



Nader Roushan
Tehran University of Medical Sciences
Department of internal medicine
Division of gastroenterology
Imam Khomeini Hospital

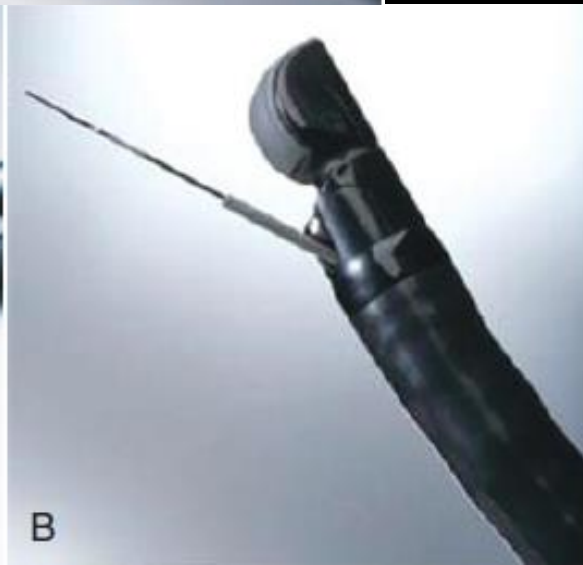


EUS

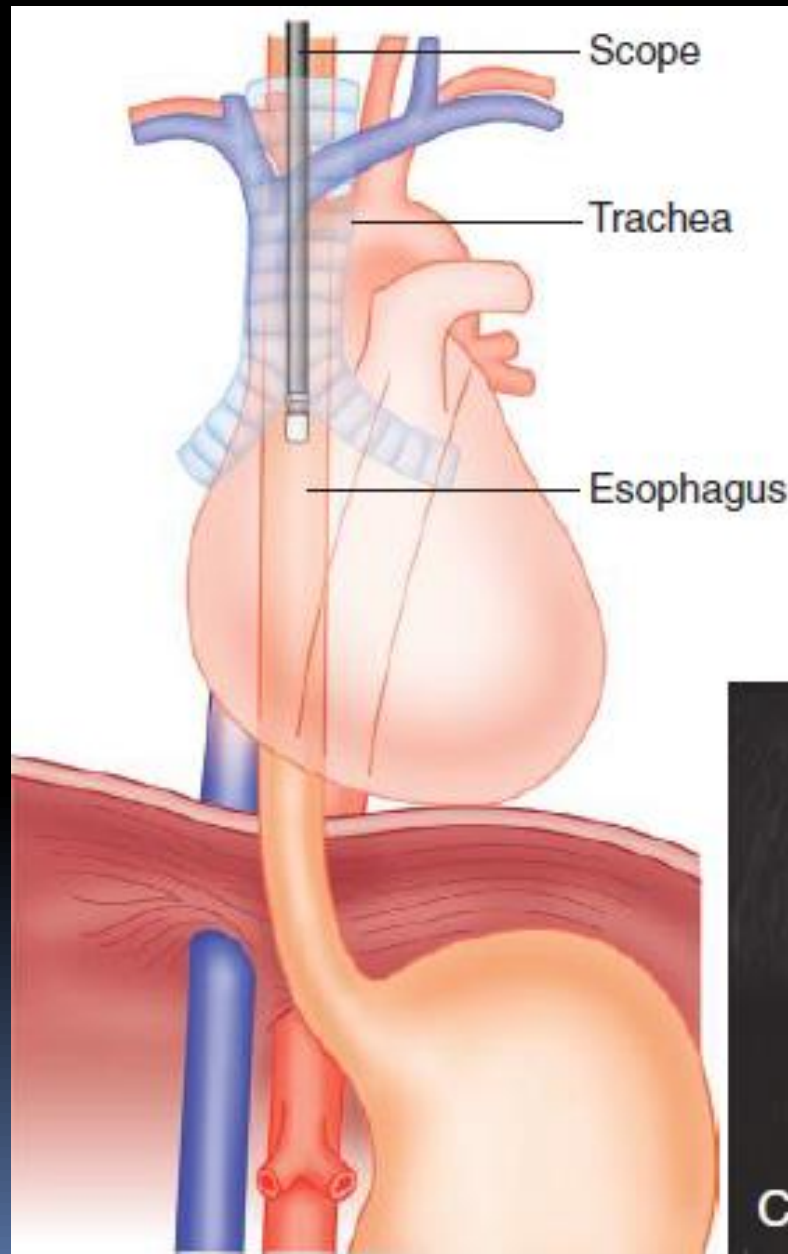
IN UPPER GI



Radial linear mini-probe



EUS in mediastinum



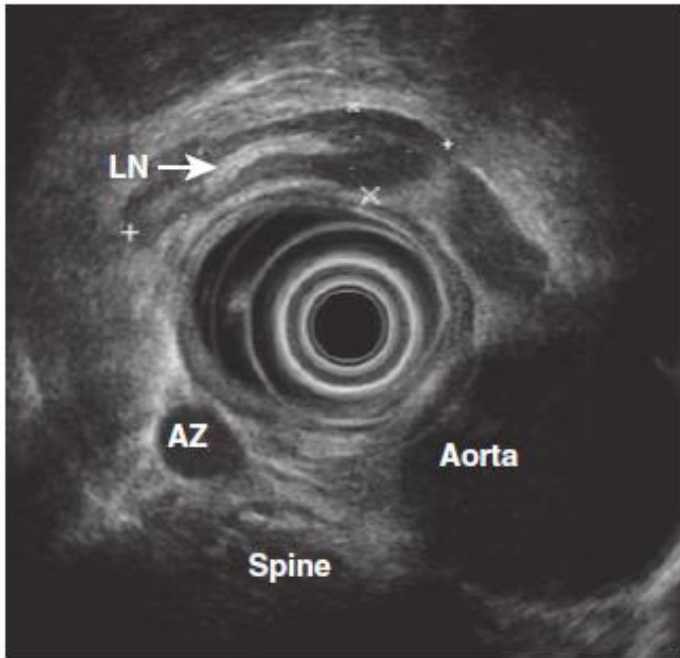


FIGURE 9-1 Benign mediastinal lymph node. Note the triangular appearance with a central hyperechoic stripe. AZ, azygos vein; LN, lymph node.

TABLE 9-1

POSTERIOR MEDIASTINAL LESIONS THAT CAN BE DIAGNOSED WITH EUS FINE-NEEDLE ASPIRATION

Malignant	Benign
Lung cancer	Reactive
Primary or metastatic	Granulomatous disease
Non-small-cell (NSCLC)	Histoplasmosis
Small-cell	Sarcoid
Mesothelioma	Tuberculosis
Lymphoma	Duplication cyst
Metastatic from nonlung primary	Leiomyoma
Gastrointestinal stromal tumor (GIST)	Mediastinitis/abscess
Spindle cell neoplasm	Pleural effusion

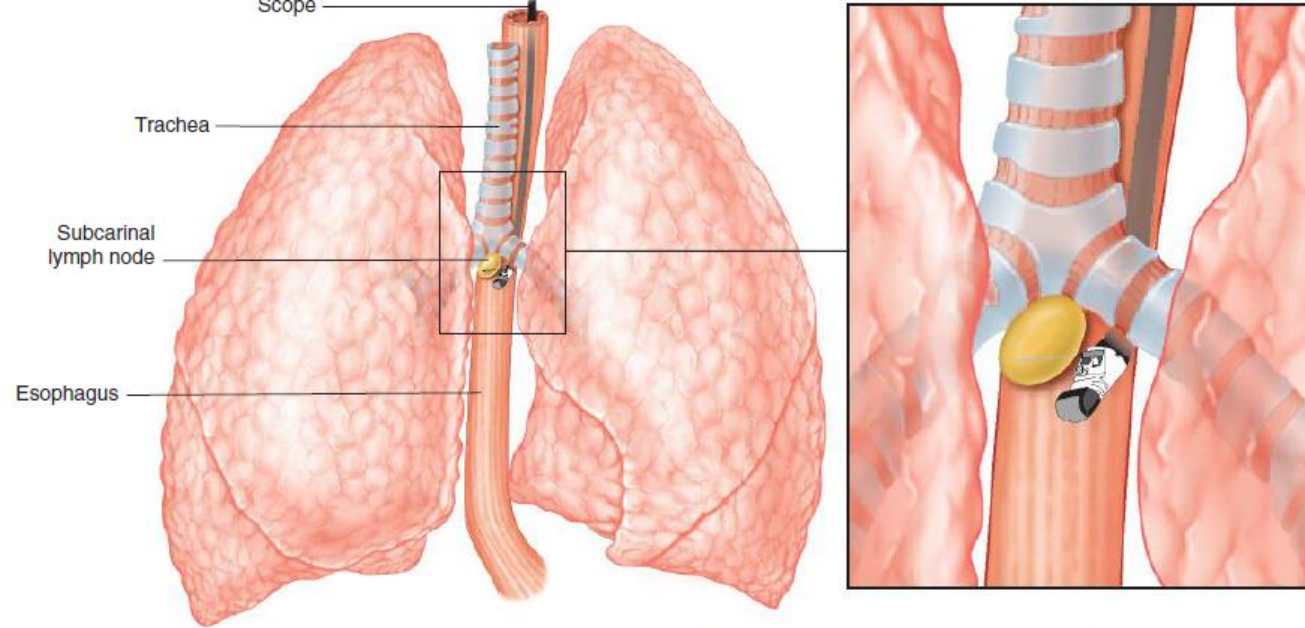


FIGURE 7-8 Diagram showing transesophageal ultrasound-guided fine-needle aspiration of a subcarinal lymph node.

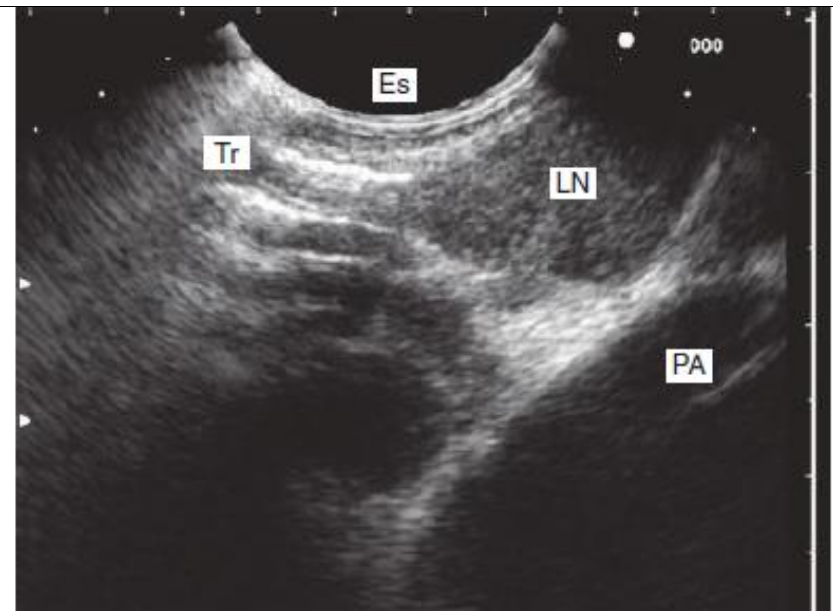


FIGURE 7-4 Lower paratracheal lymph node (LN) on the left (station 4L) located between the esophagus (Es), trachea (Tr), and pulmonary artery (PA).

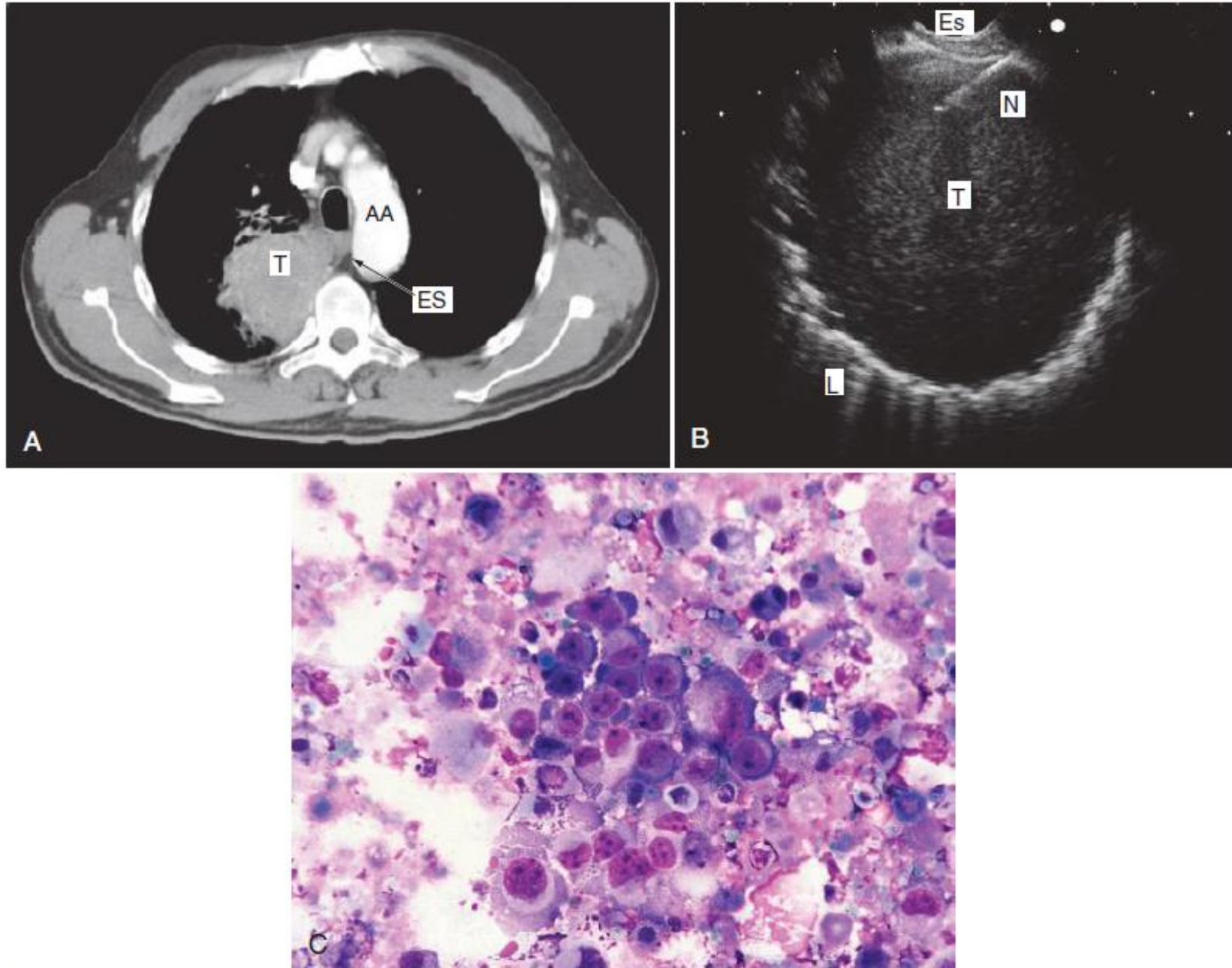


FIGURE 7-1 A 53-year-old smoker with suspected lung cancer in whom bronchoscopy did not establish a diagnosis. **A**, Computed tomography of the chest demonstrating an intrapulmonary tumor (T) in the right upper lobe located adjacent to the esophagus (ES). AA, aortic arch. **B**, Corresponding EUS fine-needle aspiration image. Notice the needle (N) located in the tumor (T). Es, esophagus; L, compromised lung tissue. **C**, Cytology of fine-needle aspirate demonstrating a squamous cell carcinoma.

