

Strategies to minimize complications of ERCP

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Disclosure

Cook Endoscopy

Advanced Sterilization Products

Common complications of ERCP

- Pancreatitis
- Bleeding
- Infection
- Perforation
- Cardiopulmonary
- Death

ASGE Guideline 2012



Only absolute way to eliminate the risk of ERCP...

- Anything related to SOD
 - No evidence for 'type III'
 - No evidence for causing pancreatitis
 - Indefensible indication for ERCP
- Most diagnostic ERCP



“ERCP is most dangerous to those who need it the least...”



Incidence, severity, and mortality of post-ERCP pancreatitis: a systematic review by using randomized, controlled trials

- Over all incidence was 9.7% with mortality of 0.7%
 - Mild in 5.7%
 - Moderate in 2.6%
 - Severe in 0.5%
- Incidence in 'high risk' patients was 14.7%
- Incidence in North America was 13%
 - Europe was 8.4%
 - Asian 9.9%
- Incidence before 2000 was 7.7%
- Incidence after 2000 was 10%

GIE 2015;81:143-149

Independent risk factors for post-ERCP pancreatitis identified with multivariable analysis

Patient-related risk factors	
Prior post-ERCP pancreatitis	8.7 (3.2-23.86)
Female sex	3.5 (1.1-10.6)
Previous recurrent pancreatitis	2.46 (1.93-3.12)
Suspected sphincter of Oddi dysfunction	1.91 (1.37-2.65)
Younger patient age (<40 years old)	1.8 (1.27-2.59)
30 vs 70 years old	2.14 (1.413.25)
Absence of chronic pancreatitis	1.87 (1.003.48)
Normal serum bilirubin	1.89 (1.222.93)
Procedure-related risk factors	
Difficult cannulation (>10 minutes)	1.76 (1.13-2.74)
Repetitive pancreatic guidewire cannulation	2.77 (1.79-4.30)
Pancreatic injection	2.2 (1.60-3.01)
Pancreatic sphincterotomy	3.07 (1.64-5.75)
Endoscopic papillary large-balloon dilation of an intact sphincter	4.51 (1.51-13.46)

Risk is additive!

Strategies to minimize risk of pancreatitis besides patient selection

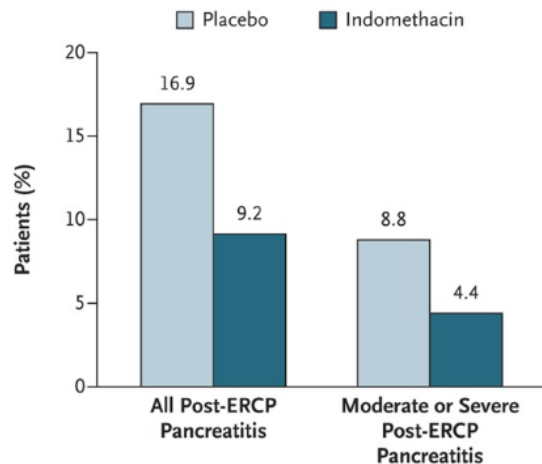
- Hydration
- Medication
- Endoscopy technique
 - Pancreatic stenting
 - Guidewire cannulation
 - Early precut

Aggressive hydration with lactated ringers

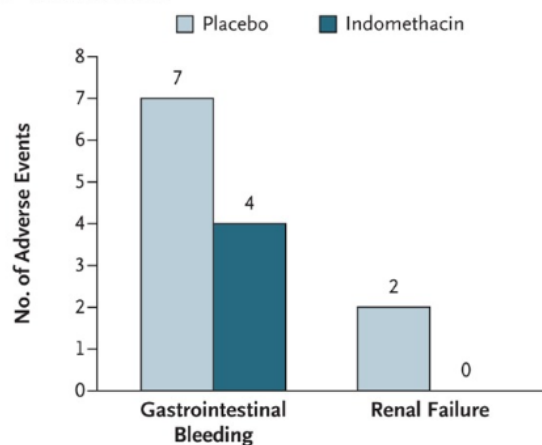
- *Aggressive hydration with lactated Ringer's solution reduces pancreatitis after endoscopic retrograde cholangiopancreatography*
 - Clin Gastroenterol Hepatol 2014 Feb;12(2):303-7
 - 0% versus 17% post ERCP pancreatitis
- *Aggressive hydration with Lactated Ringer's solution as the prophylactic intervention for postendoscopic retrograde cholangiopancreatography pancreatitis: A randomized controlled double-blind clinical trial*
 - J Res Med Sci. 2015;20(9):838
 - 5.3% versus 22.7% ($P = 0.002$) post ERCP pancreatitis
- 3ml/kg/h during and after ERCP x 8 hours + 20ml/kg bolus post procedure
- Data are weak but no reason not to use it

