Gastroparesis managed with peroral endoscopic pyloromyotomy

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ABSTRACT

Gastroparesis is delayed gastric emptying in the absence of mechanical obstruction. Cases are attributed to narcotic use, smoking, diabetes, and postsurgical complications; however, several incidences are unknown. Treatment options include diet modification, gut-stimulating medications (e.g., metoclopramide, domperidone), laparoscopic pyloroplasty, and, in the most severe cases, partial gastrectomy with Roux-en-Y reconstruction. Recently, a novel therapy has been developed, peroral endoscopic pyloromyotomy (POP). This procedure is similar to a laparoscopic pyloroplasty; however, it is performed completely endoscopically, thus negating the need for incisions. Here we present a case of gastroparesis treated with this novel technique.

KEYWORDS Delayed gastric emptying; gastroesophageal reflux; gastroparesis; peroral endoscopic pyloromyotomy

Gastroparesis manifests with symptoms of nausea, vomiting, early satiety, and bloating.^{1,2} Though not especially common (2.4 per 100,000 for men and 9.6 per 100,000 for women³), this is a difficult disease to treat. The etiology of gastroparesis is most commonly idiopathic but can also be due to chronic narcotic use, uncontrolled diabetes, or postsurgical causes such as iatrogenic vagal nerve injury.¹ Treatment is both medical and surgical, with the medical options of dietary changes, glycemic control, and gastric promotility medications typically being exhausted before moving on to the more invasive modalities of endoscopic intervention or surgery.² These more invasive options include pyloric dilation or Botox injections, gastric electrical stimulation, laparoscopic pyloroplasty, and even partial or total gastrectomy.² Most recently, peroral endoscopic pyloromyotomy (POP) has emerged as a novel and effective option for treating gastroparesis.² POP is an adaptation of peroral endoscopic myotomy (POEM), which was developed for the treatment of achalasia.^{4,5} Here we discuss a case where POP was used to treat a patient's severe gastroparesis refractory to medical treatment.

CASE PRESENTATION

A 50-year-old woman with a history of chronic reflux and two hiatal hernia repairs complained of long-time hoarseness, dysphagia, and early satiety despite use of daily antireflux

medications. An upper gastrointestinal study and esophagogastroduodenoscopy (EGD) showed that her hiatal hernia had recurred and that her most recent hernia repair had fallen apart. Her gastric emptying study came back at 40% after 4 hours, well over the normal range of <10%. It was determined that this patient was a candidate for POP.

The patient was taken to the operating room where formal EGD was performed, followed by POP. POP should always be performed in the operating room or endoscopy suite under general anesthesia. A high-definition, standard-length upper endoscope is required and carbon dioxide insufflation is absolutely necessary. A full diagnostic EGD is conducted prior to the operation. This is done to ensure that no anatomical abnormalities exist and to remove any retained food that might be present. The endoscope is fitted with a transparent dissecting cap to enable tissue retraction while operating within the submucosal space. POP is performed in similar fashion to POEM and includes the same operative steps: (1) submucosal injection, (2) linear mucosotomy, (3) submucosal tunnel creation, (4) myotomy, and (5) mucosotomy closure (*Figure 1*). The injection and mucosotomy are performed in the antrum of the stomach approximately 3 cm proximal to the pylorus and in the posterior greater curve.

Using an endoscopic injection needle or hybrid knife, 7 to 10 mL of a dilute methylene blue dye mixture was injected into

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Received May 10, 2019; Revised August 1, 2019; Accepted August 12, 2019.

Figure 1. Operative steps for peroral endoscopic pyloromyotomy: (a) submucosal injection, (b) linear mucosotomy, (c) submucosal tunnel creation, (d) myotomy, and (e) mucosotomy closure.

the gastric wall to create a submucosal bleb. The blue dye helped differentiate the layers of the submucosal space and improved visualization of submucosal blood vessels. A 1.5- to 2-cm longitudinal mucosotomy was made using a triangle-tip knife using a cutting setting on the coagulation device. This made a cleaner cut and helped prevent excessive char buildup at the site of mucosal entry. The submucosal tunnel was created by dissecting the loose submucosal fibrous tissue using a spray coagulation setting. Dissection proceeded directly along the muscularis layer of the gastric wall, to maintain orientation and to minimize the possibility of injury to the mucosa. Tunneling continued just past the pylorus, until the duodenal mucosa was visualized.

Once the tunnel was completed, the myotomy was performed on the pylorus muscle using the triangle-tip knife. The myotomy was extended until the visible pyloric bar was fully divided, which was confirmed by reaching the thin duodenal musculature. This was performed with care in order to avoid a full-thickness injury. To conclude the procedure, the mucosotomy was closed with six endoscopic hemoclips. A redo laparoscopic hernia repair with fundoplication was also indicated and immediately followed her POP procedure. At this time, it became evident that both vagal nerves had been transected during one of her previous hiatal hernia repairs. This provided an explanation for her severe delayed gastric emptying and significant symptoms, which were likely exacerbating her pre-existing gastroesophageal reflux disease symptoms as well.

The patient did well postoperatively, and her upper gastrointestinal study showed no leak. She noted symptom improvement of her gastroparesis since the procedure and reported that her quality of life has improved. Her repeat gastric emptying study came back markedly improved from 40% preoperatively to 9.7% at 12 weeks postoperatively.

DISCUSSION

POP should only be performed on those refractory to medical treatment and requires a full EGD first to rule out anatomical obstruction as a cause of symptoms as well as to remove any gastric contents prior to the procedure. Barring such findings on a full diagnostic EGD, the surgeon may proceed.

To date, single-center series have shown encouraging outcomes in follow-up. One cohort of seven patients treated with

POP showed clinical improvement and significant decrease in gastric emptying study times in six of seven patients.² Another study of 30 patients demonstrated POP effectiveness when 47% of patients had complete normalization of gastric emptying postoperatively.⁶ Finally, the largest series on POP so far demonstrated an average 4-hour gastric emptying study time drop from 37% preoperatively to 20% postoperatively.⁷

A recent review evaluating POP data from seven institutions with 158 patients across the USA showed the technical success rate to be 100%, with procedure times varying from 40 to 120 minutes. The overall complication rate of POP was found to be quite low in these studies, ranging from 0% to 6.7%. Finally, nausea and vomiting were the symptoms found to be most consistently improved across the board.⁸

In conclusion, POP is a novel and efficacious treatment option for gastroparesis, where results have shown both clinical improvement and significantly decreased gastric emptying study times. Though outcomes are limited to short-term follow-up, they are encouraging and demonstrate significant benefits of incisionless surgery with decreased morbidity and faster recovery times. POP also presents an option for patients with multiple comorbidities who may not do well with an open or laparoscopic operation. It has so far been shown to be a low-risk procedure that yields an improved clinical picture and quality of life in those suffering from gastroparesis.

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