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SURGERY FOR DUODENAL ULCER

Part of "CHAPTER 70 - SURGERY FOR PEPTIC ULCER DISEASE AND POSTGASTRECTOMY SYNDROMES"

Vagotomy in the Treatment of Duodenal Ulcer

The reduction of acid secretion by gastric denervation serves as the physiological basis of all modern surgical treatments for duodenal ulcer. Truncal vagotomy reduces basal and maximal acid output by 85% and 50%, respectively.7 This reduction in acid secretion results from the removal of the direct acetylcholine influences on the parietal cell, as well as reduction in sensitivity of the parietal cell to gastrin and histamine.8,9 Although pepsin may play a role in mucosal injury in patients with duodenal ulcer, the clinical benefit of vagotomy in reducing pepsinogen secretion and gastric proteolytic activity is less clear.10 Gastric motor function is dramatically altered by truncal vagotomy. Receptive relaxation, or decrease in muscular tone of the proximal stomach with ingestion of food, and antral peristaltic and proximal gastric nonphasic motor activity are abolished by vagotomy.11,12 Loss of vagus-dependent gastric motor function and regulation of pyloric resistance require that truncal vagotomy be performed in conjunction with a procedure to facilitate gastric emptying. The combined effect of vagotomy and bypass or destruction of the pylorus appears to be differential emptying of solids and liquids. Emptying of liquids is accelerated, probably secondary to increased intragastric pressure with loss of receptive relaxation,13,14 whereas emptying of solids is more variable.15,16 Vagotomy-induced acceleration of emptying of liquids may contribute to dumping syndrome after gastric drainage or resection procedures.

Gastric denervation procedures have been devised that preserve a more normal neural relationship with the remainder of the gastrointestinal tract than is possible after truncal vagotomy (Fig. 70-1). Selective vagotomy preserves the celiac and hepatic branches of the vagus but still results in gastric atony and requires a concomitant drainage procedure to facilitate gastric emptying. The advantage of this procedure over truncal vagotomy in preventing postvagotomy diarrhea is not clear.17 Highly selective vagotomy preserves the anterior and posterior nerves of Latarjet as well as their terminal branches to the pyloroantral region, while selectively denervating the acid-producing parietal cell mass. The previously described accelerated emptying of liquids from the stomach after vagotomy is least after highly selective vagotomy.14 Highly selective vagotomy has become the most widely accepted antiulcer procedure in the elective setting because it avoids the morbidity associated with loss of pyloroantral function.

