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Interventional endoscopic ultrasound and advanced endoscopic retrograde cholangiopancreatography access techniques

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ABSTRACT

Advanced endoscopic retrograde cholangiopancreatography (ERCP) ductal access techniques require a higher level of skill compared to standard ERCP access maneuvers. These techniques are used in cases of standard ERCP access failures and include dual-wire techniques and precut papillotomy. Interventional endoscopic ultrasound (EUS) procedures requiring a higher level of technical skill as compared to more basic EUS procedures (eg, diagnostic EUS and EUS-fine needle aspiration) include EUS-guided drainage of pancreatic fluid collections, EUS-guided pancreaticobiliary ductal access and drainage, and EUS-guided vascular interventions. In this article, we review techniques and outcomes of advanced ERCP access techniques and of interventional EUS procedures. Issues related to training in these techniques, assessing competency in these procedures, and incorporating these highly complex and higher-risk procedures into endoscopic practice are also discussed.

1. Advanced ERCP techniques for biliary access

Achieving biliary access can be difficult in up to 10% of routine endoscopic retrograde cholangiopancreatography (ERCP) procedures [1,2]. Biliary cannulation may be considered difficult based on total cannulation time and number of failed cannulation attempts; generally >10 minutes of cannulation or >5 cannulation attempts [3]. Advanced ERCP access techniques may be required to achieve biliary access in cases of difficult cannulation.

1.1. Dual-wire technique

Oftentimes, the pancreatic duct is inadvertently cannulated during attempted biliary ERCP. In cases of difficult biliary access, a guidewire can be left in the pancreatic duct, and efforts can be directed to perform a dual-wire technique (DWT). The technique consists of advancing a hydrophilic-tipped guidewire preferably to the distal pancreatic body to ensure that the soft tip is deeply anchored into the pancreatic duct. The guidewire is thought to straighten the intramural segment of the bile duct facilitating subsequent biliary cannulation. A sphincterotome with a second wire is then passed down the duodenoscope channel (alongside the pancreatic duct wire) and advanced to cross on top of the pancreatic wire aiming toward the biliary orifice at 11-o'clock. In some cases, fluoroscopy is helpful to ensure appropriate orientation of the sphincterotome toward the biliary axis with respect to the placed pancreatic wire. DWT has been shown to be successful in 74%-91% [4,5]. Placement of a small caliber prophylactic plastic pancreatic stent or rectal indomethacin or both are used to reduce the risk of post-ERCP pancreatitis.

1.2. Precut papillotomy

Precut papillotomy may be used to facilitate biliary access in difficult cannulation cases. There are several techniques of precut papillotomy including cutting from the ampullary orifice, above the ampullary orifice (fistulotomy), and transpancreatic sphincterotomy. All techniques have similar success rate reaching more than 90% [6-9]. Despite the notion that precut papillotomy is a dangerous procedure, multiple studies have shown that it is equally safe to conventional sphincterotomy if performed by experts [10,11].

Precut papillotomy from the ampullary orifice is performed by using a needle knife for incision, starting at the orifice and moving upwards over the roof of the papilla in the biliary direction. Once the mucosa is dissected, careful inspection is performed to identify the bile duct orifice or evidence for bile drainage. Probing with a guidewire, needle knife, or cannulation tool can then help confirm and gain access to the bile duct.

Precut papillotomy from above the ampullary orifice, also known as fistulotomy, is performed either by cutting downward just distal to transverse duodenal fold or upward 2 mm from above

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the ampullary orifice. Currently, there is evidence to support that precut fistulotomy carries a lower risk for post-ERCP pancreatitis compared to conventional precut papillotomy, likely related to reduced or no direct contact with the papilla [9,12,13]. In fact, the European Society of Gastrointestinal Endoscopy recommends precut fistulotomy as the preferred technique for precut access [14].

Transpancreatic septotomy involves placement of a traction sphincterotome in the pancreatic orifice followed by cutting through common channel septum and toward the biliary direction. Obviously, pancreatic access by a guidewire needs to be achieved to perform this technique.

1.3. Training and credentialing

The goal of any fellowship is to train individuals to achieve a level of competency that allows them to perform independently in their practice. Defining and measuring competency in standard ERCP techniques in general and advanced ERCP techniques in specific has been a subject of many debates secondary to subjectivity and lack of standardized training [15]. It is no longer believed that simply participating in at least 200 ERCPs is a sufficient marker of competency [16]. A better surrogate marker for competency is the rate of deep biliary cannulation; even better is completing the intended therapy in an unaided fashion.

