ERCP complications
Identification and management

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Introduction

Endoscopic retrograde cholangio-pancreatography (ERCP) is one of the most demanding procedures in gastrointestinal endoscopy.

ERCP is associated with an increased risk of complications including pancreatitis, hemorrhage, perforation and infection.

Post-ERCP pancreatitis (PEP) is the most frequent complication of ERCP (~3.5%).

Dumonceau JM *et al*. Endoscopy. 2014;46(9):799-815.
ASGE Standards of Practice Committee. Gastrointest Endosc. 2017;85(1):32-47.

Post-ERCP complications

Incidence

Acute pancreatitis
overall incidence 1%-7%, severe 0.4%, mortality <0.1%

Post-sphincterotomy bleeding
incidence 1%-2% up to 10%, severe 0.5%, mortality <0.1%

Acute cholangitis
incidence ≈ 1%, severe 0.1%, mortality <0.1%

Acute cholecystitis
incidence 0.2-0.5%, severe 0.1%, mortality <0.1%

Perforation
Incidence 0.3%-0.6%, severe 0.2%, mortality <0.1%

Costamagna Best P Res Clin Gastro 2008

Complications of ERCP – frequency

Multicenter series

Author	n	Pancreatitis	Bleeding	Perforation	Cholangitis
Williams	5264	1.6%	0.9%	0.4%	1%
Loperfido	2769	1.3%	0.7%	0.6%	0.9%
Freeman	2347	5.4%	2%	0.3%	1%
Vitte	2708	3%	1.5%	0.9%	1.9%
Masci	700	3.6%	1.4 %	0.4%	0.1%
Total		**2.98%**	**1.3%**	**0.52%**	**0.98%**

Costamagna Best P Res Clin Gastro 2008; Barthet Endoscopy 2002; Loperfido GIE 1998; Masci Am J Gastro 2001; Freeman GIE 2001; Vitte Gastroenterol Clin Biol 2007

Complications of ERCP

Based on volume

Author	Range	Overall rate	Mortality
Large series >2000 (multicenter)	2347-5264	7.1%	0.5%
Series >500, <2000 (single centre)	701-1223	8.4 %	0.5%
Series <500 (single centre)	181-336	11.1%	0.3%

Definition of low volume center ??? – 100, 200 or 300/year ?

Costamagna Best P Res Clin Gastro 2008; Barthet Endoscopy 2002

Complications of ERCP

Definition

Complication	*Mild*	*Moderate*	*Severe*
Pancreatitis	Clinical pancreatitis, amylase at least 3x normal >24 hours after procedure, requiring admission or prolongation of planned admission to 2-3 days	Pancreatitis requiring hospitalization of 4-10 days	Hospitalization > 10 days, or hemorrhagic pancreatitis phlegmon, pseudocyst, or intervention (percutaneous drainage or surgery)
Bleeding	Clinical (ie, not just endoscopic) evidence of bleeding Hemoglobin drop < 3 g, and no need for transfusion	Transfusion (< 4 units), no angiographic intervention or surgery	Transfusion ≥ 5 units, or intervention (angiographic or surgical)
Perforation	Possible, or only very slight leak of fluid or contrast, treatable by fluids and suction for ≤ 3 days	Any definite perforation treated medically 4-10 days	Medical treatment >10 days, or intervention (percutaneous or surgical)
Infection (cholangitis)	>38 °C for 24-48 hours	Febrile or septic illness requiring > 3days of hospital treatment or endoscopic percutaneous intervention	Septic shock or surgery

Cotton PB et al 1991

Post-ERCP pancreatitis (PEP)

Definition, incidence, prediction

Consensus definition and grading of severity

Complication	Mild	Moderate	Severe
Pancreatitis	Clinical pancreatitis, amylase at least 3 × normal >24 h after procedure, requiring unplanned admission or prolongation of planned admission to 2-3 days	Pancreatitis requiring hospitalization of 4-10 d	Pancreatitis requiring hospitalization >10 d, intervention (percutaneous drainage or surgery), development of necrosis, or pseudocyst

Incidence

Low-risk patients: 2-3% High-risk patients: 8-26%

Effect of risk factors is synergistic.

Mild or moderate severity in approximately 90% of cases.

Prediction

Serum amylase or lipase values <1.5 times the ULN, obtained 2-4 hours post-ERCP have a very high negative predictive value for PEP.

Values >3-5 times the ULN at 4-6 hours post-ERCP have increasing positive predictive value for PEP.

Cotton PB *et al*. Gastrointest Endosc. 1991;37(3):383-93.
Freeman ML, Guda NM. Gastrointest Endosc. 2004;59(7):845-64.
Dumonceau JM *et al*. Endoscopy. 2014;46(9):799-815.

Post-ERCP pancreatitis (PEP)

Risk factors

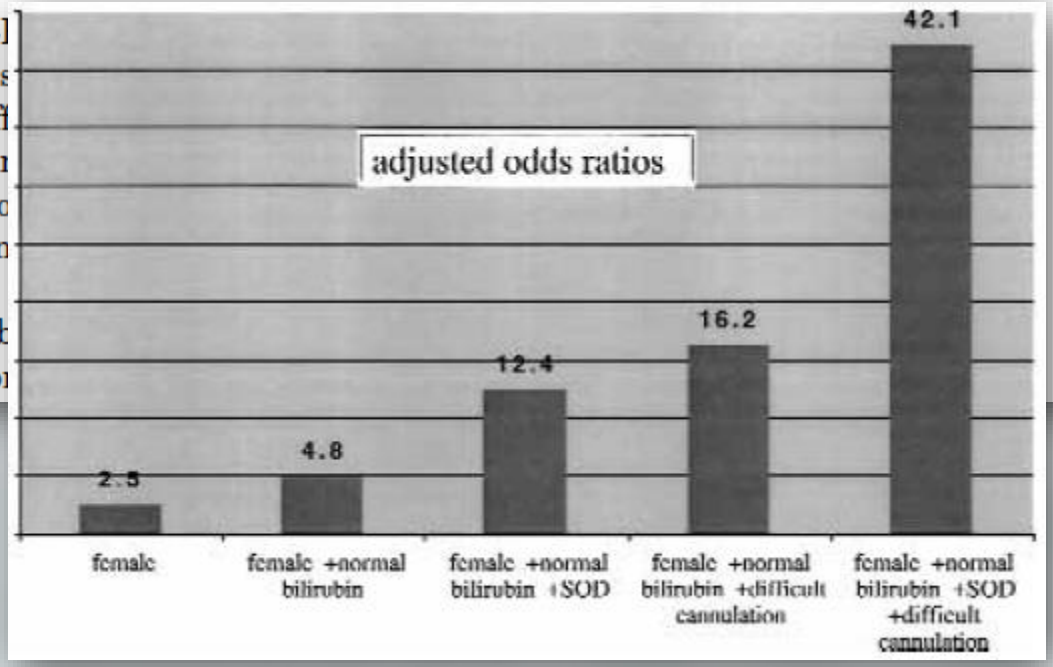
	Adjusted odds ratios (95 % confidence intervals in parentheses except where indicated otherwise)	Pooled incidence of PEP in patients with vs. those without risk factor
Patient-related risk factors		
Definite risk factors		
Suspected sphincter of Oddi dysfunction (SOD)	1.91 (1.37 – 2.65)	8.6 % vs. 2.5 %
Female gender	3.5 (1.1 – 10.6)	4.0 % vs. 2.1 %*
Previous pancreatitis	2.46 (1.93 – 3.12)	6.7 % vs. 3.8 %
Likely risk factors		
Previous PEP	8.7 (3.2 – 23.86)	30 % vs. 3.5 %
Younger age	Range of odds ratios: 1.09 – 2.87	6.2 % vs. 2.6 %
Nondilated extrahepatic bile ducts		3.8 % vs. 2.3 %
Absence of chronic pancreatitis	1.87 (1.00 – 3.48)	4.0 % vs. 3.1 %
Normal serum bilirubin	1.89 (1.22 – 2.93)	4.15 % vs. 1.43 %
Procedure-related risk factors		
Definite risk factors		
Cannulation attempts duration > 10 minutes[2]	1.76 (1.13 – 2.74)	3.8 % vs. 10.8 %
Pancreatic guidewire passages > 1	2.77 (1.79 – 4.30)	2.9 % vs. 9.5 %
Pancreatic injection	2.2 (1.60 – 3.01)	3.3 % vs. 1.7 %
Likely risk factors		
Precut sphincterotomy[3]	2.3 (1.4 – 3.7)	5.3 % vs. 3.1 %
Pancreatic sphincterotomy	3.07 (1.64 – 5.75)	2.6 % vs. 2.3 %
Biliary balloon sphincter dilation	4.51 (1.51 – 13.46)	9.3 % vs. 2.6 %
Failure to clear bile duct stones	3.35 (1.33 – 9.10)	1.7 % vs. 1.6 %
Intraductal ultrasound (IDUS)[4]	2.41 (1.33 – 4.39)	8.37 % vs. 2.76 %

Dumonceau JM *et al*. Endoscopy. 2014;46(9):799-815.

Post-ERCP pancreatitis (PEP)

Risk factors

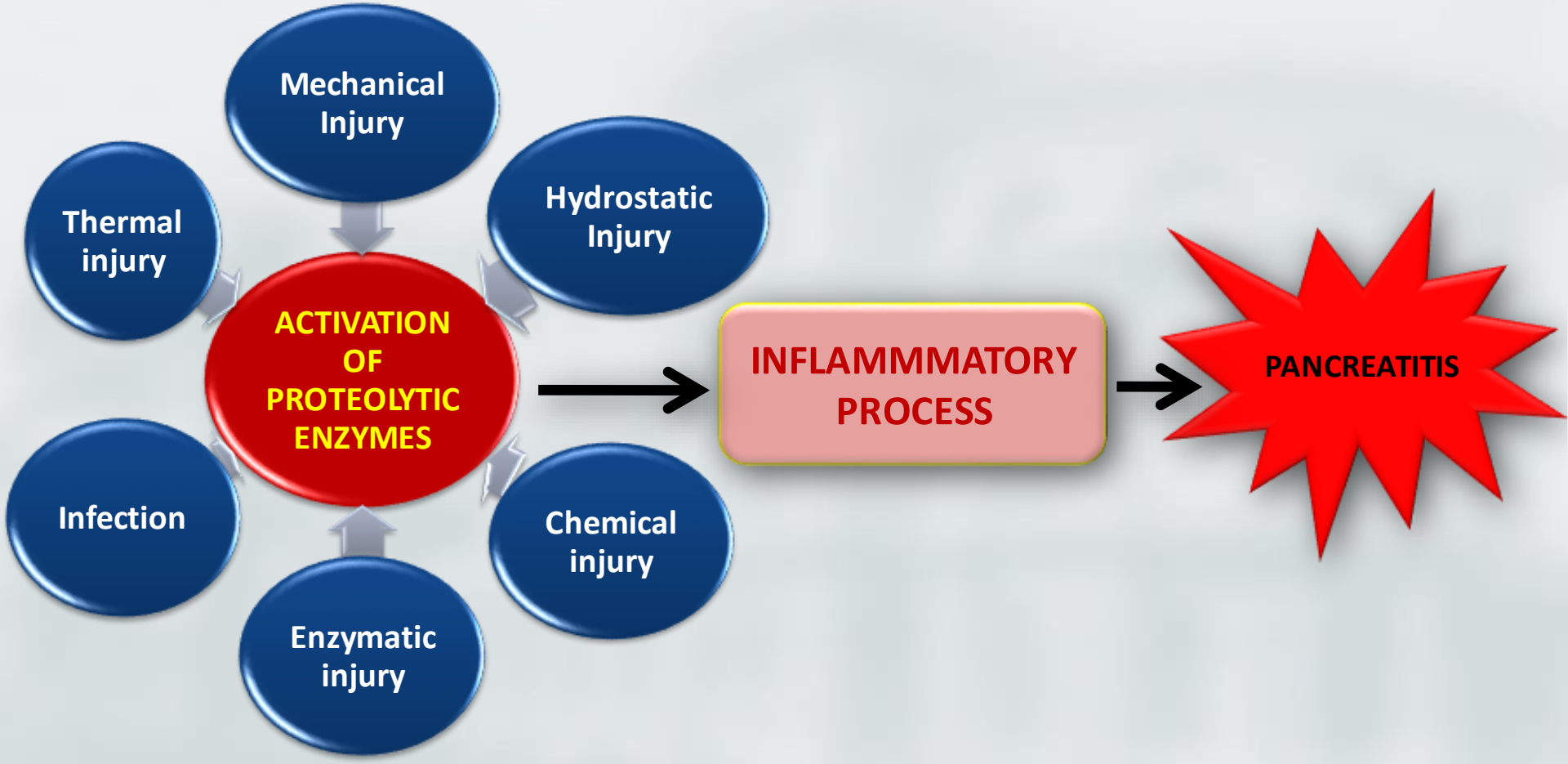
Risk factor	Adjusted OR	95% CI	*p* value
History of post-l			0.0001
Biliary balloon s			0.0027
Moderate-to-diff			0.0001
Pancreatic sphi			0.0001
≥1 Pancreatic co			0.0051
Suspected sphin			0.0001
Female gender			0.0001
Normal serum b			0.0023
Absence of chro			0.0471



Freeman ML *et al*. Gastrointest Endosc. 2001;54(4):425-34.