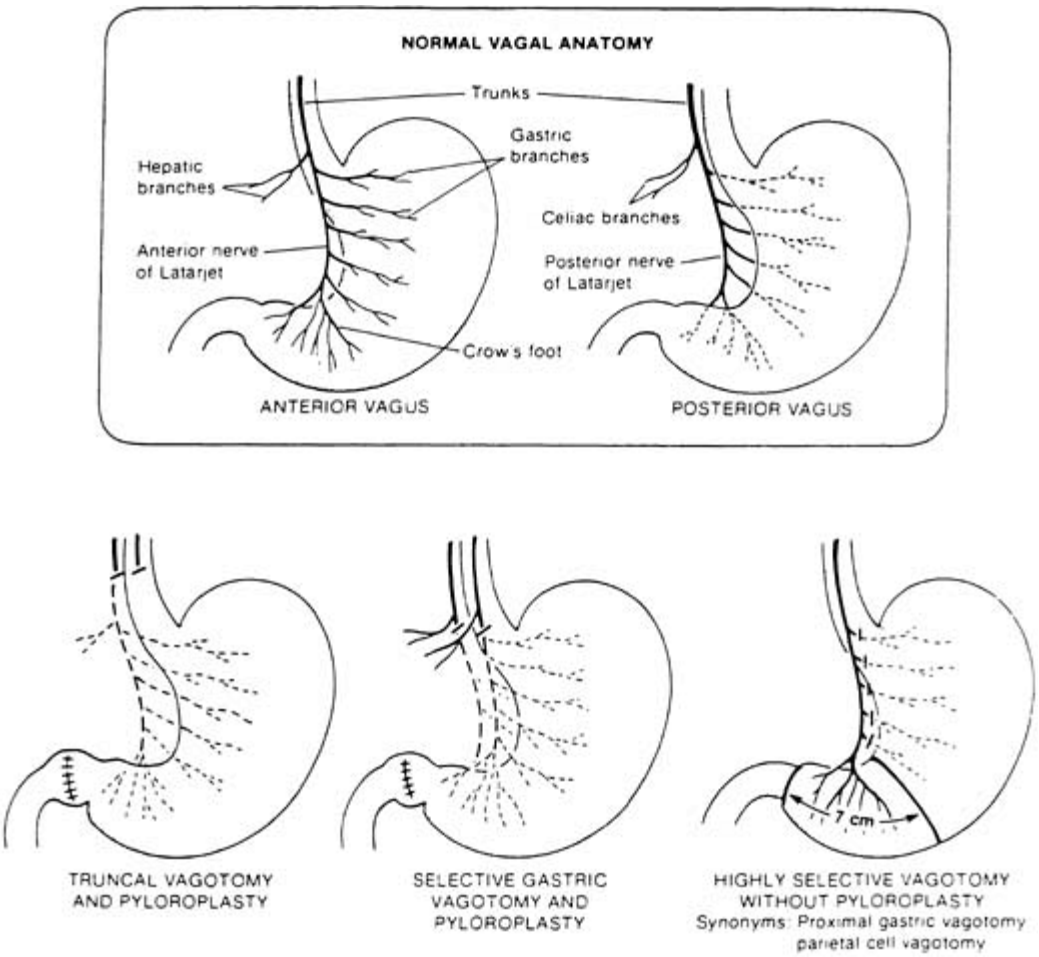

FIGURE 70-1. Normal vagal anatomy and types of vagotomy. Truncal and selective vagotomies are shown with a gastric drainage procedure (pyloroplasty). During truncal vagotomy, nerve trunks are divided above the celiac and hepatic branches. During selective vagotomy, the anterior and posterior nerves are divided *distal* to the celiac and hepatic branches, thus preserving extragastric innervation of the gastrointestinal tract and theoretically reducing the risk of gallstone formation and diarrhea. During highly selective vagotomy, individual branches of the anterior and posterior nerves of Latarjet to the body of the stomach are divided, sparing the terminal branches to the pylorus and antrum ("crow's foot"). Pyloroantral motor function is thus preserved, and gastric drainage is unnecessary. (From Debas HT, Orloff SL. Surgery for peptic ulcer disease and postgastrectomy syndromes. In: Yamada T, ed. Textbook of gastroenterology, 2nd ed. Philadelphia: JB Lippincott, 1995.)

Specific Operations

Vagotomy and Drainage

If truncal or selective vagotomy is performed, the clinical effects of resulting gastric atony can be minimized by pyloroplasty, gastroduodenostomy, or gastrojejunostomy (Fig. 70-2). The Heineke-Mikulicz pyloroplasty has historically been the most widely used method of drainage. Vagotomy and drainage offer no real advantage over highly selective vagotomy in

terms of recurrent ulcer risk, and they add the potential complications of diarrhea and dumping syndrome. The most common use of this procedure has been in the setting of bleeding duodenal ulcer in which a gastroduodenotomy is required to gain access to the bleeding site, and closure as a pyloroplasty is very convenient.

