

Original Article

A One-step Procedure by Using Linear Echoendoscope to Perform EUS-guided Choledochoduodenostomy and Duodenal Stenting in Patients with Irresectable Periapillary Cancer

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Abstract:

Objective: Endoscopic ultrasound-guided choledochoduodenostomy (EUS-CD) has become an alternative method after unsuccessful endoscopic retrograde cholangiopancreatography (ERCP) treatment. We present a case series study and its feasibility by using only a linear therapeutic channel echoendoscope to create both a biliary-enteral fistula and anatomic enteral recanalization.

Methods: We presented seven cases of unresectable periapillary cancer with both biliary and duodenal obstruction. In these cases, the EUS-guided technique might be an alternative to double stenting (biliary and enteral) in the same procedure and equipment.

Results: In all cases, the location of the biliary obstruction was in the distal common bile duct (CBD) and the grade of proximal dilation diameter varied from 15 mm to 20 mm. Two patients had type I (28.6%) and five had type II (71.4%) duodenal obstruction. Technical success of EUS-CD, by the stent placement, occurred in 100% of the cases. There were no early complications. Biliary drainage was effective clinically as well as in laboratory in 6 cases (6/7), by relieving obstructive jaundice and decreasing bilirubin levels.

Conclusion: EUS equipment may offer an alternative to double stenting in the same procedure and with palliative propose.

Keywords: endoscopic retrograde cholangiopancreatography; endoscopic ultrasound; choledochoduodenostomy; periapillary cancer

INTRODUCTION

Endoscopic retrograde cholangiopancreatography (ERCP) is the first-line therapy for palliative biliary drainage in patients with unresectable periapillary cancer.¹⁻⁵ Its success rate varies from 90% to 95%; however, even when performed by experienced endoscopists, cannulation may be failed.⁶⁻⁹

Percutaneous transhepatic biliary drainage (PTBD) is an rationale option prior to the surgery, but may cause several complications, which can be bleeding, hemobilia, peritonitis and liver abscess, and poor quality of life due to the presence of an external catheter.¹⁰ Complication, morbidity and mortality rates of PTBD are 30%, 7% and 5%, respectively.^{4,11,12} Surgical treatment offers long period of drainage patency, but also with high rates of morbidity and

mortality.¹²

Endoscopic ultrasound (EUS) is an established method for diagnosis of biliary and pancreatic diseases. In 1996, Wiersema *et al.* published the first case of EUS-guided cholangiopancreatography¹³. Giovannini *et al.*¹⁴ pioneered, in 2001, by performing a EUS-guided choledochoduodenostomy (EUS-CD). Several case studies analyzed the role of EUS-CD as an alternative method after unsuccessful ERCP in patients with unresectable periapillary cancer.^{2,4,15-21}

That tumors when in advanced stages, causes biliary obstruction and also duodenal obstruction.²² Although biliary obstruction usually occurs prior to duodenal, they can occur simultaneously.²²⁻²⁵ In these cases, the use of self-expandable metal stents (SEMS) to stent the biliary duct and the duodenal lumen has been proved effective as palliative treatment.²⁶

We present here a case series study and the feasibility by using only a linear therapeutic channel echoendoscope to create both a biliary-enteral fistula and anatomic enteral recanalization in seven patients with obstructive jaundice

