

Cystic lesions of the pancreatic-duodenal region: a pictorial review

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Learning objectives

To describe and illustrate the imaging findings of pancreatic and duodenal cystic lesions, emphasizing the contribution of cross-sectional imaging modalities to the differential diagnosis.

Background

Pancreas and duodenum are anatomically close retroperitoneal organs. Both may develop cystic lesions; therefore, it is sometimes difficult to establish the lesion's organ of origin. However, some imaging features together with the clinical setting may help to make the differential diagnosis.

Imaging findings OR Procedure details

DUODENAL CYSTIC LESIONS

Cystic lesions of the duodenum are almost always benign.

They may be:

- congenital or acquired
- intraluminal, intramural or extramural
- primary or secondary

DUODENAL CYSTIC LESIONS

| DUODENAL CYSTIC LESIONS | PRIMARY | SECONDARY |
|-------------------------|--|-----------------------|
| CONGENITAL | True Diverticulum Duplication Cyst Cystic Dystrophy of the Duodenal Wall | Choledocoele |
| ACQUIRED | Pseudodiverticulum | Intramural pseudocyst |

Fig. 1: Duodenal Cystic Lesions

References: C. Ruivo; Coimbra, PORTUGAL

Extramural and intraluminal diverticula communicate with the duodenal lumen.

They are generally asymptomatic unless complicated:

- Diverticulitis (inflammation)
- Acute abdomen (perforation)
- Upper gastrointestinal bleeding (hemorrhage)
- Pancreatitis (pancreatic stasis)
- Cholangitis and cholecistitis (biliary stasis)
- Bowel obstruction (intraluminal diverticulum)

PRIMARY

*** Extramural diverticulum**

True diverticulum

- This results from failure of the recanalization process of the duodenal lumen during embryogenesis
- It is composed of all the layers of the intestinal wall

Pseudodiverticulum

- Due to the herniation of the submucosal and mucosal layers through a duodenal muscular defect
- Contrary to true diverticula, pseudodiverticula do not contain the muscular layer of the duodenal wall

The most frequent location of extramural diverticula is on the mesenteric border of the 2nd or 3rd portions of the duodenum.

They extend towards the pancreas and when fluid-filled they can be misdiagnosed as a cystic lesion of the pancreatic head.

⌘ Abdominal CT/MRI:

- Air-fluid, fluid or residual particulate food-filled mass along the medial wall of the 2nd or 3rd portions of the duodenum
- Thin enhancing wall
- Communication with the duodenal lumen
- +/- dilated bile duct and/or pancreatic duct

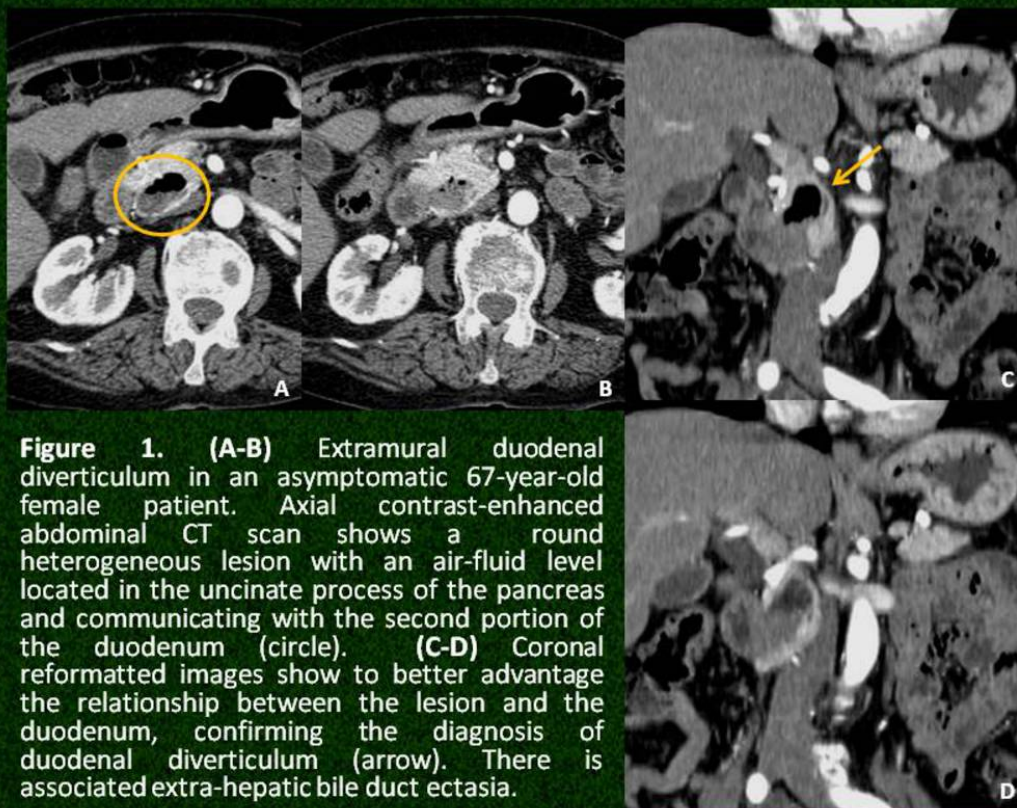


Fig. 2: Extramural Diverticulum - CT

References: C. Ruivo; Coimbra, PORTUGAL

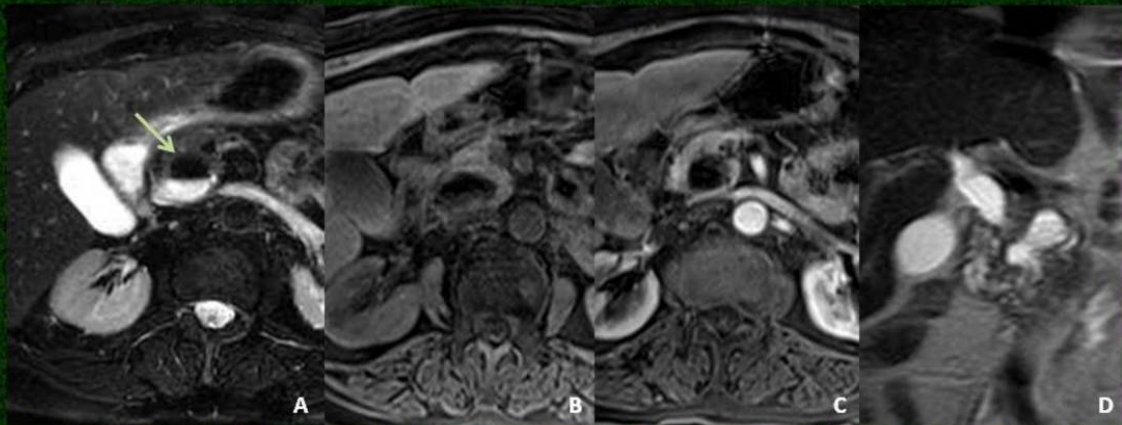


Figure 2. Extramural diverticulum on MRI. Axial T2-weighted (A), T1-weighted fat-suppressed before (B) and after Gadolinium administration (C) and coronal HASTE (D) images show a round heterogeneous lesion with an air-fluid level (arrow in A) and a thin enhancing wall projecting in the uncinate process of the pancreatic gland and communicating with the second portion of the duodenum.

Fig. 3: Extramural Diverticulum - MRI

References: C. Ruivo; Coimbra, PORTUGAL

* Intramural / inverted diverticulum

This is a rare developmental anomaly usually found within the 2nd or 3rd portions of the duodenum. It has the appearance of a *"thumb of a glove"* and it is lined by mucosa on both surfaces. It develops between the fourth and eighth week of the embryo's life, but it increases in size during adult life.

▣ Abdominal CT:

- Fluid or residual particulate food-filled rounded lesion in the lumen of the 2nd or 3rd portions of the duodenum
- Thin enhancing wall (*"double-walled appearance"* or *"halo sign"*)
- Better seen with oral contrast administration

* Duplication cyst

- 5% of all small bowel duplications
- Most often located on the mesenteric side of the second and third portions of the duodenum
- Wall consisting of enteric or heterotopic mucosa and a muscular layer which is in continuity with the one of the duodenum
- The lumen of the cyst generally does not communicate with the duodenal lumen
- Adult patients typically present with symptoms of bowel obstruction, but may also develop biliary obstruction and pancreatitis
- Complications: hemorrhage, perforation and malignant transformation

▣ Abdominal CT/MRI:

- Well-circumscribed cystic mass along the mesenteric border of the descending duodenum
 - high density content # blood clot
 - mural nodules # carcinoma
- It can cause mass effect and eventually luminal compression.

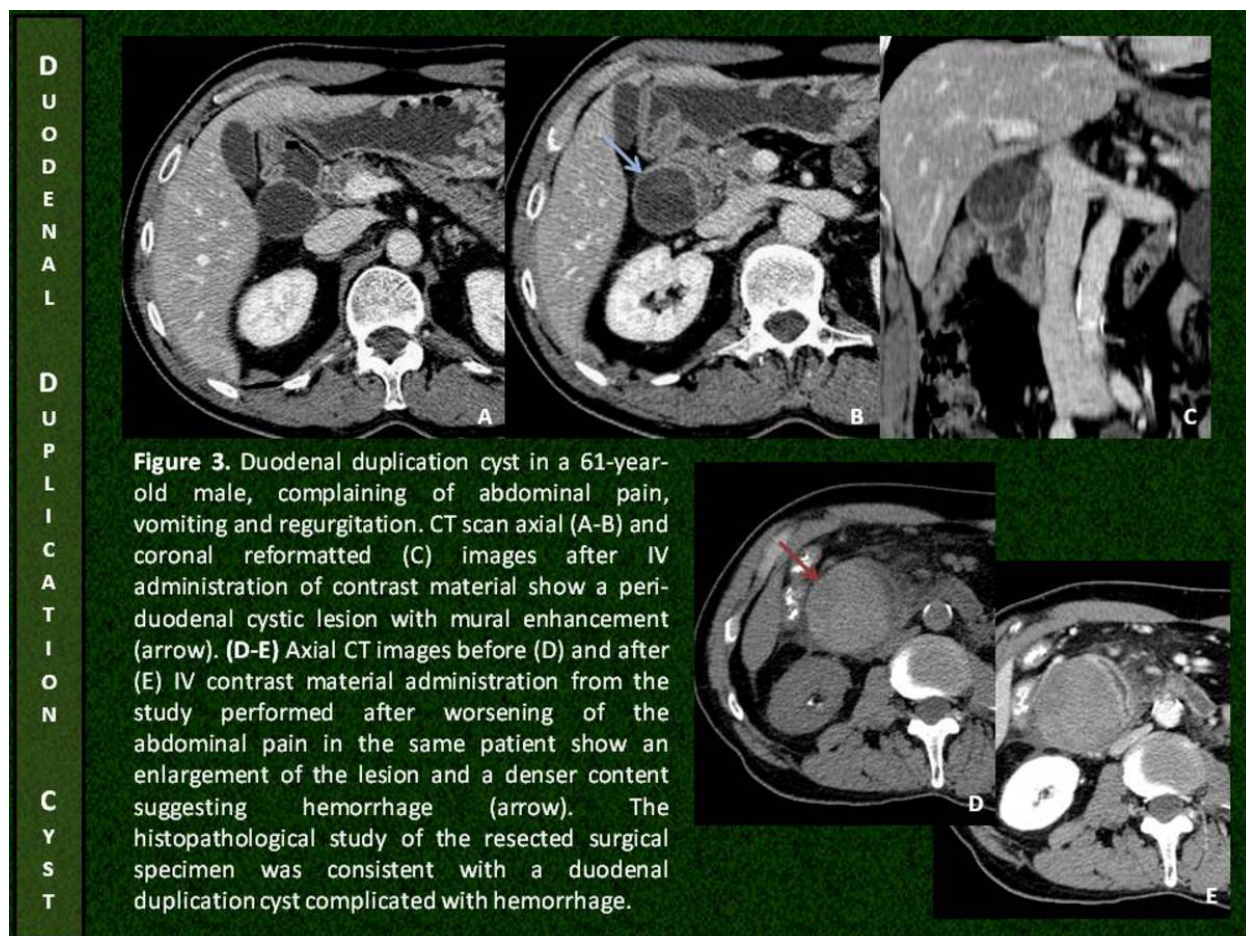


Fig. 4: Duodenal Duplication Cyst

References: C. Ruivo; Coimbra, PORTUGAL

* Cystic dystrophy of the duodenal wall

- It is characterized by the presence of heterotopic pancreatic tissue within the duodenal wall.
- The pancreatic duct's obstruction of this ectopic pancreas results in an inflammatory process and production of cystic lesions in the duodenal wall thickness
- Two patterns are described according to the cyst size:
 - # < 1 cm: solid pattern (uncommon)
 - # simulates duodenal neoplasm
 - # > 1 cm: cystic pattern (more common)
 - # mimics intramural pseudocyst

▣ Abdominal CT:

- Multiple small and elongated cysts within duodenal wall
- Mural thickening of the descending duodenum
- +/- stenosis of the duodenal lumen

