



Endoscopic biliary drainage for distal biliary stenosis: a narrative review of current status and future prospects

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Objective: A narrative review was conducted for the purpose of clarifying one index on the selection method of biliary drainage for benign and malignant diseases.

Background: Distal bile duct stenosis is a condition that occurs in cases of not only malignant diseases but also benign diseases; this condition causes obstructive jaundice in affected individuals. With respect to malignant diseases, although bile duct stenosis often occurs in cases of biliary tract cancers and pancreatic cancer, it can also occur due to infiltration in cases of cancer arising in organs other than the bile ducts, gallbladder and pancreas. Endoscopic biliary drainage is the gold standard technique for distal bile duct stenosis. In recent years, endoscopic ultrasound-guided biliary drainage (EUS-BD) has been used as an alternative to percutaneous transhepatic biliary drainage (PTBD) in cases in which the use of endoscopic retrograde cholangiopancreatography (ERCP) was unsuccessful or considered difficult.

Methods: The literature search was done thorough the PubMed database. We searched the literature on published with the keywords biliary stenosis/biliary obstruction/ERCP/EUS-guided fine-needle aspiration (EUS-FNA)/EUS-BD/EUS-guided hepaticogastrostomy (EUS-HGS)/EUS-guided choledochoduodenostomy (EUS-CDS)/EUS-guided hepaticojejunostomy (EUS-HJS) and EUS-guided antegrade stenting (EUS-AS) from year 1976 to 2021. Literature was selected from retrospective studies/prospective studies/case reports/reviews and meta-analysis studies.

Conclusions: The development of endoscopic biliary drainage has led to an increase in the number of available options for biliary drainage in cases of distal bile duct stenosis. However, there is no dedicated device for EUS-BD, and generalization of the procedure remains questionable in EUS-BD. For each case, the most appropriate technique for biliary drainage should be selected after necessary considerations.

Keywords: Distal bile duct stenosis; endoscopic biliary drainage; endoscopic ultrasound-guided biliary drainage (EUS-BD); biliary strictures

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Introduction

Distal bile duct stenosis is a condition that causes obstructive jaundice and occurs not only in people with malignant diseases but also in people with benign diseases. With respect to malignant diseases, distal bile duct

stenosis is usually caused by biliary tract cancers such as cholangiocarcinoma and tumors of the papilla of Vater and pancreatic head; however, distal bile duct stenosis due to dissemination or metastasis of cancer arising in other organs has also been observed. Obstructive jaundice may

occur in 70% of patients with pancreatic cancer (1). The benign conditions that cause distal bile duct stenosis include immunoglobulin G4-related sclerosing cholangitis, chronic pancreatitis and the presence of inflammatory lesions; such stenosis can also occur postoperatively (2-4). Endoscopic biliary drainage is the gold standard technique for the treatment of distal bile duct stenosis; however, in difficult cases or cases in which treatment with other techniques was unsuccessful, percutaneous transhepatic biliary drainage (PTBD) has been selected as an alternative technique.

In recent years, endoscopic ultrasound (EUS)-guided biliary drainage (EUS-BD) has been used as an alternative technique for treatment. The approach to biliary drainage differs between benign and malignant diseases, and the current drainage method is controversial. There is also no consensus on whether transpapillary biliary drainage should be selected or EUS-BD should be performed. Based on the literature reports, this review was conducted for the purpose of clarifying one index for the selection method of biliary drainage for benign and malignant diseases. We present the following article in accordance with the Narrative Review reporting checklist (available at <https://dx.doi.org/10.21037/dmr-21-55>).

Methods

The literature search was done thorough the PubMed database. We searched the literature on published with the keywords biliary stenosis/biliary obstruction/ERCP/EUS-guided fine-needle aspiration (EUS-FNA)/EUS-BD/EUS-guided hepaticogastrostomy (EUS-HGS)/EUS-guided choledochoduodenostomy (EUS-CDS)/EUS-guided hepaticojejunostomy (EUS-HJS) and EUS-guided antegrade stenting (EUS-AS) from year 1976 to 2021. Literature was selected from retrospective studies/prospective studies/case reports/reviews and meta-analysis studies.

Biliary stenosis

The diseases that cause distal bile duct stenosis are diverse. While it is often observed in cases of biliary tract cancers and pancreatic cancer, bile duct stenosis can also occur due to infiltration of cancer arising in other organs (1,5,6). It results in obstructive jaundice and often requires biliary drainage.

