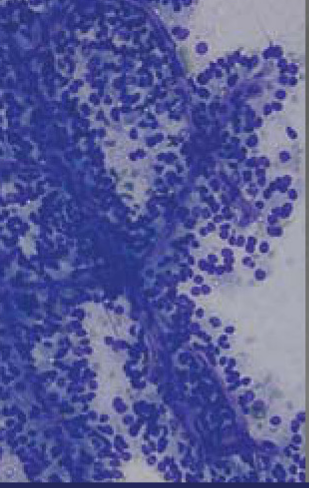
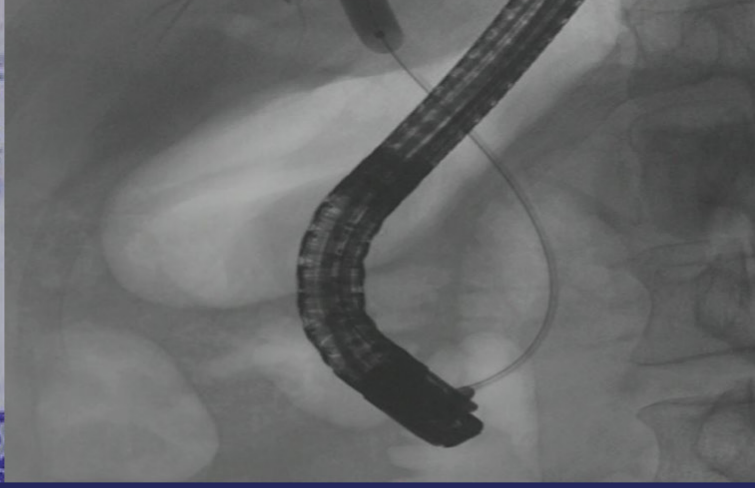
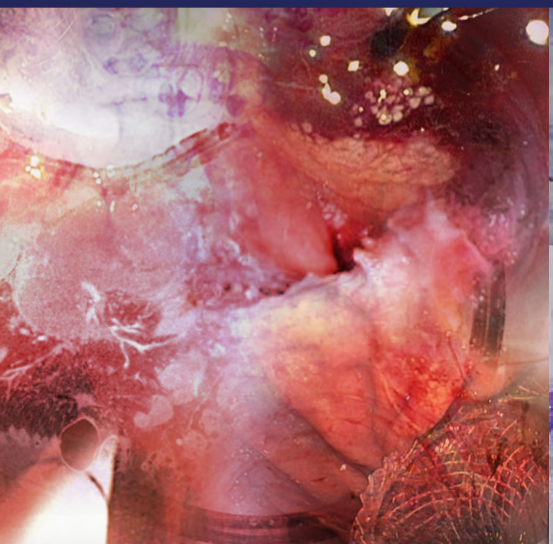



Advanced Endoscopy Handbook

CONTRIBUTORS | ENDOSCOPY SECTION

Ji Young Bang, MD
Shyam Varadarajulu, MD



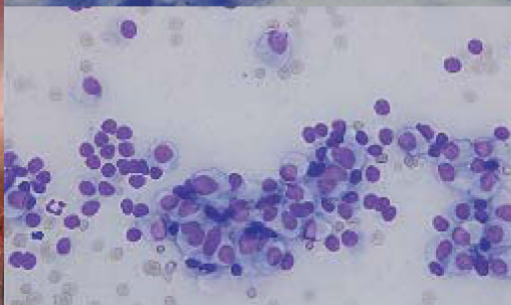


Table of Contents

General Section

Guideline for antibiotic prophylaxis for endoscopic procedures

With the exception of patients at high risk for bacteremia (listed below), prophylactic antibiotics are required only when performing the following endoscopic procedures included in the table:

Procedure	Antibiotic	Duration
PEG/PEJ	Cefazolin 1gm iv or Clindamycin 900mg iv. If MRSA risk, Vancomycin 15mg/kg iv	1 dose pre-procedure
• ERCP for biliary obstruction but incomplete drainage (Hilar stricture, PSC) • ERCP for cholangitis (These pateints should already be on antibiotics)	Ciprofloxacin 500mg po/400mg iv or Augmentin 50mg po or Unasyn 3gm iv or Ampicillin 2gm iv + Gentamicin 5mg/kg iv or Vancomycin 15mg/kg iv + Gentamicin 5mg/kg iv.	Pre-procedure + 5-7 days (No consensus)
• EUS-FNA of cystic lesions (any location) • EUS-guided interventions (PFC drainage, biliary drainage, FNI of cysts/tumors)	Ciprofloxacin 500mg po/400mg iv.	Pre-procedure + 3-5 days

Antibiotics should be administered in the following high risk patients for any endoscopic procedure

- Cirrhosis with GI bleed
- Peritoneal dialysis undergoing colonoscopy
- Immunocompromised patients (severe neutropemia <500/mm^3 and for advanced hematologic malignancies).

References

1. ASGE Standards of Practice Committee. Antibiotic prophylaxis for GI endoscopy. Gastrointest Endosc 2015; 81:81-89.
2. Meyer GW. Antibiotic prophylaxis for gastrointestinal endoscopic procedures. UpToDate; Oct 16, 2016.
3. Brand M, Bizos D, O'Farrell P Jr. Antibiotic prophylaxis for patients undergoing elective endoscopic retrograde cholangiopancreatography. Cochrane Database Syst Rev 2010; Oct 6:CD007345.

Guideline for anticoagulation prior to endoscopic procedures

Cessation and reinitiation of antiplatelet agents and anticoagulants depend on:

- Risk of bleeding from endoscopic procedure
- Patient's risk of thromboembolism

High risk endoscopic procedures

Therapeutic/Interventional procedures

- ERCP with sphincterotomy
- Ampullectomy
- EUS-guided interventions including pancreatic fluid collection drainage cyst aspiration
- Polypectomy
- EMR/ESD
- PEG/PEJ placement
- Endoscopic hemostasis
- Balloon dilation of strictures

Diagnostic procedures

- EUS-FNA

All other procedures = lower risk

Patients at high risk for thromboembolism

Arterial thrombosis
- Prosthetic cardiac valve
- Any valve + CVA/TIA in last 6 months

Coronary stents
- DES within 12 months
- Mitral valve
- Older generation aortic valve
- BMS within 1 month (12 months if placed in the setting of ACS)
- History of in-stent restenosis

Atrial fibrillation
- with $CAHD_2DS_2$-VASc score ≥ 2
- with mitral stenosis
- with prosthetic cardiac valve at any site

Venous thrombosis
- PE/DVT diagnosed in last 3 months
- Some thrombophilia types
- Protein C deficiency
- Protein S deficiency
- Antithrombin deficiency
- Antiphospholipid antibodies

Multiple thrombophilic disorders

References

1. ASGE Standards of Practice Committee. The management of antithrombotic agents for patients undergoing GI endoscopy. Gastrointest Endosc 2016; 83:3-16.
2. Veitch AM, Vanbiervliet G, Gershlick AH et al. Endoscopy in patients on antiplatelet or anticoagulant therapy, including direct oral anticoagulants: British Society of Gastroenterology (BSG) and European Society of Gastrointestinal Endoscopy (ESGE) guidelines. Endoscopy 2016; 48:385-402.
3. Kamath PS. Management of anticoagulants in patients undergoing

endoscopic procedures. UpTo- Date. Feb 23, 2016.

