EUS-guided biliary rendezvous using a short hydrophilic guidewire

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Key words: endosonography, cholangiopancreatography, endoscopic retrograde, endoscopy, gastrointestinal, biliary tract diseases

Abbreviations: EUS, endoscopic ultrasound; ERCP, endoscopic retrograde cholangiopancreatography; PTBD, per-cutaneous transhepatic biliary drainage; CBD, common bile duct

Background and study aims: EUS-guided rendezvous technique for biliary access requires expert manipulation of the guidewire across the downstream stricture or papilla. Published literature reports usage of the long-wire system to prevent loss of wire during scope exchange. We studied the efficacy of using a short hydrophilic guidewire in EUS-guided rendezvous.

Patients and methods: This is a retrospective study conducted in a tertiary care referral centre. 15 patients underwent EUS-guided biliary rendezvous with short wire. EUS-guided transduodenal / transgastric puncture of the biliary system was performed, followed by antegrade placement of a hydrophilic short-wire (260 cm) across the downstream stricture and/or papilla. Retrograde access was then achieved by retrieving the trans-papillary wire, followed by standard ERCP intervention. Main outcome measurements were rates of procedural success and complications.

Results: EUS-guided biliary rendezvous was successful in 14 patients (93.3%). Failure was seen in one patient due to a tight malignant biliary stricture. One patient had peri-choledochal bile tracking which did not require any specific treatment.

Conclusions: Short-wire system in EUS-guided biliary rendezvous is highly effective and safe. It is a useful salvage procedure for biliary cannulation in patients with accessible papilla.

Introduction

The cornerstone for therapeutic ERCP is successful deep cannulation of the biliary or pancreatic duct. However, even in expert hands, selective cannulation is unsuccessful in 3 to 12%.¹ In these cases, per-cutaneous transhepatic biliary drainage (PTBD) was the standard alternative technique but it has complication rates of 4 to 32% and mortality rate of up to 5.6%.²

In 2004, EUS-guided biliary access for rendezvous ERCP was introduced as an additional option for patients who fail standard ERCP cannulation and drainage.^{2,3} Recent articles cite procedural success rates of 58 to 80%.⁴⁻⁶ These modest success rates may be explained by technical limitations of advancing a wire across the obstruction including acuity of needle angle compared with the duct, presence of tight strictures and impacted stones. Also, initial experience with this technique relied on the use of long-wire (450 cm length) system to avoid loss of wire during wire advancement and scope exchange. Short guidewire (260 cm length) has advantages of better steerability of the wire and faster exchanges of scope or accessories. The major drawback would be the possibility of losing the wire during the exchanges and thus,

resulting in repeat manoeuvres and increased procedural time.

Here, we report our initial experience of EUS-guided biliary rendezvous, in patients with accessible papilla but failed deep cannulation, using the short guidewire technique.

Patients and Methods

Patients

This was a retrospective study. Between August 2009 and March 2010, 15 patients underwent EUS-guided biliary rendezvous with short guidewire technique. Inclusion criteria were patients who failed deep biliary access by standard cannulation with wire-guided sphincterotome. In all the patients, a precut papillotomy failed or was not deemed to be indicated due to distorted anatomy. All patients had dilated CBD and endoscopically accessible papilla. Patients with bleeding diathesis or portal hypertension were excluded. The patient characteristics and reasons for rendezvous procedure are shown in **Table 1**.

Informed consent was obtained from all patients or their next-of-kin prior to the procedure. The study was approved by the institution ethics committee.

Methods

Procedures were performed with intravenous midazolam and propofol administered by an anesthesiologist. All patients received intravenous broad-spectrum antibiotic with 3rd generation

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Submitted: Jun/30/2011; Revised: Dec/20/2011; Accepted: Dec/20/2011
Previously published online: www.landesbioscience.com/journals/jig
DOI: 10.4161/jig.1.4.19967

