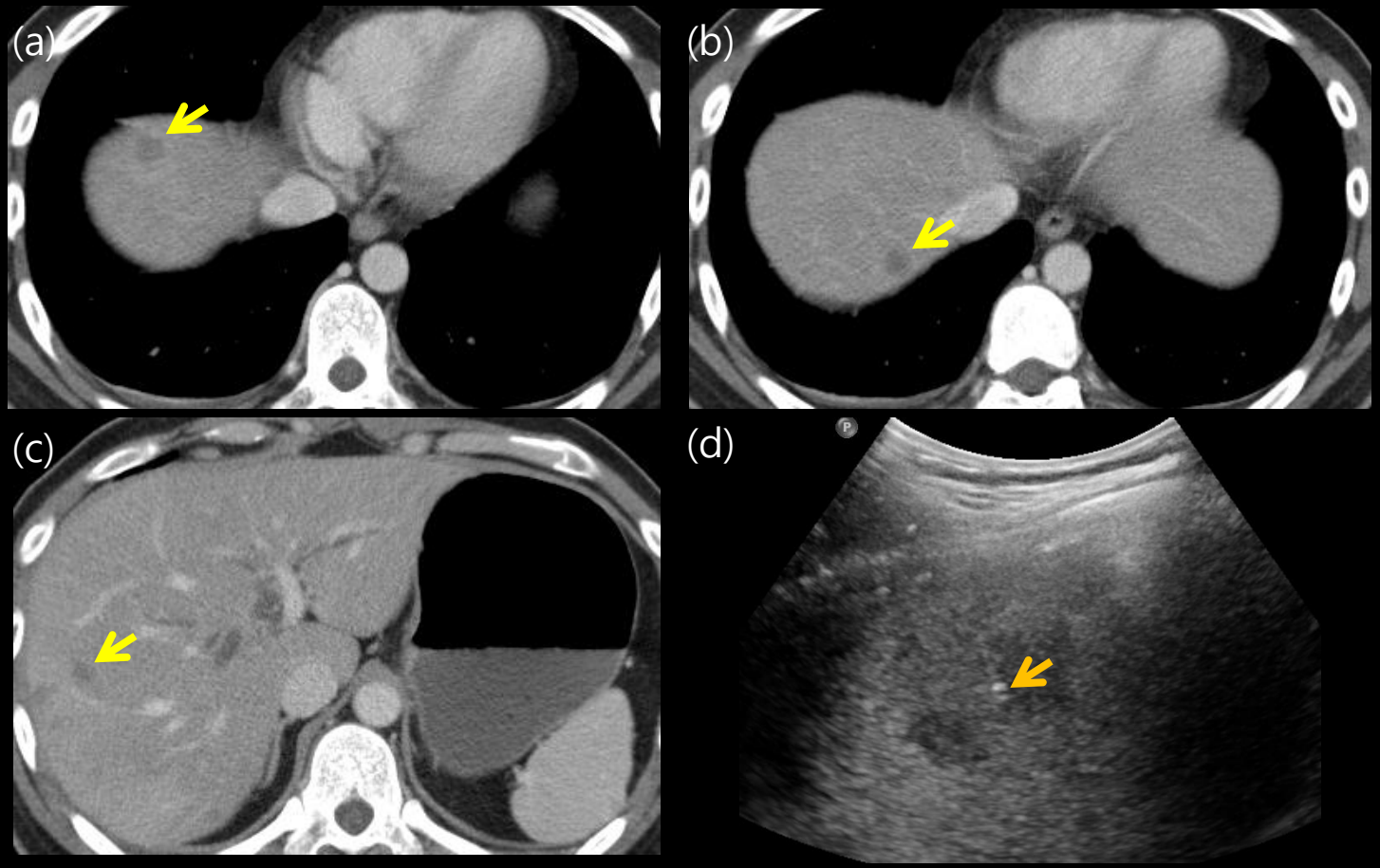


Figure 9-3. 31 years old man presented with acute pancreatitis by pancreatic adenocacinoma.
(a)-(c) After 1 month, axial contrast-enhanced abdomen CT image shows multiple hepatic hypodense nodules (yellow arrow).
(d) Ultrasonography guided liver biopsy was performed in one lesion of multiple hepatic hypoechoic nodules. Tip of biopsy needle (orange arrow) is found in ultrasonography image. This nodule was confirmed by pathology into poorly diffentiated metastatic adenocarcinoma.

Conclusions

- Identifying etiology of acute and recurrent pancreatitis is vital.
  - In guiding management
  - In preventing future attacks.

- Pancreatitis due to pancreatic tumors
  - Reported but is rare.
    - in only 1-2% of cases of acute pancreastitis.
      - Adenocarcinoma
      - Intrapapillary mucinous neoplasm
      - Lymphoma
      - Metastases

Conclusions

"Obstuctive" theory

Main pancreatic duct obstruction by;
- Viscous mucinous secretions
- Direct duct disruption.

↓

Pancreatic ductal pressures ↑

↓

Premature release & activation of pancreatic enzymes

↘

"non-obstructive" theory

Tumor itself releases enzymes that activate pancreatic trypsinogen

↓

Acute pancreatitis secondary to pancreatic tumor as initial clinical manifestation.

Conclusions

- Lesions that can mimic a neoplasm or are indistinguishable from one another on a single scan.
  - Abscess
  - Pseudocyst
  - Focal pancreatitis

- Useful image findings in accurately identifying acute pancreatitis due to underlying malignancy include;
  - Significant dilatation of the pancreatic duct
  - Disproportion between size of the pancreatic head and body (head being substantially bulkier)
  - Peripancreatic and upper abdominal lymphadenopathy
  - Distant metastases
  - Vascular encasement or invasion
  - Recurrent pancreatitis without a known underlying risk factor

Conclusions

- A variety of tumors metastasize to the pancreas, including;
  - Small cell carcinoma of the lung : most common.
  - Prostatic carcinoma
  - Breast carcinoma
  - Stomach carcinoma
  - Renal cell carcinoma
  - Hodgkin's disease

- Mechanism of metastasis induced acute pancreatitis, include;
  - Mechanical ductal obstruction
  - Rupture or vascular compromise secondary to tumor invasion
  - Compression from enlarged peripancreatic lymph nodes
  - Others : infectious, metabolic, nutritional, and traumatic factors

Conclusions

- Acute pancreatitis without cholelithiasis or history of alcohol consumption
  - Can be the only one clue in early detection of pancreatic tumor
- Intraductal papillary mucinous neoplasm
  - Most common tumor that can manifest acute pancreatitis in this study.

Conclusions

- Characteristic image findings in acute pancreatitis secondary to pancreatic tumor
  - Accompanied localized upstream duct dilatation at tumor site
  - Parenchymal swelling without peripancreatic fluid collection

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