

# Endoscopic Management of Delayed Duodenojejunal Marginal Ulcer Perforation after Pylorus-Preserving Pancreaticoduodenectomy

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<b>Background</b>	A 76-year-old female presented with left lower quadrant pain 18 months following pylorus-preserving pancreaticoduodenectomy (PPPD) for margin negative, lymph node-negative ampullary adenocarcinoma. Workup revealed a marginal ulcer perforation near the duodenojejunostomy.
<b>Summary</b>	Our 76-year-old patient presented with left lower quadrant pain. Subsequent workup, including labs and CT scan, revealed an abscess. A drainage catheter initially placed by interventional radiology (IR) drained enteric contents. Drain interrogation revealed a fistulous collection between the abscess and the small bowel near the duodenojejunostomy. This finding was confirmed on the upper gastrointestinal series. She was actively receiving salvage chemotherapy for recurrent metastatic adenocarcinoma. The patient underwent successful endoscopic intervention with endoscopic suture closure of the fistula and placement of covered stents in the afferent and efferent duodenojejunostomy limbs. Her IR drain output remained bilious post-procedure, although a repeat upper gastrointestinal series revealed no leak. The patient was subsequently started on a clear liquid diet which she tolerated. She was then discharged to a skilled nursing facility with the IR drain in place, total parenteral nutrition, and a clear liquid diet.
<b>Conclusion</b>	Marginal ulcer development is a well-described complication after pancreaticoduodenectomy. We present a case of a marginal ulcer perforation 18 months after a PPPD managed primarily with endoscopic intervention. This case highlights the importance of a multidisciplinary team approach to individualize treatment options to optimize patient care.
<b>Key Words</b>	endoscopy; marginal ulcer; pancreaticoduodenectomy; fistula

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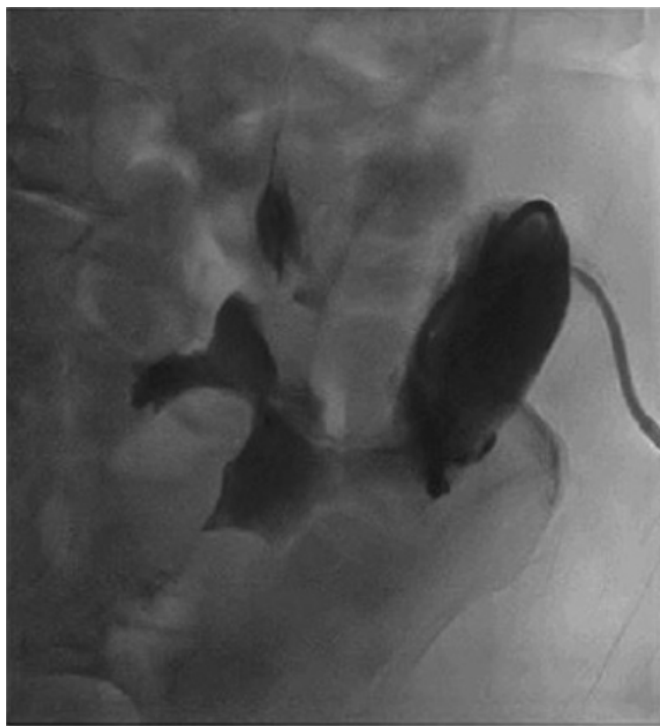
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## Case Description

A 76-year-old woman who underwent a PPPD 18 months before presentation for margin negative, lymph node-negative ampullary adenocarcinoma reported progressively worsening left lower quadrant abdominal pain. On presentation, reconciliation of her home medications revealed that the PPI she was discharged with after initial surgery had been discontinued. Workup revealed a pericolic intra-abdominal abscess suggestive of complicated diverticular disease.

Interventional radiology (IR) was consulted for drainage catheter placement. After placement, the catheter drained biliary contents raising the suspicion of different underlying pathology. The drain was interrogated, revealing a small fistulous tract between the abdominal collection and small bowel near the duodenojejunal anastomosis (Figure 1).

