

# EUS-guided rendezvous is a viable salvage technique for failed biliary cannulation in patients with Roux-en-Y gastric bypass undergoing BAE-ERCP

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## ABSTRACT

**Background and study aims** Biliary cannulation via balloon-assisted-ERCP (BAE-ERCP) can be challenging. Patients with Roux-en-Y gastric bypass (RYGB) have among the lowest reported BAE-ERCP success rates when compared with other types of surgically altered anatomy. We explored the role of EUS-guided rendezvous (EUS-RV) as a rescue technique when BAE-ERCP fails.

**Patients and methods** Consecutive patients with RYGB underwent BAE-ERCP for both benign and malignant indications. Among them, patients in whom BAE-ERCP failed despite use of conventional advanced biliary cannulation techniques underwent EUS-RV if the ampulla could be reached.

**Results** Forty-three consecutive patients with RYGB underwent BAE-ERCP. The procedure was successful in 30 patients (69.7%). Among the 13 patients with failed ERCP, EUS-RV was performed in five. Technical success was achieved in all five patients (100%), thereby increasing the overall BAE-ERCP success to 35 patients (81.3%). There were no major procedure-related adverse events on immediate and 3-month follow-up. Average total procedure time for failed BAE-ERCP followed by EUS-RV was 129 minutes (range 47–205 minutes).

**Conclusions** EUS-RV in patients with RYGB has high technical and clinical success and can be a viable alternative to more invasive options when BAE-ERCP fails using traditional cannulation techniques.

## Introduction

Global obesity rates continue to rise. It is estimated that approximately 50% of adults in the United States will be either overweight or obese by 2030 [1]. Roux-en-Y gastric bypass (RYGB) is the most commonly performed bypass operation for weight loss in the west. Rapid weight loss that follows RYGB leads to an increased lifetime risk of choledocholithiasis. It is es-

timated that up to 1.2% of patients with RYGB will develop choledocholithiasis and require endoscopic retrograde cholangiopancreatography (ERCP) during their lifetime [2].

Currently available options for ERCP in patients with RYGB include: 1) laparoscopic-assisted transgastric ERCP (LA-ERCP); 2) balloon-assisted enteroscopy ERCP (BAE-ERCP); 3) interventional radiology rendezvous guidewire-assisted ERCP (RGA-ERCP); and 4) endoscopic ultrasound-directed transgastric

ERCP (EDGE). Each modality has its benefits and drawbacks, and the chosen approach often relies on locally available expertise and institutional guidelines. BAE-ERCP is often preferred in patients with uncomplicated biliopancreatic disease due to cost efficiency, ability to complete ERCP in a single setting, a low adverse event (AE) rate, and low rate of fistulas (gastro-gastric or gastro-cutaneous). This approach, however, can be technically challenging, requires additional training, and can be time-consuming [3].

Therapeutic success rates for BAE-ERCP are significantly lower (61%-90%) in patients with RYGB when compared with other types of surgically altered anatomy such as hepaticojejunostomy (80%-100%), and Billroth II (100%). A common cause of failed BAE-ERCP (22%) in patients with RYGB is the inability to obtain deep cannulation of the bile duct despite use of advanced cannulation techniques such as double wire, pancreatic septotomy, and pre-cut needle knife [3,4].

EUS-guided rendezvous (EUS-RV) for deep biliary access was first described in 2004. With technological advancement, technique refinement, and availability of specialized accessories, EUS-RV is now considered safe and highly efficacious for advanced biliary cannulation in patients with native anatomy who have both benign and malignant disease [5,6]. It is perhaps the perceived difficulty of EUS-RV in RYGB patients that has prevented its adoption as a technique for advanced biliary access. At our institution, patients with failed biliary cannulation using BAE-ERCP frequently undergo a staged or primary EDGE procedure. Alternatively, patients can be referred to interventional radiology for percutaneous drainage, or to surgery for bile duct exploration that is associated with increase in morbidity, cost, and length of stay. We explored the role of EUS-RV as an advanced cannulation technique in patients with RYGB undergoing BAE-ERCP.

