Endoscopic Ultrasonographic Access and Drainage of the Common Bile Duct

Savreet Sarkaria, MD, Subha Sundararajan, MD,
Michel Kahaleh, MD*

KEYWORDS

- Endoscopic ultrasonography • Endoscopic retrograde cholangiopancreatography
- Rendezvous • Biliary drainage • Biliary obstruction • EUS-guided cholangiography
- EUS-guided biliary drainage • EUS-guided choledochoduodenostomy

KEY POINTS

- When conventional endoscopic retrograde cholangiopancreatography for biliary drainage is not possible, endoscopic ultrasound-guided biliary drainage (EUS-BD) should be considered as an alternative to percutaneous biliary drainage or surgical options.
- EUS-BD can be performed either via a transhepatic approach or an extrahepatic approach, with or without rendezvous.
- This article discusses the evolving role of EUS-BD and reviews the published data that support EUS-BD as an effective and attractive option for biliary drainage when performed in centers with expertise.

INTRODUCTION

Endoscopic retrograde cholangiography (ERCP) is the current standard of care for biliary drainage. When an initial ERCP attempt is unsuccessful, the recommended next step is referral to an expert endoscopist. In expert hands, ERCP is successful in 90% to 98% of patients, with complication rates of less than 10%.[1,2]

Traditionally, patients with failed conventional ERCP were referred for either percutaneous transhepatic biliary drainage (PTBD) or surgical intervention. However, PTBD can be difficult to perform or even contraindicated in patients with obesity, ascites, or intervening structures, such as vasculature or lungs. Complication rates of PTBD range from 10% to 20%, and common complications include cholangitis, bile leak, bleeding, fistula formation, peritonitis, empyema, pneumothorax, and stent occlusion.[3–5] The mortality rate associated with PTBD has been reported to be as high as 6%,[6] and

Division of Gastroenterology & Hepatology, Weill Cornell Medical College, 1305 York Avenue, New York, NY 10021, USA
* Corresponding author. Division of Gastroenterology & Hepatology, Department of Medicine, Weill Cornell Medical College, New York, NY 10021.
E-mail address: mkahaleh@gmail.com

Gastrointest Endoscopy Clin N Am 23 (2013) 435–452
http://dx.doi.org/10.1016/j.giec.2012.12.013 giendo.theclinics.com

long-term efficacy was recently questioned. In addition, the external drainage associated with PTBD can lead to significant patient dissatisfaction and a decrease in quality of life; this can be secondary to pain from the external biliary drain, difficulty taking care of the drain, or complications related to infection or leakage.[3–5]

Endoscopic ultrasound-guided biliary drainage (EUS-BD) is a novel and attractive alternative after failed ERCP. Artifon and colleagues[7] found EUS-BD and PTBD to have similar efficacy, complication rates, and costs. EUS-BD has the additional advantage that it can be performed while under the same sedation as attempted ERCP.

Although surgical drainage is reasonably effective, it is associated with 2% to 5% mortality and 17% to 37% morbidity.[8] Moreover, surgery requires a longer recovery time. In patients with malignant biliary obstruction who already have a poor prognosis and short life expectancy, the invasive nature, longer recovery, and delay in chemotherapy make surgery a less attractive option.

The development of therapeutic linear-array echoendoscopes and the evolution of endoscopic ultrasonography (EUS) from a diagnostic to a therapeutic modality has made EUS an attractive tool in our armamentarium to provide biliary drainage. EUS has been a widely accepted modality for diagnosing and treating many pancreatobiliary diseases for years. The proximity of the stomach and duodenum to the pancreatobiliary tree has allowed high-frequency transducers to provide high-resolution images of the pancreas, pancreatic ducts, bile ducts, and gallbladder.

Contrast injection through the fine-needle aspiration (FNA) needle allows for EUS-guided cholangiography (ESC). Once the cholangiogram has been obtained, ERCP accessories are then used through the working channel of the echoendoscope to complete the procedure and accomplish biliary drainage. ESC therefore represents a hybrid technique that combines EUS-guided FNA and ERCP.

This article discusses the evolving role of EUS-BD and reviews data that support EUS-BD as an effective and attractive option when conventional ERCP for biliary drainage is not possible.

INDICATIONS FOR EUS-GUIDED BILIARY DRAINAGE

Guidelines have not yet been established as to when EUS-BD should be performed. EUS-BD, however, should be considered any time that successful cannulation of the bile duct cannot be achieved via ERCP in the hands of an expert endoscopist. This situation can arise in patients with surgically altered anatomy such as those with Roux-en-Y anatomy, Billroth II anatomy, or postbariatric biliopancreatic diversion. Inability to cannulate the biliary system can also be encountered in patients with gastric-outlet obstruction, tumor infiltration at the level of the duodenum, periampullary diverticula, tortuous bile ducts, impacted stones, or malignancy with bile-duct infiltration.[9–11]

EUS-GUIDED BILIARY DRAINAGE: PROCEDURAL CONSIDERATIONS

Patient Selection and Evaluation

Consent for EUS-BD should be incorporated into the consent for ERCP any time when failed ERCP may be anticipated.