Indomethacin

A Post-ERCP Pancreatitis



B Adverse Events



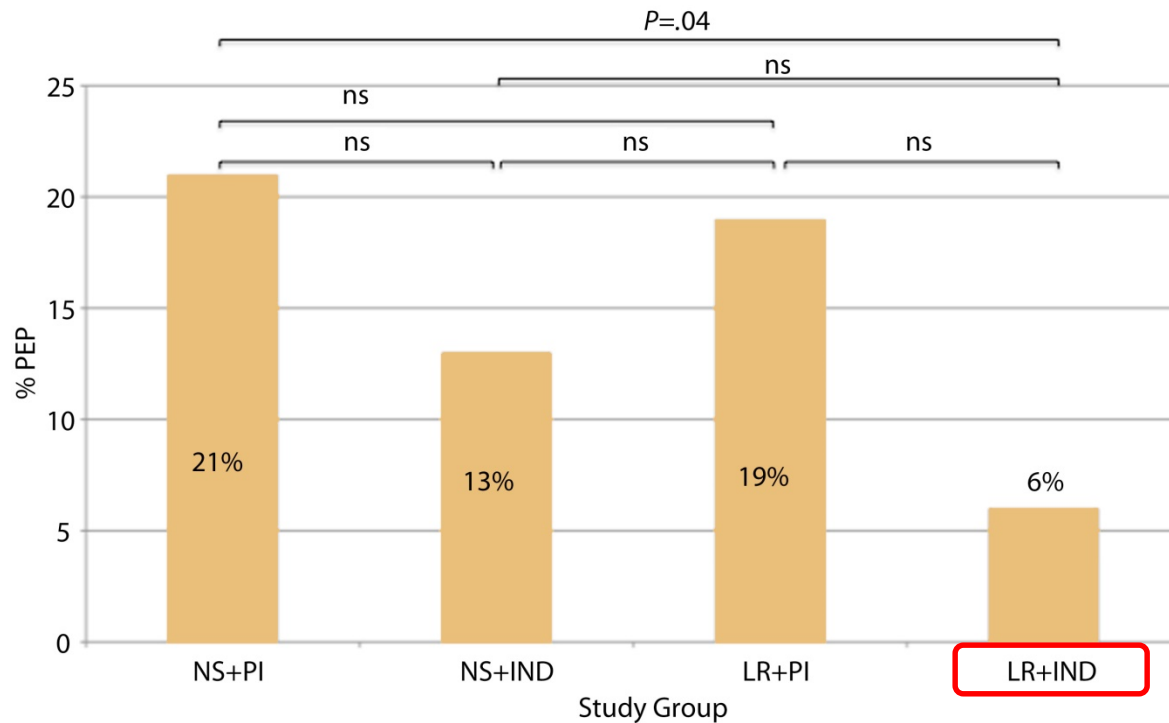
	Patients with PEP		
	Indomethacin (n=16)	Placebo (n=11)	% Relative Risk Reduction (Indomethacin vs. Placebo)
Pancreatic Stent Placement – no. (%)	8 (50)	4 (36)	-28%
Suspected Sphincter of Oddi Dysfunction – no. (%)	1 (6)	1 (9)	+33%
History of Post-ERCP Pancreatitis	2 (13)	1 (9)	-21%
Difficult Cannulation	6 (38)	5 (45)	+16%
Wire Cannulation of Pancreatic Duct – no. (%)	13 (81)	7 (64)	-21%
Pancreatography – no. (%)	8 (50)	8 (73)	+32%
Pancreatic Acinarization – no. (%)	2 (13)	0 (0)	NA
Therapeutic Biliary Sphincterotomy – no. (%)	7 (44)	3 (27)	-39%
Therapeutic Pancreatic Sphincterotomy – no. (%)	2 (13)	3 (27)	+52%
Balloon Dilation of Biliary Sphincter – no. (%)	0 (0)	1 (9)	NA
Trainee Involvement in ERCP – no. (%)	12 (75)	8 (73)	-3%

Gastroenterology. 2016 Apr; 150(4): 911–917.

