

# Role of Endoscopy in the Management of Pancreatic Diseases

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# Disclosures

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- Boston Scientific, consultant

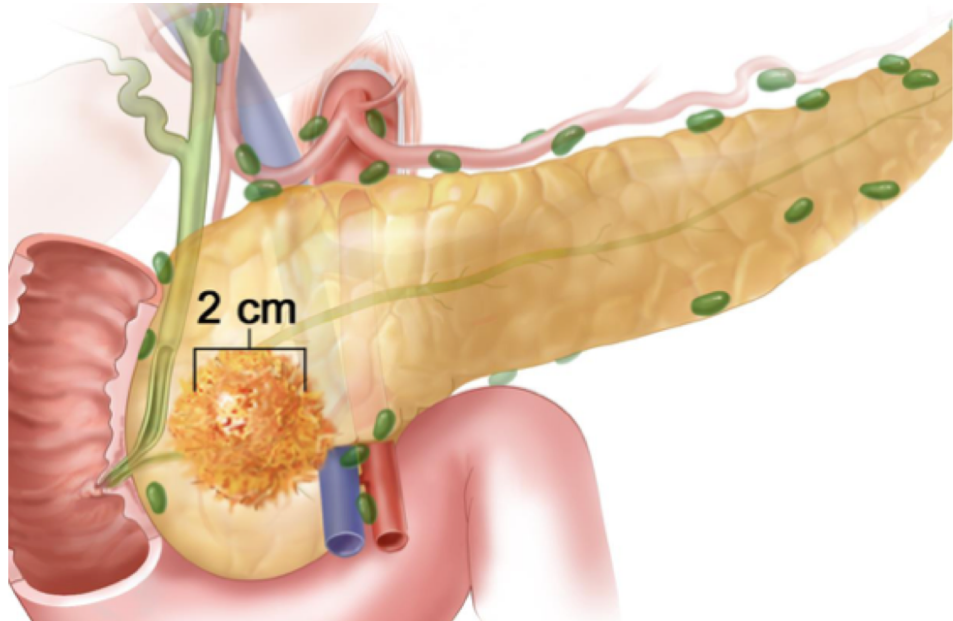


# Case #1

# Case

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- A 58 yo man presents with painless jaundice.
- He has lost 15 pounds over the past 3 months.
- A CT scan reveals a 2.3 cm mass in the head of the pancreas.



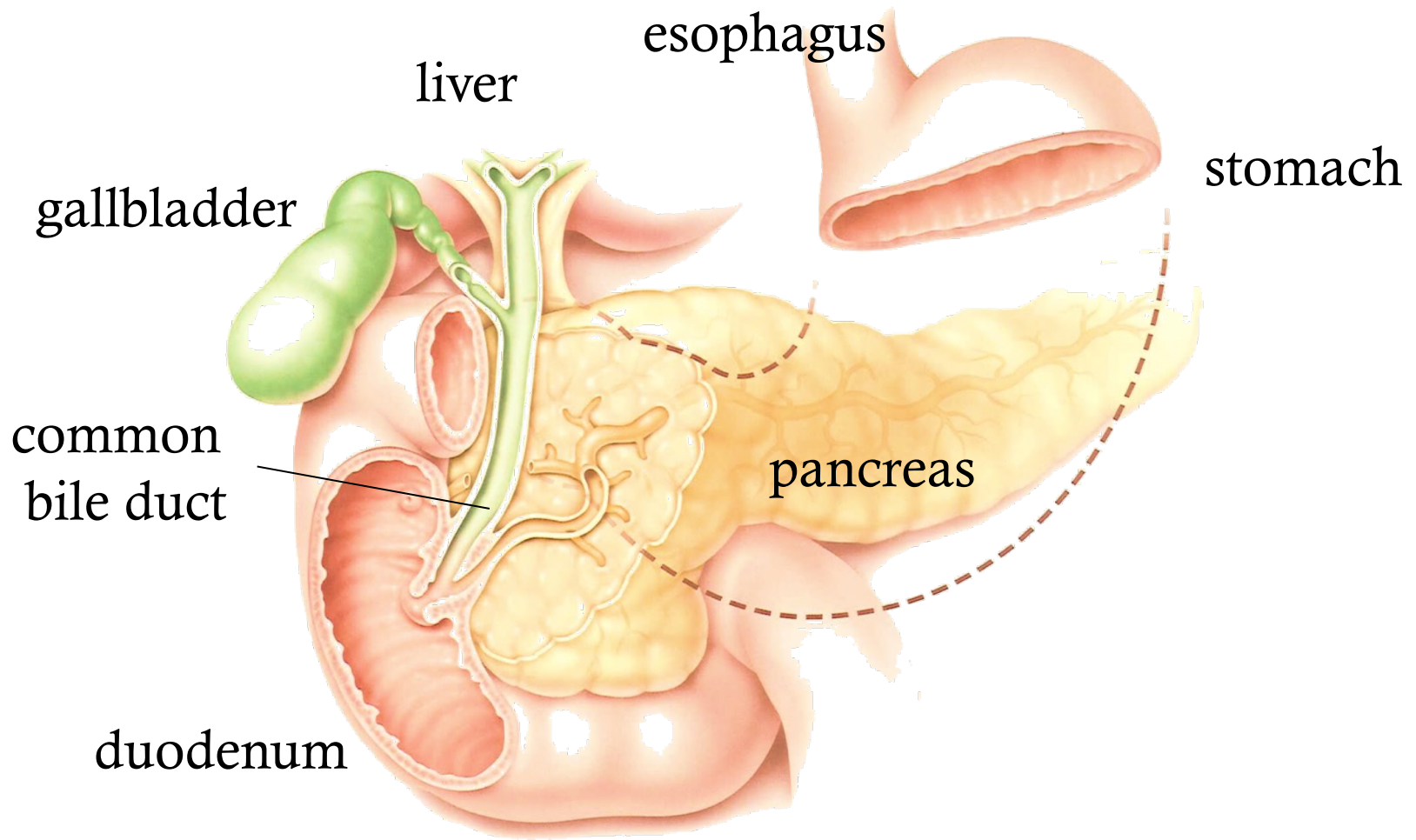
# Question

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- How would you obtain a tissue diagnosis of the pancreatic mass?
  - a) Percutaneous biopsy
  - b) ERCP
  - c) Endoscopic ultrasound

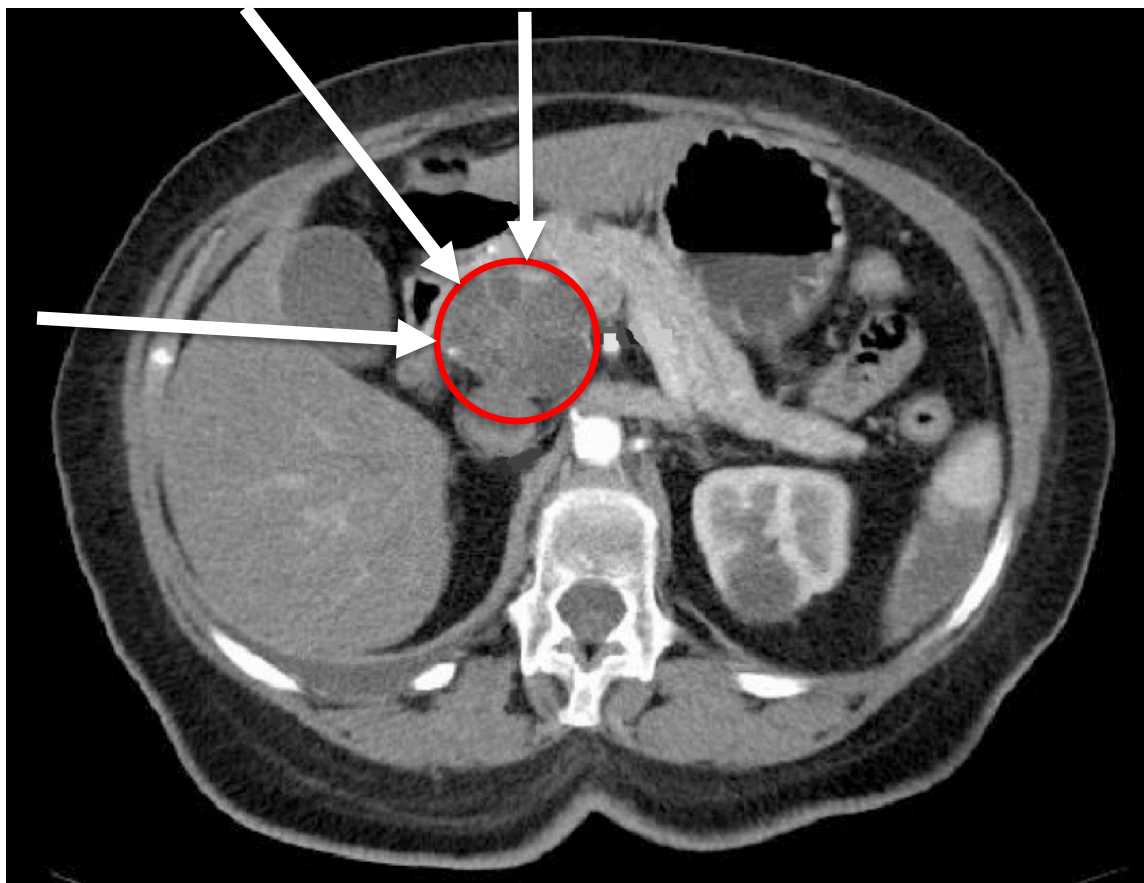
# Anatomy

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# Percutaneous Biopsy

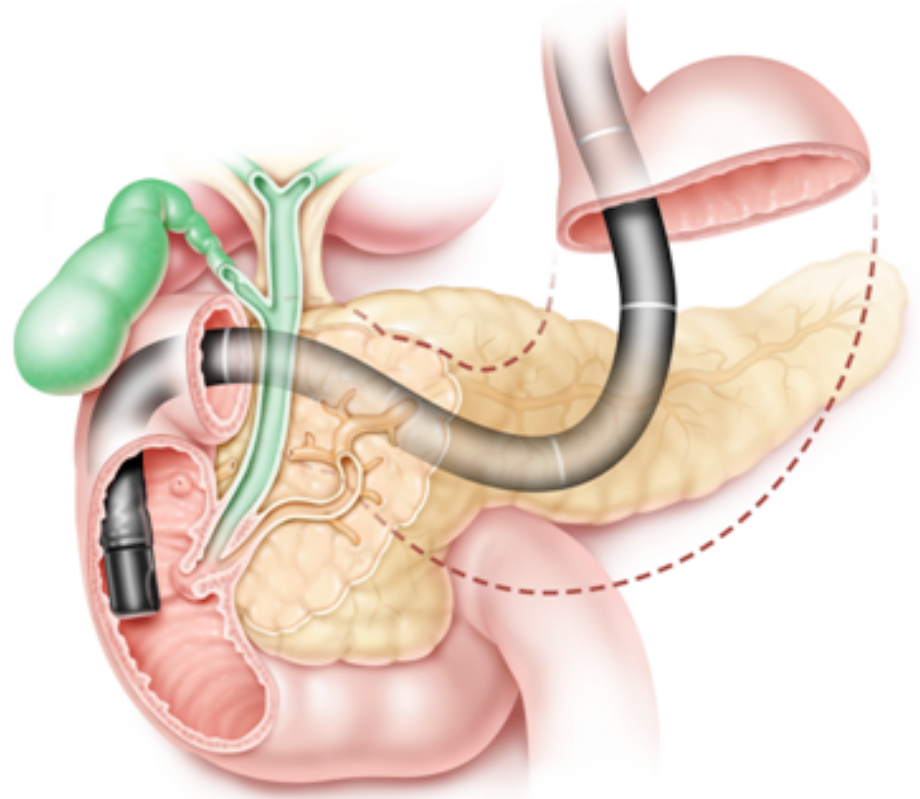
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# ERCP

