Training the next generation of advanced endoscopists in EUS-guided biliary and pancreatic drainage: learning from master endoscopists

EUS-guided biliary and pancreatic drainage, an advanced endoscopic procedure, engenders its own unique challenges in patients for whom conventional cannulation has failed. Judging by the popularity of the lectures on this topic at this year’s Digestive Disease Week, there appears to be a growing interest in learning more on this technique. Time and patience are crucial to achieving mastery of this procedure. Only endoscopists highly skilled in both EUS and ERCP should perform these procedures. As these procedures continue to evolve, we must address how to and whether to adequately train the next generation of interventionalists in these techniques. Therefore, to expand the horizons of the trainee’s techniques and address the training process and thoughts related to this procedure, in this month’s Fellows’ Corner, we bring together a group of master endoscopists who share with us some tips and tricks related to this procedure. Dr Jessica Widmer, an advanced endoscopy fellow from New York Presbyterian Hospital-Weill Cornell Medical Center in New York, leads this effort.

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ERCP is the standard of care for therapeutic interventions of the biliary and pancreatic ductal systems. The technical success rate has been reported as more than 90%, with less than a 10% complication rate.1 In a small subset of patients, conventional access is not possible with ERCP. In the past, these patients were treated with surgical or percutaneous drainage. With the evolution of therapeutic EUS, we now have the capability for EUS-guided biliary or pancreatic duct drainage. First introduced by Weirsema et al in 1996 to guide repeat ERCP,2 this technique is now internationally established as an alternative to surgical and percutaneous drainage modalities, with high success rates and minimal complications. Only endoscopists highly skilled in both EUS and ERCP should perform these procedures, and as they continue to evolve, we must address how to adequately train the next generation of interventionalists in these techniques. We have asked for advice from some of the pioneers in this field.

Key Points
- Only endoscopists with skills in both EUS and ERCP should perform EUS-guided biliary and pancreatic drainage procedures.
- EUS-guided drainage should not be used to compensate for a lack of ERCP skills.
- Most trainees are not obtaining the experience needed to perform these procedures.
- Trainees who exhibit superior technical skills may begin participating in procedures such as EUS-guided cystgastrostomy or various aspects of the EUS-guided drainage technique under their mentor’s supervision.
- When the trainee takes on the responsibility of performing these procedures, one must be equipped to manage the potential complications.

BILIARY DRAINAGE

Echoendoscopic biliary drainage is an option for treating obstructive jaundice when ERCP fails. These procedures compose alternative methods to surgery and percutaneous transhepatic biliary drainage, and it has been made possible by the continuous development and improvement of echoendoscopes and accessories. The development of linear array echoendoscopes in the early 1990s brought a new approach to the diagnostic and therapeutic dimension of echoendoscopic capabilities, making it possible to perform a puncture with direct ultrasonographic view. Despite the high success rate and low morbidity of biliary drainage by ERCP, it may not be
possible due to tumor ingrowth within a stent, tumor gut compression, periampullary diverticula, and anatomic variation.

The echoendoscopic technique starts with needle puncture and contrast medium injection of the left biliary tree. When the procedure is performed from the gastric wall, access is made through hepatic segment III. From the duodenum, the common bile duct is punctured. Dilatation of the puncturing tract is performed by using a 6F cystotome or dilating catheter. A plastic or metallic stent is then introduced. The technical success of hepatocystogastrostomy is near 98%, and complications—pneumoperitoneum, choleperitoneum, infection, and stent dysfunction—are present in about 20% of cases. To prevent bile leakage, two stents have been used: a long, uncovered, metallic stent (8 or 10 cm) is initially introduced, followed by a second, shorter, fully covered stent within the first stent to bridge the bile duct and the stomach. EUS-guided biliary drainage also can be performed from the duodenum. Choledochoduodenostomy has an overall success rate of 92%, with complications in the area of 14%, including pneumoperitoneum and focal bile peritonitis. Over the last 10 years, the technique was performed in expert centers by endoscopists with experience in both EUS and ERCP. This seems to be a general guideline to safer procedure execution.

PANCREATIC DRAINAGE

The development of interventional EUS also has provided better access to the region of the pancreas. Just as pancreatic fluid collections, such as pseudocysts, can be successfully drained from the stomach or duodenum by endoscopic cystenterostomy or cystgastrostomy, the same technique could be used to access a dilated pancreatic duct when the duct cannot be drained by conventional ERCP because of complete obstruction. The main indications include (1) stenosis of the pancreaticojejunostomy or pancreaticogastrostomy anastomosis after Whipple resection, causing acute recurrent pancreatitis, (2) main pancreatic duct stenosis due to chronic pancreatitis, (3) post-acute pancreatitis, or (4) pancreatic trauma after failed ERCP. EUS-guided pancreaticogastrostomy or bulbo-stomy offers an alternative to surgical intervention.

