Dig Dis Sci (2011) 56:3364–3369
DOI 10.1007/s10620-011-1743-6

ORIGINAL ARTICLE

Percutaneous Gastrostomy Tube Placement to Perform Transgastrostomy Endoscopic Retrograde Cholangiopancreaticography in Patients with Roux-en-Y Anatomy

Bezawit Tekola · Andrew Y. Wang · Madhuri Ramanath · Brent Burnette · Kristi Ellen · Bruce D. Schirmer · Peter T. Hallowell · Bryan G. Sauer · Michel Kahaleh

Received: 5 April 2011 / Accepted: 26 April 2011 / Published online: 31 May 2011

Abstract
Background Roux-en-Y gastric bypass (RYGB) surgery is one of the most commonly performed bariatric surgeries in the United States. Patients with prior RYGB are not amenable to conventional endoscopic retrograde cholangiopancreaticography (ERCP). Surgical gastrostomy (SG) tube placement enables transgastrostomy ERCP (TG-ERCP).
Materials and Methods Eleven patients with RYGB anatomy received open Stamm gastrostomy after which the tract was then allowed to mature for an average of 45 days before therapeutic TG-ERCP. The success rate and procedure-related complications of both gastrostomy and ERCP were assessed.
Results TG-ERCP was performed on eleven patients (median age 52 years, range 37–61 years) with prior RYGB and pancreatobiliary diseases. Indications for ERCP in these patients included suspected gallstone pancreatitis ($n = 4$), ampullary/biliary strictures ($n = 5$), pancreas divisum ($n = 1$), and common bile duct clipping as a result of RYGB surgery ($n = 1$). Two individuals developed post surgical complications with stomal-related infections. TG-ERCP with therapeutic intervention was successfully performed in all patients. Intervention included stone extractions ($n = 11$), biliary stricture dilation ($n = 11$), biliary sphincterotomy ($n = 11$), biliary ($n = 3$) and pancreatic ($n = 1$) stent placement, ampullary biopsies ($n = 3$), choledochoscopy ($n = 1$), and pseudocyst drainage ($n = 1$). Complications included post-ERCP pancreatitis ($n = 2$), post-sphincterotomy bleeding ($n = 1$), gastrostomy site bleed ($n = 1$), and gastric perforation ($n = 1$). The total number of ERCP sessions for the eleven patients was 15 (1 or 2 per patient). Median follow-up was 42 days (range 7–123 days).
Conclusion Surgical open gastrostomy followed by TG-ERCP enables therapeutic intervention but is associated with significant complications.

Keywords Roux-en-Y gastric bypass · Hepaticojejunostomy · Pancreaticoduodenectomy · ERCP

B. Tekola · A. Y. Wang · M. Ramanath · B. Burnette · K. Ellen · B. G. Sauer · M. Kahaleh
Digestive Health Center of Excellence, Department of Medicine, University of Virginia Health System, Charlottesville, VA, USA

B. D. Schirmer · P. T. Hallowell
Department of Surgery, University of Virginia Health System, Charlottesville, VA, USA

M. Kahaleh (✉)
Division of Gastroenterology and Hepatology, University of Virginia Health System, Box 800708, Charlottesville, VA 22908, USA
e-mail: mkahaleh@gmail.com

Introduction

As obesity rates rise, both in the United States and in other parts of the world, surgical intervention that alters the gastrointestinal tract, for example the Roux-en-Y gastric bypass (RYGB), is becoming increasingly prevalent, and access to the distal GI tract is often a challenge. RYGB is effective in that it involves a long-limb bypass which causes maldigestion and malabsorption [1]. Endoscopic retrograde cholangiopancreatography (ERCP) in patients who have undergone RYGB surgery is problematic with success rates well below 70% [2], because of difficulties accessing the ampulla [3, 4]. To overcome such challenges, various approaches to accessing the biliary tract have been proposed in the literature. Percutaneous transhepatic

cholangiography [5, 6], laparoscopic transgastric endoscopy [7], intraoperative transjejunostomy [8], and double–balloon-enteroscopy-assisted approaches [9–11] have been tried with variable success. Many of these methods enabling therapeutic ERCP are time-consuming, costly, invasive, and, in many cases, challenging. Single balloon-assisted ERCP, yet another alternative, might have higher rates of complications as compared to conventional ERCP, such as pancreatitis, as demonstrated by Wang et al. [12].

Transgastrostomy-ERCP (TG-ERCP) has been described in the literature [13, 14] and is regarded as a successful means of gaining access to the native ampulla for complex therapeutic intervention. The objective of this study was to evaluate the effectiveness of TG-ERCP in treating patients with complex pancreatico-biliary diseases and to evaluate procedure-related complications.