ABBREVIATION KEY

Acute Coronary Syndrome (ACS)
Bare Metal Stent (BMS)
Cerebrovascular Accident (CVA)
Deep Vein Thrombosis (DVT)
Drug-Eluting Stents (DES)
Pulmonary Embolism (PE)
Transient Ischemic Attack (TIA)

Patients at high risk for thromboembolism

	High bleeding risk procedure
Agent	**Cessation prior to procedure**
Aspirin	Not needed
Thienopyridines: Clopidogrel/ Prasugrel	Consult cardiology first - 5 days if OK to stop, switch to aspirin
Warfarin	Stop 5 days prior, bridge with low molecular weight heparin (LMWH) 2 days after warfarin cessation, last dose of LMWH given 24 hours prior to procedure
Factor Xa inhibitor: • **Rivaroxaban (Xarelto)** • **Apixaban (Eliquis)** • **Edoxaban (Savaysa)** **Direct thrombin inhibitor:** • **Dabigatran (Pradaxa)**	N/A as direct oral anticoagulants (DOAC) not indicated in high risk thrombosis pts
Heparin	
Unfractionated heparin	4 hours
LMWH	24 hours

Low bleeding risk procedure		
Reinitiation post-procedure	**Cessation prior to procedure**	**Reinitiation post-procedure**
Same day	Not needed	Same day
When adequate hemostasis achieved during endoscopy	Not needed	Same day
Restart same day at usual dose, continue LMWH until INR therapeutic	Not needed (ensure INR is not supratherapeutic)	Same day
N/A as (DOAC) not indicated in high risk thrombosis patients	Day of procedure - Omit morning dose	Same day
Same day likely OK based on bridging guidelines	No data	No data
Same day likely OK based on bridging guidelines	No data	No data

Patients at low risk for thromboembolism

	High bleeding risk procedure
Agent	**Cessation prior to procedure**
Aspirin	Not needed
Thienopyridines: Clopidogrel/ Prasugrel	5 days, switch to aspirin
Warfarin	5 days
Factor Xa inhibitor: • **Rivaroxaban (Xarelto)** • **Apixaban (Eliquis)** • **Edoxaban (Savaysa)** **Direct thrombin inhibitor:** • **Dabigatran (Pradaxa)**	2 days (3 days if GFR < 50, 4 days if GFR < 30)

Low bleeding risk procedure		
Reinitiation post-procedure	**Cessation prior to procedure**	**Reinitiation post-procedure**
Same day	Not needed	Same day
When adequate hemostasis achieved during endoscopy	Not needed	Same day
Same day at usual dose	Not needed (ensure INR is not supratherapeutic)	Same day
2 days or delay until adequate hemostasis achieved	Day of procedure - Omit morning dose	Same day

Low bleeding risk procedure		
Reinitiation post-procedure	Cessation prior to procedure	Reinitiation post-procedure
Same day	Not needed	Same day
When adequate hemostasis achieved during endoscopy	Not needed	Same day
Restart same day at usual dose, continue LMWH until INR therapeutic	Not needed (ensure INR is not supratherapeutic)	Same day
N/A as (DOAC) not indicated in high risk thrombosis patients	Day of procedure - Omit morning dose	Same day
Same day likely OK based on bridging guidelines	No data	No data
Same day	Not needed	Same day
When adequate hemostasis achieved during endoscopy	Not needed	Same day
Same day at usual dose	Not needed (ensure INR is not supratherapeutic)	Same day
2 days or delay until adequate hemostasis achieved	Day of procedure - Omit morning dose	Same day

Cautery Settings - ERBE VIO300D

GI offers the most demanding arena for electrosurgery. This is due to thin-walled anatomy. Understanding your generator and having a rationale prior to activation is paramount.

Program	Generator	Mode	Mode	Mode
EMR/ Polypectomy	ERBE VIO300D	EndoCut Q	Forced Coag	Soft Coag
		Effect 2	Effect 2	Effect 5
		Duration 1	Watts 18	Watts 80
		Interval 4		
	ERBE VIO3	EndoCut Q	Forced Coag	Soft Coag
		Effect 2	1.0	4.5
		Duration 1		
		Interval 4		
Captivator Snare	ERBE VIO300D	EndoCut Q	Forced Coag	Soft Coag
		Effect 2	Effect 2	Effect 5
		Duration 2	Watts 18	Watts 80
		Interval 3		
	ERBE VIO3	EndoCut Q	Forced Coag	Soft Coag
		Effect 2	1.0	4.5
		Duration 2		
		Interval 3		

		Incision	Incision	Dissection	Coag Grasper
ESD - Dual Knife	ERBE VIO300D	EndoCut I	DryCut	Forced Coag	Soft Coag
		Effect 3	Effect 3	Effect 2	Effect 5
		Duration 1	Watts 100	Watts 50	Watts 80
		Interval 1	N/A	N/A	N/A
ESD - Dual Knife	ERBE VIO3	EndoCut I	DryCut	Precise Sect	Soft Coag
		Effect 3	4.5	5.0	4.5
		Duration 1	N/A	N/A	N/A
		Interval 1	N/A	N/A	N/A
ESD - Hybrid Knife	ERBE VIO300D	EndoCut I	DryCut	Forced Coag	Soft Coag
		Effect 2	Effect 3	Effect 2	Effect 5
		Duration 3	Watts 100	Watts 50	Watts 80
		Interval 1	N/A	N/A	N/A
ESD - Hybrid Knife	ERBE VIO3	EndoCut I	DryCut	Precise Sect	Soft Coag
		Effect 2	5.3	5.6	4.5
		Duration 3	N/A	N/A	N/A
		Interval 1	N/A	N/A	N/A

		Incision	Incision	Dissection	Coag Grasper
POEM - Dual Knife	ERBE VIO300D	EndoCut I	DryCut	Forced Coag	Soft Coag
		Effect 3	Effect 3	Effect 2	Effect 5
		Duration 1	Watts 100	Watts 50	Watts 80
		Interval 1	N/A	N/A	N/A
POEM - Dual Knife	ERBE VIO3	EndoCut I	DryCut	Precise Sect	Soft Coag
		Effect 3	4.5	5.0	4.5
		Duration 1	N/A	N/A	N/A
		Interval 1	N/A	N/A	N/A
POEM - Hybrid Knife	ERBE VIO300D	EndoCut I	DryCut	Forced Coag	Soft Coag
		Effect 3	Effect 3	Effect 2	Effect 5
		Duration 1	Watts 100	Watts 50	Watts 80
		Interval 1	N/A	N/A	N/A
POEM - Hybrid Knife	ERBE VIO3	EndoCut I	DryCut	Precise Sect	Soft Coag
		Effect 3	5.3	5.6	4.5
		Duration 1	N/A	N/A	N/A
		Interval 1	N/A	N/A	N/A