Post-ERCP pancreatitis (PEP)

Pathogenesis



Adapted from Dr. Manu Tandan, Asian Institute of Gastroenterology, Hyderabad, India.
Freeman ML, Guda NM. Gastrointest Endosc. 2004;59(7):845-64.

Post-ERCP pancreatitis (PEP)

Prevention – strategies in practice

Patient selection

- indication
- risk stratification
- alternative imaging modalities

Endoscopic techniques/maneuvers

- standard cannulation (attempts, guidewire, contrast injection)
- difficult cannulation (precut, double wire technique)
- specific techniques (balloon dilation of the sphincter of Oddi)
- prophylactic pancreatic stents (routine use, rescue/salvage ERCP)

Conservative management

- hydration
- prophylactic medications (NSAIDs)

Post-ERCP pancreatitis (PEP)

Prevention – recommendations

Prophylaxis of post-ERCP pancreatitis: European Society of Gastrointestinal Endoscopy (ESGE) Guideline – Updated June 2014

ESGE

Jean-Marc Dumonceau[1], Angelo Andriulli[2], B. Joseph Elmunzer[3], Alberto Mariani[4], Tobias Meister[5], Jacques Deviere[6], Tomasz Marek[7], Todd H. Baron[8], Cesare Hassan[9], Pier A. Testoni[4], Christine Kapral[10]

Endoscopy 2014; 46: 799–815

Adverse events associated with ERCP

ASGE

ASGE STANDARDS OF PRACTICE COMMITTEE

Gastrointest Endosc. 2017;85(1):32-47.

Post-ERCP pancreatitis (PEP)

Patient selection

Indication

- only therapeutic ERCP indicated
- information needed (history, medication, laboratory values)

Risk stratification

- analyzing risk factors (overall, PEP, bleeding)
- cost – benefit

Alternative imaging modalities

- MRCP
- EUS (!!!)

Appropriate patient selection is instrumental in reducing PEP.

Trying to avoid unnecessary or marginally indicated ERCP, especially in high-risk patients!

Dumonceau JM *et al*. Endoscopy. 2014;46(9):799-815.
ASGE Standards of Practice Committee. Gastrointest Endosc. 2017;85(1):32-47.

Endoscopic techniques

Standard cannulation

Attempts

- try to minimize
- procedure-related definite risk factor for PEP (>5-10 min.)

Contrast injection into the pancreatic duct (PD)

- only incidentally or if required
- keep volume as low as possible
- procedure-related definite risk factor for PEP

Cannulation technique

- wire-guided cannulation
- wire-assisted cannulation

830-4.
85-93.
Tse F *et al*. Endoscopy. 2013;45(8):605-18.

Endoscopic techniques

Cannulation – wire-guided vs. contrast injection

Guide wire-assisted cannulation for the prevention of post-ERCP pancreatitis: a systematic review and meta-analysis

F. Tse, Y. Yuan, P. Moayyedi, G. I. Leontiadis

Conclusion: Compared with the contrast-assisted cannulation technique, the guide wire-assisted cannulation technique increases the primary cannulation rate and reduces the risk of PEP, and therefore appears to be the most appropriate first-line cannulation technique.

Study or subgroup	Guide wire Events	Guide wire Total	Contrast Events	Contrast Total	Weight, %	Risk ratio [95 % CI]*
Non-crossover studies						
Apostolopoulos 2005 [46]	4	67	3	6		
Artifon 2007 [47]	13	150	33	15		
Katsinelos 2008 [50]	25	167	31	16		
Bailey 2008 [48]	25	215	29	21		
Lee 2009 [53]	28	150	36	150	27.5	0.78 [0.50–1.21]
Kobayashi 2010 [52]	5	163	6	159	3.9	0.81 [0.25–2.61]
Nambu 2011 [57]	3	86	4	86	2.5	0.75 [0.17–3.25]
Kawakami 2012 [51]	8	199	6	201	4.9	1.35 [0.48–3.81]
Total		**1197**		**1189**	**100.0**	**0.75 [0.60–0.95]**
Total events	111		148			
Total events	1252		1151			
Kawakami 2012 [51]	8	199	6	201	10.1	1.35 [0.48–3.81]
Subtotal		**1117**		**1003**	**68.2**	**0.85 [0.58–1.23]**
Total events	51		57			
Heterogeneity: $Tau^2 = 0.00$; $\chi^2 = 5.23$, df = 6 (P = 0.51); $I^2 = 0\%$						
Test for overall effect: Z = 0.86 (P = 0.39)						
Total		**1784**		**1666**	**100.0**	**0.51 [0.32–0.82]**
Total events	62		112			

Need for precut

PEP

12 RCTs – 3450 patients

Endoscopic techniques

Standard cannulation

Prophylaxis of post-ERCP pancreatitis: European Society of Gastrointestinal Endoscopy (ESGE) Guideline – Updated June 2014

Jean-Marc Dumonceau[1], Angelo Andriulli[2], B. Joseph Elmunzer[3], Alberto Mariani[4], Tobias Meister[5], Jacques Deviere[6], Tomasz Marek[7], Todd H. Baron[8], Cesare Hassan[9], Pier A. Testoni[4], Christine Kapral[10]

Endoscopy 2014; 46: 799–815

ESGE recommends keeping the number of cannulation attempts as low as possible *(Grade B)*.

The number of injections and volume of contrast medium injected into the pancreatic duct should be kept as low as possible *(Grade B)*.

The wire-guided technique is recommended for deep biliary cannulation *(Grade A)*.

Endoscopic techniques

Difficult cannulation

Definition (in an intact papilla)

- cannulation attempts of duration >5 minutes
- >5 attempts
- ≥2 pancreatic guidewire passages

Options

- persistent attempts at cannulation using standard methods
- pancreatic guidewire placement (double wire technique)
- precut sphincterotomy
- repeat attempts at 24–48 hours later
- patient referral to another endoscopist/center

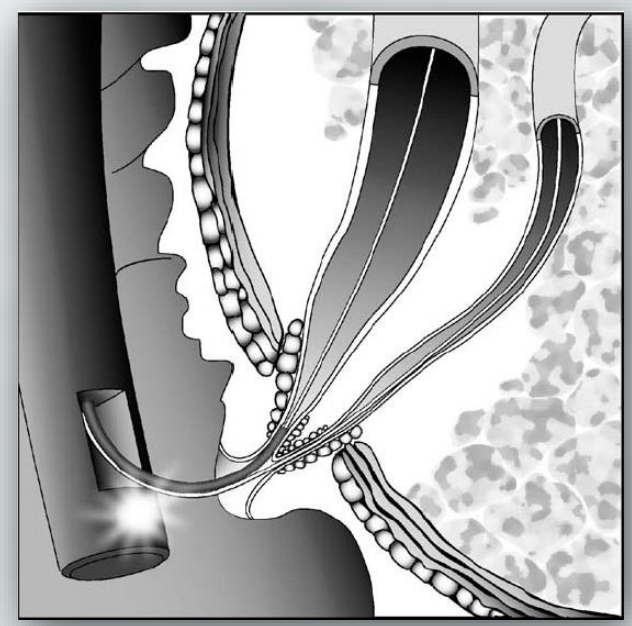
Halttunen J *et al*. Scand J Gastroenterol. 2014;49(6):752-8.
Dumonceau JM *et al*. Endoscopy. 2014;46(9):799-815.

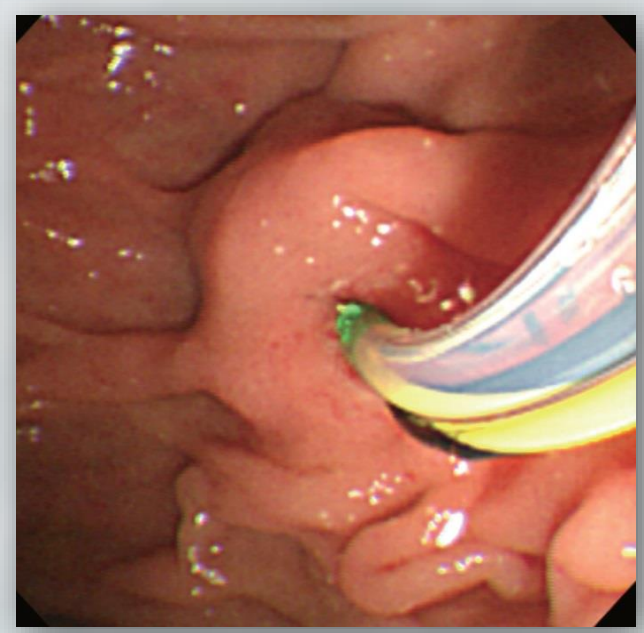
Endoscopic techniques

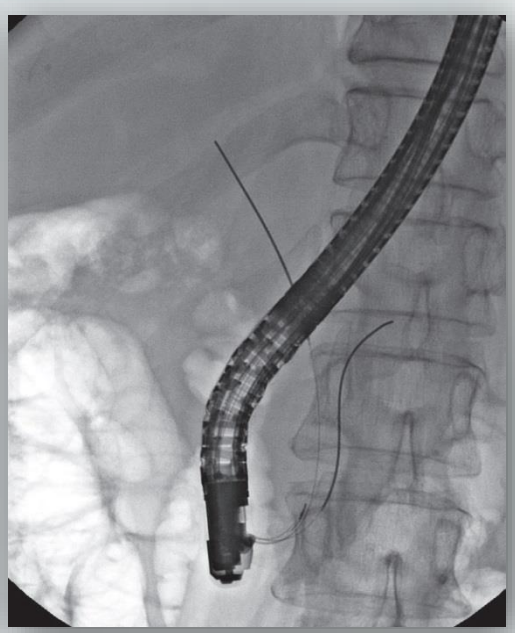
Difficult cannulation – pancreatic wire placement

Hypothesis (double guidewire technique)

- facilitates deep biliary cannulation
- prevents repeated cannulation of PD







Gyökeres T *et al*. Endoscopy. 2003;35(1):95-6.
Song BJ, Kang DH. Clin Endosc. 2014;47(3):217-21.

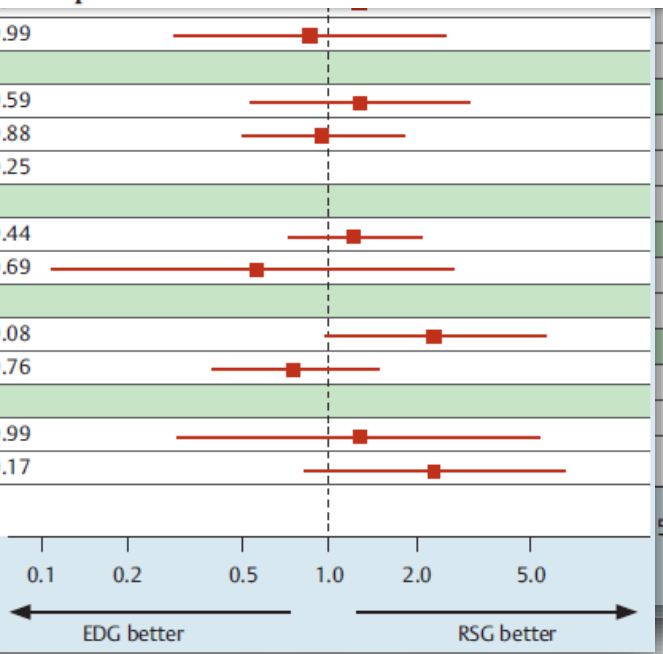
Endoscopic techniques

Difficult cannulation – pancreatic wire placement

Early use of double-guidewire technique to facilitate selective bile duct cannulation: the multicenter randomized controlled EDUCATION trial

Conclusions: During therapeutic ERC using wire-guided cannulation, converting to a double-guidewire technique neither facilitated selective bile duct cannulation nor decreased PEP incidence compared with repeated use of a single-wire technique.