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- Endoscopic retrograde cholangiopancreatography
- Evaluation of the:
  - Bile ducts
  - Pancreatic duct
- Requires fluoroscopy

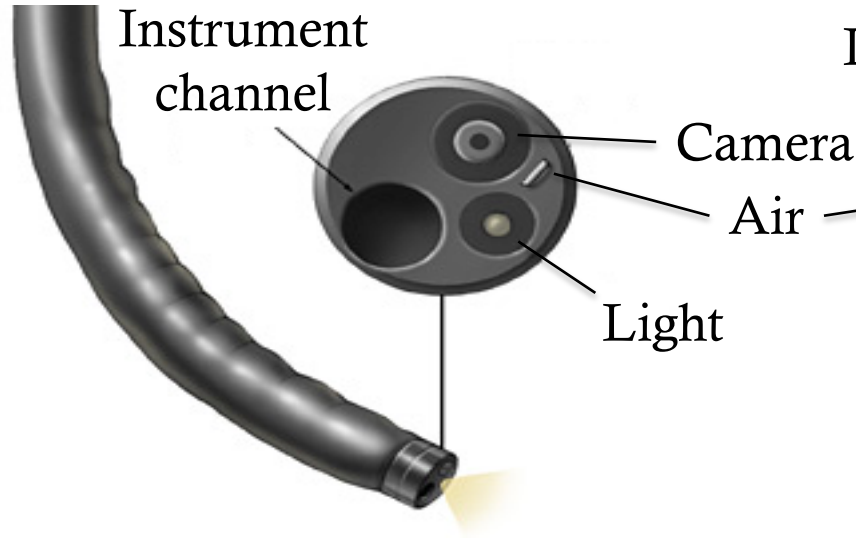




# Scope Design

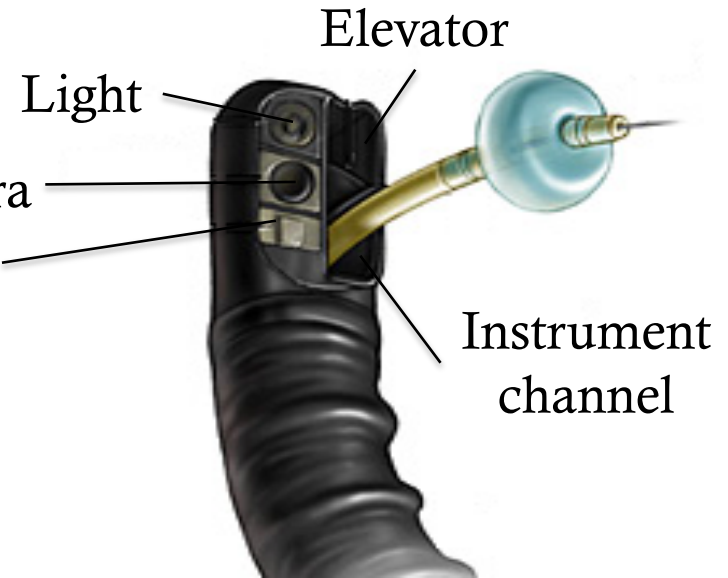
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Upper Endoscope



Forward-viewing

Duodenoscope



Side-viewing

# ERCP

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Endoscopic View



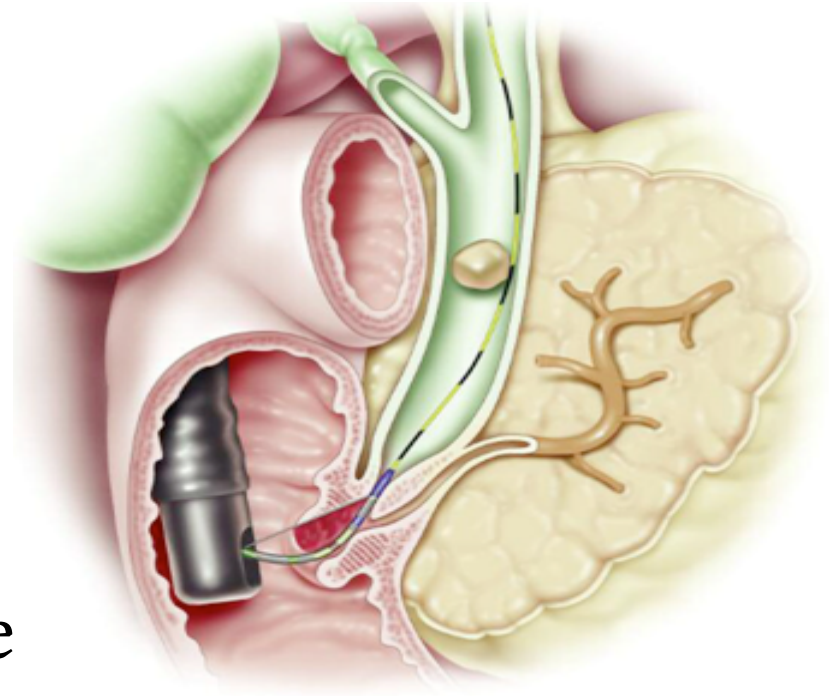
Fluoroscopic View



# Indications

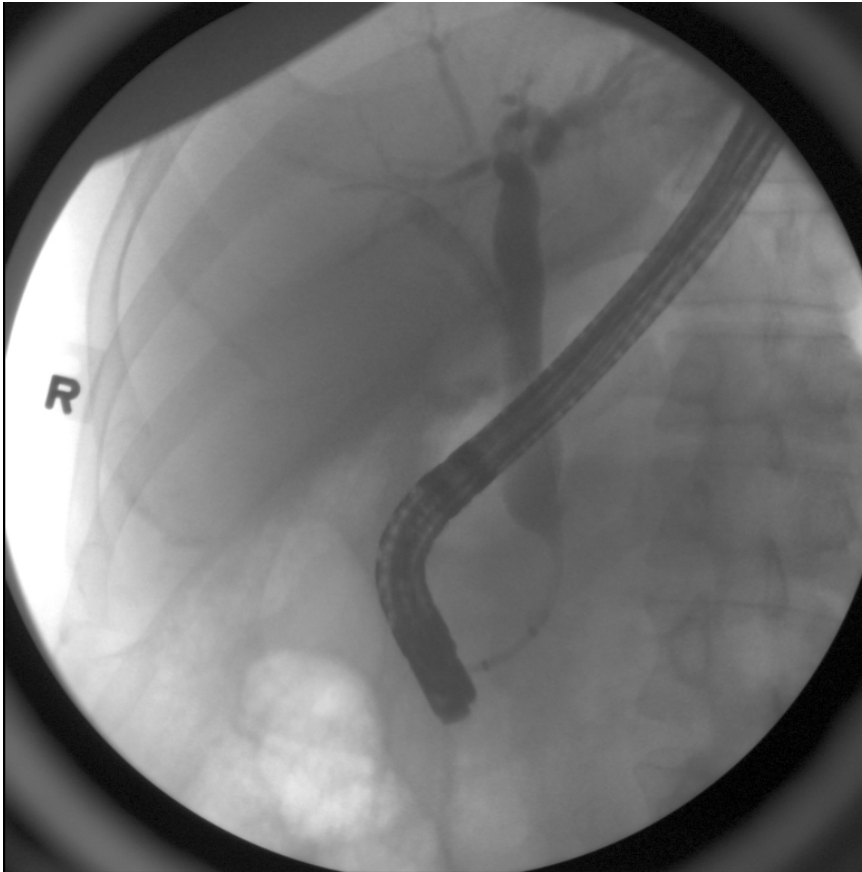
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- CBD stone removal
- Stent placement
- Stricture dilation
- Biopsy of biliary stricture



# ERCP for Biliary Stricture

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Identify stricture location

Determine stricture length

Stent placement to relieve  
biliary obstruction

Benign or malignant?

How to obtain tissue?

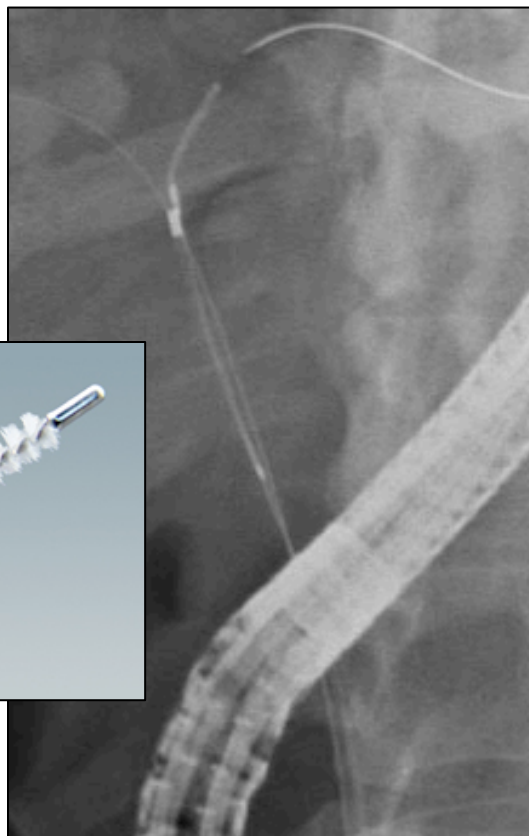
Pancreatic mass?

# Tissue Diagnosis in ERCP

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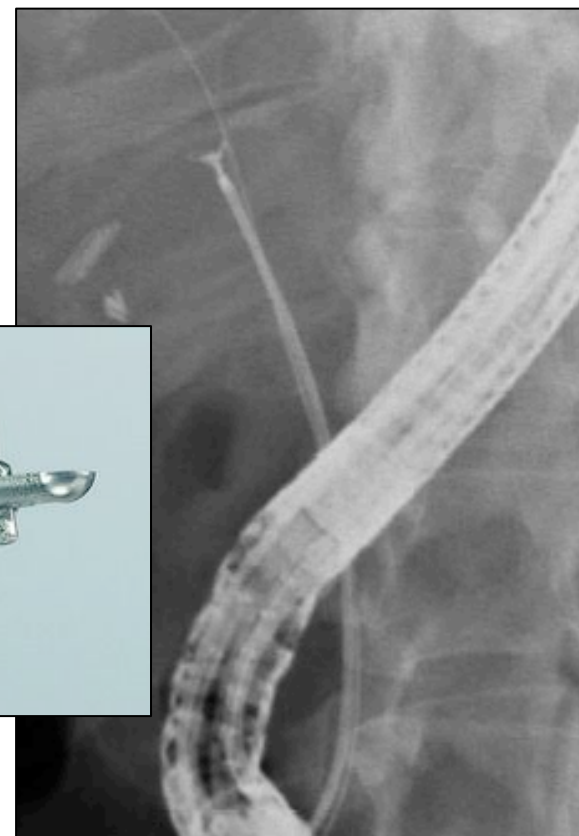
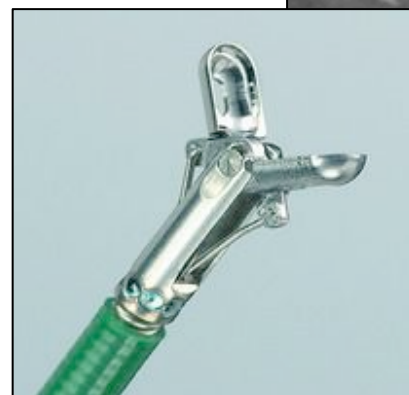
## Brushings

diagnostic  
yield:  
35%



## Biopsy forceps

diagnostic  
yield:  
48%



# Tissue Diagnosis in ERCP

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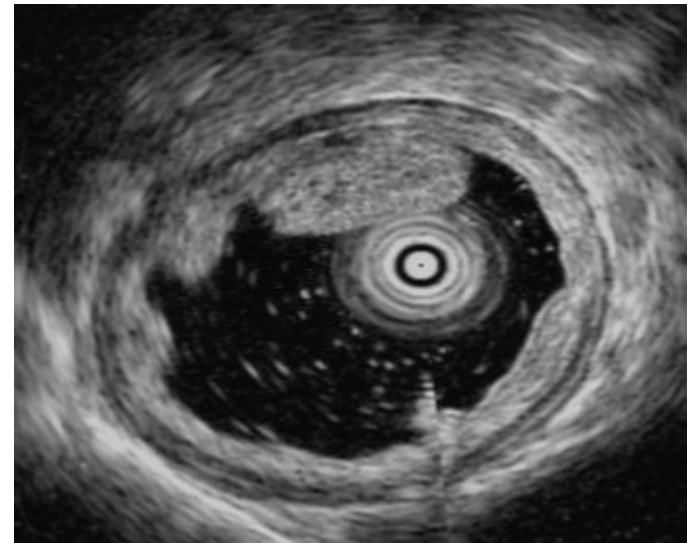
## Cholangioscopy