With the use of a linear interventional echoendoscope, the dilated main pancreatic duct is well-visualized. Pancreatic drainage is then performed under combined fluoroscopic and US guidance, with the tip of the echoendoscope positioned such that the inflated balloon is in the duodenal bulb while the accessory channel remains within the stomach. A needle (19 gauge, Echotip Ultrasound Needle, EUSN-19-T, or Access Needle; Cook Ireland Ltd, Limerick, Ireland) is inserted via the stomach into the proximal pancreatic duct, and contrast medium is injected. Opacification demonstrates a pancreatogram. The needle is exchanged over a guidewire (0.02 inch diameter; Terumo Europe, Leuven, Belgium) for a diathermic sheath (prototype Cysto-Gastro set; EndoFlex, Voerde, Germany), needle-knife, or dilating catheter, which is then used to enlarge the channel between the stomach and main pancreatic duct. After exchange over a guidewire (rigid 0.035-inch diameter), a 7F pancreaticogastrostic stent is deployed.

From the technical point of view, the EUS-guided approach has two crucial steps. The first is the identification of an optimal point to puncture without intervening vessels and with a short distance between the duct and the gut wall. Once this point is identified, the endoscope should be straightened as much as possible in a stable position. The second critical step is that once the puncture has been performed, and the guidewire is curled within the duct, the wall dilator must be introduced without losing the endoscope position and under ultrasonographic view. Once the dilator has been inserted through the fistula, the ultrasonographic view is no longer needed, and the dilation and stent insertion can be made under endoscopic view.

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The EUS drainage techniques have exciting potential but are performed mostly in tertiary-care referral centers by expert therapeutic endoscopists. Only endoscopists who are skilled at both ERCP and EUS should perform this procedure to avoid potential serious complications. Additionally, trained hepatobiliary surgeons and interventional radiologists should be available in the event of failure or complication.

Although many case series have been reported, firm conclusions are limited because of great variations among studies in the endoscopic approaches applied, procedural goals, technical and clinical endpoints, definitions of success, and duration and extent of follow-up. Furthermore, we lack data from well-designed, prospective, randomized, controlled studies comparing different therapeutic approaches.

Currently, there are no set guidelines on how to train young interventionalists in these techniques. We do believe that EUS-guided access should be performed under supervision until at least 10 procedures have been performed completely by the trainee. It is not a method to be used by novice endoscopists, but consideration can be given to advanced endoscopy fellows who already have trained in basic and advanced EUS and ERCP. In our Learning Center, we have a program in which the trainee should participate in 6 months of advanced therapeutic EUS. During that time, additional procedures are introduced, including celiac plexus neurolysis, pseudocyst drainage, and alcohol ablations.
EUS-guided biliary and pancreatic drainage incorporates elements from EUS: linear pancreateobiliary anatomy and EUS-guided FNA of small targets skills. However, these techniques use only about 20% of skills needed to perform EUS-guided drainage. What EUS-guided drainage really incorporates is skills in fluoroscopy-guided interventions of the ducts such as guidewire manipulation, dilation, and stenting, which comprise about 80% of the skills needed. For training in ERCP, the learning process is said to take at least 180 procedures with an 80% successful cannulation rate. Realistically, it is closer to 500 procedures with a 90% successful cannulation rate or even 1000 procedures with 95% success. Few trainees are actually obtaining the experience needed to develop these skills, and it is important to say that EUS-guided drainage should not be used for lack of adequate ERCP skills, similar to precut sphincterotomy as a substitute for cannulation skills. During fellowship, the trainee should master patient selection, procedural set-up including sedation, and device nuances (needles, guidewires, dilators). Knowing these details will prepare trainees for their opportunities. It can be helpful to see a mentor sweating with needle-guidewire constraints and keeping the echoendoscope in a stable, stationary position. One way to begin developing the skills necessary for EUS-guided drainage is to begin with a more common, easier target such as a pseudocyst. In order to be proficient in this technique, one should complete at least 25 procedures, but it is probably difficult to obtain these numbers during an advanced endoscopy fellowship, particularly if mentors are still fine-tuning their own techniques. The notion of complexity levels creates an opportunity for supervised hands-on teaching of EUS-guided drainage techniques. Similar to the ERCP complexity scale: removal of common bile duct stones <1 cm shares common skills but is easier than bilateral metal stenting in Klatskin tumors, so is EUS-guided rendezvous at the other end of the spectrum from pancreatic juice leakage if the stent placement is not successful. Third, current stents are not dedicated for pancreatic juice leakage if the stent placement is not successful. This procedure comes at a skill level of at least 1000 lifetime ERCPs (6-7 years at a medium volume or 3-4 years at a high-volume endoscopy center after fellowship).