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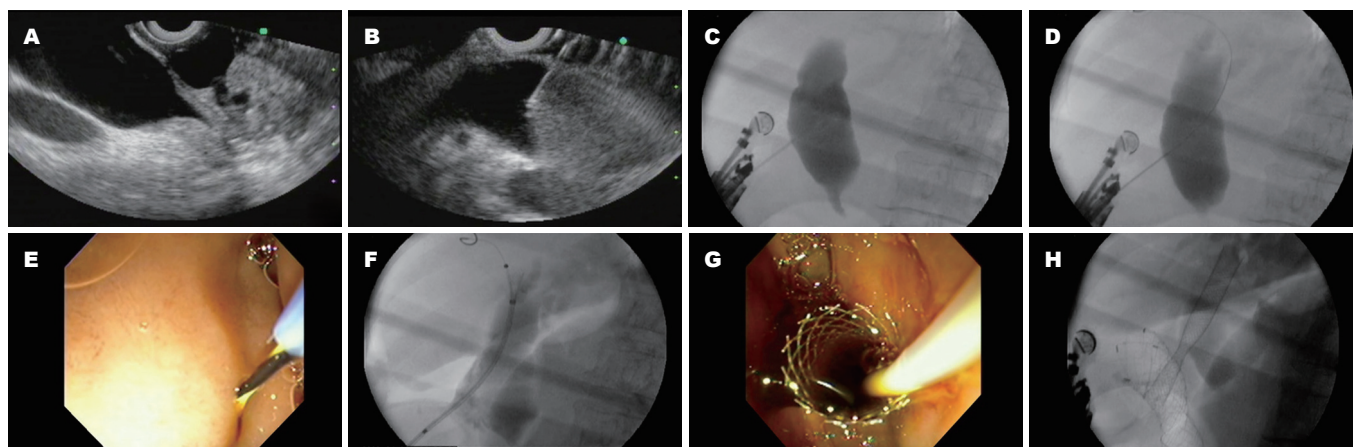


Figure 1. Sequence of images demonstrating the steps of the choledochoduodenostomy. The last image shows the final appearance of simultaneously biliary and duodenal metal stents.

and duodenal obstruction due to unresectable periampullary cancer.

PATIENTS AND METHODS

EUS-CD, in the first portion of the duodenum, associated with duodenal SEMS placement was performed in seven patients with unresectable periampullary cancer that presented with obstructive jaundice and invasive duodenal obstruction.

ERCP treatment for biliary drainage was attempted in all cases but failed due to a complete obstruction of the distal common bile duct (CBD) or papillary invasion by the tumor.

The concept of EUS-CD was discussed with patients' family as an alternative treatment to avoid PTBD or surgery procedures. All participants were provided with written informed consent and this study was approved by the Institutional Review Board of our institution's committee.

Laboratory tests and clinical follow-up were performed after 7 and 30 days of the procedure, and monthly until patients' death. The mean follow-up was 140 days (30 days to 17 months). Subsequently, all patients underwent palliative chemotherapy.

The EUS-CD procedure was performed by an experienced endoscopist under conscious sedation, using a combination of intravenous midazolam, fentanyl and propofol. Prophylactic antibiotic (ciprofloxacin 400mg I.V.) was used at the beginning of the procedure, routinely used in cases of obstructed biliary system.

The CBD was visualized in the duodenal bulb window using a linear echoendoscope (GFUCT160, Olympus, Tokyo, Japan) (Fig. 1A). Color Doppler Ultrasound was used to identify vascular anatomy on the trajet. The dilated bile duct was punctured with a 19-gauge FNA needle (EUSN-19-T, Cook Endoscopy, Winston-Salem, NC, USA) (Fig. 1B). The puncture position was chosen based on EUS evaluation, at the CBD above the tumor, through the distal part of the

duodenal bulb.

For confirmation of biliary access, bile was aspirated and followed by iodine contrast injection under fluoroscopy view to demonstrate biliary opacification (Fig. 1C).

A 0.035-inch guidewire was introduced through the needle, under fluoroscopy view (Fig. 1D). It was attempted to pass the guidewire through the lesion, to reach the duodenum, as a *Rendezvous* maneuver, however in all cases without success.

After that, the needle was withdrawn and a wire-guided needle knife (KD-441Q, Olympus, Tokyo, Japan) was used to enlarge the site puncture in the duodenal wall (Fig. 1E), using the coagulation power to avoid bleeding. Then, a partially covered self-expandable metallic stent (Wallflex[®], Boston Scientific) was passed over the guide (Fig. 1F, 1G), through the choledochoduodenal fistula, without any dilatation procedure.

Duodenal SEMS placement was performed during the same endoscopic procedure without the need to change EUS device for a frontal view endoscope and/or duodenoscope. Stricture evaluation was performed by injection of contrast above and immediately downstreamed it, to assess morphology, length, and degree of obstruction. Duodenal stricture was passed with a 5-6 French (Fr) ERCP catheter and a hydrophilic guidewire was inserted distally. When the guidewire was correctly positioned distally to the stricture, the stent catheter was advanced over the guidewire. At this time, the stent was released (Fig. 1H) and its correct position and performance were documented immediately after deployment by contrast injection.