# EUS

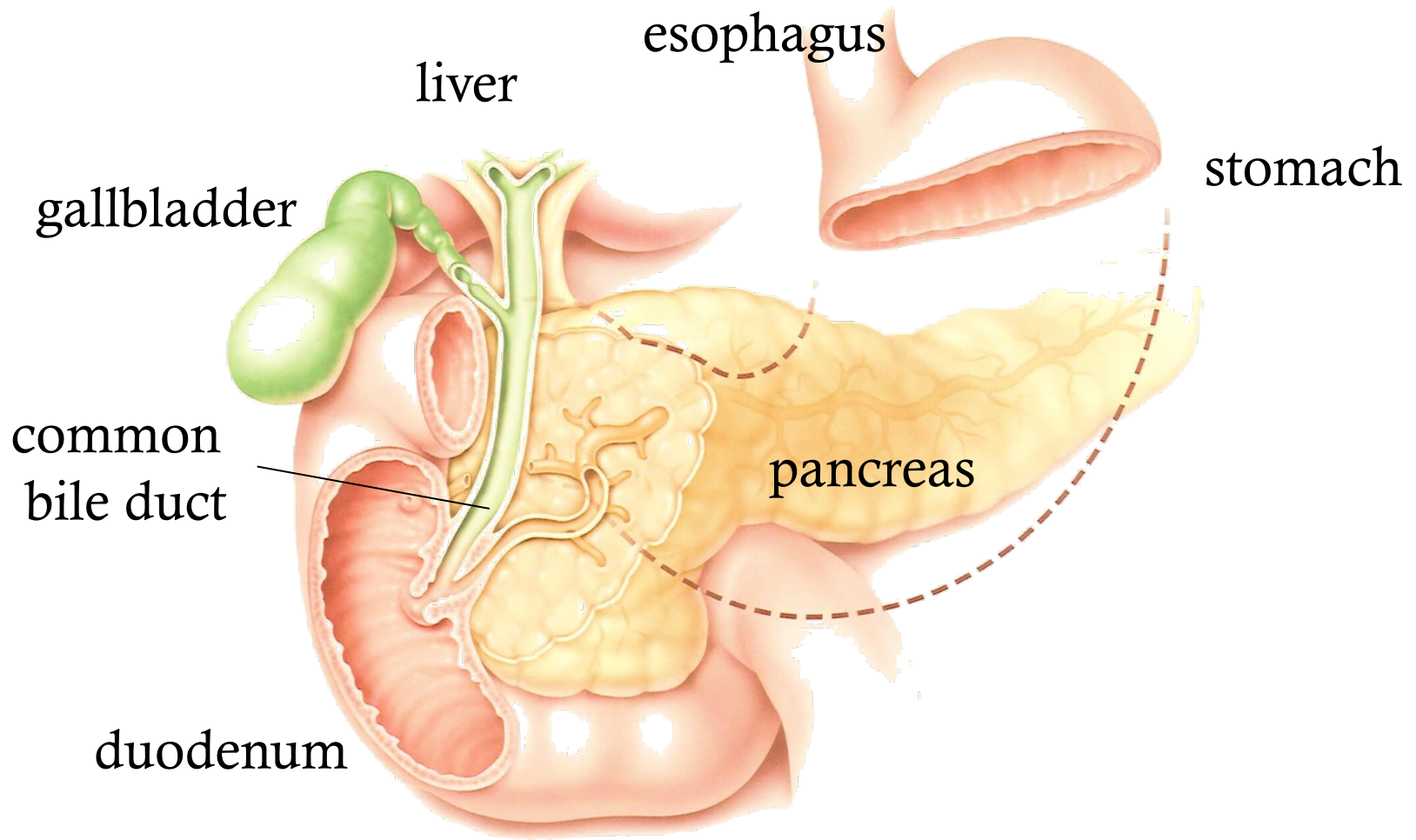
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- Endoscopic Ultrasound
- Combines endoscopy with ultrasound capability
- Examination of
  - Upper GI tract
  - Bile ducts and pancreas
  - Rectum



# Anatomy

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# Indications

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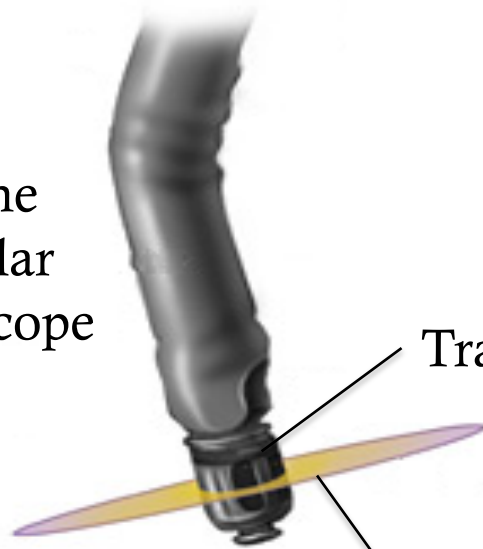
- Staging of cancer
  - Esophagus / Stomach / Pancreas / Rectum
- Fine needle aspiration of tissue and cysts
- Evaluation of submucosal lesions
- Gallstone disease
- Drainage of pancreatic pseudocysts

