

Endoscopic Ultrasound-Guided Enteroenterostomy for Afferent Limb Syndrome

Hicham El Bacha, MD¹, Sarah Leblanc, MD^{2,3}, Benoit Bordacahar, MD^{2,3}, Bertrand Brieu, MD^{2,3}, Maximilien Barret, MD, PhD^{2,3}, Eric Savier, MD, PhD⁴, Olivier Soubrane, MD, PhD⁵, Bertand Dousset, MD, PhD^{3,6}, and Frederic Prat, MD, PhD^{2,3}

¹Medecine B, Hôpital ibn-sina, Faculté de Médecine et de Pharmacie, Mohamed V University, Rabat, Morocco

²Department of Gastroenterology, Cochin Hospital, Assistance Publique-Hôpitaux de Paris, Paris, France

³Institut Cochin, Paris-Descartes University, Paris, France

⁴Department of Digestive, Hepato-Biliary and Pancreatic Surgery and Liver Transplantation, AP-HP, Pitié-Salpêtrière Hospital, Paris, France

⁵Department of Hepatobiliarypancreatic Surgery and Liver Transplantation, AP-HP, Beaujon Hospital, Clichy, France

⁶Surgery Department, Cochin Hospital, Paris, France

ABSTRACT

Afferent limb syndrome (ALS) is a rare complication of duodenopancreatectomy, resulting from the mechanical obstruction of the afferent limb usually after local malignancy recurrence. Management of ALS (ie, surgery and palliative therapy) is often unsatisfactory. We present 5 cases of endoscopic ultrasound-guided internal drainage of the afferent limb using lumen-apposing metal stents. All procedures were successful, with no related complications; 2 patients had a complete regression of their symptoms, one experienced cholangitis recurrence, and 2 patients died after some weeks because of their malignancies. Endoscopic ultrasound-guided enteroenterostomy offers a convenient and safe palliative solution for patients presenting ALS.

INTRODUCTION

Afferent limb syndrome (ALS), also called afferent loop syndrome, is a late postoperative complication of duodenopancreatectomy defined as the dilatation of the afferent limb with accumulation of biliopancreatic fluid, which can be easily identified on abdominal computed tomography (CT) scan.¹ ALS is due to the mechanical obstruction of the afferent limb, which can be caused by adhesions, loop kinking, internal hernia or anastomotic stenosis, and most often because of local cancer recurrence.² The accumulation of biliopancreatic fluid can induce pancreatitis, abdominal pain, vomiting, and most of all reflux cholangitis through the bilioenteric anastomosis. We present 4 cases of ALS treated by endoscopic enteroanastomosis by lumen-apposing metal stents (LAMS).

CASE REPORT

The aim of the technique was to obtain an internal drainage of the afferent limb through the stomach or jejunum by creating an endoscopic anastomosis. The gastroenterostomy or enteroenterostomy was created under endoscopic ultrasound (EUS) and fluoroscopic guidance; after endosonographic identification of the dilated afferent limb, the latter was accessed using either a 19-gauge needle, followed by electrocautery-enhanced lumen-apposing metal stent (ECE-LAMS) (2-step procedure) or ECE-LAMS in a single-step procedure (HotAXIOS, 15 × 10 mm; Boston Scientific, Marlborough, MA). A guidewire was advanced into the afferent limb before ECE-LAMS release. Contrast was injected under fluoroscopy after stent release to confirm the correct placement of the stent and observe contrast reflux into the biliary tree (Figure 1).

Patient 1: A 72-year-old woman presented in a degraded condition with biliary sepsis. She had a history of hepatectomy and common bile duct resection with Roux-en-y anastomosis for a Bismuth III cholangiocarcinoma. CT showed ascitis, peritoneal carcinomatosis, several liver abscesses, and a dilation of the afferent limb measured up to 70 mm in diameter. We performed an