ERCP	ERBE VIO300D	EndoCut I	Forced Coag
		Effect 2	Effect 1
		Duration 3	Watts 20
		Interval 3	
	ERBE VIO3	EndoCut I	Forced Coag
		Effect 2	1.0
		Duration 3	
		Interval 3	
Pancreatic Cut	ERBE VIO300D	EndoCut I	Forced Coag
		Effect 1	Effect 1
		Duration 2	Watts 20
		Interval 3	
	ERBE VIO3	EndoCut I	Forced Coag
		Effect 1	1.0
		Duration 2	
		Interval 3	
Bipolar Probe	ERBE VIO300D	BiPolar Soft	
		Effect 2	
		Watts 20	
	ERBE VIO3	BiPolar Soft	
		2.0	

Hot Axios	ERBE VIO300D	AutoCut
		Effect 5
		Watts 100
	ERBE VIO3	AutoCut
		4.0
Zenkers	ERBE VIO300D	EndoCut I
		Effect 1
		Duration 4
		Interval 1
	ERBE VIO3	EndoCut I
		Effect 1
		Duration 4
		Interval 1

EUS

Surveillance Protocol for Pancreatic Cysts

IPMN Surveillance

IPMN: Main pancreatic duct >5mm without an obstructive cause

- First line treatment: Surgery for all operable candidates.
- If surgery not a consideration: Surveillance EUS q 6 months

Branch-Duct IPMN Surveillance

- Cyst < 1cm — EUS or CT/MRI q 2years.
- Cyst 1-2cm — EUS q 1year X 2 and lengthen interval if no change.
- Cyst >2-3cm — EUS q 6 months x 2 followed by annual EUS or CT/MRI for 5 years.
- Cyst >3cm — Surgical referral OR EUS q 6 months if surgery not a consideration.

Indications for Surgery	Indications for FNA/FNB
• Mural nodule/mass in a cyst or high-grade dysplasia • Positive cytology for cancer • Mixed-type IPMN: Concomitant MPD (>5mm) involvement and cyst communicates with MPD. • Symptomatic cysts • Thick cyst wall • >2mm increase in cyst size at surveillance	• Need for tissue/definitive diagnosis prior to surgery • Cyst ≥ 1-2cm to determine their mucinous nature • Thick cyst walls to determine if it is a neuroendocrine tumor • Mass in an inoperable cyst (vascular invasion) that is suspicious for cancer

Routine Investigations to request:

- If aspirate > 2cc: CEA/glucose, amylase, cytology and mucin
- Diagnosing mucinous cyst = KRAS, GNAS
- Diagnosing advanced neoplasia = KRAS/GNAS and alterations in TP53/P1K 3CA/PTEN

Protocol for Cyst Ablation

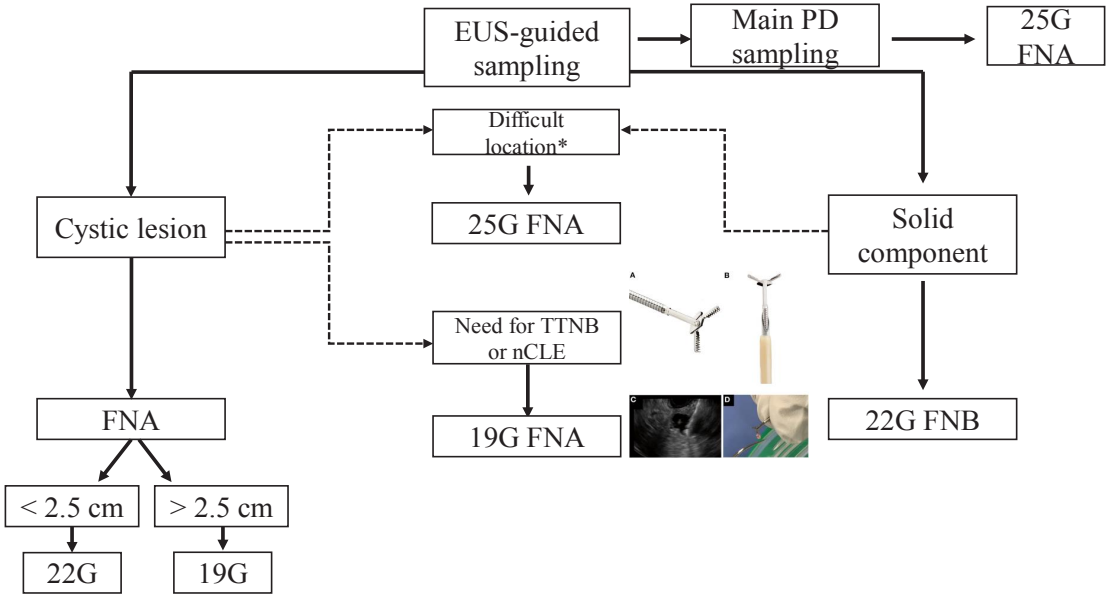
Inclusion Criteria

1. Branch-duct IPMN measuring >2 and up to 4cm in size and located in the head or body of the pancreas.
2. A branch-duct IPMN or mucinous cyst neoplasm (MCN) with high-risk features (mural nodule or enlarging in size) in a high-risk surgical patient.
3. Branch-duct IPMN or MCN measuring > 2 and up to 4cm in size and located in the tail of the pancreas in a high-risk surgical candidate.

Exclusion Criteria

1. Cysts measuring <2cm or > 4cm.
2. Multi-loculated cysts (>4 locules).
3. Cysts communicating with the main pancreatic duct via an obvious side-branch measuring 2mm or more in diameter.
4. Cysts with hypoechoic mass lesions that on FNA reveal malignant cells.
5. Recent history of pancreatitis and EUS findings suggestive of a pseudocyst.
6. Bleeding tendency; INR >1.4 or platelet count <70,000.