Table 1. Patient profile

Patient	Age (Years)	Sex	Pathology	Reason for Rendezvous	Precut
1	60	M	Pancreatic head cancer	Failed cannulation	Y
2	42	F	Pancreatic head cancer	Failed cannulation	Y
3	70	F	Pancreatic head cancer	Failed cannulation	Y
4	50	F	Pancreatic head cancer	Failed cannulation	Y
5	44	F	Pancreatic head cancer	Distorted duodenal anatomy	N
6	52	M	Pancreatic head cancer	Distorted duodenal anatomy	N
7	84	M	Pancreatic head cancer	Distorted duodenal anatomy	N
8	37	F	CBD stones	Failed cannulation. Floppy papilla	Y
9	65	M	CBD stones	Failed cannulation. Floppy papilla	Y
10	39	F	CBD stones	Failed cannulation. Edematous papilla	Y
11	39	F	Cholangiocarcinoma	Failed cannulation	Y
12	43	M	Cholangiocarcinoma	CBD was cannulated but wire could not negotiated across a tight mid-CBD stricture	N
13	36	M	Ampullary cancer	Deformed papilla	N
14	63	M	Ampullary cancer	Deformed papilla	N
15	46	M	Chronic pancreatitis with distal biliary stricture	Distorted duodenal anatomy	N

Figure 1. Schematic representation of the 3 bile duct approaches; 1, intrahepatic from the proximal stomach; 2, extrahepatic from the distal body/antrum; and 3, extrahepatic from the duodenum. Figure 1A. Fluoroscopic image of EUS-guided puncture of the intrahepatic duct and the wire being negotiated downstream into the CBD.

cephalosporin or fluoroquinolone.

EUS was performed using a linear array echoendoscope (GFUCT140; Olympus Medical, Tokyo, Japan) with colour doppler assessment for regional vasculature. Bile duct puncture was performed using a 19-gauge needle (Echo Tip 19; Cook Endoscopy, Winston Salem, North Carolina). The puncture site was chosen after careful endosonographic assessment of the biliary tree. We utilized three sites (**Figure 1**) of puncture; intrahepatic from the proximal stomach (**Figure 1a**), extrahepatic from the antrum, and extrahepatic from the duodenum (**Figure 2**, **Figure 2a**). The guiding principle was that the wire exiting from the needle should be directed towards the ampulla and not upstream. Once a puncture was made, confirmation of biliary access was achieved by bile aspiration through the needle and contrast instillation under fluoroscopy (**Figure 2b**). Subsequently, a 260 cm long, 0.032-inch hydrophilic angled-tip guidewire

(Glidewire, Terumo Medical Corp., Somerset, New Jersey) was inserted through the needle and directed in an antegrade manner downstream, across the stricture and/or papilla into the duodenum. It was essential that several loops of the wire were placed in the distal duodenum to maintain wire stability during needle and scope withdrawal (**Figure 3**, **Figure 3a**). The needle, followed by the echoendoscope was then withdrawn. During withdrawal of the needle device, standard exchange was performed till the wire was completely within the device. Using a 12-ml syringe, water was then flushed (**Figure 4**) into the device to “float the wire” and maintain its position during further withdrawal of the needle. Once the needle device had been detached and withdrawn completely from the echoendoscope, the scope was withdrawn gradually while performing fluoroscopy to ensure that the distal end of the wire remains within the distal duodenum. When the scope was completely removed, the wire

Figure 2. Schematic representation of the transduodenal extrahepatic duct puncture with guidewire loops placed in the distal duodenum. A: EUS-guided puncture of the CBD; B: EUS-guided cholangiography, showing a dilated CBD till the ampullary region.

Figure 3. Schematic representation of the echoendoscope withdrawal, while observing that the wire loops remain stable at the distal duodenum. Figure 3A. Fluoroscopic image as per Figure 3.

was grasped and secured at the oral orifice. The ERCP therapeutic duodenoscope (TJF 160; Olympus Medical) was then inserted alongside the wire. The distal end of the wire was then retrieved through the accessory channel with a snare (**Figure 5, Figure 5a**), while simultaneously, the other end of the wire was fed down the mouth with its terminal end grasped with a small-pronged biopsy forceps (FB-19-K.1 Olympus Medical) (**Figure 6, Figure 6a**) to prevent loss of proximal wire traction. The wire was slowly withdrawn in the accessory channel till sufficient length was available to load a sphincterotome. Forceps hold was then released in the antrum and the wire was further pulled in the accessory channel till its other end lay completely within the bile duct. Care was taken to insert the sphincterotome over the wire into the bile duct before the final pulling and adjustment of the wire within the bile duct was done. Following this, ERCP was completed in the usual fashion (**Figure 7**).