RESULTS

The procedure was performed in seven patients, including five females and two males. The mean age was 66 years old, ranging between 34 and 86 years old. All cases were diagnosed by imaging studies as unresectable cancer. Six of them had pancreatic adenocarcinoma and one had papillary

Table 1. Description of cases age, gender, primary cancer and correlation between endoscopic findings of biliary and duodenal lesions

Case	Age	Sex	Primary cancer	Level of Biliary Obstruction	Extension of Biliary Stenosis	Level of Duodenal Obstruction / Type	Extension of Duodenal Obstruction
01	75	F	Pancreatic adenocarcinoma	distal CBD	20 mm	Duodenal Bulb type I	30 mm
02	59	M	Pancreatic adenocarcinoma	distal CBD	20 mm	Duodenal second portion Type II	NA
03	34	F	Pancreatic adenocarcinoma	distal CBD	20 mm	Duodenal second portion Type II	20 mm
04	71	F	Pancreatic adenocarcinoma	distal CBD	15 mm	Duodenal second portion Type II	50 mm
05	86	F	Papillary adenocarcinoma	distal CBD	18 mm	Duodenal second portion Type II	NA
06	85	F	Pancreatic adenocarcinoma	distal CBD	20 mm	Duodenal Bulb Type I	30 mm
07	52	M	Pancreatic adenocarcinoma	distal CBD	18 mm	Duodenal second portion Type II	20 mm

Table 2. Description of SEMS placement in biliary and duodenal obstruction correlated with additional technique features

Case	Biliary SEMS	Needle diameter	Puncture enlargement with needle-knife	Duodenal SEMS	Duodenal balloon dilation	Success technique	Complications
01	PCSEMS 10 mm × 60 mm	19 G	Yes	18 mm × 90 mm	No	Yes	No
02	PCSEMS 10 mm × 80 mm	19 G	Yes	18 mm × 110 mm	No	Yes	No
03	PCSEMS 10mm × 60 mm	19 G	Yes	22 mm × 60 mm	No	Yes	No
04	PCSEMS 8 mm × 60 mm	19 G	Yes	18 mm × 110 mm	No	Yes	No
05	PCSEMS 8 mm × 60 mm	19 G	Yes	22 mm × 90 mm	No	Yes	No
06	PCSEMS 8 mm × 60 mm	19 G	Yes	18 mm × 90 mm	No	Yes	No
07	PCSEMS 10 mm × 80 mm	19 G	No	18 mm × 90 mm	No	Yes	No

SEMS: self-expandable metal stent.

adenocarcinoma.

In all cases, the location of the biliary obstruction was in the distal CBD and the grade of proximal dilation diameter varied from 15 mm to 20 mm. Two patients had type I (28.6%) and five had type II (71.4%) duodenal obstruction (Tab. 1).

Technical success of EUS-CD, by the stent placement, occurred in 100% of the cases. There were no early complications (Tab. 2). Biliary drainage was effective

clinically as well as in laboratory in 6 cases (6/7), by relieving obstructive jaundice and a decreasing bilirubin levels (Tab. 3).

Duodenal SEMS placement was effective in 100% of the cases that remained alive after a follow up of 7 and 30 days. The major cause of failure over time was ingrowth phenomenon, requiring the placement of another duodenal SEMS over the previous one in one patient. Duodenal obstruction relief and follow-up period are represented in

Table 3. Direct bilirubin levels and clinical jaundice according to follow-up time period

Case	DB Pre SEMS	DB after 7 days	DB after 30 days	DB after 60 days	DB after 90 days	DB after 120 days
01	17,7	8,2	2,1	0,5	Death ¹	--
02	16,9	5,14	2,31	0,6	0,17	0,21
03	16,83	11,58	Death ¹	--	--	--
04	3,20	6,20	15,54	8,54	Surgery ²	CI
05	14,6	5,3	0,3	CI/NA	CI/NA	CI/NA
06	12,22	CI/NA	3,1	0,87	CI/NA	0,18
07	6,3	1,8	Death ¹	--	--	--

DB: direct bilirubin; SEMS: self-expandable metal stent; CI: clinical improvement; NA: laboratory no available; ¹: death before this follow up, because of the disease; ²: biliary surgery for biliar drainage.