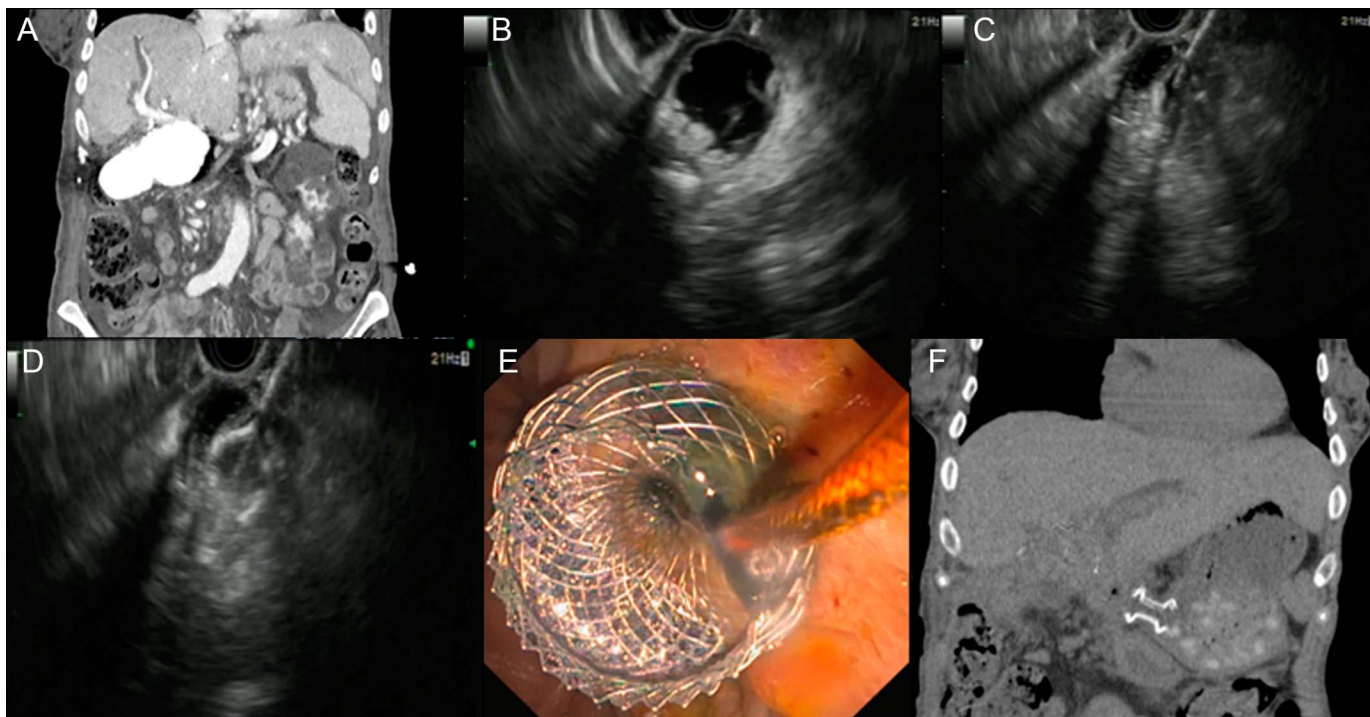


Figure 1. Afferent limb syndrome drainage procedure: (A) computed tomography scan revealing a dilated afferent limb. (B) Endoscopic ultrasound localization of the afferent limb. (C) Puncture of the afferent limb. (D) Opening the distal flange. (E) Proximal flange positioning. (F) Decompression of the limb through gastroenterostomy.

endoscopic gastroenterostomy to drain the afferent limb by using a 15-mm HotAXIOS stent. There was no postprocedure complication. The patient resumed oral feeding within 24 hours and some activities for a few days. However, disease progression led to the patient's death 15 days later, although without any recurrence of digestive intolerance, sepsis, or biliary symptoms.

Patient 2: A 67-year-old woman who underwent pancreaticoduodenectomy 1 year earlier for cholangiocarcinoma was referred for cholangitis and dilated intrahepatic bile ducts. CT scan showed peritoneal carcinomatosis nodules. Attempts to reach the afferent limb with standard endoscopes (duodenoscope and pediatric colonoscope) were unsuccessful because of jejunal stenosis between the gastrojejunal and the hepaticojejunal anastomoses. Percutaneous drainage and transhepatic cholangiography showed afferent limb dilation with a patent biliary anastomosis. We subsequently performed a gastroenterostomy using a 15-mm HotAXIOS LAMS. After stenting, the patient recovered without complications, oral feeding was well tolerated, and the sepsis subsided for a couple of weeks. However, sepsis resumed 2 months later because of the extension of carcinomatosis between the LAMS and the biliary anastomosis. External drainage allowed control of the sepsis, but mild cholestasis persisted. The patient died 3 months after LAMS insertion from fresh cholangitis and disease progression.