Main outcome measures

Successful procedure was defined as the ability to negotiate the wire across the downstream obstruction and rendezvous with ERCP, followed by therapeutic biliary decompression. Complications were assessed per consensus criteria.⁷ Pericholedochal bile leakage was defined as visualization of a streak of contrast adjacent to the bile duct wall. All patients were monitored for 4 hours post-procedure and followed up at 1-month, with subsequent visits on an as-per-needed basis.

Results

Fifteen patients were included in the study; 8 male and 7 female patients. Their mean age was 51 years; range 36 to 84. Mean CBD diameter was 17.8 mm; range 12 to 27. **Table 2** shows the intervention and outcome data.

EUS-guided biliary rendezvous was successful in 14 of 15

Figure 4. Water is flushed via a syringe into the needle to “float-the-wire” during withdrawal of the needle. The arrow points to the tip of the wire floating within the syringe.

Figure 5. Schematic representation of the snare grasping the wire, for retrieval into the accessory channel. Figure 5A. Endoscopic view of the wire-capture with a snare.

Figure 6. Schematic representation of the small-pronged forceps, maintaining proximal wire traction, while the other end of the wire is pulled back into the accessory channel. Figure 6A. Fluoroscopic image as per Figure 6.

Figure 7. Schematic representation of cannulation of the CBD in the usual ERCP fashion after rendezvous.

Table 2. Technical problems and outcome

Patient	EUS approach	Ductal Puncture	Technical Problem	Success/ Failure	Complication
1	Transduodenal (1 st attempt: transgastric)	CBD	Initial transgastric approach failed (wire could not be negotiated downstream)	Success	Nil
2	Transgastric (proximal stomach)	Hilum	Nil	Success	Nil
3	Transduodenal	CBD	Failure to pass wire across stricture. Direct transluminal metal stent inserted.	Failure	Nil
4	Transduodenal	CBD	Nil	Success	Pericholedochal contrast tracking
5	Transduodenal	CBD	Wire slipped from forceps grasp in the stomach	Success	Nil
6	Transduodenal	CBD	Nil	Success	Nil
7	Transduodenal	CBD	Nil	Success	Nil
8	Transduodenal	CBD	Nil	Success	Nil
9	Transduodenal	CBD	Nil	Success	Nil
10	Transduodenal	CBD	Nil	Success	Nil
11	Transduodenal	CBD	Nil	Success	Nil
12	Transgastric (proximal stomach)	Hilum	Nil	Success	Nil
13	Transduodenal	CBD (twice)	Wire slipped out of CBD. Repeat puncture required	Success	Nil
14	Transgastric (antrum)	CBD	Nil	Success	Nil
15	Transgastric (proximal stomach)	Hilum	Nil	Success	Nil

patients (93.3%). Once the wire was across the papilla and in the duodenum, rendezvous ERCP with biliary drainage was successfully completed in all patients. In a patient with locally advanced pancreatic head adenocarcinoma, wire could not be negotiated across the distal biliary stricture. Direct transduodenal drainage was performed with a covered expandable metal stent. One patient had procedure-related complication, presenting with abdominal pain secondary to peri-choledochal contrast tracking. He recovered completely after 2 days of in-hospital conservative management. There was no elevation of serum amylase or lipase.

A few technical difficulties were encountered. One, negotiation of the wire downstream was not successful in a patient following a transgastric hilar puncture. This was rectified successfully with a transduodenal CBD puncture. Two, loss of proximal wire traction occurred in two patients. Although one patient had completion of the procedure without additional intervention, the

second patient required a repeat ductal puncture as the wire had completely slipped out of the CBD. Thus two patients (13.3%) required a second puncture.

Discussion

Our study demonstrates the efficacy of using a short guidewire for EUS-guided biliary rendezvous, with success in 93.3% (14 of 15 patients). Complication was mild and seen in 1 patient (6.7%).

