Digestive Endoscopy 2025; ••: ••–•• doi: 10.1111/den.15060

Guidelines

World Endoscopy Organization guidelines on endoscopic retrograde cholangiopancreatography biliary cannulation and sphincterotomy techniques

Stefano Francesco Crinò,[1] Lars Aabakken,[2,3] Amol Bapaye,[4] Shannon Chan,[6] Mitsuhiro Kida,[8] Ryan Law,[9] Fauze Maluf-Filho,[10,11] Parit Mekaroonkamol,[13] Eduardo Guimarães Hourneaux de Moura,[12] Alexandre Bestetti,[12] Ibrahim Mostafa,[14] Do Hyun Park,[15] Ruveena Bhavani Rajaram,[16] Nageshwar D. Reddy,[5] Dong Wan Seo,[15] Rapat Pittayanon[13] and Anthony Yuen Bun Teoh[7]

[1]Diagnostic and Interventional Endoscopy of Pancreas, The Pancreas Institute, G.B. Rossi University Hospital, Verona, Italy, [2]Department of Transplantation Medicine, Section of Gastroenterology, Oslo University Hospital, [3]Faculty of Clinical Medicine, University of Oslo, Oslo, Norway, [4]Shivanand Desai Center for Digestive Disorders, Deenanath Mangeshkar Hospital and Research Center, Pune, Maharashtra, [5]Gastroenterology, Asian Institute of Gastroenterology, Hyderabad, India, [6]Department of Surgery, Prince of Wales Hospital, The Chinese University of Hong Kong, Shatin, [7]Surgery Centre, Hong Kong Sanatorium and Hospital, Happy Valley, Hong Kong, [8]Department of Gastroenterology, Kitasato University Hospital, Sagamihara City, Japan, [9]Division of Gastroenterology and Hepatology, Mayo Clinic, Rochester, Minnesota, USA, [10]Instituto do Cancer do Estado de São Paulo (ICESP), [11]Department of Gastroenterology, University of São Paulo, [12]Gastrointestinal Endoscopy Unit, Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo, São Paulo, Brazil, [13]Division of Gastroenterology, Department of Medicine, Faculty of Medicine, Chulalongkorn University and King Chulalongkorn Memorial Hospital, Thai Red Cross, Bangkok, Thailand, [14]Department of Gastroenterology and Hepatology, Theodor Bilharz Research Institute Cairo, Cairo, Egypt, [15]Division of Gastroenterology, Department of Internal Medicine, University of Ulsan College of Medicine, Seoul, Korea and [16]Gastroenterology and Hepatology Unit, Department of Medicine, Faculty of Medicine, University of Malaya Medical Centre, Kuala Lumpur, Malaysia

Recent guidelines on biliary cannulation are lacking. This guideline is an initiative of the World Endoscopy Organization (WEO) with the involvement of a panel of experts from Asia, Europe, and America. Relevant clinical questions on four areas (post-endoscopic retrograde cholangiopancreatography [ERCP] pancreatitis [PEP] prophylaxis, biliary cannulation techniques, sphincterotomy/papillary balloon dilation, and biliary cannulation in special circumstances) were developed and answered after systematic reviews of the literature and using the Grading of Recommendations Assessment, Development, and Evaluation methodology. Successful biliary cannulation and sphincterotomy are cornerstones of ERCP and are indispensable for almost all therapeutic and advanced diagnostic procedures. However, adverse events, particularly PEP, may commonly occur and impair patients' outcomes. A high cannulation rate and a low rate of PEP are quality indicators for ERCP and should be the goal of all endoscopists. With this guideline we aimed to provide clinical practice advice applicable worldwide, regardless of resources and expertise availability. The main recommendations focus on specific aspects of ERCP, including pre-, intra-, and postprocedural measures to reduce the risk of PEP, the technique for an initial biliary cannulation attempt, options for cannulation in cases of difficult biliary access, alternatives to ERCP in case of failure (percutaneous- and endoscopic ultrasound-guided), and biliary access in altered anatomy (periampullary diverticulum and postsurgical anatomy) and in the presence of duodenal stenosis.

Key words: biliary stricture, difficult biliary cannulation, endoscopic retrograde cholangiopancreatography, papillary dilation, post-ERCP pancreatitis

Corresponding: Anthony Yuen Bun Teoh, Surgery Centre, Hong Kong Sanatorium and Hospital, 4/F Central Block, 2 Village Road, Happy Valley, Hong Kong. Email: anthony.yb.teoh@hksh.com
Received 24 January 2025; accepted 14 May 2025.

INTRODUCTION

ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY (ERCP) is the gold standard for interventional pancreaticobiliary procedures to manage an array of disorders. Deep biliary cannulation represents not only the first but also one of the most challenging steps of ERCP. Cannulation of a native or intact papilla fails in ~5–11% of cases,[1,2] even in experienced hands. Different ERCP-based techniques have been described to achieve successful biliary cannulation when conventional attempts fail. Of note, extensive manipulation of the papilla when attempting deep biliary cannulation, with or without pancreatic duct (PD) injection/cannulation, has been reported to be associated with a higher risk of post-ERCP pancreatitis (PEP).[3] Both biliary cannulation and PEP rates represent ERCP quality measures reported by the European Society of Gastrointestinal Endoscopy (ESGE).[4] Moreover, in recent years endoscopic ultrasound (EUS)-guided biliary access techniques have been described, thus adding further options for biliary drainage when conventional ERCP fails. EUS-guided access or drainage techniques are not widely available worldwide, and require specific expertise and equipment. In cases of unsuccessful ERCP, percutaneous transhepatic biliary drainage remains a viable option.

The ESGE published the latest available guideline on ERCP cannulation and sphincterotomy in 2016,[3] while an international consensus focused on difficult biliary access appeared in 2017.[5]

This evidence- and consensus-based guideline aimed to provide updated statements on successful biliary cannulation while mitigating risks, considering all different techniques and strategies. Moreover, potential future research areas are highlighted.

METHODS

THIS GUIDELINE IS an initiative of the World Endoscopy Organization (WEO) led by the WEO Research Committee chair (A.Y.B.T.), who invited the listed authors to participate in the project development. Six working groups were formed, each coordinated by a team leader (S.C., R.B.R., S.F.C., I.M., P.M., and F.M.F.). This guideline covered four areas: PEP prophylaxis, biliary cannulation techniques, biliary sphincterotomy/papillary balloon dilation, and ERCP in special circumstances (surgically-altered anatomy/duodenal obstruction).

The team leaders of each working group prepared the key questions that the expert panel discussed during a preliminary meeting. In total, 14 clinical questions (CQ) were finalized based on the PICO method (Problem/Population, Intervention, Comparison, Outcome) and assigned to subgroups (Table S1). The team leaders divided their (sub) questions among all members of their respective working groups, who performed a systematic literature search of PubMed/MEDLINE, Cochrane Library, and Embase for papers published up to June 2023 on the topic. Studies published in English and available in full text were included, focusing on meta-analyses or randomized controlled trials (RCTs). If the addressed topics were not covered by meta-analyses or RCTs, then prospective studies, retrospective analyses, and case series were considered. Details of the literature search are reported in Table S2. All the relevant articles were included and summarized in the literature tables for key topics.

The Grading of Recommendations Assessment, Development, and Evaluation (GRADE) system was adopted to define the quality of evidence and the strength of recommendation (Fig. 1).[6] Articles were individually assessed for quality of evidence by the certified methodologist (R.P.). The certainty of the evidence was defined as one of four grades (high, moderate, low, or very low) and the strength of recommendation as two categories (strong or conditional/suggest) (Table 1).[7] Factors influencing the strength of the recommendation include the quality of the evidence, clinical and patient-reported outcomes, risk of harm, costs, and voting threshold (Fig. 1).

Each working group formulated the statements, and the first draft was distributed electronically to the panel members. On February 3, 2024, an online meeting was conducted to review and discuss the evidence and revise the statements.

During a second online meeting on March 10, 2024, the members expressed their agreement on a five-point scale (strongly agree, agree, neutral, disagree, or strongly disagree) via an anonymous web-based system. Statements were approved with an overall 80% agreement (combining "strongly agree" or "agree"). Statements with less than 80% agreement were further discussed for possible amendments, re-voted, and eventually excluded if such an agreement level was not reached. The strength of the recommendation was labeled as "strong" if the rate of "strongly agree" exceeded 80%; otherwise, it was considered "conditional," and statements phrased as "we recommend" or "we suggest," respectively.

The experts predefined difficult biliary cannulation as follows: prolonged duration of attempting to cannulate following visualization of the papilla for >10 min; or >5 cannulation attempts; or ≥2 unintended PD cannulations or duct opacification with contrast.[3,5,8]

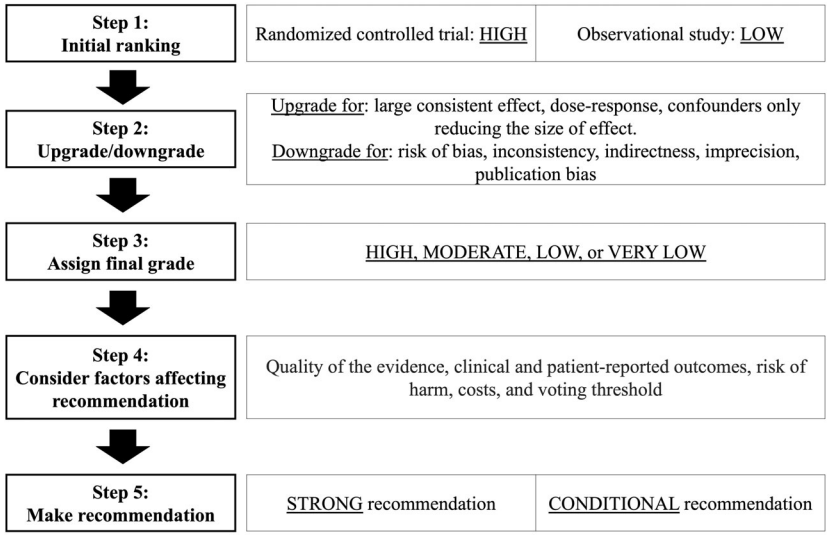

Figure 1 Grading of Recommendations Assessment, Development, and Evaluation (GRADE) process to assess the quality of evidence and the strength of recommendation.

Table 1 Grading of Recommendations Assessment, Development, and Evaluation (GRADE) quality of evidence interpretation and strength of recommendations

	Criteria
GRADE quality of evidence	
High	We are very confident that the effect of the study reflects the actual effect
Moderate	We are quite confident that the effect in the study is close to the true effect, but it is also possible it is substantially different
Low	The true effect may differ significantly from the estimate
Very low	The true effect is likely to be substantially different from the estimated effect
Strength of recommendation	
Strong	Strong recommendations are offered when the desirable effects of an intervention clearly outweigh the undesirable effects
Conditional	Conditional recommendations are offered when trade-offs are less certain – either because of low-quality evidence or because evidence suggests that desirable and undesirable effects are closely balanced

Each statement of this guideline includes the grade of evidence, strength of the recommendation, and voting result (Table 2).

CLINICAL QUESTIONS AND STATEMENTS

PEP prophylaxis

POST-ERCP PANCREATITIS IS defined as new or worsened abdominal pain (compatible with pancreatitis-type pain) combined with >3 times the normal value of serum amylase or lipase at more than 24 h after ERCP and requiring new or prolongation of hospitalization.[9] According to the ESGE guidelines, patients should be stratified into high-risk or low-risk groups according to patient-related and procedure-related risk factors.[9] In a recent meta-analysis of 145 RCTs including 19,038 patients, the overall cumulative incidence of PEP was 10.2% (95% confidence interval [CI] 9.3–11.3), increasing to 14.1% (95% CI 11.5–17.2) in high-risk patients.[10] PEP is generally mild, with cumulative incidences of severe PEP and mortality of 0.5% (95% CI 0.3–0.7) and 0.2% (95% CI 0.08–0.3), respectively.[10] Intravenous hydration, rectal nonsteroidal anti-inflammatory drugs (NSAIDs), and pancreatic stent placement are the three principal measures that can be applied, alone or in combination, pre-, intra-, or postprocedurally, to prevent PEP.

Table 2 List of statements with strength of recommendation, Grading of Recommendations Assessment, Development, and Evaluation (GRADE) of evidence, and voting results

Areas of interest	Statement	Strength of recommendation/GRADE of evidence/voting results
PEP prophylaxis	1. When used alone, the WEO recommends administering aggressive periprocedural and postprocedural intravenous Lactated Ringer's solution to prevent PEP in an inpatient setting when rectal NSAIDs are not available	Strong recommendation Moderate quality of evidence *Strongly agree: 83.3%, Agree: 16.7%*
	2 When used alone, the WEO recommends administering rectal NSAIDs from 30 to 90 min before to immediately after ERCP for all patients if there are no contraindications	Strong recommendation Moderate quality of evidence *Strongly agree: 83.3%, Agree: 16.7%*
	3 When used alone, the WEO recommends inserting a prophylactic pancreatic stent in high-risk patients if PD access has already been achieved	Strong recommendation Moderate quality of evidence *Strongly agree: 83.3%, Agree: 16.7%*
	4 There is some evidence suggesting combination therapy may further reduce the chance of PEP. The WEO suggests administrating rectal NSAIDs together with aggressive intravenous hydration or PD stenting	Conditional recommendation Low quality of evidence *Strongly agree: 72.7%, Agree: 27.3%*
Biliary cannulation techniques	5 The WEO recommends using the guidewire-assisted technique for primary biliary cannulation, as it is associated with a lower risk of PEP and a higher success rate	Strong recommendation Moderate quality of evidence *Strongly agree: 81.8%, Agree: 18.2%*
	6 In the case of more than one unintentional pancreatic duct cannulation with deep access of the guidewire into the pancreatic duct, the WEO suggests attempting biliary cannulation with DGW technique or TPS followed by pancreatic stent placement after cannulation	Conditional recommendation Low quality of evidence *Strongly agree: 45.5%, Agree: 54.5%*
	7 In the case of failed biliary cannulation with DGW technique or TPS and presence of a guidewire in the pancreatic duct, the WEO suggests inserting a pancreatic duct stent followed by precut sphincterotomy over the stent	Conditional recommendation Very low quality of evidence *Strongly agree: 27.3%, Agree: 72.7%*
	8 In the case of difficult biliary cannulation without unintentional PD cannulation, the WEO suggests using advanced biliary cannulation techniques (such as precut or PD cannulation attempt for pancreatic guidewire-assisted techniques) with or without a PD stent after biliary cannulation	Conditional recommendation Low quality of evidence *Strongly agree: 27.3%, Agree: 72.7%*
	9 In the case of bile duct cannulation failure, the WEO suggests referring patients to high-volume centers for repeat ERCP with an interval of at least 48 h between attempts, provided that the patient's condition is suitable for the delay	Conditional recommendation/Very low quality of evidence *Strongly agree: 63.6%, Agree: 36.4%*
	10 If the patient's condition requires urgent biliary drainage and expertise is available, the WEO suggests obtaining biliary cannulation by the percutaneous rendezvous technique	Conditional recommendation Very low quality of evidence *Strongly agree: 75%, Agree: 25%*
	11 Alternatively, if the expertise is available, the WEO recommends using the EUS-guided rendezvous technique to access the biliary system	Strong recommendation Moderate quality of evidence *Strongly agree: 91.7%, Agree: 8.3%*

