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Traversibility to the Papilla Decides the Feasibility of EUS-guided Cholangio-Pancreatic Access for Patients with Difficult Biliary Cannulation

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Abstract

Background: EUS-guided direct cholangio-pancreatic access (EUS-DCP) may be useful in cases with an inaccessible papilla, however, it is challenging due to the technical difficulty and high complication rate. EUS-rendezvous for antegrade cholangio-pancreatography (EUS-RV) also is feasible in these patients.

Aims: To evaluate the indications, feasibility and safety of the EUS-DCP/RV in our case series.

Methods: The success and complication rates were analyzed and compared between patients undergoing EUS-DCP and those undergoing EUS-RV.

Results: Sixteen patients underwent EUS-DCP, including EUS-hepatogastrostomy in four and EUS-choledochduodenostomy in twelve patients. Six patients underwent EUS-RV, including two patients who required double–metallic stent deployment for malignant biliary and duodenal obstruction, one with ampullary cancer, two with chronic pancreatitis and one with papillary stricture due to the ampullectomy. The success rate was 62.5% (10/16) in the EUS-DCP group and 100% (6/6) in the EUS-RV group. The complication rate was 33% in the EUS-DCP group and 0% in the EUS-RV group, respectively.

Conclusions: Although the feasibility of EUS-DCP or EUS-RV depends on the traversibility to the papilla, EUS-RV, rather than EUS-DCP, appears to be more feasible and safe, and may represent the modality of first choice for patients with an inaccessible papilla.

Keywords: EUS-guided; Rendezvous; EUS-BD; EUS-PD

Introduction

EUS-guided direct cholangio-pancreatic access (EUS-DCP) may be feasible in patients with an inaccessible papilla [1], however, it poses a challenge due to its technical difficulty and relatively high complication rate [2,3]. EUS-rendezvous may be a more feasible alternative for antegrade cholangiopancreatography (EUS-RV) in patients with an inaccessible papilla than EUS-DCP. Even in expert hands, ERCP fails in 5-10% of cases [4], especially those with an inaccessible papilla associated with peri-ampullary or gallbladder cancer. Simultaneous double-stenting for the duodenum and bile duct has been attempted in patients with jaundice and duodenal obstruction [5]. While studies on EUS-guided pancreatobiliary drainage have been published [1,6-9], whether EUS-RV or EUS-DCP should be attempted first has not yet been elucidated. Therefore, we report based on our experience, the feasibility and superiority of EUS-RV.

Method

Our hospital started to use EUS-based interventions after failed ERCP in 2007. Between April 2008 and December 2012, 2000 therapeutic ERCPs were performed at our endoscopy unit, and therapeutic EUS for the biliary and/or pancreatic duct was carried out in 22 cases. All of the EUS-guided cholangiopancreatic drainages were performed by two interventional endoscopists (K.K. K.H). Cases of interventional EUS at our institution between April 2008 and December 2012 included 300 cases of EUS-guided fine needle aspiration biopsy (EUS-FNA), 40 cases of EUS-guided pancreatic pseudocyst drainage (EUS-CD), and 8 cases of EUS-guided celiac plexus neurolysis (EUS-CPN). All of the patients who underwent therapeutic EUS received prophylactic antibiotics prior to the procedures. The indications for interventional drainage using EUS were as follows: 1) Inaccessible papilla in attempted ERCP, even after precut sphincteromoty (Figures 1-4); 2) refractory cholangitis recognized after transpapillary endoscopic stent placement; 3) gastric outlet obstruction associated with an inaccessible papilla (Figures 5-9).

EUS-RV rather than EUS-DCP was attempted in patients with failed ERCP from 2008-2011. EUS-RV was attempted in patients with a duodenoscope-accessible papilla; even if the papilla was inaccessible due to gastric outlet obstruction, a duodenal stent was initially placed in the period from 2010-2011 in cases in which ERCP failed. EUS-guided biliary and/or pancreatic puncture was performed with a 19-gauge needle (Echo-Tip; Cook Medical Co, USA). We used a curvilinear echo-endoscope (GF-UCT2000P; Olympus Co, Tokyo) to accommodate a 0.035 inch guidewire (Jagwire, Boston Scientific Co, USA).