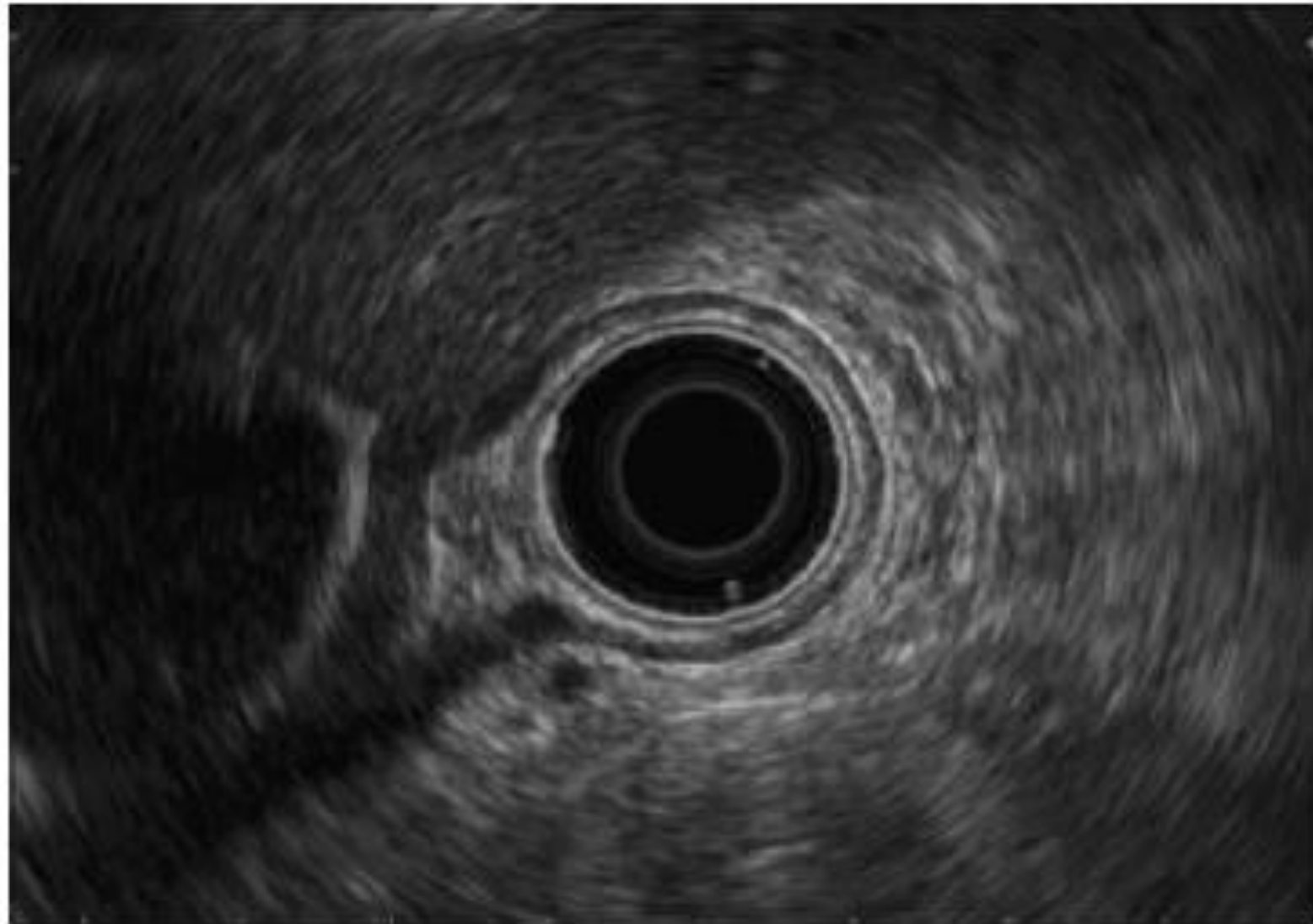


FIGURE 12-2 The five-layer gastric wall as examined using a radial echoendoscope at 7.5 MHz.

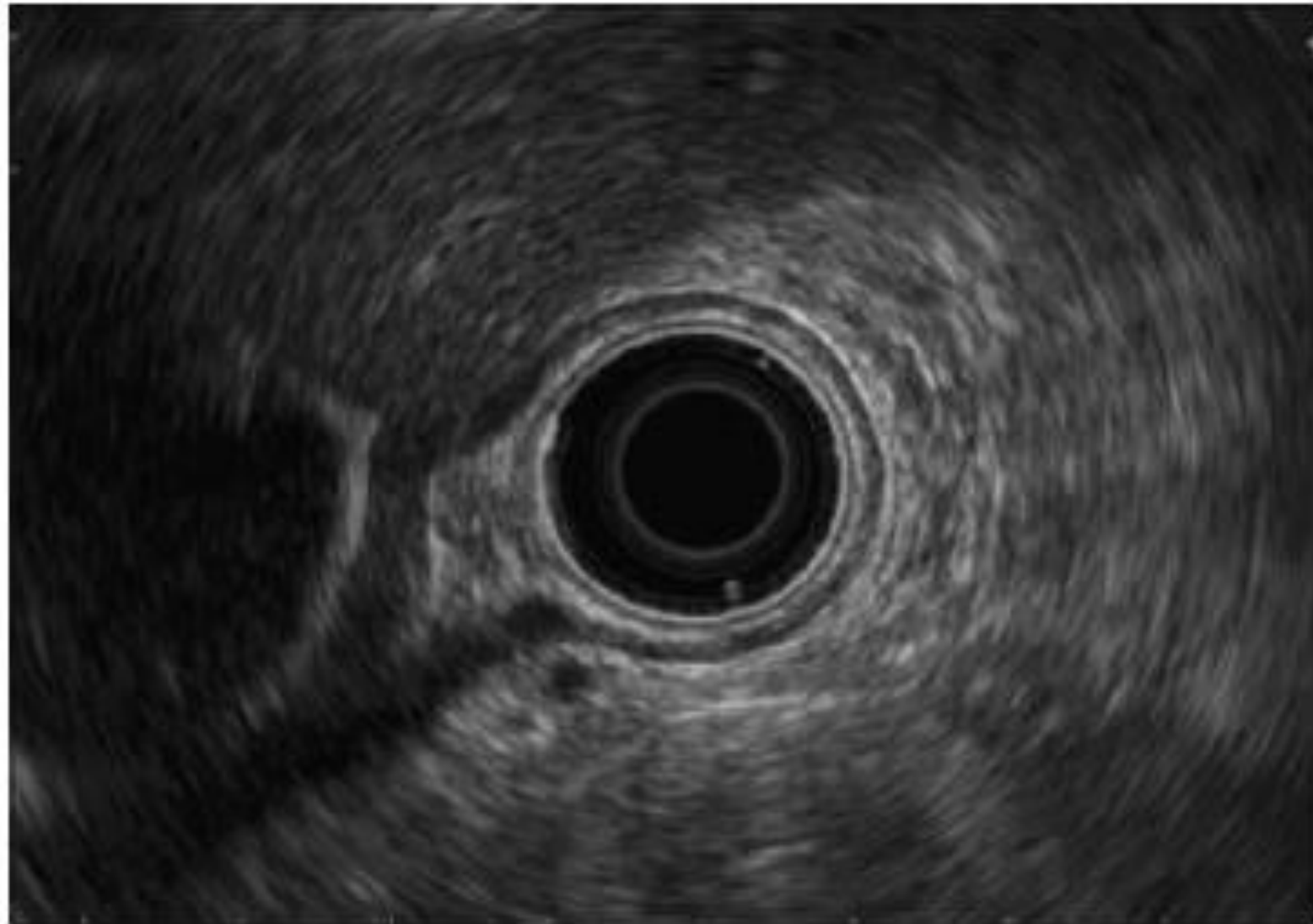
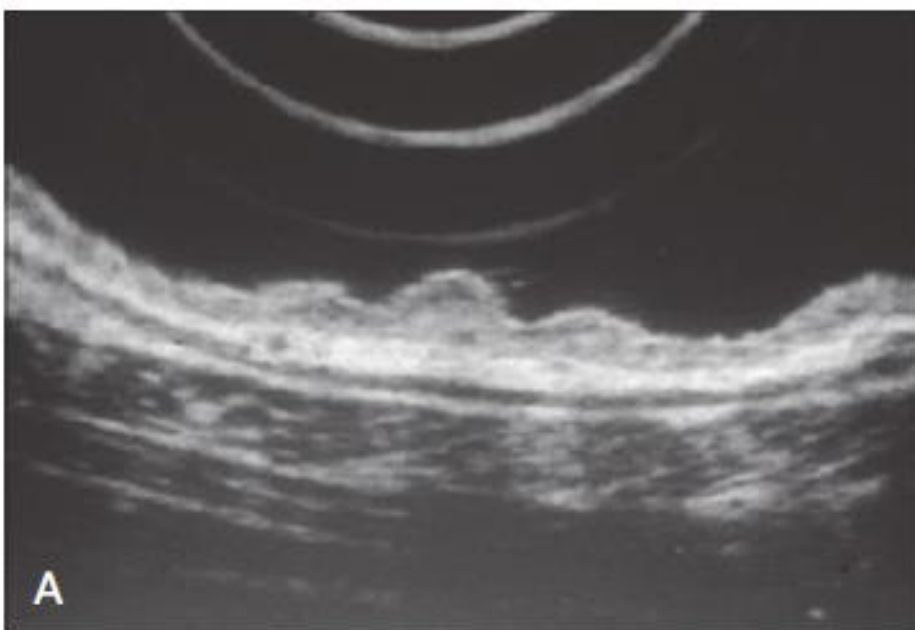


FIGURE 12-2 The five-layer gastric wall as examined using a radial echoendoscope at 7.5 MHz.



T1a



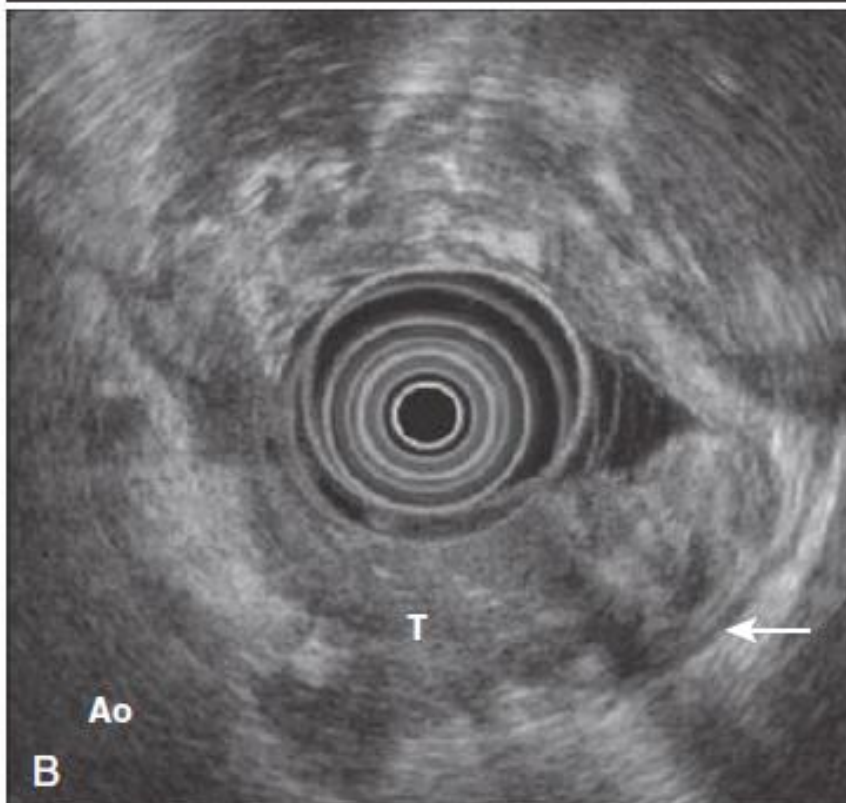
T1b

FIGURE 12-7 Early stage gastric cancer. **A**, Early stage gastric cancer confined to the mucosal layer. **B**, Early stage gastric cancer extending to the submucosal layer.

