Technical considerations in EUS-guided gallbladder drainage

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INTRODUCTION

Over the past decade, EUS-guided gallbladder drainage (EGBD) has been increasingly performed in high-surgical risk patients with acute cholecystitis as an alternative to percutaneous cholecystostomy (PC).[1,2]

Palliation of malignant biliary obstruction in patients where both ERCP and EUS-guided bile duct drainage are not feasible is another emerging indication for EGBD.[3]

Procedural steps of EGBD have been detailed elsewhere. We will address now access site, stent choice, stent insertion technique, and the potential usefulness of double-pigtail stents (DPS) placed through larger caliber transmural stents as an adjunct measure to EGBD.

BEST ACCESS SITE FOR EUS-GUIDED GALLBLADDER DRAINAGE: TRANSGASTRIC OR TRANSDUODENAL

There is some variability in the location of the gallbladder relative to the gastrointestinal (GI) tract. However, in most individuals, the gallbladder can be accessed under EUS both from the distal gastric antrum and from the proximal duodenum, most commonly from the duodenal bulb. Transgastric access occurs in the body of the gallbladder whereas transduodenal access generally takes place at the neck of the gallbladder. Available data comparing transgastric vs. transduodenal EGBD are limited and show no differences in technical or clinical success rates and in the incidence of adverse events (AEs).[4]

Proof of the superiority of any of the two approaches regarding clinical success or AEs is therefore lacking. However, there are both theoretical and practical reasons making one access site potentially preferable to another. Theoretical reasons that favor transduodenal access are as follows: (a) The duodenum is less mobile than the stomach, which may result in a less technically challenging procedure and may carry a lesser risk of stent migration or dislodgment over the long term; (b) the risk of food reflux into the gallbladder associated with large caliber stents may be lower in the bulb than in the antrum. Theoretical reasons that favor transgastric access are as follows: (a) The gallbladder body represents a larger entry site than the gallbladder neck, making it an easier target for some patients and allowing more space to accommodate internal flanges of lumen-apposing metal stents (LAMS); (b) in case of acute or delayed AEs (e.g., perforation or stent migration) the consequences may be less serious.

Commentary

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following transgastric EGBD, given that surgical access to the stomach is easier than to the duodenal bulb, and that closure of the thicker gastric wall may be more reliably accomplished. Conflicting reasons favoring one access site over another related to the possibility of subsequent elective cholecystectomy following EGBD have been put forward. Some surgeons question the higher difficulty of duodenal vs. gastric closure, whereas some others find that a fibrous band between the stomach and the gallbladder poses greater interference during laparoscopic cholecystectomy. The issue is thus far unsettled. Preliminary evidence on the feasibility of cholecystectomy following EGBD with LAMS is reassuring, even if details on transduodenal vs. transgastric access are yet lacking.\(^6\)

Practical reasons are more relevant in choosing access site. In patients who may have duodenal tumor involvement or indwelling duodenal self-expandable metal stents (SEMS), transgastric access is clearly preferable. This anatomic factor is not uncommon in patients currently undergoing EGBD, given that underlying pancreatobiliary malignancy is present in up to 40% of them. In the absence of duodenal malignant involvement, better endosonographic imaging of the gallbladder, closer apposition, lack of interposed vessels, more stable echoendoscope position, and improved ergonomics for the endoscopist may sometimes be distinctly obtained from the antrum or from the duodenum in each individual patient. The individual variability across patients on the location (gastric vs. duodenal) of a potentially “best access site” probably explains the relatively even distribution of transgastric and transduodenal access for EGBD in the largest published series.\(^4,7,8\)

In summary, the site from which the gallbladder is more clearly imaged, within a closer distance to the GI wall and within easier reach from the transducer, should be chosen for access, regardless of its location in the duodenal bulb or in the distal antrum.

**STENT CHOICE FOR EUS-GUIDED GALLBLADDER DRAINAGE: PLASTIC OR METAL**

EGBD was originally reported using plastic DPS, which have now been largely replaced by metal stents, either SEMS or LAMS. Metal stents for EGBD decrease the risk of leakage and offer longer lasting patency. However, concerns remain about the use of metal stents (LAMS or SEMS) for EGBD in patients who may later undergo elective cholecystectomy. A thin caliber plastic nasocystic drainage catheter is preferred by some endoscopists for EGBD in patients who are planned to undergo elective cholecystectomy.\(^6\) However, nasocystic drainage catheters are inconvenient to patients and nursing staff alike. Preliminary evidence suggests that LAMS cause minimal or no interference with subsequent cholecystectomy.\(^3\) Nonetheless, until further confirmatory data become available, plastic DPS or nasocystic drainage catheters should be preferentially used for EGBD in patients who are likely to undergo cholecystectomy. Laparoscopic cholecystectomy can be safely performed following EGBD using plastic nasocystic drainage catheters without increased technical difficulty compared to patients who underwent PC.\(^6\)

