New trends in interventional endoscopy in pancreatobiliary and liver diseases

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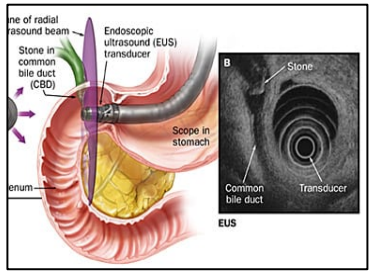
ALVARO CUNQUEIRO HOSPITAL

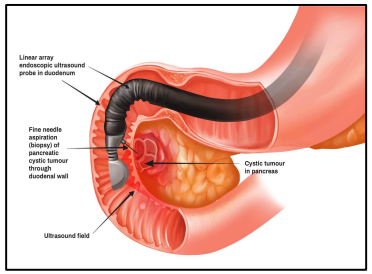
EUS EVOLUTION

80'S



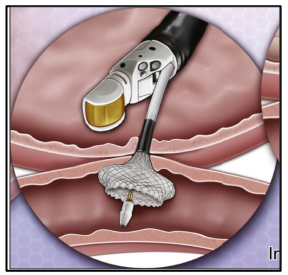
IMAGING

90'S



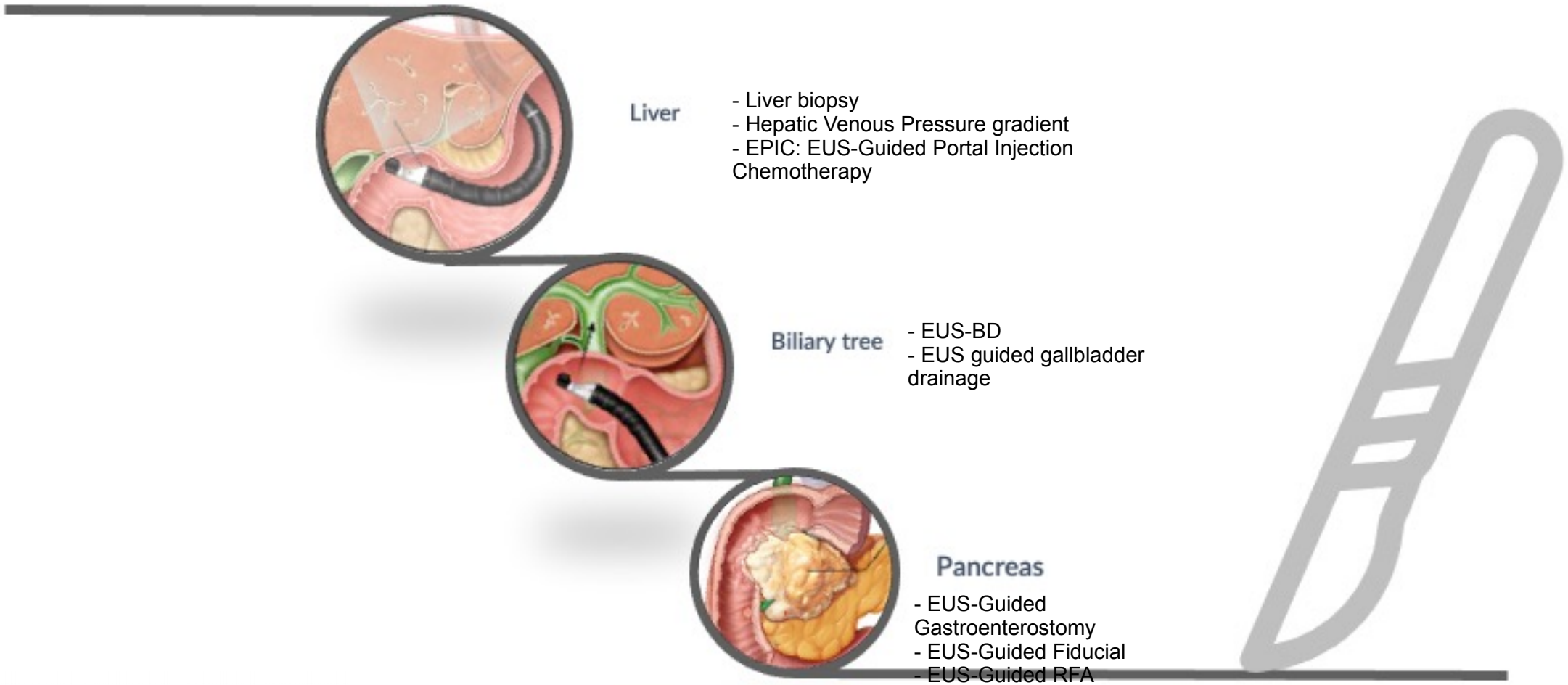
EUS-FNA

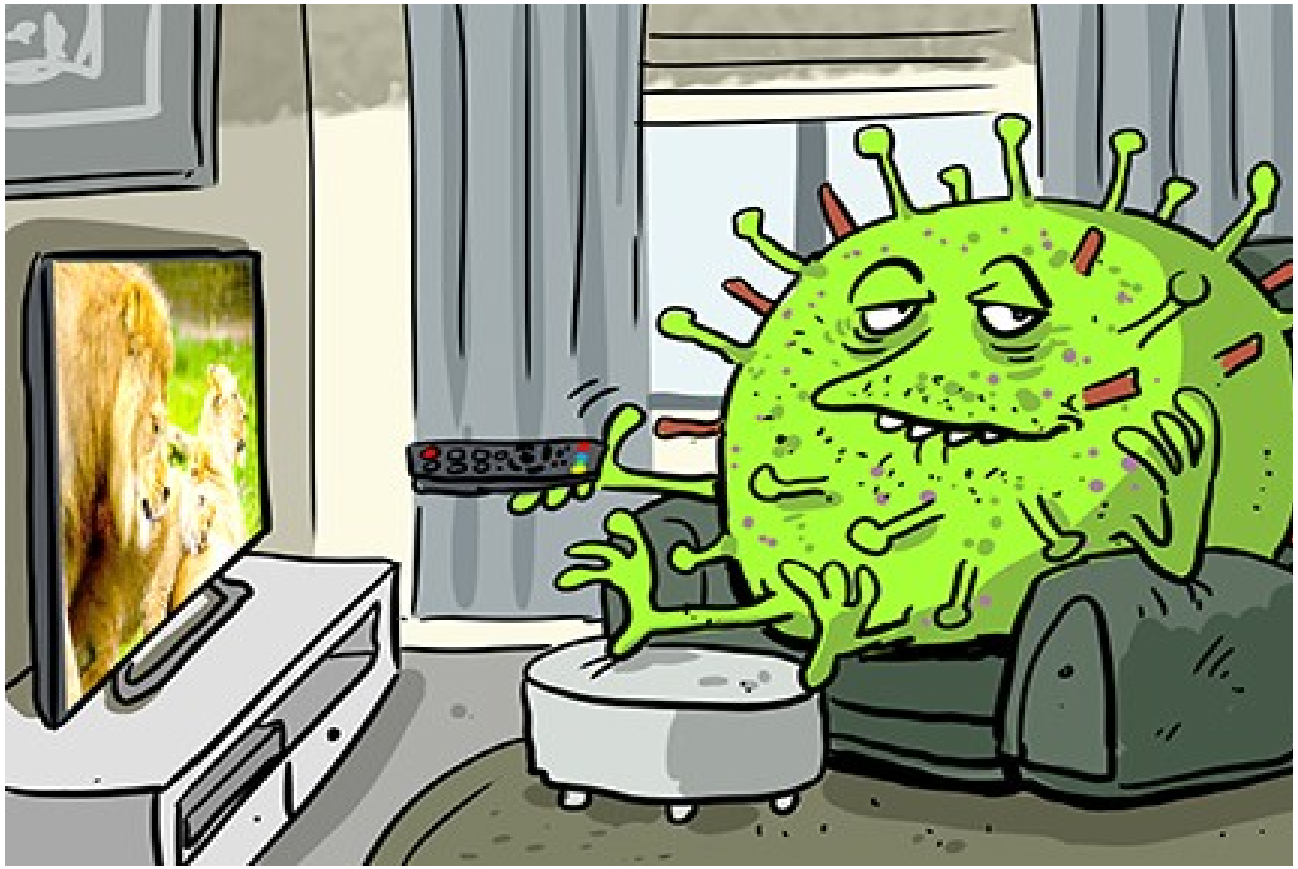
20'S



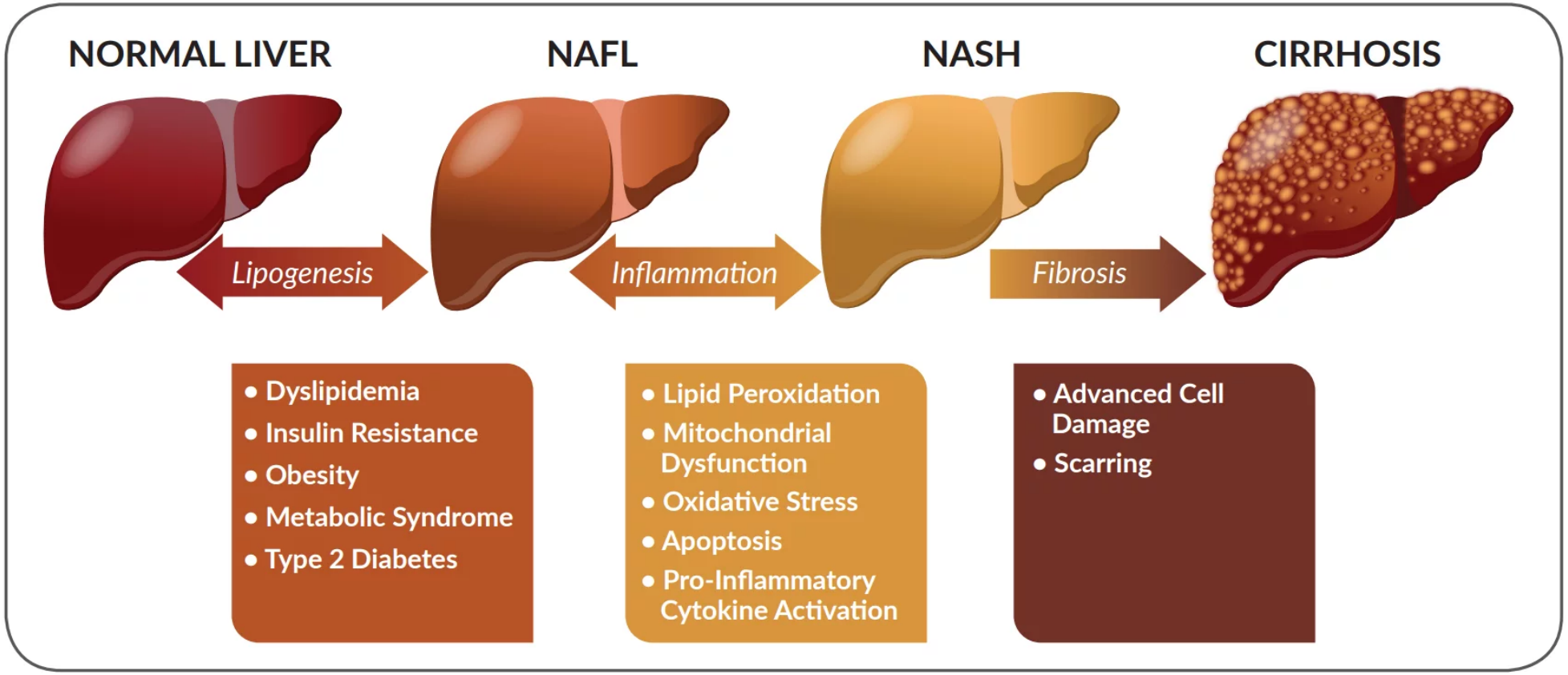
THERAPY

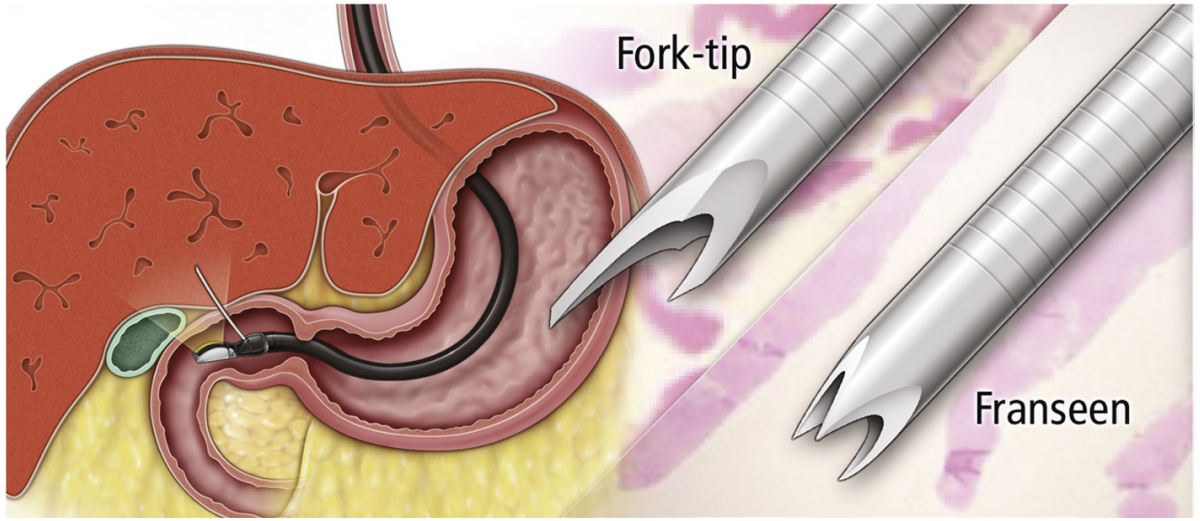
Endoscopic diagnosis and therapy of the Hepatobiliary and Pancreatic System





OBESITY


NORMAL LIVER
NAFL
NASH
CIRRHOSIS
Lipogenesis
Inflammation
Fibrosis
• Dyslipidemia
• Insulin Resistance
• Obesity
• Metabolic Syndrome
• Type 2 Diabetes
• Lipid Peroxidation
• Mitochondrial Dysfunction
• Oxidative Stress
• Apoptosis
• Pro-Inflammatory Cytokine Activation
• Advanced Cell Damage
• Scarring



EUS-Guided LIVER BIOPSY

EUS – liver biopsy: parenchymal diseases

Potential benefits

- Perform bilobar sampling under real-time
- Minimize risk of puncturing a large vessel or organs
- Patient comfort (sedation)
- Efficiency and convenience in patients who require liver biopsy and upper GI Endoscopy or EUS

J. Lariño Noia. ESGE days 2022

EUS – liver biopsy: parenchymal diseases

Efficacy and safety

Author/year	Study type	No patients	Needle type	Needle Brand	Diagnostic yie
Gleeson/2009	Retrospective	9	EUS-TB	Quickcore(QC)	100
Diehl/2015	Prospective cohort	110	EUS-FNA	Expect 19G	98
Sey/2016	Retrospective	75	TB vs FNB	QC vs Procore	83
Shah/2017	Retrospective	24	EUS-FNB	Sharkcore 19G	96
Shimizu/2018	Retrospective	44	EUS-FNB	Echotip 19G	100
Ching-Companioni 2018				dle	100
Mok/2018	Prospective crossover	40	EUS-FNA	Expect flex 19G	98
Patel/2020	Retrospective	135	TB vs FNB	QC vs Acquire/SC	65
Nieto/2020	Retrospective	420	EUS-FNB	Ac 19G vs SC 19G	100
Hashimoto/2020	Randomized crossover	22	EUS-FNB	Ac 19G vs SC 19G	100

ADVERSE EVENTS: 2.3%

Mohan et al; Gastrointest Endosc 2019

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EUS – liver biopsy: parenchymal disea
The importance of the sample adequacy