T2



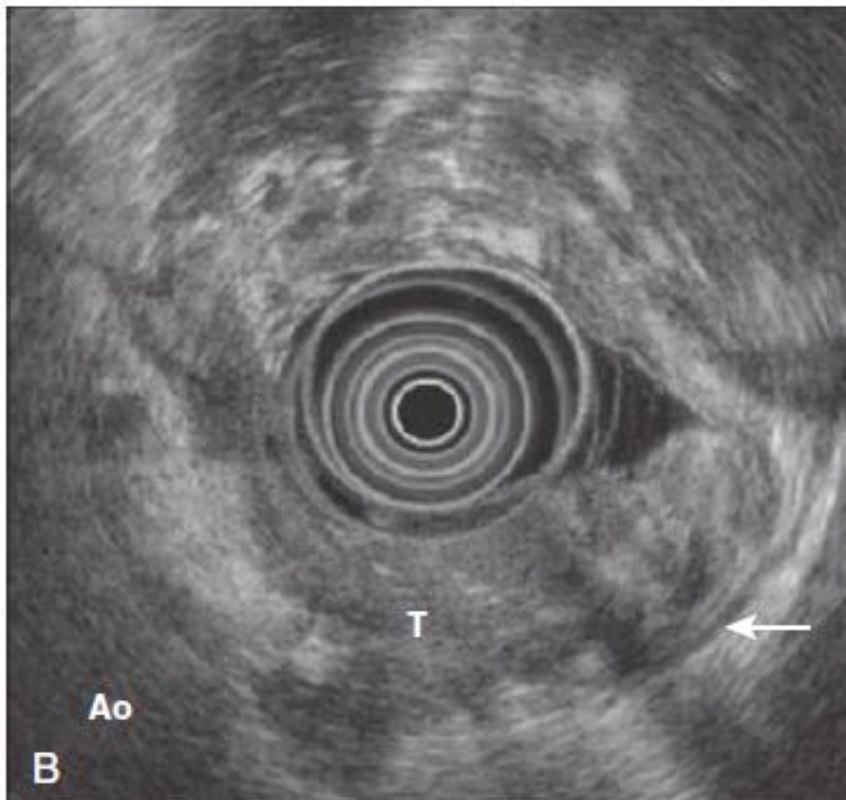
T3

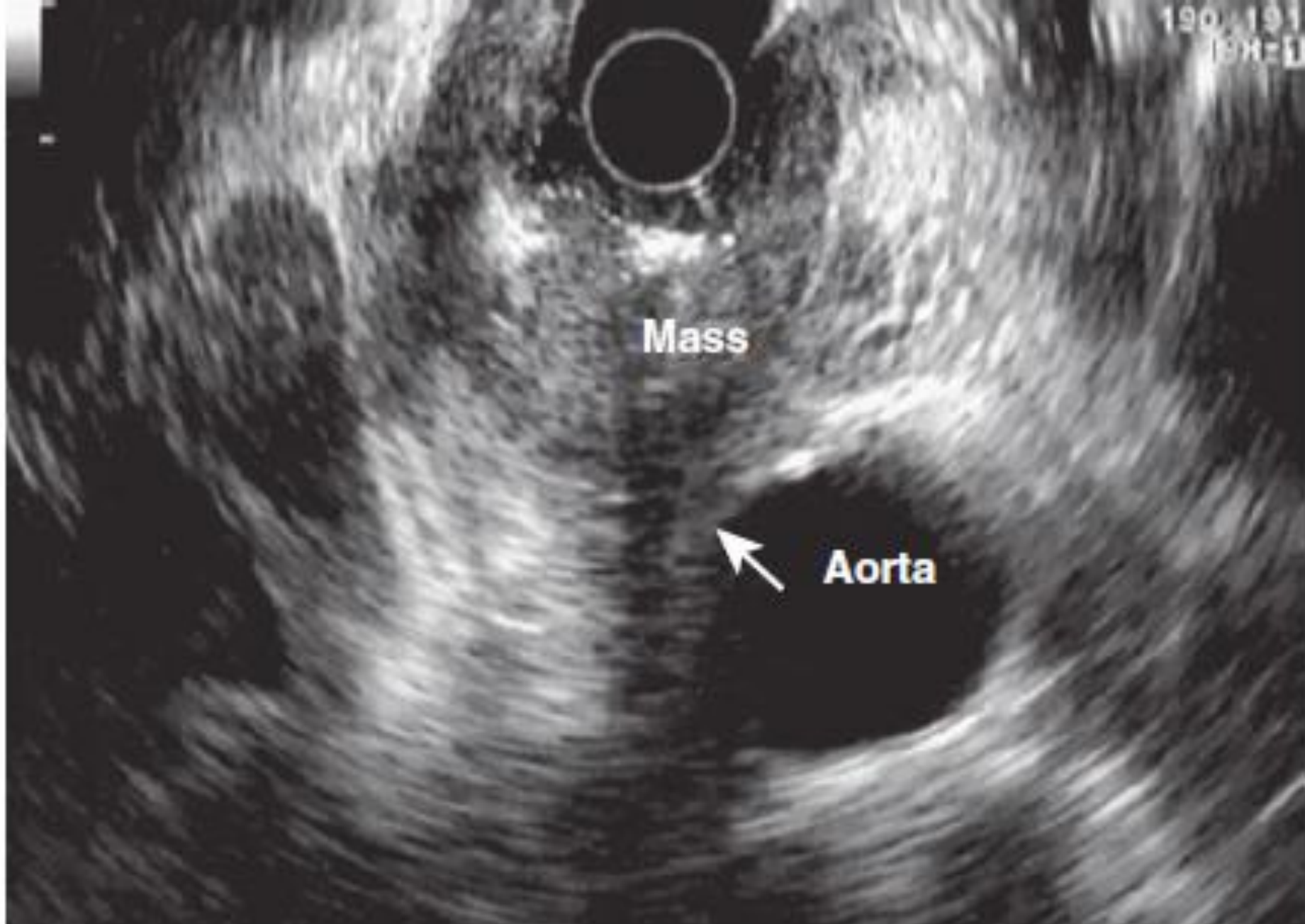


T2

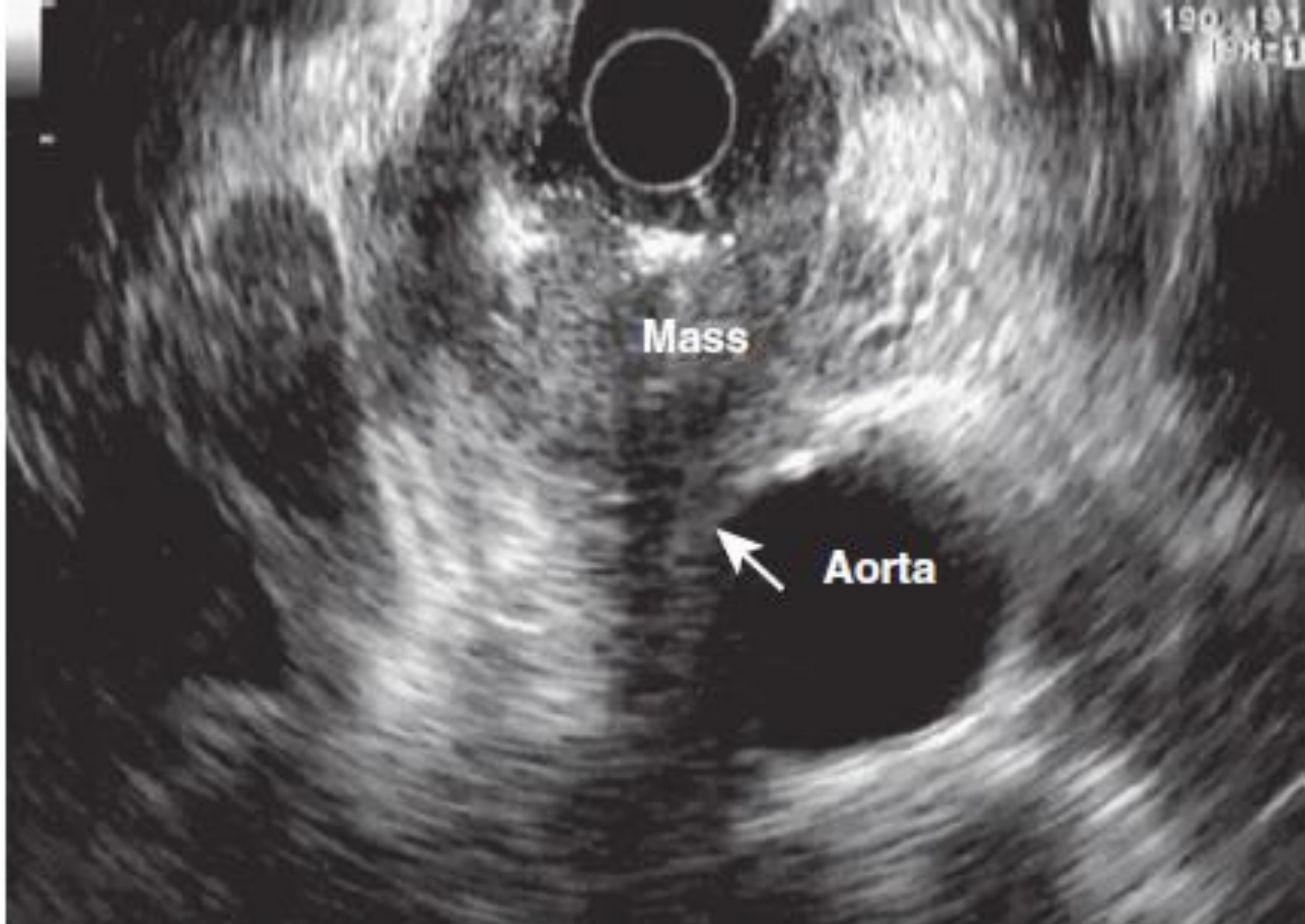


T3





T4



T4

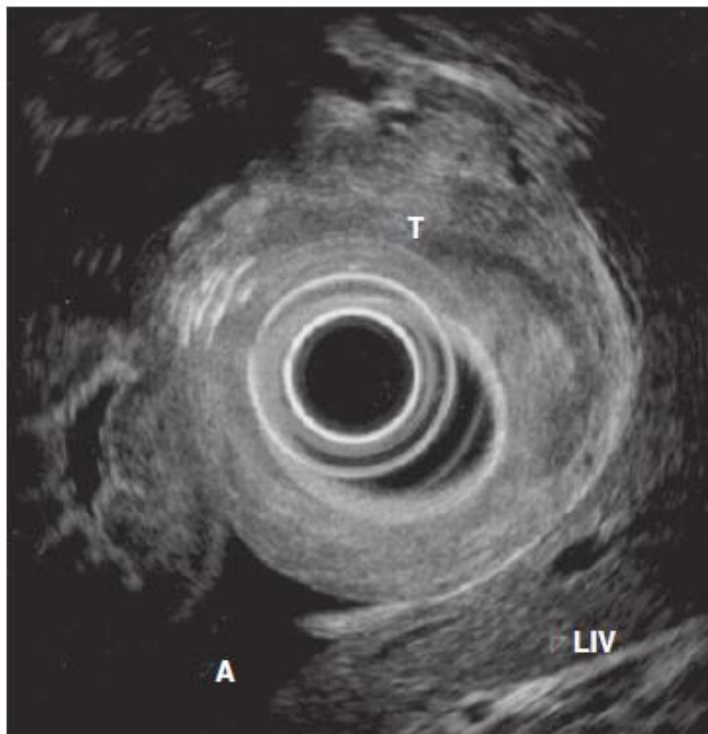


FIGURE 12-5 Presence of ascites (A) as diagnosed with a radial echo-
endoscope in advanced gastric cancer. LIV, liver; T, tumor.

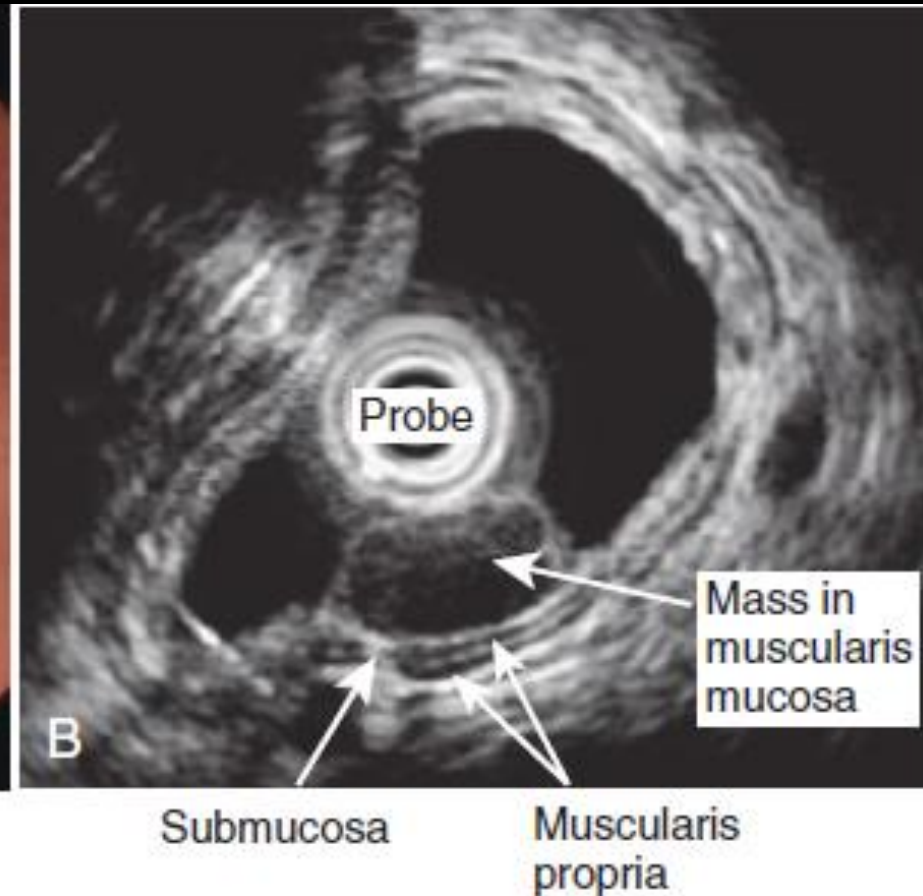
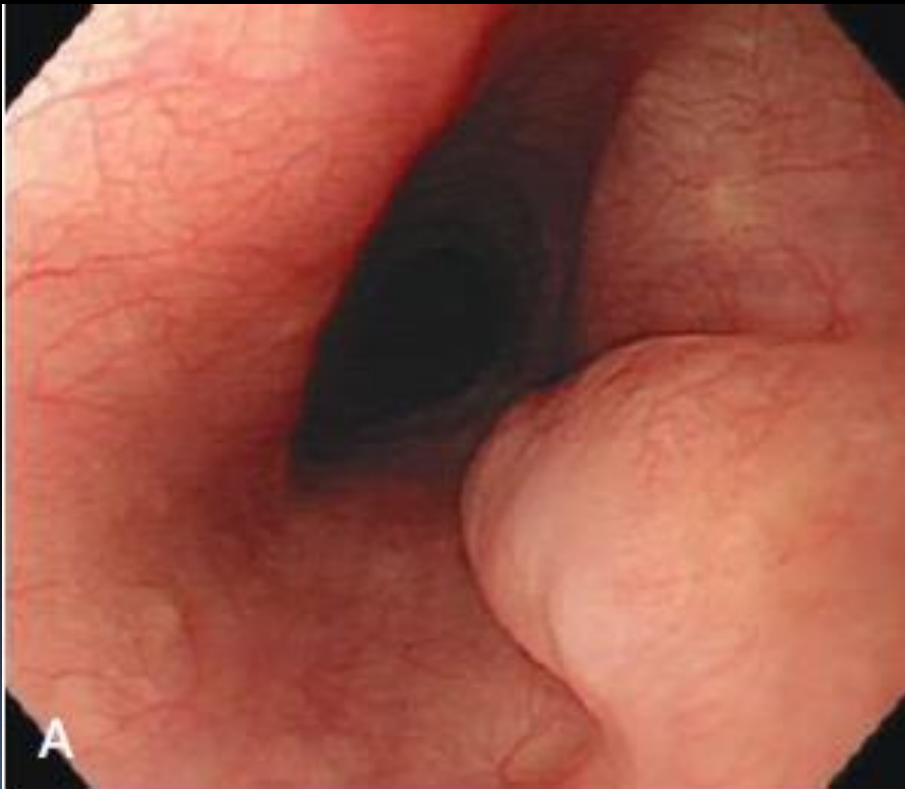


FIGURE 12-6 Hepatic metastasis of gastric cancer. EUS-guided fine-
needle aspiration of a metastatic deposit in the left lobe of the liver in
a patient with gastric cancer that was missed on computed tomography
imaging.