EUS-FNA, bile duct biopsy, and bile duct brushing cytology are useful for the histological diagnosis of malignant bile duct stenosis. Results for evaluations of the

diagnostic accuracy of EUS-FNA for pancreatic tumors have been widely reported, with a reported sensitivity of approximately 90% and an average of specificity of 95% (7-11). Regarding transpapillary histological diagnoses of bile duct tumors, it has been found that intraductal biopsy has a sensitivity of 48%, and biliary brush cytology has a slightly lower sensitivity (45%); however, the sensitivity of a combination of both modalities (brush cytology and intraductal biopsy) has been reported to be 59% (12). In another study, direct biliary biopsies with peroral cholangioscopy (POCS) were found to have a sensitivity of 68.2%, which was higher than the sensitivity of endoscopic retrograde cholangiopancreatography (ERCP)-guided brushing, which was 21.4%; the overall accuracy of POCS-guided biopsies was 87.1%, and that for ERCP-guided brushing was 65.5% (13).

On the other hand, bile duct stenosis can also develop because of benign diseases. In clinical practice, bile duct obstruction due to common bile duct stones is often observed; however, few cases of bile duct stenosis have been reported. The benign diseases that most commonly cause distal bile duct stenosis include chronic pancreatitis and immunoglobulin G4-related sclerosing cholangitis associated with autoimmune pancreatitis (AIP), and bile duct lesions have been reported to occur in 13–21% of cases of chronic pancreatitis (2,3,14). Although it is necessary to confirm the lack of coexistence of malignant diseases, the usefulness of EUS-FNA for the diagnosis AIP has been reported (15,16). In cases of benign distal bile duct stenosis, it is necessary to rule out the possible coexistence of malignant disease through histological examinations. Often, with respect to stent choices and techniques used for biliary drainage, there are differences between the treatment methods selected for malignant and benign disorders; such differences have been discussed later in this review.

Endoscopic retrograded cholangiopancreatography

ERCP is the gold standard technique for biliary drainage. It involves the use of a transpapillary approach in which drainage is performed using plastic stents (PSs) or self-expandable metallic stents (SEMSs). The use of PSs or SEMSs for malignant biliary strictures has been reported several times; in particular, the indwelling of SEMSs has been reported to be very useful (17,18) (*Figure 1*). Chemotherapy is expected to prolong the survival of patients with biliary pancreatic cancer. The patency period

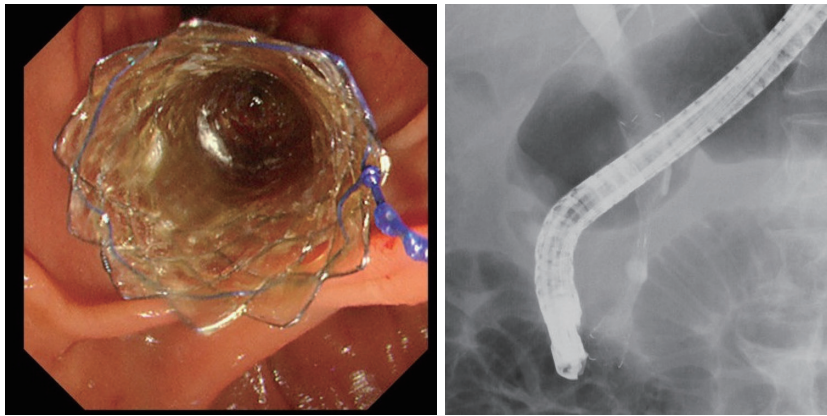


Figure 1 Deployment of a SEMS with ERCP for malignant biliary stenosis. SEMS, self-expandable metallic stent; ERCP, endoscopic retrograde cholangiopancreatography.

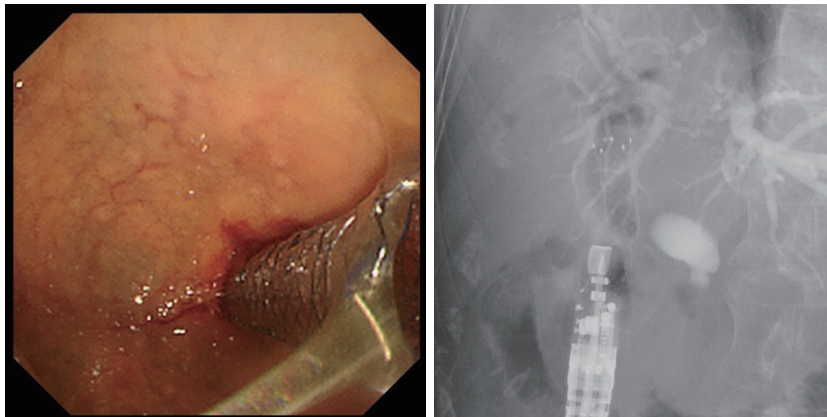


Figure 2 Deployment of a SEMS with EUS-CDS for malignant biliary stenosis. SEMS, self-expandable metallic stent; EUS-CDS, EUS-guided choledochoduodenostomy.