## Patients and methods

### Design

The study was conducted at a large tertiary referral center. Data regarding patient demographics, procedure details, and follow-up were prospectively collected from 2022 to 2024 using a prospective Institutional Review Board-approved protocol.

### Patient characteristics

Consecutive patients with RYGB underwent BAE-ERCP for both benign and malignant indications (► **Table 1**). Among them, patients in whom BAE-ERCP failed despite use of conventional advanced biliary cannulation techniques underwent EUS-RV if the ampulla could be reached and anatomy was favorable. All patients underwent BAE-ERCP using the Fujifilm short-type double-balloon enteroscope system (EI-580 BT).

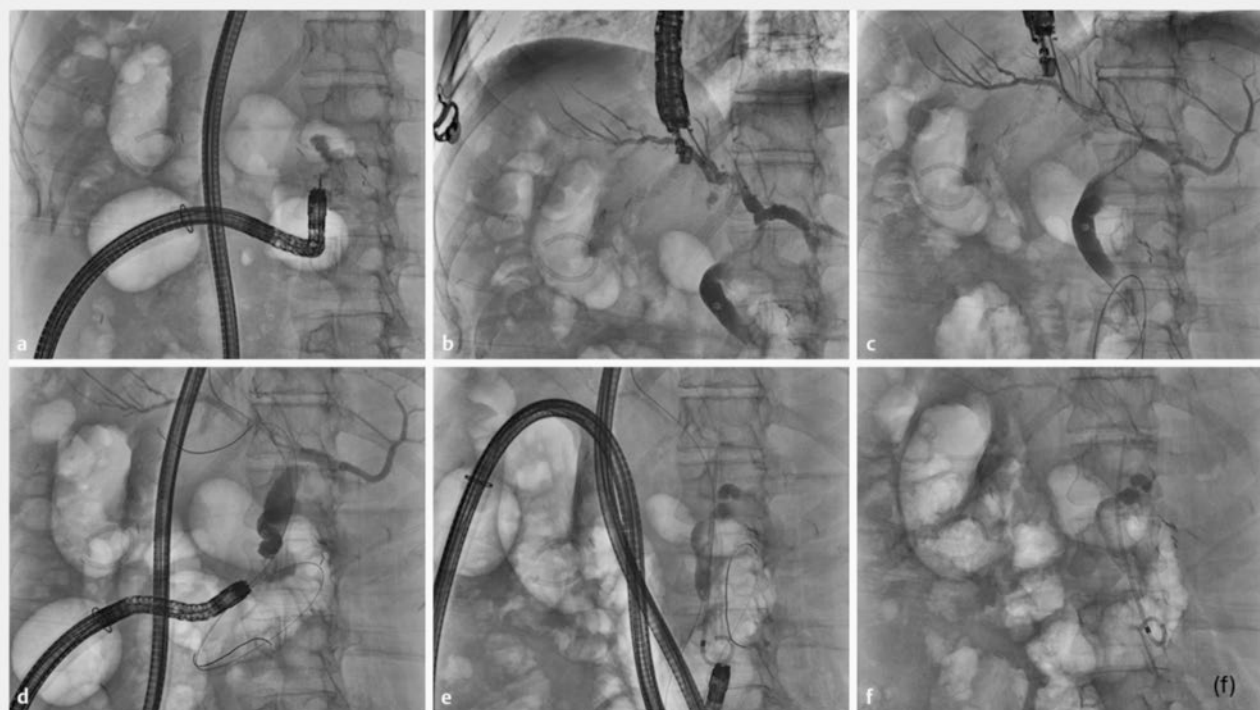
### EUS-rendezvous procedure

After a determination of failed cannulation was made with BAE-ERCP, the billio-pancreatic limb was marked using a tattoo and the enteroscope was gradually withdrawn from the patient. Using a curvilinear echoendoscope (GF-UCT180, Olympus Medical Systems, Center Valley, Pennsylvania, United States), the left lobe of the liver was identified. After ensuring that the transducer was beyond the esophago-gastric junction (EGJ), a pre-flushed 19-gauge fine-needle aspiration needle (Expect, Boston Scientific, Marlboro, Massachusetts, United States) was used to access segment 2 or segment 3 biliary radicles. Following bilious aspiration to confirm intraductal location, a 0.025-inch angled-tip, 450-cm guidewire (VisiGlide 2, Olympus Medical Systems, Center Valley, Pennsylvania, United States) was passed across the ampulla and coiled several times in the duodenum. The echoendoscope was then withdrawn while leaving the guidewire in place. The balloon-assisted enteroscope was then reintroduced and advanced cautiously toward the ampulla using the previously placed tattoo as a guide. Using a standard sphincterotome, attempts were made to cannulate the common bile duct (CBD) alongside the