Subepithelial lesions

leiomyoma

2nd layer



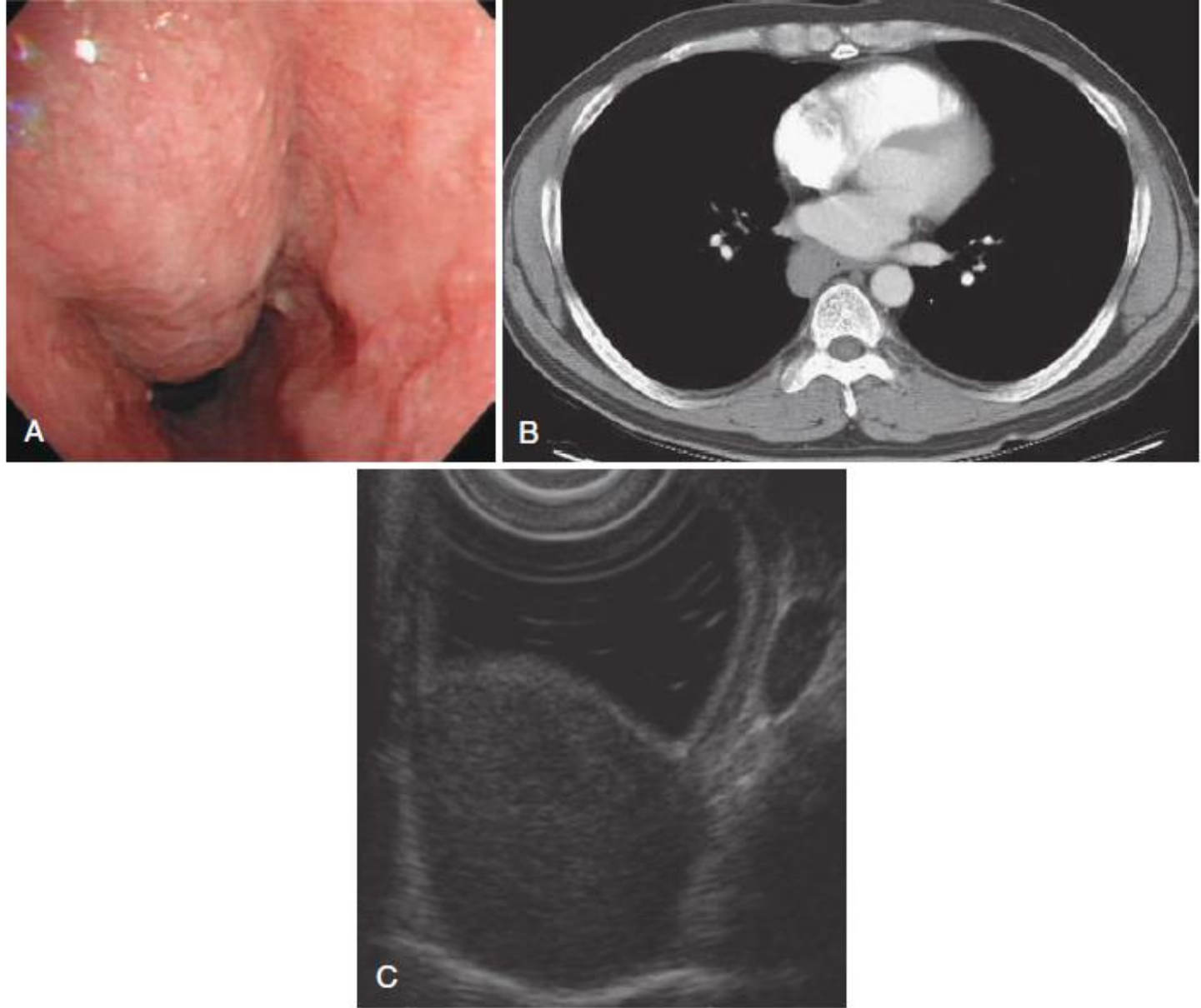
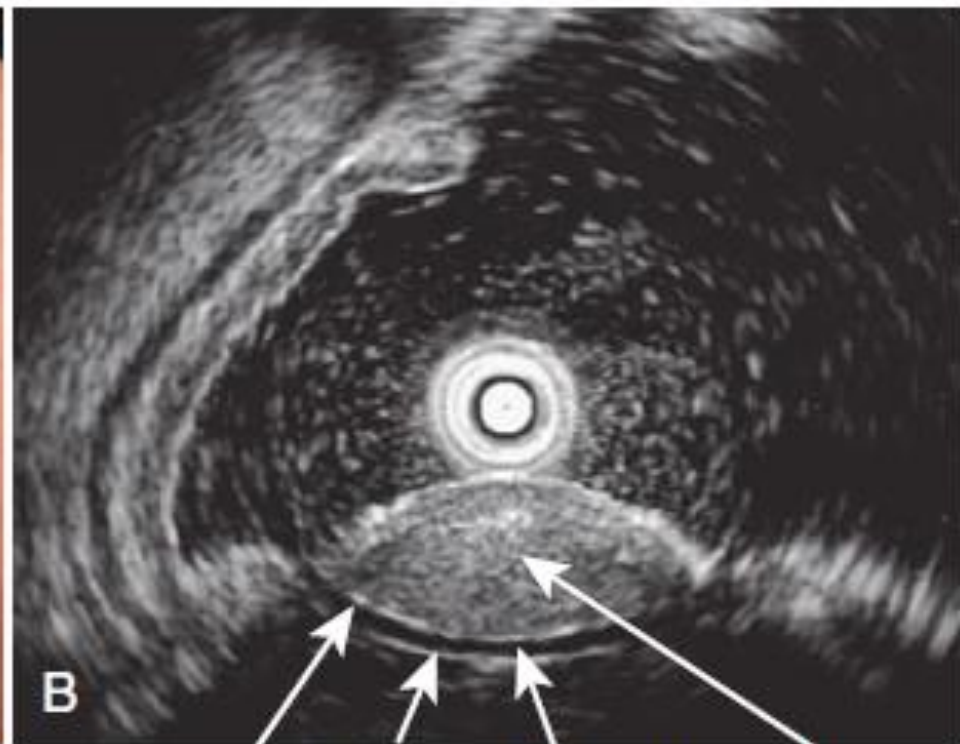
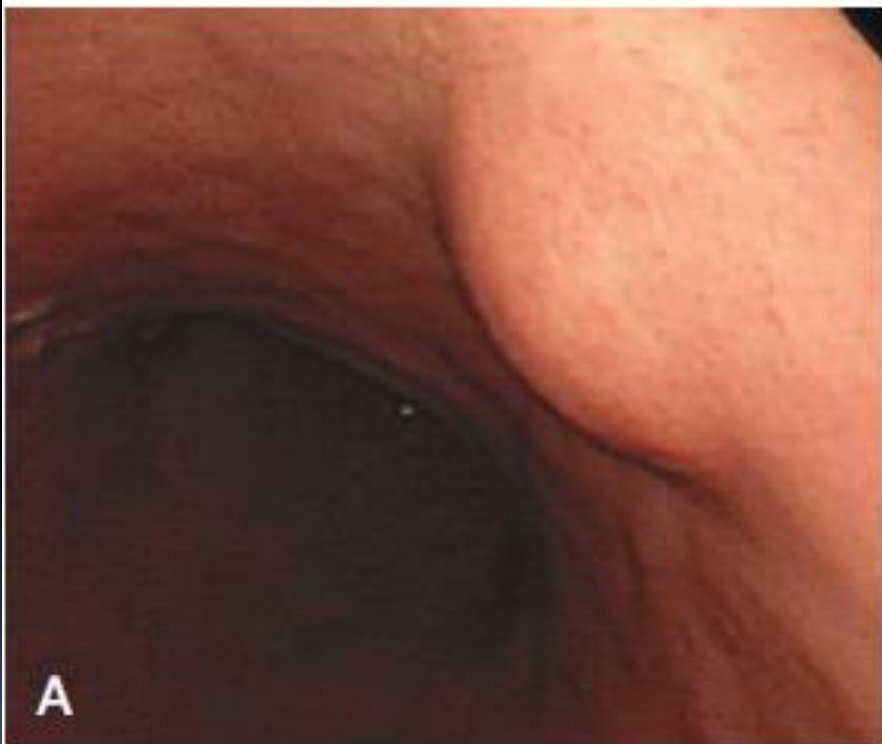


FIGURE 11-10 Bronchogenic cyst. **A**, Endoscopic view of a bulging mass lesion at the mid esophagus. **B**, The mass looks like a solid mass lesion on computed tomography. **C**, EUS demonstrated a round, homogeneous, hypoechoic lesion in the mediastinum.

differentiate mural lesion ↔ extrinsic compression

lipoma



Submucosa Serosa Muscularis propria Mass

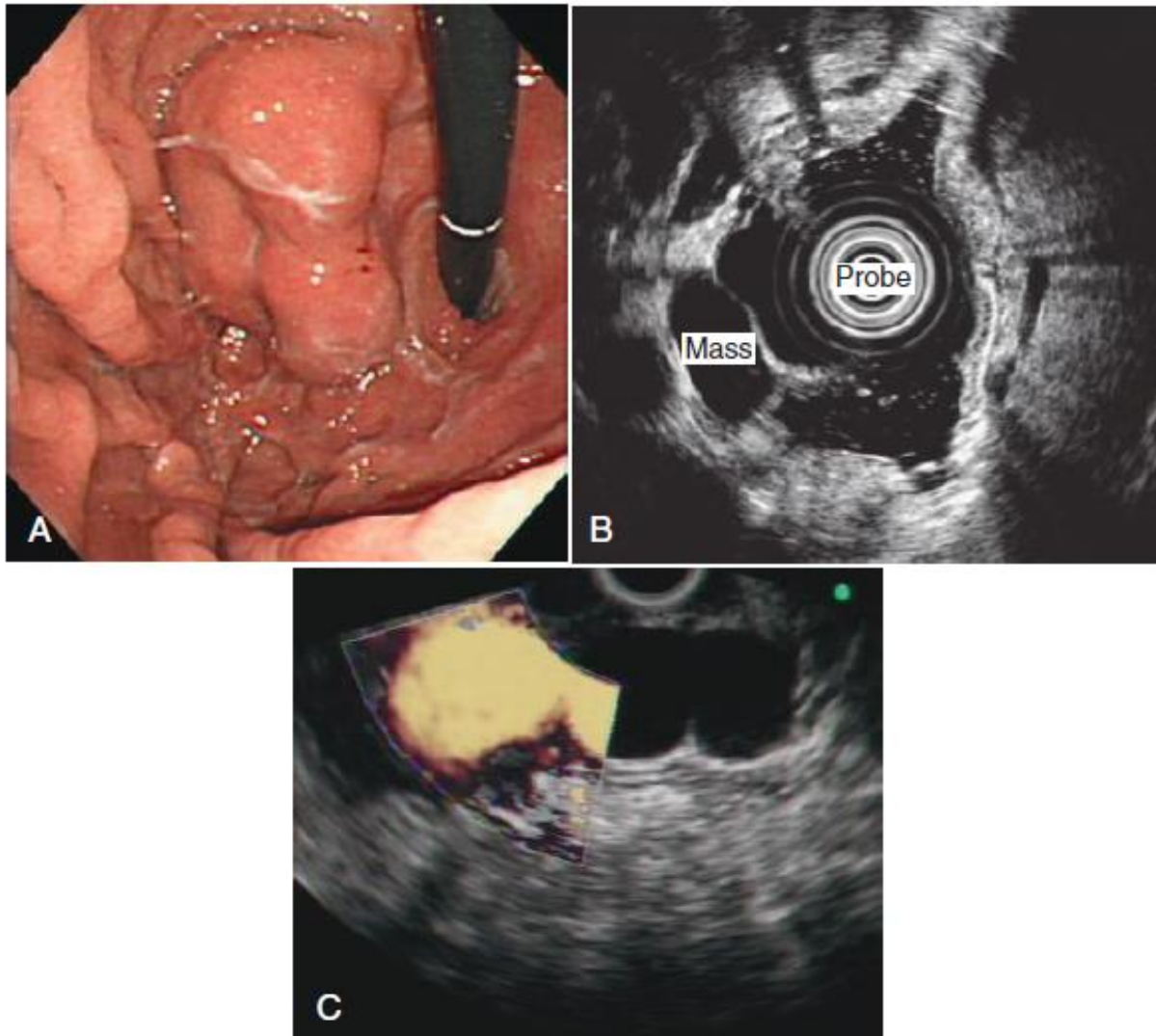
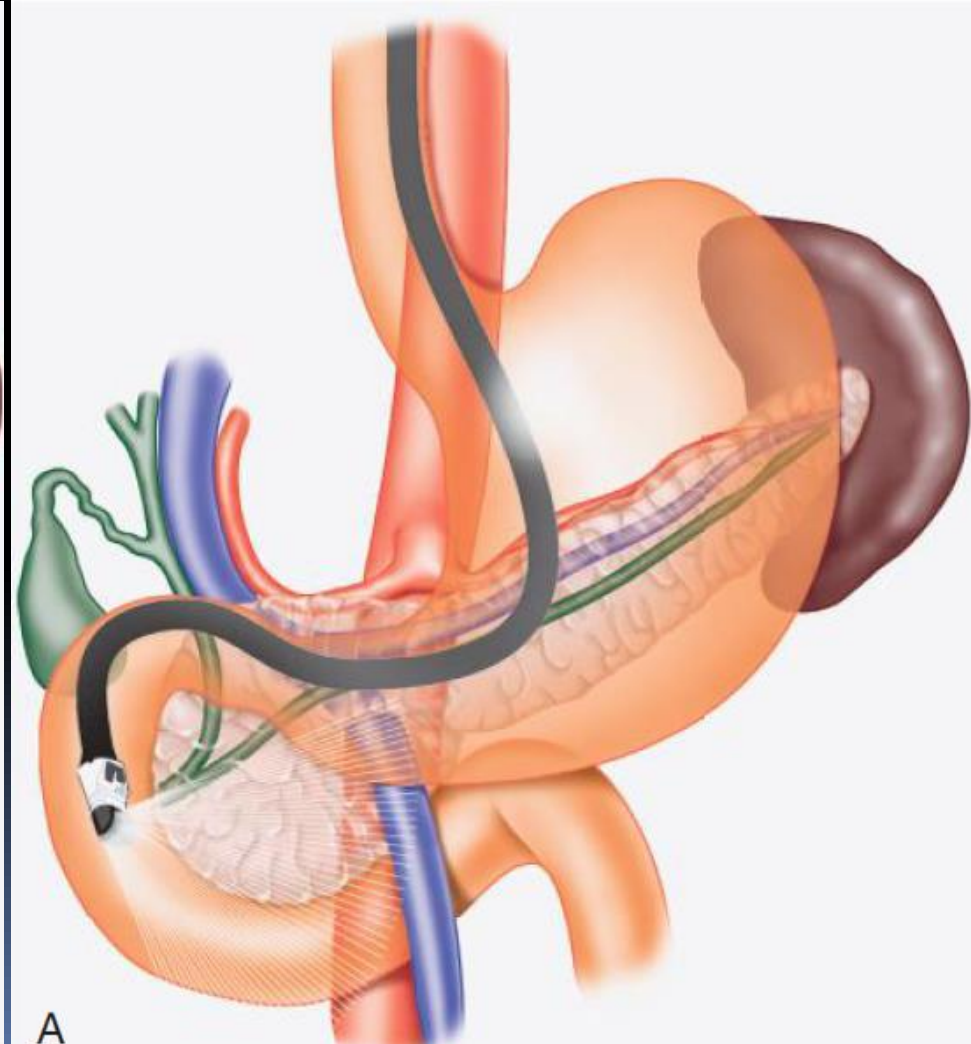
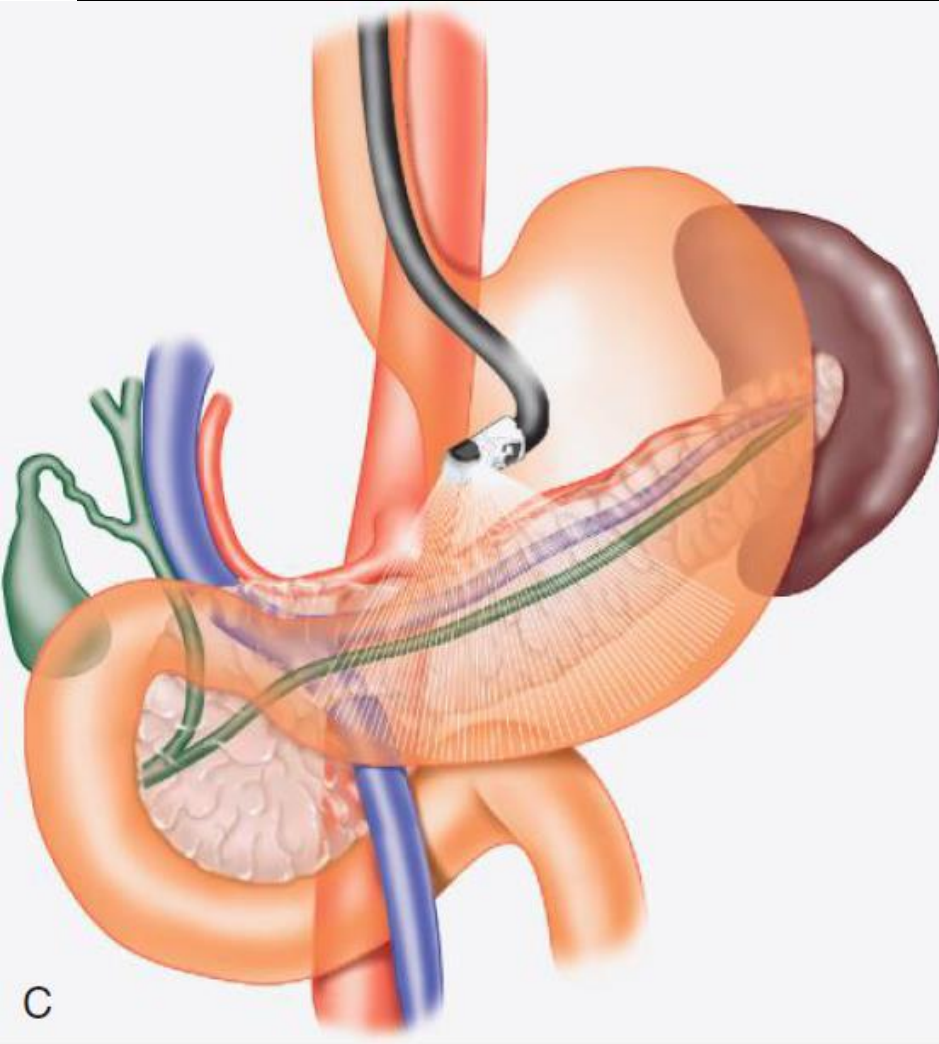


FIGURE 11-11 Gastric fundic varices. **A**, Endoscopic view of a large bulging mass lesion at the gastric fundus. **B** and **C**, EUS confirmed large, anechoic, tubular, submucosal vessels with multiple extramural collateral vascular structures.