The preprocedure evaluation is similar to that of a standard ERCP, and should include evaluation for cardiopulmonary risk and the use of anticoagulants for coagulation disorders. In addition, the use of general anesthesia should be strongly considered. If the patient is not already on antibiotics to cover biliary pathogens, the authors routinely administer antibiotics both during the procedure and for 7 to 14 days after the procedure, depending on the clinical scenario, adequacy of drainage, and patient course.

Materials and Instruments

It is important to ensure that all required equipment is readily available before puncturing the bile ducts. Once the bile duct has been accessed via EUS, it is crucial to proceed in an expeditious manner without any additional or unnecessary manipulation to reduce the chances of losing access and minimize complications. It is also imperative that the team in the room is familiar with the techniques and instruments used during these procedures so that wires and instruments are successfully exchanged.

1. *Fluoroscopy.* Fluoroscopy equipment should be set up before starting the procedure. Fluoroscopy is needed to evaluate the angle of bile-duct puncture. The fluoroscopy image should be centered with the tip of the scope, bile ducts, and duodenum all in view.
2. *Contrast.* Contrast to perform cholangiography should be available and prefilled in labeled syringes.
3. *Water.* Plenty of water to flush catheters and hydrophilic wires should be in easily accessible containers and syringes. Water is much more effective than saline; saline is sticky because of its salt content.
4. *Echoendoscope.* Echoendoscopes with a 3.8-mm working channel (therapeutic echoendoscope) will permit a variety of catheters and stent diameters to be used. In addition, a duodenoscope should be available if there is the possibility of rendezvous technique and conversion to retrograde procedure.
5. CO_2 should be used for insufflation to decrease barotrauma.
6. *FNA needles.* 19-gauge FNA needles are preferred over 22-gauge needles because they allow manipulation of 0.035-in guide wires.
7. *Guide wires.* Hydrophilic 0.035-in guide wires are preferred because of their ease of manipulation and ability to support a variety of catheters and stents. In addition, it is important to use uncoated wires, when possible, because of the “shearing” effect that the FNA needle can have on the coating of the guide wire.
8. *Dilation.* It is preferable to have both 4 - to 6-mm wire-guided dilating balloons and 6F to 7F dilating bougie catheters.
9. *Sphincterotome*. A rotatable sphincterotome or bending catheter should be available if the wire needs to be redirected to facilitate transpapillary passage of wire.
10. *Stents*. Appropriate stent selection is crucial for adequate biliary drainage and fewer complications. Refer to the later discussion regarding placement of plastic versus self-expanding metal stents (SEMS).

Techniques

Choice of approach

EUS-BD is typically performed using either the EUS-guided rendezvous technique followed by conversion to ERCP, with placement of transpapillary stent in retrograde fashion, or by creating a tract from either the stomach or the duodenum into the bile ducts and placing a stent in an antegrade fashion. When the duodenoscope can be advanced to the ampulla, it is preferable to attempt an EUS-guided rendezvous procedure.

EUS-guided rendezvous

This approach can only be used when a duodenoscope can be advanced to the second portion of the duodenum. It may be appropriately used after failed ERCP attributable to periampullary diverticula, tortuous bile ducts, impacted stones, or malignancy with bile-duct infiltration. Transpapillary drainage via EUS-BD can be attempted using classic rendezvous, parallel rendezvous,[9] or standard cannulation, without rendezvous, after cholangiography by contrast injection through an EUS needle.[10,11]

In this procedure, under EUS and Doppler guidance a needle is inserted into either the left hepatic or common bile duct. The authors find it helpful to have the echoendoscope in the stomach or duodenal bulb; under fluoroscopic guidance one is then able to visualize the FNA needle pointing caudad before accessing the duct with the FNA needle (**Fig. 1**). This caudad position of the FNA needle facilitates advancing the guide wire distally into the duodenum (**Figs. 2** and **3**).

Once EUS imaging shows insertion into the duct, a syringe is attached to the FNA needle and bile aspiration is performed to confirm position. Contrast injection through the FNA needle provides a cholangiogram. The needle is then flushed with water and the guide wire is inserted through the FNA needle, advanced beyond the ampulla, and into the duodenum. Conventional ERCP in a retrograde fashion is then completed.

The limiting step for any method of transpapillary drainage is guide-wire manipulation. Because the FNA needle is rigid and has a sharp cutting edge, to and fro movements of the needle over the wire may bend or shear the guide wire, which in turn can lead to an inability to further manipulate the wire or thread catheters over the wire. If this happens, both the wire and the needle need to be removed, resulting in loss of access. Furthermore, shearing of the wire can potentially result in parts of the wire and coating becoming displaced and left behind in the equipment or the patient's bile duct.