Sampling of Pancreatic Cyst Lesions



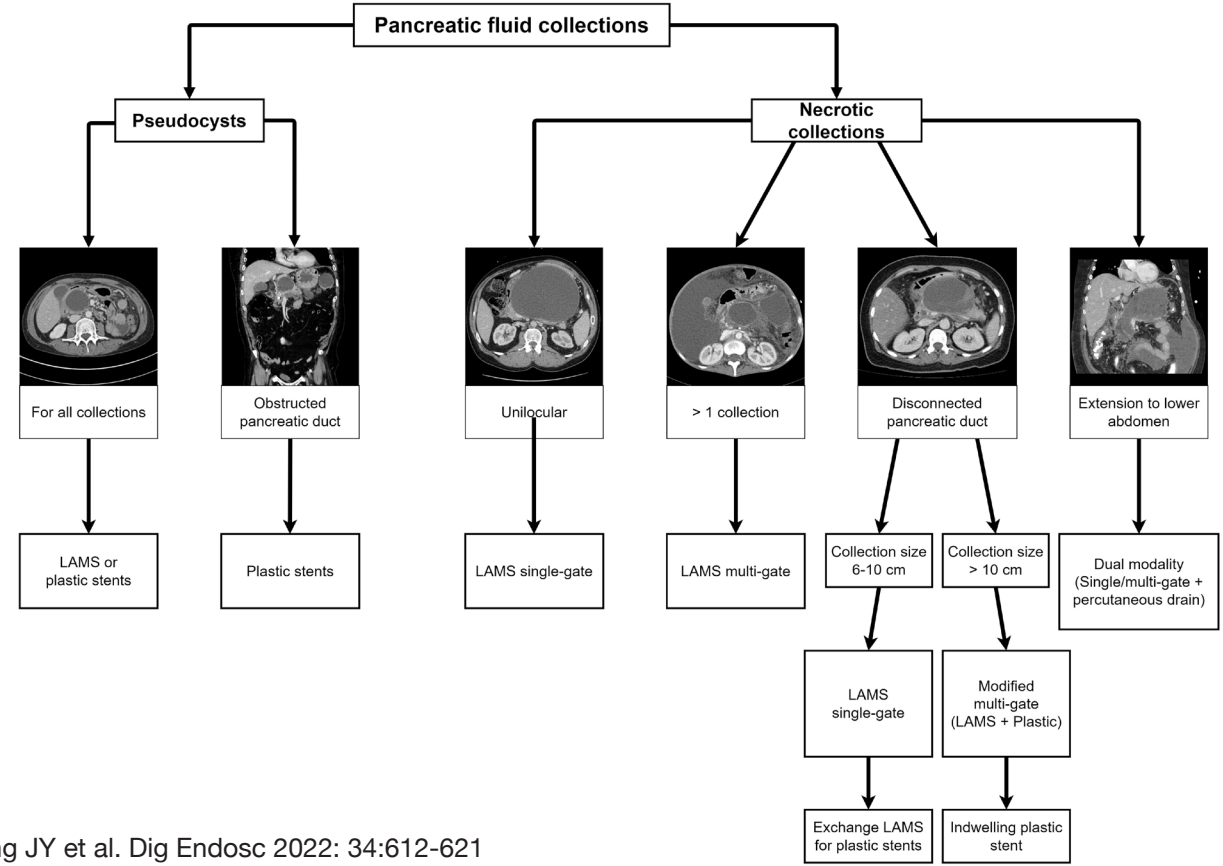
**Concern for traversing bile duct, pancreatic duct, varices/vasculature, small uncinate cyst. TTNB = through-the-needle biopsy; nCLE = needle based confocal laser endomicroscopy*

Recommend Procedural Techniques to Achieve Optimal Overall Outcomes for EUS-guided FNB of Solid Pancreatic Masses

Needle Type	Best Cellularity	Best Diagnostic Accuracy	Best Overall Outcome (Specimen)
Reverse-bevel	Stylet retraction = suction	Suction	Suction
Menghini-tip	No suction = stylet retraction = suction	Suction	Suction
Franseen	Stylet Retraction	Stylet retraction = suction	Stylet retraction
Fork-tip	No suction = stylet retraction	Stylet retraction = suction	Stylet retraction

Adapted from Bang JY et al. Clin Gastroenterol Hepatol. 2021 April; 19(4):825-835 e7

Orlando Protocol Endoscopic Management of Pancreatic Fluid Collections



Bang JY et al. Dig Endosc 2022: 34:612-621

Celiac Plexus Interventions

Neurolysis for Pancreatic Cancer

- 19 or 22G needle
- 10 ml of 0.25% Bupivacaine
- 20 ml of dehydrated (98%) alcohol
- 5 ml of Normal Saline

Block for Chronic Pancreatitis

- 19 or 22G needle
- 10 ml of 0.25% Bupivacaine
- 80mg of Triamcinolone in 2 mls
- 5 ml of Normal Saline

Necrosectomy: Steps and Tools

LAMS selection

- 20 mm LAMS – facilitate access to the necrotic cavity at index procedure without need for dilation.
- All other LAMS – dilation to 15mm at index procedure is required to access the necrotic cavity.

Steps

- Debridement – Hot snares only for adherent debris; cold snares for other debris; wide-jaw alligator forceps.
- Extraction – Use cap-fitted large channel gastroscope. The debris is drawn into the cap using snares and by application of suction.
- Irrigation – use saline to irrigate intra-procedurally; 3% hydrogen peroxide mixed with saline, 1:4, may be flushed at the end of procedure and then suctioned off to “sterilize” the cavity. However, peroxide injection must be performed only at the end of the procedure as the effervescence obscure endoscopic view. Peroxide injection must not be carried under high pressure as soilage of peritoneal cavity causes severe pain that may require a peritoneal washout.

How to make a smear?

1. Express one drop of material onto a slide slightly below the frosted end.
2. Pick up the slide with your nondominant hand, holding the frosted portion with your thumb and index finger.
3. With your dominant hand, pick up a clean slide, designated “the spreader slide” by the frosted end and position it perpendicular to the slide with the droplet.
4. Gentle press the middle of the spreader slide onto the droplet and allow for the droplet to spread by diffusion. Then quickly pulled the spreader slide along the surface of the “non-spreader” slide maintaining even pressure and contact until an ovoid shaped smear is created.

How to make a touch imprint?

1. Express aspirated or biopsied material onto a slide.
2. Identify firm or contiguous non-bloody or mucoid “core” fragments (typically tan-yellow or pink).
3. Pick up “core” fragment and gentle dab onto slide allowing for the superficial cells to adhere.
4. Do not attempt to smear slide or “core” fragments. This may lead to uninterpretable “thick” slides and loss of valuable diagnostic material.
5. After gently dabbing the slide a few times, transfer the “core” fragment to a specimen container for cell block (histologic) processing.