# EUS Scope Design

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Radial

Scans in plane  
perpendicular  
to axis of scope

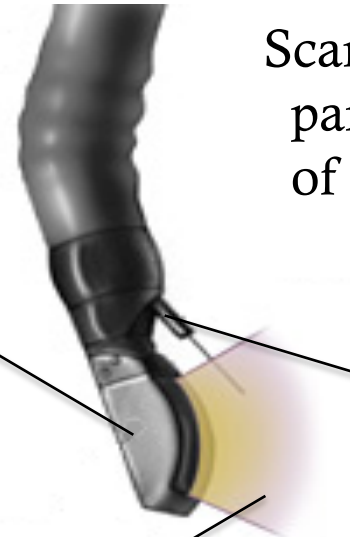


Transducer

Plane of imaging

Linear

Scans in plane  
parallel to axis  
of scope



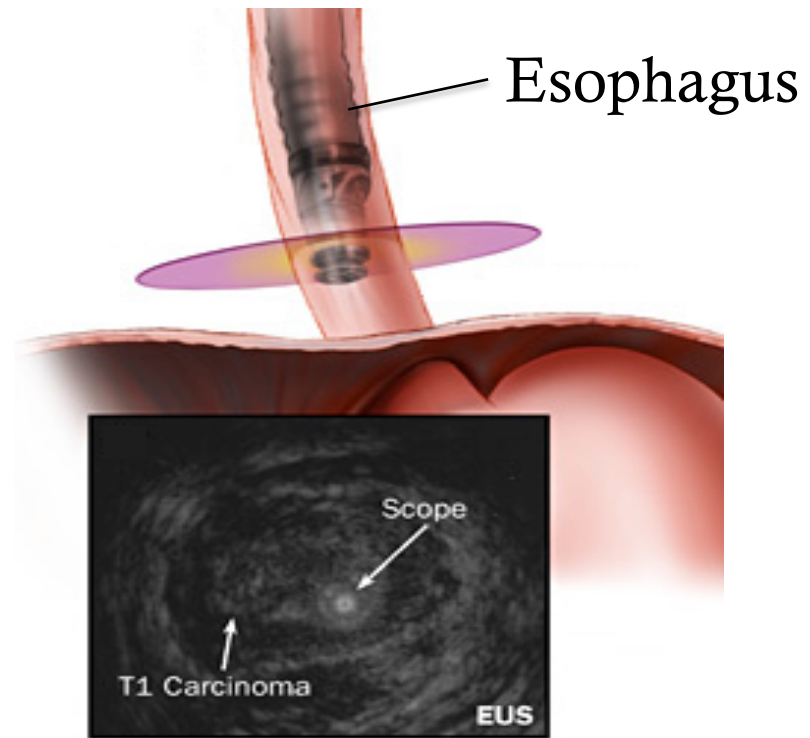
Instrument  
channel



# Radial EUS

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Radial

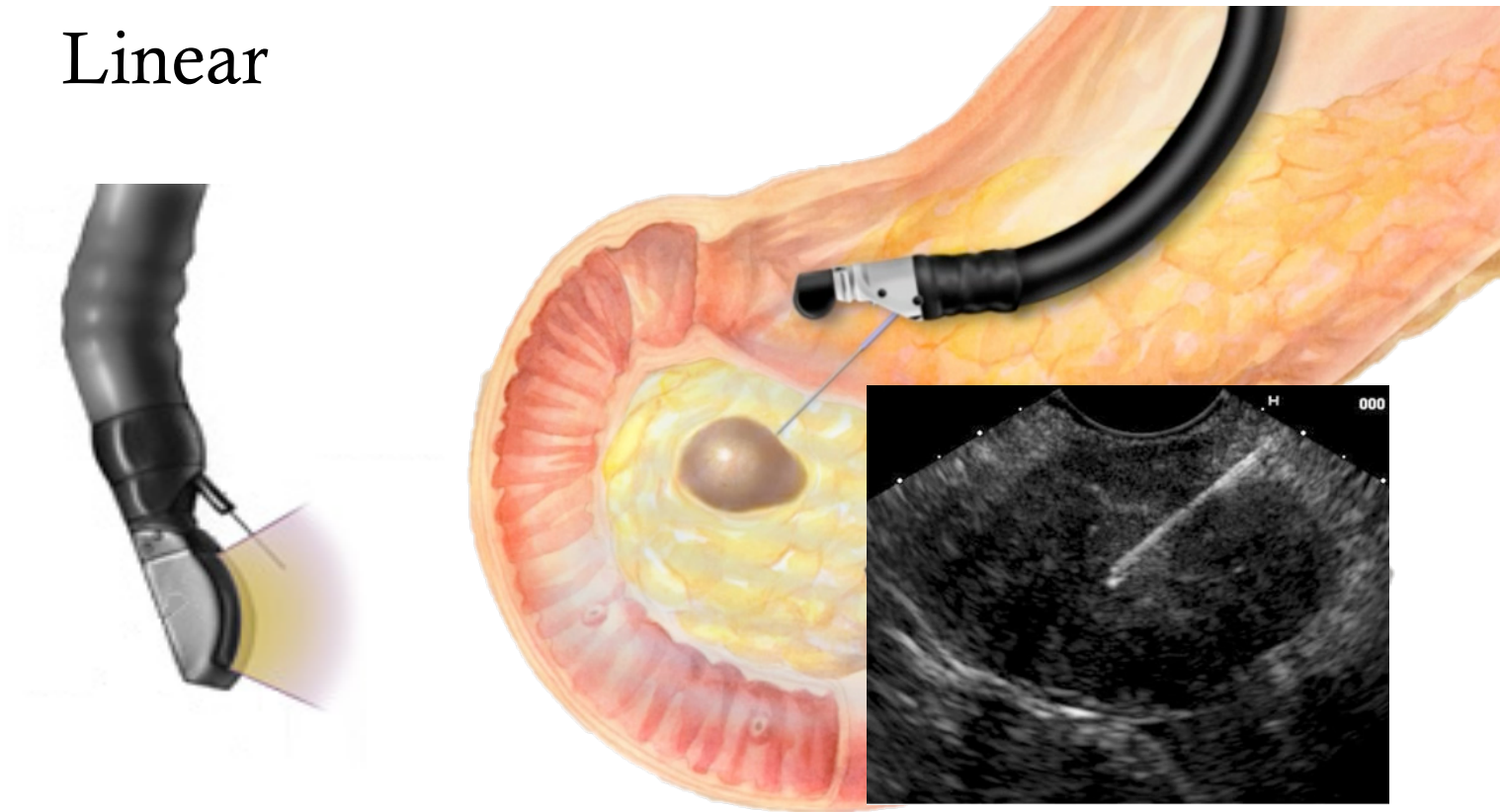


Cancer Staging

# Linear EUS

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Linear

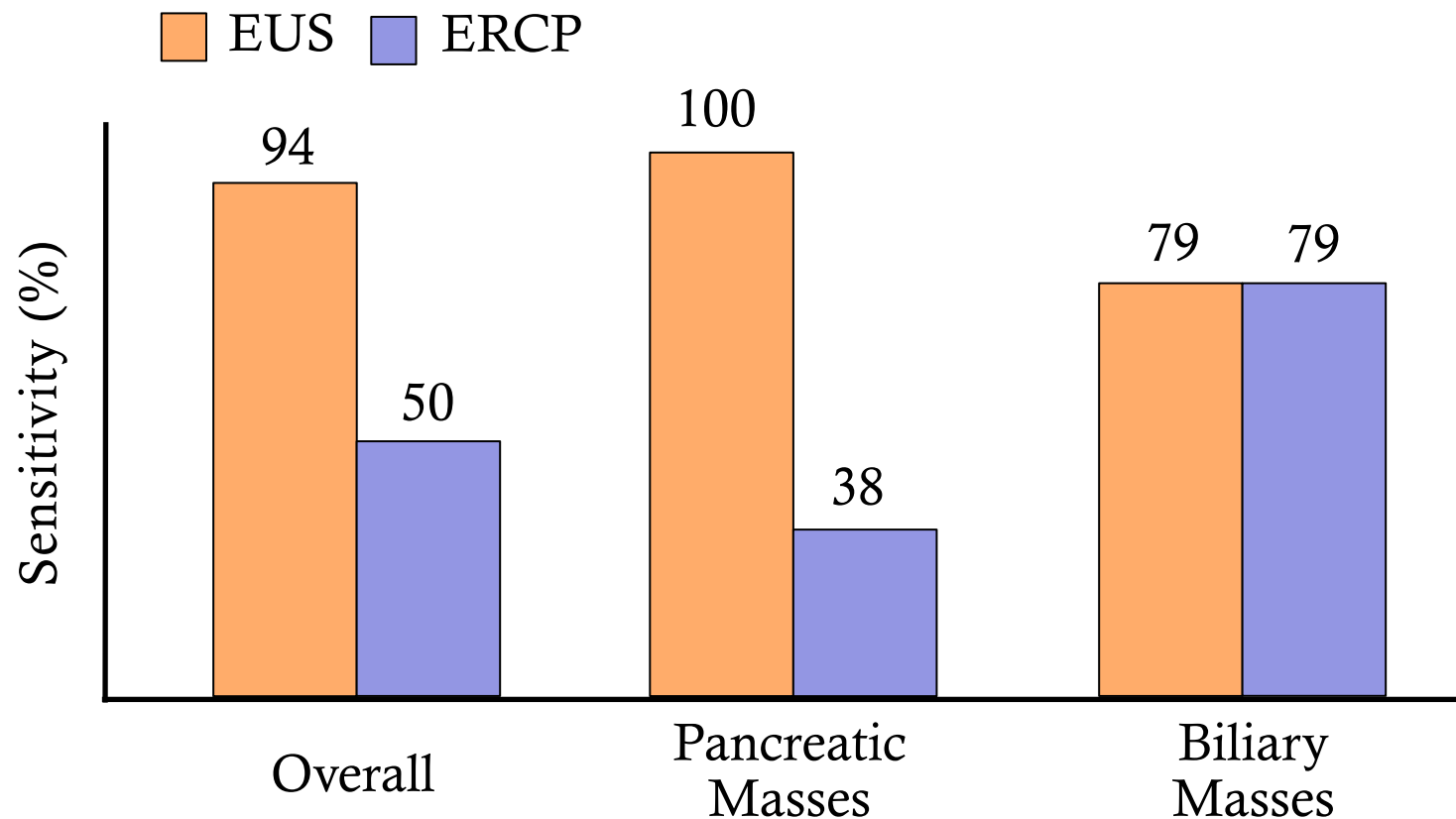


Fine Needle Aspiration

# Endoscopic Ultrasound

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- EUS vs. ERCP in malignant biliary obstruction (n=51)



# Comparison

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Percutaneous

ERCP

EUS

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High Sensitivity



High Specificity



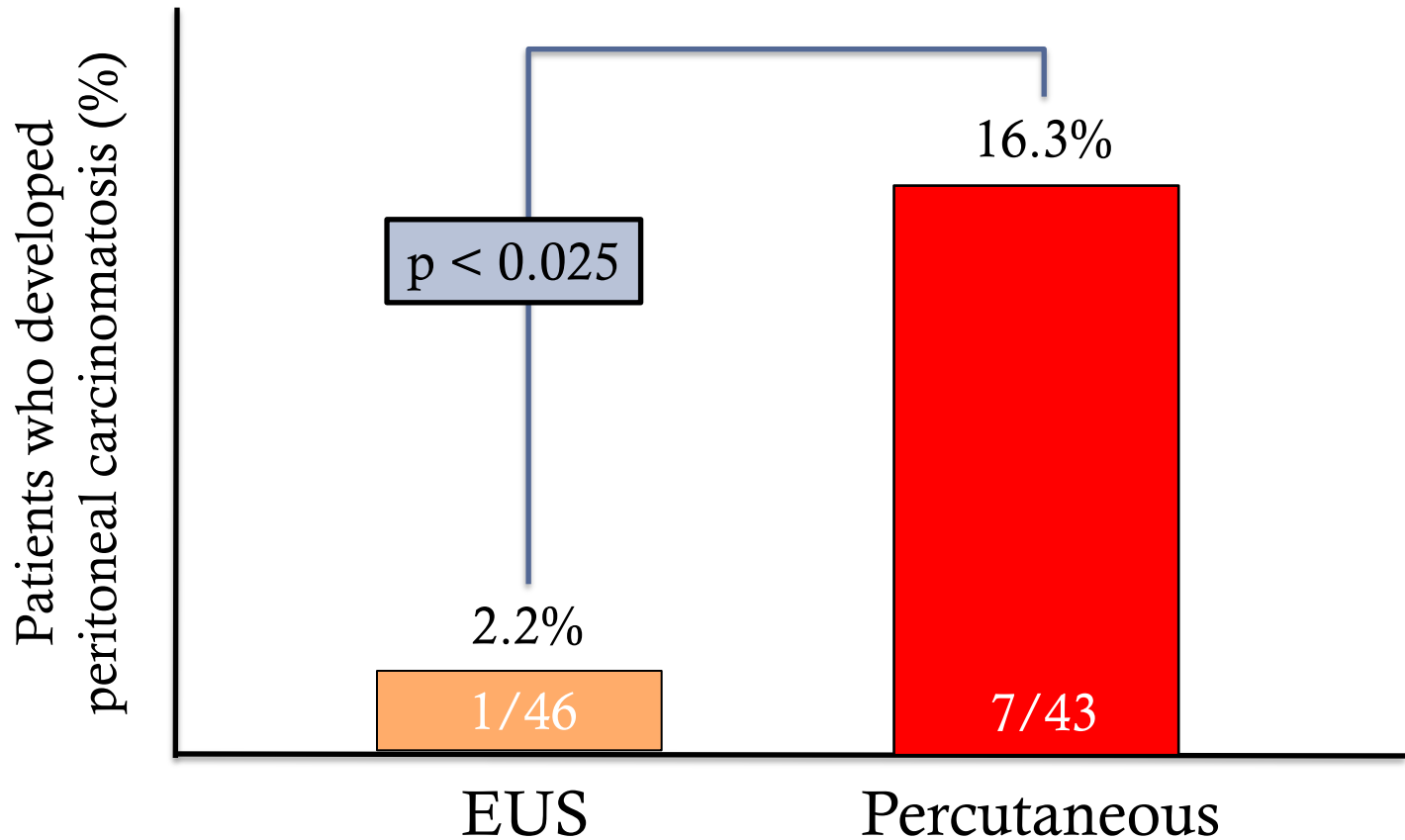
Low Risk of Seeding

Staging of Cancer

Relieve Biliary Obstruction

# Seeding of Cancer

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# Comparison

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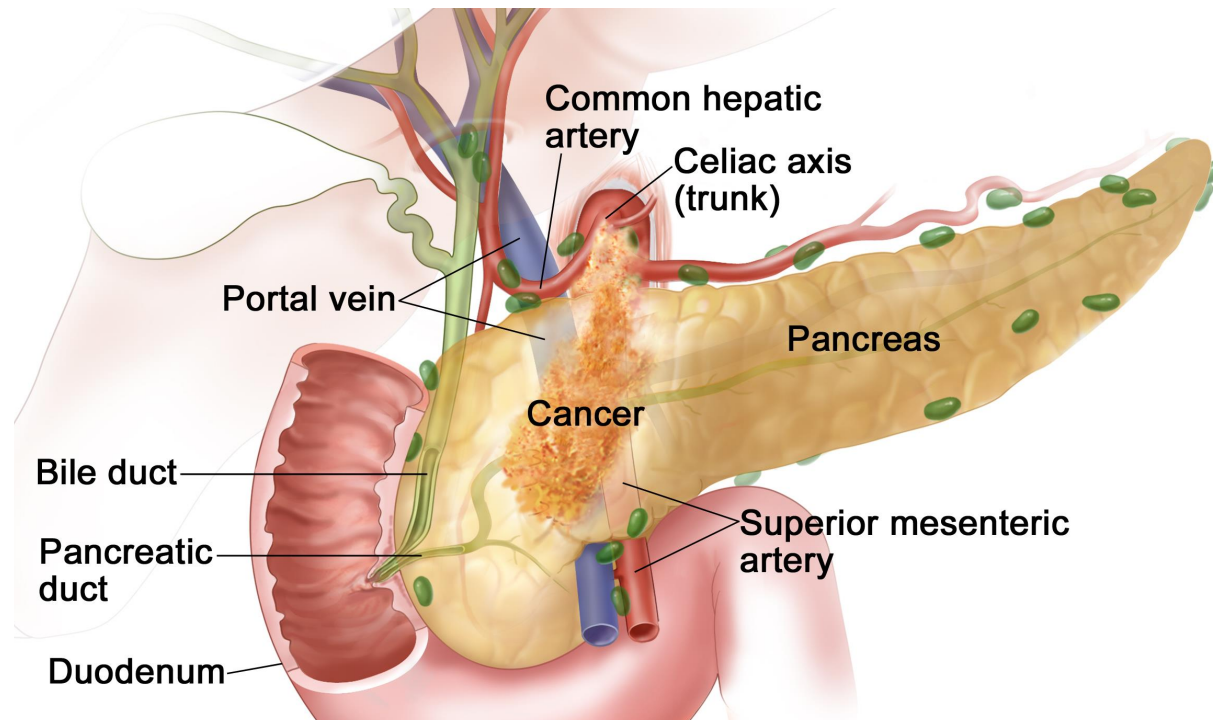
	Percutaneous	ERCP	EUS
High Sensitivity	✓		✓
High Specificity	✓	✓	✓
Low Risk of Seeding		✓	✓
Staging of Cancer			✓
Relieve Biliary Obstruction		✓	



# Case

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- EUS shows a mass in the head of the pancreas with involvement of local vessels.



