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Brief Clinical Report

Laparoscopic Highly Selective Vagotomy: Technique and Case Report

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Summary: As the advantages of minimally invasive surgical techniques become more apparent, new applications are being identified. Here we describe the technique and our initial experience with laparoscopic highly selective vagotomy. The ability to perform this effective antiulcer operation laparoscopically with minimal resultant pain, reduced hospital time, less cost, and diminished morbidity may make surgical therapy a more attractive option in the management of peptic ulcer disease. **Key Words:** Laparoscopic surgery—Highly selective vagotomy—Peptic ulcer disease.

The surgical treatment of peptic ulcer disease has changed dramatically since 1884, when Von Rydygier performed the first gastorenterostomy for duodenal ulcer disease (1). With a limited understanding of gastric physiology, gastroenterostomy was the operation of choice until the 1920s, when partial gastrectomy was adopted. During the 1930s and 1940s, subtotal gastrectomy became the most common ulcer operation. As the contribution of the vagus nerves to acid production and peptic ulcer became more well known, primarily through the work of Lester Dragstedt (2,3), truncal vagotomy was recognized as an effective antiulcer operation. Gastric stasis after this operation led to the development of vagotomy and pyloroplasty. The discovery of gastrin prompted surgeons to perform vagotomy and antrectomy, thus ablating both the cephalic and gastric phases of acid secretion.

Vagotomy and antrectomy proved to be 90 to 95% effective in preventing recurrent duodenal ulcer. Unfortunately, the procedure was accompanied by a disconcerting number of postoperative gastrointestinal complaints. The search for a more selective approach to decreasing gastric acid secretion while avoiding the complications of truncal vagotomy and gastric resection or drainage led to the development of the parietal cell vagotomy (4).

Parietal cell, or highly selective, vagotomy is a physiologically sound ulcer operation. Dividing the branches of the vagus nerves that supply the parietal cell mass results in a 70 to 80% decrease in basal acid output and a 50 to 60% decrease in maximal acid output (5). This reduction is similar to that seen following truncal vagotomy. The gastric antrum is not denervated; thus, its function in gastric emptying is not disturbed. The hepatic and cephalic branches are preserved. Postgastrectomy side effects, such as dumping and diarrhea, are rare. Morbidity is reported to be less than 5%, and mortality averages less than 1%. Although there is a learning curve involved in performing highly selective vagotomy, in experienced hands, ulcer recurrence should be acceptable at less than 10% (6–8). Highly selective vagotomy has become our procedure of choice as an elective operation for duodenal ulcers.

The explosion in laparoscopic technology has allowed us to develop a new technique that combines the advantages of parietal cell vagotomy with those of minimally invasive surgery. Here we report our

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initial experience with what we believe is the first reported laparoscopic highly selective vagotomy.

CASE REPORT

The patient, a 46-year-old white woman, had a 5-year history of duodenal ulcer disease. Maintenance therapy with H_2 antagonists had failed to control symptoms of intermittent epigastric pain. Two months before operation, the patient had been admitted through the emergency department for hematemesis. Esophagogastroduodenoscopy had revealed a large posterior duodenal ulcer. She was placed on oral Famotidine, 20 mg twice daily. She continued to complain of pain and was referred to the Surgery Department for intractable duodenal ulcer disease.

The patient smoked a pack and a half of cigarettes per day but had no other significant medical or surgical history. She was 5 ft 3 in tall and weighed 140 lbs. Her physical examination was completely unremarkable. Preoperative hematocrit was 44%.

The patient consented to undergo laparoscopic highly selective vagotomy with the understanding that conversion to laparotomy was possible. On February 25, 1992, she was taken to the operating room; the laparoscopic procedure was completed in approximately 4 h. On postoperative day 1, her nasogastric tube and Foley catheter were withdrawn, and she was started on a clear liquid diet. Postoperative hematocrit was 41%. On postoperative day 2, she was advanced to a regular diet and was discharged on the morning of postoperative day 3. She took three doses of intramuscular morphine during the first 18 h after operation and four doses of oral pain medication (oxycodone and acetaminophen) on postoperative days 1 and 2. On postoperative day 7, she returned to work and full activity. She is tolerating a regular diet, is off medication, and reports no pain or gastrointestinal complaints.

METHODS

Operating room

The operating room arrangement is similar to that used with laparoscopic cholecystectomy. Video monitors are placed at the head of the operating table, the first assistant stands on the patient's left, and the second assistant stands on the patient's right. After administration of general endotracheal anesthesia, the patient is placed in a modified lithotomy position with the hips and knees only slightly flexed and the lower extremities abducted only wide enough to allow the surgeon to stand between them. We have found this the most convenient and effective operating position. The abdomen is prepped from the nipples to the pubis. The procedure is performed with the patient in a 30 to 40° reverse Trendelenburg position.