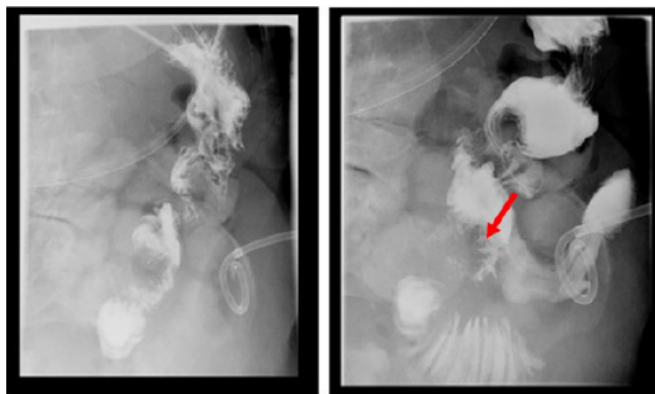
**Figure 1.** IR Drainage Catheter Placement. Published with Permission



UGIS confirmed the fistulous collection (red arrow) between the efferent limb of the duodenojejunostomy and the abscess (Figure 2). Of note, four months prior, the patient was diagnosed with recurrent adenocarcinoma that had metastasized to intra-abdominal lymph nodes, both lobes of the liver, right lower lobe of the lung, right lung

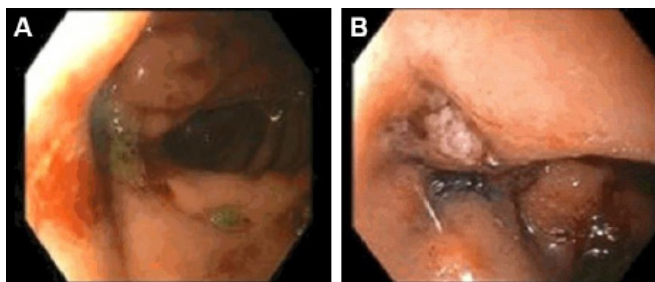
hilum, and left lower neck lymph nodes. The patient was then started on salvage chemotherapy with gemcitabine/Abraxane. After extensive discussions with the patient and her family, the decision was made to attempt endoscopic management of the fistulous tract.

**Figure 2.** Upper GI Series Confirming Fistulous Collection between Efferent Limb of Duodenojejunostomy and Abscess. Published with Permission



Endoscopy revealed a 1.2 cm fistula seen in the efferent limb just distal to the gastrojejunal anastomosis with clean margins (Figure 3A). After assessing the situation, the decision was made to close the fistula with endoscopic sutures and place covered metal stents in the afferent and efferent limbs under fluoroscopic guidance to exclude the fistula (Figure 3B).

**Figure 3.** Fistula Before (A) and After (B) Closure with Endoscopic Sutures. Published with Permission



The patient subsequently underwent another upper GI series to assess the intervention revealing no extravasation of contrast (Figure 4). She was started on a clear liquid diet which she tolerated. She was then discharged to a skilled nursing facility with the IR drainage catheter, TPN, and clear liquid diet.

**Figure 4.** Postendoscopic Intervention Upper GI Series. Published with Permission



After discharge, the patient underwent several drain checks with IR, which revealed a gradual resolution of the fluid collection. Two months after the initial endoscopic intervention, an endoscopy revealed a healed fistula, though the previously placed stents were absent. It was believed that the stents had migrated or passed. IR evaluation confirmed the migration of one stent and passing of the other, during which the IR drain was also downsized.