Table 2 (*Continued*)

Areas of interest		Statement	Strength of recommendation/GRADE of evidence/voting results
Biliary sphincterotomy/ papillary balloon dilation	12	The WEO recommends using a mixed electrocautery current for ES	Strong recommendation High quality of evidence *Strongly agree: 83.3%, Agree: 16.7%*
	13	The WEO suggests that the size of ES should be individualized according to the patient's condition and the endoscopist's experience, but not exceed the upper margin of the intraluminal biliary bulge	Conditional recommendation Very low quality of evidence *Strongly agree: 75%, Agree: 25%*
	14	The WEO suggests using EPSBD as an alternative to ES in patients with hemorrhagic tendencies when ES is contraindicated	Conditional recommendation Low quality of evidence *Strongly agree: 66.7%, Agree: 33.3%*
	15	The WEO suggests maintaining an extended duration of dilation when EPSBD is employed to reduce the risk of pancreatitis	Conditional recommendation Low quality of evidence *Strongly agree: 25%, Agree: 75%*
	16	The WEO suggests using EPLBD in conjunction with a small ES to retrieve large-size or difficult common bile duct stones in a dilated duct of ≥12 mm	Conditional recommendation Moderate quality of evidence *Strongly agree: 58.3%, Agree: 41.7%*
	17	The WEO suggests against routine ES before biliary stent placement for malignant obstruction	Conditional recommendation High quality of evidence *Strongly agree: 50%, Agree: 50%*
ERCP in special circumstances	18	In the presence of PAD, the WEO suggests proceeding with cannulation and sphincterotomy in the usual manner using the previously described techniques	Conditional recommendation Moderate quality of evidence *Strongly agree: 75%, Agree: 25%*
	19	In patients with a history of Billroth II gastrectomy, the WEO suggests accessing the duodenal papilla using a forward-viewing endoscope with a distal cap or a duodenoscope	Conditional recommendation Moderate quality of evidence *Strongly agree: 66.7%, Agree: 33.3%*
	20	In patients with a history of Billroth II gastrectomy, the WEO suggests performing biliary cannulation using the guidewire-assisted technique with rotatable or Billroth II-dedicated sphincterotomes or bendable cannulas	Conditional recommendation Very low quality of evidence *Strongly agree: 27.3%, Agree: 72.7%*
	21	In patients with other types of surgically-altered anatomy where ductal access is difficult, apart from Billroth II gastrectomy, the WEO suggests performing ERCP with device-assisted enteroscopy	Conditional recommendation High quality of evidence *Strongly agree: 27.3%, Agree: 72.7%*
	22	In patients with RYGB for obesity, the WEO suggests performing LA-ERCP over EA-ERCP because it is more technically successful	Conditional recommendation Moderate quality of evidence *Strongly agree: 36.4%, Agree: 63.6%*
	23	Alternatively, if expertise is available, the WEO suggests performing EDGE	Conditional recommendation Moderate quality of evidence *Strongly agree: 72.7%, Agree: 27.3%*
	24	In patients with inaccessible papilla due to duodenal obstruction, the WEO suggests performing EUS- or percutaneous-guided access according to local expertise	Conditional recommendation Low quality of evidence *Strongly agree: 75%, Agree: 25%*

DGW, double guidewire; EA-ERCP, enteroscopy-assisted ERCP; EDGE, EUS-directed transgastric ERCP; EPLBD, endoscopic papillary large balloon dilation; EPSBD, endoscopic papillary small balloon dilation; ERCP, endoscopic retrograde cholangiopancreatography; ES, endoscopic sphincterotomy; EUS, endoscopic ultrasound; LA-ERCP, laparoscopy-assisted ERCP; NSAID, nonsteroidal anti-inflammatory drug; PAD, periampullary diverticulum; PD, pancreatic duct; PEP, post-ERCP pancreatitis; RYGB, Roux-en-Y gastric bypass; TPS, transpancreatic sphincterotomy; WEO, World Endoscopy Organization.

CQ 1: What are the recommended prophylactic measures to reduce the risk of PEP?

Statement 1. When used alone, the WEO recommends administering aggressive periprocedural and postprocedural intravenous lactated Ringer's solution to prevent PEP in an inpatient setting when rectal NSAIDs are not available.

Strongly agree: 83.3%, Agree: 16.7%.

(Strong recommendation/Moderate quality of evidence)

Discussion: Most studies defined aggressive hydration as a periprocedural bolus of 20 mL/kg followed by 3 mL/kg/h for 8 h postprocedure, following the study by Buxbaum *et al.*[11] Lactated Ringer's solution was used in most studies, and the data suggest its superiority in the prevention of PEP as compared to normal saline.[12–14]

Nine meta-analyses of RCTs were identified (Table S3).[15–23] These studies demonstrated a reduced risk of PEP with aggressive hydration without differences in adverse events (AEs) compared with standard hydration or no hydration. Aggressive fluid hydration with lactated Ringer's has also been shown to be noninferior to rectal NSAIDs.[24] However, prolonged (up to 24 h) postprocedure hydration may not be suitable for outpatient-basis ERCP. Also, aggressive fluid hydration may be contraindicated in patients with cardiac and/or renal insufficiencies.

Statement 2. When used alone, the WEO recommends administering rectal NSAIDs from 30 to 90 min before to immediately after ERCP for all patients if there are no contraindications.

Strongly agree: 83.3%, Agree: 16.7%.

(Strong recommendation/Moderate quality of evidence)

Discussion: We identified 31 meta-analyses of RCTs on the use of NSAIDs for PEP prevention (Table S4).[23 25–54] All but two[43,52] of these meta-analyses demonstrated NSAIDs to reduce the risk of PEP, both in unselected and high-risk populations,[23,29,38–41,45–47] without increasing the risk of AEs.[23,25,26,33,35,41,50] However, since studies excluded patients with a history of peptic ulcer disease, renal insufficiency, and allergy to aspirin and NSAIDs, the above recommendation precludes these groups of patients.

Most studies were performed with indomethacin and diclofenac. They were both found to be effective in subgroup analyses.[30,35,37,38,41,44,46–48,51,53] There is no sufficient evidence to recommend one over the other. However, they should be administered rectally because of their higher efficacy than other routes.[31 35,38,42,46–48] The standard dose for rectal indomethacin and diclofenac is 100 mg for adults. A paucity of studies has evaluated the efficacy of low-dose NSAIDs, showing conflicting results[55–58]; thus, when the standard dosage is contraindicated, a low-dose alternative can be considered. Regarding the timing of administration, most studies showed positive results using NSAIDs before ERCP (minimum 30 min and maximum 90 min) or immediately after ERCP.[23,35,38,39,41,44,46,47,50]

Statement 3. When used alone, the WEO recommends inserting a prophylactic pancreatic stent in high-risk patients if PD access has already been achieved.

Strongly agree: 83.3%, Agree: 16.7%.

(Strong recommendation/Moderate quality of evidence)

Discussion: In 12 meta-analyses (Table S5)[23,27,37,52,59–66] published between 2004 and 2023, PD stenting has been shown to effectively prevent PEP compared to placebo in high-risk and mixed-case groups of patients with an odds ratio ranging between 0.22 and 0.50, an absolute risk difference between 12.0% and 13.3%, and a number needed to treat between 7 and 10. In these studies, prophylactic PD stenting also alleviated the severity of PEP, nearly eliminating the risk of severe PEP.

A recent meta-analysis from ASGE[23] demonstrated that PD stenting reduced the risk of PEP also in patients who underwent prophylactic PD stenting as an additional step (intentional) at the end of biliary cannulation, suggesting that PD stent could be attempted even if wire access had not been already achieved unintentionally. However, these data are summarized from RCTs often conducted at referral centers with expert endoscopists, and the rate of intentional PD cannulation for a prophylactic purpose may be lower in community hospitals. Moreover, the ease of PD cannulation is variable. Endoscopists should note that failed PD stenting after attempted PD stent insertion is a risk factor for PEP. Choksi *et al.* reported a PEP rate of 34.7% in patients who did not receive indomethacin and had failed PD stenting.[67] This rate was significantly higher than that observed in cases where PD stenting was not attempted or was successful.[68] We recommend using a short (3 to 5 cm) 5F PD stent with no internal flange to facilitate spontaneous migration and should be preferred.[69] An external flange/pigtail is recommended to avoid intrapancreatic migration. PD stents should not be kept for more than 14 days due to the chance of stent-induced PD fibrosis and a higher risk of PEP.[70] An abdominal X-ray within 14 days should ensure spontaneous passage of the stent. Of note, in case of chronic obstruction of the PD with atrophy of the pancreatic parenchyma, the benefit of inserting a PD stent may be questionable, even if PD access has already been achieved.

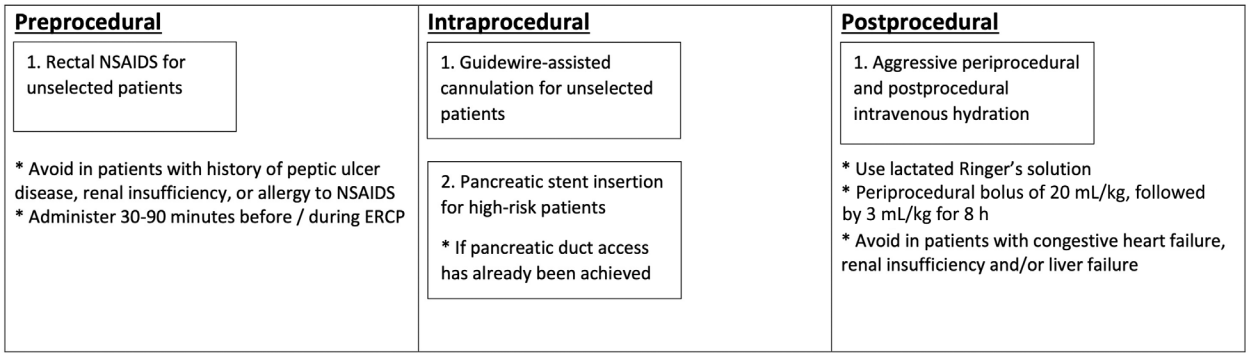

Figure 2 Strategies for prevention of post-endoscopic retrograde cholangiopancreatography (ERCP) pancreatitis in the preprocedural, intraprocedural, and postprocedural periods. NSAID, nonsteroidal anti-inflammatory drug.

Statement 4. There is some evidence suggesting that combination therapy may further reduce the chance of PEP. The WEO suggests administerating rectal NSAIDs together with aggressive intravenous hydration and/or PD stenting.

Strongly agree: 72.7%, Agree: 27.3%.

(Conditional recommendation/Low quality of evidence)

Discussion: Combination therapy with rectal NSAIDs and aggressive fluid hydration[19,21,51,54,71–73] or PD stenting[71,73] have been studied. The results mainly come from indirect comparison in network meta-analyses, and interpretation is difficult due to the heterogeneous modalities used and outcome measurement. In the latest noninferiority RCT comparing rectal indomethacin and rectal indomethacin plus PD stent, Elmunzer *et al*. showed that indomethacin alone was inferior to the combination of indomethacin plus prophylactic stent ($P = 0.011$).[74] The relative benefit of stent placement appeared more prominent among patients at highest risk for pancreatitis. However, 19.3% in the PD stent + rectal indomethacin group did not receive a PD stent due to technical issues.[74]

The panel suggests, in the absence of contraindications, the administration of rectal NSAIDs with aggressive fluid hydration and/or deploying a PD stent if PD access has already been achieved.

Figure 2 shows the strategies for prevention of pancreatitis in preprocedural, intraprocedural, and postprocedural periods.

Biliary cannulation techniques

CQ 2: Which technique should be used for initial cannulation to gain common bile duct access?

Statement 5. The WEO recommends using the guidewire-assisted technique for primary biliary cannulation, as it is associated with a lower risk of PEP and a higher success rate.

Strongly agree: 81.8%, Agree: 18.2%.

(Strong recommendation/Moderate quality of evidence)

Discussion: Three meta-analyses (Table S6), including 15 RCTs, four of which were in the form of abstract, compared biliary cannulation using contrast- and guidewire-assisted cannulation in terms of risk of success rate and risk of PEP.[75–77] The guidewire-assisted cannulation technique demonstrated a significantly higher success rate and a lower PEP rate than the contrast-assisted cannulation technique in all three meta-analyses.

Besides, a "mixed" technique that may occasionally facilitate deep cannulation has been described.[78] An accurate observation of the papillary morphology prior to attempted cannulation attempts may predict the ease of cannulation (see Supplementary Material).[79–83]

CQ 3: What should be done in case of unintentional pancreatic cannulation during initial cannulation?

Statement 6. In the case of more than one unintentional PD cannulation with deep access of the guidewire into the PD, the WEO suggests attempting biliary cannulation with a transpancreatic sphincterotomy (TPS) or double guidewire (DGW) technique, followed by pancreatic stent placement after cannulation.

Strongly agree: 45.5%, Agree: 54.5%.

(Conditional recommendation/Low quality of evidence)

Statement 7. In the case of failed biliary cannulation with TPS or DGW technique and the presence of a guidewire in

the pancreatic duct, the WEO suggests inserting a pancreatic duct stent followed by precut sphincterotomy over the stent.

Strongly agree: 27.3%, Agree: 72.7%.

(Conditional recommendation/Very low quality of evidence)

Discussion: In the case of difficult biliary cannulation, several advanced techniques have been described (Supplementary Material).[84–88] We identified 10 meta-analyses of RCTs comparing different techniques (Table S7).[89–98] However, the interpretation of data is complex due to the heterogeneous definitions of difficult biliary cannulation, cannulation techniques used, involvement of trainees, the inclusion of intentional and unintentional PD cannulation, rescue techniques, and prophylactic measures, including PD stent placement, in RCTs. The panel agrees that unintentional PD cannulation determines a specific scenario. Unintentional PD cannulation/access with the guidewire is defined as easy, preferential entry into the PD, not requiring repeated cannulation attempts or papilla manipulation. Relevant studies comparing different techniques after unintentional PD cannulation are reported in Table S8.[99–102] Persistence of standard cannulation attempts may result in multiple PD cannulation/access that is associated with an increased risk of PEP.[3,8] Consequently, when more than one unintentional PD cannulation or access of the guidewire occurs, the panel suggests using the DGW technique or TPS to gain biliary access. Both techniques allow PD stent placement after biliary cannulation without further papilla manipulation. The positive effect of PD stenting on the risk of PEP has been discussed in Statement 3, and specifically demonstrated in an RCT using the DGW technique,[103] where the placement of a PD stent reduced the rate of PEP close to 0%.

Only one RCT, including 274 patients, compared the DGW technique with persistent attempts with a single guidewire after unintentional PD cannulation.[100] No significant difference in biliary cannulation rate was observed between the two techniques. However, the DGW technique was more effective in patients with malignant biliary strictures. The incidence of PEP was similar in the two groups, but a PD stent was placed only in 18% of patients in the DGW group.[100]

There is no clear evidence to suggest TPS or DGW in the setting of unintentional PD cannulation. In the two RCTs directly comparing these two techniques after unintentional PD cannulation,[99,102] the successful biliary cannulation rate was similar. The PEP rate was comparable in the larger RCT,[102] whereas it was higher in the DGW group in the smaller study.[99] In an RCT, biliary cannulation with guidewire after PD stent placement achieved a lower success rate than DGW. However, after precutting over the stent, the rate of successful biliary cannulation was equal in the two arms.[101]

CQ 4: How to proceed in the case of difficult biliary cannulation without unintentional PD cannulation?