Subgroup	RSG, n		EDG, n		Relati… risk		
	Success	Total	Success	Total			
Age							
< 60 year	8	30	8	26	1.30		
≥ 60 year	15	107	18	111	1.16		
Gender							
Female	15	70	13	63	0.961		
Male	8	67	14	74	1.58		
Body mass index							
<25.0 kg/m²	17	103	22	105	1.27		
≥25.0 kg/m²	6	33	5	32	0.86	0.29–2.54	0.99
Disease							
Biliary stones	8	72	10	71	1.27	0.53–3.03	0.59
Malignantstricture	15	57	13	52	0.95	0.50–3.03	0.88
Benign stricture	0	8	1	14			0.25
Intraverticular ampulla							
–	18	95	25	107	1.23	0.72–2.11	0.44
+	5	42	2	30	0.56	0.11–2.69	0.69
Operator							
Trainee*	6	50	14	50	2.33	0.97–5.58	0.08
Expert	17	87	13	87	0.76	0.40–1.48	0.76
Failed cannulation within the limits							
with pancreatic stent	3	19	3	15	1.27	0.30–5.40	0.99
without pancreatic stent	4	22	8	19	2.32	0.82–6.50	0.17



PEP

Endoscopic techniques

Difficult cannulation – pancreatic wire placement

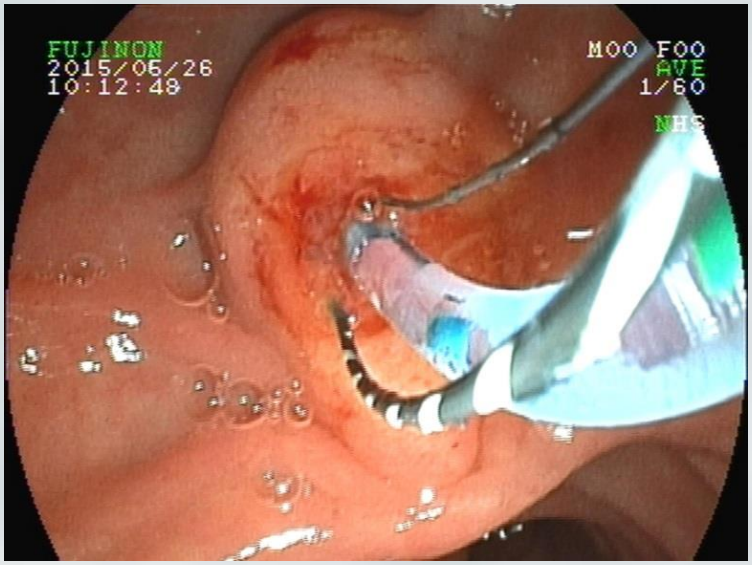
ESGE suggests restricting the use of a PGW as a backup technique to cases with repeated inadvertent cannulation of the pancreatic duct; if this method is used, deep biliary cannulation should be attempted using a guidewire rather than the contrast-assisted method and a prophylactic pancreatic stent should be placed ***(Evidence level 1–; Grade B).***

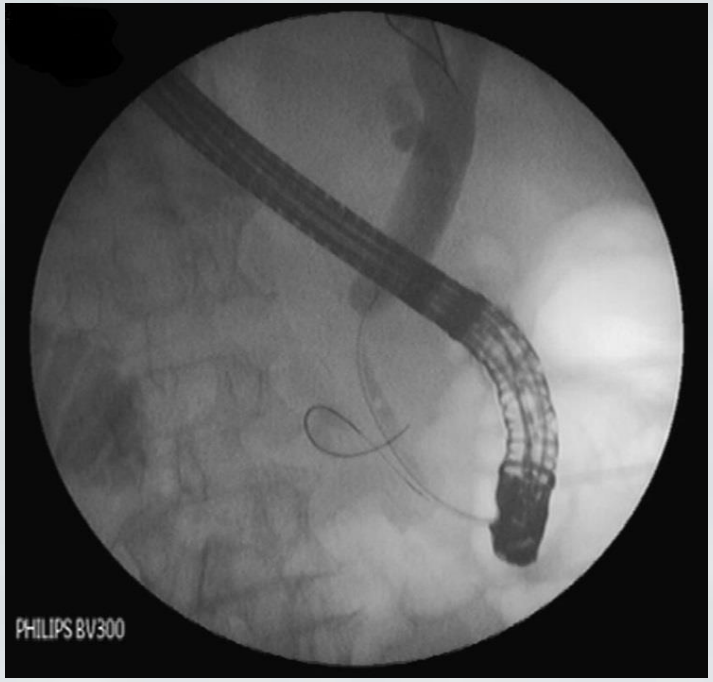
Endoscopic techniques

Difficult cannulation – pancreatic wire placement

In case of difficult biliary cannulation, when the guidewire is unintentionally inserted repeatedly into the PD, we utilize the double guidewire technique as an option.

For the prevention of PEP we use 5-Fr prophylactic pancreatic stents.





Endoscopic techniques

Difficult cannulation – precut sphincterotomy

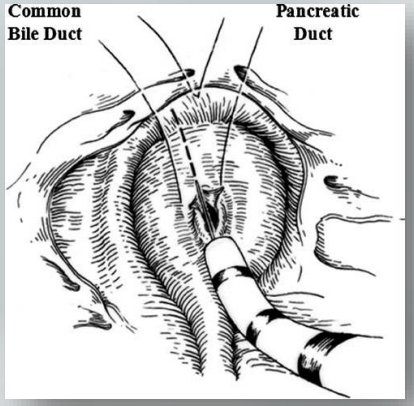
Access sphincterotomy

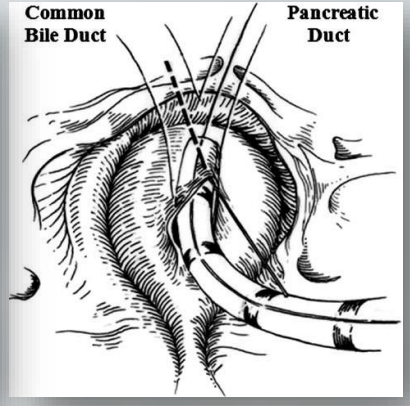
Primarily designed for gaining access into the biliary or pancreatic duct when the conventional methods of selective cannulation fail.

Basic principle is to unroof the ampulla of Vater for exposing the duct epithelium.

<u>Techniques</u>

- needle-knife (NK) sphincterotomy
  - conventional (free hand); over PD stent; suprapapillary fistulotomy
- traction sphincterotomy
  - traction papillotomy; transpancreatic precut sphincterotomy





Siegel JH. Endoscopy. 1980;12:130-133.
Bourke MJ *et al.* Endoscopy. 2009;41:612-617.

Endoscopic techniques

Difficult cannulation – precut sphincterotomy

Clinical Gastroenterology and Hepatology 2015;13:1722–1729

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

Prakalathan Sundaralingam,* Philip Masson,‡ and Michael J. Bourke*

In conclusion, our study shows that although there is no difference in overall cannulation rate, the institution of early precut sphincterotomy significantly improves primary cannulation rates compared with persistent standard therapy in patients with difficult biliary access. The early use of precut sphincterotomy does not increase the risk of post-ERCP pancreatitis and in experienced hands may actually reduce this risk.

Zhou 2006	1	43	2
Cennamo 2009	1	36	6
Manes 2009	2	77	11
Subtotal (95% CI)		156	
Total events	4		19
Heterogeneity: Tau³ = .00, Chi³ = 1.04, df = 2 (P = .6			
Test for overall effect Z = 2.24 (P = .03)			
Total (95% CI)		227	
Total events	14		27
Heterogeneity: Tau³ = .15, Chi³ = 4.91, df = 4 (P = .30), I² = 19%			
Test for overall effect Z = 1.19 (P = .23)			
Test for subgroup differences: Chi³ = 3.62, df = 1 (P = .06); I² = 72.4%			

PEP

0.01 0.1 1 10 100

Favors early precut Favors standard

5 RCTs – 523 patients

Endoscopic techniques

Difficult cannulation – precut sphincterotomy

Prophylaxis of post-ERCP pancreatitis: European Society of Gastrointestinal Endoscopy (ESGE) Guideline – Updated June 2014

Jean-Marc Dumonceau[1], Angelo Andriulli[2], B. Joseph Elmunzer[3], Alberto Mariani[4], Tobias Meister[5], Jacques Deviere[6], Tomasz Marek[7], Todd H. Baron[8], Cesare Hassan[9], Pier A. Testoni[4], Christine Kapral[10]

Endoscopy 2014; 46: 799–815

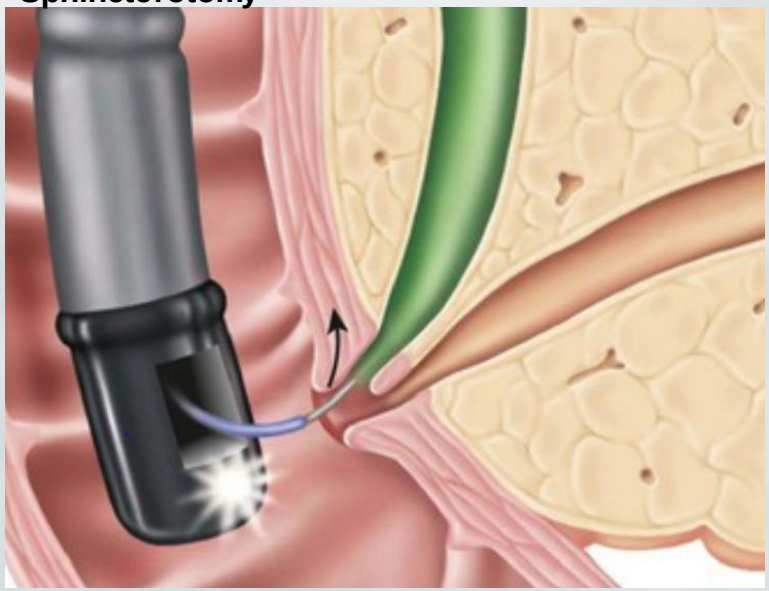
In cases of difficult cannulation, early precut is associated with lower PEP incidence *(Grade B)*.

Needle-knife fistulotomy should be the preferred precut technique *(Grade B)*.

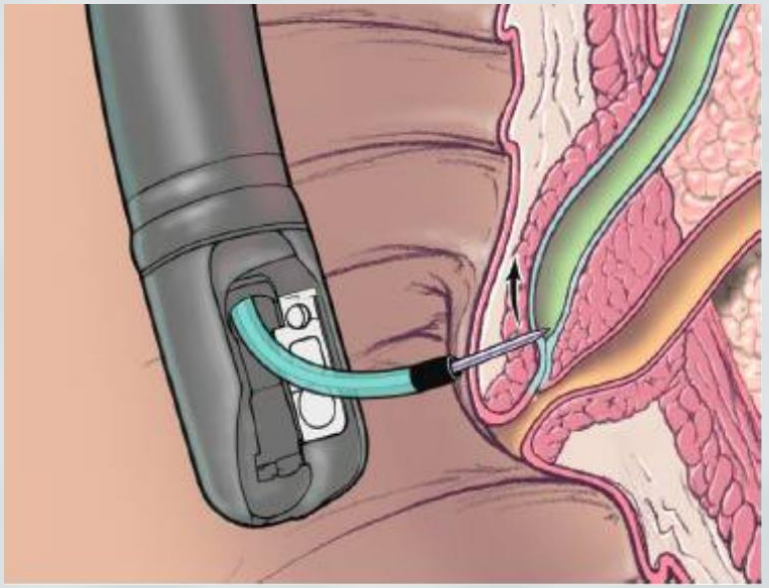
If conventional precut is elected and pancreatic cannulation is easily obtained, ESGE suggests attempting to place a small diameter pancreatic stent to guide the cut and leaving it in place for a minimum of 12-24 hours *(Grade B)*.

Needle knife sphincterotomy vs. fistulotomy

Sphincterotomy



Fistulotomy



One RCT, one meta-analysis, and one retrospective study have shown **significantly lo**

Endoscopic techniques

Difficult cannulation – precut sphincterotomy

We prefer early NK precut sphincterotomy in case of difficult biliary cannulation.

For the prevention of PEP we routinely use 5-Fr prophylactic pancreatic stents.

Free-hand precut

Over PD stent

Traction papillotomy

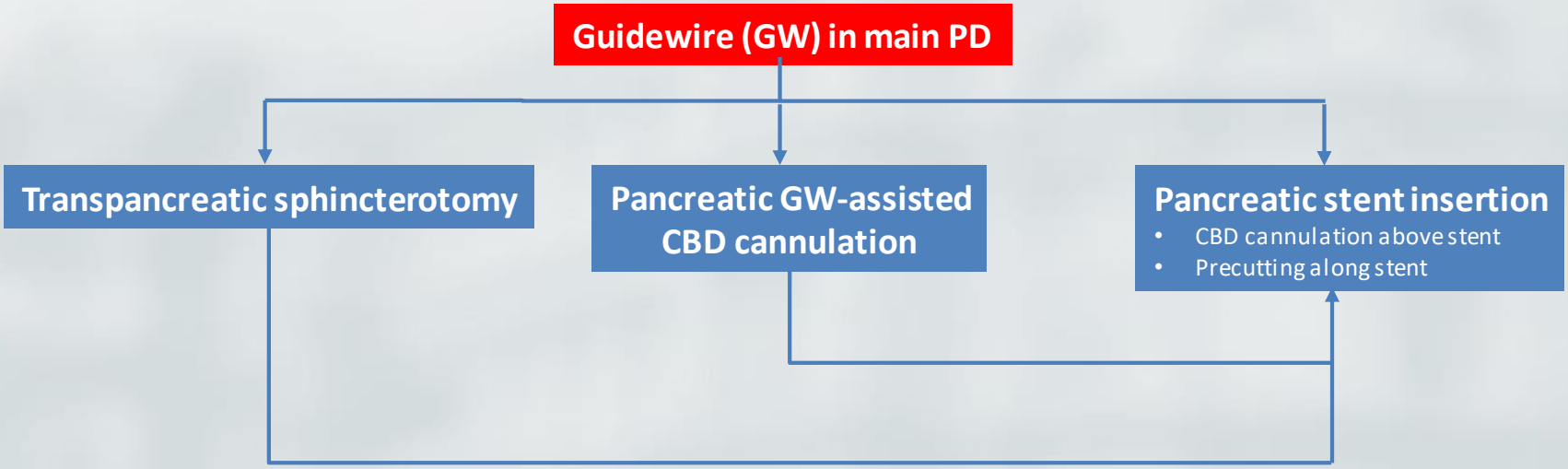
*” **A well-positioned guidewire in the MPD is a real blessing**.*

This can occur only once during an ERCP, and during the next attempt neither the CBD nor the MPD can be cannulated.