# Case

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- EUS shows a mass in the head of the pancreas with involvement of local vessels.
- FNA of the mass is performed.
- ERCP reveals a distal CBD stricture and a biliary stent is placed.
- The patient is referred to oncology for treatment of pancreatic adenocarcinoma.

# Case

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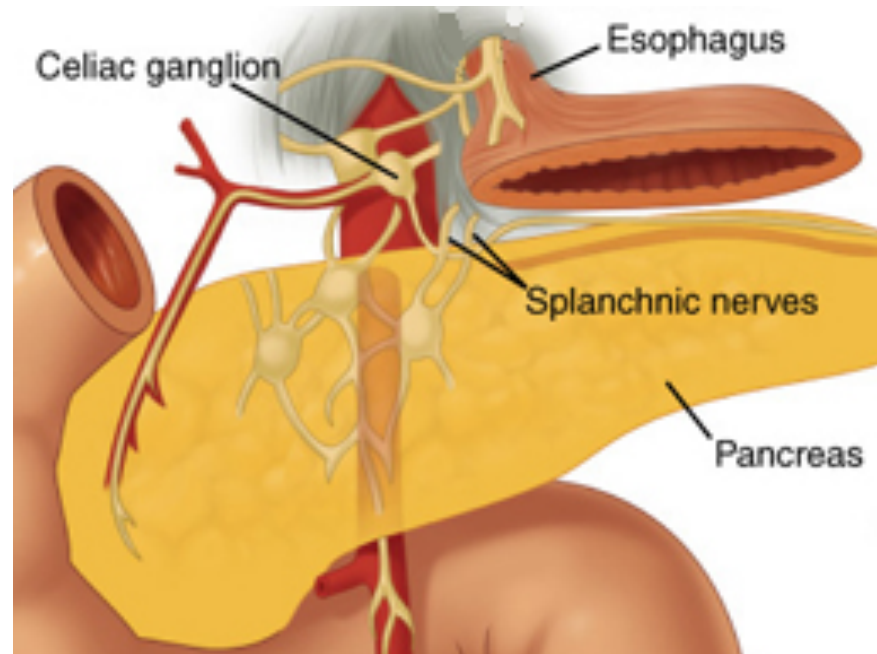
- A month later, the patient develops worsening abdominal pain radiating to his back.
- The pain is poorly controlled despite increasing doses of narcotics.
- A celiac plexus block is recommended for pain control.



# Celiac Plexus Block

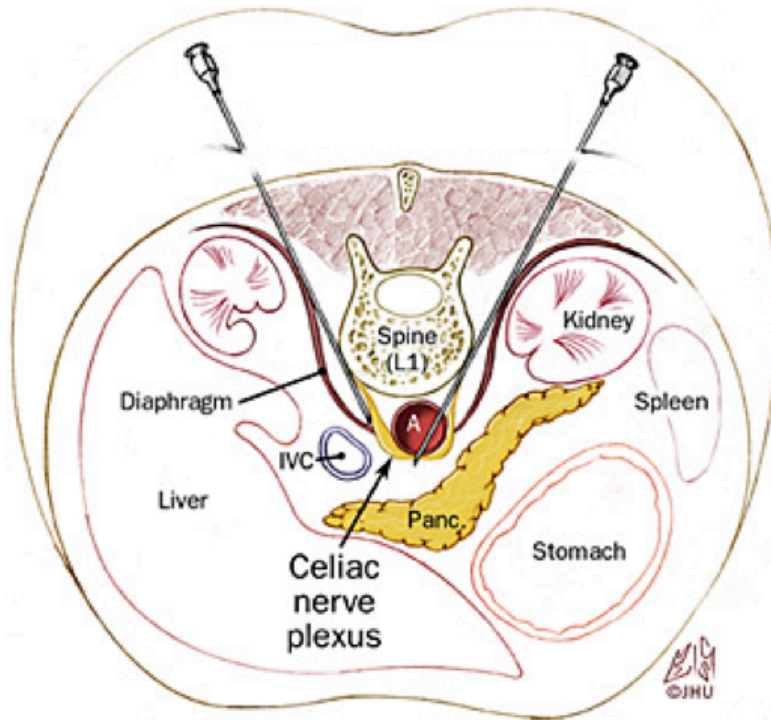
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- Useful in the management of chronic pain
  - Pancreatic cancer
  - Chronic pancreatitis
- Celiac plexus
  - Dense network of ganglia and nerve fibers
  - Transmits pain sensation for the pancreas

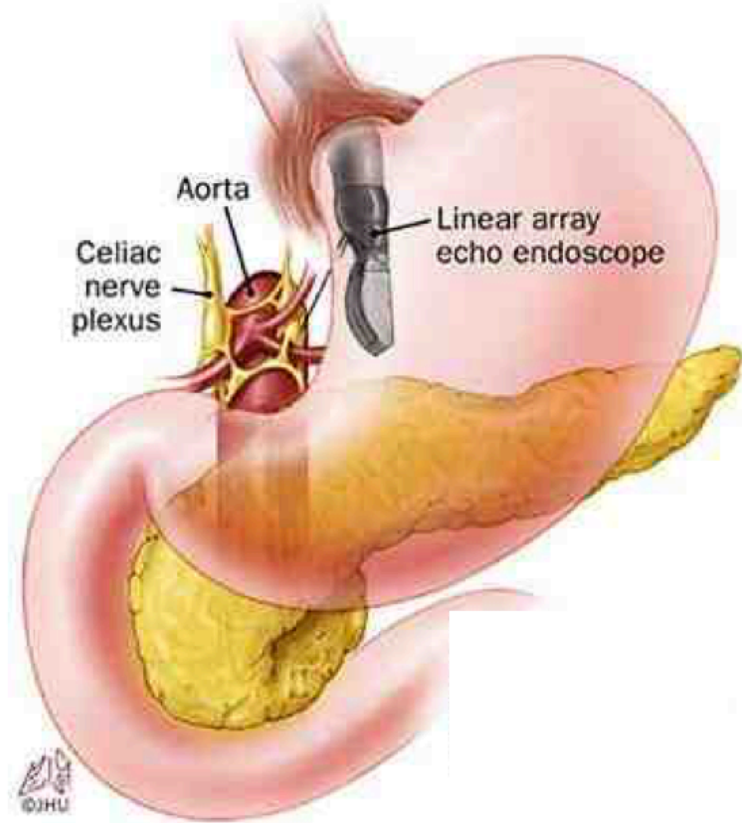


# Celiac Plexus Block

## Percutaneous



## Endoscopic Ultrasound



# Celiac Plexus Block

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- Efficacy
  - Decreased pain based on mean visual analog score
  - Decreased opioid use
  - Reduction in constipation
- Safety
  - No increased adverse effects

# Case

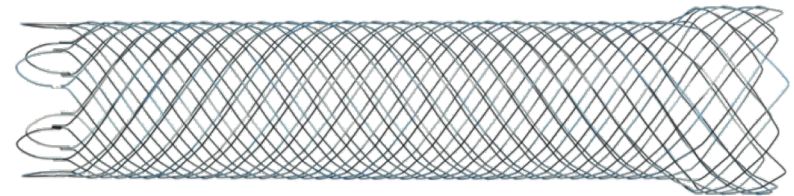
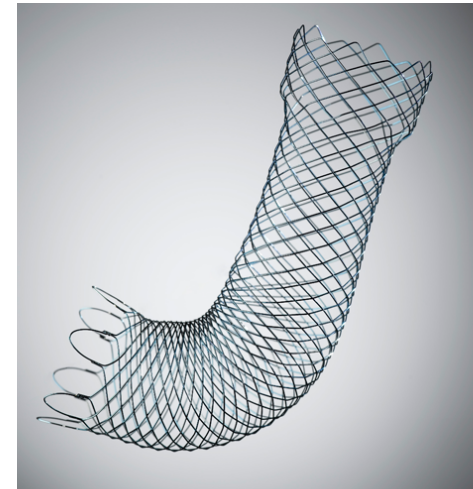
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- The patient's pain improves after the celiac block.
- However, 6 weeks later, he develops obstructive symptoms with inability to tolerate PO.
- Imaging reveals a duodenal obstruction due to the large pancreatic mass.
- He is referred to a surgeon but the patient is considered to be a poor surgical candidate.

# Enteral Stents

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- Self-expandable metal stents are a nonsurgical alternative for palliation of GI obstructions.
- Relieves obstructions of:
  - Esophagus
  - Stomach/Duodenum
  - Bile duct
  - Colon

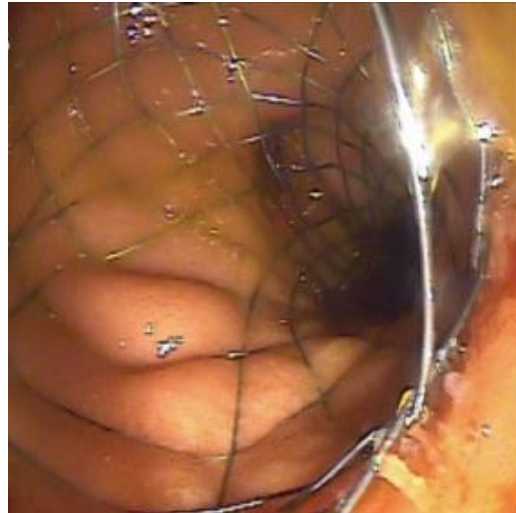
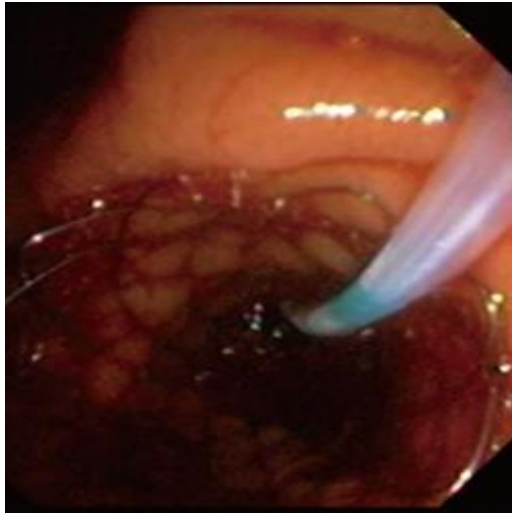




# Enteral Stents

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- Goals of stent placement
  - Relieve obstructive symptoms
  - Resume a normal diet
  - Improve quality of life



# Case

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- Following stent placement, the patient is able to tolerate oral intake.
- The patient was ultimately seen by palliative care and discharged home on hospice.



# Endoscopy in Pancreas Cancer

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## Indication

1. Obtain tissue diagnosis
2. Relieve biliary obstruction
3. Reduce chronic pain
4. Relieve GI tract obstruction

## Procedure

- EUS with FNA
- ERCP with stent placement
- EUS with celiac plexus block
- EGD with enteral stent placement

# Case #2

# Case

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- 28 yo woman with a history of repeated episodes of alcoholic acute pancreatitis.
- Two months after her last pancreatitis episode, she presents to the ER with abdominal pain.
- Labs are unremarkable.
- CT abdomen reveals a 2.9 x 1.9 cm cyst in the body of the pancreas.