Hence, it is crucial to flush both the FNA needle and the guide wire with copious amounts of water before inserting the guide wire. In addition, avoiding unnecessary friction between the guide wire and the FNA needle is of paramount importance. When the wire is being advanced, it should be done with enough speed to maximize likelihood of crossing the stricture. If the wire must be pulled back, this should be done cautiously and aborted at the moment any resistance is met.

To facilitate passing the guide wire into the duodenum, EUS and fluoroscopy should be used to select a site and position as distal as possible in the bile duct with a tangential needle orientation to the duct before the actual puncture. Transpapillary wire advancement is much more difficult from an intrahepatic puncture, as the wire may

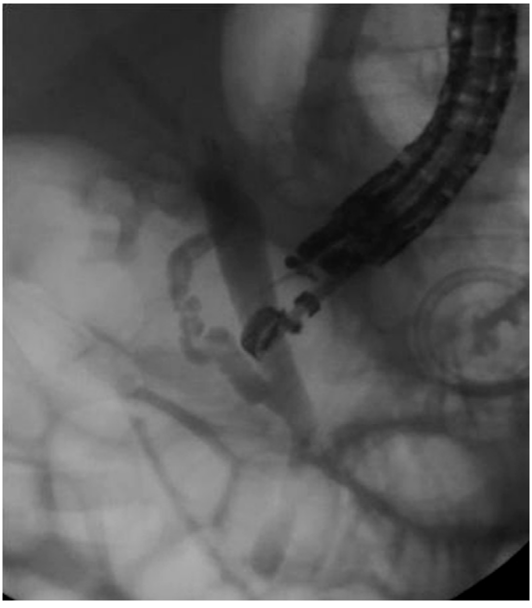

Fig. 1. Puncture of the common bile duct by ultrasonography with contrast injection.

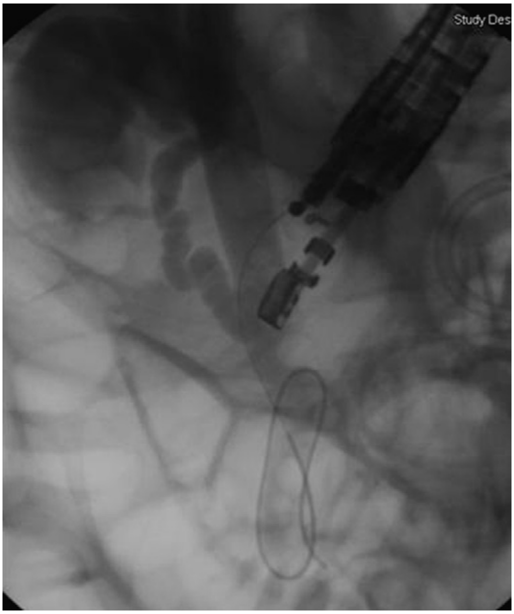

Fig. 2. Fluoroscopic image of the guide wire advanced antegrade into the common bile duct.

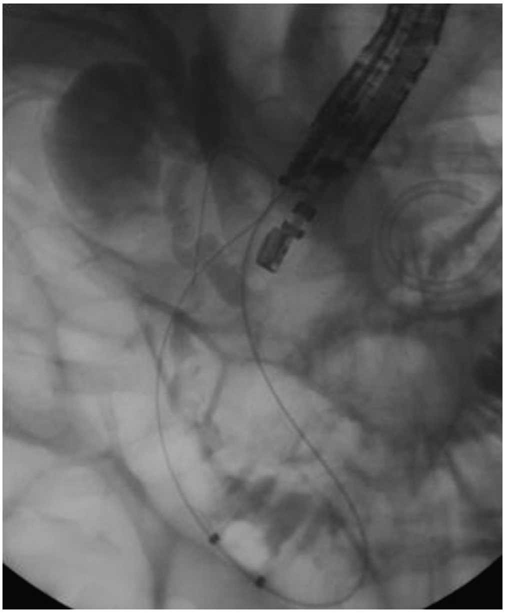

Fig. 3. Fluoroscopic image of a retrieval balloon advanced across the distal biliary stricture in the duodenum.

go peripherally into another branch of the left intrahepatic ducts or into the right-lobe ducts. With intrahepatic duct puncture, passage of the transpapillary guide wire often requires dilation of the puncture tract to allow intraductal passage of catheters or sphincterotomes. Once the wire is in the bile duct, if transpapillary passage is not achieved, the FNA needle should be exchanged for a sphincterotome or dilating bougie. At this point, the wire can be manipulated back and forth safely to facilitate passage beyond the ampulla.

In this rendezvous technique the echoendoscope is removed, with the FNA needle, still attached to the biopsy channel and guide wire, left in place (**Fig. 4**). The assistant feeds the wire into the needle at the same rate that the endoscopist removes the scope and needle assembly. The position of the guide wire is monitored fluoroscopically to prevent both looping in the stomach and dislodgment of the transpapillary looped wire. It is helpful to have at least 3 to 5 large loops of guide wire in the small bowel to ensure that transpapillary access is maintained.