- PR Indomethacin 50mg x 2
- Appears to work, especially in high risk
- No harm, so why not?
 - Contraindication – anaphylaxis, pregnancy

N Engl J Med. 2012;366(15):1414

Lactated Ringer's solution in combination with rectal indomethacin for prevention of post-ERCP pancreatitis and readmission: a prospective randomized, double-blinded, placebo-controlled trial

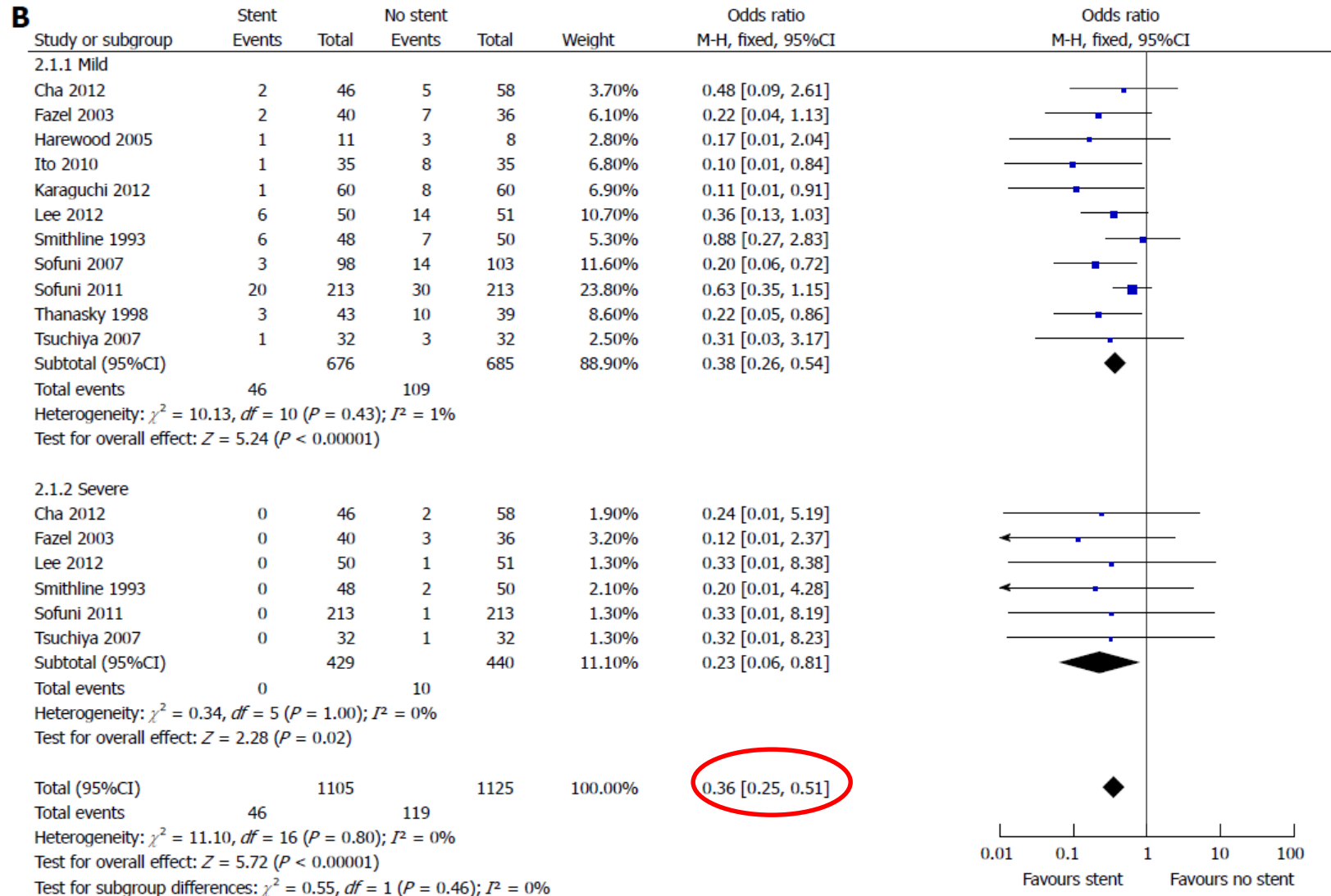


- Double blinded PCT
- But high pancreatitis rate
- But still makes sense