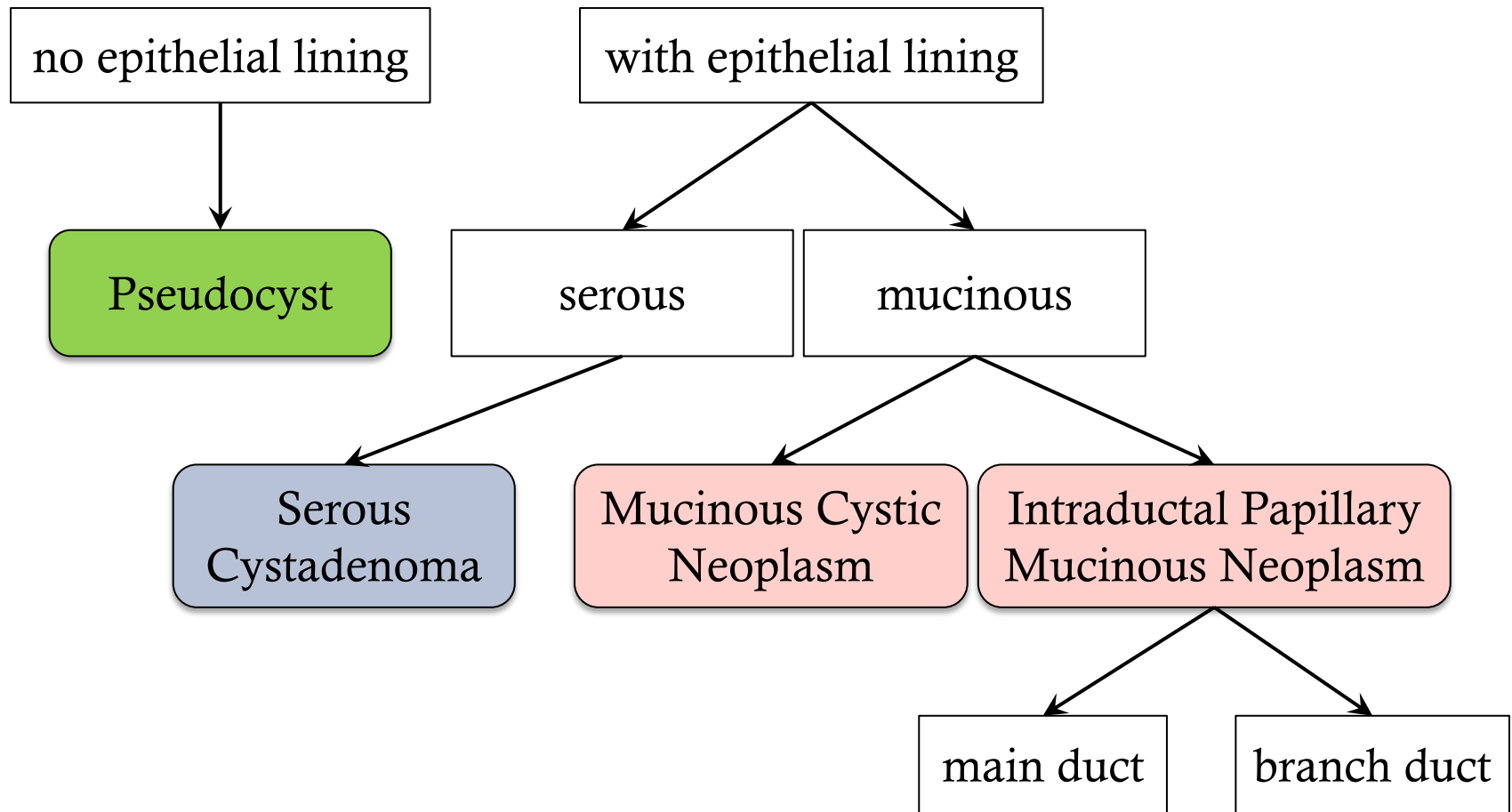
# Question

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- What type of pancreas cyst does she have?
  - a) Serous cystadenoma
  - b) Intraductal papillary mucinous neoplasm
  - c) Pancreatic pseudocyst
  - d) Mucinous cystic neoplasm
  - e) I had no idea there were this many different types of pancreatic cysts.

# Pancreas Cyst Classification

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# Pancreatic Cystic Neoplasms

	Cyst Fluid				Malignant Potential	Tx
	Aspirate	Cytology	CEA	Amylase		
Pseudocyst	murky brown	---	low	high	---	depends
Serous cystadenoma	thin, bloody	cuboidal, glycogen cells	low	low	---	---
MCN	viscous	+mucin ovarian stroma	>200	low	++	resect
MD-IPMN	viscous	+mucin	>200	high	+++	resect
SB-IPMN	viscous	+mucin	>200	high	+ / ++	monitor resect

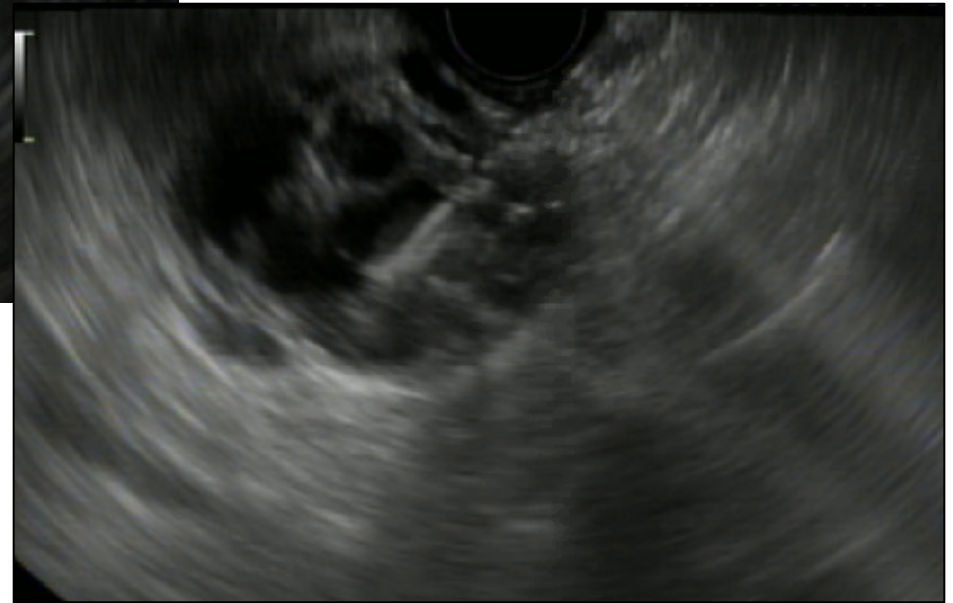


# Endoscopic Ultrasound

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2.7 x 2.2 cm cyst in the  
body of the pancreas



FNA performed

# FNA Results

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- 6 cc of clear, thick fluid aspirated
- Cyst fluid
  - Amylase 849 U/L
  - CEA 10,259.0 ng/mL
  - Cytology acute inflammation with lymphocytes and monocytes  
histiocytes also present  
negative for malignant cells

# Pancreatic Cystic Neoplasms

	Cyst Fluid				Malignant Potential	Tx
	Aspirate	Cytology	CEA	Amylase		
Pseudocyst	murky brown	---	low	high	---	depends
Serous cystadenoma	thin, bloody	cuboidal, glycogen cells	low	low	---	---
MCN	viscous	+mucin ovarian stroma	>200	low	++	resect
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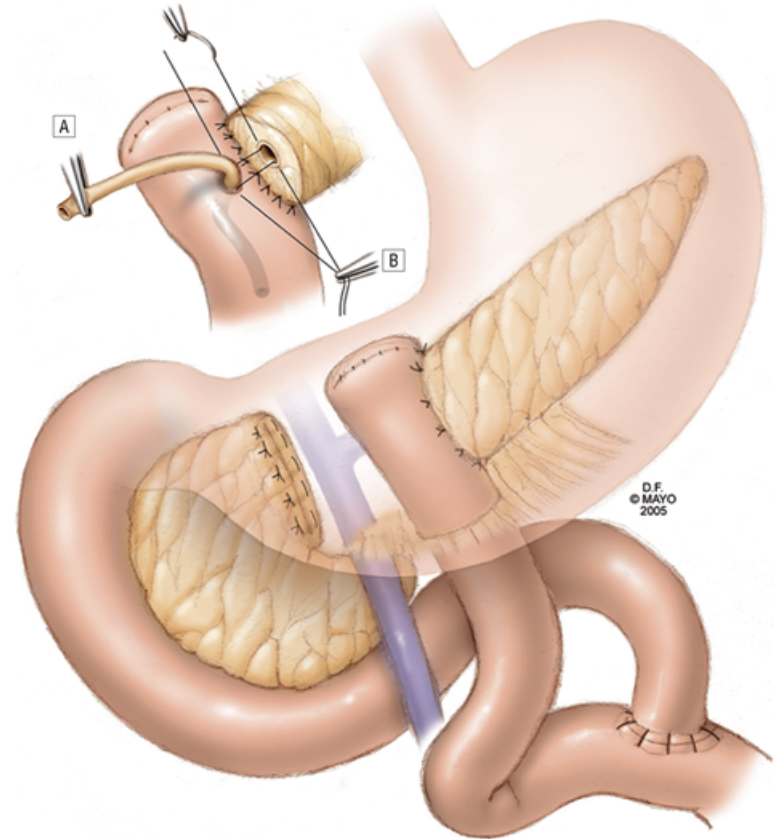
# Pancreatic Cystic Neoplasms

	Cyst Fluid				Malignant Potential	Tx
	Aspirate	Cytology	CEA	Amylase		
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MD-IPMN	viscous	+mucin	>200	high	+++	resect
SB-IPMN	viscous	+mucin	>200	high	+ / ++	monitor resect

# Case

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- Patient was referred to Pancreas Surgery.
- Underwent successful middle pancreatectomy.
- Final pathology:
  - Mucinous cystic neoplasm with low grade dysplasia



# Case #3

# Case

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- 39 year old woman feels lightheaded and dizzy every morning for the past few months.
- She becomes diaphoretic and thirsty.
- Also occurs after physical activity.
- Symptoms improve after eating a muffin, bread, or juice.



# Laboratory Data

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- Fasting labs
  - Insulin                      124  $\mu\text{U}/\text{mL}$                       (2.6-24.9  $\mu\text{U}/\text{mL}$ )
  - C-peptide                      6.7  $\text{mg}/\text{mL}$                       (1.1-4.4  $\text{mg}/\text{mL}$ )
  - Glucose                      44  $\text{mg}/\text{dL}$                       (65-99  $\text{mg}/\text{dL}$ )
- Patient was lightheaded and dizzy.
- Given orange juice with symptom resolution.



# Question

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- What is the diagnosis?
  - a) Glucagonoma
  - b) Insulinoma
  - c) Surreptitious sulfonylurea use
  - d) Diabetes mellitus
  - e) I don't know. Refer to Endocrinology.

# Case

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- Whipple's triad:
  - Symptoms likely to be caused by hypoglycemia.
  - Low plasma glucose at time of symptoms.
  - Relief of symptoms when glucose raised to normal.
- Work-up is consistent with an insulinoma.
- Tumor localization is pursued to guide preoperative planning.

