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# Efficacy of Laparoscopic Pyloroplasty for the Treatment of Gastroparesis

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**BACKGROUND:** The modest results of nonoperative modalities for the treatment of gastroparesis necessitate greater consideration of surgical therapies. However, the role of surgery is not well defined. The aim of this study is to present our experience with laparoscopic pyloroplasty as early treatment for gastroparesis.

**STUDY DESIGN:** Fifty patients with refractory gastroparesis underwent laparoscopic pyloroplasty (hand-sewn Heineke-Mikulicz configuration) from 2006 to 2013 at our institution. Preoperative and postoperative symptom data, gastric emptying scintigraphy, and technical outcomes of the procedure were reviewed. A single-factor ANOVA was performed for the comparison of continuous variables. Results are reported as mean  $\pm$  SD or median absolute deviation.

**RESULTS:** Thirty-four of 50 (68%) patients had previous foregut procedures and/or cholecystectomy. Thirty-two of 50 (64%) patients underwent concomitant procedures (ie, paraesophageal hernia repair and gastrotomy takedown) along with the pyloroplasty. Operative time, including combined procedures, blood loss, and length of stay were  $175 \pm 56$  minutes,  $64 \pm 50$  mL,  $2.5 \pm 2.7$  days, respectively. There were no conversions to open technique or intraoperative complications. There were no suture-line leaks. The readmission rate was 14%. All patients had symptom follow-up and 33 (66%) had postoperative gastric emptying scintigraphy. Postoperative symptom improvement was reported by 82% of the patients ( $p < 0.001$ ). Median preoperative  $T_{1/2}$  was  $180 \pm 73$  minutes and postoperative  $T_{1/2}$  was  $60 \pm 23$  minutes ( $p < 0.001$ ). Five patients (10%), who had normalized postoperative  $T_{1/2}$  times, required other gastric emptying procedures; distal gastrectomy ( $n = 2$ ), duodenojejunostomy ( $n = 2$ ), and gastric stimulator placement ( $n = 1$ ).

**CONCLUSIONS:** Laparoscopic pyloroplasty is an effective early-treatment modality for selected cases of gastroparesis, with substantial improvement in objective gastric emptying times and low morbidity. The laparoscopic approach does not preclude subsequent procedures when necessary. (J Am Coll Surg 2014;218:652–662. © 2014 by the American College of Surgeons)

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Gastroparesis is a chronic syndrome characterized by delayed gastric emptying (DGE) of solid foods with or without liquids in the absence of mechanical obstruction.<sup>1</sup> It is estimated to affect around 4% of the population,<sup>1</sup> with a higher prevalence in patients with diabetes, who exhibit 30% to 50% gastroparesis.<sup>2</sup> The majority of

gastroparesis belong to 1 of 3 categories: diabetic (29%), postsurgical (13%), and idiopathic (36%).<sup>3,4</sup> The cardinal symptoms are early satiety, postprandial fullness, bloating, upper abdominal pain, nausea, and vomiting. Diagnosis is based on the combination of symptoms, absence of gastric outlet obstruction or ulceration, and delay in gastric emptying confirmed with a gastric emptying scintigraphy (GES).<sup>3</sup>

Special attention should be paid to gastroparesis patients in the setting of gastroesophageal reflux disease (GERD). Previous studies have shown that approximately 40% of patients with GERD have associated DGE.<sup>5,6</sup> Although there is poor correlation between symptoms and DGE in GERD patients,<sup>7</sup> not addressing this problem during the performance of an antireflux procedure

**Disclosure Information:** Nothing to disclose.

Presented at the Southern Surgical Association 125th Annual Meeting, Hot Springs, VA, December 2013.

Received December 6, 2013; Accepted December 10, 2013.