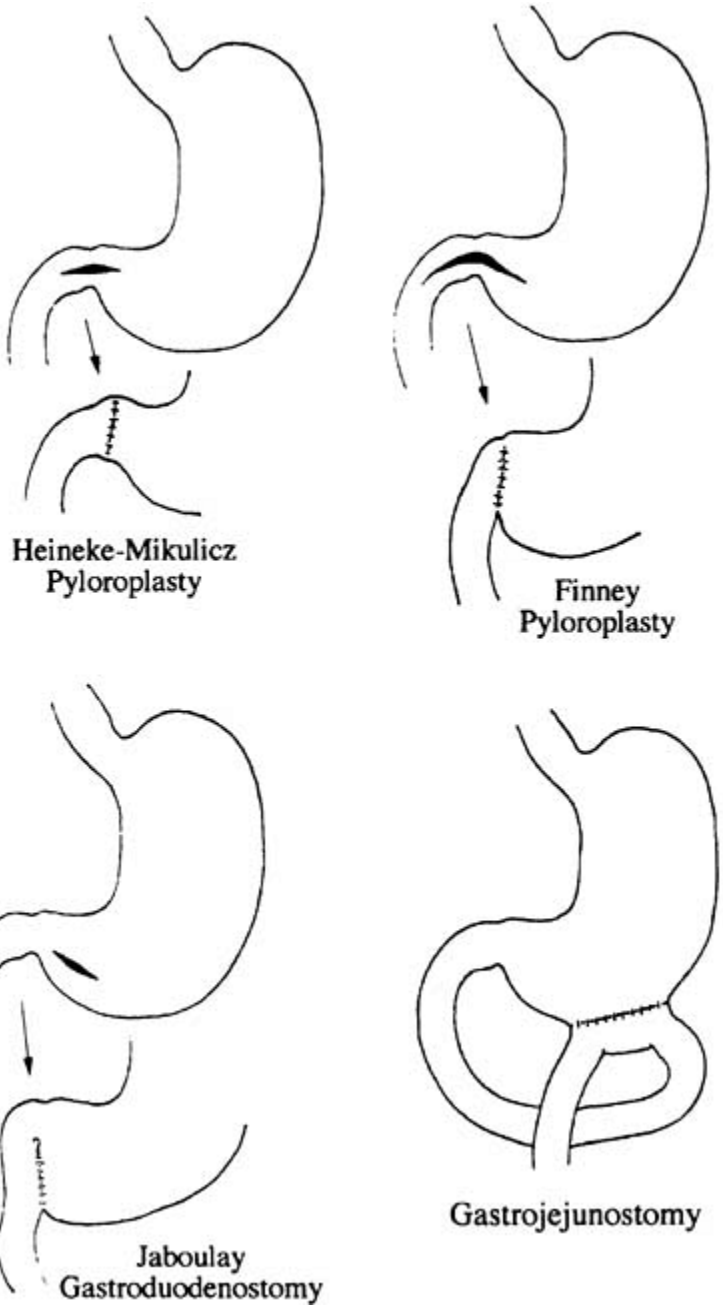

FIGURE 70-2. Methods of gastric drainage: The Heineke-Mikulicz pyloroplasty is most frequently used in cases of duodenal ulcer bleeding, because the transpyloric incision required to expose the bleeding ulcer can easily be closed in a transverse orientation. The Finney pyloroplasty and Jaboulay gastroduodenostomy were historically performed when the duodenal bulb was badly deformed by chronic ulcer scar. A gastrojejunostomy may be performed if access to the pyloroduodenal area is

limited.

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Highly Selective Vagotomy

The ideal operation for peptic ulcer disease is one that is associated with a minimal risk of ulcer recurrence and is tolerated extremely well by patients to whom it is offered. In practice, although highly selective vagotomy is associated with better patient tolerance than other antiulcer procedures, there is considerable variability in reports pertaining to how well it achieves the goal of minimizing risk of ulcer recurrence. Parietal cell vagotomy, superselective vagotomy, and proximal gastric vagotomy are synonymous terms used to describe the procedure.

Highly selective vagotomy is accomplished by dividing the terminal branches of the nerves of Latarjet to the lesser curvature of the stomach, from a point approximately 6 cm proximal to the pylorus to a point at least 5 to 6 cm proximal to the esophagogastric junction on the esophagus (Fig. 70-3). These nerves are found in the anterior and posterior peritoneal leaves of the lesser omentum (gastrohepatic ligament). The two to three terminal branches of the nerves of Latarjet (“crow’s foot”) to the antrum and pylorus are preserved. Great care must be taken to ensure sufficient periesophageal dissection, because high vagal branches can easily be missed.

