Moving closer to developing an optimal algorithm for EUS-guided biliary drainage

Endoscopic ultrasonography-guided biliary drainage (EUS-BD) was developed more than a decade ago[1] as the fourth drainage technique (surgical drainage, percutaneous transhepatic drainage, endoscopic transpapillary drainage, EUS drainage). At present, ERCP is the first-line therapy for biliary decompression, and percutaneous transhepatic biliary drainage (PTBD) has been traditionally performed when ERCP fails. However, EUS-BD has recently replaced PTBD in high-volume centers that provide interventional EUS because it appears as effective as PTBD, as shown by the results of randomized controlled trials (RCT).[2,3] Presently in our institution we have replaced PTBD with EUS-BD regardless of whether the disease is benign or malignant.

In terms of comparison with ERCP, no studies thus far have compared EUS-BD and ERCP, owing to the present limited indication of failed ERCP cases, although a multicenter non-RCT has suggested that both techniques were similarly effective.[4] In the recent study by Tyberg et al,[5] it was surprising that only 52 patients with failed ERCP were prospectively enrolled in the registry during the approximately 4.5 years of the study. This means that biliary drainage was mostly completed with the use of only ERCP by skilled endoscopists in their interventional endoscopy high-volume center. These data are similar to those in other high-volume centers where skilled endoscopists are present.[6,7] Thus, although current evidence is limited, ERCP still receives a high priority for biliary drainage, not only in standard endoscopic units but also in high-volume centers that provide interventional EUS.

Broadly, EUS-BD includes several approaches such as EUS-guided choledochoenterostomy (mostly choledochoduodenostomy [EUS-CDS]), EUS-guided hepaticoenterostomy (mostly hepaticogastrostomy [EUS-HGS]), EUS-rendezvous technique (EUS-RV), and EUS-guided antegrade stenting (EUS-AS). Basically, EUS-BD is divided into 2 access routes from the viewpoint of anatomic access, namely, intrahepatic (IH) and extrahepatic (EH) access routes.[8] The former route includes EUS-HGS, EUS-RV, and EUS-AS. The latter route includes EUS-CDS, EUS-RV, and EUS-AS. The latest summary report including all procedures showed that the technical success rates and adverse event rates of EUS-HGS (n = 340), CDS (n = 153), RV (n = 267), and AS (n = 39) were 95% and 17%, 92% and 15%, 81% and 11%, and 77% and 5%, respectively.[9] To date, the selection of each technique has depended on the preference and experience of the endoscopist in almost all institutions. However, there is no perfect technique that can accomplish biliary drainage in various patients. For instance, the IH approach is difficult or not possible in patients with nondilated intrahepatic bile duct (IHBD). By contrast, the EH approach is possible in patients with a distal bile duct stricture but not possible in patients with complete gastric outlet obstruction (GOO) or nearly complete blockage of the EH bile duct. Therefore, I believe that the selection of the EUS-BD technique must be flexible according to the patient's anatomy (eg, Whipple resection or Roux-en-Y) and condition (eg, GOO).[10]

> Recently in our own unit we have attempted performing antegrade stenting with a metal stent as much as possible in cases of EUS-guided hepaticogastrostomy to avoid unnecessary adverse events. However, the use of 2 metal stents appears expensive, although we mostly use a plastic stent for EUS-HGS in such cases.

In their study, Tyberg et al[5] proposed a novel algorithm with individualization based on the patient's anatomy. Patients with a dilated IHBD on cross-sectional imaging and confirmed by EUS visualization received an IH approach with AS or HGS stent placement if anterograde placement was not feasible. Patients with a nondilated IHBD on cross-sectional imaging and confirmed by EUS visualization underwent the EH approach with an RV technique or a transenteric stent placement if RV was not feasible. If the IH approach was attempted but unsuccessful, conversion to the EH approach was performed. Thus far, numerous debates about the optimal drainage approach (EH vs IH) have arisen. I suggest that either the HGS or the CDS technique can be selected because

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they have similar outcomes[9] when transmural drainage is scheduled in case of a distal biliary stricture. However, when RV or AS is considered, I believe that EUS-HGS is optimal compared with EUS-CDS, theoretically because the needle is punctured toward the downstream of the bile duct from the peripheral IHBD during the IH approach, and guidewire manipulation is relatively easy to allow subsequent EUS-RV and EUS-AS. However, because the needle is usually punctured toward the hilar portion during the EH approach, it appears difficult to direct the guidewire across the stricture and papilla for the completion of EUS-RV and EUS-AS except for a needle puncture at a short scope position or a very long scope position (the scope tip is positioned toward the downstream of the bile duct), which allows directing the guidewire across the stricture and papilla. Thus, I agree that the IH approach should be the first-line approach compared with the EH approach in EUS-BD. A similar algorithm according to guidewire manipulation was been proposed in 2013 by Park et al.[11] These 2 algorithms suggest that guidewire manipulation is the most difficult step and the key factor for a successful EUS-BD procedure.

