Double-balloon enteroscopy as a rescue technique for failed direct percutaneous endoscopic jejunostomy when using conventional push enteroscopy (with video)

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Direct percutaneous endoscopic jejunostomy (DPEJ) tube placement is indicated in patients who require prolonged enteral feeding but are not suitable candidates for PEG or when attempted PEG placement fails. Although PEG with transgastric jejunal tube extension (PEG-J) is another option, the delivery rate of enteral feeds is limited by the narrow-bore extension tube, which is also prone to frequent obstruction and migration back into the stomach.[1,2] Furthermore, PEG-J may not decrease the risk of recurrent aspiration pneumonia as has been shown with DPEJ.[3]

However, DPEJ is technically challenging, with lower rates of successful placement than PEG. DPEJ is usually performed by using colonoscopes or push enteroscopes, with or without overtubes.[4] In 1 large series, DPEJ failed in nearly a third of 307 attempts because of lack of transillumination and inability to pass into the jejunum.[5]

Double-balloon enteroscopy (DBE) may increase the likelihood of finding a suitable site for percutaneous endoscopic jejunostomy (PEJ) placement by allowing deeper access into the small intestine. We hypothesized that DBE-assisted DPEJ placement would succeed when failure occurred with use of a colonoscope.

Abbreviations: BAE, balloon-assisted enteroscopy; BMI, body mass index; CVA, cerebrovascular accident; DBE, double-balloon enteroscopy; DPEJ, direct percutaneous endoscopic jejunostomy; GETA, general endotracheal anesthesia; LLQ, left lower abdominal quadrant; LUQ, left upper abdominal quadrant; MAC, monitored anesthesia care; PEG-J, PEG with jejunal tube extension; PEJ, percutaneous endoscopic jejunostomy.

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This video can be viewed directly from the GIE website or by using the QR code and your mobile device. Download a free QR code scanner by searching "QR Scanner" in your mobile device's app store.

METHODS

Patients

In this prospective pilot study, approved by the Institutional Review board, patients in whom DPEJ with push enteroscopy failed were offered DBE-assisted DPEJ placement. Patients or their legal guardians provided written informed consent. Inclusion criteria were as follows: (1) age older than 18 years, (2) appropriate indication and approval for jejunostomy feeding tube placement by the nutrition service, (3) absence of a bleeding disorder, (4) platelet count over 50 × 10(9) per liter, and (5) International Normalized Ratio below 1.5. Exclusion criteria were as follow: (1) allergy to latex, (2) enteroenteric anastomosis less than 4 weeks old, (3) ascites, (4) small-bowel obstruction, and (5) pregnancy. Intravenous antibiotic prophylaxis was administered.

Procedures

Conventional DPEJ was performed with variable-stiffness pediatric colonoscopes (PCF-Q180AL, Olympus America, Center Valley, PA) with CO_2 insufflation by 4 experienced endoscopists uninvolved with subsequent DBE procedures. Conventional procedures were performed by using moderate sedation (fentanyl and midazolam) or monitored anesthesia care (MAC). Procedure tolerance was graded as excellent, good, fair, or poor by the endoscopist and registered nurse responsible for sedation and monitoring, and this information was entered into the GI database at the end of the procedure.

The DBE system (EN-450T5, Fujinon, Inc., Saitama, Japan) is located within a surgical suite at one Mayo Clinic hospital.

All DBE procedures are performed with anesthesia support. The type of sedation used (MAC or general endotracheal anesthesia [GETA]) is at the discretion of the anesthesiologist. CO_2 is used for insufflation. DBE-DPEJ was performed by 1 of 2 experienced DBE endoscopists (L. M. W. K. S. and E. R.). Fluoroscopy was used only in patients with surgically altered gut anatomy to help identify the afferent and efferent limbs. One of 2 registered nurses who assist with all tube placements performed the skin portion of the procedure under the endoscopist's direction.

The DBE was performed by using the standard push-pull technique after the balloon enteroscope was advanced beyond the ligament of Treitz. We limited insertion of the enteroscope to the midjejunum (≤150 cm from the ligament of Treitz). During advancement, a site in the jejunum was sought for PEJ tube placement by transillumination and finger indentation. If an adequate site was not identified, it was sought during instrument withdrawal. After a suitable site was identified, DPEJ placement was performed by using the Ponsky pull PEG technique and kit (MIC PEG Kit, Kimberly-Clark, Roswell, GA). The safe tract technique was used.[6] To prevent jejunal loop displacement during trocar insertion, the anesthetic needle was grasped with a long-length polypectomy snare to anchor the jejunum to the abdominal wall.[7] The trocar was inserted alongside the needle into the jejunum. The looped wire from the PEG kit was inserted through the trocar and grasped with the snare to exit the mouth. Over the wire, a 20F feeding tube was pulled into position (Video 1, available online at www.giejournal.org). The balloon enteroscope was not reinserted to evaluate the PEJ site.