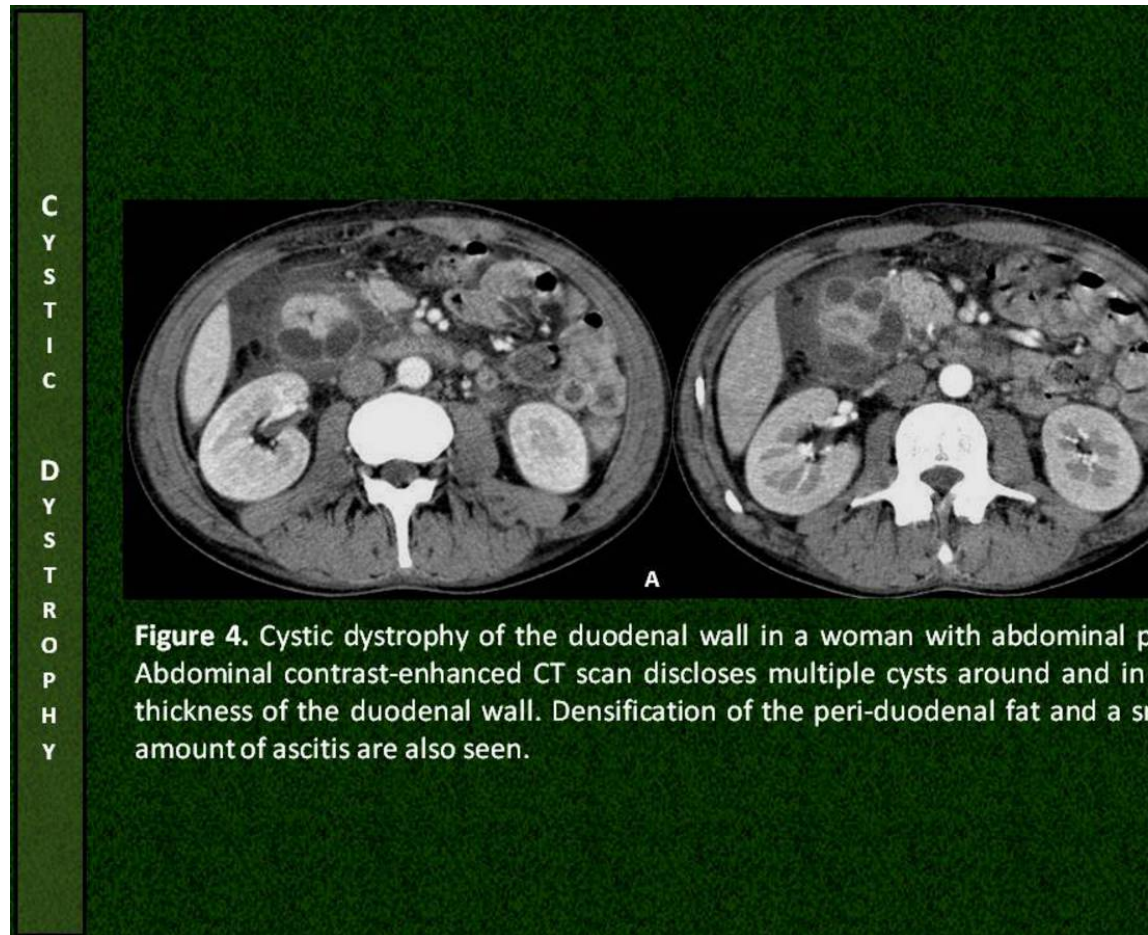


Fig. 5: Cystic Dystrophy of the Duodenal Wall

References: C. Ruivo; Coimbra, PORTUGAL

* Choledocoele

- Cystic dilatation of the intramural segment of the bile duct
- It arises due to a pancreaticobiliary maljunction, which allows reflux of pancreatic fluid into the biliary tree, resulting in parietal weakness.
- It corresponds to the type III of the Todani's classification scheme of choledocal cysts.
- It can manifest with abdominal pain, recurrent pancreatitis or cholangitis and cholangiocarcinoma.

- Biliary stasis favors the development of calculus.

▣ Abdominal CT:

- Cystic mass in the duodenal lumen, at the periampullar level
- Communicates and continues with the bile and pancreatic ducts
- Signs of acute or chronic pancreatitis
- Bile stones

▣ MRCP:

- Cystic dilatation of the intramural portion of the common bile duct
- +/- calculus

PANCREATIC CYSTIC LESIONS

| PANCREATIC CYSTIC LESIONS | |
|----------------------------------|---|
| NON-NEOPLASTIC | NEOPLASTIC |
| True epithelial cyst | Lymphangioma |
| Pseudocyst | Serous cystadenoma |
| Organized necrosis | Solid pseudopapillary tumor |
| Abscess | Mucinous cystic tumors |
| | Intraductal papillary mucinous tumor (IPMT) |
| | Necrotic tumors |

Fig. 6: Pancreatic Cystic Lesions

NON-NEOPLASTIC

*** True epithelial cyst**

- Congenital cystic mass which results from an abnormal segmentation of the primitive ducts
- It may be single or multiple, uni or multilocular and has a variable size
- Frequently associated with genetic disorders:

Cystic fibrosis

Von Hippel-Lindau disease

Adult polycystic kidney disease

▣ Abdominal CT:

- Well-defined round and homogeneous mass of low attenuation (0-20HU)
- Thin imperceptible wall
- No enhancement after iv contrast administration

▣ Abdominal MRI:

- Well-defined round mass without solid compound
- T1: low signal intensity; T2: very high signal intensity

*** Inflammatory cysts**

- These include the complications of severe acute pancreatitis: pancreatic pseudocyst, abscess and organized necrosis
- Unilocular or multilocular

Pseudocyst

- It appears within 4-6 weeks after the onset of acute pancreatitis

- It may arise in the setting of chronic pancreatitis
- Unlike congenital cysts, pseudocysts lack an epithelial wall; instead, they are surrounded by non-epithelialized granulation tissue.
- Complications: hemorrhage, superinfection, rupture and obstruction of adjacent viscera.

▣ Abdominal CT/MRI:

- Round or oval, unilocular cystic mass which may have homogeneous or heterogeneous (mixed density/intensity) content
- 85% are located in the pancreatic body and tail; 15% in the pancreatic head; sometimes they penetrate into the duodenal wall
- Smooth thin or uniform thick wall which enhances after iv contrast administration

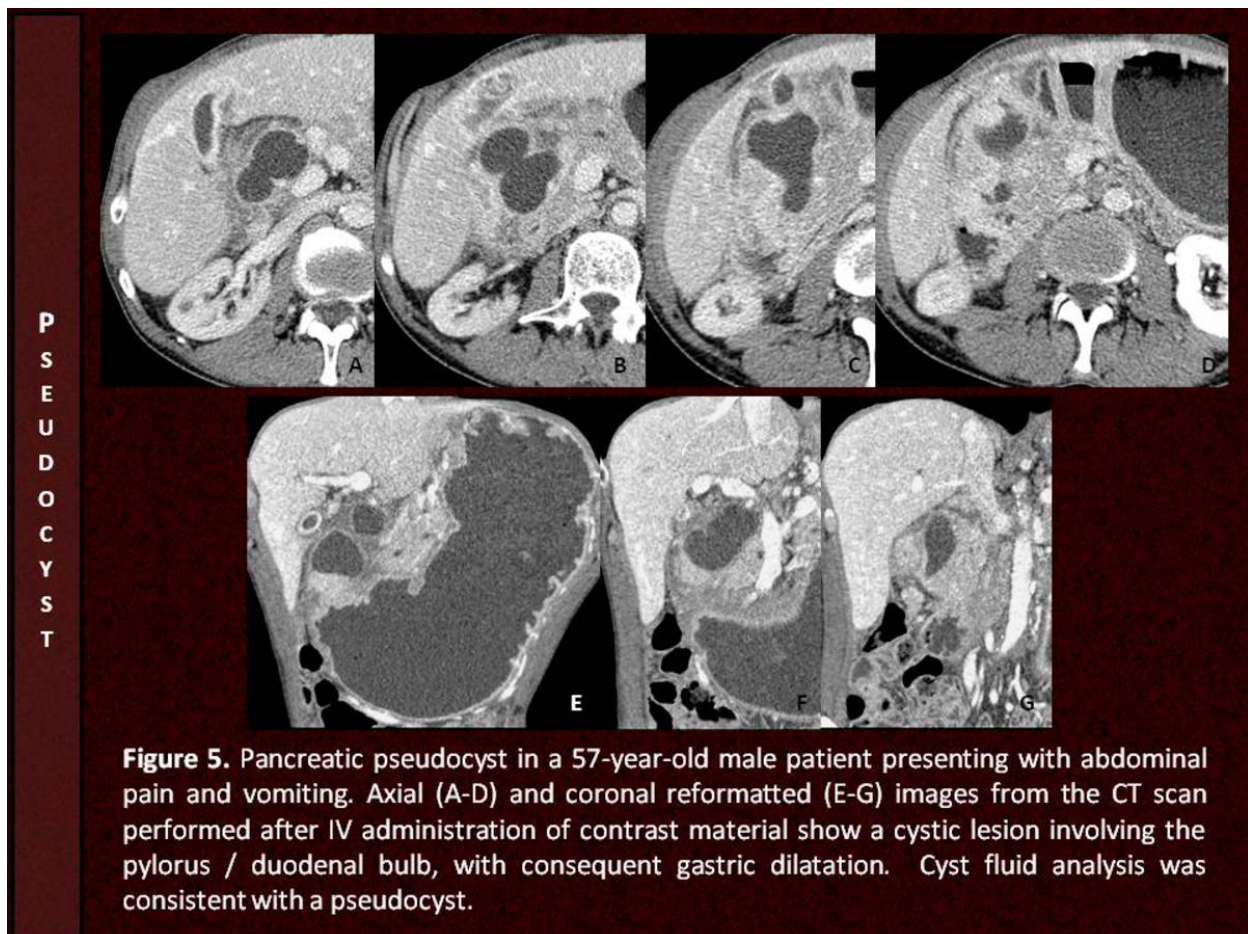


Fig. 7: Pseudocyst - CT

References: C. Ruivo; Coimbra, PORTUGAL

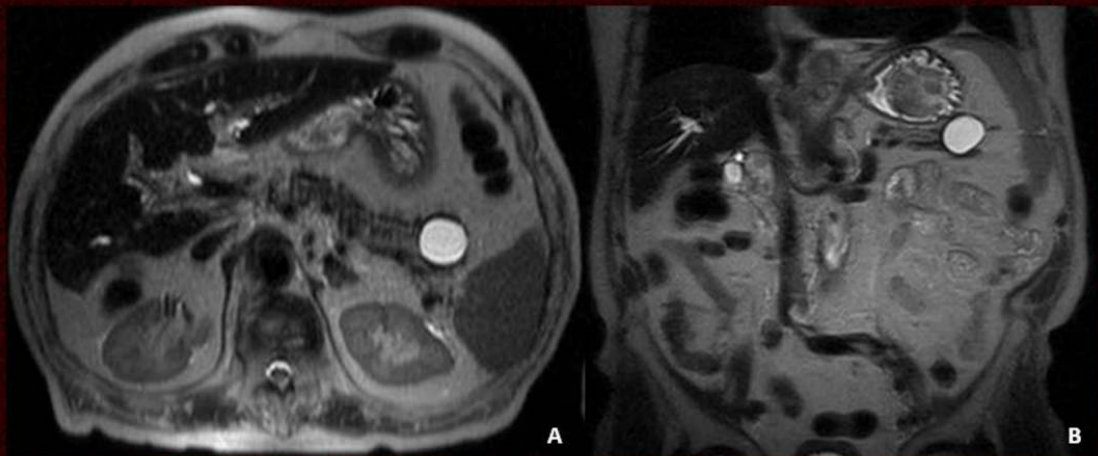


Figure 6. Pseudocyst in a 75-year-old male with previous history of acute pancreatitis. Abdominal MR axial (A) and coronal (B) HASTE images depict a thin-walled unilocular and homogeneous cystic lesion located in the pancreatic tail. The main pancreatic duct is not enlarged and it does not show communication with the cyst.

Fig. 8: Pseudocyst - MRI

References: C. Ruivo; Coimbra, PORTUGAL

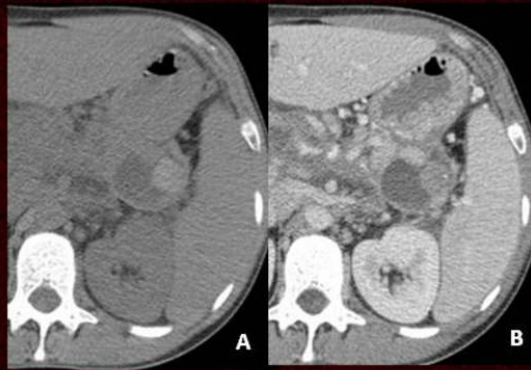


Figure 7. Bleeding pseudocyst in a 37-year-old patient with chronic pancreatitis. (A-B) Images from the axial CT scan show a cystic mass in the pancreatic tail with an internal area of high spontaneous density due to recent hemorrhage. (C-F) The MR study performed in the same patient demonstrated the lesion with high intensity signal on T2-weighted sequences (C), showing hypointense areas consistent with acute hemorrhage. The T1-weighted dynamic study (D-F) reveals a tiny nodular excentric area within the cyst (square in E) following the blood pool signal.

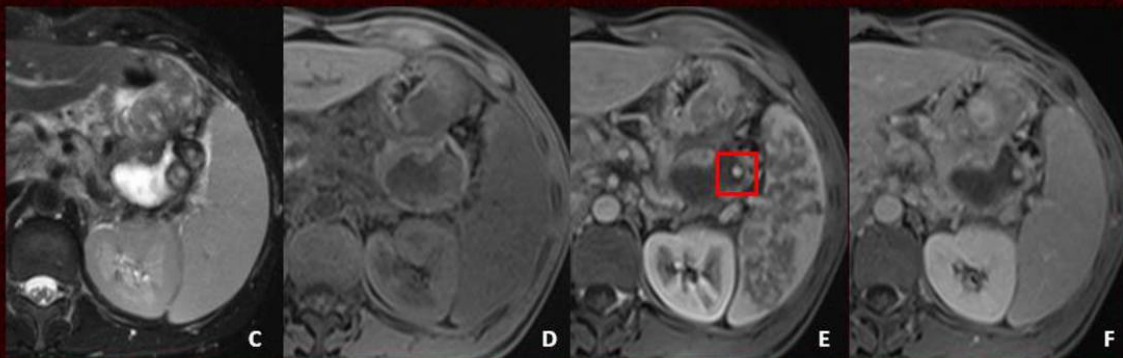


Fig. 9: Bleeding pseudocyst

References: C. Ruivo; Coimbra, PORTUGAL

Organized pancreatic necrosis

- It consists of diffuse or focal areas of nonviable pancreatic tissue, involving > 30% of the glandular tissue.
- With time, areas of necrosis liquefy and produce a uni- or multiloculated fluid collection which replaces pancreatic parenchyma and expands within the pancreatic bed.

▣ Abdominal CT:

- Uniloculated or septated fluid collection replacing previously necrotic pancreatic parenchyma
- It may be homogeneous or heterogeneous (debris)

- Gas bubbles in the collection (in the absence of previous percutaneous intervention or a gastrointestinal fistula) suggest infection, but its absence does not exclude superinfection.



Fig. 10: Organized Pancreatic Necrosis

References: C. Ruivo; Coimbra, PORTUGAL



Figure 9. CT scan images in a 80-year-old woman with severe pancreatitis show multiple and confluent fluid collections which replace almost all of the pancreatic parenchyma.