Statement 8. In the case of difficult biliary cannulation without unintentional PD cannulation, the WEO suggests using advanced biliary cannulation techniques (such as precut or an intentional PD cannulation attempt for pancreatic guidewire-assisted techniques) with or without a PD stent after biliary cannulation.

Strongly agree: 27.3%, Agree: 72.7%.

(Conditional recommendation/Low quality of evidence)

Discussion: In cases of difficult biliary cannulation without unintentional guidewire access/cannulation of the PD, the persistence of standard techniques or advanced techniques (i.e. early/late precut sphincterotomy/fistulotomy, PD cannulation attempt followed by pancreatic guidewire-assisted techniques) can be considered to gain deep biliary cannulation (Supplementary Material). Published data suggest some advantages in terms of the PEP rate of early precut sphincterotomy compared with the persistence of standard cannulation techniques,[89,90,95,98] especially when a fistulotomy is performed.[95] The attempt to PD cannulation for pancreatic guidewire-assisted techniques can be considered when precut/fistulotomy is deemed challenging. Indeed, a higher risk of PEP with PD cannulation attempts compared with fistulotomy has been reported.[104] Factors including papillary anatomy, operator's experience, and ERCP indication should be evaluated to choose among advanced techniques.[105–107]

CQ 5: How should biliary access be achieved if bile duct cannulation is not possible after the use of advanced biliary cannulation techniques?

Statement 9. In the case of bile duct cannulation failure, the WEO suggests referring patients to high-volume centers for repeat ERCP with an interval of at least 48 h between attempts, provided that the patient's condition is suitable for the delay.

Strongly agree: 63.6%, Agree: 36.4%.

(Conditional recommendation/Very low quality of evidence)

Statement 10. If the patient's condition requires urgent biliary drainage and expertise is available, the WEO suggests obtaining biliary cannulation by the percutaneous rendezvous technique.

Strongly agree: 75%, Agree: 25%.

(Conditional recommendation/Very low quality of evidence)

Statement 11. Alternatively, if the expertise is available, the WEO recommends using the EUS-guided rendezvous technique to access the biliary system.

Strongly agree: 91.7%, Agree: 8.3%.

(Strong recommendation/Moderate quality of evidence)

Discussion: There is currently no consensus on achieving biliary cannulation when the papilla is accessible, and bile duct cannulation fails even with advanced cannulation techniques. In this setting, ERCP can be repeated after a time interval, or cannulation can be achieved using the "rendezvous" technique, based on the antegrade advancement of a guidewire through the papilla into the duodenum, which allows easier subsequent cannulation that can be performed over or alongside the wire. No studies directly compared repeat ERCP with rendezvous. However, rendezvous requires additional expertise and may be more invasive than repeat ERCP. Therefore, repeat ERCP seems more reasonable in the absence of urgent drainage.

Repeat ERCP: Ten (nine retrospective and one prospective cohort) studies examined the outcome of repeat ERCP via standard and advanced biliary cannulation techniques after an initial ERCP failure attempt (Table S9).[108–117] The pooled success rate for repeat ERCP attempts was 79% (95% CI 75–82%, I^2 = 0%) (Fig. S1). In most studies, the second ERCP attempt succeeded using standard cannulation techniques. Of note, the biliary orifice is usually more easily identified if a precut or TPS is performed at the index ERCP. The AE rate for repeat ERCP was comparable to index ERCP. The exact interval duration is not standardized. In reported studies, it ranges between 2 and 6 days, with some evidence of a longer interval being associated with a higher cannulation rate. However, the decision to wait longer than 2 days should be solely individualized to avoid any unnecessary risk of AEs due to the patient's underlying condition.

Rendezvous: The guidewire can be negotiated through the papilla for endoscopic rendezvous via a percutaneous- or EUS-guided approach (described in the Supplementary Material) with comparable outcomes observed in a recent meta-analysis.[118]

Most available studies reported percutaneous-rendezvous (PE-RV) outcomes performed for specific indications (e.g. complete bile duct transection, impossibility of inserting a stent in patients with anastomotic strictures, refractory bile duct obstruction, cannulation in surgically-altered anatomy) and not for failed papillary cannulation during ERCP. Therefore, we selected six retrospective studies that were performed in the setting of failed biliary cannulation (Table S10).[119–124] The pooled technical success rate was 95% (95% CI 93–97%, I^2 = 0%), whereas the pooled rate of AEs was 23% (95% CI 7–38%, I^2 = 93.8%) (Fig. S2).

We identified 18 studies investigating the outcomes of EUS-guided rendezvous (EUS-RV), which are summarized in Table S11.[124–141] The pooled technical success rate was 87% (95% CI 82–92%, I^2 = 72.7%), and the pooled rate of AEs was 13% (95% CI 9–16%, I^2 = 40.6%) (Fig. S3).

The panel suggests equally PE-RV and EUS-RV, depending on center availability and expertise. Figure 3 shows the proposed algorithm for biliary cannulation.

Biliary sphincterotomy/papillary balloon dilation

CQ 6: How should endoscopic biliary sphincterotomy (ES) be performed?

Statement 12. The WEO recommends using a mixed electrocautery current for ES.

Strongly agree: 83.3%, Agree: 16.7%.

(Strong recommendation/High quality of evidence)

Discussion: Endoscopic sphincterotomy can be performed using pure cut or "mixed" currents. Mixed currents are available in two varieties: *blended* (both cutting and coagulating currents are delivered together) and *alternating* (cutting and coagulating currents are interspersed one after another in short bursts).[142] Finally, based on the anatomy of the papilla, the concept of using pure cut initially followed by blended current has also been proposed.

We identified four meta-analyses, including up to 11 RCTs, which investigated the outcomes of different currents used during ES (Table S12).[143–146] All studies reported a comparable rate of PEP and a higher risk of bleeding with pure cut compared with *alternating* or *blended* current. It is important to note that this difference was observed only in mild but not in moderate to severe bleeding.[144,145] No difference in perforation was observed.[143–146] A recent RCT published after the above-mentioned meta-analyses reported a higher rate of PEP in the *alternating* current group (5.8% vs. 2.2%, P = 0.034).[147] Intraprocedural bleeding occurred more often with pure cut (P = 0.018), but delayed bleeding

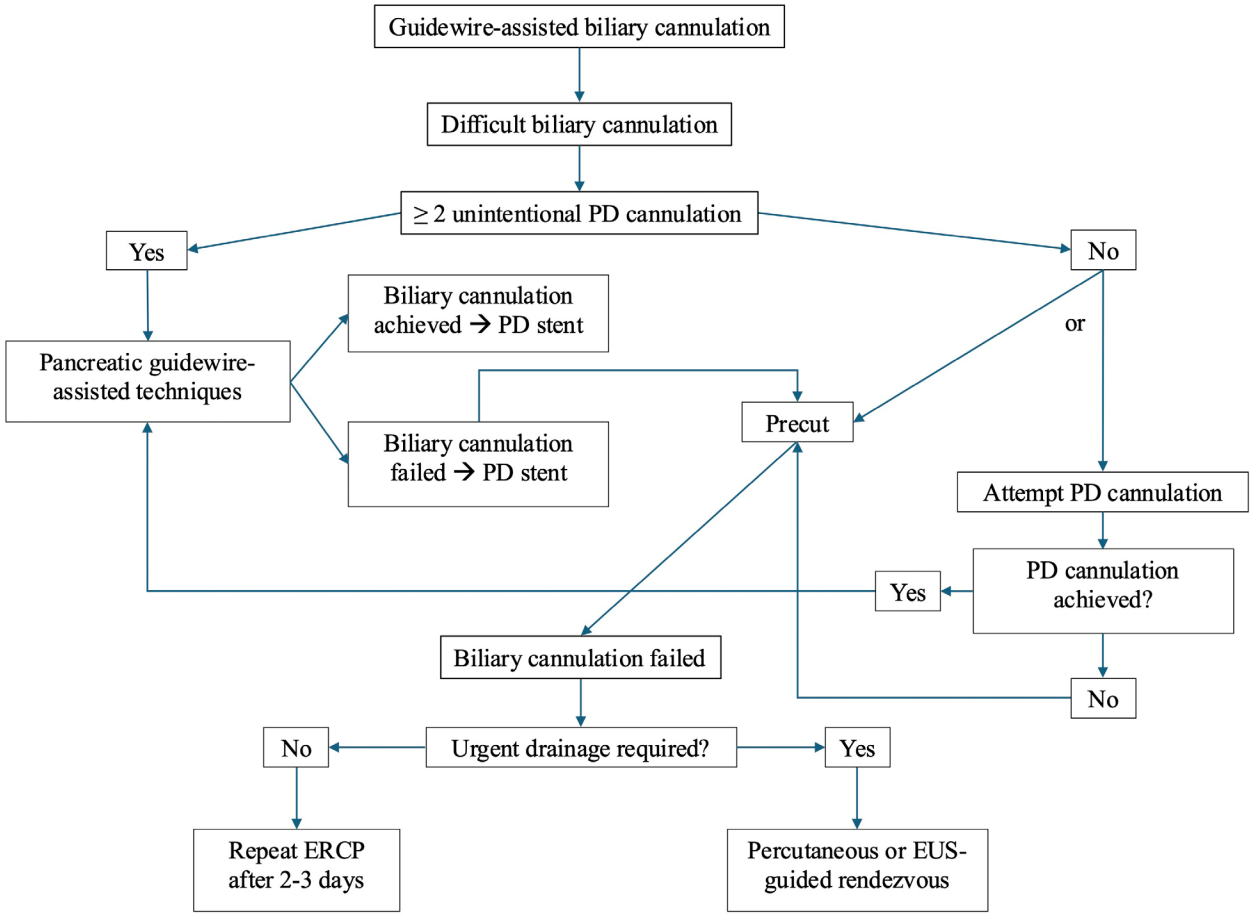

Figure 3 Algorithm of techniques for difficult biliary cannulation. ERCP, endoscopic retrograde cholangiopancreatography; EUS, endoscopic ultrasound; PD, pancreatic duct.

was more frequent with *alternating* current ($P = 0.047$).[147] The panel agrees to recommend a mixed current, considering that pure cut current increases the risk of bleeding and does not add a clear advantage in reducing the risk of PEP. When comparing mixed currents (i.e. *alternating* vs. *blended* current), three meta-analyses found no significant difference in the risk of PEP.[144–146] Therefore, there are no sufficient data to recommend one mixed current over the other. No advantages were demonstrated using the strategy of using pure cut initially followed by blended current.[145,146]

Statement 13. The WEO suggests that the size of ES should be individualized according to the patient's condition and the endoscopist's experience but not exceed the upper margin of the intraluminal biliary bulge.

Strongly agree: 75%, Agree: 25%.

(Conditional recommendation/Very low quality of evidence)

Discussion: Data on the proper size of ES are limited, as it varies according to the intended intervention.

The lack of a standardized definition in the published literature is also another challenge, as the size, shape, and morphology of each patient's ampulla frequently differ. ES can be extended along the bile duct axis up to the junction between the intraduodenal part of the bile duct and the duodenal wall. This landmark can often be assessed endoscopically, since there is a good correlation between the endoscopic appearance and the ampulla anatomy.[148] ES is considered small if it does not exceed the circumferential hood around the orifice (Fig. S4). Contrarily, if it extends to the intramural portion of the bile duct, it is considered large. ES is considered medium size when the cut extends between

these landmarks. We did not identify trials comparing the AEs and endoscopic outcomes with different ES sizes. However, the panel agrees that extending the cut beyond the superior margin of the ampulla, which determines the border of the distal common bile duct on the medial wall of the duodenum, can increase the risk of perforation.[149]

The size of ES depends largely on the intended intervention. ES for biliary obstruction in a patient with ampullary cancer can be minimal and just enough for the stent to be inserted. In contrast, ES in a patient with a large biliary stone may need to be as large as the stone size to facilitate stone extraction and lithotripsy, if needed. Extension of the prior ES site to the level of the first duodenal fold can be safely performed if required by the intended intervention.[150] In addition, the size of the distal common bile duct, the anatomy of the ampulla, the technical challenges of the scope position, and the endoscopist's experience also play crucial roles as the determining factors. The panel agrees that the size of ES should be individualized according to the indication, intended intervention, anatomy of the ampulla, and the endoscopist's experience but should not exceed the upper margin of the visualized intraduodenal bile duct. If a large ES cannot be safely performed, it is suggested that a small ES be performed, followed by balloon dilation of the ampulla, as a higher rate of AEs, including perforation and bleeding, is associated with large ES.[151]

CQ 7: When and how should endoscopic papillary small balloon dilation (EPSBD) be performed?

Statement 14. The WEO suggests using EPSBD as an alternative to ES in patients with hemorrhagic tendencies when ES is contraindicated.

Strongly agree: 66.7%, Agree: 33.3%.

(Conditional recommendation/Low quality of evidence)

Statement 15. The WEO suggests maintaining an extended duration (>1 to ≤5 min) of dilation when EPSBD is employed to reduce the risk of pancreatitis.

Strongly agree: 25%, Agree: 75%.

(Conditional recommendation/Low quality of evidence)

Discussion: The historical rationale for the use of endoscopic papillary balloon dilation as an alternative to ES for the extraction of small to medium-sized biliary stones is to preserve the papillary sphincter function for the potential benefit of reducing the risk of recurrent stones.[152,153] Although asymptomatic bacterial colonization of the biliary tract has been frequently reported after ES, this has not been shown to necessarily translate into an increased risk of recurrent stone formation.[154] The size of balloon dilation used for this indication has been typically small (≤10 mm diameter),[155] and the technique is termed EPSBD.

We identified four meta-analyses comparing EPSBD with ES (Table S13).[156–159] EPSBD was less successful for overall complete stone clearance[157,159] or at index procedure,[156,157] had a higher risk of pancreatitis, and a higher rate of additional need for mechanical or electrohydraulic lithotripsy.[156,158] The rate of bleeding was close to zero with EPSBD and significantly lower than with ES.[156–159] A more recent meta-analysis demonstrated better results with ES in terms of stone clearance and PEP rate when studies using a ≤10 mm balloon were evaluated.[160]

A short duration (≤1 min) of balloon dilation has been associated with a higher PEP risk in three meta-analyses. Differently, longer duration (>1 min) has comparable pancreatitis risk with ES.[160–162]

The panel agrees that the most clinically relevant differences to pursue ES in lieu of EPSBD are the significantly higher incidence of PEP and the lower rate of stone clearance at the index procedure with EPSBD. Considering the questionable long-term benefits of preserving the biliary sphincter to prevent stone recurrence, EPSBD cannot be recommended as an alternative to ES for retrieving small to medium-sized stones. However, the virtually absent risk of bleeding with EPSBD makes this procedure useful in select subgroups of patients with coagulation disorders where ES is contraindicated.

CQ 8: When and how should endoscopic papillary large balloon dilation (EPLBD) be performed?

Statement 16. The WEO suggests using EPLBD in conjunction with a small ES to retrieve large-size or difficult common bile duct stones in a dilated duct of ≥12 mm.

Strongly agree: 58.3%, Agree: 41.7%.