- Diagnostic yield: Specimen that allows the pathologist to make a diagnosis

SAMPLE ADEQUACY

AAS

✓Total specimen length > 20 mms
✓Complete Portal Triads (CPTs) > 10

AASLD POSITION PAPER Hepatology 2009

Liver Biopsy

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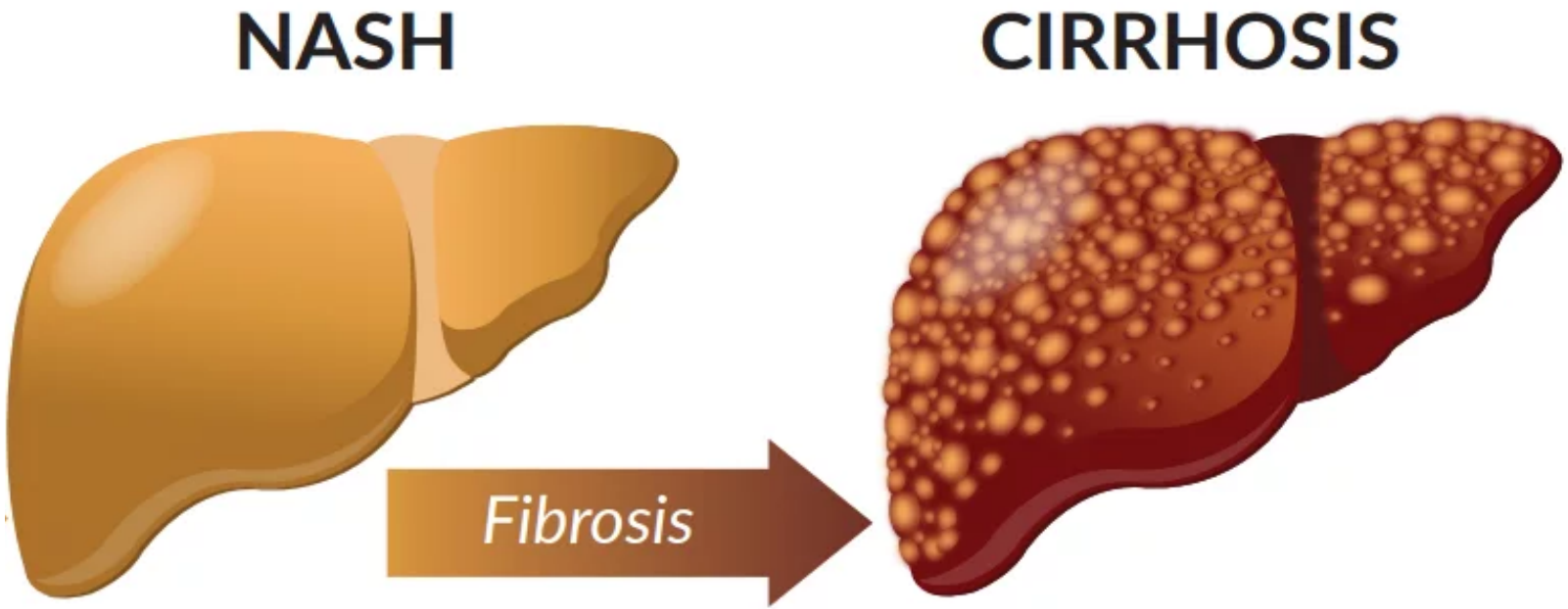
EUS – liver biopsy: parenchymal disease

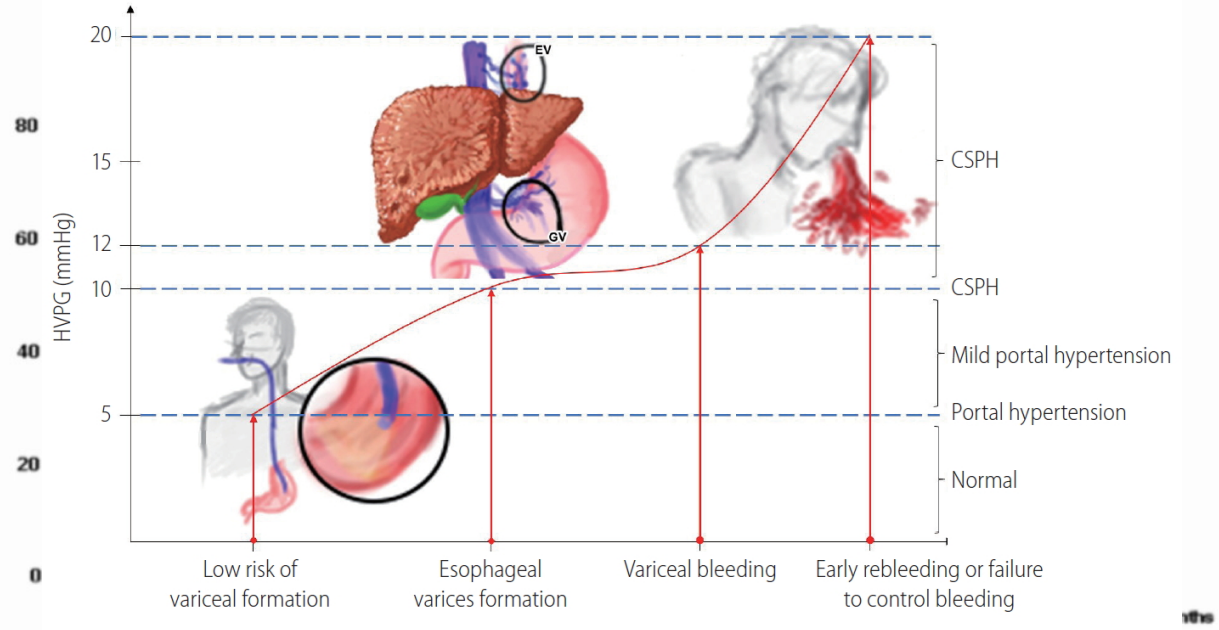
Comparition versus percutaneous biopsy

- 40 patients underwent liver biopsy:
  - EUS – FNB 19G Franseen needle (n=21)
  - Percutaneous 16G Trucut needle (n=19)
- Outcomes:
  - Primary: % of optimal specimenes (≥25 mms specimen length and ≥11 CP
  - Secondary: Adverse events, costs, procedure time…

J. Lariño Noia. ESGE days 2022


NASH
CIRRHOSIS
Fibrosis

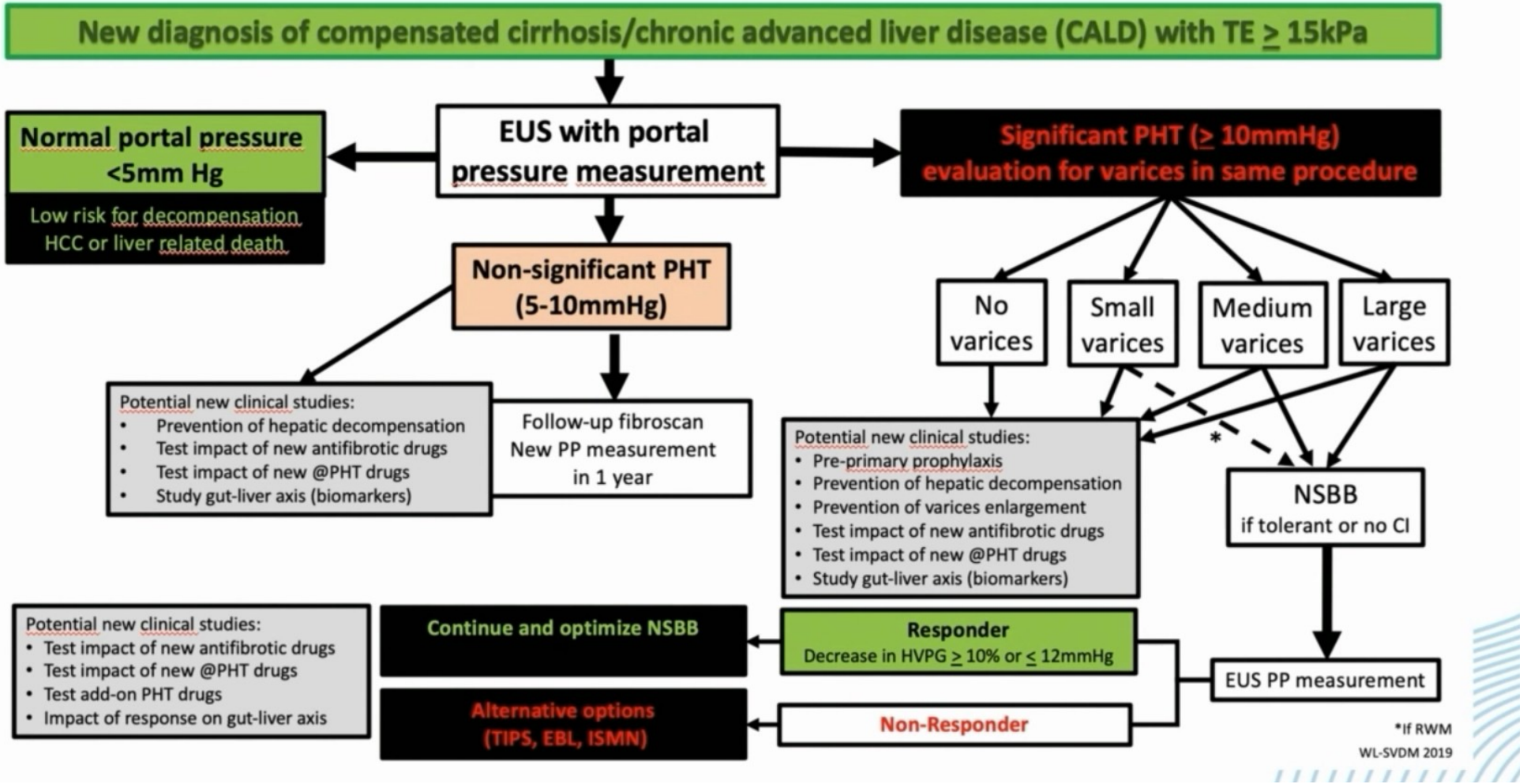
The value of early increased HVPG in predicting decompensation



Risk of varices development associated with increased HVPG

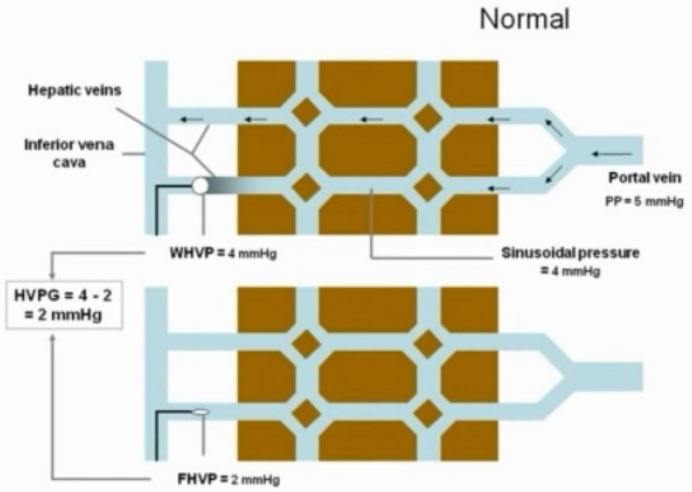
HVPG > 10mmHg is a strong predictor of decompensation in compensated cirrhotic patients without varices

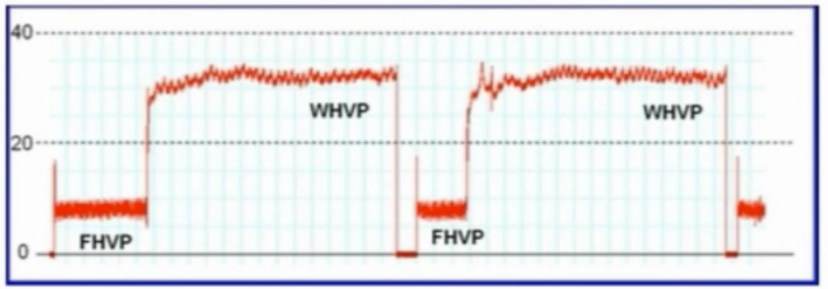
Potential future pathway: early risk stratification & monitor early intervention

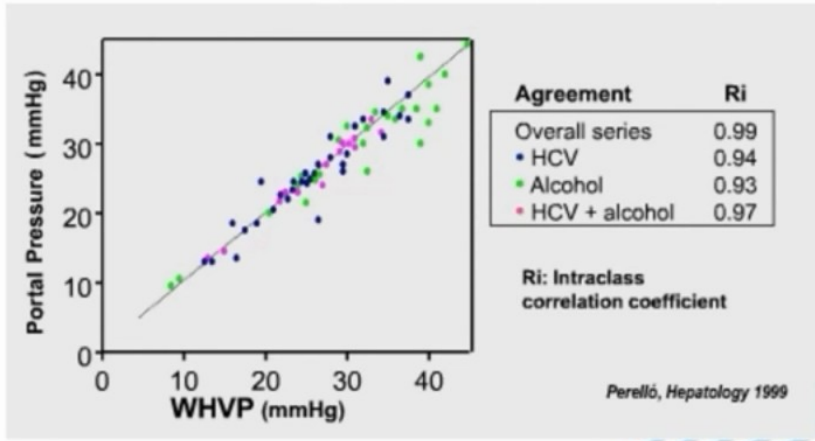


Hepatic Venous Pressure Gradient (HVPG)

Indirect portal pressure measurement through hepatic vein catheterisation

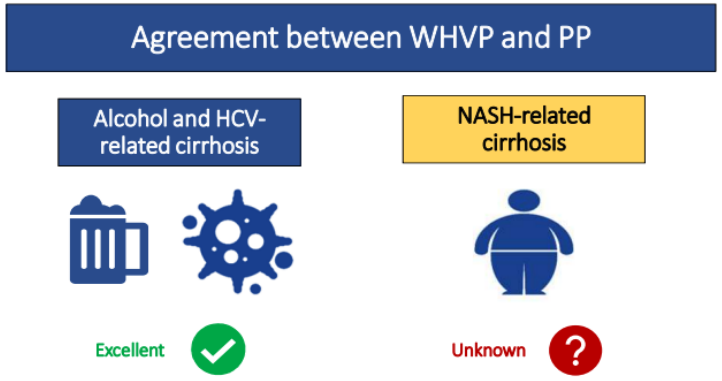


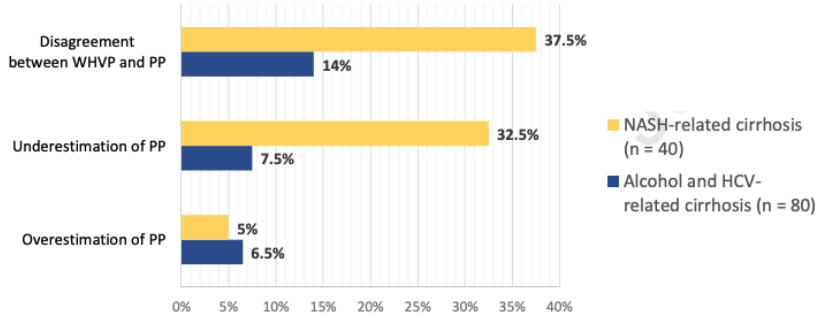




HVPG = WHVP – FHVP (Normal range 3-5mmHg)

Clinical need





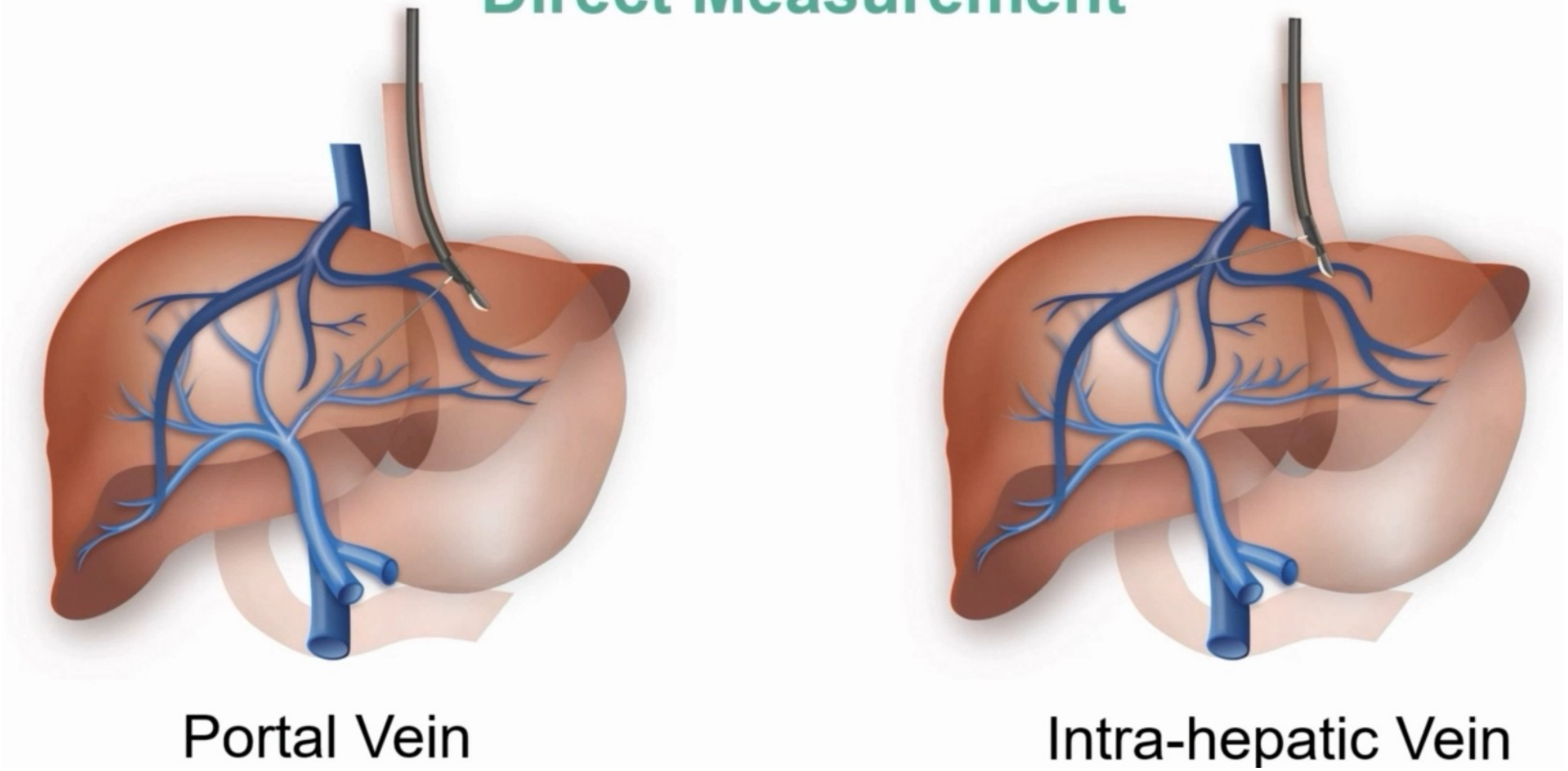
J Hepatol. 2021 Apr;74(4):811-818. doi: 10.1016/j.jhep.2020.10.003. Epub 2020 Oct 14.