Fig. 11: Organized Pancreatic Necrosis

References: C. Ruivo; Coimbra, PORTUGAL

Pancreatic abscess

- It is a late complication (> 5 weeks)
- Unlike pseudocyst, it has a thick and/or irregular wall
- In contrast to organized necrosis, it does not replace the pancreatic parenchyma but appears close to the gland

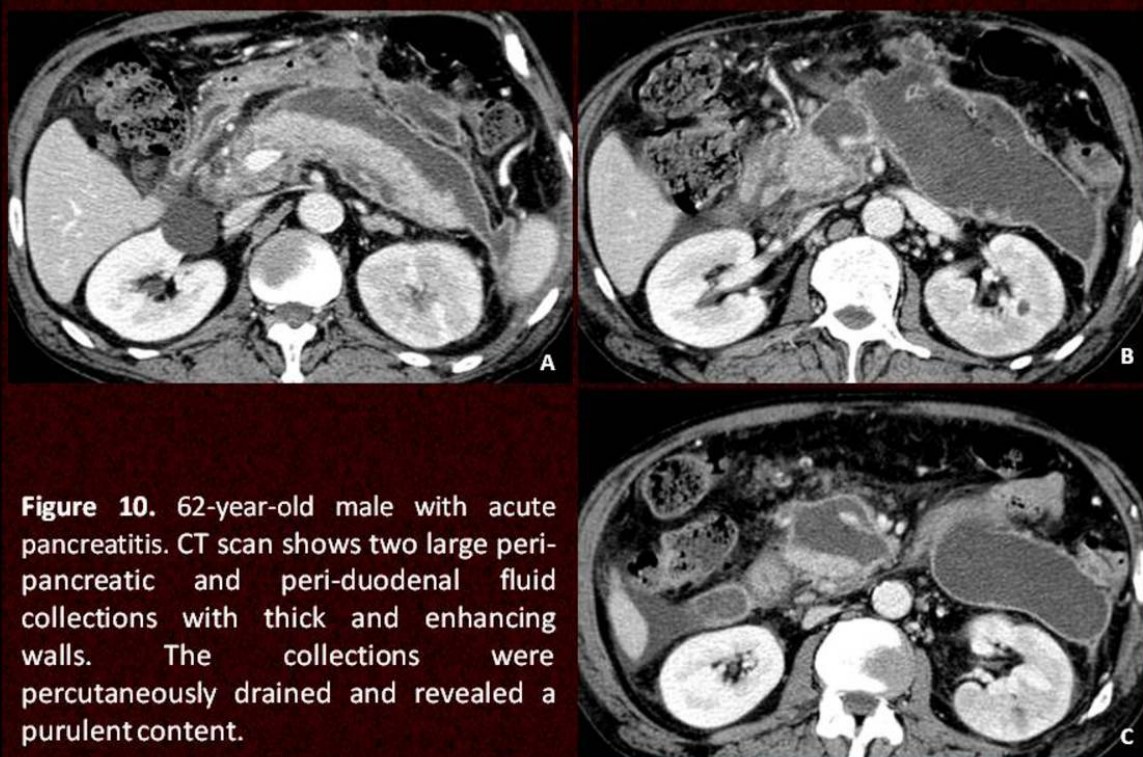


Fig. 12: Pancreatic Abscess

References: C. Ruivo; Coimbra, PORTUGAL

NEOPLASTIC

PANCREATIC CYSTIC LESIONS

| BENIGN | MALIGNANT |
|---|--|
| Cystic lymphangioma Serous cystadenoma Mucinous cystadenoma | Mucinous cystadenocarcinoma Solid pseudopapillary tumor Intraductal papillary mucinous tumor (IPMT) Cystic islet cell tumor Necrotic metastasis Necrotic adenocarcinoma |

Fig. 13: Neoplastic Pancreatic Cystic Lesions

References: C. Ruivo; Coimbra, PORTUGAL

* Cystic lymphangioma

- Due to a congenital dilatation of the lymphatic ducts
- The mesenteric form is more frequent than the pancreatic one
- Women are more frequently affected

⌘ Abdominal CT/MRI:

- Well-circumscribed and multiloculated cystic mass, located in or adjacent to the pancreatic gland
- Thin septa and wall enhance after iv contrast administration
- T1: hypointense or hyperintense (cystic content rich in protein); T2: hyperintense

Figure 11. Cystic lymphangioma of the pancreas in two different female patients. **(A)** CT scan shows a well-circumscribed and multiloculated cystic mass in the pancreatic tail. Wall and septa are thin and regular and enhance after IV administration of contrast material. **(B-C)** MR study reveals a multiloculated cystic mass in the pancreatic body with high signal intensity in T1- **(B)** and T2- **(C)** weighted images.



Fig. 14: Cystic Lymphangioma

References: C. Ruivo; Coimbra, PORTUGAL

* Serous cystadenoma

- Microcystic lesion # collection of cysts (more than 6) that range from a few millimeters up to 2 cm in size
- The oligocystic variant also exists (10%) and simulates a mucinous cystic tumor
- It affects elderly women (> 60 years old)

▣ Abdominal CT:

- Multiloculated cystic mass with an internal honeycomb pattern and lobulated contours
- More frequently located in the pancreatic head
- Central stellate scar with calcification (30%) is pathognomonic

- May simulate a solid mass when internal cysts are very small
- Thin septa and wall enhance after iv contrast administration

▣ Abdominal MRI:

- Cluster of small cysts with no communication with the pancreatic duct
- Cysts - T1: hypointense; T2: hyperintense
- Scar and septa - T1 and T2: hypointense; signal void if calcificied scar; T1 after Gadolinium (Gd): delayed enhancement of the wall, septa and central scar

Some features may help to distinguish the oligocystic/macrocystic variant from mucinous cystic tumors:

- Specific location (pancreatic head)
- Lobulated contours



Fig. 15: Serous Cystadenoma

References: C. Ruivo; Coimbra, PORTUGAL

* Mucinous cystic tumors

Unilocular or macrocystic lesion # composed of less than 6 cysts larger than 2 cm

They do not communicate with the pancreatic duct

Benign lesions have a high potential for malignancy and are indistinguishable from malignant lesions in imaging modalities # all mucinous tumors should therefore be surgically removed

Mucinous cystadenoma

· Most common in women in the fifth and sixth decades

· Predominates in the body and tail of the pancreas

▣ Abdominal CT:

- Unilocular or mildly septated cystic lesion
- Thick enhancing wall +/- curvilinear calcifications

▣ Abdominal MRI:

- Unilocular or mildly septated cystic lesion
 - T1: homogeneous low signal intensity (more frequent) or increased intrinsic signal intensity (due to mucin);
 - T2: homogeneous high signal intensity
- Thick enhancing wall and mildly thickened and enhancing septa at delayed-phase imaging

Figure 13. Mucinous cystadenoma in a 51-year-old asymptomatic woman. **(A)** CT scan after IV contrast administration reveals a unilocular cystic mass in the pancreatic head. **(B-E)** T2-weighted (B) and T1-weighted fat-suppressed images before (C) and after (D-E) Gadolinium IV administration reveal a bilocular and homogeneous cystic mass in the pancreatic head. No enhancing soft-tissue elements are seen.

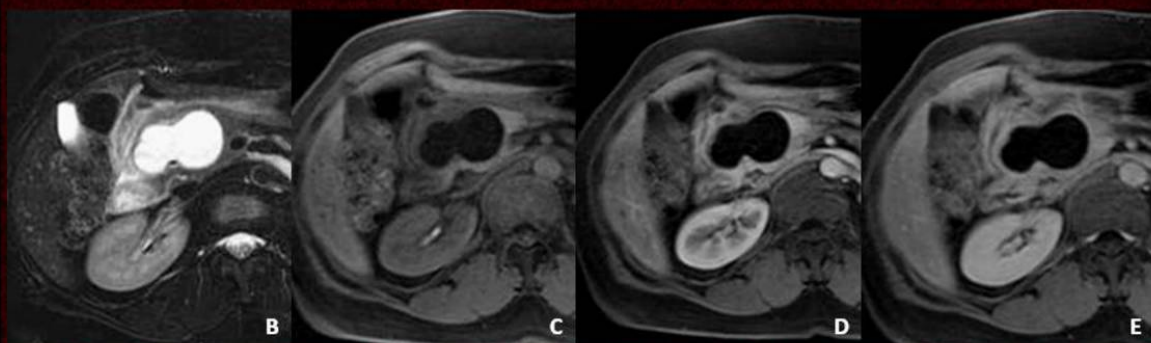


Fig. 16: Mucinous Cystadenoma

References: C. Ruivo; Coimbra, PORTUGAL



Figure 14. 31-year-old asymptomatic woman with a mucinous cystadenoma. **(A)** Abdominal CT image discloses a macrocystic mass in the pancreatic tail, with septal and mural enhancement. Axial T2-weighted **(B)** and T1-weighted enhanced GRE images **(C-D)** show enhancing septa, but no solid soft-tissue nodular elements.



Fig. 17: Mucinous Cystadenoma

References: C. Ruivo; Coimbra, PORTUGAL

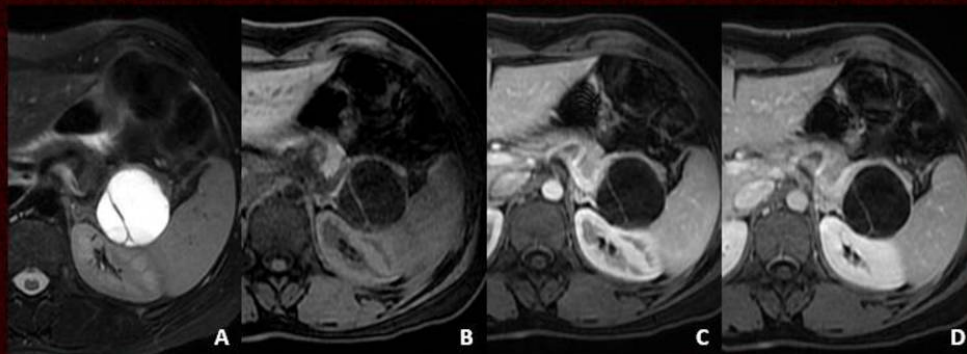


Figure 15. MR findings of mucinous cystadenoma. T2-weighted (A) and T1-weighted fat-suppressed dynamic study before (B) and after (C) IV administration of Gadolinium depict a cystic mass in the pancreatic tail. There are few non-enhancing septations. No mural nodules were found.

Fig. 18: Mucinous Cystadenoma

References: Filipe Caseiro Alves, PhD

Mucinous cystadenocarcinoma

- Affects older women
- Imaging findings may be the same of the mucinous cystadenoma
- Enhancing intracystic nodular excrescences and septation are suspicious of malignancy

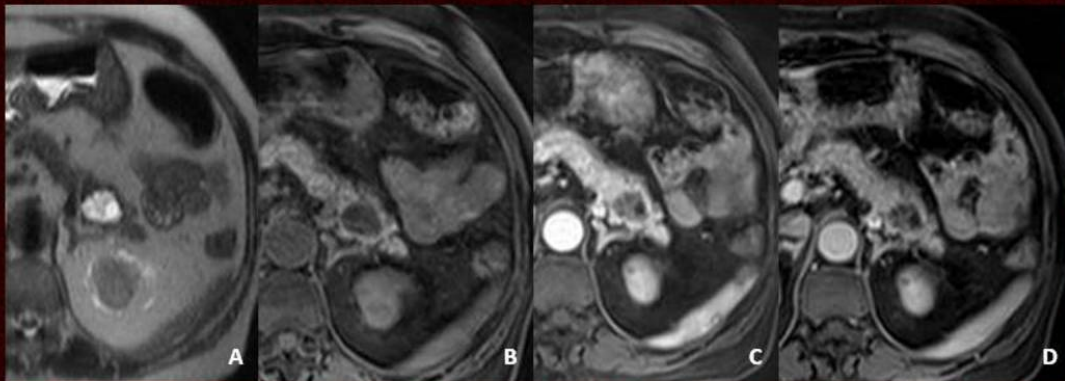


Figure 16. Abdominal MR images in a 73-year-old female patient demonstrate a complex cystic lesion in the pancreatic tail. On T2-weighted images (A) the lesion shows heterogeneous internal structure. The dynamic study (B-D) reveals enhancing solid components. The findings are consistent with a mucinous cystadenocarcinoma.

Fig. 19: Mucinous Cystadenocarcinoma

References: C. Ruivo; Coimbra, PORTUGAL

* Solid pseudopapillary tumor

- It has a high incidence in young women (mean, 25 years old)
- Consists of cystic and solid components
- More frequently involves the pancreatic tail but it can be found in any portion of the pancreatic gland
- It has a low potential for malignancy

▣ Abdominal CT:

- Large and well-circumscribed mass, often capsulated
- Variable contents: uniformly cystic, cystic and solid or completely solid, depending on the degree of necrosis and hemorrhage

- Fluid-debris level: hemorrhage in necrotic zone
- Solid areas and peripheral rim enhance progressively after iv contrast administration

▣ Abdominal MRI:

- Large and well-circumscribed mass
- T1: areas of high signal intensity (hemorrhagic necrosis); T2: complex internal signal or completely hyperintense ; fluid-debris or fluid-fluid levels
- Fibrous capsule of low signal intensity on T1 and T2