Table 4. Symptoms, type of feeding and duodenal obstruction relief during follow up period

Case	7 days	30 days	60 days	90 days	120 days	Total follow-up
01	Semi-solid diet	Semi-solid diet	Semi-solid diet	Semi-solid diet / Vomiting	Death ¹	97 days
02	Semi-solid diet	Semi-solid diet	Semi-solid diet	Semi-solid diet / Vomiting	Liquid diet / vomiting ³ (Second stent)	17 Months Death ¹
03	Semi-solid diet / Sporadic vomiting ²	Death ¹	--	--	--	18 days
04	Semi-solid diet	Semi-solid diet	Semi-solid diet / Sporadic vomiting	Semi-solid diet / Sporadic vomiting ²	Semi-solid diet / Sporadic vomiting ²	177 days Death ¹
05	Semi-solid diet	Semi-solid diet	Semi-solid diet	Vomiting ²	Semi-solid diet / Sporadic vomiting ²	4 months
06	Semi-solid diet	Semi-solid diet	Semi-solid diet	Semi-solid diet	Semi-solid diet / Sporadic vomiting ²	143 days Death ¹
07	Semi-solid diet	Semi-solid diet / Sporadic vomiting ²	Death ¹	--	--	43 days

¹Death before this follow up, because of the disease; ²Treatment with symptomatic and nasoenteral tube; ³Ingrowth phenomenon.

Table 4.

DISCUSSION

Patients with periampullary cancer, which includes lesions from papilla, head of the pancreas, distal CBD and duodenum or metastatic lesions are usually diagnosed in advanced stages, when curative surgical treatment is not

feasible. The mean survival time of these patients ranges from 6 to 12 months. However, when concomitant duodenal obstruction occurs, their survival decreases.²⁷

Simultaneous palliative treatment in cases of biliary and duodenal obstruction remains controversial in literature.

Surgical treatment with biliary-digestive bypass combined with gastro-jejunal anastomosis has high rates of morbidity (25%-37%) and mortality (2.5%).²⁸⁻³⁰ In addition, it also has

an increased length of hospital stay and financial costs as compared to endoscopic treatment.²⁸

PTBD is an alternative method for biliary drainage, even though it has a complication rate ranging from 10% to 30% and decreases the patients' quality of life when internal drainage is not achieved and there is a necessity for an external catheter.³¹ In cases with concomitant duodenal obstruction, symptoms reliefs are obtained with stent placement through upper endoscopy.

Endoscopic treatments with placement of SEMS for biliary drainage during ERCP³² and duodenal SEMS, through upper endoscopy,³³ have been used as less invasive methods. However, some studies describe difficulties in these techniques, such as failure in cannulation or access to the biliary tree through ERCP, and the location of duodenal obstruction for upper endoscopy.^{22,23,34,35}

Recently, EUS-CD has become an alternative method after unsuccessful ERCP treatment.³⁶⁻⁴⁰ Park *et al.*, in 2009,⁴¹ had 100% technical and clinical success in a study with 4 patients. In the same year, Hanada *et al.*,²⁰ obtained the same results without complications. Giovannini *et al.*,⁴² in 2011, reported a series of 9 patients who underwent EUS-CD and achieved technical and therapeutic success rates of 88.9%, and complication was observed in only one patient.

Our results suggest therapeutic EUS as an alternative for these patients, with good clinical success, feasible technique and safety. It is a less invasive procedure to biliary drainage in patients whose ERCP treatment failed due to tumor invasion.

Mutignani *et al.*,²⁷ proposed a classification for the duodenal obstruction in relation to the papilla: Type I stenosis, involving duodenal bulb or first part of duodenum, without involvement of the papilla; Type II stenosis, affecting the second part of the duodenum, with involvement of the papilla; and Type III stenosis, involving the third part of the duodenum without involvement of the papilla. The procedure of dual stent placement is more difficult in type II cases due to technical difficulty in biliary access because of previous enteral stent or tumor local invasion.^{22,23,34,35} In our cases most patients had the type II stenosis and all patients reported improvement of obstructive symptoms and quality of life after the stent placement.

This case series presents seven cases of unresectable periampullary cancer with both biliary and duodenal obstruction. In these cases, the technique may be an alternative to double stenting in the same procedure and equipment.

However, further studies are needed to standardize this procedure technique and compare it with PTBD.

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