Patient 3: A 67-year-old man, who underwent child reconstruction for a pT3N1M0 cholangiocarcinoma 2 years earlier, was referred for cholangitis because of an ALS associated with

liver and peritoneal metastasis. Percutaneous transhepatic cholangiography found no biliary anastomotic stenosis. We performed an endoscopic gastrojejunostomy using a 15-mm HotAXIOS LAMS. The patient did well after the procedure. No cholangitis recurrence was noticed. A percutaneous drain initially placed was removed after 1 month, and the patient was able to undergo chemotherapy without any recurrence of the ALS.

Patient 4: A 54-year-old man, who underwent pancreaticoduodenectomy 3 years earlier for pT3N1, R1 cholangiocarcinoma, was referred for acute cholangitis with afferent limb dilatation because of local recurrence. A diverting jejunostomy was created using a 15-mm HotAXIOS LAMS; the patient has been doing well after the procedure, with no recurrence of cholangitis until the most recent news, 12 months after the procedure.

Patient 5: A 56-year-old man, who underwent hepatectomy and bile duct resection with Roux-en-y anastomosis 1 year earlier for cholangiocarcinoma and recurrence surgery 3 months earlier, was referred for vomiting and acute cholangitis. CT showed local recurrence with afferent limb dilatation. A diverting gastrojejunostomy was created using a 15-mm HotAXIOS LAMS. There was no postprocedure complication. However, the patient died after 1 week of acute kidney failure.

DISCUSSION

Although symptoms associated with the ALS are not uncommon, with one study reporting delayed GI problems in 13%

Table 1. Procedures and patients characteristics

Patient no	Sex, age	Symptoms	Tumor type and surgery	Stent type	Procedure-related adverse events	Cholangitis recurrence	Survival
1	F, 72 yr	Cholangitis Ascites Liver abscess	CholangioCa Roux-en-Y	HotAXIOS, 15 × 10 mm	No	No	2 wk
2	F, 67 yr	Cholangitis	CholangioCa, W + C	HotAXIOS, 15 × 10 mm	No	Yes, at 2 mo	3 mo
3	M, 67 yr	Cholangitis	CholangioCa, W + C	HotAXIOS, 15 × 10 mm	No	No	6 mo
4	M, 54 yr	Cholangitis	CholangioCa, W + C	HotAXIOS, 15 × 10 mm	No	No	Alive 12 mo after procedure
5	M, 56 yr	Cholangitis Vomiting	CholangioCa Roux-en-Y	HotAXIOS, 15 × 10 mm	No	No	1 wk (kidney failure)

W + C, Whipple resection + Child reconstruction.

after pancreaticoduodenectomy for pancreatic cancer, the “true” ALS with limb dilatation and cholangitis remains rare. ALS develops mostly after the second year of surgery and is in 33% of cases because of locoregional malignant recurrence.³ The patient’s condition is generally seriously impaired at that stage of the disease, with palliation and comfort being the primary objectives of care. Surgery in the context of carcinomatosis is ineffective and undesirable. However, conservative management also has limited efficacy, including percutaneous biliary drainage, which is both uncomfortable and has small or no effect on the afferent limb dilation, and the source of biliary reflux. Endoscopic drainage technique using LAMS solves this problem in a remarkably simple way, allowing a mini-invasive intervention with a short hospital stay and, contrary to external drainage, not impairing quality of life once limb decompression has been achieved.

LAMS are recently developed stents initially designed for pancreatic pseudocyst drainage and endoscopic necrosectomy.⁴ The design of LAMS stents with wide flanges and a tighter short saddle section, fully covered with silicon, allows stent anchoring with limited risk of leakage and migration, thus providing a secure and efficient way to create digestive endoscopic anastomoses.^{5,6} This particular capability to create a tight apposition of bowel walls has opened new avenues of endoscopic intervention such as the internal drainage of cholecystitis, the creation of an access to an excluded digestive segment (ie, endoscopic retrograde cholangiopancreatography after Roux-en-Y gastric bypass), or that of a gastrojejunal bypass in obese patients.⁷⁻⁹

Performing LAMS application requires proficiency in interventional EUS and complication management because some serious adverse events such as peritonitis and bleeding may occur in case of stent misplacement.¹⁰ The puncture site should be carefully chosen, including the absence of bowel or omentum interposition between the afferent limb and the gastroenteric wall and the shortest possible distance to the biliary anastomosis. The latter is important to avoid ALS recurrence such as in our reported case 2 and the former not to exceed the AXIOS saddle section length, which could induce stent migration or anastomotic bile leak. The

tract should be chosen to have no adjacent vascularization to prevent acute and delayed bleeding as reported in pancreatic pseudocyst drainage.¹¹

Compared with other LAMS devices, HotAXIOS delivery system allows a single step stent insertion, in which guidewire placement is only optional, making the procedure particularly expeditious and safer than when device exchanges are required for tract cautery or dilation.