Biliary access could be either transduodenal (EUS-CDS) or transgastric (EUS-HGS), depending on the case. Pancreatic access involves transgastric puncture (EUS-PD). Right after the puncture, biliary and/or pancreatography is performed, followed by placement of a 0.035-inch wire (Boston Scientific Co, USA) advanced through the FNA needle: 1. EUS-DCP: we attempted the direct method from

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Figure 1: Repeated attempts at ERCP failed because of the oblique view and nodular invasive ampullary carcinoma obstructing the orifice.

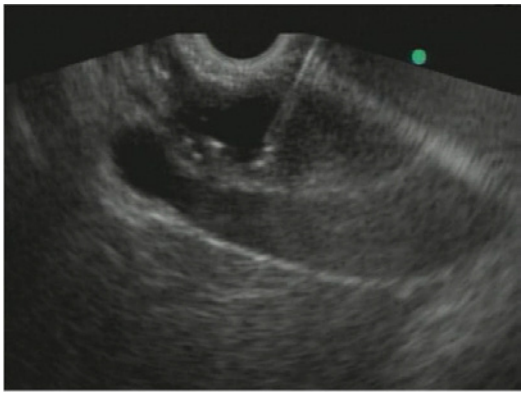

Figure 2: A 19 gauge-needle was used to puncture the dilated common bile duct approximately 2-3 cm proximal to the papilla.

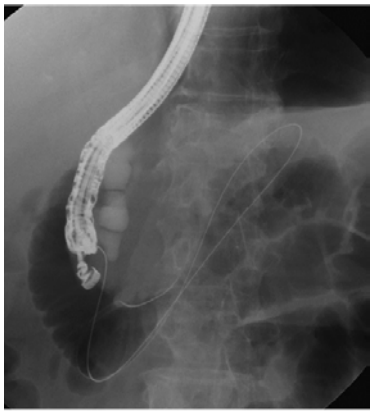

Figure 3: We manipulated the guidewire into the ampulla.

Figure 4: We successfully placed an 8.5Fr biliary plastic stent.

Figure 5: Computed tomography showing unresectable gallbladder cancer invading the duodenum.

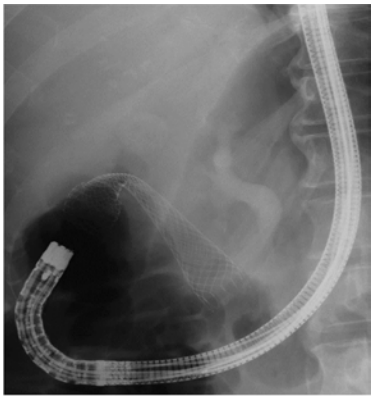

Figure 6: Endoscopic duodenal metallic stent placed in the 1st and 2nd portion of the duodenum.

2008 and 2010 in patients with failed ERCP. 2. EUS-RV: we attempted EUS-RV, where the guidewire was advanced across the papilla, then, the echoendoscope was removed and a duodenoscope was inserted. The transpapillary wire was retrieved by using a grasping snare and rendezvous ERCP was completed. In cases where gastric outlet obstruction was recognized, the initial duodenal stent (Wall stent, 20 mm in diameter, 8-12 cm in long; Boston scientific Co, USA) was placed endoscopically, then, EUS-RV was attempted. If EUS-RV still failed, EUS-HGS (EUS-guided hepatogastrostomy)/CDS (EUS-guided choledochduodenostomy) was performed. As for dilatation of the puncture site, we first used an ultra-tapered catheter (4F Ultra tapered, CooK Medical Co, USA), and then no. 6 and 7 Fr Soehendra dilators (Cook Medical Co, USA). If the dilations proved difficult, a triple lumen precut knife was tried (KD441, Olympus Co, Tokyo, Japan). Covered metallic stent placement was performed in patients with unresectable malignancy. Patients who were poor candidate for surgery or had a life expectancy of less than three months, a plastic stent (7Fr, Flexima, Boston Scientific Co, USA) was deployed. In regard to the pancreas, the EUS-PD (Figures 10-14) was performed