Agreement between wedged hepatic venous pressure and portal pressure in non-alcoholic steatohepatitis-related cirrhosis

Conclusions: In patients with decompensated NASH cirrhosis, WHVP does not estimate PP as accurately as in patients with alcohol- or HCV-related cirrhosis, mainly because of PP underestimation. Further studies aimed to assess this agreement in patients with compensated NASH cirrhosis are needed.

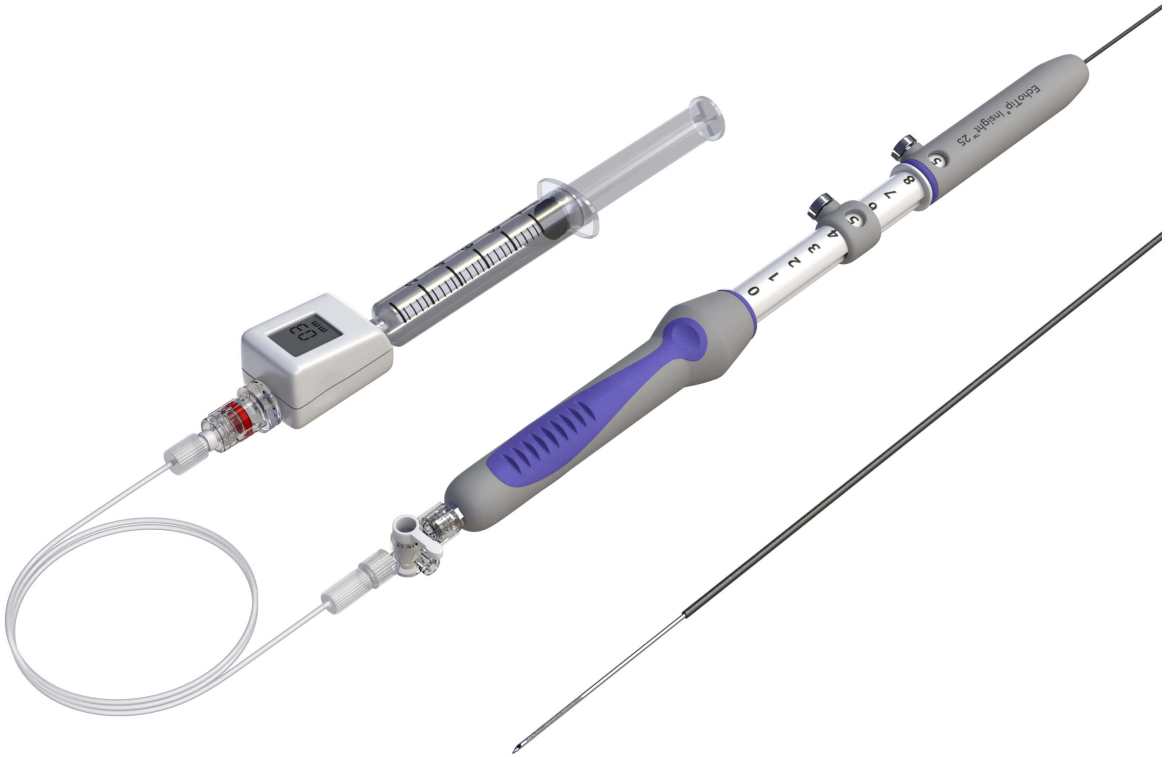
EUS-Portal Pressure Gradient

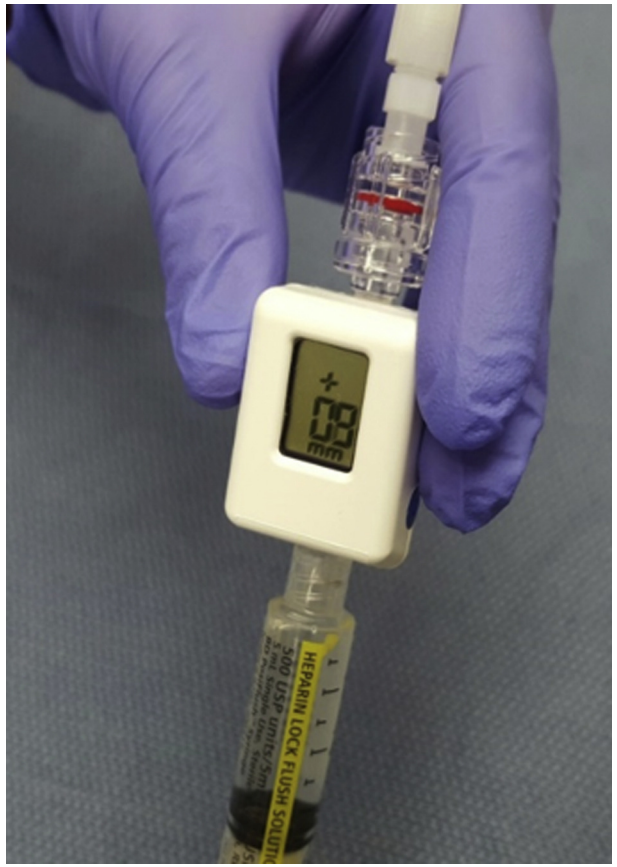
Direct Measurement



Portal Vein

Intra-hepatic Vein


EchoTip Ineight 25


HEPARIN LOCK FLUSH SOLUTION

EUS-guided portal pressure gradient measurement with a novel 25-gauge needle device versus standard transjugular approach: a comparison animal study

Jason Y Huang [1], Jason B Samarasena [1], Takeshi Tsujino [1], Kenneth J Chang [1]

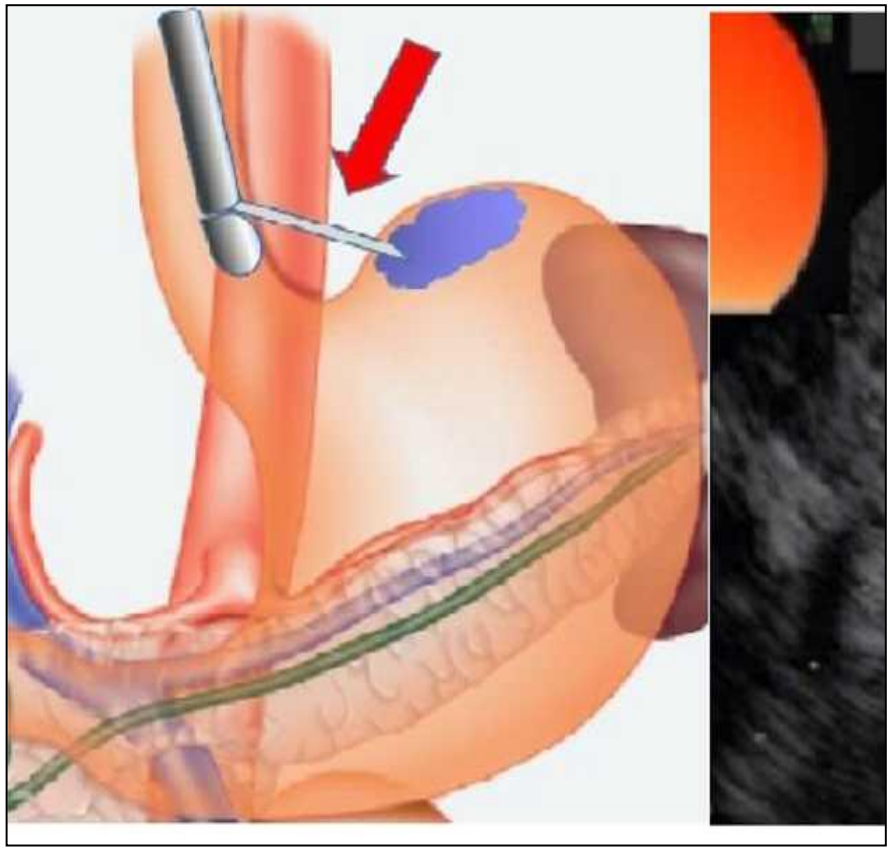
Affiliations + expand

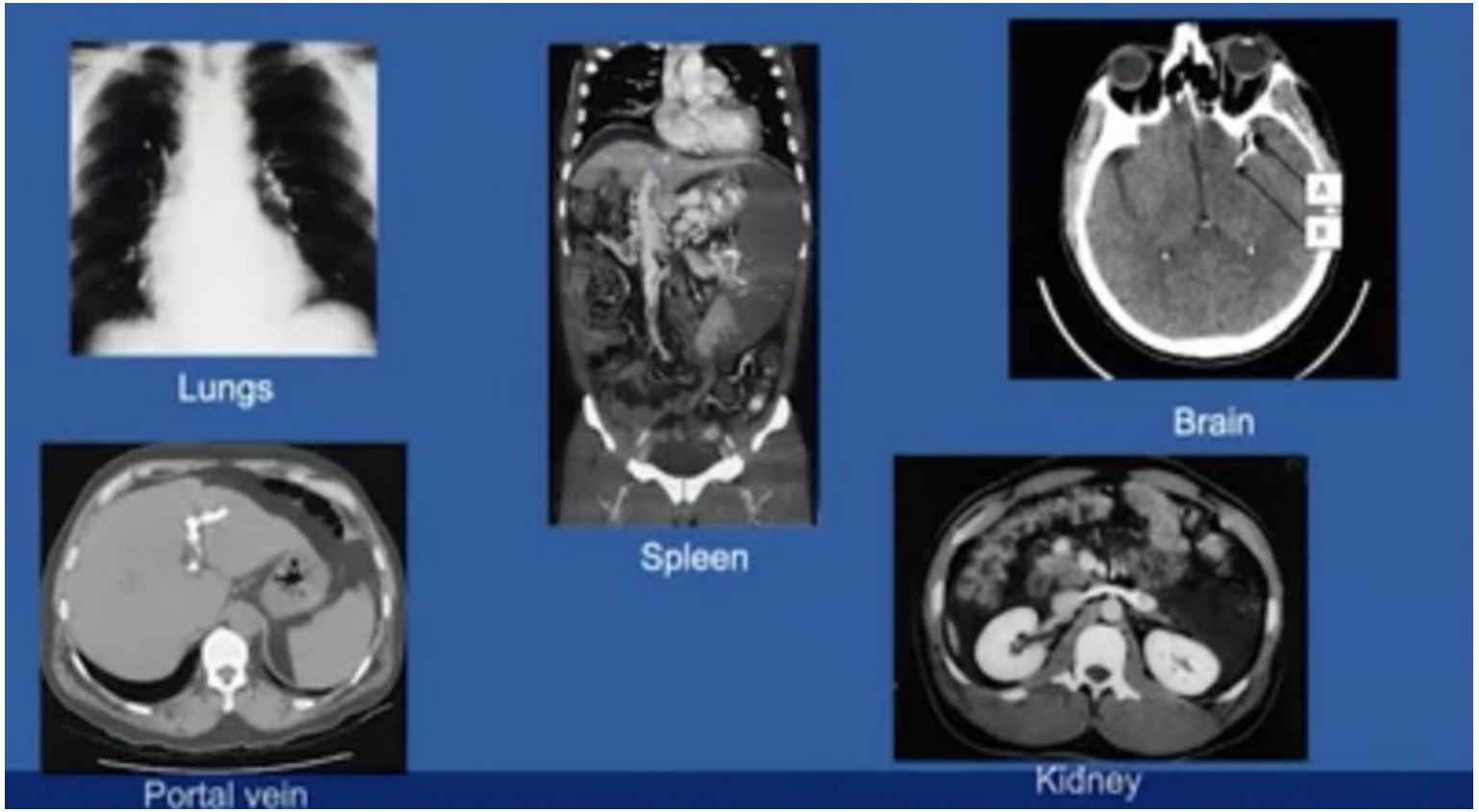
PMID: 26945557 DOI: 10.1016/j.gie.2016.02.032

Results: EUS identification, access, and manometry was successful in all targeted vessels. There was excellent correlation (R, .985-.99) between EUS and IR methods in all pressure ranges. No adverse event occurred.

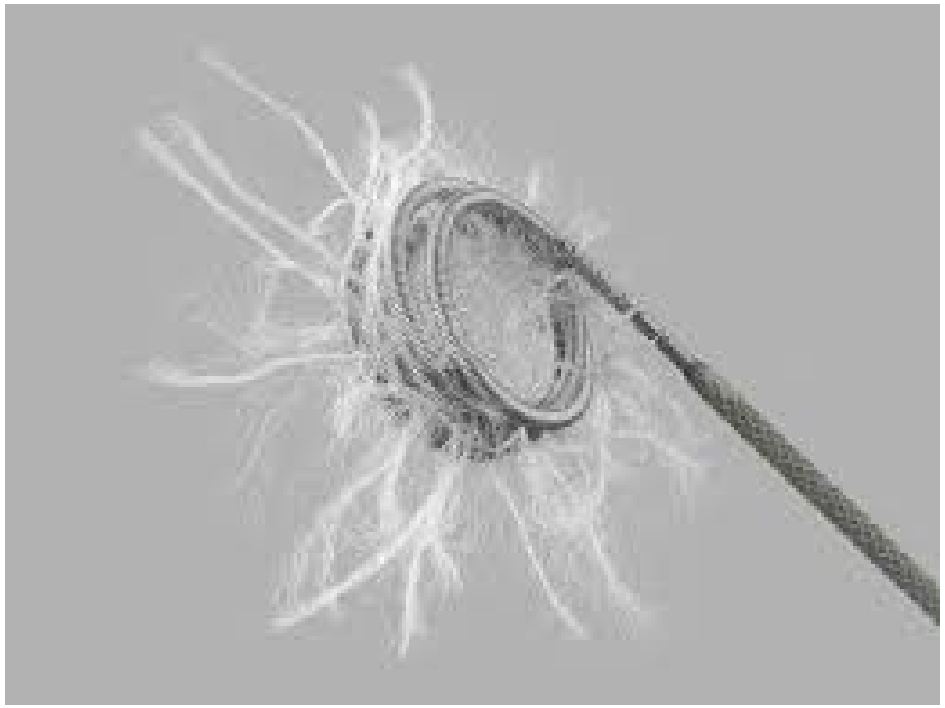
Conclusions: This novel technique of EUS-PPG measurement using a 25G needle and novel manometer was feasible and demonstrated excellent correlation with the standard transjugular method throughout low, medium, and high pressure ranges.