For optimal outcomes, a thorough assessment of the disease stage of evolution and ALS etiology maybe mandatory because some patients may not experience a sustained benefit from the procedure when their malignancy comes to a terminal evolution. As seen in some of our cases, despite a successful procedure with no related complication, 2 patients died after a short time because of their malignancy. By contrast, a third patient, after primary clinical success, presented persistent mild cholestasis and subsequent recurrent cholangitis because of the progression of peritoneal carcinomatosis (Table 1). In conclusion, provided technical proficiency and carefully selected indications, EUS-guided enteroenterostomy by LAMS offers a convenient and safe palliative solution for patients presenting ALS because of progressive malignancy after duodenopancreatectomy.

DISCLOSURES

Author contributions: H. El Bacha wrote the manuscript and is the article guarantor. S. Leblanc, B. Bordacahar, B. Brieu, M. Barret, E. Savier, O. Soubrane, B. Dousset, F. Prat approved the final manuscript.

Financial disclosure: None to report.

Previous presentation: This case was presented at the ESGE days; April 4-6, 2019; Prague, Czech Republic.

Informed consent was obtained for this case report.

Received August 6, 2019; Accepted June 8, 2020

REFERENCES

1. Courtney A, Levine MS. The postoperative stomach Woodfield. *Eur J Radiol.* 2005;53(3):341–52.
2. Gayer G, Barsuk D, Hertz M, Apter S, Zissin R. CT diagnosis of afferent loop syndrome. *Clin Radiol.* 2002;57(9):835–9.
3. Pannala R, Brandabur JJ, Gan SI, et al. Afferent limb syndrome and delayed GI problems after pancreaticoduodenectomy for pancreatic cancer: Single-center, 14-year experience. *Gastrointest Endosc.* 2011;74(2):295–302.
4. Siddiqui AA, Adler DG, Nieto J, et al. EUS-guided drainage of peri-pancreatic fluid collections and necrosis by using a novel lumen-apposing stent: A large retrospective, multicenter U.S. Experience (with videos). *Gastrointest Endosc.* 2016;83(4):699–707.
5. Pushpak T, Cosgrove N, Loren DE, Kowalski T, Siddiqui AA. Endoscopic ultrasound-guided gastroenterostomy using a lumen-apposing self-expanding metal stent for decompression of afferent loop obstruction. *Endoscopy.* 2015;47:E395–6.
6. Rodrigues-Pinto E, Grimm IS, Baron TH. Efficacy of endoscopically created bypass anastomosis in treatment of afferent limb syndrome: A single-center study. *Clin Gastroenterol Hepatol.* 2016;14(4):633–7.
7. Jain D, Bhandari BS, Agrawal N, Singhal S. Endoscopic ultrasound-guided gallbladder drainage using a lumen-apposing metal stent for acute cholecystitis: A systematic review. *Clin Endosc.* 2018;51(5):450–62.
8. Kedia P, Tyberg A, Kumta NA, et al. EUS-directed transgastric ERCP for Roux-en-Y gastric bypass anatomy: A minimally invasive approach. *Gastrointest Endosc.* 2015;82(3):560–5.
9. Ligresti D, Amata M, Granata A, et al. Single session EUS-guided temporary gastro-gastrostomy and ERCP following gastric bypass. *Obes Surg.* 2018;28:886–8.
10. Tyberg A, Perez-Miranda M, Sanchez-Ocaña R, et al. Endoscopic ultrasound-guided gastrojejunostomy with a lumen-apposing metal stent: A multicenter, international experience. *Endosc Int Open.* 2016;4(3):E276–81.
11. Amateau SK, Freeman ML. Avoidance, recognition and management of complications associated with lumen apposing metal stents. *Gastrointest Endosc Clin N Am.* 2018;28:219–31.

Copyright: © 2020 The Author(s). Published by Wolters Kluwer Health, Inc. on behalf of The American College of Gastroenterology. This is an open-access article distributed under the terms of the Creative Commons Attribution-Non Commercial-No Derivatives License 4.0 (CCBY-NC-ND), where it is permissible to download and share the work, provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal.