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Invited Review Article

Endoscopic ultrasonography-guided biliary drainage: an alternative to percutaneous transhepatic puncture

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A B S T R A C T

Endoscopic retrograde cholangiopancreatography (ERCP) is the first-choice treatment for patients with obstructive jaundice. However, there are patients in whom bile duct access is not possible. In these patients, percutaneous transhepatic biliary drainage (PTBD) may be performed as an alternative biliary drainage method. PTBD is reportedly associated with a moderate mortality rate. In recent years, endoscopic ultrasonography-guided biliary drainage (EUS-BD) in patients with failed ERCP has been reported as an alternative to PTBD. EUS-BD is classified into three techniques: (1) EUS-guided choledocoduodenostomy (EUS-CDS); (2) EUS-guided hepatogastrostomy (EUS-HGS); and (3) EUS-guided antegrade (EUS-AG) approach. Herein, we focus on the current status of EUS-BD in light of these techniques.

Keywords: EUS-guided antegrade stenting, endoscopic ultrasonography-guided biliary drainage, EUS-guided choledocoduodenostomy, EUS-guided hepaticogastrostomy

Introduction

Stent placement under endoscopic retrograde cholangiopancreatography (ERCP) is an established procedure for patients with biliary obstruction. The technical success rate of ERCP was reported to be over 90%.[1] On the other hand, there are patients in whom bile duct access is not possible because of failed biliary cannulation or an inaccessible papilla. In these cases, percutaneous transhepatic biliary drainage (PTBD) is an alternative biliary drainage method. However, PTBD has an associated mortality rate of 0%–5.6%.[2,3]

In recent years, endoscopic ultrasonography-guided biliary drainage (EUS-BD) in patients with failed ERCP has been reported to be an alternative method to PTBD or surgical interventions. The first report of EUS-BD was made by Giovannini et al[4] in 2001. Many endoscopists have described EUS-BD, and following their reports, EUS-BD is presently classified into 3 techniques as follows: (1) EUS-guided choledocoduodenostomy (EUS-CDS); (2) EUS-guided hepatogastrostomy (EUS-HGS); and (3) EUS-guided antegrade (EUS-AG) approach. However, there are no criteria regarding which procedure should be selected from these 3 different techniques, and the selection is usually entrusted to each institution. Herein, we review the status of EUS-BD in light of these 3 different techniques.

Definitions

Technical success rate refers to the success rate of the procedure. Clinical success rate indicates the improvement rate of the symptoms or laboratory data after the procedure.

(1) EUS-guided choledocoduodenostomy (EUS-CDS)

Actual technique for EUS-CDS

When a curved linear array endoscope is used for EUS-CDS, the extrahepatic bile duct is visualized in a long or short position. On the other hand, when a forward-view echoendoscope is used on EUS-CDS, the extrahepatic bile duct is visualized in a long position, because the visualization of the extrahepatic bile duct in the short position is difficult for anatomical reasons. After careful observation of the extrahepatic biliary duct and the absence of interposing vessels using color Doppler, the extrahepatic bile duct is punctured with a 22 G or 19 G FNA needle (Sono-tip Pro Control, Medi-Globe, Rosenheim, Germany). After the stylet is removed, bile juice is aspirated and the contrast medium is injected into the bile duct for cholangiography (Fig. 1A). Then, a 0.025-inch guidewire (Visiglide, Olympus medical systems, Tokyo, Japan) is inserted into the outer sheath. If necessary, a biliary catheter for dilation (Soehendra biliary

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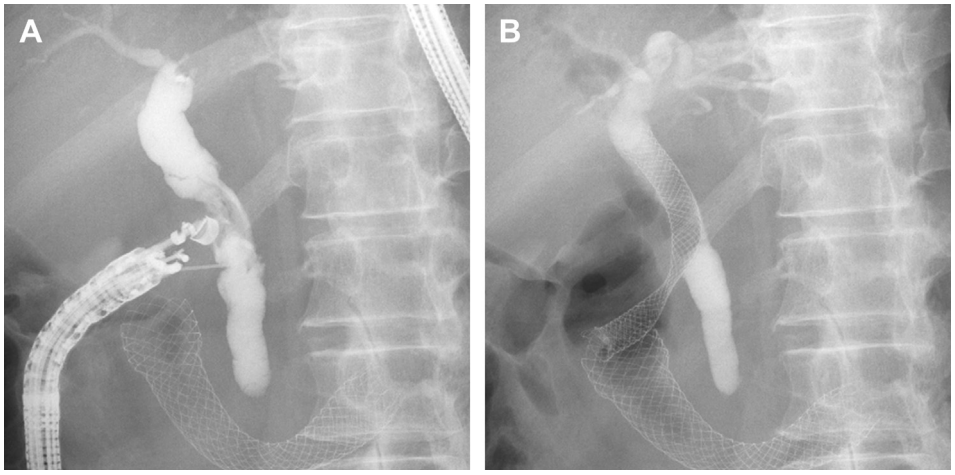