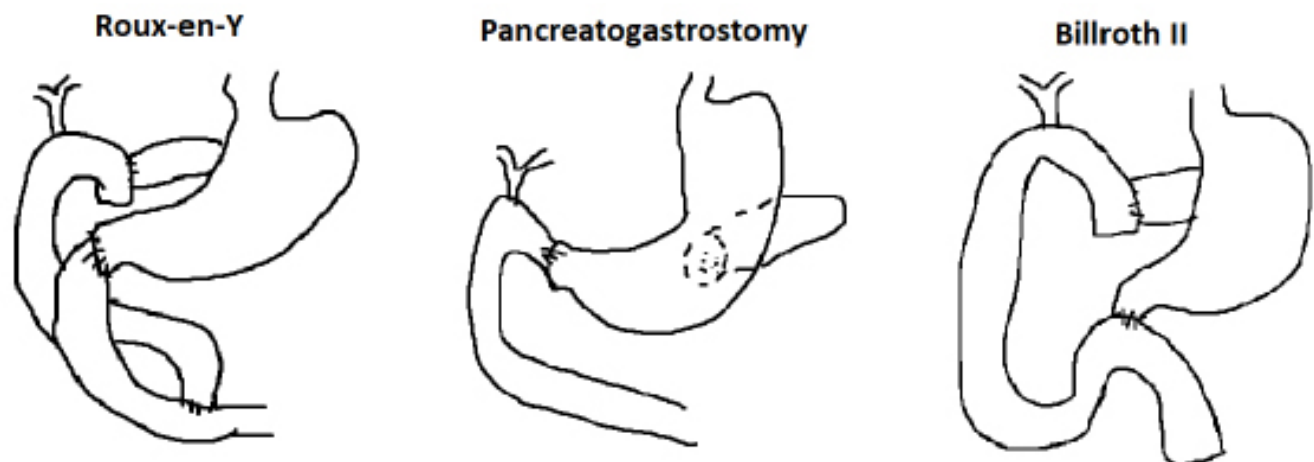
Two weeks after downsizing the IR drain and immediately after an IR drain exchange, the patient was admitted to the hospital in septic shock secondary to *Klebsiella* bacteremia

from an unknown source, acute kidney injury, and atrial fibrillation with rapid ventricular rate. While the source of her bacteremia was further investigated, a family meeting was initiated to discuss the patient's prognosis. During the meeting, both the patient and her family members decided on the palliative route, and so the patient was transitioned to hospice care and subsequently died two days later.

## Discussion

Marginal ulcers, previously a common complication after procedures involving upper GI reconstruction, are now less prevalent with the advent of proton pump inhibitors.<sup>1</sup> In the setting of conventional pancreaticoduodenectomy (PD), a review of the literature revealed that the occurrence of marginal ulcers ranges from 1 to 9.4%.<sup>2-4</sup> In a study by Sakaguchi et al. that reported 72 patients who underwent standard PD and 28 who underwent PPPD,<sup>4</sup> 14.3% patients developed marginal ulceration after PPPD compared to 0 (0%) patients who underwent standard PD. Of the four patients with marginal ulcers, three patients were reconstructed with the Roux-en-Y method, and one patient was reconstructed via a pancreaticogastrostomy. In the Roux-en-Y method, the distal jejunal loop anastomosed to the bulb was directly exposed to gastric juice without neutralization by pancreatic juices from the proximal jejunal limb, increasing the risk for marginal ulcers.<sup>5</sup> In our patient, our PPPD reconstruction was done in a Billroth II fashion allowing pancreatic juices to neutralize acidic gastric juices from the stomach (Figure 5). Patients who undergo PPPD at our institution are also discharged with a PPI.

**Figure 5.** Types of Reconstruction Following PPPD. Published with Permission



According to Yeo et al., PD has recently been deemed a safe and suitable resection option to manage, in select patients, both malignant and benign disorders of the pancreatic and periampullary regions. These authors noted that “common postoperative complications include delayed gastric emptying, disruption of the pancreatic-enteric anastomosis with subsequent pancreatic fistula, wound infection, and hemorrhage.”<sup>4</sup>