	Smear	Touch Imprint Cytology (TIC)	Notes
FNA	✓		Most lesions that can be sampled with a 25G, 22G, or 19G aspiration needle can be smeared without creating thick uneven smears.
FNB or SOC Biopsy **SOC = Single Operator Cholangioscopy**	✓	✓	Semisolid lesions that contain firm tissue fragments and tissue fluid (cellular aggregates and blood) can be smeared and the large firm fragments can be evaluated by touch imprint cytology and subsequently submitted for cell blocks.
Fibrotic or Calcified Lesions		✓	Firm GISTs, leiomomas, sarcomas, or fibrotic lesions (AIP, chronic pancreatitis) and firm desmoplastic adencar\ cinomas may be difficult or impossible to smear without compromising the tissue. TIC is recommended.
Epithelial Lesions	✓	✓	

Technical Factors that Compromise or Limit Microscopic Evaluation	
Delayed Transfer of Material from Needle	Coagulated or clotted blood obstructs the needle, preventing expression of possible diagnostic material, and yields excessively dense material which may compromise or limit cytologic evaluation
Smearing Excessive Material on One Slide	Excessive material creates overly thick smears and does not allow for enough light to be transmitted through the tissue fragment for proper microscopic evaluation.
Smearing Too Hard	Smearing with gentle pressure creates the desired monolayer; smearing too firmly creates crushed artifact that may compromise or limit interpretation.
Touch Imprint Cytology (TIC) Too Hard	Pressing the tissue fragment too hard or too extensively along the slide may consume the tissue fragment, lead to thick uninterpretable slides, and cause significant crush (distortion) artifact compromising the both cytologic and histologic diagnoses.

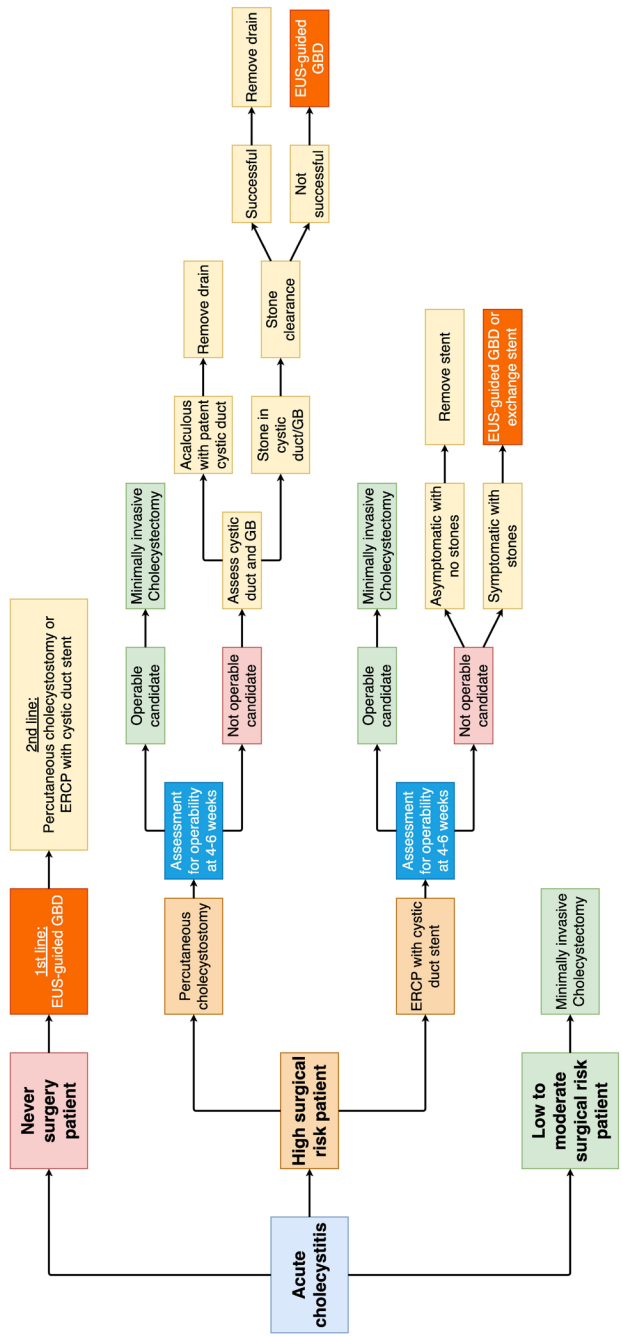
Various Utilizations of Aspirated Smears and Touch Imprint Slides	
Air-dried smears and slides	Smears are typically air-dried for ROSE and subsequently stained with a modified Giemsa-Wright (Romanowsky type statin), e.g. Diff-Quik, Richard Allen Three Step Stain, etc.
Immediate Fixation	Smears and TIC slides are not allowed to air-dry but instead are immediately submerged in 95% ethanol or sprayed with a fixative for off-site evaluation. Immediate fixation for Papanicolaou staining is excellent for nuclear details.
Molecular Testing	Mutational analysis and in situ hybridization can be performed on smears and TIC slides, if necessary.

Collection Media and Ancillary Testing	
Formalin	The standard solution is 10% neutral buffered formalin. Formalin cross-links the proteins without affecting the antigenicity. Therefore, it does not negatively affect IHC analysis. Overall, formalin is excellent for fixation, but penetrates the tissue rather slowly.
Alcohol based Solutions (CytoLyt and Spray Fixatives)	Alcohol (methanol and ethanol) based solutions penetrate cells rather rapidly and preserve good nuclear detail. CytoLyt is a methanol based buffered transport media. It lyses RBCs and dissolves mucus, thereby minimizing obstructing artifact.
Normal Saline	Saline can be used for short-term specimen transportation to the laboratory. If a delay in transportation is anticipated, refrigeration will typically maintain specimen viability for 24-72 hours.
Transport	Media Laboratories may use various transport media including Hank's media, RPMI, or saline for flow cytometry or microbiology cultures.

Technical Factors that Compromise Specimen Preservation	
Delayed or No Fixation	The lack of fixation in a timely manner may induce cellular changes that can compromise microscopic evaluation.
Immediate Fixation	The lack of proper fixation may induce cellular change (secondary to pH, cellular metabolism enzymatic activity, and the presence of bacteria and microorganisms) that can compromise microscopic evaluation.
Molecular Testing	Formalin is not ideally used for cytologic processing and may inhibit cell button formation, consequently leading to an unsatisfactory cell block. Also CytoLyt and formalin should never be used for flow cytometry specimens or microbiology cultures which require viable cells.

IHC and Molecular Markers for various lesions sampled by EUS-FNA	
GIST	DOG-1, CD34, CD117/c-kit, vimentin, PDGRF-a, BRAF
Neuroendocrine	Chromogranin, Synatophysin (various hormones – VIP, Glucagon, Somatostatin, Insulin, Gastrin, etc.)
Solid Pseudopapillary Tumor	Beta-catenin, CD10, CD56, Vimentin, Pro- gesterone receptor, trypsin, chymotrypsin
Autoimmune Pancreatitis (Lympho- plasmacytic Sclerosing Pancreatitis)	IgG4
Pancreatoblastoma	CEA, mucin, keratin
Hodgkin Lymphoma	CD15, CD30, PAX5, EBV
B-cell Lymphoma	CD19, CD20, CD79a, Flow Cytometry
Pancreatic Adenocarcinoma	S100P, Maspin, Loss of SMAD4, CA19-9, Claudin18,
Cholangiocarcinoma	CEA, CK7, CK19, Mucin
Hepatocellular Carcinoma	Hepar-1, Glypican 3, AFP
Colorectal Carcinoma	CK20, CDX2
Pulmonary Adenocarcinoma	TTF1, Napsin A, PDL1, EGFR, Kras, ALK
Renal Cell Carcinoma	RCC, Vimentin, CD10, CAIX, PAX8
Gastric Signet-Ring Carcinoma	CEA, Mucin, CK7
Breast Carcinoma	GATA3, ER, PR, GCDFP-15, Mammoglo-bin
Acinar Cell Carcinoma	Amylase, Lipase, Trypsin, Chymotrypsin, BCL-10