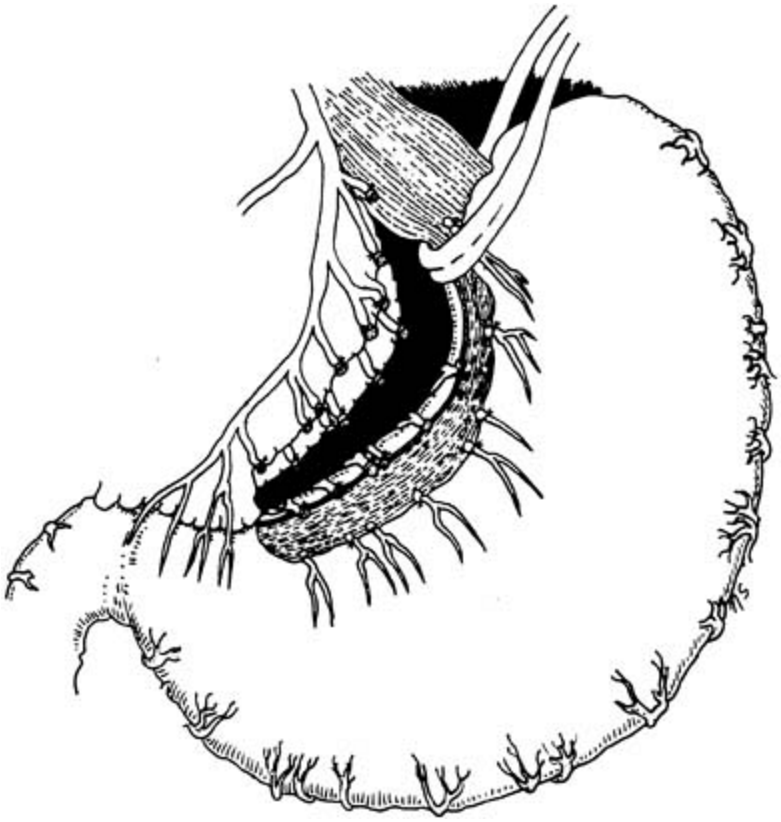

FIGURE 70-3. Highly selective vagotomy. Selective denervation of the parietal cell mass is achieved by careful division of all proximal anterior and posterior vagal branches, distally to a point approximately 6 cm from the pylorus. All surrounding tissues are dissected from a 5- to 6-cm segment of esophagus proximally. Antropyloric innervation must be carefully preserved to prevent postoperative gastric stasis. The bare area on the lesser curvature can be closed with seromuscular sutures, but it is more typically left undisturbed.

Ulcer recurrence rates after highly selective vagotomy are variable and are thought to depend on operator skill as well as duration of follow-up. Ulcer recurrence rates between 9% and 17% have been reported at centers where the procedure has been done frequently.18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38 and 39 A consistently described, time-dependent rise in the incidence of recurrent ulcer suggests that long periods of follow-up (>10 years) are required to examine the results of highly selective vagotomy reliably.23,25

Based on patterns of Congo red staining (a surface pH lower than 3.0 will stain black) during standard highly selective vagotomy, an “extended” highly selective vagotomy has been proposed that adds division of the right and left gastroepiploic pedicles to the other cardinal features of the operation.26 Reports describing the use of extended highly selective vagotomy with intraoperative assessment of completeness of gastric denervation suggest that very low rates of recurrent ulceration can be achieved by the skilled

application of these procedures.26,27,28 and 29

Highly selective vagotomy has been shown to result in an immediate decrease in both basal and maximal acid outputs.20,30 Afterward, there is a time-dependent recovery of basal and maximal acid outputs to approximately 30% and 50% of preoperative levels, respectively.20 Patterns of acid secretion that have been

associated with increased risk of ulcer recurrence after highly selective vagotomy include high preoperative or persistently elevated postoperative basal acid outputs.31,32 High postoperative maximal acid output has also been reported to correspond to an increase in the risk of ulcer recurrence.33,34 These patterns of postoperative acid secretion in patients evaluated on a long-term basis after highly selective vagotomy were correlated with untreated *H pylori* infection.35 In addition to selected patterns of gastric acid hypersecretion, there are data indicating that the ulcer recurrence rate is higher in patients with prepyloric ulcer treated by highly selective vagotomy than in patients with ulcers of the first portion of the duodenum (Fig. 70-4).36,37 and 38 The role of *Helicobacter,* if any, and the potential impact of “extended” procedures in this pattern of disease are uncertain.