Placement of trocars

Pneumoperitoneum is established with CO_2 using either the Veress needle or the open technique. (We prefer the open technique.) The puncture is made approximately 4 cm above the umbilicus in the midline. A 0° laparoscope is placed through a 10- to 11-mm sheath in this position (sheath 1). Then, under direct vision, four other 10- to 11-mm trocars and sheaths are placed as depicted in Figure 1.

Conduct of the operation

The second assistant retracts the left lobe of the liver to the right using a three-pronged liver retractor (Cabot Medical, Langhorne, PA, U.S.A.). The retractor is placed through the subxiphoid sheath (sheath 2). A laparoscopic Babcock clamp (Cabot Medical) is placed through the right subcostal sheath (sheath 3). The surgeon grasps the anterior wall of the stomach with this instrument and pushes the stomach down and to the left. The first assistant manipulates the camera and also uses a Babcock clamp placed through the left lateral subcostal sheath (sheath 5) to grasp the anterior wall of the stomach and retract it to the left. This Babcock is

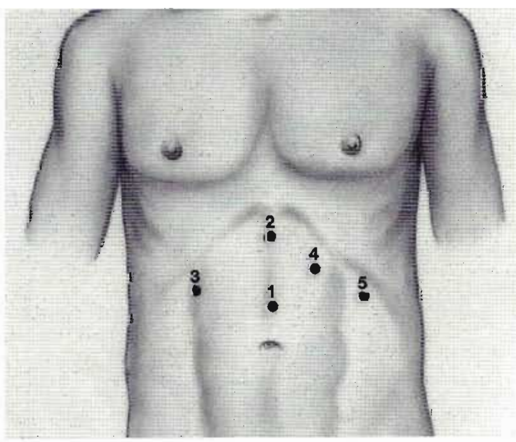

FIG. 1. Location of sheaths and instruments used through each. All are 10 to 11 mm. Sheath 1: 0°, forward-viewing laparoscope; sheath 2: three-pronged retractor; sheath 3: laparoscopic Babcock clamp and standard blunt-tipped grasper; sheath 4: right-angle dissector, clip applier, laparoscopic scissors; and sheath 5: laparoscopic Babcock clamp.

placed more distally on the stomach near the greater curvature. In this fashion, the stomach is retracted down and to the left, putting the lesser omentum on the stretch. The surgeon then uses the hook cautery placed through the left subcostal sheath (sheath 4) to incise the peritoneum along the lesser curvature, thus exposing the neurovascular bundles. The bundles are then dissected distally down to the Crow's foot, preserving the antral branches of the Latarjet's nerves. Isolation of the bundles is most easily performed using a right-angle dissector. Bundles are clipped and divided (Fig. 2). Dissection is then carried up to the gastroesophageal junction. The position of the Babcock clamps is adjusted to keep the lesser omentum on the stretch. Dissection is not carried onto the esophagus at this point.

With the anterior branches divided, the left-sided Babcock is placed on the lesser curve of the stomach, and it is retracted up and to the left. The right-sided Babcock is replaced with a standard grasper, which is used to retract the anterior leaf of the lesser omentum to the right. These maneuvers roll the posterior leaflet anteriorly (Fig. 3). Again using the right-angle dissector and the hook cautery, the neurovascular bundles are isolated, clipped, and divided (Fig. 4). Dissection begins at the midpoint of the lesser curve and initially proceeds distally, then toward the gastroesophageal junction. Gaining access to the lesser sac through the posterior leaflet allows dissection to proceed expeditiously. Once the lesser sac is entered, a grasper placed through the right subcostal sheath can be used to elevate the stomach anteriorly, thus providing good exposure of the posterior bundles.

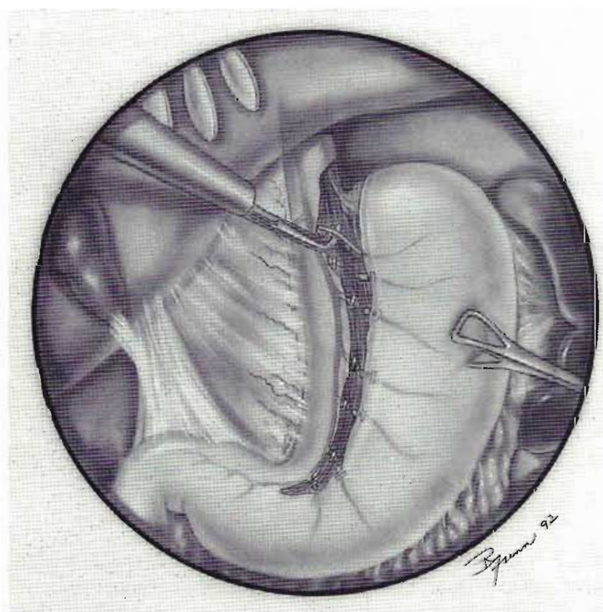

FIG. 2. Laparoscopic view of division of anterior proximal gastric vagal fibers.