The large majority of current EGBD patients, however, will never become surgical candidates, because of chronic, severe underlying conditions, including advanced malignancy. In these patients, transmural stents are left in situ indefinitely. Metal stents should preferably be used for this type of permanent EGBD. Even if standard tubular covered SEMS appear to provide good long-term patency in some patients, the available data are limited.\(^3\) Flared partially covered SEMS (22-mm diameter uncovered flares; 40–70 mm long covered mid portion) offer very good long-term results, with only 4 patients out of 56 (7%) experiencing stent migration and/or relapsing cholecystitis in the largest series to date.\(^8\) The incidence of long-term AEs following EGBD with LAMS appears to be similar, with 4 patients out of 59 (6.8%) requiring unplanned admissions in one series,\(^4\) six patients out of 71 (8.5%) experiencing stent migration and/or relapsing cholecystitis in another,\(^7\) and two instances of relapsing cholecystitis out of 27 (7%) prospectively followed-up patients.\(^9\)

A distinctive feature of series reporting EGBD with LAMS is the capability to perform transluminal intervention through the lumen of the LAMS into the gallbladder. Lavage and stone removal were described in the early series.\(^10,11\) More recently, a range of different diagnostic and therapeutic interventions including magnifying endoscopy, laser lithotripsy and polypectomy have been reported.\(^12\) Of note, spontaneous clearance of gallstones in patients who underwent follow-up cholecystoscopy 1–3 months after
EGBD with LAMS was noted in 56%. Using active transcholecystic endoscopic intervention for stone removal, the final gallstone clearance rate was 88%. LAMS were removed in patients who achieved stone clearance.[12] Even if not only feasible but appealing, it is yet unproven if this strategy of active intervention into the gallbladder may further decrease recurrence rates over the long-term.

**FREE-HAND CAUTERY VS. OVER-THE-WIRE GALLBLADDER ENTRY**

Like other EUS-guided drainage procedures, EGBD has conventionally been performed following the sequence of needle puncture of the gallbladder, through the needle wire insertion, and serial over-the-wire exchange of dilators and eventually, stent delivery catheters. The introduction of a commercially available cautery-enabled LAMS delivery catheter (Axios™, Boston Scientific, Marlboro, MA, USA) has allowed single-step insertion, without the need for prior needle puncture or guidewire insertion.[13] Contrary to the fate of predecessor one-step stent delivery systems tested for EUS-guided insertion of plastic pigtail stents nearly two decades ago,[14] cautery-enabled LAMS delivery systems have experienced rapid dissemination. In the largest series on EGBD with LAMS reported to date, mean stent deployment time using this “free-hand” technique was 3.1 min, significantly shorter than the mean time of 7.7 min required for over-the-wire traditional stent insertion.[15] However, most authors using the free-hand LAMS insertion technique have evolved from the over-the-wire technique. Concerns remain about the reproducibility of the free-hand technique for novel LAMS users. A guidewire in place might theoretically prevent cautery-induced damage to the contralateral gallbladder wall and would also facilitate salvage in the unlikely (but possible) case of LAMS misdeployment. To combine the benefits of the free-hand access technique (i.e., shorter, easier stent delivery catheter insertion) with the benefits of wire-guidance, the so-called “hybrid free-hand” technique can be used. In the hybrid free-hand LAMS insertion technique, the guidewire is preloaded into the cautery-enabled stent delivery catheter, and coiled into the gallbladder on initial free-hand entry, before stent deployment. Further evaluation of these different LAMS insertion techniques is required before a single approach can be more widely recommended for all operators.

**DOUBLE-PIGTAIL STENTS THROUGH LARGE-CALIBRE METAL STENTS FOR EUS-GUIDED GALLBLADDER DRAINAGE?**

The rationale behind the strategy of placing DPS inside shorter, larger diameter LAMS during EUS-guided drainage is three-fold: (a) Preventing tissue hyperplasia secondary to stent pressure at either end; (b) avoiding blockage of the LAMS lumen from impaction of necrotic contents or stones on the inner flange following decompression caused by drainage; and (c) facilitating salvage of the fistulous tract in case of LAMS migration. Gornals et al. first used DPS through LAMS in 6 patients out of 12 (50%) with walled-off pancreatic necrosis,[15] and subsequently in a single case of a LAMS choledocho-duodenostomy patient experiencing cholangitis.[16] Irani et al. used DPS in six patients out of 15 (40%) with EGBD.[17] All authors placing DPS through LAMS during EUS-guided drainage procedures acknowledge the empirical basis for its use. Even if placing DPS appears simple enough, it is unclear whether it does improve outcomes and in which cases it should be considered.