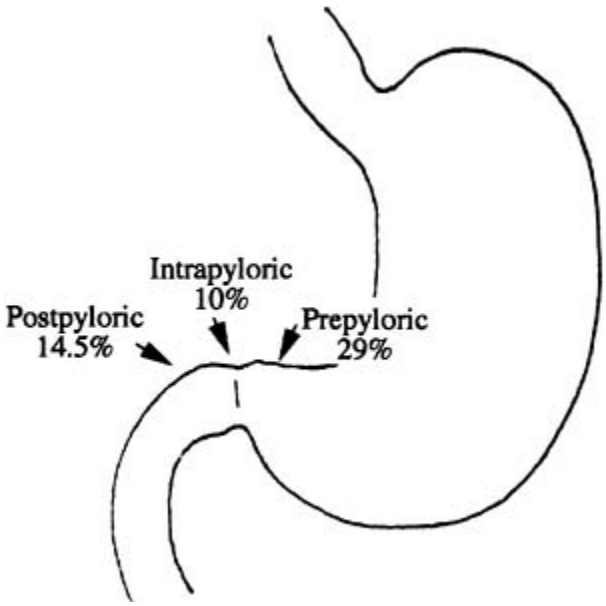

FIGURE 70-4. Ulcer recurrence rate after highly selective vagotomy according to preoperative site of ulcer. The data reported by Schafmayer and colleagues reflect 5-year follow-up of 392 patients. Prepyloric ulcer location appears to be associated with a higher risk of ulcer recurrence than duodenal or intrapyloric location. (Adapted from Schafmayer A, Börger WH, Köhler H, et al. Recurrent ulcers after proximal gastric vagotomy: special aspects of the prepyloric ulcer. Dig Surg 1989;6:4).

Even in the current era of peptic ulcer treatment, highly selective vagotomy will probably continue to play a role, albeit minor, in the management of duodenal ulcers that are *Helicobacter* negative or unresponsive to repeated cycles of antibiotic therapy. Because highly selective vagotomy is now performed so infrequently, referral of patients to tertiary

care centers for this highly technical procedure is advisable.39

Vagotomy and Antrectomy

Of the procedures historically performed for duodenal ulcer, antral resection coupled with truncal or selective vagotomy is associated with the lowest risk of ulcer recurrence (0% to 2%).40,41 However, the risk of postgastrectomy and postvagotomy problems associated with this procedure rendered it a less-favored option as compared with highly selective vagotomy even before the advent of anti-*Helicobacter* therapy. Removal of the gastrin-secreting tissues of the distal stomach retains a large gastric reservoir, which must be anastomosed to either the duodenum (Billroth I) or the proximal jejunum (Billroth II) (Fig. 70-5). After antrectomy for benign disease, gastroduodenostomy (Billroth I) is preferred to gastrojejunostomy, to avoid the problems associated with an afferent anastomotic jejunal limb and duodenal stump. To avoid retained antrum syndrome, it is advisable histologically to verify the presence of duodenal Brunner glands at the distal margin of resection by frozen section after antrectomy, particularly if scarring or active inflammation makes clear identification of the pylorus difficult.