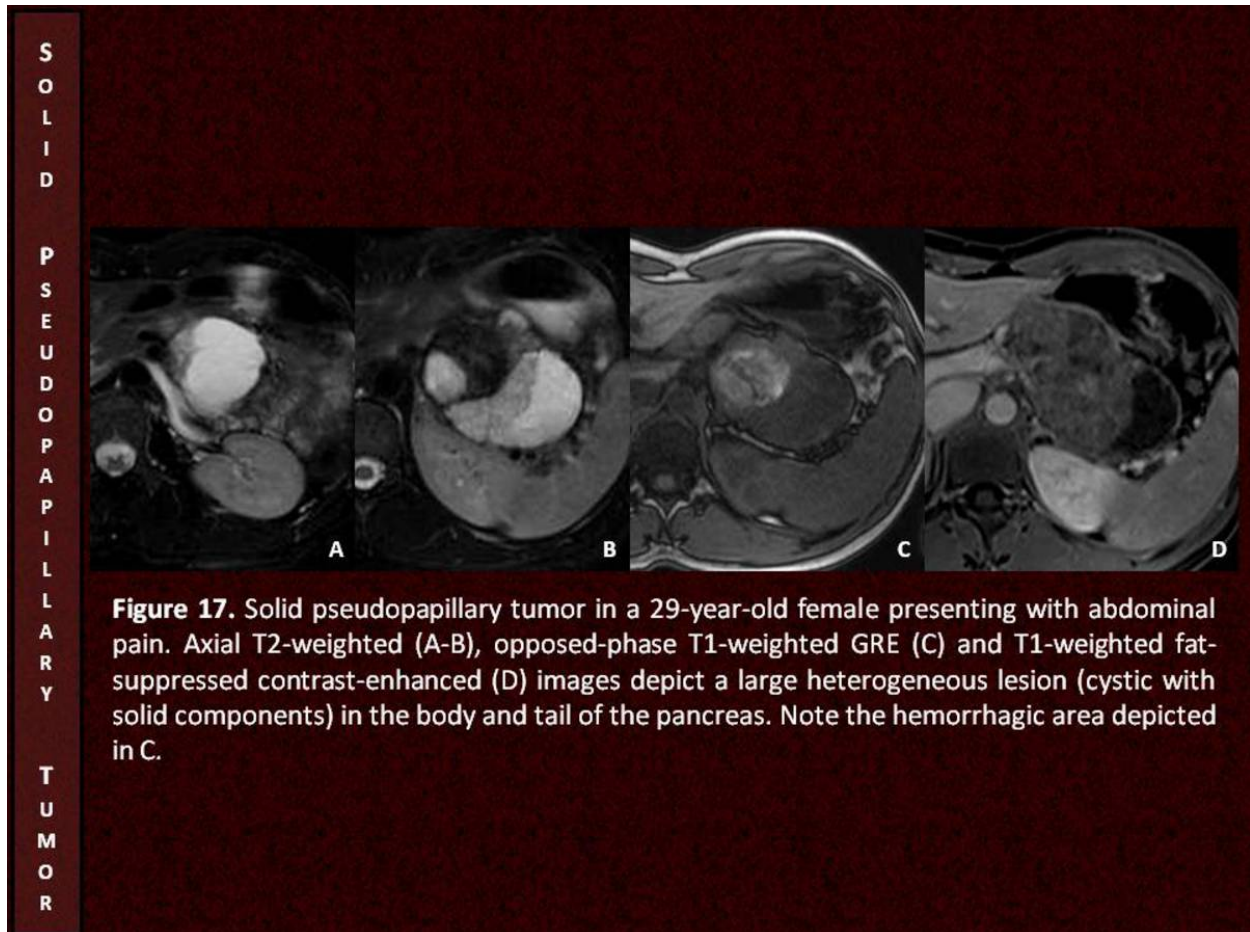


Fig. 20: Solid Pseudopapillary Tumor

References: C. Ruivo; Coimbra, PORTUGAL

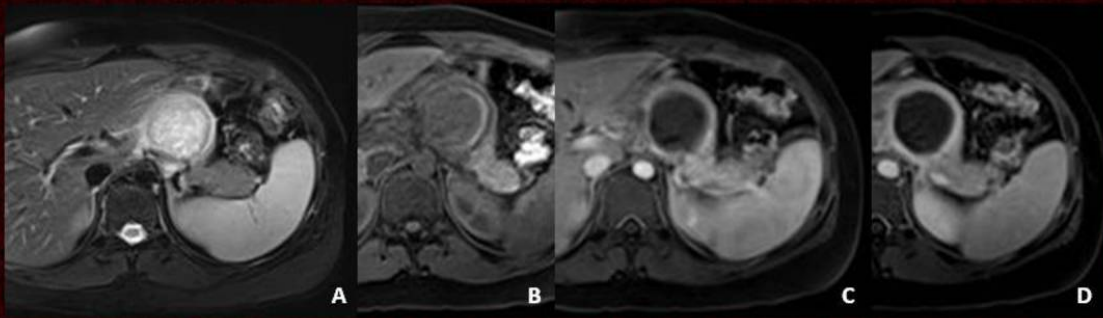


Figure 18. Solid pseudopapillary tumor in an 13-year-old boy presenting with nausea, upper abdominal pain and weight loss. Axial T2-weighted MR image (A) disclosed a heterogeneous hyperintense lesion in the body of the pancreas. On T1-weighted fat-suppressed unenhanced sequence the lesion is hypointense, depicting an incomplete rim of high signal intensity (in B), consistent with hemorrhage. Note the fibrous capsule surrounding the lesion, hypointense on both T1- and T2-weighted sequences. Contrast-enhanced images (C-D) show peripheral enhancement of the mass. A partial pancreatectomy was performed and the histopathological analysis was consistent with a solid pseudopapillary tumor.

Fig. 21: Solid Pseudopapillary Tumor

References: Hospital Pediátrico de Coimbra, Portugal

* IPMT

- As with mucinous tumor, IPMT is a mucin-producing pancreatic tumor. However, it communicates with the pancreatic duct, which can be demonstrated in CT and even better with MRCP.
- Affects preferentially old men (60-80 years old)
- Three types are described in the literature:
 - Side-branch type
 - Main pancreatic duct type
 - Combined type

Side-branch IPMT

- Predominates in the pancreatic head and uncinate process
- Arises from cystic dilatation of the side branch ducts by mucin
- Segmental involvement is common

▣ Abdominal CT and MRCP:

- Unilocular cyst or a grape-like cluster of small cysts
- Dilatation of the main pancreatic duct

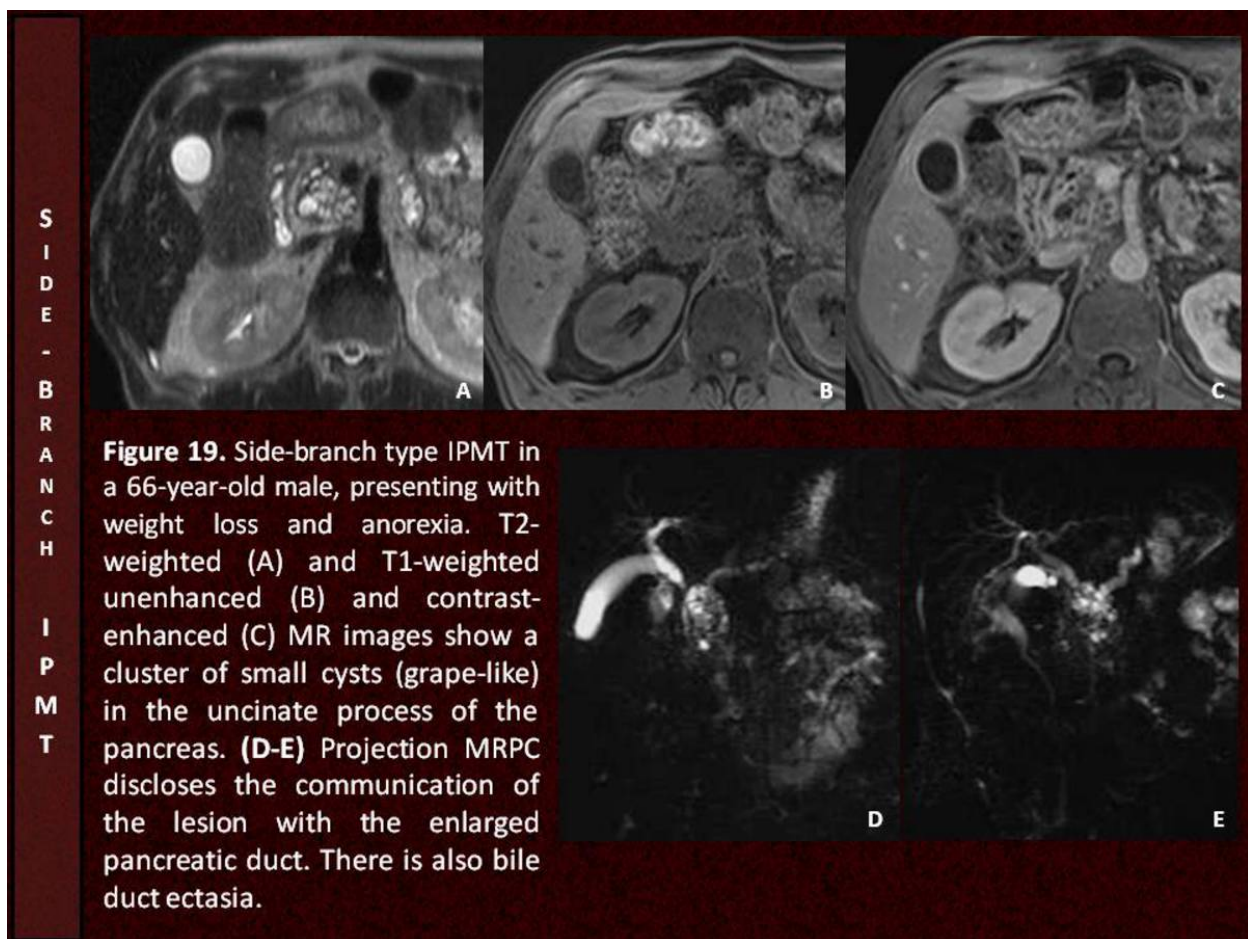


Fig. 22: Side-Branch IPMT

References: C. Ruivo; Coimbra, PORTUGAL

Main duct IPMT

- It results in cystic dilatation of main pancreatic duct by mucin
- Diffuse involvement of the pancreas is more frequent
- It is a premalignant lesion

▣ Abdominal CT and MRCP:

- Diffuse /cystic dilatation of the main pancreatic duct +/- intra - ductal calcifications
- Atrophy of the gland

Imaging findings suggestive of malignancy

- Lesion size > 3 cm or duct diameter > 15 mm
- Irregularity / thickening of the cysts' walls
- Mural nodules / papillary excrescences
- Diffuse involvement
- Bulging papilla projecting into the duodenal lumen