After the echoendoscope is removed, a duodenoscope is advanced side by side with the guide wire while the assistant holds the wire under gentle traction from the patient's mouth to prevent looping. In the classic rendezvous technique, once the papilla is reached with the duodenoscope (or a longer endoscope in patients with altered anatomy), the transpapillary guide wire can be grasped with a polypectomy snare and retrieved through the working channel for subsequent over-the-wire cannulation. Standard ERCP catheters can then be threaded over the wire once it has exited from the endoscope channel. The procedure can then be converted and completed by conventional ERCP with stent placement in a retrograde manner (**Fig. 5**).

Alternatively, the guide wire can be left in place, the echoendoscope can be removed, and a duodenoscope can be used to cannulate next to the previously placed guide wire, in a parallel rendezvous technique. In the parallel rendezvous technique, once the duodenoscope reaches the papilla, a sphincterotome is used to cannulate the bile duct alongside the ESC-placed wire.

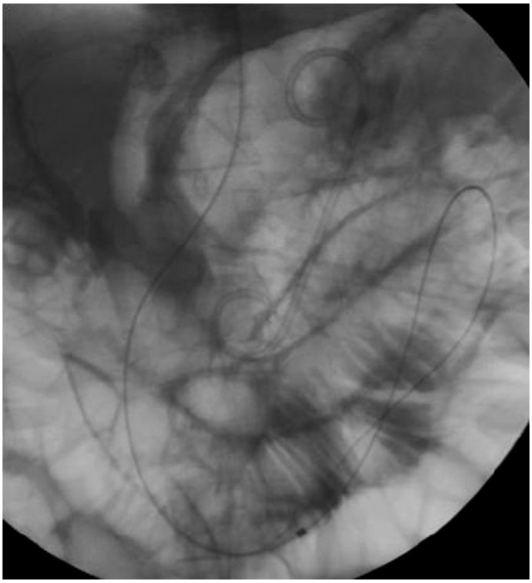

Fig. 4. Fluoroscopic images of the guide wire left in place after removal of the echoendoscope, to permit a rendezvous.

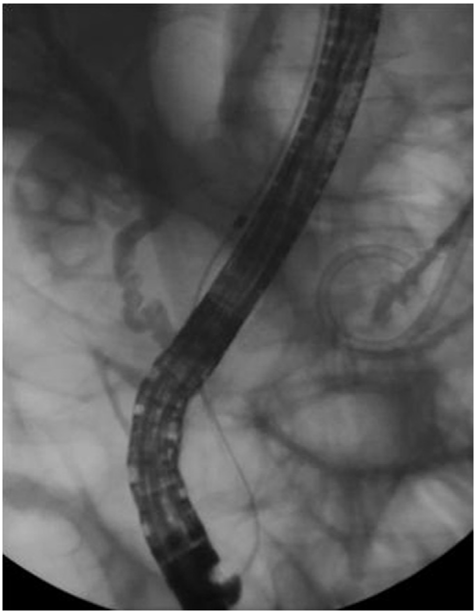

Fig. 5. Fluoroscopic images of the guide wire pulled in the working channel of the duodenoscope advanced into the duodenum.

If the guide wire cannot be advanced beyond the ampulla and into the duodenum, a transenteric tract must be created into the bile duct. This action can be accomplished by dilating over the guide wire with a 4- to 6-mm wire-guided balloon catheter or a 6F to 7F dilating bougie followed by stent placement in an anterograde manner.

A third approach, which is less commonly performed, is contrast injection via EUS followed by standard cannulation ERCP. This method obtains a cholangiogram, via the EUS FNA needle, that provides a road map for cannulation. In addition, the injection of contrast either may make a patulous papilla more evident (eg, an intradiverticular papilla) or the pressure created by the flow of contrast may open the biliary orifice. Furthermore, as has been described for minor papilla cannulation, combining contrast with methylene blue may be of additional benefit with bile-duct cannulation.[12]

Transmural drainage: EUS-guided choledochoduodenostomy and hepaticogastrostomy

When the transpapillary approach cannot be accomplished with the EUS-guided rendezvous, either the transgastric-transhepatic (intrahepatic) or transenteric-transcholedochal (extrahepatic) approach must be used. In these cases, a tract between the digestive tract and bile ducts is created by performing either an EUS-guided choledochoduodenostomy (EUS-CDS) or an EUS-guided hepaticogastrostomy (EUS-HGS).

The intrahepatic approach is performed via the neighboring gastrointestinal tract (usually the cardia or in the lesser curvature of the stomach) to allow visualization of the left intrahepatic bile ducts. After checking local vasculature with color flow Doppler (**Fig. 6**), the EUS needle is then advanced into an intrahepatic duct (**Fig. 7**). This maneuver is followed once again by bile aspiration, cholangiogram, and advancement of the guide wire with fluoroscopic guidance across the ampulla and into the duodenum (**Figs. 8–10**). Then, in an antegrade manner, a 6F or 7F bougie or dilating

Fig. 6. Color flow Doppler of the left liver before puncture.

catheter is inserted over the guide wire to dilate the tract (Fig. 11) followed by antegrade stent deployment with drainage into the stomach (Figs. 12 and 13).