(Conditional recommendation/Moderate quality of evidence)

Discussion: Sphincteroplasty or papillary dilation performed with a large balloon (≥12 mm) is termed EPLBD), to differentiate it from EPSBD.

EPLBD can be used in conjunction with ES.[155] Performing ES before EPLBD results in ablation of the sphincter of Oddi and alters the vector of the dilation force such that the tear continues in the direction of the ES, thus reducing the pressure on the PD caused by balloon dilation and

facilitating PD drainage and reducing the risk of PEP. Either a small or a large ES can precede EPLBD, but a large ES could increase the risk of bleeding and perforation. In particular situations, such as surgically-altered anatomy, ES may be challenging; thus, EPLBD without ES can be considered.

We identified six meta-analyses comparing different procedures for stone removal (Table S14).[160,163–167] Overall, ES + EPLBD overcame ES and EPLBD alone for overall stone removal and bile duct clearance at index ERCP, outperformed only by single-operator cholangioscopy in a recent network meta-analysis.[167] Similarly, these studies speak in favor of ES + EPLBD regarding the need for mechanical lithotripsy.[163–166] The rates of PEP and perforation were lower after ES + EPLBD,[163,164,166] but bleeding was more frequent when compared with EPLBD alone.[163,164,166] Based on the benefits of complete stone clearance with lower rates of PEP and perforation, the panel suggests using ES + EPLBD to manage large or difficult bile duct stones.

The balloon diameter should be matched to the diameter of the distal bile duct and the short axis diameter of the stone, with the maximum balloon diameter not exceeding the diameter of the distal bile duct.[168]

CQ 9: Is ES required prior to biliary stenting for malignant disease?

Statement 17. The WEO suggests against routine ES before biliary stent placement for malignant obstruction.

Strongly agree: 50%, Agree: 50%.

(Conditional recommendation/High quality of evidence)

Discussion: Historically, ES has been utilized to ease stent insertion and deployment and reduce the risk of PEP by lowering the pressure on the PD orifice produced by the self-expandable metal stent (SEMS).[169] However, ES may increase the risk of bleeding or perforation.

We identified four meta-analyses comparing outcomes of biliary drainage with or without ES (Table S15).[170–172] All meta-analyses agree that there is a higher risk of bleeding with the addition of ES, with no differences in terms of successful stent insertion, stent migration, or occlusion, and perforation.[170–173] Only one meta-analysis reported a higher risk of cholangitis after ES.[172] The main impact on cholangitis is due to the study of Zhou *et al*., which included only proximal stenosis with stent placement above the papilla.[174]

The risk of PEP differs among the meta-analyses. The first meta-analysis of three RCTs published in 2014 reported a higher risk of PEP without ES.[170] Again, the higher risk of pancreatitis seems related to the study by Zhou *et al*.[174] The second meta-analysis included RCTs and observational studies, and a subgroup analysis was performed in patients with biliary obstruction. The authors found no difference in PEP incidence, including when only patients with SEMS were evaluated.[171] The third meta-analysis included only RCTs with the placement of SEMS and found no difference in the PEP rate.[172] The last meta-analysis found a trend toward significance favoring ES in studies with malignant biliary obstruction, but without a difference according to the stent used (plastic or SEMS).[173] Concerning the diameter of plastic biliary stents, two RCTs found no difference in PEP rate between ES and non-ES groups after large-bore (8.5F or 10F) plastic stent placement.[175,176]

The panel agrees that ES is not necessary in all cases of biliary stent placement for malignant biliary obstruction. However, the incidence of PEP with or without ES in the specific setting of FCSEMS placed across the papilla in patients without chronic obstruction of the PD should be further investigated.

ERCP in special circumstances

CQ 10: How should biliary cannulation be performed in the presence of periampullary diverticulum (PAD)?

Statement 18. In the presence of PAD, the WEO suggests proceeding with cannulation and sphincterotomy in the usual manner using the previously described techniques.

Strongly agree: 75%, Agree: 25%.

(Conditional recommendation/Moderate quality of evidence)

Discussion: Identifying the papilla and successfully achieving selective cannulation of the bile duct may be more difficult in the presence of PAD, particularly when the papilla is found within the diverticulum. We identified three meta-analyses reporting a lower success rate of cannulation in patients with PAD than in those without PAD (Table S16).[177–179] However, this difference is mainly related to the influence of older studies, which traditionally reported increased cannulation difficulty and failure rates.[177–179] Moreover, a significantly lower cannulation rate was associated with intradiverticular papilla compared with non-intradiverticular papilla in patients with PAD.[178,179] Two meta-analyses demonstrated a higher risk of PEP and bleeding in patients with PAD,[178,179] but only one showed a higher risk of perforation.[178]

No studies have been identified comparing biliary cannulation techniques in the presence of PAD. The panel suggests using the same techniques suggested for biliary cannulation in the absence of PAD. However, in the case of difficult biliary cannulation without unintentional PD cannulation, the panel suggests prudence in performing a free-hand precut. Anatomic abnormalities and positioning difficulties caused by PAD may increase the risk of bleeding and perforation.

CQ 11: How should ERCP be performed in patients with a history of Billroth II gastrectomy?

Statement 19. In patients with a history of Billroth II gastrectomy, the WEO suggests accessing the duodenal papilla using a forward-viewing endoscope with a distal cap or a duodenoscope.

Strongly agree: 66.7%, Agree: 33.3%.

(Conditional recommendation/Moderate quality of evidence)

Statement 20. In patients with a history of Billroth II gastrectomy, the WEO suggests performing biliary cannulation using the guidewire-assisted technique with rotatable or Billroth II-dedicated sphincterotomes or bendable cannulas.

Strongly agree: 27.3%, Agree: 72.7%.

(Conditional recommendation/Very low quality of evidence)

Discussion: We identified four meta-analyses on ERCP in patients with Billroth II gastrectomy anatomy (Table S17).[180–183] Using a gastroscope with or without a distal cap or a duodenoscope is comparable in terms of the afferent loop intubation rate, selective cannulation rate, and AE rate. The panel agrees that adding a distal cap can improve the inspection of the blind area of the small intestinal mucosa behind the semilunar folds and the stability of the endoscope during ERCP maneuvers. Balloon enteroscopy-assisted ERCP did not significantly improve ERCP outcomes in patients with Billroth II gastrectomy anatomy[182,183] and should be considered in the case of failure with standard scopes. Alternatively, standard or pediatric colonoscopes, or a short-type double-balloon enteroscope, can also be utilized, particularly in patients with a long afferent limb.

In Billroth II patients, the ampulla is approached caudally, and the biliary orifice is located at the 5 o'clock position, which renders biliary cannulation and the sphincterotomy orientation more challenging. Rotatable and Billroth II-dedicated sphincterotomes and bendable cannulas may prove to be useful in overcoming the cannulation difficulty in patients with Billroth II anatomy.[184] No studies compared these different accessories or approaches. In the case of standard cannulation failure, it is possible to proceed with rendezvous-assisted cannulation. Percutaneous rendezvous showed higher technical success in this setting than EUS-guided rendezvous.[118]

Once biliary cannulation is achieved, some of the options to ablate the biliary sphincter are conventional sphincterotomy, EPSBD, EPLBD, and ES + EPLBD. These approaches seem to have similar rates of clinical success and AEs.[182]

CQ 12: How should ERCP be performed in patients with hepaticojejunostomy, Roux-en-Y reconstruction after cancer surgery, or pancreaticoduodenectomy?

Statement 21. In patients with other types of surgically-altered anatomy where ductal access is difficult, apart from Billroth II gastrectomy, the WEO suggests performing ERCP with device-assisted enteroscopy.

Strongly agree: 27.3%, Agree: 72.7%.

(Conditional recommendation/High quality of evidence)

Discussion: Roux-en-Y reconstruction is performed as part of various luminal surgeries: Roux-en-Y hepaticojejunostomy, Whipple surgery, pylorus-preserving pancreaticoduodenectomy, Roux-en-Y gastrectomy, and Roux-en-Y gastric bypass (RYGB). In the former three operations, the jejunal loop is accessed to reach a bilioenteric anastomosis. In the latter two operations, the jejunal loop is accessed to reach the ampulla of Vater.

We identified seven meta-analyses reporting on enteroscopy-assisted ERCP (EA-ERCP) outcomes in patients with Roux-en-Y anatomy, including hepaticojejunostomy, Whipple resection, pylorus-preserving duodenopancreatectomy, and Roux-en-Y gastrectomy (Table S18).[180,183,185–189] Different enteroscopes were used, including single-balloon, double-balloon (short or conventional), and spiral. The enteroscopic (i.e. intubation of the limb and visualization of the papilla), diagnostic (i.e. cannulation of the desired duct), and therapeutic (i.e. completion of the procedure) success range between 82.9–97.2%, 69.4–95.1%, and 61.7–98%, respectively, with an AE rate between 4% and 6.6%.[180,183,185–189] There are insufficient data to suggest one scope over the other. However, the experience with spiral EA-ERCP is very limited compared to balloon-enteroscopy, and a recent meta-analysis found that spiral EA-ERCP was inferior to balloon EA-ERCP in terms of procedural success rates.[189]

CQ 13: How should ERCP be performed in patients with RYGB for obesity?

Statement 22. In patients with RYGB for obesity, the WEO suggests performing laparoscopy-assisted ERCP (LA-ERCP) over EA-ERCP because it is more technically successful.

Strongly agree: 36.4%, Agree: 63.6%.

(Conditional recommendation/Moderate quality of evidence)

Statement 23. Alternatively, if expertise is available, the WEO suggests performing EUS-directed transgastric ERCP (EDGE).

Strongly agree: 72.7%, Agree: 27.3%.

(Conditional recommendation/Moderate quality of evidence)

Discussion: Roux-en-Y gastric bypass is one of the most common bariatric surgeries. ERCP is particularly challenging in patients with RYGB due to a long Roux limb, an angulated jejuno-jejunostomy, the frontal and caudal approach to the ampulla from the biliopancreatic limb, and the scarcity of dedicated accessories for longer scopes. Options included LA-ERCP, EA-ERCP, and EDGE (described in the Supplementary Material).

We identified 17 meta-analyses reporting on the outcomes of these procedures in patients with RYGB (Table S19).[180,189–204]

The results of systematic reviews of the observational studies comparing LA-ERCP versus EDGE versus EA-ERCP found a greater success rate in the first two approaches (>90%).[189,191,193,194,196,199–201,204] However, despite high technical success, EDGE and LA-ERCP have a nonnegligible high rate of AEs (14–24% and 13–21%, respectively).[189,191–193,199–204] While EA-ERCP is safer but less successful in patients with RYGB anatomy, LA-ERCP has logistic limitations, such as coordinating the surgical and endoscopic teams in the operating room and EDGE requires specific expertise. Considering LA-ERCP or EDGE's significantly higher technical success than EA-ERCP's, the panel suggests LA-ERCP or EDGE equally, depending on the local expertise and availability.

CQ 14: How should biliary cannulation be performed in patients with inaccessible papilla due to duodenal obstruction?

Statement 24. In patients with inaccessible papilla due to duodenal obstruction, the WEO suggests performing EUS- or percutaneous-guided access according to local expertise.

Strongly agree: 75%, Agree: 25%.

(Conditional recommendation/Low quality of evidence)

Discussion: Gastric outlet obstruction (GOO) can develop concurrently with malignant biliary obstruction in patients with periampullary or pancreatic malignancies. About 15–20% of patients with pancreatic cancer develop GOO.[205] GOO can occur before, simultaneously, or after biliary obstruction.[206] Moreover, duodenal strictures can be classified according to the location of the obstruction into three types: in Type 1, the obstruction is proximal to the papilla; in Type 2, the stenosis involves the ampullary region; and in Type 3, the stricture is located distal to the papilla.[207] The patient prognosis, tumor resectability, the timing of the onset of GOO and biliary obstruction, and, consequently, the possible presence of a previously placed biliary or duodenal stent are important factors to consider in the management of this condition. Moreover, the possibility of treating the GOO with EUS-guided gastroenterostomy, which demonstrated longer patency than duodenal stents, should also be taken into account.[208]

In Type 3 stenosis, the papilla is usually endoscopically reachable, and standard ERCP can be performed. However, an increased risk of duodenal-biliary reflux, even after duodenal stent placement, should be considered.[209]

Duodenal strictures of Types 1 and 2 are a reason for failed ERCP because the papilla is not reachable or impossible to cannulate. For Type 1 stenosis, a duodenal SEMS can be placed, and the ERCP can be performed through the SEMS lumen to access the ampulla. A retrospective study showed a technical success rate of 87%.[210] However, the success rate can be significantly lower if the duodenal stent obscures the major papilla. Therefore, this strategy should be used if the distal end of the duodenal stent can be placed presumptively above the papilla. Moreover, this technique cannot be used if GOO is managed with EUS-guided gastroenterostomy. For Type 2 stenosis, the success rate of ERCP through a duodenal stent is significantly lower.[210,211]

Percutaneous and EUS-guided drainage procedures are valuable alternatives for biliary decompression. EUS-guided drainage requires specific skills and experience. Therefore, local expertise should be a relevant factor in the decision-making process. The main techniques of EUS-guided drainage include EUS-guided choledochoduodenostomy, EUS-guided hepaticogastrostomy, EUS-guided antegrade stenting, and EUS-guided gallbladder drainage. EUS-guided drainage seems superior to the percutaneous route in terms of safety and reintervention rate.[212,213] However, most studies were retrospective in nature, and they compared percutaneous drainage with plastic stents vs. EUS-guided

Table 3 Potential topic of interest for future research on post-endoscopic retrograde cholangiopancreatography (ERCP) pancreatitis (PEP), advanced techniques for biliary cannulation, sphincterotomy/papillary balloon dilation, and ERCP in special circumstances

Areas of interest	Topics for future research
PEP prophylaxis	Rectal diclofenac vs. rectal indomethacin
	Effectiveness and costs of combined vs. single interventions
	Efficacy and safety of "intentional" pancreatic duct stenting after biliary cannulation in high-risk patients
Biliary cannulation techniques	Efficacy and safety of the "mixed" cannulation technique compared with the guidewire-assisted technique
	Comparison between different pancreatic-guidewire assisted cannulation techniques and precut in the specific setting of *unintentional* pancreatic duct cannulation
	Effectiveness, safety, and costs of repeat ERCP vs. percutaneous- or endoscopic ultrasound-guided rendezvous
	Effectiveness and safety of precut vs. percutaneous- or endoscopic ultrasound-guided rendezvous
Biliary sphincterotomy/papillary balloon dilation	PEP and bleeding rates after endoscopic sphincterotomy performed with pure cut vs. mixed currents
	Association between adverse events and duration of EPSBD performed as an alternative to endoscopic sphincterotomy
	Comparison between single-operator cholangioscopy and ES + EPLBD for the treatment of difficult choledocholithiasis
	Performing biliary sphincterotomy before FCSEMS placement across the papilla in patients without chronic obstruction of the main pancreatic duct
ERCP in special circumstances	Comparison between different cannulation techniques in the presence of periampullary diverticulum
	Enteroscopy-assisted ERCP using new scopes in patients with surgically-altered anatomy
	Comparison between LA-ERCP and EDGE in patients with Roux-en-Y gastric bypass anatomy
	Different endoscopic approaches for the management of concomitant GOO and malignant biliary obstruction

EDGE, endoscopic ultrasound-directed transgastric ERCP; EPLBD, endoscopic papillary large balloon dilation; EPSBD, endoscopic papillary small balloon dilation; ES, endoscopic sphincterotomy; FCSEMS, fully covered self-expandable metal stent; GOO, gastric outlet obstruction; LA-ERCP, laparoscopic-assisted ERCP.

drainage with SEMS.[212,213] In a recent network meta-analysis including five RCTs comparing different techniques for biliary drainage after ERCP failure (i.e. EUS-guided choledochoduodenostomy, EUS-guided hepaticogastrostomy, percutaneous drainage, and surgery), none of the treatments evaluated demonstrated superior clinical efficacy and safety compared to percutaneous drainage[214]; however, percutaneous drainage showed slightly poorer performance in terms of safety profile in the ranking analysis.[214]

Although some evidence suggests that EUS-guided hepaticogastrostomy or EUS-guided antegrade stenting should be preferred over EUS-guided choledocoduodenostomy to reduce the risk of stent dysfunction in the case of concomitant GOO,[215,216] there are no randomized trials comparing one approach with another. Therefore, it may be premature to conclude the superiority of any of the EUS-guided biliary drainage approaches.