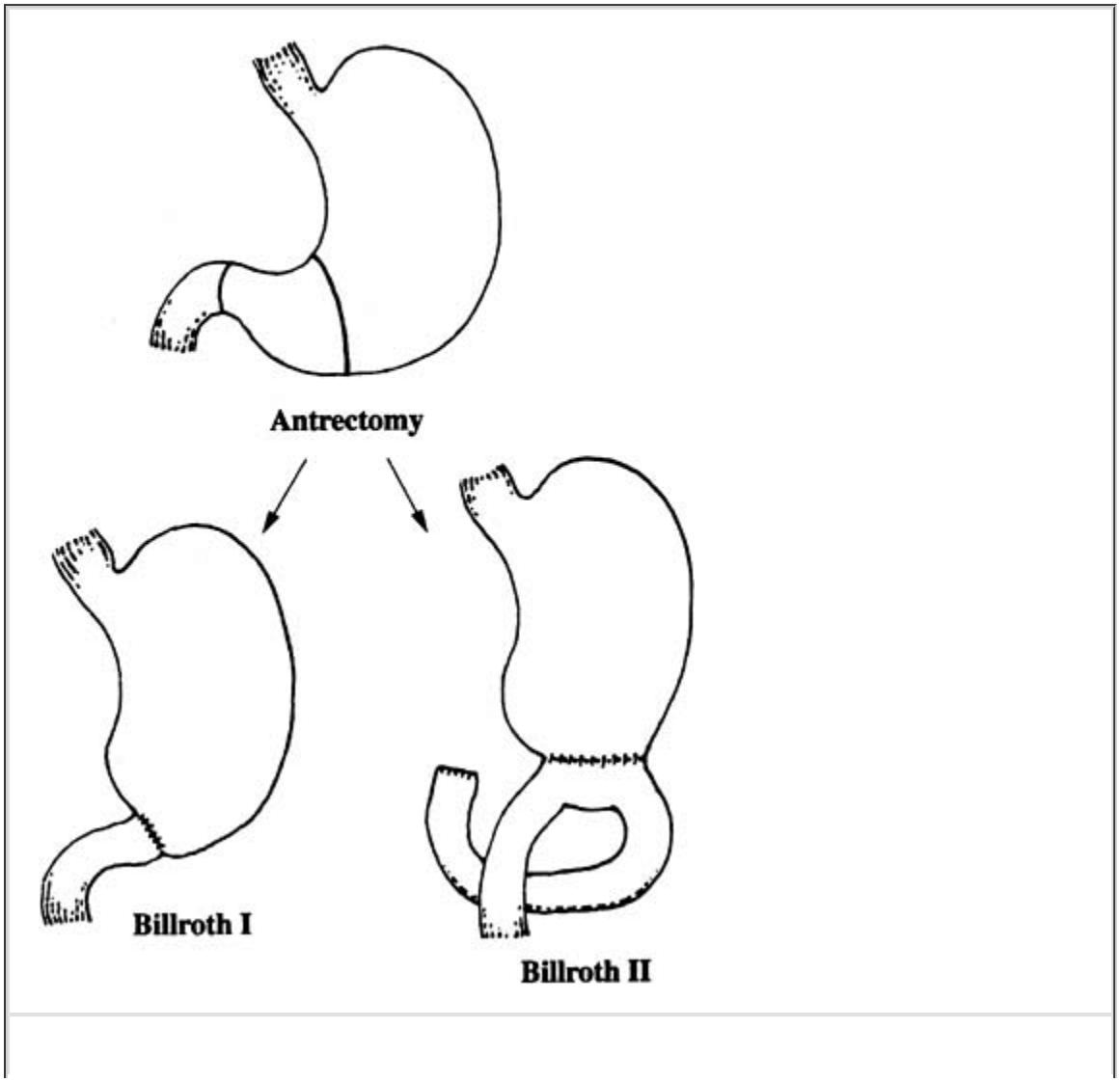

FIGURE 70-5. Reconstruction after gastrectomy: Billroth I (gastroduodenostomy) and Billroth II (loop gastrojejunostomy). Billroth I is the preferred reconstruction after gastrectomy for benign disease.

The decision to perform vagotomy and antrectomy for benign duodenal ulcer disease is an infrequent and difficult one. In the elective setting, highly selective vagotomy offers the advantage of greater patient tolerance, albeit with a higher risk of ulcer recurrence. In complex situations when *Helicobacter*-negative ulcers have failed to respond to antisecretory therapy and ulcer recurrence may be more likely after highly selective vagotomy (prepyloric ulcer or ulcers that are highly resistant to treatment with antisecretory agents), vagotomy and antrectomy may be more satisfactory operations despite their higher associated long-term morbidity.

Laparoscopic Procedures for Peptic Ulcer Disease

Posterior truncal vagotomy and anterior seromyotomy, described by Taylor and colleagues,42,43 have been performed laparoscopically without substantially modifying the

procedures44,45 and 46 (Fig. 70-6). Gastroparesis, dumping syndrome, and postvagotomy diarrhea are encountered no more frequently than after highly selective vagotomy, despite division of the posterior vagal trunk. The major concerns surrounding these operations relate to their unproven efficacy. No data examining extent of residual acid-secreting tissue either intraoperatively or postoperatively are available, nor has eventual gastric reinnervation after anterior seromyotomy been excluded. One report, which examined a modified stapled technique of anterior seromyotomy, described effectively reduced acid secretion and the absence of recurrent ulcer at a mean of 5 years after surgery in a small group of patients.47 Similar results have been achieved with laparoscopic posterior truncal anterior highly selective vagotomy (Hill-Barker procedure).48 The technical feasibility of laparoscopic highly selective vagotomy,49,50 and 51 as well as laparoscopic bilateral truncal vagotomy with pyloromyotomy for drainage,52 has been reported, although the long-term results of these operations are unavailable.