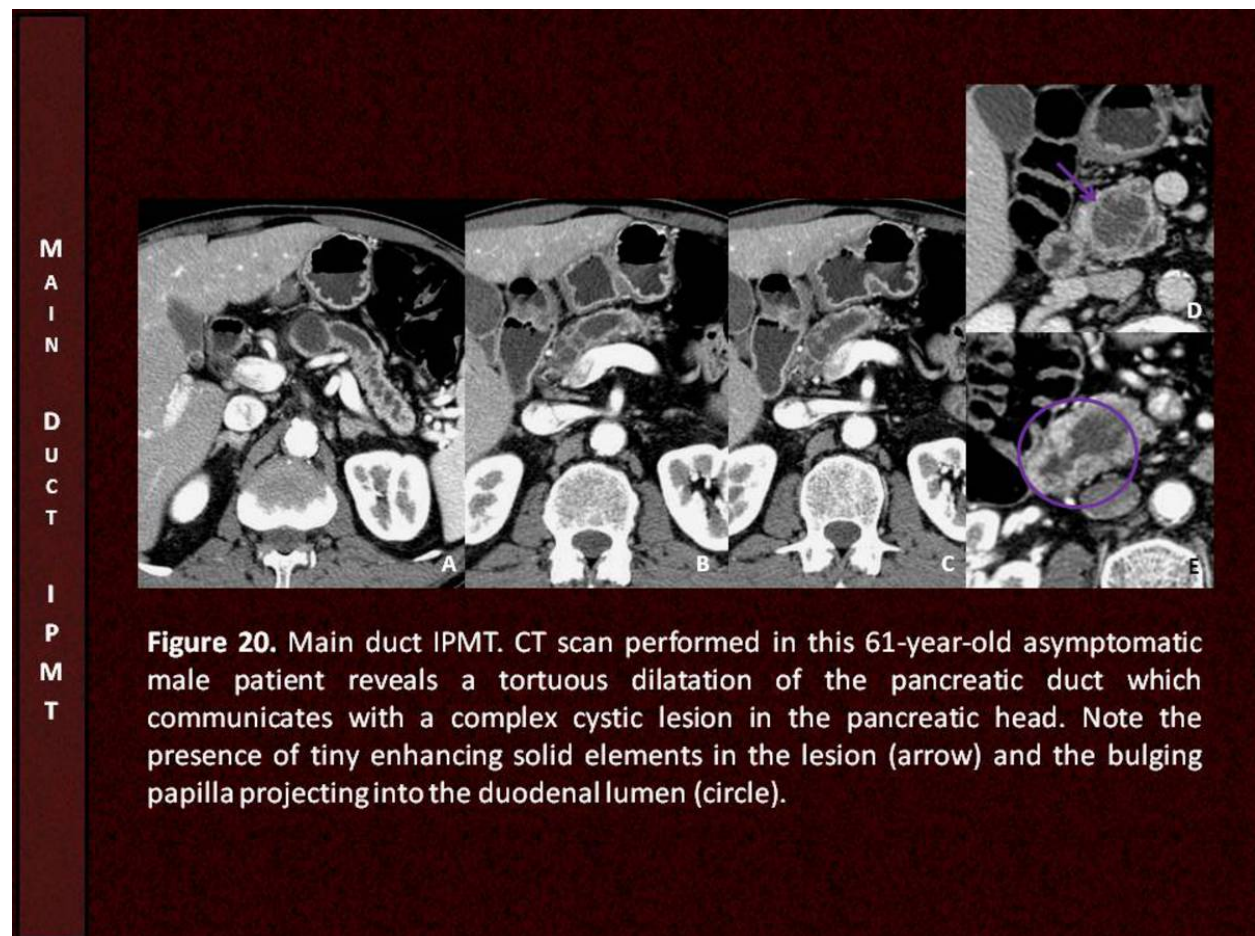


Fig. 23: Main duct IPMT

References: C. Ruivo; Coimbra, PORTUGAL

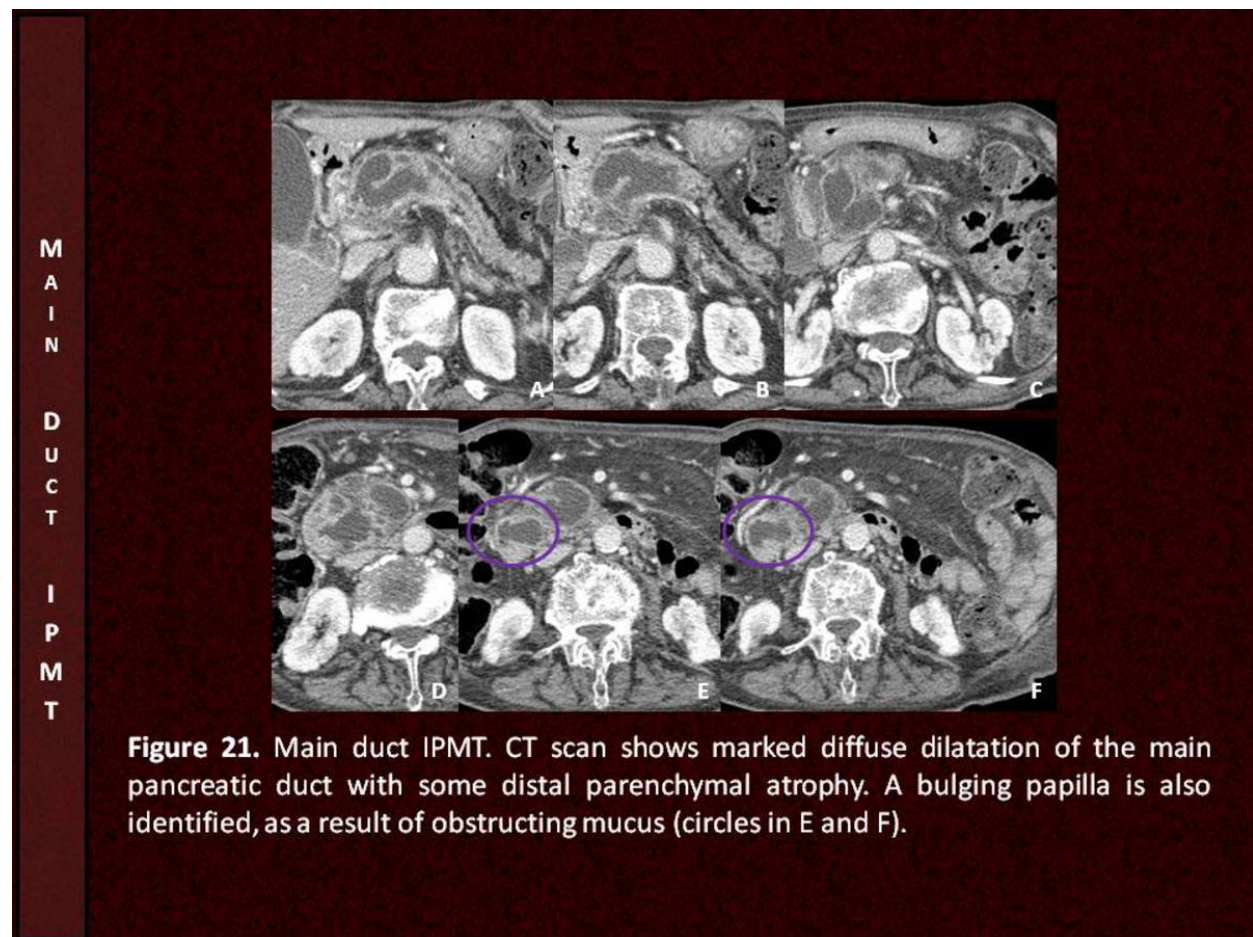


Fig. 24: Main duct IPMT

References: C. Ruivo; Coimbra, PORTUGAL

*** Necrotic tumors**

- Primary or secondary
- Ductal adenocarcinoma
- Cystic neuroendocrine tumor
- Metastasis
- Due to cystic degeneration of a solid tumor

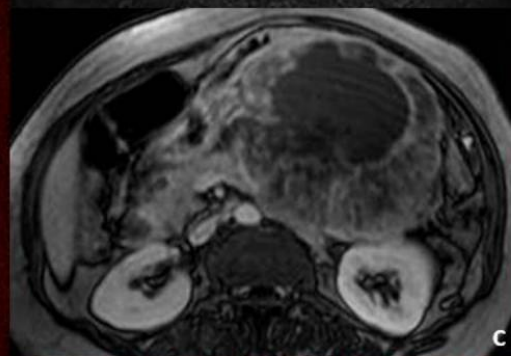
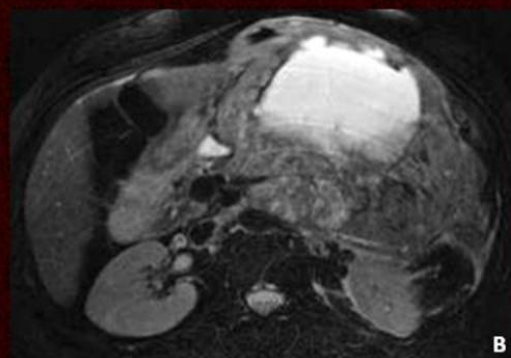


Figure 22. Necrotic primary pancreatic tumor. Axial CT scan (A) and T2-weighted (B) and T1-weighted GRE contrast-enhanced MR images (C) in a 61-year-old woman presenting with weight loss, anorexia and an abdominal mass. There is a large heterogeneous mass in the pancreatic body and tail, with an exuberant cystic component. The stomach is compressed and invaded. Histopathological study revealed a dedifferentiated pancreatic carcinoma.

Fig. 25: Dedifferentiated Pancreatic Carcinoma

References: C. Ruivo; Coimbra, PORTUGAL

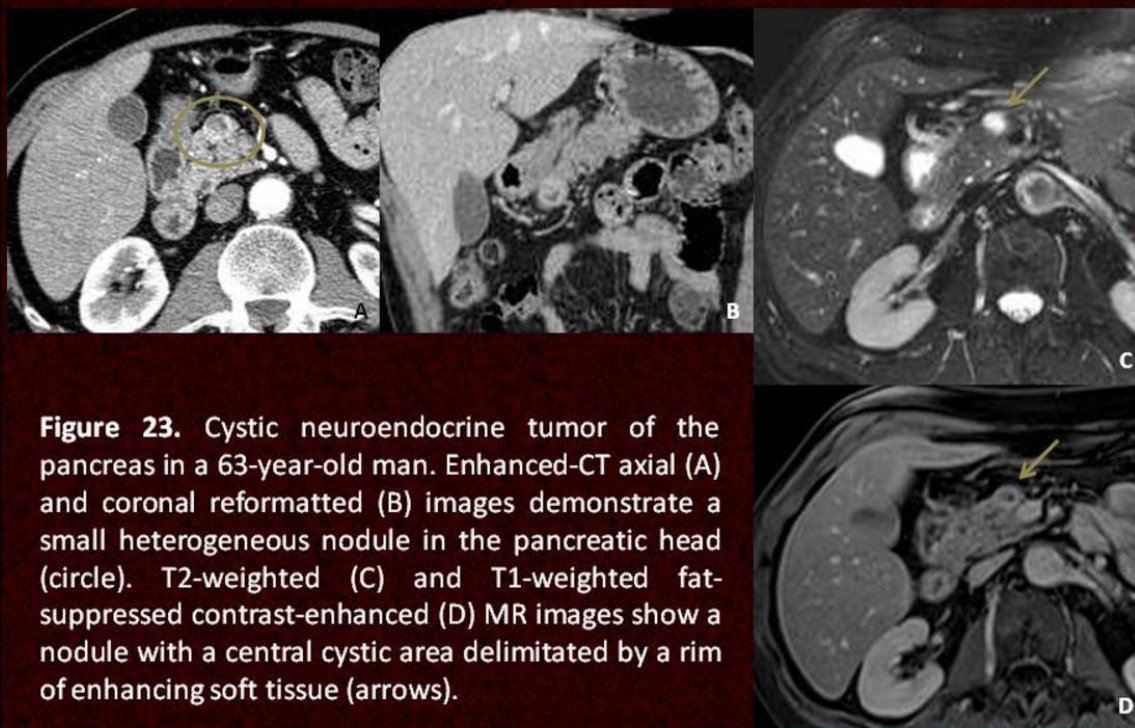


Fig. 26: Cystic Neuroendocrine Pancreatic Tumor

References: C. Ruivo; Coimbra, PORTUGAL

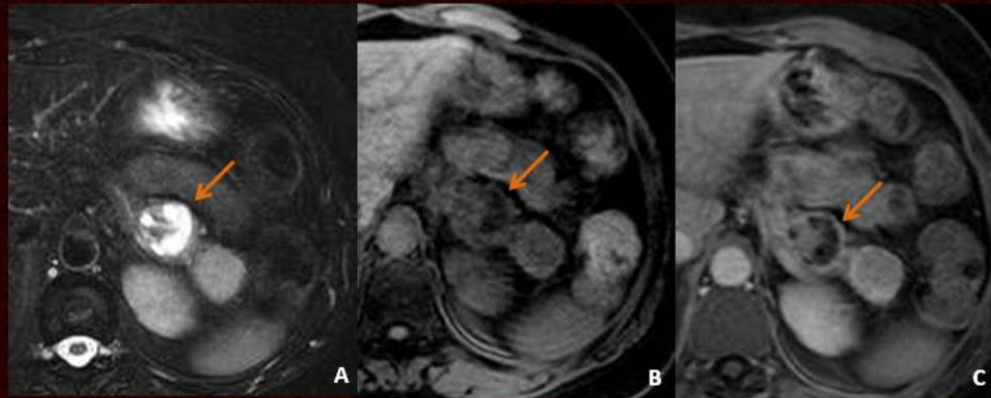


Figure 24. Necrotic metastasis in a 58-year-old woman with a history of synoviosarcoma. T2-weighted (A) and T1-weighted fat-suppressed unenhanced (B) and contrast-enhanced (C) MR images disclose two enhancing solid masses in the pancreatic tail. Note that one (arrows) of them is heterogeneous, showing exuberant cystic areas. Histopathological analysis was consistent with metastasis.

Fig. 27: Pancreatic Metastasis

References: C. Ruivo; Coimbra, PORTUGAL

Images for this section:

DUODENAL CYSTIC LESIONS

| DUODENAL CYSTIC LESIONS | PRIMARY | SECONDARY |
|-------------------------|--|-----------------------|
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| ACQUIRED | Pseudodiverticulum | Intramural pseudocyst |

Fig. 1: Duodenal Cystic Lesions

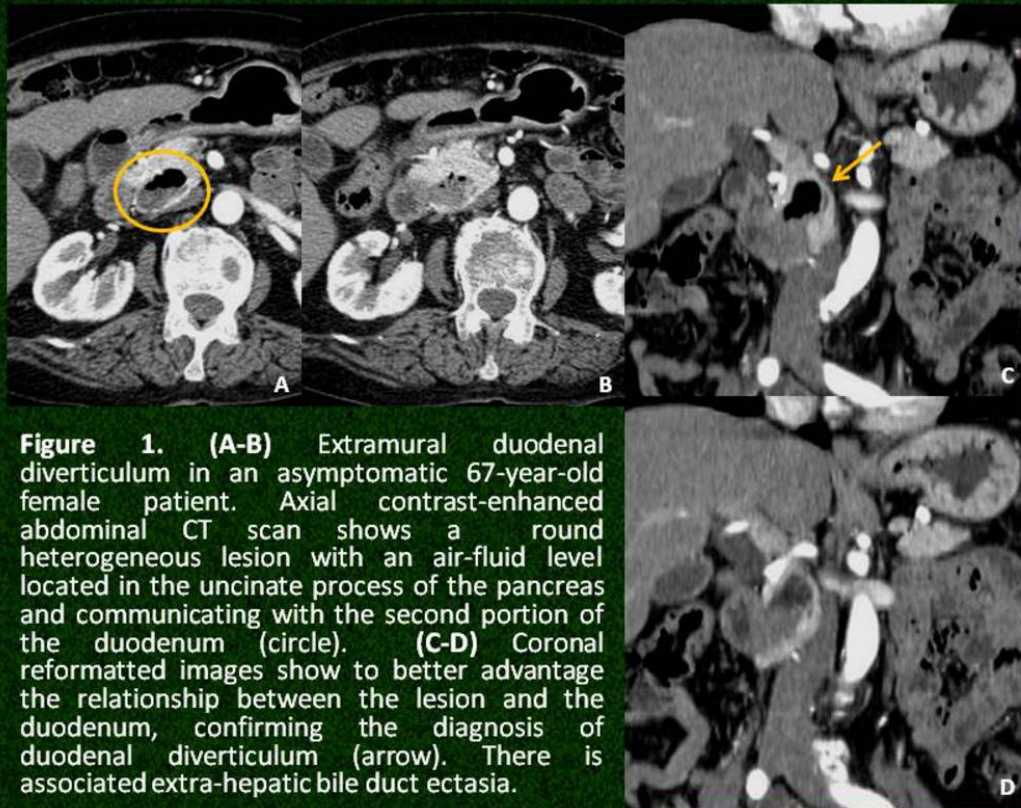


Fig. 2: Extramural Diverticulum - CT

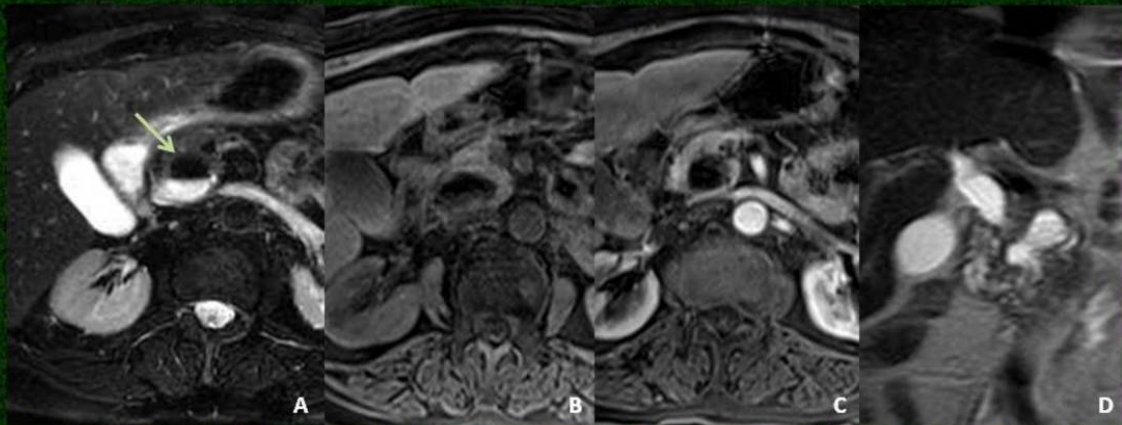


Figure 2. Extramural diverticulum on MRI. Axial T2-weighted (A), T1-weighted fat-suppressed before (B) and after Gadolinium administration (C) and coronal HASTE (D) images show a round heterogeneous lesion with an air-fluid level (arrow in A) and a thin enhancing wall projecting in the uncinate process of the pancreatic gland and communicating with the second portion of the duodenum.

