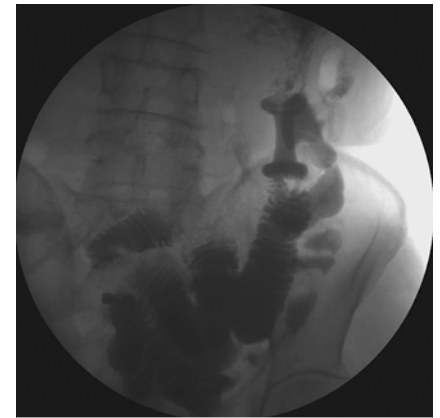


Saline with methylene blue-assisted endoscopic ultrasound-guided gastrojejunostomy using a double-flared fully covered metal stent



► **Fig. 1** The stages of endoscopic ultrasound-guided gastrojejunostomy and stent placement. **a** Computed tomography showed a low-density 23×17 mm mass in the pancreatic head (presumed to be pancreatic cancer), along with distal biliary obstruction, a dilated pancreatic duct, and multiple enlarged pancreatic, hilar, and hepatic lymph nodes. **b** Angiography showed the distal bowel. Then, the wire was removed and approximately 200 mL of saline with methylene blue dye was pumped into the distal small bowel through the catheter. **c** The guidewire was inserted through the needle lumen into the jejunum, the needle was removed over the wire, and the fully covered, double-flared, metal stent was introduced and released. **d** Contrast agent was injected through the working channel and clearly showed the jejunum.



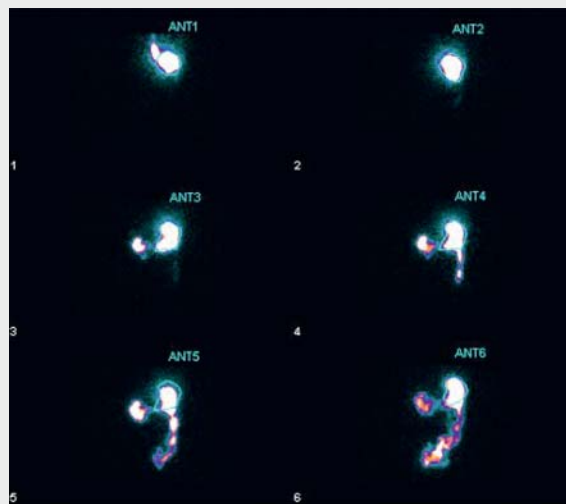
► **Fig. 2** A computed tomography scan 4 days after the procedure confirmed that the stent was in a good position and that oral contrast agent passed easily from stomach to jejunum.

Here, we report a successful EUS-guided gastrojejunostomy (EUS-GJ) in a 65-year-old man who presented to our hospital with malignant duodenal stenosis, causing persistent vomiting and difficulty eating. Computed tomography (CT) showed a low-density 23×17 mm mass in the pancreatic head (presumed to be pancreatic cancer), along with distal biliary obstruction, a dilated pancreatic duct, and multiple enlarged pancreatic, hilar, and hepatic lymph nodes (► **Fig. 1 a**). The patient had undergone a Roux-en-Y bypass 2 years previously at another hospital. The previous surgery precluded laparoscopic intervention because of abdominal adhesions; we therefore decided to perform EUS-GJ.

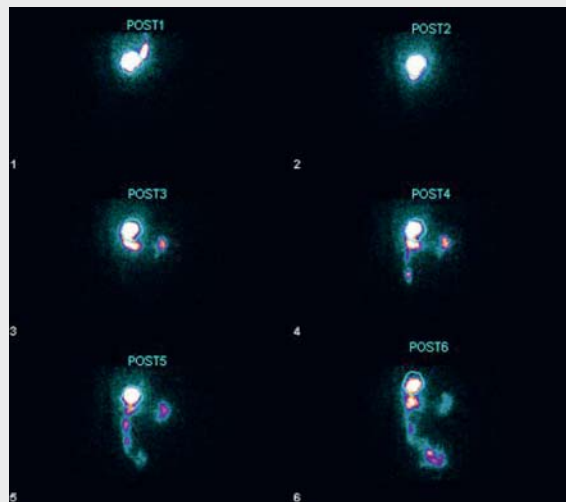
The patient was placed in a supine position under general anesthesia. The endoscope was advanced to the area of the stenosis, and a guidewire and catheter were inserted across the stenosis, which was too narrow for passage of the endoscope. Angiography showed the distal bowel. Then, the wire was removed and approximately 200 mL of saline with methylene blue dye was pumped into the distal small bowel through the catheter

Duodenal malignant stenosis can be caused by primary duodenal cancer or pancreatic cancer involving the duodenum [1]. Current treatment options include laparoscopic bypass and palliative duodenal stent placement under endoscopic or radiographic guidance. Both methods have their advantages and disadvantages. Surgical methods will cause greater trauma to patients, while a duo-