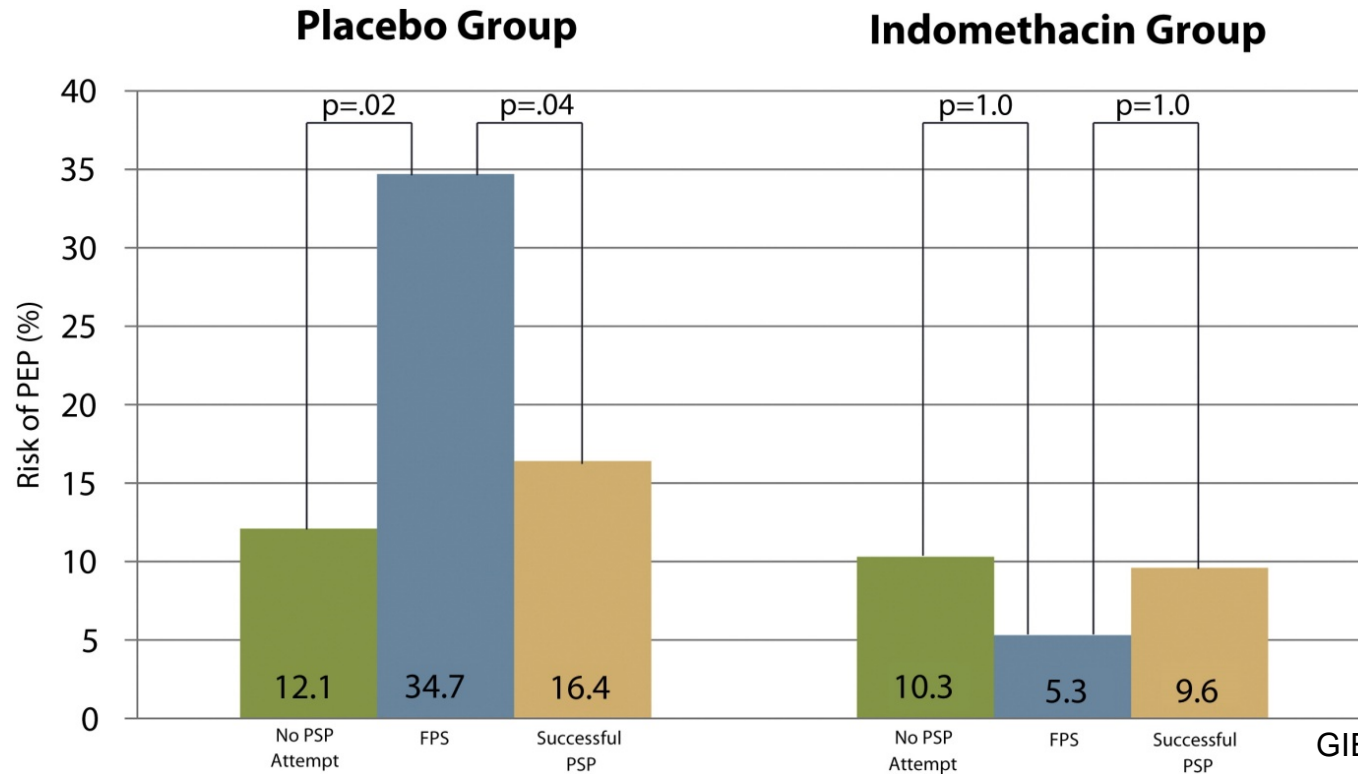
GIE, 2017 (85), 1005–1013

- What about aggressive intra and post procedure hydration?
- Beware of increased serum lactate level
- No reason not to use LR + indomethacin

Updated meta-analysis of pancreatic stent placement in preventing post-endoscopic retrograde cholangiopancreatography pancreatitis



The risk of post-ERCP pancreatitis and the protective effect of rectal indomethacin in cases of attempted but unsuccessful prophylactic pancreatic stent placement