Methods

From December 2004 to July 2009, eleven patients (10 women) who had a remote RYGB presented to the University of Virginia Health System for therapeutic ERCP. The indications for all eleven patients included suspected gallstone pancreatitis ($n = 4$), ampullary/biliary strictures ($n = 5$), pancreas divisum ($n = 1$), and common bile duct clipping as a result of RYGB surgery ($n = 1$) (Table 1). Before proceeding with TG-ERCP, four failed standard ERCP, three failed at reaching the ampulla using a pediatric or adult colonoscope, two patients failed percutaneous transhepatic cholangiography, and one patient failed single-balloon-assisted ERCP.

These patients underwent TG-ERCP following these steps:

(1) *Open Surgical Distal Gastrostomy:* Access to the peritoneal cavity was via an upper midline incision through the old upper midline scar. The distal stomach was identified and a 32-French Malecot gastrostomy tube was then inserted into the lumen of the stomach and secured with a double purse-string suture of #2-0 silk. The stomach was secured to the anterior abdominal wall with interrupted #2-0 silk sutures. This secured the tube in place and secured the stomach to the anterior abdominal wall circumferentially. The midline incision was then closed with running #1 PDS suture to close the fascia and peritoneum in a single layer. Subcutaneous tissues were irrigated with saline and the skin was closed with a skin stapler. Sterile dressings were then applied. The tube itself was secured to the skin with a 2-0 nylon suture and then sterilely dressed.

(2) *TG-ERCP:* After the SG tract had been allowed to mature (median 45 days; Table 1), patients underwent ERCP. A guidewire was placed through the gastrostomy tube and coiled in the stomach under fluoroscopy. Subsequently, the gastrostomy tube was removed and consecutive bougie dilations (Savary-Gillard, Cook Medical, Winston-Salem, NC, USA) of the stoma were performed up to 36 French (Fig. 1). A ball-tipped catheter (Boston Scientific, Marlborough,

Table 1 Patient characteristics

Patient #	Gender	Age	ERCP indication	Time delay between surgery and ERCP (days)	Total # ERCP session	Intervention[a]	Complications
1	M	52	CBD clipping during gastric bypass; stent revision	49	2	A,B,C	Post-ERCP pancreatitis, Pseudocyst
2	F	61	Gallstone pancreatitis	32	1	A,B	Post-ERCP bleed
3	F	53	Gallstone pancreatitis	47	1	A,B	None
4	F	54	Gallstone pancreatitis	35	1	A,B	Post-ERCP bleed
5	F	41	Ampullary stricture	29	1	A,B	None
6	F	51	Ampullary stricture	135	1	A,B,D	Gastrostomy site infection and bleeding
7	F	42	Ampullary stricture	45	1	A,B,D	Contained gastric perforation
8	F	37	Ampullary stricture	85	2	A,B,C,D	None
9	F	55	Gallstone pancreatitis; pancreatic pseudocyst	51	1	A,B,F	Gastrostomy site infection,
10	F	54	Pancreatic divisum	46	2	A,B,E	None
11	F	47	Biliary stenosis	29	2	A,B,C,G	None

[a] A, biliary sphincterotomy; B, biliary stone extraction; C, biliary stent; D, ampullary biopsy; E, pancreatic stent; F, cystenterostomy; G, choledochoscopy