of SEMSs is longer than that of PSs, and through the use of SEMSs, frequent re-interventions can be avoided; however, PSs are commonly used for benign distal bile duct stenosis, and their usefulness has also been reported (19-21). Although a long patency period of SEMSs can be expected, no fatal adverse events associated with SEMS placement have been observed. It has also been reported that SEMS removal can be performed without the occurrence of adverse events (19,20). In transpapillary biliary drainage, both PS and SEMS are used as effective biliary drainage at many facilities. However, it is not possible to perform it in all cases, and it is necessary to discuss the drainage method for patients with difficult transpapillary biliary drainage.

EUS-BD

The transition to EUS-BD began in 1996, when Wiersema *et al.* reported their novel technique of performing endosonography-guided cholangiopancreatography (22). In 2001, Giovannini *et al.* first reported the use of EUS-BD for EUS-guided bilioduodenal anastomosis (23). Since then, EUS-BD has been developed as an alternative to PTBD for cases in which the performance of ERCP is unsuccessful or considered difficult (*Figure 2*).

EUS-BD includes EUS-HGS, which involves the anastomosis of the stomach to an intrahepatic bile duct, EUS-CDS, which involves the anastomosis of the duodenum to an extrahepatic bile duct, and EUS-guided

hepaticoenterostomy or EUS-HJS (EUS-HES/HJS), which involves the anastomosis of the small intestine to an intrahepatic bile duct.

EUS-CDS is mainly performed for malignant biliary strictures, and although its performance with PSs has been reported, currently, it is usually performed with SEMSs (24-26). Its use is indicated for cases in which there is distal bile duct stenosis without stenosis in the duodenal bulb; currently, it is used for primary drainage and as an alternative to PTBD; in this regard, randomized control trials have also been conducted (27-30). Reportedly, the technical success rate is 90.9-100%, and the incidence rate is 7-23%. Adverse events include biliary peritonitis, stent migration, and bleeding; however, the incidence of fatal adverse events is not high. The performance of EUS-CDS with lumen-apposing metallic stents has also been reported, and the simplification of the procedure is expected to cause an improvement in the success rate and decrease in the incidence of adverse events (31-33).

EUS-HGS may be performed not only in cases of malignant bile duct stenosis but also in cases of benign bile duct stenosis. PSs are also widely used for EUS-HGS. With respect to the use of EUS-HGS with SEMSs for malignant bile duct stenosis, success rates >90% have been reported; further, the occurrence of adverse events such as bleeding, peritonitis and cholangitis, has been reported (34-37). The use of EUS-HGS as well as EUS-CDS for primary drainage has been reported (38).

With the development of new stents and devices with small-diameter devices, the performance of EUS-HGS without fistula dilation has also been reported (39-41). Additionally, the use of a 22-gauge EUS-FNA needle and 0.018-inch guidewire for EUS-HGS has been reported (42,43). EUS-HGS without fistula dilation or EUS-HGS with small-diameter needles may be considered for the prevention of bile leakage. In this regard, Yamamoto *et al.* performed a study to determine risk factors for adverse events associated with bile leakage during EUS-HGS (44).

EUS-HES/HJS is a technique for carrying out drainage by puncturing the intrahepatic bile duct. The technique is similar to EUS-HGS; however, in EUS-HES/HJS the punctured side is the postoperative intestinal tract. For postoperative autopsy, the approach from the duodenal papilla to distal bile duct stenosis requires balloon-assisted endoscopy and can sometimes be difficult. EUS-HES allows for simple bile duct drainage by puncturing the intrahepatic bile duct from a modified anatomy. Regarding EUS-HES, the use of a method in which the distal bile duct

was approached through a fistula formed by EUS-HES has been reported; this method has been described later in this review.

The development of dedicated devices for EUS-BD is expected to lead to an increase in the procedure's success rate and a decrease in the incidence of associated adverse events; furthermore, it is expected that it will be possible in many facilities.

The outcomes of previously reported EUS-BD are from the tertiary hospital, and the discussing point is that the procedure has not been generalized. The lack of a dedicated device is also considered to be a factor hindering the generalization of the procedure.