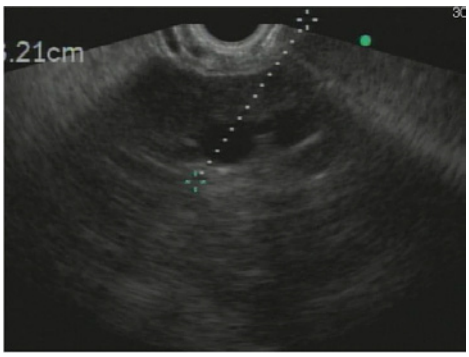

Figure 7a: Endosonography showed a dilated intrahepatic duct measuring 10 mm in diameter.

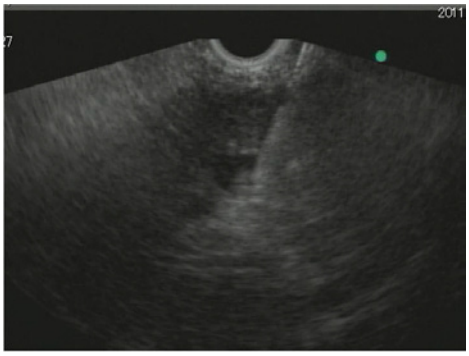

Figure 7b: EUS-HGS was performed; a 19-gauge needle was introduced through the stomach to puncture the left lobe of the liver.

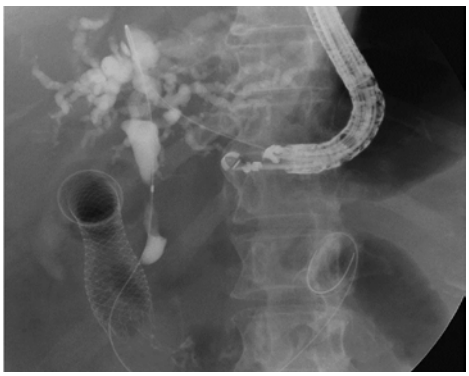

Figure 8: A guidewire was advanced over the ampulla via a intrahepatic bile duct.

via the ampulla. If the intended EUS-DCP and/or EUS-RV failed, percutaneous drainage was carried out.

Results

The procedure was clinically effective in all cases. EUS-DCP was performed in 16 patients, as summarized in table 1, EUS-hepatogastrostomy in four, and EUS-choledochduodenostomy in twelve patients.

EUS-RV was accomplished in 6 patients, as summarized in table 1, including two patients who required double–metallic stenting for malignant biliary and duodenal obstruction, one patient with

Figure 9: Finally, a transpapillary endoscopic metallic stent was successfully placed through the mesh of the duodenal stent.

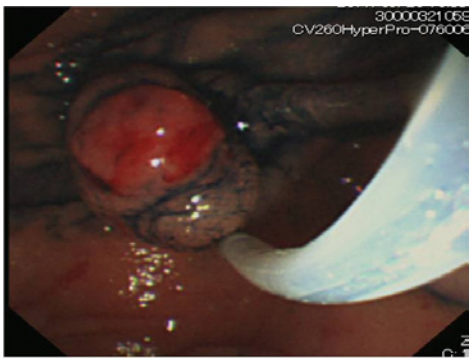

Figure 10: Endoscopic snare ampullectomy was successfully performed.

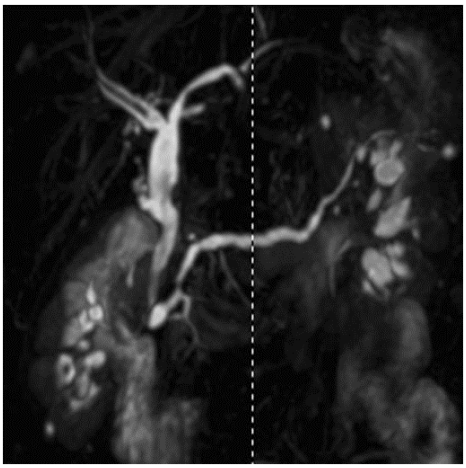

Figure 11: MRCP showed severe stenosis in the head of the main pancreatic duct.

ampullary cancer who required the duodenal approach, and two cases requiring a gastric approach, including two case of chronic pancreatitis and a case of papillary and main pancreatic duct stricture developing after ampullectomy.