We believe that in order to achieve a high standard of successful biliary cannulation ($>90\%$) and acquire skills to perform advanced ERCP access techniques, it is crucial to invest into a fourth year of advanced training postfellowship. Goals of advanced ERCP training period should include ensuring that the trainee (1) achieves a high level of success with standard ERCP maneuvers and (2) has watched and participated in (preferably the latter) advanced ERCP access techniques performed by or under the tutelage of experts. Training should include the placement of pancreatic duct stents, as these are often placed in conjunction with advanced access techniques. Unfortunately, adequate baseline skills are not universally achieved upon completion of a fourth-year advanced endoscopy training program. A recent multicenter effort to assess advanced trainee competence (RATES study) revealed substantial variability in individual learning curves and the time needed to achieve competence in ERCP and endoscopic ultrasound (EUS) [17].

In our experience, DWT is technically less demanding and should precede precut papillotomy in cases of difficult access (Figure 1). Although there is no predetermined number of cases a trainee should perform before deemed competent, we suggest that one should be able to conduct DWT unaided in at least 10 cases.

On the contrary, precut papillotomy requires a high level of skill, and some authorities suggest that it should be performed by experts only [18]. However, this technique is sparingly performed secondary to high success rate of standard biliary cannulation in tertiary centers with high expertise and the high success rate of DWT, which often precedes precut papillotomy. Consequently, most trainees have a very limited or no exposure to precut access during their years of ERCP training; a tool that is of utmost importance especially during their first few years of practice when their rate of successful cannulation could be $<90\%$.

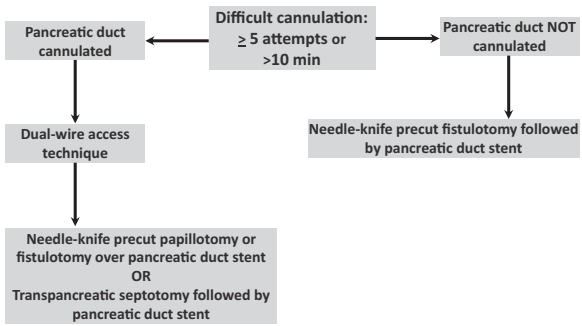

Fig. 1. Suggested algorithm for difficult bile duct cannulation.

A question arises as to whether it is appropriate for endoscopists with inadequate training in precut papillotomy technique to perform such a procedure independently in their practice. One study concluded that precut fistulotomy can be performed safely and effectively by an endoscopist who had performed a minimum of 100 ERCPs during training; half of which are therapeutic and at least 10 are precut papillotomy [19]. Two other studies reported personal experience in performing precut papillotomy independently without prior experience during training [20,21]. Both authors had performed more than 200 ERCPs before their first precut papillotomy attempt and achieved comparable success and complication rates to that reported by other experienced centers over the course of their study. Not unexpectedly, there was a learning curve showing more successful precut attempts with increasing experience over time.

Currently, there is no national standardized formal credentialing in precut papillotomy in regard to the minimum number of cases to be performed and assessment of proficiency. We suspect that most hospital credentialing committees would allow physicians with privileges in ERCP to perform any aspects of ERCP, including precut papillotomy. We believe that achieving baseline competence in ERCP and conventional biliary access should be a prerequisite to even attempting precut papillotomy. For the endoscopist skilled in conventional cannulation but lacking prior training exposure to advanced access techniques, in-depth review of educational videos or attending advanced ERCP training workshops could be useful.

1.4. Recommendations for incorporating advanced ERCP access techniques into clinical practice

A randomized controlled trial has shown similar efficacy of DWT and precut papillotomy [5]. Given that precut technique can be associated with high risk of adverse events especially for low-volume endoscopist, we recommend DWT as the first-line method if the pancreatic duct is repeatedly accessed without successful selective biliary cannulation. If the DWT fails, then a short pancreatic stent is placed, and precut papillotomy over the stent or precut fistulotomy is performed. If neither biliary duct nor pancreatic duct is accessed, then precut fistulotomy is preferred over other precut techniques given decreased risk of postprocedure pancreatitis [14].

For endoscopists who are initially incorporating precut papillotomy into practice, we suggest to start with simpler cases such as an impacted biliary stone or bulging type intraduodenal segment of the bile duct. We also suggest that a more experienced partner, if available, be present to guide or help during the first few precut access procedures.

2. EUS-guided drainage of inflammatory pancreatic fluid collections

Postinflammatory pancreatic fluid collections consist of pseudocysts and walled-off pancreas necrosis (WOPN), and may develop following acute interstitial or necrotizing pancreatitis [22]. Historically, chronic pancreatic fluids collections (PFCs) were managed surgically. Advances in interventional EUS have allowed for a paradigm shift from a surgical to a more minimally invasive treatment approach. The more common indications for treating