EUS in stomach

- cause of an intramural lesion → based on its layer of origin & echo
- → lesion can be removed safely by EMR
- FNA & IHC for CD117 → GIST ↔ leiomyoma

Pancreatobiliary EUS



100%

2684/2709
41Hz



7.5DM R4.0 G67 C10 A1

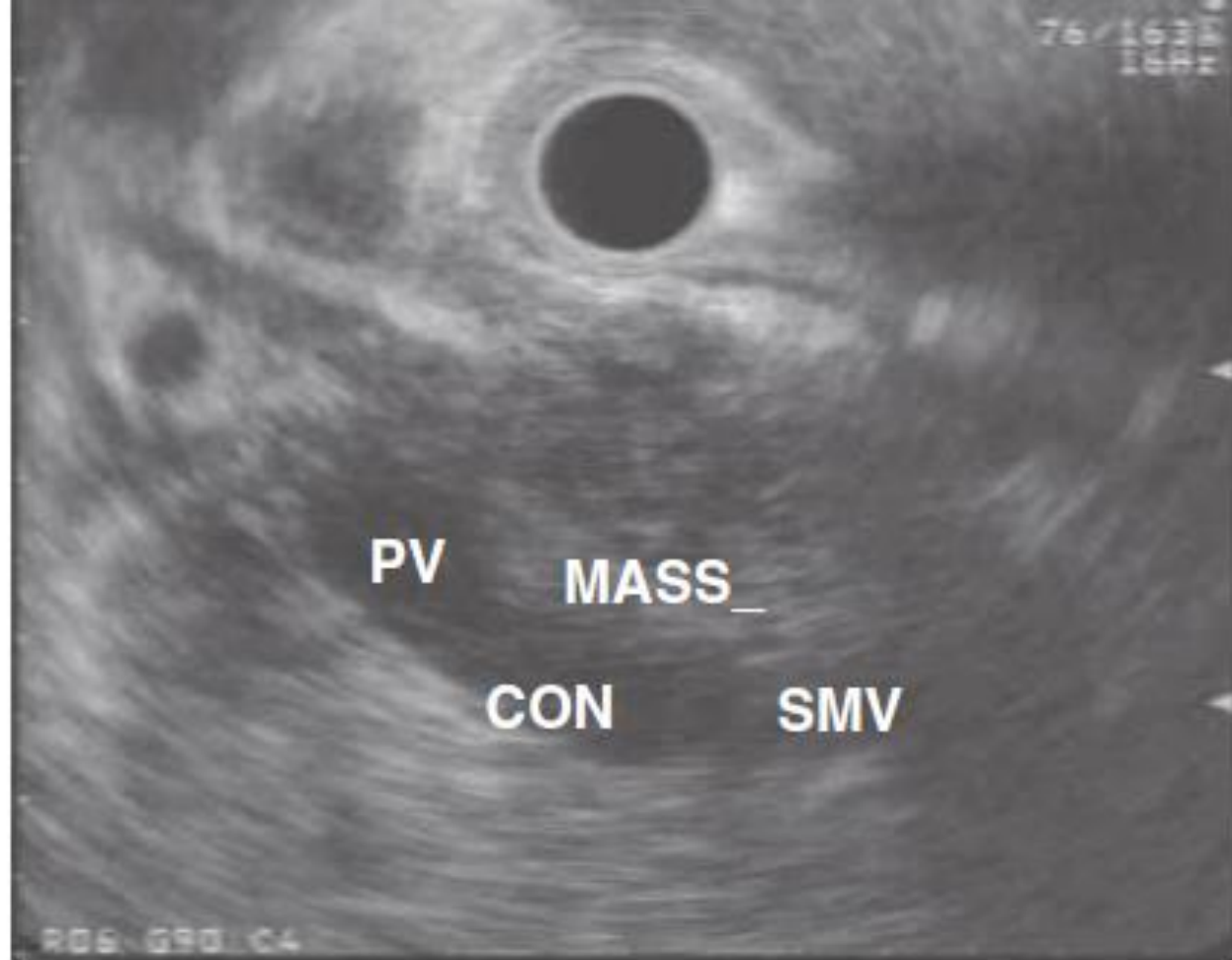


FIGURE 15-4 Radial image (7.5 MHz) of a large pancreatic head mass with adherence and invasion into the superior mesenteric vein (SMV) just below the portal vein confluence. A malignant-appearing lymph node is seen adjacent to the mass. Invasion into the SMV was confirmed at surgery.

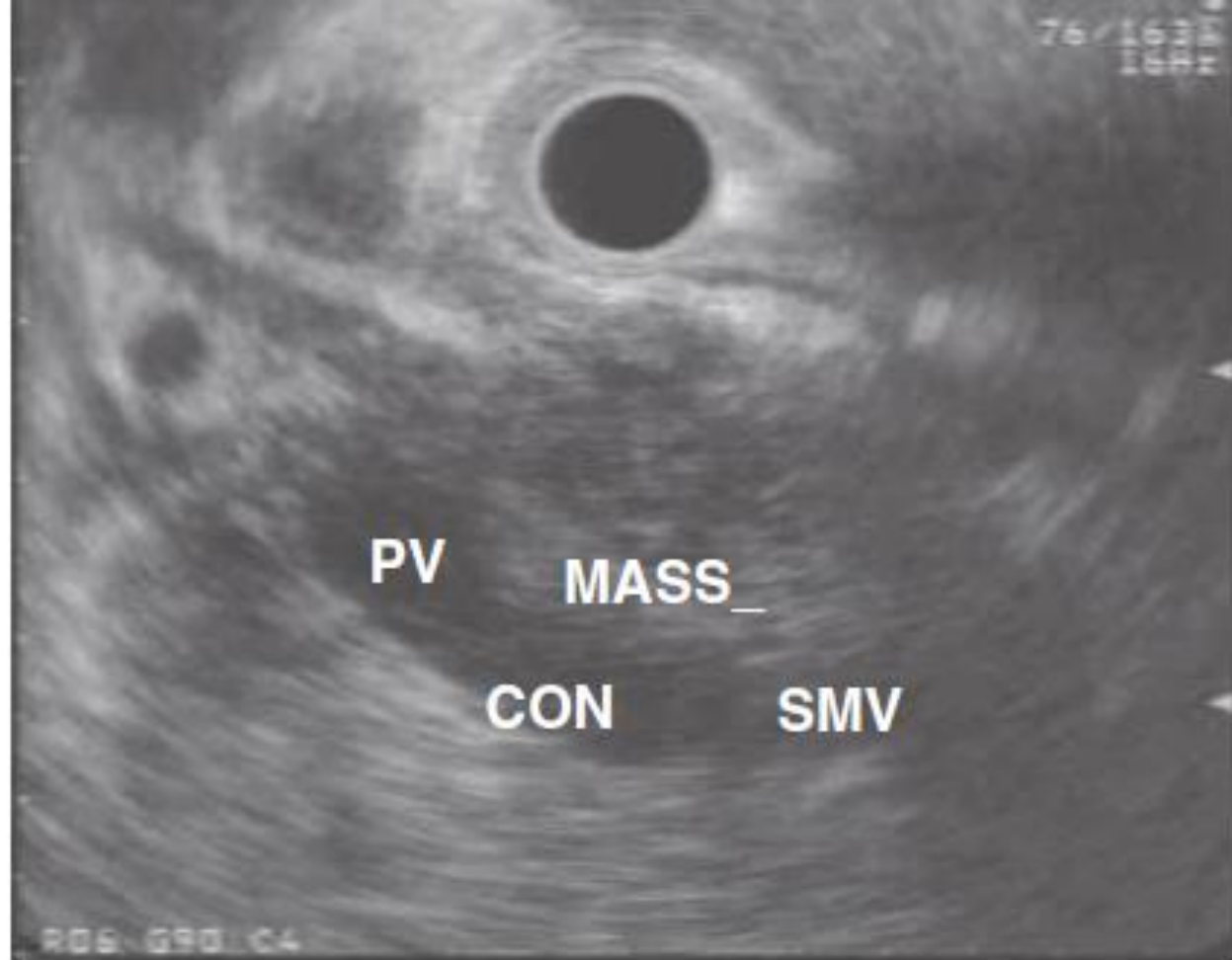


FIGURE 15-4 Radial image (7.5 MHz) of a large pancreatic head mass with adherence and invasion into the superior mesenteric vein (SMV) just below the portal vein confluence. A malignant-appearing lymph node is seen adjacent to the mass. Invasion into the SMV was confirmed at surgery.

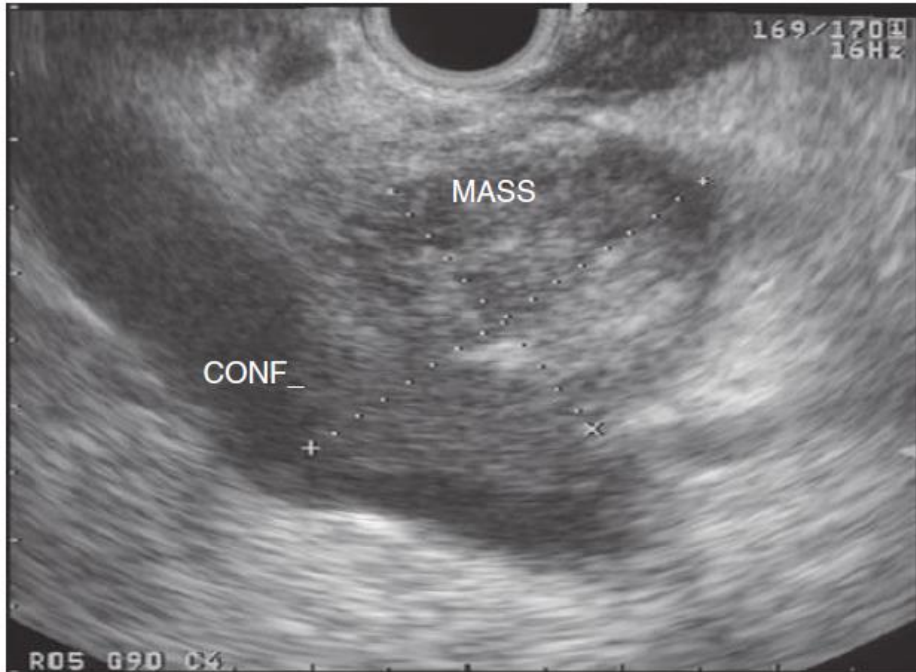


FIGURE 15-11 Linear EUS image (7.5 MHz) of a 2.8-cm pancreatic mass that is invading the portal vein confluence.

accuracy of MRI is reportedly equivalent⁵⁷ or superior⁵⁵ to EUS. For overall venous invasion, EUS is reportedly superior⁶



FIGURE 15-13 Linear EUS image (7.5 MHz) of a 31-mm hypoechoic mass in the head of a pancreas with a long segment of the superior mesenteric artery (SMA) encasement. A biliary stent (ST) is also seen.

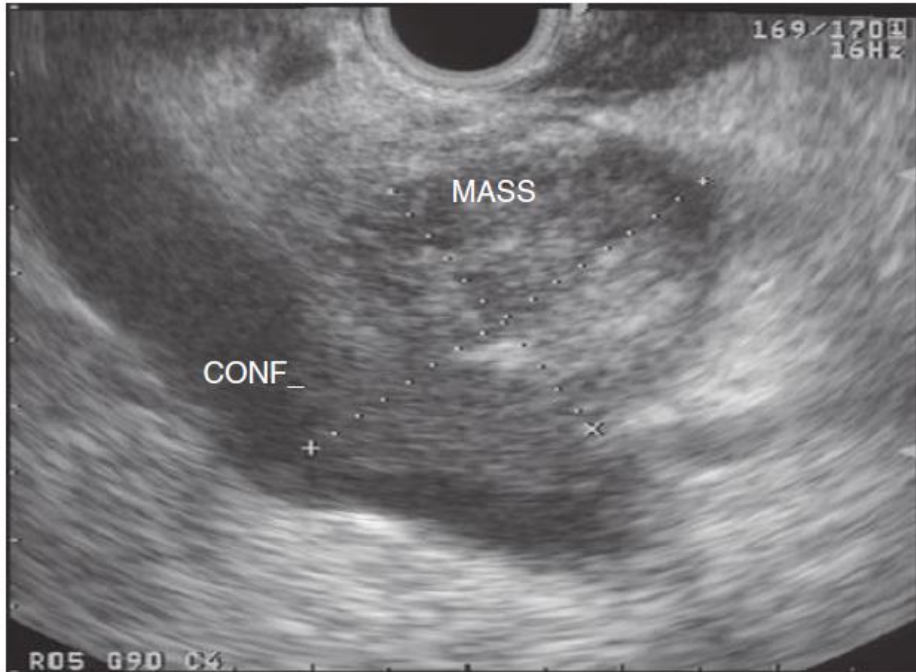


FIGURE 15-11 Linear EUS image (7.5 MHz) of a 2.8-cm pancreatic mass that is invading the portal vein confluence.

accuracy of MRI is reportedly equivalent⁵⁷ or superior⁵⁵ to EUS. For overall venous invasion, EUS is reportedly superior⁶



FIGURE 15-13 Linear EUS image (7.5 MHz) of a 31-mm hypoechoic mass in the head of a pancreas with a long segment of the superior mesenteric artery (SMA) encasement. A biliary stent (ST) is also seen.