DISCUSSION

THE WEO CONSENSUS- and evidence-based guidelines aimed to improve clinical practice on biliary cannulation during ERCP. Particular attention was paid to covering and integrating all the available techniques for biliary drainage, considering that different resources are available worldwide.

Compared with the ESGE guidelines published in 2016, we focused on biliary cannulation. We aimed to provide a single document reporting practical step-by-step advice based on patient care scenarios commonly encountered in clinical practice. Our comprehensive study also provides guidance for preventing PEP and biliary access in patients with surgically-altered anatomy. Table 3 shows possible topics for future research.

The statements represent a consensus of best practices based on the available evidence at the time of preparation.

The guidelines provided should be interpreted on a patient-by-patient basis, realizing that each consensus statement may not be applicable to all patients.

CONFLICT OF INTEREST

AUTHOR S.F.C. IS a consultant for AlphaTau and Oncosil Medical and has been a paid speaker for Boston Scientific. F.M.-F. is a consultant for Boston Scientific, Cook Medical, and Olympus. A.Y.B.T. is an Associate Editor of *Digestive Endoscopy*. He is also a consultant for CMR surgical, Boston Scientific, Cook, Taewoong, Microtech, and MI Tech Medical Corporation. Dr. Ryan Law is a consultant for Boston Scientific and Olympus America. He receives research support from Boston Scientific and Olympus America and royalties from UpToDate. The other authors declare no conflict of interest for this article.

FUNDING INFORMATION

NONE.

REFERENCES

1 DeBenedet AT, Elmunzer BJ, McCarthy ST, Elta GH, Schoenfeld PS. Intraprocedural quality in endoscopic retrograde cholangiopancreatography: A meta-analysis. *Am J Gastroenterol* 2013; **108**: 1696–704; quiz 705.
2 Williams EJ, Taylor S, Fairclough P *et al*. Are we meeting the standards set for endoscopy? Results of a large-scale prospective survey of endoscopic retrograde cholangiopancreatograph practice. *Gut* 2007; **56**: 821–9.
3 Testoni PA, Mariani A, Aabakken L *et al*. Papillary cannulation and sphincterotomy techniques at ERCP: European Society of Gastrointestinal Endoscopy (ESGE) clinical guideline. *Endoscopy* 2016; **48**: 657–83.
4 Domagk D, Oppong KW, Aabakken L *et al*. Performance measures for ERCP and endoscopic ultrasound: A European Society of Gastrointestinal Endoscopy (ESGE) quality improvement initiative. *Endoscopy* 2018; **50**: 1116–27.
5 Liao WC, Angsuwatcharakon P, Isayama H *et al*. International consensus recommendations for difficult biliary access. *Gastrointest Endosc* 2017; **85**: 295–304.
6 Guyatt GH, Oxman AD, Vist GE *et al*. GRADE: An emerging consensus on rating quality of evidence and strength of recommendations. *BMJ* 2008; **336**: 924–6.
7 Balshem H, Helfand M, Schünemann HJ *et al*. GRADE guidelines: 3. Rating the quality of evidence. *J Clin Epidemiol* 2011; **64**: 401–6.
8 Halttunen J, Meisner S, Aabakken L *et al*. Difficult cannulation as defined by a prospective study of the Scandinavian Association for Digestive Endoscopy (SADE) in 907 ERCPs. *Scand J Gastroenterol* 2014; **49**: 752–8.
9 Dumonceau JM, Kapral C, Aabakken L *et al*. ERCP-related adverse events: European Society of Gastrointestinal Endoscopy (ESGE) guideline. *Endoscopy* 2020; **52**: 127–49.
10 Akshintala VS, Kanthasamy K, Bhullar FA *et al*. Incidence, severity, and mortality of post-ERCP pancreatitis: An updated systematic review and meta-analysis of 145 randomized controlled trials. *Gastrointest Endosc* 2023; **98**: 1–6.e12.
11 Buxbaum J, Yan A, Yeh K, Lane C, Nguyen N, Laine L. Aggressive hydration with lactated Ringer's solution reduces pancreatitis after endoscopic retrograde cholangiopancreatography. *Clin Gastroenterol Hepatol* 2014; **12**: 303–7.e1.
12 Park CH, Paik WH, Park ET *et al*. Aggressive intravenous hydration with lactated Ringer's solution for prevention of post-ERCP pancreatitis: A prospective randomized multicenter clinical trial. *Endoscopy* 2018; **50**: 378–85.
13 Lee A, Ko C, Buitrago C, Hiramoto B, Hilson L, Buxbaum J. Lactated ringers vs normal saline resuscitation for mild acute pancreatitis: A randomized trial. *Gastroenterology* 2021; **160**: 955–7.e4.
14 Wu BU, Hwang JQ, Gardner TH *et al*. Lactated Ringer's solution reduces systemic inflammation compared with saline in patients with acute pancreatitis. *Clin Gastroenterol Hepatol* 2011; **9**: 710–7.e1.
15 Wu D, Wan J, Xia L, Chen J, Zhu Y, Lu N. The efficiency of aggressive hydration with lactated Ringer solution for the prevention of post-ERCP pancreatitis: A systematic review and meta-analysis. *J Clin Gastroenterol* 2017; **51**: e68–76.
16 Zhang ZF, Duan ZJ, Wang LX, Zhao G, Deng WG. Aggressive hydration with lactated Ringer solution in prevention of postendoscopic retrograde cholangiopancreatography pancreatitis: A meta-analysis of randomized controlled trials. *J Clin Gastroenterol* 2017; **51**: e17–26.
17 Radadiya D, Devani K, Arora S *et al*. Peri-procedural aggressive hydration for post endoscopic retrograde cholangiopancreatography (ERCP) pancreatitis prophylaxsis: Meta-analysis of randomized controlled trials. *Pancreatology* 2019; **19**: 819–27.
18 Wu M, Jiang S, Lu X *et al*. Aggressive hydration with lactated ringer solution in prevention of post-endoscopic retrograde cholangiopancreatography pancreatitis: A systematic review and meta-analysis. *Medicine (Baltimore)* 2021; **100**: e25598.
19 Márta K, Gede N, Szakács Z *et al*. Combined use of indomethacin and hydration is the best conservative approach for post-ERCP pancreatitis prevention: A network meta-analysis. *Pancreatology* 2021; **21**: 1247–55.
20 Wang RC, Jiang ZK, Xie YK, Chen JS. Aggressive hydration compared to standard hydration with lactated Ringer's solution for prevention of post endoscopic retrograde cholangiopancreatography pancreatitis. *Surg Endosc* 2021; **35**: 1126–37.
21 Radadiya D, Brahmbhatt B, Reddy C, Devani K. Efficacy of combining aggressive hydration with rectal indomethacin in

preventing post-ERCP pancreatitis: A systematic review and network meta-analysis. *J Clin Gastroenterol* 2022; **56**: e239–49.
22 Park TY, Kang H, Choi GJ, Oh HC. Aggressive hydration for preventing post-endoscopic retrograde cholangiopancreatography pancreatitis: Trial sequential analysis. *Surg Endosc* 2023; **37**: 1366–75.
23 Buxbaum JL, Freeman M, Amateau SK *et al*. American Society for Gastrointestinal Endoscopy guideline on post-ERCP pancreatitis prevention strategies: Summary and recommendations. *Gastrointest Endosc* 2023; **97**: 153–62.
24 Guha P, Patra PS, Misra D *et al*. An open-label randomized controlled trial comparing effectiveness of aggressive hydration versus high-dose rectal indomethacin in the prevention of Postendoscopic retrograde cholangiopancreatographic pancreatitis (AHRI-PEP). *J Clin Gastroenterol* 2023; **57**: 524–30.
25 Elmunzer BJ, Waljee AK, Elta GH, Taylor JR, Fehmi SM, Higgins PD. A meta-analysis of rectal NSAIDs in the prevention of post-ERCP pancreatitis. *Gut* 2008; **57**: 1262–7.
26 Ding X, Chen M, Huang S, Zhang S, Zou X. Nonsteroidal anti-inflammatory drugs for prevention of post-ERCP pancreatitis: A meta-analysis. *Gastrointest Endosc* 2012; **76**: 1152–9.
27 Akbar A, Abu Dayyeh BK, Baron TH, Wang Z, Altayar O, Murad MH. Rectal nonsteroidal anti-inflammatory drugs are superior to pancreatic duct stents in preventing pancreatitis after endoscopic retrograde cholangiopancreatography: A network meta-analysis. *Clin Gastroenterol Hepatol* 2013; **11**: 778–83.
28 Akshintala VS, Hutfless SM, Colantuoni E *et al*. Systematic review with network meta-analysis: Pharmacological prophylaxis against post-ERCP pancreatitis. *Aliment Pharmacol Ther* 2013; **38**: 1325–37.
29 Yaghoobi M, Rolland S, Waschke KA *et al*. Meta-analysis: Rectal indomethacin for the prevention of post-ERCP pancreatitis. *Aliment Pharmacol Ther* 2013; **38**: 995–1001.
30 Yuhara H, Ogawa M, Kawaguchi Y, Igarashi M, Shimosegawa T, Mine T. Pharmacologic prophylaxis of post-endoscopic retrograde cholangiopancreatography pancreatitis: Protease inhibitors and NSAIDs in a meta-analysis. *J Gastroenterol* 2014; **49**: 388–99.
31 Li X, Tao LP, Wang CH. Effectiveness of nonsteroidal anti-inflammatory drugs in prevention of post-ERCP pancreatitis: A meta-analysis. *World J Gastroenterol* 2014; **20**: 12322–9.
32 Sun HL, Han B, Zhai HP, Cheng XH, Ma K. Rectal NSAIDs for the prevention of post-ERCP pancreatitis: A meta-analysis of randomized controlled trials. *Surgeon* 2014; **12**: 141–7.
33 Sethi S, Sethi N, Wadhwa V, Garud S, Brown A. A meta-analysis on the role of rectal diclofenac and indomethacin in the prevention of post-endoscopic retrograde cholangiopancreatography pancreatitis. *Pancreas* 2014; **43**: 190–7.
34 Ahmad D, Lopez KT, Esmadi MA *et al*. The effect of indomethacin in the prevention of post-endoscopic retrograde cholangiopancreatography pancreatitis: A meta-analysis. *Pancreas* 2014; **43**: 338–42.
35 Puig I, Calvet X, Baylina M *et al*. How and when should NSAIDs be used for preventing post-ERCP pancreatitis? A systematic review and meta-analysis. *PLoS One* 2014; **9**: e92922.
36 Shi N, Deng L, Altaf K, Huang W, Xue P, Xia Q. Rectal indomethacin for the prevention of post-ERCP pancreatitis: A meta-analysis of randomized controlled trials. *Turk J Gastroenterol* 2015; **26**: 236–40.
37 Vadalà di Prampero SF, Faleschini G, Panic N, Bulajic M. Endoscopic and pharmacological treatment for prophylaxis against postendoscopic retrograde cholangiopancreatography pancreatitis: A meta-analysis and systematic review. *Eur J Gastroenterol Hepatol* 2016; **28**: 1415–24.
38 Patai Á, Solymosi N, Mohácsi L, Patai ÁV. Indomethacin and diclofenac in the prevention of post-ERCP pancreatitis: A systematic review and meta-analysis of prospective controlled trials. *Gastrointest Endosc* 2017; **85**: 1144–56.e1.
39 Wan J, Ren Y, Zhu Z, Xia L, Lu N. How to select patients and timing for rectal indomethacin to prevent post-ERCP pancreatitis: A systematic review and meta-analysis. *BMC Gastroenterol* 2017; **17**: 43.
40 Inamdar S, Han D, Passi M, Sejpal DV, Trindade AJ. Rectal indomethacin is protective against post-ERCP pancreatitis in high-risk patients but not average-risk patients: A systematic review and meta-analysis. *Gastrointest Endosc* 2017; **85**: 67–75.
41 Hou YC, Hu Q, Huang J, Fang JY, Xiong H. Efficacy and safety of rectal nonsteroidal anti-inflammatory drugs for prophylaxis against post-ERCP pancreatitis: A systematic review and meta-analysis. *Sci Rep* 2017; **7**: 46650.
42 Li L, Han Z, Yuan H, Zhang G, Jia Y, He C. Nonsteroidal anti-inflammatory drugs reduce the incidence of post-endoscopic retrograde cholangiopancreatography pancreatitis: A meta-analysis. *J Hepatobiliary Pancreat Sci* 2017; **24**: 520–9.
43 Feng Y, Navaneethan U, Zhu X *et al*. Prophylactic rectal indomethacin may be ineffective for preventing post-endoscopic retrograde cholangiopancreatography pancreatitis in general patients: A meta-analysis. *Dig Endosc* 2017; **29**: 272–80.
44 Yang C, Zhao Y, Li W *et al*. Rectal nonsteroidal anti-inflammatory drugs administration is effective for the prevention of post-ERCP pancreatitis: An updated meta-analysis of randomized controlled trials. *Pancreatology* 2017; **17**: 681–8.
45 Garg R, Mohan BP, Krishnamoorthi R, Rustagi T. Pre-endoscopic retrograde cholangiopancreatography (ERCP) administration of rectal indomethacin in unselected patients to reduce post-ERCP pancreatitis: A systematic review and meta-analysis. *Indian J Gastroenterol* 2018; **37**: 120–6.
46 Lyu Y, Cheng Y, Wang B, Xu Y, Du W. What is impact of nonsteroidal anti-inflammatory drugs in the prevention of post-endoscopic retrograde cholangiopancreatography pancreatitis: A meta-analysis of randomized controlled trials. *BMC Gastroenterol* 2018; **18**: 106.
47 Liu L, Li C, Huang Y, Jin H. Nonsteroidal anti-inflammatory drugs for endoscopic retrograde cholangiopancreatography postoperative pancreatitis prevention: A systematic review and meta-analysis. *J Gastrointest Surg* 2019; **23**: 1991–2001.