# Tumor Localization

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- Non-invasive
  - CT scan



# Tumor Localization

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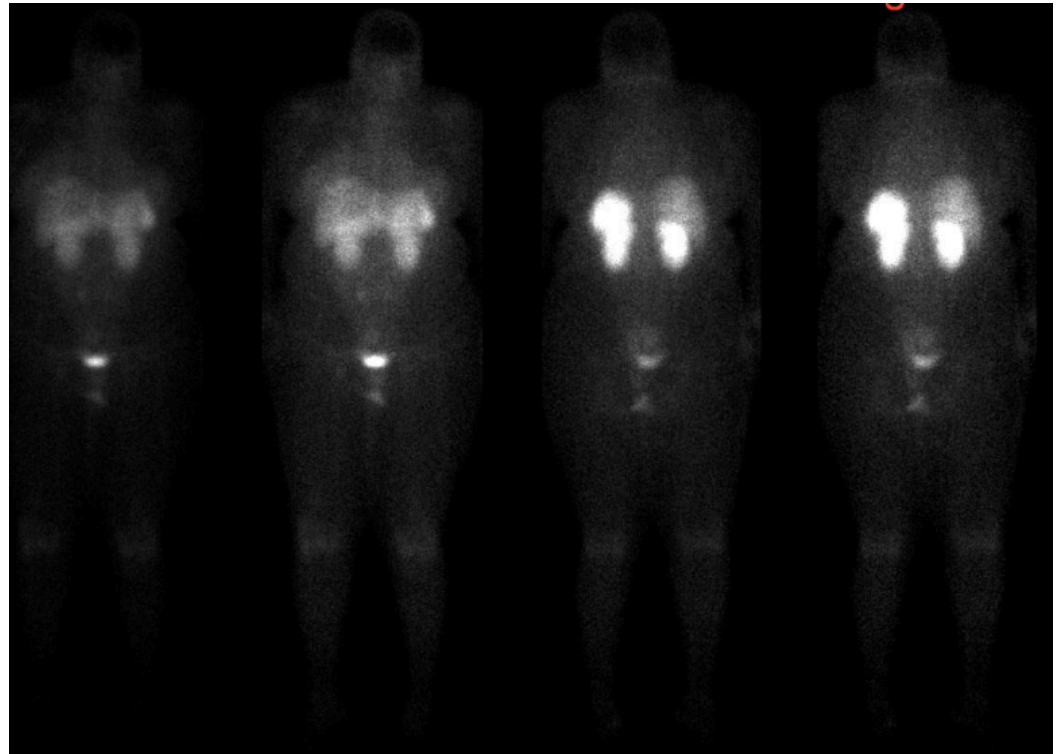
- Non-invasive
  - CT scan
  - MRI



# Tumor Localization

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- Non-invasive
  - CT scan
  - MRI
  - Octreotide scan



# Tumor Localization

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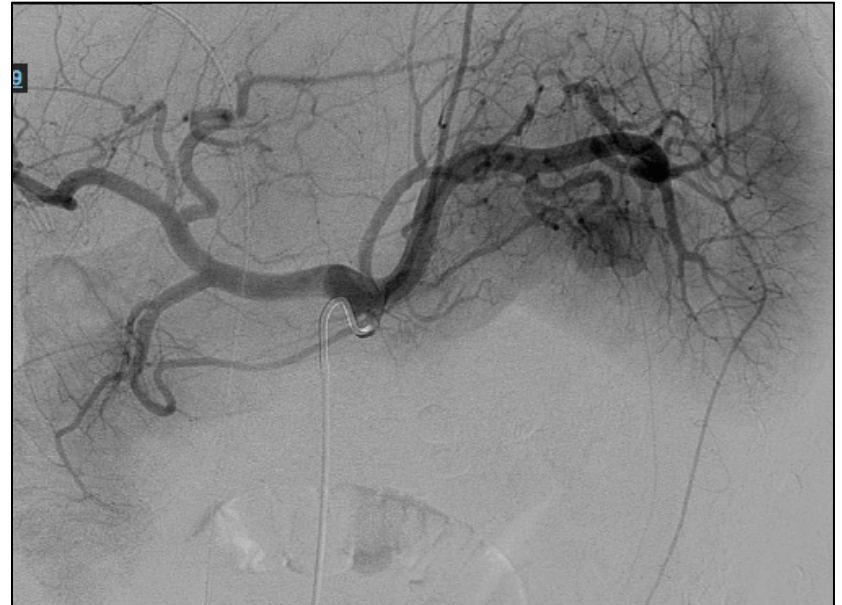
- Non-invasive
  - CT scan
  - MRI
  - Octreotide scan
- Invasive
  - Endoscopic ultrasound



# Tumor Localization

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- Non-invasive
  - CT scan
  - MRI
  - Octreotide scan
- Invasive
  - Endoscopic ultrasound
  - Selective arterial calcium stimulation (SACST)



# Case

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- Patient undergoes initial evaluation at an outside institution:
    - CT abdomen/pelvis
    - MRI/MRCP
    - Octreotide scan
    - Endoscopic ultrasound
- } all negative!
- Referred to UCLA for SACST.



# SACST

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Insulin Levels

Time (min)

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0      30      60      90      120      180

GDA

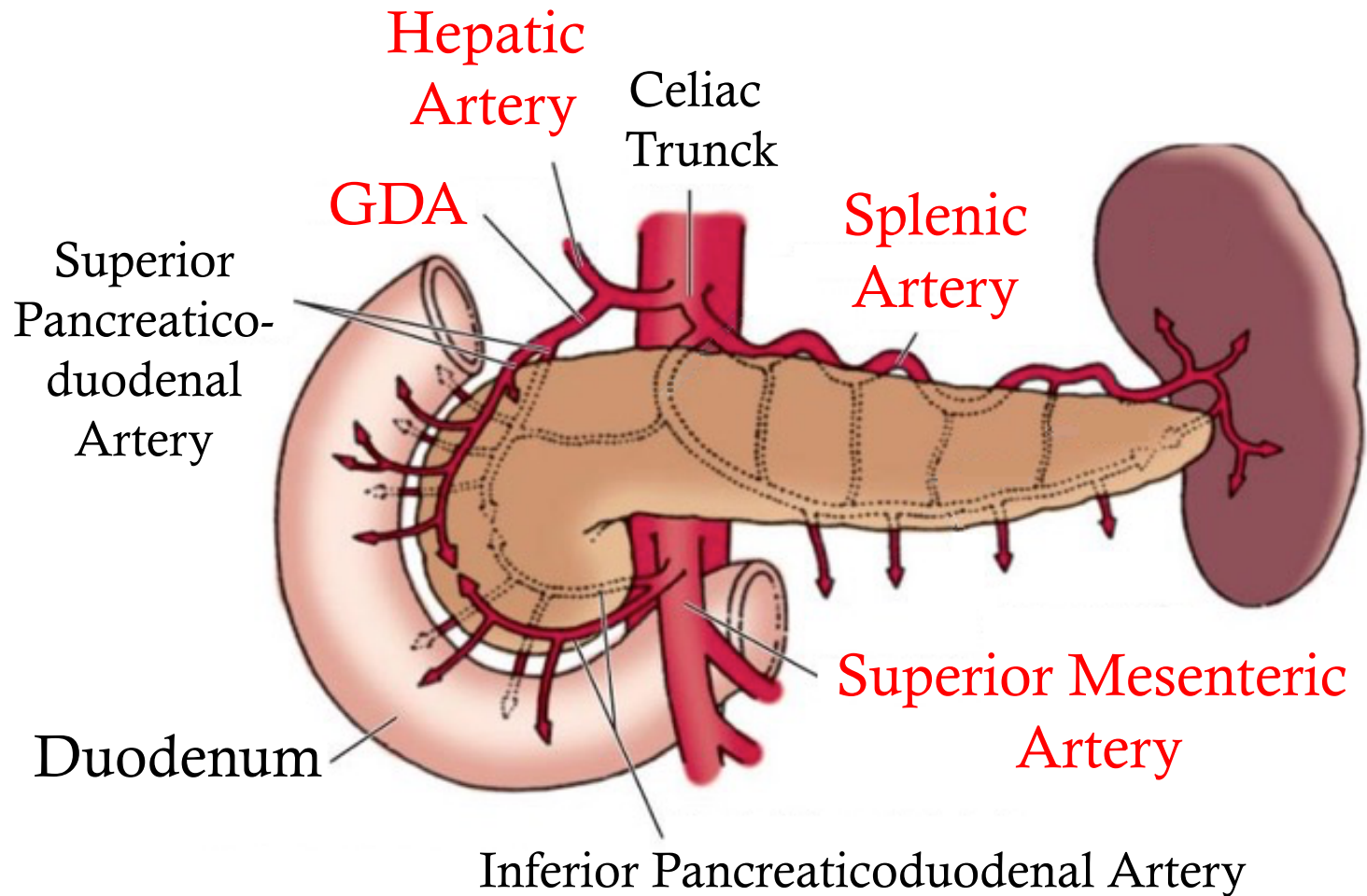
Hepatic

Splenic

SMA

# Arterial Supply to Pancreas

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# SACST

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## Insulin Levels

	Time (min)					
	0	30	60	90	120	180
GDA	6	8	7	6	6	5
Hepatic	16	NA	12	19	9	7
Splenic	16	43	31	NA	19	24
SMA	6	8	7	8	8	9

# SACST

---

## Insulin Levels

### Time (min)

---

	0	30	60	90	120	180
GDA	6	8	7	6	6	5
Hepatic	16	NA	12	19	9	7
Splenic	16	43	31	NA	19	24
SMA	6	8	7	8	8	9

# BUT...

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- Nurse ordered *calcium* levels on the collected samples.
- Blood sat in the lab for 3 days before insulin levels sent.
- IR attending offers to redo the procedure free of cost.



# SACST - Redo

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## Insulin Levels

### Time (min)

---

	<b>0</b>	<b>30</b>	<b>60</b>	<b>90</b>	<b>120</b>	<b>180</b>
GDA	414	281	292	221	188	130
Hepatic	31	27	23	21	20	18
Splenic	11	17	18	15	12	10
SMA	6	9	9	7	6	6

# SACST - Redo

---

## Insulin Levels

## Time (min)

---

	<b>0</b>	<b>30</b>	<b>60</b>	<b>90</b>	<b>120</b>	<b>180</b>
<b>GDA</b>	<b>414</b>	<b>281</b>	<b>292</b>	<b>221</b>	<b>188</b>	<b>130</b>
Hepatic	31	27	23	21	20	18
Splenic	11	17	18	15	12	10
SMA	6	9	9	7	6	6

# Case

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- Patient referred to Pancreas Surgery for surgical resection of the insulinoma.

- Surgeon:



- Surgeon requests repeat endoscopic ultrasound.