Success rate

The success rate was 62.5% (10/16) for EUS-DCP and 100% (6/6)

Figure 12: We tried EUS-RV; EUS-guided pancreatic duct puncture using a 19-gauge needle.

Figure 13: The guidewire was introduced into the duodenum.

Figure 14: Finally, the pancreatic stent (7Fr/7 cm) was placed.

for EUS-RV.

Duration

The median duration of the procedure was 58 minutes (range 29-110 min).

The median duration of stent patency was 178 days (53-1090 days) for biliary drainage.

Complication

The complication rate was 25% (4/16; self-limiting local peritonitis in one, peritonitis requiring percutaneous drainage in one, bleeding requiring transfusion in one and distal stent migration in one patient) in the EUS-DCP group and 0% in the EUS-RV group.

Discussion

Interventional-EUS has been used as an alternative for cases with an inaccessible papilla after difficult therapeutic ERCP [2,3]. Inaccessible papilla is encountered in patients with an intra-diverticular papilla, anatomic variations after surgery, and malignancy invading the duodenal bulb [10,11]. EUS-RV is feasible in both biliary and pancreatic obstruction, and can allow recovery of the physiological flow of bile and pancreatic juice. Interventional EUS has theoretical advantages over the percutaneous method, [12,13] in such as the low complication rate, avoidance of long-term external drainage, and higher safety [2]. In EUS-RV, EUS is used only for puncture of the obstructed duct and passage of the guidewire in an antegrade fashion through the papilla for subsequent retrograde rendezvous via ERCP [14]. In addition, EUS-DCP needs dilatation of the fistula to more than 7Fr in diameter, which may be associated with complications, such as bleeding and leak. We believe that EUS-RV will potentially enhance the success rate and safety of antegrade cholangiopancreatic stent placement.

In 2004, Mallery et al. were the first to report two cases of transduodenal EUS-rendezvous biliary access for ERCP [15]. Once the papilla is traversed, the guidewire can be advanced to the bowel and transpapillary ERCP can be performed by retrieving the guidewire with a snare. Based on our data, we believe that EUS-RV is more feasible, associated with a lower complication rate and are safer than EUS-DCP. In our series, our technical success rate of EUS-RV was 100%, similar to the success rate (67-100%) reported in most other series [1]. We encountered no adverse events of the procedure in our series, indicating that EUS-RV may be preferable over other techniques, because unlike EUS-DCP, this technique only involves passage of a guidewire and no creation of a larger fistula. A previous study reported a failure rate of EUS-RV of 20% due to the difficulty of guidewire manipulation across strictures [2]. Guidewire manipulation through the papilla is challenging, however, we use a flexible and straight-type guidewire.

What are the tips for successful EUS-RV? Firstly, a proper puncture site and proper direction of the needle allow easy guidewire manipulation and promise of success. An acute angle for puncture by the 19-gauge needle facilitates manipulation of the guidewire across a stricture. Secondly, it is important to select the right candidates who show sufficient dilatation of the bile and/or pancreatic duct (intrahepatic bile duct dilatation to over 4 mm, common bile duct dilatation to over 8 mm, [16] and main pancreatic duct dilatation to over 4 mm) for safe puncture. Thirdly, use of the flexible type of guidewire for manipulation by the experienced operator could have enhanced the success rate for EUS-RV. Fourthly, in the presence of duodenal obstruction, placement of a self-expandable metal stent enables introduction of a duodenoscope for ERCP.