Pancreatic cysts

CLASSIFICATION OF PANCREATIC CYSTS

No or Very Low Malignant Potential

Pseudocyst
Lymphoepithelial cyst
Retention cyst
Congenital cyst
Lymphangioma
Serosus cystadenoma

Malignant Potential

Intraductal papillary mucinous neoplasm
Mucinous cystic neoplasm

Malignant

Pancreatic ductal adenocarcinoma
Neuroendocrine tumor
Solid pseudopapillary neoplasm
Pancreatoblastoma
Acinar cystadenocarcinoma

IPMN

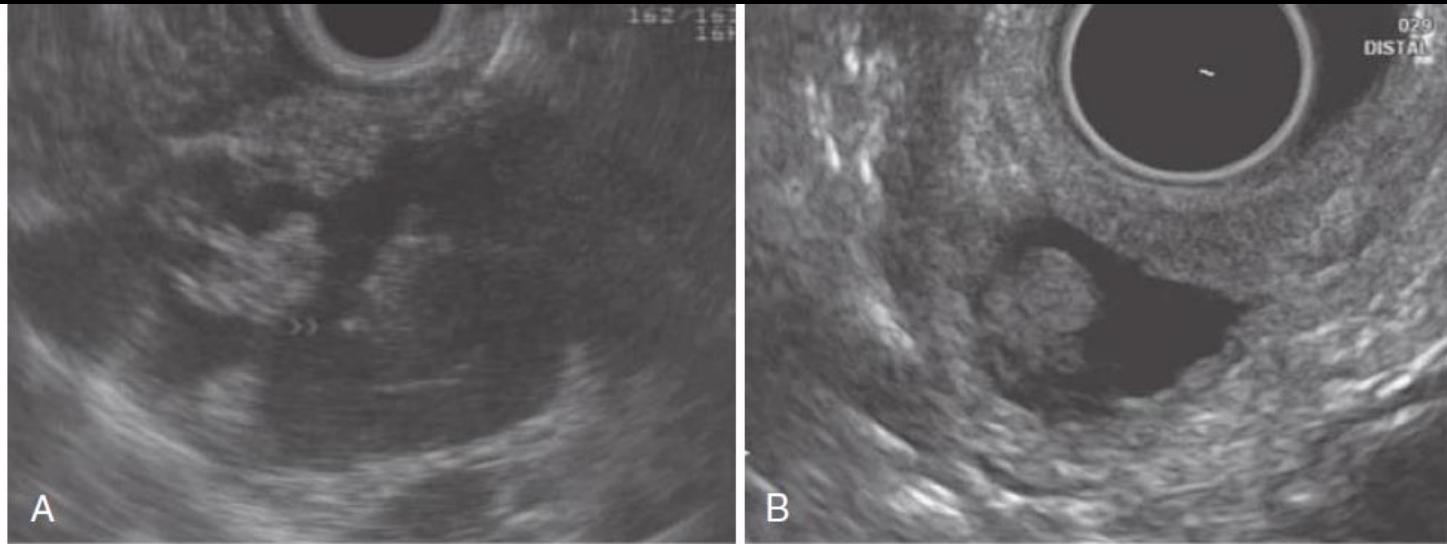


FIGURE 16-3 Main duct intraductal papillary mucinous neoplasia (IPMN). **A**, The main pancreatic duct is markedly dilated, and hyperechoic nodules can be seen arising from the duct wall. **B**, Mural nodule arising from the pancreatic duct wall in a patient with a main duct IPMN.

CYST→

Benign ↔ Malignant

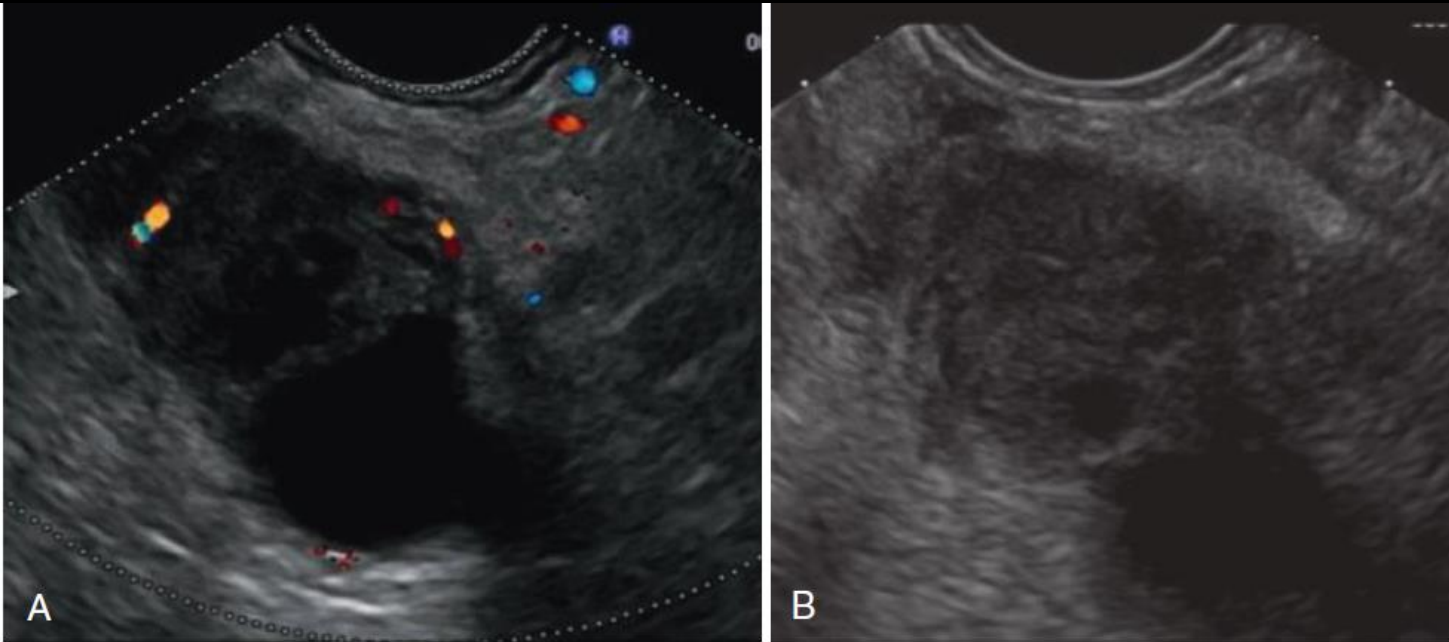


FIGURE 16-23 Cystic pancreatic ductal adenocarcinoma. **A**, There is a cyst with a possible solid component between the 9-o'clock and 12-o'clock position. **B**, On further scanning, an irregular, hypoechoic mass with an irregular edge becomes clear. On fine-needle aspiration (FNA), the cyst fluid carcinoembryonic antigen was low with no mucin on cytology. FNA of the solid component confirmed an adenocarcinoma. (Copyright AM Lennon.)

CYST→

Benign ↔ Malignant



FIGURE 16-5 EUS fine-needle aspiration. A 19-G, 22-G, or 25-G needle can be used. In this case, a 22-G needle was sufficient to aspirate the lesion completely.

ampulla

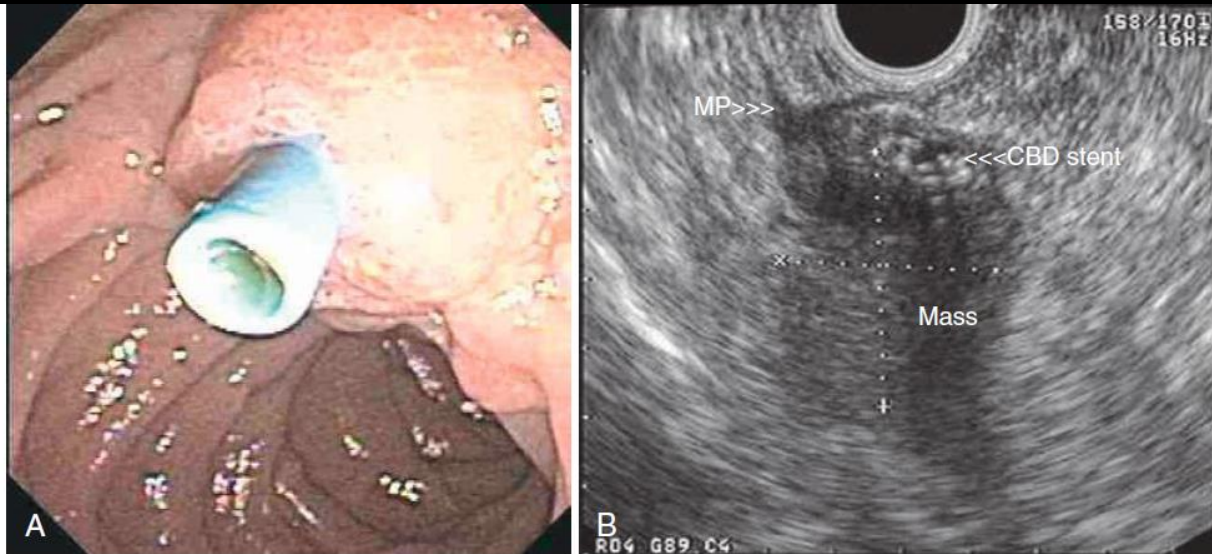
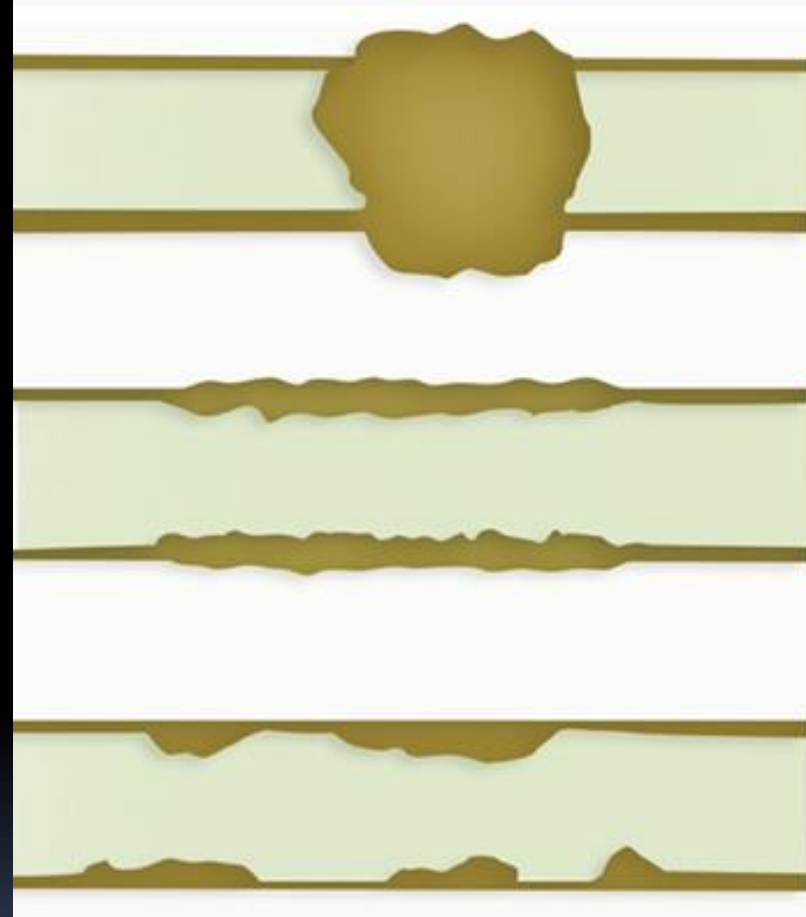


FIGURE 17-22 A, Endoscopic view of an ampullary mass in a patient who presented with painless jaundice. A plastic biliary stent was previously placed. B, Linear EUS image (7.5 MHz) of the same lesion. Tumor infiltration of the duodenal muscularis propria (MP) was strongly suspected. The patient was referred for pancreaticoduodenectomy. CBD, common bile duct.

Pathology Macroscopically

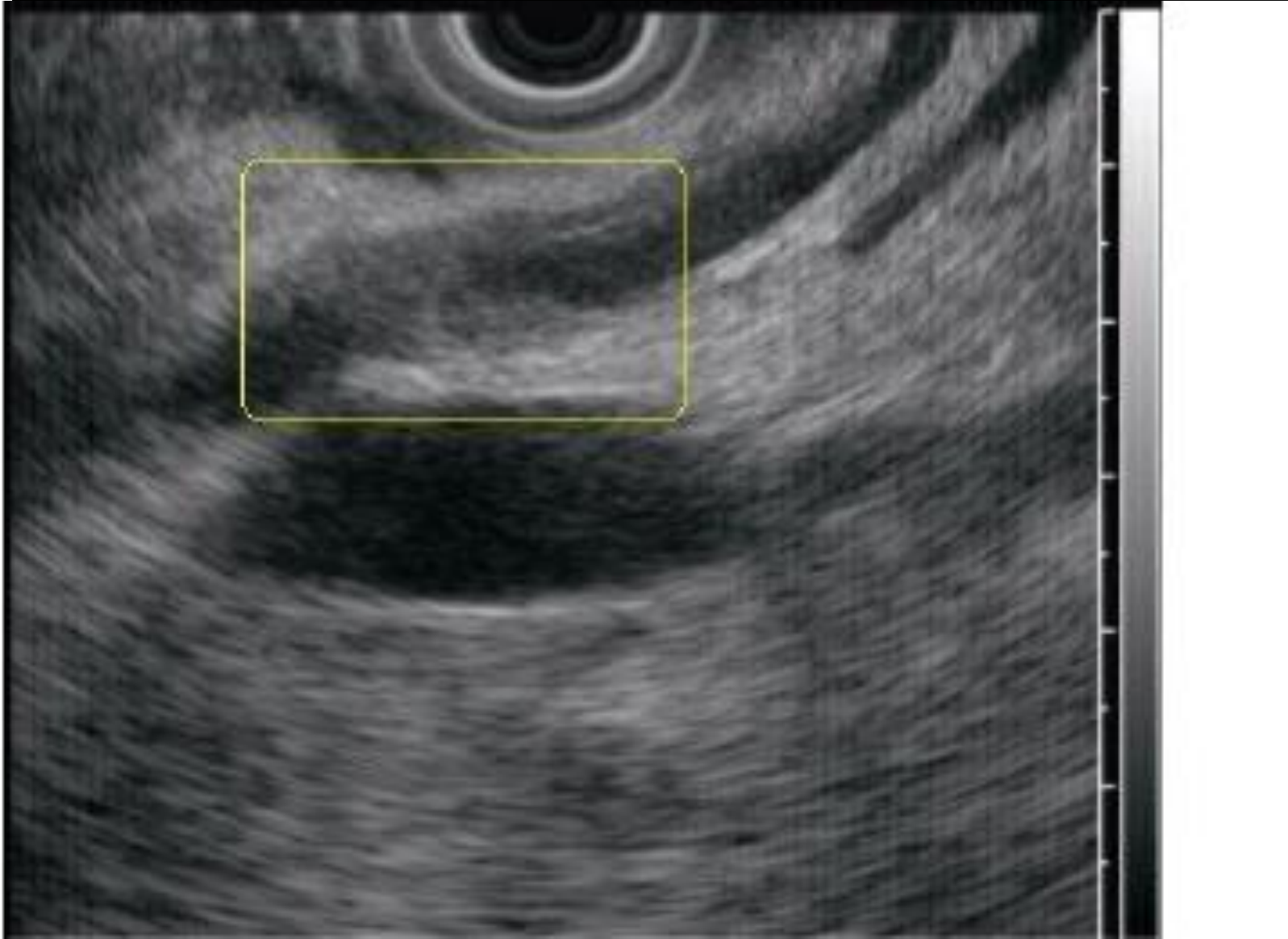
- mass forming
- periductal-infiltrating
- intraductal-papillary