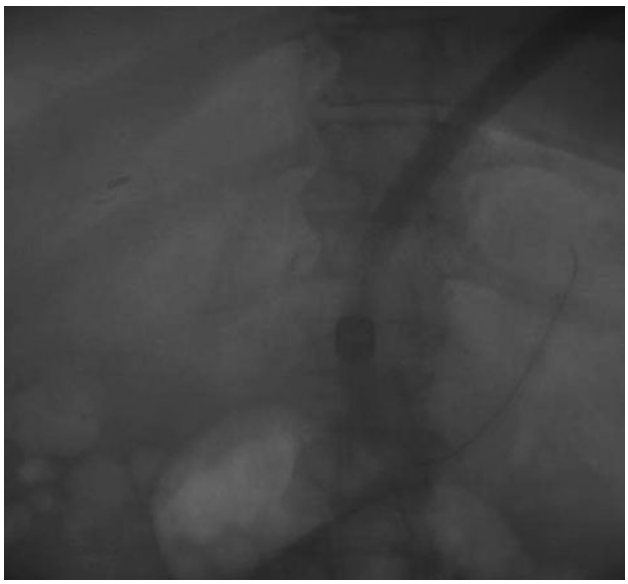

Fig. 1 Bougie dilation over guide wire placed in the excluded stomach

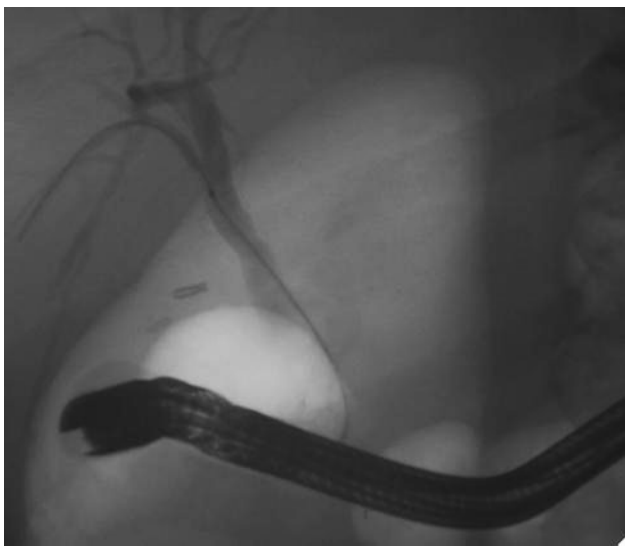

Fig. 2 Endoscopic retrograde cholangiography performed through the gastrostomy track created

MA, USA) was inserted through the working channel of the duodenoscope (TJV-160VF; Olympus America, Center Valley, PA, USA) and the guidewire that was coiled in the stomach was back-fed through the ball tip catheter. The duodenoscope was passed over the wire into the stomach and then advanced to the major papilla. Therapeutic ERCP was performed using standard devices, including sphincterotomes, retrieval balloons, and stents (Fig. 2).

All procedures were performed by experienced pancreaticobiliary endoscopists who routinely performed more than 500 ERCPs annually. Patients were captured prospectively in our pancreatico-biliary database. This study was approved by our Institutional Review Board.

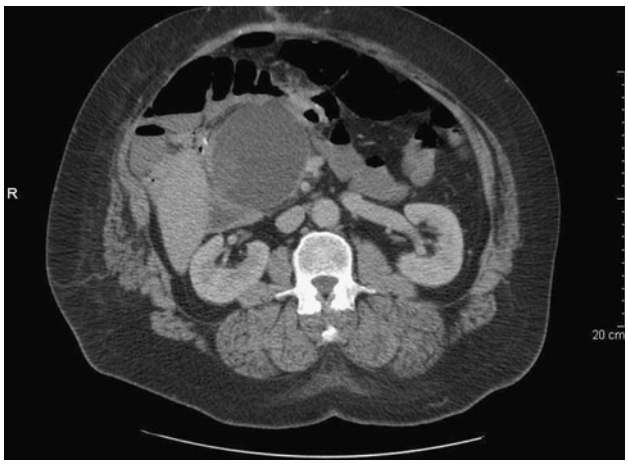

Fig. 3 Mature pseudocyst identified on CT abdomen

Fig. 4 Fluoroscopic images of conventional cystogastrostomy performed though the gastrostomy track

Results

Patient Characteristics

Eleven patients (10 women) median age 52 years, range 37–61 years, had previous RYGB. Indications for ERCP included gallstone pancreatitis ($n = 4$), one of which was complicated by pseudocyst formation requiring cystenterostomy ($n = 1$) (Figs. 3, 4, 5), ampullary/biliary stricture ($n = 5$), pancreatic divisum ($n = 1$), and iatrogenic bile duct clipping during gastric bypass ($n = 1$).

Fig. 5 Resolution of pseudocyst confirmed by CT abdomen

All patients underwent successful surgical placement of a Stamm gastrostomy. The median time between surgical Stamm gastrostomy placement and TG-ERCP was 45 days (range 29–135 days).

Therapeutic TG-ERCP

All eleven patients underwent biliary sphincterotomy and balloon sweep with stone/sludge extraction. Three patients underwent biliary stenting. One patient underwent pancreatic duct dilation with temporary stent placement. Three patients had ampullary biopsies. One patient underwent endoscopic transenteric pancreatic pseudocyst drainage and another had choledochoscopy using Spyglass (Boston Scientific).

Follow-up and Complications

Post procedure all patients were followed up in the clinic with a median follow up time of 42 days (range 7–123 days). Overall, three patients (27%) had post-surgical complications after placement of the gastrostomy tube. Two of the three patients developed surgical site infections (18%), which resolved with outpatient oral antibiotic therapy. One patient had mild bleeding (9%) that did not necessitate transfusion therapy (Fig. 6).