48 Serrano JPR, de Moura DTH, Bernardo WM *et al*. Nonsteroidal anti-inflammatory drugs versus placebo for post-endoscopic retrograde cholangiopancreatography pancreatitis: A systematic review and meta-analysis. *Endosc Int Open* 2019; **7**: E477–86.
49 Shou-Xin Y, Shuai H, Fan-Guo K *et al*. Rectal nonsteroidal anti-inflammatory drugs and pancreatic stents in preventing post-endoscopic retrograde cholangiopancreatography pancreatitis in high-risk patients: A network meta-analysis. *Medicine (Baltimore)* 2020; **99**: e22672.
50 Yang J, Wang W, Liu C, Zhao Y, Ren M, He S. Rectal nonsteroidal anti-inflammatory drugs for endoscopic retrograde cholangiopancreatography postoperative pancreatitis prevention: A network meta-analysis. *J Clin Gastroenterol* 2020; **54**: 305–13.
51 Akshintala VS, Sperna Weiland CJ, Bhullar FA *et al*. Non-steroidal anti-inflammatory drugs, intravenous fluids, pancreatic stents, or their combinations for the prevention of post-endoscopic retrograde cholangiopancreatography pancreatitis: A systematic review and network meta-analysis. *Lancet Gastroenterol Hepatol* 2021; **6**: 733–42.
52 Dubravcsik Z, Hritz I, Keczer B, Novák P, Lovász BD, Madácsy L. Network meta-analysis of prophylactic pancreatic stents and non-steroidal anti-inflammatory drugs in the prevention of moderate-to-severe post-ERCP pancreatitis. *Pancreatology* 2021; **21**: 704–13.
53 Shi QQ, Huang GX, Li W, Yang JR, Ning XY. Rectal nonsteroidal anti-inflammatory drugs, glyceryl trinitrate, or combinations for prophylaxis of post-endoscopic retrograde cholangiopancreatography pancreatitis: A network meta-analysis. *World J Clin Cases* 2022; **10**: 7859–71.
54 Du F, Zhang Y, Yang X *et al*. Efficacy of combined management with nonsteroidal anti-inflammatory drugs for prevention of pancreatitis after endoscopic retrograde cholangiography: A Bayesian network meta-analysis. *J Gastrointest Surg* 2022; **26**: 1982–97.
55 Otsuka T, Kawazoe S, Nakashita S *et al*. Low-dose rectal diclofenac for prevention of post-endoscopic retrograde cholangiopancreatography pancreatitis: A randomized controlled trial. *J Gastroenterol* 2012; **47**: 912–7.
56 Tomoda T, Kato H, Ueki T *et al*. Combination of diclofenac and sublingual nitrates is superior to diclofenac alone in preventing pancreatitis after endoscopic retrograde cholangiopancreatography. *Gastroenterology* 2019; **156**: 1753–60.e1.
57 Katoh T, Kawashima K, Fukuba N *et al*. Low-dose rectal diclofenac does not prevent post-ERCP pancreatitis in low- or high-risk patients. *J Gastroenterol Hepatol* 2020; **35**: 1247–53.
58 Koshitani T, Konaka Y, Ohishi T *et al*. Prophylaxis of post-endoscopic retrograde cholangiopancreatography pancreatitis using temporary pancreatic stents versus rectal nonsteroidal anti-inflammatory drugs: A randomized controlled trial. *Pancreas* 2022; **51**: 663–70.
59 Singh P, Das A, Isenberg G *et al*. Does prophylactic pancreatic stent placement reduce the risk of post-ERCP acute pancreatitis? A meta-analysis of controlled trials. *Gastrointest Endosc* 2004; **60**: 544–50.
60 Andriulli A, Forlano R, Napolitano G *et al*. Pancreatic duct stents in the prophylaxis of pancreatic damage after endoscopic retrograde cholangiopancreatography: A systematic analysis of benefits and associated risks. *Digestion* 2007; **75**: 156–63.
61 Choudhary A, Bechtold ML, Arif M *et al*. Pancreatic stents for prophylaxis against post-ERCP pancreatitis: A meta-analysis and systematic review. *Gastrointest Endosc* 2011; **73**: 275–82.
62 Shi QQ, Ning XY, Zhan LL, Tang GD, Lv XP. Placement of prophylactic pancreatic stents to prevent post-endoscopic retrograde cholangiopancreatography pancreatitis in high-risk patients: A meta-analysis. *World J Gastroenterol* 2014; **20**: 7040–8.
63 Mazaki T, Mado K, Masuda H, Shiono M. Prophylactic pancreatic stent placement and post-ERCP pancreatitis: An updated meta-analysis. *J Gastroenterol* 2014; **49**: 343–55.
64 Fan JH, Qian JB, Wang YM, Shi RH, Zhao CJ. Updated meta-analysis of pancreatic stent placement in preventing post-endoscopic retrograde cholangiopancreatography pancreatitis. *World J Gastroenterol* 2015; **21**: 7577–83.
65 Sugimoto M, Takagi T, Suzuki R *et al*. Pancreatic stents to prevent post-endoscopic retrograde cholangiopancreatography pancreatitis: A meta-analysis. *World J Meta-Anal* 2019; **7**: 249–58.
66 da Cruz Portela JC, Bernardo WM, de Moura DTH *et al*. Pancreatic stent placement for prevention of post-ERCP pancreatitis in high-risk patients: A systemic review and meta-analysis. *JOP* 2019; **20**: 16–23.
67 Choksi NS, Fogel EL, Cote GA *et al*. The risk of post-ERCP pancreatitis and the protective effect of rectal indomethacin in cases of attempted but unsuccessful prophylactic pancreatic stent placement. *Gastrointest Endosc* 2015; **81**: 150–5.
68 Elmunzer BJ, Higgins PD, Saini SD *et al*. Does rectal indomethacin eliminate the need for prophylactic pancreatic stent placement in patients undergoing high-risk ERCP? Post hoc efficacy and cost-benefit analyses using prospective clinical trial data. *Am J Gastroenterol* 2013; **108**: 410–5.
69 Afghani E, Akshintala VS, Khashab MA *et al*. 5-Fr vs. 3-Fr pancreatic stents for the prevention of post-ERCP pancreatitis in high-risk patients: A systematic review and network meta-analysis. *Endoscopy* 2014; **46**: 573–80.
70 Smith MT, Sherman S, Ikenberry SO, Hawes RH, Lehman GA. Alterations in pancreatic ductal morphology following polyethylene pancreatic stent therapy. *Gastrointest Endosc* 1996; **44**: 268–75.
71 Park TY, Kang H, Choi GJ, Oh HC. Rectal NSAIDs-based combination modalities are superior to single modalities for prevention of post-endoscopic retrograde cholangiopancreatography pancreatitis: A network meta-analysis. *Korean J Intern Med* 2022; **37**: 322–39.
72 Oh HC, Kang H, Park TY, Choi GJ, Lehman GA. Prevention of post-endoscopic retrograde cholangiopancreatography pancreatitis with a combination of pharmacological agents based

on rectal non-steroidal anti-inflammatory drugs: A systematic review and network meta-analysis. *J Gastroenterol Hepatol* 2021; **36**: 1403–13.
73 Choi JH, Lee SH, Kim JS *et al*. Combinatorial effect of prophylactic interventions for post-ERCP pancreatitis among patients with risk factors: A network meta-analysis. *Gut Liver* 2023; **17**: 814–24.
74 Elmunzer BJ, Foster LD, Serrano J *et al*. Indomethacin with or without prophylactic pancreatic stent placement to prevent pancreatitis after ERCP: A randomised non-inferiority trial. *Lancet* 2024; **403**: 450–8.
75 Cennamo V, Fuccio L, Zagari RM *et al*. Can a wire-guided cannulation technique increase bile duct cannulation rate and prevent post-ERCP pancreatitis?: A meta-analysis of randomized controlled trials. *Am J Gastroenterol* 2009; **104**: 2343–50.
76 Cheung J, Tsoi KK, Quan WL, Lau JY, Sung JJ. Guidewire versus conventional contrast cannulation of the common bile duct for the prevention of post-ERCP pancreatitis: A systematic review and meta-analysis. *Gastrointest Endosc* 2009; **70**: 1211–9.
77 Tse F, Liu J, Yuan Y, Moayyedi P, Leontiadis GI. Guidewire-assisted cannulation of the common bile duct for the prevention of post-endoscopic retrograde cholangiopancreatography (ERCP) pancreatitis. *Cochrane Database Syst Rev* 2022; **3**: Cd009662.
78 Bourke MJ, Costamagna G, Freeman ML. Biliary cannulation during endoscopic retrograde cholangiopancreatography: Core technique and recent innovations. *Endoscopy* 2009; **41**: 612–7.
79 Miyaguchi K, Mizuide M, Tanisaka Y *et al*. Distinguishing the papilla of Vater during biliary cannulation using texture and color enhancement imaging: A pilot study. *DEN Open* 2023; **3**: e125.
80 Tanisaka Y, Takenaka M, Mizuide M *et al*. Efficacy of texture and color enhancement imaging for short-type single-balloon enteroscopy-assisted biliary cannulation in patients with Roux-en-Y gastrectomy: Multicenter study (with video). *Dig Endosc* 2024; **36**: 1030–40.
81 Haraldsson E, Lundell L, Swahn F, Enochsson L, Löhr JM, Arnelo U. Endoscopic classification of the papilla of Vater. Results of an inter- and intraobserver agreement study. *United European Gastroenterol J* 2017; **5**: 504–10.
82 Watanabe M, Okuwaki K, Kida M *et al*. Transpapillary biliary cannulation is difficult in cases with large oral protrusion of the duodenal papilla. *Dig Dis Sci* 2019; **64**: 2291–9.
83 Haraldsson E, Kylänpää L, Grönroos J *et al*. Macroscopic appearance of the major duodenal papilla influences bile duct cannulation: A prospective multicenter study by the Scandinavian Association for Digestive Endoscopy Study Group for ERCP. *Gastrointest Endosc* 2019; **90**: 957–63.
84 Dumonceau JM, Devière J, Cremer M. A new method of achieving deep cannulation of the common bile duct during endoscopic retrograde cholangiopancreatography. *Endoscopy* 1998; **30**: S80.
85 Goff JS. Common bile duct pre-cut sphincterotomy: Transpancreatic sphincter approach. *Gastrointest Endosc* 1995; **41**: 502–5.
86 Slivka A. A new technique to assist in bile duct cannulation. *Gastrointest Endosc* 1996; **44**: 636.
87 Freeman ML, Guda NM. ERCP cannulation: A review of reported techniques. *Gastrointest Endosc* 2005; **61**: 112–25.
88 Mariani A, Di Leo M, Giardullo N *et al*. Early precut sphincterotomy for difficult biliary access to reduce post-ERCP pancreatitis: A randomized trial. *Endoscopy* 2016; **48**: 530–5.
89 Cennamo V, Fuccio L, Zagari RM *et al*. Can early precut implementation reduce endoscopic retrograde cholangiopancreatography-related complication risk? Meta-analysis of randomized controlled trials. *Endoscopy* 2010; **42**: 381–8.
90 Gong B, Hao L, Bie L, Sun B, Wang M. Does precut technique improve selective bile duct cannulation or increase post-ERCP pancreatitis rate? A meta-analysis of randomized controlled trials. *Surg Endosc* 2010; **24**: 2670–80.
91 Choudhary A, Winn J, Siddique S *et al*. Effect of precut sphincterotomy on post-endoscopic retrograde cholangiopancreatography pancreatitis: A systematic review and meta-analysis. *World J Gastroenterol* 2014; **20**: 4093–101.
92 Navaneethan U, Konjeti R, Venkatesh PG, Sanaka MR, Parsi MA. Early precut sphincterotomy and the risk of endoscopic retrograde cholangiopancreatography related complications: An updated meta-analysis. *World J Gastrointest Endosc* 2014; **6**: 200–8.
93 Sundaralingam P, Masson P, Bourke MJ. Early precut sphincterotomy does not increase risk during endoscopic retrograde cholangiopancreatography in patients with difficult biliary access: A meta-analysis of randomized controlled trials. *Clin Gastroenterol Hepatol* 2015; **13**: 1722–9.e2.
94 Tse F, Yuan Y, Moayyedi P, Leontiadis GI, Barkun AN. Double-guidewire technique in difficult biliary cannulation for the prevention of post-ERCP pancreatitis: A systematic review and meta-analysis. *Endoscopy* 2017; **49**: 15–26.
95 Tang Z, Yang Y, Yang Z, Meng W, Li X. Early precut sphincterotomy does not increase the risk of adverse events for patients with difficult biliary access: A systematic review of randomized clinical trials with meta-analysis and trial sequential analysis. *Medicine (Baltimore)* 2018; **97**: e12213.
96 Pecsi D, Farkas N, Hegyi P *et al*. Transpancreatic sphincterotomy is effective and safe in expert hands on the short term. *Dig Dis Sci* 2019; **64**: 2429–44.
97 Guzman-Calderon E, Martinez-Moreno B, Casellas JA, Aparicio JR. Transpancreatic precut papillotomy versus double-guidewire technique in difficult biliary cannulation: A systematic review and meta-analysis. *Endosc Int Open* 2021; **9**: E1758–67.
98 Facciorusso A, Ramai D, Gkolfakis P *et al*. Comparative efficacy of different methods for difficult biliary cannulation in ERCP: Systematic review and network meta-analysis. *Gastrointest Endosc* 2022; **95**: 60–71.e12.

99 Yoo YW, Cha SW, Lee WC, Kim SH, Kim A, Cho YD. Double guidewire technique vs transpancreatic precut sphincterotomy in difficult biliary cannulation. *World J Gastroenterol* 2013; **19**: 108–14.

100 Sasahira N, Kawakami H, Isayama H *et al*. Early use of double-guidewire technique to facilitate selective bile duct cannulation: The multicenter randomized controlled EDUCATION trial. *Endoscopy* 2015; **47**: 421–9.

101 Eminler AT, Parlak E, Koksal AS, Toka B, Uslan MI. Wire-guided cannulation over a pancreatic stent method increases the need for needle-knife precutting in patients with difficult biliary cannulations. *Gastrointest Endosc* 2019; **89**: 301–8.

102 Kylanpaa L, Koskensalo V, Saarela A *et al*. Transpancreatic biliary sphincterotomy versus double guidewire in difficult biliary cannulation: A randomized controlled trial. *Endoscopy* 2021; **53**: 1011–9.

103 Ito K, Fujita N, Noda Y *et al*. Can pancreatic duct stenting prevent post-ERCP pancreatitis in patients who undergo pancreatic duct guidewire placement for achieving selective biliary cannulation? A prospective randomized controlled trial. *J Gastroenterol* 2010; **45**: 1183–91.

104 Pecsi D, Farkas N, Hegyi P *et al*. Transpancreatic sphincterotomy has a higher cannulation success rate than needle-knife precut papillotomy – a meta-analysis. *Endoscopy* 2017; **49**: 874–87.

105 Horiuchi A, Nakayama Y, Kajiyama M, Tanaka N. Effect of precut sphincterotomy on biliary cannulation based on the characteristics of the major duodenal papilla. *Clin Gastroenterol Hepatol* 2007; **5**: 1113–8.

106 Canena J, Lopes L, Fernandes J *et al*. Influence of a novel classification of the papilla of Vater on the outcome of needle-knife fistulotomy for biliary cannulation. *BMC Gastroenterol* 2021; **21**: 147.

107 Zhang QS, Xu JH, Dong ZQ, Gao P, Shen YC. Success and safety of needle knife papillotomy and fistulotomy based on papillary anatomy: A prospective controlled trial. *Dig Dis Sci* 2022; **67**: 1901–9.