EUS-AS

EUS-AS is a method of approaching distal bile duct stenosis through a fistula formed by EUS-HGS or EUS-HES/HJS. It is suggested that EUS-AS, which is performed during EUS-HES/HJS, may be effective (45,46). Unlike the retrograde approach from the duodenal papilla, with the antegrade approach, sphincterotomy or balloon dilation of the papilla of Vater is expected to be difficult in some cases. In cases of malignant distal bile duct stenosis, stent deployment may often be the main purpose of treatment techniques. Therefore, the occurrence of post-procedural pancreatitis may be unavoidable when stents are deployed across the papilla of Vater. However, there have been few reports of the occurrence of pancreatitis after EUS-AS. In a study in which the use of EUS-AS and PTBD for malignant distal bile duct obstruction in patients with surgically altered anatomy were compared, with respect to safety and efficacy, EUS-AS was found to be similar to PTBD; thus, EUS-AS is considered an effective method (47). EUS-AS requires not only EUS-BD but also ERCP, and it should ideally be performed by skilled endoscopists.

Conclusions

We reviewed reports on the method and current status of endoscopic biliary drainage. We will discuss strategies for endoscopic biliary drainage for benign and malignant stenosis in this part.

In cases of malignant biliary strictures, the methods used for endoscopic biliary drainage may differ depending on whether the strictures are resectable or unresectable. In cases of malignant biliary strictures, EUS-BD is not guaranteed to be safe, and in such cases, biliary drainage

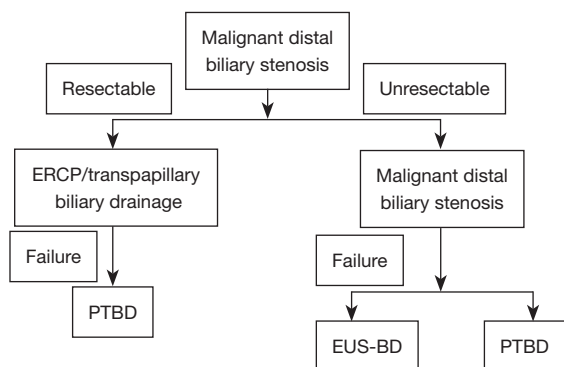


Figure 3 Flowchart of the strategy of biliary drainage for malignant distal biliary stenosis. ERCP, endoscopic retrograde cholangiopancreatography; PTBD, percutaneous transhepatic biliary drainage; EUS-BD, endoscopic ultrasound-guided biliary drainage.

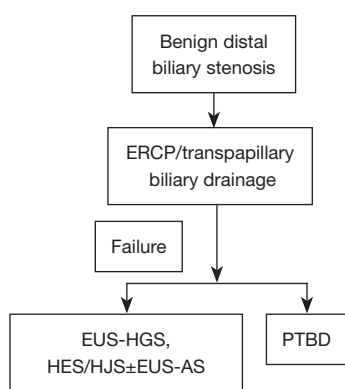


Figure 4 Flowchart of the strategy of biliary drainage for benign distal biliary stenosis. ERCP, endoscopic retrograde cholangiopancreatography; EUS-HGS, EUS-guided hepaticogastrosomy; EUS-HES/HJS, EUS-guided hepaticoenterostomy or hepaticojejunostomy; EUS-AS, EUS-guided antegrade stenting; PTBD, percutaneous transhepatic biliary drainage.

with ERCP should be selected. For cases involving resectable malignant biliary strictures in which performing ERCP is difficult, PTBD, the safety of which has been established, should be selected. On the other hand, EUS-BD is considered an option for unresectable malignant biliary strictures; however, despite the safety and success rate of EUS-BD, it is unlikely to be used commonly for primary drainage. EUS-BD is considered to be a very effective technique for patients for whom the performance

of biliary drainage with ERCP is difficult (Figure 3).

ERCP is considered the first choice for treating benign distal bile duct stenosis. The use of EUS-BD for benign biliary stenosis has been reported many times, and EUS-HGS and EUS-HES/HJS are considered to be particularly effective for cases in which transpapillary treatment is difficult due to postoperatively altered anastomosis. However, it is safe to limit the use of EUS-BD to cases of benign biliary strictures in which, with respect to safety, the performance of biliary drainage with ERCP is difficult (Figure 4).

The development of endoscopic biliary drainage has led to an increase in the number of available options for biliary drainage in cases of distal bile duct stenosis. However, there is no dedicated device for EUS-BD, and generalization of the procedure remains questionable in EUS-BD. For each case, the most appropriate technique for biliary drainage should be selected after necessary considerations.

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Footnote

Reporting Checklist: The authors have completed the Narrative Review reporting reporting checklist. Available at <https://dx.doi.org/10.21037/dmr-21-55>

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at <https://dx.doi.org/10.21037/dmr-21-55>). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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