GIE 2015;81:156-158

- Not randomized; intent to stent unclear in a retrospective review
- Why was pancreatitis so common after failed stent?
 - Excessive attempt ('beating up' the papilla);
 - Intrinsically high risk patients in Indiana, i.e., so called SOD patients?
- Indomethacin is possibly protective after failed stenting
- *So place PD stent only if 'easy'*

Guidewire-assisted cannulation of the common bile duct for the prevention of post-endoscopic retrograde cholangiopancreatography (ERCP) pancreatitis

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No of Participants (studies)	Quality of the evidence (GRADE)	Comments
	Assumed risk	Corresponding risk				
	Contrast-assisted cannulation, Main analysis	Guidewire-assisted cannulation				
Post-ERCP pancreatitis (ITT)	67 per 1000	34 per 1000 (22 to 55)	RR 0.51 (0.32 to 0.82)	3450 (12 studies)	⊕⊕⊕⊖ moderate ^{1,2}	NNT was 31 (95% CI 19 to 78)

*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

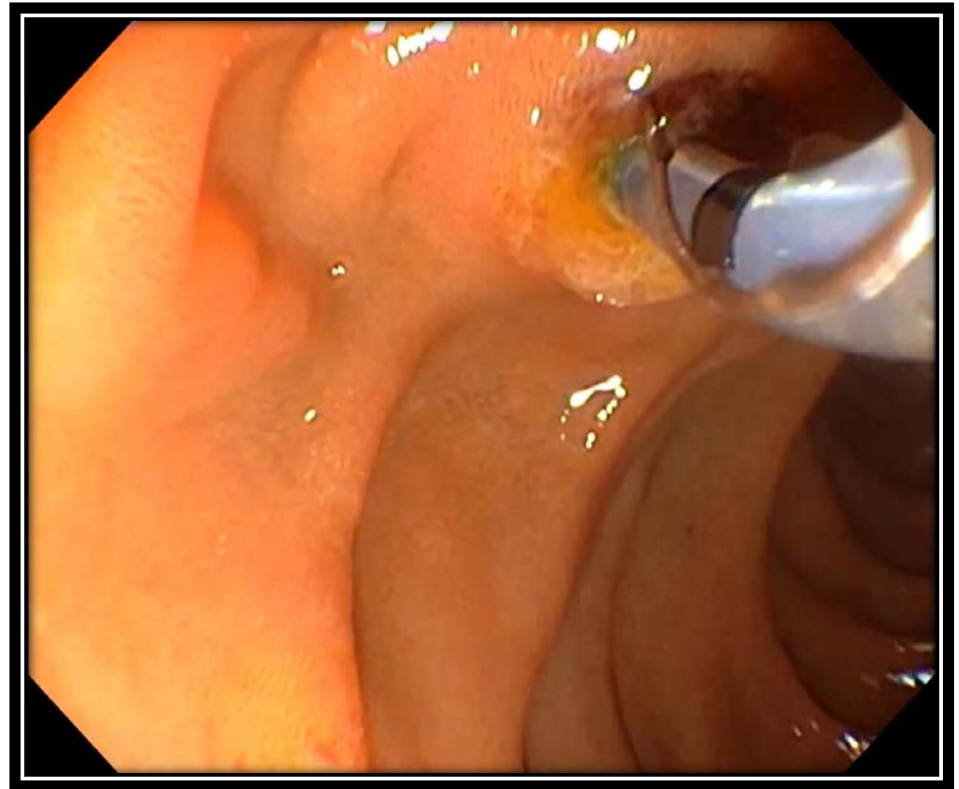
CI: Confidence interval; **RR:** Risk ratio;

- Higher selective cannulation rate (RR 1.07, 95% CI 1.00 to 1.15)
- Less precut sphincterotomy (RR 0.75; 95% CI, 0.60-0.95)
 - But no difference in studies that allowed cross over
- Really no reason not to use guidewire cannulation

Cochrane Database of Systematic Reviews 2012, Issue 12.