108 Ramirez FC, Dennert B, Sanowski RA. Success of repeat ERCP by the same endoscopist. *Gastrointest Endosc* 1999; **49**: 58–61.

109 Kevans D, Zeb F, Donnellan F, Courtney G, Aftab AR. Failed biliary access following needle knife fistulotomy: Is repeat interval ERCP worthwhile? *Scand J Gastroenterol* 2010; **45**: 1238–41.

110 Kim J, Ryu JK, Ahn DW *et al*. Results of repeat endoscopic retrograde cholangiopancreatography after initial biliary cannulation failure following needle-knife sphincterotomy. *J Gastroenterol Hepatol* 2012; **27**: 516–20.

111 Donnellan F, Enns R, Kim E *et al*. Outcome of repeat ERCP after initial failed use of a needle knife for biliary access. *Dig Dis Sci* 2012; **57**: 1069–71.

112 Pavlides M, Barnabas A, Fernandopulle N *et al*. Repeat endoscopic retrograde cholangiopancreaticography after failed initial precut sphincterotomy for biliary cannulation. *World J Gastroenterol* 2014; **20**: 13153–8.

113 Colan-Hernandez J, Aldana A, Concepción M *et al*. Optimal timing for a second ERCP after failure of initial biliary cannulation following precut sphincterotomy: An analysis of experience at two tertiary centers. *Surg Endosc* 2017; **31**: 3711–7.

114 Peñaloza Ramírez A, Rodríguez Tello D, Murillo Arias A, Barreto Pérez J, Aponte Ordóñez P. Endoscopic retrograde cholangiopancreatography results three days after a failed precut. *Rev Esp Enferm Dig* 2021; **113**: 486–9.

115 Lo MH, Lin CH, Wu CH *et al*. Management of biliary diseases after the failure of initial needle knife precut sphincterotomy for biliary cannulation. *Sci Rep* 2021; **11**: 14968.

116 Flumignan VK, Seike MG, Souza VS, Cirqueira MI, Silva AB, Artifon ELA. Difficult biliary cannulation: Should we always try a second ERCP after a failed needle-knife fistulotomy? *Arq Gastroenterol* 2021; **58**: 509–13.

117 Deng X, Liao R, Pan L, Du C, Wu Q. Second endoscopic retrograde cholangiopancreatography after failure of initial biliary cannulation: A single institution retrospective experience. *Exp Ther Med* 2022; **23**: 297.

118 Yoon SB, Yang MJ, Shin DW *et al*. Endoscopic ultrasound-rendezvous versus percutaneous-endoscopic rendezvous endoscopic retrograde cholangiopancreatography for bile duct access: Systematic review and meta-analysis. *Dig Endosc* 2024; **36**: 129–40.

119 Wayman J, Mansfield JC, Matthewson K, Richardson DL, Griffin SM. Combined percutaneous and endoscopic procedures for bile duct obstruction: Simultaneous and delayed techniques compared. *Hepato-Gastroenterology* 2003; **50**: 915–8.

120 Neal CP, Thomasset SC, Bools D *et al*. Combined percutaneous-endoscopic stenting of malignant biliary obstruction: Results from 106 consecutive procedures and identification of factors associated with adverse outcome. *Surg Endosc* 2010; **24**: 423–31.

121 Tomizawa Y, Di Giorgio J, Santos E, McCluskey KM, Gelrud A. Combined interventional radiology followed by endoscopic therapy as a single procedure for patients with failed initial endoscopic biliary access. *Dig Dis Sci* 2014; **59**: 451–8.

122 Yang MJ, Kim JH, Hwang JC *et al*. Usefulness of combined percutaneous-endoscopic rendezvous techniques after failed therapeutic endoscopic retrograde cholangiography in the era of endoscopic ultrasound guided rendezvous. *Medicine (Baltimore)* 2017; **96**: e8991.

123 Chivot C, Yzet C, Bouzerar R *et al*. Safety and efficacy of percutaneous transhepatic-endoscopic rendezvous procedure in a single session. *Surg Endosc* 2021; **35**: 3534–9.

124 Hanssens M, DH E, Degroote H, Hindryckx P. EUS-guided versus PTC-guided rendezvous in case of failed ERCP: A case-control study. *Surg Endosc* 2023; **37**: 3492–7.

125 Kim YS, Gupta K, Mallery S, Li R, Kinney T, Freeman ML. Endoscopic ultrasound rendezvous for bile duct access using a transduodenal approach: Cumulative experience at a single center. A case series. *Endoscopy* 2010; **42**: 496–502.

126 Dhir V, Bhandari S, Bapat M, Maydeo A. Comparison of EUS-guided rendezvous and precut papillotomy techniques for biliary access (with videos). *Gastrointest Endosc* 2012; **75**: 354–9.
127 Iwashita T, Lee JG, Shinoura S *et al*. Endoscopic ultrasound-guided rendezvous for biliary access after failed cannulation. *Endoscopy* 2012; **44**: 60–5.
128 Shah JN, Marson F, Weilert F *et al*. Single-operator, single-session EUS-guided anterograde cholangiopancreatography in failed ERCP or inaccessible papilla. *Gastrointest Endosc* 2012; **75**: 56–64.
129 Dhir V, Bhandari S, Bapat M, Joshi N, Vivekanandarajah S, Maydeo A. Comparison of transhepatic and extrahepatic routes for EUS-guided rendezvous procedure for distal CBD obstruction. *United European Gastroenterol J* 2013; **1**: 103–8.
130 Kawakubo K, Isayama H, Sasahira N *et al*. Clinical utility of an endoscopic ultrasound-guided rendezvous technique via various approach routes. *Surg Endosc* 2013; **27**: 3437–43.
131 Park DH, Jeong SU, Lee BU *et al*. Prospective evaluation of a treatment algorithm with enhanced guidewire manipulation protocol for EUS-guided biliary drainage after failed ERCP (with video). *Gastrointest Endosc* 2013; **78**: 91–101.
132 Khashab MA, Valeshabad AK, Modayil R *et al*. EUS-guided biliary drainage by using a standardized approach for malignant biliary obstruction: Rendezvous versus direct transluminal techniques (with videos). *Gastrointest Endosc* 2013; **78**: 734–41.
133 Iwashita T, Yasuda I, Mukai T *et al*. EUS-guided rendezvous for difficult biliary cannulation using a standardized algorithm: A multicenter prospective pilot study (with videos). *Gastrointest Endosc* 2016; **83**: 394–400.
134 Tang Z, Igbinomwanhia E, Elhanafi S, Othman MO. Endoscopic ultrasound guided rendezvous drainage of biliary obstruction using a new flexible 19-gauge fine needle aspiration needle. *Diagn Ther Endosc* 2016; **2016**: 3125962.
135 Bill JG, Darcy M, Fujii-Lau LL *et al*. A comparison between endoscopic ultrasound-guided rendezvous and percutaneous biliary drainage after failed ERCP for malignant distal biliary obstruction. *Endosc Int Open* 2016; **4**: E980–5.
136 Okuno N, Hara K, Mizuno N *et al*. Endoscopic ultrasound-guided rendezvous technique after failed endoscopic retrograde cholangiopancreatography: Which approach route is the best? *Intern Med* 2017; **56**: 3135–43.
137 Nakai Y, Isayama H, Matsubara S *et al*. A novel "hitch-and-ride" deep biliary cannulation method during rendezvous endoscopic ultrasound-guided ERCP technique. *Endoscopy* 2017; **49**: 983–8.
138 Shiomi H, Yamao K, Hoki N *et al*. Endoscopic ultrasound-guided rendezvous technique for failed biliary cannulation in benign and resectable malignant biliary disorders. *Dig Dis Sci* 2018; **63**: 787–96.
139 Iwashita T, Uemura S, Yoshida K *et al*. EUS-guided hybrid rendezvous technique as salvage for standard rendezvous with intra-hepatic bile duct approach. *PLoS One* 2018; **13**: e0202445.
140 Martinez B, Martinez J, Casellas JA, Aparicio JR. Endoscopic ultrasound-guided rendezvous in benign biliary or pancreatic disorders with a 22-gauge needle and a 0.018-inch guidewire. *Endosc Int Open* 2019; **7**: E1038–43.
141 Matsubara S, Nakagawa K, Suda K *et al*. A proposed algorithm for endoscopic ultrasound-guided rendezvous technique in failed biliary cannulation. *J Clin Med* 2020; **9**: 3879.
142 Morris ML, Tucker RD, Baron TH, Song LM. Electrosurgery in gastrointestinal endoscopy: Principles to practice. *Am J Gastroenterol* 2009; **104**: 1563–74.
143 Verma D, Kapadia A, Adler DG. Pure versus mixed electrosurgical current for endoscopic biliary sphincterotomy: A meta-analysis of adverse outcomes. *Gastrointest Endosc* 2007; **66**: 283–90.
144 Li DF, Yang MF, Chang X *et al*. Endocut versus conventional blended electrosurgical current for endoscopic biliary sphincterotomy: A meta-analysis of complications. *Dig Dis Sci* 2019; **64**: 2088–94.
145 Funari MP, Ribeiro IB, de Moura DTH *et al*. Adverse events after biliary sphincterotomy: Does the electric current mode make a difference? A systematic review and meta-analysis of randomized controlled trials. *Clin Res Hepatol Gastroenterol* 2020; **44**: 739–52.
146 Hedjoudje A, Cheurfa C, Farha J *et al*. Safety of different electrocautery modes for endoscopic sphincterotomy: A Bayesian network meta-analysis. *Ther Adv Gastrointest Endosc* 2021; **14**: 26317745211062983.
147 Pereira Funari M, Ottoboni Brunaldi V, Mendonca Proenca I *et al*. Pure cut or endocut for biliary sphincterotomy? A multicenter randomized clinical trial. *Am J Gastroenterol* 2023; **118**: 1871–9.
148 Köksal A, Eminler AT, Parlak E. Biliary endoscopic sphincterotomy: Techniques and complications. *World J Clin Cases* 2018; **6**: 1073–86.
149 Ryozawa S, Itoi T, Katanuma A *et al*. Japan Gastroenterological Endoscopy Society guidelines for endoscopic sphincterotomy. *Dig Endosc* 2018; **30**: 149–73.
150 Mavrogiannis C, Liatsos C, Papanikolaou IS *et al*. Safety of extension of a previous endoscopic sphincterotomy: A prospective study. *Am J Gastroenterol* 2003; **98**: 72–6.
151 Enns R, Eloubeidi MA, Mergener K *et al*. ERCP-related perforations: Risk factors and management. *Endoscopy* 2002; **34**: 293–8.
152 Staritz M, Ewe K, Meyer zum Büschenfelde KH. Endoscopic papillary dilatation, a possible alternative to endoscopic papillotomy. *Lancet* 1982; **1**: 1306–7.
153 Yasuda I, Tomita E, Enya M, Kato T, Moriwaki H. Can endoscopic papillary balloon dilation really preserve sphincter of Oddi function? *Gut* 2001; **49**: 686–91.
154 Tsai TJ, Lin CK, Lai KH *et al*. Does preserved sphincter of Oddi function prevent common bile duct stones recurrence in patients after endoscopic papillary balloon dilation? *J Chin Med Assoc* 2018; **81**: 311–5.

155 Kim TH, Kim JH, Seo DW *et al*. International consensus guidelines for endoscopic papillary large-balloon dilation. *Gastrointest Endosc* 2016; **83**: 37–47.
156 Baron TH, Harewood GC. Endoscopic balloon dilation of the biliary sphincter compared to endoscopic biliary sphincterotomy for removal of common bile duct stones during ERCP: A metaanalysis of randomized, controlled trials. *Am J Gastroenterol* 2004; **99**: 1455–60.
157 Weinberg BM, Shindy W, Lo S. Endoscopic balloon sphincter dilation (sphincteroplasty) versus sphincterotomy for common bile duct stones. *Cochrane Database Syst Rev* 2006; **2006**: CD004890.
158 Liu Y, Su P, Lin S *et al*. Endoscopic papillary balloon dilatation versus endoscopic sphincterotomy in the treatment for choledocholithiasis: A meta-analysis. *J Gastroenterol Hepatol* 2012; **27**: 464–71.
159 Zhao HC, He L, Zhou DC, Geng XP, Pan FM. Meta-analysis comparison of endoscopic papillary balloon dilatation and endoscopic sphincteropapillotomy. *World J Gastroenterol* 2013; **19**: 3883–91.
160 Tringali A, Rota M, Rossi M, Hassan C, Adler DG, Mutignani M. A cumulative meta-analysis of endoscopic papillary balloon dilation versus endoscopic sphincterotomy for removal of common bile duct stones. *Endoscopy* 2019; **51**: 548–59.
161 Liao WC, Tu YK, Wu MS *et al*. Balloon dilation with adequate duration is safer than sphincterotomy for extracting bile duct stones: A systematic review and meta-analyses. *Clin Gastroenterol Hepatol* 2012; **10**: 1101–9.
162 Yu ZY, Liang C, Yang SY, Zhang X, Sun Y. The therapeutic effect of balloon dilatation with different duration for biliary duct calculi: A network meta-analysis. *J Minim Access Surg* 2022; **18**: 327–37.
163 Park CH, Jung JH, Nam E *et al*. Comparative efficacy of various endoscopic techniques for the treatment of common bile duct stones: A network meta-analysis. *Gastrointest Endosc* 2018; **87**: 43–57.e10.
164 Lyu Y, Cheng Y, Wang B, Zhao S, Chen L. Comparison of the efficacy and safety of three endoscopic methods to manage large common bile duct stones: A systematic review and network meta-analysis. *J Laparoendosc Adv Surg Tech A* 2021; **31**: 443–54.
165 Hu J, Mu N, He Y. Comparing the efficacy of endoscopic balloon dilation alone and combined with endoscopic sphincterotomy for common bile duct stone: A systematic review and meta-analysis. *Ann Palliat Med* 2022; **11**: 163–72.
166 Aziz M, Khan Z, Haghbin H *et al*. Endoscopic sphincterotomy vs papillary large balloon dilation vs combination modalities for large common bile duct stones: A network meta-analysis. *Endosc Int Open* 2022; **10**: E1599–607.
167 Facciorusso A, Gkolfakis P, Ramai D *et al*. Endoscopic treatment of large bile duct stones: A systematic review and network meta-analysis. *Clin Gastroenterol Hepatol* 2023; **21**: 33–44.e9.
168 Itoi T, Ryozawa S, Katanuma A *et al*. Japan Gastroenterological Endoscopy Society guidelines for endoscopic papillary large balloon dilation. *Dig Endosc* 2018; **30**: 293–309.
169 Dumonceau JM, Tringali A, Papanikolaou IS *et al*. Endoscopic biliary stenting: Indications, choice of stents, and results: European Society of Gastrointestinal Endoscopy (ESGE) clinical guideline – updated October 2017. *Endoscopy* 2018; **50**: 910–30.
170 Cui PJ, Yao J, Zhao YJ, Han HZ, Yang J. Biliary stenting with or without sphincterotomy for malignant biliary obstruction: A meta-analysis. *World J Gastroenterol* 2014; **20**: 14033–9.
171 Sofi AA, Nawras A, Alaradi OH, Alastal Y, Khan MA, Lee WM. Does endoscopic sphincterotomy reduce the risk of post-endoscopic retrograde cholangiopancreatography pancreatitis after biliary stenting? A systematic review and meta-analysis. *Dig Endosc* 2016; **28**: 394–404.
172 Mangiavillano B, Montale A, Frazzoni L *et al*. Endoscopic biliary self-expandable metallic stent in malignant biliary obstruction with or without sphincterotomy: Systematic review and meta-analysis. *Endosc Int Open* 2019; **7**: E26–35.
173 Martins OC, Antunes do Livramento VJ, de Florencio Mesquita C *et al*. The addition of endoscopic sphincterotomy to biliary stent placement and its impact on the risk of adverse events: An updated meta-analysis of randomized controlled trials. *Gastrointest Endosc* 2024; **100**: 406–14.e2.
174 Zhou H, Li L, Zhu F, Luo SZ, Cai XB, Wan XJ. Endoscopic sphincterotomy associated cholangitis in patients receiving proximal biliary self-expanding metal stents. *Hepatobiliary Pancreat Dis Int* 2012; **11**: 643–9.
175 Giorgio PD, Luca LD. Comparison of treatment outcomes between biliary plastic stent placements with and without endoscopic sphincterotomy for inoperable malignant common bile duct obstruction. *World J Gastroenterol* 2004; **10**: 1212–4.
176 Kato S, Kuwatani M, Onodera M *et al*. Risk of pancreatitis following biliary stenting with/without endoscopic sphincterotomy: A randomized controlled trial. *Clin Gastroenterol Hepatol* 2022; **20**: 1394–403.e1.
177 Jayaraj M, Mohan BP, Dhindsa BS *et al*. Periampullary diverticula and ERCP outcomes: A systematic review and meta-analysis. *Dig Dis Sci* 2019; **64**: 1364–76.
178 Mu P, Yue P, Li F *et al*. Does periampullary diverticulum affect ERCP cannulation and post-procedure complications? An up-to-date meta-analysis. *Turk J Gastroenterol* 2020; **31**: 193–204.
179 Xie XX, Li X, Chen YH, Geng C, Wang CH. Impact of periampullary diverticula on the rates of successful cannulation and ERCP complications: An up-to-date systematic review and meta-analysis. *J Dig Dis* 2024; **25**: 573–86.
180 Skinner M, Popa D, Neumann H, Wilcox CM, Mönkemüller K. ERCP with the overtube-assisted enteroscopy technique: A systematic review. *Endoscopy* 2014; **46**: 560–72.
181 Park TY, Bang CS, Choi SH *et al*. Forward-viewing endoscope for ERCP in patients with Billroth II gastrectomy: A systematic review and meta-analysis. *Surg Endosc* 2018; **32**: 4598–613.