***Therefore, even during the first guidewire passage into the MPD, the endoscopist must seriously consider performing some pancreatic technique for CBD cannulation** instead of removing the guidewire from the pancreas and trying again with the standard technique.”*

Jesús Garcia-Cano, Rev Esp Enferm Dig 2017;109:171-3

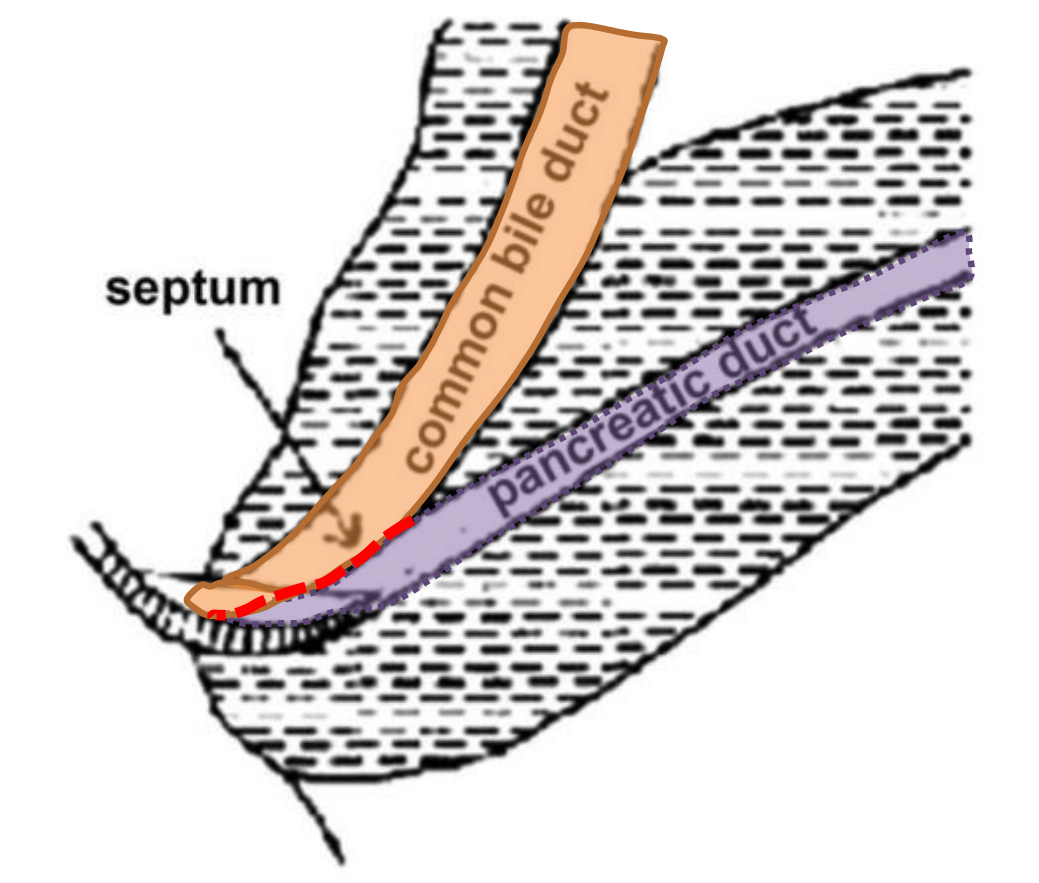
Pancreatic techniques for bile duct cannulation



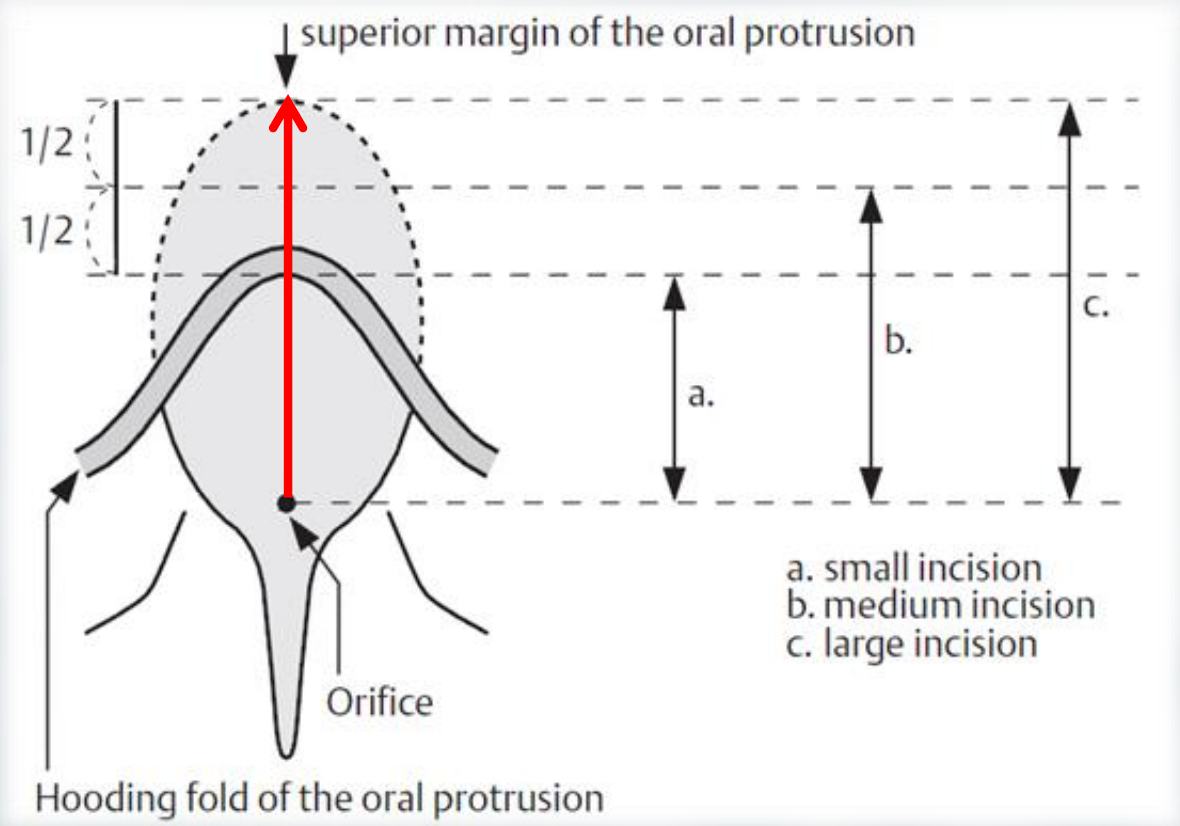
Transpancreatic sphincterotomy

Synonymous with:

- Transpancreatic precut papillotomy
- Precut transpancreatic sphincterotomy
- Transpancreatic septotomy
- Upward pancreatic sphincter precutting

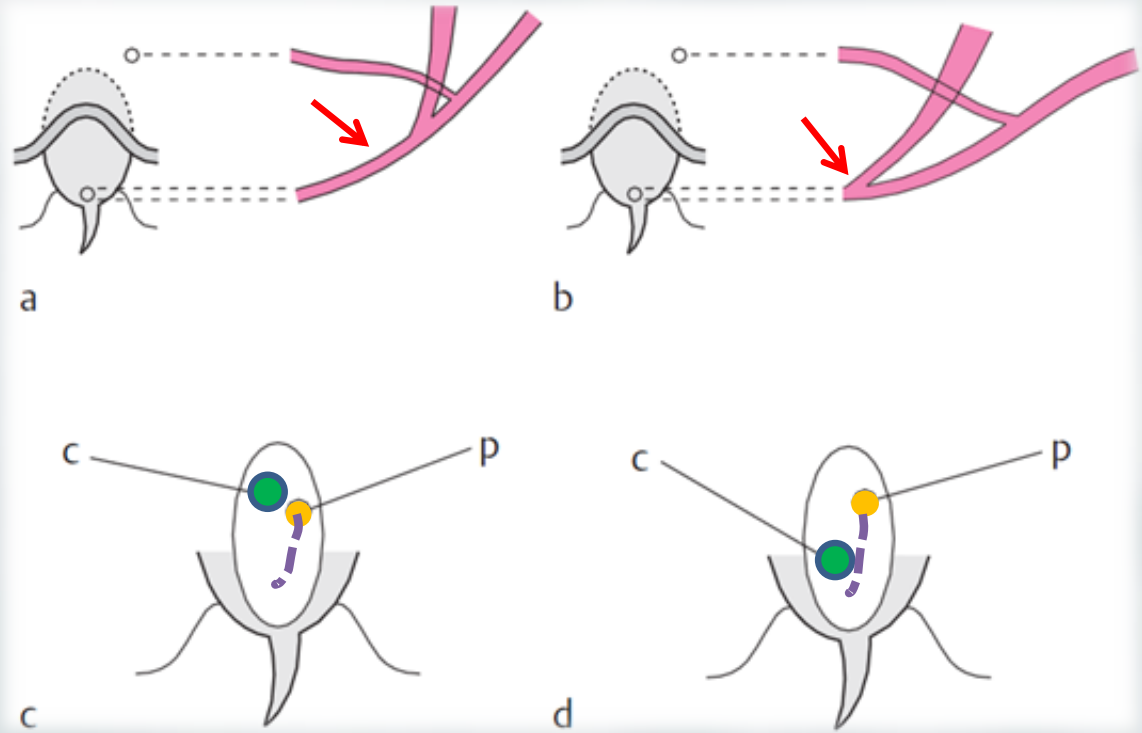


Zhong et al, Medicine 2018;97:1 (e9522)