In patients with surgically altered gut anatomy, tattooing of either the afferent or the efferent limb was performed before DPEJ to facilitate subsequent endoscopic procedures (Video 1).

Data collection and follow-up

Primary outcome measures were technical success and adverse event rates related to DBE-assisted DPEJ. Data collection also included patient demographics, indications for DPEJ, gut anatomy (native or altered), causes of failed standard DPEJ, type of sedation administered, and procedure time—from endoscope insertion to PEJ tube placement (for successful procedures) or to endoscope extubation (for failed procedures). Patients were contacted 24 hours later and 1 month later to assess tube function and adverse events. Adverse events were defined according to accepted criteria.[8]

Statistical analysis

Descriptive statistics were reported as frequency (percentage) or mean (range), as appropriate. Comparison of mean procedure times for failed DPEJ by push enteroscopy and DBE-assisted DPEJ were performed by the Wilcoxon signed rank test because of the small sample size and non-Gaussian distribution. Statistical tests were 2-sided, and P values $< .05$ were considered statistically significant.

RESULTS

Of 33 patients referred for DPEJ tube placement, DPEJ with a pediatric colonoscope failed in 10 (30%), who then consented to DBE-assisted DPEJ. Tables 1 and 2 summarize patient characteristics and outcomes. The mean age was 62 years (range, 23-89 years), and the mean body mass index (BMI) was 25 kg/m^2 (range, 14-40 kg/m^2). Four patients had surgically altered gut anatomy: pylorus-preserving pancreaticoduodenectomy (n = 1), Roux-en-Y gastric bypass (n = 2), and Roux-en-Y esophagojejunostomy (n = 1). Conventional DPEJ was performed with the patients under moderate sedation in 9 of 10 patients; the mean doses of fentanyl and midazolam were 126 μg (range, 37.5-225 μg) and 6.7 mg (range, 1.5-14 mg), respectively. The procedure tolerance for conventional DPEJ was rated as good to excellent in 90% of patients and fair in 1 patient. DBE-assisted DPEJ was performed with the patients under GETA in 9 patients and with MAC in 1 patient.

Causes of failed conventional DPEJ were inability to transilluminate and identify a site for tube placement in patients with normal gut anatomy (n = 5) or efferent limb in altered anatomy (n = 3), and limited endoscope advancement because of small-bowel angulation/fixation (n = 1) or excessive gastric looping (n = 1). DBE-assisted DPEJ was performed on the same day of failed standard DPEJ in 2 patients, the next day in 6, and 1 week later in 2. The estimated DPEJ tube location was proximal jejunum (n = 5) and midjejunum (n = 1) in patients with native gut anatomy. In patients with altered gut anatomy, the feeding tube was placed in the efferent jejunal limb (n = 3) and the distal Roux limb (n = 1) of a Roux-en-Y gastric bypass. The feeding tube location was left lower abdominal quadrant (n = 6) and left upper quadrant (n = 4). Glucagon was used in 4 of 10 patients (mean dose, 0.43 mg; range, 0.25-0.75 mg) during conventional push endoscopy and in 5 of 10 patients (mean dose, 0.6 mg; range, 0.25-1 mg) during DBE-assisted DPEJ, to decrease bowel motility. The mean procedure times for failed DPEJ by push enteroscopy and DBE-assisted DPEJ were similar: 31 (10-49) minutes and 29 (10-48) minutes, respectively (P = 1.00).

Successful PEJ placement with use of DBE was achieved in all 10 patients. One moderately severe adverse event (peristomal cellulitis) developed less than 24 hours after the procedure and resolved with intravenous antibiotics during a 4-day hospitalization. No additional adverse events occurred either 24 hours after the procedure or at the 1-month follow-up. All patients tolerated DPEJ feedings.

Although the study was designed for inclusion of 20 patients, recruitment was terminated early because of the success seen in 10 of 10 (100%) patients. This decision was made by the principal investigator (L. M. W. K. S.) and communicated to the Institutional Review Board, which approved.