182 Park TY, Song TJ. Recent advances in endoscopic retrograde cholangiopancreatography in Billroth II gastrectomy patients: A systematic review. *World J Gastroenterol* 2019; **25**: 3091–107.

183 Tanisaka Y, Ryozawa S, Mizuide M *et al*. Status of single-balloon enteroscopy-assisted endoscopic retrograde cholangiopancreatography in patients with surgically altered anatomy: Systematic review and meta-analysis on biliary interventions. *Dig Endosc* 2021; **33**: 1034–44.

184 Enestvedt BK, Kothari S, Pannala R *et al*. Devices and techniques for ERCP in the surgically altered GI tract. *Gastrointest Endosc* 2016; **83**: 1061–75.

185 Inamdar S, Slattery E, Sejpal DV *et al*. Systematic review and meta-analysis of single-balloon enteroscopy-assisted ERCP in patients with surgically altered GI anatomy. *Gastrointest Endosc* 2015; **82**: 9–19.

186 Shao XD, Qi XS, Guo XZ. Endoscopic retrograde cholangiopancreatography with double balloon enteroscope in patients with altered gastrointestinal anatomy: A meta-analysis. *Saudi J Gastroenterol* 2017; **23**: 150–60.

187 Ferretti F, Fraquelli M, Cantù P *et al*. Efficacy and safety of device-assisted enteroscopy ERCP in liver transplantation: A systematic review and meta-analysis. *Clin Transpl* 2020; **34**: e13864.

188 Anvari S, Lee Y, Patro N, Soon MS, Doumouras AG, Hong D. Double-balloon enteroscopy for diagnostic and therapeutic ERCP in patients with surgically altered gastrointestinal anatomy: A systematic review and meta-analysis. *Surg Endosc* 2021; **35**: 18–36.

189 Gkolfakis P, Papaefthymiou A, Facciorusso A *et al*. Comparison between enteroscopy-, laparoscopy- and endoscopic ultrasound-assisted endoscopic retrograde Cholangiopancreatography in patients with surgically altered anatomy: A systematic review and meta-analysis. *Life (Basel)* 2022; **12**: 1646.

190 Banerjee N, Parepally M, Byrne TK, Pullatt RC, Coté GA, Elmunzer BJ. Systematic review of transgastric ERCP in Roux-en-Y gastric bypass patients. *Surg Obes Relat Dis* 2017; **13**: 1236–42.

191 da Ponte-Neto AM, Bernardo WM, de A Coutinho LM *et al*. Comparison between enteroscopy-based and laparoscopy-assisted ERCP for accessing the biliary tree in patients with Roux-en-Y gastric bypass: Systematic review and meta-analysis. *Obes Surg* 2018; **28**: 4064–76.

192 Aiolfi A, Asti E, Rausa E, Bernardi D, Bonitta G, Bonavina L. Trans-gastric ERCP after Roux-en-Y gastric bypass: Systematic review and meta-analysis. *Obes Surg* 2018; **28**: 2836–43.

193 Dhindsa BS, Dhaliwal A, Mohan BP *et al*. EDGE in Roux-en-Y gastric bypass: How does it compare to laparoscopy-assisted and balloon enteroscopy ERCP: A systematic review and meta-analysis. *Endosc Int Open* 2020; **8**: E163–71.

194 Ayoub F, Brar TS, Banerjee D *et al*. Laparoscopy-assisted versus enteroscopy-assisted endoscopic retrograde cholangiopancreatography (ERCP) in Roux-en-Y gastric bypass: A meta-analysis. *Endosc Int Open* 2020; **8**: E423–36.

195 Klair JS, Jayaraj M, Chandrasekar VT *et al*. ERCP with overtube-assisted enteroscopy in patients with Roux-en-Y gastric bypass anatomy: A systematic review and meta-analysis. *Endoscopy* 2020; **52**: 824–32.

196 Elsharif M, Hague AG, Ahmed H, Ackroyd R. After you Roux, what do you do? A systematic review of most successful advanced assisted ERCP techniques in patients with various altered upper gastrointestinal surgical anatomical reconstructions with particular focus on RYGB (last 10 years). *Clin J Gastroenterol* 2020; **13**: 985–1009.

197 Prakash S, Elmunzer BJ, Forster EM, Cote GA, Moran RA. Endoscopic ultrasound-directed transgastric ERCP (EDGE): A systematic review describing the outcomes, adverse events, and knowledge gaps. *Endoscopy* 2022; **54**: 52–61.

198 Hajibandeh S, Hajibandeh S, Tarazi M, Mansour M, Satyadas T. Procedural outcomes of laparoscopic-assisted endoscopic retrograde cholangiopancreatography in patients with previous Roux-en-Y gastric bypass surgery: A systematic review and meta-analysis. *Obes Surg* 2021; **31**: 282–98.

199 de Oliveira VL, de Moura DTH, do Monte Júnior ES *et al*. Laparoscopic-assisted endoscopic retrograde cholangiopancreatography (ERCP) versus endoscopic ultrasound-directed transgastric ERCP in patients with Roux-en-Y gastric bypass: A systematic review and meta-analysis. *Cureus* 2022; **14**: e30196.

200 Connell M, Sun WYL, Mocanu V *et al*. Management of choledocholithiasis after Roux-en-Y gastric bypass: A systematic review and pooled proportion meta-analysis. *Surg Endosc* 2022; **36**: 6868–77.

201 Deliwala SS, Mohan BP, Yarra P *et al*. Efficacy & safety of EUS-directed transgastric endoscopic retrograde cholangiopancreatography (EDGE) in Roux-en-Y gastric bypass anatomy: A systematic review & meta-analysis. *Surg Endosc* 2023; **37**: 4144–58.

202 Saad B, Nasser M, Matar RH *et al*. Safety and efficacy of LA-ERCP procedure following Roux-en-Y gastric bypass: A systematic review and meta-analysis. *Surg Endosc* 2023; **37**: 6682–94.

203 Su T, Chen T, Wang J, Feng Y, Wang R, Zhao S. Endoscopic-directed trans-gastric retrograde cholangiopancreatography in patients with Roux-en-Y gastric bypasses: A meta-analysis. *J Clin Gastroenterol* 2023; **57**: 871–8.

204 Gangwani MK, Haghbin H, Priyanka F *et al*. Efficacy and safety of EUS-directed transgastric ERCP (EDGE) versus laparoscopic-assisted ERCP: A systematic review and meta-analysis. *Endosc Ultrasound* 2024; **13**: 16–21.

205 Gohil VB, Klapman JB. Endoscopic palliation of pancreatic cancer. *Curr Treat Options Gastroenterol* 2017; **15**: 333–48.

206 Nakai Y, Hamada T, Isayama H, Itoi T, Koike K. Endoscopic management of combined malignant biliary and gastric outlet obstruction. *Dig Endosc* 2017; **29**: 16–25.

207 Mutignani M, Tringali A, Shah SG *et al*. Combined endoscopic stent insertion in malignant biliary and duodenal obstruction. *Endoscopy* 2007; **39**: 440–7.

208 Teoh AYB, Lakhtakia S, Tarantino I *et al*. Endoscopic ultrasonography-guided gastroenterostomy versus uncovered

duodenal metal stenting for unresectable malignant gastric outlet obstruction (DRA-GOO): A multicentre randomised controlled trial. *Lancet Gastroenterol Hepatol* 2024; **9**: 124–32.
209 Hamada T, Nakai Y, Isayama H *et al*. Duodenal metal stent placement is a risk factor for biliary metal stent dysfunction: An analysis using a time-dependent covariate. *Surg Endosc* 2013; **27**: 1243–8.
210 Staub J, Siddiqui A, Taylor LJ, Loren D, Kowalski T, Adler DG. ERCP performed through previously placed duodenal stents: A multicenter retrospective study of outcomes and adverse events. *Gastrointest Endosc* 2018; **87**: 1499–504.
211 Goutorbe F, Rouquette O, Mulliez A *et al*. Temporary placement of a covered duodenal stent can avoid riskier anterograde biliary drainage when ERCP for obstructive jaundice fails due to duodenal invasion. *Surg Endosc* 2017; **31**: 625–31.
212 Sharaiha RZ, Khan MA, Kamal F *et al*. Efficacy and safety of EUS-guided biliary drainage in comparison with percutaneous biliary drainage when ERCP fails: A systematic review and meta-analysis. *Gastrointest Endosc* 2017; **85**: 904–14.
213 Hayat U, Bakker C, Dirweesh A *et al*. EUS-guided versus percutaneous transhepatic cholangiography biliary drainage for obstructed distal malignant biliary strictures in patients who have failed endoscopic retrograde cholangiopancreatography: A systematic review and meta-analysis. *Endosc Ultrasound* 2022; **11**: 4–16.
214 Facciorusso A, Mangiavillano B, Paduano D *et al*. Methods for drainage of distal malignant biliary obstruction after ERCP failure: A systematic review and network meta-analysis. *Cancers (Basel)* 2022; **14**: 3291.
215 Ogura T, Chiba Y, Masuda D *et al*. Comparison of the clinical impact of endoscopic ultrasound-guided choledochoduodenostomy and hepaticogastrostomy for bile duct obstruction with duodenal obstruction. *Endoscopy* 2016; **48**: 156–63.
216 Vanella G, Bronswijk M, van Wanrooij RL *et al*. Combined endoscopic mAnagement of BiliaRy and gastrIc OutLET obstruction (CABRIOLET study): A multicenter retrospective analysis. *DEN Open* 2023; **3**: e132.

SUPPORTING INFORMATION

ADDITIONAL SUPPORTING INFORMATION may be found in the online version of this article at the publisher's web site.

Table S1 Areas of interest, PICO questions (population, intervention, comparator, outcome), and working groups.

Table S2 Literature search.

Table S3 Summary of meta-analyses of randomized controlled trials of aggressive hydration for post-endoscopic retrograde cholangiopancreatography (PEP) prophylaxis.

Table S4 Summary of meta-analyses of randomized controlled trials (RCTs) on nonsteroidal anti-inflammatory drugs (NSAIDs) for post-endoscopic retrograde cholangiopancreatography pancreatitis (PEP) prophylaxis.

Table S5 Summary of meta-analyses of randomized controlled trials of prophylactic pancreatic stenting vs. no stenting for post-endoscopic retrograde cholangiopancreatography pancreatitis (PEP) prophylaxis.

Table S6 Summary of meta-analyses comparing contrast-assisted vs. guidewire-assisted cannulation.

Table S7 Summary of meta-analyses comparing advanced biliary cannulation techniques.

Table S8 Summary of randomized controlled trials (RCTs) comparing different advanced techniques for biliary cannulation after unintentional pancreatic duct cannulation.

Table S9 Studies that reported on outcomes of repeated endoscopic retrograde cholangiopancreatography (ERCP) after previous failed cannulation attempt.

Table S10 Studies that reported the outcomes of percutaneous rendezvous after failed endoscopic retrograde cholangiopancreatography (ERCP) biliary cannulation.

Table S11 Studies that reported the outcomes of endoscopic ultrasound-guided rendezvous after failed endoscopic retrograde cholangiopancreatography (ERCP) biliary cannulation.

Table S12 Meta-analyses investigating the outcomes of different current types during endoscopic sphincterotomy.

Table S13 Meta-analyses investigating the outcomes of endoscopic papillary small balloon dilation vs. endoscopic sphincterotomy.

Table S14 Meta-analyses investigating the outcomes of endoscopic papillary large balloon dilation.

Table S15 Meta-analyses investigating the outcomes of biliary stenting with or without endoscopic sphincterotomy.

Table S16 Meta-analyses investigating the outcomes of endoscopic retrograde cholangiopancreatography (ERCP) in patients with or without periampullary diverticulum.

Table S17 Meta-analyses on endoscopic retrograde cholangiopancreatography (ERCP) outcomes using different scopes in patients with Billroth II gastrectomy anatomy.

Table S18 Meta-analyses on endoscopic retrograde cholangiopancreatography (ERCP) outcomes in patients with surgically altered anatomy (other than Billroth II and Roux-en-Y gastric bypass).

Table S19 Meta-analyses on endoscopic retrograde cholangiopancreatography (ERCP) outcomes in patients with Roux-en-Y gastric bypass.

Figure S1 Forest plot reporting the pooled success rate of biliary cannulation during repeated endoscopic retrograde cholangiopancreatography (ERCP).

Figure S2 Forest plots reporting the pooled technical success (left panel) and adverse events (right panel) rates of percutaneous-rendezvous performed after endoscopic

retrograde cholangiopancreatography (ERCP) failed biliary cannulation.

Figure S3 Forest plots reporting the pooled (A) technical success and (B) adverse events rates of endoscopic ultrasound-guided rendezvous performed after endoscopic retrograde cholangiopancreatography (ERCP) failed biliary cannulation.

Figure S4 Landmarks of small (green curved line) and extended (black curved line) sphincterotomy. The blue straight line indicates the length of the oral protrusion of the bile duct.