Before initiating these techniques, fellows should discuss the cases and review imaging with their mentors, before and after the cases, to learn from each experience. During fellowship one learns the techniques and the foundation to perform EUS-guided drainage, but the final skill set will be acquired when you are done with training and in practice.

One must realize that stakes at EUS-guided drainage are higher than with ERCP: it is a win-all, lose-all situation. There are no chances for repeat access; you either succeed or you end up with complications. This notion makes hands-on teaching on patients difficult, so it may be beneficial to obtain early experience with animal models. Behind these teaching initiatives, there is always a persistent fellow pushing mentors to get it done. In summary, no one should get frustrated because he or she is not learning hands-on EUS-guided drainage during fellowship. This procedure comes at a skill level of at least 1000 lifetime ERCPs (6-7 years at a medium volume or 3-4 years at a high-volume endoscopy center after fellowship). Before initiating these techniques, fellows should discuss the cases and review imaging with their mentors, before and after the cases, to learn from each experience. During fellowship one learns the techniques and the foundation to perform EUS-guided drainage, but the final skill set will be acquired when you are done with training and in practice.

In my personal opinion, EUS-guided biliary drainage and pancreatic duct drainage are more sensitive than other interventional EUS procedures such as pancreatic pseudocyst drainage. There are several hurdles to surpass during the procedure. First, the maneuverability of the guidewire though small-caliber needles is usually difficult and can result in wire shearing. Second, once the large tract is created by using a dilating balloon and/or electrical cautery needle, apart from drainage of the fluid collection like pseudocyst drainage, EUS-guided biliary drainage and pancreatic duct drainage can cause continuous bile or pancreatic juice leakage if the stent placement is not successful. Third, current stents are not dedicated for EUS-guided biliary drainage and pancreatic duct drainage. This suggests that dysfunction of the stent is possible even if the stent is placed correctly, leading to bile or pancreatic juice leakage and unexpected stent migration. Therefore, I recommend that endosonographers perform more than 10 cases of EUS-guided pancreatic pseudocyst drainage (ideally more than 20 cases) to learn the techniques and trouble shooting. Then, they can perform EUS-guided biliary drainage with the assistance of experienced endosonographers. There are several techniques in EUS-guided biliary drainage—for example, rendezvous, hepaticogastrostomy, choledochoduodenostomy, and antegrade stenting. After performing more than 10 EUS-guided biliary drainage procedures, physicians can perform EUS-guided pancreatic duct drainage, because it is much more difficult to correctly advance the needle.

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into the small main pancreatic duct (<2 mm) through the hard parenchymal pancreas.

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EUS-guided ERCP is one of the most challenging procedures an interventional endoscopist can encounter. It uses skills borrowed from EUS and ERCP and many concepts from interventional radiology. Even in expert hands the procedure can fail in up to 15% to 30% of cases.9 Clearly, some recommendations are needed before training in these procedures, as suggested in the EUS-guided ERCP consortium meeting of 2011.10 It is also important to recognize that not everybody should be, nor will be, trained in these procedures, because not everybody should be doing them. We reserve this specific training to some of our advanced endoscopy fellows who have demonstrated superior skill sets and judgment.

The first step for training in these procedures is to familiarize the trainee with conventional EUS-guided FNA, EUS-guided celiac plexus block, and then EUS-guided pseudocyst drainage. The apprentice needs to demonstrate after the first 6 months complete visualization of the anatomy by US and show full understanding of the best route to gain and keep access, because access is truly the key in these procedures. Once collection drainage under endosonography has been mastered, one can conceive of training the fellow to participate in some sections of the procedure before performing the whole intervention, whether it is the puncture, the guidewire placement, the fistula creation, the deployment of the stent, or the rendezvous. This approach offers the advantage of building confidence in the advanced fellow while preserving the success and safety of the procedure. Eventually, the most skilled ones will thrive in performing the entire procedure under supervision by the end of their training. However, one should remember that with superior skills come great responsibilities, which is certainly the hardest thing to teach.

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