In the extrahepatic approach, the echoendoscope is typically advanced into the duodenum and the EUS needle is inserted directly into the common bile duct (see Fig. 1). The guide wire is then advanced in an antegrade fashion across the ampulla and into the duodenum (see Figs. 2 and 3). From this point, the remainder of the procedure is performed in the same way as the intrahepatic approach, with deployment of the stent in the duodenum.

Choice of plastic versus metal stent

Both plastic and metal stents have been used during EUS-BD. Initially plastic stents were primarily used,[11,13–26] but more recently reported cases have been published using SEMS.[7,11,13,16,18–20,22,24,27–31] These studies have included placement of uncovered, partially covered, and fully covered SEMS, as well as plastic stents within SEMS and fully covered SEMS within uncovered SEMS.[32]

Fig. 7. Endoscopic ultrasonogram of the left hepatic duct before puncture.

Fig. 8. Puncture of the left hepatic duct.

Although no comparative studies exist, SEMS theoretically provide several advantages over plastic stents in EUS-BD procedures. First, the larger diameter of SEMS is expected to offer longer-lasting patency, which is advantageous for obvious reasons such as minimizing stent occlusion and the need for repeat procedures. In addition, stent changes may be less challenging with SEMS, because it is possible to place another stent or exchange an existing stent within the original SEMS. By contrast, exchanging plastic stents involves removing the original plastic stent and risks disruption of the created enteric-biliary tract or loss of access. Another potential advantage to placing SEMS is their theoretical superiority over plastic stents in sealing bile leaks.

On the other hand, SEMS are associated with stent migration and stent foreshortening.[15,18,29] Stent foreshortening may be avoided by placing more stent in the lumen of the gastrointestinal tract during deployment so that if foreshortening does occur, enough stent will be left in the lumen of the gastrointestinal tract to ensure future access and decrease the chance of complications such as bile peritonitis and pneumoperitoneum. It is also important not to occlude intrahepatic segments of bile ducts with the membrane of the SEMS.

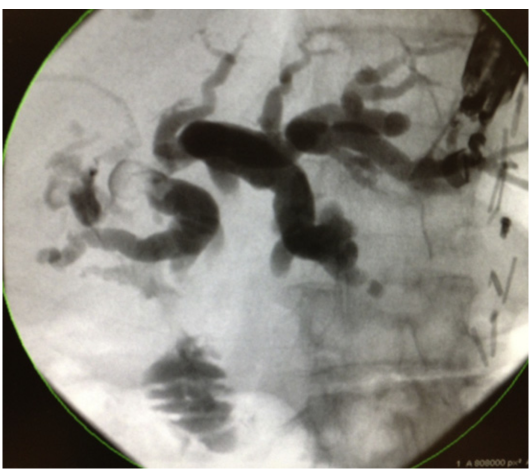

Fig. 9. Opacification of the left hepatic biliary tree dilated above the hepaticojejunostomy.

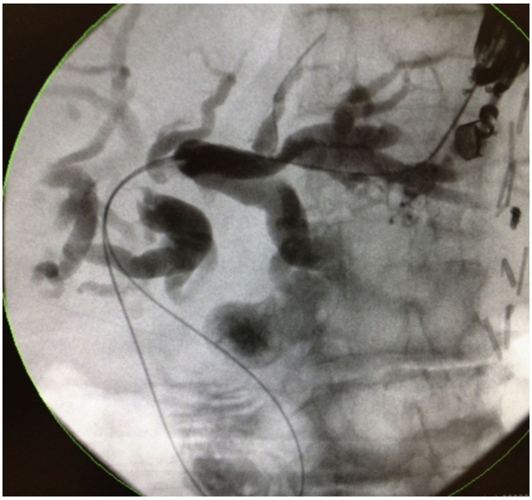

Fig. 10. Access into the left hepatic duct and into the jejunum with a hydrophilic guide wire.

When placing SEMS, the authors often place a double-pigtail plastic stent within the SEMS, particularly if there is concern regarding stent migration. The pigtails function as anchors. Likewise, if plastic stents are being placed in the absence of SEMS, double-pigtail stents should be used for the same reason.