Cannulation technique after PD is accessed first

- Maintain wire in PD
 - Cut towards the biliary orifice
 - Look for bile
 - Place 5fr x 5cm fall out stent using sphincterotome as pusher
 - Reattempt cannulation towards the biliary orifice
- Earlier precut needle knife sphincterotomy for access
 - Repeat next day if still unable to access after precut
 - Alternative cannulation techniques
 - EUS guided rendezvous
 - EUS choledochoduodenostomy
 - Percutaneous approach



Early Precut Sphincterotomy Does Not Increase Risk During Endoscopic Retrograde Cholangiopancreatography in Patients With Difficult Biliary Access: A Meta-analysis of Randomized Controlled Trials

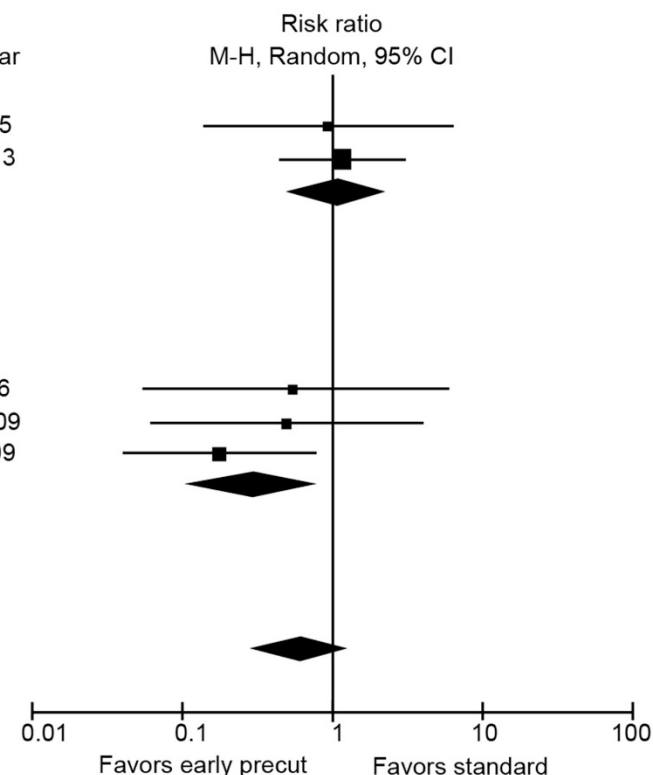
Study or Subgroup	Early precut		Standard		Weight	Risk ratio	Year
	Events	Total	Events	Total		M-H, Random, 95% CI	
4.1.1 Studies with fellows involved							
Tang 2005	2	32	2	30	14.6%	0.94 [0.14, 6.24]	2005
Swan 2013	8	39	6	34	40.8%	1.16 [0.45, 3.02]	2013
Subtotal (95% CI)		71		64	55.5%	1.11 [0.47, 2.61]	
Total events	10		8				
Heterogeneity: Tau ³ = .00, Chi ³ = .04, df = 1 (P = .84); I ³ = 0%							
Test for overall effect Z = .25 (P = .81)							

4.1.2 Studies with no fellows involved							
Zhou 2006	1	43	2	48	9.9%	0.56 [0.05, 5.94]	2006
Cennamo 2009	1	36	6	110	12.4%	0.51 [0.06, 4.09]	2009
Manes 2009	2	77	11	74	22.2%	0.17 [0.04, 0.76]	2009
Subtotal (95% CI)		156		232	44.5%	0.29 [0.10, 0.86]	
Total events	4		19				
Heterogeneity: $\tau^2 = .00$, $\chi^2 = 1.04$, $df = 2$ ($P = .60$); $I^2 = 0\%$							
Test for overall effect $Z = 2.24$ ($P = .03$)							

Total (95% CI)	227	296	100.00%	0.62 [0.28, 1.36]
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Total events	14	27
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Heterogeneity: $\tau^2 = .15$, $\chi^2 = 4.91$, $df = 4$ ($P = .30$); $I^2 = 19\%$
 Test for overall effect $Z = 1.19$ ($P = .23$)
 Test for subgroup differences: $\chi^2 = 3.62$, $df = 1$ ($P = .06$); $I^2 = 72.4\%$



- Highly variable definition of difficult cannulation – almost impossible to prove...
 - 5-12 minute attempt or >2-4 PD cannulation
- *Early precut is probably better if it can be done 'safely'*

Strategies to minimize risk of pancreatitis

- Crystal clear indications
- Do everything with low to no risk
 - Hydration with LR
 - PR indomethacin
 - Guidewire cannulation
- PD stent if easy
- Consider early precut for access