In the study protocol of Tyberg et al,[5] EUS-RV and EUS-AS were first attempted. Certainly, because EUS-RV and EUS-AS allow physiologic bile flow and stent placement with the use of conventional plastic and metal stents, they appear to be ideal drainage techniques once the procedures are successfully accomplished. However, there are several concerns. First, the success rates of these techniques when compared with those of transmural drainage techniques such as EUS-HGS and EUS-CDS are not very high, on the basis of a previous report from a high-volume center providing interventional EUS.[9] Second, EUS-RV and EUS-AS may entail longer procedure times than simple transmural drainage alone. This in turn may cause unnecessary adverse events such as bile leakage during the long procedure and eventually result in the procedure not being accomplished. Regarding adverse events, surprisingly, Tyberg et al[5] closed the puncture site only within the gastric lumen with a hemoclip or an over-the-scope clip. It concerns me that care was not taken in the hepatic puncture site. Bile leakage might be rare in cases involving the RV procedure because of the thinner needle tract, but it might possibly occur in cases involving the AS procedure with stent dysfunction. Third, EUS-RV and EUS-AS may cause procedure-related pancreatitis, which basically never occurs in simple transmural drainage. On the basis of these critical concerns, I believe that as a broad algorithm, simple transmural drainage techniques such as EUS-HGS and EUS-CDS appear better as reliable and safe procedures in standard endoscopic units and community hospitals. After the completion of the fistula or at the time of stent exchange resulting from stent occlusion, antegrade stenting may be the suboptimal technique for use in such units. Recently in our own unit we have attempted performing antegrade stenting with a metal stent as much as possible in cases of EUS-HGS to avoid unnecessary adverse events. However, the use of 2 metal stents appears expensive, although we mostly use a plastic stent for EUS-HGS in such cases.

Interestingly, I have so far thought that a metal stent was usually used for EUS-BD in the authors' unit. However, Tyberg et al[5] mentioned that the type of stent selected (plastic vs metal) was dependent on the clinical scenario because that decision depended on several factors, including the degree of ductal dilatation, the underlying disease, whether the guidewire was able to cross the anastomosis, the length of the fistulous tract, and the potential resectability in the patient. These descriptions should be considered very important points regarding the EUS-BD procedure. Several reports have suggested that covered metal stents should be used, or, in other words, should not be avoided, because they reduce bile leakage and bleeding. However, I believe that stent selection in EUS-BD should be decided on the basis of the clinical scenario, similarly to conventional ERCP. In fact, we occasionally use dedicated plastic stents in the settings of benign diseases and a non-dilated IHBD for EUS-HGS.[12]

There is a big obstacle in this present algorithm. Endosonographers should master all the techniques (ie, EUS-HGS/CDS/RV/AS) to be able to follow the algorithm. However, because the number of patients is usually limited as far as keeping the strict indication for failed ERCP cases, it may not be realistic for all endosonographers to be able to acquire the skills for all the techniques. Thus, the inclusion and use of a dry or wet training model dedicated for EUS-BD[13] to the techniques are mandatory.

In conclusion, the algorithm proposed by Tyberg et al[5] will be able to make one stream to the effective and safe performance of EUS-BD. although it is not yet perfect. Indeed, the establishment of an optimal algorithm is eagerly anticipated in the near future after sufficient and in-depth discussion by skilled interventional endoscopists with improvement of dedicated EUS-BD devices.

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Abbreviations: EUS-BD, endoscopic ultrasonography-guided biliary drainage; PTBD, percutaneous transhepatic biliary drainage; RCT, randomized controlled trial; EUS-CDS, EUS-guided choledochoduodenostomy; EUS-HGS, EUS-guided hepaticogastrostomy; EUS-RV, EUS-rendezvous technique; EUS-AS, EUS-antegrade stenting; IH, intrahepatic; EH, extrahepatic; IHBD, intrahepatic bile duct; GOO, complete gastric outlet obstruction.

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