COMPLICATIONS AND MANAGEMENT

EUS-BD can be associated with complications unique to ESC as well as those seen with routine endoscopy and ERCP, such as pancreatitis, infection, bleeding, and cardiopulmonary complications. Although further studies are needed, EUS-BD has a potentially lower rate of bleeding and pancreatitis compared with conventional ERCP, because EUS-BD lacks manipulation of the papilla itself and the associated

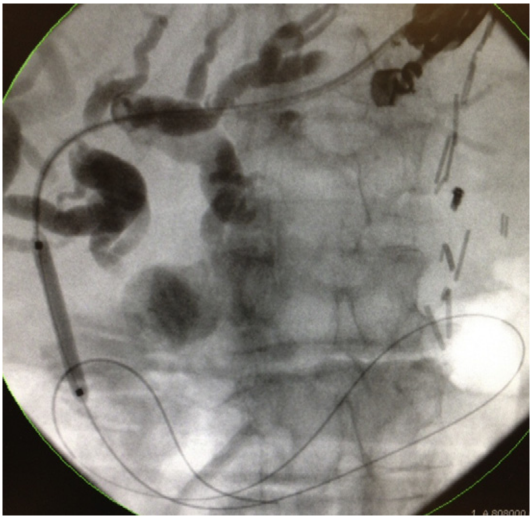

Fig. 11. Dilation of the hepaticojejunal anastomosis after crossing the biliary obstruction.

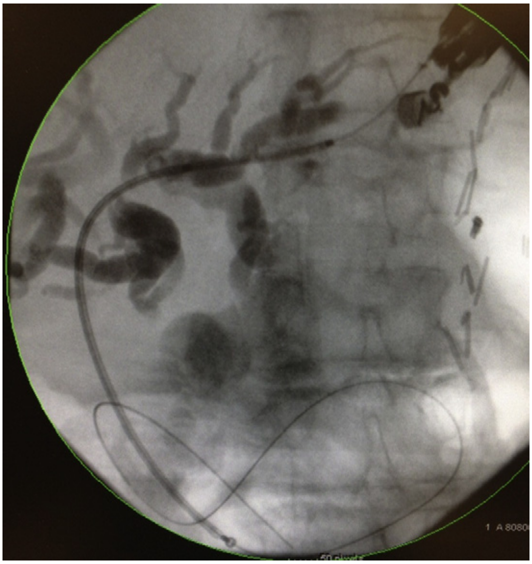

Fig. 12. Advancement of the stent delivery system across the obstruction.

complications with precut papillotomy.[33] Complications that are more specific or more likely to occur with EUS-BD include pneumoperitoneum with or without bile peritonitis, and possibly bleeding from creation or dilation of the biliary enteric tract. Overall complication rates for EUS-BD in the literature range from 10% to 36%.[11–43] Major complications requiring surgery, however, are far less common.

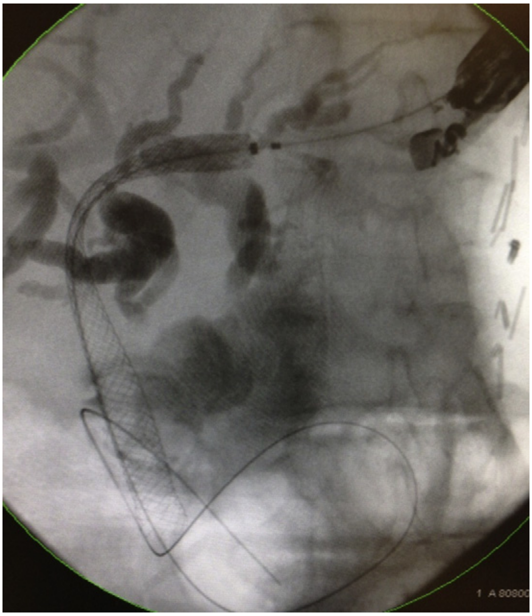

Fig. 13. Deployment of a metal stent across the obstruction.

Table 1
Published data on EUS-BD with extrahepatic approach

Authors,[Ref.] Year	No./ Total Sample	Method	Disease	Approach	Initial Stent	Success Rate (%)	Complication
Giovannini et al,[21] 2001	1	Direct (1)	Malig. (1)	Duodenum	PS (1)	100	None
Burmester et al,[15] 2003	3	Direct (3)	Malig. (3	Duodenum (2), Jejunum (1)	PS (3)	66.6	Bile leak (1)
Mallery et al,[30] 2004	2	Rendezvous (2)	Malig. (2)	Duodenum (2)	SEMS (2)	100	None
Lai and Freeman,[31] 2005	1	Rendezvous (1)	Malig. (1)	Duodenum (1)	SEMS (1)	100	None
Puspok et al,[16] 2005	6	Direct (6)	Malig. (5), Benign (1)	Duodenum (5), Jejunum (1)	PS (5), SEMS (1)	83	Subacute phlegmonous cholecystitis (1)
Kahaleh et al,[19] 2006	10	Direct (2), rendezvous (7)	Malig. (8), Benign (2)	Duodenum (5), Jejunum (5)	PS (4), SEMS (5)	90	Bile leak (1), pneumoperitoneum (2)
Will et al,[18] 2007	8	Direct (8)	Malig. (7), Benign (1)	Stomach (4), Jejunum (3), Esophagus (1)	PS (2), SEMS (5)	88	Slight pain (2), cholangitis (1)
Tarantino et al,[17] 2008	8	Direct (4), rendezvous (4)	Malig. (7), Benign (1)	Duodenal (8)	PS (8)	100	None
Yamao et al,[14] 2008	5	Direct (5)	Malig. (5)	Duodenal (5)	PS (5)	100	Pneumoperitoneum (1)
Brauer et al,[11] 2009	12	Direct (4), rendezvous (7)	Malig. (8), Benign (4)	N/A	PS (5), SEMS (5)	92	Pneumoperitoneum (1), respiratory failure (1)
Hanada et al,[23] 2009	4	Direct (4)	Malig. (4)	Duodenal (4)	PS (4)	100	None
Horaguchi et al,[22] 2009	9	N/A	Malig. (9)	Duodenal (8), Stomach (1)	PS (15), Nasobiliary tube (1)	100	Peritonitis (1)