**REFERENCES**

1. Anderloni A, Buda A, Vicelli F, et al. Endoscopic ultrasound-guided transmural stenting for gallbladder drainage in high-risk patients with acute cholecystitis: A systematic review and pooled analysis. *Surg Endosc* 2016;30:5200-8.
2. Peñas-Herrero I, de la Serna-Higuera C, Perez-Miranda M. Endoscopic ultrasound-guided gallbladder drainage for the management of acute cholecystitis (with video). *J Hepatobiliary Pancreat Sci* 2015;22:35-43.
3. Imai H, Kitano M, Omoto S, et al. EUS-guided gallbladder drainage for rescue treatment of malignant distal biliary obstruction after unsuccessful ERCP. *Gastrointest Endosc* 2016;84:147-51.
4. Teoh AY, Serna C, Penas I, et al. Endoscopic ultrasound-guided gallbladder drainage reduces adverse events compared with percutaneous cholecystostomy in patients who are unfit for cholecystectomy. *Endoscopy* 2017;49:130-8.
5. Saumoy M, Tyberg A, Brown E, et al. Cholecystectomy after endoscopic ultrasound guided gallbladder drainage? Absolutely! *Gastrointest Endosc* 2017;85:AB481-2.
6. Jang JW, Lee SS, Song TJ, et al. Endoscopic ultrasound-guided transmural and percutaneous transhepatic gallbladder drainage are comparable for acute cholecystitis. *Gastroenterology* 2012;142:805-11.
7. Dollhoffp M, Larghi A, Will U, et al. EUS-guided gallbladder drainage in patients with acute cholecystitis and high surgical risk using an electrocautery-enhanced lumen-apposing metal stent device. *Gastrointest Endosc* 2017;86:636-43.
8. Choi JH, Lee SS, Choi JH, et al. Long-term outcomes after endoscopic ultrasonography-guided gallbladder drainage for acute cholecystitis. *Endoscopy* 2014;46:656-61.
9. Walter D, Teoh AY, Itoi T, et al. EUS-guided gall bladder drainage with a lumen-apposing metal stent: A prospective long-term evaluation. *Gut* 2016;65:6-8.
10. Itoi T, Binmoeller KF, Shah J, et al. Clinical evaluation of a novel lumen-apposing metal stent for endosonography-guided pancreatic...
pseudocyst and gallbladder drainage (with videos). Gastrointest Endosc 2012;75:870-6.
11. de la Serna-Higuera C, Pérez-Miranda M, Gil-Simón P, et al. EUS-guided transenteric gallbladder drainage with a new fistula-forming, lumen-apposing metal stent. Gastrointest Endosc 2013;77:303-8.
12. Chan SM, Teoh AY, Yip HC, et al. Feasibility of per-oral cholecystoscopy and advanced gallbladder interventions after EUS-guided gallbladder stenting (with video). Gastrointest Endosc 2017;85:1225-32.
13. Teoh AY, Binmoeller KF, Lau JY. Single-step EUS-guided puncture and delivery of a lumen-apposing stent for gallbladder drainage using a novel cautery-tipped stent delivery system. Gastrointest Endosc 2014;80:1171.
14. Vilmann P, Hancke S, Pless T, et al. One-step endosonography-guided drainage of a pancreatic pseudocyst: A new technique of stent delivery through the echo endoscope. Endoscopy 1998;30:730-3.
15. Gornals JB, De la Serna-Higuera C, Sánchez-Yague A, et al. Endosonography-guided drainage of pancreatic fluid collections with a novel lumen-apposing stent. Surg Endosc 2013;27:1428-34.
16. Gornals JB, Consiglieri CF, Bergamino MA. Double pigtail for preventing ascending cholangitis after endoscopic ultrasonography-guided choledochoduodenostomy with lumen-apposing metal stent. Dig Endosc 2016;28:100.
17. Irani S, Baron TH, Grimm IS, et al. EUS-guided gallbladder drainage with a lumen-apposing metal stent (with video). Gastrointest Endosc 2015;82:1110-5.