Fig. 3: Extramural Diverticulum - MRI

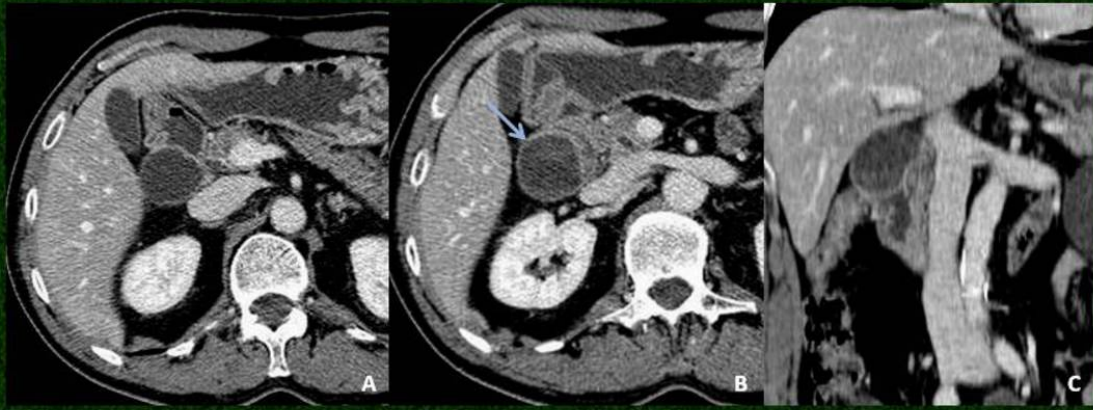


Figure 3. Duodenal duplication cyst in a 61-year-old male, complaining of abdominal pain, vomiting and regurgitation. CT scan axial (A-B) and coronal reformatted (C) images after IV administration of contrast material show a periduodenal cystic lesion with mural enhancement (arrow). (D-E) Axial CT images before (D) and after (E) IV contrast material administration from the study performed after worsening of the abdominal pain in the same patient show an enlargement of the lesion and a denser content suggesting hemorrhage (arrow). The histopathological study of the resected surgical specimen was consistent with a duodenal duplication cyst complicated with hemorrhage.

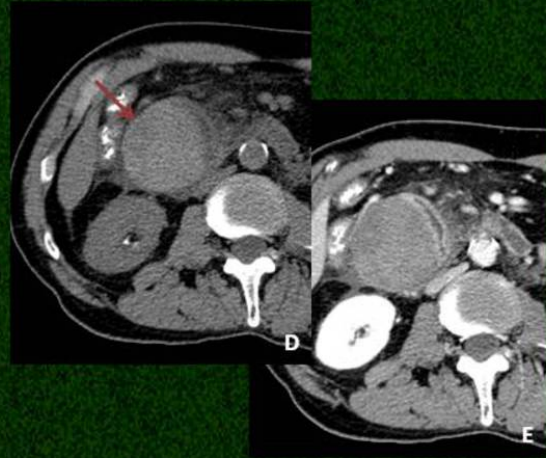


Fig. 4: Duodenal Duplication Cyst

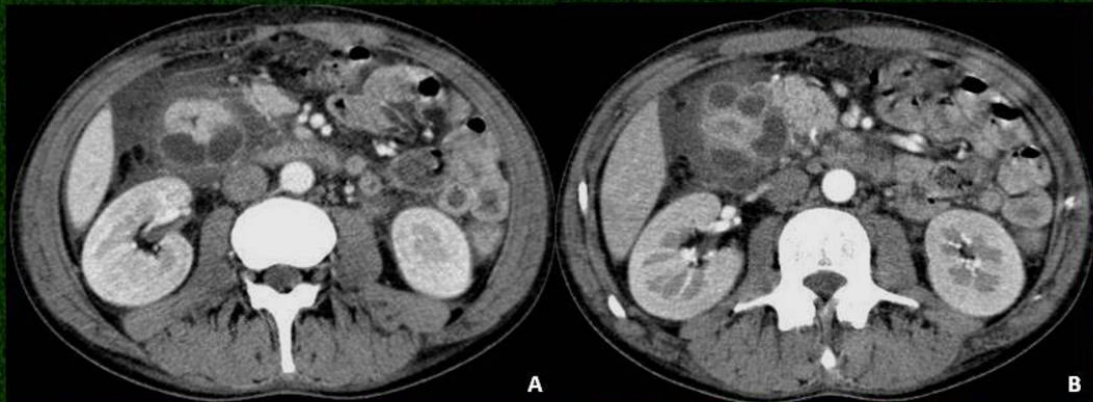


Figure 4. Cystic dystrophy of the duodenal wall in a woman with abdominal pain. Abdominal contrast-enhanced CT scan discloses multiple cysts around and in the thickness of the duodenal wall. Densification of the peri-duodenal fat and a small amount of ascitis are also seen.

Fig. 5: Cystic Dystrophy of the Duodenal Wall

PANCREATIC CYSTIC LESIONS

| BENIGN | MALIGNANT |
|---|--|
| Cystic lymphangioma Serous cystadenoma Mucinous cystadenoma | Mucinous cystadenocarcinoma Solid pseudopapillary tumor Intraductal papillary mucinous tumor (IPMT) Cystic islet cell tumor Necrotic metastasis Necrotic adenocarcinoma |

Fig. 13: Neoplastic Pancreatic Cystic Lesions

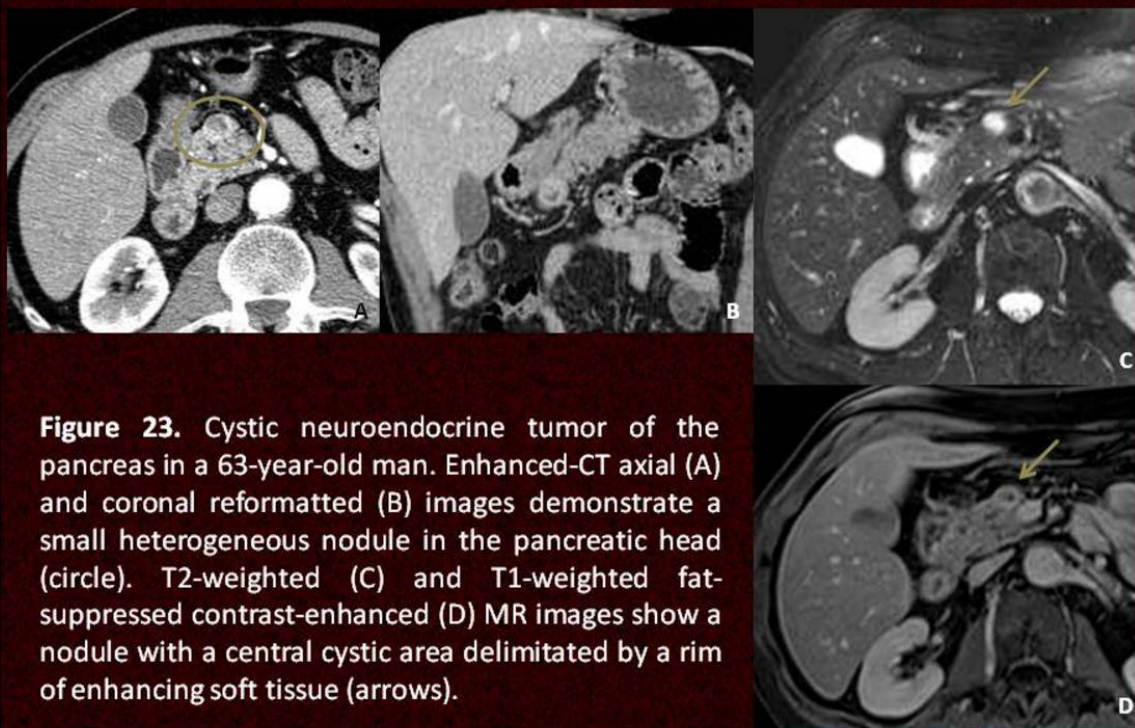


Fig. 26: Cystic Neuroendocrine Pancreatic Tumor

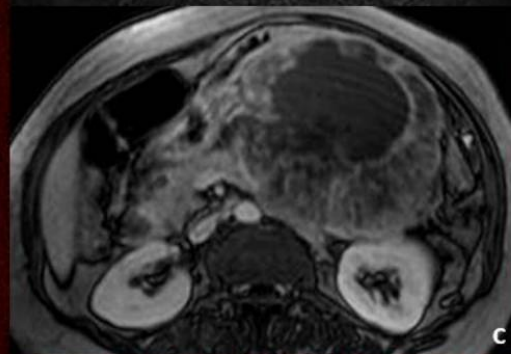
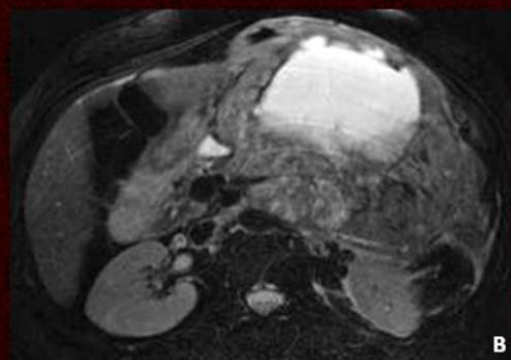


Figure 22. Necrotic primary pancreatic tumor. Axial CT scan (A) and T2-weighted (B) and T1-weighted GRE contrast-enhanced MR images (C) in a 61-year-old woman presenting with weight loss, anorexia and an abdominal mass. There is a large heterogeneous mass in the pancreatic body and tail, with an exuberant cystic component. The stomach is compressed and invaded. Histopathological study revealed a dedifferentiated pancreatic carcinoma.

Fig. 25: Dedifferentiated Pancreatic Carcinoma

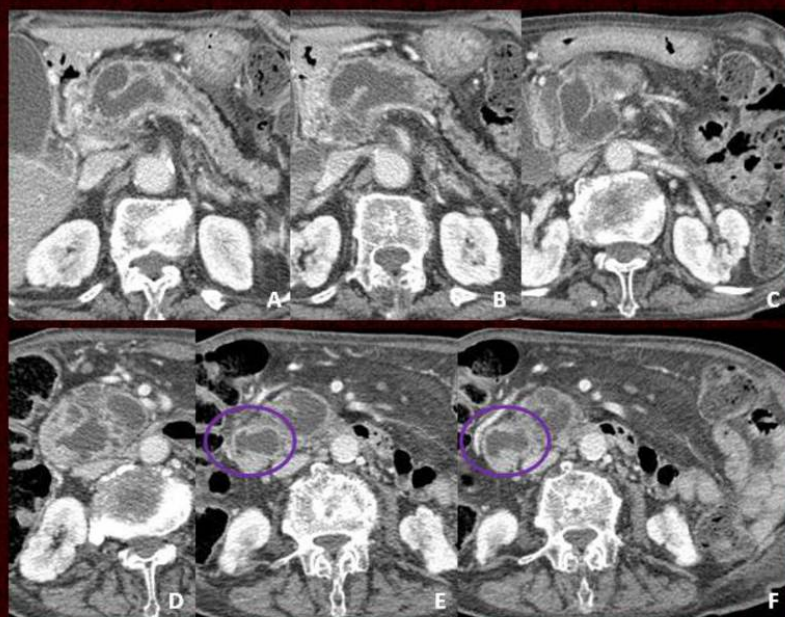


Figure 21. Main duct IPMT. CT scan shows marked diffuse dilatation of the main pancreatic duct with some distal parenchymal atrophy. A bulging papilla is also identified, as a result of obstructing mucus (circles in E and F).

Fig. 24: Main duct IPMT

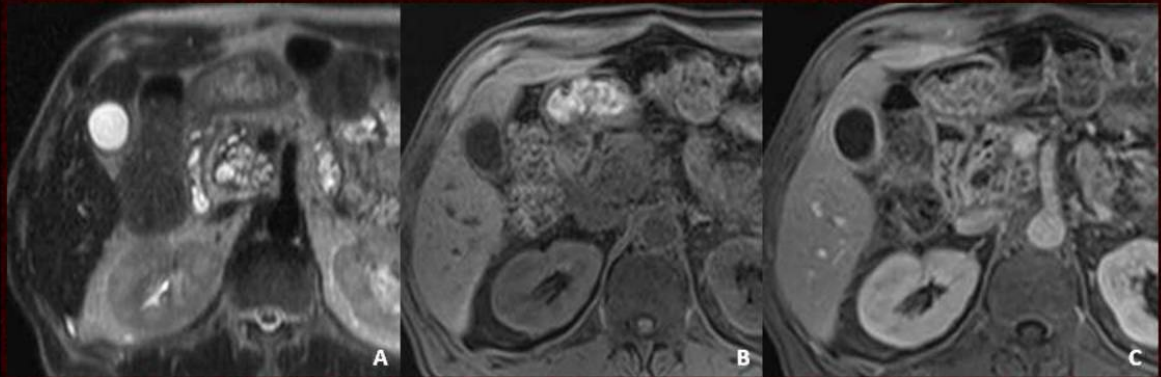


Figure 19. Side-branch type IPMT in a 66-year-old male, presenting with weight loss and anorexia. T2-weighted (A) and T1-weighted unenhanced (B) and contrast-enhanced (C) MR images show a cluster of small cysts (grape-like) in the uncinate process of the pancreas. (D-E) Projection MRPC discloses the communication of the lesion with the enlarged pancreatic duct. There is also bile duct ectasia.