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### Abbreviations and Acronyms

DGE	= delayed gastric emptying
GCSI	= Gastroparesis Cardinal Symptoms Index
GERD	= gastroesophageal reflux disease
GES	= gastric emptying scintigraphy
GS	= gastric stimulator
LP	= laparoscopic pyloroplasty
T <sub>1/2</sub>	= time required to empty 50% of ingested meal

can result in chronically increased intragastric pressures with severe postoperative bloating and/or fundoplication disruption.<sup>8</sup> For this reason, we routinely include a GES in the preoperative workup of patients with GERD and hiatal hernia and perform gastric drainage procedure simultaneously or in subsequent weeks.<sup>9</sup>

Treatment options for gastroparesis include dietary measures, medications (prokinetics and antiemetics), endoscopic treatments, and surgery. Patients who fail medical management should be considered for surgical treatment in selected cases.<sup>3</sup> The surgical armamentarium is wide and includes gastric stimulator (GS) placement, pyloroplasty, gastrostomy, feeding jejunostomy, and gastrectomy. Unfortunately, the role of surgery is neither well defined nor well studied.<sup>10</sup>

In the late 1800s, the German surgeon Walter Hermann Von Heineke and the Polish-Austrian surgeon Jan Mikulicz-Radecki described a permanent gastric drainage procedure for mechanical obstructions, known as the Heineke-Mikulicz pyloroplasty. This is the most common pyloroplasty technique and it has been successfully performed for the management of benign gastric outlet obstructions and also for electively vagotomized stomachs.<sup>11</sup> This procedure can also be performed laparoscopically with minimal complications. However, reports of laparoscopic pyloroplasty (LP) as a primary treatment option for gastroparesis are scarce.<sup>11</sup> The aim of this study is to present our experience with LP as treatment for gastroparesis.

## METHODS

### Patient population

We performed a retrospective review of patients with refractory gastroparesis who were referred for surgical treatment. All patients who underwent LP at our institution between November 2006 and June 2013 were identified. Patients who had a pyloroplasty as a component of an esophagectomy with gastric pull-up were considered a different population group and were excluded from this analysis. We included patients with a confirmed preoperative diagnosis: compatible symptoms, abnormally delayed GES, and a negative upper endoscopy for gastric outlet obstruction.

Patient demographics and other clinical data were obtained from the electronic medical records.

### Symptom evaluation

Preoperative symptoms were collected from the electronic clinical notes. For postoperative symptoms, we reviewed the notes at 1 month after surgery. In addition, all patients were asked to complete the Gastroparesis Cardinal Symptoms Index (GCSI) and the GERD Health-Related Quality of Life Scale. We chose the GCSI because it is a reliable and valid instrument for measuring symptom severity in patients with gastroparesis.<sup>12</sup>

### Gastric emptying evaluation

All patients had a GES before surgery and were ordered a follow-up study 8 weeks after the operation. A radiolabeled meal method (oatmeal or eggs injected with technetium<sup>99m</sup>) was used in most of the studies. Although a 4-hour emptying study is recommended by the current guidelines,<sup>3</sup> this was not always available and most of the nuclear medicine laboratories report the result as time required to empty 50% of ingested meal (T<sub>1/2</sub>) or predicted T<sub>1/2</sub> based on software calculations. To maintain uniformity, we used our institution cutoff values so an abnormal GES was defined by a T<sub>1/2</sub> >60 minutes (normal <60 minutes, mild 60 to 80 minutes, moderate 80 to 120 minutes, and severe >120 minutes).

### Pyloroplasty technique

Surgical technique was identical in all patients using a single-layer, hand-sewn Heineke-Mikulicz configuration. All cases were either laparoscopic or robot-assisted procedures. The surgical principle of a Heineke-Mikulicz pyloroplasty is that transverse closure of a longitudinal incision, placed through the pylorus and extending from the proximal duodenum to the distal antrum, renders the valve incompetent and increases the outlet diameter of the pylorus, thereby increasing gastric emptying.<sup>13,14</sup>

For the procedure, the patient is placed in supine position, the surgeon stands at the patient's left as in laparoscopic cholecystectomy, and the assistant surgeon at the patient's right. We used a 4-trocar approach, very similar to what we normally use for other foregut procedures. We place a 10-mm supraumbilical camera port, a 12-mm trocar in the left upper quadrant, two 5-mm trocars in the right upper quadrant, and an epigastric Nathanson liver retractor when required (Fig. 1). The first step is to perform a Kocher maneuver so the second portion of the duodenum can be fully mobilized. This ensures a tension-free closure.

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