Complications of endoscopic biliary sphincterotomy – significant risk factors for post sphincterotomy bleeding

- Coagulopathy (OR 3.32; $P < .001$)
- Active cholangitis (OR 2.59; $P < .001$)
- Anticoagulant therapy within 3 days after ERCP (OR 5.11; $P < .001$)
- Endoscopist case volume ≤ 1 per week (OR 2.17; $P = .002$)
- Any observed bleeding during the procedure (OR 1.74; $P = .004$)

NEJM 1996;335, 909-918

Bleeding risk

- Assume high risk
 - Unrecognized coagulopathy and importance of bleeding history
 - Exceptions – prior sphincterotomy or stent change
- Cardiology / Neurology / anticoagulation clinic when in doubt
- Warfarin
 - Hold 3-5 days, +/- check INR, restart immediately to 2-3 days
- DOAC
 - Dabigatran (Pradaxa), rivaroxaban (Xarelto), apixaban (Eliquis), edoxaban (Savaysal)
 - Hold 48 hours, restart immediately to 3 days
- Antiplatelet therapy
 - Usually continue aspirin / NSAID
 - Usually hold P2Y₁₂ e.g., ticlopidine (Ticlid), clopidogrel (Plavix), prasugrel (Effient), ticagrelor (Brilinta) for 5-14 days; continue aspirin if on dual therapy

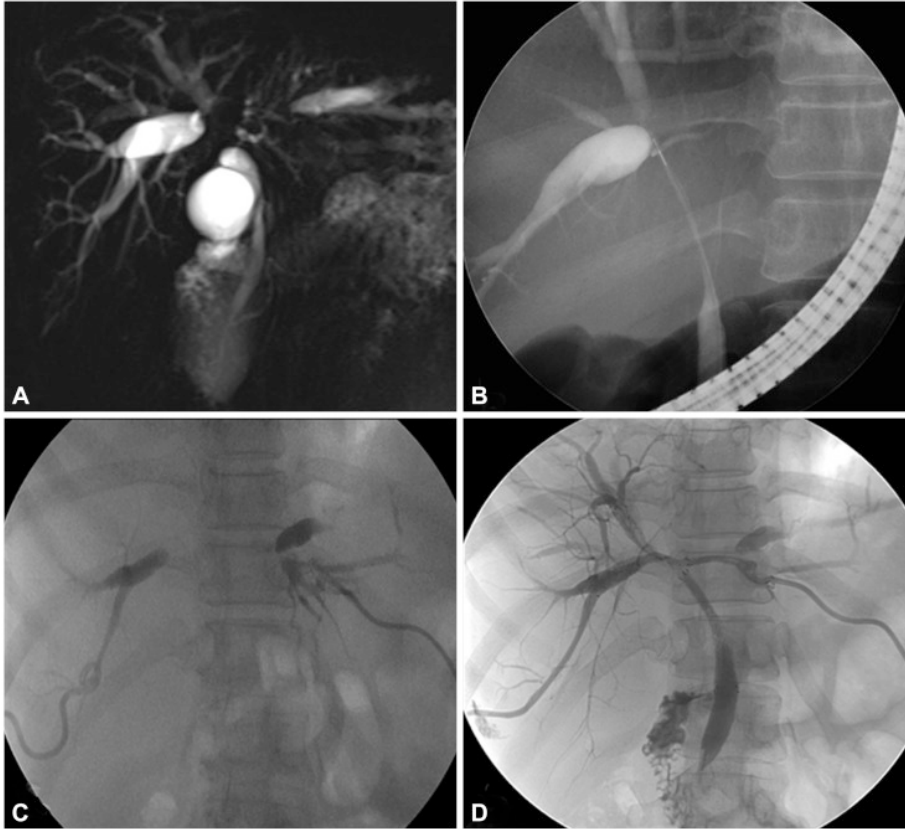
Decreasing bleeding risk

- Don't cut unless necessary
- Blended / microprocessor controlled cutting might be better than pure cutting current
- Do not cut with too much wire
- Do not tent too much