rendezvous wire (► **Fig. 1**). When this was not successful, the rendezvous wire was grasped with a forceps and pulled through the therapeutic channel of the enteroscope. A sphincterotome or cannula was then railroaded over the guidewire, across the ampulla into the CBD. The rendezvous wire was subsequently withdrawn from the patient and reloaded into the sphincterotome or cannula, thereby establishing stable biliary access. ERCP was then performed using standard BAE-ERCP methodology (► **Fig. 2**).

► **Table 1** Patient characteristics.

Patient no.	Age	Sex	Indication for ERCP	BMI	ASA
1	72	F	Choledocholithiasis CBD stricture	24.9	2
2	56	F	CBD stricture	21.29	3
3	73	F	CBD stricture	23.94	2
4	52	F	Choledocholithiasis	26.6	2
5	67	F	Choledocholithiasis, cholangitis	18.6	4

ASA, American Society of Anesthesiologists; BMI, body mass index; CBD, common bile duct; ERCP, endoscopic retrograde cholangiopancreatography.



► **Fig. 1** Fluoroscopy images demonstrating key steps of the EUS-RV procedure with the use of two wires i.e. biliary cannulation is achieved by cannulating alongside the rendezvous wire using a second wire. **a** Failed deep cannulation of the bile duct. **b** EUS-guided cholangiogram demonstrating a small stone in the distal CBD. **c** Antegrade guidewire passage across the papilla. **d** Successful cannulation of the CBD alongside the rendezvous wire using a second guidewire. **e** Biliary plastic stent placement after stone removal. **f** Rendezvous wire removal.

## Outcomes assessed

Technical success was defined as completion of all EUS-RV procedure steps and deep cannulation of the CBD. Clinical success was defined as the ability to complete the intended objective of the ERCP, such as stone clearance and stent placement. AEs were graded as per the Adverse Events in Gastrointestinal Endoscopy (AGREE) classification [7]. Serious AEs were defined as grade III or higher. All patients were followed prospectively for at least 3 months.