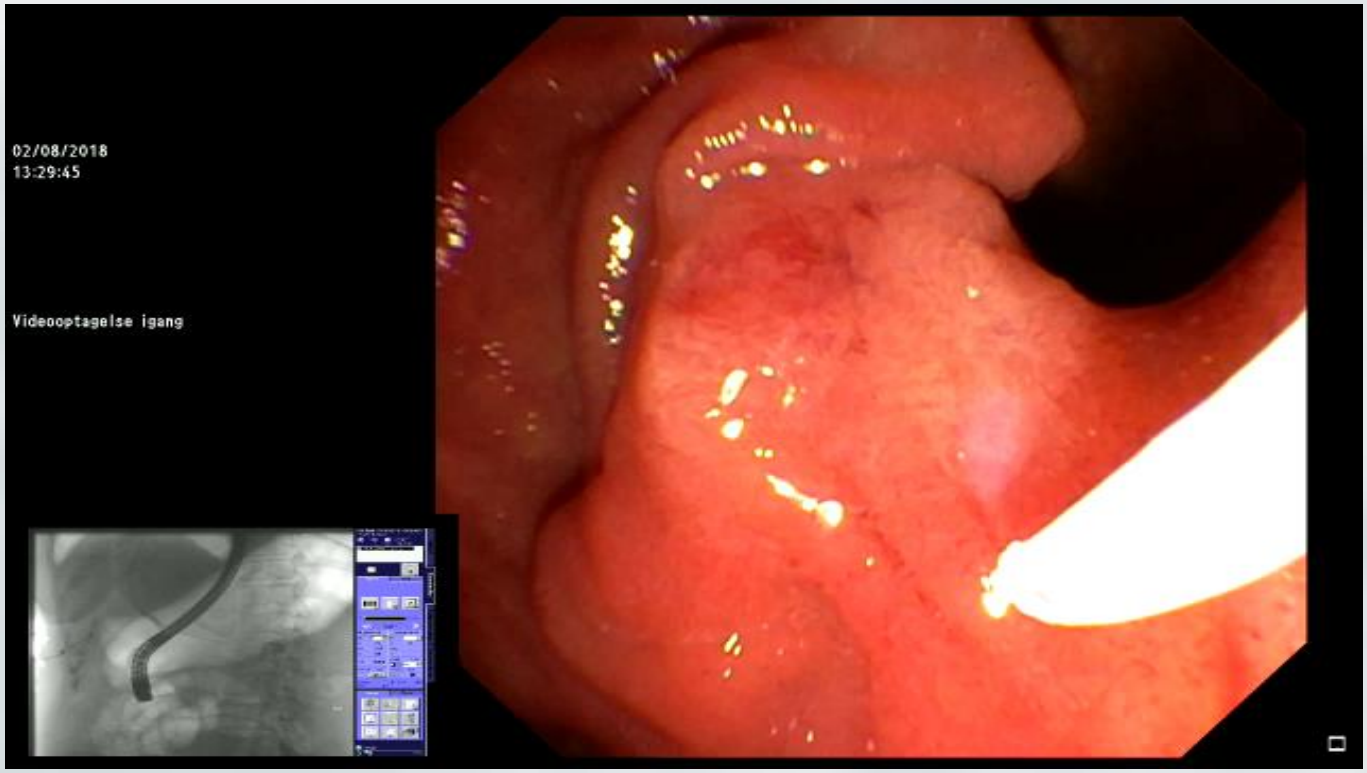
Akashi et al, Endoscopy 2004;36:405-10

Long common channel **Short** common channel



Akashi et al, Endoscopy 2004;36:405-10

Transpancreatic sphincterotomy case #1



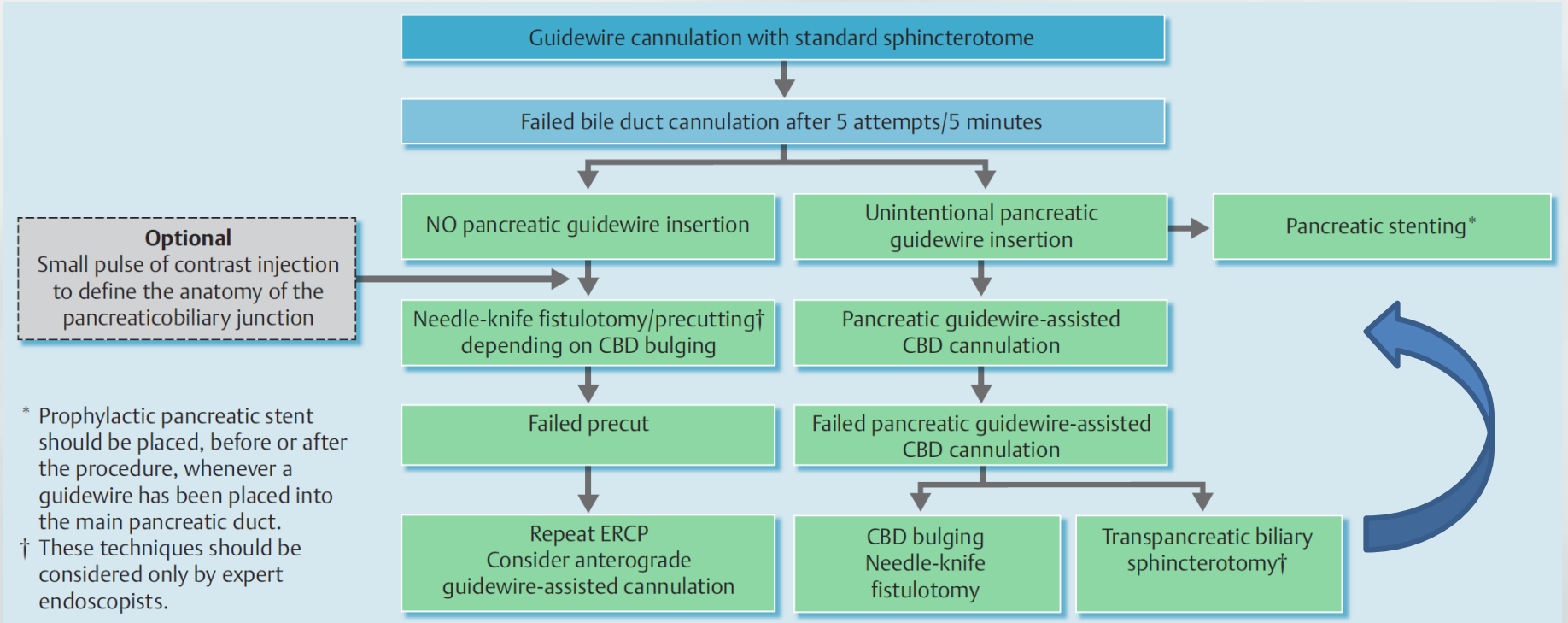


Fig. 1 Evidence-based algorithm for biliary cannulation in endoscopic retrograde cholangiopancreatography (ERCP). CBD, common bile duct.

Testoni, Endoscopy 2016

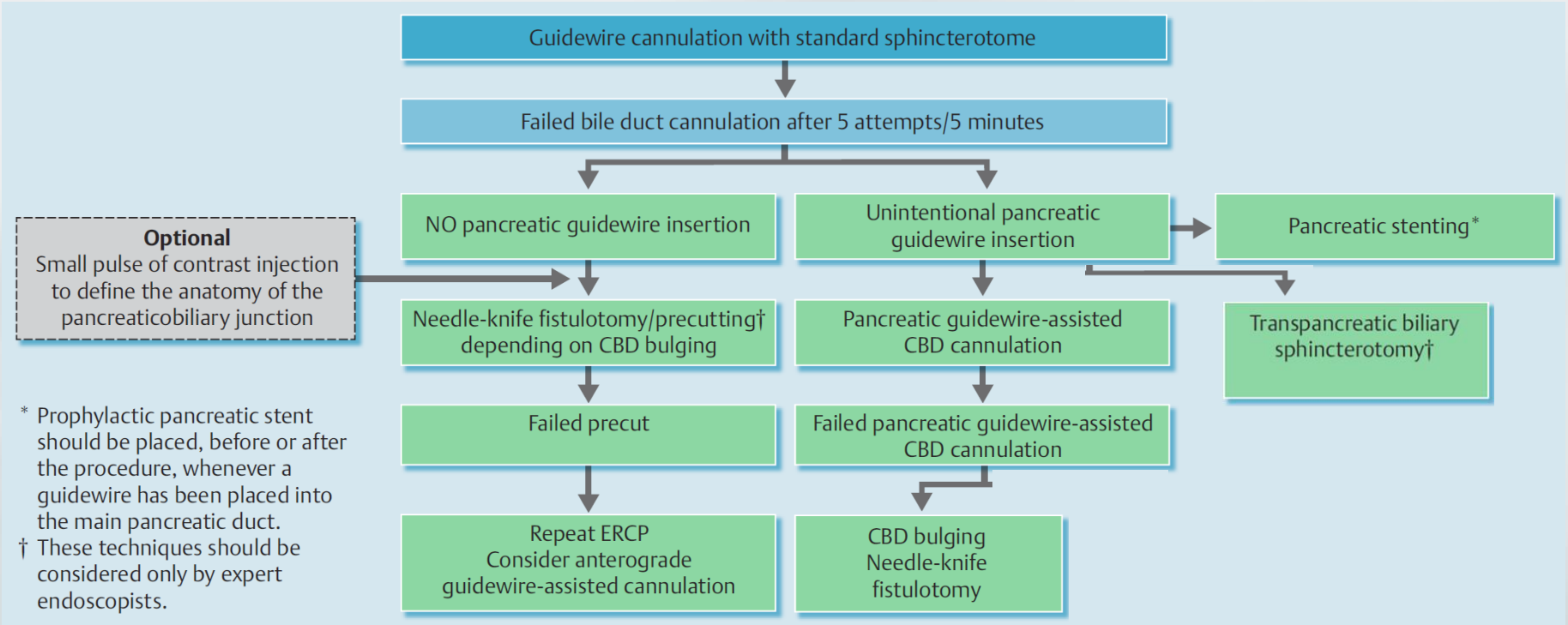


Fig. 1 Evidence-based algorithm for biliary cannulation in endoscopic retrograde cholangiopancreatography (ERCP). CBD, common bile duct.

Testoni, Endoscopy 2016

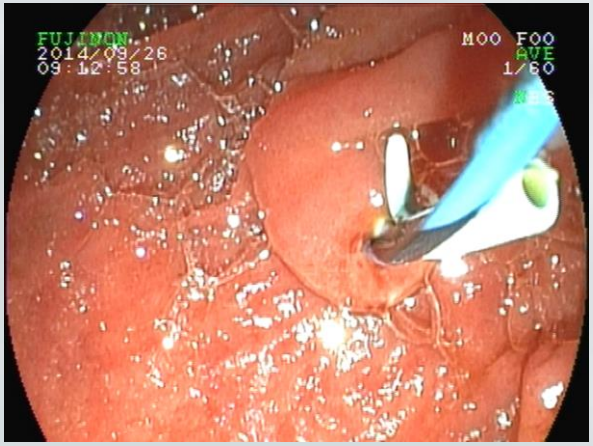
Endoscopic techniques

Prophylactic pancreatic stent (PPS) placement

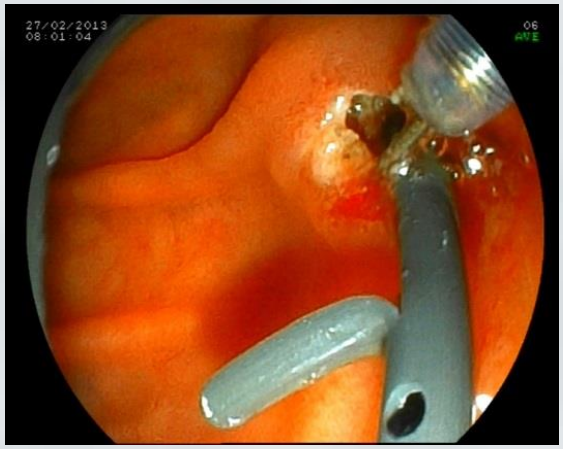
Theory

Mechanical or thermal injury during ERCP may cause papillary edema obstructing the PD; that could lead to increase in intraductal pressure and early intrapancreatic enzyme activation resulting in PEP.

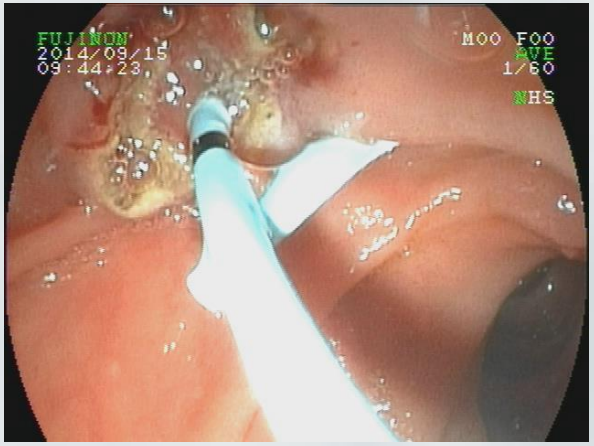
PPS can prevent PEP by maintaining the outflow of the pancreatic juice.



Wire-guided cannulation over PPS



NK precut over PPS



PD stenting after sphincterotomy

Smithline A *et al*. Gastrointest Endosc. 1993;39(5):652-7.

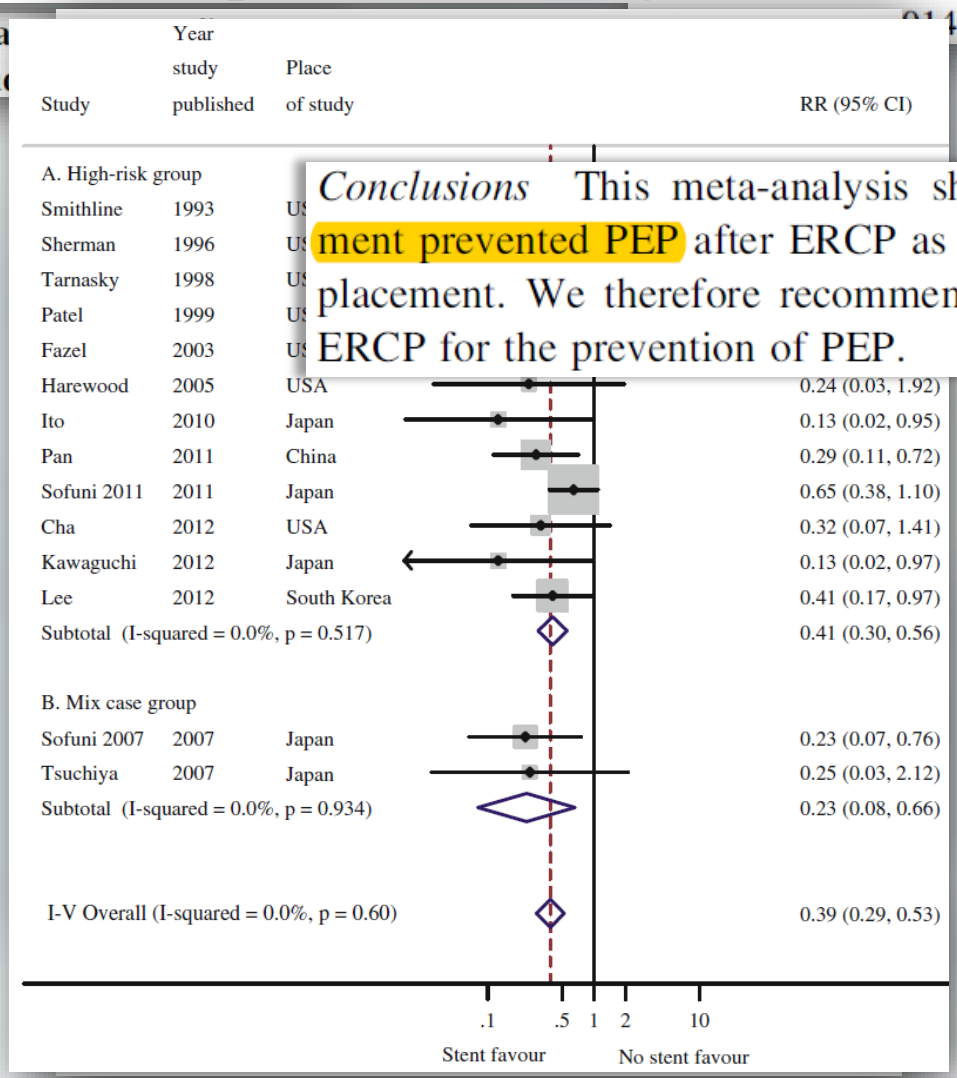
Endoscopic techniques

Prophylactic pancreatic stent (PPS) placement

Prophylactic pancreatic stent placement and post-ERCP pancreatitis: an updated meta-analysis

Takero Maza
Hideki Masu

014) 49:343–355



14 RCTs – 1541

Conclusions This meta-analysis showed that PS placement prevented PEP after ERCP as compared with no PS placement. We therefore recommend PS placement after ERCP for the prevention of PEP.