The direct method was introduced in 2001 [17], thereafter, many case series have been published by expert hands. When EMS was used, however, stent dislocation was recognized as a potential risk,

Case	Age	Sex	Diagnosis	Indication	Reason ERCP failure	EUS procedure	Target	Diameter	Needle	EUS method	Time	EUS result	Complication	Final	EUS stent	Stent patency
								(mm)	knife		(min)				obstruction	(day)
1	74	M	Pca	Jaundice	Refractory cholangiris	EUS-CDS	CBD	10	+	direct	79	ok	Peritonitis, Bleeding	EMS	-	90
2	69	M	Pca	Jaundice	Refractory cholangiris	EUS-CDS	CBD	14	-	direct	44	ok	-	EBD	+	60
3	61	M	Pca	Jaundice	Refractory cholangiris	EUS-CDS	CBD	9	-	direct	x	failure	-	EMS	x	x
4	78	M	Pca	Jaundice	Pancreatitis	EUS-CDS	CBD	12	-	direct	x	failure	-	EMS	x	x
5	77	F	Pca	Jaundice	ERCP failure	EUS-CDS	CBD	20	-	direct	40	ok	-	EBD	-	240
6	73	F	Pca	Jaundice	ERCP failure	EUS-CDS	CBD	12	-	direct	36	ok	Peritonitis	CMS	-	180
7	66	F	Pca	Jaundice	Duodenum stenosis	EUS-HGS	B2	7	-	direct	85	ok	Stent migration	EBD	-	42
8	38	M	Pca	Jaundice	Duodenum stenosis	EUS-HGS	B3	8	-	direct	x	failure	-	x	x	x
9	74	F	Pca	Jaundice	Duodenum stenosis	EUS-HGS	B3	4	-	direct	x	failure	-	PTBD	x	x
10	68	F	Pca	Jaundice	Duodenum stenosis	EUS-HGS, DuoEMS	B3	10	-	rendezvous	37	ok	-	EMS	+	256
11	70	M	I PMC	Jaundice	Refractory cholangiris	EUS-CDS	CBD	16	+	direct	60	ok	Cholangitis, Ulcer	EMS	-	62
12	83	F	I PMC	Jaundice	Pancreatitis	EUS-CDS	CBD	10	-	direct	45	ok	-	CMS	-	180
13	78	M	Klat skin	Jaundice	ERCP failure	EUS-HGS	B2	4	-	direct	x	failure		EBD	x	x
14	72	F	GBca	Jaundice	Duodenum stenosis	EUS-HGS, DuoEMS	B3	10	-	rendezvous	90	ok	-	EMS	-	120
15	85	M	BDca	Jaundice	Refractory cholangiris	EUS-CDS	CBD	10	+	direct	30	ok	-	EBD	-	210
16	73	M	Ampulaca	Jaundice	ERCP failure	EUS-CDS	CBD	20	-	direct		ok	-	EBD	-	60
17	72	M	Ampulaca	Jaundice	Ampullary tumor	EUS-CDS	CBD	10	-	direct	66	ok	-	EBD	-	1090
18	82	M	Ampulaca	Jaundice	Refractory cholangiris	EUS-CDS	CBD	20	-	direct	x	failure	-	EBD	x	x
19	72	F	Ampulaca	Jaundice	Ampullary tumor	EUS-CDS	CBD	16	-	rendezvous	32	ok	-	EBD	-	53
20	75	F	Ampulaca	Pancreatitis	Papillary stricture	EUS-PD	MPD	5	-	rendezvous	29	ok	-	EPS	-	62
21	56	M	Pancreatitis	Pancreatitis	Papillary stricture	EUS-PD	MPD	8	-	rendezvous	110	ok	-	EPS	-	124
22	66	M	Pancreatitis	Pancreatitis	Papillary stricture	EUS-PD	MPD	5	-	rendezvous	30	ok	-	EPS	-	30

M: Male, F: Female
Pca: Pancreatic Cancer
IPMC: Intraductal papillary mucinous cancer
Ampulla ca: Ampullary cancer
Klatskin: Klatskin tumor
GBca: Gallbladder cancer
BDca: Bile Duct cancer
EUS-CDS: EUS-guided Choledochduodenostomy
EUS-HGS: EUS-guided Hepatogastrostomy
Duo EMS: Endoscopic duodenal Metallic Stenting
EUS-PD: EUS-guided Pancreatic Duct stenting
CBD: Common Bile Duct
B2: bile duct segment 2, B3: bile duct segment3
MPD: Main Pancreatic Duct
EMS: Endoscopic Metallic Stenting
EBD: Endoscopic Biliary Stenting
EPS: Endoscopic Pancreatic Duct Stenting
PTBD: Percutaneous Transhepatic Biliary Drainage
PD: Pancreaticoduodenectomy
Probe: Probe operation
W: Week