## Results

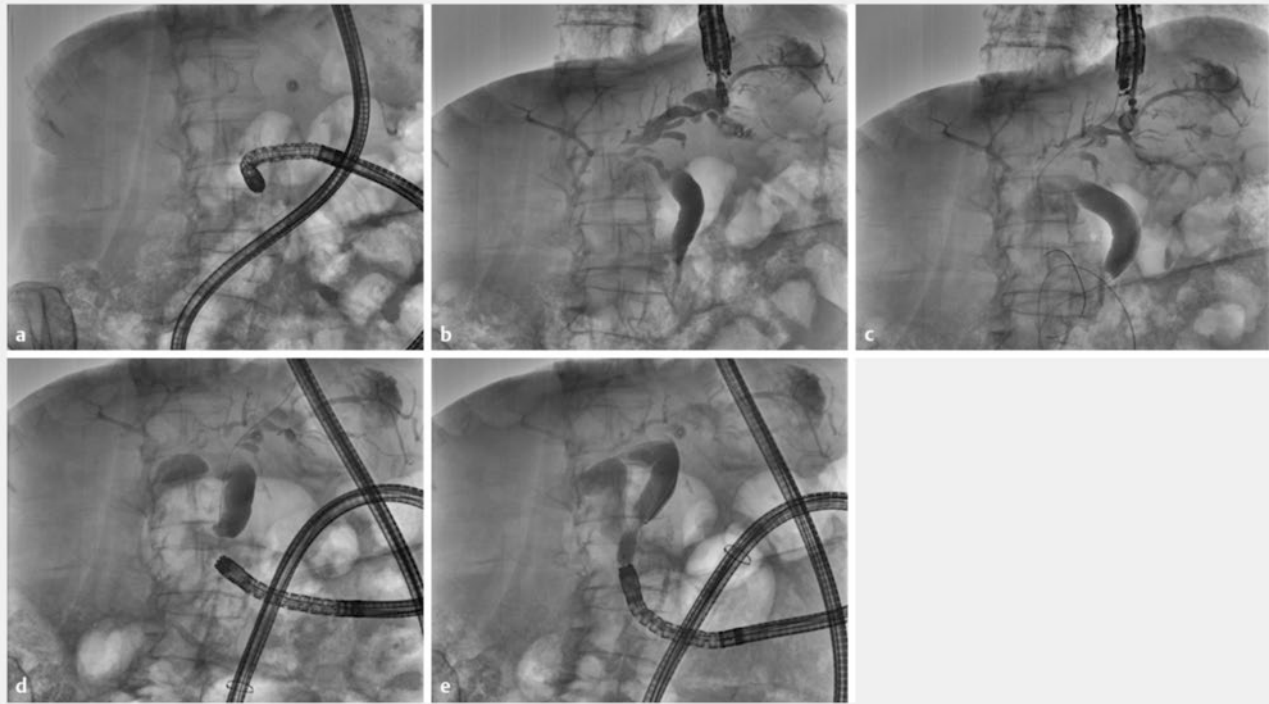
A total of 43 consecutive patients with RYGB underwent BAE-ERCP. Among them, BAE-ERCP was successful in 30 patients (69.7%). Of the 13 patients with failed BAE-ERCP, a total of five patients (0 male, 5 female; age range 52 to 73 years; average body mass index 23 kg/m<sup>2</sup>) underwent EUS-RV. EUS-RV was technically successful in all five patients (100%). Clinical success was achieved in all five patients (100%). After including the five EUS-RV patients, BAE-ERCP was successful in 35 patients (81.3%). There were no major procedure-related AEs. Two patients experienced mild abdominal pain that resolved within 12 hours with analgesics. All five patients were started on an oral diet the same day. On follow-up 3 months later, there were no reports of delayed procedure-related AEs. Average to-

tal procedure time for failed BAE-ERCP followed by EUS-RV was 129 minutes (range 47–205 minutes) (► **Table 2**).

## Discussion

The need for ERCP in patients with RYGB is expected to rise. Despite advances in technology and improvements in procedure technique, success rates for BAE-ERCP in patients with RYGB continue to be lower than for other types of surgically altered anatomy [3,4]. EUS-guided biliary access has the potential to safely augment biliary cannulation in RYGB but has traditionally been underutilized due to perceived technical difficulty and procedure time. Our single-center experience in five patients highlights the feasibility of EUS-RV biliary access in patients with RYGB in whom cannulation fails using conventional BAE-ERCP. In our patient cohort, use of EUS-RV resulted in a notable increase in technical success from 69.7% to 81.3%, emphasizing the potential impact that EUS-RV may have on BAE-ERCP technical success rates.

EDGE was first described in 2014 as an alternative to BAE-ERCP in patients with RYGB [8]. There are no currently available randomized controlled trials that compare DBE-ERCP with EDGE, and the choice between the two largely depends on institutional preference and available expertise. Although EDGE is generally considered safe for ERCP, potential drawbacks are accessory cost, use of two separate or staged procedures for



► **Fig. 2** Fluoroscopy images demonstrating key steps of the EUS-RV procedure with the use of a single wire i. e. rendezvous wire is pulled through the channel of the endoscope and used for biliary cannulation. **a** failed deep cannulation of the bile duct. **b** EU-guided cholangiogram. **c** Antegrade guidewire passage across the papilla. **d** Successful cannulation of the CBD using the rendezvous wire. The wire is grasped with a forceps and pulled through the channel of the endoscope. A cannula is subsequently advanced over wire into the biliary tree and the guidewire is withdrawn from the patient. The wire is then reloaded into the cannula and advanced into the biliary tree. **e** Balloon dilatation.