Maranki et al,[39] 2009	14	Direct (6), rendezvous (8)	Malig. (9), Benign (5)	N/A	N/A	86	Biliary peritonitis (1), abdominal pain and pneumoperitoneum (1)
Kim et al,[24] 2010	15	Rendezvous (15)	Malig. (10), Benign (5)	Duodenum (15)	PS (4), SEMS (8)	80	Pancreatitis (1)
Nguyen-Tang et al,[27] 2010	1	Rendezvous (1)	Malig. (1)	N/A	SEMS (1)	100	None
Park et al,[20,a] 2011	26	Direct (26)	Malig. (51), Benign (6)[b]	Duodenum (26)	PS (12), SEMS (12)	92	Pneumoperitoneum (6), mild bleeding (2)
Fabbri et al,[28] 2011	16	Direct (13), rendezvous (3)	Malig. (16)	Duodenum (15), Stomach (1)	SEMS (12)	75	Pneumoperitoneum (1)
Hara et al,[25,a] 2011	18	Direct (18)	Malig. (18)	N/A	PS (17)	94	Peritonitis (2), bleeding (1)
Ramirez-Luna et al,[26] 2011	9	Direct (9)	Malig. (9)	Duodenum (9)	PS (9)	89	Biloma (1)
Kim et al,[29] 2012	9	Direct (9)	Malig. (9)	Duodenum (9)	SEMS (9)	100	Pneumoperitoneum (1), migration (1), mild peritonitis (1)
Dhir et al,[43] 2012	58	Rendezvous (58)	Malig. (43), Benign (15)			98.3	Pericholedochal contrast medium leak (2)
Artifon et al,[7] 2012	13	Direct (13)	Malig. (13)	Duodenum (13)	SEMS (13)	100	Mild bleeding (1), bile leak (1)

Abbreviations: Malig, malignant; N/A, no data available; PS, plastic stents; SEMS, self-expanding metal stents.

[a] Prospective study.

[b] Malig. and Benign in Park and colleagues[20] reflect total numbers for intrahepatic and extrahepatic approach.

EUS-BD requires manipulation of the gastrointestinal tract wall integrity and the creation of a tract to directly gain access to the hepatobiliary system. This procedure can result in pneumoperitoneum and leakage of bile. Less commonly, biloma, pneumoperitoneum, or bile peritonitis can occur, although they are usually asymptomatic. Theoretically, placing a stent should help minimize this risk by sealing the tract. Although there are some data in the literature to support this proposal, further studies evaluating the different types of stents and their success are still needed. Pneumoperitoneum can usually be managed conservatively if the patient has no signs of peritonitis. Similar to treatment of pneumoperitoneum seen after percutaneous endoscopic gastrostomy (PEG) tube placement and laparoscopy, the authors use CO_2 insufflation during ERCP to minimize the effects of pneumoperitoneum.

As with conventional ERCP, bleeding can be related to sphincterotomy, but specifically with EUS-BD bleeding can also arise from transmural FNA needle instrumentation. In addition, the use of cautery can increase the risk of bleeding and formation of fistulous tracts. Using a needle-knife during ESC has been suggested in one series to be the most significant predictor of complications during EUS-BD.[33]

The results of published data are summarized in **Tables 1** and **2**.[11–43]

DISCUSSION

The first case of EUS-BD was reported by Wiersema and colleagues[38] in 1996 among 11 patients in whom conventional ERCP failed. Giovannini and colleagues[21] subsequently described the first case of choledochoduodenal fistula with stent placement for biliary decompression in 2003. Since that time, EUS-BD has been shown to be a technically feasible procedure, with approximately 400 cases reported in the literature.[11–43] The overall success rate for EUS-BD in the literature is reported to be approximately 90% (range 75%–100%).[11–43]

As this technique is still evolving, several issues need to be established. At present, it remains uncertain whether the intrahepatic approach or extrahepatic approach is preferable. In clinical practice, because of anatomic constraints and the level of obstruction, typically only a single EUS access site is possible in approximately 80% of biliary cases, allowing a choice between intrahepatic and extrahepatic bile-duct puncture only in about 20% or fewer of cases. The choice between an intrahepatic or extrahepatic approach is based on multiple factors including: access to the duodenum, degree of dilation of the left intrahepatic bile ducts, presence of ascites, and level of the obstruction based on preprocedure cross-sectional imaging. Patient anatomy and operator preference and skill are also important when considering the drainage approach.

The authors' group demonstrated that the extrahepatic approach carried a greater risk of complications compared with the intrahepatic approach, mainly in terms of bile leakage. The results in **Tables 1** and **2**, however, suggest that the extrahepatic approach has higher success rates without additional risk. The authors believe that the duodenal (transbulbar) route is easier and safer because the distance between the duodenum and the bile duct is short, the duodenal wall is thin and without any major intervening vascular structures, and the direction of the puncture is caudad. Recently Kim and colleagues[24] also found the transduodenal approach to be safer and more effective. It is clear that more studies are needed to evaluate this further.

Itoi and colleagues[35] reported that the limitations of the intrahepatic approach technique included: (1) nonapposed gastric wall and left liver lobe, resulting in the possibility of procedure failure; (2) risk of mediastinitis with a transesophageal

Table 2
Published data on EUS-BD with intrahepatic approach

Authors,[Ref.] Year	No./Total Sample	Method	Disease	Approach	Initial Stent	Success Rate (%)	Complication
Burmester et al,[15] 2003	1	Direct (1)	Malig. (1)	Stomach (1)	PS (1)	100	Bile leak (1)
Kahaleh et al,[19] 2006	13	Direct (1), rendezvous (12)	Malig. (9), Benign (4)	Stomach (13)	PS (6), SEMS (6)	92	Minor bleeding (1)
Bories et al,[13] 2007	11	Direct (9), Transpapillary (2)	Malig. (3), Benign (8)	Stomach (3), Duodenal (3), Stenosis (5)	PS (7), SEMS (3)	91	Transient ileus (1), biloma (1), cholangitis (1)
Horaguchi et al,[22] 2009	7	N/A	Malig. (7)	Stomach (5), esophagus (2)	PS (2), SEMS (5)	100	None
Maranki et al,[39] 2009	35	Direct (9), Transpapillary (24)	Malig. (26), Benign (9)	N/A	N/A	83	Self-resolving bleeding (1), pneumoperitoneum (3), aspiration pneumonia (1)
Nguyen-Tang et al,[27] 2010	4	Rendezvous (4)	Malig. (3), Benign (1)	Duodenum (1), Stomach (3)	SEMS (5)	100	None
Park et al,[20,a] 2011	31	Direct (31)	Malig. (51), Benign (6)[b]	Stomach (31)	PS (6), SEMS (25)	100	Pneumoperitoneum (1), Bile peritonitis (2)
Ramirez-Luna et al,[26] 2011	2	Direct (2)	Malig. (2)	Stomach (2)	PS (2)	100	Stent migration (1)
Kim et al,[29] 2012	4	Direct (4)	Malig. (4)	Stomach (4)	SEMS (4)	75	Mild peritonitis (1), stent migration (1)

Abbreviations: Malig, malignant; PS, plastic stents; SEMS, self-expanding metal stents.
[a] Prospective study.
[b] Malig. and Benign in Park and colleagues[20] 2011 reflect total numbers for intrahepatic and extrahepatic approach.

approach; (3) difficulty of puncture in the case of liver cirrhosis; and (4) risk of injuring the portal vein with use of small-caliber stents or SEMS with a small-diameter delivery.

The appropriate indications for EUS-BD require evaluation. At present, most literature supports considering EUS-BD when conventional ERCP methods fail. The aspects of what falls under conventional ERCP are being evaluated, including the issue of precut papillotomy, as this technique is associated with a risk of post-ERCP pancreatitis. Dhir and colleagues[43] published a retrospective series of cases in which EUS-guided rendezvous was performed in patients who failed selective cannulation (ie, with wire and sphincterotome only, and no precut technique) in comparison with patients who had precut papillotomy performed. EUS-guided rendezvous access in patients with distal biliary obstruction was found to have a higher success rate than precut papillotomy for single-session biliary access (98% vs 90.3%; P = .03), with no significant difference in terms of complications. More prospective studies are needed to evaluate the role of EUS-BD.

Consensus agreements to define the role and indications for ESC and EUS-BD techniques are also needed. Meetings were held for the first time during Digestive Disorders Week in Chicago in 2011 and again in San Diego in 2012.

SUMMARY

The high success rates reported in the literature would indicate that EUS-BD is a technically feasible and effective procedure when performed by endoscopists highly skilled in both EUS and ERCP at tertiary care and expert centers. This technique offers a clear alternative to both the percutaneous and surgical approaches in patients in whom conventional ERCP is unsuccessful or not possible. ESC holds promise as a technique for gaining access and draining the bile ducts when conventional ERCP has failed.

Further clinical trials are needed to more comprehensively evaluate the techniques used during EUS-BD, including which types of stents should be placed, and to evaluate complications associated with EUS-BD. In addition, consensus regarding the following questions is also needed: what nomenclature to use, how training should be offered, how to capture all cases performed, how to grant privileges, and how to secure reimbursement.

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