Endoscopic techniques

Prophylactic pancreatic stent (PPS) placement

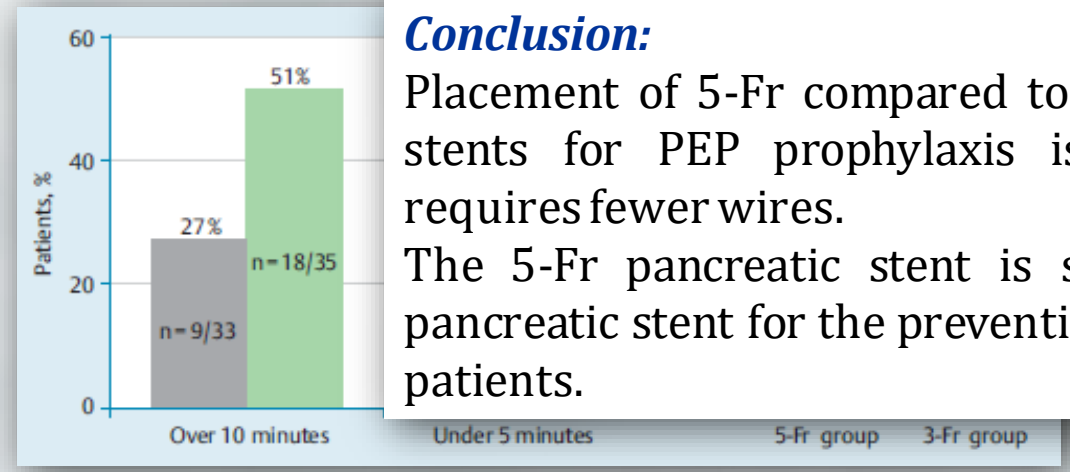
What type of stent to choose?

- US RCT (78 patients): 5-Fr vs. 3-Fr
- Network meta-analysis (6 RCTs): 561 patients

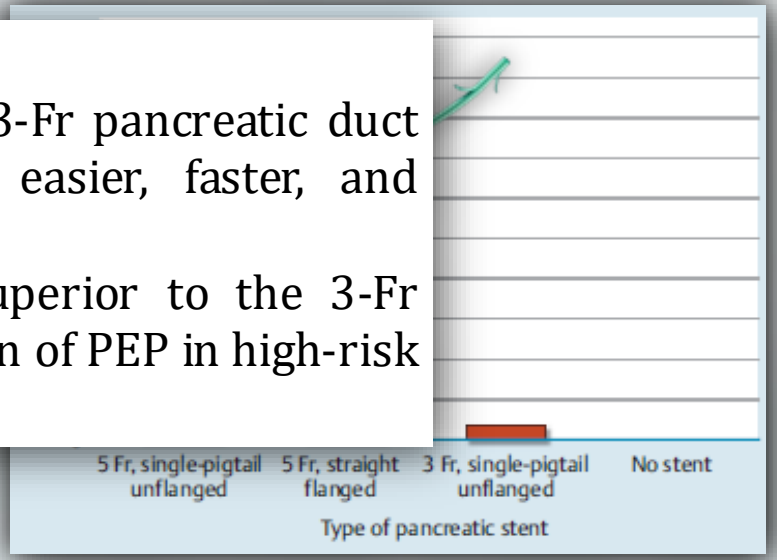
Conclusion:

Placement of 5-Fr compared to 3-Fr pancreatic duct stents for PEP prophylaxis is easier, faster, and requires fewer wires.

The 5-Fr pancreatic stent is superior to the 3-Fr pancreatic stent for the prevention of PEP in high-risk patients.



Time required for stent placement



Ranking for prevention of PEP

Zolotarevsky E *et al.* Endoscopy. 2011;43(4):325-30.
Afghani E *et al.* Endoscopy. 2014;46(7):573-80.

Endoscopic techniques

Prophylactic pancreatic stent (PPS) placement

Complications

Attempted but unsuccessful PPS placement (high risk for PEP: ~40%)

Successful placement

- Early dislodgement
- Proximal migration
- Ductal perforations (3/2283 cases = 0.1%)
- Prolonged retention in PD
  - ductal and parenchymal changes
  - stent fragmentation
  - pancreatitis caused by removal of retained stents

Dubravcsik Z *et al.* Z Gastroenterol. 2014;52:A12.
Freeman ML. Clin Gastroenterol Hepatol. 2007;5(11):1354-65.
Moffatt DC *et al.* Gastrointest Endosc. 2011;73(5):980-6.
Hritz I *et al.* Gastrointest Endosc. 2011;74(6):1429-30;

Endoscopic techniques

Prophylactic pancreatic stent (PPS) placement

Prophylactic pancreatic stenting decreases the risk of PEP in high risk and mixed-case groups; it nearly eliminates the risk of severe PEP.

ESGE recommends the placement of 5-Fr pancreatic stents in cases at high risk of PEP.

Passage of the stent from the pancreatic duct should be evaluated within 5 to 10 days of placement and retained stents should be promptly removed endoscopically *(Level 1+; Grade A).*

Endoscopic techniques

Prophylactic pancreatic stent (PPS) placement

We routinely use PPS in high risk patients and procedures.

We prefer 5-Fr prophylactic pancreatic stents.

PD stenting after sphincterotomy

Hritz I *et al.* Gastrointest Endosc. 2011;74(6):1429-30.

Endoscopic techniques

Specific/“therapeutic” utilization of PPS

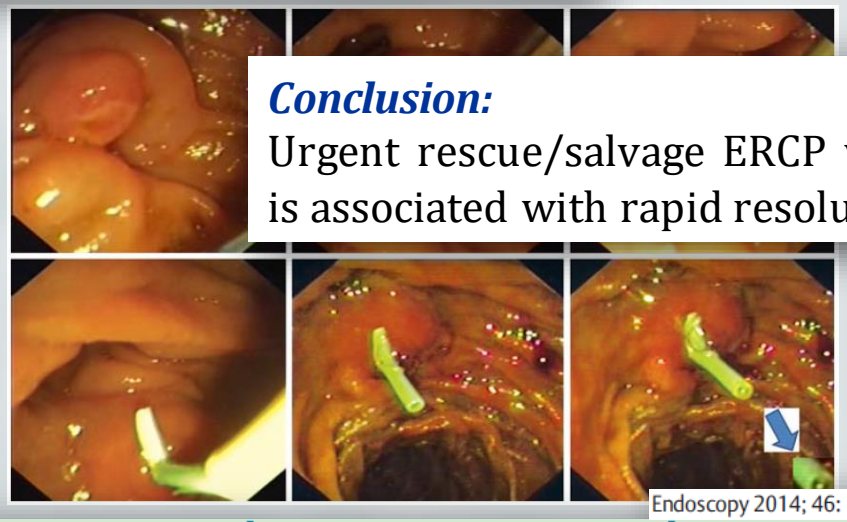
Ongoing (predicted severe) PEP at early stage

- „Rescue ERCP” (6 patients without preciding PPS)
- „Salvage ERCP” (7 early dislodgements, 5 patients without preciding PPS)

Rescue ERCP and insertion of a small-caliber pancreatic stent to prevent the evolution of severe post-ERCP pancreatitis: a case-controlled series

László Madácsy · Gábor Kurucsai · Ildikó Joó · Szilárd Gódi · Roland Fejes · András Székely

Surg Endosc (2009) 23:1887–1893



Conclusion:

Urgent rescue/salvage ERCP with PPS placement is associated with rapid resolution of PEP.

Endoscopy 2014; 46: 1085–1091

Urgent ERCP with pancreatic stent placement or replacement for salvage of post-ERCP pancreatitis

Tossapol Kerdsirichairat[1], Rajeev Attam[1], Mustafa Arain[1], Yan Bakman[1], David Radosevich[2], Martin Freeman[1]

Conservative management

Hydration

Theory

Hypoperfusion of the microvasculature during the early phase of acute pancreatitis.

Emphasis

Early volume resuscitation to prevent or limit pancreatic injury.

Working Group IAP/APA Acute Pancreatitis Guidelines. Pancreatology. 2013;13(4 Suppl 2):e1-15.
Tenner S *et al*. Am J Gastroenterol. 2013;108(9):1400-15.

Conservative management

Hydration

Clinical Gastroenterology and Hepatology 2014;12:303–307

Aggressive Hydration With Lactated Ringer's Solution Reduces Pancreatitis After Endoscopic Retrograde Cholangiopancreatography

James Buxbaum,* Arthur Yan,* Kelvin Yeh,* Christianne Lane,* Nancy Nguyen,* and Loren Laine‡

Assessed for eligibility (n=171)

In conclusion, this prospective randomized trial suggests that aggressive hydration with lactated Ringer's solution reduces the incidence of post-ERCP pancreatitis.

	n (%)	n (%)	*P* value
Post-ERCP pancreatitis	4 (17)	0 (0)	.016
Hyperamylasemia	9 (39.1)	9 (23.1)	.146
Pancreatic pain	5 (21.7)	5 (7.7)	.116
	Median (IQR)	Median (IQR)	*P* value
2-Hour amylase (*U/L*)	172 (596)	162 (296)	.42
8-Hour amylase (*U/L*)	200 (639)	138 (190)	.10
Total fluids during first 24 hours (*L*)	2.2 (2.1)	3.8 (1.5)	<.001
Hospitalization (*days*)	4 (6)	(3)	.41

(n=0)

(n=2) : prior sphincterotomy

Conservative management

Hydration

Prophylaxis of post-ERCP pancreatitis: European Society of Gastrointestinal Endoscopy (ESGE) Guideline – Updated June 2014

Jean-Marc Dumonceau[1], Angelo Andriulli[2], B. Joseph Elmunzer[3], Alberto Mariani[4], Tobias Meister[5], Jacques Deviere[6], Tomasz Marek[7], Todd H. Baron[8], Cesare Hassan[9], Pier A. Testoni[4], Christine Kapral[10]

Endoscopy 2014; 46: 799–815

In a pilot study, intensive hydration seemed to effectively prevent PEP. Large-scale RCTs to establish an evidence-based approach to intensive hydration are needed.

We routinely administer ≥2500 ml of lactated Ringrer's solution iv. after ERCP.

Conservative management

Prophylactic medications - NSAIDs

Rectal nonsteroidal anti-inflammatory drugs administration is effective for the prevention of post-ERCP pancreatitis: An updated meta-analysis of randomized controlled trials

Conclusions: A single rectal dose of NSAIDs is effective in preventing PEP both in high-risk and in unselected patients, regardless of timing of administration (pre- or post-ERCP) and NSAID type (indomethacin or diclofenac).