► **Table 2** Results.

Patient no.	Reason for failed cannulation using BAE-ERCP	Cannulation alongside the rendezvous wire successful	EUS-RV technical success	EUS-RV clinical success	Major AE	Minor AE	Procedure time (min)
1	Failure to cannulate both CBD and PD	N	Y	Y	N	Y	205
2	Failure to cannulate both CBD and PD	N	Y	Y	N	N	123
3	Repeated PD cannulation	Y	Y	Y	N	N	47
4	Repeated PD cannulation	Y	Y	Y	N	Y	140
5	Failure to cannulate both CBD and PD	N	Y	Y	N	N	130

AE, adverse event; BAE-ERCP, balloon-assisted enteroscopy endoscopic retrograde cholangiopancreatography; CBD, common bile duct; EUS-RV, endoscopic ultrasound-guided rendezvous; PD, pancreatic duct.

non-emergent indications, and gastro-gastric fistula formation that occurs in up to 31% of patients [9]. At present, there is no expert consensus on a preferred approach. At our institution, patients with uncomplicated pancreaticobiliary disease undergo BAE-ERCP. If deep cannulation fails on the first attempt, patients generally undergo an EDGE procedure during a different setting. In rare instances, when the BAE-ERCP is aborted early,

an EDGE procedure may be performed during the same setting. We explored EUS-RV as an advanced technique to rescue failed biliary cannulation and avoid additional procedures in carefully selected patients who had favorable anatomy for EUS-RV, that is, dilated intrahepatic ducts that were easily accessible from the gastric pouch and easy access to the ampulla with an enteroscope.

Our study has several limitations. First, we report a small sample size with a technical success rate that is higher than most reported literature on EUS-RV. Contributing factors may have been our highly selective patient choice (EUS-RV was not attempted in patients without dilated ducts or suboptimal EUS-access from the gastric pouch) and conduct of the study at a large referral center where all the rendezvous procedures were performed by an advanced endoscopist (KK) with experience in interventional EUS techniques and altered-anatomy ERCP. The results of this study may not be generalizable or applicable to routine clinical practice. Second, as with EUS-guided RV access in native anatomy, one must ideally have a plan for definitive transmural biliary drainage when accessing an obstructed intrahepatic biliary system. Therefore, we selected only patients with dilated intrahepatic ducts who had easy EUS-guided access to the left intrahepatic ducts. Lastly, a noteworthy limitation of EUS-RV in RYGB patients is that it is not a viable option when the ampulla cannot be reached with an enteroscope, which occurs in approximately 15% of patients [10].

## Conclusions

EUS-RV presents a viable and promising option when biliary cannulation fails during BAE-ERCP in carefully selected patients with RYGB. Our study demonstrates high technical and clinical success with EUS-RV, providing clinicians with a valuable alternative to more invasive and costly procedures such as EDGE or bile duct exploration. Although the procedure requires advanced technical expertise and is limited by factors such as inability to reach the ampulla, when used in the right clinical setting, EUS-RV can rescue failed biliary cannulation, with potentially lower morbidity and cost and shorter length of stay. Further studies with larger multicenter cohorts are required to validate these results and establish standardized protocols.

## Conflict of Interest

Shayan Irani, MD is a consultant for Boston Scientific, Gore, and Conmed. Dennis Yang, MD is a consultant for Microtech, Medtronic, Olympus, FujiFilm, and Apollo Endosurgery. Mustafa Arain is a consultant for Cook, Boston Scientific, and Olympus. Muhammad Hasan, MD is a consultant for Boston Scientific and Olympus. Dr Cosgrove is a consultant for Olympus and Boston Scientific. The remaining authors have no conflict of interest to declare.

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