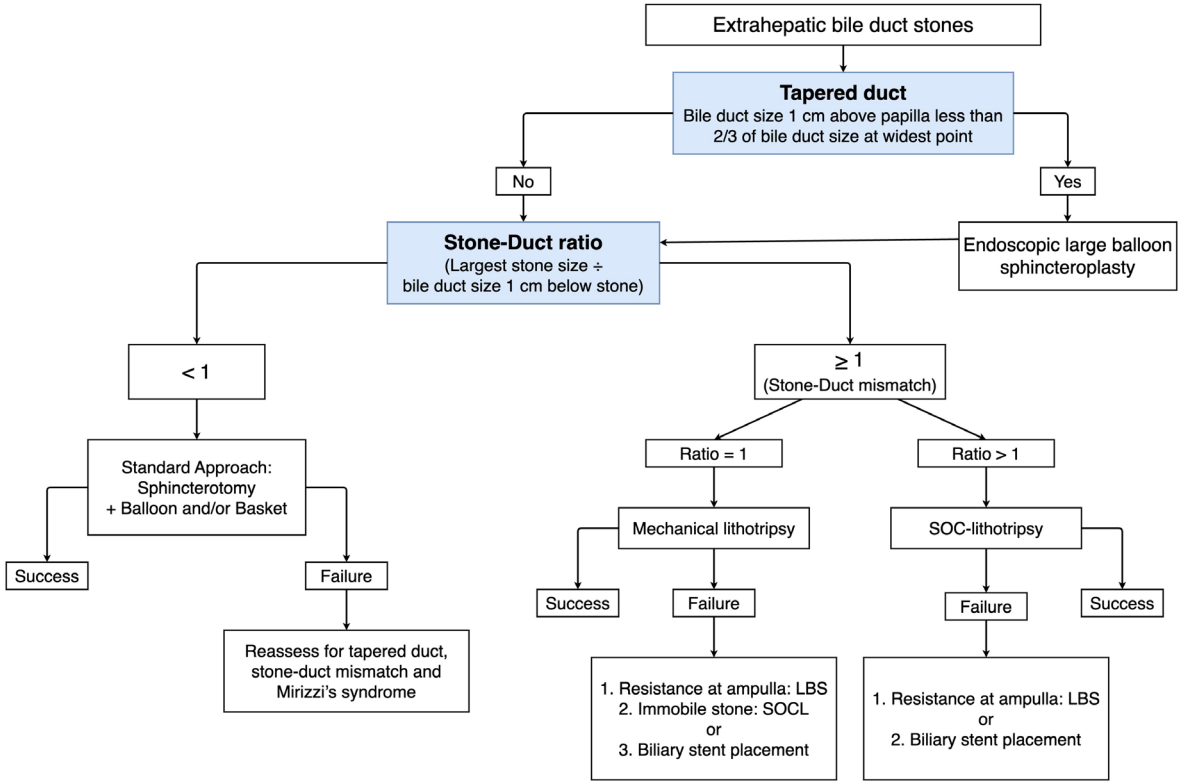
Orlando Proposal for EUS-guided Gallbladder Drainage in Acute Cholecystitis



Adapted from Bang et al. Gut 2024: 73(3) 395-397

ERCP

Protocol for Endoscopic Management of Bile Duct Stones



Adapted from Bang JY et al. Dig Endosc 2024; 36(7): 825-833.

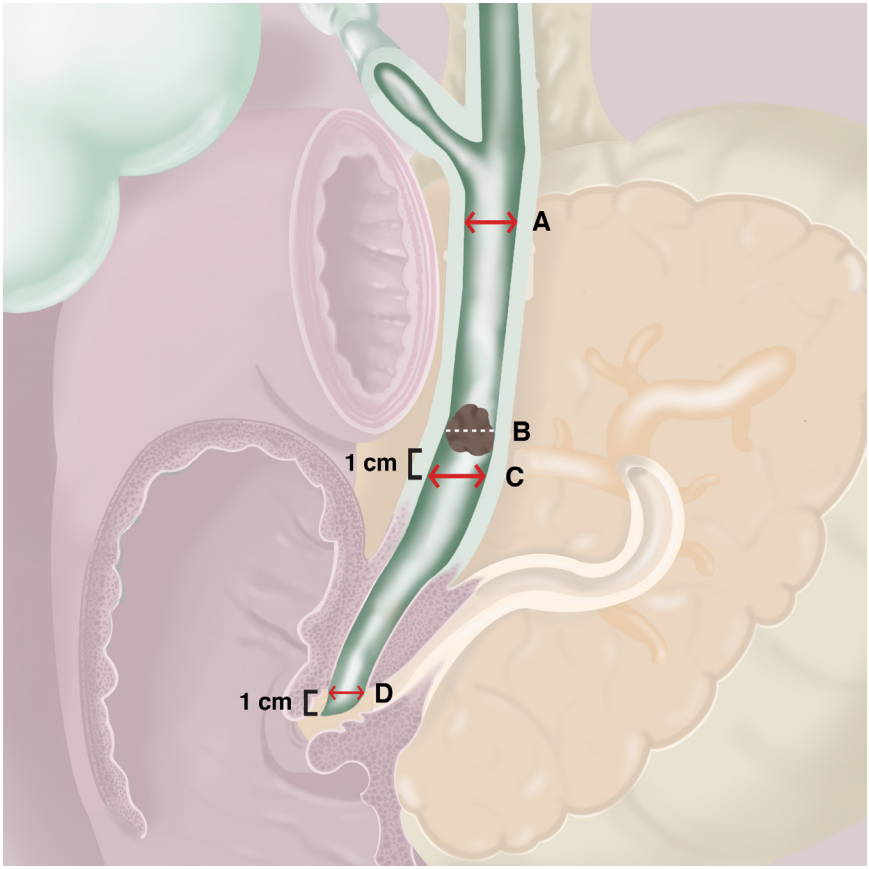
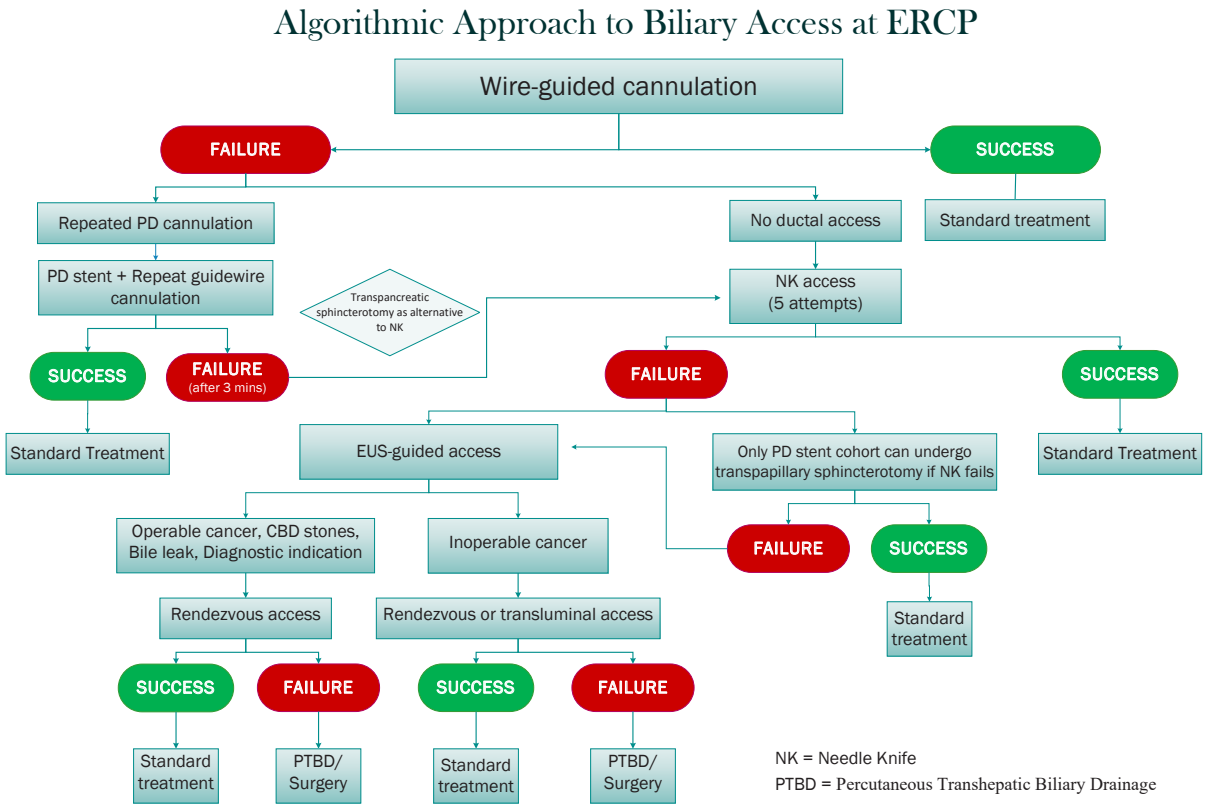