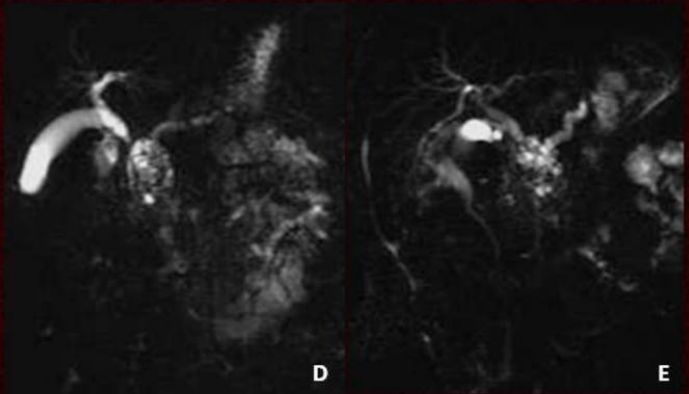


Fig. 22: Side-Branch IPMT

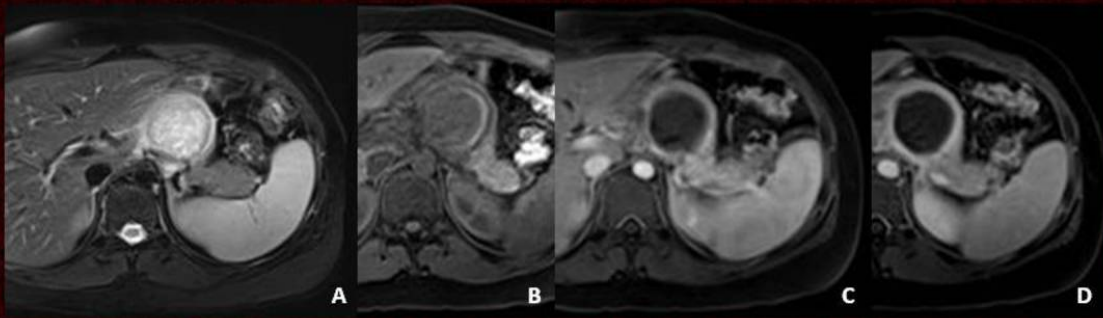


Figure 18. Solid pseudopapillary tumor in an 13-year-old boy presenting with nausea, upper abdominal pain and weight loss. Axial T2-weighted MR image (A) disclosed a heterogeneous hyperintense lesion in the body of the pancreas. On T1-weighted fat-suppressed unenhanced sequence the lesion is hypointense, depicting an incomplete rim of high signal intensity (in B), consistent with hemorrhage. Note the fibrous capsule surrounding the lesion, hypointense on both T1- and T2-weighted sequences. Contrast-enhanced images (C-D) show peripheral enhancement of the mass. A partial pancreatectomy was performed and the histopathological analysis was consistent with a solid pseudopapillary tumor.

Fig. 21: Solid Pseudopapillary Tumor

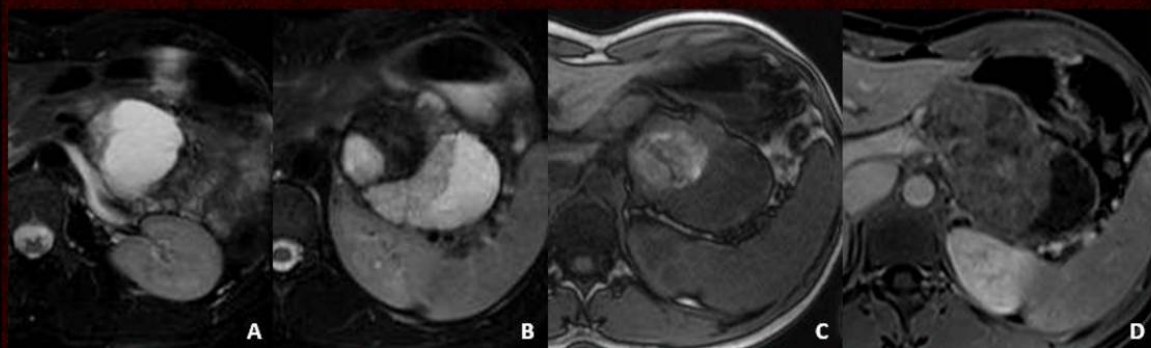


Figure 17. Solid pseudopapillary tumor in a 29-year-old female presenting with abdominal pain. Axial T2-weighted (A-B), opposed-phase T1-weighted GRE (C) and T1-weighted fat-suppressed contrast-enhanced (D) images depict a large heterogeneous lesion (cystic with solid components) in the body and tail of the pancreas. Note the hemorrhagic area depicted in C.

Fig. 20: Solid Pseudopapillary Tumor



Figure 9. CT scan images in a 80-year-old woman with severe pancreatitis show multiple and confluent fluid collections which replace almost all of the pancreatic parenchyma.

Fig. 11: Organized Pancreatic Necrosis

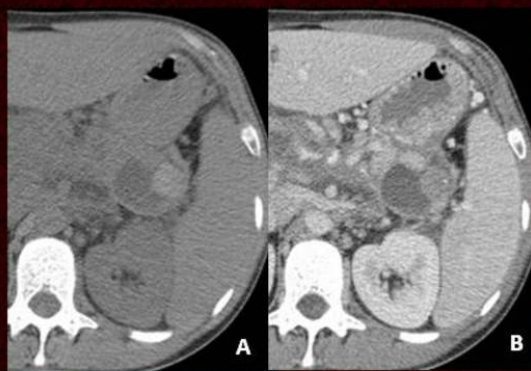


Figure 7. Bleeding pseudocyst in a 37-year-old patient with chronic pancreatitis. (A-B) Images from the axial CT scan show a cystic mass in the pancreatic tail with an internal area of high spontaneous density due to recent hemorrhage. (C-F) The MR study performed in the same patient demonstrated the lesion with high intensity signal on T2-weighted sequences (C), showing hypointense areas consistent with acute hemorrhage. The T1-weighted dynamic study (D-F) reveals a tiny nodular excentric area within the cyst (square in E) following the blood pool signal.

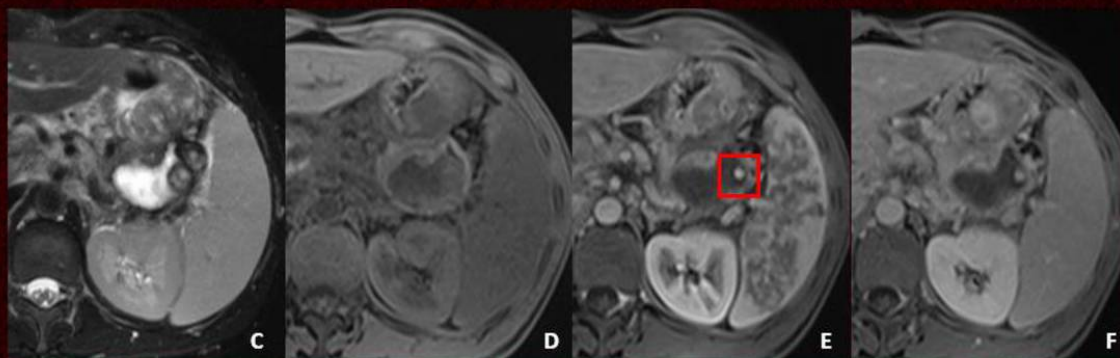


Fig. 9: Bleeding pseudocyst

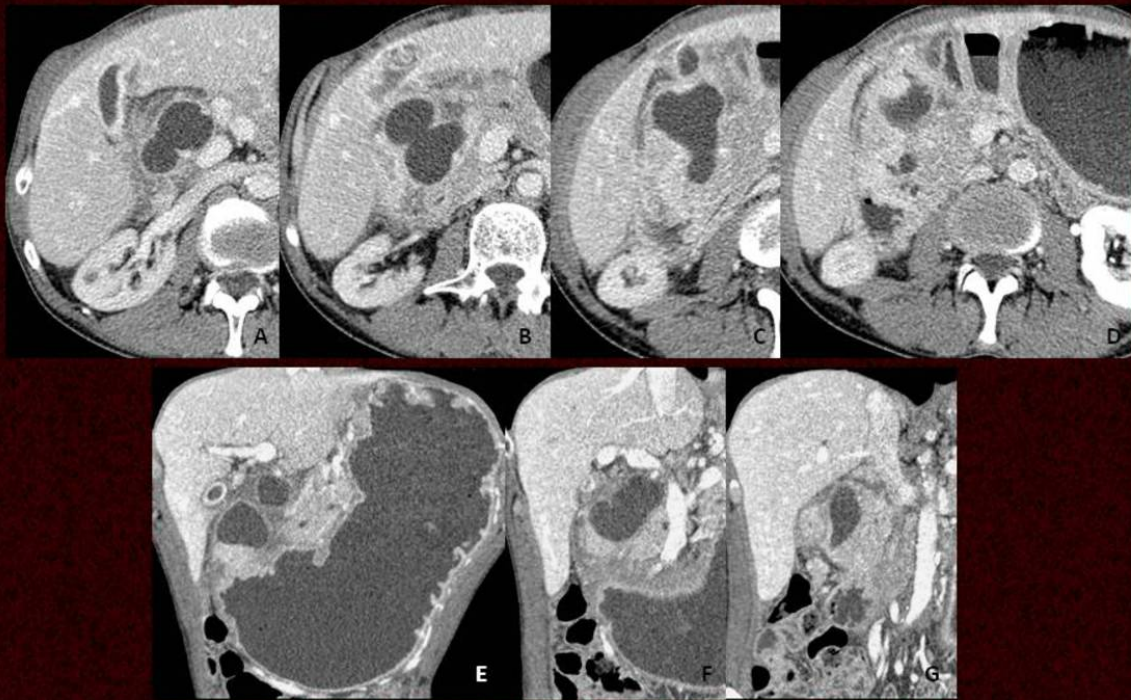


Figure 5. Pancreatic pseudocyst in a 57-year-old male patient presenting with abdominal pain and vomiting. Axial (A-D) and coronal reformatted (E-G) images from the CT scan performed after IV administration of contrast material show a cystic lesion involving the pylorus / duodenal bulb, with consequent gastric dilatation. Cyst fluid analysis was consistent with a pseudocyst.

Fig. 7: Pseudocyst - CT

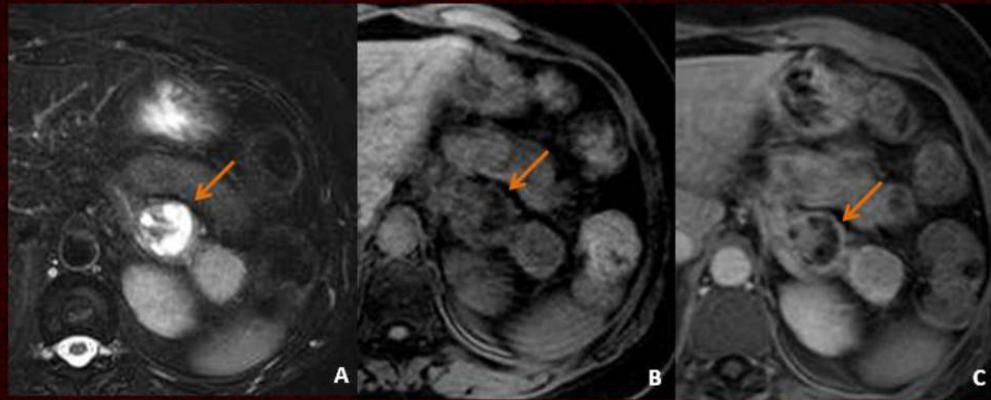


Figure 24. Necrotic metastasis in a 58-year-old woman with a history of synoviosarcoma. T2-weighted (A) and T1-weighted fat-suppressed unenhanced (B) and contrast-enhanced (C) MR images disclose two enhancing solid masses in the pancreatic tail. Note that one (arrows) of them is heterogeneous, showing exuberant cystic areas. Histopathological analysis was consistent with metastasis.

Fig. 27: Pancreatic Metastasis

PANCREATIC CYSTIC LESIONS

| NON-NEOPLASTIC | NEOPLASTIC |
|---|---|
| True epithelial cyst Pseudocyst Organized necrosis Abscess | Lymphangioma Serous cystadenoma Solid pseudopapillary tumor Mucinous cystic tumors Intraductal papillary mucinous tumor (IPMT) Necrotic tumors |

Fig. 6: Pancreatic Cystic Lesions



Figure 6. Pseudocyst in a 75-year-old male with previous history of acute pancreatitis. Abdominal MR axial (A) and coronal (B) HASTE images depict a thin-walled unilocular and homogeneous cystic lesion located in the pancreatic tail. The main pancreatic duct is not enlarged and it does not show communication with the cyst.

Fig. 8: Pseudocyst - MRI

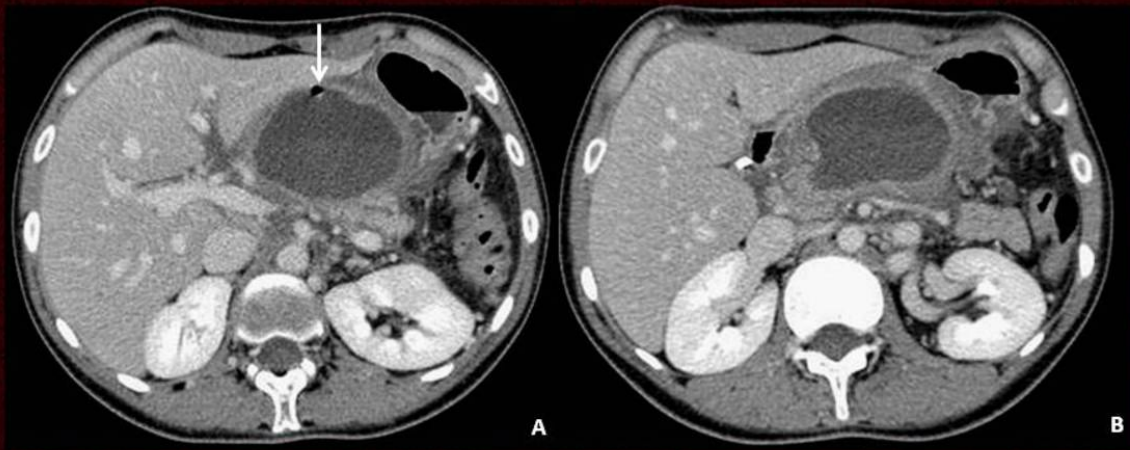


Figure 8. Organized pancreatic necrosis in a 30-year-old woman with fever and abdominal pain. Contrast-enhanced CT scan shows a large fluid collection replacing the parenchyma of the pancreatic body. An air bubble is seen (arrow in A), suggesting superinfection.