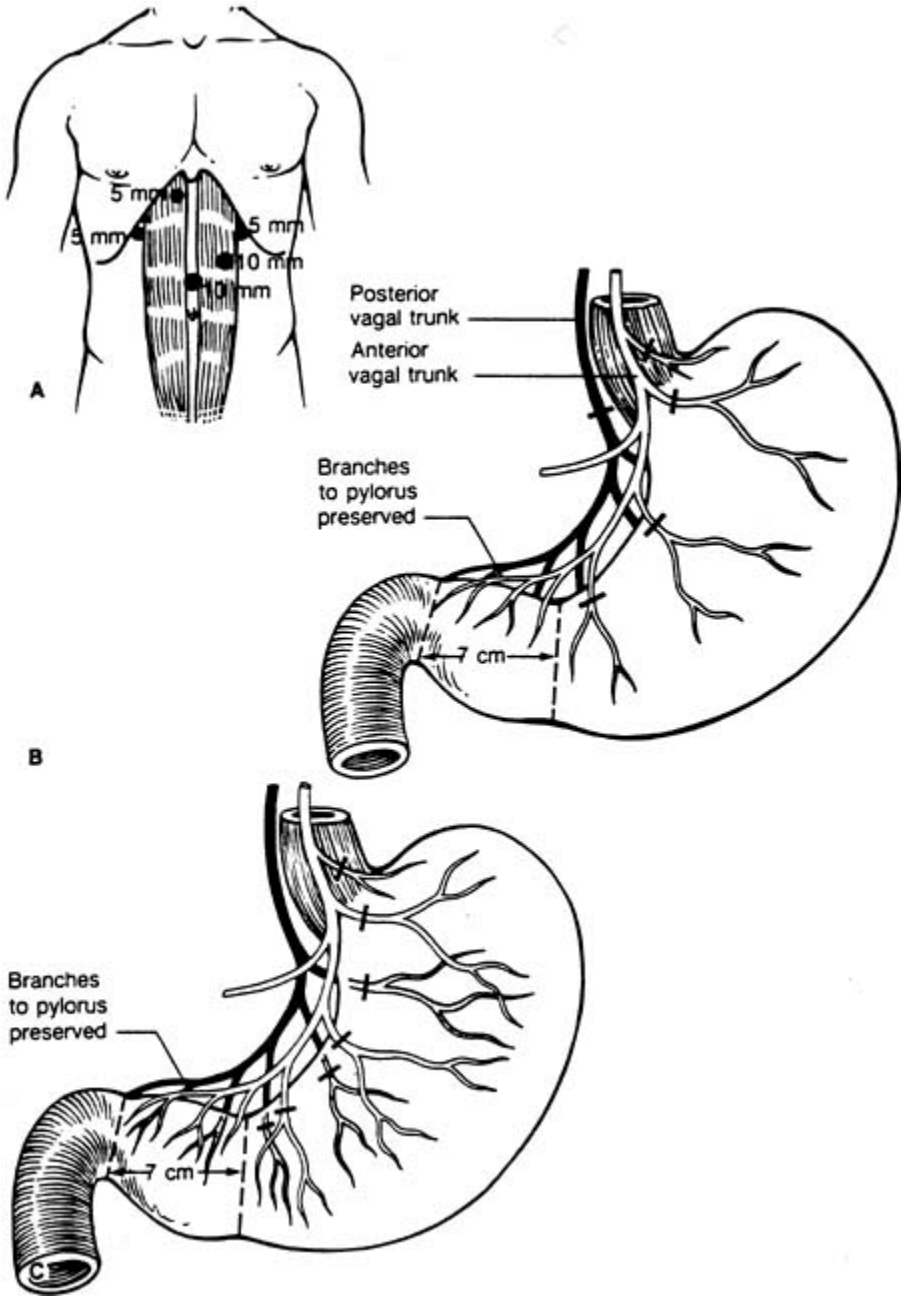

FIGURE 70-6. Laparoscopic operations for peptic ulcer. Procedures typically require five upper abdominal operative ports. Parietal cell denervation is accomplished by (**A**) anterior seromyotomy and posterior truncal vagotomy (Taylor procedure), interrupting the branches of the anterior nerve of Latarjet within the wall of the stomach, or (**B**) a more formal highly selective vagotomy, interrupting the branches of the posterior nerve of Latarjet as well. (From Debas HT, Orloff SL. Surgery for peptic ulcer disease and postgastrectomy syndromes. In: Yamada T, ed. Textbook of gastroenterology, 2nd ed. Philadelphia: JB Lippincott, 1995.)

Laparoscopic truncal vagotomy and antrectomy have been performed at several centers

worldwide, albeit in limited numbers.53,54,55 and 56 These procedures are impressive technical accomplishments, and they offer the advantages conferred by laparoscopic access (decreased postoperative pain and early return to normal function). However, the long-term morbidity of such foregut alterations remains an active concern, irrespective of the method used for access to the abdomen.