Study or Subgroup	NSAIDs Events	Total	Placebo Events	Total	Weight	Risk Ratio M-H, Random, 95% CI
1.8.1 High risk						
Andrade-Davila 2015	4	82	17	84	5.2%	0.24 [0.08, 0.69]
Heterogeneity: Tau² = 0.08; Chi² = 4.27, df = 3 (P = 0.23); I² = 30%						
Test for overall effect: Z = 3.79 (P = 0.0001)						
1.8.2 General						
Dobronte 2012	11	130	11	98	7.7%	0.75 [0.34, 1.67]
Dobronte 2014	20	347	22	318	11.1%	0.83 [0.46, 1.50]
Levenick 2016	16	223	11	226	8.4%	1.47 [0.70, 3.11]
Mansour-Ghanaei 2016	12	162	28	162	10.0%	0.43 [0.23, 0.81]
Montano 2007	13	75	28	75	11.3%	0.46 [0.26, 0.82]
Otsuka 2012	2	51	10	53	3.0%	0.21 [0.05, 0.90]
Patai 2015	18	270	37	269	12.0%	0.48 [0.28, 0.83]
Sotoudehmanesh 2007	7	221	15	221	6.7%	0.47 [0.19, 1.12]
Subtotal (95% CI)		**1479**		**1422**	**70.2%**	**0.59 [0.43, 0.82]**
Total events	99		162			
Heterogeneity: Tau² = 0.09; Chi² = 11.85, df = 7 (P = 0.11); I² = 41%						
Test for overall effect: Z = 3.13 (P = 0.002)						
Total (95% CI)		**2016**		**1973**	**100.0%**	**0.52 [0.40, 0.68]**
Total events	139		261			
Heterogeneity: Tau² = 0.08; Chi² = 18.09, df = 11 (P = 0.08); I² = 39%						
Test for overall effect: Z = 4.70 (P < 0.00001)						
Test for subgroup differences: Chi² = 2.00, df = 1 (P = 0.16), I² = 50.0%						

Risk Ratio M-H, Random, 95% CI

0.01 0.1 1 10 100

Favours experimental Favours control

Inclusion criteria

Pancreatology 17 (2017) 681–688

12 RCTs – 3989 patients

Conservative management

Prophylactic medications - NSAIDs

ESGE recommends routine rectal administration of 100 mg of diclofenac or indomethacin immediately before or after ERCP in all patients without contraindication *(Grade A)*.

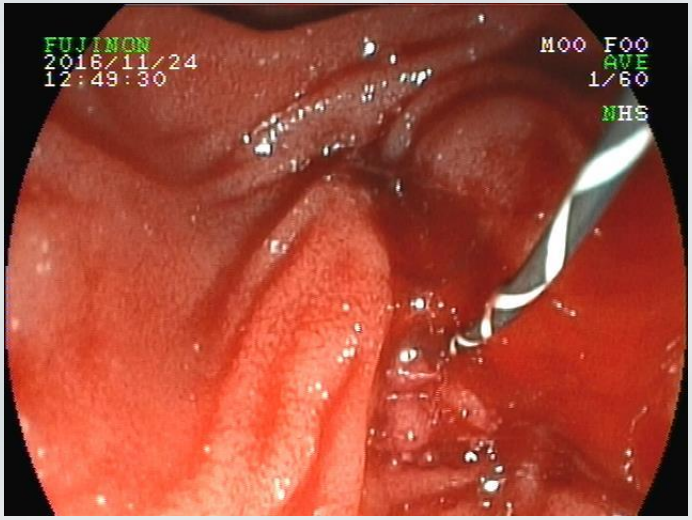
Effective PEP prophylaxis has only been demonstrated using diclofenac or indomethacin *(Level 1++)*.

Post-ERCP bleeding

Definition

Clinically evident bleeding with drop in hemoglobin (>3 g)

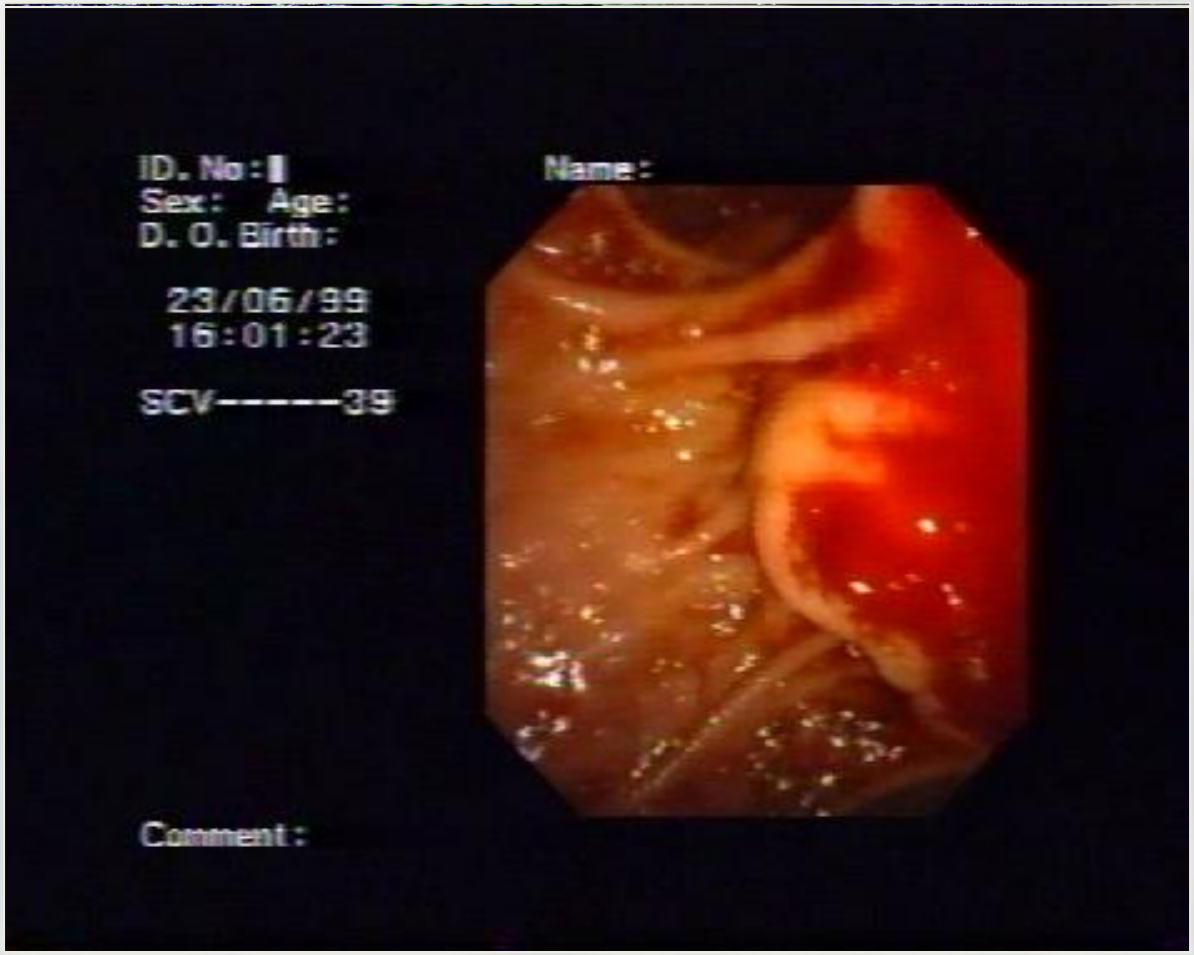
Mild	-	No transfusion
Moderate	-	< 4 units
Severe	-	> 4 units / Intervention



Cotton PB et al 1991

Post-ERCP bleeding

Incidence



All	1.5-3 %
Significant	1 %
Severe	0.5 %
Fatal	0.1 %

Post-ERCP bleeding

Risk factors

Definite	May be	No
Coagulopathy	Cirrhosis	ASA / NSAID
Anti Coagulants >3d	Dilated CBD	Ampullary tumor
Cholangitis	Periampullary diverticulum	Longer ES
Lower ERCP volume	Precut	Extension of prior ES
Pure cutting current		
Chronic renal failure		

NIH Consesus Conference 2002
Barthet Endoscopy 2009

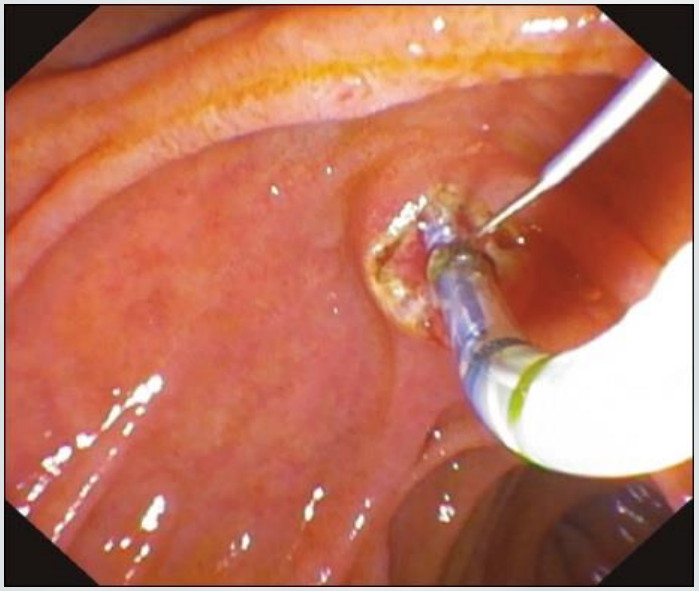
Post-ERCP bleeding

Prevention

HF settings for ES
alternating cutting and coagulation cycles (e.g. EndoCut, PulseCut)

Direction of ES
between 11-1 o'clock (least vascular area of ampulla)

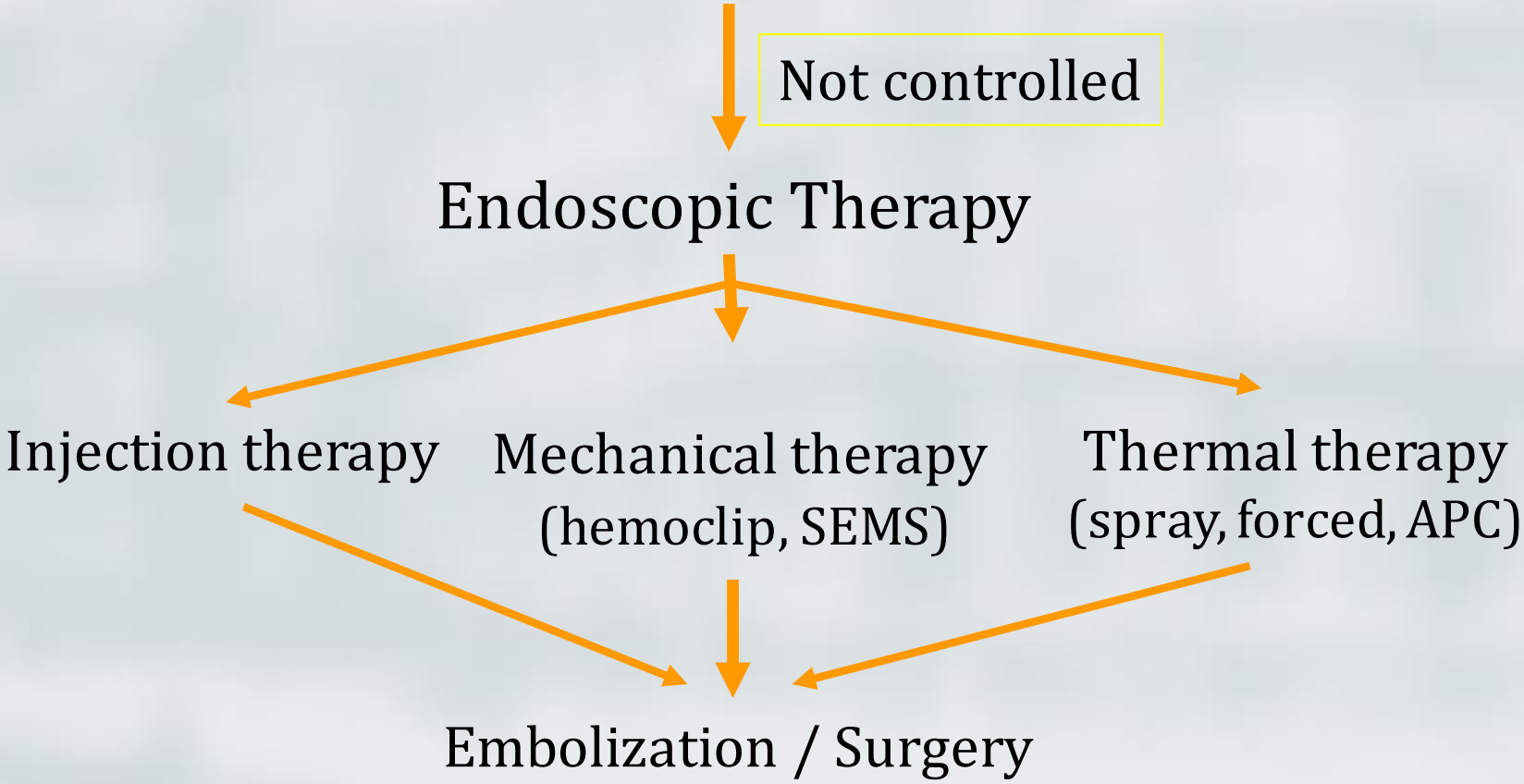
Endoscopic papillary large balloon dilation (EPLBD) is alternative to ES in patients with coagulopathy



Post-ERCP bleeding

Management algorithm

- Extend the cut/use coagulation
- Spray epinephrine solution
- Balloon tamponade