Fig. 10: Organized Pancreatic Necrosis

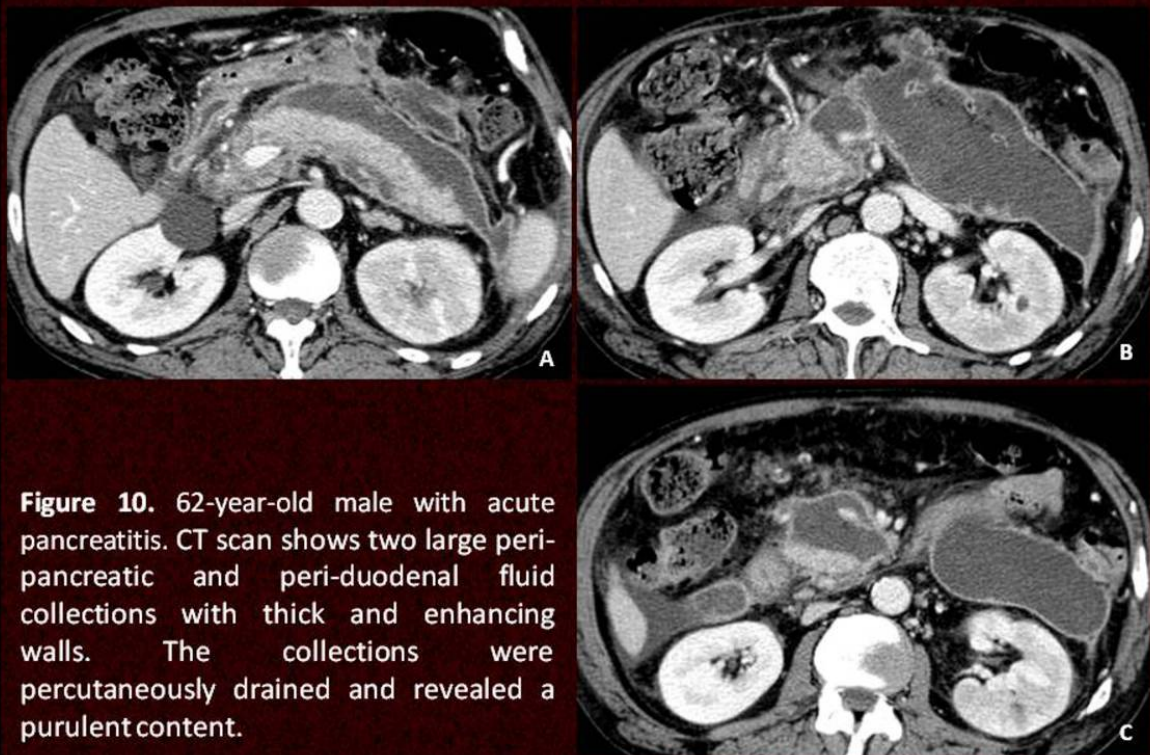


Fig. 12: Pancreatic Abscess

Figure 11. Cystic lymphangioma of the pancreas in two different female patients. **(A)** CT scan shows a well-circumscribed and multiloculated cystic mass in the pancreatic tail. Wall and septa are thin and regular and enhance after IV administration of contrast material. **(B-C)** MR study reveals a multiloculated cystic mass in the pancreatic body with high signal intensity in T1- **(B)** and T2- **(C)** weighted images.

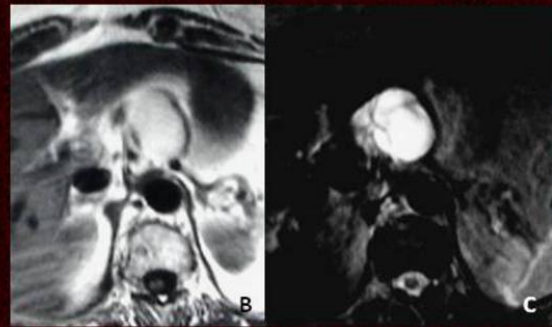


Fig. 14: Cystic Lymphangioma

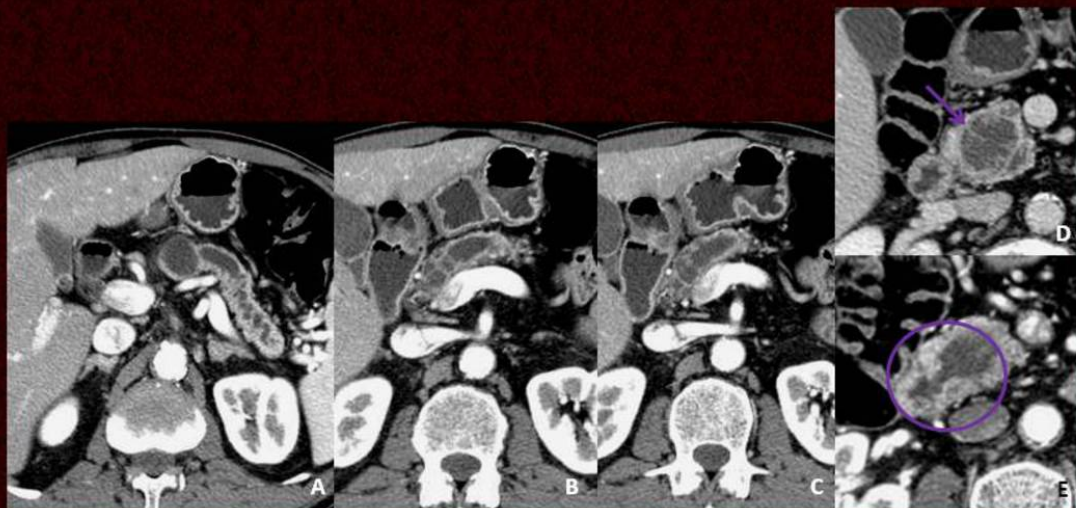


Figure 20. Main duct IPMT. CT scan performed in this 61-year-old asymptomatic male patient reveals a tortuous dilatation of the pancreatic duct which communicates with a complex cystic lesion in the pancreatic head. Note the presence of tiny enhancing solid elements in the lesion (arrow) and the bulging papilla projecting into the duodenal lumen (circle).

Fig. 23: Main duct IPMT

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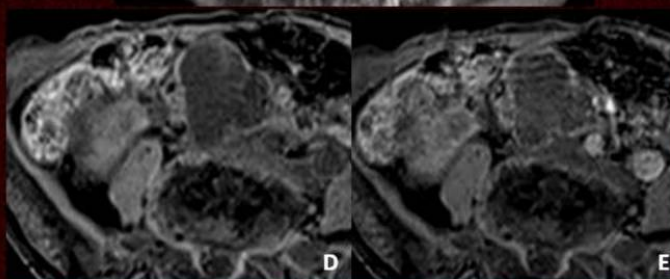
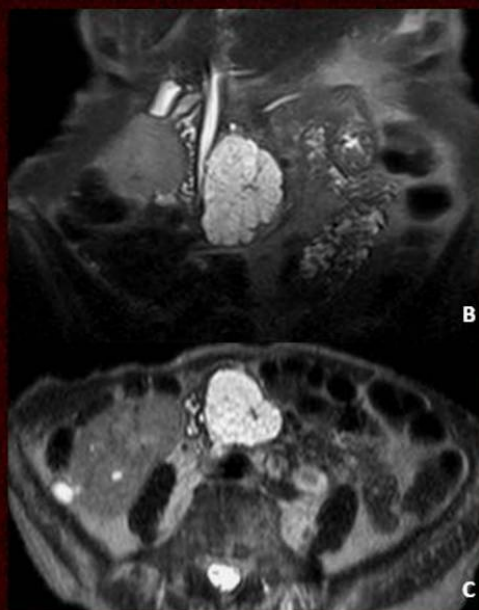


Figure 12. Serous cystadenoma in a 75-year-old female patient. (A) Enhanced-CT scan shows a lobulated microcystic mass in the uncinate process of the pancreas, which has multiple thin and enhancing septa. (B-E) Abdominal MR images (T2-weighted (B-C) and T1-weighted fat-suppressed before (D) and after (E) Gadolinium IV administration) in the same patient demonstrates the cystic mass with an internal honeycomb pattern. Note the slight enhancement of the septa after contrast administration (E).

Fig. 15: Serous Cystadenoma

Figure 13. Mucinous cystadenoma in a 51-year-old asymptomatic woman. **(A)** CT scan after IV contrast administration reveals a unilocular cystic mass in the pancreatic head. **(B-E)** T2-weighted (B) and T1-weighted fat-suppressed images before (C) and after (D-E) Gadolinium IV administration reveal a bilocular and homogeneous cystic mass in the pancreatic head. No enhancing soft-tissue elements are seen.

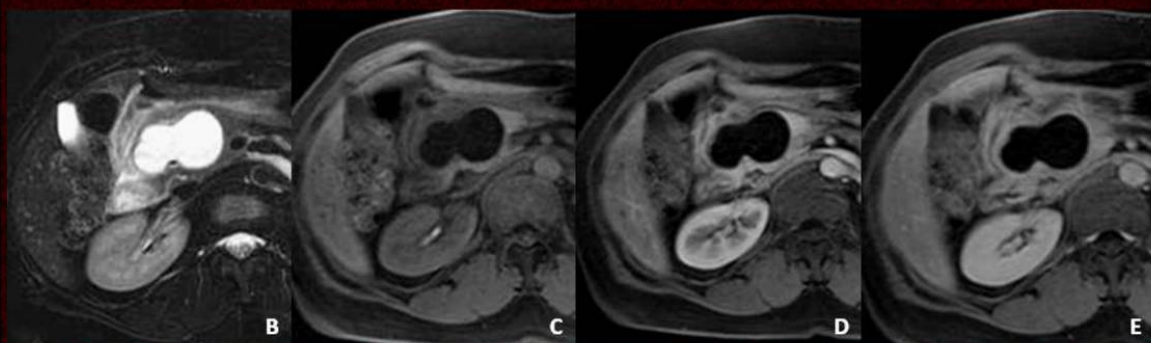


Fig. 16: Mucinous Cystadenoma



Figure 14. 31-year-old asymptomatic woman with a mucinous cystadenoma. **(A)** Abdominal CT image discloses a macrocystic mass in the pancreatic tail, with septal and mural enhancement. Axial T2-weighted **(B)** and T1-weighted enhanced GRE images **(C-D)** show enhancing septa, but no solid soft-tissue nodular elements.

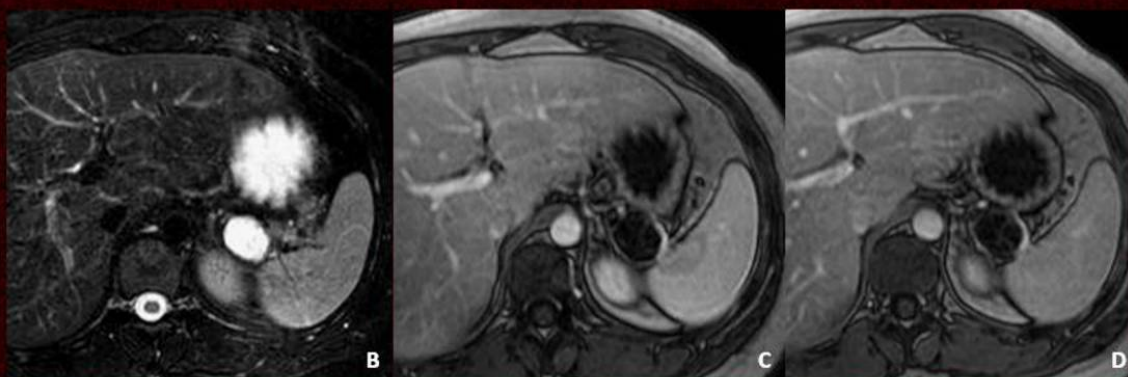


Fig. 17: Mucinous Cystadenoma

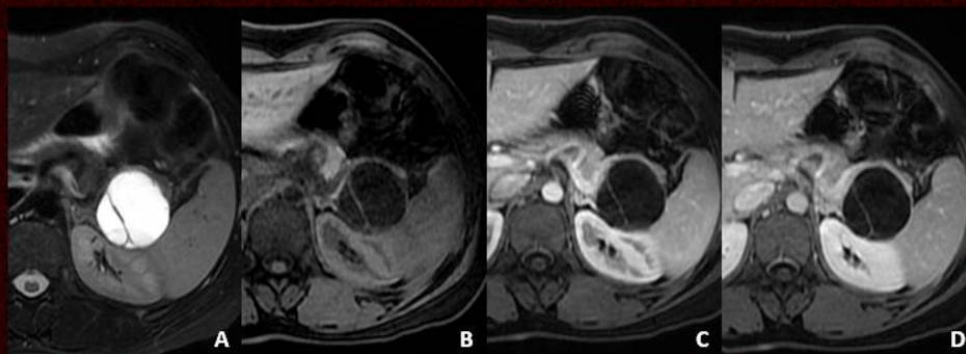


Figure 15. MR findings of mucinous cystadenoma. T2-weighted (A) and T1-weighted fat-suppressed dynamic study before (B) and after (C) IV administration of Gadolinium depict a cystic mass in the pancreatic tail. There are few non-enhancing septations. No mural nodules were found.

Fig. 18: Mucinous Cystadenoma

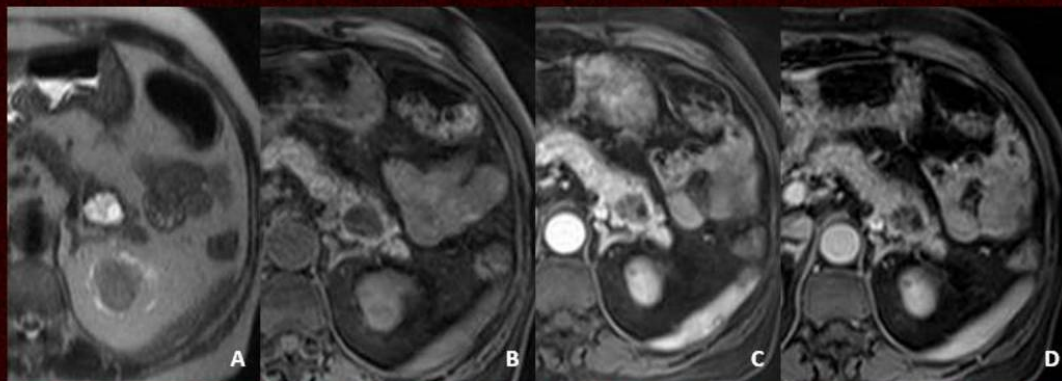


Figure 16. Abdominal MR images in a 73-year-old female patient demonstrate a complex cystic lesion in the pancreatic tail. On T2-weighted images (A) the lesion shows heterogeneous internal structure. The dynamic study (B-D) reveals enhancing solid components. The findings are consistent with a mucinous cystadenocarcinoma.

Fig. 19: Mucinous Cystadenocarcinoma

Conclusion

Familiarization with the spectrum of CT and MRI findings of cystic masses of the pancreatic-duodenal region, together with knowledge of the patient's clinical history and laboratory data are essential to make a presumptive diagnosis, in order to ensure proper patient management.

Personal Information

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