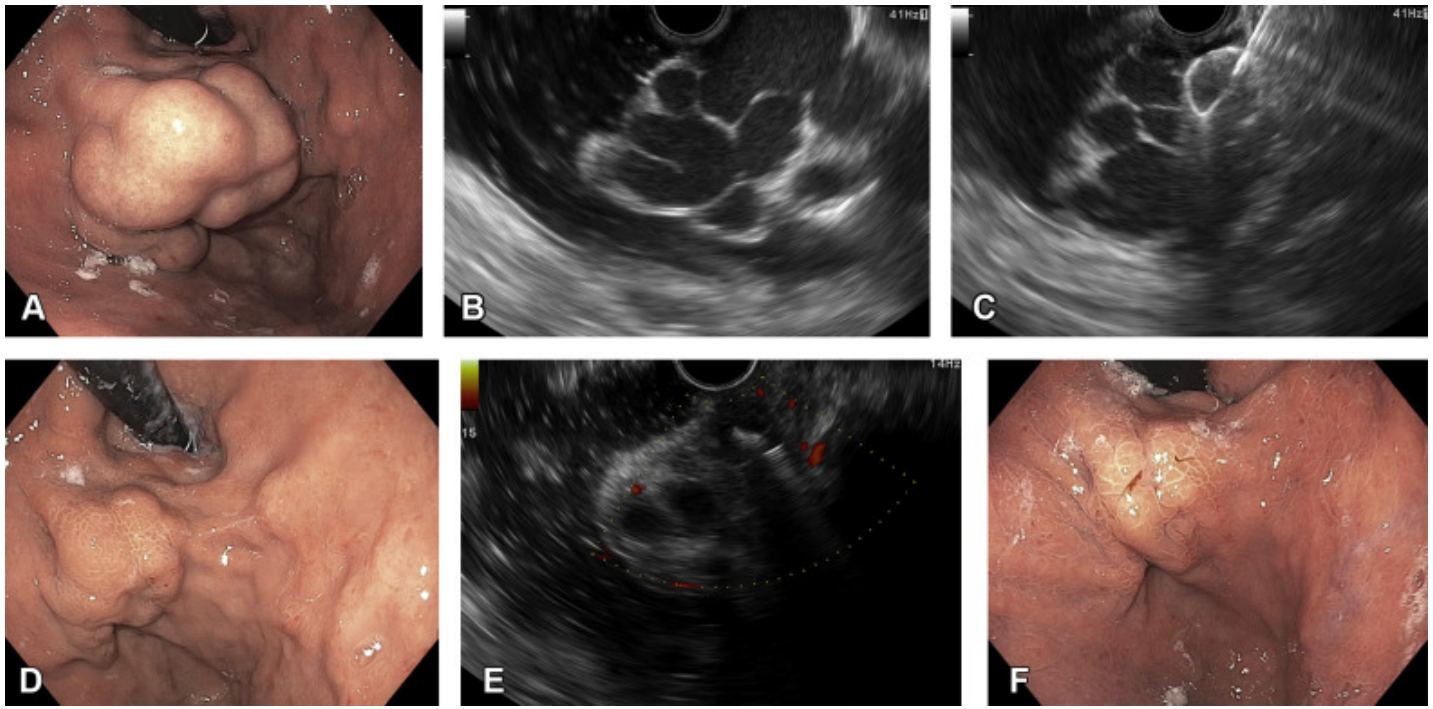
Endovascular therapy
Gastric variceal bleeding





Endovascular therapy
Variceal Bleeding





VARICEAL BLEEDING

GASTRIC VARICES

Main study: CYA +/- coils

- Retrospective n=152
- Recent bleeding 70%
- Technical success = 99%
  - ✓ Average number of sessions= 1.4
  - ✓ Average CYA volume= 2 ml
- Complete obliteration on Doppler = 93
  - ✓ 3 sessions for 25 patients
- Complications:
  - = 1% PE (not increased)
  - = 3% post embolization hemorrhage

Comparative studies

- *Retrospective study*: endo vs EUS - n=40
  - ✓ Recurrence 23% vs 8.8% ($p<0.05$)
  - ✓ No difference in complications
- *Multicenter study*: Coils vs CYA - n=30
  - ✓ No difference in efficacy or recurrence
  - ✓ Fewer complications: 9% vs 57% ($p<0.01$)
- *Randomized study*: coils + CYA vs CYA
  - ✓ No difference
- *Meta-analysis*
  - ✓ Combined approach (coils + CYA) = better technical/clinical and safety outcomes

Endovascular therapy:

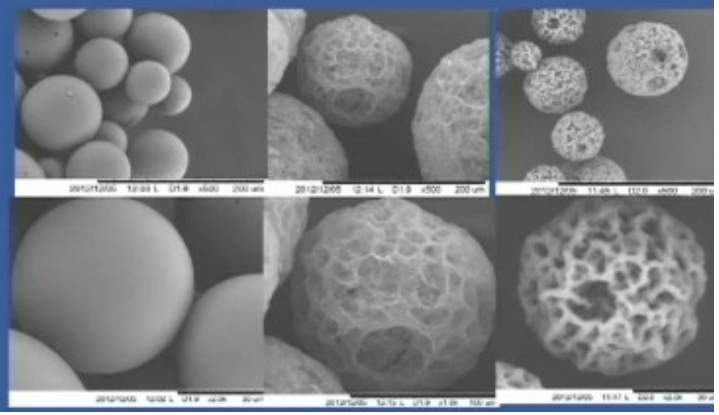
EUS-guided Portal Injection Chemotherapy (EPIC)

EUS: enables direct access to portal vein

Goal: Optimize liver levels of chemo, minimize systemic toxicity

Chemotherapy: Delayed release (bound to albumin or drug-eluting beads)

Animal study (n=24):
Paclitaxel: hepatic ↑60%, systemic ↓24%
Doxorubicin: hepatic ↑5x, cardiac ↓30x
Irenotecan: hepatic 2x, systemic 1/2
(Faigel et al GIE 2016)



PORTAL VEIN INTERVENTIONS

Embolization

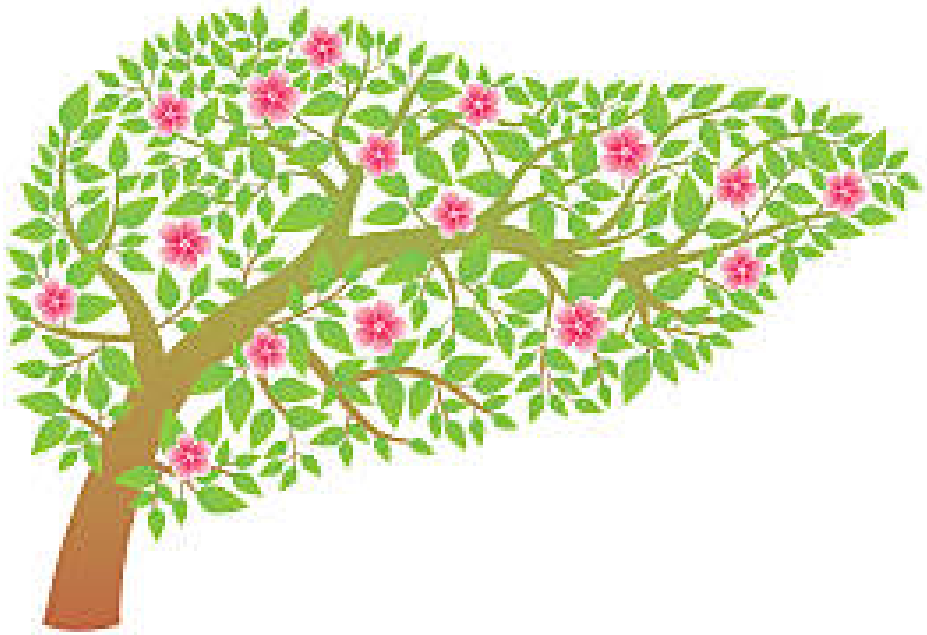
- Transhepatic puncture + CYA/Coils

Porto-systemic shunt

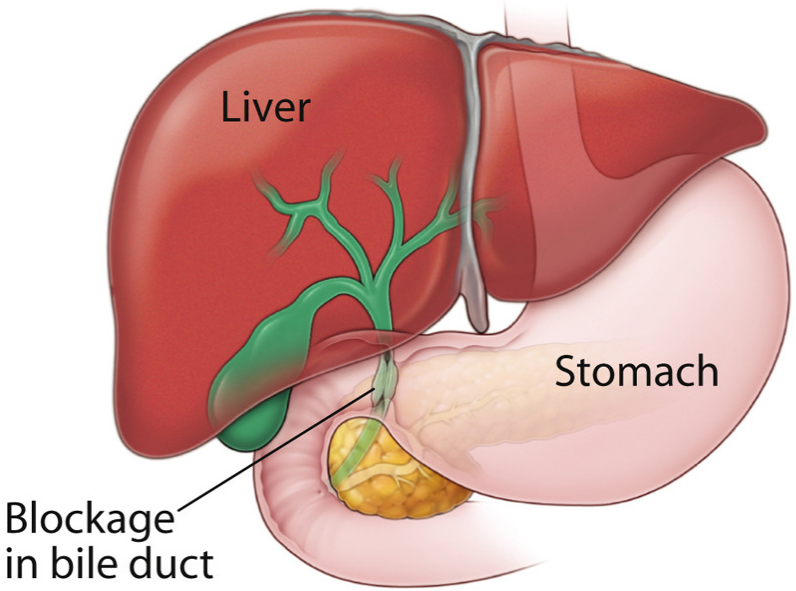
- Trans sus-hepatic/portal puncture + covered SEMS

Only animal studies = feasibility

Benefits in humans to demonstrate…compared to current techniques



The role of endoscopy in biliary disease



EUS-guided biliary drainage after failed ERCP

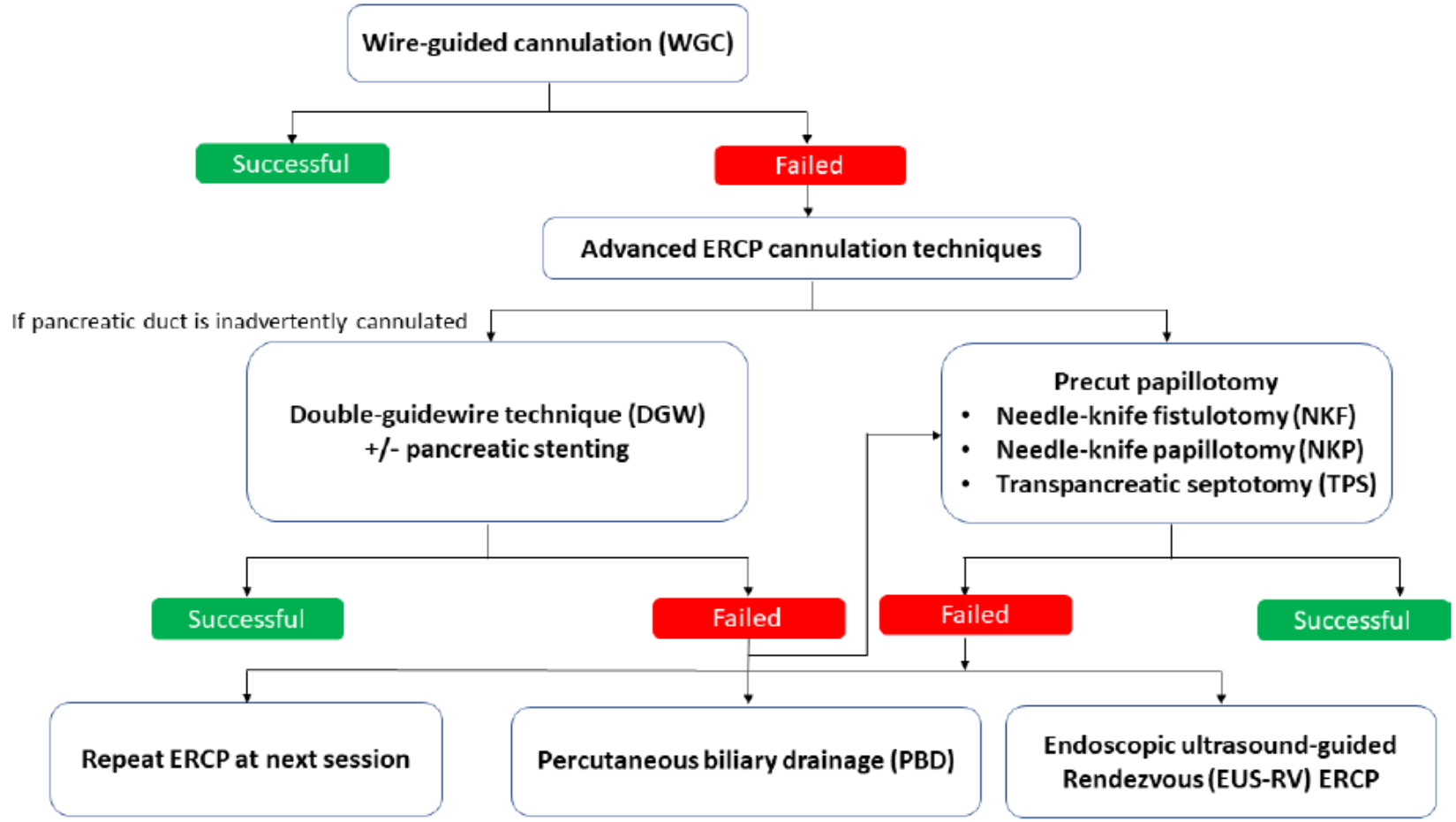
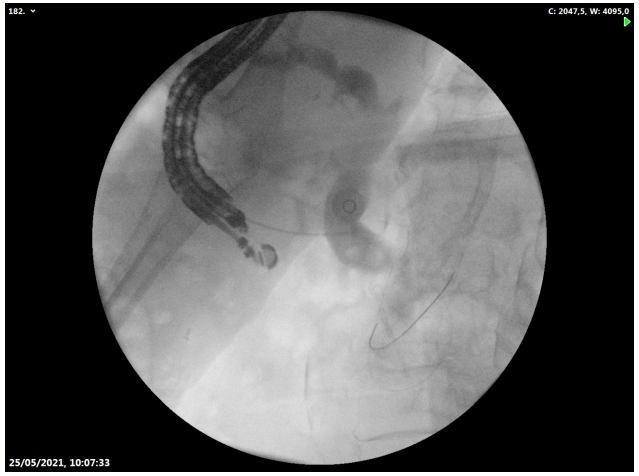


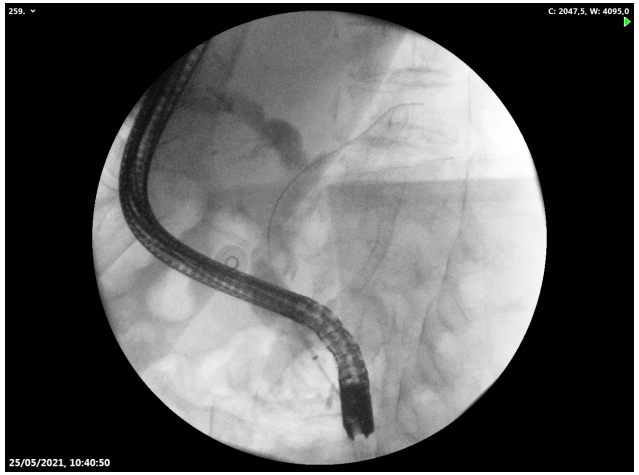
Figure 2. Salvage methods for difficult bile duct access.

Gastroenterol. Insights 2021, 12, 405–422.