Fig. 1. Cholangiogram findings of EUS-guided choledocoduodenostomy. (A) Puncture is performed to the extrahepatic bile duct with 19 G needle from the duodenal bulb, and the contrast medium is injected into the bile duct. (B) A fully covered metal stent is placed through the choledocoduodenostomy fistula.

dilator, Cook Endoscopy, Germany), an electrocautery dilator (Cyst-gastro-sets, ENDO-FLEX, Voerde, Germany), a 4-mm papillary balloon dilator (Hurricane RX, Boston scientific, MA, USA), or a combination of these materials, is used for dilation of the fistula. Finally, a 5-Fr to 10-Fr biliary plastic stent or an 8-mm to 10-mm covered metal stent (CMS) is placed into the extrahepatic bile duct for choledocoduodenostomy (Fig. 1B).

Review of published data for EUS-CDS (Table 1)

Technical and clinical success rate

Total 348 cases from 41 papers regarding EUS-CDS have been reviewed.[4–44] The average technical success rate for EUS-CDS was 91.8% (312/340). The reasons for the technical failure of EUS-CDS were stent impaction,[9,32] failure of fistula dilation,[23] and guidewire dislodgement.[5] Thirty four papers described the clinical success rates of EUS-CDS. The average clinical success rate was 94.5% (223/236). There were no significant differences in success rate between the plastic stents and the metal stents [94.1% (64/68) vs. 98.2% (115/117), $P = 0.27$].

Adverse events

Thirty-eight papers described complications related to EUS-CDS. The average complication rate related to EUS-CDS was 14.8% (48/324). The most common complication associated with EUS-CDS was peritonitis 4.0% (11/258). The other complications were pneumoperitonitis 3.1% (8/258), bleeding 2.7% (7/258), bile leak 1.9% (5/258), perforation 1.2% (3/258), abdominal pain 1.2% (3/258), biloma 0.8% (2/258), cholangitis 0.8% (2/258), pancreatitis 0.4% (1/258), hemobilia 0.4% (1/258), and stent misplacement 0.4% (1/258). There were no significant differences in complication rate between the plastic stents and the metal stents [16.4% (17/104) vs. 11.0% (17/154), $P = 0.22$]. However, these data have limitations because dedicated stents such as a partially covered metal stent (PCMS) with an anti-migrating flap[38] and a lumen-apposing metal stent[40,43] were included in the metal stent group.

There were 26 papers that described the details of late complications except stent occlusion. The average late complication rates after EUS-CDS was 7.3% (13/177), and the causes of all the complications were stent migration. Plastic stents accounted for 4.2% (4/72) and metal stents 7.6% (6/79). There was no significant difference in the late complications rates between plastic stents and metal stents ($P = 0.59$). Moreover, there was no reported mortality related to EUS-CDS.

(2) EUS-guided hepaticogastrostomy (EUS-HGS)

Actual technique for EUS-HGS

By using a curved linear array echoendoscope in a short position, the intrahepatic bile duct is visualized through the stomach. EUS-HGS has some differences in terms of points of the puncture route and placement of a guidewire compared with EUS-CDS. EUS-HGS has to puncture and penetrate the liver parenchyma. After puncturing the left intrahepatic bile duct (segment 2 or 3) using a 22 G or a 19 G FNA needle, a guidewire is placed in the right intrahepatic bile duct, common bile duct, or duodenum via the stricture and papilla antegradely. The details of the methods and the use of the devices for the stent placement followed the EUS-CDS procedure (Fig. 2A). Finally, a 5-Fr to 10-Fr biliary plastic stent or an 8-mm to 10-mm CMS is placed into the intrahepatic bile duct for hepaticogastrostomy (Fig. 2B).

Review of published data for EUS-HGS (Table 2)

Technical and clinical success rate

Total 153 cases from 21 papers regarding EUS-HGS have been reviewed.[5,14,19,21,24,26,31,35,37,38,41,42,45–53] The average technical success rate, for EUS-HGS was 95.4% (146/153). The reasons for the technical failure of EUS-HGS were no visualization of suitable target ducts,[21] inability to place the guidewire into the intrahepatic duct,[31,48] slipping out of the guidewire during the fistula dilation,[54] and stent misplacement.[37]

Sixteen papers described the clinical success rate of EUS-HGS. The average clinical success rate was 90.9% (100/110). There were