Five patients (45%) developed post-ERCP complications (Fig. 7). Two of these patients (18%) had post-ERCP bleeding, considered to be mild and moderate [15]. One patient had a gastrointestinal bleed from TG-ERCP due to biliary sphincterotomy but did not require blood transfusion. The other patient presented with bleeding from the gastrostomy site the day after ERCP. This patient was transfused a total of two units packed red blood cells, and

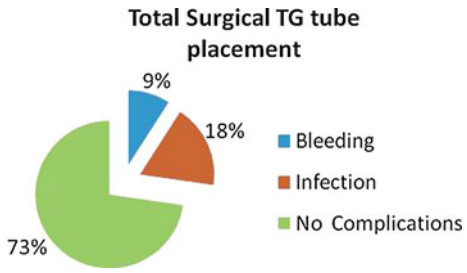

Fig. 6 Post surgical (SG) complications

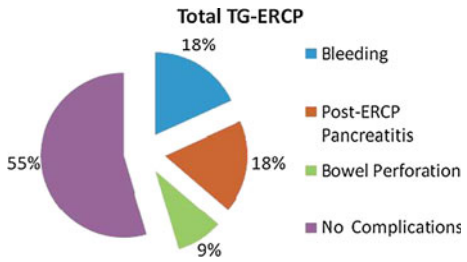

Fig. 7 Post ERCP complications

the bleeding site was found to be cutaneous and successfully cauterized with sliver nitrate.

Another two of the five patients had post-ERCP pancreatitis (18%). One patient with iatrogenic bile duct clipping intraoperatively, had severe post-ERCP pancreatitis using the Cotton classification [15], with subsequent abscess formation. A second was diagnosed with moderate post-ERCP pancreatitis [15].

One of the five patients (9%) sustained a contained gastric perforation [15] at the site of the endoscopic dilation. The patient was managed conservatively with IV antibiotics and total parenteral nutrition for two days before being able to start oral nutrition, with the PEG tube left in place to facilitate healing. She subsequently made a full recovery and returned to a regular diet.

Discussion

Bariatric surgery is an increasingly common procedure as obesity rates continue to rise in the United States. Consequently, it has become difficult managing these patients with surgically altered anatomy when they develop biliary or pancreatic diseases. Traditional peroral endoscopy for ERCP has a low success rate in patients who have had Roux-en Y gastric bypass. Wright et al. reported a success rate of 65–70% using a forward viewing pediatric or adult colonoscope followed by exchanging for a duodenoscope [2].

Other investigators have used pediatric colonoscopes and single or double-balloon enteroscopes to facilitate

ERCP [12, 16] but these techniques also have their limitations. In particular, using a longer scope to perform therapeutic ERCP can be challenging, because the equipment currently available is suboptimal and does not enable the full array of therapeutic pancreatico-biliary intervention, for example pseudocyst drainage, choledochoscopy, or placement of large biliary stent [9, 11].

Percutaneous transhepatic cholangiography [5, 6] and laparoscopic transgastric endoscopy [7] are two techniques that have been described in the literature. The former is the current standard of patient care [6] yet, despite advances in technology, PTC is not reliably able to provide some therapeutic options, for example biliary or pancreatic sphincterotomy. The latter involves a more challenging single-stage procedure and may require conversion to open gastrostomy, as described by Gutierrez et al. [17], making it, at times, a multi-step procedure.

TG-ERCP was first described by Baron et al. [13] and seems to be a compromise of all the above-mentioned techniques. Comparable with our study, Gutierrez et al. [17] reported the successful use of surgical gastrostomy for RYGB anatomy to perform various techniques including ERCP. Their study demonstrated the use of a laparoscopic surgical gastrostomy as a single-step procedure with pancreaticobiliary intervention. Conversely, our study demonstrates a two-step procedure in which patients underwent an open gastrostomy with a maturation period before endoscopic intervention. Gutierrez et al. noted a 10% laparoscopic re-exploration rate with ultimate conversion to open gastrostomy [17]. Our series was able to avoid this conversion of access, and has the advantage of gastrostomy tract reusability for repeat ERCP in the future, which is important when treating benign conditions. It also enables the wider variety of endoscopic intervention that surgical gastrostomy allows, for example biliary and pancreatic stenting, ampullary biopsies, pseudocyst drainage, and choledochoscopy.