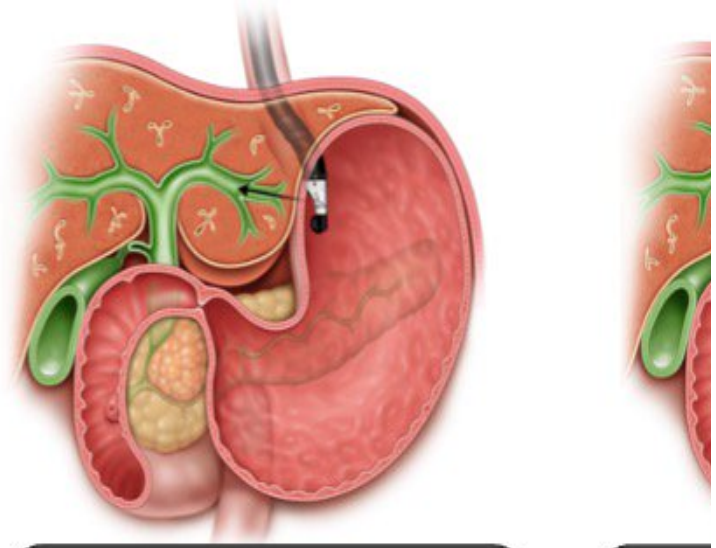
Punctured bile duct	IHBD	EHBD	
Scope location	Stomach	D1	D2
Figure			
Stability of scope	Stable	Stable	Unstable
Size of bile duct	Small	Large	Large
Puncture direction	Ampulla	Hepatic hilar	Ampulla
Distance to the papilla	Long	Short	Very short

IHBD, intrahepatic bile duct; EHBD extrahepatic bile duct; D1, duodenum bulb; D2, the second portion of the duodenum





Iwashita T, Uemura S, Yoshida K, Mita N, Tezuka R, et al. (2018) EUS-guided hybrid rendezvous technique as salvage for standard rendezvous with intra-hepatic bile duct approach. PLOS ONE 13(8): e0202445. https://doi.org/10.1371/journal.pone.0202445



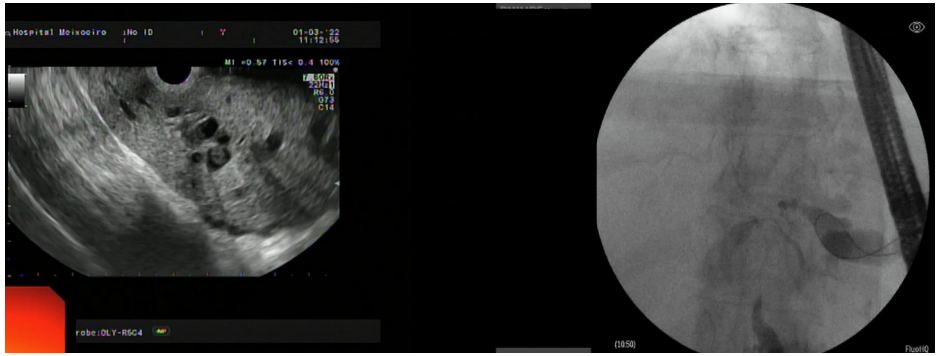
Intrahepatic

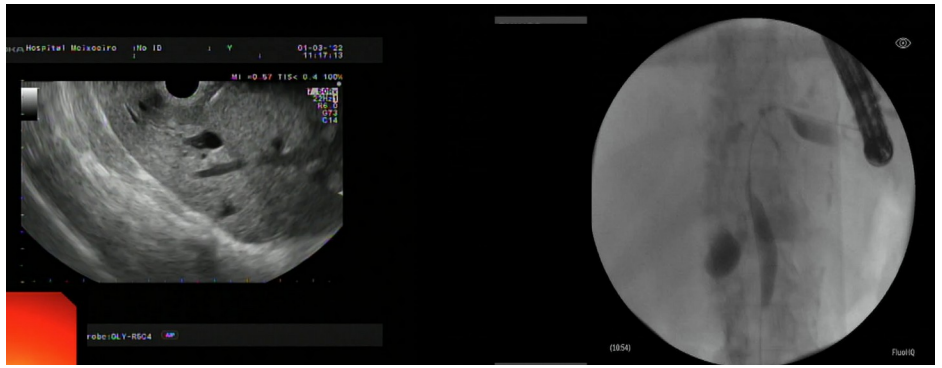
Left lobe accessed from stomach

- Hepaticogastrostomy
- Rendezvous

Common

- Chole
- Rend
- Anteg





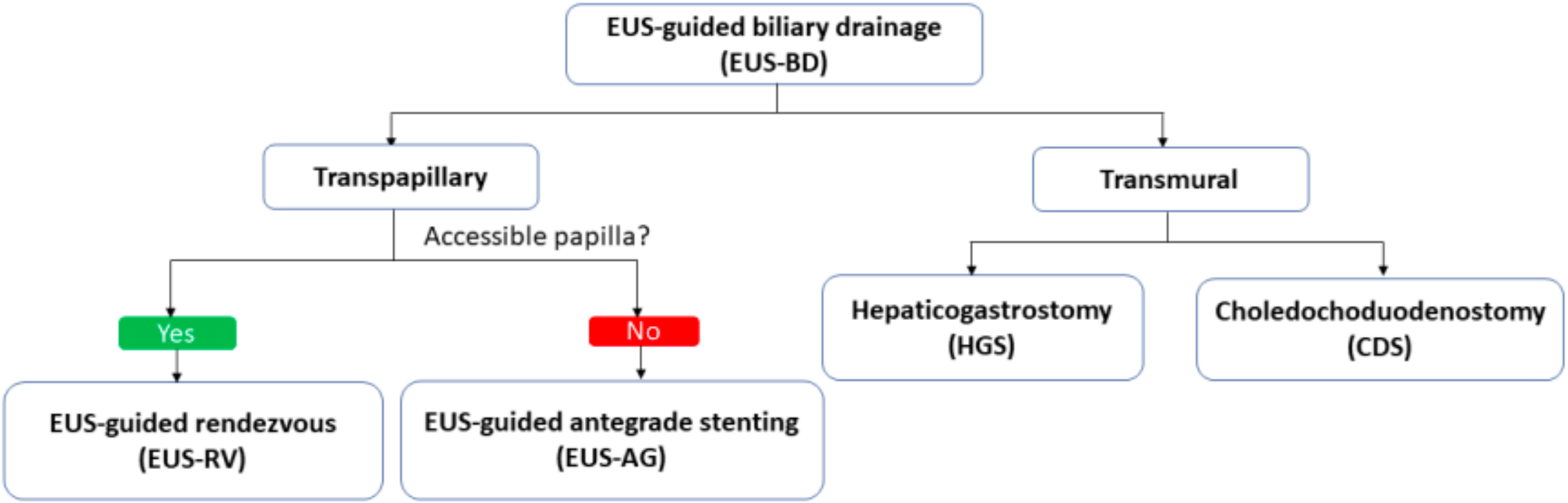
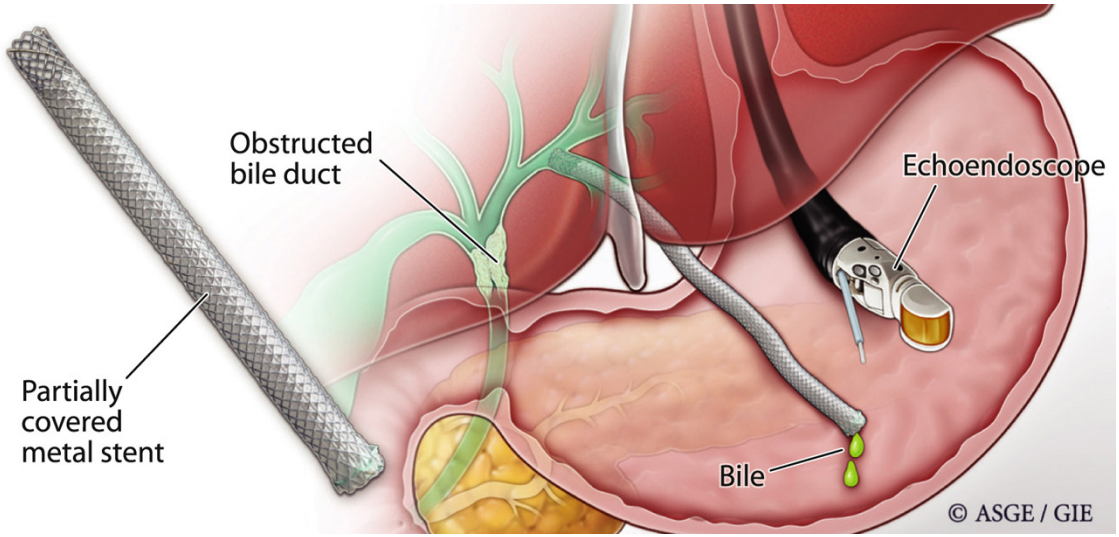
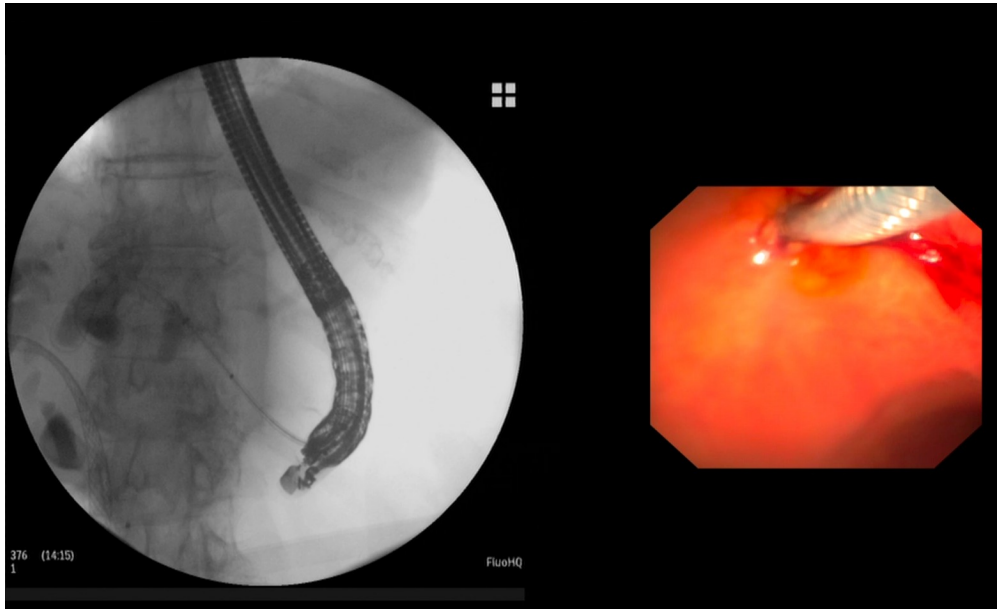
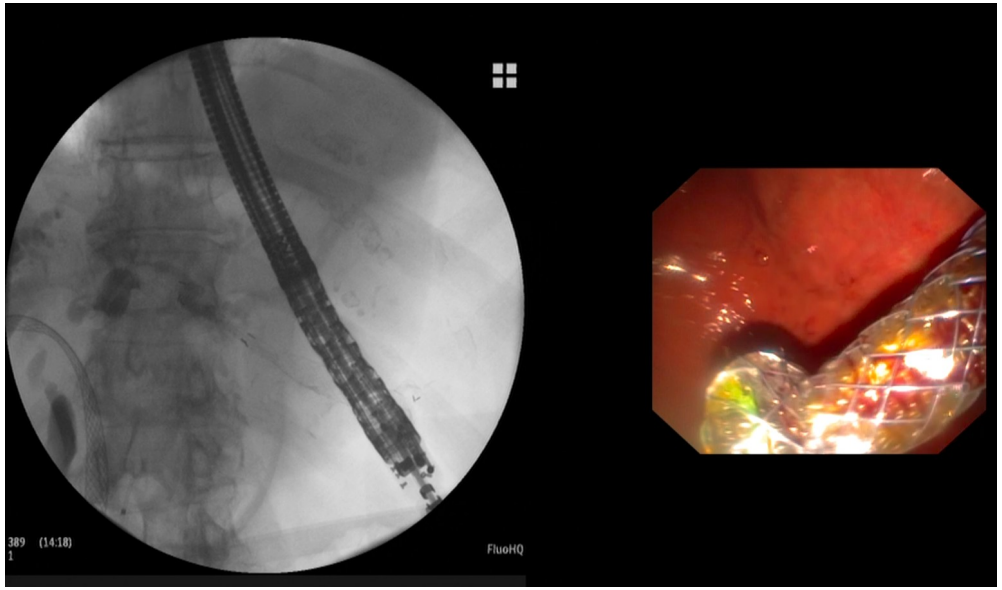


Figure 5. Classification of EUS-guided biliary drainage.

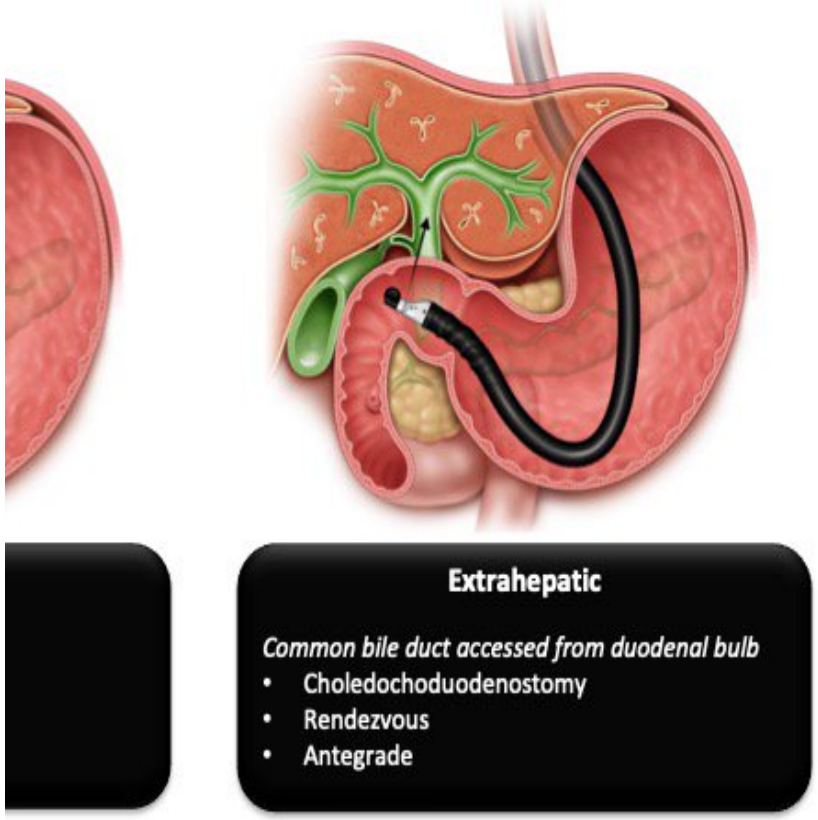






GIE. September 2020, 623-631.e1

uided Bile Duct Drainage



Extrahepatic

Common bile duct accessed from duodenal bulb

- Choledochoduodenostomy
- Rendezvous
- Antegrade

https://youtu.be/jliEKxgRoxY

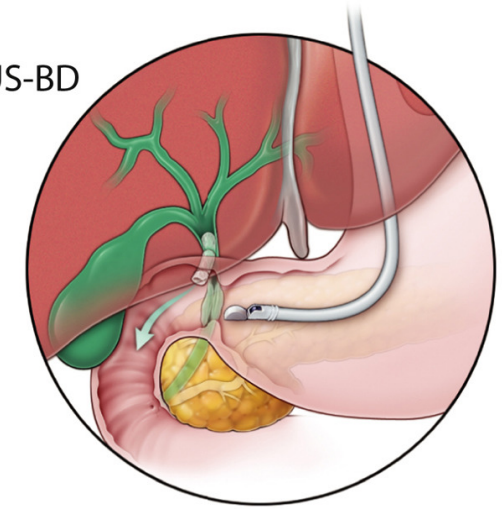
Thieme

Therapeutic endoscopic ultrasound: European Society of Gastrointestinal Endoscopy (ESGE) Guideline

MAIN RECOMMENDATIONS

1 ESGE recommends the use of endoscopic ultrasound-guided biliary drainage (EUS-BD) over percutaneous transhepatic biliary drainage (PTBD) after failed endoscopic

EUS-BD



Guideline

Thieme

retrograde cholangiopancreatography (ERCP) in malignant distal biliary obstruction when local expertise is available.
Strong recommendation, moderate quality evidence.

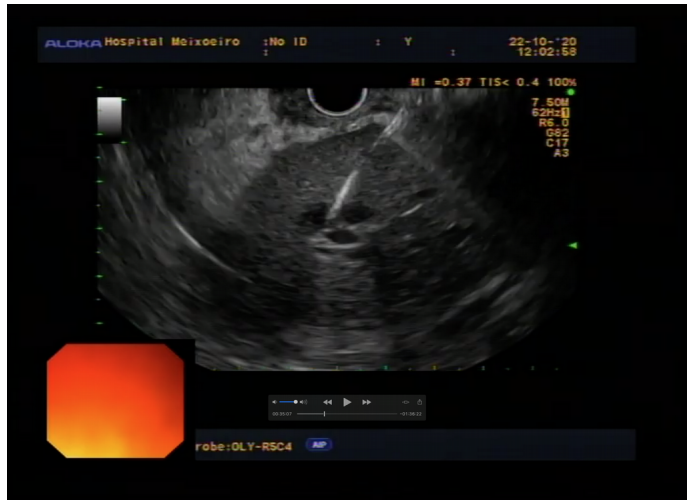
2 ESGE suggests EUS-BD with hepaticogastrostomy only for malignant inoperable hilar biliary obstruction with a dilated left hepatic duct when inadequately drained by ERCP and/or PTBD in high volume expert centers.
Weak recommendation, moderate quality evidence.

3 ESGE recommends that EUS-guided pancreatic duct (PD) drainage should only be considered in symptomatic patients with an obstructed PD when retrograde endoscopic intervention fails or is not possible.

over percutaneous gallbladder drainage where both techniques are available, owing to the lower rates of adverse events and need for re-interventions in EUS-GBD.
Strong recommendation, high quality of evidence.

6 ESGE recommends EUS-guided gastroenterostomy (EUS-GE), in an expert setting, for malignant gastric outlet obstruction, as an alternative to enteral stenting or surgery.
Strong recommendation, low quality evidence.

7 ESGE recommends that EUS-GE may be considered in the management of afferent loop syndrome, especially in the setting of malignancy or in poor surgical candidates.
Strong recommendation, low quality evidence.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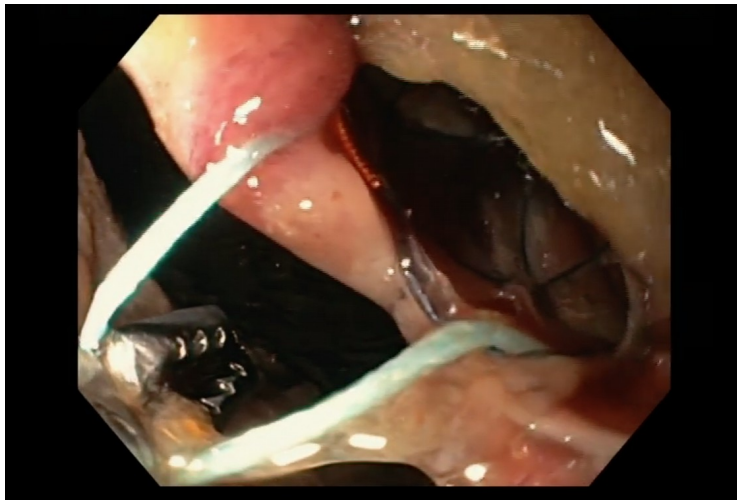
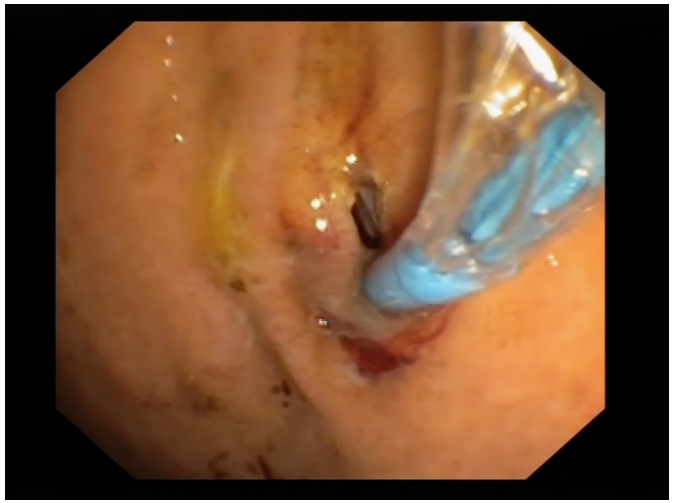
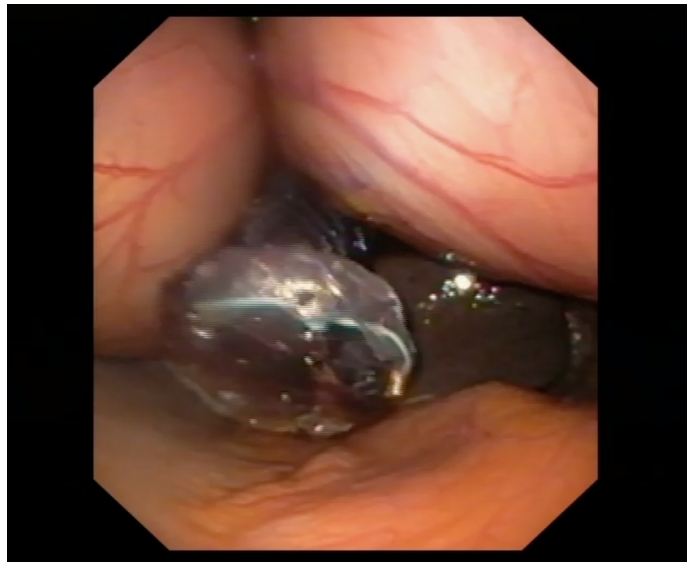
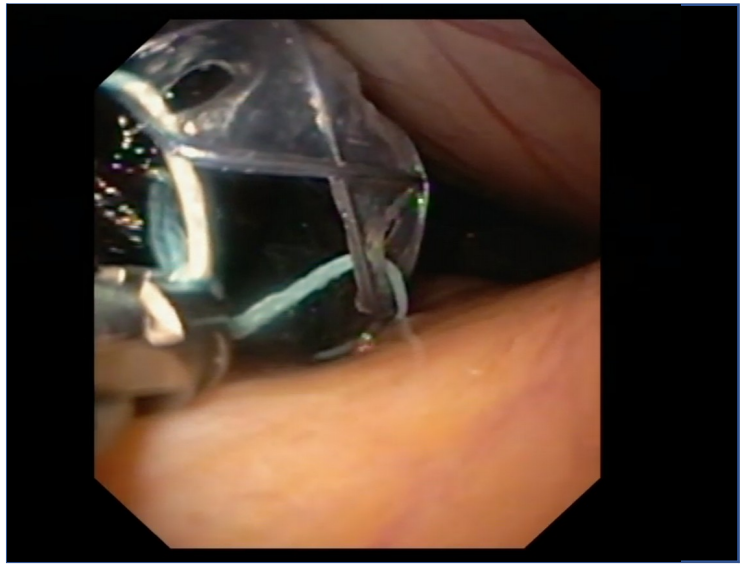
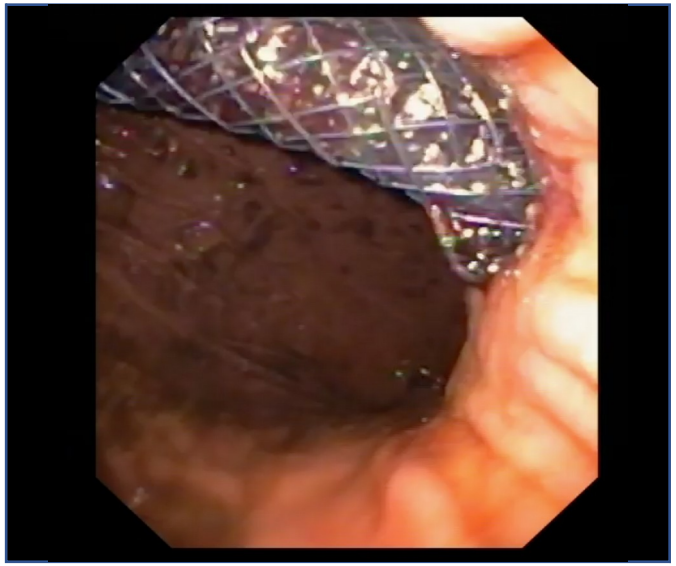










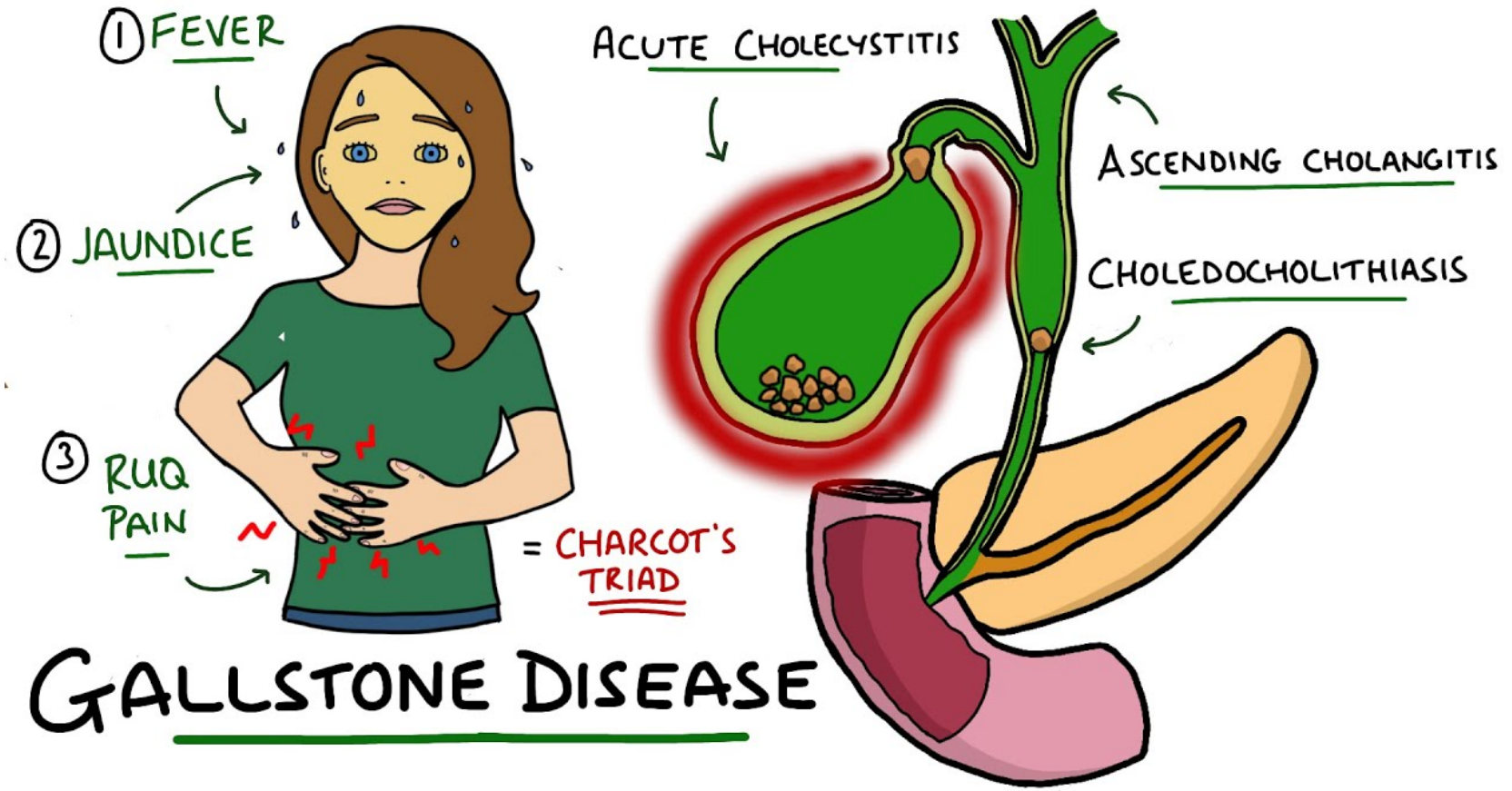
Adverse events after EUS-BD

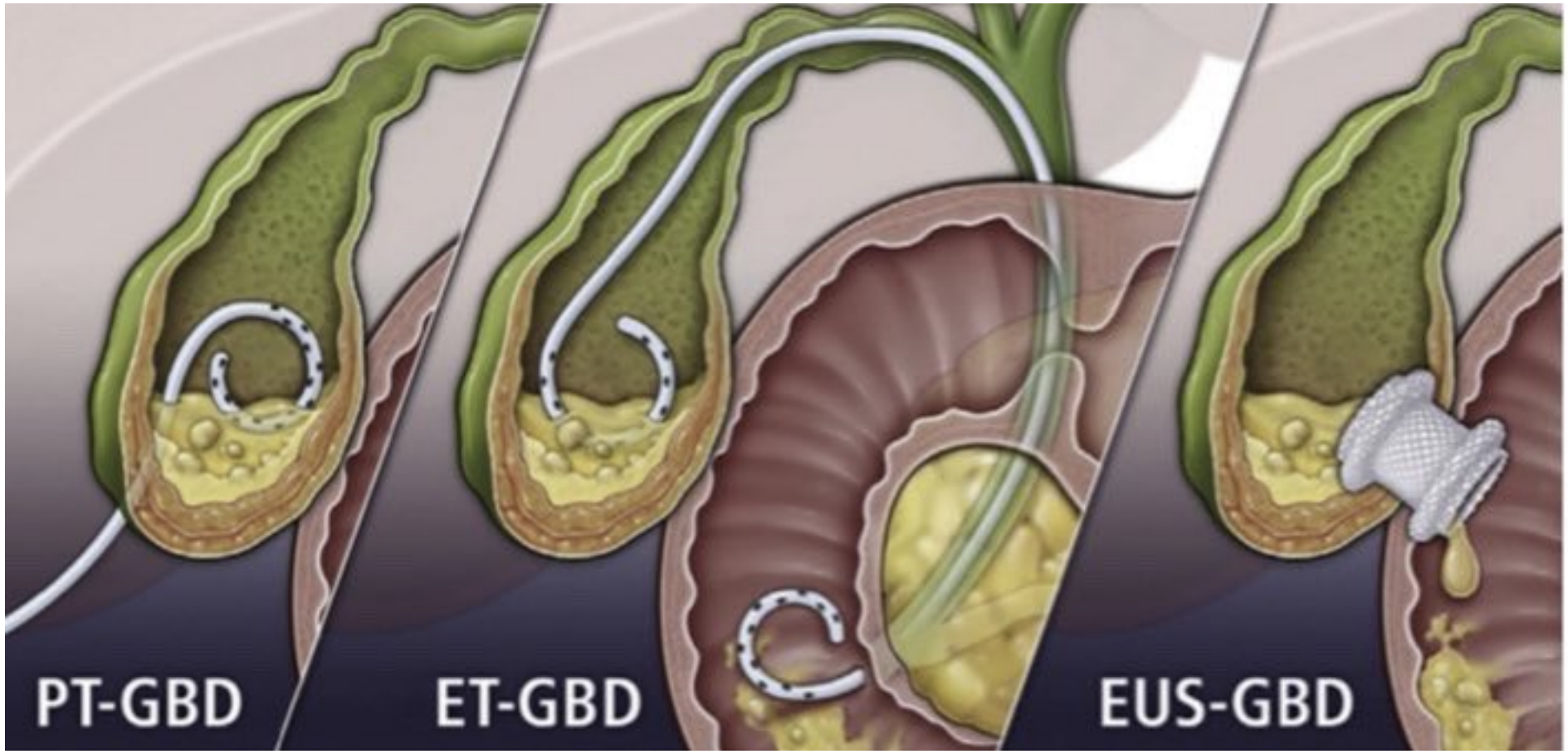
16% for EUS-CDS and EUS-HGS (in a meta-analysis of 756 patients
14% for EUS-CDS alone (572 patients)

Most Commonly:
Abdominal pain 18%
Cholangitis: 4%
Bleeding 4%
Biliary Leak 4%
Perforation 3%

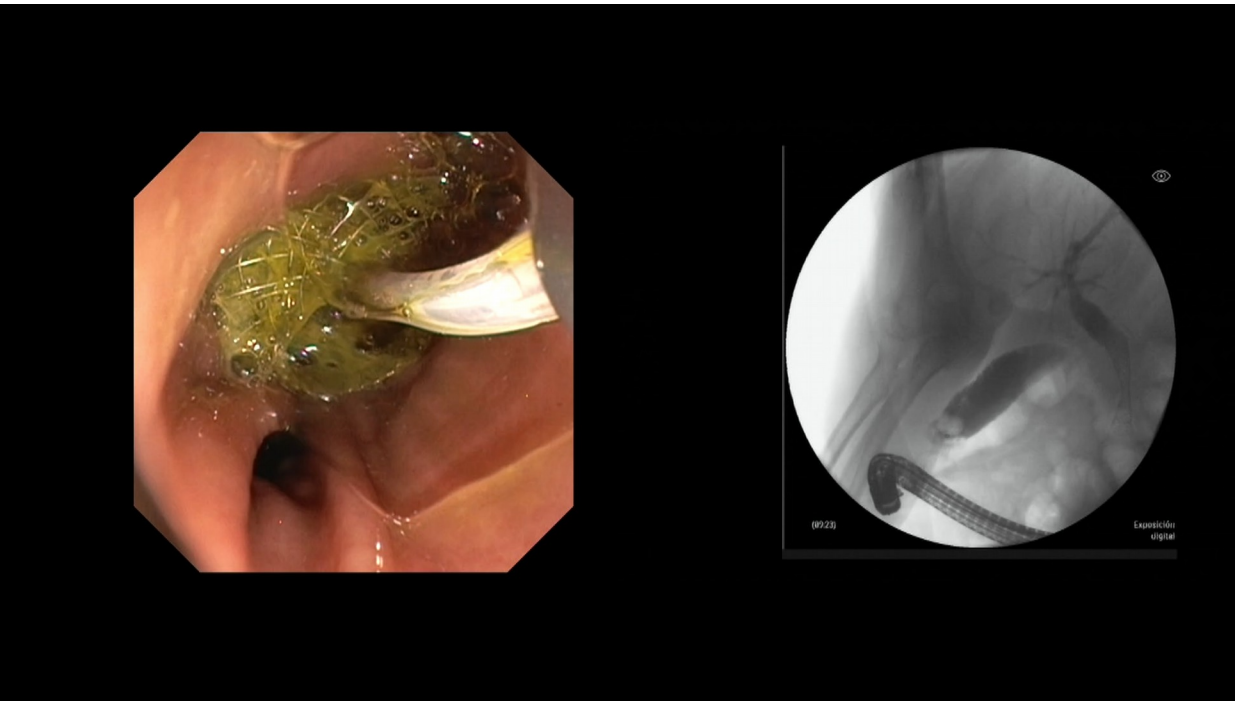
Rare: Pneumoperitoneum, haemobilia,

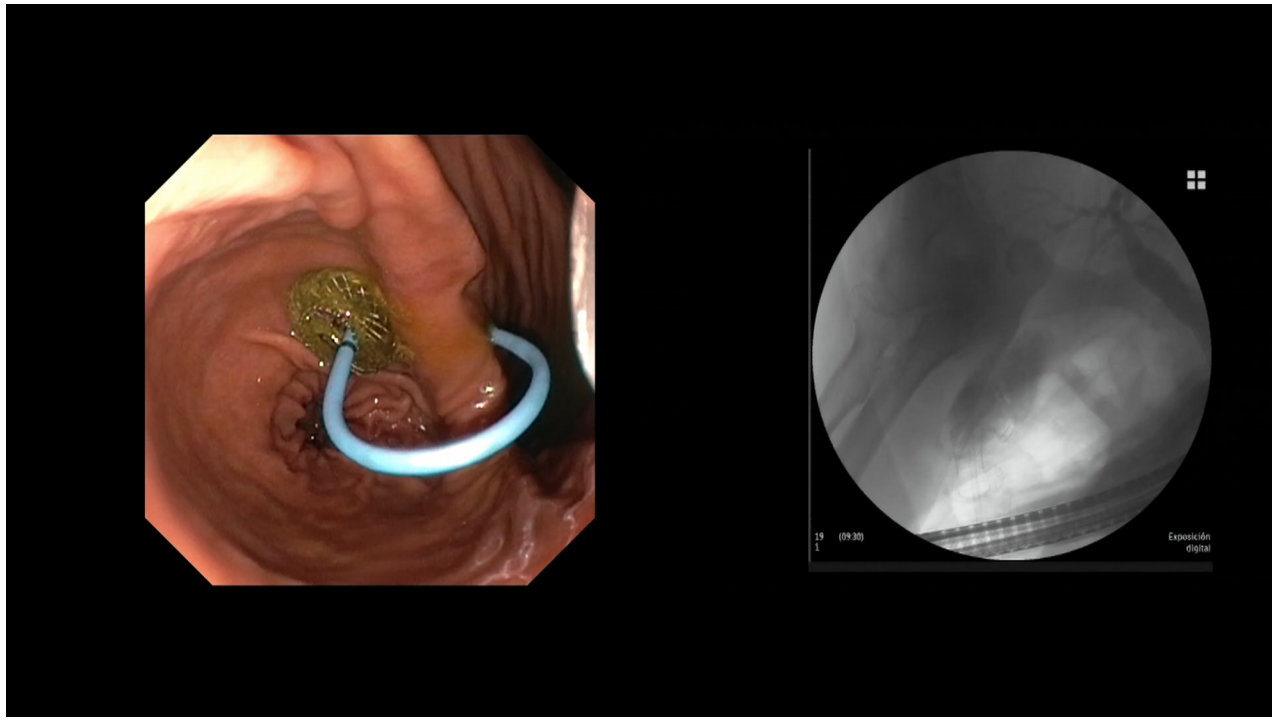
Mortality 0- 3%


1 FEVER
2 JAUNDICE
3 RUQ PAIN
= CHARCOT'S TRIAD
ACUTE CHOLECYSTITIS
ASCENDING CHOLANGITIS
CHOLEDOCHOLITHIASIS
GALLSTONE DISEASE

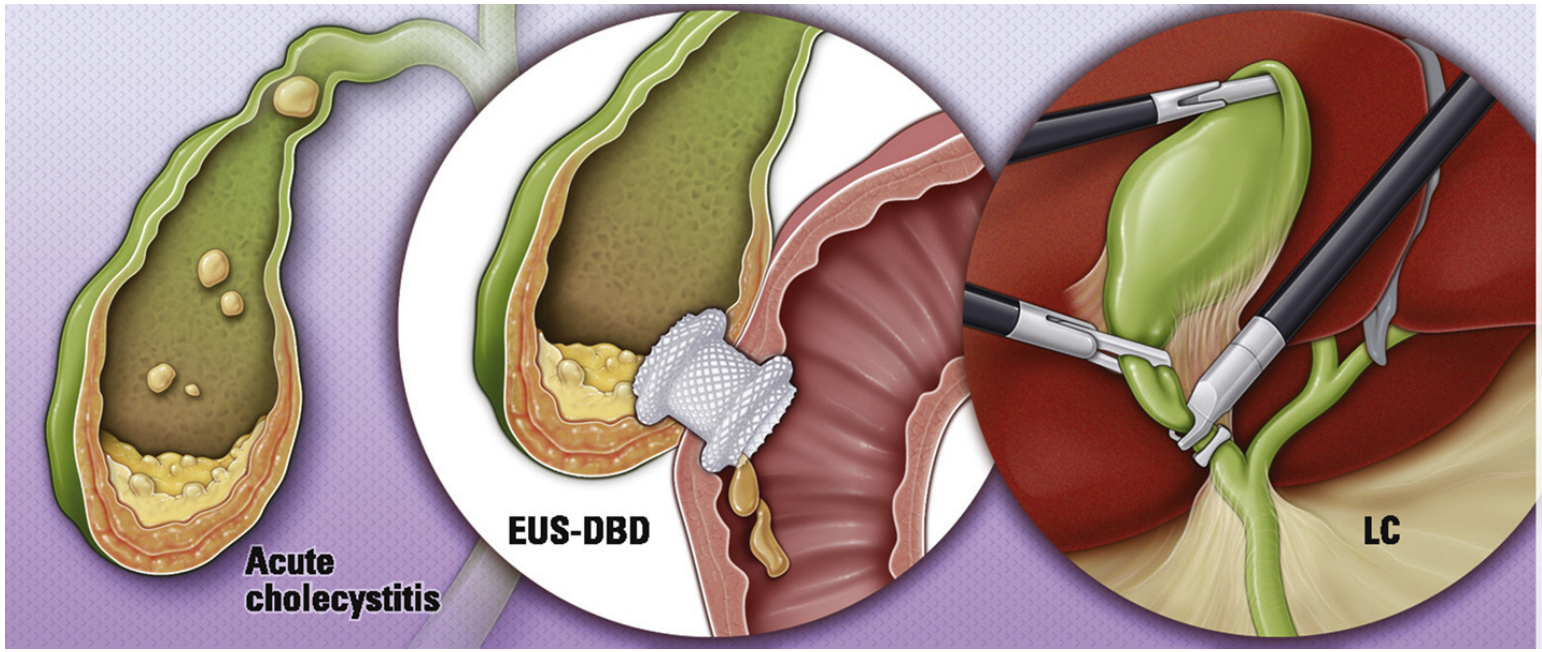

PT-GBD
ET-GBD
EUS-GBD

https://youtu.be/7QZP12v6Xwk





EUS-guided gallbladder drainage versus laparoscopic cholecystectomy for acute cholecystitis: a propensity score analysis with 1-year follow-up data CME

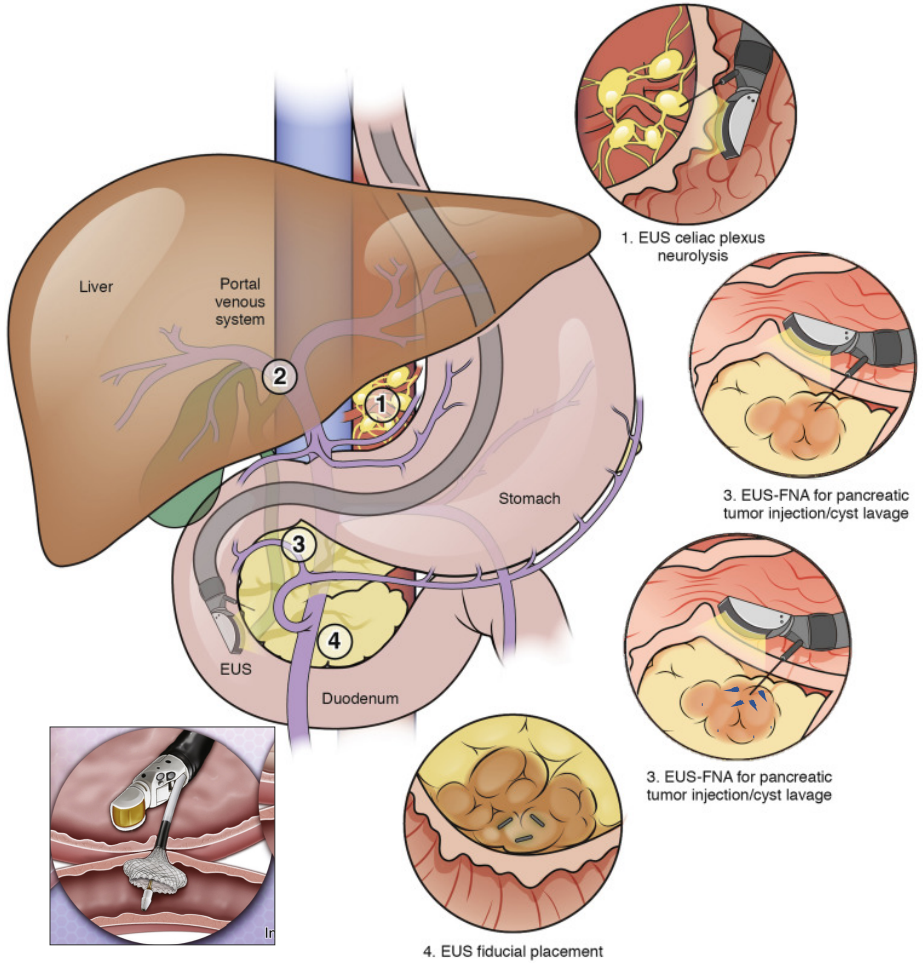


Comparison on clinical outcomes of the two procedures

	EUS-GBD n = 30	LC n = 30	*P* value
Technical success (%)	30 (100)	30 (100)	-
Clinical success (%)	28 (93.3)	30 (100)	1
Length of hospital stay (days)	6.8 (8.1)	5.5 (2.7)	1
30-day adverse events (%)	4 (13.3)	4 (13.3)	1
30-day mortality (%)	2 (6.7)	0 (0.0)	1
Recurrent cholecystitis (%)	1 (3.3)	0 (0.0)	0.168
Recurrent biliary events (%)	3 (10.0)	3 (10.0)	0.784
Re-interventions (%)	4 (13.3)	3 (10.0)	1
Unplanned readmissions (%)	3 (10.0)	3 (10.0)	0.784

may or may not be surgically fit to undergo definitive cholecystectomy. (Gastrointest Endosc 2021;93:577-83.)

The role of endoscopy in pancreatic disease



Major complications or death: 69% surgery vs 40% step-up ap.

Percutaneous step-up approach better than open surgery

PANTHER

Major complications or death: 80% surgery vs 20% endoscopy

Endoscopic necrosectomy better than open surgery

PENGUIN

Endoscopic step-up approach less fistula and lower hospital stay

Endoscopic step-up approach slightly better than percutaneous

TENSION

How?

Step-up approach: drainage, if no improvement: endoscopic or minimally invasive surgical necrosectomy

Dutch Pancreatitis Study Group

Invasive treatment of infected pancreatic necrosis

When?

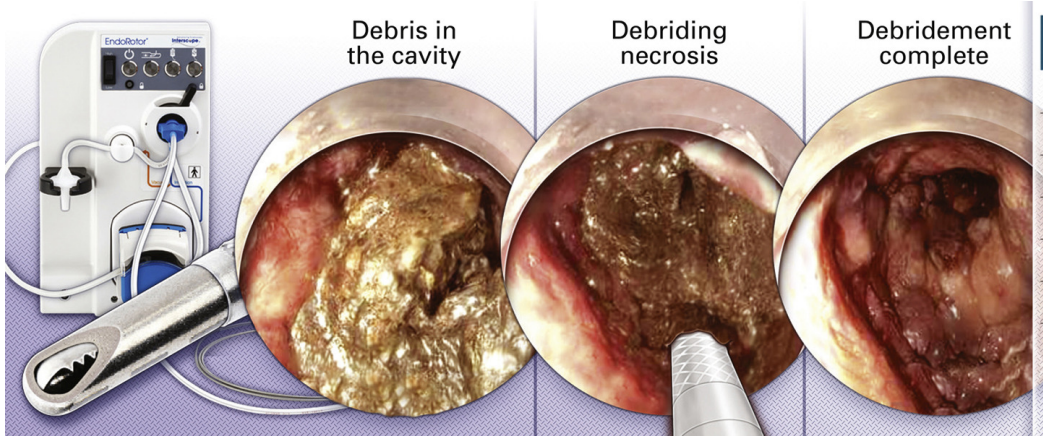
POINTER

Delayed drainage (once collections are encapsulated) slightly better than immediate drainage (within 24h of IPN diagnosis)

39% of pts randomized to delayed drainage didn´t need drainage, also less number of interventions

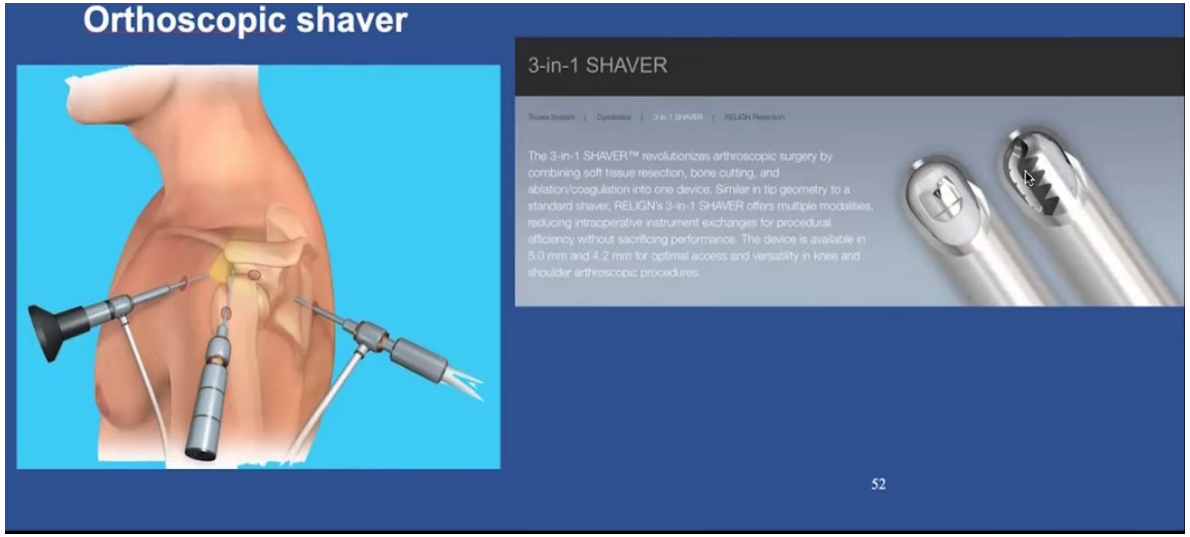
Infographics by @DeMadaria #TheAmylaseSchool

https://youtu.be/9-MHpem14sM



Procedure	Number of Patients	Necrosis removed	Necrosis remaining
1	30/30 (100%)	80 (50)	9* (25)
2	15/30 (50%)	40 (70)	20 (41)
3	9/30 (30%)	65 (78)	20 (24)
4	5/30 (17%)	25 (43)	20 (31)
5	3/30 (10%)	-	-
6	1/30 (3%)	-	-
7	1/30 (3%)	-	-

* Value reported for 29/30 subjects.



DEN Digestive Endoscopy
For Gastroenterologists and Endoscopic Surgeons

Review

Interventional endoscopic ultrasound for pancreat neuroendocrine neoplasms

Mihai Rimbaş, Mihaela Horumbă, Gianenrico Rizzatti, Stefano Francesco Crinò, A Guido Costamagna, Alberto Larghi

First published:29 January 2020 | https://doi.org/10.1111/den.13635

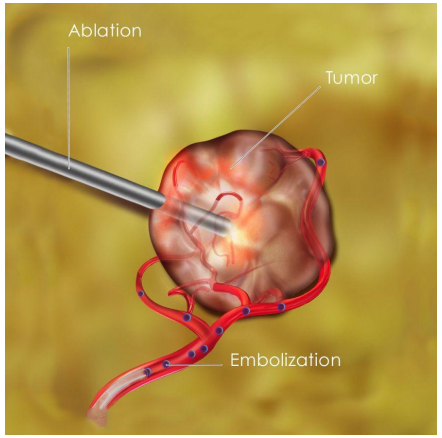
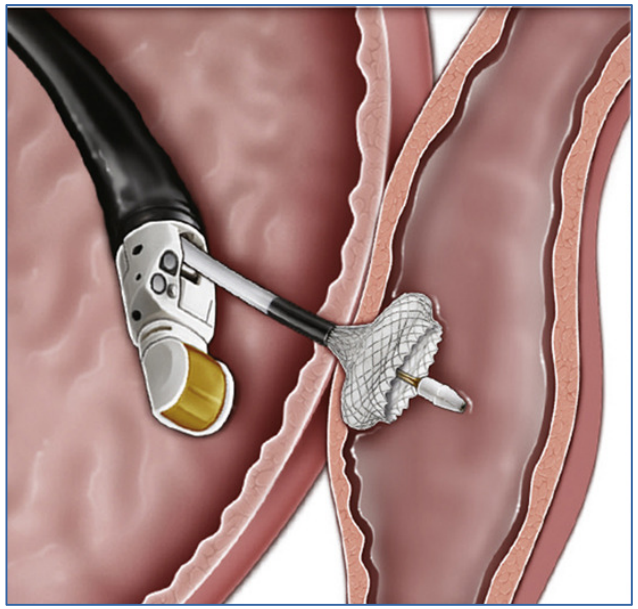


Table 4 Summary of the studies evaluating treatment of functional (F) and non-functional (NF) pancreatic neuroendocrine neoplasms (PanNENs) with endoscopic ultrasound (EUS)-guided radiofrequency ablation

Author, year	Diagnosis	No. of pts.	No. of lesions	MEN1 synd.	Lesion size (mm)	Needle gauge	Power (W)	Application duration (s)	No. of sessions	Applications per session	Effectiveness†	Adverse events (no.)	Follow-up (months)
Rossi, 2014[CS]	NF-PanNEN	1	1	No	9	22‡	10–15	NR	1	NR	100%	None	34
Armellini, 2015[CR]	NF-PanNEN	1	1	No	20	18	NR	NR	1	2	100%	None	1
Pai, 2015[PS]	NF-PanNEN	2	2	No	27.5	19 & 22‡	20	90–120	1.5	5	100%	None	NR
Lakhtakia, 2016[CS]	F-PanNEN	3	6	No	16.7	19	50	10–15	1	3	100%	None	10.3
Waung, 2016[CR]	F-PanNEN	1	1	No	18	19‡	10	90–120	3	8.3	100%	None	10
Bus-Cutrina, 2017[CR]	F-PanNEN	1	1	No	10	22‡	10	120	1	3	100%	None	10
Barthet, 2019[PS]	NF-PanNEN	12	14	1	13.1	18	50	NR	NR	NR	71.4%	Pancreatitis (1); fever (1); extrapancreatic necrosis (1); MPD stenosis (1)	12
Choi, 2018[PS]	NF-PanNEN	7	7	No	20.3	18 & 19	50	NR	1.9	5.3	71.4%	Abdominal pain (1); pancreatitis (1)	13
	F-PanNEN	1	1	No	12	19	50	NR	1	3	100%	None	13
Lamine, 2018[CR]	F-PanNEN	1	1	No	12	19	NR	NR	1	NR	100%	Fever (1)	2
Oleinikov, 2019[RS]	NF-PanNEN	11	18	2	17.7	19	10–50	5–12	NR	3–10	83.3%	Mild pancreatitis (2)	8
	F-PanNEN	7	9	1	15.3	19	10–50	5–12	NR	3–10	100%	None	9.7
Dancour, 2019[RS]	F-PanNEN	8	8	No	16	19	50	5–12	1	6	85.7%	None	9.25
deNucci, 2019[PS]	NF-PanNEN	7	8	No	14.5	19	NR	NR	NR	NR	100%	None	12
	F-PanNEN	3	3	No	14.5	19	10	NR	NR	NR	100%	None	12
Younis, 2019[CS]	NF-PanNEN	3	NR	No	10	19	NR	NR	1	NR	NR	Abdominal pain (1)	NR

CR, case report; CS, case series; PS, prospective study; RS, retrospective study.
†Effectiveness defined as in Table 2.
‡The procedures were performed using the Habib EUS-radiofrequency ablation catheter (Boston Scientific Corp.); all other procedures were performed with the EUSRA RF electrode (Taewoong Medical Co., Ltd.)



EUS-guided gastroenterostomy

https://youtu.be/9-MHpem14sM

Gastroenterostomía guiada por ecoendoscopia como tratamiento de la estenosis gastrointestinal.

Initial results:

7 patients: 1 Gastric cancer (Peritoneal carcinomatosis + ascitis)
1 Duodenal cancer
5 Pancreatic cancer

Technical success: 86.7%. 1 deployments
(Closure with OVESCO clip
+ Conventional duodenal stent palliation)

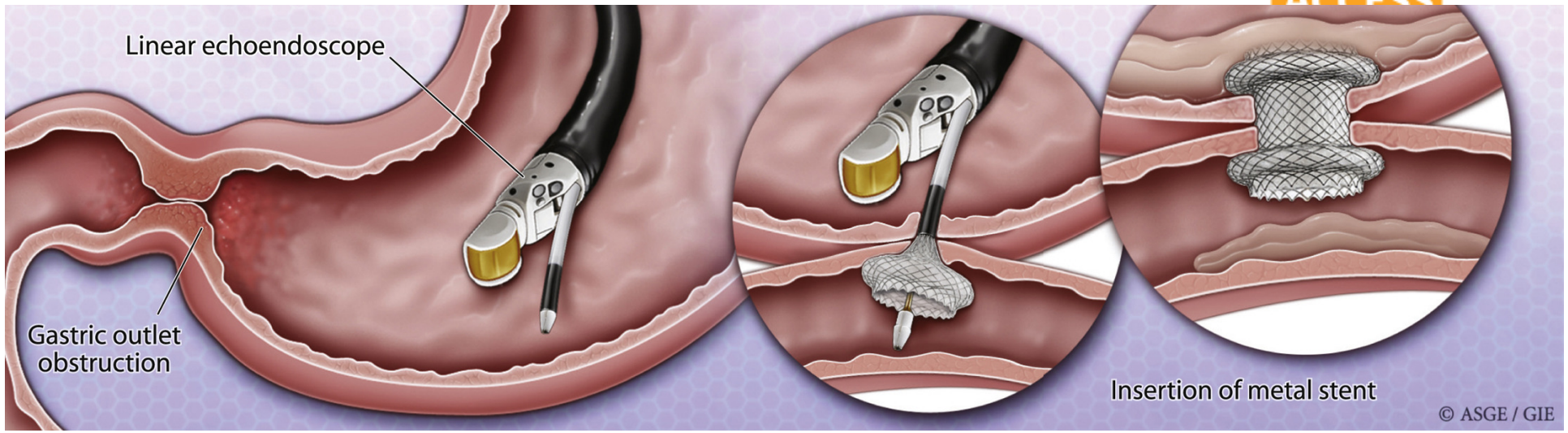
Clinical success: 6 patients: 100%.

Follow up 3.7 meses (SD +/-2.1).

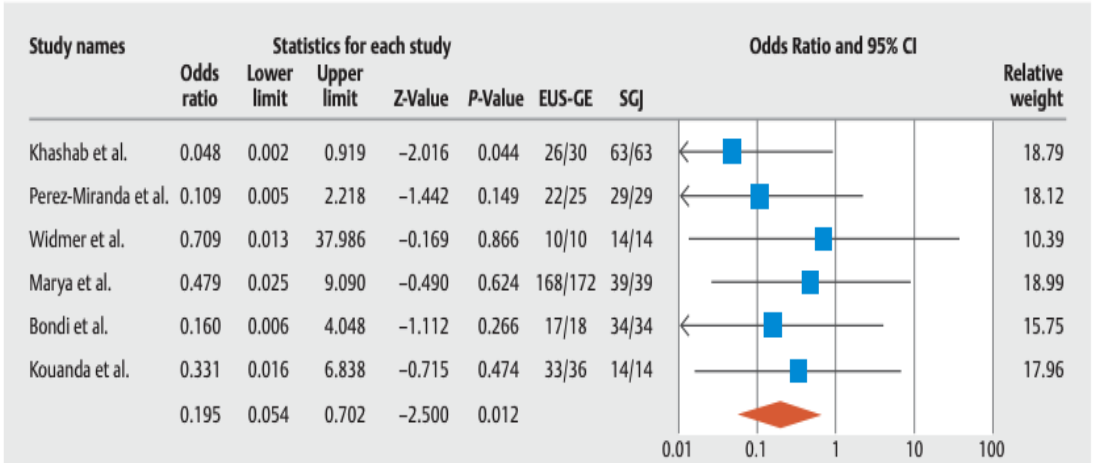
Thieme

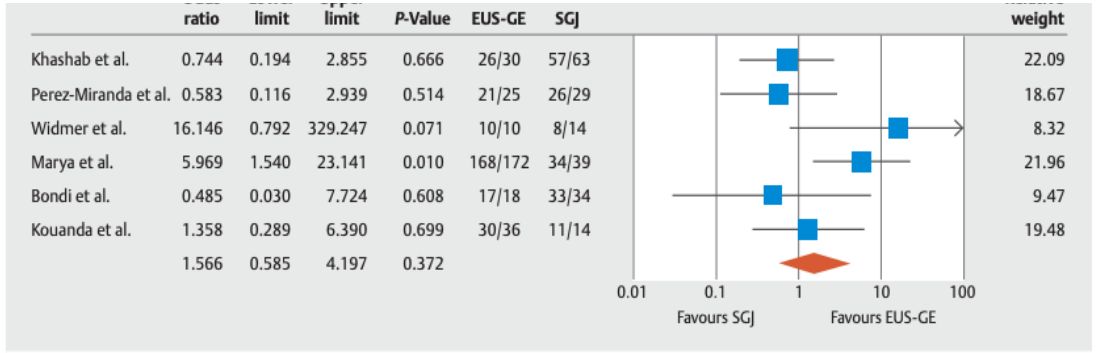
Endoscopic ultrasound-guided gastroenterostomy versus surgical gastrojejunostomy in treatment of malignant gastric outlet obstruction: Systematic review and meta-analysis

OPEN ACCESS

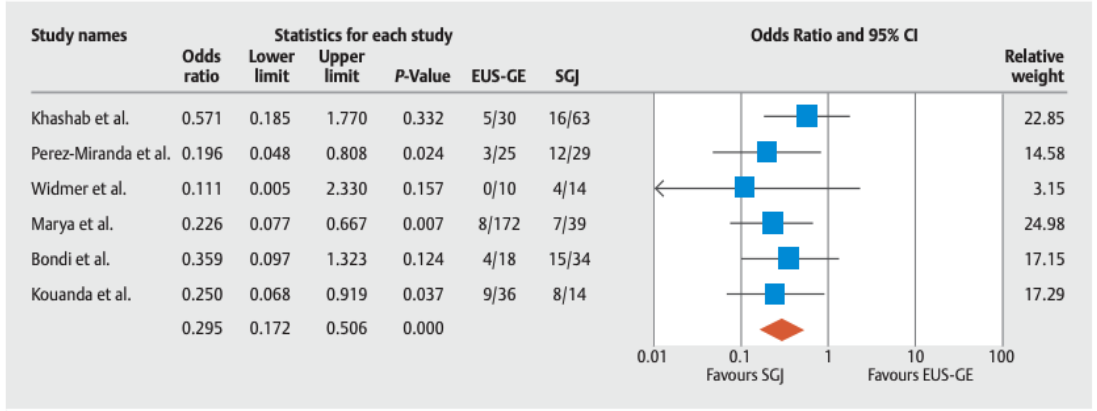


Endosc Int Open 2022; 10: E361–E368





▶ **Fig. 4** Forest plot for EUS-GE vs SGJ clinical success. Pooled OR = 1.566 (95 %CI: 0.584–4.197). Prediction Interval = 0.108 to 22.685 [The true effect size (OR) in 95 % of all populations falls in this interval]



▶ **Fig. 5** Forest plot for EUS-GE vs SGJ adverse events. Pooled OR = 0.295 (95 %CI: 0.172–0.506). Prediction interval = 0.137–0.634 [The true effect size (OR) in 95 % of all populations falls in this interval].

Endosc Int Open 2022; 10: E361–E368

Liver Biopsy
Portal pressure

Endovascular therapy

PALLIATION OF BILIARY OBSTRUCTION

- SALVAGE AFTER ERCP FAILURE

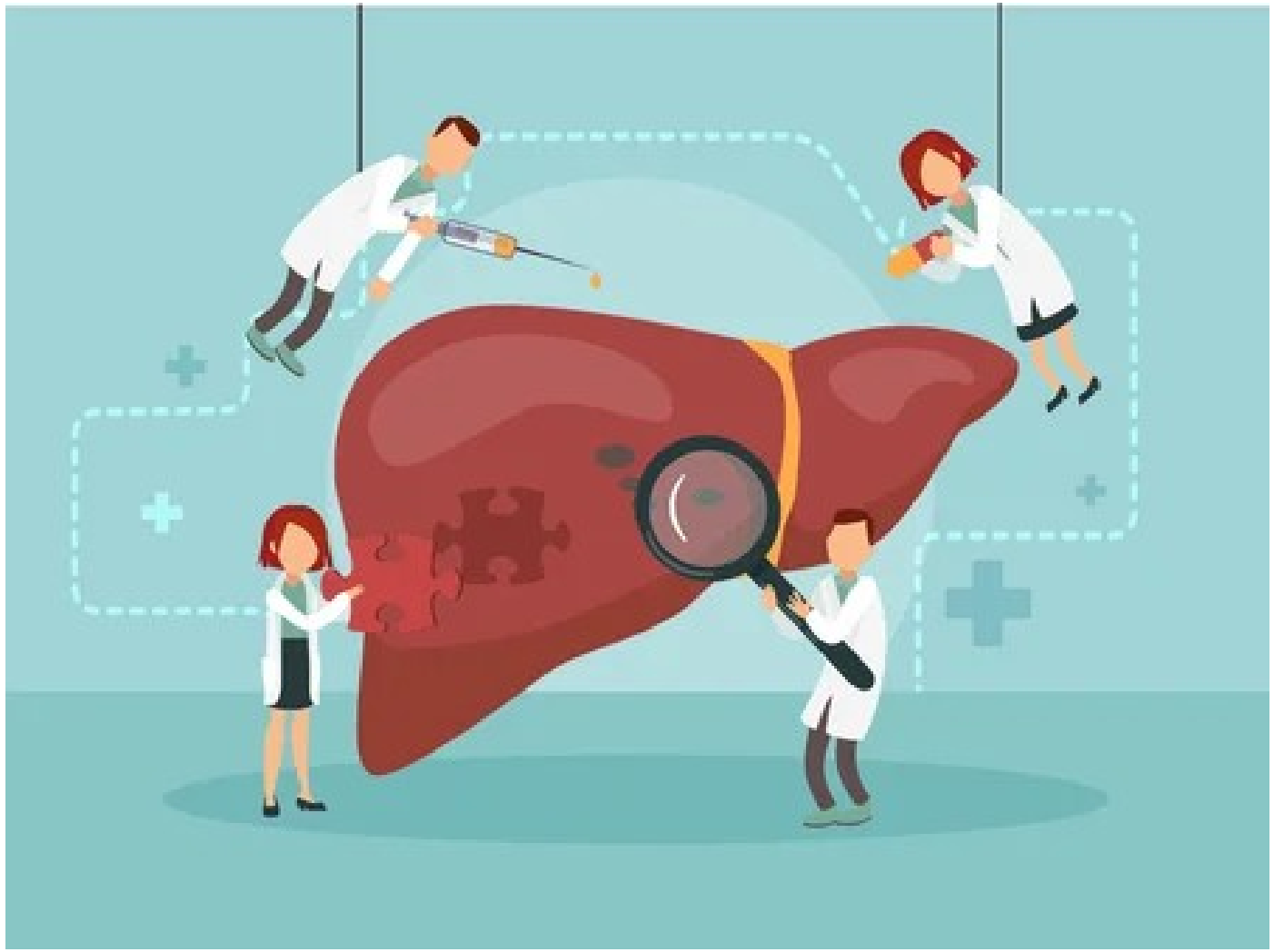
- ALTERNATIVE TO ERCP

PALLIATION OF ENTERIC OBSTRUCTION

DRAINAGE OF GALLBLADDER IN PATIENT UNFIT FOR SURGERY

PANCREATIC FLUID COLLECTIONS

FIRST CHOICE
PC / WON.



Gracias