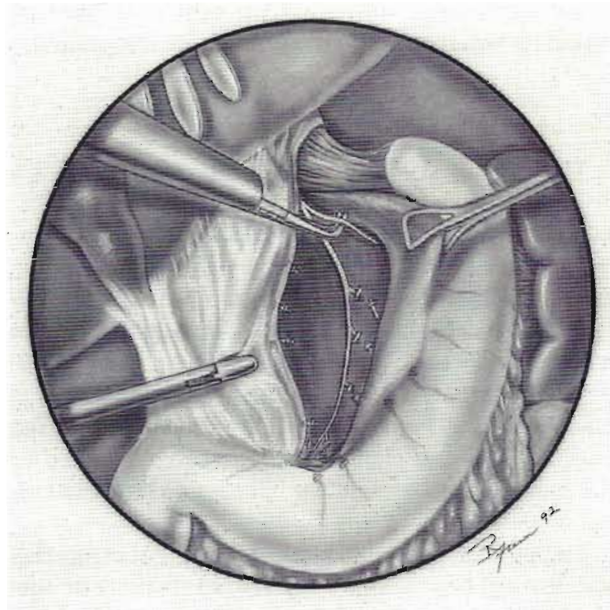

FIG. 3. Laparoscopic view of division of posterior proximal gastric vagal fibers. Left-sided Babcock retracting the lesser curvature to the left and a grasper retracting the anterior leaflet of the lesser omentum to the right, exposing the branches of the posterior vagus nerve.

After the lesser curve is cleared anteriorly and posteriorly (Fig. 5) up to the gastroesophageal junc-

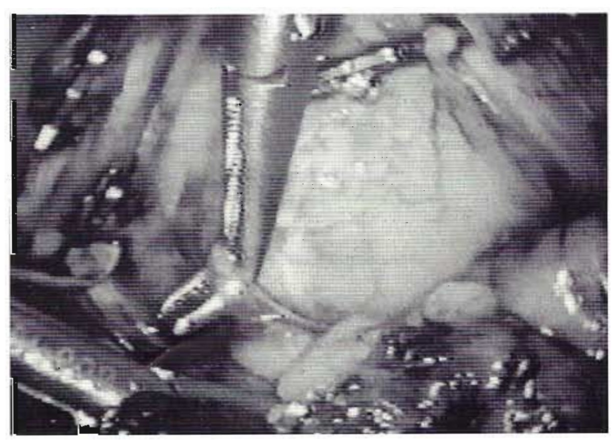

FIG. 4. Laparoscopic photograph showing how the right-angle dissector is used to isolate a branch of the posterior vagus nerve. Clips can be seen on divided anterior and intermediate vagal branches. The posterior wall of the stomach is seen behind and to the right of the dissector.

FIG. 5. Laparoscopic photograph showing the denervated lesser curvature of the stomach. Clips can be seen on the anterior and posterior branches of the vagus nerves. The right-sided Babcock, seen on the left, is on the lesser curvature elevating the stomach. The suction/irrigation probe is seen in the lesser sac along the posterior gastric wall. The left lobe of the liver is seen at the bottom of the photograph.

tion, dissection on the esophagus is begun. At this point, the left-sided Babcock is placed high on the gastric fundus near the gastroesophageal junction. It is used to retract anteriorly and to the left. The right-sided grasper is used to retract the lesser omentum to the right. In this way, the distal esophagus is exposed for dissection. Once dissection on the esophagus is started, the right-sided grasper is replaced with a Babcock clamp, which is placed at the gastroesophageal junction. It is used to push the gastroesophageal junction to the left and retract anteriorly, thus allowing dissection to proceed up the esophagus. The distal 5-cm area is cleared (Fig. 6).