Post-ERCP bleeding

Management

Bács-Kiskun County University Teaching Hospital, Endoscopy Unit

Post-ERCP perforation

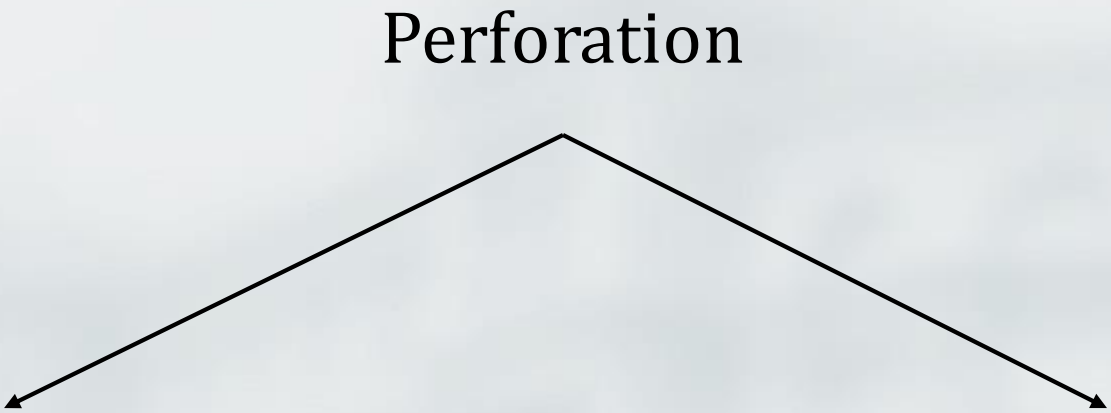
Definition

Mild	-	Conservative, treated ≤3 days
Moderate	-	Conservative, treated 4-10 days
Severe	-	Intervention, treated >10 days

Cotton PB et al 1991

Post-ERCP perforation

Localization



Retroperitoneal

- pre cut
- guidewire
- sphincterotomy

Intraperitoneal

- Billroth II
- D1 / D2 narrowing

Post-ERCP perforation

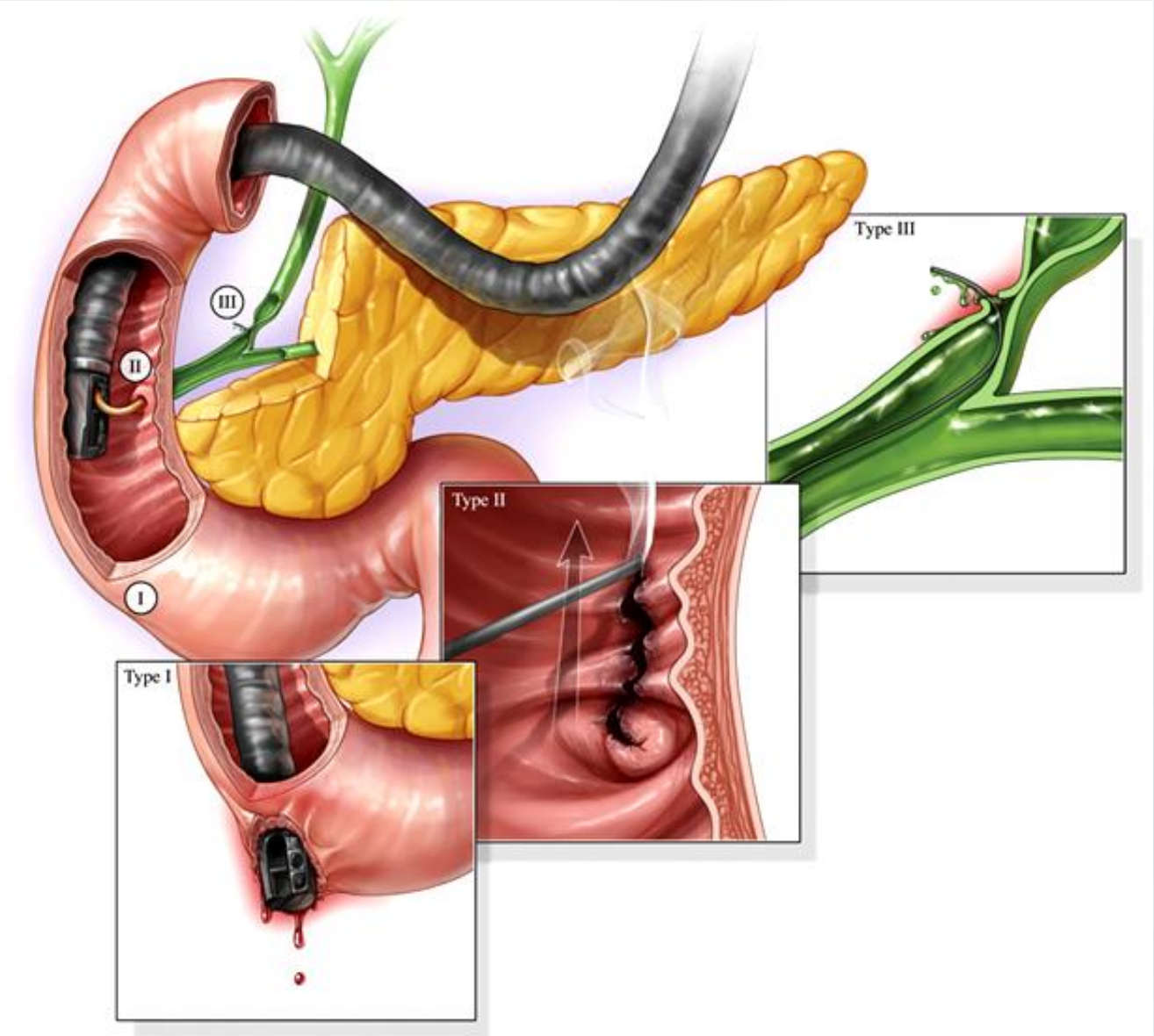
Clinical features

- Ranging between 0.3 % to 1.5 % (mean 0.6%)
  - Poorly defined (low prevalence)
  - CT scan required because of air insufflation (use of CO_2!)
  - 2/3 retroperitoneal perforation, 1/3 duodenal perforation
  - Surgery required in 25% to 50% of the patients

Barthet Gastroenterol Clin Biol 2002; Williams Endoscopy 2007;
Loperfido GIE 1998; Freeman N Engl J Med 1996

Post-ERCP perforation

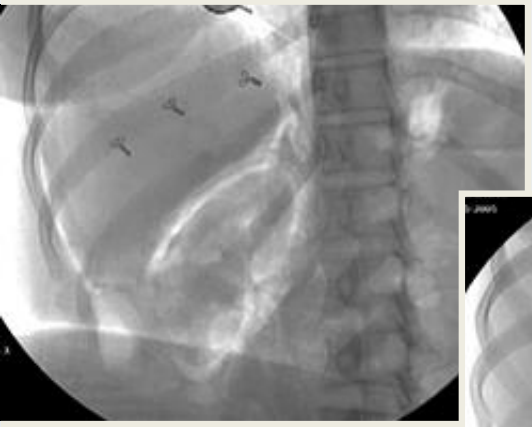
Sites of perforation



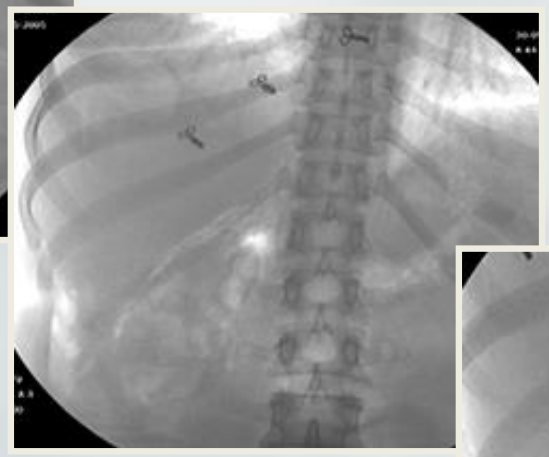
Baron Gastrointest Endosc 2012

Post-ERCP perforation

Retroperitoneal perforation



Day 1



Day 3

Day 5

Day 7

Post-ERCP perforation

Management

Prevention

CO_2 insufflation, adequate caution

Determining the severity

presence of peritoneal signs, systemic inflammatory response, anatomical location, degree of leakage

Conservative treatment

fasting, fluids iv., antibiotics iv.

Surgical treatment

drainage of collections, repairing defect, diversion (?)

ASGE Standards of Practice Committee. Gastrointest Endosc. 2017;85(1):32-47.

Post-ERCP cholangitis

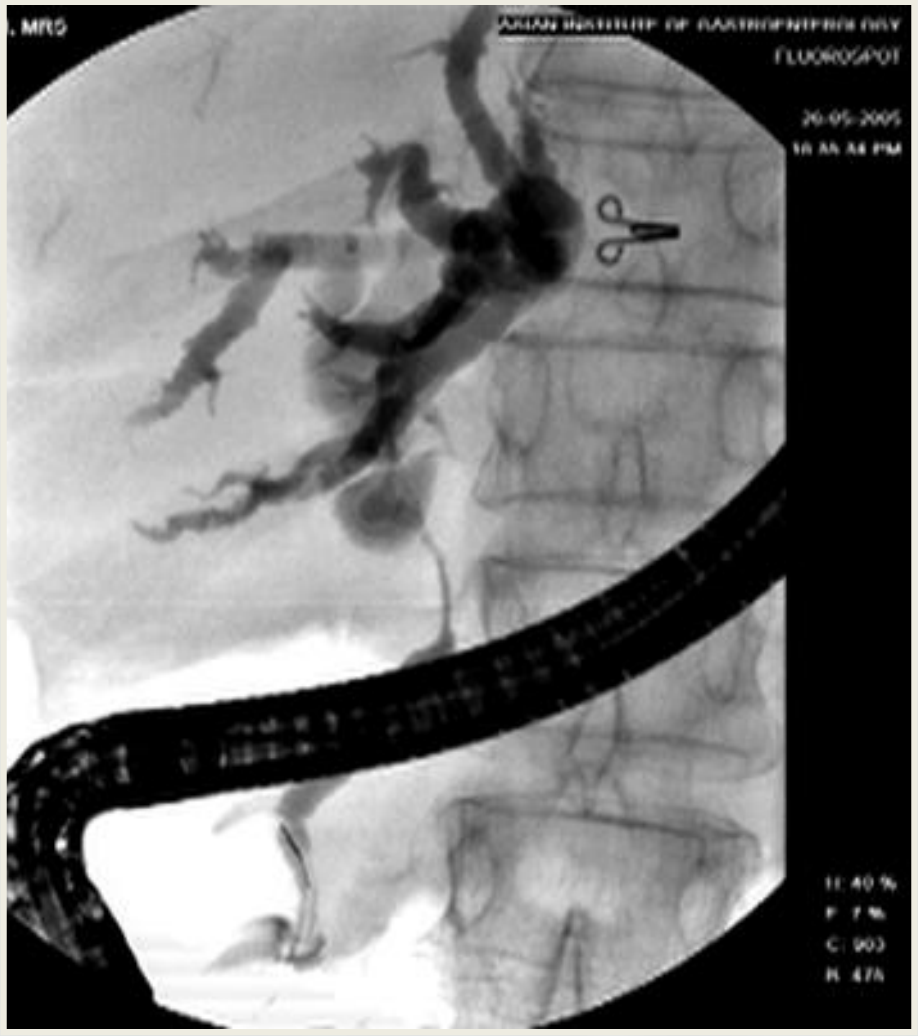
Definition

Mild	>38 °C for 24 to 48 hrs
Moderate	Fever > 3 days, endoscopic intervention
Severe	Septic shock, surgery

Cotton PB et al 1991

Post-ERCP cholangitis

Predisposing factor



Failed drainage after injection of contrast

Post-ERCP cholangitis

Incidence, management

- Ranging between 0.9 % to 2.9 % (mean 0.9%)
- Depends on the quality of the biliary drainage
  - Antibiotic prophylaxis recommended in patients with malignant stenosis, liver transplantation
  - Proper ERCP technique
  - Adequate biliary clearance or drainage of the upstream bile duct

Barthet Endoscopy 2002; Loperfido GIE 1998;
Engl J Med 1996; Masci Am J Gastro 2001

Post-ERCP complications

- Minimum standards of quality in ERCP

- What is considered sucessful:
  - overall complication rates <10%
  - overall success rates > 85%

Costamagna Best P Res Clin Gastro 2008;
Barthet GCB 2002

SUMMARY

- Appropriate indication is indispensable for successful ERCP.
- Appropriate patient selection is instrumental in reducing post-ERCP complications. Always perform with adequate caution.
- For PEP prevention wire-guided cannulation is the preferred standard technique. In assisted cannulation PPS placement is recommended. Precut sphincterotomy is safe and effective alternative to standard cannulation. Rectal NSAID administration is the first line prevention method in PEP prophylaxis in all patients. PPS placement is effective and safe method for PEP prophylaxis, especially in high-risk patients.
- For prevention of post-ERCP bleeding blended current, good ES direction or EPLBD is preferred. Management of post-ERCP bleeding includes injection, mechanical and thermal therapeutic modalities.
- Post-ERCP perforation may be treated conservatively or surgically. Severity can be determined by clinical, laboratory or imaging signs.
- Post-ERCP cholangitis is treated with iv. antibiotics; adequate biliary clearance or drainage of the upstream bile duct is required.

ERCP is most dangerous for people who need it least.

Peter B. Cotton