The incidence of marginal ulcers after PD ranges from as low as 1% up to 9.4%.<sup>2-4</sup> Marginal ulcers often present with vague abdominal symptoms such as pain, dysphagia, nausea, and vomiting. These symptoms are usually managed conservatively with a six-week course consisting of acid-blocking agents and cytoprotective agents such as sucralfate. NSAIDs should also be discontinued, and patients should be encouraged to stop smoking. Although medical management of marginal ulcers is successful in 85 to 95% of patients, surgery—revision of the gastro or duodenojejunostomy with resection and vagotomy (in stable patients)—or Graham patch, abdominal washout, feeding tube placement (in unstable patients) may be indicated if marginal ulcers perforate or if persistent pain or recurrent bleeding occurs despite maximal medical therapy.<sup>6-9</sup>

With the rapid evolution of interventional endoscopic techniques in recent years, less invasive options are now available to manage a broad range of GI pathology. They can also be utilized to manage postoperative complications. These innovative interventional endoscopic techniques have included the development of endoscopic closure techniques such as clipping, stenting, suturing, gluing, and endoscopic vacuum therapy and revolutionized the management of GI defects. Interventional endoscopic techniques typically provide a more affordable alternative to surgery with less morbidity and resource utilization.<sup>10</sup>

Fistulas in the GI tract are epithelialized tracts that are continuously exposed to GI secretions, whereby the resulting inflammation poses significant challenges in closure. These fistulas are frequently acid-related, related to a failure of healing, malignant, or have associated radiation injury, which alters the anatomy and causes fibrotic changes, further complicating the management.

Gastric fistulas, though rare, can be seen after bariatric surgery, percutaneous endoscopic gastrostomy tube removal, or as in our case, may result from a marginal ulcer.<sup>11</sup> In these settings, endoscopic intervention ranges from clips to adhesive glue application, endoscopic suturing, to stenting.

Endoscopic clips, mostly the over-the-scope clip (OTSC), have been the most successful (80.3%) in the immediate closure of esophageal, gastric and colonic fistulas. However, long-term success has not been tested or is disappointing, with a high fistula recurrence rate (19.7%).<sup>12</sup> Less studied, although seemingly promising, endoscopic suture closure of fistulas (mean fistula size=9 mm) had 100% and 80% initial and long-term clinical success in patients with GI fistulas, respectively (n=40). Long-term clinical success was more likely if the fistula was closed within 30 days of diagnosis as compared with >30 days after diagnosis (69% versus 23%, respectively; P=0.037). Though this study suggests that endoscopic suturing can be used to close larger fistulas with short-term success, its long-term clinical efficacy is limited by the lack of data and the high recurrence in available retrospective studies.<sup>13</sup>

Endoscopic devices and technical innovation promise new and less invasive techniques to manage a wide range of GI disruptions. With trends leaning towards endoscopic management of GI leaks, perforations, and fistulas and studies proving good patient outcomes, management of these GI disruptions involves a multidisciplinary team consisting of advanced endoscopists, surgeons, and interventional radiology, as appropriate.<sup>11</sup> While endoscopic closure can be highly successful in cases identified early and with minimal extra-luminal contamination, surgical or interventional radiology-directed drainage may be warranted in cases of uncontained perforation, delayed recognition, or gross contamination. Therefore, the decision regarding conservative, endoscopic, or surgical management should be individualized.

## Conclusion

In the setting of gastrointestinal operations, gastrointestinal disruptions are well-described complications. We present a case of a marginal ulcer presenting 18 months after a PPPD as a fistula that was managed with interventional radiology drainage, endoscopic suturing, and stenting. We conclude that management of GI disruptions after GI procedures should involve a multidisciplinary team to individualize treatment options and optimize patient outcomes.

## Lesson Learned

Endoscopic devices and technical innovation promise new and less invasive management options for a wide range of GI disruptions. While endoscopic closure proves to be highly successful in cases identified early and with mini-

mal extraluminal contamination, surgical repair or interventional radiology-directed drainage may be warranted in cases of uncontained perforation, delayed recognition, or gross contamination. Therefore, conservative, radiographic, endoscopic, or surgical management should be individualized to the patient's needs.

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