Minimizing infection risk

- Meticulous reprocessing
- Use of sterile accessories whenever possible including water, water bottle, tubing etc.
- Prophylactic antibiotics not recommended except for
 - Post OLT patient
 - Incomplete drainage
 - Retained stones / sludge
 - Over filling of complex hilar strictures

Risk of infection with hilar stricture

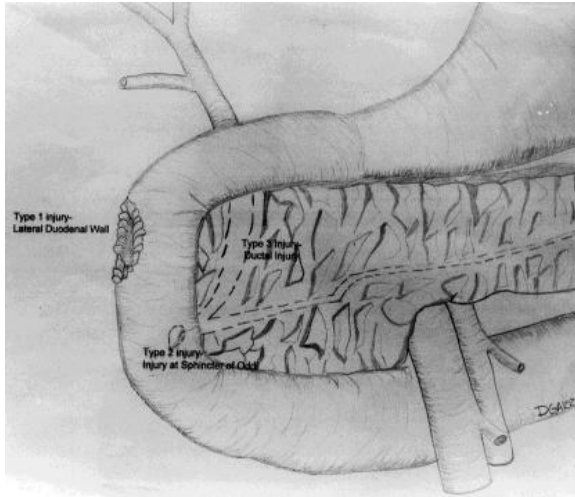


- MRCP first
- Inject only if absolutely necessary
- Always inject proximal to stricture
- Inject each side separately and only after wire access in contralateral side

Risk factors for perforation

- Surgically altered anatomy
- Recent surgery
- Stricture / cancer
- Old age – cervical spur
- Difficult cannulation
- Sphincterotomy
- Large balloon dilation
- Barotrauma
- Stiff wires, plastic stents, metal stent / introducer

Perforation



Ann Surg. 2000 Aug;232(2):191-8.

- I – limit dilation, cervical spur
- II – cut between 11 – 1 O'clock, cut and dilate
- III – hydrophilic guidewire, wire lock
- IV – CO2, water

Immediate recognition is key!

- Strange air shadow / control film
- Difficulty insufflating
- Hemodynamic instability
- Crepitus, tense abdomen
- Pain

Table 1. Classification of Iatrogenic Duodenal Perforations during Endoscopic Retrograde Cholangiopancreatography

Reference	Type and definition
Stapfer et al. ¹	Type I, lateral or medial duodenal wall perforation, endoscope related Type II, periampullary perforations, sphincterotomy related Type III, ductal or duodenal perforations due to endoscopic instruments Type IV, guidewire-related perforation with presence of retroperitoneal air at X-ray
Howard et al. ²	Group I, guidewire perforation Group II, periampullary perforation Group III, duodenal perforation
Enns et al. ³	Esophageal, gastric, and duodenal perforation Sphincterotomy-related perforation Guidewire-related perforation

ASGE recommendations

1. Use techniques that reduce the risk of pancreatitis (i.e., wire-guided cannulation, prophylactic pancreatic duct stenting). ⊕⊕⊕⊕
2. Pancreatic duct stenting in high-risk individuals. ⊕⊕⊕⊕
3. Follow FDA recommendations for duodenoscope reprocessing. ⊕⊕⊕⊕
4. Early precut for difficult biliary cannulation when expertise is available. ⊕⊕⊕○
5. Rectal nonsteroidal anti-inflammatory drugs (NSAIDs). ⊕⊕⊕○
6. No large balloon dilation (EPLBD) of an intact sphincter. ⊕⊕⊕○
7. Sphincterotomy only when absolutely indicated. ⊕⊕⊕○
8. Use microprocessor-controlled generator with mixed current. ⊕⊕⊕○

ASGE recommendations

9. Antibiotic prophylaxis for OLT patients and possible incomplete biliary drainage; continue afterwards for incomplete biliary drainage. ⊕⊕⊕○
10. Insufficient evidence that rectal NSAIDs + PD stenting is better than either technique alone for prevention of post-ERCP pancreatitis in high-risk individuals. ⊕⊕○○
11. Rectal indomethacin may reduce the risk and severity of post-ERCP pancreatitis in average-risk individuals. ⊕⊕○○
12. Non operative management for type II, III, IV perforations from ERCP without peritonitis or SIRS. ⊕⊕○○
13. No premedication in patients with food or IV contrast allergies. ⊕⊕○○
14. Periprocedural IV LR hydration. ⊕○○○

GIE 2017;85: 32-47