Illustration depicting areas of measurement for stone size and bile duct diameter. (A) Largest bile duct diameter. (B) Largest stone size. (C) Bile duct diameter 1 cm below the stone. (D) Distal bile duct diameter 1 cm above the ampullary orifice.



Bang JY et al. Dig Endosc 2023

Quick Facts

Difficult bile duct stones: Tips for successful ductal clearance

Stone size > diameter of distal bile duct

- Lithotripsy: Mechanical or cholangioscopy-guided laser/EHL
  - Do all fragmentation before removing stones
  - Flush with sterile saline to clear small remaining stone fragments

Intrahepatic stones

- Use a curved guidewire to access specific branches
- Balloon dilate strictures prior to stone removal
- Check for complete removal of stones with cholangioscopy
- Use fluoroscopy in multiple projections to confirm complete stone removal

Impacted stones

- Use cholangioscopy-guided laser/EHL

Stones located above the stricture

- Lithotripsy: Mechanical or cholangioscopy-guided laser/EHL
  - Do all fragmentation before removing stones
  - Flush with sterile saline to clear small remaining stone fragments
- Consider placement of a fully covered metal stent for 3-4 weeks in a dilated bile duct to allow small stone fragments to pass following lithotripsy and hence ensure complete stone removal

Impacted basket: How to disimpact

- Push the basket into the middle of the bile duct to release the stone
- Fragment the stone within the basket using
  - Soehendra lithotriptor (requires a lithotriptor-compatible basket) or
  - Cholangioscopy-guided laser/EHL
- Gentle balloon dilation of the bile duct beside the basket
- Insert a plastic stent alongside the basket to allow the edema to decrease, and then attempt stone/basket removal in a few days (as a last resort)

Cholangioscopy-guided biopsies: Practical tricks for maximizing yield

- Get enface with the target if possible
- For target located in the periphery of visual field
  - Turn open forceps into the target and push into the target with forceps/scope
- Perform 6-8 bites
- Target tumor vessels if visible

Hilar stenting using metal stents: Technical tips

- Dilation! Dilation! Dilation of the stricture segment is critical!
- If the bile duct is not significantly dilated, place an 8 mm diameter uncovered metal stent
- Place two guidewires side by side prior to stent deployment
- If possible ensure that the distal ends of both stents are protruding from the papilla to allow easy access to both left and right hepatic ducts at a later time

Accessories for pancreatic duct access

- Normal pancreatic duct
  - Tapered tip catheter with 0.018 inch guidewire
- Chronic pancreatitis or pancreatic cancer
  - Sphincterotome with 0.025/0.035 inch coil-tip guidewire
- Avoid overfilling the pancreatic duct and side branches
  - Cold forceps avulsion followed by tissue ablation with snare tip and soft coagulation settings
  - Hot forceps avulsion can also be used; ensure tissue is pulled away from the muscle layer prior to evulsion

Perforation closure

- First learn to recognize the perforation!
  - Target sign indicates resection of the muscularis propria and MUST be closed!
  - Hemoclips can be used when target sign is present Rotational clips are preferred due to ease of use
- Full thickness perforation
  - Over the scope clips (OTSC) devices or endoscopic suturing devices can be used (for any site) OTSC if size of perforation £ 1 cm Suturing device if > 1 cm

EMR

Injection medium

Content:

- 500 mL of Voluven (6% hydroxyethyl starch in 0.9% sodium chloride)
  (Normal saline is an acceptable alternative to voluven)
- 5 mL of indigo carmine
- 1 mL Epinephrine 1: 100,000
- 9 mL of the voluven/indigo carmine solution is mixed with 1 mL of 1:100,000 epinephrine in a 10mL syringe

Choice of snares

- Oval-shaped snares are most commonly used. Stiff snares are better for non-granular flat polyps
- 1.5-2.5 cm snares are most commonly used and ideal for performing routine EMR
  - Larger the snare, greater the risk of drawing up the muscularis propria and causing a perforation
- If submucosal fibrosis is present, use small or monofilament snares and suction polyp into the cap prior to closing the snare

Practical tips

- Begin with the most difficult area for resection
- Decompress the lumen prior to snare closure
- Close the snare slowly and push the base of the snare into the base of the resection area
- Ensure that the snare is closed tightly
- Cut through the polyp quickly
- Polyp remnants
  - Consider cauterizing the margins post-resection using tip of the snare and soft coagulation