In our study, TG-ERCP has its own set of limitations. Primarily, the invasive approach for placement of the SG tube exposes the patient to the risk of post surgical complications, for example infections, bleeding, or gastric perforation. The other major limitation is the significant delay between SG tube placement and the therapeutic ERCP. While such delays could be limited to perhaps three weeks, even this time frame excludes emergency use of the technique. Thus, this technique could be reserved for stable patients with difficult anatomy having recurrent pancreatitis or biliary obstruction that have failed the various current endoscopic intervention requiring biliary or pancreatic intervention not amenable to PTC.

Overall, TG-ERCP enables therapeutic ERCP in patients that have undergone RYGB surgery. Although effective, this technique is associated with both surgically and endoscopically related complications and careful patient selection is indicated. The limitation of this technique is the time delay required for maturation of the gastrostomy tract. Given the paucity of data about this modality, further research is warranted to evaluate the safety and efficacy of this procedure as a means of facilitating ERCP in gastric bypass patients.

References

1. Wang Y, Zhang C. Bariatric surgery to correct morbid obesity also ameliorates atherosclerosis in patients with type 2 diabetes mellitus. *Am J Biomed Sci*. 2009;1:56–69.
2. Wright BE, Cass OW, Freeman ML. ERCP in patients with long-limb Roux-en-Y gastrojejunostomy and intact papilla. *Gastrointest Endosc*. 2002;56:225–232.
3. Feitoza AB, Baron TH. Endoscopy and ERCP in the setting of previous upper GI tract surgery. Part I: reconstruction without alteration of pancreaticobiliary anatomy. *Gastrointest Endosc*. 2001;54:743–749.
4. Feitoza AB, Baron TH. Endoscopy and ERCP in the setting of previous upper GI tract surgery. Part II: postsurgical anatomy with alteration of the pancreaticobiliary tree. *Gastrointest Endosc*. 2002;55:75–79.
5. Sundbom M, Nyman R, Hedenstrom H, Gustavsson S. Investigation of the excluded stomach after Roux-en-Y gastric bypass. *Obes Surg*. 2001;11:25–27.
6. Ferrucci JT Jr, Mueller PR, Harbin WP. Percutaneous transhepatic biliary drainage: technique, results, and applications. *Radiology*. 1980;135:1–13.
7. Peters M, Papasavas PK, Caushaj PF, Kania RJ, Gagne DJ. Laparoscopic transgastric endoscopic retrograde cholangiopancreatography for benign common bile duct stricture after Roux-en-Y gastric bypass. *Surg Endosc*. 2002;16:1106.
8. Mergener K, Kozarek RA, Traverso LW. Intraoperative transjejunal ERCP: case reports. *Gastrointest Endosc*. 2003;58:461–463.
9. Dellon ES, Kohn GP, Morgan DR, Grimm IS. Endoscopic retrograde cholangiopancreatography with single-balloon enteroscopy is feasible in patients with a prior Roux-en-Y anastomosis. *Dig Dis Sci*. 2009;54:1798–1803.
10. Mehdizadeh S, Ross A, Gerson L, et al. What is the learning curve associated with double-balloon enteroscopy? Technical details and early experience in 6 U.S. tertiary care centers. *Gastrointest. Endosc*. 2006;64:740–750.
11. Emmett DS, Mallat DB. Double-balloon ERCP in patients who have undergone Roux-en-Y surgery: a case series. *Gastrointest Endosc*. 2007;66:1038–1041.
12. Wang AY, Sauer BG, Behm BW, et al. Single-balloon enteroscopy effectively enables diagnostic and therapeutic retrograde cholangiography in patients with surgically altered anatomy. *Gastrointest Endosc*. 2010;71:641–649.
13. Baron TH, Vickers SM. Surgical gastrostomy placement as access for diagnostic and therapeutic ERCP. *Gastrointest Endosc*. 1998;48:640–641.
14. Baron TH, Chahal P, Ferreira LE. ERCP via mature feeding jejunostomy tube tract in a patient with Roux-en-Y anatomy (with video). *Gastrointest Endosc*. 2008;68:189–191.
15. Cotton PB, Lehman G, Vennes J, et al. Endoscopic sphincterotomy complications and their management: an attempt at consensus. *Gastrointest Endosc*. 1991;37:383–393.

16. Elton E, Hanson BL, Qaseem T, Howell DA. Diagnostic and therapeutic ERCP using an enteroscope and a pediatric colonoscope in long-limb surgical bypass patients. *Gastrointest Endosc*. 1998;47:62–67.

17. Gutierrez JM, Lederer H, Krook JC, Kinney TP, Freeman ML, Jensen EH. Surgical gastrostomy for pancreatobiliary and duodenal access following Roux en Y gastric bypass. *J Gastrointest Surg*. 2009;13:2170–2175.