Table 1: Characteristics of the 22 patients.

and sometimes brought about fatal complications [18]. EUS-DCP required a large fistula as compared to EUS-RV. If the papilla cannot be traversed, a transluminal stent must be inserted using a permanent fistula made by EUS, which is often laborious and requires high skill because of the potential risk of penetrating the fibrotic hard wall of the common bile duct in EUS-CDS, and a small intrahepatic bile duct surrounded by inflammatory liver parenchyma in EUS-HGS [2]. In addition, a transluminal stent tends to show migration when EUS-HGS is carried out using a metal stent [16]. Thus, we recommend EUS-RV. Our success rate with EUS-DCP was low as compared with a previous report, because of our lack of skill. We believe that EUS-DCP might be used as a salvage method in the event of failure of EUS-RV.

In regard to EUS-PD, transluminal drainage may be technically difficult because of a tight and dense fibrotic stricture, sometimes accompanied by an occlusive stone; its complication rate is significantly high and success rate is relatively low [3]. Proceeding to the guidewire is more feasible than dilating the stricture with stent if the puncture site is appropriate. Transpapillary stent placement is a safe and effective technique for managing ductal disruption, on the other hand, the success rate of EUS-PD is low, with a significantly high complication rate [19]; therefore the anterograde method would be preferable if the guidewire is advanced to the papilla by EUS-RV.

Patients with gastric outlet obstruction (GOO) pose the biggest challenge to ERCP as well as EUS-RV. In type II COO [5], a duodenal stent may be placed first, followed by attempt at EUS-RV. Iwamuro [20] reported that biliary stent deployment through the duodenal metallic stent was feasible under endosonographic guidance; however, we believe that this technique might be more difficult and require a higher level of skill than EUS-RV, because of the rigidity of the scope and instability of the duodenal stent, which can cause perforation. In the event of failure of EUS-RV, EUS-CDS may be tried through the mesh of the stent. However, with the intraductal pressure being higher in the common bile duct than that in the hepatic duct, as reported by Kahaleh [21], EUS-CDS may be associated with a greater risk of leakage as compared to EUS-HGS. Therefore, we consider that EUS-RV may be preferable. Some patient, like Case 1, showed jaundice with duodenal stenosis. Recently, it was reported that endoscopic double-stenting may facilitate anterograde rendezvous technique in cases with gastric outlet obstruction. Since an endoscopically deployed duodenal stent takes time (two to three days) to expand fully and allow the duodenal scope to pass through, simultaneous stent placement is difficult, and sometimes the duodenal stent impedes transpapillary cannulation. In our series, combined endoscopic stent-in-stent placement for biliary and duodenal stent obstruction through the mesh was successful and could be performed without difficulty in cases with difficult endoscopic identification of the major duodenal papilla.

Among the limitations of this study was that it was a retrospective study and the sample size was small. Our success rate of EUS-DCP was low as compared to a previous report of 94.3% [2], however, our success rate improved when EUS-RV was carried out. EUS-RV can be attempted in patients in whom the papilla is or is potentially accessible through placement of a duodenal stent. Once a duodenal stent is placed endoscopically, it is important to wait for at least 48 to 72 hours for full expansion of the stent to allow smooth passage of the duodenoscope [22]. If EUS-RV fails, EUS-DCP should be performed. To perform EUS-RV and/or EUS-DCP, one should remember that these techniques should only be performed by experts in interventional EUS, because of the high complication rates [23] and relatively low success rates, even in high-volume centers.

In conclusion, EUS-guided drainage is one of the useful alternatives for cases with difficult biliary and/or pancreatic cannulation, however, there are problems related to the technique, feasibility of performance, and the high complication rate. The feasibility of EUS-RV or EUS-DCP depends on the traversibility of the papilla. EUS-rendezvous could allow drainage of an obstructed biliary and/or pancreatic duct. Based on our experience, we propose EUS-RV as a more feasible, safe and preferable option for patients with an inaccessible papilla than EUS-DCP. Prospective studies to validate our results are necessary.

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