- Cold forceps avulsion followed by tissue ablation with snare tip and soft coagulation settings
- Hot forceps avulsion can also be used; ensure tissue is pulled away from the muscle layer prior to evulsion

Perforation closure

- First learn to recognize the perforation!
  - Target sign indicates resection of the muscularis propria and MUST be closed!
  - Hemoclips can be used when target sign is present
  - Rotational clips are preferred due to ease of use
- Full thickness perforation
  - Over the scope clips (OTSC) devices or endoscopic suturing devices can be used (for any site)
  - OTSC if size of perforation £ 1 cm
- Suturing device if > 1 cm

ESD

Injection medium

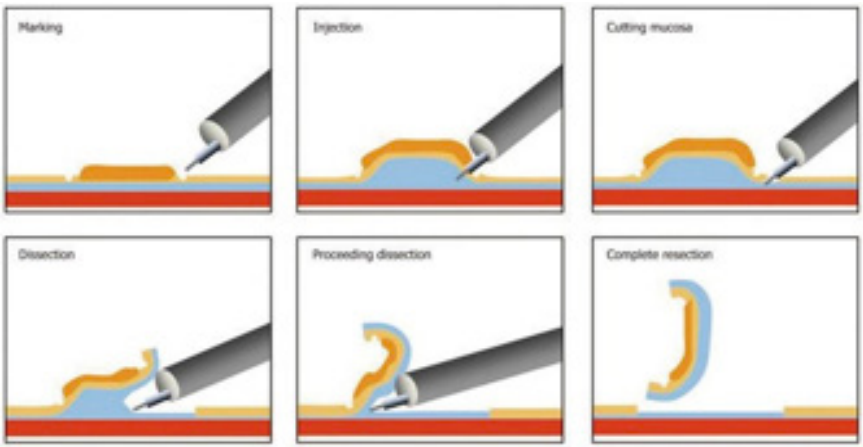
- Voluven mixed with indigo carmine

Accessories

- Endoscopic cap
- Injection needle for initial lifting of the submucosal space
- Dual knife or hybrid knife for marking the lesion, mucosal incision and submucosal dissection
- Coagraspers for hemostasis and cauterization of large blood vessels
- Endoscopic clips for closure of any visible muscle injury

Practical tips

- Delay circumferential mucosal incision for as long as possible in order to avoid rapid leakage of the injection solution from the submucosal space
- Begin mucosal incision and submucosal dissection in the most difficult areas
- Submucosal dissection can be easier in the retroflexed position, especially in the stomach and rectum
- Cauterize larger blood vessels using coagraspers when visualized to minimize bleeding during the procedure



Peroral Endoscopic Myotomy (POEM)

Injection solution

Normal saline mixed with indigo carmine

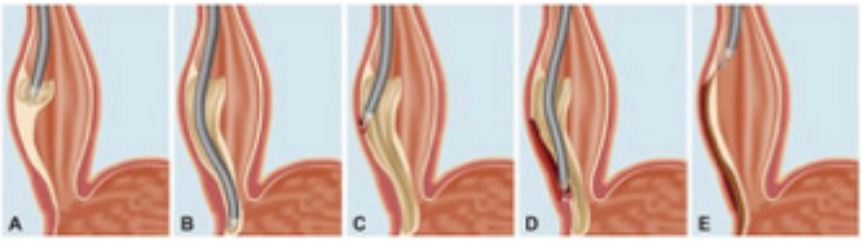
Accessories

- Endoscopic cap
- Injection needle for initial lifting of the submucosal space prior to mucosal incision
- Hybrid knife for mucosal incision, tunneling and myotomy. The triangle tip knife is also commonly used.
- Coagraspers for hemostasis and cauterization of large blood vessels
- Endoscopic clips for closure of the mucosal incision site

Practical tips

- Administer broad spectrum antibiotics pre-procedure and for 5 days post-procedure
- Inject 10-20mL of the injection solution into the submucosal space prior to mucosal incision and perform a deep mucosal incision, as this will make entry into the submucosal space as easy as possible
- There is increasing evidence that there is no significant difference in treatment outcomes between the anterior and posterior techniques
- Unlike with ESD, superficial injury to the circular muscle during the tunneling process is permitted/encouraged as this can make myotomy more efficient
- Cauterize larger blood vessels using coagraspers when visualized to minimize bleeding during the procedure
- Full thickness myotomy can be safely performed and

preferred in the distal esophagus/GE junction



Hemostasis

Cyanoacrylate Injection for Variceal Treatment

Materials needed

- Therapeutic gastroscope
- Cyanoacrylate 0.5mL vials
- Three to five, 25G needles with 5mm tip
- Sterile water
- Silicone
- 3mL syringes
- Transparent cap for gastric cardia varices treatment
- Eye protection

Preparation

- Lubricate gastroscope working channel and scope tip with silicone.
- Draw 1mL of cyanoacrylate into a 3mL syringe and repeat for a total of X syringes. Draw 3mL of sterile water into a 3mL syringe and repeat for a total of X syringes. Draw 10mL of sterile water into 2-3, 10mL syringes.

Procedure

- Attach 3mL water syringe to 25G needle and prime with sterile water; measure dead space. Remove water syringe and connect cyanoacrylate syringe. Puncture varix and inject 1mL cyanoacrylate.
- Switch to water syringe and inject 1mL water.
- Remove needle from varix and needle is quickly retracted.
- Flush injector into gastric lumen with 2-3 mL sterile water from 10mL syringe. Repeat injection as needed.

- If repeat injection is performed:
  - Remove gastroscope with injector still in working channel.
  - Check injector distal end; if coated with cyanoacrylate then cut the proximal end of the injector near the handle and remove by pulling out from the scope tip.
  - Lubricate gastroscope tip and working channel with silicone.
  - Reinsert gastroscope and repeat procedure.

Technical tips

- Do not inject >2mL in a single varix at one time. Do not inject >3 sites in a single session. Do not exceed a total volume of 5mL per session.
- Follow-up.
- Repeat EGD and glue injection within 1-2 weeks.
- Surveillance is recommended at 2, 6 and 12 months after variceal obliteration. Repeat treatment as required.

Hemospray

- Hemospray is a powder (TC-325), which when sprayed onto the site of an active GI bleed, absorbs water to form a physical barrier over the site of bleeding.
- It is currently approved for management of non-variceal upper GI bleeding.
- It is available in a special delivery system that contains a CO2 canister for spraying the powder directly onto the site of bleed via a 7Fr or 10Fr delivery catheter (that is in turn inserted into the working channel of the endoscope). Powder is deployed when a button is pressed on the delivery system.
- The delivery catheter should be positioned 1-2 cm from the site of bleeding. However, direct contact with the

bleeding site should be avoided in order to minimize the risk of catheter occlusion.

- The powder should be sprayed in short 1-2 second bursts until the entire area of bleeding is covered with powder and any active bleeding has stopped.

Notes