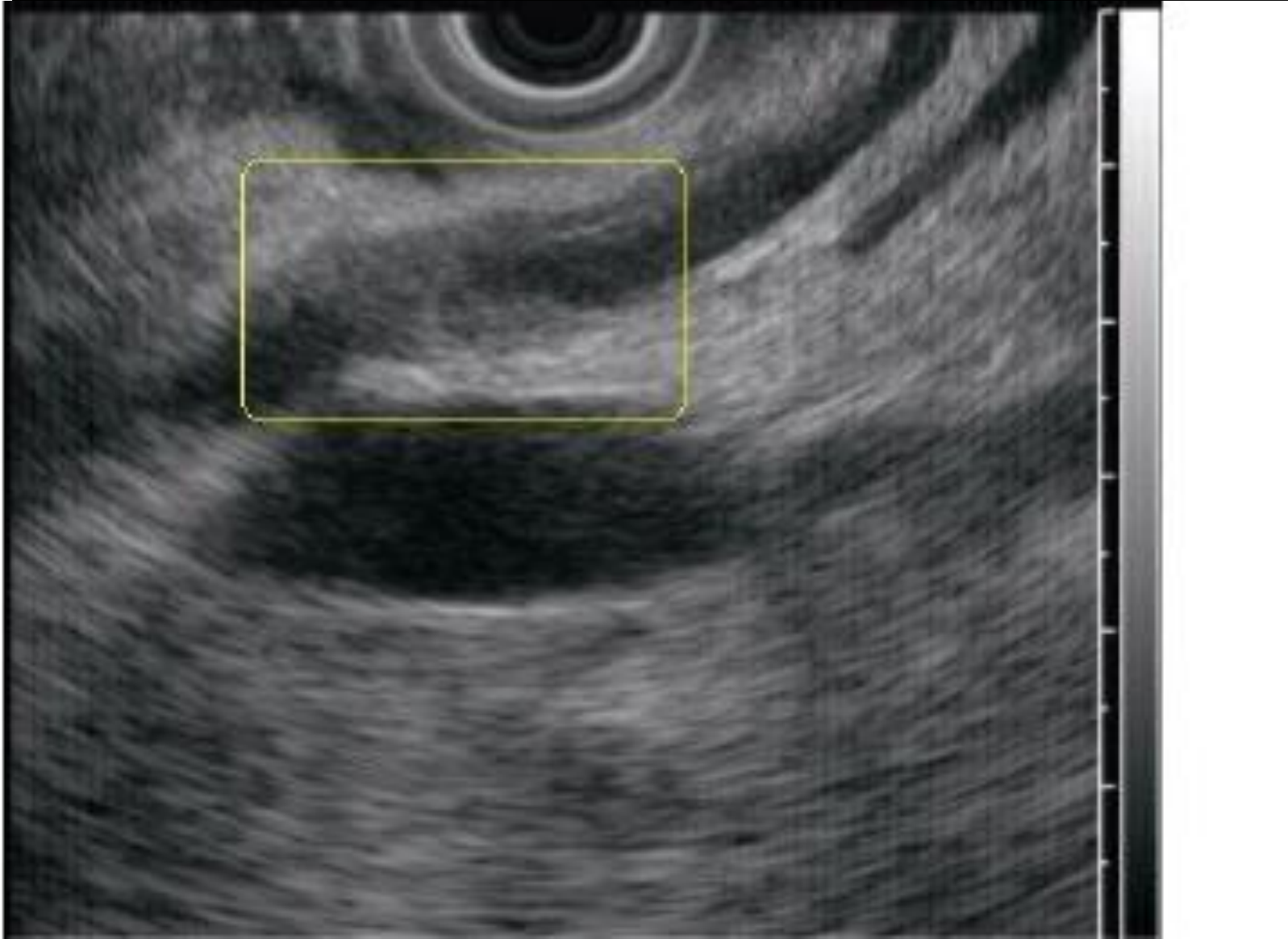
CC



infiltrating lesion with irregular margins



infiltrating lesion with irregular margins



EUS-Guided Tissue Acquisition

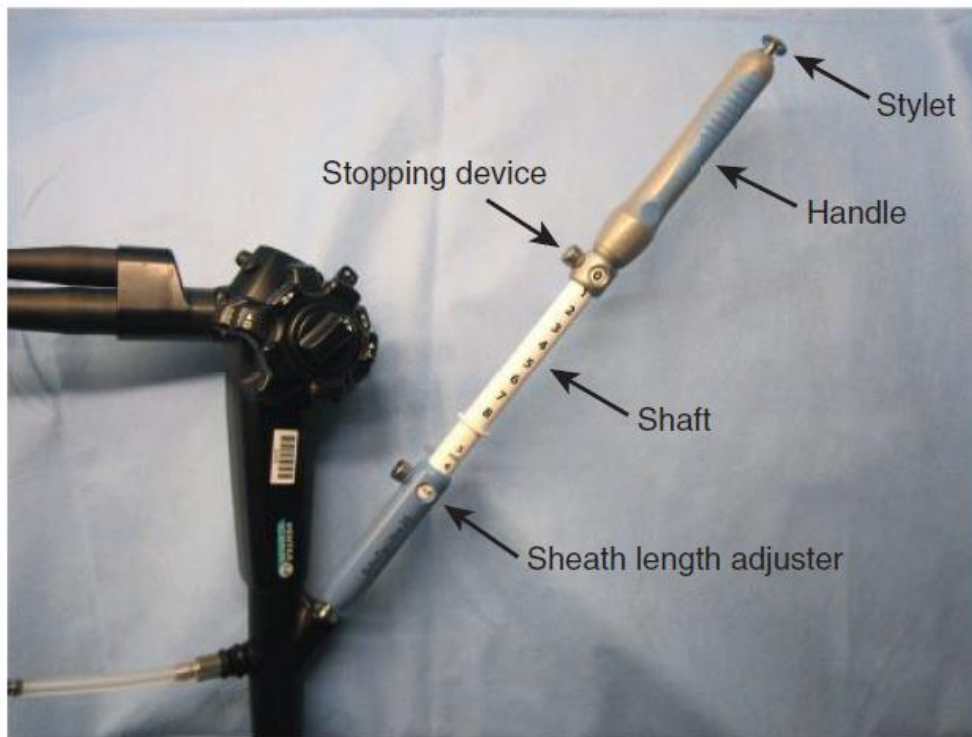


FIGURE 21-1 The needle system is firmly Luer-locked to the operating channel of the echoendoscope.



FIGURE 22-10 Novel 19-G, 22-G, and 25-G ProCore needles with reverse bevel technology for acquisition of tissue samples.

Pancreas

Bile duct

Digestive wall lesions^a

 Suspicious wall thickening

 Subepithelial lesions

Adrenal glands

Liver

Retroperitoneal masses

Lymph nodes

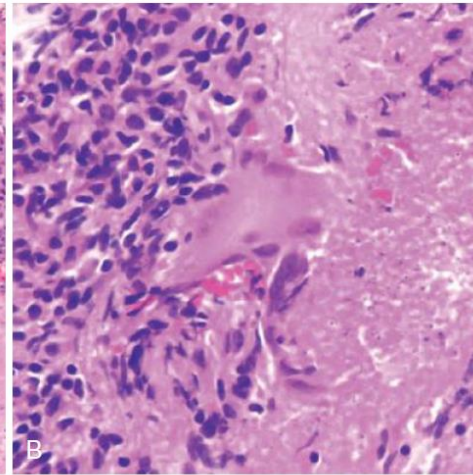
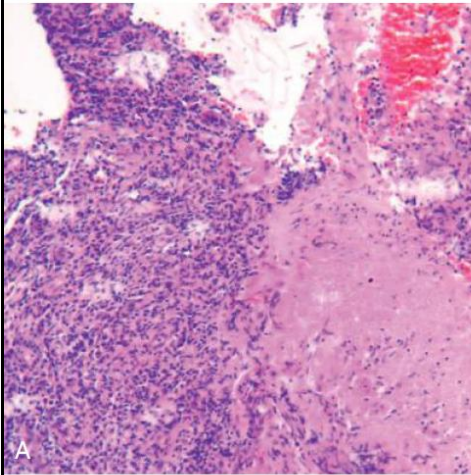
Posterior mediastinum

 Suspicious lymph nodes

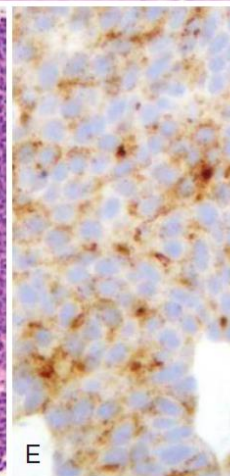
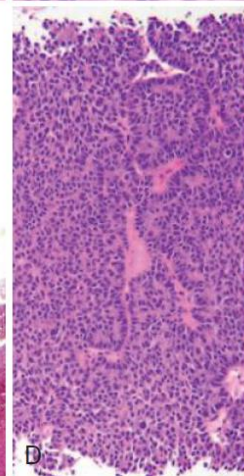
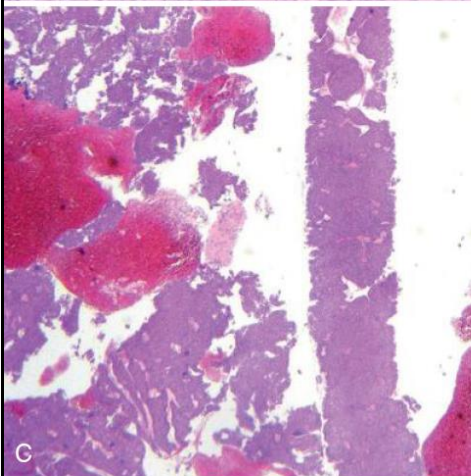
 Pulmonary masses^b

^aDigestive wall lesions include the esophagus, stomach, duodenum, and rectum.

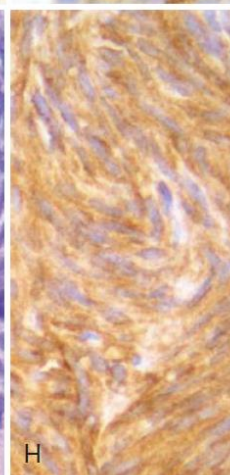
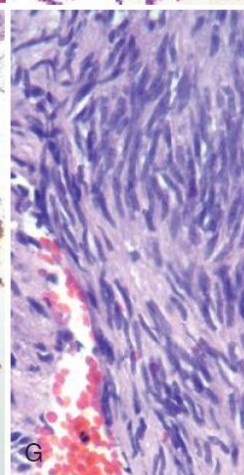
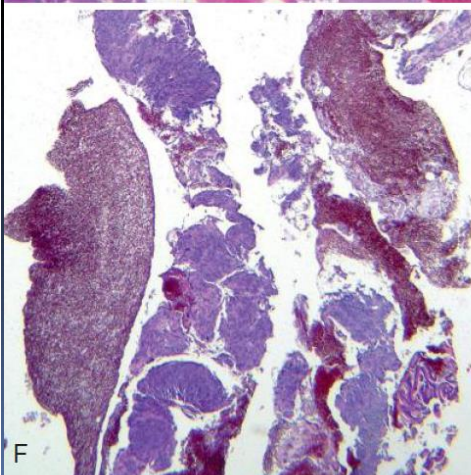
^bPulmonary masses must abut the posterior mediastinum to be visualized under EUS.



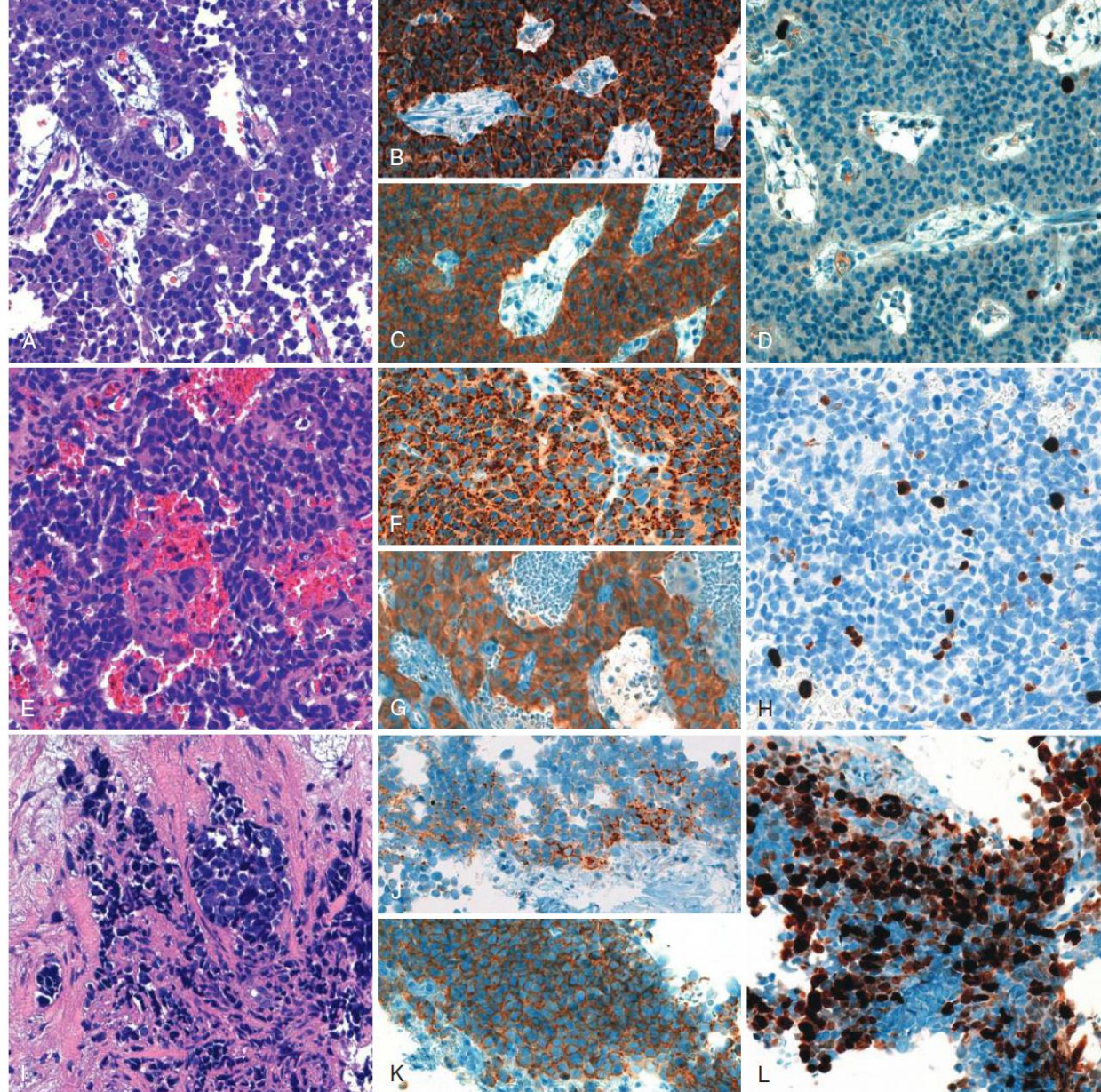
Mediastinal LN TB granuloma



NET G1 IHC chromogranin



GIST IHC c-kit



G1

G2

G3

FIGURE 22-7 Examples of grading for neuroendocrine neoplasms in EUS FNTA samples. **A-D**, Grade 1 PNET showing trabecular histology, mild atypia (**A**), intense immunoreactivity for chromogranin A (**B**) and synaptophysin (**C**), and rare cells with nuclear labeling for ki-67 (**D**). **E-H**, Grade 2 PNET showing large trabecular structure, moderate cell atypia (**E**), intense immunoreactivity for chromogranin A (**F**) and synaptophysin (**G**), and discrete cells with nuclear labeling for ki-67 (**H**). **I-L**, High-grade, G3, p-NEC fragmented sample showing abundant desmoplasia and solid islets of cells with severe atypia and scarce cytoplasm (**I**), focal and often faint immunoreactivity for chromogranin A (**J**), intense and diffuse immunoreactivity for synaptophysin (**K**), and diffuse nuclear labeling for ki-67 (**L**). **A, E, I**, hematoxylin and eosin; **B-D, F-H, and J-L**, immunoperoxidase. PNET, pancreatic neuroendocrine tumor. pNEC, xxxxxxx. (Larghi A, Capurso G, Carnuccio A, et al. Ki-67 grading of nonfunctioning pancreatic neuroendocrine tumors on histologic samples obtained by EUS-guided fine-needle tissue acquisition: a prospective study. *Gastrointest Endosc*. 2012;76:570-577.) p-NEC, high-grade pancreatic neuroendocrine carcinoma; p-NET, low-grade to intermediate-grade pancreatic neuroendocrine tumor.