Patients with obstructed biliary system require biliary drainage to treat cholestatic symptoms and cholangitis. Although ERCP is the preferred modality of drainage, deep biliary access by standard techniques may not always be achieved and may require precut papillotomy, transpancreatic sphincter incision or rendezvous technique. In our patients, despite the failure of precut papillotomy and presence of distorted papillary anatomy, EUS-guided biliary

Table 3. Recent series of EUS-guided biliary rendezvous

Author (Reference)	Year	N	Procedure	Biliary rendezvous success rate	Complication rate	Reason for failure
Kahaleh M, et al. ²	2006	23	13 Transhepatic approach 10 Extrahepatic approach (5 had failed initial transhepatic approach)	18/23 (78.3%)	4/23 (17.4%) 1 Bleeding (filling defects during cholangiography; spontaneously resolved) 1 Bile leak 2 Self-limiting pneumoperitoneum	1 Impacted CBD stone 1 Primary sclerosing cholangitis (tortuous duct, multiple strictures) 3 Malignant strictures
Brauer BC, et al. ³	2009	12	All Extrahepatic approach	4/12 (33.3%)	2/12 (16.7%) 1 pneumoperitoneum and peritonitis (resolved with conservative management) 1 cardiac and respiratory failure	1 inadequate echoendoscope position The rest not specified.
Kim YS, et al. ⁴	2010	15	All Extrahepatic approach	12/15 (80%)	1/15 (6.7%) moderate pancreatitis	1 dissection of choledochocoele 1 pancreatic head cancer 1 chronic pancreatitis
Our study	2011	15	3 Transhepatic approach 12 Extrahepatic approach	14/15 (93.3%)	1/15 (6.7%) pericholedochal contrast leakage	1 pancreatic head cancer

rendezvous had a high success rate, and avoided the morbidity of PTBD and surgery.

In the 1990s, EUS-guided biliary intervention was first introduced with fine needle ductal puncture and cholangiopancreatography.^{8,9} Subsequently, Mallery et al and Kahaleh et al, reported their experience with EUS-guided biliary rendezvous technique in 2004.^{2,3} We improvised on this technique by using short guidewires which confer several advantages.^{10,11} Asides from better guidewire manipulation, device and scope exchanges were more rapid. One possible drawback, however, would be the loss of proximal wire traction when the distal end is pulled into the therapeutic duodenoscope. We overcame this by using a small pronged forceps that allowed us to have a firm grasp of the smooth hydrophilic guidewire.

Table 3 shows the recent series of EUS-guided biliary rendezvous. Success rates to achieve rendezvous ranged from 33.3% to 80%. Brauer et al³ showed that although the rendezvous procedure was successful in only 4 of 12 patients (33.3%), a further 7 patients achieved therapeutic drainage by subsequent means; cannulation with the aid of the “fluoroscopic roadmap” or “everted papilla”, or transluminal stent insertion. We believe that our short-guidewire technique provided better control and manipulation of the wire and thus, allowed us to have a very high success rate.

Complication rates ranged from 6.7% to 17.4%, and include self-limiting pneumoperitoneum, bleeding and bile leak. Despite a reported⁴ higher incidence of complications during extrahepatic bile duct puncture, we encountered only one complication, which was mild and transient.

Of the three approaches – transgastric intrahepatic, transgastric extrahepatic, transduodenal extrahepatic – we found that the transgastric approach allowed the needle to be directed in the downstream direction most easily. Despite this, the transgastric intrahepatic duct approach failed in one patient as the wire could

not be negotiated downstream. This may be due to the difficulty in negotiating the longer and more tortuous course and a relatively less dilated intrahepatic duct, as compared to the common bile duct.

There were a few limitations in our study. Although the high procedural success rate may be due to the use of a short guidewire, we did not have a randomized comparison with long wire technique to validate this. Also, as all procedures were performed by expert endoscopists in a high volume tertiary referral center, similar results may not be reproducible in centers with less experience.

Conclusion

EUS-guided rendezvous technique for biliary access in patients with a short guidewire is feasible, with high success and low complication rates. It is a suitable salvage method for failed ERCP cannulation despite precut papillotomy or when the papilla is distorted.

Acknowledgement

We thank Mr. Sehjad Vora for technical assistance in the procedures.

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