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## Endoscopic Biliary Drainage in Surgically Altered Anatomy: A Systematic Review and Meta-Analysis Comparing Enteroscopy-Assisted ERCP and EUS-Guided Approaches

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**ADMINISTRATIVE INFORMATION****Support** - No financial support.**Review Stage at time of this submission** - Completed but not published.**Conflicts of interest** - None declared.**INPLASY registration number:** INPLASY202610074

**Amendments** - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 21 January 2026 and was last updated on 21 January 2026.

**INTRODUCTION**

**Review question / Objective** This systematic review and meta-analysis aims to compare the efficacy and safety of enteroscopy-assisted endoscopic retrograde cholangiopancreatography (EA-ERCP) versus endoscopic ultrasound-guided biliary drainage (EUS-BD) in adult patients with surgically altered anatomy. The primary objectives are to evaluate and compare pooled technical success, clinical success, and procedure-related adverse event rates between the two approaches in both benign and malignant pancreatobiliary diseases.

**Rationale** Endoscopic retrograde cholangiopancreatography (ERCP) is the standard endoscopic procedure for the management of biliary diseases; however, its feasibility and success are significantly reduced in patients with surgically altered anatomy (SAA). Postoperative anatomical changes pose substantial technical

challenges to conventional ERCP, including difficulty in accessing the afferent limb and limited maneuverability at the papilla or biliary-enteric anastomosis. Enteroscopy-assisted ERCP (EA-ERCP) has been developed to overcome these challenges, but it remains technically demanding with variable success rates. In parallel, endoscopic ultrasound-guided biliary drainage (EUS-BD) has emerged as an alternative approach that bypasses surgically altered anatomy and has demonstrated promising outcomes. Despite the increasing use of both techniques, existing evidence is fragmented, and direct comparative data remain limited. Therefore, a systematic review and meta-analysis directly comparing EA-ERCP and EUS-BD is necessary to inform evidence-based decision-making regarding the optimal endoscopic approach in patients with surgically altered anatomy.

**Condition being studied** Patients with surgically altered gastrointestinal anatomy who require endoscopic biliary drainage for benign or

malignant pancreaticobiliary diseases. Surgically altered anatomy includes postoperative reconstructions such as Billroth II gastrectomy, Roux-en-Y reconstruction, pancreaticoduodenectomy, and other biliary-enteric anastomoses that significantly impact endoscopic access to the biliary system.

## METHODS

**Search strategy** A comprehensive literature search will be conducted in MEDLINE (via PubMed), Scopus, and the Cochrane Library. Database-specific search strategies will combine controlled vocabulary terms (e.g., MeSH) and free-text keywords related to surgically altered anatomy and endoscopic biliary interventions. Search terms will include combinations of “surgically altered anatomy,” “postoperative anatomy,” “enteroscopy-assisted ERCP,” “balloon-assisted enteroscopy,” “double-balloon enteroscopy,” “single-balloon enteroscopy,” “spiral enteroscopy,” “EUS-guided biliary drainage,” “EUS-guided hepaticogastrostomy,” “choledochoduodenostomy,” “antegrade stenting,” and “rendezvous.” No restrictions will be applied regarding publication year. Only studies published in English will be included. Reference lists of eligible articles and relevant reviews will be manually screened to identify additional studies.

**Participant or population** Adult patients ( $\geq 18$  years) with surgically altered gastrointestinal anatomy who require endoscopic biliary drainage for benign or malignant pancreaticobiliary diseases.

**Intervention** Endoscopic ultrasound-guided biliary drainage (EUS-BD), including EUS-guided hepaticogastrostomy, choledochoduodenostomy, antegrade biliary stenting, and rendezvous techniques.

**Comparator** Enteroscopy-assisted endoscopic retrograde cholangiopancreatography (EA-ERCP) performed using device-assisted enteroscopy, including single-balloon, double-balloon, or spiral enteroscopes.

**Study designs to be included** Randomized controlled trials, prospective or retrospective cohort studies, and case-control studies.

**Eligibility criteria** Studies enrolling adult patients with surgically altered anatomy that directly compare EA-ERCP and EUS-BD and report at least one relevant outcome (technical success, clinical success, or adverse events) will be included. Studies with fewer than 10 patients, non-

comparative case series, review articles, conference abstracts, editorials, letters, animal studies, pediatric studies, and non-English publications will be excluded.

**Information sources** Electronic databases including MEDLINE (PubMed), Scopus, and the Cochrane Library will be searched. Additional sources will include manual screening of reference lists of included studies and relevant review articles, as well as citation tracking using database tools.

**Main outcome(s)** Primary outcomes include technical success, clinical success, and procedure-related adverse events. Technical success is defined as successful biliary access with completion of the intended therapeutic intervention. Clinical success is defined as a  $\geq 50\%$  reduction or normalization of serum total bilirubin within 14 days following the procedure. Adverse events will be categorized according to the ASGE lexicon.

**Additional outcome(s)** Subgroup outcomes based on the type of surgically altered anatomy and underlying disease etiology (benign vs malignant).

**Data management** All retrieved records will be imported into Rayyan software for de-duplication and screening. Data extraction will be performed using standardized data extraction forms, and extracted data will be stored in spreadsheet software for analysis.

**Quality assessment / Risk of bias analysis** The risk of bias for randomized controlled trials will be assessed using the Cochrane Risk of Bias 2 tool. Non-randomized comparative studies will be assessed using the Newcastle–Ottawa Scale or ROBINS-I tool, as appropriate. Quality assessment will be conducted independently by two reviewers, with disagreements resolved by consensus or a third reviewer.

**Strategy of data synthesis** A random-effects meta-analysis will be conducted to pool effect estimates across studies. Dichotomous outcomes will be summarized using risk ratios with 95% confidence intervals. Heterogeneity will be assessed using the  $I^2$  statistic and Cochran’s Q test. Statistical analyses will be performed using Jamovi software.

**Subgroup analysis** Subgroup analyses will be performed according to the type of surgically altered anatomy and type of biliary disease, if sufficient data are available.

**Sensitivity analysis** Sensitivity analyses will be conducted by excluding studies at high risk of bias to assess the robustness of the pooled results.

**Language restriction** Only English-language studies will be included.

**Country(ies) involved** Republic of Korea; Morocco.

**Other relevant information** This systematic review and meta-analysis will be conducted in accordance with the PRISMA 2020 guidelines.

**Keywords** Surgically altered anatomy; EA-ERCP; EUS-guided biliary drainage; systematic review; meta-analysis.

**Dissemination plans** The results of this systematic review and meta-analysis will be submitted for publication in a peer-reviewed international gastroenterology journal and may be presented at relevant scientific conferences.

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