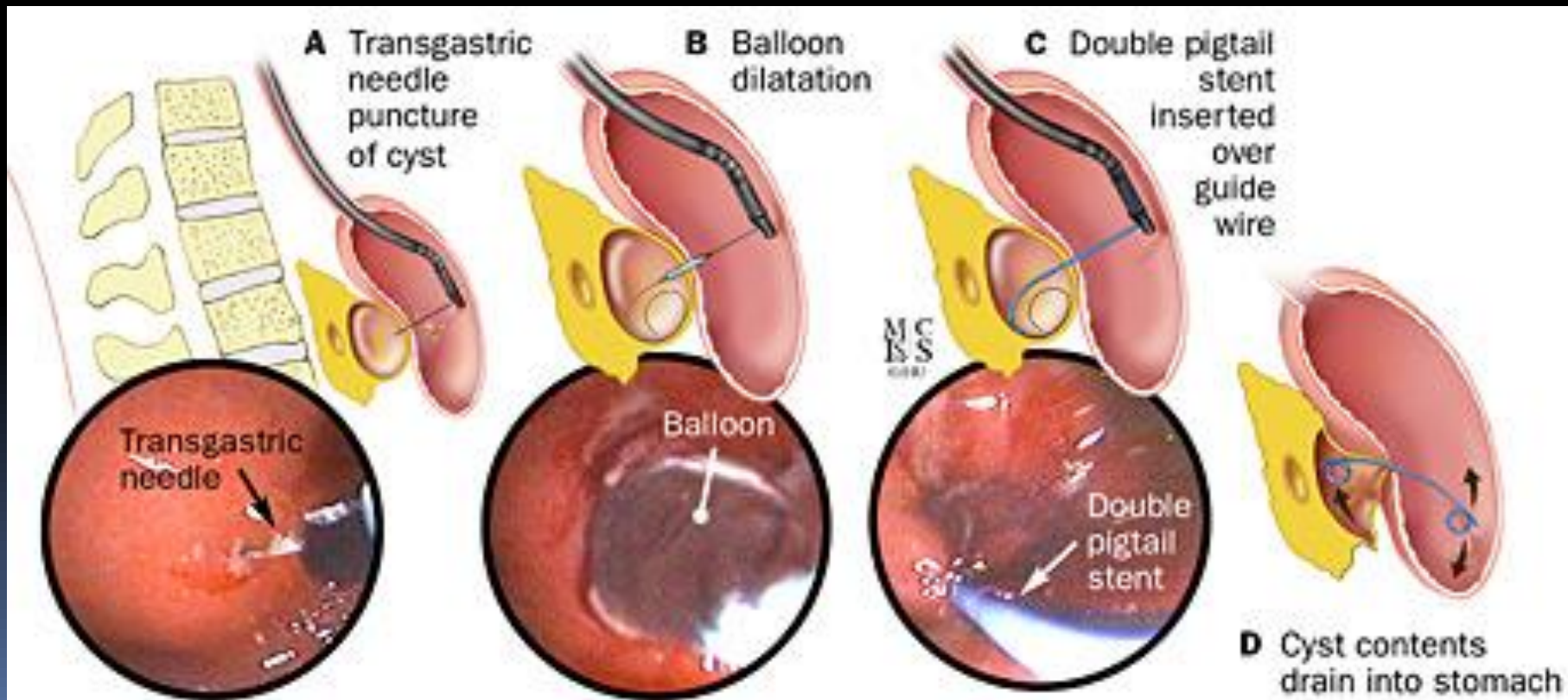


Interventional EUS

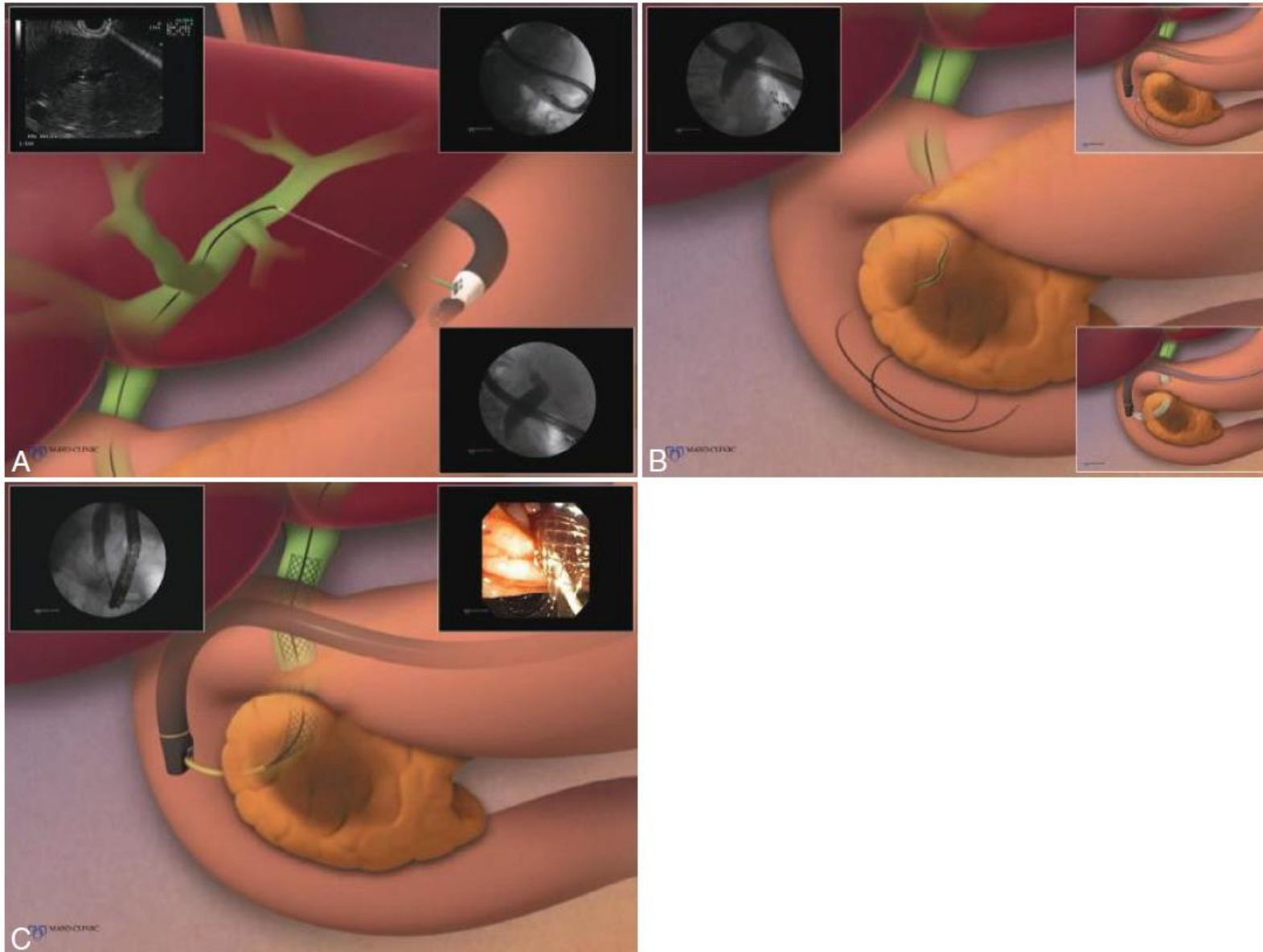


CYST DRAINAGE

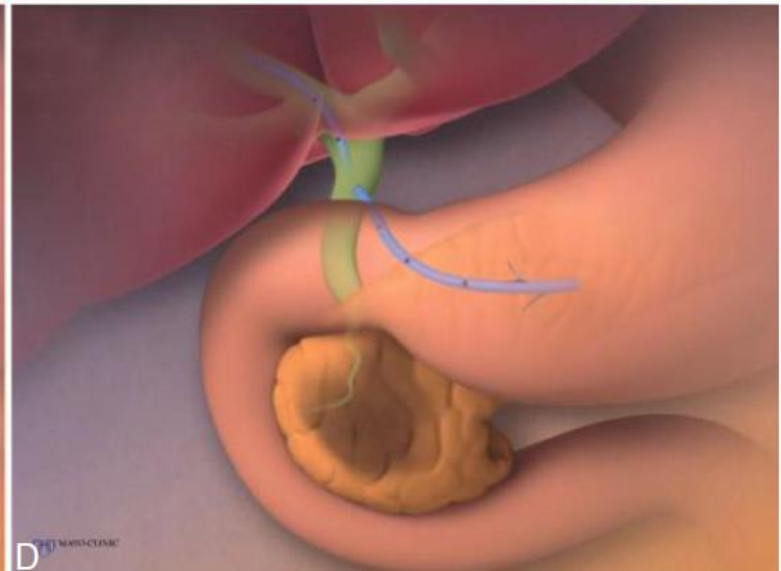
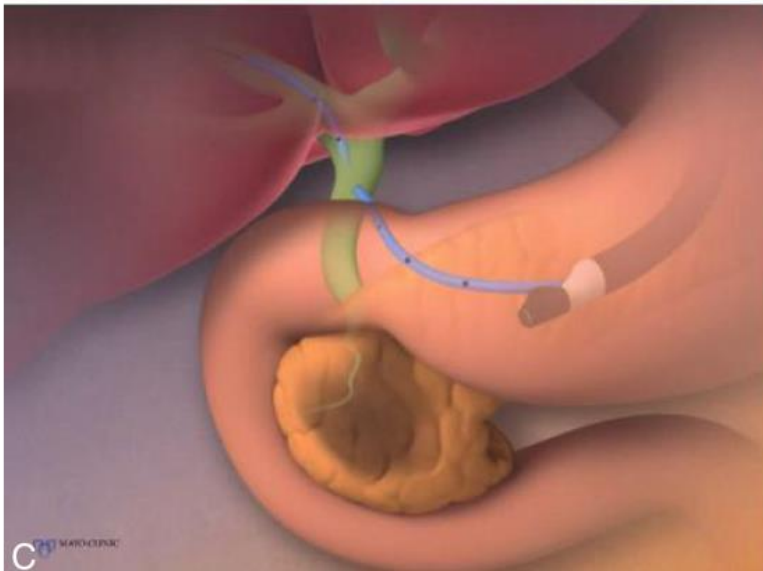
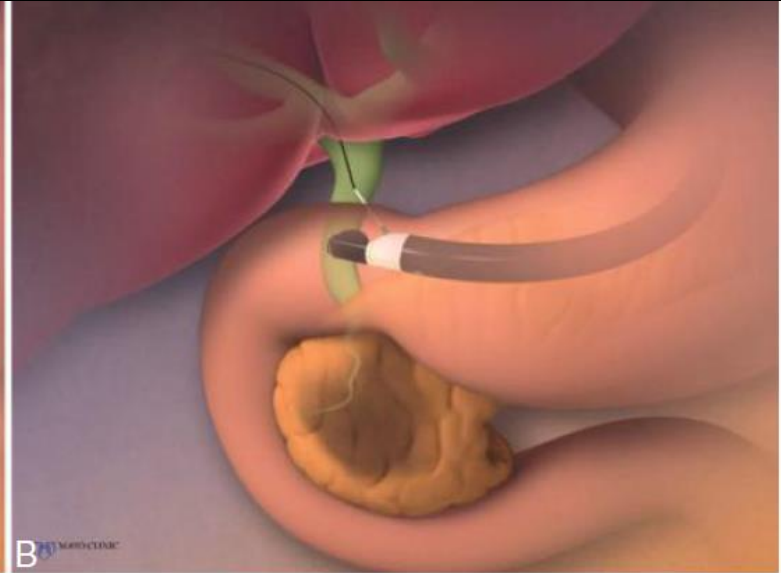
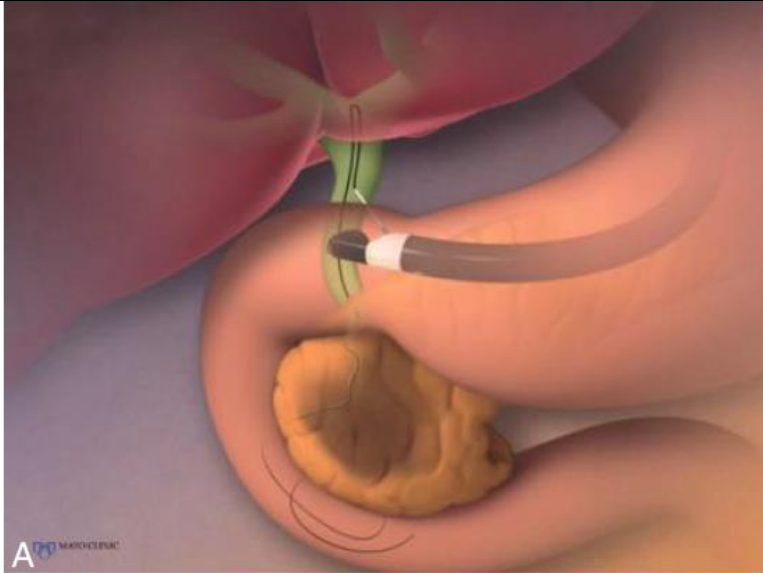
- Pseudocyst
- abscess



Biliary drainage



Biliary drainage



EUS guided ablation therapy

- photodynamic therapy
- Brachytherapy
- radiofrequency ablation
- injection of ethanol
- Fiducial chemotherapy



Celiac ganglion neurolysis