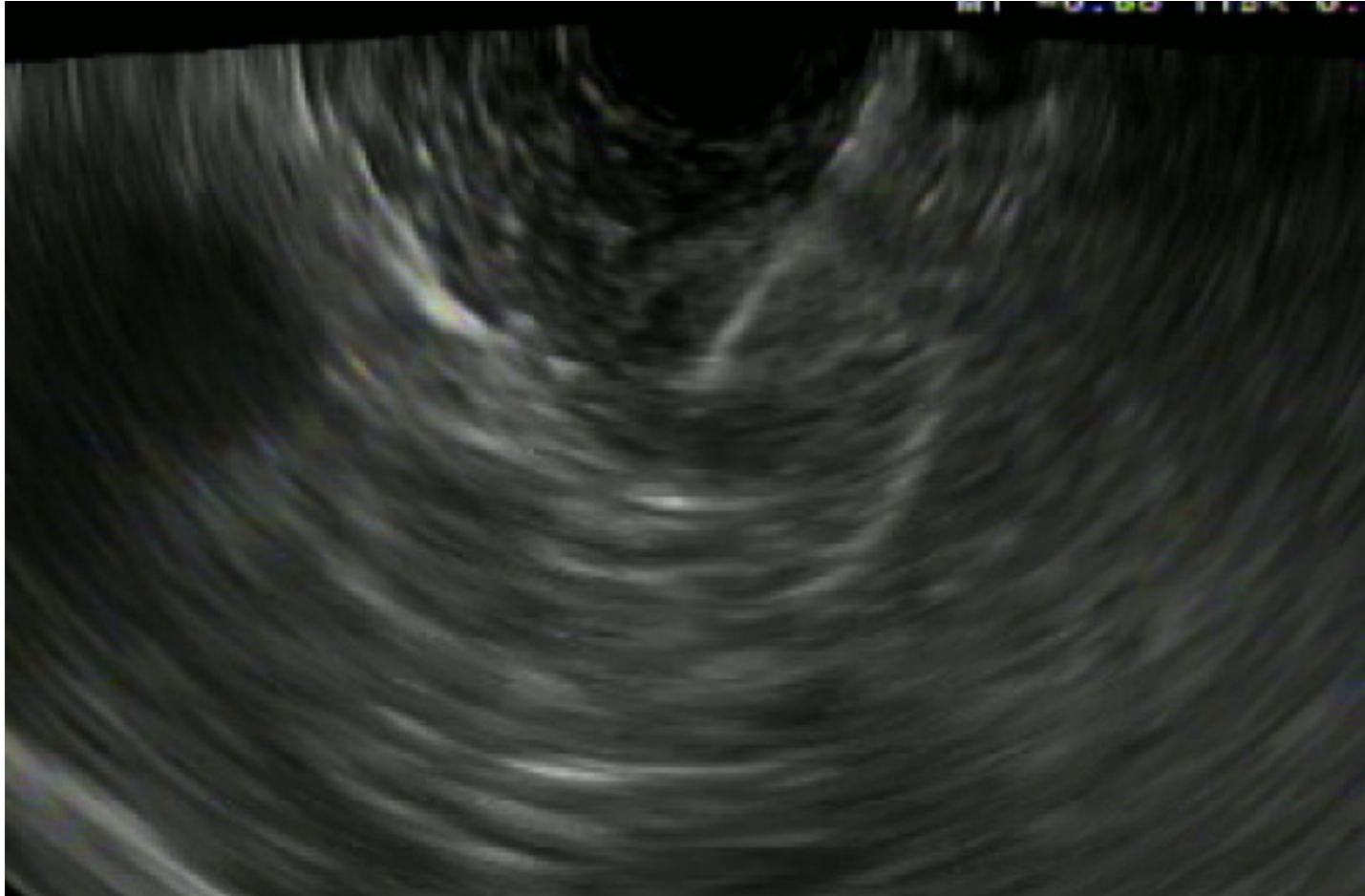
# Endoscopic Ultrasound

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# Fine Needle Aspiration

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# FNA Results

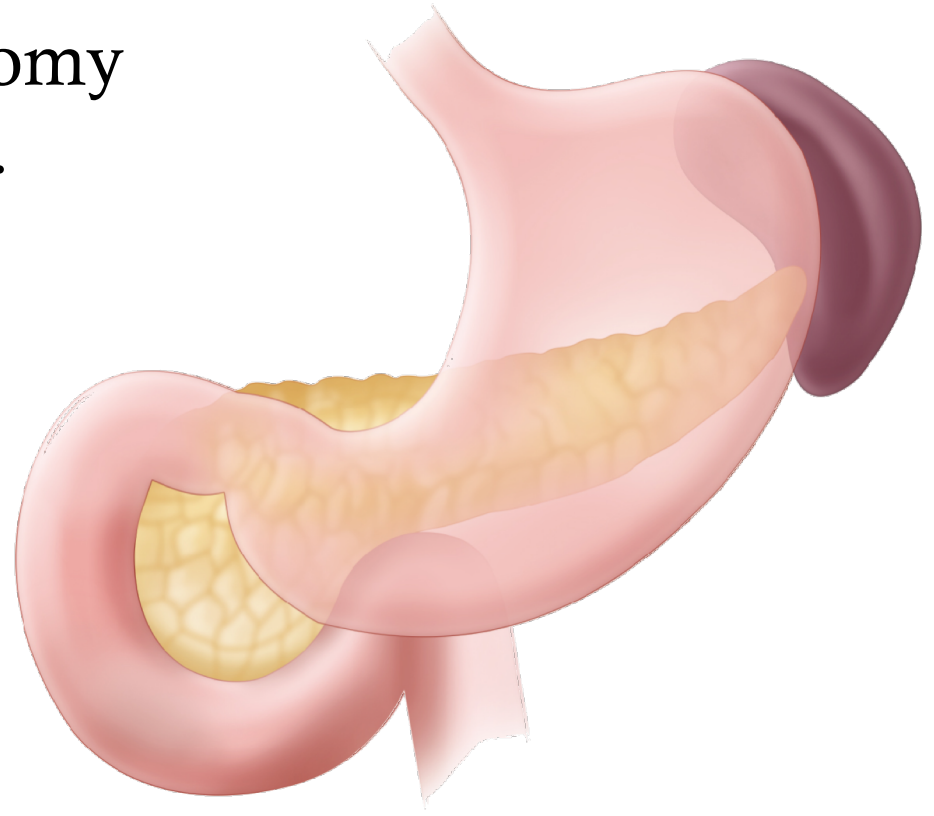
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- Final Diagnosis
  - Neuroendocrine tumor!
  - Immunostains are supportive
    - Synaptophysin: positive
    - Chromogranin: positive
    - Trypsin: negative

# Case

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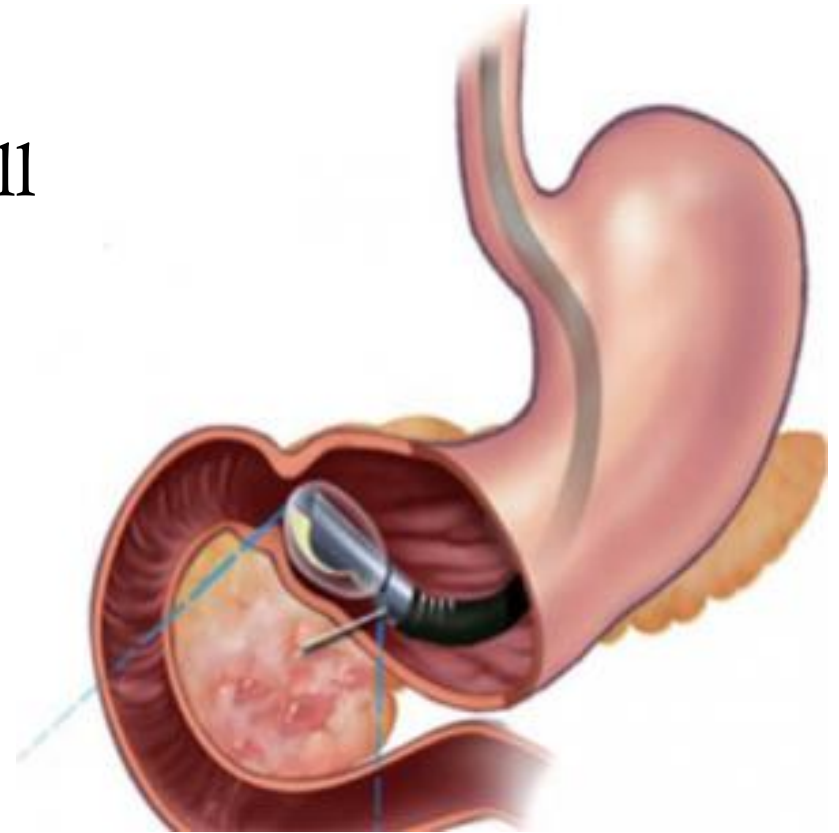
- Patient underwent successful distal pancreatectomy with splenectomy.
- She no longer has hypoglycemic episodes!



# Endoscopic Ultrasound

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- Provides high resolution imaging of the pancreas
- Can detect lesions as small as 2-3 mm in size
- Very high sensitivity for tumor detection

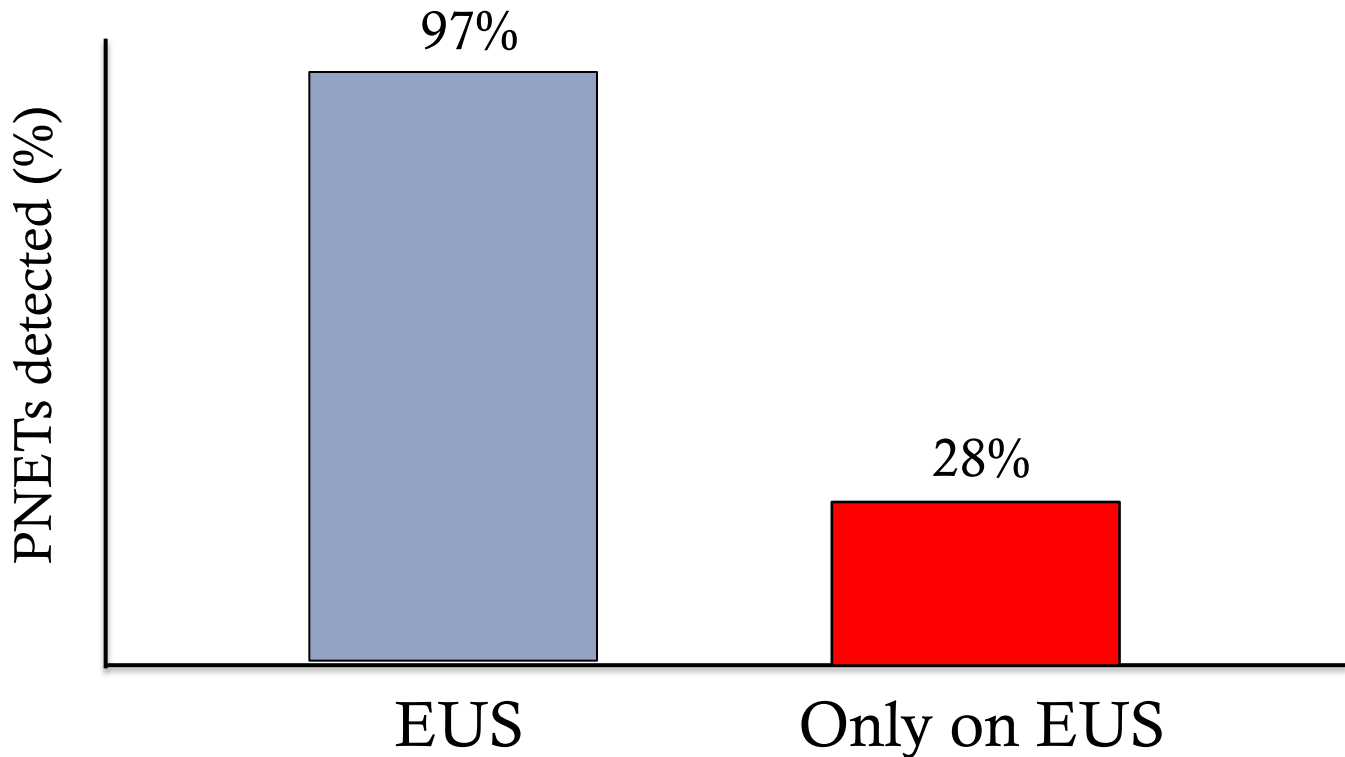


# EUS for Detecting PNETs

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Systematic Review (17 studies)

n=612 patients with PNETs



# Conclusions

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- Endoscopy plays a multifaceted role in the management of pancreatic cancer.
- Cyst fluid analysis of pancreas cysts can aid in the diagnosis and management.
- Endoscopic ultrasound is a very sensitive test for imaging the pancreas.

Thank you!



# Stephen Kim, MD

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## Contact Information

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