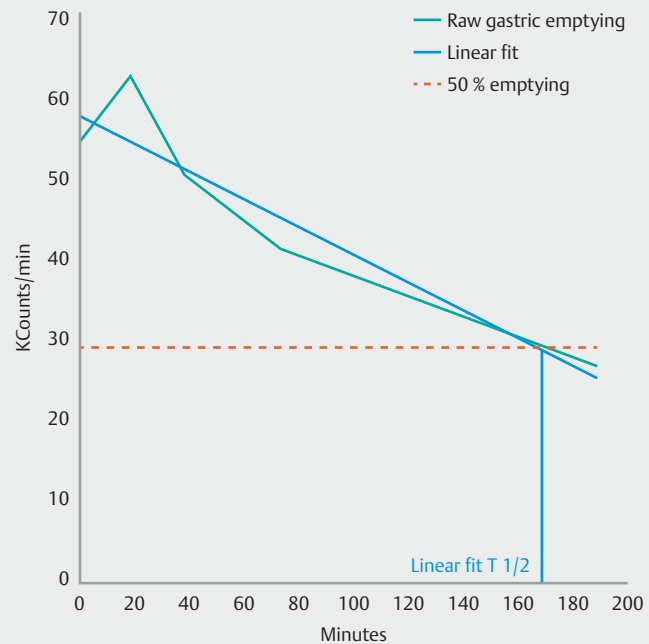
denal stent might remain patent for only a short time (generally 3–6 months), with the risk of tumor ingrowth and/or overgrowth [2]. For these reasons, we may also choose endoscopic ultrasound-guided gastroenterostomy (EUS-GE), with placement of a double-flared, fully covered, metal stent to create an anastomosis and bypass the obstruction.



Anterior



Posterior



Decay Corrected by Xeleris: Yes

Linear fit T 1/2 (min) = 169.28

Linear fit slope (%/min) = 0.30

Raw data T 1/2 (min) = 185.68

Tc_99m

Frame	Time	Fit	Raw % empty	KCounts/min**	Anterior	Post
1	0.0	0	0	54.05	67.00	43.60
2	18.0	5	- 15	62.02	89.04	43.20
3	38.0	11	7	50.39	78.79	32.23
4	54.0	46	15	46.16	71.00	30.02
5	73.0	22	24	40.97	56.44	29.74
6	189.0	56	51	26.61	46.22	15.32

** Geometric mean

► **Fig. 3** Postprandial gastric emptying was evaluated after a meal of fried eggs and bread, and showed good function, with the meal passing into the jejunum through the stent.

► **Fig. 1 b**). The endoscope was then removed and a longitudinal echoendoscope, with a working channel of 3.8 mm (Pentax, Tokyo, Japan), was positioned at the posterior wall along the greater curvature of the stomach according to the preoperative CT image, which showed the proximal jejunum to be located outside the gastric wall. EUS visualization of the dilated bowel adjacent to the stomach was obtained. An Echo Tip Ultra EUS needle (19-G; Cook Medical Inc., Bloomington, Indiana, USA) was introduced via the working channel of the echoendoscope, and the wall of jejunum was punctured under EUS guidance. The blue fluid was aspirated to confirm that the needle

was in the proximal jejunum, and contrast agent was then injected through the needle to show the jejunum. Next, the guidewire was inserted through the needle lumen into the jejunum, the needle was removed over the wire, and the fully covered, double-flanged, metal stent (16 mm/35 mm; Micro-Tech (Nanjing) Co., Ltd. Nanjing, China) was introduced and released (► **Fig. 1 c**). A large amount of blue fluid was seen rushing into the gastric cavity. Finally, the lumen of the deployed stent was dilated with a 12 mm columnar balloon dilator. The endoscope was passed through the stent into the jejunum after dilation of the stent. Contrast agent was injected through the working

channel and clearly showed the jejunum (► **Fig. 1 d**). The patient received postoperative antibiotics and proton pump inhibitors, and did not develop fever or any sign of peritonitis.

A CT scan 4 days after the procedure confirmed that the stent was in a good position and that oral contrast agent passed easily from stomach to jejunum (► **Fig. 2**). Upper gastrointestinal endoscopy with a standard endoscope on postoperative Day 5 showed that the stent was in place and was well opened, allowing passage of the endoscope from the stomach to the jejunum. Finally, postprandial gastric emptying was evaluated after a meal of fried eggs and bread, and



Video 1 Saline with methylene blue-assisted endoscopic ultrasound-guided gastrojejunostomy using a double-flared fully covered metal stent

showed good function, with the meal passing into the jejunum through the stent (► **Fig. 3**, ► **Video 1**).

As EUS techniques and related devices develop [3,4], various modalities of EUS-GE have received attention, including balloon-assisted methods and other techniques [5]. Here, we have described successful EUS-JE, in which saline with methylene blue was used to fill the jejunum in advance of the wall puncture. We found that this method was simple and fast, and we believe it is a useful new technique for EUS-GE.

Endoscopy_UCTN_Code_TTT_1AS_2AG

Competing interests

None

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