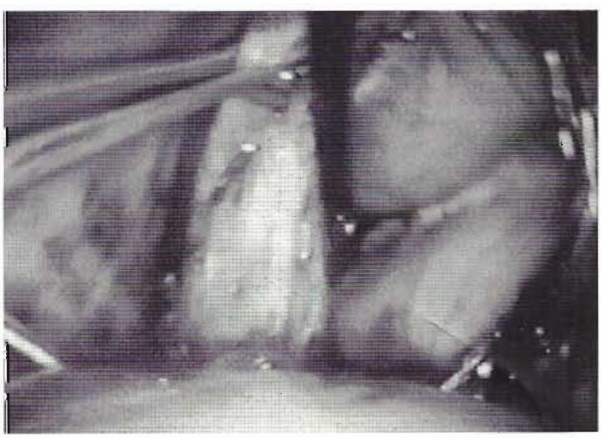

FIG. 6. Laparoscopic photograph of the cleared distal 5 cm of the esophagus. The right-sided Babcock is at the gastroesophageal junction, retracting anteriorly and to the left. Again the suction/irrigation probe is in the lesser sac.

With the parietal cell mass denervated and the distal esophagus cleared, the procedure is terminated. The abdomen is irrigated, the pneumoperitoneum evacuated, and the wounds are closed in the standard fashion.

DISCUSSION

Others have described the technical aspects of laparoscopic posterior truncal vagotomy and anterior seromyotomy (9–12). This relatively new ulcer operation is technically less demanding than a highly selective vagotomy, but it has some disadvantages. Theoretically, it may lead to gastric stasis, postvagotomy diarrhea (because the posterior vagal trunk supplies the small bowel), and recurrent ulcer (because high fundal branches may be missed). Also, the possibility of missing the posterior vagus is real, as it is the most commonly missed trunk during routine truncal vagotomy (13,14). This may lead to a high rate of incomplete vagotomy and recurrent ulcer. In clinical practice, however, good results have been reported. Katkhouda and Mouriel (15) from France reported a 79% decrease in basal acid output and an 83% decrease in maximal output in 10 patients undergoing the procedure. Endoscopic examination 2 months after operation showed complete ulcer healing in nine patients and a residual ulcer scar in one patient. No postoperative abdominal complaints were noted. Obviously, more experience and long-term follow-up is needed before firm conclusions can be drawn as to the efficacy of this operation.

Highly selective vagotomy performed in the standard fashion has proved to be an effective operation. The primary stumbling blocks to performing a laparoscopic highly selective vagotomy have been the difficulty in ligating the branches of the posterior vagus and clearing the distal esophagus. Our experience in the laboratory and in the patient reported is that these problems can be overcome. The right-angle dissector and the Babcock clamps are important. The Babcock clamps allow significant traction to be placed on the stomach. Once the anterior and intermediate nerves and vessels are divided, the left-sided Babcock clamp is used to grasp the stomach on the lesser curvature. This maneuver rolls the posterior leaflet of the lesser omentum anteriorly, allowing easy dissection. Once the lesser sac is entered through the posterior leaflet, dissection, both proximal and distal, on the lesser curvature can proceed using the right-angle dissector. When dissection begins on the posterior leaflet, the right-sided Babcock is replaced with a standard grasper, which is used to retract the anterior leaflet of the lesser omentum down and to the right. This maneuver is also important in exposing the posterior neurovascular bundles. In dissecting the distal esophagus, the left-sided Babcock is used to grasp the stomach high on the fundus near the gastroesophageal junction. The gastroesophageal junction is retracted anteriorly and to the left, putting the esophagus on the stretch and thus exposing it for dissection.

In early 1943, Dragstedt performed his first two truncal vagotomies. During that same year, he published his technique and case reports (2). His new operation was a radical change in the surgical treatment of duodenal ulcer disease. It would be years before his ideas were widely accepted. In our case, the operation is known to be effective. We are simply reporting a new approach to carrying out the procedure.

CONCLUSIONS

Our intent in submitting this manuscript is to share our technical experience with laparoscopic highly selective vagotomy. In this communication, emphasis is primarily on the technical aspects of the procedure. At this time, postoperative gastric acid studies have not yet been completed on the patient reported. It is our hope that these results, along with others, will show that highly selective vagotomy, an operation with minimal side effects and a low ulcer recurrence rate, can be performed safely and effectively under laparoscopic guidance.

Ten percent of Americans can expect to suffer from ulcer disease at some point in life (16). Eighty percent of patients with duodenal ulcer can expect recurrence within 1 year of discontinuing medical therapy (17–20). A third of these patients will require long-term maintenance medical therapy (21,22). Despite these recurrence rates and the need for expensive, long-term medical therapy, surgical treatment of ulcer disease has declined significantly (23). Development of an ulcer operation associated with low morbidity, little pain, a short hospital stay, rapid return to work, minimal postoperative gastrointestinal complaints, and low recurrence rates may make operation a more attractive option in the treatment of duodenal ulcer disease.

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